Final

Work Plan
Additional Sampling for
CC RVAAP-69 Building 1048 Fire Station,
CC RVAAP-70 East Classification Yard, and
CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift
Ravenna Army Ammunition Plant Restoration Program
Camp Ravenna, Portage and Trumbull Counties, Ohio

November 30, 2017

Contract No.: W912QR-12-D-0002
Delivery Order: 0003

Prepared for:

U.S. Army Corps of Engineers,
Louisville District
600 Dr. Martin Luther King Jr. Place
Louisville, Kentucky 40202-2267

Prepared by:

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Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

RECEIVED 12/28/2017

December 27, 2017

Mr. Mark Leeper, P.G., MBA
Team Lead
Cleanup and Restoration Branch
111 South George Mason St.
Arlington, VA 22204

Re: US Army Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
267000859211

Subject: Approval of "Final Work Plan, Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift", Dated November 30, 2017, Ohio EPA ID #s 267-000859-211, 267-000859-214, and 267-000859-220

Dear Mr. Leeper:

On November 30, 2017, the Ohio Environmental Protection Agency (Ohio EPA) received the "Final Work Plan, Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift" at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. All suggested changes from your October 16, 2017 letter have been incorporated.

Ohio EPA approves the document.

Please call me at (330) 963-1170, if you have questions.

Sincerely,

Bob Princic for

Edward D'Amato
Environmental Specialist
Division of Environmental Response and Revitalization

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None.

14. ABSTRACT

The Work Plan summarizes previous investigations, evaluates existing data, identifies data gaps, and presents a soil and groundwater sampling approach to complete investigations under the RVAAP Restoration Program.
- A Revised Site Inspection report will be completed at CC RVAAP-70 East Classification Yard.
- A Revised Remedial Investigation report will be completed for CC RVAAP-69 Building 1048 Fire Station.
- A Revised Remedial Investigation report will be completed for CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift.
The Work Plan includes a Sampling and Analysis Plan, composed of a Field Sampling Plan and Quality Assurance Project Plan; an Accident Prevention Plan containing a Site Safety Health Plan; and a Waste Management Plan.

15. SUBJECT TERMS

Work Plan, Scope of Work, Additional Sampling, RVAAP=Ravenna Army Ammunition Plant

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for the
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Camp Ravenna, Ohio

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ARNG = Army National Guard
DERR=Division of Emergency and Remedial Response
Ohio EPA=Ohio Environmental Protection Agency
OHARNG = Ohio Army National Guard
REIMS = Ravenna Environmental Information Management System
RVAAP = Ravenna Army Ammunition Plant
USACE = United States Army Corps of Engineers

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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Parsons has completed the Final Work Plan Additional Sampling for Areas of Concern including CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor-Pool Hydraulic Lift at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in this project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions was verified. This included review of data quality objectives; technical assumptions, methods, procedures, and materials to be used; the appropriateness of data used and the level of data obtained; and the reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing United States Corps of Engineers policy.

Independent Technical Reviewer:

Dan Griffiths, PG, CPG ______________________ 27 November 2017

Parsons (Signature) (Date)

Technical Director

Plan Preparer/Reviewer:

Edward Heyse, Ph.D., P.E. ______________________ 27 November 2017

Parsons (Signature) (Date)

Project Manager

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TABLE OF CONTENTS

LIST OF APPENDICES .... **iv**

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

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

ACRONYMS AND ABBREVIATIONS .... **vi**

EXECUTIVE SUMMARY .... **ix**

1.0 PROJECT DESCRIPTION **1**

1.1 Introduction 1
1.2 Project Scope and Objectives 1
1.3 Work Plan Organization 3
1.4 Facility Description and History 3
1.5 Environmental Setting 4
1.5.1 Physiographic Setting 4
1.5.2 Topography 5
1.5.3 Geology 5
1.5.4 Hydrogeology 5
1.5.5 Surface Water 5
1.5.6 Climate 6
1.5.7 Surrounding Land Use 6
1.5.8 Ecology 6

2.0 PREVIOUS INVESTIGATIONS **7**

2.1 CC RVAAP-69 Building 1048 Fire Station 7
2.1.1 Operational History/Description 7
2.1.2 Previous Investigations Summary 7
2.2 CC RVAAP-70 East Classification Yard 11
2.2.1 Operational History/Description 12
2.2.2 Previous Investigations Summary 12
2.3 CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift 20
2.3.1 Operational History/Description 20
2.3.2 Previous Investigations Summary 21

3.0 EVALUATION OF EXISTING DATA **25**

3.1 CC-RVAAP 69 Former Building 1048 Fire Station Data Gap Assessment 25
3.1.1 Conceptual Site Model 25
3.1.2 Data Assembly and Use Assessment 27
3.1.3 Screening Criteria 28

3.1.4 Nature and Extent Evaluation 28
3.1.5 Data Gap Summary 29
3.2 CC-RVAAP 70 East Classification Yard Data Gap Assessment 29
3.2.1 Conceptual Site Model 29
3.2.2 Data Assembly and Use Assessment 32
3.2.3 Screening Criteria 32
3.2.4 Presence/Absence Evaluation 33
3.2.5 Data Gap Summary 33
3.3 CC-RVAAP 74 Building 1034 Motor Pool Hydraulic Lift Data Gap Assessment 34
3.3.1 Conceptual Site Model 34
3.3.2 Data Assembly and Use Assessment 36
3.3.3 Screening Criteria 36
3.3.4 Nature and Extent Evaluation 36
3.3.5 Data Gap Summary 37

4.0 PROPOSED SAMPLING STRATEGY 39

4.1 Proposed Sampling for CC-RVAAP 69 Building 1048 Fire Station 39
4.2 Proposed Sampling for CC-RVAAP 70 East Classification Yard 41
4.3 Proposed Sampling for CC-RVAAP 74 Building 1034 Motor Pool Hydraulic Lift 42

5.0 PROJECT ACTIVITIES 45

5.1 Premobilization 45
5.1.1 Utility Clearance 45
5.1.2 Pre-Field Work Meetings 45
5.2 Mobilization and Site Preparation 45
5.2.1 Temporary Facilities 46
5.2.2 Site Access and Security 46
5.2.3 Decontamination 46
5.2.4 Brush Removal 46
5.2.5 Sludge Removal 47
5.3 Investigation Field Work 47
5.4 Schedule 51
5.5 Analytical Work 51
5.6 Data Management / Data Validation 52
5.7 Surveying and Mapping 52
5.8 Reporting 52
5.9 Project Resources 53

6.0 ENVIRONMENTAL PROTECTION PLAN 54

6.1 Protection of Natural Resources 55
6.2 Protection of Landscape 55
6.3 Protection of Cultural Resources 55

6.4 Disposal of Waste 56
6.5 Protection of Water Resources 56
6.6 Spill Control 56

7.0 PROJECT DOCUMENTATION AND SAMPLE QUALITY ASSURANCE/QUALITY CONTROL 57

7.1 Monthly Activity Reports 57
7.2 Sample Handling and Tracking 57
7.3 Field Activities Coordination 57
7.4 Field and Laboratory Quality Assurance/Quality Control 57
7.5 Bi-Weekly Conference Call and Restoration Advisory Board Meetings 57

8.0 DISPOSITION OF INVESTIGATION-DERIVED WASTE 59

9.0 DATA SCREENING PROCESS 61

9.1 Data Screening for Site Related Compounds 61
9.2 Data Screening for Chemicals of Potential Concern 62
9.3 Data Screening for Chemicals of Concern 62

10.0 DELIVERABLES 65

11.0 REFERENCES 67

FIGURES 69

TABLES 119

LIST OF APPENDICES

Appendix A Field Sampling Plan
Appendix B Uniform Federal Policy-Quality Assurance Project Plan
Appendix C Accident Prevention Plan
Appendix C-1 Site Safety and Health Plan
Appendix D Waste Management Plan
Appendix E Regulatory Correspondence and Comment Response Tables

LIST OF FIGURES

Figure 1-1 Site Location Map Work Plan Additional Sampling for CC RVAAP-69, CC RVAAP-70, and CC RVAAP-74 71
Figure 1-2 Topography at CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift........ 73
Figure 1-3 Topography at CC RVAAP-70 East Classification Yard 75
Figure 1-4 Soils Map of CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift........ 77
Figure 1-5 Soils Map of CC RVAAP-70 East Classification Yard........ 79
Figure 1-6 Geologic Map of Unconsolidated Deposits 81
Figure 1-7 Geologic Bedrock Map at CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift........ 83
Figure 1-8 Geologic Bedrock Map at CC RVAAP-70 East Classification Yard 85
Figure 1-9 Groundwater Unconsolidated Aquifer Map for CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift 87
Figure 1-10 Groundwater Unconsolidated Aquifer Map for CC RVAAP-70 East Classification Yard 89
Figure 1-11 Surface Water Features and Surveyed Wetlands for CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift........ 91
Figure 1-12 Surface Water Features and Surveyed Wetlands for CC RVAAP-70 East Classification Yard 93
Figure 2-1 CC RVAAP-69 Building 1048 Fire Station Existing Sample Locations and Previous Carbon Tetrachloride Detections 95
Figure 2-2 CC RVAAP-70 East Classification Yard Existing Sample Locations 97
Figure 2-3 CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift Existing Sample Locations 99
Figure 3-1 CC RVAAP-69 Building 1048 Fire Station Cross Section A-A' 101
Figure 3-2 CC RVAAP-69 Building 1048 Fire Station Cross Section B-B' 103
Figure 3-3 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Cross Section A-A' .. 105
Figure 3-4 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Cross Section B-B'... 107
Figure 3-5 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Cross Section C-C'... 109
Figure 4-1 CC RVAAP-69 Building 1048 Fire Station Proposed Sample Locations........ 111
Figure 4-2 CC RVAAP-70 East Classification Yard Proposed Soil Sampling........ 113
Figure 4-3 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Proposed Sample Locations 115
Figure 4-4 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Proposed Soil and Groundwater Sample Locations 117

LIST OF TABLES

Table 1-1 Summary of Remedial Investigations and Site Inspection 120
Table 3-1 Summary of Chemical of Potential Concern in Surface and Subsurface Soil at CC RVAAP-69 122
Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard.. 123
Table 3-3 Summary of Analytical Results for Inorganic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard.. 131
Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard.. 135
Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard.. 155
Table 9-1 Chemical of Potential Concern Screening Levels for Surface Soil and Sediment 163
Table 9-2 Chemical of Potential Concern Screening Levels for Subsurface Soil................. 164
Table 9-3 Chemical of Potential Concern Screening Levels for Groundwater...................... 165
Table 9-4 Chemical of Concern Screening Levels for Surface Soil and Sediment 166
Table 9-5 Chemical of Concern Screening Levels for Subsurface Soil................................ 167
Table 9-6 Chemical of Concern Screening Levels for Groundwater.................................... 168

ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
amsl	above mean sea level
AOCs	Areas of Concern
AHAs	Activity Hazard Analysis
AMEC	AMEC Environment and Infrastructure
APP	Accident Prevention Plan
ARNG	Army National Guard
AST	aboveground storage tank
bgs	below ground surface
BSV	background screening value
BUSTR	Bureau of Underground Storage Tank Regulations
Camp Ravenna	Camp Ravenna Joint Military Training Center
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental, Response, Compensation, and Liability Information System
COCs	chemicals of concern
COPCs	chemicals of potential concern
COPECs	chemicals of potential ecological concern
COR	Contracting Officer Representative
CRM	Cultural Resources Manager
DFFO	Director's Final Findings and Orders
DLA	Defense Logistics Agency
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
DQOs	data quality objectives
DRO	diesel range organics
DU	decision unit
ECC	Environmental Chemical Corporation
EM	Engineering Manual
EPCs	Exposure Point Concentrations
ERA	Ecological Risk Assessment
ERIS	Environmental Restoration Information System
FPCON	Force Protection Condition
FSP	Field Sampling Plan
FWCUG	Facility-Wide Cleanup Goal
FWSAP	Facility-Wide Sampling and Analysis Plan
FWSHP	Facility-Wide Safety and Health Plan
GIS	Geographic Information System
GRO	gasoline range organic
HQ	hazard quotient
HRR	Historical Records Review
IDW	Investigation Derived Waste
ISM	incremental sampling methodology

ACRONYMS AND ABBREVIATIONS (CONTINUED)

LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
MEC	Munitions and Explosives of Concern
mg/kg	milligram per kilogram
MRO	Motor Oil-Range Organics
MTBE	methyl tertiary-butyl ether
NCP	National Oil and Hazardous Substances Contingency Plan
NGB	National Guard Bureau
NPL	National Priorities List
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
OSWER	Office of Solid Waste Emergency Response
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PDF	Portable Document Format
PID	photoionization detector
PPE	personal protective equipment
PWS	Performance Work Statement
QA	Quality Assurance
QC	Quality Control
RAB	Restoration Advisory Board
RDBMS	Relational Database Management System
REIMS	Ravenna Environmental Information Management System
RI	Remedial Investigation
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SDSFIE	Spatial Data Standards for Facilities, Infrastructure and Environment
SI	Site Inspection
SOR	Sum of Ratios
SRCs	Site-Related Chemicals
SSHP	Site Safety and Health Plan
SVOC	semivolatile organic compound
TAL	target analyte list
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TNT	2,4,6-trinitrotoluene
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USP&FO	United States Property and Fiscal Officer
UST	underground storage tank
UV	ultraviolet light

ACRONYMS AND ABBREVIATIONS (CONTINUED)

VOC	volatile organic compound
WMP	Waste Management Plan
WOE	weight-of-evidence
WP	Work Plan

EXECUTIVE SUMMARY

Parsons was contracted by the United States Army Corps of Engineers (USACE), Louisville District to conduct environmental services at seven Areas of Concern (AOCs) under Contract No. W912QR-12-D-0002-0003 under the Ravenna Army Ammunition Plant (RVAAP) Restoration Program at Camp Ravenna, Ohio.

This Work Plan (WP) was prepared in accordance with Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) guidance and regulations, the Ohio Environmental Protection Agency (Ohio EPA) Director's Final Findings and Orders (DFFO, Ohio EPA, 2004), and the National Oil and Hazardous Substances Contingency Plan (NCP). This document was prepared in accordance with the *Submission Format Guidelines for the Ravenna Army Ammunition Plant Restoration Program, Version 21* (Vista, 2015). This WP was prepared to address data gaps and conduct additional investigations at three AOCs as identified in the Performance Work Statement (PWS) and thorough an evaluation of existing data. Revised Remedial Investigation (RI) and Site Inspection (SI) reports will be prepared that incorporate the new data collected as part of this Work Plan, responses to Ohio EPA comments on the original Draft reports, as well as information and data already compiled in preliminary draft or draft documents prepared by Environmental Chemical Corporation (ECC) under Delivery Order 0004 of Contract # W912QR-04-D-0039.

This WP also includes a project-specific Field Sampling Plan (FSP), Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP), Accident Prevention Plan (APP), Site Safety and Health Plan (SSHP), and Waste Management Plan (WMP). The FSP is an addendum to the RVAAP Facility-Wide Sampling and Analysis Plan (FWSAP) (Science Applications International Corporation [SAIC] 2011a). The UFP-QAPP was written in accordance with *Office of Solid Waste Emergency Response (OSWER) Directive 9272.0-17 Implementation of the Uniform Federal Policy for Quality Assurance Project Plans at Federal Facility Hazardous Waste Sites* (United States Environmental Protection Agency [USEPA], 2005). The APP was developed using the minimum basic outline provided in Appendix A of the *USACE Engineering Manual (EM) 358-1-1, Safety and Health Requirements Manual* (USACE 2014). The SSHP is an addendum to the RVAAP Facility-Wide Safety and Health Plan (FWSHP) (SAIC 2011b). The WMP was prepared in accordance with CERCLA guidance and regulations and the Camp Ravenna Waste Management Guidelines (Ohio Army National Guard [OHARNG], 2016).

Field investigations outlined in this WP address identified data gaps at three AOCs:

Site Inspection:

- CC RVAAP-70 East Classification Yard

Remedial Investigation:

- CC RVAAP-69 Building 1048 Fire Station
- CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

Previous investigation work to date were reviewed, the existing data to identify data gaps evaluated, and additional investigation activities (groundwater and soil sampling and analysis) to be conducted to address the data gaps are presented. The following paragraphs, arranged by AOC, summarize the information detailed in this WP.

CC RVAAP-69 Building 1048 Fire Station

The fire station was previously located in the former RVAAP Administration Area in the northwest quadrant of the intersection of George Road and South Service Road. No documented evidence was found regarding specific years of service for the Building 1048 Fire Station. A site schematic, dated 1941, was found as part of the Historical Records Review (HRR) (SAIC, 2011c); therefore, it is assumed services commenced shortly after the 1941 building construction. The fire station building was demolished in late 2008, and the site currently remains undeveloped. Possible sources of chemicals of potential concern (COPCs) are unreported spills or leaks from firefighting equipment. Carbon tetrachloride was commonly used through the 1950s to extinguish fires as the chemical was readily available, nonflammable, easily volatilized, and inhibited the combustion process. Former employees reported that it was common practice for the fire department to clean out fire extinguishers behind (i.e., the west side) the fire building, and to allow the contents of the fire extinguishers (carbon tetrachloride) to spill onto the ground surface (SAIC, 2011c).

RI sampling was conducted in 2012 and 2015. Sampling included 4 surface and 16 subsurface incremental sampling methodology (ISM) samples, which were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and target analyte list (TAL) metals. Sampling also included 57 discrete subsurface soil samples from 9 borings which were analyzed for VOCs. Full suite analyses were also performed on one surface sample and four subsurface samples. Data were screened by comparing concentrations to the most stringent Resident Receptor Facility-Wide Cleanup Goals (FWCUGs). June 2017 USEPA Regional Screening Levels (RSLs) for Residential Soil were used for those analytes without established Resident Receptor FWCUGs at cancer risk of 1×10^{-6} or a hazard quotient (HQ) of 0.1. The following COPCs were identified for surface soil: two inorganics (chromium and cobalt) and five SVOCs (benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; dibenz[a,h]anthracene; and indeno[1,2,3-c,d]pyrene). One inorganic (arsenic), one SVOC (benzo[a]pyrene), and two VOCs (carbon tetrachloride and chloroform) were identified as COPCs for subsurface soil. However, only the VOCs have not been delineated.

The existing data was evaluated to identify the following data gaps and propose actions to address those data gaps:

- <u>The vertical extent of carbon tetrachloride in soil at SB101 is not defined.</u> The deepest sample collected from boring 69-1048-SB101 (SB101) at 15-16 feet below ground surface (bgs) exceeded the June 2017 USEPA RSL of 0.65 milligram per kilogram (mg/kg) for carbon tetrachloride. Carbon tetrachloride detected in samples from 5-16 feet bgs in this boring consistently exceeded the USEPA Residential RSL. Concentrations in this boring appear to decrease below 10 feet bgs (~ 1,014 feet above mean sea level [amsl]). Soil concentrations in soil borings 72-1048-RV5-SB2, 69-1048-SB101, 69-1048-SB104, and 69-1048-SB105 range from 0.7 mg/kg to 14 J mg/kg, which exceed the June 2017 USEPA Residential RSL. The boring log shows that SB101 extended to 20 feet bgs; however, no samples were collected for laboratory analysis below 16 feet bgs. A new boring will be installed in the immediate vicinity of the earlier borings SB101 and RV5-SB2. The boring will extend from the ground surface to bedrock, which is estimated to be 45 feet bgs. The length of the core will be screened with a photoionization detector (PID) monitor. Discrete soil samples will be collected every 5 feet from the length of the core in each boring beginning at 10 feet bgs. If a contaminant presence is observed within any five-foot interval based on odor, staining or elevated PID, then the discrete soil samples will be collected from the location within the five-foot interval where the chemical presence is indicated. Soil samples will be analyzed for carbon tetrachloride and its decay products (i.e., chlorinated methanes). All new borings will be continuously logged.

- The lateral extent of carbon tetrachloride in soil is not well defined below a depth of 1018 feet amsl. Carbon tetrachloride concentrations in soil at borings SB101 and SB104 were highest in the vertical interval between 5 and 10 feet bgs (1015 to 1020 feet amsl). The soil borings immediately to the north (SB105), south (SB103) and east (SB102) of SB101 were only sampled to a depth of 10 feet bgs (1018 to 1019 feet amsl). Additional soil borings will be installed north (near SB105), east (near SB102) and south (near SB103) of the maximum detected concentrations. These soil borings will extend to the water table, which is approximately 10 to 20 feet bgs at CC RVAAP-69. All new borings will be continuously logged. The length of the cores will be screened with a PID monitor. If no evidence of a chemical release is noted (no odors, staining, or elevated PID readings), then discrete soil samples will be collected every 5 feet from the length of the core in each boring beginning at 10 feet bgs (i.e., samples at 10, 15 and 20 feet bgs). However, if evidence of potential chemical release is observed, then discrete soil samples will be collected from the interval exhibiting the highest odors, staining, or elevated PID readings. Soil samples will be analyzed for carbon tetrachloride and its decay products. The ground surface elevation at CC RVAAP-69 varies between 1025 and 1029 feet amsl. These proposed samples will define the extent of carbon tetrachloride and its decay products in the vadose zone and upper portions of the saturated zone, which may extend as deep as 1005 feet amsl. Contamination is defined to a depth of about 13 feet bgs (1012 feet amsl) in distal sample locations (SB106, SB109, and SB107); therefore, additional step out samples will not be necessary regardless of whether carbon tetrachloride is detected in any of the proposed soil samples.
- Groundwater was not evaluated as part of the previous investigations. The potentiometric surface for Camp Ravenna aquifers is mapped annually from groundwater elevation measurements in monitoring wells. The groundwater flow direction in the unconsolidated aquifer beneath AOC CC RVAAP-69 is generally to the east at an elevation between 1010 and 1020 feet amsl (10 to 20 feet bgs) (TEC-WESTON Joint Venture, 2016). Groundwater grab samples will be collected, and then groundwater monitoring wells will be installed and monitored to establish the local groundwater flow direction and delineate carbon tetrachloride in groundwater, if any. In order to efficiently optimize the number of monitoring wells needed to define the direction of groundwater flow and monitor a plume, first grab samples will be collected using a Screen Point 16 sampler. If groundwater grab samples cannot be collected from well points, then temporary wells will be installed, developed, and sampled. Groundwater grab samples will be collected from the upper portion of the saturated zone within the unconsolidated aquifer. These screening samples will be used to select monitoring well locations. Initial groundwater grab samples will be collected from near the maximum concentrations detected in soil, near RV5-SB2, and in locations approximately 50 to 70 feet downgradient (east to southeast) of that location (i.e., between the former Building 1048 Fire Station and George Road/South Service Road). Groundwater grab samples will be analyzed for chlorinated methanes on a quick turn (24 hour) basis, and additional step-in or step-out samples will be collected until the plume is delineated or until sampling establishes that carbon tetrachloride or its decay products are not present in groundwater at concentrations above Residential Receptor FWCUGs in

groundwater using the carcinogenic risk level of 10^{-6} or the HQ of 0.1. If a carbon tetrachloride groundwater plume is detected and delineated with grab samples, a minimum of three monitoring wells will be installed; one near the maximum concentrations detected (near RV5-SB2), one upgradient of the source area, and one at the downgradient extent of the plume. More than the minimum of three monitoring wells may be needed to confirm the extent of potential carbon tetrachloride contamination beneath CC RVAAP-69. Borings from the new monitoring wells will be continuously logged. If a carbon tetrachloride groundwater plume is not indicated by the grab samples, at minimum one monitoring well will be installed near RV5-SB2 (where maximum concentrations have been detected in soil). At least two additional monitoring wells will be installed to ensure that the local potentiometric surface can be mapped. Monitoring wells will be installed with screens set across the water table (estimated at 10 to 20 feet bgs) to maximize the likelihood of intercepting any COPCs in groundwater because the maximum concentrations in soil to date are in the interval of 5 to 10 feet bgs. Monitoring wells will be developed and sampled quarterly in the first year for carbon tetrachloride and its decay products (chlorinated methanes). The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program. If dense non-aqueous phase liquid (DNAPL) is present in the bottom of the CC RVAAP-69 monitoring wells, its thickness will be measured with an oil/water interface probe capable of detecting the presence of non-aqueous phase liquid within the well casing.

CC RVAAP-70 East Classification Yard

The former RVAAP was originally equipped with east and west classification yards during the facility's early operational years. The East Classification Yard is located east of Load Line 1 and the Main Defense Logistics Agency (DLA) Ore Storage Area in close proximity to the intersection of Ramsdell Road and Irons Road. No documentation was found during the HRR to define the specific years of operation of the AOC. The East Classification Yard AOC consists of Building 47-40 (Round House, still exists but is not actively used), the former herbicide storage shed (former Building 47-60), the containment area for a former aboveground storage tank (AST) (documented spill of No. 5 fuel oil occurred within the containment area in 1986), and an outdoor open wash rack south of the East Classification Yard (north of Butts-Kistler Road). A railroad track complex is located east of the site and is currently used by the OHARNG. Two former 15,000-gallon diesel fuel underground storage tanks (USTs), RV-11 and RV-22, were located west of the wash rack, but were removed in February 1990 and received No Further Action determinations in April 1992 (SAIC, 2011c).

SI sampling was conducted in 2012. The AOC was divided into seven decision units (DU) to identify potential chemical releases associated with historical practices conducted at the East Classification Yard. The 2012 SI sampling included surface soil, subsurface soil, and dry sediment samples:

- Former Fuel Oil Spill Area (DU01) was established as the area within the containment berm that surrounded the former AST where No. 5 fuel oil was released. One surface soil ISM sample, and 9 subsurface soil ISM samples were collected and analyzed for VOCs, methyl tertiary-butyl ether (MTBE), SVOCs, 2 total petroleum hydrocarbons (TPH)-diesel range organics (DRO) carbon chain compounds (C10-C20, C20-C34), and 1 TPH-gasoline range organics (GRO) carbon chain. Additionally, one subsurface sample was analyzed the full analytical suite.

- Drainage Ditch West of Building 47-40 (DU02) was established to evaluate the dry sediment in the AOC drainage ditches. One dry sediment sample was collected from the drainage ditch to the west of Building 47-40 and analyzed for VOCs, MTBE, SVOCs, TPH-GRO, and TPH-DRO.
- Building 47-40 Round House (DU03) was established as a 15-foot zone surrounding the exterior perimeter of Building 47-40 to sample for potential contamination resulting from locomotive maintenance activities conducted at Building 47-40. One surface soil ISM sample and 7 subsurface soil ISM samples were collected and analyzed for SVOCs, TAL metals and polychlorinated biphenyls (PCBs).
- Building 47-40 Interior Repair Pit (DU04) was established to sample the soil beneath the concrete floor of the Interior Repair Pit. The Interior Repair Pit lies underneath the area where locomotives were maintained and is a low point for any releases, which increases the likelihood of finding potential contamination from activities conducted within Building 47-40. The soil samples collected from the bottom of the Interior Repair Pit (beneath the concrete floor) were considered to be subsurface samples because the concrete floor prevents contact directly with the underlying soil. The SI photo log indicates black grime (called sludge in this WP) in the bottom of the pit. Five soil borings were advanced through the concrete floor of the pit. Auger refusal (due to encountering sandstone bedrock) was encountered at less than 4 feet depth in all five borings; therefore, subsurface soil ISM samples were collected at vertical intervals ranging from 0-1 feet to 0-3.83 feet (below the repair pit bottom). All samples were analyzed for SVOCs, TAL metals and PCBs.
- Former Herbicide Storage Shed (DU05) was established to sample soil around the former herbicide storage shed. One surface soil ISM sample and 9 subsurface soil ISM samples were collected and samples were analyzed for SVOCs and herbicides. One sample was also analyzed for full suite analyses. Additional analyses were performed for VOCs and TPH-GRO on vertical ISM soils collected from DU05 SB02 due to field observations and PID field screening vapor headspace results of 75 parts per million indicating the likelihood of potential contamination in soil at this boring.
- Outdoor Wash Rack Area (DU06) was established to investigate the potential release of chemicals from site operations to surface soil and by infiltration to subsurface soil, and by overland conveyance to nearby drainage ditches. One surface soil ISM sample and 7 subsurface soil ISM samples were collected and analyzed for SVOCs, PCBs, and explosives. Additional analyses were performed for VOCs and TPH-GRO on a vertical ISM soil sample collected from DU06 SB05 due to field observations and PID field screening vapor headspace results of 40 parts per million indicating the likelihood of potential contamination in soil at this boring.
- Drainage Ditch East of Building 47-40 (DU07) was established to evaluate the dry sediment in the AOC drainage ditches. Two dry sediment ISM samples (including a field duplicate) were collected from the drainage ditch to the east of Building 47-40 and analyzed for the full analytical suite including VOCs, MTBE, SVOCs, metals, TPH-GRO and TPH-DRO, herbicides, explosives, PCBs, and propellants.

Data were screened by comparing concentrations to the most stringent Resident Receptor FWCUGs or USEPA Residential Receptor RSLs for those analytes without established FWCUGs at cancer risk of 1×10^{-6} or a HQ of 0.1 (Chapter 3 Tables). Petroleum hydrocarbons were screened using Bureau of Underground Storage Tank Regulation (BUSTR) Action Levels (Ohio Department of Commerce, 2017). Data screening was re-accomplished as part of this WP using FWCUGs (SAIC, 2010) and updated (June 2017) Residential RSLs. Concentrations of petroleum constituent VOCs and SVOCs at Former Fuel Oil Spill Area DU01 were also compared to appropriate FWCUGs or RSLs. Chemicals exceeding these screening levels in surface soil and/or dry sediment are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and Aroclor 1242. These results are consistent with the Draft SI Report (ECC, 2015a), except that benzo(a)pyrene exceeded its FWCUG at the Former Fuel Oil Spill Area DU01. These chemicals do not have Camp Ravenna background values. All inorganics were below Camp Ravenna background levels, except arsenic in the dry sediment samples from the ditches. In the Draft SI Report (ECC, 2015a), arsenic was eliminated because concentrations were below the wet sediment background value. Chemicals exceeding these screening levels in subsurface soil are benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. Inorganics in subsurface soil were below Camp Ravenna background levels. These results are consistent with the Draft SI Report (ECC, 2015a). Petroleum constituent VOCs and SVOCs at the Former Fuel Oil Spill Area (DU01) had formerly been compared only to BUSTR Soil Class 2 Action Levels. VOC and SVOC data at the Former Fuel Oil Spill Area (DU01) were re-evaluated and compared to FWCUGs (SAIC, 2010) or to June 2017 Residential RSLs if FWCUGs were not available. Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene in subsurface soil at the Former Fuel Oil Spill Area (DU01) exceeded the screening criteria.

Existing data was evaluated as part of the WP to identify the following data gaps and propose actions to address those data gaps:

- <u>Soil underneath the floor inside Building 47-40 has not been sampled at locations that are stained and cracked</u>. Prior to sampling, oily sludge will be removed from the floor of Building 47-40 and Interior Repair Pit. The sludge will be removed to reveal areas of the floor that are stained and cracked and therefore the most likely routes that chemicals could have followed to enter the subsurface, and to prevent cross contamination when borings are advanced through the floor. After removing the sludge from the floor of Building 47-40, the concrete floor will be inspected for cracks and stains. Additional soil sampling within this building is proposed to target soil underneath visible cracks and stains on the concrete floor of Building 47-40 in order to confirm/deny evidence of impact below the concrete floor. Two soil borings will be installed near cracks and biased towards locations which exhibit staining or had sludge on the floor. One of these borings will be near the former oil storage rack on the East wall of Building 47-40 through the wooden floor in that area. Discrete soil samples will be collected from each boring at 2-foot intervals down to 7 feet bgs or until sandstone is reached (from 0-2, 2-4, 4-6, and 6-7 feet bgs), and samples will be analyzed for VOCs, SVOCs, PCBs, and TAL metals. All new borings will be continuously logged.
- <u>Soil underneath the concrete floor of the Interior Repair Pit (DU04) has not been sampled for VOCs</u>. After the sludge is removed as described above, the concrete floor of the Interior Repair Pit will be inspected for any visible cracks and staining after the sludge is removed. Two soil borings will be drilled inside the Interior Repair Pit with preference given to any

locations with cracks, staining, or sludge noted on the concrete floor. The length of the cores will be screened with a PID monitor. If no evidence of a chemical release is noted (no odors, staining, or elevated PID readings), then discrete soil samples will be collected every 2 feet from the length of the core in each boring. However, if evidence of potential chemical release is observed, then discrete soil samples will be collected from the interval exhibiting the highest odors, staining, or elevated PID readings. Samples from each boring will be analyzed to confirm/deny the presence of VOCs. Previous boring logs indicate that sandstone was reached from approximately 1-4 feet bgs in the pit; therefore, the proposed soil borings will be drilled until sandstone is reached. All new boings will be continuously logged.

- Discrete soil samples have not been collected and analyzed for VOCs from locations at the Outdoor Wash Rack Area at the vertical interval where odor and elevated PID readings were noted in boring logs. Boring logs for 70-4759-DU6-SB1 and 70-4759-DU6-SB5 at the wash rack area indicated elevated PID readings in 2012. Proposed additional soil sampling will target the soil near these previous borings with elevated PID readings at the wash rack to confirm/deny the presence of VOCs. Borings will be drilled near 70-4759-DU6-SB1 and 70-4759-DU6-SB5, and soil cores will be collected from 1 to 7 feet bgs. The entire soil core will be screened with a PID and discrete samples will be collected from the depth intervals with field indications of potential contamination such as staining, odors, or elevated PID readings. However, if no field evidence is noted, then samples will be collected from the 6 to 7 feet bgs interval, which indicated elevated PID readings and odor during the 2012 field investigation. The soil samples will be analyzed for VOCs. All new boings will be continuously logged.
- Sediment from the storm drain at the southwest corner of Building 47-40 has not been sampled for potential contamination that may have resulted from the Outdoor Wash Rack. The storm drain at the southwest corner of Building 47-40 will be inspected where wash water may have drained from the wash rack for staining, odors, or elevated PID readings. A sediment sample will be collected from the storm drain and analyzed for PCBs, SVOCs, and explosives. One boring will be drilled as close to the drain as possible and soil samples will be collected to determine if subsurface soil near this storm drain was impacted by historical activities at the wash rack. Subsurface soil samples will be collected from 1-3, 3-5, and 5-7 feet bgs from the boring and analyzed for VOCs, PCBs, SVOCs, and explosives. All new boings will be continuously logged.

CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

Building 1034 Motor Pool Hydraulic Lift is located south of the intersection of George Road and South Service Road just south of Building 1037 in the Administration Area in the south-central portion of Camp Ravenna. The Building 1034 Motor Pool Hydraulic Lift consists of the former underground hydraulic lift at Building 1034. Design drawings for the building and lift are dated 1941. There is one in-ground hydraulic lift that is composed of two cylinders; each in its own underground vault. The smaller (eastern) vault contains a hydraulic cylinder the portion of the lift that fitted under the rear axle of a vehicle. The larger, “L” shaped (western) vault contained a separate hydraulic cylinder for the front axle and a storage tank that stored the hydraulic fluid. The position of the front axle lift could be adjusted to accommodate different sized vehicles. When it was realized that the hydraulic system was losing fluid, an attempt was made to find the leak and the lift was taken out of service. The date that the lift was taken out of service was not recorded. The underground hydraulic lift is in place but no longer active. Building 1034 is currently unoccupied and used for storage, however, the Army plans to remodel the building for use as a workspace.

RI sampling was conducted in 2013. Only subsurface soil was sampled because the AOC is inside an existing building and is covered by the concrete floor. A total of 21 soil borings were advanced through the floor to depths ranging from 6 to 15 feet bgs, and soil samples were collected from intervals where hydrocarbon odor or staining was noted. If there was no indication of hydrocarbons, then soil samples were collected from the bottom of the boring. A total of 33 discrete samples and one composite sample were collected. All soil samples were analyzed for polycyclic aromatic hydrocarbons (PAHs), DRO, and motor oil-range organics (MRO) because the hydraulic fluid used in the lift contained mineral oil (a petroleum by-product). One sample was analyzed for the full suite of analytes. A total of 18 PAHs were detected and identified as Site-Related Chemicals (SRCs, including all 7 PAHs regulated under BUSTR). However, none of the PAH SRCs exceeded their BUSTR Soil Class 1 Action Levels or FWCUGs. Therefore, the horizontal and vertical extent of SVOCs/PAHs has been delineated at this AOC, and delineation of PAHs in soil is not a data gap. No further sampling or analysis for PAHs in soil is proposed. DRO and MRO petroleum hydrocarbons (which together encompass the range of mineral oil-based hydraulic fluid) were detected in 10 of 21 borings sampled at depths up to 14 feet bgs. MRO detections in two soil borings 5,900 mg/kg at 6-6.5 feet bgs in 74-1034-HL-SB17 and 26,000 mg/kg at 8-8.5 feet bgs in 74-1034-HL-SB18, located on opposite sides of the rear axle portion of the hydraulic lift, exceeded the BUSTR Soil Class 1 Action Limit of 5,000 mg/kg. The boring log for 74-1034-HL-SB18 indicated "free product" at 7.5-8.0 feet bgs. MRO was the only COPC identified.

To avoid confusion, the TPH-C_{10} to C_{20} distillate range previously described in the Draft RI as "diesel range organics" or "DRO" will be more accurately described in this WP as "middle distillates range." Also, the TPH-C_{20} to C_{34} distillate range described in the Draft RI is "motor oil range" or "MRO" (not to be confused with middle rage organics or distillates) will be more accurately described in this WP as "heavy distillates range." Existing data were evaluated to identify the following data gaps and propose actions to address those data gaps:

- <u>It is unclear if the "free product" historically identified in 74-1034-HL-SB18 at 7.5 to 8.5 feet bgs is mobile light non-aqueous phase liquid (LNAPL) or residual LNAPL.</u> The historic boring log for SB18 noted "free product," and the concentration of TPH-C_{20} to C_{34} heavy distillates range in soil exceeds the saturation level for Class 1 soil. These results could indicate the presence of mobile LNAPL. However, the results could also represent residual LNAPL only. A new boring will be installed in the immediate vicinity of the earlier boring 74-1034-HL-SB18; the soil will be photographed, visually inspected, and scanned with an ultraviolet light (UV) light and PID to evaluate if mobile LNAPL flows out of the formation versus residual LNAPL or oil that is essentially immobile and held in capillary spaces. An UV light will also be used to help screen for the presence of hydraulic oil. All new borings will be continuously logged. A soil sample will be collected from 7.5 to 8.5 feet bgs to confirm what was found by evaluating the chromatograph to a known sample of hydraulic fluid (i.e., mineral oil). Soil samples will be analyzed for VOCs, TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges, and PCBs. A temporary well will be installed in the borehole to a depth of approximately 10 feet bgs and screened across the vertical interval where "free product" was historically noted in the gravel layer on the SB18 boring log. The temporary well will be developed. Measurements (depth to LNAPL and/or water) will be made to determine if mobile LNAPL flows into the well, indicating the presence or absence of mobile LNAPL.

- <u>The horizontal extent of COPCs in soil is not defined east and south of 74-1034-HL-SB18.</u> The elevated TPH-C_{20} to C_{34} heavy distillates range detections at SB18 and SB17 were detected at approximately 6 to 8.5 feet bgs. However, to the east and south of SB18, soil in borings 1034-HL-SB-14 and 74-1034-HL-SB-19 did not indicate elevated PID readings, odor or staining at this interval. Soil was only sampled at the bottom of these boreholes at about 14 feet bgs, and, therefore, the extent of COPCs in soil was not bounded east and south of SB18. Soil borings will be advanced in the immediate vicinity of the earlier borings 1034-HL-SB-14 and 74-1034-HL-SB-19, and collect soil samples from 7.5 to 8.5 feet to evaluate the horizontal extent in east and south of 74-1034-HL-SB18. Soil samples will be analyzed for VOCs, TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges. All new soil boings will be continuously logged.

- <u>Groundwater was not evaluated as part of the previous investigations, and it is unknown if groundwater is impacted or if enough hydraulic fluid was released to accumulate as mobile LNAPL at the water table</u>. The potentiometric surface for Camp Ravenna aquifers is mapped annually from groundwater elevation measurements in monitoring wells. The groundwater flow direction in the unconsolidated aquifer beneath AOC CC RVAAP-69 is generally to the east at an elevation between 1010 and 1020 feet amsl (TEC-WESTON Joint Venture, 2016). Depth to groundwater is expected to be between 10 to 20 feet bgs. Groundwater grab samples will be collected and analyzed, and then groundwater monitoring wells will be installed and sampled to establish the local groundwater flow direction and delineate potential hydraulic fluid (mobile LNAPL and/or dissolved phase) in groundwater, if any. In order to efficiently optimize the number of monitoring wells needed to define the direction of groundwater flow and monitor a potential plume, first groundwater grab samples will be collected using a Screenpoint 16 sampler. If groundwater grab samples cannot be collected from well points, then temporary wells will be installed, developed, and sampled. Groundwater grab samples will be collected from the upper portions of the saturated zone within the unconsolidated aquifer. The results from these screening samples will be used to select monitoring well locations. Initial groundwater grab samples will be collected approximately 20 feet downgradient (east and southeast) of soil boring 74-1034-HL-SB18 where the maximum TPH-C_{20} to C_{34} heavy distillates range concentrations were detected in 2013 (i.e., outside the southeast corner of Building 1034). Groundwater grab samples will be analyzed for VOCs and PAHs on a quick turn (24 hour) basis. Additional step-out samples will be collected until the plume is delineated or until groundwater grab samples establish that VOCs and PAHs are not present in groundwater above BUSTR Action Levels. Constituents that do not have BUSTR Action Levels will be compared to Resident Receptor FWCUGs using the carcinogenic risk level of 10^{-6} or the HQ of 0.1 or current USEPA Residential RSLs (June 2017). A minimum of three monitoring wells will be installed and developed; one near the maximum detection of TPH-C_{20} to C_{34} heavy distillates range in soil (near SB18), one upgradient well near the cylinder that held the hydraulic fluid (near SB02), and one at the downgradient extent of the plume (if a plume exists). More than the minimum of three monitoring wells may be needed to confirm the extent of potential contamination beneath CC RVAAP-74. Borings from new monitoring wells will be continuously logged. Monitoring wells will be installed with screens set across the water table (estimated at 10 to 20 feet bgs) to maximize the likelihood of intercepting mobile LNAPL or a hydrocarbon plume. The fluid levels in the wells will be measured to detect mobile LNAPL, if any, and groundwater samples will be analyzed for VOCs, PAHs, and PCBs. The local potentiometric surface will be mapped using groundwater elevations in wells installed at CC RVAAP-74 and adjacent AOC CC RVAAP-69. Monitoring wells will be developed and sampled quarterly for the first year. The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program.

- Only one soil sample was analyzed for VOCs. Although hydraulic fluid is not expected to contain volatile components, it is possible that VOCs were used and released as part of automobile maintenance activities in Building 1034. All soil samples from this AOC will be analyzed for VOCs in addition to TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges. One soil sample will be analyzed for PCBs. All groundwater samples from this AOC will be analyzed for VOCs and PAHs. Groundwater samples from groundwater monitoring wells will also be analyzed for PCBs.

1.0 PROJECT DESCRIPTION

1.1 Introduction

This Work Plan (WP) is submitted to the United States (U.S.) Army in accordance with Section 3 the Performance Work Statement (PWS) for environmental services at Areas of Concern (AOCs) under the Ravenna Army Ammunition Plant (RVAAP) Restoration Program at Camp Ravenna, Ohio. The task order was issued by the United States Army Corps of Engineers (USACE), Louisville District on 27 July 2016.

This WP was prepared in accordance with Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) guidance and regulations, Ohio Environmental Protection Agency (Ohio EPA) Director's Final Findings and Orders (DFFOs, Ohio EPA, 2004), and the National Oil and Hazardous Substances Contingency Plan (NCP). The U.S. Army is bound to the DFFOs issued 10 June 2004 by the Ohio EPA pursuant to the authority vested under Chapters 3734, 3745, and 6111 of the Ohio Revised Code. The objective of the Orders is to ensure that the public health, safety, and welfare, as well as the environment, is protected from the disposal, discharge, or release of chemicals. The former RVAAP is not on the United States Environmental Protection Agency (USEPA) National Priorities List (NPL), although it is in the USEPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database. The Ohio EPA is the lead environmental regulator for the RVAAP restoration program. The DFFOs form the basis for the implementation of a CERCLA-based environmental remediation program at the installation.

This WP describes data gap investigations to complete the Site Inspection (SI) at CC RVAAP-70 East Classification Yard and Remedial Investigations (RI) at CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift at Camp Ravenna under Delivery Order 0003 of Contract No. W912QR-12-D-0002. The revised documents will be prepared incorporating the new data collected as part of this WP, responses to Ohio EPA comments on the original Draft reports, as well as information and data already compiled in preliminary draft or draft documents prepared by Environmental Chemical Corporation (ECC) under Delivery Order 0004 of Contract # W912QR-04-D-0039. The locations of AOCs included in this WP are presented in Figure 1-1. The three AOCs addressed in this WP and the investigation activities to be completed are summarized in Table 1-1.

1.2 Project Scope and Objectives

The objective of this WP is to identify and propose sampling for any remaining data gaps that must be addressed to complete the RIs for AOCs CC RVAAP-69 and CC RVAAP-74, and the SI for AOC CC RVAAP-70. The scope of this WP includes:

- Provide a summary of all historical reports and conclusions for the three AOCs requiring further evaluation (see Section 2.0 of this WP);
- Evaluate existing soil sampling data and determine whether data gaps exist (see Section 3.0 of this WP);
- Present a sampling approach to address the data gaps to complete the RI and SI Reports (see Sections 4.0 and 5.0 of this WP), including:
- Conduct additional sampling as necessary to determine the presence/absence or nature and extent of contamination at the AOCs;

- Determine groundwater characteristics to include flow direction and the nature and extent (horizontal and vertical) of chemicals of potential concern (COPCs) in groundwater, if any, as part of the RI reports at CC RVAAP-69 and CC RVAAP-74;
- Install groundwater monitoring wells at CC RVAAP-69 and CC RVAAP-74. One groundwater monitoring well at each of these two AOCs will be installed at or near the soil sampling location exhibiting the highest detections of COPCs, if any.
- Sample the groundwater monitoring wells quarterly for the first year, and report sampling and analytical results in the Revised RI reports for CC RVAAP-69 and CC RVAAP-74. The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program.
- Present the human health and ecological risk assessment methodology that will be presented in the Revised RI reports to assess human health and ecological risks (see Section 9.0 of this WP);

This WP presents sampling protocol and sample locations to address data gaps, health and safety specifications to minimize the potential for personnel injury or illness, and quality assurance (QA) and quality control (QC) requirements to ensure data are usable and defensible. The Field Sampling Plan (FSP) is an addendum to the RVAAP Facility-Wide Sampling and Analysis Plan (FWSAP) (Science Applications International Corporation [SAIC] 2011a). The Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) was written in accordance with *Office of Solid Waste Emergency Response (OSWER) Directive 9272.0-17 Implementation of the Uniform Federal Policy for Quality Assurance Project Plans at Federal Facility Hazardous Waste Sites* (USEPA, 2005). The Accident Prevention Plan (APP) was developed using the minimum basic outline provided in Appendix A of the *USACE Engineering Manual (EM) 358-1-1, Safety and Health Requirements Manual* (USACE November 2014). The Site Safety and Health Plan (SSHP) is an addendum to the RVAAP Facility-Wide Safety and Health Plan (FWSHP) (SAIC 2011b). The Waste Management Plan (WMP) was prepared in accordance with CERCLA guidance and regulations and the Camp Ravenna Waste Management Guidelines (Ohio Army Nation Guard [OHARNG], 2016).

The FSP (Appendix A) outlines the sampling strategy, field methods, and requirements for implementing field sampling activities. The project-specific UFP-QAPP (Appendix B) presents the data quality objectives (DQOs) for field sampling, laboratory analysis, and reporting, which will provide results to be used in risk assessments presented in the RI and SI Reports. The project-specific APP (Appendix C) and SSHP (Appendix C-1) present the potential hazards, project-specific staff organization, qualifications, responsibilities, training requirements, activity hazard analyses (AHAs), and monitoring requirements that may be encountered during the implementation of the WP. The WMP (Appendix D) describes all waste management and tracking activities.

CC RVAAP-69 and CC RVAAP-74 have previously undergone investigations to characterize the nature and extent of COPCs, as well as evaluate human health and ecological risks. Data from the previous investigations will be compiled with any new data collected under this WP to develop the Revised RI Reports. Ohio EPA comments on original Draft version of the CC RVAAP-74 RI report will also be addressed in the Revised RI Report.

CC RVAAP-70 has previously undergone an investigation to determine the presence or absence of potential contamination in surface soil, subsurface soil, and dry sediment. Data from the previous investigation will be compiled with any new data collected under this WP to develop the Revised SI Report. Ohio EPA comments on original Draft version of the CC RVAAP-70 SI report will also be addressed in the Revised SI Report.

1.3 Work Plan Organization

This WP provides the technical approaches and field activities to be completed in order to fill data gaps for the SI and RIs at the three AOCs. This WP has the following contents:

- Section 1—Project Description
- Section 2—Previous Investigations
- Section 3—Evaluation of Existing Data
- Section 4—Proposed Sampling Strategy
- Section 5—Project Activities
- Section 6—Environmental Protection Plan
- Section 7—Project Documentation and Sample Quality Assurance/Quality Control
- Section 8—Disposition of Investigation-Derived Waste
- Section 9—Data Screening Process
- Section 10—Deliverables
- Section 11—Conclusions
- Section 12—References

This WP consists of six appendices:

- Appendix A—Field Sampling Plan (FSP)
- Appendix B—Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP)
- Appendix C—Accident Prevention Plan (APP)
  - Appendix C-1—Site Safety and Health Plan (SSHP)
- Appendix D—Waste Management Plan (WMP)
- Appendix E—Signed Documentation and Correspondence (included in Final WP)
- Appendix F—Comment Response Table (included in Final WP)

1.4 Facility Description and History

The former RVAAP, now known as the Camp Ravenna Joint Military Training Center (Camp Ravenna), located in northeastern Ohio within Portage and Trumbull counties, is approximately three (3) miles east/northeast of the City of Ravenna and one (1) mile north/northwest of the City of Newton Falls. Camp Ravenna is federally owned and is approximately 11 miles long and 3.5 miles wide. Camp Ravenna is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk

Southern Railroad to the north; and State Route 534 to the east. In addition, Camp Ravenna is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland.

Industrial operations at the former RVAAP consisted of 12 munitions-assembly facilities referred to as "load lines." Load lines 1 through 4 were used to melt and load 2,4,6-trinitrotoluene (TNT) and Composition B into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls were cleaned with water and steam. Following cleaning, the waste water, containing TNT and Composition B, was known as "pink water" for its characteristic color. Pink water was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport to earthen settling ponds. Load Lines 5 through 11 were used to manufacture fuses, primers, and boosters. Potential chemicals in these load lines include lead compounds, mercury compounds, and explosives. From 1946 to 1949, Load Line 12 was used to produce ammonium nitrate for explosives and fertilizers prior to use as a weapons demilitarization facility.

In 1950, the former RVAAP was placed in standby status and operations were limited to renovation, demilitarization, and normal maintenance of equipment, along with storage of munitions. Production activities were resumed from July 1954 to October 1957 and again from May 1968 to August 1972. In addition to production missions, various demilitarization activities were conducted at facilities constructed at Load Lines 1, 2, 3, and 12. Demilitarization activities included disassembly of munitions and explosives melt-out and recovery operations using hot water and steam processes. Periodic demilitarization of various munitions continued through 1992.

In addition to production and demilitarization activities at the load lines, other facilities at the former RVAAP included sites that were used for the burning, demolition, and testing of munitions. These burning and demolition ground consisted of large parcels of open space or abandoned quarries. Other types of sites present at the former RVAAP include landfills, an aircraft fuel tank testing facility, material storage areas, and various general industrial support and maintenance facilities.

As of September 2013, administrative accountability for the entire 21,683-acre facility has been transferred to the United States Property and Fiscal Officer (USP&FO) for Ohio and the property subsequently licensed to the OHARNG for use as a military training site, Camp Ravenna. The RVAAP restoration program involves cleanup of former production/operational areas throughout Camp Ravenna related to former activities conducted under the RVAAP.

1.5 Environmental Setting

This section describes the physical features, topography, geology, hydrogeology, and environmental characteristics of Camp Ravenna and the three AOCs addressed in this WP.

1.5.1 Physiographic Setting

Camp Ravenna is located within the Southern New York Section of the Appalachian Plateaus physiographic province (Brockman, 1998). This province is characterized by elevated uplands underlain primarily by Mississippian and Pennsylvanian age bedrock units that are horizontal or gently dipping. The province is characterized by its rolling topography with incised streams having dendritic drainage patterns. The Southern New York Section has been modified by glaciation, which rounded ridges, filled major valleys, and blanketed many areas with glacially-derived unconsolidated deposits (e.g., sand, gravel, and finer-grained outwash deposits). As a result of glacial activity in this section, old stream drainage patterns were disrupted in many locales, and extensive wetland areas developed.

1.5.2 Topography

Camp Ravenna consists of generally flat ground cut through by stream valleys. Elevation on the site varies from 1100 feet above mean sea level (amsl) in the east to 1150 feet amsl in the west and 1200 feet amsl in the central portion if the site. Locations of the AOCs are presented in Figure 1-1. Local topography is presented on Figures 1-2 and 1-3, and is relatively flat at all three AOCs. The ground surface in the vicinity of CC RVAAP-69 and CC RVAAP-74 is between 1030 and 1020 feet amsl (Figure 1-2). The ground surface around CC RVAAP-70 is between 950 and 960 feet amsl (Figure 1-3). Topographical information was obtained from the Ravenna Environmental Information Management System (REIMS).

1.5.3 Geology

The surficial soil unit at CC RVAAP-70, CC RVAAP-69 and CC RVAAP-74 is mapped as Mahoning silt loam (Figures 1-4 and 1-5). Subsurface materials below the surficial soil unit within the anticipated drilling depth at all three AOCs are estimated to be primarily clay and silty clay. These soils are Hiram Till glacial deposits or fill material (Figure 1-6). The bedrock underlying all three AOCs is Sharon Sandstone. The available elevation contours of the bedrock surface are only provided at 50-foot intervals, but appears to range be between 950 and 1000 feet amsl near CC RVAAP-69 and CC RVAAP-74 (Figure 1-7) or approximately 40-50 feet below ground surface (bgs). The elevation of bedrock at CC RVAAP-70 is approximately 950 feet amsl (Figure 1-8) or less than 10 feet bgs. Geological layers and elevations were obtained from REIMS.

1.5.4 Hydrogeology

Groundwater flow across Camp Ravenna is generally to the east. Most wells yield 5 to 20 gallons per minute from sandstone units of the Pottsville Group, of which the Sharon Sandstone is a member (Winslow and White, 1966). Wells may yield as much as 800 gallons per minute where the sandstone units are of large thickness, areal extent, and permeability.

The potentiometric surface for Camp Ravenna aquifers is mapped annually from groundwater elevation measurements in monitoring wells, most recently in the *Facility-Wide Groundwater Monitoring Program, RVAAP-66 Facility-Wide Groundwater Annual Report for 2015* (TEC-WESTON Joint Venture, 2016). The groundwater flow direction in the unconsolidated aquifer beneath AOCs CC RVAAP-69 and CC RVAAP-74 is generally to the east at an elevation between 1010 and 1020 feet amsl (10 to 20 feet bgs) as illustrated in Figure 1-9. The groundwater flow direction in the unconsolidated aquifer beneath AOC CC RVAAP-70 is to the northeast at an elevation between 940 and 950 feet amsl (about 10 feet bgs) as illustrated in Figure 1-10.

1.5.5 Surface Water

Surface water on Camp Ravenna consists primarily of streams and small ponds and lakes. Surface water on the central and eastern portions of the site flows generally to the northeast, eventually entering the Mahoning River. Surface water on the western portion of the site generally flows to the south into the Michael J. Kirwan Reservoir. Surface water and wetlands are present approximately 1500 feet east of AOCs CC RVAAP-69 and CC RVAAP-74 (Figure 1-11). Surface water and wetlands are present approximately 1,700 feet northeast of AOC CC RVAAP-70 (Figure 1-12). Surface water features were obtained from REIMS.

1.5.6 Climate

Camp Ravenna is located in a temperate region of Ohio with annual precipitation of 36 to 39 inches. The average July high temperature is 82 °F and the average January low temperature is 18 °F.

1.5.7 Surrounding Land Use

Camp Ravenna is located in northeastern Ohio within Portage County and Trumbull County. Camp Ravenna is surrounded by several communities: Windham on the north; Garrettsville 6 miles to the northwest; Newton Falls 1 mile to the southeast; Charlestown to the southwest; and Wayland 3 miles to the south. The land surrounding Camp Ravenna consist primarily of residential and farm land along with some areas of commercial and light industrial use.

1.5.8 Ecology

Camp Ravenna has a diverse range of vegetation and habitat resources. Habitats present within Camp Ravenna include large tracts of closed-canopy hardwood forest, scrub/shrub open areas, grasslands, wetlands, open-water ponds and lakes, and semi-improved administration areas (OHARNG, 2014).

Vegetation at Camp Ravenna can be grouped into three categories: herb-dominated, shrub-dominated, and tree-dominated. Approximately 60% of Camp Ravenna is covered by forest or tree-dominated vegetation. Camp Ravenna has seven forest formations, four shrub formations, eight herbaceous formations and one non-vegetated formation (OHARNG, 2014). There is a tree-cutting restriction from 1 April to 30 September.

Surface water features within Camp Ravenna include a variety of streams, ponds, floodplains and wetlands. Numerous streams drain Camp Ravenna, including approximately 19 miles of perennial streams. Approximately 282 acres of ponds are found on Camp Ravenna. These ponds provide valuable habitat and support to wood ducks, hooded mergansers, mallards, Canada geese and other birds and wildlife species. Some ponds have been stocked with fish and are used for fishing and hunting (OHARNG, 2014). Wetlands are abundant and prevalent throughout Camp Ravenna. These wetland areas include seasonal wetlands, wet fields and forested wetlands. Most of the wetland areas on Camp Ravenna are the result of natural drainage and beaver activity; however, some wetland areas are associated with anthropogenic settling ponds and drainage areas.

An abundance of wildlife is present on Camp Ravenna; 35 species of land mammals, 214 species of birds, 47 species of fish and 34 species of amphibians and reptiles have been identified (OHARNG, 2014). The federally threatened Northern Long Eared Bat is present at Camp Ravenna. Ohio State-listed plant and animal species have been identified through confirmed sightings and/or biological inventories at Camp Ravenna.

2.0 PREVIOUS INVESTIGATIONS

The following sections provide summaries of historical information and findings of previous investigations at three AOCs requiring further activities.

2.1 CC RVAAP-69 Building 1048 Fire Station

CC RVAAP-69 Building 1048 Fire Station is located within the south-central portion of Camp Ravenna and includes an area behind the former Fire Station Building where fire extinguisher chemicals were reportedly discharged. The Building 1048 Fire Station was demolished in 2008. A site layout is shown on Figure 2-1.

2.1.1 Operational History/Description

The fire station was previously located in the former RVAAP Administration Area in the northwest quadrant of the intersection of George Road and South Service Road. The Building 1048 Fire Station was situated between Building 1048A and 1048B. Building 1048A was known as the Guard Headquarters and Building 1048B was known as the Ambulance Garage. Building 1067, which was an equipment repair shop, is located to the north of the Building 1048 Fire Station. Buildings 1037 (former Laundry Building) and former Power House No. 6 are located to the east. An approximately 8 foot by 8-foot metal storage shed, denoted as Building T-4510, was located adjacent to the Building 1048 Fire Station. In 1968, the fire station was referred to as the Fire and Guard Building, and consisted of 12,130 square feet. No documented evidence was found regarding specific years of service for the Building 1048 Fire Station. A site schematic dated 1941 was found as part of the Historical Records Review (HRR); therefore, it is assumed services commenced shortly after the 1941 building construction. The fire station building was demolished in late 2008, and the site currently remains undeveloped.

Potential sources of chemical releases are unreported spills or leaks from firefighting equipment. Carbon tetrachloride was commonly used through the 1950s to extinguish fires as the chemical was readily available, nonflammable, easily volatilized, and inhibited the combustion process. Former employees reported that it was common practice for the fire department to clean out fire extinguishers behind (i.e., the west side) the fire building, and to allow the contents of the fire extinguishers (carbon tetrachloride) to spill onto the ground surface (SAIC, 2011c).

2.1.2 Previous Investigations Summary

Timeline for investigations at AOC CC RVAAP-69:

- December 2011 – HRR report completed (SAIC, 2011c)
- October 2012 – RI WP finalized (ECC, 2012)
- November 2012 – Initial RI sampling performed at CC RVAAP-69
- December 2012 – SI Sampling conducted at Underground Storage Tank (UST) RV-5 as part of investigations for AOC CC RVAAP-72
- May 2014 – Preliminary Draft RI report submitted (ECC and AMEC Environment and Infrastructure [AMEC], 2014)
- March 2015 – Field change notice issued outlining additional sampling at CC RVAAP-69 (ECC, 2015b)
- April 2015 – Additional RI sampling performed at CC RVAAP-69

- July 2015 – Draft RI report prepared (ECC and AMEC, 2015a)

2.1.2.1 Historical Records Review

The following paragraphs summarize details for CC RVAAP-69 presented in the *Final Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern), Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC, 2011c).

Interviewees reported that it was common practice for the fire department to clean out fire extinguishers behind the west side of the fire building and to allow the contents of the fire extinguishers (carbon tetrachloride) to spill onto the ground surface. No documented evidence was discovered to confirm these practices. Interviewees noted that an approximately 8-foot × 8-foot metal storage shed was located adjacent to the fire station, which was used to store carbon tetrachloride and possibly other chemicals. One interviewee noted the storage shed was dismantled in 1993. No drawings or maps were found of the metal storage shed. Building 1048 Fire Station was demolished in late 2008, and the building site was re-graded as part of the demolition project. The AOC area north/northeast of the building was not re-graded.

Inspection of the AOC during the HRR property visit did not indicate visual evidence of chemical releases. Historical records indicate a 100-gallon gasoline non-regulated UST (RV-5) was located at Building 1048A, which serviced the Fire Station and adjacent Guard Quarters. RV-5 was removed prior to 1990. No closure sampling documentation exists for RV-5, as this UST had capacities of 100 gallons and was exempt from Bureau of Underground Storage Tank Regulation (BUSTR) requirements. The HRR identified former UST RV-5 for potential further investigation under CC RVAAP-72 Facility Wide USTs. The HRR recommended the surface soil near the former shed and northwest of the former fire station be sampled for target analyte list (TAL) metals, semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs) as part of a further investigation.

No facility-wide groundwater monitoring wells were present at the Administration Area at the time of the HRR. The nearest facility-wide groundwater monitoring well was LL5mw-004, located over 3,500 feet northwest of the Building 1048 Fire Station (SAIC, 2011c). The generalized regional groundwater flow direction in the Administration Area is to the southeast toward a tributary to the west branch of the Mahoning River located southeast of the AOC (SAIC, 2011c).

Groundwater targets included human receptors that use groundwater for potable water supply, as well as environmental receptors (e.g., livestock, fish farms) and physical targets (e.g., springs) that may be affected by potential groundwater contamination on or adjacent to the AOC (SAIC, 2011c). There are no public, livestock, or commercial groundwater supply wells within Camp Ravenna (SAIC 2011c). A groundwater supply well is located in the Administration Area approximately 500 feet southwest of the Building 1048 Fire Station. This well provides a limited supply of potable water for non-drinking supply purposes for OHARNG. Accordingly, human exposure respective to potential chemicals in groundwater at the AOC could occur if groundwater is used for domestic supply purposes in the future. Currently, the OHARNG has the potential to use groundwater on the facility where there are no municipal hookups and no contamination from past usage. No groundwater samples were collected as part of the HRR project. The HRR suggested that leaching of potential chemicals in soil to groundwater is a potential migration pathway for the AOC, which may require further evaluation.

No surface water or wet sediment samples were collected as part of the HRR. Surface water within the Administration Area occurs intermittently as storm water runoff overland, through constructed roadside ditches, and a storm sewer network throughout the Administration Area (SAIC, 2011c). Sediment within nearby roadside conveyances appeared to be dry sediment, as defined by Camp Ravenna guidance, and is not typically inundated for more than seven days at a time. Sediment within the storm sewer network may exist but was not confirmed during the HRR property visit. No visual signs of potential contamination were observed within drainage ditches during the HRR property visit. Surface water flow is a primary migration pathway for potential contamination to leave the AOC, flowing overland or through natural/manmade conveyances. There are no perennial surface water features at the AOC, including no perennial streams within the AOC nor any observed springs or point groundwater discharge points to a surface water body in the immediate vicinity of the Building 1048 Fire Station. The closest perennial feature to receive drainage from the Administration Area is a tributary to the west branch of the Mahoning River, located southeast of the AOC. Surface water targets include human receptors that use surface water for potable water supply or recreation, as well as environmental (e.g., streams, wetlands, sensitive aquatic environments) and physical targets (e.g., public or private water distribution system intakes) that may be affected by potential groundwater contamination on or adjacent to the AOC (SAIC, 2011c). Given the absence of surface water features, there is no direct exposure pathway for human receptors or ecological targets to surface water at the AOC (SAIC, 2011c).

Potential soil targets included human and ecological (animal and plant) receptors that may come into contact with surface or subsurface soil, if chemicals are present within or adjacent to the former Building 1048 Fire Station (SAIC, 2011c). Likewise, future human exposure to potential soil contaminants could occur with active use of the AOC (e.g., training activities). Ecological receptors present in the AOC vicinity may also be exposed to potential soil contaminants in the future.

Airborne contamination (e.g., windblown dust) was not considered a viable migration or exposure pathway at the AOC (SAIC, 2011c). Although the likely chemical associated with the Building 1048 Fire Station (carbon tetrachloride) has high volatility, the estimated timeframe of any releases would result in attenuation of the chemical in surface soil. The Building 1048 Fire Station area was well vegetated. Camp Ravenna is located in a humid climate, and soil moisture content is typically high, which reduces the potential for dust generation.

Based on the findings of the HRR, an RI was recommended the AOC. Potential sources of contamination included unreported spills or leaks from firefighting equipment. As chemical releases may or may not have occurred at the Building 1048 Fire Station, there is the potential for chemicals to exist and to have migrated (SAIC, 2011c).

2.1.2.2 2012 Remedial Investigation

The following paragraphs summarize the 2012 sampling event that was originally described in the *Preliminary Draft Remedial Investigation Report CC RVAAP-69 Building 1048 Fire Station, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio* (ECC and AMEC, 2014).

ECC performed RI field work at Former Building 1048 in November 2012 to delineate the nature and extent of contamination related to operations at the AOC. Decision units (DU) were designed to encompass the historical operational areas plus an additional 30 feet in all directions where chemical storage or fire extinguisher discharge activities could have impacted surrounding media.

The AOC was divided into three DUs, and surface and subsurface soils were sampled using incremental sampling methodology (ISM) techniques. A total of four surface ISM samples (one from each DU and a duplicate) were collected from a depth of 0-1 feet bgs, and two subsurface ISM samples were collected at depths of 1-4 feet bgs, and 4-7 feet bgs. Five vertical ISM samples were also collected from a depth of 1-7 feet bgs at each subsurface ISM location in each DU (15 total). In addition, a deep soil boring was drilled within DU03 and a vertical composite soil sample was collected from 7-13 feet bgs. The surface soil and subsurface soil were analyzed for SVOCs, TAL metals, and VOCs in accordance with the recommendations of the HRR (SAIC, 2011c). In addition, approximately 10 percent of the samples were also analyzed for organochlorine pesticides, polychlorinated biphenyls (PCBs), and explosives/propellants. Carbon tetrachloride was the primary target of the investigation due to its reported use, storage, and release within the AOC. Of the few VOCs detected, only carbon tetrachloride was detected consistently within the subsurface soil, within the soil borings completed surrounding the former shed area (DU01-DU03). Carbon tetrachloride was not detected in surface soil.

In both surface and subsurface soil, the majority of Site-Related Chemicals (SRCs) identified were SVOCs. These SVOCs, primarily polycyclic aromatic hydrocarbons (PAHs), are commonly detected in surface and subsurface soil at Camp Ravenna AOCs. The metals detected in surface and subsurface soil were at concentrations only slightly above their respective background screening value (BSV). No sediment or surface water were present on site, and therefore no samples were collected of these media.

2.1.2.3 Site Inspection for Facility-Wide Underground Storage Tanks

A SI for CC RVAAP-72 Facility-Wide USTs included sampling at a former UST RV-5, which was located beneath the footprint of former Building 1048 (ECC, 2015c). Carbon tetrachloride in soil sample 72-1048-RV5-SB2 at 5-6 feet bgs was detected at a concentration of 14 milligrams per kilogram (mg/kg) in December 2012, which exceeds the June 2017 USEPA Residential Regional Screening Level (RSL) of 0.65 mg/kg. Former UST RV-5 was used to store gasoline and is not the suspected source of carbon tetrachloride. Carbon tetrachloride was known to be used and reportedly disposed of at the former Building 1048 Fire Station (AOC CC RVAAP-69). The CC RVAAP-72 Final SI therefore associated the carbon tetrachloride with CC RVAAP-69, and a subsequent sampling phase was conducted for the CC RVAAP-69 RI to delineate the extent of carbon tetrachloride. The SI report (ECC, 2015c) recommended UST RV-5 for no further action. The results of soil samples from former UST RV-5 were included in the CC RVAAP-69 Draft RI Report (ECC and AMEC, 2015a).

2.1.2.4 2015 Remedial Investigation

A Field Change Notice, dated 4 March 2015 (ECC, 2015b), was issued to outline additional subsurface sampling to delineate the nature and extent of carbon tetrachloride detected at 72-1048-RV5-SB2.

ECC collected 34 discrete subsurface soil samples from five soil borings on 7 April 2015. One soil boring (69-1048-SB101) was completed in the approximate location of the December 2012 carbon tetrachloride detection (14 mg/kg) in soil near the former UST RV-5 (CC RVAAP-72 Facility-Wide USTs; ECC, 2015c) within the footprint of the former Building 1048. Four additional soil borings (69-1048-SB102 through 69-1048-SB105) were completed surrounding the 69-1048-SB101 location (approximately 35-foot square grid). Soil boring locations and carbon tetrachloride analytical results are shown on Figure 2-1. All soil samples were analyzed for VOCs. Four investigative subsurface soil samples were analyzed for the full analytical suite (VOCs, SVOCs, TAL metals, organochlorine pesticides, PCBs, and explosives/propellants). All samples collected as part of the Field Change Notice were included in the CC RVAAP-69 Draft RI Report (ECC and AMEC, 2015a).

Upon review of analytical results from the 7 April 2015 sample results, ECC drilled four additional soil borings (69-1048-SB106 through 69-1048-SB109) and collected 23 subsurface soil samples using discrete sampling methods on 29 April 2015. Soil borings 69-1048-SB106 and 69-1048-SB109 were drilled within the footprint of the former guard quarters building, east of DU02. Soil boring 69-1048-SB107 was drilled just west of DU01, and 69-1048-SB108 was drilled north of DU03 and northwest of DU02. Sample locations and carbon tetrachloride analytical results are shown on Figure 2-1. These samples were analyzed for VOCs only.

No groundwater samples were collected as part of RI activities.

2.1.2.5 Draft Remedial Investigation Report

The following paragraphs summarize the *Draft Remedial Investigation Report CC RVAAP-69 Building 1048 Fire Station, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio* (ECC and AMEC, 2015a). Note that this Draft RI Report does not appear to have been submitted to or reviewed by Ohio EPA.

Sampling results from all previous sampling events, including the initial RI sampling in November 2012, Former UST RV-5 data from CC RVAAP-72 SI collected in December 2012, the 7 April 2015 sampling event as noted in Field Change Notice, and additional sampling on 29 April 2015, were presented and evaluated in the Draft RI.

SRCs were identified in all media evaluated at CC RVAAP-69 Building 1048 Fire Station (i.e., surface and subsurface soil). A total of 37 chemicals were identified as SRCs for surface soil including 11 inorganics, 3 VOCs, 20 SVOCs, a PCB, an explosive, and a propellant. A total of 24 SRCs were identified for subsurface soil including 3 inorganics, 5 VOCs and 11 SVOCs.

The nature and extent of contamination was evaluated by comparing SRC concentrations to the most stringent Resident Receptor Facility-Wide Cleanup Goals (FWCUGs). June 2017 USEPA RSLs for Residential Soil at 1×10^{-6} or a hazard quotient (HQ) of 0.1 were used for those analytes without established Resident Receptor FWCUGs. A weight-of-evidence (WOE) approach was used if extent was not delineated to 1×10^{-6} or HQ of 0.1. The following COPCs were identified for surface soil: 2 inorganics (chromium and cobalt) and 5 SVOCs (benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; dibenz[a,h]anthracene; and indeno[1,2,3-c,d]pyrene). The following COPCs were identified as for subsurface soil: one inorganic (arsenic), 1 SVOC (benzo[a]pyrene), and 2 VOCs (carbon tetrachloride and chloroform).

Carbon tetrachloride analytical results are illustrated in Figure 2-1. Concentrations of carbon tetrachloride in subsurface soil near the middle of the Former Fire House No. 1 exceed the June 2017 USEPA Residential RSL of 0.65 mg/kg. Soil concentrations in soil borings 72-1048-RV5-SB2, 69-1048-SB101, 69-1048-SB104, and 69-1048-SB105 range from 0.7 mg/kg to 14 J mg/kg, which exceed the June 2017 USEPA Residential RSL.

2.2 CC RVAAP-70 East Classification Yard

The CC RVAAP-70 East Classification Yard AOC consists of the Former Fuel Oil 1860 Spill Area, Building 47-40 (Round House), Former Herbicide Storage Shed, the Outdoor Wash 1861

Rack Area, and drainage ditches. Potential sources of contamination include railroad maintenance activities, fuel release, and herbicide storage and maintenance (SAIC, 2011c). A site layout is shown on Figure 2-2.

2.2.1 Operational History/Description

The former RVAAP was originally equipped with east and west classification yards during the facility's early operational years. The East Classification Yard is located east of Load Line 1 and the Main Defense Logistics Agency (DLA) Ore Storage Area in close proximity to the intersection of Ramsdell Road and Irons Road. No documentation was found during the HRR to define the specific years of operation of the AOC. The East Classification Yard AOC consists of Building 47-40 (the Round House still exists, but is not actively used), the former herbicide storage shed (former Building 47-60), the containment area for a former aboveground storage tank (AST) (documented spill of No. 5 fuel oil occurred within the containment area in 1986), and an outdoor open wash rack south of the East Classification Yard (north of Butts-Kistler Road). A railroad track complex is located east of the site and is currently used by the OHARNG. Two former 15,000-gallon diesel fuel USTs, RV-11 and RV-22, were located west of the wash rack, but were removed in February 1990 and received No Further Action in April 1992 (SAIC, 2011c).

The East Classification Yard was used for switching and maintaining railroad cars. Building 47-40 (Round House) was used for locomotive engine repairs and other maintenance activities (SAIC, 2011c). The former herbicide storage shed was used to store a track-mounted herbicide sprayer and the herbicides used to control vegetation along the railroads at Camp Ravenna. Interviewees for the HRR noted an outdoor open wash rack was located to the south of the East Classification Yard was used to wash box cars, which carried explosives. The wash rack was also reportedly to wash the engines.

Typical chemicals/products used during locomotive maintenance activities may have included engine washing chemicals, valve oil, electrolytes (battery maintenance), locomotive black paint, solvents for parts degreasing, lubrication oil, metal preservatives, carbolineum, creosote, and cold patch asphalt. In addition, the resident locomotive stored within the Round House building also contained at least two PCB transformers.

2.2.2 Previous Investigations Summary

Timeline for investigations at AOC CC RVAAP-70:

- December 2011 –HRR report completed (SAIC, 2011c)
- October 2012 – SI WP finalized (ECC, 2012)
- November and December 2012 – SI sampling performed at CC RVAAP-70
- July 2015 – Draft SI Report submitted (ECC, July 2015a)
- March 2016 – Ohio EPA Notice of Deficiency

2.2.2.1 Historical Records Review

The following paragraphs summarize details for CC RVAAP-70 presented in the *Final Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern), Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC, 2011c).

A spill report dated 11 August 1986 documents a leak of No. 5 fuel oil from an AST (Tank 65B) from the East Classification Yard. The spill report indicates that a broken valve caused the leak. The entire contents of the tank emptied into the bermed containment area. The report indicates the containment area was scarified and the contaminated soil was piled within the containment area. However, no quantities of contaminated soil were noted. The report indicates that approximately 16,632 gallons of fuel oil was salvaged from the containment area and approximately 120 gallons of oil mixed with dirt and straw were to be disposed per Ohio EPA instructions. The report indicates that straw was placed on oil in areas where the equipment could not reach, such as beneath the support structures and by piping. Samples of the contaminated soil were collected to determine if the contaminated soil could be incinerated in accordance with the regulations at that time. The report states that the sample results were acceptable for burning under the regulations at that time. No final report regarding the cleanup was found during the HRR. The tanks had since been removed from the AOC and the area was overgrown with vegetation during the HRR site walks. The HRR recommended that surface and subsurface soil within, and in the vicinity of, the former tank containment area and surface soil and dry sediment within any nearby surface water conveyances be analyzed for SVOCs and VOCs.

Building 47-40 (Round House) was used as a locomotive maintenance and repair building. The interior of the building contains a floor pit that was used by personnel to access the undersides of the engines for repair. No documented evidence related to spills or releases were found for the Round House building. Building 47-40 contained at least 2 PCB transformers. Service to the transformers is unknown. Interviewees indicated the transformer oil was tested for PCBs; however, no records of testing were discovered during the HRR. Staining from past operations was visible on the concrete floor within the building. No other visible evidence of impacts was noted during the property visit/perimeter survey. The HRR recommended that surface soil and dry sediment samples around doors and service bay entrances and in drainage ditches leading from the building to the storm sewer inlets located around the building be analyzed for TAL metals, SVOCs, and PCBs.

A storage shed used to store herbicides and a track mounted sprayer was located in the East Classification Yard. Herbicide mixing operations may also have occurred at the building. The interviewees noted the herbicides may have been mixed with waste oil and applied for vegetation control. No documents relating to spills or releases were found for this AOC during the HRR. No documentation was found, but some herbicide applications used petroleum products (e.g., oil, kerosene, diesel fuel) as carrier agents. No documentation was found pertaining to the amount of herbicides stored in the herbicide storage shed; however, one interviewee noted the amount stored was approximately 20 gallons. There was no visible evidence of impacts (e.g., stained soil, stressed vegetation) from the area of the former herbicide storage shed. The HRR recommended that surface soil and dry sediment near the former shed and any runoff conveyances be analyzed for herbicides and SVOCs.

Two interviewees noted the presence of an outdoor wash rack, assumed to wash down the box cars (which carried explosives) and/or the train engines, on site. The wash rack was outdoors and open with no means of collecting wastewater. No documents related to the wash rack were discovered during the HRR. The wash rack was supplied with water from nearby Well House #15. One interviewee noted there were no controls in place to collect the wash water. Field personnel noted the potential location of the wash rack just south of the East Classification Yard and north of Butts-Kistler Road. Concrete AST supports were discovered at the location along with old abandoned pipes and valves, assumed to be water pipes from the well house. No visual evidence of impacts (e.g., stained soil, stressed vegetation) from the tank or wash rack activities was observed. The HRR recommended that surface soil and dry sediment in the vicinity of the former wash rack and any runoff conveyances be analyzed for explosives, SVOCs, and PCBs.

Groundwater targets include human receptors that use groundwater for potable water supply, as well as environmental receptors (e.g., livestock, fish farms) and physical targets (e.g., springs) that may be affected by potential groundwater contamination on or adjacent to the AOC. There are no public, livestock, or commercial groundwater supply wells within Camp Ravenna (SAIC, 2011c). Groundwater in the vicinity of the East Classification Yard is not currently used by the U.S. Army or OHARNG for potable or industrial purposes. However, the OHARNG and U.S. Army have the potential to use groundwater on the facility where there are no municipal hookups and no previous contamination from past usage. Therefore, there are potential human receptors to groundwater. No groundwater samples were collected as part of this project and no groundwater monitoring wells are located in the immediate vicinity of the AOC. The HRR suggested that leaching of potential chemicals in soil to groundwater, with subsequent lateral migration to either surface water discharge or other surface water exposure points, are potential migration pathways at the AOC, which may require future evaluation.

No surface water or wet sediment samples were collected as part of the HRR project. Surface water within the East Classification Yard occurs intermittently as storm water runoff overland, through constructed roadside ditches, and through the storm sewer network (SAIC, 2011c). Sediment within nearby roadside conveyances appears to be dry sediment, as defined by RVAAP guidance, and is not typically inundated for more than seven days at a time. Sediment within the storm and sanitary sewer networks exists. No visual signs of potential chemical releases were observed within drainage areas during the HRR property visit. Surface water flow is a primary migration pathway for potential contamination to leave the AOC, flowing overland or through natural/manmade conveyances. There are no perennial surface water features at the AOC. The closest perennial feature to receive drainage from the East Classification Yard is a tributary to the west branch of the Mahoning River located approximately 2,000 feet to the northeast of the AOC. Surface water targets include human receptors that use surface water for potable water supply or recreation, as well as environmental (e.g., streams, wetlands, sensitive aquatic environments) and physical targets (e.g., public or private water distribution system intakes) that may be affected by potential groundwater contamination on or adjacent to the AOC. Because there are no observed springs or groundwater discharge points to a surface water body in the vicinity of the AOC, there is no direct exposure pathway for human receptors or environmental and physical targets to surface water at the AOC. However, the HRR noted that further evaluation of dry sediment within drainage conveyances at the East Classification Yard may be required as part of soil evaluation to determine the presence of contamination. The HRR also recommended evaluation of surface water quality if surface water is discovered in drainage conveyances for extended periods during wet periods of the year.

Potential soil targets include human and ecological (animal and plant) receptors that may come into contact with surface or subsurface soil, if contaminants are present within or adjacent to the East Classification Yard (SAIC, 2011c). Likewise, future human exposure to potential soil contaminants could occur with active use of the AOC (e.g., training activities). The HRR suggested that ecological receptors present in the vicinity of the East Classification Yard may also be exposed to potential soil contaminants in the future.

Airborne contamination (e.g., windblown dust) was not considered a viable migration or exposure pathway at this AOC (SAIC, 2011c). The likely chemicals associated with the East Classification Yard (SVOCs, PCBs, inorganic chemicals) have low volatility. Former operational areas lots are paved, gravel covered, or well vegetated. Camp Ravenna is located in a humid climate, and soil moisture content is typically high, which reduces the potential for dust generation.

Based on the findings of the HRR, an SI was recommended at specific DUs within the AOC. Potential sources of contamination included railroad maintenance activities, fuel release, and herbicide storage and maintenance.

2.2.2.2 Draft Site Inspection Report

The following paragraphs summarize the 2012 sampling event that was originally described in the *Draft Remedial Inspection Report CC RVAAP-70 East Classification Yard, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio* (ECC, 2015a).

ECC preformed SI field work in November and December 2012. ECC collected samples from within seven DUs established at the AOC in order to identify potential contamination associated with historical practices conducted the East Classification Yard as documented in the HRR. The DUs and SI sample locations are illustrated in Figure 2-2.

Surface water was not present at this AOC during the SI field work, and groundwater is being evaluated on a facility-wide basis (RVAAP-66 Facility-Wide Groundwater). Therefore, samples were not collected from surface water or groundwater during the SI.

ECC used analytical results from samples collected during the SI to determine if potential contamination was present at the DUs by first identifying the SRCs. Per Camp Ravenna's Facility-Wide Human Health Risk Assessment Manual (USACE, 2005), a chemical detected at a concentration greater than the established background value, that is not an essential nutrient, and has not been screened out through a frequency of detection evaluation is identified as an SRC. An SRC may, or may not be, related to the former operations at the site. SRCs are discussed in the paragraphs below for each DU. The resulting maximum detected concentration of each SRC identified in the SI at DU02, DU03, DU04, DU05, DU06, and DU07 was compared to the most stringent FWCUG for the Resident Receptor (between the adult and child receptors) using the target cancer risk level of 10^{-6} or the target HQ for non-carcinogenic risks of target HQ = 0.1 for each SRC to determine the presence of potential contamination.

At DU01, Former Fuel Oil Spill Area, the maximum detected concentration of the petroleum-related compound SRCs were compared to BUSTR (Ohio Department of Commerce, 2017) Soil Class 2 criteria as well as the for the total petroleum hydrocarbons (TPH)-diesel range organics (DRO) and TPH-gasoline range organics (GRO) concentrations reported at the AOC because FWCUGs have not been established for these chemicals. The non-petroleum SRCs at DU01 were compared to the most stringent FWCUG for the Resident Receptor (between the adult and child receptors) using the target cancer risk level of 10^{-6} or the target HQ for non-carcinogenic risks of target HQ = 0.1 for each SRC to determine the presence of potential contamination.

The SRCs that exceeded the most stringent value (between adult and child receptors) Resident Receptor FWCUG, using a target cancer risk level of 10^{-6} or the target HQ = 0.1 for non-carcinogenic risks, were then evaluated using a WOE approach. The WOE evaluation considers the SRCs that exceed their Resident Receptor FWCUGs or BUSTR criteria, as described above, to determine if the chemical should be identified as potential contamination.

Former Fuel Oil Spill Area (DU01)

DU01 was established as the area within the containment berm that surrounded the former AST where No. 5 fuel oil was released. ECC collected one surface soil ISM sample, and 9 subsurface soil ISM samples including one sample from 1-4 feet bgs, one sample from 4-7 feet bgs, and seven (including one field duplicate) samples from 1-7 feet bgs. All samples were analyzed for VOCs, methyl tertiary-butyl ether (MTBE), SVOCs, 2 TPH-DRO carbon chain compounds (C10-C20, C20-C34), and 1 TPH- GRO carbon chain. Additionally, one subsurface sample was analyzed the full analytical suite. The HRR had only recommended analyzing soil for SVOCs and VOCs. ASTs are not regulated under BUSTR; however, as the vestiges of the historical No. 5 fuel oil release may be in the subsurface, the BUSTR Soil Class 2 Action Levels (Ohio Administrative Code, 1301:7-9-13, effective 1 July 2012) were used in the SI as the criteria for screening the analytical results for petroleum compounds. The reported concentrations for petroleum compounds (TPH-DRO or TPH-GRO) for the Former Fuel Oil Spill Area were compared to the BUSTR Soil Class 2 Action Levels because no FWCUGs have been established for these measurements.

SRCs identified in the surface soil sample included 10 SVOCs (primarily PAH compounds) and 2 petroleum hydrocarbons (DRO carbon chain compounds). Surface soil SRCs were likely from petroleum compounds that were compared to BUSTR criteria screening. All reported concentrations were less than BUSTR Soil Class 2 Action Levels (Ohio Department of Commerce 2017) for petroleum-related compounds.

SRCs identified in the subsurface soil samples included 8 VOCs (acetone, benzene, carbon disulfide, ethylbenzene, methyl ethyl ketone, methylene chloride, toluene, and xylenes), 14 SVOCs (primarily PAH compounds), 2 petroleum hydrocarbons (DRO carbon chain compounds), 1 petroleum hydrocarbon (GRO carbon chain compound), 1 explosive (nitrobenzene), and 2 metals (cadmium and silver). All petroleum SRCs were subject to BUSTR criteria.

- There were no TPH-DRO, TPH-GRO carbon chain compounds, VOCs (BTEX), MTBE, or PAHs reported at concentrations greater than BUSTR Soil Class 2 Action Levels in any of the subsurface ISM soil samples collected.
- Nitrobenzene, carbon disulfide, methyl ethyl ketone, methylene chloride, cadmium, and silver were reported at concentrations less than the most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL. The June 2017 USEPA Residential RSL was used for screening in the event that no FWCUG has been established for a specific chemical.
- All reported concentrations were less than BUSTR Soil Class 2 Action Levels for petroleum-related compounds and less than the most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL for other compounds where no FWCUG has been established for the chemical.

Building 47-40 Round House (DU03)

DU03 was established as a 15-foot zone surrounding the exterior perimeter of Building 47-40 to sample for potential contamination from locomotive maintenance activities conducted at Building 47-40. ECC collected one surface soil ISM sample, 7 subsurface soil ISM samples including one sample from 1-4 feet bgs, one sample from 4-7 feet bgs, and 5 samples from 1-7 feet bgs, and one composite soil sample from 7-13 feet bgs at DU03. All samples were analyzed for SVOCs, TAL metals and PCBs.

SRCs identified in the surface soil sample included 18 SVOCs (primarily PAH compounds), 10 metals, and one PCB (Aroclor 1254).

- The 10 metals and the one PCB were less than the most stringent Resident Receptor FWCUGs.
- Four of the 17 SVOCs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and indeno[1,2,3-cd]pyrene) were reported at concentrations greater than the Resident Receptor FWCUGs in the surface soil samples. The SI report noted that Building 47-40 is surrounded by potential anthropogenic PAH sources unrelated to the former activities at the AOC such as asphalt and railroad maintenance practices (burning).

SRCs identified in the subsurface soil samples included 2 metals (cadmium and silver), 5 VOCs (acetone, benzene, carbon disulfide, methyl ethyl ketone, and toluene), 16 PAH compounds, and 1 SVOC bis(2-ethylhexyl)phthalate.

- The maximum detected concentrations of cadmium, silver, acetone, benzene, carbon disulfide, methyl ethyl ketone, toluene, and bis(2-ethylhexyl)phthalate were less than their corresponding most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL (where no FWCUG has been established for the chemical).
- All PAHs reported, except for benzo(a)pyrene in the 1- to 4-feet bgs horizontal subsurface sample, were less than the FWCUGs. This benzo(a)pyrene concentration is approximately 5 percent of the reported surface soil concentration.

Building 47-40 Interior Repair Pit (DU04)

DU04 was established to sample the soil beneath the concrete floor of the Interior Repair Pit. The Interior Repair Pit lies underneath the area where locomotives were maintained and is a low point for any releases, which increases the likelihood of finding potential contamination from activities conducted within Building 47-40. The soil samples collected from the bottom of the Interior Repair Pit (beneath the concrete floor) were considered to be subsurface samples because the concrete floor prevents contact directly with the underlying soil. The SI photo log indicates black grime (called sludge in this WP) in the bottom of the pit. Five soil borings were advanced through the concrete floor of the pit. Auger refusal (due to encountering sandstone bedrock) was encountered at less than 4 feet depth in all five borings; therefore, subsurface soil ISM samples were collected at vertical intervals ranging from 0-1 feet to 0-3.83 feet (below the repair pit bottom). All samples were analyzed for SVOCs, TAL metals and PCBs.

SRCs were identified in the subsurface soil samples collected as follows: 9 SVOCs (primarily PAH compounds) and 3 TAL metals (cadmium, cobalt, and silver). All SVOCs and TAL metals were less than their corresponding most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL where no FWCUG has been established for the chemical. No organic or inorganic potential contamination was identified in the soil sampled within DU04 beneath the floor slab of the Interior Repair Pit. Therefore, the results indicate that there is no evidence of a potential CERCLA release associated with Building 47-40 Interior Repair Pit.

Although results of the initial investigation of the soil completed for the SI at DU04 indicated there is no potential contamination in DU04 subsurface soil, the U.S. Army proposed that additional sampling be completed to include the subsurface soils under the Interior Repair Pit. The findings of the additional soil sampling would be presented in a Supplemental SI that focuses only on the soil within DU04. Completion of the Supplemental SI will allow the U.S. Army to ensure there is no contamination in the subsurface soil beneath the Interior Repair Pit within Building 47-40.

Former Herbicide Storage Shed (DU05)

ECC collected one surface soil ISM sample and 9 subsurface soil ISM samples including one sample from 1-4 feet bgs, one sample from 4-7 feet bgs, and 7 samples (including one field duplicate) from 1-7 feet bgs. All samples were analyzed for SVOCs and herbicides. One sample was also analyzed for full suite analyses. Additional analyses were performed for VOCs and TPH-GRO on vertical ISM soils collected from DU05 SB02 due to field observations and photoionization detector (PID) field screening vapor headspace results of 75 parts per million indicating the likelihood of potential contamination at this boring.

SRCs identified in the surface soil sample included 17 SVOCs (primarily PAH compounds) and one herbicide (2,4,5-trichlorophenoxyacetic acid).

- The only detected herbicide (2,4,5 trichlorophenoxyacetic acid) was reported at a concentration less than the June 2017 USEPA Residential RSL.
- All SVOCs were reported at concentrations less than the corresponding most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL where no FWCUG has been established for the chemical except for benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene. The SI report noted that the Former Herbicide Storage Shed is surrounded by potential anthropogenic PAH sources unrelated to the former activities at the AOC such as asphalt and railroad maintenance practices (burning).

SRCs identified in the subsurface soil samples included 6 VOCs (acetone, benzene, carbon disulfide, ethylbenzene, methyl ethyl ketone, and toluene), 16 SVOCs (primarily PAH compounds), one herbicide (2,4,5 trichlorophenoxyacetic acid), 2 metals (cadmium and silver), and one petroleum hydrocarbon (DRO carbon chain compound).

- The TPH-DRO carbon chain compound was reported at a concentration less than BUSTR Soil Class 2 Action Levels.
- Except for benzo(a)pyrene, all other SRC concentrations were less than the most stringent Resident Receptor FWCUGs or June 2017 USEPA Residential RSLs, where no FWCUG has been established for the chemical.

Outdoor Wash Rack Area (DU06)

Past operations at the Outdoor Wash Rack Area (DU06) may have resulted in a release of chemicals from site operations to surface soil and by infiltration to subsurface soil, and by overland conveyance to nearby drainage ditches. ECC collected one surface soil ISM sample and 7 subsurface soil ISM samples including one sample from 1-4 feet bgs, one sample from 4-7 feet bgs, and 5 samples from 1-7 feet bgs. Soil samples collected during the SI were analyzed for SVOCs, PCBs, and explosives, as recommended in the HRR. Additional analyses were performed for VOCs and TPH-GRO on vertical ISM soil sample collected from DU06 SB05 due to field observations and PID field screening vapor headspace results of 40 parts per million indicating the likelihood of potential contamination at this boring.

SRCs identified in the surface soil sample included 16 SVOCs (primarily PAH compounds), one explosive (2,6-dinitrotoluene), and one PCB (Aroclor 1260).

- The explosive (2,6-dinitrotoluene) and PCB (Aroclor 1260) concentrations were less than the most stringent Resident Receptor FWCUGs.
- All SVOCs were reported at concentrations less than the most stringent Resident Receptor FWCUGs, except for benzo(a)pyrene and benzo(b)fluoranthene. The SI report noted that the Outdoor Wash Rack Area is surrounded by potential anthropogenic PAH sources unrelated to the former activities at the AOC such as asphalt and railroad maintenance practices (burning).

SRCs identified in the subsurface soil samples included 13 SVOCs (primarily PAH compounds), one PCB (Aroclor 1260), 2 petroleum hydrocarbons (DRO carbon chain compounds), and one explosive (tetryl).

- The TPH-DRO carbon chain compounds were reported at concentrations less than the BUSTR Soil Class 2 Action Levels.
- Except for benzo(a)pyrene, all other SRC concentrations were less than the most stringent Resident Receptor FWCUGs or June 2017 USEPA Residential RSLs, where no FWCUG has been established for the chemical.

Drainage Ditch East of Building 47-40 (DU07)

The HRR (SAIC, 2011c) recommended an evaluation of the dry sediment in the AOC drainage ditches. ECC collected two dry sediment ISM samples (including a field duplicate) from the drainage ditch to the east of Building 47-40 (DU07). The samples were analyzed for the full analytical suite including VOCs, MTBE, SVOCs, metals, TPH-GRO and TPH-DRO, herbicides, explosives, PCBs, and propellants.

SRCs identified in the dry sediment samples included one VOC (acetone), 16 SVOCs (primarily PAH compounds), one propellant (nitrocellulose), 2 petroleum hydrocarbons (DRO carbon chain compounds), 2 pesticides (p,p'-dichlorodiphenyldichloroethylene [DDE], p,p'-dichlorodiphenyltrichloroethane [DDT]), 10 metals, and 3 PCBs (Aroclors 1242, 1248, and 1260).

- The TPH-DRO carbon chain compounds were reported at concentrations less than BUSTR Soil Class 2 Action Levels.
- Acetone, nitrocelloluse, Aroclor 1248, Aroclor 1260, p,p'-DDE and p,p'-DDT were all reported at concentrations less than the most stringent Resident Receptor FWCUGs or June 2017 USEPA Residential RSL.
- Nine of the 10 metals were less than dry sediment FWCUGs. In the WOE evaluation, arsenic was evaluated using the established wet sediment arsenic background value because the drainage ditch is intermittently wet and supports wetland fauna as observed in November 2012 and again in April 2015 when standing water was observed. The reported drainage ditch arsenic concentrations were less than the established wet sediment background value; therefore, arsenic is not potential contamination at DU07.
- All SVOCs were reported at concentrations less than the most stringent Resident Receptor FWCUGs, except for benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene. The SI report attributed the occurrence of PAHs in the sediments within the drainage ditch to overland storm water discharge from these surrounding paved areas and general atmospheric deposition from vehicular traffic.

- o Aroclor 1242 was reported at a concentration greater than the June 2017 USEPA Residential RSL. This was the only detection of Aroclor 1242 at CC RVAAP-70, which suggests that this PCB is not from site-related activities. The drainage ditch receives overland flow from the railroad yard and from offsite locations.

Drainage Ditch West of Building 47-40 (DU02)

The HRR (SAIC, 2011c) recommended an evaluation of the dry sediment in the AOC drainage ditches. ECC collected one dry sediment sample from the drainage ditch to the west of Building 47-40 (DU02). Dry sediment was analyzed for VOCs, MTBE, SVOCs, TPH-GRO, and TPH-DRO.

SRCs identified in the dry sediment sample included 13 SVOCs (primarily PAH compounds) and 2 petroleum hydrocarbon compounds (DRO carbon chain compounds).

- o The TPH-DRO carbon chain compounds were reported at concentrations less than BUSTR Soil Class 2 Action Levels.
- o All SVOCs were reported at concentrations less than the most stringent Resident Receptor FWCUGs, except for benzo(a)pyrene. The SI report attributed the occurrence of PAHs in the sediments within the drainage ditch to overland storm water discharge from these surrounding areas and general atmospheric deposition from vehicular traffic.

2.2.2.3 Ohio EPA Comments on Draft Site Inspection Report

In a letter dated 3 March 2016, the Ohio EPA provided a Notice of Deficiency for the Draft SI to the Army National Guard (ARNG). Ohio EPA comments were addressed as part of this WP and will be incorporated into the Revised SI.

2.3 CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift

CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift is located within the south-central portion of Camp Ravenna. The potential source of contamination is leaking hydraulic fluid from the former hydraulic lift system. A site layout is shown on Figure 2-3.

2.3.1 Operational History/Description

CC-RVAAP-74 Building 1034 Motor Pool Hydraulic Lift is located south of the intersection of George Road and South Service Road just south of Building 1037 in the Administration Area in the south-central portion of Camp Ravenna. The Building 1034 Motor Pool Hydraulic Lift consists of the former underground hydraulic lift at Building 1034. Design drawings for the building and lift are dated 1941. There is one in-ground hydraulic lift that is composed of two cylinders; each in its own underground vault. The smaller (eastern) vault contains a hydraulic cylinder the portion of the lift that fitted under the rear axle of a vehicle. The larger, “L” shaped (western) vault contained a separate hydraulic cylinder for the front axe land a storage tank that stored the hydraulic fluid. The position of the front axle lift could be adjusted to accommodate different sized vehicles. When it was realized that the hydraulic system was losing fluid, an attempt was made to find the leak and the lift was taken out of service. The date that the lift was taken out of service was not recorded.

The underground hydraulic lift is in place but no longer active. Building 1034 is currently unoccupied and used for storage, however, the U.S. Army plans to remodel the building for use as a workspace.

2.3.2 Previous Investigations Summary

Timeline for investigations at AOC CC RVAAP-74:

- December 2011 – Historical Records Review (HRR) report completed (SAIC, 2011c)
- October 2012 – RI WP finalized (ECC, 2012)
- April 2013 – Initial RI sampling performed at CC RVAAP-74
- March 2015 – Draft RI report prepared (ECC and AMEC, 2015b)
- June 2015 – Ohio EPA's Review of Draft RI Report; Notice of Deficiency
- July 2015 – U.S. Army Response to Comments
- August 2015 – Ohio EPA's Review of Draft RI Report; Notice of Deficiency
- October 2015 – U.S. Army Response to Comments
- March 2016 – Ohio EPA's Review of U.S. Army's Response to Comments

2.3.2.1 Historical Records Review Report

The following paragraphs summarize details for CC RVAAP-74 presented in the *Final Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern), Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC, 2011c).

Interviewees noted maintenance workers would need to add hydraulic oil to the underground lift system on a yearly basis. The former supervisor of the maintenance workers indicated approximately 55 gallons of hydraulic oil would be added to the system each year. Once it was discovered the lift system was leaking, an attempt was made to discover where the leaked hydraulic oil was located. The underground lift system was taken out of service, but not removed, and replaced by an aboveground lift system. No documents were discovered regarding the specific year the underground lift system was removed from service.

The hydraulic floor lift system is described in a 1969 drawing as a twin-post lift system constructed of metal. The hydraulic lift utilized hydraulic oil as a fluid to raise and lower the posts. This hydraulic system was controlled by pneumatics/compressed air. The components of the underground lift system were enclosed in a pit. The below-grade system consists of a cast in concrete "L" shaped pit measuring approximately 12 feet (long portion of the "L" shape) and 4 feet (short portion of the "L" shape) in length, 3 feet in width, and 4 feet in depth. The pit is reportedly buried at depths ranging from 4 feet bgs to approximately 8 feet bgs. The twin- post lift reportedly has a clearance of 6 feet between the floor surface and the bottom of the lift (height in the air).

It is also believed that an additional floor lift system was historically used at the Building 1034 Motor Pool facility. Given the building was used for car repairs and maintenance, it was presumed that the garage used typical garage maintenance chemicals such as oils, gasoline, and solvents for degreasing. Building 1034 Motor Pool was reportedly also used to store batteries, contained a car wash area, and an oil/water separator. The oil/water separator was observed during the HRR property visit/perimeter survey and was measured with a tape measure at 12 feet below floor level. The sump contained approximately a foot of standing liquid, which appeared to have approximately 6 inches of water on the bottom and 6 inches of oil on the top based on coating of the tape measure. An oil sheen was noted on the top of the water layer. Interviewees noted that degreasing activities occurred at the AOC, and Building 1034 was used to store batteries. No documentation or visual impacts (stained flooring) relating to spills or releases from the degreasing activities or battery storage were found for this AOC during the HRR; therefore, no future sampling was recommended in conjunction with degreasing activities or battery storage.

No facility-wide groundwater monitoring wells were present in the Administration Area at the time of the HRR. The nearest facility-wide groundwater monitoring well was LL5mw-004, located over 4,300 feet to the northwest of Building 1034 (SAIC, 2011c). The generalized regional groundwater flow direction in the Administration Area is to the southeast toward a tributary to the west branch of the Mahoning River located southeast of the AOC (SAIC, 2011c).

Groundwater targets included human receptors that use groundwater for potable water supply, as well as environmental receptors (e.g., livestock, fish farms) and physical targets (e.g., springs) that may be affected by potential groundwater contamination on or adjacent to the Hydraulic Lift. There were no public, livestock, or commercial groundwater supply wells within Camp Ravenna. The U.S. Army and OHARNG currently maintain groundwater supply wells for non-potable sanitary and institutional use in the Administration Area in the vicinity of the AOC. Human exposure to potential chemicals in groundwater could occur if groundwater was used for domestic supply purposes in the future. Currently, the OHARNG has the potential to use groundwater on the facility where there are no municipal hookups and no contamination from past usage. No groundwater samples were collected as part of the HRR project. The HRR suggested that leaching of potential soil contaminants to groundwater, with subsequent lateral migration to either surface water discharge or other surface water exposure points, were potential migration pathways for the AOC, which required further evaluation.

Surface water within the Administration Area occurs intermittently as storm water runoff overland into the storm sewer network that drains the area adjacent to Building. Storm sewers direct flow to the south and east to outlets into drainage ditches. Sediment within the storm sewer network may exist but its presence was not confirmed during the HRR property visit. Natural drainage conveyances exist to the southeast that potentially receive overland runoff. There are no perennial surface water features or wetlands adjacent to the AOC. The closest perennial feature to receive drainage from the Administration Area is a tributary to the west branch of the Mahoning River located southeast of the AOC. Surface water flow was not believed to be a primary migration pathway for potential contamination transport at this AOC. Surface water targets include human receptors that use surface water for potable water supply or recreation, as well as environmental (e.g., streams, wetlands, sensitive aquatic environments) and physical targets (e.g., public or private water distribution system intakes) that may be affected by potential groundwater contamination on or adjacent to the AOC. No perennial streams are located within the AOC. There are no observed springs or point groundwater discharge points to a surface water body in the immediate vicinity of the Building 1034 Motor Pool Hydraulic Lift. Therefore, there is no direct exposure pathway for human receptors or ecological targets to surface water at the AOC.

Potential soil targets identified in the HRR included human and ecological (animal and plant) receptors that may come into contact with surface or subsurface soil, if chemicals are present within or adjacent to the former Building 1034 Motor Pool Hydraulic Lift. Considering that chemical releases would most likely have been directly to subsurface soil, a low likelihood exists that ecological receptors present in the AOC vicinity would be exposed. Future human exposure to potential soil contaminants associated with the AOC could occur with active use of the AOC (e.g., training activities).

Airborne contamination (e.g., windblown dust) was not considered a viable migration or exposure pathway at the AOC. The likely contaminants associated with the Building 1034 Motor Pool Hydraulic Lift (SVOCs, inorganic chemicals) have low volatility and potential releases of contaminants would likely have been to subsurface soil. The operational areas are paved, gravel covered, or currently well vegetated. Camp Ravenna is located in a humid climate and soil moisture content is typically high, which reduces the potential for dust generation.

Based on the findings of the HRR, an RI was recommended at the AOC. The potential source of contamination is leaks of hydraulic fluid from the lift system. The areas within Building 1034 that were recommended in the HRR for further investigation were the hydraulic lift and the oil/water separator.

2.3.2.2 Draft Remedial Investigation Report

The following paragraphs summarize the 2013 sampling event that was originally described in the *Draft Remedial Investigation Report CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio* (ECC and AMEC, 2015b).

ECC performed RI field work in April 2013 at the AOC. Only subsurface soil was sampled because the AOC is inside an existing building and is covered by the concrete floor. Sample results were used to define the nature and extent of contamination. ECC installed 21 soil borings through the floor to depths ranging from 6 to 15 feet bgs, and collected soil samples from intervals where hydrocarbon odor or staining was noted. If there was no indication of hydrocarbon contamination, soil samples were collected from the bottom of the boring. A total of 33 discrete samples and one composite sample were collected. All soil samples were analyzed for SVOCs, DRO, and motor oil- range organics (MRO) because the hydraulic fluid used in the lift contained petroleum compounds. One sample was analyzed for the full suite of analytes. All 33 soil samples collected in 2013 were analyzed for PAHs. A total of 18 PAHs were detected and identified as SRCs (including all 7 PAHs regulated under BUSTR). However, none of the PAH SRCs exceeded their BUSTR Soil Class 1 Action Levels or FWCUGs. Therefore, the horizontal and vertical extent of SVOCs/PAHs has been delineated at this AOC, and delineation of PAHs in soil is not a data gap. No further sampling or analysis for PAHs in soil is proposed. DRO and MRO petroleum hydrocarbons (which together encompass the range of mineral oil-based hydraulic fluid) were detected in 10 of 21 borings sampled at depths up to 14 feet bgs (Figure 2-3). MRO exceeded the BUSTR Soil Class 1 Action Limit of 5,000 mg/kg in two soil borings: 5,900 mg/kg at 6-6.5 feet bgs in 74-1034-HL-SB17 and 26,000 mg/kg at 8-8.5 feet bgs in 74-1034-HL-SB18, located on opposite sides of the rear axle portion of the lift (labeled “Covered Pit” on some drawings). The boring log for 74-1034-HL-SB18 indicated “free product” at 7.5-8.0 feet bgs.

2.3.2.3 Ohio EPA Review

Ohio EPA reviewed the Draft RI report. Ohio EPA and the U.S. Army exchanged several letters and comments regarding the report between June 2015 and March 2016. Ohio EPA comments were addressed as part of this WP and will be incorporated into the Revised RI.

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3.0 EVALUATION OF EXISTING DATA

This section presents the procedure followed to complete the historical data screen to determine if the AOCs require additional sampling and data collection to support evaluation of the Unrestricted (Residential) Land Use. The following steps were followed in this data gap analysis procedure and are presented in detail below:

- Review and update the conceptual site model (CSM) pertaining to soil and groundwater associated with the three sites recommended for further evaluation by the U.S. Army and incorporating information in the historical reports summarized in Section 2 of this WP
- Assemble all previously collected data stored in REIMS and collect all available data from the original Preliminary Draft and Draft versions of the reports;
- Review the data use assessment performed in the previous draft reports to ensure that the media sampled meet the DQOs established for the investigations;
- Review the data screen using the current Unrestricted (Residential) Land Use screening criteria available in the Draft RI reports for CC RVAAP-69 and CC RVAAP-74;
- Review the data screen using the current ecological screening criteria available in the Draft RI reports for CC RVAAP-69 and CC RVAAP-74;
- Perform a detailed evaluation of each location that exceeds screening criteria to determine if nature and extent is defined for CC RVAAP-69 and CC RVAAP-74 to complete evaluation of Unrestricted (Residential) Land Use;
- Perform a detailed evaluation of each location that exceeds screening criteria to determine the presence or absence of contamination at CC RVAAP-70; and
- Recommend locations for additional sampling at locations where elimination of data gaps is required to complete development of the RI reports for CC RVAAP-69 and CC RVAAP-74 and the SI report for CC RVAAP-70.

3.1 CC-RVAAP 69 Former Building 1048 Fire Station Data Gap Assessment

This section presents only information specific to Former Building 1048 Fire Station that was used in the data gap analysis of soil and groundwater. The data gap analysis identifies areas that require further investigation to define the nature and extent of contamination that will be evaluated in the Revised RI Report.

3.1.1 Conceptual Site Model

The CSM for conditions at CC RVAAP-69 Building 1048 Fire Station, including the potential contaminant sources, migration, pathways, release mechanisms, and receptors was developed in the previous Draft RI for CC RVAAP-69 Building 1048 Fire Station (ECC and AMEC, 2015a). The CSM is summarized and updated below based on information and data previously collected for this RI, environmental investigation of an adjacent AOC (CC RVAAP-72 Facility-Wide USTs), and informed assumptions about CC RVAAP-69 Building 1048 Fire Station.

3.1.1.1 Contaminant Sources

Carbon tetrachloride, used in fire extinguishers, was the only potential contaminant for this AOC identified in the HRR. No primary contaminant sources are located at the AOC because primary contaminant sources (discharge of fire extinguishers and stored chemicals) were eliminated, and the site is no longer used as a fire station. Potential secondary sources (contaminated media) were identified during the previous environmental investigations. The most notable secondary sources were carbon tetrachloride and chloroform in subsurface soil. Groundwater has not yet been sampled at this AOC.

Data collected to date indicate that surface soil is not impacted by carbon tetrachloride; therefore, the historical records reports of discharge to the ground surface outside of the building either did not occur, or concentrations have dissipated over time. Re-grading of the site following demolition of the building may have also contributed to volatilization of carbon tetrachloride that may have been present in near-surface soil.

Concentrations of carbon tetrachloride in subsurface soil near the middle of the Former Fire House No. 1 in the general vicinity of the former 100-gallon unregulated UST RV-5 (Figure 2-1) exceed the June 2017 USEPA Residential RSL of 0.65 mg/kg (a FWCUG has not been established). Soil concentrations in soil borings 72-1048-RV5-SB2, 69-1048-SB101, 69-1048-SB104, and 69-1048-SB105 range from 0.7 mg/kg to 14 J mg/kg, which exceed the June 2017 USEPA Residential RSL. Carbon tetrachloride concentrations only exceed 0.65 mg/kg in soil below 4 feet bgs. Carbon tetrachloride was not related to the historical activities and use of the former UST RV-5, which was used to store gasoline (ECC, 2015c). The mechanism for the carbon tetrachloride release within the former Fire House footprint is undetermined. It is unknown if carbon tetrachloride was released as an organic liquid or as wash water containing dissolved carbon tetrachloride.

Chloroform was also detected in six subsurface soil samples at concentrations greater than the June 2017 USEPA Residential RSL of 0.32 mg/kg (a FWCUG has not been established). These chloroform concentrations were detected in soil from 9-16 feet bgs in 69-1048-SB101 within the footprint of the former building (collocated with carbon tetrachloride detections). Chloroform concentrations ranged from 0.33 to 0.87 mg/kg. Chloroform may have originated from the biodegradation of carbon tetrachloride (USEPA, 1998).

Other SRCs that exceeded screening criteria included PAHs in surface and subsurface soil, and arsenic in subsurface soil. PAHs are commonly detected in surface and subsurface soil at Camp Ravenna and exceedances are most likely anthropogenic sources from vehicle use and asphalt paving surrounding the AOC. There is no record of PAHs used or stored at the AOC. Arsenic in one sample from 9-13 feet bgs was the only inorganic detected in subsurface soil at concentrations greater than the FWCUG. This concentration only slightly exceeded the BSV.

The HRR (SAIC, 2011c) only discusses carbon tetrachloride fire extinguishers in the context of the Building 1048 Fire Station. Mr. Gary Wolfgang, a former RVAAP employee, stated that RVAAP used carbon tetrachloride extinguishers exclusively in the early days.

3.1.1.2 Contaminant Transport / Transformation

No groundwater samples were collected as part of the previous RI investigations. Infiltrating precipitation could potentially leach carbon tetrachloride and its decay products from soil in sufficient quantities to impact groundwater. Once in groundwater, chemicals could potentially migrate in the dissolved phase to surface water. Regional groundwater flow is to the east. Chemicals dissolved in groundwater will be transported downgradient by advection and dispersion.

Chemicals in surface soil may be transported in particulates in storm water run-off following a storm event (ECC and AMEC, 2015). However, the chemicals in surface soil at this AOC are primarily PAHs and metals, and are unlikely to be associated with a release from the former Fire Station.

Carbon tetrachloride can degrade to chloroform, methylene chloride, and chloromethane under anaerobic conditions (USEPA, 1998). Chloroform concentrations were detected in a subsurface soil sample 69-1048-SB101 above its June 2017 USEPA Residential RSL. The chloroform exceedances are located in the same boring as the carbon tetrachloride exceedances.

3.1.1.3 Receptors

There are no wetlands or surface water features within the AOC. During storm events, surface water within this area either runs off the land following topography toward surrounding drainage or infiltrates into the subsurface (ECC and AMEC, 2015a). Infiltration is limited by the presence of silty and clayey soils. Heavy precipitation flows intermittently as storm water runoff within ditches and a sewer network throughout the Administrative Area. The closest surface water feature, with associated wetlands, is a tributary to the West Branch of the Mahoning River located approximately 1,500 feet north and east of the AOC (ECC and AMEC, 2015a). The West Branch of the Mahoning is located southeast of Camp Ravenna and flows east into the Mahoning River.

Contaminated soil media may represent a direct exposure pathway for human and biological receptors under current and future land use. The future land use is military training. The representative receptor for the area is the National Guard Trainee (NGT). The Unrestricted (Residential) Land Use was evaluated in the Draft RI using the Resident Receptor scenario. This land use and receptor scenario is used to evaluate an “unrestricted land use” option (ECC and AMEC, 2015a). The Revised RI report will also evaluate the Commercial/Industrial Land Use using the Industrial Receptor as required by the 2014 Final Technical Memorandum (National Guard Bureau (NGB) 2014). Current and future human receptors could be exposed to carbon tetrachloride in subsurface soil.

No groundwater receptors were identified for this AOC in the previous Draft RI report (ECC and AMEC, 2015a). However, the OHARNG has the potential to use groundwater on the facility. Therefore, there are potential human receptors to groundwater. Groundwater was not investigated during the 2012 and 2015 investigations; therefore, it is unknown if groundwater is impacted. However, a groundwater supply well is located approximately 350 feet to the south-southeast (Figure 1-2). There are four water supply wells that provide nonpotable water to the Administration Area located along George Road (where Building 1048 is located). It is unknown if the wells are screened in the unconsolidated overburden or in deeper bedrock aquifers, but the groundwater wells are a potential exposure pathway to human receptors. Significant ecological receptors are unlikely given that the AOC is marginal habitat, surface soil is not impacted by carbon tetrachloride, and any discharges of groundwater to surface water are there at least 1,500 feet from the AOC.

3.1.2 Data Assembly and Use Assessment

The data gap analysis considered all sampling results from previous sampling events performed by ECC, including the initial RI field sampling in November 2012, Former UST RV-5 data from CC RVAAP-72 SI collected in December 2012, the 7 April 2015 sampling event as noted in Field Change Notice, and additional sampling on 29 April 2015, all of which are summarized in the Draft RI (ECC and AMEC, 2015a).

ECC performed internal data verification on 100 percent of the data and third-party independent data validation on 10 percent of the 2012 RI laboratory data. Data quality issues were minor and did not impact the chemicals that were ultimately selected as COPCs. Therefore, the data met DQOs for intended use.

3.1.3 Screening Criteria

COPCs were identified, and horizontal and vertical extent of contamination was delineated by comparing the SRCs identified in surface and subsurface soil with the most stringent of the Resident Receptor FWCUGs at a target risk of 1×10^{-6} and a HQ of 0.1. USEPA Residential RSLs were used for comparison if FWCUGs are not established for an analyte. COPCs for CC RVAAP-69 surface and subsurface soil, as identified in the Draft RI (ECC and AMEC, 2015a), are presented in Table 3-1. Screening levels for the COPCs (updated with current June 2017 RSLs) are presented in Section 9.0. Evaluation of the nature and extent of COPCs is discussed in Section 3.1.4.

A Screening Level Ecological Risk Assessment (ERA) was conducted during the Draft RI to evaluate the potential for chemical constituents detected in surface soil (0-1 feet) at CC RVAAP-69 Building 1048 Fire Station to adversely affect ecological receptors. Chemicals of potential ecological concern (COPECs) identified in the Draft RI included the metals copper lead, mercury and zinc, SVOC dibenzofuran, and explosives nitroguanidine and tetryl. None of these COPECs appear to be related to a release from the former Fire Station. The Draft RI concluded that it is unlikely that exposure to surface soil would adversely affect communities or populations of common ecological receptors or individuals of state-listed species in CC RVAAP-69 Building 1048 Fire Station. COPECs for Former Building 1048 will be updated and re-evaluated in the next version of the RI. However, additional sampling of surface soil to evaluation ecological impacts is not considered necessary.

3.1.4 Nature and Extent Evaluation

Although several PAHs and metals exceeded the screening criteria in surface soil, except for benzo(a)pyrene, none of the surface soil COPCs were identified as COPCs for subsurface soil. The COPCs (and COPECs) for surface soil do not appear to be related to historical releases from the former Fire Station. All existing data will be carried forward for evaluation in the RI. COPCs in surface soil appear to be adequately characterized and no data gaps for surface soils were identified.

For subsurface soil, COPCs benzo(a)pyrene and arsenic each exceeded its screening level in only one sample. These COPCs are adequately delineated.

Chloroform exceeds its screening level in only one borehole (SB101), and all exceedances are collocated with carbon tetrachloride. The vertical and lateral extent of carbon tetrachloride concentrations are illustrated in Figure 2-1 as well as east-west cross section A-A′ (Figure 3-1) and north-south cross section B-B′ (Figure 3-2). Because the ground surface is not even, the vertical extent of contamination is discussed in both feet bgs and feet amsl. The ground surface at CC RVAAP-69 varies between 1025 and 1029 feet amsl. The vertical extent of carbon tetrachloride concentrations in soil is not fully delineated. The deepest sample collected from boring 69-1048-SB101 (SB101) at 15-16 feet bgs exceeded the June 2017 USEPA Residential RSL of 0.65 mg/kg for carbon tetrachloride. Carbon tetrachloride from 5-16 feet bgs (1020 to 1009 feet amsl) in this boring consistently exceeded the June 2017 USEPA Residential RSL, though concentrations appear to decrease below 10 feet bgs (~ 1,014 feet amsl). Boring logs show that SB101 extended to 20 feet bgs. No organic vapors were detected with the PID at any vertical interval, and no samples were collected for laboratory analysis below 16 feet bgs. No other soil borings at this AOC were sampled below 15 feet bgs. Therefore, the vertical extent of carbon tetrachloride in soil at SB101 is not defined.

Some of the soil borings installed in 2015 did not extend deeper than 10 feet bgs. The maximum carbon tetrachloride concentrations in soil at borings SB101 and SB104 were detected in the vertical interval between 5 and 10 feet bgs (1020 to 1015 feet amsl). The soil borings immediately to the north (SB105), south (SB103) and east (SB102) of SB101 were only sampled to a depth of 10 feet bgs (1018 to 1019 feet amsl). Borings further north (SB109), west (SB107) and east (SB106) bound the lateral extent of carbon tetrachloride to a depth of 12 to 13 feet bgs (1012 to 1013 feet amsl). The lateral extent of carbon tetrachloride in soil is not well defined below a depth of 1018 feet amsl.

3.1.5 Data Gap Summary

The following data gaps have been identified for AOC CC RVAAP-69:

- The vertical extent of carbon tetrachloride in soil at SB101 is not defined.
- The lateral extent of carbon tetrachloride in soil is not well defined below a depth of 1018 feet amsl.
- Groundwater was not evaluated as part of the previous investigations.

3.2 CC-RVAAP 70 East Classification Yard Data Gap Assessment

This section presents only information specific to the East Classification Yard that was used in the data gap analysis of soil and groundwater. The summary of the data gap analysis identifies areas that require further investigation to confirm the presence or absence of chemicals greater than screening criteria that will be evaluated in the Revised SI Report. The following steps were used to generate the data and screening criteria for the data gap analysis.

3.2.1 Conceptual Site Model

A CSM was not developed as part of the previous Draft SI Report for CC RVAAP-70 East Classification Yard (ECC, July 2015a). The following sections provide information on potential contaminant sources, transport and transformation of chemicals, and potential receptors summarized from Section 6.0 Exposure Pathways in the previous Draft SI Report and Section 4.0 CC RVAAP-70 East Classification Yard in the HRR.

3.2.1.1 Contaminant Sources

Past operations at the AOC may have resulted in a release of chemicals from site operations to surface soil and by infiltration to subsurface soil, and by overland conveyance to nearby drainage ditches. No primary sources of contamination exist as operations have been discontinued and most of the infrastructures (except for the Round House Building 47-40 and rails) have been demolished. Secondary sources such as chemicals in soil and dry sediment may exist from releases related to maintenance operations, petroleum storage, or herbicide storage and mixing operations.

The HRR reported a leak of No. 5 Fuel Oil from a former AST (Tank 65B) in the AST containment area. The spilled fuel oil reportedly did not overflow or leak through the containment berm. The spill report for the Former Fuel Oil Spill Area (DU01) indicated that the containment area of the

ASTs was scarified and approximately 16,632 gallons of No. 5 fuel oil was salvaged, by unspecified means, from the containment area. Surface and subsurface soil were sampled and analyzed for DRO, GRO, VOCs and SVOCs in 2012. All petroleum constituent SRCs were below BUSTR Class 2 Action Levels, and non-petroleum SRCs were below Resident Receptor FWCUGs (or June 2017 USEPA Residential RSLs), suggesting that there are no contaminant sources associated with the Former Fuel Oil Spill Area. As part of this WP evaluation, the SI data for VOCs and SVOCs were compared to FWCUGs (Tables 3-2 and 3-4) and determined that PAHs benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene exceed their FWCUGs at DU01. The PAHs may be the remnant of fuel oil release(s) at DU01. However, given the very low concentrations of other petroleum SRCs at DU01, the source of the PAH may be unrelated to releases from the East Classification Yard.

Maintenance activities in the Round House (Building 47-40) may have resulted in releases of PCBs, lubricants and oils, and organic-based solvents from cleaning or degreasing operations. Oily sludges (approximately two inches deep) cover the bottom of the interior repair pit. The repair pit is the lowest point in the building, and represents a location where spills of liquids could drain. Oily sludges are also present along the east wall of the building where an oil storage rack was located. Other portions of the floor appear to be relatively free of oily sludges but some areas exhibit staining, including portions constructed of or lined with wood. Liquid releases could have leached to the soil under the building floor through cracks in the concrete or between wooden planks. Surface and subsurface soil around the perimeter of the building, and subsurface floor beneath the floor the of repair pit, were sampled in 2012. All samples were analyzed for PCBs, SVOCs and metals. One subsurface sample from the perimeter of the building was also analyzed for VOCs. The only chemicals that exceeded FWCUGs were PAHs from samples around the perimeter of the building. No chemicals were detected above FWCUGs from subsurface soils beneath the repair pit. However, although organic solvents were reportedly used in the Round House, most of the soil samples were not analyzed for VOCs. Also, floor of the repair pit was covered with oily sludge and it is unknown if any samples were collected near cracks in the concrete floor. Finally, no subsurface samples were collected beneath any stained areas of the floor outside of the repair pit, including areas of the floor constructed of wood.

A storage shed used to store herbicides and a track mounted sprayer was located in the East Classification Yard. Herbicide mixing operations may also have occurred at the building. Herbicides may have been mixed with waste oil and applied for vegetation control. No documents relating to spills or releases were found for this AOC. Surface and subsurface soil were sampled around the former herbicide storage shed in 2012. All samples were analyzed for SVOCs and herbicides. One subsurface sample was also analyzed for GRO and VOCs due to an elevated PID reading. The only chemicals that exceeded FWCUGs in any samples were PAHs.

The outdoor wash rack was assumed to wash down the box cars that carried explosives and/or the train engines. The wash rack was located outdoors and open with no means of collecting wastewater (SAIC, 2011c). Wash water either infiltrated into the underlying soil or flowed overland to storm drains and ditches. Surface and subsurface soil were sampled in 2012. All samples were analyzed for SVOCs, PCBs, and explosives. Several samples noted odor and elevated PID readings at the bottom of the boring (about 7 feet bgs) where the unconsolidated soil meets bedrock. The soil sample from the boring with the highest PID reading was also analyzed for GRO and VOCs. However, the sample was a vertical ISM sample from the entire boring, not a discrete sample from the interval where odor and elevated PID headspace were noted. The only chemicals that exceeded FWCUGs in any of the soil samples were PAHs. Because no discrete soil samples were collected at the depth where odor and elevated PID readings were noted, it is uncertain if soils were adequately sampled for VOCs.

To date, the only chemicals that exceed their FWCUGs in any soil samples at any of the East Classification Yard potential release areas were PAHs. While the PAHs could have resulted from releases or maintenance activities at the East Classification Yard, other sources unrelated to these activities are also possible. PAHs may be present in soil due to asphalt pavement, deposition of locomotive exhaust, or as a result of burning vegetation (either forest fires or as a way to maintain vegetation clearance of the railroad). Distinguishing between East Classification Yard releases and sources unrelated to AOC releases will be difficult. However, because no other constituents that would be expected from a release at this AOC (e.g., DRO, PCBs, herbicides, explosives) exceed FWCUGs, the argument for other anthropogenic or natural sources of the PAHs is plausible.

3.2.1.2 Contaminant Transport / Transformation

The chemicals identified at CC RVAAP-70 to date (PAHs in soil and sediment, and a single PCB detection in sediment) have low solubility and therefore are not be anticipated to dissolve into and be transported in water. These chemicals are strongly sorbed to soil, and the primary transport mechanism is anticipated to be transport of soil and sediment in surface water.

Surface water in the form of runoff may be a potential migration pathway for potential contamination to leave the AOC (including the Wash Rack [DU06] and Former Herbicide Storage Shed [DU05]), flowing overland or through natural/manmade conveyances. Storm water runoff drains to the existing storm sewer system located in the area, which discharges to a drainage ditch along the west side of the railroad track yard that flows to the north. A drainage conveyance also drains the area west of the former AST bermed enclosure that also flows to the north (SAIC, 2011c).

Sediment from both ditches was sampled in 2012. Sediment from the east ditch was analyzed for the full suite of analytes, and sediment from the west ditch was analyzed for VOCs, MTBE, SVOCs, TPH-GRO, and TPH-DRO. PAHs were detected at concentrations above FWCUGs in sediment from both ditches (similar to those detected in surface soils at the other DUs at this AOC). Aroclor 1242 was also detected at a concentration above its FWCUG in the sediment sample from the east ditch.

There are no perennial surface water features at CC RVAAP-70 East Classification Yard. The closest perennial feature to receive drainage from the East Classification Yard is a tributary to the west branch of the Mahoning River, located approximately 2,000 feet northeast of the AOC. No surface water or wet sediment samples were collected as part of the previous SI, because only dry sediment samples were collected since the drainage ditches were dry in November 2012 during the SI sampling.

There is a storm water drain at the southwest corner of Building 47-40 (located between the building and the Outdoor Wash Rack Area). The drain is half filled with sediment and was not sampled in 2012.

Groundwater is relatively shallow at the East Classification Yard and presumably flows near the bottom of the unconsolidated soil and top of the bedrock (the vertical interval where odors and elevated PID readings were noted on borings from the Outdoor Wash Rack). The chemicals identified to date (PAHs and a single PCB detection) have low solubility and therefore are not be anticipated to dissolve into and be transported in groundwater. However, if VOCs are detected at any of the potential release areas, groundwater transport may be a significant transport mechanism.

3.2.1.3 Receptors

Current and future human and ecological (animal and plant) receptors may come into contact with contamination in the surface or subsurface soil.

Airborne contamination (e.g., windblown dust) is not considered a migration or exposure pathway at this AOC (ECC, 2015a). The former RVAAP facility is located in a humid climate, and soil moisture content is typically high, which reduces the potential for dust generation.

Potential surface water targets include human receptors that use surface water for potable water supply or recreation, as well as environmental (e.g., streams, wetlands, and sensitive aquatic environments) and physical targets (e.g., public or private water distribution system intakes) that may be affected by potential groundwater contamination on or adjacent to the AOC (ECC, 2015a). There are no perennial surface water streams or wetlands in the immediate vicinity of the East Classification Yard AOC. There are no observed springs or groundwater discharge points to a surface water body in the immediate vicinity of the AOC. Therefore, there is no direct exposure pathway for human receptors or ecological targets to surface water at this AOC (ECC, 2015a).

No chemicals have been identified at this AOC to date that would be likely to dissolve in or be transported by groundwater. The OHARNG has the potential to use groundwater on the facility. Therefore, there are potential human receptors to groundwater. If other chemicals, particularly VOCs, are identified at this AOC in the future, the potential for groundwater receptors may need to be re-evaluated.

3.2.2 Data Assembly and Use Assessment

The data gap analysis considered all sampling results from previous sampling events performed by ECC, including the field sampling in November and December 2012, and the 1 April 2013 additional subsurface soil sample collected from DU03 SB-6, which are summarized in the Draft SI Report (ECC, 2015a).

ECC performed internal data verification on 100 percent of the data and third-party independent data validation on 10 percent of the SI laboratory data. Data quality issues were minor and did not impact the chemicals that were ultimately selected as SRCs. In general, the data validation performed for the CC RVAAP-70 SI indicates that results are usable for their intended purposes. Three compounds were qualified as rejected in select samples: n-nitrosodiphenylamine, 4-chloroaniline, and 3,3-dichlorobenzidine. These compounds are not SRCs (ECC, 2015a).

3.2.3 Screening Criteria

SRCs identified in surface and subsurface soil were screened relative to the most stringent of the Resident Receptor FWCUGs at a target risk of 1×10^{-6} and a HQ of 0.1. June 2017 USEPA Residential RSLs were used for comparison if FWCUGs are not established for an analyte. SRCs for CC RVAAP-70 surface and subsurface soil were originally screened in the Draft SI (ECC, 2015a). The SI data was re-evaluated using FWCUGs (SAIC, 2010) and updated (June 2017) Residential RSLs. Concentrations of petroleum constituent VOCs and SVOCs at Former Fuel Oil Spill Area DU01 were also compared to appropriate FWCUGs or June 2017 USEPA Residential RSL in accordance with Ohio EPA comments from March 2016. The results of this evaluation are illustrated in Table 3-2 for organics in surface soil and dry sediment, in Table 3-3 for inorganics in surface soil and dry sediment, in Table 3-4 for organics in subsurface soil, and in Table 3-5 for inorganics in subsurface soil.

SRCs exceeding screening levels in surface soil and/or dry sediment are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and Aroclor 1242. These results are consistent with the Draft SI Report (ECC, 2015a), except that benzo(a)pyrene exceeded its FWCUG at the Former Fuel Oil Spill Area DU01. All inorganics were below Camp Ravenna background levels except arsenic in the dry sediment samples from the ditches. In the Draft SI Report (ECC, 2015a), arsenic was eliminated because concentrations were below the wet sediment background value.

SRCs exceeding screening levels in subsurface soil are benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene, including at the Former Fuel Oil Spill Area (DU01) where petroleum constituent VOCs and SVOCs had been compared only to BUSTR Soil class 2 Action Levels. All inorganics were below Camp Ravenna background levels. These results are consistent with the Draft SI Report (ECC, 2015a).

No Screening Level ERA has been conducted for CC RVAAP-70.

3.2.4 Presence/Absence Evaluation

The goal of the SI is to establish presence or absence of contamination. If contamination is present, the nature and extent of contamination will be evaluated in an RI.

The HRR (SAIC, 2011c) evaluated historical records and recommended sampling and analyses based on the suspected chemical use, activities and potential releases at each DU within the AOC. All recommendations of the HRR were followed during the SI sampling events in 2012 and 2013. For the most part, sampling and analysis are adequate to determine presence or absence of contamination. To date, the only chemicals identified above screening level concentrations are PAHs at most of the DUs, and one PCB in a single dry sediment sample.

There were few instances where HRR recommendations appear to be incomplete, or sampling was not conducted at optimum locations to detect potential contamination:

- Although organic solvents were likely used in the Building 47-40 Round House, VOCs were not identified for analysis at this location.
- Soil borings within Building 47-40 Round House may not have been optimally placed to identify potential releases. It is unknown if soil borings within the repair pit are located near cracks in the concrete. Stained areas of the floor outside of the repair pit that are located near cracks in concrete or at wooden floor planks were not samples.
- Discrete soil samples from soil borings in the Outdoor Wash Rack area were not collected for VOC analysis despite observations of odor and elevated PID readings.
- Sediment has accumulated in a storm water drain near the southwest corner of Building 47-40, and may be the result of surface water runoff/sediment transport from the Outdoor Wash Rack Area. This sediment has not been sampled.

3.2.5 Data Gap Summary

The following data gaps have been identified for CC RVAAP-70:

- Soil underneath the floor inside Building 47-40 has not been sampled at locations where the floor is stained and cracked.
- Soil underneath the floor of the Interior Repair Pit (DU04) has not been sampled for VOCs.
- Discrete soil samples have not been sampled and analyzed for VOCs from locations at the Outdoor Wash Rack Area at the vertical interval where odor and elevated PID readings were noted in boring logs.
- Sediment from the storm drain at the southwest corner of Building 47-40 has not been sampled for contamination from the Outdoor Wash Rack.

3.3 CC-RVAAP 74 Building 1034 Motor Pool Hydraulic Lift Data Gap Assessment

This section presents only information specific to the Motor Pool Hydraulic Lift that was used in the data gap analysis of soil and groundwater. The summary of the data gap analysis identifies areas that require further investigation to define the nature and extent of contamination that will be evaluated in the Revised RI Report. The following steps were used to generate the data and screening criteria for the data gap analysis.

3.3.1 Conceptual Site Model

The CSM for conditions at CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift, including the contaminant sources, migration, pathways, release mechanisms, and receptors was developed in the previous Draft RI for CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift (ECC and AMEC, 2015b). The CSM is summarized and updated below based on information and data previously collected for this RI, and informed assumptions about CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift.

3.3.1.1 Contaminant Sources

The underground hydraulic lift system is not in use but is still in place in the southeast corner of Building 1034. The lift has two underground parts; an “L” shaped feature that includes a cylinder that contained hydraulic fluid as well as an adjustable lift that could be positioned under the front axle of a car, and a rear axle lift component that is listed as a “covered pit” on some of the drawings.

The underground hydraulic lift required hydraulic fluid (mineral oil) to be added a couple of times per year. An estimated 300 gallons of oil were added to the lift over a 10-year period (SAIC, 2011c). The lift system potentially leaked hydraulic oil; however, the leak could not be located. Hydraulic oil was observed entering the oil/water separator sump. The underground lift system was taken out of service and replaced by an aboveground lift system (SAIC, 2011c).

While the hydraulic lift system remains in place beneath Building 1034, hydraulic fluids were removed and, therefore, the primary contaminant source has been removed (i.e., there are no continuing leaks).

The 2013 RI sampling indicates that soil has been impacted by hydraulic fluid. Elevated MRO concentrations (which includes most of the hydraulic fluid molecular weight range) were detected in soil borings SB17 and SB18. These detections are limited to a relatively small area (the borings are about 6 feet apart) and are closest to the rear axle portion of the hydraulic lift (labeled “covered pit” in some figures). MRO detections in the other 19 boreholes were much lower, suggesting that the hydraulic fluid leak may be limited to the vicinity of the rear axle portion of the lift. The vertical interval of the elevated detections was 6-8 feet bgs (1014 to 1016 feet amsl). The SB18 boring log noted "free product" at 7.5 feet bgs. The elevated MRO detections may be located near the water table that is estimated to be located between 1010 and 1020 feet amsl at CC RVAAP-74 (Figure 1-9).

RI soil samples were analyzed for DRO, MRO and SVOCs. One sample (at SB06) was analyzed for full suite analytes, which includes VOCs. No VOCs were detected, but the sample was not collected from a boring with the maximum MRO detections. Hydraulic fluid is not anticipated to contain VOCs, but solvents may have been used in the facility.

3.3.1.2 Contaminant Transport / Transformation

If released in sufficient quantities to overcome capillary forces, hydraulic fluid (mineral oil) could travel downward to the water table where it could potentially accumulate as mobile light non-aqueous phase liquid (LNAPL). Mineral oil is primarily aliphatic hydrocarbons and therefore not very soluble in water. Like other petroleum-based products, mineral oil, if present, would be expected to biodegrade in the environment under both aerobic and anaerobic conditions. Groundwater flow rates in the predominantly clay overburden are likely relatively low. Therefore, any resulting COPC plume in groundwater is expected to be relatively small and likely limited to an area relatively near the point of release.

No groundwater samples were collected as part of the previous RI investigations. Once in groundwater, COPCs could potentially migrate in the dissolved phase to surface water. Regional groundwater flow is to the east. Chemicals dissolved in groundwater will be transported downgradient by advection and dispersion. As discussed above, hydraulic fluid constituents that dissolve in groundwater are not anticipated to migrate far from the release point.

If present, VOCs in soil could migrate in soil gas by diffusion and infiltrate into the overlying building through cracks in the floor or through the hydraulic lift and oil water separator openings in the floor.

3.3.1.3 Receptors

Because this AOC is located within a covered building, no sediment, perennial streams, surface water bodies, or wetlands are present within CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift. There are no observed springs or groundwater discharge points to a surface water body or wetland in the immediate vicinity of the Motor Pool Hydraulic Lift. The closest potential groundwater discharge location is a tributary to the West Branch of the Mahoning River approximately 2,000 feet to the east.

Direct exposures to COPCs in soil would only occur if the building is demolished and soil is excavated at some point in the future.

Groundwater beneath this AOC is not currently monitored; therefore, it is unknown if groundwater is impacted. Exposures to COPCs in groundwater are unlikely because hydraulic fluid is only sparingly soluble and readily biodegradable. The nearest Camp Ravenna groundwater supply well is located in the Administration Area approximately 250 feet northwest (upgradient) of the hydraulic lift. The OHARNG has the potential to use groundwater on the facility. Therefore, there are potential human receptors to groundwater.

Because the U.S. Army intends to remodel Building 1034 for use as a workspace, vapor intrusion to indoor air is a potential exposure pathway if VOCs are present.

Significant ecological receptors are unlikely given that the AOC is marginal habitat, surface soil is not impacted by SRCs, and any discharges of groundwater to surface water are there at least 2,000 feet from the AOC.

3.3.2 Data Assembly and Use Assessment

The data gap analysis considered all sampling results from previous sampling events performed by ECC, including the initial RI field sampling in April 2013, which are summarized in the Draft RI (ECC and AMEC, 2015b).

ECC performed internal data verification on 100 percent of the data and third-party independent data validation on 10 percent of the RI laboratory data. Data quality issues were minor and did not impact the chemicals that were ultimately selected as COPCs. Therefore, data meet DQOs for intended use.

3.3.3 Screening Criteria

COPCs were identified, and the horizontal and vertical extent of contamination were delineated by comparing the SRCs identified in surface and subsurface soil with the most stringent of the Resident Receptor FWCUGs at a target risk of 1×10^{-6} and a HQ of 0.1. June 2017 USEPA Residential RSLs were used for comparison if FWCUGs are not established for an analyte. BUSTR Soil Class 1 Action Levels were used for DRO and MRO. Screening levels are presented in Section 9.0. The only COPC identified at AOC CC RVAAP-74 was MRO, which exceeded the BUSTR Action Level for Soil Class 1 of 5,000 mg/kg in two samples.

The BUSTR Soil Class 1 Action Level for MRO is 5,000 mg/kg; neither FWCUGs nor June 2017 USEPA Residential RSLs have been established for MRO. However, the U.S. Army (letter dated 22 October 2015) calculated Residential Receptor FWCUGs for MRO of 1,000,000 mg/kg (assuming MRO consists of aliphatic hydrocarbons) and 30,000 mg/kg (assuming MRO consists of aromatic hydrocarbons). The MRO concentrations at CC RVAAP-74 exceed the BUSTR Soil Class 1 Action Level but not the FWCUG estimated by the U.S. Army.

All 33 soil samples collected in 2013 were analyzed for polycyclic aromatic hydrocarbons (PAHs) using EPA Method SW-846-8270. A total of 18 PAHs were detected and identified as SRCs (including all 7 PAHs regulated under BUSTR). However, none of the PAH SRCs exceeded their BUSTR Soil Class 1 Action Levels or FWCUGs. Therefore, the horizontal and vertical extent of SVOCs/PAHs has been delineated at this AOC, and delineation of PAHs in soil is not a data gap. No further sampling or analysis for PAHs in soil is proposed.

A Screening Level ERA was conducted during the Draft RI (ECC and AMEC, 2015b) to evaluate the potential for chemical constituents detected in environmental media at CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift to adversely affect ecological receptors. The Level I ERA concluded that no further investigation or removal action is necessary because the ecological exposure pathway is incomplete. No habitat is present at CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift as it consists of the area in/under Building 1034. Affected subsurface soil is covered by the building and occurs at a depth interval below the zone of biological activity.

3.3.4 Nature and Extent Evaluation

To avoid confusion, the TPH-C_{10} to C_{20} distillate range previously described in the Draft RI as "diesel range organics" or "DRO" will be more accurately described in this WP as "middle distillates range." Also, the TPH-C_{20} to C_{34} distillate range described in the Draft RI is "motor oil range" or "MRO" (not to be confused with middle rage organics or distillates) will be more accurately described in this WP as "heavy distillates range. The previous Draft RI (ECC and AMEC, 2015c) indicated there are no chemicals of concern (COCs) for CC RVAAP-74. The primary SRC of concern is hydraulic fluid. Hydraulic fluid is believed to be mineral oil and was detected by TPH-C_{20} to C_{34} heavy distillates range (previously called MRO) analysis (and to a lesser extent, TPH-C_{10} to C_{20} [previously called DRO]). Most of SRCs identified at CC RVAAP-74 were SVOCs, as well as a few metals.

“Free product” was recorded on the boring log for sample 74-1034-HL-SB18 at 7.5 to 8.5 feet bgs during the 2013 field investigation (Figure 2-3). Cross-sections were prepared to evaluate the lateral extent of TPH-C_{20} to C_{34} heavy distillates range in soil with depth (Figures 3-3, 3-4 and 3-5). The “free product” noted on the soil boring is located in a relatively isolated zone of gravel at an interval that is otherwise primarily clay (Figures 3-3 and 3-5). The horizontal extent of COPCs in soil is not bounded to the east and south of 74-1034-HL-SB18 because soil samples were not collected at the same vertical interval (approximately 1014 feet amsl or 8 feet bgs) in 1034-HL-SB-14 and 74-1034-HL-SB-19.

Groundwater was not evaluated as part of the previous investigations. It is unknown if groundwater is impacted or if enough hydraulic fluid was released to accumulate as mobile LNAPL at the water table. Site-specific depth of groundwater and direction of groundwater flow have not been determined. The Facility-Wide Groundwater Monitoring Program, RVAAP-66 Facility-Wide Groundwater Annual Report for 2015 (TEC-WESTON Joint Venture, 2016) includes a regional groundwater maps that suggest that the water table is located between 1010 and 1020 feet amsl and flow is to the east (Figure 1-9); however, the scale of the map may not capture local flow variations. Topography slopes to the southeast and may influence the local groundwater flow direction.

Only one soil sample to date has been analyzed for VOCs, and no VOCs were detected. The sample selected for VOC analysis was not collocated with the maximum concentration of TPH-C_{20} to C_{34} heavy distillates range. Although hydraulic fluid is not anticipated to contain VOCs, it is possible that organic solvents were used during vehicle maintenance activities.

3.3.5 Data Gap Summary

The following data gaps have been identified for CC RVAAP-74:

- It is unclear if the “free product” historically noted on the 74-1034-HL-SB18 boring log at 7.5 to 8.5 feet bgs is mobile LNAPL or residual LNAPL.
- The horizontal extent of COPCs in soil is not defined east and south of 74-1034-HL-SB18.
- Groundwater was not evaluated as part of the previous investigations and it is unknown if groundwater is impacted or if enough hydraulic fluid was released to accumulate as mobile LNAPL at the water table.
- Only one soil sample was analyzed for VOCs.

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4.0 PROPOSED SAMPLING STRATEGY

Proposed additional sampling is presented below for each AOC to address data gaps. Proposed sample location maps illustrated in Figures 4-1 through 4-4. A complete listing of proposed samples, sample identifiers, sample type (including sample depth intervals), and sample analyses are presented in the UFP-QAPP (Appendix B).

4.1 Proposed Sampling for CC-RVAAP 69 Building 1048 Fire Station

The following approach has been developed to address data gaps:

Data Gap 1: The vertical extent of carbon tetrachloride in soil at SB101 is not defined. A new boring will be installed in the immediate vicinity of the earlier borings RV5-SB2 (where the maximum carbon tetrachloride concentrations in soil have been detected). The boring will extend from the ground surface to bedrock (estimated at 45 feet bgs). The length of the core will be screened with a PID monitor. If no evidence of a chemical release is noted (no odors, staining, or elevated PID readings), then discrete soil samples will be collected every 5 feet from the length of the core in each boring beginning at 10 feet bgs (i.e., samples at 10, 15, 20, 25, 30, 35, 40 and 45 feet bgs). However, if evidence of potential chemical release is observed, then discrete soil samples will be collected from the interval exhibiting the highest odors, staining, or elevated PID readings. Soil samples will be analyzed for carbon tetrachloride and its decay products (chlorinated methanes). All new boings will be continuously logged.

The density of liquid carbon tetrachloride (1.59 g/cm^3) is greater than water. If carbon tetrachloride was released as an organic liquid, it is possible that it migrated vertically through the unconsolidated soils and potentially pooled on top of the bedrock. If carbon tetrachloride was released as a chemical dissolved in water, density effects would be minimal and COPCs likely did not migrate vertically much below the water table. Collecting soil samples near the location where maximum concentrations have been detected (possible release point near RV5-SB2) through the entire unconsolidated soil column should adequately define the vertical extent of carbon tetrachloride in soil.

Earlier investigations analyzed all soil samples for VOCs, SVOCs and metals, as well as 10 percent of soil samples for organochlorine pesticides, PCBs, and explosives/propellants. In subsurface soil, only carbon tetrachloride and chloroform were detected above June 2017 USEPA Residential RSLs in more than one sample. Further analysis for compounds other than carbon tetrachloride and its decay products is not necessary to address data gaps. Therefore, data gap samples will be analyzed for chlorinated methanes.

Data Gap 2: The lateral extent of carbon tetrachloride contamination in soil is not well defined below a depth of 1018 feet AMSL. Additional soil borings will be installed at locations north (near SB105), east (near SB102) and south (near SB103) of the maximum detected concentrations (i.e., possible release area near RV5-SB2). These soil borings will extend to the water table (approximately 10 to 20 feet bgs at CC RVAAP-69). All new boings will be continuously logged. The length of the core will be screened with a PID monitor. If no evidence of a chemical release is noted (no odors, staining, or elevated PID readings), then discrete soil samples will be collected every 5 feet from the length of the core in each boring beginning at 10 feet bgs (i.e., samples at 10, 15 and 20 feet bgs). However, if evidence of potential chemical release is observed, then discrete soil samples will be collected from the interval exhibiting the highest odors, staining, or elevated PID readings. Soil samples will be analyzed for carbon tetrachloride and its decay products (chlorinated methanes). The ground surface elevation at CC RVAAP-69 varies between 1029 feet and 1025 feet amsl. These proposed samples will define the extent of carbon tetrachloride (and decay products) in the vadose zone and upper portions of the saturated zone, which may extend as deep as 50 feet bgs.

Contamination is defined to a depth of approximately 13 feet bgs (1012 feet amsl) in distal sample locations (SB106, SB109, and SB104); therefore, additional step out samples will not be necessary regardless of whether carbon tetrachloride is detected in any of the proposed soil samples.

If carbon tetrachloride extends deeper into the subsurface, delineation will focus on delineating any resulting groundwater plume.

Data Gap 3: Groundwater was not evaluated as part of the previous investigations. Groundwater grab samples will be collected, and then groundwater monitoring wells will be installed and monitored to establish the local groundwater flow direction and delineate potential carbon tetrachloride in groundwater, if any

In order to efficiently optimize the number of monitoring wells needed to define the direction of groundwater flow and monitor a plume, first groundwater grab samples will be collected using a Screenpoint 16 sampler. If groundwater grab samples cannot be collected from well points, then temporary wells will be installed, developed, and sampled. Groundwater grab samples will be collected from the upper portions of the saturated zone within the unconsolidated aquifer. The results from these screening samples will be used to select groundwater monitoring well locations. Initial groundwater grab samples will be collected from near the maximum concentrations detected in soil (near RV5-SB2) and in locations approximately 50 to 70 feet downgradient (east to southeast) of that location (i.e., between the former Building 1048 Fire Station and George Road/South Service Road). Groundwater grab samples will be analyzed for chlorinated methanes on a quick turn (24 hour) basis, and additional step-in or step-out samples will be collected until the potential plume is delineated or until carbon tetrachloride is not detected in groundwater grab samples at concentrations above the Adult Resident FWCUG (0.204 micrograms per liter [µg/L]).

If a carbon tetrachloride groundwater plume is detected and delineated, the orientation of the plume will provide an indication of the local groundwater flow direction.

If a carbon tetrachloride groundwater plume is detected and delineated with grab samples, a minimum of three monitoring wells will be installed; one near the maximum concentrations detected (near RV5-SB2), one upgradient of the source area, and one at the downgradient extent of the plume. More than the minimum of three monitoring wells may be needed to confirm the extent of potential carbon tetrachloride contamination beneath CC RVAAP-69. Borings from new monitoring wells will be continuously logged.

If a carbon tetrachloride groundwater plume is not indicated by the grab samples, at minimum one monitoring well will be installed near RV5-SB2 (where maximum concentrations have been detected in soil). At least two additional monitoring wells will be installed to ensure that the local potentiometric surface can be mapped.

Monitoring wells will be installed with screens set across the water table (estimated at 10 to 20 feet bgs) to maximize the likelihood of intercepting the potential plume because the maximum concentrations in soil to date are in the interval of 5 to 10 feet bgs (1015 to 1020 feet amsl). However, if it is determined that carbon tetrachloride extends deeper in the unconsolidated soil, it may be necessary to install additional deeper wells. The local potentiometric surface will be mapped using groundwater elevations in wells installed at CC RVAAP-69 and adjacent AOC CC RVAAP-74.

Monitoring wells will be developed, and sampled quarterly for the first year. The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program.

If dense non-aqueous phase liquid (DNAPL) is present in the bottom of the CC RVAAP-69 monitoring wells, its thickness will be measured with an oil/water interface probe capable of detecting the presence of non-aqueous phase liquid within the well casing.

4.2 Proposed Sampling for CC-RVAAP 70 East Classification Yard

The following approach has been developed to address data gaps:

Data Gap 1: Soil underneath the floor inside Building 47-40 has not been sampled at locations that are stained and cracked. Prior to sampling, oily sludge (approximately 10 cubic yards) will be removed from the floor of Building 47-40 and Interior Repair Pit. The sludge will be removed to reveal areas of the floor that are stained and cracked and therefore the most likely routes that chemicals could enter the subsurface, and to prevent cross contamination when borings are advanced through the floor. The sludge will be containerized and sampled for waste characterization and disposal purposes. The sludge will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) (Method 1311) metals, TCLP VOCs, TCLP SVOCs, TCLP herbicides, TCLP pesticides, total sulfide, total cyanide, corrosivity (pH), and flashpoint.

After removing the sludge from the floor of Building 47-40, the concrete floor will be inspected for cracks and stains. Additional soil sampling within this building has been proposed to target soil underneath visible cracks and stains on the concrete floor of Building 47-40 in order to confirm/deny evidence of impact below the concrete floor. Two soil borings will be installed near cracks and biased towards locations which exhibit staining or had sludge on the floor. One of these borings will be near the former oil storage rack on the East wall of Building 47-40 through the wooden floor in that area. Discrete soil samples will be collected from each boring at 2 foot intervals down to 7 feet bgs or until sandstone is reached (0-2, 2-4, 4-6, and 6-7 feet bgs), and samples will be analyzed for VOCs, SVOCs, PCBs, and TAL metals. All new boings will be continuously logged.

Data Gap 2: Soil underneath the concrete floor of the Interior Repair Pit (DU04) has not been sampled for VOCs. After the sludge is removed as described above, the concrete floor of the Interior Repair Pit will be inspected for any visible cracks and staining after the sludge is removed. Two soil borings will be drilled inside the Interior Repair Pit with preference given to any locations with cracks, staining, or sludge noted on the concrete floor. The length of the cores will be screened with a PID monitor. If no evidence of chemicals are noted (no odors, staining, or elevated PID readings), then discrete soil samples will be collected every 2 feet from the length of the core in each boring. However, if evidence of potential contamination is observed, then discrete soil samples will be collected from any intervals with odors, staining, or elevated PID readings. Samples from each boring will be analyzed to confirm/deny the presence of VOCs. Previous boring logs indicate that sandstone was reached from approximately 1-4 feet bgs in the pit; therefore, the proposed soil borings will be drilled until sandstone is reached. All new boings will be continuously logged.

Data Gap 3: Discrete soil samples have not been sampled and analyzed for VOCs from locations at the Outdoor Wash Rack Area at the vertical interval where odor and elevated PID readings were noted in boring logs. Boring logs for 70-4759-DU6-SB1 and 70-4759-DU6-SB5 at the wash rack area had elevated PID readings in 2012. Proposed additional soil sampling will target the soil near these previous borings with elevated PID readings at the wash rack to confirm/deny the presence of VOCs. Borings will be drilled near 70-4759-DU6-SB1 and 70-4759-DU6-SB5, and soil cores will be collected from 1 to 7 feet bgs. The entire soil core will be screened with a PID monitor and discrete samples will be collected from the depth intervals with field indications of potential contamination (staining, odors, or elevated PID readings). However, if no field evidence of potential contamination is noted, then samples will be collected from the 6 to 7 feet bgs interval, which had elevated PID readings and odor in the 2012 field investigation. The soil samples will be analyzed for VOCs. All new boings will be continuously logged.

Data Gap 4: Sediment from the storm drain at the southwest corner of Building 47-40 has not been sampled for contamination from the Outdoor Wash Rack. The storm drain at the southwest corner of Building 47-40 will be inspected for staining where wash water may have drained from the wash rack. A sediment sample will be collected from the storm drain and analyzed for PCBs, SVOCs, and explosives. One boring will be drilled as close to the drain as possible and soil samples will be collected to determine if subsurface soil near this storm drain was impacted by historical activities at the wash rack. Subsurface soil samples will be collected from 1-3, 3-5, and 5-7 feet bgs from the boring and analyzed for VOCs, PCBs, SVOCs, and explosives. All new boings will be continuously logged.

4.3 Proposed Sampling for CC-RVAAP 74 Building 1034 Motor Pool Hydraulic Lift

The following approach has been developed to address data gaps:

Data Gap 1: It is unclear if the "free product" historically identified in 74-1034-HL-SB18 at 7.5 to 8.5 feet bgs is mobile LNAPL or residual LNAPL. The historic boring log for SB18 noted "free product," and the concentration of TPH-C_{20} to C_{34} heavy distillates range in soil exceeds the saturation level for Class 1 soil. These results could indicate the presence of mobile LNAPL. However, the results could also represent residual LNAPL only. A new continuously logged boring will be installed in the immediate vicinity of the earlier boring 74-1034-HL-SB18; the soil will be photographed, visually inspected, and scanned with a PID to evaluate if mobile LNAPL flows out of the formation versus residual saturation or oil that is essentially immobile and held in capillary spaces. An ultraviolet light (UV) light will also be used to help screen for the presence of hydraulic oil. A soil sample will be collected from 7.5 to 8.5 feet bgs to confirm what was found by evaluating the chromatograph to a known sample of hydraulic fluid (i.e., mineral oil). Soil samples will be analyzed for VOCs, TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges, and PCBs. A temporary well will be installed in the borehole to a depth of approximately 10 feet bgs and screened across the vertical interval where "free product" was historically noted in the gravel layer on the SB18 boring log. The temporary well will be developed if any fluid enters the well. Measurements (depth to LNAPL and/or water) will be made to determine if mobile LNAPL flows into the well, indicating the presence or absence or mobile LNAPL"

Data Gap 2: The horizontal extent of soil contamination is not defined east and south of 74-1034-HL-SB18. Soil borings will be advanced in the immediate vicinity of the earlier borings 1034-HL-SB-14 and 74-1034-HL-SB-19, and collect soil samples from 7.5 to 8.5 feet to evaluate the horizontal extent in east and south of 74-1034-HL-SB18. Soil samples will be analyzed for

VOCs, TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges. All new boings will be continuously logged.

Data Gap 3: Groundwater was not evaluated as part of the previous investigations, and it is unknown if groundwater is impacted or if enough hydraulic fluid was released to accumulate as mobile LNAPL at the water table. Groundwater grab samples will be collected and analyzed, and then groundwater monitoring wells will be installed, developed, and sampled to establish the local groundwater flow direction and delineate TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges, and VOCs in groundwater, if any.

A minimum of three monitoring wells will be installed; one near the maximum detection of TPH-C_{20} to C_{34} heavy distillates range in soil (near SB18), one upgradient well near the cylinder that held the hydraulic fluid (near SB02), and one at the downgradient extent of the plume (if a plume exists).

One groundwater monitoring well will be located approximately three feet southeast of the soil sampling location exhibiting the greatest amount of TPH-C_{20} to C_{34} heavy distillates range (74-1034-HL-SB18), and used to determine if mobile LNAPL exists at the water table and establish depth to groundwater. The well will be located a few feet from 74-1034-HL-SB18 to avoid pushing any COPCs present through a potential confining layer into groundwater.

A second groundwater monitoring well will be located near soil boring 74-1034-HL-SB02. This location is in the regional upgradient direction and only very low TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate range concentrations were detected in soil in 2013. This location is close to the cylinder that contained hydraulic fluid, and is likely to be the most upgradient location where hydraulic fluid could be present. Borings from new monitoring wells will be continuously logged.

In order to efficiently optimize the number of monitoring wells needed to define the direction of groundwater flow and monitor a plume, if any, first groundwater grab samples will be collected using a Screenpoint 16 sampler. If groundwater grab samples cannot be collected from well points, then temporary wells will be installed, developed, and sampled. Groundwater grab samples will be collected from the upper portions of the saturated zone within the unconsolidated aquifer. The results from these screening samples will be used to select monitoring well locations. A groundwater grab sample will be collected approximately three feet southeast of 74-1034-HL-SB18 prior to installing the first groundwater monitoring well. Initial groundwater grab samples will be collected approximately 20 feet downgradient (east and southeast) of soil boring 74-1034-HL-SB18 where the maximum TPH-C_{20} to C_{34} distillate range concentrations were detected in 2013 (i.e., outside the southeast corner of Building 1034). Groundwater grab samples will be analyzed for VOCs and PAHs on a quick turn (24 hour) basis. Additional step-out samples will be collected until the plume is delineated or until VOCs and PAHs are not present in groundwater above BUSTR Action Levels. Constituents that do not have BUSTR Action Levels will be compared to Resident Receptor FWCUGs using the carcinogenic risk level of 10^{-6} or the HQ of 0.1 or current USEPA Residential RSLs (June 2017). If a plume is detected, a third well will be installed near the downgradient edge of the plume. If no plume is detected in the grab samples or the first two wells, then the third well will be located to help determine local groundwater flow direction. More than the minimum of three monitoring wells may be needed to confirm the extent of potential contamination beneath CC RVAAP-74.

Monitoring wells will be installed with screens set across the water table (estimated at 10 to 20 feet bgs) to maximize the likelihood of intercepting mobile LNAPL or a COPC plume. The fluid levels in the wells will be measured to detect mobile LNAPL, if any, and groundwater samples will be analyzed for VOCs, PAHs, and PCBs. The local potentiometric surface will be mapped using groundwater elevations in wells installed at CC RVAAP-74 and adjacent AOC CC RVAAP-69. Monitoring wells will be developed and sampled quarterly for the first year. The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program.

Data Gap 4: Only one soil sample was analyzed for VOCs. All soil samples from this AOC will be analyzed for VOCs in addition to TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges. One soil sample will be analyzed for PCBs. Groundwater samples from this AOC will be analyzed for VOCs and PAHs. Groundwater samples from groundwater monitoring wells will also be analyzed for PCBs.

5.0 PROJECT ACTIVITIES

This WP includes descriptions of all project activities and contains addenda to Facility-wide documents. The FSP is an addendum to the RVAAP FWSAP (SAIC 2011a), the UFP-QAPP is written in accordance with *OSWER Directive 9272.0-17 Implementation of the Uniform Federal Policy for Quality Assurance Project Plans at Federal Facility Hazardous Waste Sites* (USEPA, 2005), and the SSHP is an addendum to the FWSHP (SAIC 2011b).

5.1 Premobilization

Premobilization will consist of scheduling and coordination of the field team. All personnel entering Camp Ravenna must be on an access roster 48 hours in advance of required entry to Camp Ravenna. This includes deliveries, pickups, and subcontractors. Work hours are 0730 – 1630 Monday through Friday, except on federal holidays. Extended work days and weekend work hours must be pre-approved by and requested through the Camp Ravenna Environmental Office. All personnel working on Camp Ravenna are required to provide a 40-hour OSHA HAZWOPER certificate and a current 8-hour refresher certificate prior to admittance to Camp Ravenna. The HAZWOPER certificate for all field personnel will be sent to Vista at least 1 week in advance of field work. The field team will inspect all equipment to be used during the sampling event. Prior to the commencement of field activities, all team members will review:

- Site activities to be performed;
- Data obtained during previous site visits;
- Approved field procedures as presented in this WP;
- Potential hazards specific to the location;
- Safe work practices.

5.1.1 Utility Clearance

Prior to any intrusive activities, subsurface utility clearing will be performed. Details on utility clearance are provided in the FSP (Appendix A, Section 4.3). Any utility lines that may be damaged during intrusive activities will be repaired. A 3rd party locater company will be used. Utility clearance will be coordinated with OHARNG Environmental Specialist Katie Tait at least two weeks prior to intrusive work.

5.1.2 Pre-Field Work Meetings

Parsons will schedule and conduct a pre-mobilization meeting with ARNG/OHARNG/USACE to verify that all necessary preparations for a successful field effort have been completed. The meeting will be held prior to the day of the scheduled mobilization of the drilling subcontractor to review daily operating procedures (safety and security). This meeting will be attended by key project personnel, including the Parsons project manager or field team representative and subcontractor personnel. Security requirements, staging areas, Investigation Derived Waste (IDW) protocols, and health and safety requirements will be reviewed.

5.2 Mobilization and Site Preparation

Mobilization shall include all activities required to transport, assemble, and set up on site all equipment, personnel, and other services necessary to perform the work. Transportation and assembly of equipment necessary to perform the work during the project are also included in the mobilization item.

5.2.1 Temporary Facilities

Sanitary facilities and hand wash stations will be placed at locations coordinated with the OHARNG. No other temporary facilities on site are anticipated.

5.2.2 Site Access and Security

Camp Ravenna is fenced and Site access is through gates that are controlled by security personnel. The gates open during work hours and gate hours. Report any suspicious activity or persons to the Range Control.

Parsons field teams will carry cell phones to communicate with Camp Ravenna Range Control and Environmental Office when conducting field work at Camp Ravenna. Parsons field team leads will provide Camp Ravenna Range Control and Environmental Office with their cell phone numbers. Parsons will report field activities to Becky Shreffler at Vista on a weekly basis so she can log Parsons activities on the weekly activities log. Additionally, when in the field, Parsons will coordinate with Range Control daily to let them know where Parsons field teams will be working.

If Munitions and Explosives of Concern (MEC) or potential MEC is discovered, the Camp Ravenna Range Control, Camp Ravenna Environmental Office and USACE will be notified immediately.

Parsons and all associated sub-contractors' employees will comply with applicable installation, facility and area commander installation/facility access and local security policies and procedures. Access to Camp Ravenna requires that an access roster be submitted and a valid photo identification be displayed when entering Camp Ravenna. Parsons' workforce will comply with all personal identity verification requirements as directed by the DoD, the U.S. Army and/or local policy. In addition to the changes otherwise authorized by the changes clause of this contract, should the Force Protection Condition (FPCON) at any installation or facility change, the Government may require changes in contractor security matters or processes.

5.2.3 Decontamination

A centralized decontamination pad will be constructed by the drilling subcontractor on a location approved by the ARNG/OHARNG. Before drilling operations commence and at the completion of the drilling program, the drilling rig, rods, tools, bits, and any reusable drive casing shall be cleaned using high-pressure steam. The rods, bits, reusable drive casing, and any tools and reusable sampling equipment that contact potentially contaminated materials shall also be steam-cleaned between boreholes. Decontamination water and IDW will be properly containerized, sampled, inspected and disposed. The FSP (Appendix A) provides more detailed information.

5.2.4 Brush Removal

Brush will be removed from the former wash rack area on south side Building 4740 at CC RVAAP-70 to access sampling locations. Proposed sample locations in the former wash rack area are within 30 feet of the South Service Road, and brush cutting will be limited to areas necessary to access the sample locations. Brush cutting will be coordinated with the Natural Resource Manager in advance of the brush cutting. Brush removal will be conducted in accordance with the Environmental Protection Plan (Section 6.0 of this WP). Brush cuttings will be left on site.

5.2.5 Sludge Removal

The purpose of oily sludge removal at the Round House Building 4740 is to prevent cross contamination of environmental samples when drilling through the building floor and through the bottom of the interior repair pit. Oily sludge is also removed in order to identify cracks in the concrete floor where contamination may have entered the subsurface.

American Waste Management Services, Inc. will remove oily sludge at CC RVAAP-70 from the Interior Repair Pit and the floor of the Round House Building 4740 with Parsons oversight. Prior to starting work, all windows and doors shall be opened to allow for ventilation. A 4-gas meter (lower explosive limit [LEL], oxygen, carbon dioxide, carbon monoxide, and hydrogen sulfide) shall be calibrated and placed central to the work area. A smooth-edge excavator bucket, shovels, and hand-scrapers will be used to remove all loose sludge from the floor. Brooms and brushes will then be used to clean the floor surface. If liquids or semi-solids are encountered, oil-dry will be spread on the area to soak up the liquids prior to removal.

For the Interior Pit, the smooth-edge bucket of the excavator will then be used to remove the oily sludge from the bottom of the repair pit, followed by removal using shovels and final broom-cleaning prior to any drilling through the repair pit bottom.

Oily sludge will be placed into a roll-off box that has been lined with plastic. Any areas of the floor that were used for stockpiling the materials will be cleaned to the extent possible. Upon completion of sludge removal, hand tools and the excavator bucket will be decontaminated by scraping off the sludge and then using dry rags to remove any residual material. All scrapings, rags, brooms, brushes, and disposable personal protective equipment (PPE) will be placed into the roll-off. Samples of the roll off contents will be collected for analysis of TCLP VOCs, TCLP SVOCs, TCLP metals, TCLP herbicides, TCLP pesticides, total sulfide, total cyanide, corrosivity (pH), and flashpoint. An "analysis pending' label shall be placed on the roll-off until receipt of the analytical data.

5.3 Investigation Field Work

<u>CC RVAAP-69</u>

Parsons has considered the fact that CC RVAAP-69 and CC RVAAP-74 are directly across the street from each other; therefore, wells at both sites can be used to determine local groundwater flow direction. The sequencing of the field work at CC RVAAP-69 (Figure 4-1) is as follows:

1) Collect groundwater grab samples to screen for potential groundwater COPCs and determine location for monitoring wells. Advance direct push borings to a depth just below the water table (anticipated at approximately 20-25 feet bgs) and collect groundwater grab samples using Screenpoint 16 sampler. Groundwater grab samples will be analyzed using 24-hour quick turnaround analysis for carbon tetrachloride and carbon tetrachloride degradation products (including chloroform, methylene chloride, and chloromethane). If groundwater grab samples cannot be collected from well points, then temporary wells will be installed, developed, and sampled. A boring log will document key data such as date of drilling, total depth of the boring, and depth of the grab groundwater sample. The initial direct push borings for groundwater grab samples will be lithologically characterized to determine depth to water-saturated soil to ensure the Screenpoint sampler is set at the appropriate depth. Soil samples will not be collected for lab analysis, and, once groundwater depth is confirmed, boreholes for additional groundwater grab samples will

not be lithologically characterized. Groundwater grab samples will be collected in groups of 3 or 4. The initial groundwater grab samples will be collected from four locations; one near RV5-SB2 (where maximum concentrations were detected in soil) and three samples in locations approximately 50 to 70 feet downgradient (east to southeast) of the that location (i.e., between the former Building 1048 Fire Station and George Road/South Service Road). Additional step-in or step-out samples will be collected in the general area illustrated in Figure 4-1 until the plume is delineated or until groundwater grab samples establish that carbon tetrachloride and/or its decay products are not detected in groundwater at concentrations above the Adult Resident FWCUG (0.204 µg/L). While waiting on quick turn results (between groundwater grab sample events), other activities will be completed as outlined below. However, grab sample screening must be complete to finalize the location of the other two monitoring wells (Step 4 below).

2) Advance four soil borings to delineate the vertical and lateral extent of carbon tetrachloride in soil. Soil boring near SB101 will extend to bedrock (anticipated to be 45 feet bgs), and boring locations near earlier borings SB102, SB103 and SB105 will extend to the 20 feet bgs (anticipated depth of the water table at CC RVAAP-69). Soil borings will be lithologically logged over their entire depth. The length of the core will be screened with a PID monitor. If no evidence of a chemical release is noted (no odors, staining, or elevated PID readings), then discrete soil samples will be collected every 5 feet from the length of the core in each boring beginning at 10 feet bgs. However, if evidence of potential chemical release is observed, then discrete soil samples will be collected from the interval exhibiting the highest odors, staining, or elevated PID readings. Soil samples will be analyzed for carbon tetrachloride and its decay products (chlorinated methanes).

3) Install and develop a source area groundwater monitoring well 69-MW001 at the location of the maximum carbon tetrachloride detection in soil (72-1048-RV5-SB2). Lithologically log the soil boring over its entire depth.

4) Review groundwater grab sample results. If a carbon tetrachloride (or decay product) plume has been detected and delineated, install and develop two additional monitoring wells 69-MW002 and 69-MW003 up- and downgradient of the source area well 69-MW001. Lithologically log the soil borings over their entire depth. Location of these monitoring wells will be determined by the results of the groundwater grab samples. If a plume has not been detected using grab samples, a minimum of three wells will be installed to ensure that the local groundwater flow direction can be determined. More than the minimum of three monitoring wells may be needed to confirm the extent of potential carbon tetrachloride contamination beneath CC RVAAP-69. If DNAPL is present in the bottom of the CC RVAAP-69 monitoring wells, its thickness will be measured with an oil/water interface probe capable of detecting the presence of non-aqueous phase liquid within the well casing.

5) Sample CC RVAAP-69 groundwater monitoring wells quarterly for the first year (four sampling events). Groundwater samples will be analyzed for carbon tetrachloride and its chlorinated methane decay products (including chloroform, methylene chloride, and chloromethane). The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program.

CC RVAAP-70

The sequencing of the field work at CC RVAAP-70 (Figure 4-2) is as follows:

1) Clear brush as necessary to access Building 47-40. Only brush required to allow access for the investigation will be cleared.
2) Remove and characterize oily sludge/sediment (estimated 10 cubic yards) from the floor of Building 47-40 and interior repair pit.
3) Advance two soil borings (concrete coring required) to evaluate the presence of contamination in soil near cracks in the concrete floor of Building 47-40 and biased towards locations which had sludge and/or staining. One of the borings will be located near the former oil storage area along the east wall of Building 47-40 where staining is observed on the wooden floor planks. Collect discrete soil samples from each boring at 2-foot intervals down to 7 feet bgs or until sandstone is reached (0-2, 2-4, 4-6, and 6-7 feet bgs), and analyze samples for VOCs, SVOCs, PCBs, and TAL metals. All new boings will be continuously logged.
4) Advance two soil borings (concrete coring required) to evaluate the presence of contamination in soil beneath the floor of the interior repair pit. Borings will be located at areas where cracks are observed in the concrete floor of the pit. Previous boring logs within the interior repair pit indicate that sandstone was reached at approximately 1 to 4 feet below the bottom of the pit; therefore, the proposed soil borings will be drilled until sandstone is reached. Continuous cores will be collected and visually logged, and the length of the cores will be screened with a PID monitor. If no evidence of contamination is noted (no odors, staining, or elevated PID readings), then discrete soil samples will be collected in 2-foot intervals down to 4 feet below the pit bottom and analyzed for VOCs. However, if evidence of soil contamination is observed, then discrete soil samples will be collected from any intervals with odors, staining, or elevated PID readings. All new boings will be continuously logged.
5) Advance two soil borings near former locations 70-4759-DU6-SB1 and 70-4759-DU6-SB5 where elevated PID readings were noted during the 2012 field investigation. Previous soil borings in this area encountered bedrock at approximately 7 feet bgs. Collect continuous soil cores from 1 to 7 feet bgs, and the entire soil core will be logged and screened with a PID monitor. Discrete soil samples will be collected for laboratory analysis from the depth intervals with field indications of contamination (staining, odors, or elevated PID readings). However, if no evidence of contamination is noted, then samples will be collected from the 6 to 7 feet bgs interval for laboratory analysis to coincide with the elevated PID readings described on the 2012 boring logs. Analyze soil samples for VOCs. All new boings will be continuously logged.
6) Collect a sediment sample from the storm drain and analyze for PCBs, SVOCs, and explosives. Advance one soil boring as close to the storm drain as possible and collect soil samples to determine if subsurface soil near this storm drain was impacted by historical activities at the wash rack. Discrete subsurface soil samples will be collected from the boring at 2 foot intervals (from 1-3, 3-5, and 5-7 feet bgs) and analyzed for VOCs, PCBs, SVOCs, and explosives. All new boings will be continuously logged.

CC RVAAP-74

AOCs CC RVAAP-69 and CC RVAAP-74 are directly across the street from each other; therefore, wells at both sites can be used to determine local groundwater flow direction. The sequencing of the field work at CC RVAAP-74 (Figures 4-3, and 4-4) is as follows:

1) Collect groundwater grab samples to screen for groundwater COPCs and determine location for monitoring wells. Advance direct push borings to a depth just below the water table (anticipated at approximately 20-25 feet bgs) and collect groundwater grab samples using Screenpoint 16 sampler. Groundwater grab samples will be analyzed using 24-hour quick turnaround analysis for VOCs and PAHs. If groundwater grab samples cannot be collected from well points, then temporary wells will be installed, developed, and sampled. A boring log will document key data such as date of drilling, total depth of the boring, and depth of the grab groundwater sample. The initial direct push borings for groundwater grab samples will be lithologically characterized to determine depth to water-saturated soil to ensure the Screenpoint sampler is set at the appropriate depth. Soil samples will not be collected for lab analysis, and, once groundwater depth is confirmed, boreholes for additional groundwater grab samples will not be lithologically characterized. Groundwater grab samples will be collected in groups of 3 or 4. The initial groundwater grab samples will be collected from four locations; just southeast of 74-1034-HL-SB18 (where maximum concentrations were detected in soil) and three samples in locations approximately 20 feet downgradient (east to southeast) of that location. Additional step-in or step-out samples will be collected in the general area illustrated in Figure 4-4 until the plume is delineated or until COPCs are not detected in groundwater grab samples above BUSTR Action Levels. Constituents that do not have BUSTR Action Levels will be compared to Resident Receptor FWCUGs using the carcinogenic risk level of 10^{-6} or the HQ of 0.1 or current USEPA Residential RSLs (June 2017). While waiting on quick turn results (between groundwater grab sample events), Parsons will accomplish the activities outlined below. However, grab sample screening must be complete to locate the third monitoring well (Step 6 below).

2) Advance a continuously sampled soil boring co-located to 74-1034-HL-SB18. The soil boing will be continuously logged. The soil will be photographed, visually inspected, and scanned with a PID to evaluate the presence or absence of mobile LNAPL (i.e., oil that flows out of the formation versus residual saturation or oil that is essentially immobile and held in capillary spaces). Collect a soil sample from 7.5 to 8.5 feet bgs for chromatographic analysis to attempt to confirm if the organic material is hydraulic fluid (i.e., mineral oil). If possible, the existing hydraulic oil cylinder at the site will be opened and sampled to get a comparative chromatograph. The sample will also be analyzed for TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges to compare to previous analytical results, for VOCs to determine if there is a risk to indoor air, and for PCBs which could be an additive to hydraulic fluid. A temporary well will be installed in the borehole to a depth of approximately 10 feet bgs and screened across the vertical interval where "free product" was noted in the gravel layer on the SB18 boring log. The temporary well will be developed if any fluid enters the well. Measurements (depth to organic liquid and/or water) will be made to determine if organic liquid flows into the well, indicating "free product."

3) Advance soil borings adjacent to 1034-HL-SB-14 and 74-1034-HL-SB-19 and collect soil samples from 7.5 to 8.5 feet for TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges and VOC

analysis to evaluate the horizontal extent COPCs in soil to the east and south of 74-1034-HL-SB18. All new boings will be continuously logged.

4) Install and develop a groundwater monitoring well 74-MW001 approximately three feet southeast of the soil sampling location exhibiting the greatest amount of TPH-C_{20} to C_{34} heavy distillates range (74-1034-HL-SB18, TPH-C_{20} to C_{34} of 26,000 mg/kg) to determine if mobile LNAPL exists at the water table and establish depth to groundwater. The well will be located a few feet southeast of 74-1034-HL-SB18 to avoid pushing potential COPCs through the apparent confining layer into groundwater. Lithologically log the soil boring over its entire depth.
5) Install and develop a groundwater monitoring well 74-MW002 approximately near former boring 74-1034-HL-SB02 located just west of the cylinder that contained hydraulic fluid. This location had trace amounts of TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges, and represents the most upgradient location where hydraulic fluid is likely present. Lithologically log the soil boring over its entire depth.
6) Review groundwater grab sample results. If a groundwater plume was indicated by grab samples, install and develop a groundwater monitoring well 74-MW003 at the eastern (downgradient) end of the plume. If no plume is indicated by the groundwater grab samples, then install and develop the third well to best map the local groundwater potentiometric surface. Lithologically log the soil boring over its entire depth.
7) Measure LNAPL thickness, if any, prior to each sampling event. Measure groundwater elevations in monitoring wells at CC RVAAP-74 and nearby AOC CC RVAAP-69 quarterly before sampling to map the local groundwater potentiometric surface. Sample CC RVAAP-74 groundwater monitoring wells quarterly for the first year (four sampling events). The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program.

5.4 Schedule

Parsons plans to complete all field work in a single mobilization. A single drilling rig with both direct push and hollow-stem auger capability will be used for drilling to complete the soil borings, grab samples, and well installation in a single mobilization. Sludge removal and brush cutting at Building 47-40 will be completed prior to mobilizing the drill rig.

All work tasks described in the PWS and this WP will not be initiated until the Final WP is approved. Field activities will then be scheduled and coordinated with ARNG/OHARNG/USACE. It is anticipated that the field work for this WP will be begin in fall 2017.

5.5 Analytical Work

A summary of all proposed samples is provided in the UFP-QAPP (Appendix B, Worksheets 17 and 18).

Carbon tetrachloride and chloroform were the only VOCs to be consistently detected in subsurface soil at CC RVAAP-69 Building 1048 Former Fire Station. Based on detections of carbon tetrachloride within the footprint of the former Building 1048 greater than the June 2017 USEPA Residential RSL, VOC analysis for CC RVAAP-69 soil and groundwater samples will only report results for carbon tetrachloride and carbon tetrachloride degradation products (including chloroform, methylene chloride, and chloromethane).

Soil and sediment at CC RVAAP-70 will be analyzed for the contaminant types identified for the individual DUs in the HRR (SAIC, 2011c) and original WP (ECC, 2012), as well as VOCs. Analyses for soil beneath Building 47-40 include VOCs, SVOCs, PCBs, and TAL metals beneath Building 47-40. Analyses for soil and sediment at the former Wash Rack include VOCs, PCBs, SVOCs, and explosives.

All soil samples from CC RVAAP-74 will be analyzed for VOCs in addition to TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges. One soil sample will also be analyzed for PCBs. Groundwater samples from this AOC will be analyzed for VOCs and PAHs. Groundwater samples from groundwater monitoring wells will also be analyzed for PCBs.

The FWSAP (SAIC, 2011a) indicates that typically 10 percent of all samples are submitted for full suite analysis while the remaining 90 percent will have targeted analyses based on the investigation-specific goals. Full suite analyses were performed during the earlier (2012 through 2015) RI and SI investigations and accomplished the goal of identifying any additional (unanticipated) COPCs at the AOCs. Because this data gap investigation is targeted at specific, previously identified COPCs, further full suite analyses are not necessary and only targeted analyses based on investigation specific goals are proposed.

5.6 Data Management / Data Validation

The data validation and usability processes are detailed in the UFP-QAPP (Appendix B, Worksheets 36 and 37). Parsons will meet the data validation requirements outlined in Section 10.0 of the FWSAP (SAIC, 2011a).

Data will be managed, evaluated, processed, and presented using a Geographic Information System (GIS) with a Relational Database Management System (RDBMS). Project data quality is ensured by using standardized data collection procedures and formats, a robust data validation process, and a thorough QC review of the database. Standardization of collection and storage is enhanced by use of the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE). The RDBMS will be used to export data directly into report tables and figures to eliminate transcription errors. Parsons will provide data electronically using U.S. Army REIMS and/or Environmental Restoration Information System (ERIS) database formats.

5.7 Surveying and Mapping

Upon completion of the subsurface work, a surveyor (licensed in State of Ohio) will determine the locations of the individual borings and wells. For each location, a northing, easting, elevation, and brief description for each surveyed location, including control points will be recorded. The top of casings will also be surveyed for the monitoring wells. All coordinates and elevations will be recorded on the boring logs upon receipt of quality assured survey results. Horizontal coordinates will be referenced to the Ohio State Plan Coordinate System and will be surveyed with an accuracy of at least 1 foot. Vertical measurements will be referenced to the National Geodetic Vertical Datum of 1929 and surveyed with an accuracy of at least 0.01 feet.

5.8 Reporting

Revised RI reports will be prepared for CC RVAAP-69 and CC RVAAP-74 for Army review. These reports will incorporate existing and new data, and address U.S. Army as well as any Ohio

EPA comments on earlier draft reports. Upon acceptance of the Revised RI reports by the USACE Contracting Officer Representative (COR), the Draft RI reports will be prepared for Ohio EPA review. Then responses to Ohio EPA comments will be prepared, and once accepted the Final RI reports will be prepared that incorporate the responses to Ohio EPA comments.

A Revised SI will be prepared for CC RVAAP-70 for U.S. Army review. This report will incorporate existing and new data, and address Ohio EPA comments on the earlier Draft Report. Upon acceptance of the Revised SI report by the USACE COR, a Draft SI report will be prepared for Ohio EPA review. Then responses to Ohio EPA comments will be prepared, and once accepted a Final SI report will be prepared that incorporates the responses to Ohio EPA comments.

5.9 Project Resources

Building 1036 will be available for IDW and equipment storage, and sample processing. Water may be accessed via fire hydrants through a back-flow preventer and water meter obtained from the Portage County Water district.

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6.0 ENVIRONMENTAL PROTECTION PLAN

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract will be protected during the entire period of this contract. Parsons will confine its activities to areas defined by this WP.

6.1 Protection of Natural Resources

Prior to the beginning of field operations, Parsons will identify, in consultation with the ARNG/OHARNG/USACE, all land resources to be preserved within the work area. Parsons has reviewed the OHARNG 2014 Integrated Natural Resource Management Plan and each site to be aware of all ecological resources at the sites prior to beginning of work.

The work areas are inside Buildings 1034 and 47-40, or primarily in cleared (mowed) areas and near roads and parking lots. Brush cutting will be required at only one location; immediately south of Building 47-40 (former outdoor wash rack area at CC RVAAP-70 East Classification Yard). Otherwise impacts to natural resources are not anticipated.

Brush cutting restrictions include a prohibition on tree felling and brush cutting of vegetation 3” in diameter and greater between 1 April and 30 September to avoid potential impacts to roosting bats. In addition, when practical, mowing and brush cutting (less than 3” diameter brush) will not be conducted between 15 April and 15 August to minimize disturbance on ground and shrub-nesting birds. Parsons will clear the brush after 15 August and avoid cutting trees that are greater than 3 inches in diameter.

Site activities will involve minimal ground disturbance and a storm water plan is not necessary. Ground disturbance is limited to driving drill rigs onto the site and advancing boreholes as indicated in Sections 4 and 5 of this WP. However, should site work involve ground disturbance, best management practices and erosion control methods such as hay bales and silt fences will be coordinated with the ARNG. Erosion controls will be maintained until the site work is completed.

Surface water and wetlands are present approximately 1500 feet east of AOCs CC RVAAP-69 and CC RVAAP-74 (Figure 1-11). Surface water and wetlands are present approximately 1,700 feet northeast of AOC CC RVAAP-70 (Figure 1-12). Parsons will complete a walk though of the AOCs prior to field work to make sure there are no wetlands in work areas. Impacts to streams and wetlands are not anticipated, and impacts to other natural resources will be minimal.

6.2 Protection of Landscape

Parsons will coordinate with OHARNG to identify any trees, shrubs, vines, grasses, landforms, and other landscape features in the work areas to be preserved. Except in work areas, trees or shrubs will not be removed, cut, defaced, injured, or destroyed without the permission from the ARNG/OHARNG/USACE. Brush clearing is only anticipated in the former outdoor wash rack area immediately south of Building 47-40 at CC RVAAP-70 East Classification Yard, as described in Section 6.1. Any brush that is generated as a result of vegetation removal will remain onsite. Parsons and its Subcontractors will repair any ruts or landscape damage and will return all areas to their previous state.

6.3 Protection of Cultural Resources

Due to the highly-disturbed nature of these sites, it is unlikely that cultural or archaeological resources will be found. However, any discovered cultural resources will be handled in accordance with the OHARNG Procedure for Inadvertent Discovery of Cultural Materials. In the event that artifacts or human remains are encountered, the following steps should be followed:

1) Immediately stop the ground disturbing activity.
2) Report any observations or discoveries of artifacts or human remains immediately to Camp Ravenna Range Control (614-336-6041). Range Control will immediately notify the OHARNG Cultural Resources Manager (CRM)/ Environmental Office.
3) The Range Control or the CRM will secure any artifacts or human remains, as appropriate. If human remains are suspected, they are not to be disturbed and Range Control will promptly notify State Highway Patrol or Federal Bureau of Investigation, as appropriate.
4) The CRM and Range Control will take measures to protect the location from further disturbance until appropriate parties are notified.
5) If a site area or burial is identified as the source of the materials discovered, the CRM will make arrangements for site recordation and stabilization, in consultation with the Ohio Historic Preservation Office and any interested Native American Tribes.

6.4 Disposal of Waste

Disposal of waste, trash, and other materials off the project site will be in accordance with all applicable federal, state, and local rules, regulations, and laws and Section 8.0 of the FWSAP (SAIC, 2011a), the Camp Ravenna Waste Management Guidelines, and Appendix D of this WP.

All waste remains onsite until it is properly characterized, profiled and transported to a licensed disposal facility.

6.5 Protection of Water Resources

Parsons will keep field operations under surveillance, management, and control to avoid pollution of surface and ground waters. Wetlands and streams are not anticipated to be present in Parsons work areas; however, site walk throughs will be completed prior to field work to identify any wetlands.

6.6 Spill Control

Small spill response kits (e.g., paper towel, diaper, etc.) will be on-hand to assist in the cleanup. Spill response will be in accordance with the spill procedure Camp Ravenna Integrated Contingency Plan. The Spill Plan and the First Responder Spill Reporting Form are located in Appendix C, APP. Any spills will be reported to Camp Ravenna Range Control.

7.0 PROJECT DOCUMENTATION AND SAMPLE QUALITY ASSURANCE/QUALITY CONTROL

Project documents and records that will be generated are detailed in the UFP-QAPP (Appendix B, Worksheet 29), which describes how information will be collected, verified, and stored. Worksheet 29 supports data completeness, data integrity, and ease of retrieval.

7.1 Monthly Activity Reports

Parsons will submit monthly progress reports to the USACE by the fifth (5) day of the month in accordance with Parsons Project Management Plan (Parsons, 2016).

7.2 Sample Handling and Tracking

Sample handling, custody, and disposal procedures are detailed in the UFP-QAPP (Appendix B, Worksheets 26 and 27). Worksheets 26 and 27 describe sample numbering, as well as sample custody from collection in the field through testing and disposal by the laboratory.

7.3 Field Activities Coordination

The DFFO (Ohio EPA, 2004) requires that the U.S. Army notify Ohio EPA 15 days prior to field activities. Therefore, Parsons will notify the USACE and OHARNG 3 weeks prior to field activities so that Ohio EPA can be notified.

Parsons will report field activities to Becky Shreffler at Vista on a weekly basis so she can log Parsons activities on the weekly activities log. When in the field, Parsons will coordinate with Range Control daily to let them know where Parsons employees and their subcontractors will be working. Additionally, bi-weekly updates will be discussed at the Camp Ravenna bi-weekly contractors' meeting with the U.S. Army, OHARNG, and any other contractors that are operating within or near the work site. Parsons will coordinate closely with the OHARNG with the various field activities required for executing this WP, as well as coordinating our field activities to avoid interference with on-going OHARNG training and transportation activities during all phases of this work.

7.4 Field and Laboratory Quality Assurance/Quality Control

The UFP-QAPP (Appendix B) was prepared in accordance with UFP-QAPP guidance to ensure environmental data collected are scientifically sound, of known and documented quality, and suitable for the intended purposes. The UFP-QAPP focuses on the site-specific details for the site to include investigation methods, general analytical services, data management, and data validation procedures. The proposed sample plan is provided in Worksheet 18 of the UFP-QAPP. Field quality control samples are summarized on Worksheet 20. Analytical quality control and corrective actions are described on Worksheet 28.

7.5 Bi-Weekly Conference Call and Restoration Advisory Board Meetings

The Parsons project manager will keep the COR, or his designated representative informed of the project status. The Parsons project manager will also participate in the bi-weekly status meetings with the ARNG/OHARNG and USACE and provide updates on the project activities.

Parsons will prepare presentation materials, as required, and support the U.S. Army at Restoration Advisory Board (RAB) meetings to discuss the activities and findings of the field investigations, as directed to do so by the U.S. Army.

As necessary with all multi-site, multi-task projects, phone conferences and informal site meetings with the COR or his representative(s) will be documented appropriately through follow-up emails and summaries in the monthly status reports.

8.0 DISPOSITION OF INVESTIGATION-DERIVED WASTE

All IDW, including PPE, disposable sampling equipment, and decontamination fluids, will be segregated, handled, labeled, characterized, managed, and disposed in accordance with federal, state, and local rules, regulations, and laws, and Section 8.0 of the FWSAP (SAIC, 2011a), the Camp Ravenna Waste Management Guidelines, and Appendix D (Waste Minimization Plan) of this WP. The waste will be temporarily stored within Building 1036 on secondary containment pending disposal. Overflow for larger amounts of IDW is on the east side of Building 1036 or north of Building 1036.

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9.0 DATA SCREENING PROCESS

A data screening process has been developed for the RVAAP restoration program to expedite the risk assessment process. Data generated under this WP will be screened using the processes established in a series of documents, including:

- *Ravenna Army Ammunition Plant Facility-Wide Human Health Risk Assessors Manual – Amendment 1* (USACE, 2005).
- *United States Army Corps of Engineers, Ravenna Army Ammunition Plant (RVAAP) Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals, Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE Louisville District, 2012).
- *Final Technical Memorandum: Land Uses and Revised Risk Assessment Process for the Ravenna Army Ammunition Plant (RVAAP) Installation Restoration Program, Portage/Trumbull Counties, Ohio* (NGB, 2014).
- *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC, 2010).
- *Technical Guidance Manual for the 2017 Closure, Corrective Action, and Petroleum Contaminated Soil Rules, Bureau of Underground Storage Tank Regulations (BUSTR), (Ohio Department of Commerce, 2017).*

These processes are summarized in this section.

9.1 Data Screening for Site Related Compounds

Analytical results will initially be evaluated to determine whether the chemical is a SRC. This will be accomplished by performing the screening described below. The reported results will be used to (1) compare the reported concentrations to the BSV (where established), (2) determine the frequency of detection and WOE, and (3) determine whether the chemical is an essential nutrient.

All analytical results from previous investigations as well as results for the additional sampling event performed by Parsons will comprise the datasets for screening. The dataset will not include QC samples (except for FDs) or rejected results. All analytes having at least one detected value will be included in the data screening process.

All chemicals not eliminated during the screening steps will be retained as SRCs. The steps involved in the SRC screening are summarized below:

- ***Data Quality Assessment***—Data will be produced, reviewed, and reported by the laboratory in accordance with specifications in the UFP-QAPP (Appendix B).
- ***Background Screening***—The detected concentrations of inorganic chemicals will be compared to Camp Ravenna BSVs, where established. If a chemical concentration is greater than the BSVs (or detected for those inorganics with no BSVs such as cadmium and silver), the respective inorganic chemicals will be retained as SRCs. All detected organic compounds will be considered SRCs (BSVs are not established for organic compounds at Camp Ravenna), except for those dismissed based on frequency-of-detection or WOE screening as described below.

- ***Screening of Essential Human Nutrients***—Chemicals that are considered essential nutrients (e.g., calcium, chloride, iodine, iron, magnesium, potassium, phosphorous, and sodium) are an integral part of the human food supply and are often added to foods as supplements. USEPA recommends these chemicals not be evaluated unless they are grossly elevated relative to background concentrations or would exhibit toxicity at the observed concentrations (USEPA 1989, SAIC 2010). The chemicals that will be considered as essential nutrients are calcium, iron, magnesium, potassium, and sodium.
- ***Frequency of Detection/WOE Screening***—Chemicals not detected in a given medium will be eliminated as SRCs. A WOE approach will be used to determine if chemicals with a low detection frequency (i.e., 5 percent or less where a chemical was analyzed in more than 20 samples) are AOC-related. If the detected results for a chemical show no clustering, concentrations are not substantially elevated relative to the Limit of Quantitation, and no source is evident, the results will be considered spurious, and the chemical will be eliminated from further consideration.

All detected chemicals that are not eliminated by the screening process above are identified SRCs.

9.2 Data Screening for Chemicals of Potential Concern

SRCs are further screened to develop COPCs. COPC screening is used to determine presence or absence of contamination during the SI phase of the CERCLA process. The nature and extent of COPCs is determined in the RI phase.

SRCs will be identified as COPCs if the maximum SRC concentration in a given medium at an AOC DU exceeds:

- The most stringent FWCUG for the Resident Receptor (lower of adult and child receptors) or National Guard Trainee using the carcinogenic risk level of 10^{-6} or the HQ of 0.1.
- The most stringent USEPA RSL for the Resident Receptor or Industrial Receptor (June 2017) using the target carcinogenic risk level of 10^{-6} or the target HQ of 0.1 (if SRC does not have a FWCUG).
- The BUSTR Action Levels for petroleum hydrocarbons (i.e., TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges) (Ohio Department of Commerce, 2017).

COPC screening levels for SCRs anticipated to be encountered during execution of this WP (based on historical sampling results) are provided in Table 9-1 for surface soil and sediment, Table 9-2 for subsurface soil, and Table 9-3 for groundwater.

9.3 Data Screening for Chemicals of Concern

For those AOCs undergoing an RI, COPCs are further screened to select COCs. COCs are those COPCs that represent an elevated risk and are the basis of remedial alternatives development in the Feasibility Study.

Exposure Point Concentrations (EPCs) will be developed for each COPC at each AOC. EPCs are the lower of (1) the ISM result, (2) the 95 percent upper confidence limit of the mean concentration, or (3) the maximum concentration. For CC RVAAP-69, CC RVAAP-70, and those constituents at CC RVAAP-74 that are not regulated by BUSTR, a COPC will be selected as a COC if the EPC exceeds:

- The most stringent FWCUG for the Resident Receptor (lower of adult and child receptors) or National Guard Trainee using the carcinogenic risk level of 10^{-5} or the HQ of 1.0
- The most stringent USEPA RSL for the Resident Receptor or Industrial Receptor (June 2017) using the target carcinogenic risk level of 10^{-5} or the target HQ of 1.0 (if SRC does not have a FWCUG)
- The BUSTR Action Levels for petroleum hydrocarbons (i.e., TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges) (Ohio Department of Commerce, 2017).

For CC RVAAP-74 constituents that are regulated by BUSTR Analytical Group 3 (including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, naphthalene, and TPH-C20 to C34) are COCs (Ohio Department of Commerce, 2017), and will be compared to appropriate BUSTR Action Levels.

In addition, a COPC will be selected as a COC if it contributes significantly to additive effects. Additive effects are evaluated using a Sum of Ratios (SOR) approach (USACE Louisville District, 2012). The ratio of the EPC to the FWCUG is calculated for each COPC. The ratios are summed for those COPCs that target the same organ (carcinogens and non-carcinogens are evaluated separately). If the SOR exceeds 1, any COPC that contributes at least 10 percent to the total SOR is considered a COC. If the SOR exceeds 1, any COPC that contributes between 5 and 10 percent of the total SOR is considered further as a possible COC.

COC screening levels for COPCs anticipated to be encountered during execution of this WP (based on historical sampling results) are provided in Table 9-4 for surface soil and sediment, Table 9-5 for subsurface soil, and Table 9-6 for groundwater.

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10.0 DELIVERABLES

Deliverables for this WP will be produced in preliminary draft, draft, and final versions and in hard copy and electronic Portable Document Format (PDF). All deliverables will be prepared in accordance with CERCLA and the NCP following requirements of the Ohio EPA DFFO for Camp Ravenna and the most current version of the *RVAAP Deliverable Documents Formatting Guidelines* (Vista, 2015). Preliminary draft versions of documents will be prepared and submitted to the U.S. Army for review. Parsons will document how all ARNG/OHARNG/USACE comments are addressed in a Response to Comments Table. Once initial comments from the U.S. Army are addressed, a draft version of the document will be prepared for review by the regulators and the U.S. Army unless the U.S. Army requests a review of the revised preliminary draft before it is issued to the regulators. Following the receipt and resolution of ARNG/OHARNG/USACE comments on the draft document, it will be revised and a final version of the document issued for the record. All documents submitted to Ohio EPA will be identified as draft until completion of ARNG/OHARNG/USACE coordination, when they will be signed and finalized (if required).

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11.0 REFERENCES

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Facility-Wide Coal Storage, CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift, CC RVAAP-76 Depot Area, and CC RVAAP-79 DLA Ore Storage Sites, Ravenna Army Ammunition Plant Restoration Program, Camp Ravenna, Portage and Turnbull Counties, Ohio. October 3.

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FIGURES

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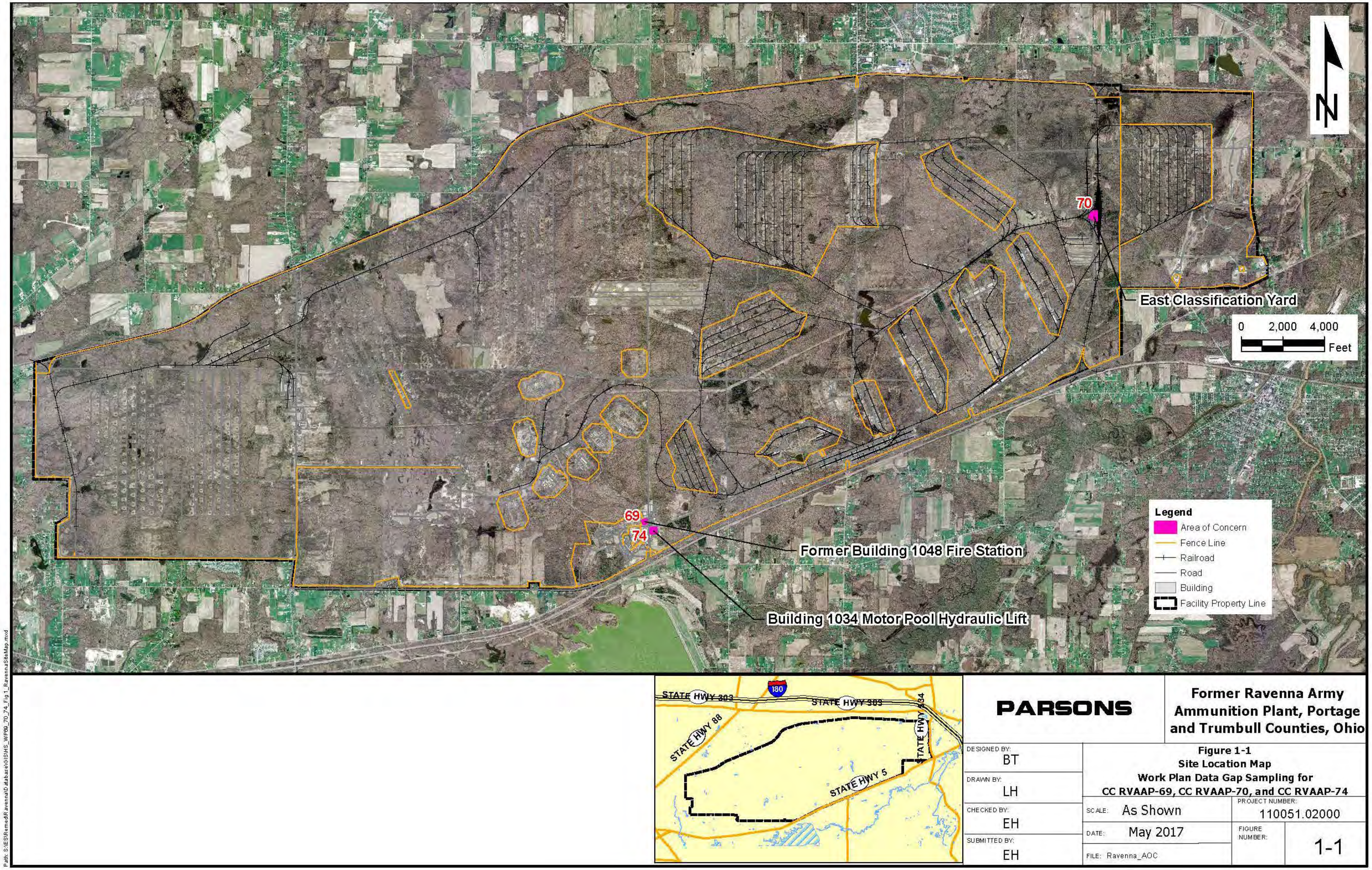

Figure 1-1 Site Location Map Work Plan Additional Sampling for CC RVAAP-69, CC RVAAP-70, and CC RVAAP-74

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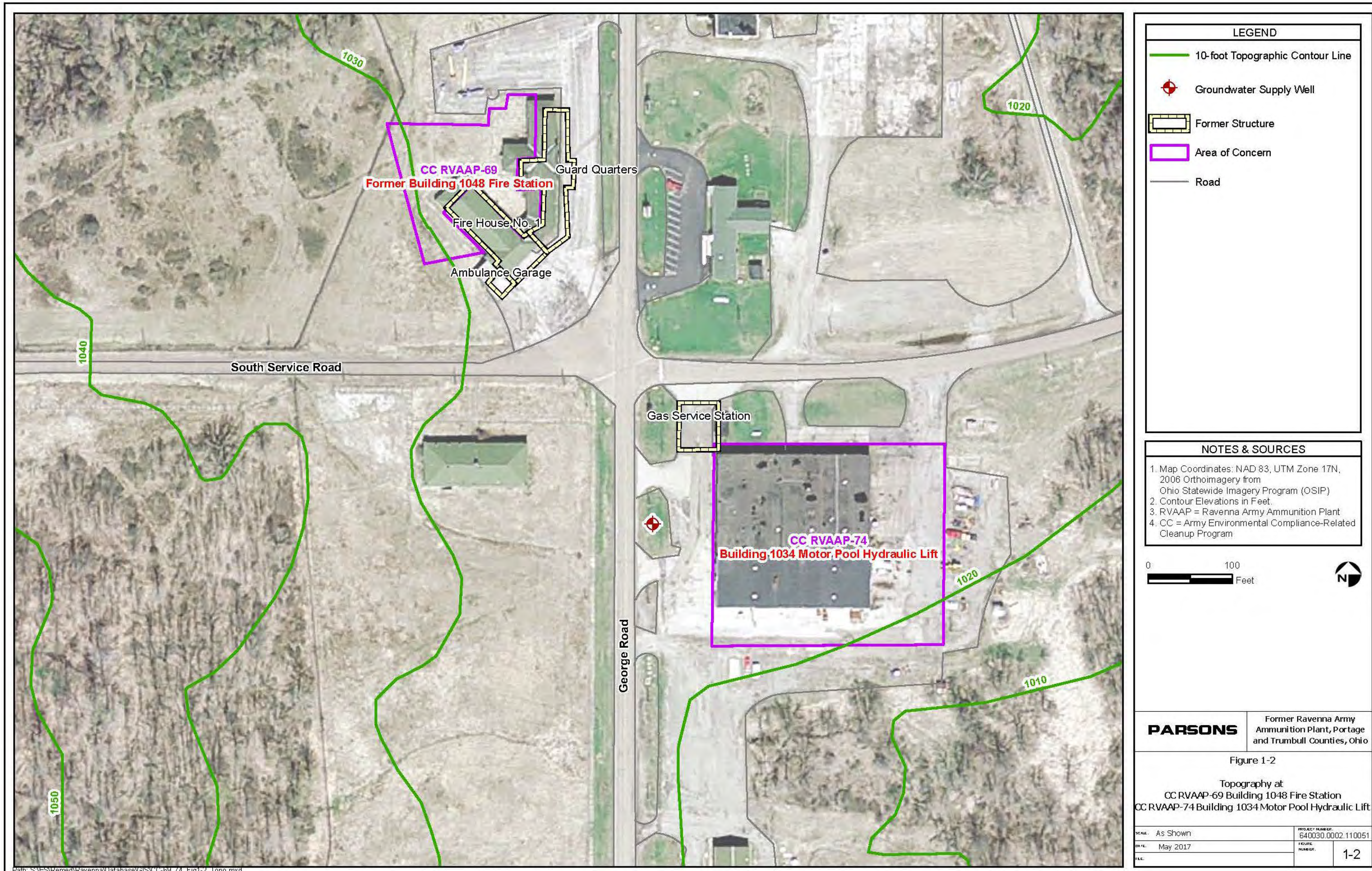

Figure 1-2 Topography at CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

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Figure 1-3 Topography at CC RVAAP-70 East Classification Yard

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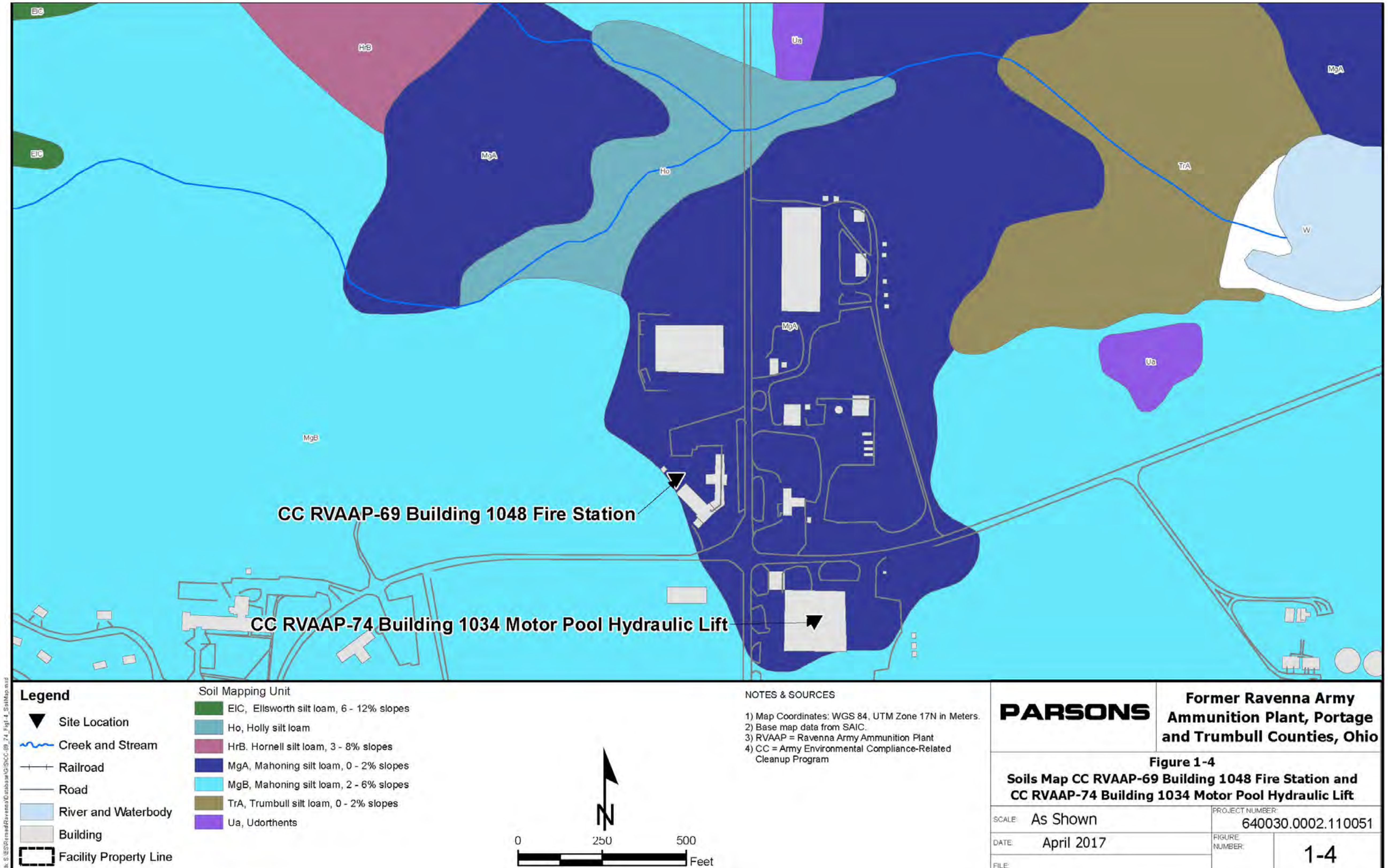

Figure 1-4 Soils Map of CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

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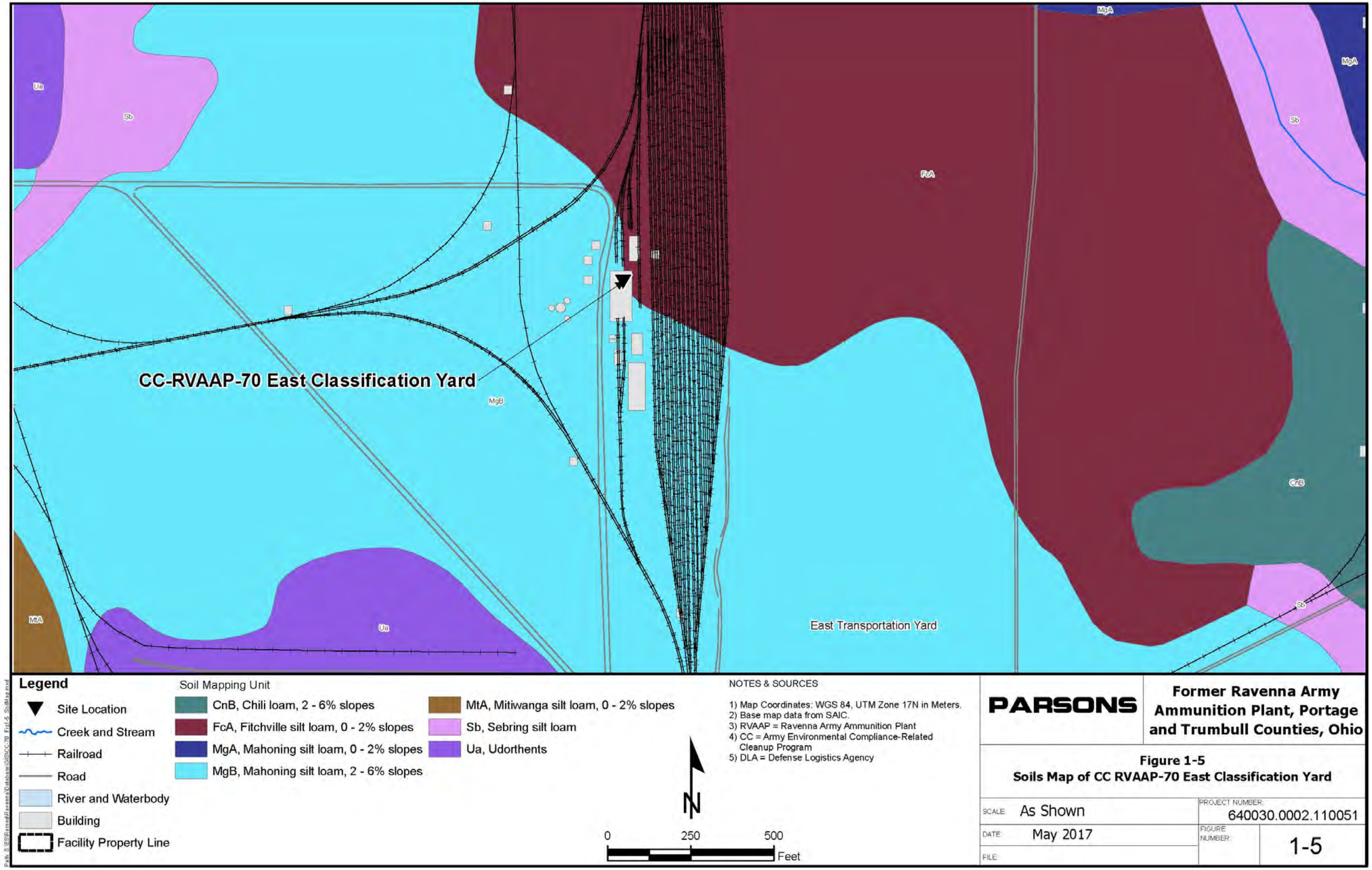

Figure 1-5 Soils Map of CC RVAAP-70 East Classification Yard

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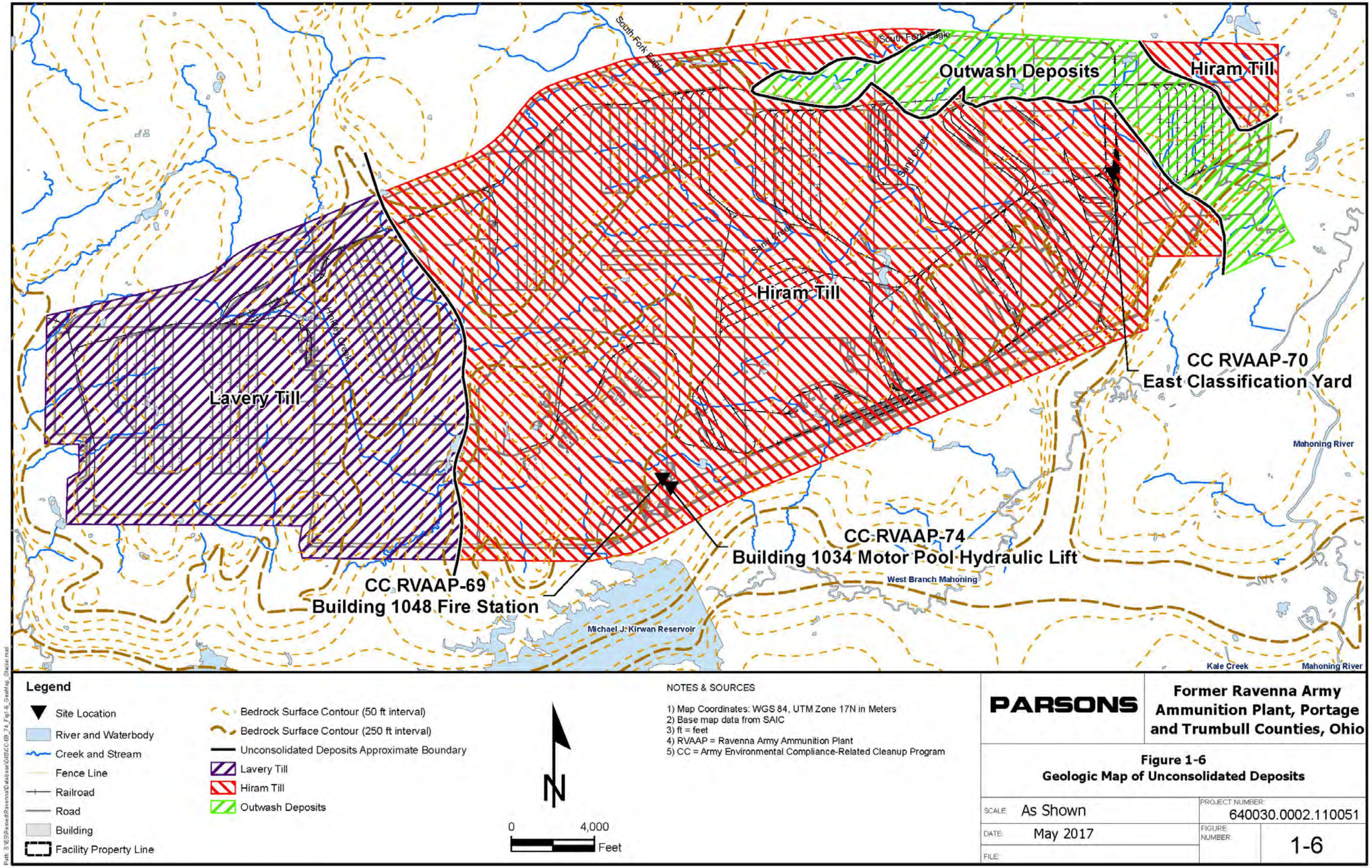

Figure 1-6 Geologic Map of Unconsolidated Deposits

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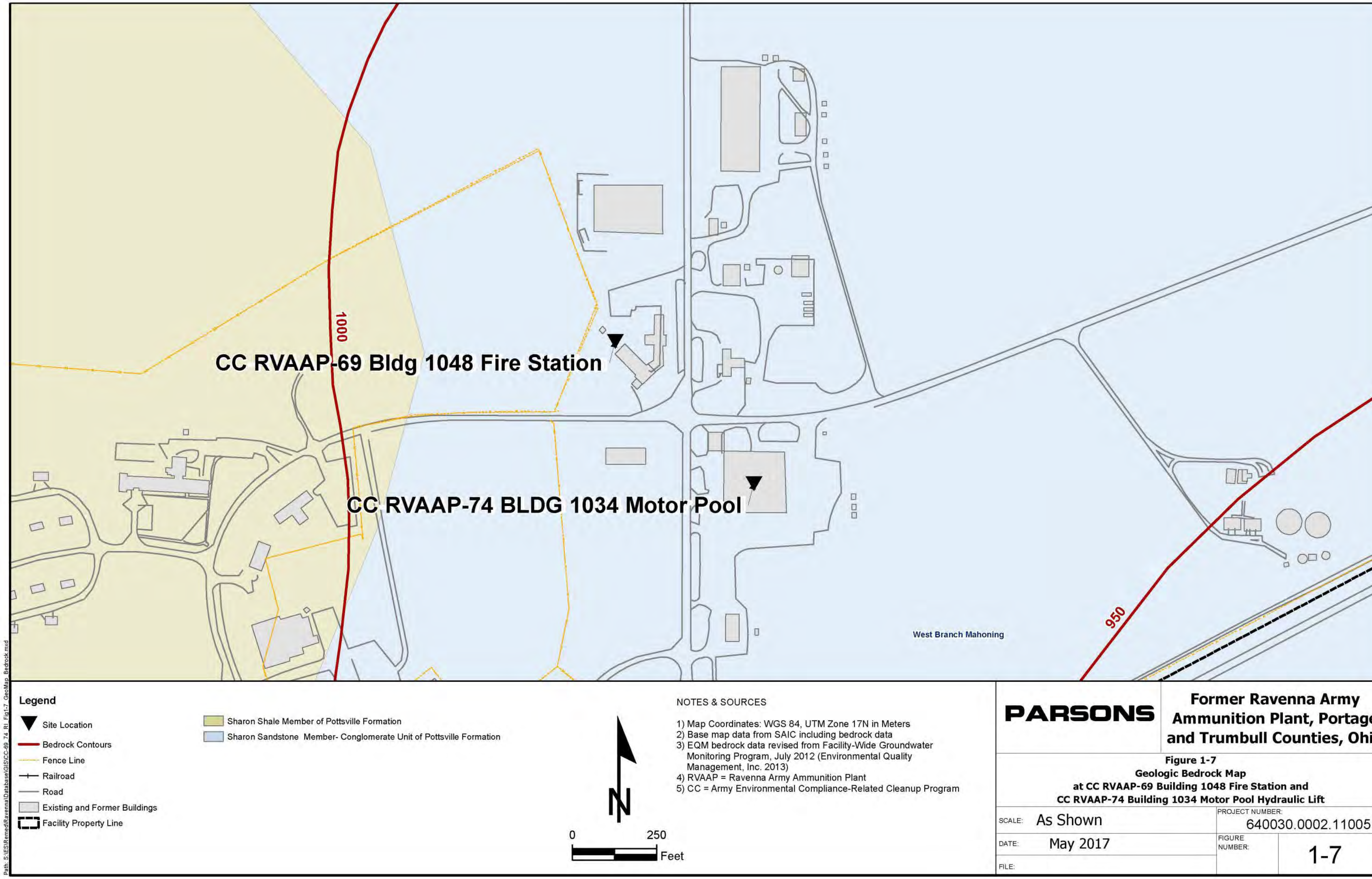

Figure 1-7 Geologic Bedrock Map at CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

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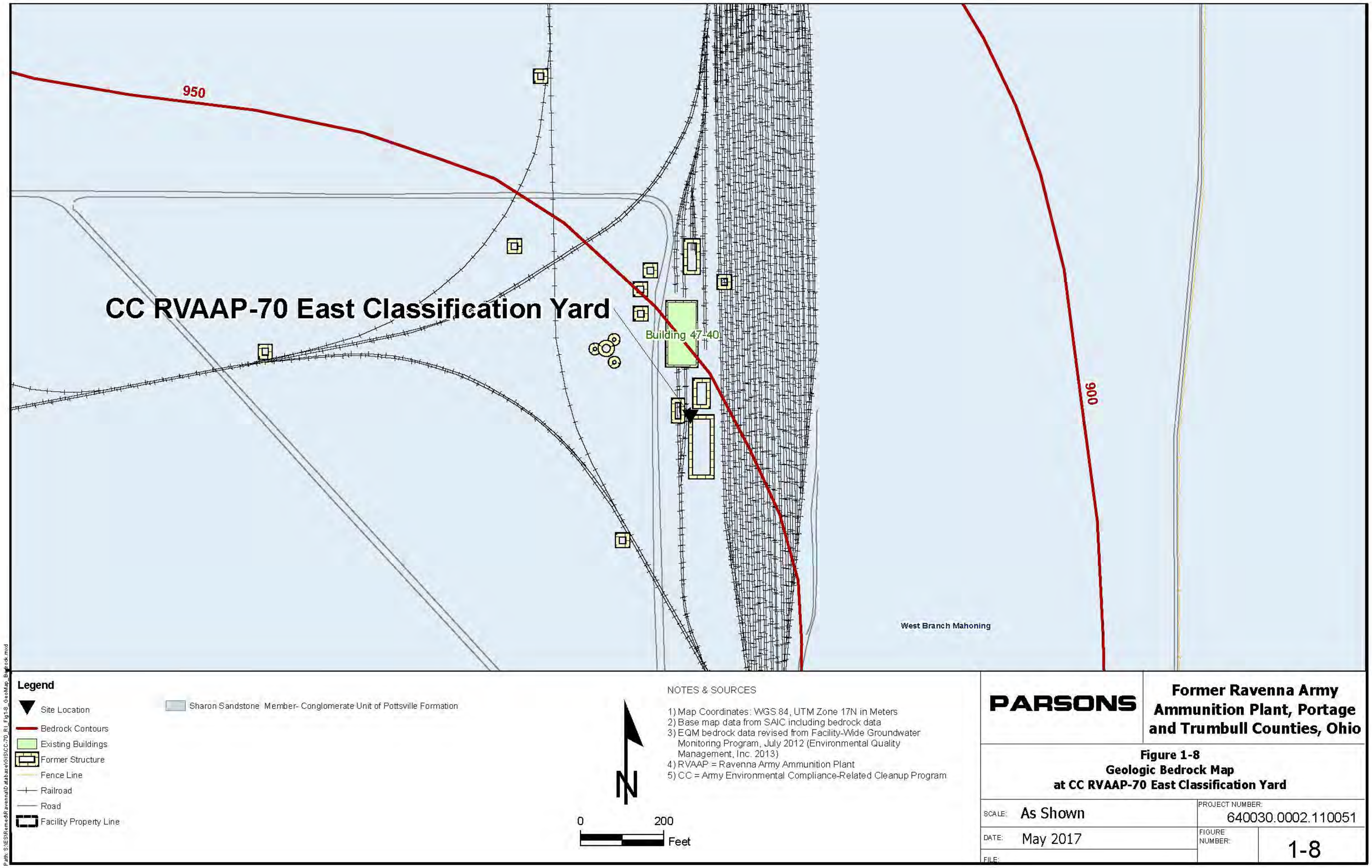

Figure 1-8 Geologic Bedrock Map at CC RVAAP-70 East Classification Yard

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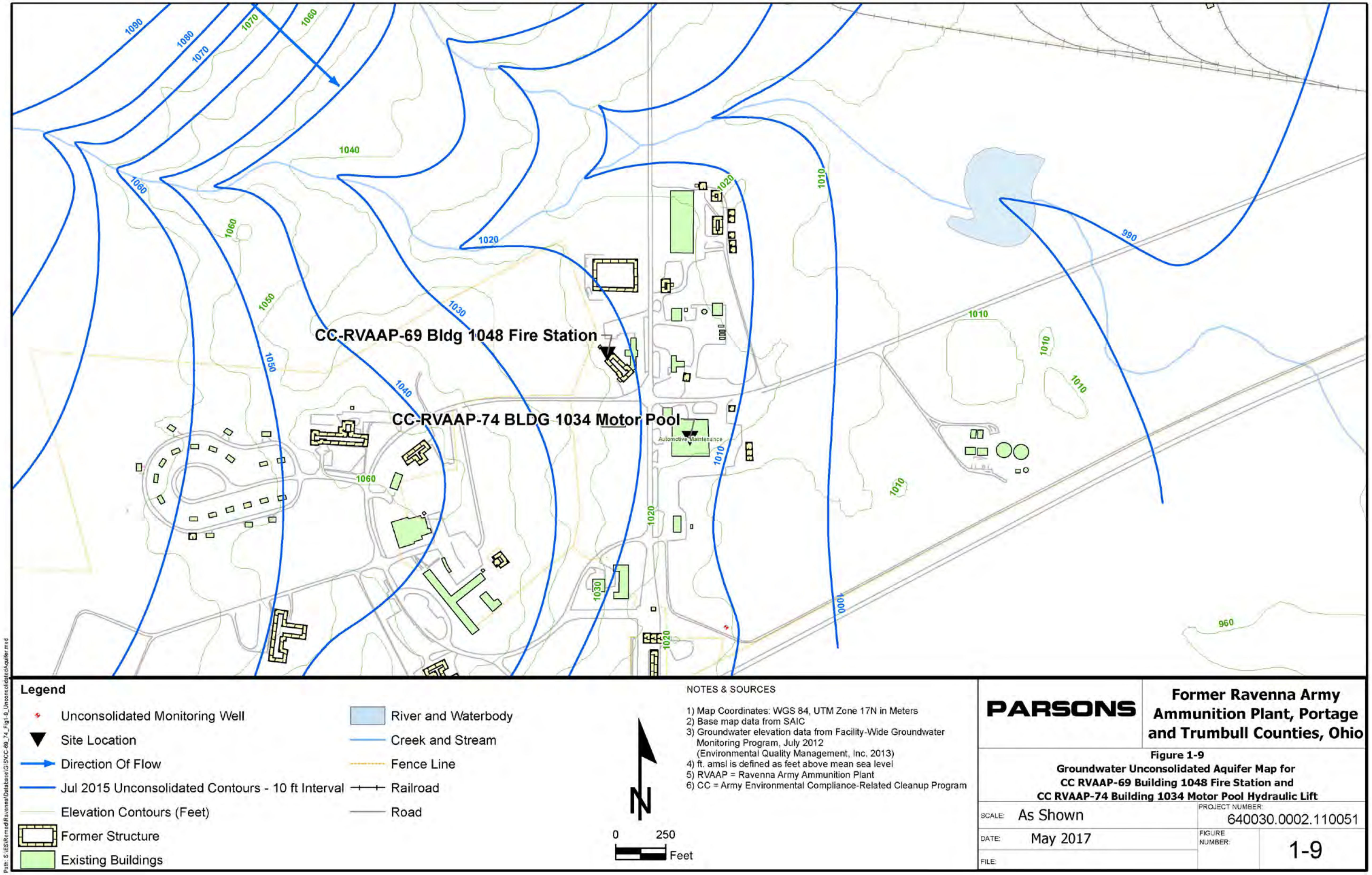

Figure 1-9 Groundwater Unconsolidated Aquifer Map for CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

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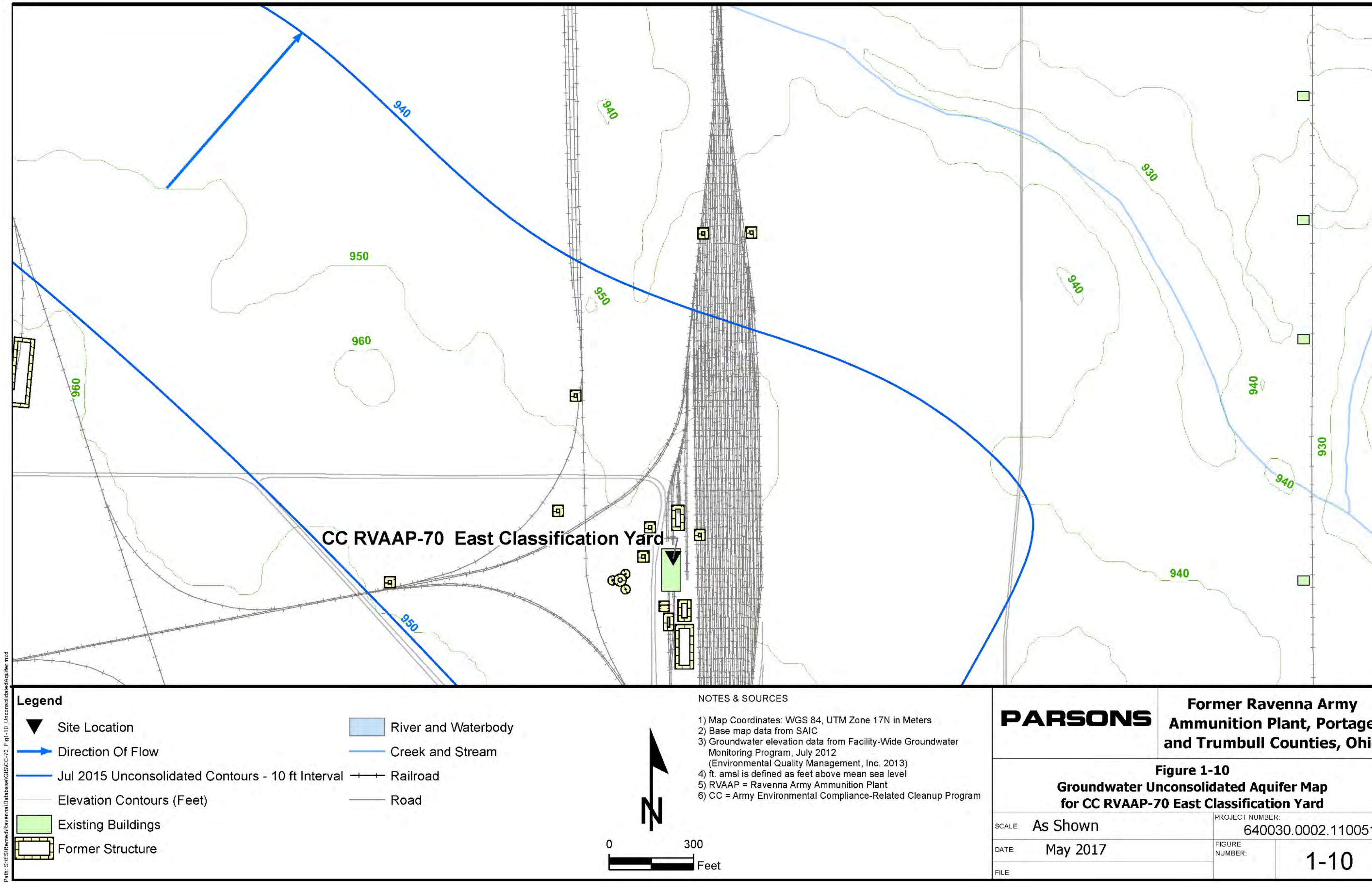

Figure 1-10 Groundwater Unconsolidated Aquifer Map for CC RVAAP-70 East Classification Yard

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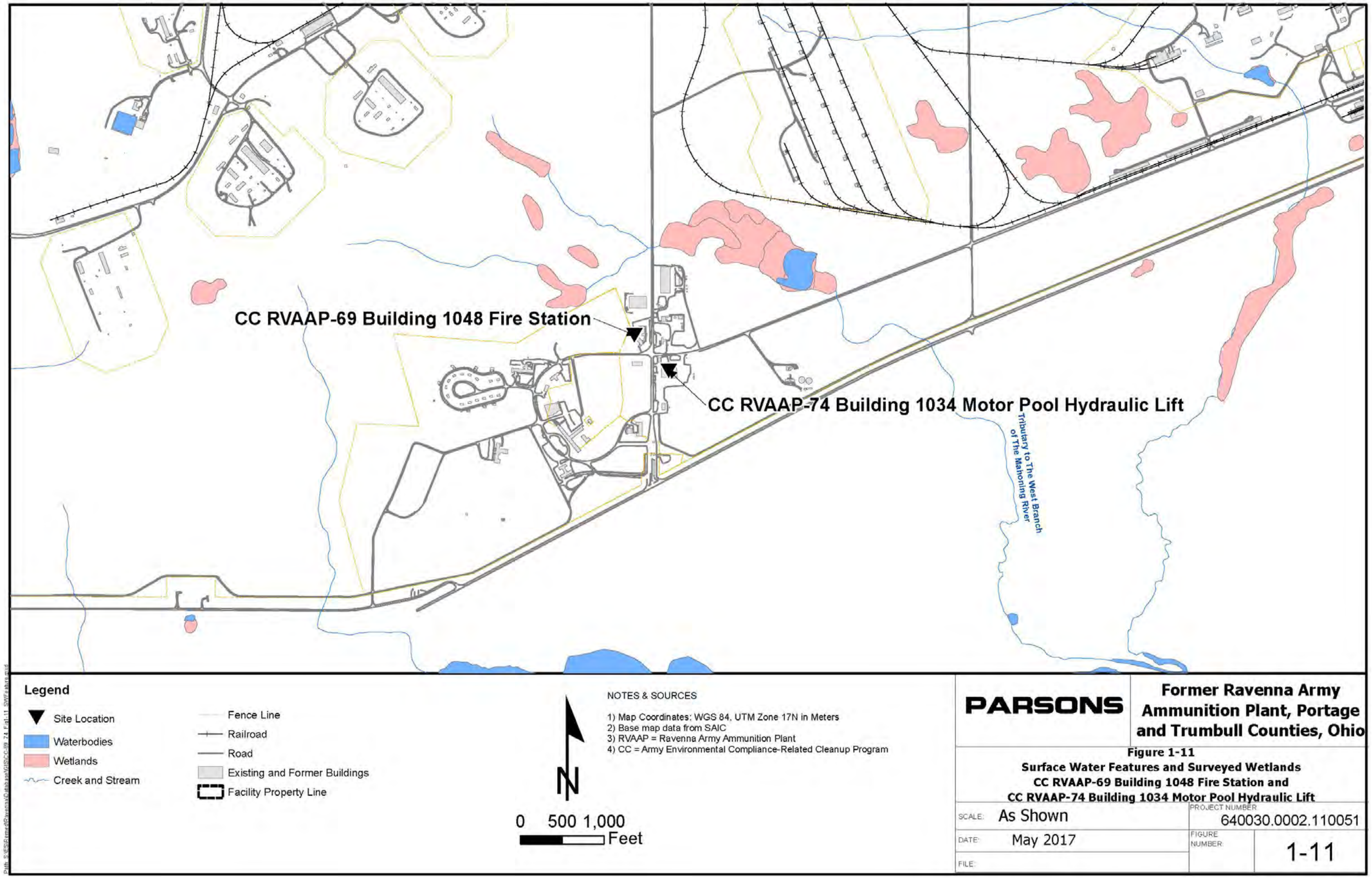

Figure 1-11 Surface Water Features and Surveyed Wetlands for CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

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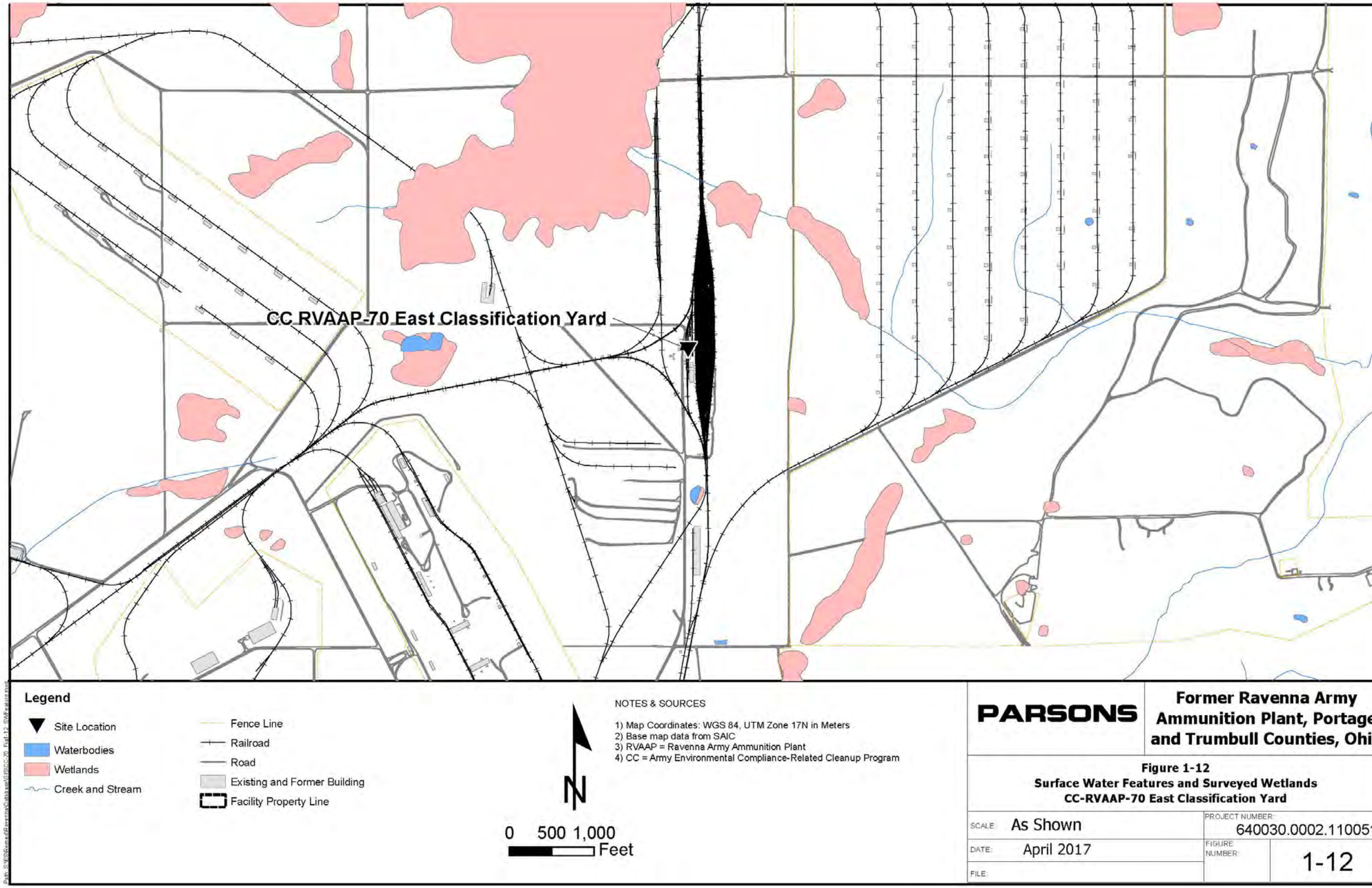

Figure 1-12 Surface Water Features and Surveyed Wetlands for CC RVAAP-70 East Classification Yard

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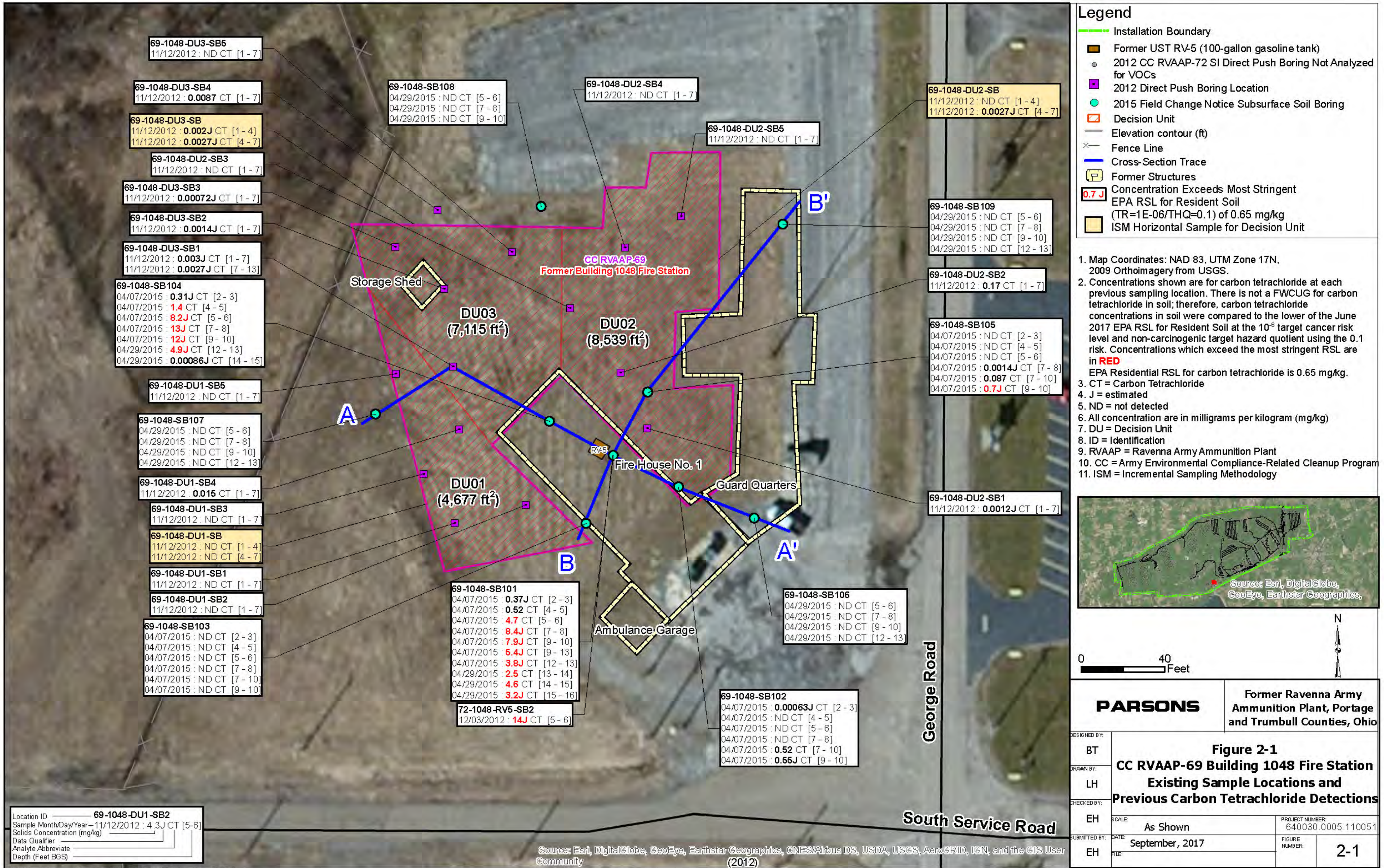

Figure 2-1 CC RVAAP-69 Building 1048 Fire Station Existing Sample Locations and Previous Carbon Tetrachloride Detections

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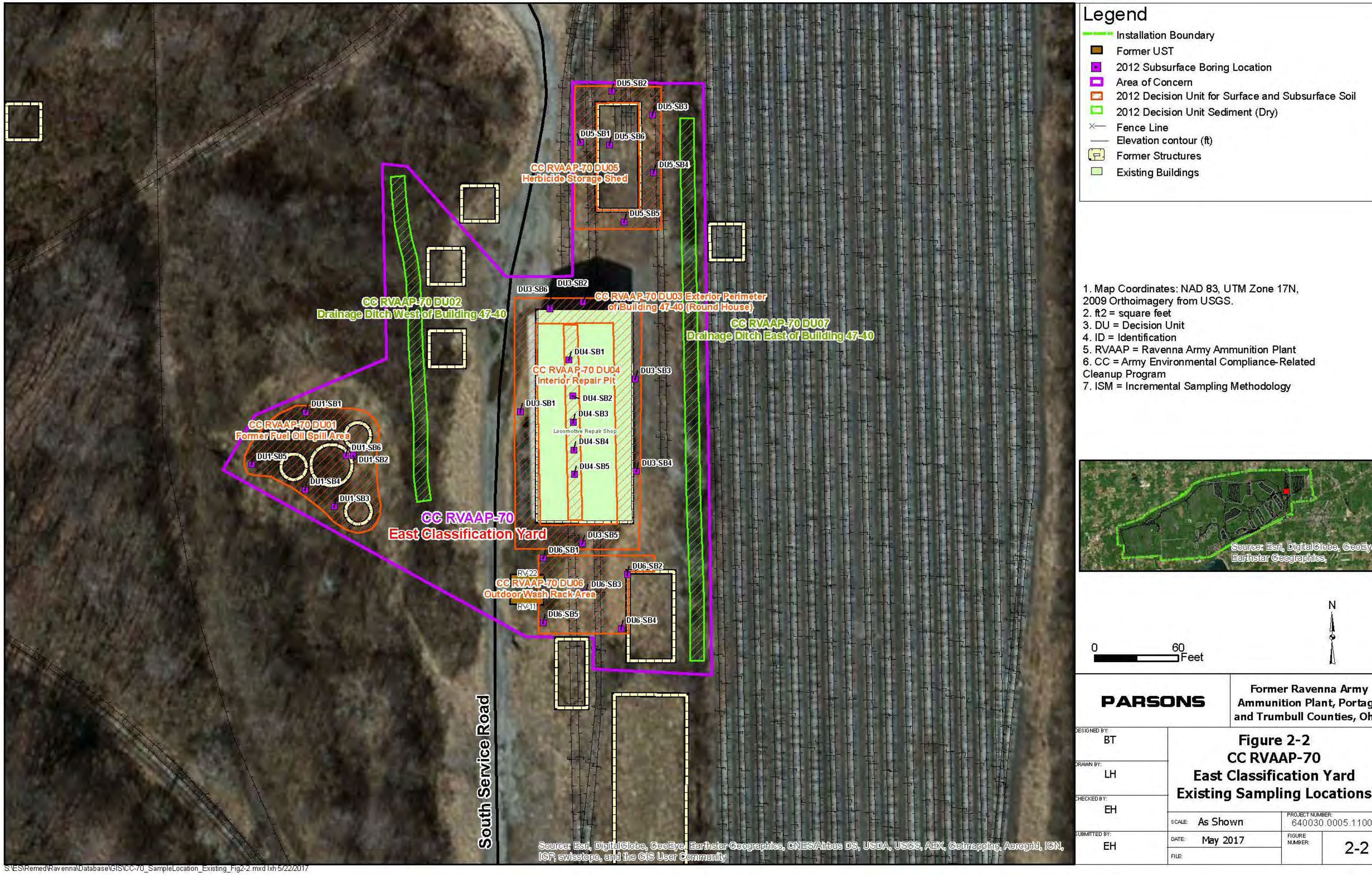

Figure 2-2 CC RVAAP-70 East Classification Yard Existing Sample Locations

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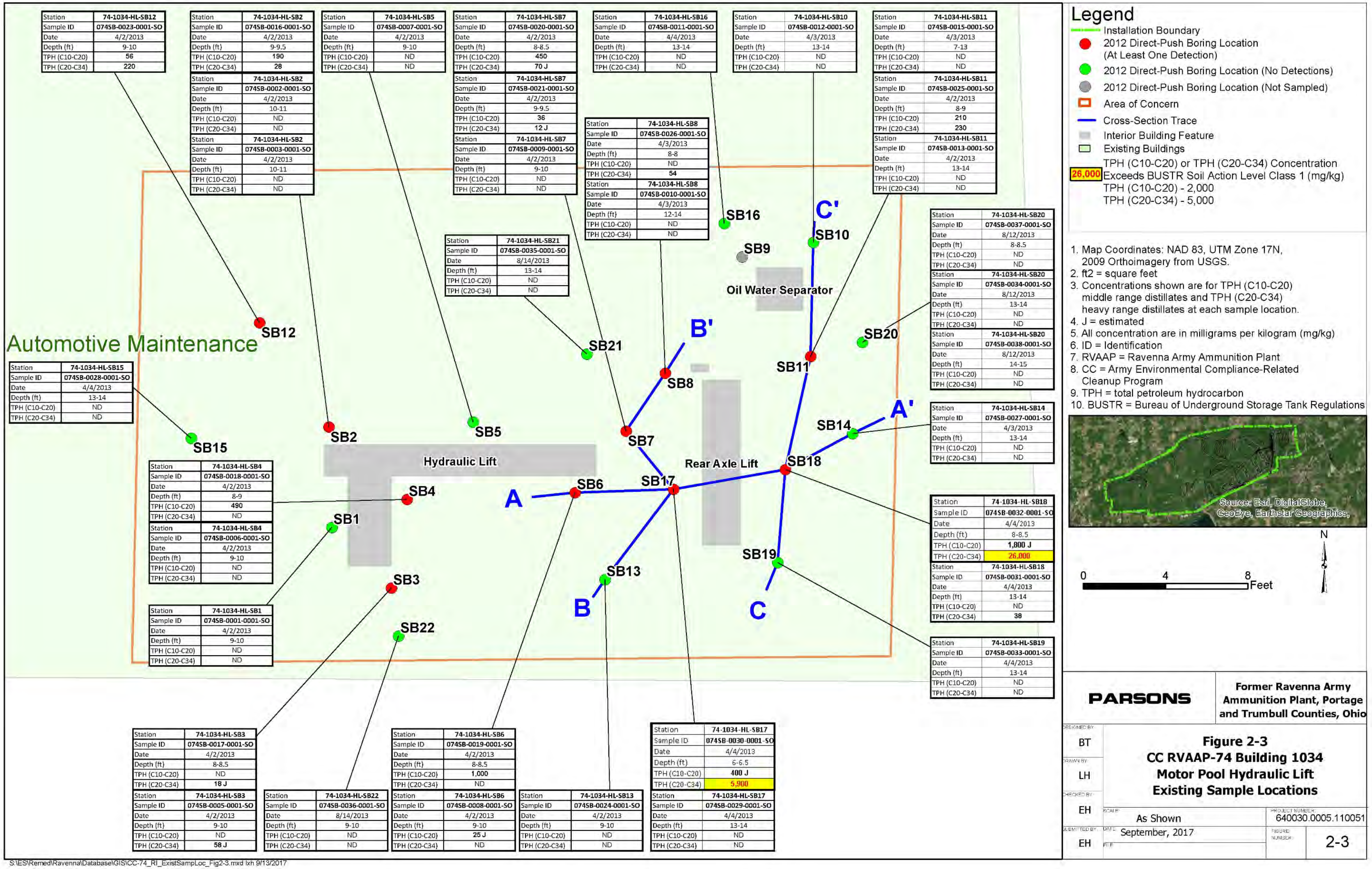

Figure 2-3 CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift Existing Sample Locations

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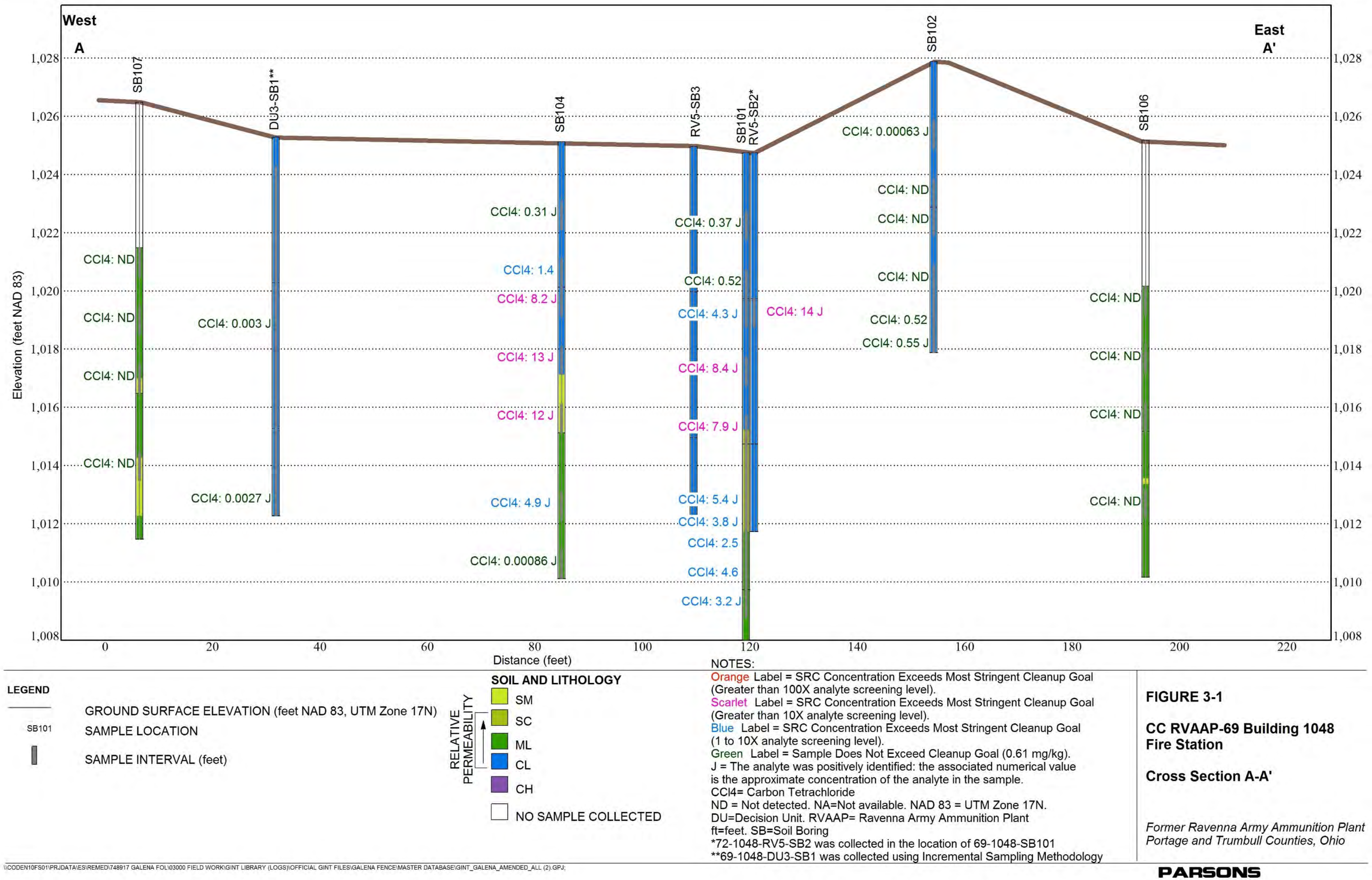

Figure 3-1 CC RVAAP-69 Building 1048 Fire Station Cross Section A-A'

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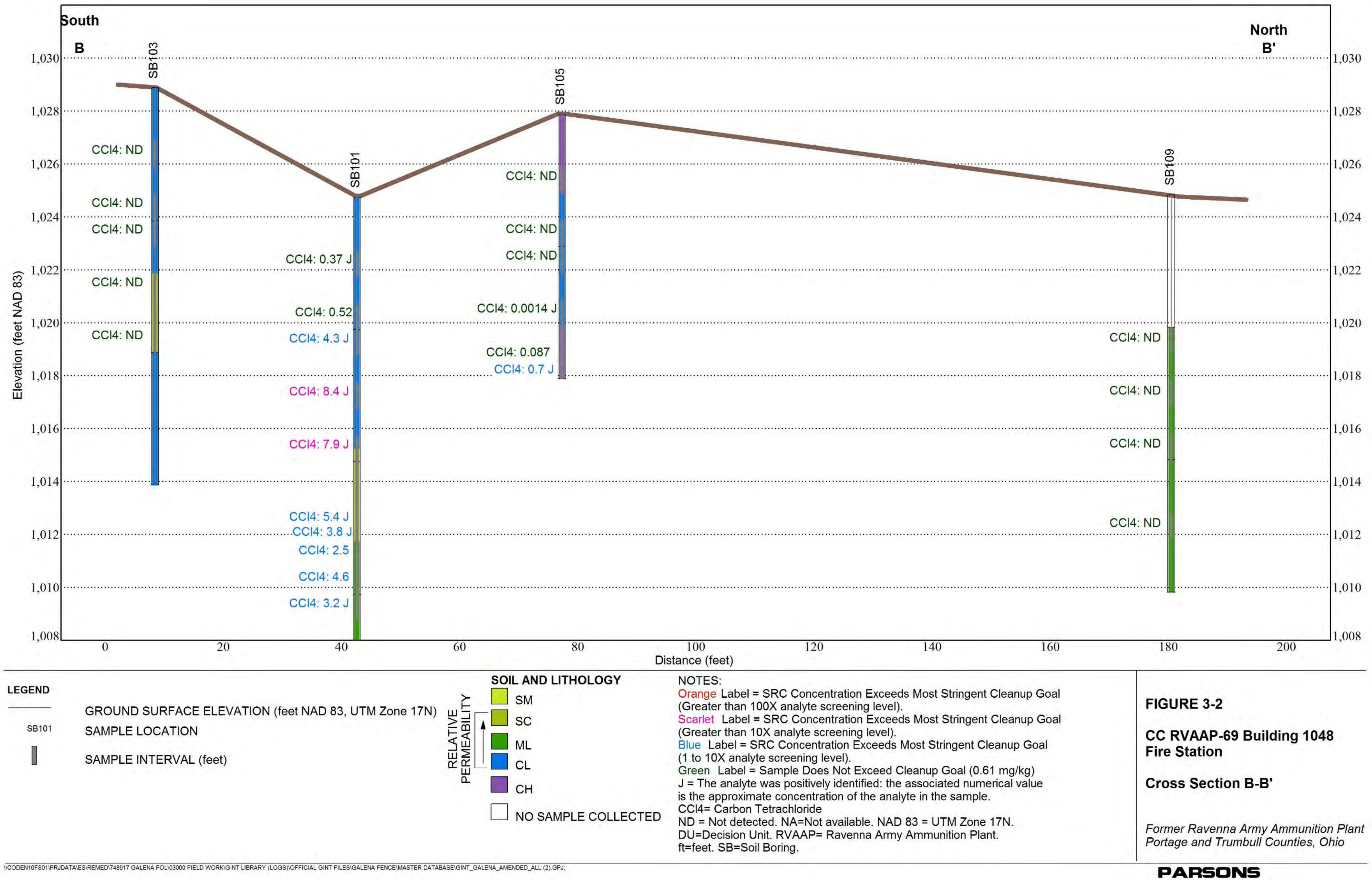

Figure 3-2 CC RVAAP-69 Building 1048 Fire Station Cross Section B-B'

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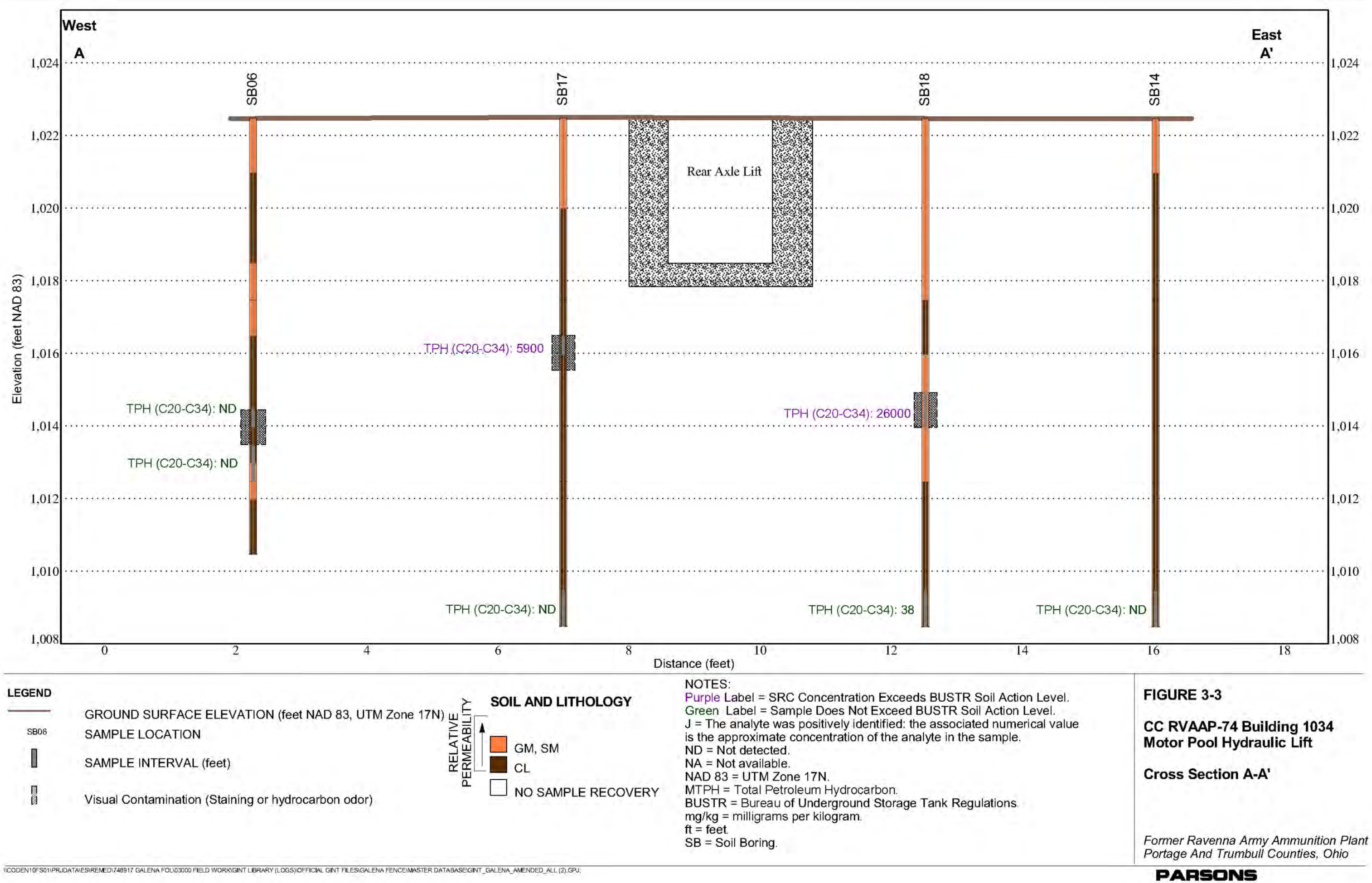

Figure 3-3 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Cross Section A-A'

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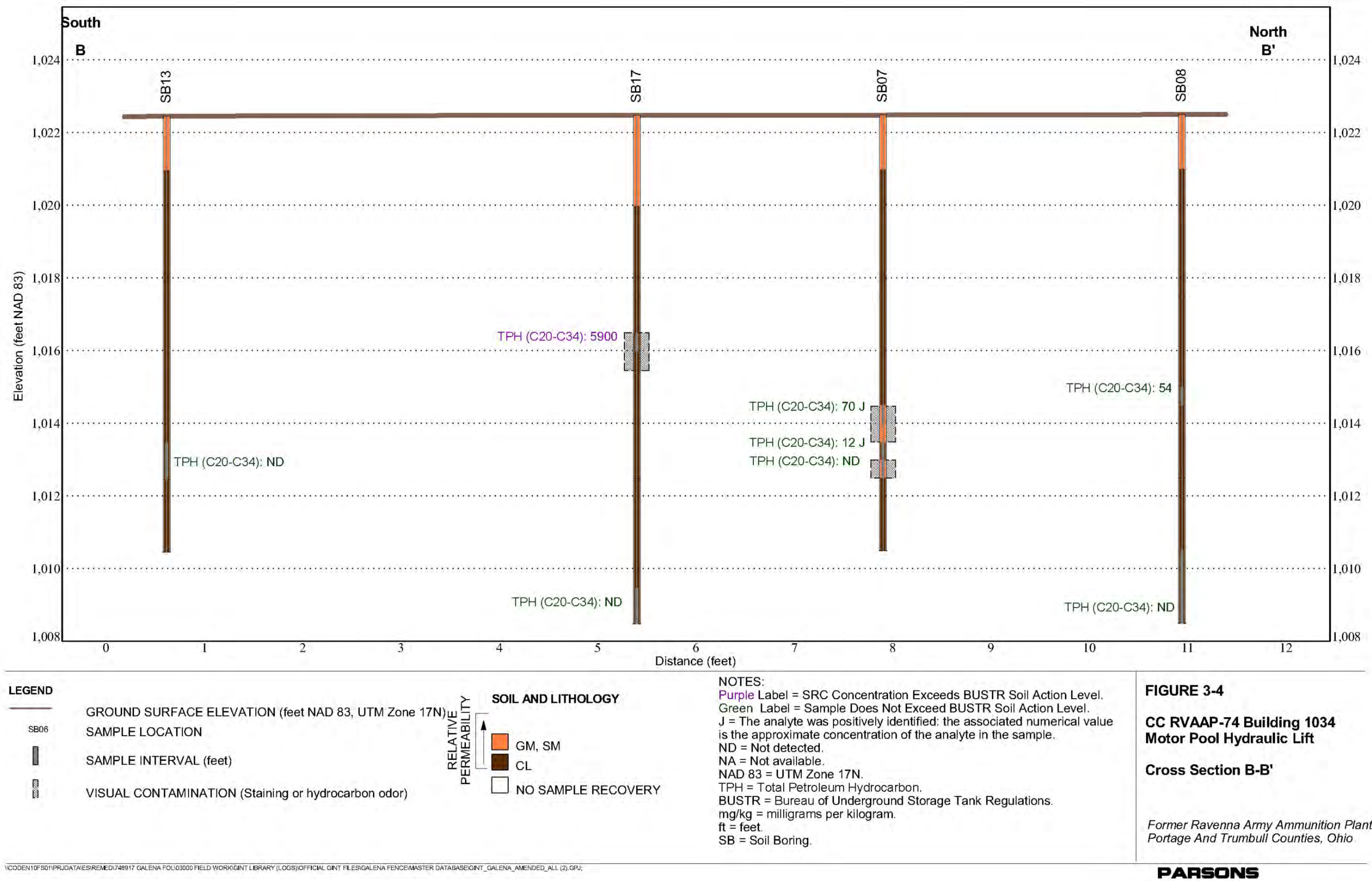

Figure 3-4 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Cross Section B-B'

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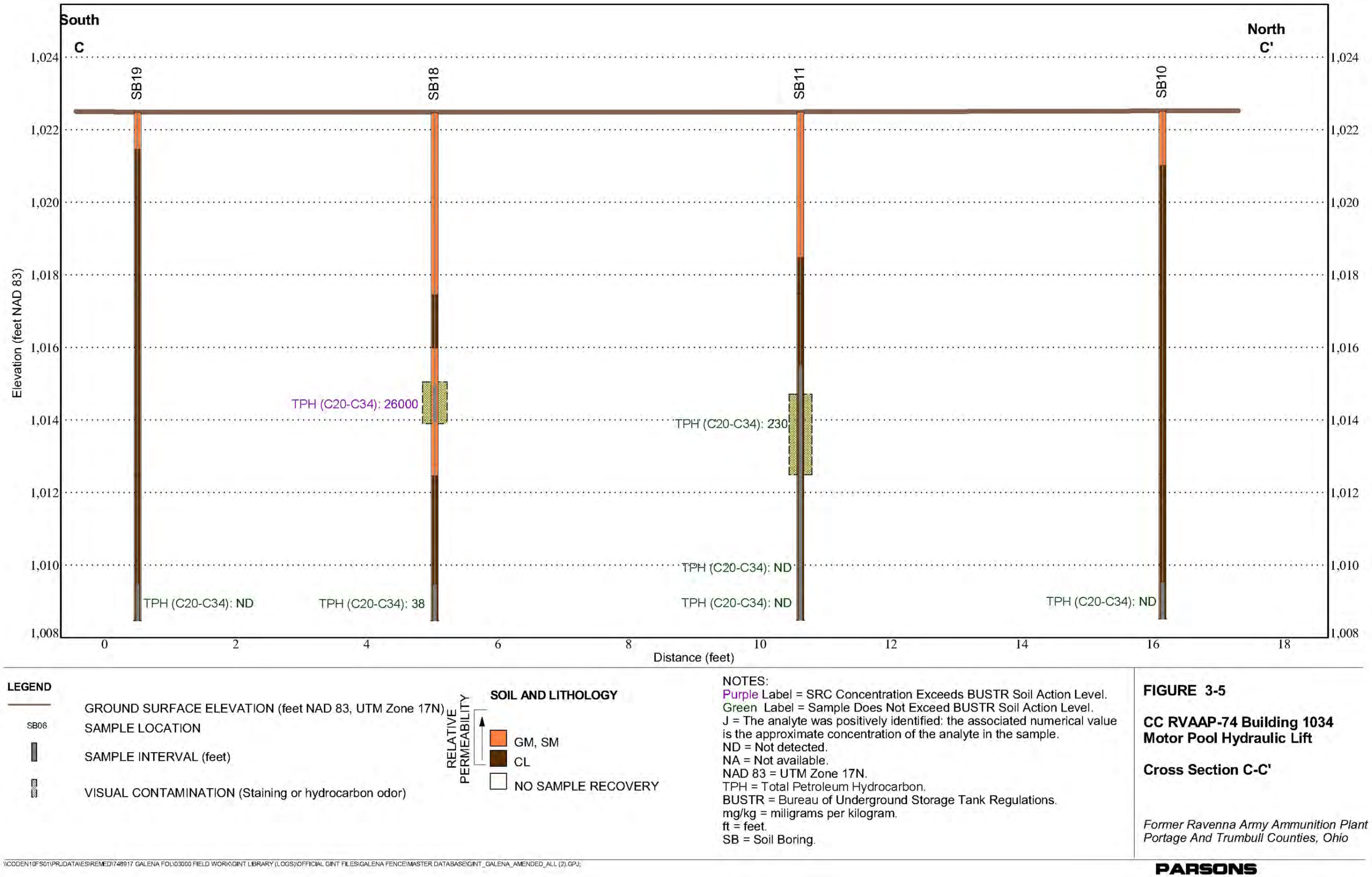

Figure 3-5 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Cross Section C-C'

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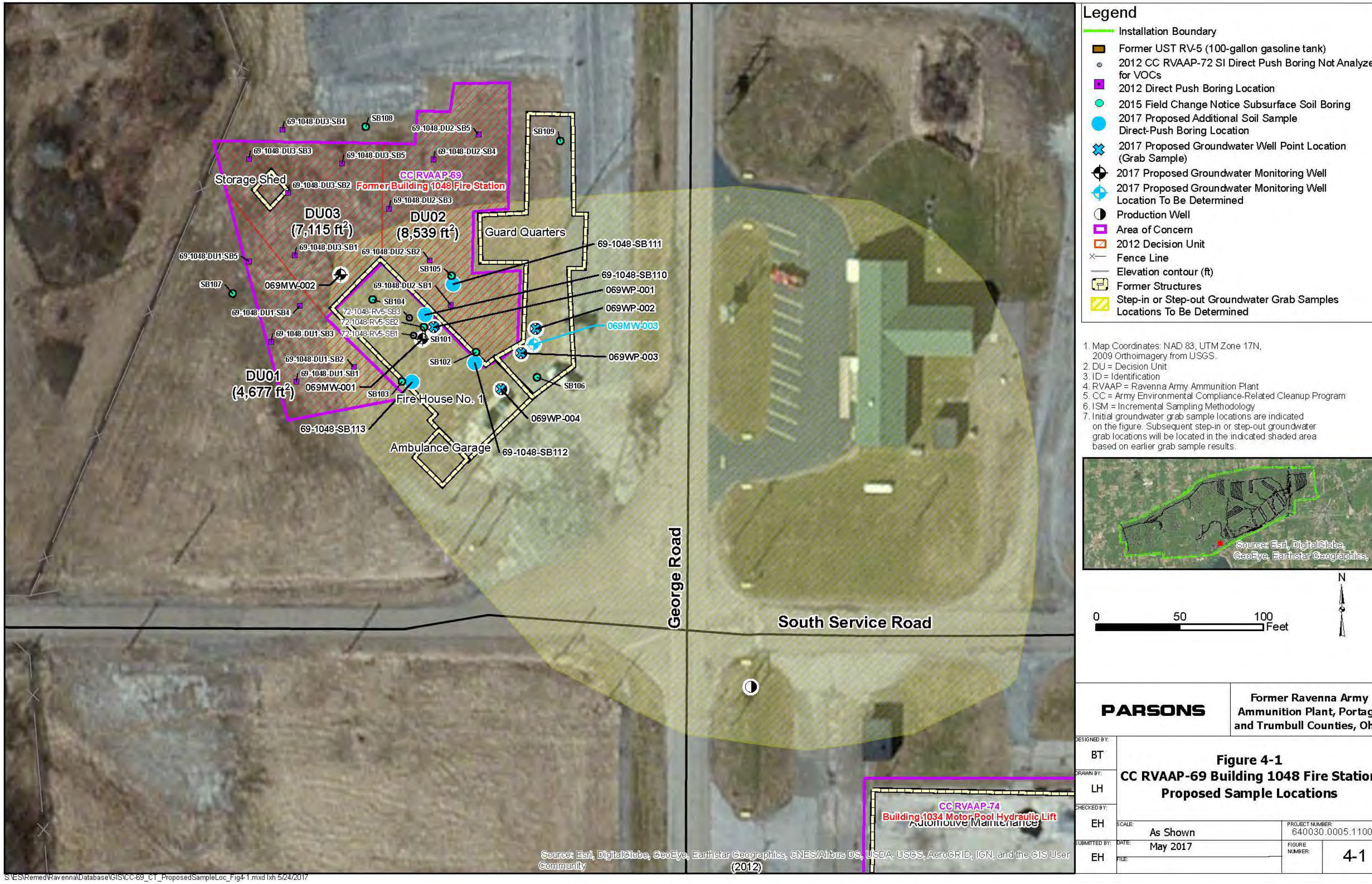

Figure 4-1 CC RVAAP-69 Building 1048 Fire Station Proposed Sample Locations

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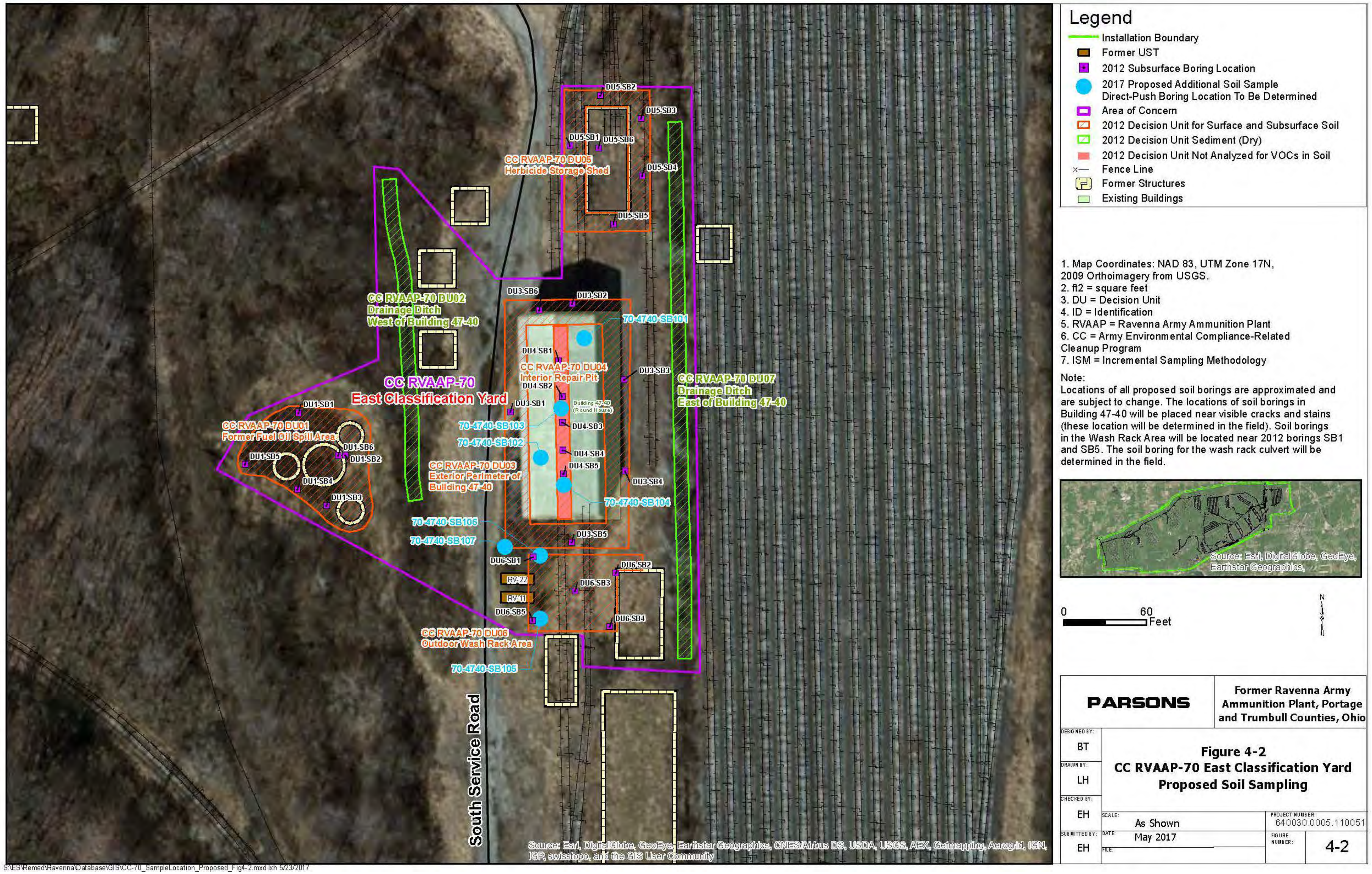

Figure 4-2 CC RVAAP-70 East Classification Yard Proposed Soil Sampling

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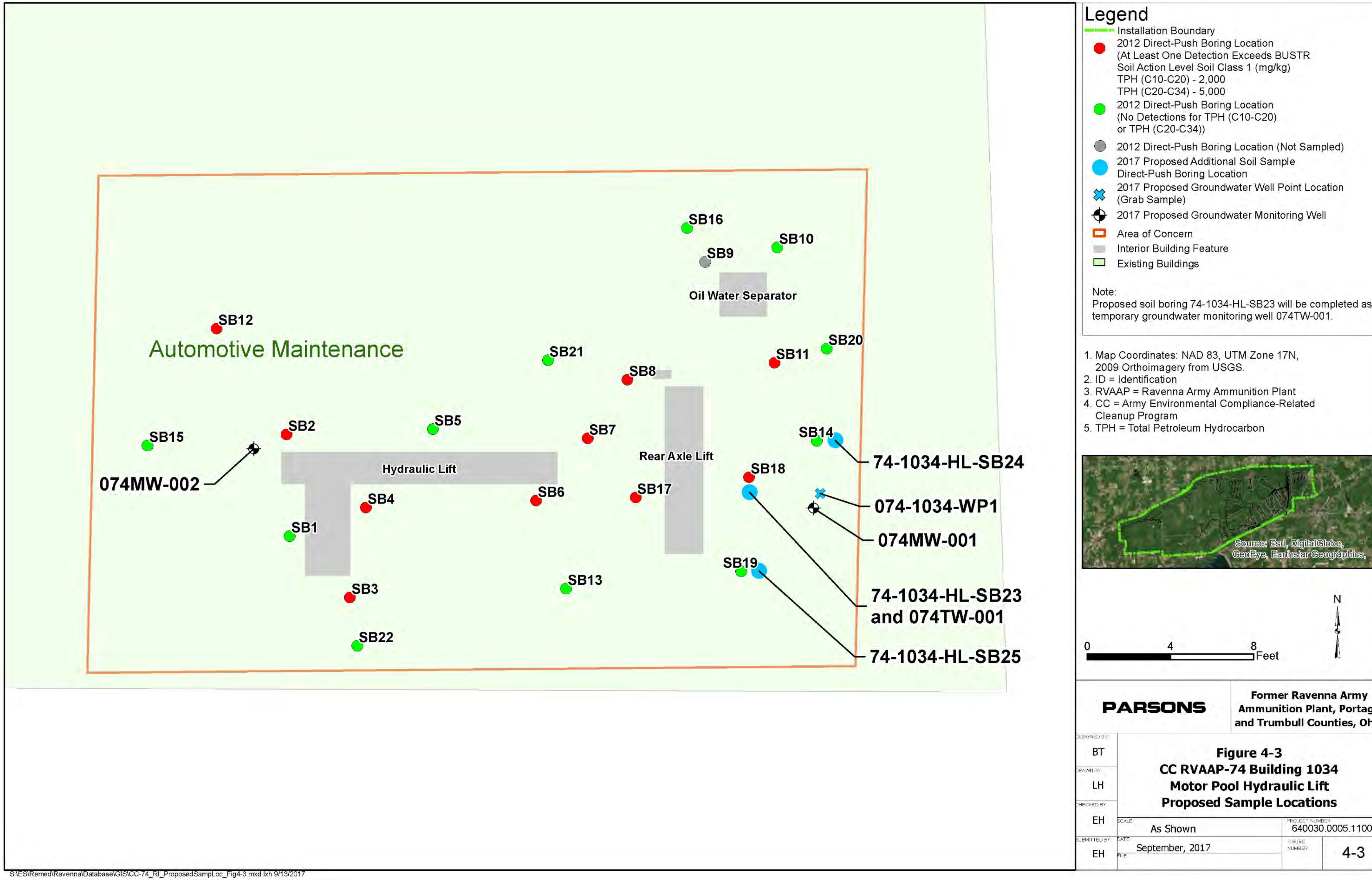

Figure 4-3 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Proposed Sample Locations

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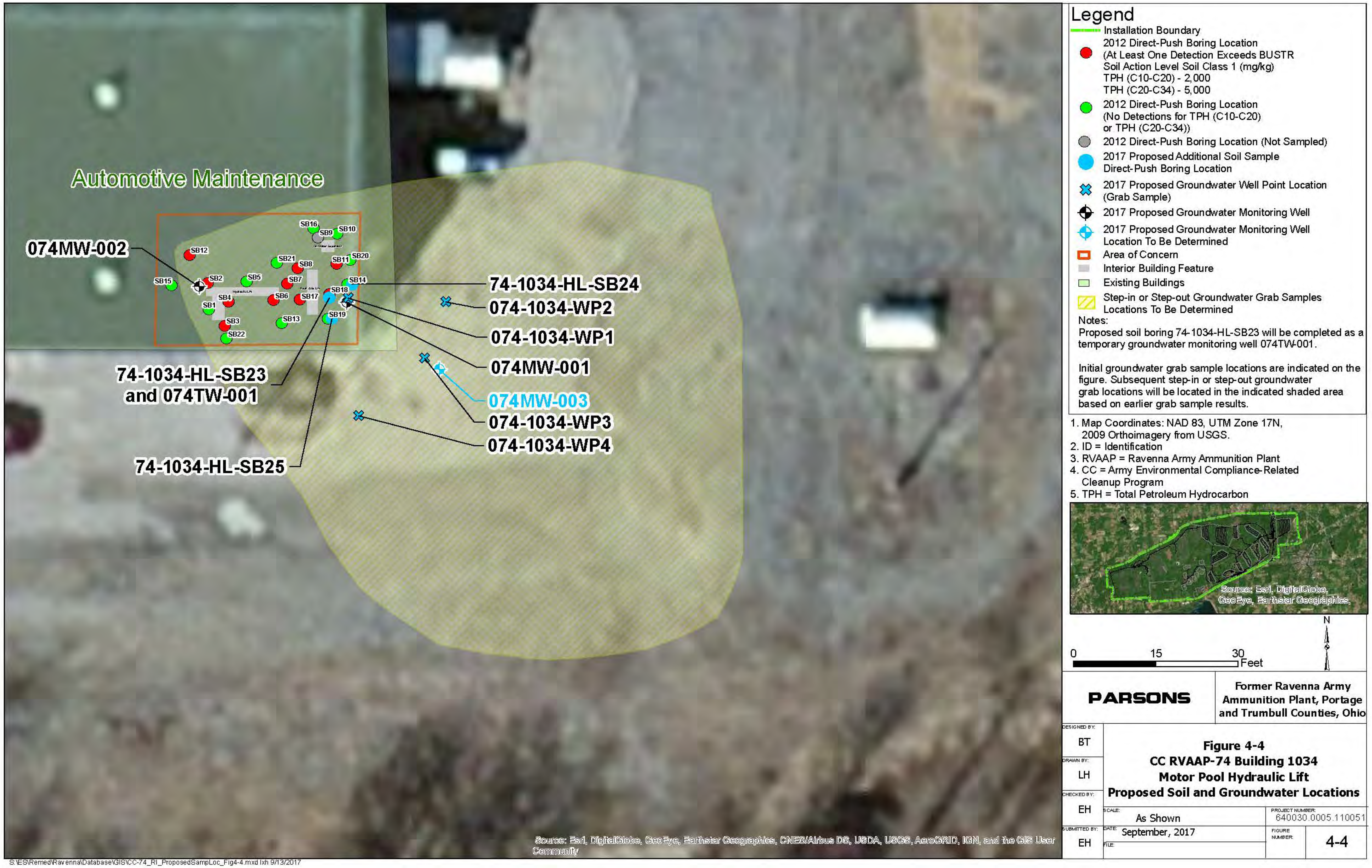

Figure 4-4 CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift Proposed Soil and Groundwater Sample Locations

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TABLES

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Table 1-1 Summary of Remedial Investigations and Site Inspection

AOC	Activity	Media	Chemicals	Exposure Pathway
CC RVAAP-69 Building 1048 Fire Station	Remedial Investigation	Subsurface Soil and Groundwater	Carbon Tetrachloride	Groundwater ingestion; Soil direct contact
CC RVAAP-70 East Classification Yard	Site Inspection	Surface and Subsurface Soil	VOCs, Fuels, PAHs, metals, explosives, herbicides, PCBs	Direct contact with soil and sediment
CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift	Remedial Investigation	Subsurface Soil and Groundwater	Hydraulic Fluid	Soil direct contact; Possible vapor intrusion

Table 3-1 Summary of Chemical of Potential Concern in Surface and Subsurface Soil at CC RVAAP-69

Chemical of Potential Concern	Exposure Area Building 1048 Fire Station	
	Surface Soil (0-1 feet bgs)	Subsurface Soil (>1 feet bgs)
Metals		
Arsenic		X
Chromium	X	
Cobalt	X	
Semivolatile Organic Compounds		
Benzo(a)anthracene	X	
Benzo(a)pyrene		X
Benzo(b)fluoranthene	X	
Dibenz(a,h)anthracene	X	
Indeno(1,2,3-c,d)pyrene	X	
Volatile Organic Compounds		
Carbon Tetrachloride		X
Chloroform		X

Notes:
bgs = below ground surface.
X = Selected as a chemical of potential concern.

Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	West Drainage Ditch, DU02**	West Drainage Ditch, DU02**	Building 4740 Ext, DU03	Former Herbicide Storage Shed, DU05
							Location ID:	70-4744-DU1-SS	70-DD-DU2-SS	70-DD-DU2-SS	70-4740-DU3-SS	70-4760-DU5-SS
							Field Sample ID:	070SS-0001M-0001-SO	070SS-0002M-0001-SO	070SS-0002M-0002-SO	070SS-0003M-0001-SO	070SS-0004M-0001-SO
							Lab Sample ID:	240-17230-1	240-17230-2	240-17230-2	240-17230-3	240-17230-4
							Sample Date:	11/5/2012	11/5/2012	11/7/2012	11/5/2012	11/5/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemicals	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	ND	ND	NR/NA	NR/NA	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	ND	ND	NR/NA	NR/NA	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	ND	ND	NR/NA	NR/NA	NR/NA
Chloroform	None	None	None	None	None	1,400	320	ND	ND	NR/NA	NR/NA	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	ND	ND	NR/NA	NR/NA	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	ND	ND	NR/NA	NR/NA	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	ND	ND	NR/NA	NR/NA	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	ND	ND	NR/NA	NR/NA	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	ND	ND	NR/NA	NR/NA	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	ND	NR/NA	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	NR/NA	ND	ND
2,6-Dinitrotoluene	None	13,600	1,100	769	None	-	-	ND	ND	NR/NA	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	ND	**25 J**	NR/NA	**540**	**420**
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	ND	NR/NA	**550**	**140**
Acenaphthylene	None	None	None	None	None	None	None	ND	ND	NR/NA	**47 J**	**65**
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	ND	**18 J**	NR/NA	**2,500**	**420**
Benzo(a)anthracene	None	4,770	650	221	-	-	-	**84**	**110**	NR/NA	**3,200**	**750**
Benzo(a)pyrene	None	477	65	22	-	-	-	**110**	**130**	NR/NA	**1,900**	**460**
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	**110**	**160**	NR/NA	**3,100**	**950**
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	**270**	**240**	NR/NA	**1,100**	**310**
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	**35**	**69**	NR/NA	**980**	**310**
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	NR/NA	ND	ND

Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	West Drainage Ditch, DU02**	West Drainage Ditch, DU02**	Building 4740 Ext, DU03	Former Herbicide Storage Shed, DU05
							Location ID:	70-4744-DU1-SS	70-DD-DU2-SS	70-DD-DU2-SS	70-4740-DU3-SS	70-4760-DU5-SS
							Field Sample ID:	070SS-0001M-0001-SO	070SS-0002M-0001-SO	070SS-0002M-0002-SO	070SS-0003M-0001-SO	070SS-0004M-0001-SO
							Lab Sample ID:	240-17230-1	240-17230-2	240-17230-2	240-17230-3	240-17230-4
							Sample Date:	11/5/2012	11/5/2012	11/7/2012	11/5/2012	11/5/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Semivolatile Organic Compounds (µg/kg)												
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	NR/NA	ND	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	NR/NA	**340 J**	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	**130**	**140**	NR/NA	**3300**	**1100**
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	ND	NR/NA	**420 J**	**170 J**
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	**110**	**180**	NR/NA	**8,400**	**1800**
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	ND	NR/NA	**710**	**160**
Indeno(1,2,3-cd)pyrene	None	4,770	650	221	-	-	-	**47**	**100**	NR/NA	**1,000**	**280**
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	NR/NA	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	ND	**21 J**	NR/NA	**480**	**270**
Nitrobenzene	None	None	None	None	NA	22,000	5,100	ND	ND	NR/NA	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	**130**	**71**	NR/NA	**5,900**	**1200**
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	**180**	**170**	NR/NA	**5,700**	**1300**

Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Duplicate	Duplicate
							Location:	Outdoor Wash Rack Area, DU06	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**
							Location ID:	70-4759-DU6-SS	70-CDD-DU7-SS	70-CDD-DU7-SS	70-CDD-DU7-SS	70-CDD-DU7-SS
							Field Sample ID:	070SS-0005M-0001-SO	070SS-0006M-0001-SO	070SS-0006M-0001-SO	070SS-0007M-0001-SO	070SS-0007M-0002-SO
							Lab Sample ID:	240-17230-5	240-17230-6	240-17230-6	240-17230-7	240-17317-12
							Sample Date:	11/5/2012	11/5/2012	11/7/2012	11/5/2012	11/7/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	NR/NA	ND	NR/NA	**28 J**	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	NR/NA	ND	NR/NA	ND	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	NR/NA	ND	NR/NA	ND	NR/NA
Chloroform	None	None	None	None	None	1,400	320	NR/NA	ND	NR/NA	ND	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	NR/NA	ND	NR/NA	ND	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	NR/NA	ND	NR/NA	ND	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	NR/NA	ND	NR/NA	ND	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	NR/NA	ND	NR/NA	ND	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	NR/NA	ND	NR/NA	ND	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	**81 J**	ND	NR/NA	ND	NR/NA
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	NR/NA	ND	NR/NA
2,6-Dinitrotoluene	None	13,600	1,100	769	None	-	-	ND	ND	NR/NA	ND	NR/NA
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	**690**	**280**	NR/NA	**260**	NR/NA
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	**40 J**	NR/NA	**68 J**	NR/NA
Acenaphthylene	None	None	None	None	None	None	None	**66**	ND	NR/NA	ND	NR/NA
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	**80**	**79**	NR/NA	**110**	NR/NA
Benzo(a)anthracene	None	4,770	650	221	-	-	-	**210**	**160**	NR/NA	**230**	NR/NA
Benzo(a)pyrene	None	477	65	22	-	-	-	**210**	**130**	NR/NA	**190**	NR/NA
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	**360**	**200**	NR/NA	**300**	NR/NA
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	**380**	**130**	NR/NA	**190**	NR/NA
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	**190**	**91**	NR/NA	**120**	NR/NA
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	NR/NA	ND	NR/NA
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	NR/NA	ND	NR/NA
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	NR/NA	ND	NR/NA
Chrysene	None	477,000	65,000	22,100	-	-	-	**320**	**200**	NR/NA	**270**	NR/NA
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	**160 J**	**88 J**	NR/NA	**100 J**	NR/NA

Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil Samples and Dry Sediment Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Duplicate	Duplicate
							Location:	Outdoor Wash Rack Area, DU06	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**
							Location ID:	70-4759-DU6-SS	70-CDD-DU7-SS	70-CDD-DU7-SS	70-CDD-DU7-SS	70-CDD-DU7-SS
							Field Sample ID:	070SS-0005M-0001-SO	070SS-0006M-0001-SO	070SS-0006M-0001-SO	070SS-0007M-0001-SO	070SS-0007M-0002-SO
							Lab Sample ID:	240-17230-5	240-17230-6	240-17230-6	240-17230-7	240-17317-11
							Sample Date:	11/5/2012	11/5/2012	11/7/2012	11/5/2012	11/7/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard	**Resident Receptor**									
Method/Chemical	**BKG**	**Trainee**	**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Semivolatile Organic Compounds (µg/kg)												
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	**410**	**370 J**	NR/NA	**610**	NR/NA
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	**38 J**	NR/NA	**77 J**	NR/NA
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	**170**	**90**	NR/NA	**110**	NR/NA
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	NR/NA	ND	NR/NA
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	**490**	**220**	NR/NA	**220**	NR/NA
Nitrobenzene	None	None	None	None	None	22,000	5,100	ND	ND	NR/NA	ND	NR/NA
Phenanthrene	None	None	None	None	None	None	None	**320**	**420 J**	NR/NA	**650**	NR/NA
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	**330**	**280 J**	NR/NA	**480 J**	NR/NA

Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	West Drainage Ditch, DU02**	Building 4740 Ext, DU03	Former Herbicide Storage Shed, DU05	Outdoor Wash Rack Area, DU06	East Drainage Ditch, DU07**
							Location ID:	70-DD-DU2-SS	70-4740-DU3-SS	70-4760-DU5-SS	70-4759-DU6-SS	70-CDD-DU7-SS
							Field Sample ID:	070SS-0002M-0002-SO	070SS-0003M-0001-SO	070SS-0004M-0001-SO	070SS-0005M-0001-SO	070SS-0006M-0001-SO
							Lab Sample ID:	240-17230-2	240-17230-3	240-17230-4	240-17230-5	240-17230-6
							Sample Date:	11/7/2012	11/5/2012	11/5/2012	11/5/2012	11/5/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000*	NR/NA	NR/NA	NR/NA	NR/NA	**1.0 J**
Petroleum Hydrocarbons Diesel Range (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	**23**
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	**110**
Petroleum Hydrocarbons Gasoline Range (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	ND	NR/NA	NR/NA	NR/NA	ND
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	**8.7 J**
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	NR/NA	NR/NA	**24 J**
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	**10 J**	NR/NA	ND
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	**0.050 J**	ND
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	ND	ND
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	ND	ND
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	NR/NA	ND	NR/NA	ND	**380 J**
PCB-1248	None	3,460	349	203	None	-	-	NR/NA	ND	NR/NA	ND	ND
PCB-1254	None	3,460	120*	203	None	-	-	NR/NA	**47 J**	NR/NA	ND	ND
PCB-1260	None	3,460	349	203	None	-	-	NR/NA	ND	NR/NA	**70 J**	ND

Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Duplicate	Duplicate
							Location:	Former Fuel Oil Spill Area, DU01	West Drainage Ditch, DU02**	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**	East Drainage Ditch, DU07**
							Location ID:	70-4744-DU1-SS	70-DD-DU2-SS	70-CDD-DU7-SS	70-CDD-DU7-SS	70-CDD-DU7-SS
							Field Sample ID:	070SS-0001M-0001-SO	070SS-0002M-0001-SO	070SS-0006M-0001-SO	070SS-0007M-0001-SO	070SS-0007M-0002-SO
							Lab Sample ID:	240-17230-1	240-17230-2	240-17317-11	240-17230-7	240-17317-12
							Sample Date:	11/5/2012	11/5/2012	11/7/2012	11/5/2012	11/7/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)	0-1 (ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	**0.90 J**	NR/NA
Petroleum Hydrocarbons Diesel Range (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	**50 J**	**73 J**	NR/NA	**30**	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	**470**	**450**	NR/NA	**150**	NR/NA
Petroleum Hydrocarbons Gasoline Range (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	ND	ND	ND	ND	ND
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	NR/NA	ND	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	ND	NR/NA
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	ND	NR/NA
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	ND	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	NR/NA	NR/NA	NR/NA	ND	NR/NA
PCB-1248	None	3,460	349	203	None	-	-	NR/NA	NR/NA	NR/NA	**120**	NR/NA
PCB-1254	None	3,460	120*	203	None	-	-	NR/NA	NR/NA	NR/NA	ND	NR/NA
PCB-1260	None	3,460	349	203	None	-	-	NR/NA	NR/NA	NR/NA	**43 J**	NR/NA

Table 3-2 Summary of Analytical Results for Organic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

Notes:
Yellow shading of a result indicates concentration is greater than the most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL.
The FWCUGs used for data comparison are the values for the most stringent Resident Receptor FWCUG between the adult and the child receptor using the Target Cancer Risk level of 10^{-6}. The June 2017 RSLs shown are also the values for the Target Cancer Risk level of 10^{-6}. Any exceptions are noted with an asterisk (*).
* Indicates non-carcinogenic FWCUGs and June 2017 RSLs using the Target Hazard Quotient = 0.1.
**Dry sediment ISM samples were from the two drainage ditches (DU02 and DU07) since the drainage ditches were dry at time of sample collection in November 2012.
RSLs are presented only for chemicals without Resident Receptor FWCUGs.
The National Guard Trainee FWCUGs and the June 2017 Industrial RSLs are shown on this table for comparison purposes only.
The reported concentrations for petroleum compounds (TPH-DRO and TPH-GRO) were compared to the BUSTR Soil Class 2 Action Levels since no FWCUGs have been established for these chemicals. BUSTR criteria only apply to the analytical results from the Former Fuel Oil Spill Area (DU01).
Bold indicates chemical detected.
µg/kg = Microgram per kilogram.
BHC = Hxachlorocyclohexane.
BKG = Background.
BUSTR = Bureau of Underground Storage Tank Regulations.
DDD = Dichlorodiphenyldichloroethane.
DDE = Dichlorodiphenyldichloroethylene.
DDT = Dichlorophenyltrichloroethane.
DU = Decision unit.
ft = Feet.
FWCUG = Facility-Wide Cleanup Goal (SAIC 2010).
ID = Identification.
ISM = Incremental sampling methodology.
J = Estimated value less than reporting limits.
mg/kg = Milligram per kilogram.
NA = Not applicable.
ND = Non-detect at the Limit of Detection.
NR/NA = Not reported/Not analyzed.
PCB = Polychlorinated biphenyl.
RSL = Regional Screening Level (USEPA, June 2017).
SAIC = Science Applications International Corporation.
USEPA = United States Environmental Protection Agency.

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Table 3-3 Summary of Analytical Results for Inorganic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard

							Sample Type:	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	West Drainage Ditch, DU02(2)	Building 4740 Ext, DU03	Former Herbicide Storage Shed, DU05
							Location ID:	70-4744-DU1-SS	70-DD-DU2-SS	70-4740-DU3-SS	70-4760-DU5-SS
							Field Sample ID:	070SS-0001M-0001-SO	070SS-0002M-0001-SO	070SS-0003M-0001-SO	070SS-0004M-0001-SO
							Lab Sample ID:	240-17230-1	240-17230-2	240-17230-3	240-17230-4
							Sample Date:	11/5/2012	11/5/2012	11/5/2012	11/5/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1(ft)	0-1(ft)	0-1(ft)	0-1(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**								
Method/ Chemical	**BKG**		**Resident Child**	**Resident Adult**	**Industrial**	**Residential**					
Metals (mg/kg)											
Aluminum	17,700	3,496*	7,380*	52,923*	-	-		NR/NA	NR/NA	**9,000**	NR/NA
Antimony	0.96	175*	2.82*	13.6*	-	-		NR/NA	NR/NA	**0.41**	NR/NA
Arsenic	15.4(3)	2.78	0.524	0.425	-	-		NR/NA	NR/NA	**11**	NR/NA
Barium	88.4	351*	1,413*	8,966*	-	-		NR/NA	NR/NA	**93**	NR/NA
Beryllium	0.88	None	None	None	230*	16*		NR/NA	NR/NA	**0.91**	NR/NA
Cadmium	0	10.9	6.41*	22.3*	-	-		NR/NA	NR/NA	**0.26**	NR/NA
Calcium**	15,800	None	None	None	None	None		NR/NA	NR/NA	**33,000**	NR/NA
Chromium	17.4	329,763*	8,174*	19,694*	-	-		NR/NA	NR/NA	**26**	NR/NA
Cobalt	10.4	7.03	131*	803	-	-		NR/NA	NR/NA	**7.4**	NR/NA
Copper	17.7	25,368*	311*	2,714*	-	-		NR/NA	NR/NA	**21**	NR/NA
Iron**	23,100	184,370*	2,313*	19,010*	-	-		NR/NA	NR/NA	**19,000**	NR/NA
Lead	26.1	None	None	None	800*	400*		NR/NA	NR/NA	**45**	NR/NA
Magnesium**	3,030	None	None	None	None	None		NR/NA	NR/NA	**4,300**	NR/NA
Manganese	1,450	35.1*	293*	1,482*	-	-		NR/NA	NR/NA	**960**	NR/NA
Mercury	0.036	172*	2.27*	16.5*	-	-		NR/NA	NR/NA	ND	NR/NA
Nickel	21.1	12,639*	155*	1,346*	-	-		NR/NA	NR/NA	**29**	NR/NA
Potassium**	927	None	None	None	None	None		NR/NA	NR/NA	**740**	NR/NA
Selenium	1.4	None	None	None	580*	39*		NR/NA	NR/NA	**0.65**	NR/NA
Silver	0	3,105*	38.6*	324*	-	-		NR/NA	NR/NA	**0.035 J**	NR/NA
Sodium**	123	None	None	None	None	None		NR/NA	NR/NA	**130**	NR/NA
Thallium	0	47.7*	0.612*	4.76*	-	-		NR/NA	NR/NA	**0.17 J**	NR/NA
Vanadium	31.1	2,304*	44.9*	156*	-	-		NR/NA	NR/NA	**12**	NR/NA
Zinc	61.8	187,269*	2,321*	19,659*	-	-		NR/NA	NR/NA	**76**	NR/NA

Table 3-3 Summary of Analytical Results for Inorganic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

						Sample Type:	Primary	Primary	Dup. of 0006M-0001-SS
						Location:	Outdoor Wash Rack Area, DU06	East Drainage Ditch, DU07(2)	East Drainage Ditch, DU07(2)
						Location ID:	70-4759-DU6-SS	70-CDD-DU7-SS	70-CDD-DU7-SS
						Field Sample ID:	070SS-0005M-0001-SO	070SS-0006M-0001-SO	070SS-0007M-0001-SO
						Lab Sample ID:	240-17230-5	240-17230-6	240-17230-7
						Sample Date:	11/5/2012	11/5/2012	11/5/2012
						Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM
						Sample Depth:	0-1(ft)	0-1(ft)	0-1(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**				
		National Guard Trainee	**Resident Receptor**						
Method/Chemical	**BKG (1)**		**Resident Child**	**Resident Adult**	**Industrial**	**Residential**			
Metals (mg/kg)									
Aluminum	17,700	3,496*	7,380*	52,923*	-	-	NR/NA	**9,800 J**	**9,700**
Antimony	0.96	175*	2.82*	13.6*	-	-	NR/NA	**1.5 J**	**1.1**
Arsenic	15.4(3)	2.78	0.524	0.425	-	-	NR/NA	**18**	**19**
Barium	88.4	351*	1,413*	8,966*	-	-	NR/NA	**71**	**67**
Beryllium	0.88	None	None	None	230*	16*	NR/NA	**0.75**	**0.72**
Cadmium	0	10.9	6.41*	22.3*	-	-	NR/NA	**0.46**	**0.31**
Calcium**	15,800	None	None	None	None	None	NR/NA	**7,000**	**4,500**
Chromium	17.4	329,763*	8,174*	19,694*	-	-	NR/NA	**35**	**21 J**
Cobalt	10.4	7.03	131*	803	-	-	NR/NA	**8.6**	**8.2**
Copper	17.7	25,368*	311*	2,714*	-	-	NR/NA	**23**	**22**
Iron**	23,100	184,370*	2,313*	19,010*	-	-	NR/NA	**23,000**	**22,000**
Lead	26.1	None	None	None	800*	400*	NR/NA	**62**	**42 J**
Magnesium**	3,030	None	None	None	None	None	NR/NA	**2,800**	**2,400**
Manganese	1,450	35.1*	293*	1,482*	-	-	NR/NA	**520**	**430**
Mercury	0.036	172*	2.27*	16.5*	-	-	NR/NA	**ND**	**ND**
Nickel	21.1	12,639*	155*	1,346*	-	-	NR/NA	**30**	**27**
Potassium**	927	None	None	None	None	None	NR/NA	**940**	**1,000**
Selenium	1.4	None	None	None	580*	39*	NR/NA	**0.99**	**1.2**
Silver	0	3,105*	38.6*	324*	-	-	NR/NA	**0.034 J**	**0.037 J**
Sodium**	123	None	None	None	None	None	NR/NA	**55 J**	**49 J**
Thallium	0	47.7*	0.612*	4.76*	-	-	NR/NA	**0.24**	**0.19**
Vanadium	31.1	2,304*	44.9*	156*	-	-	NR/NA	**16**	**16**
Zinc	61.8	187,269*	2,321*	19,659*	-	-	NR/NA	**110**	**110**

Table 3-3 Summary of Analytical Results for Inorganic Chemicals Detected in Surface Soil and Dry Sediment Samples Collected November 2012, CC RVAAP-70 East Classification Yard (continued)

Notes:
Yellow shading of a result indicates concentration is greater than the most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL.
The FWCUGs used for data comparison are the values for the most stringent Resident Receptor FWCUG between the adult and the child receptor using the Target Cancer Risk level of 10^{-6}. The June 2017 RSLs shown are also the values for the Target Cancer Risk level of 10^{-6}. Any exceptions are noted with an asterisk (*).
The background concentrations for metals shown in this table were obtained from two sources: (1) *Final Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (SAIC 2010); and (2) *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC 2001).
1. Dry sediment ISM samples were collected from DU02 and DU07, since drainage ditches were dry at time of sample collection in November 2012.
2. The 15.4 mg/kg is the established background value for arsenic for dry sediment (surface soil) since the ditch was dry during the time of sampling. Subsequent site visits indicate that the ditch is intermittently filled with standing water; therefore, the established background value for wet sediment of 19.5 mg/kg was used for comparison for the arsenic results.

* Indicates non-carcinogenic FWCUGs and June 2017 RSLs using the Target Hazard Quotient = 0.1.
** Denotes the chemical is an essential nutrient. Chemicals that are considered essential nutrients (e.g., calcium, iron, magnesium, potassium, and sodium) are an integral part of the human food supply and are often added to foods as supplements. USEPA recommends these chemicals not be evaluated unless they are grossly elevated relative to background concentrations or would exhibit toxicity at the observed concentrations (USEPA 1989, SAIC 2010).
RSLs are presented only for chemicals without Resident Receptor FWCUGs.
The National Guard Trainee FWCUGs and the Industrial RSLs are shown on this table for comparison purposes only.
Bold indicates chemical detected.
BKG = Background.
DU = Decision unit.
ft = Feet.
FWCUG = Facility-Wide Cleanup Goal (SAIC 2010).
ISM = Incremental sampling methodology.
J = Estimated value less than reporting limits.
mg/kg = Milligram per kilogram.
NA = Not applicable.
ND = Not detected.
NR/NA = Not reported/Not analyzed.
RSL = Regional Screening Level (USEPA June 2017).
SAIC = Science Applications International Corporation.
USEPA = United States Environmental Protection Agency.

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Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Int, DU04
							Location ID:	70-4744-DU1-SB	70-4744-DU1-SB	70-4740-DU3-SB	70-4740-DU3-SB	70-4740-DU4-SS
							Field Sample ID:	070SB-0011M-0001-SO	070SB-0012M-0001-SO	070SB-0019M-0001-SO	070SB-0020M-0001-SO	070SS-0048M-0001-SO
							Lab Sample ID:	240-17768-1	240-17768-2	240-17669-1	240-17669-2	240-18581-17
							Sample Date:	11/14/2012	11/14/2012	11/13/2012	11/13/2012	12/7/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	1-4 (ft)	4-7 (ft)	1-4 (ft)	4-7 (ft)	0-1 (ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	ND	ND	NR/NA	NR/NA	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	ND	ND	NR/NA	NR/NA	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	ND	ND	NR/NA	NR/NA	NR/NA
Chloroform	None	None	None	None	None	1,400	320	ND	ND	NR/NA	NR/NA	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	ND	**790 J**	NR/NA	NR/NA	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	ND	ND	NR/NA	NR/NA	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	**0.91 J**	ND	NR/NA	NR/NA	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	ND	**63 J**	NR/NA	NR/NA	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	ND	**2,600 J**	NR/NA	NR/NA	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	**18 J**	**3,000**	ND	ND	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	**860**	ND	**4.6 J**	**12**
Acenaphthylene	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	ND	ND	**19 J**	**4.8 J**	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	ND	**360**	**88**	**6.2 J**	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	ND	**320**	**88**	**4.2 J**	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	ND	ND	**130**	**6.2 J**	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	ND	**140**	**54**	**5.1 J**	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	ND	ND	**61**	**4.2 J**	ND
Benzyl butyl phthalate	None	None	None	None	None	1,200,000	290,000	ND	ND	ND	ND	**16 J**
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	ND	**27 J**	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	ND	**310**	**110**	**5.7 J**	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	**470 J**	ND	**5.3 J**	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	**15 J**	**380**	**220**	**4.8 J**	**7.7 J**
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	**1,400**	ND	**4.3 J**	**19**
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	ND	ND	**52**	**4.8 J**	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	ND	**180**	ND	ND	ND
Phenanthrene	None	None	None	None	None	None	None	**29**	**2400**	**100**	**6.8**	**38**
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	**26 J**	**2200**	**160**	**4.7 J**	**8.7**

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Int, DU04
							Location ID:	70-4744-DU1-SB	70-4744-DU1-SB	70-4740-DU3-SB	70-4740-DU3-SB	70-4740-DU4-SS
							Field Sample ID:	070SB-0011M-0001-SO	070SB-0012M-0001-SO	070SB-0019M-0001-SO	070SB-0020M-0001-SO	070SS-0048M-0001-SO
							Lab Sample ID:	240-17768-1	240-17768-2	240-17669-1	240-17669-2	240-18581-17
							Sample Date:	11/14/2012	11/14/2012	11/13/2012	11/13/2012	12/7/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	1-4(ft)	4-7(ft)	1-4(ft)	4-7(ft)	0-1(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	**30**	**730**	NR/NA	NR/NA	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	**120**	**990**	NR/NA	NR/NA	NR/NA
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	ND	**160**	NR/NA	NR/NA	NR/NA
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	NR/NA	NR/NA	ND	ND	ND
PCB-1248	None	3,460	349	203	None	-	-	NR/NA	NR/NA	ND	ND	ND
PCB-1254	None	3,460	120*	203	None	-	-	NR/NA	NR/NA	ND	ND	ND
PCB-1260	None	3,460	349	203	None	-	-	NR/NA	NR/NA	ND	ND	ND
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Building 4740 Int, DU04	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Outdoor Wash Rack, DU06	Outdoor Wash Rack, DU06
							Location ID:	70-4740-DU4-SB	70-4760-DU5-SB	70-4760-DU5-SB	70-4759-DU6-SB	70-4759-DU6-SB
							Field Sample ID:	070SB-0049M-0001-SO	070SB-0027M-0001-SO	070SB-0028M-0001-SO	070SB-0034M-0001-SO	070SB-0035M-0001-SO
							Lab Sample ID:	240-17768-1	240-17669-9	240-17669-10	240-17669-16	240-17669-17
							Sample Date:	11/14/2012	11/13/2012	11/13/2012	11/13/2012	11/13/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	1-4(ft)	4-7(ft)	1-4(ft)	4-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Chloroform	None	None	None	None	None	1,400	320	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	**28 J**	ND	**51 J**	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	ND	ND	**36**	**89**	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	ND	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	ND	ND	ND	**58**	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	ND	ND	ND	**39**	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	ND	ND	ND	**40**	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	ND	ND	ND	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	ND	ND	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	ND	ND	ND	ND	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	ND	ND	**27 J**	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	ND	**8.0**	ND	**39**	ND
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	ND	ND	ND	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	ND	**67 J**	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	**3.9 J**	ND	**22 J**	**65**	ND
Phenanthrene	None	None	None	None	None	None	None	ND	ND	**60**	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	6.6 U	**5.6 J**	ND	**45**	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Building 4740 Int, DU04	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Outdoor Wash Rack, DU06	Outdoor Wash Rack, DU06
							Location ID:	70-4740-DU4-SB	70-4760-DU5-SB	70-4760-DU5-SB	70-4759-DU6-SB	70-4759-DU6-SB
							Field Sample ID:	070SB-0049M-0001-SO	070SB-0027M-0001-SO	070SB-0028M-0001-SO	070SB-0034M-0001-SO	070SB-0035M-0001-SO
							Lab Sample ID:	240-17768-1	240-17669-9	240-17669-10	240-17669-16	240-17669-17
							Sample Date:	11/14/2012	11/13/2012	11/13/2012	11/13/2012	11/13/2012
							Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
							Sample Depth:	0-1 (ft)	1-4(ft)	4-7(ft)	1-4(ft)	4-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	ND	NR/NA	NR/NA	ND	ND
PCB-1248	None	3,460	349	203	None	-	-	ND	NR/NA	NR/NA	ND	ND
PCB-1254	None	3,460	120*	203	None	-	-	ND	NR/NA	NR/NA	ND	ND
PCB-1260	None	3,460	349	203	None	-	-	ND	NR/NA	NR/NA	ND	ND
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	ND	**48**	NR/NA	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	ND	ND
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	ND	ND
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	ND	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01
							Location ID:	70-4744-DU1-SB1	70-4744-DU1-SB2	70-4744-DU1-SB3	70-4744-DU1-SB4	70-4744-DU1-SB5
							Field Sample ID:	070SB-0013M-0001-SO	070SB-0014M-0001-SO	070SB-0015M-0001-SO	070SB-0016M-0001-SO	070SB-0017M-0001-SO
							Lab Sample ID:	240-17768-3	240-17768-4	240-17768-5	240-17768-6	240-17768-7
							Sample Date:	11/13/2012	11/14/2012	11/14/2012	11/14/2012	11/14/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard	**Resident Receptor**									
Method/Chemical	**BKG**	**Trainee**	**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	ND	ND	ND	ND	ND
Benzene	None	None	None	None	-	5,100	1,200	ND	ND	ND	ND	ND
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	**3.1 J**	ND	ND	**3.6 J**	**3.6 J**
Chloroform	None	None	None	None	None	1,400	320	ND	ND	ND	ND	ND
Ethylbenzene	None	None	None	None	-	25,000	5,800	ND	**350 J**	ND	ND	ND
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	ND	ND	ND	ND	ND
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	**2.2 J**	ND	**2.5 J**	ND	ND
Toluene	None	None	None	None	-	4,700,000*	490,000*	ND	**26 J**	ND	ND	ND
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	ND	**1,200 J**	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	ND	**15,000**	**20 J**	ND	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	**3,800**	ND	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	ND	**590**	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	ND	**1,400**	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	**62**	**730**	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	ND	**310**	ND	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	**45**	**580**	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	ND	ND	ND	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	ND	ND	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	ND	**1,600**	ND	ND	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	**2,300**	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	**18 J**	**1,500**	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	**6,300**	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	None	4,770	650	221	-	-	-	ND	ND	ND	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	ND	**840**	ND	ND	ND
Phenanthrene	None	None	None	None	None	None	None	**36**	**9,800**	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	**28 J**	**9,200**	ND	ND	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01
							Location ID:	70-4744-DU1-SB1	70-4744-DU1-SB2	70-4744-DU1-SB3	70-4744-DU1-SB4	70-4744-DU1-SB5
							Field Sample ID:	070SB-0013M-0001-SO	070SB-0014M-0001-SO	070SB-0015M-0001-SO	070SB-0016M-0001-SO	070SB-0017M-0001-SO
							Lab Sample ID:	240-17768-3	240-17768-4	240-17768-5	240-17768-6	240-17768-7
							Sample Date:	11/13/2012	11/14/2012	11/14/2012	11/14/2012	11/14/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	**37**	**3,300**	**26**	**37**	**30**
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	**160**	**4,700**	**16 J**	**51**	**61**
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	**0.140**	**190**	ND	ND	ND
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
PCB-1248	None	3,460	349	203	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
PCB-1254	None	3,460	120*	203	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
PCB-1260	None	3,460	349	203	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Duplicate	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Building 4740 Ext, DU03	Building 4740 Ext, DU03
							Location ID:	70-4744-DU1-SB6	70-4744-DU1-SB6	70-4744-DU1-SB6	70-4740-DU3-SB1	70-4740-DU3-SB1
							Field Sample ID:	070SB-0042M-0001-SO	070SB-0042M-0001-SO	070SB-0043M-0001-SO	070SB-0021M-0001-SO	070SB-0026-0001-SO
							Lab Sample ID:	240-18581-1	240-18735-1	240-18581-1	240-17669-3	240-17669-8
							Sample Date:	12/7/2012	12/12/2012	12/7/2012	11/13/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Composite
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	7-13(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	**24**	NR/NA	ND	NR/NA	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	**0.73 J**	NR/NA	**0.84 J**	NR/NA	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	ND	NR/NA	ND	NR/NA	NR/NA
Chloroform	None	None	None	None	None	1,400	320	ND	NR/NA	ND	NR/NA	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	**4.7**	NR/NA	**4.7 J**	NR/NA	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	**6.2 J**	NR/NA	**5.5 J**	NR/NA	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	ND	NR/NA	ND	NR/NA	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	**2.7 J**	NR/NA	**1.9 J**	NR/NA	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	**20**	NR/NA	**20**	NR/NA	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	NR/NA	ND	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	NR/NA	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	**680 J**	NR/NA	**660**	ND	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	**380**	NR/NA	**260**	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	**79**	NR/NA	**61 J**	ND	ND
Anthracene	None	None	None	None	-	23,000,000*	1,800,000*	ND	NR/NA	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	**140**	NR/NA	**150**	**30 J**	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	**41 J**	NR/NA	**51 J**	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	**34 J**	NR/NA	**33 J**	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	**57 J**	NR/NA	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	ND	NR/NA	ND	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	NR/NA	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	NR/NA	ND	ND	**29 J**
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	NR/NA	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	**190 J**	NR/NA	**98 J**	ND	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	**250 J**	NR/NA	**180 J**	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	**170 J**	NR/NA	**120 J**	**42**	ND
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	**650 J**	NR/NA	**500**	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	ND	NR/NA	ND	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	NR/NA	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	**50 J**	NR/NA	**51 J**	ND	ND
Phenanthrene	None	None	None	None	None	None	None	**1,000**	NR/NA	**810**	**17 J**	ND
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	**1,000**	NR/NA	**730**	**33**	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Building 4740 Ext, DU03	Building 4740 Ext, DU03
							Location ID:	70-4744-DU1-SB6	70-4744-DU1-SB6	70-4744-DU1-SB6	70-4740-DU3-SB1	70-4740-DU3-SB1
							Field Sample ID:	070SB-0042M-0001-SO	070SB-0042M-0001-SO	070SB-0043M-0001-SO	070SB-0021M-0001-SO	070SB-0026-0001-SO
							Lab Sample ID:	240-18581-1	240-18735-1	240-18581-1	240-17669-3	240-17669-8
							Sample Date:	12/7/2012	12/12/2012	12/7/2012	11/13/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Composite
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	7-13(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard	**Resident Receptor**									
Method/Chemical	**BKG**	**Trainee**	**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	ND	NR/NA	NR/NA	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	**370**	NR/NA	**350**	NR/NA	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	**430**	NR/NA	**400**	NR/NA	NR/NA
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	NR/NA	ND	**0.980**	NR/NA	NR/NA
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	ND	NR/NA	NR/NA	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	ND	NR/NA	NR/NA	NR/NA	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	ND	NR/NA	ND	ND	ND
PCB-1248	None	3,460	349	203	None	-	-	ND	NR/NA	ND	ND	ND
PCB-1254	None	3,460	120*	203	None	-	-	ND	NR/NA	ND	ND	ND
PCB-1260	None	3,460	349	203	None	-	-	ND	NR/NA	ND	ND	ND
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	ND	NR/NA	NR/NA	NR/NA	NR/NA
Nitrobenzene	None	None	None	None	None	22	5.1	**0.078 J**	NR/NA	NR/NA	NR/NA	NR/NA
Tetryl	None	None	None	None	None	230*	16*	ND	NR/NA	NR/NA	NR/NA	NR/NA

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03
							Location ID:	70-4740-DU3-SB2	70-4740-DU3-SB3	70-4740-DU3-SB4	70-4740-DU3-SB5	70-4740-DU3-SB6
							Field Sample ID:	070SB-0022M-0001-SO	070SB-0023M-0001-SO	070SB-0024M-0001-SO	070SB-0025M-0001-SO	070SB-0046M-0001-SO
							Lab Sample ID:	240-17669-4	240-17669-5	240-17669-6	240-17669-7	240-18581-5
							Sample Date:	11/13/2012	11/13/2012	11/13/2012	11/13/2012	12/7/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	NR/NA	NR/NA	NR/NA	NR/NA	**19 J**
Benzene	None	None	None	None	-	5,100	1,200	NR/NA	NR/NA	NR/NA	NR/NA	**0.40 J**
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	NR/NA	NR/NA	NR/NA	NR/NA	**0.63 J**
Chloroform	None	None	None	None	None	1,400	320	NR/NA	NR/NA	NR/NA	NR/NA	ND
Ethylbenzene	None	None	None	None	-	25,000	5,800	NR/NA	NR/NA	NR/NA	NR/NA	ND
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	NR/NA	NR/NA	NR/NA	NR/NA	**4.6 J**
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	NR/NA	NR/NA	NR/NA	NR/NA	ND
Toluene	None	None	None	None	-	4,700,000*	490,000*	NR/NA	NR/NA	NR/NA	NR/NA	**2.5 J**
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	NR/NA	NR/NA	NR/NA	NR/NA	ND
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	**4.3 J**	**5.3 J**	ND	**4.3 J**	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	ND	ND	**8.2**	ND	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	ND	ND	**6.8**	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	ND	ND	**13**	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	ND	ND	**5.4 J**	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	ND	ND	**7.8**	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	**19 J**	ND	ND	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	ND	ND	**21**	ND	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	ND	ND	**16**	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	ND	ND	**5.1 J**	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	**4.7 J**	**4.3 J**	**5.1 J**	**5.5 J**	ND
Phenanthrene	None	None	None	None	None	None	None	ND	**4.2 J**	**5.7 J**	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	ND	ND	**12**	ND	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03
							Location ID:	70-4740-DU3-SB2	70-4740-DU3-SB3	70-4740-DU3-SB4	70-4740-DU3-SB5	70-4740-DU3-SB6
							Field Sample ID:	070SB-0022M-0001-SO	070SB-0023M-0001-SO	070SB-0024M-0001-SO	070SB-0025M-0001-SO	070SB-0046M-0001-SO
							Lab Sample ID:	240-17669-4	240-17669-5	240-17669-6	240-17669-7	240-18581-5
							Sample Date:	11/13/2012	11/13/2012	11/13/2012	11/13/2012	12/7/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	NR/NA	ND
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	ND*
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	NR/NA	NR/NA	ND*
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	ND	ND	ND	ND	ND
PCB-1248	None	3,460	349	203	None	-	-	ND	ND	ND	ND	ND
PCB-1254	None	3,460	120*	203	None	-	-	ND	ND	ND	ND	ND
PCB-1260	None	3,460	349	203	None	-	-	ND	ND	ND	ND	ND
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	ND
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	NR/NA	ND
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Duplicate	Primary	Primary	Primary
							Location:	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Int, DU04	Building 4740 Int, DU04	Building 4740 Int, DU04
							Location ID:	70-4740-DU3-SB6	70-4740-DU3-SB6	70-4740-DU4-SB1	70-4740-DU4-SB2	70-4740-DU4-SB3
							Field Sample ID:	070SB-0046M-0001-SO	070SB-0047M-0001-SO	070SB-0050M-0001-SO	070SB-0051M-0001-SO	070SB-0052M-0001-SO
							Lab Sample ID:	240-22663-5	240-18581-5	240-18581-6	240-18581-19	240-18581-20
							Sample Date:	4/1/2013	12/7/2012	12/7/2012	12/7/2012	12/7/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	0-1(ft)	0-1.25(ft)	0-4(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Chloroform	None	None	None	None	None	1,400	320	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	NR/NA	ND	ND	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	NR/NA	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	NR/NA	**34 J**	**5.2 J**	ND	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	NR/NA	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	NR/NA	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	NR/NA	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	NR/NA	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	NR/NA	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	NR/NA	ND	ND	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	NR/NA	ND	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	NR/NA	ND	ND	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	NR/NA	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	NR/NA	ND	ND	ND	ND
Carbazole	None	835,000	44,600	69,400	-	-	-	NR/NA	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	NR/NA	ND	ND	ND	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	-	-	-	NR/NA	ND	**3.8 J**	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	-	-	-	NR/NA	ND	**7.9 J**	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	-	-	-	NR/NA	ND	**3.4 J**	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	NR/NA	ND	ND	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	NR/NA	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	NR/NA	ND	**5.6 J**	ND	ND
Phenanthrene	None	None	None	None	None	None	None	NR/NA	ND	**14**	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	-	-	-	NR/NA	ND	**4.2 J**	ND	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Duplicate	Primary	Primary	Primary
							Location:	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Int, DU04	Building 4740 Int, DU04	Building 4740 Int, DU04
							Location ID:	70-4740-DU3-SB6	70-4740-DU3-SB6	70-4740-DU4-SB1	70-4740-DU4-SB2	70-4740-DU4-SB3
							Field Sample ID:	070SB-0046M-0001-SO	070SB-0047M-0001-SO	070SB-0050M-0001-SO	070SB-0051M-0001-SO	070SB-0052M-0001-SO
							Lab Sample ID:	240-22663-5	240-18581-5	240-18581-6	240-18581-19	240-18581-20
							Sample Date:	4/1/2013	12/7/2012	12/7/2012	12/7/2012	12/7/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	0-1(ft)	0-1.25(ft)	0-4(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	ND	NR/NA	NR/NA	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	ND	NR/NA	NR/NA	NR/NA	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	NR/NA	ND	ND	ND	ND
PCB-1248	None	3,460	349	203	None	-	-	NR/NA	ND	ND	ND	ND
PCB-1254	None	3,460	120*	203	None	-	-	NR/NA	ND	ND	ND	ND
PCB-1260	None	3,460	349	203	None	-	-	NR/NA	ND	ND	ND	ND
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Building 4740 Int, DU04	Building 4740 Int, DU04	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05
							Location ID:	70-4740-DU4-SB4	70-4740-DU4-SB5	70-4760-DU5-SB1	70-4760-DU5-SB2	70-4760-DU5-SB3
							Field Sample ID:	070SB-0053M-0001-SO	070SB-0054M-0001-SO	070SB-0029M-0001-SO	070SB-0030M-0001-SO	070SB-0031M-0001-SO
							Lab Sample ID:	240-18581-21	240-18581-22	240-17669-11	240-17669-12	240-17669-13
							Sample Date:	12/7/2012	12/7/2012	11/13/2012	11/13/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	0-3.83(ft)	0-2.83(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	NR/NA	NR/NA	NR/NA	ND	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	NR/NA	NR/NA	NR/NA	ND	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	NR/NA	NR/NA	NR/NA	**2.7 J**	NR/NA
Chloroform	None	None	None	None	None	1,400	320	NR/NA	NR/NA	NR/NA	ND	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	NR/NA	NR/NA	NR/NA	ND	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	NR/NA	NR/NA	NR/NA	ND	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	NR/NA	NR/NA	NR/NA	ND	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	NR/NA	NR/NA	NR/NA	ND	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	NR/NA	NR/NA	NR/NA	ND	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	ND	**130 J**	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	ND	ND	**28 J**	**63**	**5.4 J**
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	ND	ND	**31 J**	**3.6 J**	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	ND	ND	**33**	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	ND	ND	**51**	**8.0**	**5.10 J**
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	ND	ND	**30 J**	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	ND	ND	ND	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	ND	ND	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	ND	ND	**39**	**8.1**	**5.3 J**
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	ND	ND	**64**	**7.2**	**4.4 J**
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	ND	ND	**16**	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	ND	ND	ND	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	ND	ND	**17 J**	**19**	**6.2 J**
Phenanthrene	None	None	None	None	None	None	None	ND	ND	**35**	**63**	**4.2 J**
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	ND	ND	**50**	**7.0**	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary	Primary
							Location:	Building 4740 Int, DU04	Building 4740 Int, DU04	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05
							Location ID:	70-4740-DU4-SB4	70-4740-DU4-SB5	70-4760-DU5-SB1	70-4760-DU5-SB2	70-4760-DU5-SB3
							Field Sample ID:	070SB-0053M-0001-SO	070SB-0054M-0001-SO	070SB-0029M-0001-SO	070SB-0030M-0001-SO	070SB-0031M-0001-SO
							Lab Sample ID:	240-18581-21	240-18581-22	240-17669-11	240-17669-12	240-17669-13
							Sample Date:	12/7/2012	12/7/2012	11/13/2012	11/13/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	0-3.83(ft)	0-2.83(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	NR/NA	NR/NA	NR/NA	**35**	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	NR/NA	NR/NA	NR/NA	ND	NR/NA
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	ND	ND	NR/NA	NR/NA	NR/NA
PCB-1248	None	3,460	349	203	None	-	-	ND	ND	NR/NA	NR/NA	NR/NA
PCB-1254	None	3,460	120*	203	None	-	-	ND	ND	NR/NA	NR/NA	NR/NA
PCB-1260	None	3,460	349	203	None	-	-	ND	ND	NR/NA	NR/NA	NR/NA
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	ND	**77**	ND
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Duplicate	Primary
							Location:	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Outdoor Wash Rack Area, DU06
							Location ID:	70-4760-DU5-SB4	70-4760-DU5-SB5	70-4760-DU5-SB6	70-4760-DU5-SB6	70-4759-DU6-SB1
							Field Sample ID:	070SB-0032M-0001-SO	070SB-0033M-0001-SO	070SB-0044M-0001-SO	070SB-0045M-0001-SO	070SB-0036M-0001-SO
							Lab Sample ID:	240-17669-14	240-17669-15	240-18581-3	240-18581-4	240-17669-18
							Sample Date:	11/13/2012	11/13/2012	12/7/2012	12/7/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	NR/NA	NR/NA	**41 J**	NR/NA	NR/NA
Benzene	None	None	None	None	-	5,100	1,200	NR/NA	NR/NA	**1.3 J**	NR/NA	NR/NA
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	NR/NA	NR/NA	ND	NR/NA	NR/NA
Chloroform	None	None	None	None	None	1,400	320	NR/NA	NR/NA	ND	NR/NA	NR/NA
Ethylbenzene	None	None	None	None	-	25,000	5,800	NR/NA	NR/NA	**1.8 J**	NR/NA	NR/NA
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	NR/NA	NR/NA	**12 J**	NR/NA	NR/NA
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	NR/NA	NR/NA	ND	NR/NA	NR/NA
Toluene	None	None	None	None	-	4,700,000*	490,000*	NR/NA	NR/NA	**3.3 J**	NR/NA	NR/NA
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	NR/NA	NR/NA	ND	NR/NA	NR/NA
Semivolatile Organic Compounds (µg/kg)												
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	**56**	ND	ND	**81**	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	**17 J**	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	**19 J**	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	**52**	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	**58**	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	**100**	ND	ND	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	**50**	ND	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	**39**	ND	ND	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	ND	ND	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	**95**	ND	ND	ND	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	**120**	ND	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	**42**	ND	ND	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	**49**	ND	ND	**69**	ND
Phenanthrene	None	None	None	None	None	None	None	**55**	ND	ND	**45 J**	ND
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	**87**	ND	ND	ND	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Duplicate	Primary
							Location:	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Outdoor Wash Rack Area, DU06
							Location ID:	70-4760-DU5-SB4	70-4760-DU5-SB5	70-4760-DU5-SB6	70-4760-DU5-SB6	70-4759-DU6-SB1
							Field Sample ID:	070SB-0032M-0001-SO	070SB-0033M-0001-SO	070SB-0044M-0001-SO	070SB-0045M-0001-SO	070SB-0036M-0001-SO
							Lab Sample ID:	240-17669-14	240-17669-15	240-18581-3	240-18581-4	240-17669-18
							Sample Date:	11/13/2012	11/13/2012	12/7/2012	12/7/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**									
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**					
Propellants (mg/kg)												
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	ND	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20 (DRO)	None	None	None	None	10,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12 (GRO)	None	None	None	None	5,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Pesticides (µg/kg)												
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	ND	NR/NA	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	ND	NR/NA	NR/NA
Polychlorinated Biphenyls (µg/kg)												
PCB-1242	None	None	None	None	None	950	230	NR/NA	NR/NA	ND	NR/NA	ND
PCB-1248	None	3,460	349	203	None	-	-	NR/NA	NR/NA	ND	NR/NA	ND
PCB-1254	None	3,460	120*	203	None	-	-	NR/NA	NR/NA	ND	NR/NA	ND
PCB-1260	None	3,460	349	203	None	-	-	NR/NA	NR/NA	ND	NR/NA	ND
Herbicides (µg/kg)												
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	ND	ND	ND	ND	NR/NA
Explosives (mg/kg)												
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	NR/NA	NR/NA	ND	NR/NA	ND
Nitrobenzene	None	None	None	None	None	22	5.1	NR/NA	NR/NA	ND	NR/NA	ND
Tetryl	None	None	None	None	None	230*	16*	NR/NA	NR/NA	ND	NR/NA	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary
							Location:	Outdoor Wash Rack Area, DU06	Outdoor Wash Rack Area, DU06	Outdoor Wash Rack Area, DU06	Outdoor Wash Rack Area, DU06
							Location ID:	70-4759-DU6-SB2	70-4759-DU6-SB3	70-4759-DU6-SB4	70-4759-DU6-SB5
							Field Sample ID:	070SB-0037M-0001-SO	070SB-0038M-0001-SO	070SB-0039M-0001-SO	070SB-0040M-0001-SO
							Lab Sample ID:	240-17669-19	240-17669-20	240-17669-21	240-17669-22
							Sample Date:	11/13/2012	11/13/2012	11/13/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**					
		National Guard Trainee	**Resident Receptor**								
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**				
Volatile Organic Compounds (µg/kg)											
Acetone	None	None	None	None	None	67,000,000*	6,100,000*	NR/NA	NR/NA	NR/NA	ND
Benzene	None	None	None	None	-	5,100	1,200	NR/NA	NR/NA	NR/NA	ND
Carbon Disulfide	None	None	None	None	None	350,000*	77,000*	NR/NA	NR/NA	NR/NA	ND
Chloroform	None	None	None	None	None	1,400	320	NR/NA	NR/NA	NR/NA	ND
Ethylbenzene	None	None	None	None	-	25,000	5,800	NR/NA	NR/NA	NR/NA	ND
Methyl Ethyl Ketone	None	None	None	None	None	19,000,000*	2,700,000*	NR/NA	NR/NA	NR/NA	ND
Methylene Chloride	None	None	None	None	None	320,000*	35,000*	NR/NA	NR/NA	NR/NA	ND
Toluene	None	None	None	None	-	4,700,000*	490,000*	NR/NA	NR/NA	NR/NA	ND
Xylenes, Total	None	None	None	None	-	250,000*	58,000*	NR/NA	NR/NA	NR/NA	ND
Semivolatile Organic Compounds (µg/kg)											
1,2-Dichlorobenzene	None	None	None	None	None	930,000*	180,000*	ND	ND	**200 J**	ND
2,4,5-Trichlorophenol	None	None	None	None	None	8,200,000*	630,000*	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	None	-	-	ND	ND	**190**	ND
Acenaphthene	None	None	None	None	None	4,500,000*	360,000*	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	None	None	None	ND	ND	ND	ND
Anthracene	None	None	None	None	None	23,000,000*	1,800,000*	ND	ND	**22 J**	ND
Benzo(a)anthracene	None	4,770	650	221	-	-	-	ND	ND	**44**	ND
Benzo(a)pyrene	None	477	65	22	-	-	-	ND	ND	**70**	ND
Benzo(b)fluoranthene	None	4,770	650	221	-	-	-	ND	ND	**70**	ND
Benzo(g,h,i)perylene	None	None	None	None	None	None	None	ND	ND	**58**	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	-	-	-	ND	ND	ND	ND
Benzyl butyl phthalate	None	None	None	None	None	None	None	ND	ND	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	None	160,000	39,000	ND	ND	ND	ND
Carbazole	None	835,000	44,600	69,400	None	-	-	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	-	-	-	ND	ND	**55**	ND
Dibenzofuran	None	1,192,000*	15,300*	119,000*	None	-	-	ND	ND	**51 J**	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	None	-	-	**18 J**	ND	**68**	ND
Fluorene	None	11,458,000*	243,000*	737,000*	None	-	-	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	-	-	-	ND	ND	ND	ND
Isophorone	None	None	None	None	None	2,400,000	570,000	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	-	-	-	ND	ND	**130**	ND
Phenanthrene	None	None	None	None	None	None	None	ND	ND	**120**	ND
Pyrene	None	3,815,000*	122,000*	207,000*	None	-	-	**17 J**	ND	**110**	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

							Sample Type:	Primary	Primary	Primary	Primary
							Location:	Outdoor Wash Rack Area, DU06	Outdoor Wash Rack Area, DU06	Outdoor Wash Rack Area, DU06	Outdoor Wash Rack Area, DU06
							Location ID:	70-4759-DU6-SB2	70-4759-DU6-SB3	70-4759-DU6-SB4	70-4759-DU6-SB5
							Field Sample ID:	070SB-0037M-0001-SO	070SB-0038M-0001-SO	070SB-0039M-0001-SO	070SB-0040M-0001-SO
							Lab Sample ID:	240-17669-19	240-17669-20	240-17669-21	240-17669-22
							Sample Date:	11/13/2012	11/13/2012	11/13/2012	11/13/2012
							Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
							Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals				**USEPA RSL**					
		National Guard Trainee	**Resident Receptor**								
Method/Chemical	**BKG**		**Resident Child**	**Resident Adult**	**BUSTR**	**Industrial**	**Residential**				
Propellants (mg/kg)											
Nitrocellulose	None	None	None	None	None	250,000,000*	19,000,000	NR/NA	NR/NA	NR/NA	NR/NA
Diesel Range Petroleum Hydrocarbons (mg/kg)											
C10-C20 (DRO)	None	None	None	None	10,000	None	None	NR/NA	NR/NA	NR/NA	**71**
C20-C34 Motor Oil Range	None	None	None	None	20,000	None	None	NR/NA	NR/NA	NR/NA	**39**
Gasoline Range Petroleum Hydrocarbons (mg/kg)											
C6-C12 (GRO)	None	None	None	None	5,000	None	None	NR/NA	NR/NA	NR/NA	NR/NA
Pesticides (µg/kg)											
p,p'-DDE	None	49,100	2,630	4,080	None	-	-	NR/NA	NR/NA	ND	NR/NA
p,p'-DDT	None	None	None	None	None	8,500	1,900	NR/NA	NR/NA	ND	NR/NA
Polychlorinated Biphenyls (µg/kg)											
PCB-1242	None	None	None	None	None	950	230	ND	ND	ND	ND
PCB-1248	None	3,460	349	203	None	-	-	ND	ND	ND	ND
PCB-1254	None	3,460	120*	203	None	-	-	ND	ND	ND	ND
PCB-1260	None	3,460	349	203	None	-	-	ND	ND	**18 J**	ND
Herbicides (µg/kg)											
2,4,5-Trichlorophenoxyacetic Acid	None	None	None	None	None	820,000*	63,000*	NR/NA	NR/NA	NR/NA	NR/NA
Explosives (mg/kg)											
2,6-Dinitrotoluene	None	13.6	1.1	0.769	None	-	-	ND	ND	ND	ND
Nitrobenzene	None	None	None	None	None	22	5.1	ND	ND	ND	ND
Tetryl	None	None	None	None	None	230*	16*	ND	ND	**0.021 J**	ND

Table 3-4 Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected between November 2012 and April 2013, CC RVAAP-70 East Classification Yard (continued)

Notes:
Yellow shading of a result indicates concentration is greater than the FWCUG for the most stringent Resident Receptor or June 2017 USEPA Residential RSL.
The FWCUGs used for data comparison are the values for the most stringent Resident Receptor FWCUG between the adult and the child receptor using the Target Cancer Risk level of 10^{-6}. The June 2017 RSLs shown are also the values for the Target Cancer Risk level 10^{-6}. Any exceptions are noted with an asterisk (*).
* Indicates non-carcinogenic FWCUGs and RSLs using the Target Hazard Quotient = 0.1.
RSLs are presented only for chemicals without Resident Receptor FWCUGs.
The National Guard Trainee FWCUGs and the June 2017 Industrial RSLs are shown on this table for comparison purposes only.
The reported concentrations for petroleum compounds (TPH-DRO and TPH-GRO) were compared to the BUSTR Soil Class 2 Action Levels since no FWCUGs have been established for these chemicals. BUSTR criteria only apply to the analytical results from the Former Fuel Oil Spill Area (DU01).
Bold indicates chemical detected.

BKG	=	Background.
BUSTR	=	Bureau of Underground Storage Tank Regulations.
DDE	=	Dichlorodiphenyldichloroethylene.
DDT	=	Dichlorophenyltrichloroethane.
DRO	=	Diesel range organics.
DU	=	Decision unit.
ft	=	Feet.
FWCUG	=	Facility-Wide Cleanup Goal (Science Applications International Corporation 2010).
GRO	=	Gasoline range organics.
ID	=	Identification.
ISM	=	Incremental sampling methodology.
J	=	Estimated value less than reporting limits.
mg/kg	=	Milligram per kilogram.
NA	=	Not applicable.
ND	=	Not detected.
NR/NA	=	Not reported/Not analyzed.
PCB	=	Polychlorinated biphenyl.
RSL	=	Regional Screening Level (USEPA June 2017).
TPH	=	Total petroleum hydrocarbons.
USEPA	=	United States Environmental Protection Agency.

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Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Int, DU04	Building 4740 Int, DU04
						Location ID:	70-4744-DU1-SB	70-4744-DU1-SB	70-4740-DU3-SB	70-4740-DU3-SB	70-4740-DU4-SS	70-4740-DU4-SB
						Field Sample ID:	070SB-0011M-0001-SO	070SB-0012M-0001-SO	070SB-0019M-0001-SO	070SB-0020M-0001-SO	070SS-0048M-0001-SO	070SB-0049M-0001-SO
						Lab Sample ID:	240-17768-1	240-17768-2	240-17669-1	240-17669-2	240-18581-17	240-18581-18
						Sample Date:	11/14/2012	11/14/2012	11/13/2012	11/13/2012	12/7/2012	12/7/2012
						Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM
						Sample Depth:	1-4(ft)	4-7(ft)	1-4(ft)	4-7(ft)	0-1(ft)	0-1(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**							
		National Guard Trainee	**Resident Receptor**									
Method/ Chemicals	**BKG**		**Resident Child**	**Resident Adult**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	NR/NA	NR/NA	**10,000**	**10,000**	**9,600**	**5,800**
Antimony	0.96	175*	2.82*	13.6*	-	-	NR/NA	NR/NA	**0.091 J**	**0.070 J**	ND	ND
Arsenic	19.8	2.78	0.524	0.425	-	-	NR/NA	NR/NA	**12**	**10**	**8.8**	**5.8**
Barium	124	351*	1,413*	8,966*	-	-	NR/NA	NR/NA	**64**	**65**	**64**	**31**
Beryllium	0.88	None	None	None	230*	16*	NR/NA	NR/NA	**0.56**	**0.58**	**0.57**	**0.32**
Cadmium	0	10.9	6.41*	22.3*	-	-	NR/NA	NR/NA	**0.19**	**0.18**	**0.17**	**0.098 J**
Calcium**	35,500	None	None	None	None	None	NR/NA	NR/NA	**2,700**	**8,300**	**15,000**	**6,800**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	NR/NA	NR/NA	**20**	**17**	**14**	**9.1**
Cobalt	23.2	7.03	131*	803	-	-	NR/NA	NR/NA	**11**	**10**	**49**	**7.2**
Copper	32.3	25,368*	311*	2,714*	-	-	NR/NA	NR/NA	**18**	**17**	**16**	**9.9**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	NR/NA	NR/NA	**24,000**	**23,000**	**21,000**	**14,000**
Lead	19.1	None	None	None	800*	400*	NR/NA	NR/NA	**16**	**12**	**12**	**6.5**
Magnesium**	8,790	None	None	None	None	None	NR/NA	NR/NA	**2,800**	**3,900**	**4,300**	**2,700**
Manganese	3,030	35.1*	293*	1,482*	-	-	NR/NA	NR/NA	**410**	**280**	**380**	**200**
Mercury	0.044	172*	2.27*	16.5*	-	-	NR/NA	NR/NA	**0.027 J**	**0.019 J**	ND	**ND**
Nickel	60.7	12,639*	155*	1,346*	-	-	NR/NA	NR/NA	**23**	**25**	**23**	**15**
Potassium**	3,350	None	None	None	None	None	NR/NA	NR/NA	**1,000**	**1,500**	**1,300**	**920**
Selenium	1.5	None	None	None	580*	39*	NR/NA	NR/NA	**0.56**	**0.41 J**	**0.34 J**	**0.24 J**
Silver	0	3,105*	38.6*	324*	-	-	NR/NA	NR/NA	**0.031 J**	**0.026 J**	**0.029 J**	**0.015 J**
Sodium**	145	None	None	None	None	None	NR/NA	NR/NA	**58**	**69**	**150**	**74**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	NR/NA	NR/NA	**0.16**	**0.14**	**0.11**	**0.075 J**
Vanadium	37.6	2,304*	44.9*	156*	-	-	NR/NA	NR/NA	**18**	**16**	**13**	**8.7**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	NR/NA	NR/NA	**54**	**53**	**46**	**27**

Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						Location:	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Outdoor Wash Rack, DU06	Outdoor Wash Rack, DU06	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01
						Location ID:	70-4760-DU5-SB	70-4760-DU5-SB	70-4759-DU6-SB	70-4759-DU6-SB	70-4744-DU1-SB1	70-4744-DU1-SB2
						Field Sample ID:	070SB-0027M-0001-SO	070SB-0028M-0001-SO	070SB-0034M-0001-SO	070SB-0035M-0001-SO	070SB-0013M-0001-SO	070SB-0014M-0001-SO
						Lab Sample ID:	240-17669-9	240-17669-10	240-17669-16	240-17669-17	240-17768-3	240-17768-4
						Sample Date:	11/13/2012	11/13/2012	11/13/2012	11/13/2012	11/14/2012	11/14/2012
						Location Type:	Horizontal ISM	Horizontal ISM	Horizontal ISM	Horizontal ISM	Vertical ISM	Vertical ISM
						Sample Depth:	1-4(ft)	4-7(ft)	1-4(ft)	4-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**							
		National Guard Trainee	**Resident Receptor**									
Method/ Chemical	**BKG**		**Resident Child**	**Resident Adult**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Antimony	0.96	175*	2.82*	13.6*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Arsenic	19.8	2.78	0.524	0.425	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Barium	124	351*	1,413*	8,966*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Beryllium	0.88	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Cadmium	0	10.9	6.41*	22.3*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Calcium**	35,500	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Chromium	27.2	329,763*	8,174*	19,694*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Cobalt	23.2	7.03	131*	803	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Copper	32.3	25,368*	311*	2,714*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Iron**	35,200	184,370*	2,313*	19,010*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Lead	19.1	None	None	None	800*	400*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Magnesium**	8,790	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Manganese	3,030	35.1*	293*	1,482*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Mercury	0.044	172*	2.27*	16.5*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Nickel	60.7	12,639*	155*	1,346*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Potassium**	3,350	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Selenium	1.5	None	None	None	580*	39*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Silver	0	3,105*	38.6*	324*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Sodium**	145	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Thallium	0.91	47.7*	0.612*	4.76*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Vanadium	37.6	2,304*	44.9*	156*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Zinc	93.3	187,269*	2,321*	19,659*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA

Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Duplicate	Primary
						Location:	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Former Fuel Oil Spill Area, DU01	Building 4740 Ext, DU03
						Location ID:	70-4744-DU1-SB3	70-4744-DU1-SB4	70-4744-DU1-SB5	70-4744-DU1-SB6	70-4744-DU1-SB6	70-4740-DU3-SB1
						Field Sample ID:	070SB-0015M-0001-SO	070SB-0016M-0001-SO	070SB-0017M-0001-SO	070SB-0042M-0001-SO	070SB-0043M-0001-SO	070SB-0021M-0001-SO
						Lab Sample ID:	240-17768-5	240-17768-6	240-17768-7	240-18581-2	240-18735-1	240-17669-3
						Sample Date:	11/14/2012	11/14/2012	11/14/2012	12/7/2012	12/7/2012	11/13/2012
						Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
						Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**							
		National Guard Trainee	**Resident Receptor**									
Method/ Chemical	**BKG**		**Resident Child**	**Resident Adult**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	NR/NA	NR/NA	NR/NA	**12,000**	NR/NA	**12,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	NR/NA	NR/NA	NR/NA	**ND**	NR/NA	**0.074 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	NR/NA	NR/NA	NR/NA	**9.6**	NR/NA	**9.1**
Barium	124	351*	1,413*	8,966*	-	-	NR/NA	NR/NA	NR/NA	**93**	NR/NA	**68**
Beryllium	0.88	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	**0.69**	NR/NA	**0.60**
Cadmium	0	10.9	6.41*	22.3*	-	-	NR/NA	NR/NA	NR/NA	**0.21**	NR/NA	**0.16**
Calcium **	35,500	None	None	None	None	None	NR/NA	NR/NA	NR/NA	**7,000**	NR/NA	**4,000**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	NR/NA	NR/NA	NR/NA	**17**	NR/NA	**18**
Cobalt	23.2	7.03	131*	803	-	-	NR/NA	NR/NA	NR/NA	**13**	NR/NA	**7.9**
Copper	32.3	25,368*	311*	2,714*	-	-	NR/NA	NR/NA	NR/NA	**19**	NR/NA	**14**
Iron **	35,200	184,370*	2,313*	19,010*	-	-	NR/NA	NR/NA	NR/NA	**27,000**	NR/NA	**22,000**
Lead	19.1	None	None	None	800*	400*	NR/NA	NR/NA	NR/NA	**14**	NR/NA	**13**
Magnesium **	8,790	None	None	None	None	None	NR/NA	NR/NA	NR/NA	**4,100**	NR/NA	**3,000**
Manganese	3,030	35.1*	293*	1,482*	-	-	NR/NA	NR/NA	NR/NA	**510**	NR/NA	**260**
Mercury	0.044	172*	2.27*	16.5*	-	-	NR/NA	NR/NA	NR/NA	**0.018 J**	NR/NA	**0.023 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	NR/NA	NR/NA	NR/NA	**26**	NR/NA	**19**
Potassium **	3,350	None	None	None	None	None	NR/NA	NR/NA	NR/NA	**1,100**	NR/NA	**1,200**
Selenium	1.5	None	None	None	580*	39*	NR/NA	NR/NA	NR/NA	**0.54**	NR/NA	**0.49**
Silver	0	3,105*	38.6*	324*	-	-	NR/NA	NR/NA	NR/NA	**0.033 J**	NR/NA	**0.038 J**
Sodium**	145	None	None	None	None	None	NR/NA	NR/NA	NR/NA	**60**	NR/NA	**56**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	NR/NA	NR/NA	NR/NA	**0.16**	NR/NA	**0.16**
Vanadium	37.6	2,304*	44.9*	156*	-	-	NR/NA	NR/NA	NR/NA	**19**	NR/NA	**22**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	NR/NA	NR/NA	NR/NA	**57**	NR/NA	**45**

Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						Location:	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03	Building 4740 Ext, DU03
						Location ID:	70-4740-DU3-SB1	70-4740-DU3-SB2	70-4740-DU3-SB3	70-4740-DU3-SB4	70-4740-DU3-SB5	70-4740-DU3-SB6
						Field Sample ID:	070SB-0026-0001-SO	070SB-0022M-0001-SO	070SB-0023M-0001-SO	070SB-0024M-0001-SO	070SB-0025M-0001-SO	070SB-0046M-0001-SO
						Lab Sample ID:	240-17669-8	240-17669-4	240-17669-5	240-17669-6	240-17669-7	240-18581-5
						Sample Date:	11/13/2012	11/13/2012	11/13/2012	11/13/2012	11/13/2012	12/7/2012
						Location Type:	Composite	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
						Sample Depth:	7-13(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**							
		National Guard	**Resident Receptor**									
Method/ Chemical	**BKG**	**Trainee**	**Resident Child**	**Resident Adult**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**990**	**8,200**	**8,800**	**13,000**	**13,000**	**6,900**
Antimony	0.96	175*	2.82*	13.6*	-	-	ND	**0.099 J**	**0.070 J**	**0.075 J**	**0.062 J**	ND
Arsenic	19.8	2.78	0.524	0.425	-	-	**0.39**	**13**	**9.3**	**11**	**9.3**	**7.8**
Barium	124	351*	1,413*	8,966*	-	-	**6.3**	**49**	**60**	**73**	**67**	**39**
Beryllium	0.88	None	None	None	230*	16*	**0.056 J**	**0.50**	**0.48**	**0.70**	**0.71**	**0.35**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.024 J**	**0.17**	**0.18**	**0.21**	**0.21**	**0.15**
Calcium**	35,500	None	None	None	None	None	**160**	**1,700**	**1,100**	**8,300**	**11,000**	**1,600**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**2.9**	**16**	**15**	**20**	**20**	**9.8**
Cobalt	23.2	7.03	131*	803	-	-	**0.36**	**8.8**	**8.9**	**11**	**12**	**5.5**
Copper	32.3	25,368*	311*	2,714*	-	-	**1.6**	**17**	**16**	**19**	**18**	**14**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**960**	**27,000**	**21,000**	**26,000**	**26,000**	**16,000**
Lead	19.1	None	None	None	800*	400*	**3.9**	**16**	**11**	**13**	**12**	**12**
Magnesium**	8,790	None	None	None	None	None	**110**	**2,000**	**2,200**	**4,400**	**5,000**	**1,700**
Manganese	3,030	35.1*	293*	1,482*	-	-	**9.0**	**420**	**300**	**300**	**320**	**220**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	**0.036 J**	**0.031 J**	**0.032 J**	**ND**	**0.018 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	**1.2**	**18**	**19**	**28**	**30**	**12**
Potassium**	3,350	None	None	None	None	None	**210**	**740**	**800**	**1,800**	**2,100**	**630**
Selenium	1.5	None	None	None	580*	39*	**0.066 J**	**0.46**	**0.42 J**	**0.50**	**0.47**	**0.31 J**
Silver	0	3,105*	38.6*	324*	-	-	ND	**0.021 J**	**0.029 J**	**0.031 J**	**0.028 J**	**0.026 J**
Sodium **	145	None	None	None	None	None	**9.6**	**45**	**40**	**84**	**84**	**69**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.018 J**	**0.13**	**0.14**	**0.18**	**0.18**	**0.098**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**1.6**	**15**	**16**	**20**	**20**	**12**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**3.2**	**63**	**48**	**55**	**57**	**37**

Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard (continued)

						Sample Type:	Duplicate	Primary	Primary	Primary	Primary	Primary
						Location:	Building 4740 Ext, DU03	Building 4740 Int. DU04	Building 4740 Int. DU04	Building 4740 Int. DU04	Building 4740 Int. DU04	Building 4740 Int. DU04
						Location ID:	70-4740-DU3-SB6	70-4740-DU4-SB1	70-4740-DU4-SB2	70-4740-DU4-SB3	70-4740-DU4-SB4	70-4740-DU4-SB5
						Field Sample ID:	070SB-0047M-0001-SO	070SB-0050M-0001-SO	070SB-0051M-0001-SO	070SB-0052M-0001-SO	070SB-0053M-0001-SO	070SB-0054M-0001-SO
						Lab Sample ID:	240-18581-6	240-18581-19	240-18581-20	240-18581-21	240-18581-22	240-18581-23
						Sample Date:	12/7/2012	12/7/2012	12/7/2012	12/7/2012	12/7/2012	12/7/2012
						Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
						Sample Depth:	1-7(ft)	0-1(ft)	0-1.25(ft)	0-4(ft)	0-3.83(ft)	0-2.83(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**							
		National Guard Trainee	**Resident Receptor**									
Method/ Chemical	**BKG**		**Resident Child**	**Resident Adult**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**9,700**	**8,100**	**3,900**	**7,700**	**7,300**	**10,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	ND	ND	ND	ND	ND	ND
Arsenic	19.8	2.78	0.524	0.425	-	-	**8.1**	**5.8**	**1.8**	**8.0**	**6.5**	**11**
Barium	124	351*	1,413*	8,966*	-	-	**55**	**70**	**33**	**43**	**38**	**50**
Beryllium	0.88	None	None	None	230*	16*	**0.49**	**0.52**	**0.34**	**0.42**	**0.38**	**0.55**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.17**	**0.13**	**0.12**	**0.13**	**0.11**	**0.16**
Calcium**	35,500	None	None	None	None	None	**1,500**	**6,200**	**13,000**	**5,100**	**11,000**	**16,000**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**14**	**12**	**6.1**	**12**	**12**	**16**
Cobalt	23.2	7.03	131*	803	-	-	**7.6**	**28**	**32**	**14**	**8.6**	**12**
Copper	32.3	25,368*	311*	2,714*	-	-	**16**	**12**	**4.7**	**13**	**13**	**18**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**20,000**	**17,000**	**5,200**	**18,000**	**17,000**	**25,000**
Lead	19.1	None	None	None	800*	400*	**14**	**8.2**	**9.1**	**9.0**	**7.6**	**11**
Magnesium**	8,790	None	None	None	None	None	**2,500**	**3,300**	**1,800**	**3,200**	**3,400**	**5,400**
Manganese	3,030	35.1*	293*	1,482*	-	-	**270**	**280**	**260**	**270**	**220**	**310**
Mercury	0.044	172*	2.27*	16.5*	-	-	**0.021 J**	ND	ND	ND	ND	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**17**	**22**	**5.8**	**20**	**19**	**26**
Potassium**	3,350	None	None	None	None	None	**850**	**1,200**	**530**	**1,100**	**1,100**	**1,400**
Selenium	1.5	None	None	None	580*	39*	**0.40 J**	**0.33 J**	**0.26 J**	**0.27 J**	**0.24 J**	**0.42 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.029 J**	**0.018 J**	**0.017 J**	**0.020 J**	**0.017 J**	**0.027 J**
Sodium**	145	None	None	None	None	None	**91**	**110**	**110**	**76**	**86**	**160**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.13**	**0.074 J**	**0.030 J**	**0.097 J**	**0.091 J**	**0.13**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**16**	**11**	**4.7**	**11**	**11**	**15**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**45**	**34**	**18**	**38**	**34**	**51**

Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						Location:	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05	Former Herbicide Storage Shed, DU05
						Location ID:	70-4760-DU5-SB1	70-4760-DU5-SB2	70-4760-DU5-SB3	70-4760-DU5-SB4	70-4760-DU5-SB5	70-4760-DU5-SB6
						Field Sample ID:	070SB-0029M-0001-SO	070SB-0030M-0001-SO	070SB-0031M-0001-SO	070SB-0032M-0001-SO	070SB-0033M-0001-SO	070SB-0044M-0001-SO
						Lab Sample ID:	240-17669-11	240-17669-12	240-17669-13	240-17669-14	240-17669-15	240-18581-3
						Sample Date:	11/13/2012	11/13/2012	11/13/2012	11/13/2012	11/13/2012	12/7/2012
						Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
						Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**							
		National Guard Trainee	**Resident Receptor**									
Method/ Chemical	**BKG**		**Resident Child**	**Resident Adult**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**10,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	ND
Arsenic	19.8	2.78	0.524	0.425	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**7.7**
Barium	124	351*	1,413*	8,966*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**64**
Beryllium	0.88	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**0.68**
Cadmium	0	10.9	6.41*	22.3*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**0.19**
Calcium**	35,500	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**7,000**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**14**
Cobalt	23.2	7.03	131*	803	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**8.2**
Copper	32.3	25,368*	311*	2,714*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**15**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**20,000**
Lead	19.1	None	None	None	800*	400*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**12**
Magnesium**	8,790	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**3,400**
Manganese	3,030	35.1*	293*	1,482*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**340**
Mercury	0.044	172*	2.27*	16.5*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**0.017 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**19**
Potassium**	3,350	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**800**
Selenium	1.5	None	None	None	580*	39*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**0.47 J**
Silver	0	3,105*	38.6*	324*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**0.023 J**
Sodium**	145	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**89**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**0.13**
Vanadium	37.6	2,304*	44.9*	156*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**14**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	**44**

Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard (continued)

						Sample Type:	Dup. of 0044M-0001-SO	Primary	Primary	Primary	Primary	Primary
						Location:	Former Herbicide Storage Shed, DU05	Outdoor Wash Rack, DU06	Outdoor Wash Rack, DU06	Outdoor Wash Rack, DU06	Outdoor Wash Rack, DU06	Outdoor Wash Rack, DU06
						Location ID:	70-4760-DU5-SB6	70-4759-DU6-SB1	70-4759-DU6-SB2	70-4759-DU6-SB3	70-4759-DU6-SB4	70-4759-DU6-SB5
						Field Sample ID:	070SB-0045M-0001-SO	070SB-0036M-0001-SO	070SB-0037M-0001-SO	070SB-0038M-0001-SO	070SB-0039M-0001-SO	070SB-0040M-0001-SO
						Lab Sample ID:	240-18581-4	240-17669-18	240-17669-19	240-17669-20	240-17669-21	240-17669-22
						Sample Date:	12/7/2012	11/13/2012	11/13/2012	11/13/2012	11/13/2012	11/13/2012
						Location Type:	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM	Vertical ISM
						Sample Depth:	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)	1-7(ft)
		Facility-Wide Cleanup Goals			**USEPA RSL**							
		National Guard	**Resident Receptor**									
Method/ Chemical	**BKG**	**Trainee**	**Resident Child**	**Resident Adult**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Antimony	0.96	175*	2.82*	13.6*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Arsenic	19.8	2.78	0.524	0.425	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Barium	124	351*	1,413*	8,966*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Beryllium	0.88	None	None	None	230*	16*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Cadmium	0	10.9	6.41*	22.3*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Calcium**	35,500	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Chromium	27.2	329,763*	8,174*	19,694*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Cobalt	23.2	7.03	131*	803	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Copper	32.3	25,368*	311*	2,714*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Iron**	35,200	184,370*	2,313*	19,010*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Lead	19.1	None	None	None	800*	400*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Magnesium**	8,790	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Manganese	3,030	35.1*	293*	1,482*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Mercury	0.044	172*	2.27*	16.5*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Nickel	60.7	12,639*	155*	1,346*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Potassium**	3,350	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Selenium	1.5	None	None	None	580*	39*	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Silver	0	3,105*	38.6*	324*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Sodium**	145	None	None	None	None	None	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Thallium	0.91	47.7*	0.612*	4.76*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Vanadium	37.6	2,304*	44.9*	156*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA
Zinc	93.3	187,269*	2,321*	19,659*	-	-	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA	NR/NA

Table 3-5 Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected between November and December 2012, CC RVAAP-70 East Classification Yard (continued)

Notes:
Yellow shading of a result indicates concentration is greater than the most stringent Resident Receptor FWCUG or June 2017 USEPA Residential RSL.
The FWCUGs used for data comparison are the values for the most stringent Resident Receptor FWCUG between the adult and the child receptor using the Target Cancer Risk level of 10^{-6}. The June 2017 RSLs shown are also the values for the Target Cancer Risk level of 10^{-6}. Any exceptions are noted with an asterisk (*).
The background concentrations for metals shown in this table were obtained from two sources: (1) *Final Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (SAIC 2010); and (2) *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC 2001).
* Indicates non-carcinogenic FWCUGs and RSLs using the Target Hazard Quotient = 0.1.
** Denotes the chemical is an essential nutrient. Chemicals that are considered essential nutrients (e.g., calcium, iron, magnesium, potassium, and sodium) are an integral part of the human food supply and are often added to foods as supplements. USEPA recommends these chemicals not be evaluated unless they are grossly elevated relative to background concentrations or would exhibit toxicity at the observed concentrations (USEPA 1989, SAIC 2010).
RSLs are presented only for chemicals without Resident Receptor FWCUGs.
The National Guard Trainee FWCUGs and the June 2017 Industrial RSLs are shown on this table for comparison purposes only.
Bold indicates chemical detected.
BKG = Background.
DU = Decision unit.
ft = Feet.
FWCUG = Facility-Wide Cleanup Goal (SAIC 2010).
ISM = Incremental sampling methodology.
J = Estimated value less than reporting limits.
mg/kg = Milligram per kilogram.
NA = Not applicable.
ND = Not detected.
NR/NA = Not reported/Not analyzed.
RSL = Regional Screening Level (USEPA June 2017).
SAIC = Science Applications International Corporation.
USEPA = United States Environmental Protection Agency.

Table 9-1 Chemical of Potential Concern Screening Levels for Surface Soil and Sediment

Site Related Chemical	Background (mg/kg)	FWCUG (mg/kg) National Guard Trainee Receptor		FWCUG or RSL (mg/kg) Resident Receptor (most stringent of adult or child)		BUSTR Action Level (mg/kg)	COPC Screening Level (mg/kg)
		Carcinogenic (CR = 10^{-6})	Non-carcinogenic (HQ = 0.1)	Carcinogenic (CR = 10^{-6})	Non-carcinogenic (HQ = 0.1)		
Antimony	0.96		175		2.82		2.82
Arsenic	15.4	2.78	114	0.425	2.02		0.425
Cadmium	0	10.9	329	1,249	6.41		6.41
Chromium (as Cr^{+3})	17.4		329,763		8,147		8,147
Cobalt	10.4	7.03	14.0	803	131		7.03
Copper	17.7		25,368		311		311
Lead	26.1	800 [a]		400 [a]			400
Nickel	21.1		12,639		155		155
Silver	0		3,105		38.6		38.6
Thallium	0		47.7		0.612		0.612
Zinc	61.8		187,269		2,321		2,321
Acetone			67,000 [a]		6,100 [a]		6,100
Acenaphthene			4,500 [a]		360 [a]		360
Anthracene			23,000 [a]		1,800 [a]		1,800
Benzo(a)anthracene		4.77		0.221			0.221
Benzo(b)fluoranthene		4.77		0.221			0.221
Benzo(k)fluoranthene		47.7		2.21			2.21
Benzo(a)pyrene		0.477		0.022			0.022
Chrysene		477		22.1			22.1
Dibenzo(a,h)anthracene		0.477		0.022			0.022
Fluoranthene			5,087		163		163
Fluorene			11,458		243		243
Indeno(1,2,3-cd)pyrene		4.77		0.221			0.221
2-Methylnapthalene			2,384		30.6		30.6
Naphthalene			1,541		122		122
Pyrene			3,815		122		122
4,4´-DDE		49.1		2.63			2.63
4,4´-DDT		8.5 [a]		1.9 [a]			1.9
Nitrocellulose			2.5E+08 [a]		1.9E+07 [a]		1.9E+07
Aroclor 1242		0.95 [a]		0.23 [a]			0.23
Aroclor 1248		3.46		0.203			0.203
Aroclor 1260		3.46		0.203			0.203
TPH-C_{10} to C_{20} (soil class 1)						2,000	2,000
TPH-C_{10} to C_{20} (soil class 2)						10,000	10,000

Abbreviations: BUSTR = Bureau of Underground Storage Tank Regulation; COPC = Chemical of Potential Concern; CR = cancer risk; DDE = dichlorodiphenyldichloroethylene; DDT = dichlorodiphenyltrichloroethane; FWCUG = Facility Wide Cleanup Goal (SAIC, 2010); HQ = hazard quotient; mg/kg = milligram per kilogram; RSL = Regional Screening Level (June 2017); TPH = Total Petroleum Hydrocarbon.
Notes:
[a] A FWCUG (SAIC, 2010) has not been developed, therefore June 2017 Commercial/ Industrial USEPA RSLs are presented for the National Guard Trainee and June 2017 USEPA Residential RSLs are presented for the Resident Receptor.

Table 9-2 Chemical of Potential Concern Screening Levels for Subsurface Soil

Site Related Chemical	Background (mg/kg)	FWCUG (mg/kg) National Guard Trainee Receptor		FWCUG or RSL (mg/kg) Resident Receptor (most stringent of adult or child)		BUSTR Action Level[b] (mg/kg)	COPC Screening Level (mg/kg)
		Carcinogenic (CR = 10^{-6})	Non-carcinogenic (HQ = 0.1)	Carcinogenic (CR = 10^{-6})	Non-carcinogenic (HQ = 0.1)		
Arsenic	15.4	2.78	114	0.425	2.02		0.425
Cadmium	0	10.9	329	1,249	6.41		6.41
Cobalt	10.4	7.03	14.0	803	131		7.03
Silver	0		3,105		38.6		38.6
Acetone			67.000 [a]		6,100 [a]		6,100
Chloromethane			46 [a]		11 [a]		11
Methylene chloride			320 [a]		35 [a]		35
Chloroform		1.4 [a]		0.32 [a]			0.32
Carbon tetrachloride		2.9 [a]		0.65 [a]			0.65
Trichloroethene		1.9 [a]		0.41 [a]			0.41
1,2-Dichlorobenzene			930 [a]		180 [a]		180
Acenaphthene			4,500 [a]		360 [a]		360
Anthracene			23,000 [a]		1,800 [a]		1,800
Benzo(a)anthracene		4.77		0.221		12	0.221
Benzo(b)fluoranthene		4.77		0.221		12	0.221
Benzo(k)fluoranthene		47.7		2.21		120	2.21
Benzo(a)pyrene		0.477		0.022		1.2	0.022
Chrysene		477		22.1		1,200	22.1
Dibenzo(a,h)anthracene		0.477		0.022		1.2	0.022
Fluoranthene			5,087		163		163
Fluorene			11,458		243		243
Indeno(1,2,3-cd)pyrene		4.77		0.221		12	0.221
2-Methylnapthalene			2,384		30.6		30.6
Naphthalene			1,541		122	52.7	122
Pyrene			3,815		122		122
bis(2-Ethylhexyl)phthalate		160 [a]		39 [a]			39
Benzyl butyl phthalate		1,200 [a]		290 [a]			290
Dibenzofuran			1,192		15.3		15.3
Tetryl			230 [a]		16 [a]		16
Aroclor 1260		3.46		0.203			0.203
TPH-C_{10} to C_{20} (soil class 1)						2,000	2,000
TPH-C_{10} to C_{20} (soil class 2)						10,000	10,000
TPH-C_{20} to C_{34} (soil class 1)						5,000	5,000
TPH-C_{20} to C_{34} (soil class 2)						20,000	20,000

Abbreviations: BUSTR = Bureau of Underground Storage Tank Regulation; COPC = Chemical of Potential Concern; CR = cancer risk; FWCUG = Facility Wide Cleanup Goal (SAIC, 2010); HQ = hazard quotient; mg/kg = milligram per kilogram; RSL = Regional Screening Level (June 2017); TBD = to be determined; TPH = Total Petroleum Hydrocarbon.
Notes:
[a] A FWCUG (SAIC, 2010) has not been developed, therefore June 2017 Commercial/ Industrial USEPA RSLs are presented for the National Guard Trainee and June 2017 USEPA Residential RSLs are presented for the Resident Receptor.
[b] PAH and TPH concentrations from CC RVAAP-74 will be compared to BUSTR Action Levels for Soil Class 1, and TPH concentrations from CC RVAAP-70 will be compared to BUSTR Action Levels for Soil Class 2 only. BUSTR soil levels were chosen from the lowest Action Level from the following pathways: soil to indoor air, soil to non-drinking water, and direct contact (Ohio Department of Commerce, 2017).

Table 9-3 Chemical of Potential Concern Screening Levels for Groundwater

Site Related Chemical	Background (µg/L)	FWCUG (µg/L) National Guard Trainee Receptor		FWCUG or RSL (µg/L) Resident Receptor (most stringent of adult or child)		BUSTR Action Level[b] (µg/L)	COPC Screening Level (µg/L)
		Carcinogenic (CR = 10^{-6})	Non-carcinogenic (HQ = 0.1)	Carcinogenic (CR = 10^{-6})	Non-carcinogenic (HQ = 0.1)		
Chloromethane			19 [a]		19 [a]		19
Methylene chloride		57.5	1,428	5.34	9.27		5.34
Chloroform		2.23	248	0.207	8.75		0.207
Carbon tetrachloride		2.2	19.3	0.204	0.656		0.204
Benzo(a)anthracene						$9.2x10^{-7}$	$9.2x10^{-7}$
Benzo(b)fluoranthene						$9.2x10^{-7}$	$9.2x10^{-7}$
Benzo(k)fluoranthene						$9.2x10^{-6}$	$9.2x10^{-6}$
Benzo(a)pyrene						$2x10^{-7}$	$2x10^{-7}$
Chrysene						$9.2x10^{-5}$	$9.2x10^{-5}$
Dibenzo(a,h)anthracene						$9.2x10^{-8}$	$9.2x10^{-8}$
Indeno(1,2,3-cd)pyrene						$9.2x10^{-7}$	$9.2x10^{-7}$
Naphthalene						$1.4x10^{-6}$	$1.4x10^{-6}$

Abbreviations: BUSTR = Bureau of Underground Storage Tank Regulation; COPC = Chemical of Potential Concern; CR = cancer risk; FWCUG = Facility Wide Cleanup Goal (SAIC, 2010); HQ = hazard quotient; µg/L = micrograms per liter; PFOA = perfluorooctanoic acid; PFOS = perfluorooctane sulfonate; RSL = Regional Screening Level (June 2017); TBD = to be determined.

Notes:

[a] A FWCUG (SAIC, 2010) has not been developed, therefore the USEPA Tapwater RSL (June 2017) was used.

[b] PAH concentrations from CC RVAAP-74 will be compared to BUSTR Action Levels. BUSTR groundwater levels were chosen from the lowest Action Level from the following pathways: groundwater ingestion, groundwater to indoor air soil class 1, and groundwater to outdoor air soil class 1 (Ohio Department of Commerce, 2017).

Table 9-4 Chemical of Concern Screening Levels for Surface Soil and Sediment

Chemical of Potential Concern	Background (mg/kg)	FWCUG (mg/kg) National Guard Trainee Receptor		FWCUG or RSL (mg/kg) Resident Receptor (most stringent of adult or child)		COC Screening Level (mg/kg)
		Carcinogenic (CR = 10^{-5})	Non-carcinogenic (HQ = 1.0)	Carcinogenic (CR = 10^{-5})	Non-carcinogenic (HQ = 1.0)	
Antimony	0.96		1,753		28.2	28.2
Arsenic	15.4	27.8	1,140	4.25	20.2	4.25
Chromium (as Cr^{+3})	17.4		1.0E+06		81,473	81,473
Cobalt	10.4	70.3	140	8.030	1,313	70.3
Copper	17.7		253,680		3,106	3,106
Benzo(a)anthracene		47.7		2.21		2.21
Benzo(b)fluoranthene		47.7		2.21		2.21
Benzo(a)pyrene		4.77		0.221		0.221
Dibenzo(a,h)anthracene		4.77		0.221		0.221
Indeno(1,2,3-cd)pyrene		47.7		2.21		2.21
Aroclor 1242		9.5 [a]		2.3 [a]		2.3

Abbreviations: COC = Chemical of Concern; CR = cancer risk; FWCUG = Facility Wide Cleanup Goal (SAIC, 2010); HQ = hazard quotient; mg/kg = milligram per kilogram; RSL = Regional Screening Level (June 2017).
Notes:
[a] A FWCUG (SAIC, 2010) has not been developed, therefore June 2017 Commercial/ Industrial USEPA RSLs are presented for the National Guard Trainee and June 2017 USEPA Residential RSLs are presented for the Resident Receptor.

Table 9-5 Chemical of Concern Screening Levels for Subsurface Soil

Chemical of Potential Concern	Background (mg/kg)	FWCUG (mg/kg) National Guard Trainee Receptor		FWCUG or RSL (mg/kg) Resident Receptor (most stringent of adult or child)		BUSTR Action Level[b] (mg/kg)	COC Screening Level (mg/kg)
		Carcinogenic (CR = 10^{-5})	Non-carcinogenic (HQ = 1.0)	Carcinogenic (CR = 10^{-5})	Non-carcinogenic (HQ = 1.0)		
Arsenic	15.4	27.8	1,140	4.25	20.2		4.25
Chloromethane			460 [a]		110 [a]		110
Methylene chloride		10,000 [a]		570 [a]			570
Chloroform		14 [a]		3.2 [a]			3.2
Carbon tetrachloride		29 [a]		6.5 [a]			6.5
Benzo(a)pyrene		4.77		0.221		1.2	0.221
Benzo(a)anthracene						12	12
Benzo(b)fluoranthene						12	12
Benzo(k)fluoranthene						120	120
Chrysene						1,200	1,200
Dibenzo(a,h)anthracene						1.2	1.2
Indeno(1,2,3-cd)pyrene						12	12
Naphthalene						52.7	52.7
TPH-C_{10} to C_{20} (soil class 1)						2,000	2,000
TPH-C_{10} to C_{20} (soil class 2)						10,000	10,000
TPH-C_{20} to C_{34} (soil class 1)						5,000	5,000
TPH-C_{20} to C_{34} (soil class 2)						20,000	20,000

Abbreviations: BUSTR = Bureau of Underground Storage Tank Regulation; COC = Chemical of Concern; CR = cancer risk; FWCUG = Facility Wide Cleanup Goal (SAIC, 2010); HQ = hazard quotient; mg/kg = milligram per kilogram; RSL = Regional Screening Level (June 2017); TPH = Total Petroleum Hydrocarbons.
Notes:
[a] A FWCUG (SAIC, 2010) has not been developed, therefore June 2017 Commercial/ Industrial USEPA RSLs are presented for the National Guard Trainee and June 2017 USEPA Residential RSLs are presented for the Resident Receptor.
[b] PAH and TPH concentrations from CC RVAAP-74 will be compared to BUSTR Action Levels for Soil Class 1, and TPH concentrations from CC RVAAP-70 will be compared to BUSTR Action Levels for Soil Class 2 only. BUSTR soil levels were chosen from the lowest Action Level from the following pathways: soil to indoor air, soil to non-drinking water, and direct contact (Ohio Department of Commerce, 2017).

Table 9-6 Chemical of Concern Screening Levels for Groundwater

Chemical of Potential Concern	Background (µg/L)	FWCUG (µg/L) National Guard Trainee Receptor		FWCUG or RSL (µg/L) Resident Receptor (most stringent of adult or child)		BUSTR Action Level[b] (µg/L)	COC Screening Level (µg/L)
		Carcinogenic (CR = 10^{-5})	Non-carcinogenic (HQ = 1.0)	Carcinogenic (CR = 10^{-5})	Non-carcinogenic (HQ = 1.0)		
Chloromethane			190 [a]		190 [a]		190
Methylene chloride		575	14,277	53.4	92.7		53.4
Chloroform		22.3	2,477	2.07	87.5		2.07
Carbon tetrachloride		22.0	193	2.04	6.56		2.04
Benzo(a)anthracene						$9.2x10^{-7}$	$9.2x10^{-7}$
Benzo(b)fluoranthene						$9.2x10^{-7}$	$9.2x10^{-7}$
Benzo(k)fluoranthene						$9.2x10^{-6}$	$9.2x10^{-6}$
Benzo(a)pyrene						$2x10^{-7}$	$2x10^{-7}$
Chrysene						$9.2x10^{-5}$	$9.2x10^{-5}$
Dibenzo(a,h)anthracene						$9.2x10^{-8}$	$9.2x10^{-8}$
Indeno(1,2,3-cd)pyrene						$9.2x10^{-7}$	$9.2x10^{-7}$
Naphthalene						$1.4x10^{-6}$	$1.4x10^{-6}$

Abbreviations: BUSTR = Bureau of Underground Storage Tank Regulation; COC = Chemical of Concern; CR = cancer risk; FWCUG = Facility Wide Cleanup Goal (SAIC, 2010); HQ = hazard quotient; µg/L = micrograms per liter; PFOA = perfluorooctanoic acid; PFOS = perfluorooctane sulfonate; RSL = Regional Screening Level (June 2017); TBD = to be determined.

Notes:

[a] A FWCUG (SAIC, 2010) has not been developed, therefore the USEPA Tapwater RSL (June 2017) was used.

[b] PAH concentrations from CC RVAAP-74 will be compared to BUSTR Action Levels. BUSTR groundwater levels were chosen from the lowest Action Level from the following pathways: groundwater ingestion, groundwater to indoor air soil class 1, and groundwater to outdoor air soil class 1 (Ohio Department of Commerce, 2017).

APPENDIX A
FIELD SAMPLING PLAN

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Final

Field Sampling Plan
Additional Sampling for
CC RVAAP-69 Building 1048 Fire Station,
CC RVAAP-70 East Classification Yard, and
CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift

Ravenna Army Ammunition Plant Restoration Program
Camp Ravenna, Portage and Trumbull Counties, Ohio

Contract No.: W912QR-12-D-0002
Delivery Order: 0003

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TABLE OF CONTENTS

LIST OF ATTACHMENTS .... **iv**

LIST OF TABLES .... **iv**

ACRONYMS AND ABBREVIATIONS .... **v**

1.0 PROJECT DESCRIPTION **1**
1.1 Introduction 1
1.2 Facility Description 2
1.3 Areas of Concern Operational History/Description 2

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES **3**

3.0 SCOPE AND OBJECTIVES **5**
3.1 Project Scope and Objectives 5
3.2 Data Gap Evaluation 5
3.2.1 Data Assembly and Use Assessment 5
3.2.2 Chemical Parameters to Be Analyzed 5
3.3 Proposed Sampling Summary 5
3.4 Data Quality Objectives 5
3.4.1 Conceptual Site Model 5
3.4.2 Sample Design 6
3.4.2.1 Purposes of Sampling 6
3.4.2.2 Selection of Sample Locations 6

4.0 FIELD ACTIVITIES **7**
4.1 Geophysics 7
4.2 Soil Gas Survey 7
4.3 Utility Clearance 7
4.4 Groundwater 7
4.4.1 Rationale 7
4.4.2 Groundwater Grab Samples 7
4.4.3 Monitoring Well Installation 8
4.4.3.1 Drilling Methods and Equipment 8
4.4.3.1.1 Equipment Condition and Cleaning 8
4.4.3.1.2 Drilling Methods 8
4.4.3.1.3 Drilling Scenarios 9
4.4.3.2 Materials 9
4.4.3.2.1 Casing / Screen 9
4.4.3.2.2 Well Installation Materials: Filter Pack, Bentonite, and Grout 10
4.4.3.2.3 Surface Completion 11
4.4.3.2.4 Water Source 11
4.4.3.2.5 Delivery, Storage, and Handling of Materials 12

4.4.3.3 Installation 13
4.4.3.3.1 Test Holes 13
4.4.3.3.2 Soil Sampling During Drilling 13
4.4.3.3.3 Borehole Diameter and Depth 13
4.4.3.3.4 Screen and Well Casing Placement 13
4.4.3.3.5 Filter Pack Placement 14
4.4.3.3.6 Bentonite Seal 14
4.4.3.3.7 Cement / Bentonite Grout Placement 14
4.4.3.3.8 Protective Cover Placement and Well Pad Placement... 15
4.4.3.3.9 Well Identification 16
4.4.4 Well Development 16
4.4.4.1 Pump and Bailer Usage 17
4.4.4.2 Development Record 17
4.4.4.3 Development Criteria 18
4.4.4.4 Development Water Sample 19
4.4.4.5 Monitoring Well Washing 19
4.4.4.6 Well Survey 19
4.4.4.6.1 Horizontal Control 20
4.4.4.6.2 Vertical Control 20
4.4.4.6.3 Field Data 20
4.4.4.6.4 Alignment Testing 20
4.4.5 Documentation 21
4.4.5.1 Boring Logs 21
4.4.5.2 Well Construction Diagrams 22
4.4.5.3 Photographs 23
4.4.6 Well and Borehole Decommission / Abandonment 24
4.4.7 Field Measurement Procedures and Criteria 25
4.4.7.1 Static Water Level 25
4.4.7.2 Free Product Presence 26
4.4.7.3 pH, Conductivity, and Dissolved Oxygen 27
4.4.7.4 Air Quality Instruments 27
4.4.8 Sampling Methods for Groundwater 27
4.4.8.1 Micro-Purging 28
4.4.8.2 Conventional Well Purging 29
4.4.8.3 Minimum / No Purge Sampling 29
4.4.9 Sample Containers and Preservation Techniques 30
4.4.10 Sample Handling Methods for Groundwater—Filtration 30
4.4.11 Field Quality Control Sampling Procedures 30
4.4.12 Decontamination Procedures 31
4.4.13 Monitoring Well Redevelopment and Well Inspection 32
4.5 Subsurface Soil 33
4.5.1 Rationale 33
4.5.2 Procedures 33
4.5.2.1 Equipment Condition and Cleaning 33
4.5.2.2 Bucket Hand Auger Method 33

4.5.2.2.1 Bucket Hand Auger Method—Sampling for Chemical Analysis ... 34
4.5.2.3 Hydraulic Direct-Push Method ... 34
4.5.2.3.1 Hydraulic Direct-Push Method—Sampling for Chemical Analysis ... 34
4.5.2.4 Hollow Stem Auger Drilling Method ... 35
4.5.2.4.1 Hollow Stem Auger Drilling Method—Sampling for Chemical Analysis ... 35
4.5.3 Equipment Condition and Cleaning ... 36
4.5.4 Boring Logs ... 36
4.5.5 Field Measurement Procedures and Criteria ... 36
4.5.6 Sample Containers and Preservation Techniques ... 36
4.5.7 Field Quality Control Sampling Procedures ... 36
4.5.8 Decontamination Procedures ... 37
4.5.9 Borehole Abandonment ... 38
4.5.10 Site Survey ... 38
4.6 Surface Soil and Sediment Sampling ... 38
4.7 Surface Water ... 38
4.8 Other Matrices ... 38
4.9 Munitions and Explosives of Concern Avoidance ... 38

5.0 SAMPLE CHAIN OF CUSTODY / DOCUMENTATION ... 39
5.1 Field Logbook ... 39
5.2 Photographs ... 41
5.3 Sample Numbering System ... 41
5.4 Sample Documentation ... 42
5.4.1 Sample Labels ... 42
5.4.2 Sample Analysis Request Form ... 43
5.4.3 Chain-Of-Custody Records ... 43
5.4.4 Receipt of Sample Forms ... 45
5.5 Documentation Procedures ... 45
5.6 Corrections to Documentation ... 45
5.7 Monthly Reports ... 46
5.8 Submittal of Information ... 46

6.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS ... 47

7.0 INVESTIGATION-DERIVED WASTE ... 51
7.1 Investigation-Derived Waste ... 51
7.2 Waste Container Labeling ... 52
7.3 Investigation-Derived Waste Field Staging ... 53
7.4 Investigation-Derived Waste Characterization and Classification for Disposal ... 53
7.5 Investigation-Derived Waste Disposal ... 54

8.0 REFERENCES ... 55_

LIST OF ATTACHMENTS

ATTACHMENT A-1 FIELD FORMS 57

LIST OF TABLES

Table A-1-1 Summary of Remedial Investigations and Site Inspection....................................... 1

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
AOC	Area of Concern
APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
bgs	below ground surface
BUSTR	Bureau of Underground Storage Tank Regulations
Camp Ravenna	Camp Ravenna Joint Military Training Center
CC	Army Environmental Compliance-Related Cleanup Program
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental, Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
COC	contaminant of concern
COPC	contaminant of potential concern
CSM	Conceptual Site Model
DFFO	Director’s Final Findings and Orders
DLA	Defense Logistics Agency
DNAPL	dense non-aqueous phase liquid
DO	Dissolved Oxygen
DOT	Department of Transportation
DQO	Data Quality Objective
ft	feet
FSP	Field Sampling Plan
FWCUG	Facility-Wide Cleanup Goal
FWFSP	Facility-Wide Field Sampling Plan
FWQAPP	Facility-Wide Quality Assurance Project Plan
FWSAP	Facility-Wide Sampling and Analysis Plan
gal	gallon
HQ	Hazard Quotient
IATA	International Air Transport Association
ID	identification
IDW	Investigation-Derived Waste
LIMS	Laboratory Information Management System
LNAPL	light, non-aqueous phase layer
mL/min	milliliters per minute
Mg/L	milligrams per liter
mm	millimeter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NGT	National Guard Trainee
NSF	National Sanitation Foundation
NTU	nephelometric turbidity unit

ACRONYMS AND ABBREVIATIONS (CONTINUED)

OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
ORP	oxidation reduction potential
OSP	Ohio State Plane
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
PID	photoionization detector
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
PQO	project quality objective
PVC	polyvinyl chloride
PWS	Performance Work Statement
QA	Quality Assurance
QC	Quality Control
REIMS	Ravenna Environmental Information Management System
RI	Remedial Investigation
RGO	Regional Goal Objectives
RPM	Restoration Project Manager
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SI	Site Inspection
SSHP	Site Safety and Health Plan
SVOC	Semi-volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
THQ	Total Hazard Quotient
TO	Task Order
TSDF	Treatment, Storage, and Disposal Facilities
UFP-QAPP	Uniform Federal Policy- Quality Assurance Project Plan
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USP&FO	United States Property and Fiscal Officer
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WP	Work Plan

1.0 PROJECT DESCRIPTION

1.1 Introduction

This Field Sampling Plan (FSP) is submitted to the United States (U.S.) Army in accordance with Section 3 the Performance Work Statement (PWS) for environmental services at three Army Environmental Compliance-Related Cleanup Program (CC) Areas of Concern (AOC) under the Ravenna Army Ammunition Plant (RVAAP) Restoration Program at Camp Ravenna Joint Military Training Center (Camp Ravenna), Ohio. The Task Order (TO) was issued by the United States Army Corps of Engineers (USACE), Louisville District under Contract No. W912QR-12-D-0002-0003 on July 27, 2016.

This FSP (Part I of the Sampling and Analysis Plan [SAP]) is an addendum to the Facility-Wide Field Sampling Plan (FWFSP) for Environmental Investigations which is included as part of the Facility-Wide Sampling and Analysis Plan (FWSAP) (Science Applications International Corporation [SAIC], 2011). This FSP describes the procedures for conducting field activities to fill data gaps in order to complete a Site Inspection (SI) and Remedial Investigations (RI) at three AOCs at Camp Ravenna. The site-specific SAP is divided into two parts: a FSP and a Uniform Federal Policy - Quality Assurance Project Plan (UFP-QAPP). The FSP addresses the field activities including all aspects of sampling, drilling, monitoring well installation, and any field data gathering activities. The UFP-QAPP is presented as Appendix B of the Work Plan (WP), and addresses the data quality objectives (DQO), analytical methodologies, specific quality assurance (QA) and quality control (QC) activities, laboratory requirements, and data assessment activities designed to achieve the data quality goals of the project. The three AOCs addressed in this FSP and the actions proposed at each site are summarized in Table A-1-1.

Table A-1-1 Summary of Remedial Investigations and Site Inspection

AOC	Activity
CC RVAAP-69 Building 1048 Fire Station	Remedial Investigation
CC RVAAP-70 East Classification Yard	Site Inspection
CC RVAAP-74 Building 1048 Motor Pool Hydraulic Lift	Remedial Investigation

The following sections include the site-specific field sampling activities at each of the sites listed in Table A-1-1. The media addressed in this FSP include soil (surface and subsurface), sediment, and groundwater. Not all CC sites will be sampled for all media. Site-specific media to be sampled, sampling methods, frequency of sampling, and the analysis to be performed are detailed in Worksheet #17 (Tables 17-1 through 17-3)

Field work associated with conducting environmental sampling to complete RI and SI at the sites included in this TO includes:

- Installing and developing monitoring wells;
- Sampling groundwater monitoring wells;
- Surface soil and sediment sampling;
- Advancing soil borings and collecting subsurface soil and groundwater samples;

- o Removing, characterizing, and disposing of oily sludges from Building 47-40 (Round House) at CC RVAAP-70;
- o Characterizing and disposing of solid and liquid Investigation-Derived Waste (IDW); and
- o Surveying sample locations.

Field work is currently anticipated at CC RVAAP-69, CC RVAAP-70 and CC-RVAAP-74.

1.2 Facility Description

The former RVAAP, now known as the Camp Ravenna, located in northeastern Ohio within Portage and Trumbull counties, is approximately three (3) miles east/northeast of the City of Ravenna and one (1) mile north/northwest of the City of Newton Falls. The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland.

As of September 2013, administrative accountability for the entire 21,683-acre facility has been transferred to the United States Property and Fiscal Officer (USP&FO) for Ohio and the property subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site, Camp Ravenna. The RVAAP restoration program involves cleanup of former production/operational areas throughout the facility related to former activities conducted under the RVAAP.

The Army is bound to the Director's Final Findings and Orders (DFFOs) issued June 10, 2004 by the Ohio Environmental Protection Agency (Ohio EPA, 2004) pursuant to the authority vested under Chapters 3734, 3745, and 6111 of the Ohio Revised Code. The objective of the Orders is to ensure that the public health, safety, and welfare, as well as the environment, is protected from the disposal, discharge, or release of contaminants. The former RVAAP is not on the United States Environmental Protection Agency (USEPA) National Priorities List, although it is in the USEPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database. The Ohio EPA is the lead environmental regulator for the RVAAP restoration program. The DFFOs form the basis for the implementation of a Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA)-based environmental remediation program at the installation.

1.3 Areas of Concern Operational History/Description

Section 2 of the Work Plan presents site background information and the operational history of the three AOCs of concern.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Parsons' project team organization and responsibilities are presented in Worksheets #3 and #5 and Worksheets #4, #7, and #8 of the UFP-QAPP (Appendix A).

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3.0 SCOPE AND OBJECTIVES

The investigation-specific objectives have been developed using the DQO approach presented in the FWSAP. All remaining data gaps for soil , sediment, and/or groundwater at Former Building 1048, East Classification Yard, and Building 1034 will be addressed through the project scope and objectives presented in Section 3.1. The general decision rules and DQOs for the data gap analysis are discussed in Section 3.2; AOC-specific sampling objectives and designs are presented in Worksheet #17 of the UFP-QAPP for each AOC, detailing the numbers, types, and locations of samples to be collected to accomplish these objectives.

3.1 Project Scope and Objectives

The scope and objectives of this project are presented in Section 1.2 of the Work Plan.

3.2 Data Gap Evaluation

A data gap evaluation for the three AOCs is presented in Section 3 of the Work Plan.

3.2.1 Data Assembly and Use Assessment

Data for characterizing the soil for the revised RI/SI reports were extracted from the Ravenna Environmental Information Management System (REIMS) database in September 2016. This includes data from all previous RI and SI related sampling. There was no groundwater data available for the AOCs.

3.2.2 Chemical Parameters to Be Analyzed

The chemical parameters to be analyzed for each medium and individual samples are presented in the proposed sampling tables included the UFP-QAPP Worksheet #17. Parameters were chosen based on only those chemicals that exceeded the screening criteria. Proposed samples will be analyzed for only the chemicals of potential concern (COPCs) for each AOC. Full suite analysis will not be performed for all samples during the implementation of this project in cases where full suite analyses was conducted during other investigations. AOC-specific chemicals of concern (COCs) have been established and no new source areas are being investigated under these activities and full suite evaluation is therefore not warranted for all samples collected during this investigation.

3.3 Proposed Sampling Summary

A summary of the proposed sampling for each site is in the UFP-QAPP Worksheets #17 and #18.

3.4 Data Quality Objectives

As part of the facility-wide approach to environmental investigation activities at the former RVAAP, facility-wide DQOs have been developed consistent with the USEPA DQO process. The overall project DQO is to provide representative, repeatable, high quality data to fill data gaps in order to complete a SI Report at CC RVAAP-70 and RI Reports at CC RVAAP-69 and CC RVAAP-74. AOC-specific DQOs are presented in UFP-QAPP Worksheet #11.

3.4.1 Conceptual Site Model

The facility-wide conceptual site model (CSM) for RVAAP, presented in the FWSAP (SAIC, 2011), is applicable to the AOCs based on current knowledge. AOC-specific CSMs are presented in Worksheet #10 of the UFP-QAPP and Sections 3.1.1 (CC RVAAP-69), 3.2.1 (CC RVAPP-70), and 3.3.1 (CC RVAAP-74) of the WP.

3.4.2 Sample Design

Groundwater, soil, and sediment samples will be collected in accordance with the FWSAP (SAIC 2011) and as described in Section 4 of this project-specific FSP.

Parsons has considered the fact that CC RVAAP-69 and CC RVAAP-74 are directly across the street from each other; therefore, field efforts will be coordinated to collect samples from both AOCs in the same mobilization. Groundwater grab samples will be collected from both sites using direct push sampling or temporary well points, if necessary. Groundwater will be analyzed using 24-hour quick turn analysis for limited VOCs (carbon tetrachloride and its known chlorinated methane decay products) at CC RVAAP-69, and groundwater downgradient of CC RVAAP-74 only will be analyzed for VOCs and polycyclic aromatic hydrocarbons (PAHs). Soil borings and source area monitoring wells will be installed during down-time while waiting for groundwater grab sample results. The groundwater grab sample locations will be adjusted based on results until the plume(s) (if any) are delineated. Mid-plume and downgradient bounding monitoring wells will be located based on the grab sample results. More than the minimum of three monitoring wells may be needed to confirm the extent of potential carbon tetrachloride contamination beneath CC RVAAP-69. CC RVAAP-74 groundwater monitoring wells will also be analyzed for PCBs.

Soil and sediment samples will be collected from the Interior Repair Pit, within the Round House below the concrete floor, and at the Wash Rack and associated culvert at CC RVAAP-70.

The proposed soil, sediment, and groundwater sampling is summarized in Worksheet #17 of the UFP-QAPP. Sample IDs will be unique and follow the guidance in the FWSAP and REIMS. The sample IDs were approved by Patrick Ryan at Leidos.

3.4.2.1 Purposes of Sampling

The purpose of these field activities is to fill data gaps to delineate the nature and extent of contamination at CC RVAAP-69 and CC RVAAP-74, and to determine the presence or absence of contaminants at CC RVAAP-70.

3.4.2.2 Selection of Sample Locations

Worksheet #11 of Appendix B UFP-QAPP presents the rationale for selection of sample locations. Regional groundwater flow is to the east as documented in the FWSAP (SAIC, 2011) and flow direction was considered in developing proposed sample locations at CC RVAAP-69 and CC RVAAP-74. There is a topographic low to the southeast of CC RVAAP-74, which may impact the local groundwater flow direction. Therefore, groundwater flow at CC RVAAP-69 and CC RVAAP-74 is estimated to be between east to southeast. Groundwater grab sampling locations have been selected based on this estimated direction of groundwater flow.

4.0 FIELD ACTIVITIES

All field activities and sampling procedures will be accomplished in accordance with the FWSAP (SAIC 2011). Where changes or unique elements not addressed in the FWSAP have been identified, they are provided in this SAP Addendum. The general rationale for sample types, quantities, and locations is provided in Worksheet #17 of the UFP-QAPP; AOC-specific details (sample depths, location, and parameters to be analyzed) are also presented in the Worksheet #17.

4.1 Geophysics

Not anticipated.

4.2 Soil Gas Survey

Not anticipated.

4.3 Utility Clearance

Prior to all subsurface activities, Parsons will notify and coordinate a utility clearance with the Camp Ravenna Department of Public Works 10 business days prior to subsurface activities on-site, in accordance with Section 5.3 of the FWSAP. A 3rd party locater company will be used. The request will describe and illustrate sample locations and activities to be performed so utilities can be adequately marked or cleared. If a utility (known or unknown) is discovered (damaged or undamaged) during field activities, work will be stopped immediately and the Camp Ravenna Range Control will be contacted first. The Camp Ravenna Environmental Office and USACE will also be notified. Work will not recommence until the status of the utility (live, abandoned) has been determined.

4.4 Groundwater

4.4.1 Rationale

The rational for the proposed groundwater sampling is presented in Section 4 of the WP and included in UFP-QAPP Worksheets #17 and #18.

4.4.2 Groundwater Grab Samples

The following paragraph describes the details of proposed groundwater grab samples to be collected from temporary well points:

All direct push activities shall be performed in accordance with applicable state regulations. To collect groundwater grab samples at CC RVAAP-69 and CC RVAAP-74, direct push borings shall be advanced to an estimated depth of 25 feet bgs and one discrete groundwater grab (or well point) sample shall be collected between 20 and 25 feet bgs from each boring using a Screenpoint 16 (SP16) groundwater sampling tool or approved equivalent. If borings do not readily yield water to the SP16 sampler, temporary wells will be installed instead. The temporary wells shall consist of 2-inch inside diameter Schedule 40 polyvinyl chloride (PVC) casing and 5-foot long pre-pack screen having 0.01-inch slots. The pre-pack screen shall have 20-40 size filter pack sand (or approved equivalent). All temporary wells will be developed prior to sampling, following development procdures for wells as describe in Section 4.4.4. Direct push borings or temporary wells will be surveyed, as described in Section 4.4.4.6. No soil samples will be collected from these direct push borings. Additional grab samples may be collected if the original planned samples do not fully delineate the plumes. Boreholes will be abandoned as described in Section 4.4.6.

4.4.3 Monitoring Well Installation

Monitoring well construction is discussed in the subsections below. Well screens for this project will be 10 feet long and be set approximately 20-30 feet bgs. Prior to the field activities, Parsons will submit the Granular Filter Pack Approval Form, Bentonite Approval Form, and Water Approval Form to the USACE (Attachment A-1, Field Forms). The Monitoring Well Construction Diagram Form and Monitoring Well Sealing Report (Attachment A-1, Field Forms) will be used to document monitoring well installation.

4.4.3.1 Drilling Methods and Equipment

4.4.3.1.1 Equipment Condition and Cleaning

All drilling and support equipment used for well installation and groundwater grab samples will be in first-class working order, clean, and free of leaks according to Section 5.4.2.1.1 of the FWSAP. All switches (including a minimum of two functioning safety switches); gauges; and other electrical, mechanical, pneumatic, and hydraulic systems will be in a safe and operable condition before arrival and during operation. The Drill Rig Operational Checklist (Attachment A-1, Field Forms) will be completed prior to commencement of drilling and at a minimum frequency of once per week after drilling commences. All safety switches or “kill switches” will be tested and documented every working day prior to activities on-site. All safety switches must be operational prior to drilling activities.

All drilling equipment will be cleaned with steam or pressurized hot water and free of any contamination (organic or inorganic) before arriving for each investigation. After arrival, but before commencement of drilling activities, all drilling equipment (including the rig, support vehicles, water tanks [interior and exterior], augers, drill casings, rods, samplers, and tools) will be cleaned with steam or pressurized hot water using approved water at an approved, centralized decontamination pad. Approval for location of the centralized decontamination pad is provided by the ARNG/OHARNG. Sampling devices will also be decontaminated in accordance with Section 5.5.2.8 of the FWSAP.

Similar decontamination of drilling and sampling equipment will be conducted upon completion of each monitoring well borehole. However, only the equipment used during the drilling and sampling activities at each borehole location will be decontaminated. All drilling and sampling equipment used during the course of each investigation will be decontaminated prior to use.

The temporary decontamination pad to be used for equipment cleaning will be located, to the greatest extent possible, in an area surficially cross- or downgradient from the monitoring well borehole locations. The pad will be constructed in such a manner to allow for containment and collection of decontamination solid and liquid wastes and to minimize loss of overspray water during decontamination activities. Solid and liquid wastes generated from the decontamination process (IDW) will be managed in accordance with the procedures defined in Section 8.0 of the FWSAP.

4.4.3.1.2 Drilling Methods

Groundwater drilling methods are provided in Section 5.4.2.1.2 of the FWSAP. The 2-inch monitoring wells will be installed using a hollow stem auger.

Soil drilling using the hollow-stem auger method will be accomplished using a truck-mounted auger rig of sufficient size and power to advance augers to the required drilling depth. Rock coring is not anticipated. Groundwater is assumed to be 20 feet bgs; monitoring wells will be advanced 10 feet below the water table to a maximum depth of 30 feet bgs. Continuous soil sampling will be performed from 14 to 30 feet bgs during well drilling.

4.4.3.1.3 Drilling Scenarios

Guidance for drilling is provided in Section 5.4.2.1.3 of the FWSAP.

4.4.3.2 Materials

All proposed wells (either above-grade or flush-mounted) will be 2 inches in diameter. PVC is the standard material used in well construction at the former RVAAP. All materials typically used for monitoring well construction and the type of wells constructed (e.g., above-grade or flush-mounted) are presented in Section 5.4.2.2 of the FWSAP. The casing/screen and fitting materials to be used for monitoring well construction, well installation materials (such as filter packs, bentonite, and grout), and materials for well protection assembly are presented in Section 5.4.2.2 of the FWSAP and in the following subsections.

4.4.3.2.1 Casing / Screen

Following guidance in Section 5.4.2.2.1 of the FWSAP, the casing, screen, and fitting materials to be used for monitoring well construction during the investigation will be composed of new, pre-cleaned, 5.0-cm (2.0-inch) rigid Schedule 40 PVC. Screen sections will be commercially fabricated and slotted with openings equal to 0.025 cm (0.010 inches). Screen and casing sections will be flush threaded, and thermal or solvent welded couplings will not be used. Gaskets, pop rivets, and screws will not be used during monitoring well construction. Pre-packed screens will be used for intervals that cannot be filter-packed conventionally.

All materials used for monitoring well construction will be as chemically inert as technically practical with respect to the environment. All PVC screens, casings, and fittings will conform to National Sanitation Foundation (NSF)/American National Standards Institute (ANSI) Standard 14 (NSF, 2009) for potable water usage or the Annual Book of American Society for Testing Materials (ASTM) Standards (ASTM, 1995) and will bear the appropriate rating logo. Additional specifications are provided in the Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Well (USEPA, 1991).

The well caps and centralizers used for monitoring well construction will be composed of new, pre-cleaned PVC. The tops of all new monitoring well casings will be covered with water-tight expandable-flange locking well caps. The caps will be fitted to the casings and will be designed to preclude binding to the casing resulting from tightness of fit, unclean surface, or frost and to allow for equilibration between hydrostatic and atmospheric pressures. The caps will be designed to fit securely enough to preclude debris and insects from entering the monitoring well.

Well centralizers will be used in construction of all monitoring wells that are installed within open boreholes exceeding approximately 6.1 m (20.0 feet) in depth to prevent the PVC well casing from deforming. Well centralizers will be attached to the well casing at regular and equal intervals with stainless steel fasteners or strapping. Centralizer placement will be determined in the field at the time of monitoring well installation based on the total depth of each well. Centralizers will not be attached to well screens or to portions of well casings exposed to the granular filter pack or bentonite seal. Centralizers will be oriented to allow unrestricted passage of the tremie pipe used to place monitoring well construction materials within the annular space between the well and the borehole wall.

4.4.3.2.2 Well Installation Materials: Filter Pack, Bentonite, and Grout

Following guidance in Section 5.4.2.2.2 of the FWSAP, the granular filter pack used for monitoring well installation will comply with requirements defined in the *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE, 1998) and will be approved by the OHARNG prior to beginning with the fieldwork the Granular Filter Pack Description and Approval Form included in Attachment A-1. Based on the screen slot size of 0.025 cm (0.010 inches) to be used for monitoring well construction, the granular filter pack material used will generally be Global Supply No. 7 (size equals 0.047 cm [0.0188 inches]) sand. Global Supply No. 5 alternately may be used with prior approval from USACE first and approval from the Restoration Project Manager (RPM) and Ohio EPA, if conditions warrant.

The granular filter pack material will be visually clean, free of material that would pass through a No. 200 sieve, inert, siliceous, and composed of rounded grains. The filter material will be packaged in bags or buckets by the supplier and delivered. Filter pack material in pre-packed screens also will meet these criteria.

Bentonite will be used during the investigation for one or more of the following purposes:

- Creation of an annular seal during monitoring well construction between the granular filter pack and the grout seal;
- Additive in the grout mixture used to create the upper grout seal during monitoring well construction;
- Additive in the grout mixture used to abandon boreholes not converted into monitoring wells; and/or
- Abandonment of boreholes.

Bentonite material used during the investigation for monitoring well installation will comply with requirements defined in the *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE, 1998a) and will be approved by the RPM prior to beginning fieldwork using the Bentonite Description and Approval Form in Attachment A-1 of this FSP. A 500-cm^3 (1-pint) representative sample of each type of bentonite material proposed for use will be submitted to the RPM for approval, if requested. Compressed powdered bentonite pellets or chips, generally measuring 0.63 cm (0.25 inches) in size, will be used for annular seal applications. Powdered or granular bentonite will be used for grout additive applications. Bentonite seals installed in the saturated zone shall consist of pellets or chips. Bentonite seals installed in the unsaturated zone shall be granular.

Grout used during investigations for monitoring well installation or borehole abandonment will be composed of Type I portland cement, approximately 6-pound (lb) dry weight bentonite per 42.6-kg (94-lb) sack of dry cement, and a maximum of 0.02 to 0.03 m3 (6 to 7 gal) of approved water per sack of cement. The amount of water used to prepare grout mixtures will be minimized to the greatest extent possible.

All grout materials will be combined in an above-ground rigid container or mixer and mechanically blended on-site to produce a thick, lump-free mixture throughout the mixing vessel. The grout will be placed using a tremie pipe of rigid construction extended to the bottom of the borehole for vertical control of pipe placement. The tremie pipe will be equipped with side discharge holes rather than an open end to help maintain the integrity of the underlying material onto which the grout is placed. Grout will be pumped slowly into the borehole to avoid increased pressure on underlying material and the borehole.

4.4.3.2.3 Surface Completion

Following the guidance in Section 5.4.2.2.3 of the FWSAP, the well protection assembly used for monitoring well construction during investigations will be composed of new iron/steel protective casing. All monitoring wells will be constructed as above-grade installations where possible (except inside Building 1034).

Protective casings associated with above-grade well installations will be equipped with locking iron/steel covers, while those associated with flush-mount installations will be equipped with flush (not threaded) manhole-type iron/steel covers. If wells inside the building are completed as flush-mount installations, then each monitoring well will be completed at the surface with a tight-fitting lockable inner well plug. For flush-mount wells, an 8-inch diameter flush-mount road box with bolted cover will be set in a concrete pad measuring approximately 30 inches x 30 inches x 4 inches thick.

Covers on the protective casings will be designed to minimize water leakage. Protective casings installed as above grade will be surrounded by a minimum of three new iron/steel guard posts centrally located around the monitoring well to help in location and avoidance.

All locks on protective casings installed during each investigation will be opened by a single key, using Master Lock Key #10G012.

All protective casings will be 15.2 cm (6.0 inches) in diameter. The length of protective casing used for above-grade well installations will be 2.4 m (8.0 feet), approximately 1.5 m (5.0 feet) of which will extend bgs. The length of protective casing used for flush-mount well installations will be 1.5 m (5.0 feet), the entire length of which will extend bgs. The bollards/guard posts installed around above-grade protective casings will be at least 7.6 cm (3.0 inches) in diameter, and the top of each post modified to preclude the entry of water. The guard post length will be 1.8 m (6.0 feet), approximately 0.6 m (2.0 feet) of which will extend bgs, leaving 1.2 m (4.0 feet) exposed above grade and will be filled with concrete.

All bollards and risers will be painted the same color as existing monitoring wells on the facility and have the well identification (ID) number stenciled on the protective casing facing the nearest street.

4.4.3.2.4 Water Source

Following the guidance provided in Section 5.4.2.2.4 of the FWSAP, water will be used during the investigations for the following:

- Prepare grout mixtures used to install monitoring wells or abandon boreholes;
- Prepare cement mixtures used to construct monitoring well surface completions; and
- Decontaminate drilling and sampling equipment.

The water source used for the investigation will be evaluated by collecting a sample from each source used prior to starting fieldwork. Procedures for collecting, preserving, shipping, and documenting this sample, and other related requirements, are defined in the subsequent sections of this FSP and in Appendix C of the Requirements *for the Preparation of Sampling and Analysis Plans* (USACE, 2001). One QC trip blank will be placed in every cooler with volatile organic compounds (VOC) samples used to transport the sample from the field to the contracted laboratory. The water source samples will be submitted to the contracted laboratory for RVAAP full-suite analysis and for analysis of any additional contaminants to be evaluated during the investigation. The water source will only be used if analytical results indicate that the source is free of contaminants.

An approved water supply is available from a fire hydrant in front of Building 1036. If the water has been tested by a contractor within one year of Parsons' use and current analytical data is available to document its suitability, this water source may be used without additional analyses. If not, Parsons will sample the water following the procedures in the previous paragraph. The water can then be obtained through a back-flow preventer and a water meter provided by the Portage County Water district.

The water source used for the project also will comply with other requirements defined in Section 3-9, Subsection b, Items #1a through #1f of the *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE, 1998) and will be approved by the RPM prior to use by using the Water Description and Approval Form in Attachment A-1. Field personnel will transport and store the approved water required for investigation needs in a manner to avoid the chemical contamination or degradation of the approved water once obtained.

4.4.3.2.5 Delivery, Storage, and Handling of Materials

All monitoring well construction materials will be supplied and delivered to the AOC by the subcontracted drilling company retained for the investigation. Upon delivery, the Field Manager or designee will inspect and ensure the required types of materials have been delivered and the materials have not been damaged or contaminated during transport. During this inspection, the Field Manager will collect and file any material certification documentation attached to or accompanying the materials. All material certification documentation will be maintained on-site until project completion; at which time it will be transferred to the project evidence file. All materials will be stored in Building 1036 during the length of the project until used for monitoring well construction.

All well screens and well casings used for monitoring well construction will be free of foreign matter (e.g., adhesive tape, labels, soil, and grease) and will be washed with approved water before use. However, if the materials have been packaged by the manufacturer and remain so up to the time of installation, no prewashing will be conducted. Pipe nomenclature stamped or stenciled directly on well screens and/or solid casings to be located within and below the bentonite seal will be removed by sanding, unless removable by approved water washing. Washed screens and casing will be stored in plastic sheeting until immediately before placement into the borehole. All well screens and casings used for construction will be free of unsecured couplings, ruptures, and other physical breakage and/or defects.

All protective casing materials will be steam cleaned before placement unless they are in the original packaging; free of extraneous openings; and devoid of any asphaltic, bituminous, encrusting, and/or coating materials (with the exception of black paint or primer applied by the manufacturer). Washed protective casing materials will be stored in plastic sheeting until immediately before placement around monitoring well casings.

4.4.3.3 Installation

Details regarding monitoring well installation are presented in Section 5.4.2.3 of the FWSAP. Monitoring wells are anticipated to be constructed as above-grade installations, except inside Building1034 where a flush-mounted installation is required. Furthermore, boreholes for both types of installation may be completed in either overlying soil material or the underlying bedrock. The current revision(s) of the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009), USACE *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE, 1998) and ASTM D5092-04e1, *Standard Practice and Design and Installation of Ground Water Monitoring Wells* (ASTM, 2004) will be referenced for proper installation of monitoring wells.

4.4.3.3.1 Test Holes

In the event that test holes are required to be drilled before monitoring well installation during the investigation, these holes will be drilled in accordance with the procedures defined within the FWSAP (SAIC, 2011).

4.4.3.3.2 Soil Sampling During Drilling

Soil sample collection for physical, geotechnical, and/or chemical analyses during monitoring well installation activities will be performed in accordance with the procedures defined in Sections 5.5.2.4 and 5.5.2.5 of the FWSAP. See Section 4.5 of this FSP for details on subsurface soil sample collection from monitoring well locations.

Rock coring is not anticipated in this investigation.

4.4.3.3.3 Borehole Diameter and Depth

Per the guidance in Section 5.4.2.3.3 of the FWSAP, installed monitoring wells will be constructed of 5.0-cm (2.0-inch) PVC casing and screen. For monitoring wells of this size, the borehole drilled will be of sufficient diameter to permit at least 5.0 cm (2.0 inches) of annular space between the borehole wall and all sides of the well (centered screen and casing). Additional information regarding borehole drilling scenarios that may be implemented during the investigation is discussed in Section 5.4.2.1.3 of the FWSAP.

Each borehole will be advanced through the overlying soil material, and into the underlying bedrock if required, until groundwater is encountered (estimated 20 feet bgs). Drilling will be terminated at a depth of from 1.5 to 3.0 m (5.0 to 10.0 feet) below the groundwater table (estimated to be 20 feet bgs). If sufficient groundwater to support a functional monitoring well is found to be present in the borehole, a monitoring well will be constructed. However, if insufficient groundwater is found to present, the borehole will be abandoned per procedures in Section 5.4.2.5 of the FWSAP. The anticipated borehole depth for monitoring wells is 30 feet bgs.

4.4.3.3.4 Screen and Well Casing Placement

Following the guidelines in Section 5.4.2.3.4 of the FWSAP, monitoring wells will be installed per guidance in Chapter 5 of the *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE, 1998). All screens used for monitoring well construction will be installed such that the bottom of each well screen is placed no more than 0.9 m (3.0 feet) above the bottom of the drilled borehole. The screen bottom will be securely fitted with a threaded PVC cap. The threaded cap will be within 15.2 cm (6.0 inches) of the open portion of the screen. The standard length of screen used for all RVAAP monitoring wells will be 3.0 m

(10.0 feet). The casing used to construct above-grade monitoring well installations will be of sufficient length to allow for 0.7 m (2.5 feet) of the casing to extend above the ground surface. The casing used to construct flush-mounted monitoring well installations will be of sufficient length to allow for location of the casing top 5.0 cm (2.0 inches) bgs. Silt traps that extend below the screen will not be used. The top of each installed monitoring well casing will be level so that the difference in elevation between the highest and lowest points on the top of the well casing is less than or equal to 0.6 cm (0.2 inches). The north side of the PVC casing will be marked or etched in an identifiable manner.

All installed monitoring wells will be screened across the water table, which is anticipated to be at approximately 20 feet bgs. Screens are anticipated to be placed at 20-30 feet bgs.

4.4.3.3.5 Filter Pack Placement

Following guidance in Section 5.4.2.3.5 of the FWSAP, approved granular filter pack material used for monitoring well construction will be placed within the annular space around the monitoring well screen, such as clean 20-40 size sand (or approved alternate size). If approved water is used to place the filter pack, the amount of this water will be recorded and added to the volume of water to be removed during well development. The filter pack will extend from the bottom of the borehole to 0.9 to 1.5 m (3.0 to 5.0 feet) above the top of the well screen. In addition, 15.2 cm (6.0 inches) of filter pack will be placed under the bottom of the well screen to provide a firm footing. The final depth to the top of the filter pack will be measured directly with a weighted tape and recorded.

4.4.3.3.6 Bentonite Seal

Following guidance in Section 5.4.2.3.6 of the FWSAP, the type of bentonite material used to construct monitoring well seals will be composed of commercially available pellets or chips. Bentonite seals will be from 0.9 to 1.5 m (3.0 to 5.0 feet) thick, as measured immediately after placement, without allowance for swelling. Granular bentonite may be an alternative if the seal is set in a dry condition. Tremie pipes are not recommended for installing bentonite. A weighted tape will be used to prevent bridging during placement and to measure bentonite. A small volume of approved water will be used to hydrate the pellets, and the hydration time for the pellets will be a minimum of 1 hour. The bentonite seal should be placed in 0.15- to 0.3-m (6-inch to 1-foot) lifts, with each lift hydrated for a period of 30 minutes, rather than installing the entire seal at one time. An adequate bentonite seal should be allowed to form (ideally waiting overnight) before placing the grout to protect the screen and filter pack from downhole grout. The final depth to the top of the hydrated bentonite seal will be measured directly with a weighted tape and recorded.

4.4.3.3.7 Cement / Bentonite Grout Placement

Following guidance in Section 5.4.2.3.7 of the FWSAP, all grout material used for monitoring well construction will be combined in an above-ground rigid container and mechanically blended to produce a thick, lump-free mixture throughout the mixing vessel. The grout will be placed from within a decontaminated rigid grout tremie pipe, initially located just over the top of the bentonite seal, in such a manner as to minimize disturbance of the seal.

Before exposing any portion of the borehole above the seal by removal of any surface casings (to include hollow-stem augers), the annulus between the surface casing and well casing will be filled with sufficient grout to allow for planned surface casing removal. If all surface casing is to be removed in one operation, the grout will be pumped through the grout pipe until undiluted grout flows from the annulus at the ground surface. During the surface casing removal, the grout pipe will be periodically reinserted as needed for additional grouting.

If the surface casing is to be incrementally removed with intermittent grout addition, the grout will be pumped through the grout pipe until it reaches a level that will permit at least 3.0 m (10.0 feet) of grout to remain in the annulus after removing the selected length of surface casing. Using this method, the grout pipe will be reinserted only to the base of the casing yet to be removed before repeating the process. After grouting has been completed to within approximately 3.0 m (10.0 feet) of the ground surface, the remaining surface casing will be removed from the borehole and the remaining annulus will be grouted to within 1.5 m (5 feet) bgs.

Grout for monitoring wells to be completed both as above-grade and flush-mounted well installations will be added until it is present at 1.5 m (5 feet) bgs.

When initiating the grouting operation, the process will be conducted continuously until all of the surface casing or hollow-stem augers, if present, have been removed and all annular spaces are grouted to the required levels as noted above. After 24 hours, the well will be checked for grout settlement, and more grout will be added at that time to fill any depression. This process will be repeated until firm grout remains within 1.5 m (5 feet) of the ground surface. Incremental quantities of grout added in this manner will be recorded on the well construction diagram.

4.4.3.3.8 Protective Cover Placement and Well Pad Placement

Following guidance in Section 5.4.2.3.8 of the FWSAP, a 0.15-cm (6-inch) protective iron/steel casing will be installed around each monitoring well the same day as initial grout placement around the well. The protective casing's exterior will be pre-primed before being brought to RVAAP. The protective casing used for above-grade well installations will be set approximately 1.5 m (5 feet) below grade and will extend approximately 0.9 m (3 feet) above the ground surface. The protective casing used for flush-mounted well installations will be set approximately 1.5 m (5 feet) bgs with the top of the casing flush to grade. All protective casings will be installed so that the distance between the top of the protective casing and the top of the well casing is no more than 6.0 cm (2.4 inches).

For monitoring wells constructed as flush-mounted well installations, the remaining annulus formed between the outside of the protective casing and borehole, or permanent surface casing if present, will be filled to the ground surface with concrete on the day that firm grout is found to be present in the borehole. Each flush-mount monitoring well shall be completed at the surface with an 8-inch diameter flush-mount road box with screw-on cover and tight-fitting lockable inner well plug set in a concrete pad. A sloping concrete pad measuring approximately 0.71 by 0.71 m^2 (30 by 30 $inches^2$) will be poured around the exterior of the protective flush-mount casing. Concurrently, an internal mortar collar will be poured within the annulus between the protective casing and the well casing from the top of the firm grout to approximately 2.5 cm (1.0 inch) below the top of the well casing. The mortar mix will be (by weight) one part cement to two parts sand, with minimal approved water for placement.

For monitoring wells constructed as above-grade well installations, the mortar collar will be poured on the day firm grout is found in the borehole. The mortar collar will be poured within the annulus between the protective casing and the well casing from the ground surface to approximately 15.2 cm (6.0 inches) above the ground surface. After placing the mortar collar, the remaining annulus formed between the outside of the protective casing and the borehole, or permanent casing if present, will be filled with concrete to the ground surface and extended onto the apron around the well head to form a square-cornered concrete pad measuring approximately 0.71 by 0.71 m^2 (30 by 30 $inches^2$).

For flush-mounted installations, the pad will be sloped away from the casing and recessed into the ground approximately 12 cm (0.5 feet). For both types of installations, the thickness of each concrete pad will be uniform and no less than 10.2 cm (4.0 inches). Following placement and curing of the concrete pad, a drainage port measuring approximately 0.6 cm (0.25 inches) in diameter will be drilled into the above grade protective casing 0.3 cm (0.12 inches) above the top of the internal mortar collar.

Once the protective cover for above-grade well installations is in place, a minimum of three, preferably four, steel guard posts will be radially located approximately 1.2 m (4.0 feet) around each monitoring well. The guard post length will be 1.8 m (6.0 feet), approximately 0.6 m (2.0 feet) of which will be set in cement below ground level. All of the guard posts, as well as the steel protective casing including the hinges and cover/cap, will be painted orange or yellow with a paint brush and will be completely dry before sampling of the well. Monitoring wells with slip-joint aluminum covers do not require painting.

4.4.3.3.9 Well Identification

For each monitoring well installed during the investigations, the well ID number will be painted, using white or black paint, on the outside of the protective casing (after application and drying of the orange/yellow paint), and/or a metal tag bearing the designation will be attached to the protective casing or well casing depending upon the type of installation (e.g., above grade or flush-mounted). The well ID number may also be stamped or etched into the monitoring well lid.

All new wells will be identified per the requirements of the FWSAP. There are no existing monitoring wells at CC RVAAP-69 or CC RVAAP-74; therefore wells installed during the investigations will be numbered consecutively beginning with the designation 69MW-001 for wells installed at CC RVAAP-69, and 74MW-001 for wells installed at CC RVAAP-74. Boreholes drilled for monitoring well installation, but subsequently abandoned, also will be numbered consecutively beginning with the designation XXXSB-001. If boreholes previously have been drilled at the AOC, then numbering will begin with the next highest unused number. The well ID system will be consistent with the location/sample identification naming convention specified in Section 6.3 of the FWSAP.

4.4.4 Well Development

Following the guidance in Section 5.4.2.3.10 of the FWSAP, the development of wells installed at CC RVAAP-69 and CC RVAAP-74 will be initiated not sooner than 48 hr after nor longer than 7 days beyond internal mortar collar placement or the final grouting of the wells. If existing monitoring wells must be redeveloped, then the integrity of each well developed will be checked prior to development. If the integrity of the well is questionable, the well will not be developed. The integrity of the well will be checked by visual inspection of the surface casing and riser pipe and by performing an alignment test in accordance with Section 5.4.2.3.11 of the FWSAP. All well development will follow procedures outlined in Chapter 6 of the *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE, 1998); ASTM D5521-05, *Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers* (ASTM, 2005a); and Chapter 8 of the *Technical Guidance Manual for Hydrogeologic*

Investigations and Groundwater Monitoring (Ohio EPA, 2009). Field personnel will fill out the Monitoring Well Development Form (Attachment A-1, Field Forms) in its entirety to ensure all documentation requirements are met.

Following well installation, the Subcontractor will develop the new monitoring wells using a combination of pumping and gentle surging. Development will not be implemented until the seal has cured and settled. Per Ohio EPA guidance, the wells will not be developed within 48 hours of installation when using neat cement. Development will continue until a representative sample can be collected, as indicated by visually clear water (turbidity less than 5 nephelometric turbidity units [NTU]), and stabilization of pH (± 0.2 standard units) and specific conductance (± 3%) over at least three successive well volumes. Gentle surging will be initiated above the screen and work gradually downward at 2-3 foot intervals. If a well does not provide a sediment-free sample (less than 5 NTUs), development may stop when all of the following conditions are met:

- Turbidity has stabilized below 5 NTUs over three successive well volumes.
- Conductivity and pH meet the stabilization criteria described above over at least three successive well volumes.
- A minimum of three times the standing water volume in the well (to include the well screen, casing, plus saturated annulus, assuming 30 percent annular porosity plus water added during well installation) has been removed.
- The sediment thickness remaining in the well is less than 1 percent of the screen length or less than 0.1 foot for screens equal to or less than 10 feet.

4.4.4.1 Pump and Bailer Usage

Per the guidance in Section 5.4.2.3.10.1 of the FWSAP, monitoring well development will be accomplished using one of the following non-dedicated devices: a bottom discharge/filling stainless steel bailer, a submersible pump, or a peristaltic pump. The use of bailers is most effective on shallow wells. During development operations utilizing a bailer, the bailer will be rapidly surged up and down within the screen section of the well to agitate and mobilize particulates around the well screen during removal of groundwater from the well. During development operations utilizing a pump, the pump will be alternately started and stopped during groundwater removal, thus allowing the well to equilibrate and creating a surging action. The pump will be used at a higher rate than water will be extracted during purging or sampling events. During development, water should be removed throughout the entire water column in the well by periodically raising and lowering the pump. In situations where a high percentage of fine material is suspended in the groundwater, a surge block may be used in coordination with the noted devices to mobilize particulates drawn into the granular filter pack. Under no circumstances should air or chemicals be forced downhole to aid in development.

4.4.4.2 Development Record

For each monitoring well developed during the investigation, a record will be prepared in accordance with Section 5.4.2.3.10.2 of the FWSAP. The record will be prepared to include the following information:

- Project name and location;
- Well designation and location;
- Date(s) and time(s) of monitoring well installation;
- Date(s) and time(s) of monitoring well development;

- Static water level from top of well casing before and 24 hr after completion of well development with dates and times of measurements;
- Quantity of water lost during drilling, removed before well insertion, and added during granular filter placement;
- Quantity of standing water contained with the well and within the saturated annulus (assuming 30% porosity) before well development;
- Field readings of pH, conductivity, turbidity, and temperature measured before, during, and after completion of well development using an appropriate device and method in accordance with USEPA Procedure 600/4-79-020, *Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983) (see Section 5.4.3 of the FWSAP for a description of the instrument and procedure to be used for field measurements);
- Depth from the top of the well casing to the bottom of the well;
- Length of the well screen;
- Depth from the top of the well casing to the top of sediment inside the well, both before and after development, as measured directly at the time of development;
- Physical character of the removed water, including changes during development in clarity, color, particulates, and any noted odor;
- Type and size/capacity of the bailer or pump used for development;
- Description of the surge technique used during development;
- Height of the well casing above ground surface as measured directly at the time of development;
- Estimated recharge rate into the well at the time of development; and
- Quantity of water removed from the well during the development operation and the time for removal, present as both incremental and total values).

4.4.4.3 Development Criteria

Monitoring well development will be documented and will proceed until each of the following criteria is achieved:

- A turbidity reading of 5 NTUs or less is achieved using a turbidity meter, or the water is clear to the unaided eye as natural turbidity levels in groundwater may exceed 5 NTUs.
- The sediment thickness remaining within the well is less than 3.0 cm (0.1 feet) or less than 1% of the well screen.
- A minimum removal of three times the standing water volume in the well (to include the well screen and casing plus saturated annulus, assuming 30% annular porosity) has been achieved. The well volume will be calculated as follows:

  Vt = Total Well Volume Vc = Riser Casing Volume Vf = Filter Pack Volume

  $$Vt = Vc + Vf$$

  $$Vc = (\text{Height of water column}) \times (\text{Volume of Casing per Foot})$$

  $$Vf = (((\text{Saturated thickness of filter pack}) \times (\text{Volume of Borehole per Foot})) \times .3) - ((\text{Saturated thickness of filter pack}) \times (\text{Volume of casing per foot})))$$

- Indicator parameters have stabilized for three consecutive readings to within criteria defined by ASTM D6771-02, *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations* (ASTM, 2002) and

Chapter 8 of the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009).
  - ±0.2 for pH;
  - ±3% for conductivity;
  - ±0.5°C for temperature;
  - ±10% turbidity (when turbidity is greater than 5 NTU);
  - ±20 mV for oxidation reduction potential (ORP); and
  - ±10% or 0.2 mg/L (milligrams per liter, whichever is greater) for dissolved oxygen.
- In addition to the "five times the standing water volume" criteria, five times the amount of any water unrecovered from the well during installation will also be removed. Under specific circumstances, such as bedrock coring in dry rock, potable water may be introduced to the formation.

During well development, the RPM will be contacted for guidance if well recharge is slow such that the required volume of water cannot be removed during 48 consecutive hr of development, if persistent water discoloration is observed after completion of the required volume removal, or if excessive sediment remains after completion of the required volume removal.

4.4.4.4 Development Water Sample

Following guidance in Section 5.4.2.3.10.4 of the FWSAP, for each monitoring well developed at an AOC, a 500-cm3 (1-pint) sample of the last water to be removed during development will be placed into a clear glass jar and labeled with the well number and date. Each sample will be individually agitated and immediately photographed close up with a 35-millimeter (mm) camera loaded with color print film or a digital camera using a back-lit setup to show water clarity. These photographs will be identified individually with project name, well number, and photograph date and will be provided to the RPM after development of all AOC wells. Digital photographs will be submitted in electronic format. The data disks also will be provided to the RPM after receipt of the digital photographs. After the development water samples have been photographed, the samples will be disposed of in the same manner as the other water removed from the monitoring wells during the development operation. All well development water must be containerized, characterized, stored, and disposed of in accordance with Section 8.0 of the FWSAP. Well development activities should be completed at least 14 days before groundwater sampling, as discussed in Section 5.4.2.3.10 of the FWSAP.

4.4.4.5 Monitoring Well Washing

As part of each monitoring well development operation, the entire well cap and the interior of the well casing between the water table and the ground surface will be washed using water from the well. The purpose of this activity is to remove extraneous materials (e.g., grout, bentonite, sand) from the interior of the well. The monitoring well washing activity will be conducted during the overall development operation.

4.4.4.6 Well Survey

A topographic survey of the horizontal and vertical locations of newly installed groundwater monitoring wells, as wells as all soil borings, direct push borings, and temporary wells, at the AOCs will be conducted after completion of well installation according to the requirements in Section 5.4.2.3.10.6 of the FWSAP. The topographic survey will be lead/conducted by an individual licensed in an appropriate classification within the state of Ohio for the specific work anticipated to be conducted. This license will be current and active throughout the term of performance during the project.

4.4.4.6.1 Horizontal Control

Each required survey element will be topographically surveyed to determine its map coordinates referenced to the Ohio State Plane (OSP) Coordinate System. The survey will be connected to the OSP by third-order, Class II control surveys in accordance with the *Standards and Specifications for Geodetic Control Networks* (Federal Geodetic Control Committee 1984). All elements surveyed will have an accuracy of at least 0.3 m (1.0 feet) within the chosen system. Specific projects may require greater accuracy. Locations of monitoring wells will be measured at the north rim of the uncapped well casing (not the protective casing).

4.4.4.6.2 Vertical Control

Each required survey element will be topographically surveyed at the notched or marked point on the north side of the solid well casing (not the protective casing). The ground surface elevation (not the pad surface) adjacent to each well will also be measured. The location of the ground surface point surveyed will be marked using a driven hub with a nail and flagging affixed. The survey will be connected by third-order leveling to the National Geodetic Vertical Datum of 1929 in accordance with the *Standards and Specifications for Geodetic Control Networks* (Federal Geodetic Control Committee 1984). All elements surveyed will have an accuracy of at least 0.3 cm (0.01 feet). Specific projects may require greater accuracy.

4.4.4.6.3 Field Data

The topographic survey will be completed as near as possible to the time when the last monitoring well is installed at the AOC. Survey field data (as corrected), to include loop closures and other statistical data in accordance with the standards and specifications referenced above, will be provided to the RPM. Closure will be within the horizontal and vertical limits referenced above. The following data will be clearly listed in tabular form: coordinates (and system) and elevation (ground surface and top of well), as appropriate, for all boreholes, wells, and reference marks. All permanent and semi-permanent reference marks used for horizontal and vertical control (e.g., benchmarks, caps, plates, chiseled cuts, rail spikes) will be described in terms of their name, character, physical location, and reference value.

4.4.4.6.4 Alignment Testing

Per the guidance in Section 5.4.2.3.11 of the FWSAP, alignment tests will be conducted on each monitoring well installed during the investigation. This testing will be conducted to ensure that deformation and/or bending of the PVC well casing and screen is minimal. The testing will be performed using a pump or bailer with a diameter no less than 2.5 cm (1.0 inch) smaller than the well casing and screen diameter. A nylon rope will be attached to the pump/bailer, and the unit will be lowered to the bottom of the well and retrieved. The alignment test will be considered successful if the pump/bailer can be lowered and retrieved without bridging within the well. If a monitoring well fails an alignment test as described, the well will be abandoned in accordance with Section 5.4.2.5 of the FWSAP.

4.4.5 Documentation

4.4.5.1 Boring Logs

All new borings will be continuously logged. Each borehole log generated during the investigations will fully describe the subsurface environment and the procedures used to gain that description. All borehole data will be recorded in the field by the site geologist on Engineer Forms 5056-R and 5056A-R (Attachment A-1, Field Forms). Guidance on field logging of soil and rock may be found in ASTM D5434-09, *Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock* (ASTM, 2009a). Because of the large quantity of information routinely required on logs, a scale of 2.5 cm (1.0 inch) on the log equaling 0.3 m (1.0 feet) of borehole is recommended for borehole log preparation. Each original borehole log will be submitted to the RPM, along with the corresponding original well construction diagram, as soon as the field effort has been completed. Original borehole logs and well construction diagrams will be of sufficient legibility and contrast so as to provide comparable quality in reproduction and will be recorded directly in the field without transcribing from a field book or other document.

All borehole logs generated during the field effort will contain the following information found in Section 5.4.2.4.1.1 of the FWSAP:

- Unique borehole/monitoring well ID number and location denoted on a sketch map as part of the log.
- Depths or heights recorded in feet and decimal fractions thereof (tenths of feet).
- Field estimates of soil classification (Unified Soil Classification System) in accordance with ASTM D2488-09a, Standard Practice for Description and Identification of Soils (Visual Manual Procedure) (ASTM, 2009b) prepared in the field at the time of sampling by the site geologist.
- Full description of each soil sample collected for laboratory analysis, including the parameters noted in Table 5-2 of the FWSAP.
- Visual numeric estimates of secondary soil constituents and quantitative definitions of description terms (e.g., trace, little, some) recorded on the log.
- Full description, to the greatest extent practical, of bedrock material encountered, including the parameters noted in Table 5-2 of the FWSAP.
- Description of disturbed samples (if used to supplement subsurface description) in terms of the appropriate soil/rock parameter, to the extent practical. At a minimum, classification along with a description of drill action for the corresponding depth will be recorded. Notations will be made on the log that these descriptions are based on observations of disturbed material rather than intact samples.
- Visual numeric estimates of secondary soil constituents and quantitative definitions of description terms (e.g., trace, little, some) recorded on the log.
- Full description, to the greatest extent practical, of bedrock material encountered, including the parameters noted in Table 5-2 of the FWSAP.
- Description of drilling equipment, including such information as auger size (inner and outer diameter), bit types, compressor type, rig manufacturer, and model.

- Sequence of drilling activities.
- Any special problems encountered during drilling and their resolution.
- Dates and times for the start and completion of the borehole along with notation by depth for drill crew shifts and individual days.
- Each sequential boundary between various soil types and individual lithologies.
- The depth of first encountered free water along with the method of determination and any subsequent distinct water level(s) encountered thereafter. Before proceeding, the first encountered water will be allowed to partially stabilize (from 5 to 10 min) and recorded along with the time between measurements.
- Interval by depth for each sample collected, including the length of sampled interval, length of sample recovery, blow counts, and the sampler type and size (diameter and length).
- Total depth of drilling and sampling.
- Results of soil core organic vapor scan readings and soil sample organic vapor headspace readings (Section 5.5.2.3 of the FWSAP). Notation will include interval sampled, corresponding vapor readings, and key to the specific instrument used to obtain readings. A general note will be made on the log indicating the manufacturer, model, serial number, and calibration information for each instrument used.
- Definition of any special abbreviations used at the first occurrence of their usage.

In addition to the original borehole logs prepared the investigation, Parsons will also coordinate with the REIMS database manager on all data to be entered into the database. Information will be entered into this database in accordance with USACE, Louisville District's Data Standards for Environmental Restoration Sites. Information required to complete the database not recorded on original borehole logs will be recorded in the project logbook.

4.4.5.2 Well Construction Diagrams

Each monitoring well installed during the investigations will be depicted on an as-built well construction diagram (Figure 5-10, FWSAP). Each diagram will be attached to the original borehole log for that installation and will graphically denote, by depth from the ground surface, the following information found in Section 5.4.2.4.1.2 of the FWSAP

- Location of the borehole bottom and borehole diameter(s);
- Location of sump;
- Location of the well screen;
- Location of any joints;
- Location of the granular filter pack;
- Location of the bentonite seal;
- Location of grout;
- Location of centralizers;
- Height of riser (stickup), without cap/plug, above the ground surface;

- Height and width of the protective casing, without cap/cover, above the ground surface;
- Depth of protective casing base below the ground surface;
- Location and size of the drainage port;
- Location of the internal mortar collar;
- Sloped concrete pad height and diameter;
- Protective post configuration; and
- Water level 24 hr after completion of installation with date and time of measurement.

Additional information described on each as-built well construction diagram includes the following:

- Actual quantity and composition of the grout, bentonite seal, and granular filter pack used for monitoring well construction;
- The screen slot size in inches, slot configuration, total open area per foot of screen, outside diameter, nominal inside diameter, schedule/thickness, composition, and manufacturer;
- Type of material located between the bottom of the borehole and the bottom of the screen;
- The outside diameter, nominal inside diameter, schedule/thickness, composition, and manufacturer of the well casing;
- The joint design and composition;
- The design and composition and centralizers;
- Depth and description of any permanent pump or sampling device installed within the monitoring well;
- The composition and nominal inside diameter of protective casing;
- Any special problems encountered during well construction and their resolution;
- Dates and times for the start and completion of monitoring well installation; and
- Definition of any special abbreviations used at the first occurrence of their usage.

Each original well construction diagram will be submitted to the RPM as soon as the field effort is completed. Each diagram will be attached to the corresponding original borehole log for that location. In addition to the original well construction diagrams, Parsons will coordinate with the REIMS database manager to enter well information into REIMS in accordance with USACE, Louisville District's Data Standards for Environmental Restoration Sites. Information required to complete the database not recorded on original well construction diagrams will be recorded in the project logbook. Well construction diagrams (see Attachment A-1, Field Forms) with boring logs for new wells will also be submitted to Ohio Department of Natural Resources (ODNR) within 30 days in accordance with ORC 1521(B).

4.4.5.3 Photographs

Guidance for photographs taken during the investigations is provided in Section 5.4.2.4.2 of the FWSAP. The following items will be noted in the field logbook:

- Date and time;

- Photographer (name and signature);
- Name of the AOC;
- General direction faced and description of the subject taken; and
- Sequential number of the photograph.

While not required, it is recommended that all sampling points be documented via photographs. These photographs will include two or more permanent reference points to facilitate relocating the point at a later date. In addition to the information recorded in the field logbook, one or more site photograph reference maps will be prepared as required. An example of this map type is presented in Figure 5-11 of the FWSAP.

4.4.6 Well and Borehole Decommission / Abandonment

Per the requirements in Section 5.4.2.5 of the FWSAP (SAIC, 2011), abandonment, also termed decommissioning, of monitoring wells (not anticipated) and soil boreholes during the investigation will be conducted in a manner precluding any current or subsequent fluid media from entering or migrating within the subsurface environment along the axis or from the endpoint of the well/borehole. The chosen sealing material should not react with contaminants, groundwater, or geologic materials; have a hydraulic conductivity comparable to or lower than the in-situ material; and form a tight bond with the borehole and well casing, be resistant to cracking and shrinking, be of sufficient structural strength to withstand subsurface pressures, and be capable of being placed at the appropriate depth. Abandonment at Camp Ravenna will be accomplished by filling the entire volume of the well/borehole with grout composed of Type I Portland cement, 6 lb dry bentonite per 42.6-kg (94-lb) sack of dry cement, and a maximum of 0.02 to 0.03 m^3 (6 to 7 gal) of approved water per sack of cement.

The abandonment of each well/borehole will follow field procedures outlined in Chapter 9 of the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009). Well abandonment consists of removing the casing and screen, overdrilling the well borehole with a drilling bit at least 1.5 times greater than the original diameter of the borehole, and grouting to the surface. A tremie pipe will be placed to the bottom of the borehole and will be used to fill the borehole from the bottom up as the drilling stem is removed. The grout must extend from the bottom of the borehole to at least 3 feet bgs. The top 3 feet (ft) (above the frost line) can be filled with bentonite and topped with appropriate non-contaminated topsoil or gravel.

Ohio Revised Code 1521.05(C) requires that a well sealing report be filed with Ohio Department of Natural Resources (see Attachment A-1, Field Forms). For each abandoned well/borehole, a record containing the following information will be prepared and submitted to the RPM:

- Project and well/borehole designation and location coordinates;
- Location with respect to the replacement well or borehole (if any);
- Open depth of well/borehole before grouting;
- Screen material, length, and total depth;
- Casing or items left in borehole by depth, description, composition, and size (if applicable);
- Copy of the borehole log;
- Copy of the construction diagram for the abandoned well (if applicable);

- o Reason for abandonment;
- o Description and total quantity of grout used initially;
- o Description of the grout composition and mixing method;
- o Description and daily quantities (volumes) of grout used to compensate for settlement;
- o Dates of grouting;
- o Disposition of materials removed/displaced (e.g. materials, soil, groundwater);
- o Types and concentrations of contaminants present, if any;
- o Water or mud level prior to grouting and date measured; and
- o Remaining casing above ground surface: type (e.g., well, drill, or protective), height above ground, size, and composition of each (if applicable).

All depths reported in the borehole abandonment record will be designated in feet from ground surface. Original borehole abandonment records will be submitted to the RPM and the Ohio Department of Natural Resources (ODNR) in accordance with ORC 1521.05(C). Any replacement wells/boreholes installed during the investigation will be offset at least 6.0 m (20.0 feet) from any abandoned AOC in a presumed up- or cross-gradient groundwater direction.

4.4.7 Field Measurement Procedures and Criteria

Groundwater field measurements performed during the investigation will include the static water level, free product, pH, conductivity, and dissolved oxygen (DO) concentration, at a minimum, and follow the associated calibration requirements and performance checks in Table 5-3 of the FWSAP. All field instruments should be properly decontaminated as appropriate. A summary of the procedures and criteria to be used for field measurements is presented below.

4.4.7.1 Static Water Level

According to Section 5.4.3.1 in the FWSAP, static water level measurements will be made using an electronic water level indicator or oil water interface meter prior to well purging. Water-level measurements will be taken after all wells have been installed and developed and their water levels have recovered completely. Any conditions (e.g., barometric pressure) that may affect water levels will be recorded in the field log. The following procedure will be used to measure the water levels:

1. Well plugs sealing bedrock and overburden wells with low hydraulic conductivities should be loosened several days prior to the initiation of sampling to allow the well to equilibrate. Well plugs should not be left loose for periods longer than three days, when site activities are terminated for scheduled breaks, or if there is a threat of heavy rain. Caution should also be taken during periods of rain to secure expansion plugs in roadway completions to prevent surface run-off from entering the well.
2. Inspect the exterior of the well to determine if there is any evidence of the security being breached (e.g., as evidenced by damaged or missing plugs or locks, etc.), or evidence of excessive debris accumulation. If the security of the well has been compromised, record this information and notify the Project Manager (PM). Remove any excessive debris before the well is opened.
3. Open the protective outer cover of the monitoring well. Do not open any protective covering that is covered with standing water until the water has been removed. Remove

any debris that may have accumulated around the riser near the well plug. If water is present in a road box enclosure above the top of the riser and well plug, do not open the well until all water has been removed. Water found in a roadway box above the well must be collected and managed as IDW. Once the top of the well is free of standing water and debris, remove the well plug.

4. Immediately after opening the well, monitor the air space in the well with a photoionization detector (PID) instrument that measures VOCs. Record the data in the field log.
5. Water-level measurements will be collected with an oil/water interface probe capable of detecting the presence of free product (non-aqueous phase liquid) within the well casing. The oil/water interface probe will have two distinct tones that differentiate the probes contact with water or free product. The probe will be used to determine the distance between the established point of reference (usually a V-notch or indelible mark on the north side of the PVC cap) and the surface of the standing water and free product (if present) in the well. Hydraulic fluid as free product may be encountered in proposed CC RVAAP-74 wells. If hydraulic fluid is present, its thickness will be measured. Dense non-aqueous phase layers (DNAPL) may be encountered in CC RVAAP-69 wells. If DNAPL is present, its thickness will be measured.
6. Groundwater level shall be measured to the nearest 0.01 foot. Two or more sequential measurements shall be taken at each location until two measurements agree to within ± 0.01 foot.
7. All measuring equipment shall be decontaminated according to the specifications in Section 4.4.12.

4.4.7.2 Free Product Presence

During each groundwater monitoring event, static water level (gauging) and free product measurements will be collected using an oil/water interface probe according to the procedures outlined in Section 4.4.7.1 above.

Occasionally, a light, non-aqueous phase layer (LNAPL) (floating product) may be present in a monitoring well designated for sampling. If it is suspected that the well contains an LNAPL, an interface probe should be used to verify its presence. If an LNAPL is present, the thickness should be measured. Whenever possible, measurements of the free product should be taken using an interface probe. A bailer can significantly under- or overestimate the thickness of free product in the well and should not be used for determining the elevations of air/free product and free product/water interfaces. The use of bailers should be limited to verification of the presence of free product in a well or collection of a sample of it (EPA/510/R-96/001). Collection of a ground water sample may not be appropriate if an LNAPL is present in the well, for the sample will likely become contaminated as it passes through the LNAPL to reach and sample the ground water below.

Initially, the probe will be lowered into each monitoring well without touching the probe to the well casing until the alarm sounds and/or the indicator light illuminates. If free product is present, the probe will be lowered into the water column to "clean" the probe of free product and then raised back up to the level of free product in order to obtain an accurate product thickness measurement. Particularly at fuel oil sites, free product thickness can be overestimated when product "sticks" to the probe and continues to sound as product when the probe has actually descended into the water column. Water level measurements will be estimated to the nearest 0.01 foot from the top of the well casing.

4.4.7.3 pH, Conductivity, and Dissolved Oxygen

pH, conductivity, and DO measurements will be made using a multi-parameter meter designed to measure these parameters. See these requirements in the FWSAP, Section 5.4.3.2.

A groundwater sample will be retrieved from each monitoring well and immediately poured into a clean container placed onto a stable surface at the well. With the multi-parameter meter set in the appropriate mode, the meter electrode will be swirled at a slow constant rate within the sample until the meter reading reaches equilibrium. The measurements may also be made in a flow-through cell during purging by connecting the hosing from the pump to the flow-through cell/YSI 6820 meter (or equivalent).

Sample pH will be recorded to the nearest 0.1 pH unit. All recorded conductivity values will be converted to conductance at 25ºC. Sample conductivity will be recorded to the nearest 10 µmhos/cm. Stabilization criteria will follow the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009) recommendations.

4.4.7.4 Air Quality Instruments

Air quality meters, including but not limited to PIDs and multi-gas meters, will be used during subsurface drilling activities to ensure the health and safety of on-site personnel. All air quality meters will be calibrated according to manufacturers' specifications daily. Equipment calibration forms and information is detailed in Section 6.0 of the FWSAP. Use of air quality meters is further detailed in the FWSHP.

4.4.8 Sampling Methods for Groundwater

The Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites (USACE, 1998) recommends that well development be completed at least 14 days prior to sampling. This hiatus theoretically allows time for the chemical equilibrium between the aquifer and the filter pack to be established. However, this rule of thumb is unsubstantiated by scientific data.

Groundwater sample collection from monitoring wells during the investigation will involve three general steps: (1) measuring field parameters, (2) well purging, and (3) collecting the samples. All of the activities would normally be accomplished within a 2- to 4-hr period per monitoring well. Procedures and criteria for the measurement of field parameters are discussed in Section 5.4.3 of the FWSAP. Purging and sampling of monitoring wells will be accomplished using either a stainless steel bailer or a bladder pump. Further guidance on well purging is provided in Appendix C of the *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001).

During groundwater monitoring events, if an existing monitoring well is to be sampled, the integrity of the well will be checked prior to purging. Alignment testing also is recommended to ensure that the well has not been obstructed or otherwise damaged since the previous sampling event. The integrity of the well will be checked by visual inspection of the surface casing and riser pipe and by performing an alignment test in accordance with Section 5.4.2.3.11 of the FWSAP. If a monitoring well is questionable, the well will not be purged and sampled. If required, a new well will be installed as directed by the RPM.

4.4.8.1 Micro-Purging

To collect a sample representative of current groundwater conditions and minimize the quantity of liquid IDW generated as a result of well purging, wells will be micro-purged where conditions permit, in accordance with the ASTM D6771-02, *Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations* (ASTM, 2002) and the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009), Chapter 10, as follows:

- A decontaminated or dedicated bladder or submersible pump attached to dedicated Tubing will be used for purging;
- The intake depth and stabilized extraction rates should be duplicated as closely as possible for subsequent sampling events;
- The purge rate will not exceed 100 milliliters per minutr (mL/min) unless it can be shown that higher rates will not disturb the stagnant water column above the well screen (i.e., will not result in drawdown greater than 0.3 feet) with a maximum flow rate of 500 mL/min;
- The volume purged will be either two pump and tubing volumes, a minimum of 30 minutes, and stabilization of water quality parameters as outlined in Section 5.4.3.2 of the FWSAP; and
- Sample collection shall occur immediately after micro-purging.

If micro-purging cannot be accomplished for any reason, purging will be conducted in accordance with the procedures for conventional purging described in the following subsection.

When a bladder pump is used, the device will be lowered slowly until it contacts the groundwater surface, and then will continue to be lowered until the pump intake is located at the midpoint of the monitoring well screen. Non-dedicated pumps will be allowed to set in the well for a minimum of 48 hours prior to purging the well to allow stabilization. All bladder pumps will be driven by compressed air or nitrogen. The pump then will be activated and allowed to operate until a steady flow of groundwater is expelled from the return line at the ground surface. The pump rate is established once drawdown has been stabilized. Purging will continue until drawdown is stabilized, a minimum of two pump and tubing volumes have been withdrawn, 30 minutes of purging have occurred, and water quality parameters have stabilized for three consecutive readings per specifications in Section 5.4.3.2 of the FWSAP. Water quality parameters will be recorded commencing with the first flush of water through completion of sample collection. Each bladder pump used for purging/sampling will be equipped with a nylon retrieval line that will be decontaminated or discarded upon completion of purging and sampling activities. Tubing used at each monitoring well will be stored in the well casing between sampling events.

Sampling of the monitoring well will begin immediately after purging. The pump should remain on between purging and sample collection. The discharge line will not be allowed to touch any part of the interior of the sample container or the sample matrix within the container. The sample will be collected and preserved in the same manner as described in Section 5.4.5 of the FWSAP. Following completion of groundwater sampling a final set of groundwater quality parameters will be collected and recorded.

4.4.8.2 Conventional Well Purging

After initial measurement of field parameters, including measurement of the water level, purging of each monitoring well will commence until pH, conductivity, and DO have reached equilibrium, as specified in Section 5.4.3.2 of the FWSAP. Equilibrium will be established by three consecutive readings, where one well casing volume is purged between each reading following the initial measurement consisting of the first flush of groundwater. A well casing volume for conventional well purging is defined as the total of the well casing plus the saturated filter pack annulus assuming a porosity of 30%. A discussion on calculating well volumes is presented in Section 5.4.2.3.10.3 of the FWSAP. However, purging will be terminated before establishment of equilibrium if one of the following conditions is met: (1) five well volumes, including the saturated filter pack assuming a porosity of 30%, have been removed from the well; or (2) the well is purged to dryness. Each bailer used for purging/sampling will be equipped with a nylon retrieval cord that will be properly discarded upon completion of the purging and sampling activities.

Monitoring well sampling will begin immediately after purging. When a bailer is used, the device will be lowered slowly until it contacts the groundwater surface, allowed to sink to the bottom of the monitoring well and fill with a minimum of surface disturbance, and raised slowly to the surface. The sample then will be transferred to the appropriate sample bottles by tipping the bailer so that a slow discharge of sample flows gently from the top of the bailer down the side of the sample bottle with minimum entry disturbance. Bottles designated for will be filled first and in a manner so that no headspace remains. Immediately after each sample is collected and the bottles are labeled, each sample container will be placed into a sealable plastic bag and placed in an ice-filled cooler to ensure preservation.

If a monitoring well is purged to dryness, sampling will be delayed for a time period of a minimum of 1 hour and up to 24 hours to allow for recharge. During the delay period, the atmosphere of the well will be isolated to the greatest extent possible from the surface atmosphere. Upon sufficient recharge of groundwater into the well (i.e., if the well recharges to 90% of its initial water level within 24 hours), a sample will be collected without additional well purging. If sufficient well recharge does not occur within 24 hours after the initial purging, the RPM will be contacted for guidance.

4.4.8.3 Minimum / No Purge Sampling

Monitoring wells that have a tendency to go dry when utilizing low-flow or conventional purge techniques are best suited for minimum or no purge sampling. Minimum/no purge sampling should be conducted only when volumetric or low-flow sampling is not feasible. With minimum/no purge sampling, indicator parameters are not monitored. However, an initial and final set of indicator measurements will be collected for regulatory requirements and evaluation of general groundwater quality. A sample will be obtained from within the well screen, and the smallest volume of water will be purged prior to sample collection, generally the volume of the tubing. Drawdown should be measured during sampling to ensure that the water above the screened interval is not collected for analytical sample. The amount of drawdown should be no more than the distance from the top of the screen and the position of the pump intake minus 2 ft. In accordance with guidance presented in *ASTM Standard D4448* (ASTM, 2007), a bladder pump, or low-flow submersible pump, is recommended for collecting minimum/no purge samples. Further guidance is provided in the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009), Chapter 10.

4.4.9 Sample Containers and Preservation Techniques

Information regarding sample containers and preservation techniques for groundwater samples collected for chemical analyses during the investigations is presented in UFP-QAPP Worksheets #19 and #30 (Appendix B). All sample containers will be provided by contracted laboratories, who will place into the containers or provide separately, the required types and quantities of chemical preservatives. All groundwater sample containers will be stored at 4°C (±2°C) immediately after sample collection and will be maintained at this temperature until the samples are received at the contracted laboratory. Generally, groundwater samples are discrete grab samples representative of a specific location at a given point in time. Worksheets #19 and #30 of the UFP-QAPP present details regarding sample containers, preservation, and holding times.

4.4.10 Sample Handling Methods for Groundwater—Filtration

Collection of filtered groundwater samples is not anticipated; however, samples will be filtered if the turbidity is above 5 NTUs after 2 hours of purging unless the water is visibly clear. See Section 5.4.6 of the FWSAP for further details on sampling methods used to collect filtered groundwater samples from monitoring wells. Only samples for metal and total organic carbon analyses will be filtered, and then only if turbidity exceeds 50 NTU.

4.4.11 Field Quality Control Sampling Procedures

See Section 5.4.7 of the FWSAP for further details on field quality control sampling procedures. Generally, up to six different types of QA/QC samples will be collected during performance of the investigation groundwater sampling activities: duplicates, matrix spike (MS)/matrix spike duplicate (MSD)s, equipment rinsate blanks, trip blanks, source blanks, and field blanks. QC samples collected will be sent to the contracted laboratory to provide data for use in determining the quality of the analytical results reported for the associated environmental samples. QA samples collected will be sent to an U.S. Army QA laboratory for independent analysis and evaluation of analytical results reported by the contracted laboratory.

A duplicate sample is collected along with a field sample at the same sampling location and is placed into a separate container labeled with a unique sample number. The duplicate is submitted as "blind" to the laboratory and is used to determine whether the field sampling technique is reproducible and to check the accuracy of reported laboratory results. Duplicate groundwater samples will be collected during the investigation using the same procedures defined for field groundwater samples as discussed in Sections 5.4.4 and 5.4.5 of the FWSAP. Locations used for QA samples may be chosen based on criteria including but not limited to unexpected detection or concentration of certain constituents in the past. However, the number of duplicate samples will typically represent 10% of the total number of field samples collected for the investigation.

A MS is an aliquot of a sample spiked with known quantities of specified target analytes and subjected to the entire analytical procedure. It is used to measure method accuracy and to indicate matrix effects. An MSD is a second aliquot of the sample spiked with known quantities of the same compounds. The purpose of the MSD, when compared with the MS, is to determine the precision for the method, field procedures, and matrix. If required, extra volume of sample is collected along with the field sample at the sampling location. In instances where the primary sample contains enough volume to perform MS/MSD analysis, no extra volume is required. The number of MS/MSDs will typically represent 5% of the total number of field samples, as discussed in Section 9.0 of the FWQAPP.

An equipment rinsate blank is collected in the field from the final decontamination water rinse of field sampling equipment. The equipment rinsate blank is used to determine the effectiveness of the decontamination process in avoiding carryover contamination from one sampling location to the next. An equipment rinsate blank will be collected from the device used to collect groundwater samples from monitoring wells after it has undergone decontamination. Equipment rinsate blanks should include contact with all parts of the sampling equipment. Disposable equipment including bailers and pump tubing may be sampled prior to use to ensure the sterile quality of the prepackaged sampling equipment without decontamination as this equipment is prepackaged and disposed after a single use. Upon completion of the decontamination procedure, ASTM Type I or equivalent water will be poured over and through the device and collected directly into appropriate sample containers. Typically, equipment rinsate blanks are collected at a frequency of 10% or one per event per matrix. When dedicated sampling equipment is used, equipment rinsate blanks are not required.

A trip blank consists of a sealed container of ASTM Type I or equivalent water that originates at the laboratory, travels to the field with the sample containers, and back from the field to the laboratory with aqueous field samples for VOC analysis. The trip blank receives the same treatment as the field sample containers and is used to identify contamination that may occur to the field samples during transport. Trip blanks will be prepared by the contracted laboratory and shipped with sample bottles to be used for collection of field, duplicate, and equipment rinsate samples. Therefore, no sampling procedures are applicable to these blanks. Trip blanks will be included in each sample cooler containing aqueous samples for VOC analysis. Typically, one trip blank is collected per day per matrix when VOCs are analyzed.

A temperature blank (or temperature indicator) is a VOC vial or other small sample bottle filled with water and placed in each cooler. The temperature of this vial is measured upon arrival at the laboratory. The temperature blank is not analyzed and does not provide any measure of induced contamination. It is only provided to evaluate whether samples were adequately cooled during shipment.

In addition, source blanks collected from potable water sources used in the decontamination and field investigation process are analyzed for the parameters of interest. Source blank samples are analyzed to determine the potential for contamination in source water used during field activities such as in grout mixtures or to hydrate a boring. Field blanks are collected by pouring analyte-free, deionized water into appropriate containers at designated sample locations. Field blank samples are analyzed to determine the potential for contamination of a sample due to contaminant sources (e.g. airborne dust, exhaust fumes) unrelated to the specific sources being investigated. Field blanks will be collected only if these types of contaminant sources are expected to be present in the field.

4.4.12 Decontamination Procedures

Decontamination procedures are provided in Section 5.4.8 of the FWSAP. Non-dedicated equipment used to measure static water levels, develop and purge monitoring wells, and collect groundwater samples during the investigation will be decontaminated within a temporary decontamination area. The decontamination area will be designed so that all decontamination liquids are segregated in containers by type, contained from the surrounding environment, and can be recovered for disposal as IDW. Non-dedicated equipment will be decontaminated after each well is developed and again after each well is purged and sampled. The decontamination procedure will follow current guidance provided in Chapter 10 of the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009). Solvent and acid rinses may be necessary only if high levels of contamination are expected. Individual dedicated containers should be used for each step of the decontamination process. Gloves should be changed between various stages of decontamination. The procedure for equipment decontamination is as follows:

1. Wash with approved water and phosphate-free detergent using various types of brushes required to remove particulate matter and surface films.
2. Rinse thoroughly with approved potable water.
3. If analyzing for metals and expecting high levels of contamination, rinse thoroughly with hydrochloric acid (2% solution) or nitric acid (10% solution).
4. Rinse thoroughly with ASTM Type I or equivalent deionized/distilled water with analytical certification.
5. If analyzing for organics and expecting high levels of contamination, rinse thoroughly with solvent-pesticide grade isopropanol, acetone, or methanol, depending on analytes of interest.
6. Rinse thoroughly with ASTM Type I or equivalent deionized/distilled water with analytical certification.
7. Allow equipment to air dry as long as possible.
8. Place equipment on clean, dry plastic if it is to be used immediately or wrap in aluminum foil to prevent contamination if storage is required.

In addition to the well development and sampling equipment, field measurement instruments will be decontaminated between monitoring well locations. Only those portions of each instrument that come into contact with potentially contaminated environmental media will be decontaminated. Due to the delicate nature of these instruments, the decontamination procedure will involve only initial rinsing of the instruments with approved water, followed by a final rinse using ASTM Type I or equivalent water. Field measurement instruments will be rinsed with source water at the next sampling location. All solutions used in steps 3 - 6 should be dispensed from spray bottles or dispensers.

4.4.13 Monitoring Well Redevelopment and Well Inspection

Each time a monitoring well is sampled, it should be inspected to determine if there is a need for maintenance. A decrease in total well depth, a drop in yield during purging, changes in water level fluctuations, or increases in turbidity over time may indicate a possible change in hydraulic connection of the well to the aquifer or siltation in the monitoring well. Slug tests may be conducted as part of the well evaluation. The condition of the well should be inspected and recorded at least annually. Inspections should note changes in water level trends; changes in depth to bottom or observed siltation; yield changes; turbidity; and external physical condition of the well, protective casing, and well pad internal integrity. At a minimum, monitoring wells will be re-developed when 10% of the well screen is occluded by sediment or records indicate a change in yield and turbidity. Well redevelopment will follow the procedures outlined in Section 5.4.2.3.10 of the FWSAP.

4.5 Subsurface Soil

Subsurface soil samples will be collected from CC RVAAP-69, CC RVAAP-70, and CC RVAAP-74 using discrete methods as describe in Worksheets #17 and #18 of Appendix B of UFP-QAPP. All sampling will be conducted in accordance with the FWSAP (SAIC, 2011).

4.5.1 Rationale

Soil sampling will be conducted in order to fill data gaps at the AOCs as described in Section 4 of the WP and UFP-QAPP Worksheets #17 and #18.

4.5.2 Procedures

Subsurface soil will be collected by means of a hydraulic direct-push sampler or hollow-stem auger (e.g., Geoprobe) to a maximum sampling depth of 25 feet bgs or hand auger to maximum depth of 7 feet bgs. Use of a single drilling rig with both direct push and hollow-stem auger capability is desired to accomplish the above tasks. In the event that the sample location cannot be accessed with the Geoprobe subsurface soil may be collected using a bucket hand auger. The procedures for bucket hand auger, hydraulic direct-push, and hollow-stem auger sampling are discussed in Sections 5.5.2.1 and 5.5.2.5 of the FWSAP.

4.5.2.1 Equipment Condition and Cleaning

The condition of all drilling, trenching, sampling, and support equipment used for subsurface soil sampling associated with the investigation and the equipment cleaning procedures will be the same as defined in Section 5.4.2.1.1 of the FWSAP. Additional information regarding the decontamination of drilling and sampling equipment used for soil sample collection is presented in Section 5.5.2.8 of the FWSAP.

4.5.2.2 Bucket Hand Auger Method

The bucket hand auger method may be a method used during the field work for collecting subsurface soil samples if the drill rig cannot access the proposed drilling locations. The bucket hand auger collection method will be accomplished using a 3-inch-diameter stainless steel bucket auger head attached to an extension rod and T-shaped bar. The auger will be advanced continuously over 10.1- to 15.2-cm (4.0- to 6.0-inch) intervals into the soil to the required depth designated for the sampling location. Material collected in the bucket cylinder in each interval will be removed to the greatest extent possible using a stainless steel spoon. Each sample interval will be sampled using a new or decontaminated bucket hand auger, even if at the same sampling location.

Soil will be homogenized in a stainless steel bowl. Discrete samples for VOC analyses will be taken from the middle of the sample interval without being homogenized.

The bucket auger will be decontaminated after sample collection is completed; however, the auger will not be decontaminated after material is removed from each interval augered at a location unless multiple discrete samples are collected from a single location at different depth intervals.

The diameter of the bucket hand auger used for the investigations will depend upon the quantity of soil or sediment sample required to be collected from each sampling location to fulfill chemical analyses requirements. In general, a 3-inch diameter stainless steel bucket auger head should be used. Additional information regarding the methods used for collecting surface soil and sediment samples using the bucket hand auger method is presented in Sections 5.6.2.1.1 and 5.6.2.5.1 of the FWSAP.

Bucket hand augers are best suited for shallow subsurface borings and are usually limited to a depth less than 10 feet bgs. This method will be implemented in the same manner as described in Section 5.6.2.1.1 of the FWSAP.

4.5.2.2.1 Bucket Hand Auger Method—Sampling for Chemical Analysis

Following the guidelines in the FWSAP (Sections 5.5.2.4.2 and 5.5.2.5.2), subsurface soil samples collected using the bucket hand auger methods would be classified as disturbed sample types. Samples will be collected in accordance with ASTM D6907-05, *Standard Practice for Sampling Soils and Contaminated Media with Hand-Operated Bucket Augers* (ASTM 2010). A sample will be collected from the required depth using a bucket hand auger as described in Sections 5.5.2.1.4 of the FWSAP and the previous section of this FSP (Section 4.5.2.2). When a bucket hand auger is used, the sample will be placed into a decontaminated stainless steel bowl at the sampling location and homogenized prior to sampling except for VOCs which will be collected prior to homogenization.

All VOC samples will be collected as discrete aliquots without homogenization using a stainless steel spoon. All remaining samples will be collected from homogenized soil from the bucket hand auger over the depth interval. No portion of the sample that was in contact with the sampling equipment or device will be included in the sample collected for laboratory analysis.

The quantity of the sample required for analyses will be collected from the stainless steel bowl using a stainless steel spoon and placed into sample containers. Immediately after discrete samples are collected and bottles are labeled, each sample container will be placed into a sealable plastic bag and then placed into an ice-filled cooler to ensure preservation.

4.5.2.3 Hydraulic Direct-Push Method

Following the guidance from Section 5.5.2.1.5 of the FWSAP, subsurface soil samples may be collected with hydraulic direct-push samplers (e.g., Geoprobe®). Soil sampling completed using hydraulic direct-push methods will follow the *Technical Guidance Manual for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA, 2009) and *the Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations* (ASTM, 2005b). The hydraulic device may be used where continuous shallow subsurface lithologic and stratigraphic information is needed to characterize an AOC. In some circumstances, Geoprobe® may be used to collect discrete for chemical analyses. Hydraulic direct-push samplers are best used for boreholes less than 50 feet. Soil types and consistency may reduce this depth significantly.

Hydraulic-push borings will be advanced using a truck-mounted or track hydraulic system of sufficient size and power to advance the macro-core or dual tube to the required depth.

4.5.2.3.1 Hydraulic Direct-Push Method—Sampling for Chemical Analysis

Following the guidelines in the FWSAP (Section 5.5.2.5.3), the standard equipment for subsurface sample collection will be a 5-cm (2-inch) outside-diameter macro-core sampling device, advanced using 2.54-cm (1-inch)-diameter steel rods attached to the hydraulic device. Each macro-core section is approximately 1.524 m (5 feet) long. The borehole is advanced by attaching additional lengths of extension rod to the macro-core barrel and pushing the entire pipe string downward. The macro-core sampler may be fitted with a clear acetate sleeve for ease of retrieving samples.

In lieu of a macro-core sampler, a 4-inch outside-diameter dual-tube sampling device with a 2-inch interior sample liner may be used in unstable soil or below the groundwater table.

Immediately after discrete samples are collected and bottles are labeled, each sample container will be placed into a sealable plastic bag and then placed into an ice-filled cooler to ensure preservation.

4.5.2.4 Hollow Stem Auger Drilling Method

Following the guidance in the FWSAP (Section 5.5.2.1.2), the hollow-stem auger drilling method may be used during the investigations for drilling of subsurface soil boreholes from which soil samples are to be collected for analyses. This method will be implemented as a dry drilling method for the investigations. The standard equipment used for borehole drilling will be hollow-stem augers with a 15.2- to 16.5-cm (6.125- to 6.625-inches) outside diameter. Sections 5.5.2.4 and 5.5.2.5 of the FWSAP present information regarding the methods and equipment to be used for collecting subsurface soil samples from boreholes drilled using the hollow-stem auger method.

Soil drilling using the hollow-stem auger method will be accomplished using a truck-mounted auger rig of sufficient size and power to advance augers to the required drilling depth. The total boring depth depends on the depth of groundwater. The water table is anticipated to be at approximately 20 feet bgs and the total boring depth is anticipated to be approximately 30 feet bgs.

4.5.2.4.1 Hollow Stem Auger Drilling Method—Sampling for Chemical Analysis

Following the guidance provided in the FWSAP (Section 5.5.2.5.1), subsurface soil samples designated for chemical analyses will be collected from boreholes using either split-spoon or split-barrel sampling devices. Samples will be collected using these devices as part of hollow-stem auger drilling of boreholes. For split spoons, samples are usually 2-inch diameter and 6-inch long metal (brass or stainless steel) sleeves in either 18 or 24-inch long sampler.

When drilling investigation boreholes, the lead hollow-stem auger will be advanced to the top of the soil interval to be sampled. The selected soil sampling device then will be inserted into the auger string and advanced to the bottom of the soil interval. When using a split-spoon sampler, this device will be advanced to the required depth using a 63.5-kg (140-lb) hammer or continuously advanced with the auger string. When using a split-barrel sampler, this device will be hydraulically pushed to the required depth. Samplers used in non-cohesive soils may require the use of a decontaminated catch basket inserted into the shoe of the sampler in order to obtain recovery. A clean sampling device will be used to collect soil core from each sampled interval of the investigation boreholes.

Upon retrieval of the sampling device, the percentage of recovery will be recorded and the contained soil core will be split in half, lengthwise, using a stainless steel knife. Samples designated for laboratory analysis will be collected from the core using a stainless steel scoop. The scoop will either be used to retrieve an isolated section(s) of the soil core or will be run lengthwise down the core to collect a sample representative of the entire core interval. The portion of the sample designated for VOC analyses will be placed into laboratory sample containers first, followed by placement of the remaining portion of the sample into containers designated for other types of chemical analyses. Sample containers designated for VOC analyses will be filled so that minimal headspace in present in the containers. No portion of the soil core that was in contact with the sampling device wall will be included in the sample collected for laboratory analysis.

Immediately after discrete samples are collected and bottles are labeled, each sample container will be placed into a sealable plastic bag and placed into an ice-filled cooler to ensure preservation. Remaining soil will be managed as IDW.

4.5.3 Equipment Condition and Cleaning

The condition of all drilling, sampling, and support equipment used for subsurface soil sampling and the equipment cleaning procedures will be the same as defined in Section 5.4.2.1.1 of the FWSAP. Additional information regarding the decontamination of drilling and sampling equipment used for soil sample collection is presented in Section 5.5.2.8 of the FWSAP.

4.5.4 Boring Logs

All boreholes will have a complete record of borehole information. Information regarding the preparation and contents of borehole logs for the investigation is presented in Section 5.4.2.4.1.1 of the FWSAP.

4.5.5 Field Measurement Procedures and Criteria

Field measurement procedures and criteria for subsurface soil samples are presented in Section 5.5.2.3 of the FWSAP. Field measurements performed on subsurface soil samples during the investigation may include determination of volatile organic headspace gas concentrations.

A description of the field instrument and associated calibration requirements and performance checks to be used for headspace gas measurements is presented in Table 5-3 of the FWSAP. Headspace gas concentration measurements will be made using a field organic vapor analyzer. Each soil sample collected from an investigation borehole will be placed into a zip-lock bag, leaving some air space, and sealed to create an air-tight seal. The sample will then be allowed to volatilize for a minimum of 15 minutes (min). The bag will then be punctured with the organic vapor analyzer probe and headspace gas will be drawn until the meter reading is stable. The concentration of the headspace gas will be recorded to the nearest 0.1 parts per million. All soil samples used for field measurements will be allowed to volatilize for an equal period of time before screening.

Field screening for explosives and metals is not anticipated.

4.5.6 Sample Containers and Preservation Techniques

Sample container and preservation technique requirements will follow those prescribed in Section 5.0 of the FWQAPP. Contracted laboratories will provide all sample containers. All sample containers will be stored at 4ºC (±2ºC) immediately after sample collection and will be maintained at this temperature until the samples are received at the contracted laboratory.

4.5.7 Field Quality Control Sampling Procedures

Field quality control sampling procedures for soil samples are presented in Section 5.5.2.7 of the FWSAP. Duplicate QC samples, MS/MSD samples, equipment rinsate blanks, and trip blanks will be collected in association with soil samples during the investigation. Duplicate soil and MS/MSD samples (if extra volume is required for MS/MSD analysis) will be collected during the investigations using the same composited material as the primary sample, and using procedures defined for field soil samples in Section 5.5.2.5 of the FWSAP. Equipment rinsate blanks and trip blanks will be collected as described in Section 5.4.7 of the FWSAP, with the exception that subsurface soil sampling equipment will be rinsed for the equipment rinsate blanks.

In addition, source blanks collected from potable water sources used in the decontamination and field investigation process are analyzed for the parameters of interest. Source blank samples are analyzed to determine the potential for contamination in source water used during field activities such as in grout mixtures or to hydrate a boring. Field blanks are collected by pouring analyte-free, deionized water into appropriate containers at designated sample locations. Field blank samples are analyzed to determine the potential for contamination of a sample due to contaminant sources (e.g. airborne dust, exhaust fumes) unrelated to the specific sources being investigated. Temperature blanks should be used in coolers to evaluate temperatures during shipping and receipt by the laboratory.

4.5.8 Decontamination Procedures

Per Section 5.5.2.8 of the FWSAP, equipment used to drill boreholes and collect soil samples during the investigation will be decontaminated within a temporary decontamination pad constructed at the AOC. The decontamination pad will be designed so that all decontamination liquids are contained from the surrounding environment and can be recovered for disposal as IDW. Drilling equipment will be decontaminated after each borehole is completed. The decontamination procedure for drilling equipment is as follows:

1. Remove caked soil material from the exterior of the augers and cutting heads using a rod and/or brush.
2. Steam clean the equipment interior and exterior with approved water using a brush where steam cleaning is not sufficient to remove all soil material.
3. Rinse thoroughly with approved potable water.
4. Allow equipment to air dry as long as possible.
5. Place equipment on clean plastic if it will be used immediately or wrap in plastic to prevent contamination if storage is required.

Non-dedicated sampling equipment will be decontaminated after each use during borehole interval sampling. The procedure for decontamination of sampling equipment will be as follows:

1. Wash with approved water and phosphate-free detergent using brushes required to remove particulate matter and surface films.
2. Rinse thoroughly with approved potable water.
3. If analyzing for metals and expecting high levels of contamination, rinse thoroughly with hydrochloric acid (2% solution) or nitric acid (10% solution).
4. Rinse thoroughly with ASTM Type I or equivalent deionized/distilled water with analytical certification.
5. If analyzing for organics and expecting high levels of contamination, rinse thoroughly with solvent-pesticide grade isopropanol, acetone, or methanol, depending on analytes of interest.
6. Rinse thoroughly with ASTM Type I or equivalent deionized/distilled water with analytical certification.
7. Allow equipment to air dry as long as possible.

8. Place equipment on clean plastic if immediate use is anticipated or wrap in aluminum foil to prevent contamination if storage is required.

A final decontamination inspection of any equipment leaving former RVAAP at the end of field activities will be conducted to ensure proper decontamination.

4.5.9 Borehole Abandonment

All discrete subsurface boreholes completed using direct-push technology or hollow-stem augers completed above bedrock will be backfilled with U.S. Army-approved bentonite chips at the completion of sampling activities (Figure 5-3 of the FWSAP) according to the requirements in Section 5.5.2.9 of the FWSAP. Bentonite chips are used because of their ability to fall through the water column if encountered at a borehole. Bentonite chips will be added through the augers or dual tube as they are removed to prevent bridging within the borehole. Care will be taken to ensure that bridging does not occur in any soil boreholes by tamping and thoroughly hydrating the chips with an USACE-approved water source every 5 feet until the boring is filled. The top 0.076 m (0.25 feet) of each boring will be covered lightly with surrounding soil.

4.5.10 Site Survey

Upon completion of the soil sampling, a surveyor will determine the locations of the individual borings used to collect the soil samples, similar to wells as described in Section 4.4.4.6. All coordinates and elevations will be recorded on the boring logs upon receipt of quality assured survey results.

4.6 Surface Soil and Sediment Sampling

Worksheets #17 and #18 of the UFP-QAPP describe the proposed surface soil and sediment sampling.

4.7 Surface Water

Not anticipated.

4.8 Other Matrices

Not anticipated.

4.9 Munitions and Explosives of Concern Avoidance

Not anticipated.

5.0 SAMPLE CHAIN OF CUSTODY / DOCUMENTATION

5.1 Field Logbook

All information pertinent to on-site environmental task activities, including field instrument calibration data, will be recorded in field logbooks or on field forms. A typed, formatted blank boring log will be prepared in accordance with Section 6.1 of the FWSAP before sampling begins.

All logbooks or field forms will be completed in accordance with instruction defined in Appendix F of the *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001). The logbooks will be bound and the pages will be consecutively numbered. Field forms, which are a project-specific collection of forms, will be bound by a three-ring binder, comb-binding, or equivalent or contained in electronic format (i.e., field sheet on a tablet computer) and will capture specific field data, similarly to a field logbook. Logbooks and field forms should be produced on waterproof paper when possible. Entries in the logbooks or forms will be made in black waterproof ink and must be clear, objective, and legible. Entries will include, at a minimum, a description of each day's activities, individuals involved in environmental task activities, date and time of drilling or sampling, weather conditions, any problems encountered, significant events, and all field measurements. Dates are recorded in the month/date/year format; time is recorded in the 24-hour military clock format. Changes will be made by striking through the original entry in a manner that does not obliterate the original entry. The person making the change will initial and date the change.

Calibration logs will include instrument name, serial number, calibration data, and date of calibration. Lot numbers, manufacturer name, and expiration dates of standard solutions used for field instrument calibration also will be recorded. Examples of an equipment calibration log and a calibration standards log are illustrated in Attachment A-1.

Sufficient information will be recorded in the logbooks to permit reconstruction of all environmental task activities conducted. Information recorded on other project documents (e.g., boring logs, well construction diagrams, well development records, electronic records) will not be repeated in the logbooks except in summary form where determined necessary. All field logbooks will be kept in the possession of field personnel responsible for completing the logbooks, or in a secure place when not being used during fieldwork. All electronic forms of data collection will be backed-up a minimum of once per day. All logbooks will have a distinct project identification number and an inventory will be maintained. Upon completion of the field activities, all logbooks will become part of the project evidence file. The title page of each logbook will be labeled with the following information:

- Logbook title;
- Project name;
- Logbook inventory identification number;
- USACE, Louisville District/other U.S. Army contract number and project delivery order number;
- Start date for field activities; and
- End date for field activities.

Logbook and field form entries will be a compilation of relevant, factual events as they occur. Entries recorded in logbooks can include, but not be limited to, the following information:

- Name and title of author, date, and times of arrival at and departure from the work site;
- Purpose of the drilling, sampling and/or remedial activity;
- Name and contact information of the field manager;
- Names and responsibilities of field crew members;
- Names and titles of any visitors;
- Weather and site conditions;
- Field observations;
- Sample collection or task accomplishment method;
- Amount of materials used or removed;
- Number and volume of sample(s) collected;
- Sample identification number(s);
- Date and time of sample collection, and name of collector;
- Sampling type and methodology;
- Sample preservation methods;
- Details of the sampling location, including a sketch map illustrating the sampling location;
- Location, description, and log of sampling point photographs;
- References for all maps and photographs of the sampling site(s);
- Information regarding drilling decisions not recorded on the boring log;
- Types of field instruments used and the purpose of use, including calibration methods and results;
- Any field measurements made (e.g., pH, conductivity, and static water level);
- Sample documentation information, including
  - Chain of Custody record numbers; and
  - Number of shipping containers packaged (including contained chain-of-custody records) and the shipping method employed (noting applicable tracking numbers).
- Sample distribution and transportation (e.g., name and address of the laboratory and courier);
- Name and address of the U.S. Army QA laboratory for the project and the associated project Laboratory Information Management System (LIMS) number, where applicable;
- Information from containers, labels of reagents used, deionized and organic-free water used;
- Decontamination procedures;

- Type, matrix, and containerization method for IDW generated;
- IDW documentation information, including:
  - Types of containers/drums;
  - Contents, type, and approximate volume of waste;
  - Type of contamination and predicted level of contamination based on available information (i.e., generator knowledge);
  - Weekly visual inspection information.
- Summary of daily task (including costs where appropriate) and documentation on any cost or scope or work changes required by field conditions;
- Information regarding sampling changes, scheduling modifications, and change orders;
- Information regarding access agreements, if applicable;
- Signature and date of personnel responsible for recorded observations; and
- Signature and date of personnel responsible for verifying the QC review of the logbook and/or field form, including but not limited to, accuracy, completeness, legibility, consistency, and clarity.

5.2 Photographs

Information regarding the documentation of photographs for the investigation is presented in Section 5.4.2.4.2 of the FWSAP. Representative photographs will be taken of the investigative activities and any significant observations made during the field effort.

5.3 Sample Numbering System

The sampling numbering for this project was prepared in accordance with Section 6.3 of the FWSAP and in coordination with the REIMS administrator. Following the guidance, a unique sample numbering scheme will be used to identify each sample designated for laboratory analysis. The purpose of this numbering scheme is to provide a tracking system for the retrieval of analytical and field data for each sample. Sample identification numbers will be used on all sample labels or tags, field data sheets and/or logbooks, chain-of-custody forms, and all other applicable documentation used during the investigation. A listing of all sample identification numbers will be maintained in the field logbook.

The sample numbering scheme used for field samples also will be used for duplicate samples so that the sample type will not be discernible by the laboratory. However, other types of field QC samples (e.g., equipment rinsate, trip blank) will be numbered so that they can be readily identified from other sample types. The USACE, Louisville District location/sample identification naming conventions will be used for all investigations. Figure 6-3 of the FWSAP summarizes these naming conventions. Follow-up sampling at a given AOC will begin with sample numbers that follow the last number in the sequence from the initial phase of work. If a sample is not collected or is re-assigned to a different location, a specific reason and notation will be noted in the project field logbook.

5.4 Sample Documentation

5.4.1 Sample Labels

All sample labels, logbook, field records, and field form information will follow structures identified in Section 6.0 of the FWSAP. All sample containers provided by the contracted analytical laboratory for use during the investigation will be shipped with sample labels pre-affixed to the containers, or the labels will be affixed to the bottles upon delivery to the investigation area (FWSAP Figure 6-4). Information will be recorded on each sample container label at the time of sample collection. Sample labels will be completed with black indelible ink. However, if pre-printed labels are used, only field-specific information not already on the labels will be recorded at the time of sample collection. After labeling, if waterproof labels are not used, the label should be covered with wide clear tape to preserve the label during shipment. Labels and tape should not be affixed over the lid seal of VOC containers but should be affixed solely to the sample container. The information to be recorded on the labels will be as follows:

- Contractor name;
- Project name/sampling activity name;
- Sample identification number;
- Sample type (e.g. discrete or grab);
- Sample media;
- AOC name and/or sampling station number;
- Analysis to be performed;
- Associated sample methods;
- Volume of containers;
- Type of containers;
- Type of chemical preservative present in container;
- Destination laboratory name;
- Date and time of sample collection;
- Comments and special precautions; and
- Sampler(s) name and initials.

5.4.2 Sample Analysis Request Form

A separate sample analysis request form will not be used. Sample analysis request information will be recorded on a single combination analysis request and chain-of-custody form, which is discussed below.

5.4.3 Chain-Of-Custody Records

Camp Ravenna will use USEPA Region 5 chain-of-custody protocols for the environmental sampling activities as described in the *Manual of Custody and Non-Custody Sample Handling Procedures* (USEPA, 1978) and chain-of-custody form instructions defined in Appendix F of the *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001). Chain-of-custody procedures implemented for the investigations will be in three parts: documenting the handling of each sample from the time of collection, through completion of laboratory analysis, and delivery of final evidence files. The chain-of-custody form serves as a legal record of sample possession and uses a unique number printed or entered on the chain-of-custody form to identify the record. A sample or evidence file is considered to be under custody if when it is:

- In the sampler's physical possession;
- In the sampler's view after being in possession;
- In the sampler's possession and then was secured so any tampering can be detected; or
- In a designated secure area.

Custody will be documented throughout the investigation field sampling activities by the chain-of-custody form initiated for each day during which samples are collected. This chain-of-custody will accompany the samples from the AOC to the laboratory and will be returned to the Contractor Laboratory Coordinator with the final analytical report. The field sampler is responsible for the care and custody of the samples until they are transferred or properly dispatched. All personnel with sample custody responsibilities will be required to sign, date, and note the time on the chain-of-custody form in indelible ink when relinquishing samples from their immediate custody (except in the cases where samples are placed into designated secure areas for temporary storage before shipment). As few people as possible should handle the samples. All shipments will be accompanied by the chain-of-custody form identifying the contents. The original record will accompany the shipment and copies will be retained by the sampler for return to project management and the project file. Bills of lading or airbills will be used as custody documentation during times when the samples are being shipped from the AOC to the laboratory and they will be retained as part of the permanent sample custody documentation. Whenever co-located or split samples are collected for comparison analysis by the U.S. Army QA Laboratory or a government agency, a separate chain-of-custody form will be prepared for those samples and marked to indicate with whom the samples are being split.

Chain-of-custody forms will be used to document the integrity of all samples collected. To maintain a record of sample collection and transfer between personnel, shipment, and receipt by the laboratory, Chain-of-custody forms will be filled out for sample sets as determined appropriate during the course of fieldwork. An example of the chain-of-custody form used for the investigation is illustrated in Attachment A-1.

The following information will be recorded on all chain-of-custody forms:

- Project name (and USACE delivery order number);

- Name of Contractor;
- Name of Contractor PM contact information;
- Sample number (for each sample in shipment);
- Sample station (for each sample in shipment);
- Collection date and time (for each sample in shipment);
- Number of containers for each sample;
- Sample description (i.e., environmental medium);
- Sample type (discrete);
- Analyses required for each sample;
- Sample methods;
- Sample preservation technique(s);
- Chain-of-custody or shipment number;
- USACE LIMS number (only on chain-of-custody records for U.S. Army QA sample shipments);
- Shipping address of the laboratory;
- Name of subcontractor laboratory QA/QC manager and contact information;
- Date, time, method of shipment, courier, and airbill number; and
- A space to be signed as custody is transferred between individuals.

The individual shipping the samples from the field to the laboratory is responsible for completing the chain-of-custody form and noting the date and time of shipment. A field sampling team member or project QA/QC manager will also inspect the form for completeness and accuracy. In addition, this individual determines the shipping classification for samples under United States Department of Transportation (DOT) HM126F, *49 Code of Federal Regulations* (CFR), Subtitle B, Chapter 1, Subchapter C, Hazardous Materials Regulations, and International Air Transport Association (IATA) dangerous goods regulations. After the form has been inspected and determined to be satisfactorily complete, the responsible individual signs, dates, and notes the time of transfer to the approved shipping company on the form. If samples are shipped to a laboratory in the local area, samples just collected and stored on ice may not have sufficient time to cool to the required temperature of 4°C (±2°C). The responsible individual will make note of this on the chain-of-custody form. The chain-of-custody form then is placed in a sealable plastic bag and placed inside the cooler used for sample transport after the field copy of the form has been detached. If a local courier service is used, the documentation can be given to the courier directly. The field copy of the form will be appropriately filed and kept at Camp Ravenna for the duration of the AOC activities.

In addition to the chain-of-custody form, custody seals will be placed on each cooler used for sample transport. These seals consist of a tamper-proof adhesive material placed across the lid and body of the coolers in such a manner that if the cooler is opened, the seals will be broken. The custody seals ensure no sample tampering occurs between the time the samples are placed into the coolers and the time the coolers are opened for analysis at the laboratory. Cooler custody seals are signed and dated by the individual responsible for completing the chain-of-custody form contained within the cooler. The signature and date are written on both the cooler lid and cooler body portions of the seals.

5.4.4 Receipt of Sample Forms

The contracted laboratory documents the receipt of environmental samples by accepting custody of the samples from the approved shipping company. This receipt is documented under the received by block on the chain-of-custody. In addition, the contracted laboratory documents the condition of the environmental samples upon receipt as outlined in the FWSAP, Section 7.0. Sample receipt(s), including received chain-of-custody, sample cooler receipt form, and sample login information, is transmitted to the PM.

5.5 Documentation Procedures

Documentation and tracking of samples and field information used to document all samples collected during the investigation will follow the series of steps identified in Section 6.5 of the FWSAP and listed below:

1. Collect and place the samples into laboratory sample containers as defined in FWSAP Section 5.0.
2. Complete the sample container label information as defined in FWSAP Section 6.4.1.
3. Place the sample containers into an ice-filled cooler as specified by the sample method.
4. Complete sample documentation information in the field logbook as defined in FWSAP Section 6.1.
5. Complete the project and sampling information sections of the chain-of-custody form(s) for all samples to be transported in a single cooler, as defined in FWSAP Section 6.4.3.
6. Complete the airbill for the cooler to be shipped (if necessary).
7. Perform a completeness and accuracy check of the chain-of-custody form(s).
8. Complete the sample relinquishment section of the chain-of-custody form(s), as defined in FWSAP Section 6.4.3, and place the form(s) into the cooler.
9. Place seals on the exterior of the cooler as defined in FWSAP Section 6.4.3.
10. Pack and ship the cooler to the laboratory as defined in FWSAP Section 7.0.
11. Laboratory receives the cooler, inspects the contents, and records the sample receipt information of the contained chain-of-custody form(s) and cooler receipt form(s) as defined in FWSAP Sections 6.4.4 and 7.0. Each cooler must have a separate cooler receipt form.
12. Transmit the original chain-of-custody form(s) with the final analytical results from the laboratory.

5.6 Corrections to Documentation

Any corrections to documentation will follow guidance established in Section 6.6 of the FWSAP. All original information and data in field logbooks, on sample labels, on chain-of-custody forms, and on any other project-related documentation are recorded in black waterproof ink and in a completely legible manner. Errors in any document are corrected by crossing out the error and entering the correct information or data. Any error discovered in a document is corrected in the field by the individual responsible for the entry. Erroneous information or data are corrected in a manner that will not obliterate the original entry, and all corrections are initialed and dated by the individual responsible for the entry.

5.7 Monthly Reports

Parsons will submit monthly progress reports to the USACE by the fifth (5) day of the month in accordance with the Ohio EPA Findings Orders (Ohio EPA, 2004). The reports will have content similar to that specified in Section 6.7 of the FWSAP. An example of Parsons Monthly Report is provided in the Project Management Plan (PMP, Parsons, 2016). The Monthly Reports will document AOC identification and activities, status, percent complete, data collected to date (excluding analytical results), summary of the IDW generated and disposed during the month, difficulties encountered, corrective actions, and planned activities.

5.8 Submittal of Information

All information including, but not limited to, sample numbers, collection time and date, borehole and well depths, water level, and water quality measurements will be submitted in electronic format for entry into REIMS per procedures outlined in Section 10.3 of the FWQAPP, Electronic Data Deliverable File Specifications.

6.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

Sampling packaging and shipping will follow Section 7.0 of the FWSAP (SAIC, 2011). Sample containers must be packaged according to requirements for preservation in transit to laboratories. Samples requiring cooling are packaged in thermally insulated rigid-body coolers. Samples not requiring cooling (i.e., geotechnical soil samples) are packaged in heavy cardboard shipping boxes. Environmental, QA, and QC samples collected during the project are shipped within their hold time to the laboratory. During the time period between collection and shipment, all samples are stored in ice-filled coolers or refrigerators and maintained in a secure area. Sample packaging, labeling, and shipping are conducted in accordance with applicable DOT (49 CFR)/International Air Transport Associateion (IATA) dangerous goods specifications and completed in accordance with instructions defined in Appendix F of the *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001). Packaging and shipping procedures for environmental samples collected during the investigation are as follows:

- Identify all sample containers with sample labels placed onto each container. Clearly label all samples with waterproof ink.
- Verify that sample containers are the appropriate type and volume and are properly preserved.
- Match sample containers with the information on the chain-of-custody.
- Clean the exterior of all sample containers, if necessary.
- Ensure all bottles are properly sealed with lids tightened. If unsure about lid integrity, tape bottles, except those containing samples designated for volatile organic analyses, with electrical tape.
- Place all glass sample bottles in bubble wrap sleeves or Styrofoam forms.
- Place each sample bottle into a separate plastic bag that will then be sealed. For groundwater samples, place each vial for an individual sample into the same plastic bag. Wrap trip blank containers and place them in the cooler with the VOC vials. Squeeze as much air as possible from the sample container bags before sealing.
- Tape the cooler drain plug shut from both the inside and outside before placing the samples into a rigid-body cooler. Line the cooler with a large plastic bag; cushioning packing material is preferred.
- Place all of the sample containers upright in the shipping coolers inside a large plastic bag along with sufficient ice to maintain a temperature of 4°C ±2°C, which will be placed around, among, below, and on top of the sample containers. Include a temperature blank in each cooler.
- Ensure a trip blank is included in each cooler containing environmental samples for VOC analysis, beginning when the environmental samples are placed in the cooler for storage and/or shipment.
- Place additional inert packing material into the cooler, if required, to prevent shifting of the sample containers during transport.

- Place all required laboratory paperwork, including the chain-of-custody form(s), inside a plastic bag and tape it to the inside of the cooler lid.
- To complete the packing process, seal the cooler liner, close the cooler lid, and place two signed/dated custody seals on the cooler – one across the front and one across the side.
- Place arrows on each cooler indicating which end is up.
- Seal rigid-body coolers with strapping tape applied directly to the cooler body. Duct tape may be used around the seam of the cooler if shipping via a commercial carrier.
- Complete the airbill, if required for the shipment, and attach it to the top of the shipping box/cooler, which then will be transferred to the courier or commercial carrier for delivery to the laboratory. Verify the airbill contains accurate information prior to shipment.
- All coolers containing investigation samples will be shipped overnight to the laboratory by Federal Express or a similar courier.

Failure to properly handle, document, or ship the project samples as detailed could jeopardize the usability of the sample results and ultimately the project objectives.

Environmental samples should not be shipped as a hazardous material or a dangerous good unless they are known or expected to present a hazard as specified in one of the nine DOT hazard classes. Using an USEPA method to preserve a water sample does not make the sample a hazardous material (DOT, 2003). In addition to standard shipping requirements and packaging and shipping procedures, hazardous samples collected during the investigation require the following:

- Each bagged sample bottle is placed upright into a separate paint-type can, the can filled with vermiculite or a similar packing material, and the lid secured to the can. The lid is sealed with metal clips or with strapping tape.
- Arrows are placed on each can indicating which end is up.
- The outside of each can is labeled with the proper DOT shipping name and identification number for the sample. This information is recorded on a sticker affixed to the can or printed legibly directly on the can.
- The cans containing samples are placed upright in a rigid-body cooler that has had its drain plug taped shut inside and out and has been lined with a large plastic bag. Vermiculite or a similar packing material is placed into the bottom of the cooler.
- All hazardous samples are shipped to the laboratory on ice, which will be contained in double plastic bags placed around, among, and on top of the sample container cans.
- Additional inert packing material is placed around and on top of cans in the cooler to prevent shifting during transport. After this material is added, the plastic liner inside the cooler is taped shut.
- Emergency response information must accompany hazardous materials shipments. This requirement is met by providing the carrier with Safety Data Sheets or by entering the Emergency Response Guidebook guide numbers on the shipping paper.

- The following markings are placed on the top of the cooler:
  - Proper shipping name;
  - DOT identification number;
  - Shipper's or consignee's name and address; and
  - "This End Up" legibly written if the shipment contains hazardous liquid materials.
- The following labels are placed on the top of the cooler:
  - Appropriate hazard class label (placed next to the proper shipping name); and
  - "Cargo Aircraft Only," if applicable.
- The airbill, if necessary for the shipment, is completed and attached to the top of the cooler, which then is transferred to the courier for delivery to the laboratory. Restricted-article airbills are used for the shipment, and the "Shipper Declaration for Dangerous Goods" section of the airbill is properly completed.

The contracted laboratory and USACE QA laboratory will document the condition of the environmental samples upon receipt at the laboratory. This is commonly completed on a "Condition Upon Receipt" form. The Condition Upon Receipt form or cooler receipt checklist will be provided to the Contractor Laboratory QA/QC Manager within 24 hours of sample receipt and should be included as part of the final laboratory deliverable. Both Parsons and USACE QA laboratories are responsible for the final disposition of environmental samples, including proper handling and disposal.

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7.0 INVESTIGATION-DERIVED WASTE

During the performance of field activities at Camp Ravenna, IDW will be properly handled, labeled, characterized, and managed in accordance with Section 8.0 of the FWSAP (SAIC 2011), Resouce Conservation and Recovery Act (RCRA), and the May 2016 Camp Ravenna Waste Management Guidelines (see Appendix D, WMP). All waste disposal, other than municipal refuse, will be coordinated with the OHARNG/ARNG and USACE.

IDW includes all materials generated during performance of an investigation that cannot be effectively reused, recycled, or decontaminated in the field. IDW consists of materials that could potentially pose a risk to human health and the environment (e.g., sampling and decontamination wastes) and materials that pose no risk to human health and the environment (e.g., miscellaneous trash). The types of IDW anticipated to be generated during the field activities are: auger cuttings, soils from monitoring well installation, monitoring well purge water, residual sample material, personal protective equipment (PPE), disposable sampling equipment, decontamination fluids, and non-contaminated compactable and miscellaneous trash. All IDW will be collected, containerized, sampled, and staged at Building 1036 on secondary containment. All IDW waste will be sampled in accordance with the FWSAP (SAIC 2011). At the conclusion of field activities for the project, an IDW letter report will be submitted to the OHARNG/ARNG and USACE documenting the characterization and classification of the wastes. Upon approval of the IDW report, all solid and liquid IDW will be removed from the site and properly disposed. All shipments of IDW off-site will be coordinated through the OHARNG/ARNG.

7.1 Investigation-Derived Waste

This section is prepared in accordance with Section 8.1 of the FWSAP. All indigenous solid IDW will be contained in labeled, DOT-approved, open-top 55-gallon [gal] drums and sealed with bung-top lids.

All liquid indigenous IDW will be collected either in labeled, DOT-approved, new 55-gal closed-top drums or in labeled polyethylene storage tanks.

All solid non-indigenous (e.g., expendable sampling equipment, PPE, and trash) IDW will be segregated as non-contaminated and potentially contaminated material. Potentially contaminated and non-contaminated solid non-indigenous IDW will be identified in the field based on visual inspection (e.g., stained versus non-stained), usage of the waste material (e.g., outer sampling gloves versus glove liners), and field screening of the material using available field instrumentation (e.g., PID). All non-contaminated non-indigenous IDW will be contained in trash bags with potentially contaminated non-indigenous IDW being additionally contained in labeled, DOT-approved, open-top 55-gal drums equipped with plastic drum liners and sealed with bung-top lids.

All liquid non-indigenous (decontamination rinse water) IDW will be segregated by waste stream (e.g., soap and water/water rinses from alcohol rinses [e.g., methanol or isopropanol] and acid rinses [e.g., hydrochloric or nitric acid]) and contained in either labeled, DOT-approved, 55-gal closed-top drums or in approved polyethylene storage containers. All known potentially hazardous liquid non-indigenous IDW streams, such as methanol, hydrochloric acid rinses, and acetone waste from field laboratories, will be contained separately in labeled, DOT-approved closed-top drums. Listed hazardous waste streams (i.e., methanol) must be disposed of as hazardous waste and will not be combined or diluted with non-hazardous waste streams.

7.2 Waste Container Labeling

All containers, including empty ones, must be properly labeled. All waste storage containers (e.g. drums and polytanks) will be labeled immediately before and continuously during their use to ensure proper management of the contained wastes. All labels will be weather-resistant, commercially available labels. Two labels will be affixed and located on opposite sides on the upper one-third of each storage container. Labels will be legibly completed using indelible ink. The drum number will be legibly recorded directly on a clean dry drum surface on the top and upper one-third of each storage container using an indelible paint marker. Additional label information may be recorded directly on a clean dry drum surface.

An example of the waste storage container label is shown in Attachment A-1. The following procedure will be used for waste container labeling:

- Place each label on a smooth part of the container and do not affix it across drum bungs, seams, ridges, or dents.
- Upon use of a container, replace the empty label with a drum label filled out with the information listed below.
- When sampling each container per the procedures outlined in Section 8.4 of the FWSAP, affix an appropriate pending analysis label to the container.
- When classifying the IDW based on analytical results, affix the appropriate hazardous or non-hazardous label to the drum.
- Record the following information on each label:
  - Contractor-assigned container number;
  - Contents;
  - Source of waste;
  - Source location (if applicable);
  - Project name and AOC identification;
  - Physical characteristic of the waste;
  - Generation date(s);
  - Address of waste generation;
  - Satellite or 90-day accumulation container; and
  - Contact information for a contractor contact and the ARNG/OHARNG.
- Record all information on container labels with indelible ink (permanent marker or paint pen) and record necessary information in a field logbook or on an appropriate field form.
- Protect all container labels so that damage or degradation of the recorded information is prevented.
- Drum labels will be photographed when affixed to the container. Photographs will be provided to the RVAAP Operating Contractor. New photographs will be collected whenever drum status is updated (i.e. pending analysis, final classification).

- All IDW must be tracked on a container log for each container. Additionally waste must be inspected on a weekly basis (with inspections submitted to the OHARNG representative) using the inspection form provided with the May 2016 Camp Ravenna Waste Management Guidelines.

7.3 Investigation-Derived Waste Field Staging

Nonhazardous IDW will be stored onsite, at Building 1036 pending analysis and disposal. Liquid waste, whether drums or poly tanks, will be stored within secondary containment. In the unlikely event that hazardous waste is generated, it will be stored at Building 1047.

7.4 Investigation-Derived Waste Characterization and Classification for Disposal

Liquid and soil IDW will be analyzed for the following (as applicable to the waste stream):

- Toxicity Characteristic Leaching Procedure (TCLP) VOCs;
- TCLP semi-volatile organic compounds (SVOCs);
- TCLP metals;
- TCLP herbicides;
- TCLP pesticides;
- Total sulfide;
- Total cyanide;
- Reactivity;
- Corrosivity (pH); and
- Flashpoint.

Specific bottle ware, preservatives, holding times, and analytical methods for IDW analysis are presented in Worksheet #19 of the UFP-QAPP.

Analytical results from the subcontracted laboratory will be reviewed to determine if any potentially hazardous wastes exist. This review includes a comparison of the TCLP criteria against the liquid analytical results and the leachate concentrations for soil (i.e., TCLP Preparation Method 1311). Analytical results for TCLP analysis will be compared to Table 8-1 of the FWSAP, and non-TCLP analysis will be compared to Table 8-2 of the FWSAP, to determine if the IDW is classified as hazardous or non-hazardous.

After all analytical results have been received for each investigation and prior to the disposal of any waste, an IDW Report will be prepared and will include:

- An inventory of all stored IDW.
- The analytical results and IDW characterization.
- Recommendations for the disposal of all IDW Report will be submitted to the ARNG/OHARNG and, upon approval, implemented. A copy of the approved IDW Report will be included in the corresponding analytical reports.

7.5 Investigation-Derived Waste Disposal

In accordance with the Camp Ravenna Waste Management Guidelines (OHARNG, 2016) (Attachment D-1 of the Waste Management Plan), should a waste be determined to be hazardous, "Contractors are required to utilize hazardous waste haulers and Treatment, Storage, and Disposal Facilities (TSDF) on the latest Defense Reutilization Marketing Office approved list." The current qualified waste hauler and TSDF list can be viewed by following the "Qualified Facilities" and "Qualified Transporters" links found on the Defense Logistics Agency (DLA) Hazardous Waste Disposal Homepage, http://www.dispositionservices.dla.mil/newenv/hwdisposal.shtml.

If the waste is non-hazardous, a waste hauler/recycler will be identified and submitted to the ARNG/OHARNG for approval and a recommendation for disposal or recycling will be made.

For Hazardous or Non-Hazardous manifests, the following must be included:

- Restoration Program waste Site Name = Former Ravenna Army Ammunition Plant. Mailing address is Camp Ravenna ENV, 1438 State Route 534 SW, Newton Falls, Ohio 44444. Site address: 8451 State Route 5, Ravenna, Ohio 44266, (614) 336-6136. Ohio EPA ID # – OH5210020736.
- Contractor's shipping Hazardous Waste must provide a Land Disposal Restriction form in accordance with 40 CFR Part 268.
- Profiling:
    - The required shipping documentation (i.e., waste profile and summary of lab reports (IDW Report)) need to be submitted to appropriate Camp Ravenna point of contact (POC) or designee(s) for approval and signature prior to shipping.
- Results of characterization must be submitted to appropriate Camp Ravenna POC within 30 days after collecting the sample.
- Manifests - Hazardous and Non-Hazardous:
    - The waste carrier/transporter provides appropriate manifest to the Contractor.
    - The Contractor is required to:
        a. Ensure that Camp Ravenna POC or designee(s) is available to sign the manifest on the scheduled day of shipment;
        b. Verify that each manifest is properly completed and signed by Camp Ravenna POC or designee(s);
        c. Provide the Generator copy of the manifest to Camp Ravenna POC or designee(s); and
        d. Ensure that the original Generator copy of the manifest signed by the TSD facility is returned to Camp Ravenna within 30 days of the shipping date for Hazardous and Non-Hazardous Waste.
        e. The use of a Bill of Lading, in lieu of a waste manifest, must be approved by the Camp Ravenna Environmental Office.

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ATTACHMENT A-1 FIELD FORMS

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BENTONITE APPROVAL

Project for intended use:

Bentonite Material Brand Name:

Annular seal:

Grout additive:

Manufacturer:

Manufacturer’s Address

Manufacturer’s Telephone Number(s):

Product Description:

Intended Use of Product:

Potential Effects on Subsequent Chemical Analyses:

SUBMITTED BY:

Company:

Person:

Telephone Number:

Date

FOR APPROVAL (A)/DISAPPROVAL (D)	(circle one)	
Project Officer/Date	A	D
Project Geologist/Date:	A	D
U.S. Army Project Manager/Date:	A	D

Figure 5-3. Bentonite Description and Approval Form

CATEGORY 1 CALIBRATION STANDARDS LOG

PROJECT NAME:				DELIVERY ORDER NO:	
INCLUSIVE DATES FOR CALIBRATION MATERIAL USAGE	INSTRUMENT DESCRIPTION	CALIBRATION MATERIAL *	Psi/BOTTLE	NIST # LOT # AND MANUFACTURER	PERSON (INITIALS)
Start: Finish					
Start: Finish					
Start: Finish					
Start: Finish					
Start: Finish					
Start: Finish					
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Figure 6-2. Calibration Standards Logs

Figure 5-1. Drill Rig Operational Checklist for RVAAP AOC-Specific Investigations
(pg 1 of 4)

DRILL RIG OPERATIONAL CHECKLIST

Site Name:____________________________

Rig
Model: ____________________________ Manufacturer:____________________________________

Serial Number: ______________________ Rig Owner: ____________________________________

All of the below items have been inspected and are in proper working condition prior to beginning work. Any deficiencies noted have been corrected prior to beginning work.

Contractor Rig Inspector/Field Manager:

____

(Print Name) (Signature) (Date)

Drilling Subcontractor Supervisor:

____

(Print Name) (Signature) (Date)

Place an X in each appropriate ( )

1.0 GENERAL

1.1 Check all safety devices which are part of drill rig and which can be verified (see note).
Is (are all) device(s) intact and operating as designed?

Emergency Interrupt System

A.	Kill Switch 1	Yes ( ) No ( ) NA ( )
B.	Kill Switch 2	Yes ( ) No ( ) NA ( )
C.	Kill Switch 3	Yes ( ) No ( ) NA ( )
D.	Kill Switch 4	Yes ( ) No ( ) NA ( )
E.	Kill Switch 5	Yes ( ) No ( ) NA ( )
F.	Other __________________________	Yes ( ) No ( ) NA ( )
G.	Other __________________________	Yes ( ) No ( ) NA ( )
H.	Other __________________________	Yes ( ) No ( ) NA ( )

Note: All safety devices (not otherwise listed in this checklist) should be identified for each drill rig at the beginning of each project and subsequently checked at each inspection. Testing of all safety devices must be observed by health and safety personnel. List only safety devices which can be checked without disassembly or without rendering the device ineffective. This checklist does not cover United States Department of Transportation requirements.

1.2	Is the proper type and capacity of fire extinguisher(s) present, properly charged, and inspected?	Yes ( ) No ( ) NA ( )
1.3	Are all drilling rods and downhole equipment free of burs and in good condition?	Yes ( ) No ( ) NA ( )
1.4	Are rig and mast a safe distance from electrical lines?	Yes ( ) No ( ) NA ( )
1.5	Can mast be raised without encountering overhead obstructions?	Yes ( ) No ( ) NA ( )
1.6	Have spill prevention materials been placed under rig (e.g., plastic sheeting)?	Yes ( ) No ( ) NA ( )
1.7	Is a spill kit present?	Yes ( ) No ( ) NA ( )
1.8	Is the safe operating zone/exclusion zone posted (minimum radius at least equal to height of raised drill mast)?	Yes ( ) No ( ) NA ( )
1.9	Do all modifications made to the drill rig permit it to operate in a safe manner and allow the drill to operate within the manufacturer's specifications?	Yes ( ) No ( ) NA ( )
1.10	Are moving parts (excluding cathead and other moving parts normally used during operations) properly guarded?	Yes ( ) No ( ) NA ( )
1.11	Are all exhaust pipes, which would come in contact with personnel during normal operation properly guarded?	Yes ( ) No ( ) NA ( )
1.12	Are tank(s) and lines free of leakage?	Yes ( ) No ( ) NA ( )
1.13	Are all normal or manufacturer-recommended maintenance activities or schedules performed at the required frequency?	Yes ( ) No ( ) NA ( )
1.14	Are walking and standing surfaces, steps, and rungs, free of excess grease, oil, or mud which could create a hazard?	Yes ( ) No ( ) NA ( )
1.15	Is the derrick raise/lower alarm working properly?	Yes ( ) No ( ) NA ( )
1.16	Is all downhole equipment clean and free of oil and dirt?	Yes ( ) No ( ) NA ( )
2.0	**CONTROL MECHANISMS**	
	Are all control mechanisms and gauges on the drill rig functional and free of oil, grease, and ice (checked while running)?	Yes ( ) No ( ) NA ( )

Figure 5-1. Drill Rig Operational Checklist for RVAAP AOC-Specific Investigations (pg 2 of 4)

3.0 HYDRAULICS AND PNEUMATICS

Note: The mast should be lowered during the completion of this section to allow inspection of portions of the lifting mechanisms normally out of reach during operation.

3.1 Do all hydraulic reservoirs exhibit proper fluid levels? Yes ( ) No ( ) NA ( )

3.2 Are hydraulic and/or pneumatic systems in good condition free of leaks frays or other damage and functioning correctly (checked while running)? Yes ( ) No ( ) NA ( )

4.0 LIFTING MECHANISMS

Note: The mast should be lowered during the completion of this section to allow inspection of portions of the lifting mechanisms normally out of reach during operation.

4.1 Are all wires, ropes, cables, and lines in good condition and working properly? (Not kinked, worn, corroded, cracked, bent, crushed, frayed, stretched, birdcaged, or otherwise damaged) Yes ( ) No ( ) NA ( )

4.2 Have all wires, ropes, cables, and lines been wrapped around winch drums without excessive pinching or binding? Yes ( ) No ( ) NA ( )

4.3 Are all pulleys undamaged and functional? Yes ( ) No ( ) NA ( )

4.4 Are all clips, clamps, clevises, hooks, and other hardware used to rig wires, ropes, cables, or lines undamaged and attached properly? Yes ( ) No ( ) NA ( )

4.5 Do all eyes formed in wires, ropes, cables, or lines attached to the rig use a thimble to retain the shape of the eye? Yes ( ) No ( ) NA ( )

4.6 Do all hooks having functioning safety gates/latches? Yes ( ) No ( ) NA ( )

Figure 5-1. Drill Rig Operational Checklist for RVAAP AOC-Specific Investigations
(pg 3 of 4)

5.0 NONCONFORMING ITEMS

5.1 When did the last operation checklist inspection take place for this drill rig at this AOC?

Date: ____________________________

5.2 Have any nonconforming items been carried over from the last inspection? List any such items and dates or original nonconformance.

A. ____

Date: ____________________________

B. ____

Date: ____________________________

C. ____

Date: ____________________________

D. ____

Date: ____________________________

Any nonconforming items must be documented in the following remarks section and reported to the field operations manager for the project prior to operating the drill ring. Reference all remarks to the item numbers noted above.

Remarks:

____

____

____

____

Figure 5-1. Drill Rig Operational Checklist for RVAAP AOC-Specific Investigations
(pg 4 of 4)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER	
PROJECT	INSPECTOR
SHEET OF SHEETS	

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)

PROJECT	HOLE NO.

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

Figure 5-9. Engineer Form 5056A-R for Borehole Logging

HTRW DRILLING LOG

HTRW DRILLING LOG	DISTRICT	HOLE NUMBER
1. COMPANY NAME	2. DRILLING SUBCONTRACTOR	SHEET OF SHEETS

3. PROJECT	4. LOCATION
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED / 11. DATE COMPLETED
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS SCALE:

PROJECT	HOLE NO.

ENG FORM 5056-R, NOV 1998 (Proponent: CECW-EG)

Figure 5-8. Engineer Form 5056-R for Borehole Logging

EQUIPMENT CALIBRATION							
IDENTIFIER	DESCRIPTION	BACKGROUND READING	PRE	ADJUSTMENT (IF NEEDED)	POST	NAME	DATE

Figure 6-1. Equipment Calibration Log

Chain of Custody Record

COC No.:

Page ___ of ___ Date: mo/day/yr

Name: *[Contractor Name]*
Address: *[Contractor Street Address, City/State, ZIP]*
Phone Number: *[Contractor Contact Number]*
Project Manager: *[Contractor Project Manager/POC]*
Project Name:
Job/P.O. No.
Sampler (Signature) (Printed Name)

Requested Parameters

No. of Containers

Laboratory Name: *[Name]*
Address: *[Street Address, City, State, Zip]*
Phone: *[Lab POC/Sample Receiving]*
Fax: *[Lab]*
Contact: *[Lab Project Manager]*

OBSERVATIONS, COMMENTS SPECIAL INSTRUCTIONS

Laboratory No.	Site ID	Field Sample #	Site Type	Depth	Date	Time	Matrix

Relinquished by	Date	Received by	Date
Signature		Signature	
Printed Name	Time	Printed Name	Time
Company		Company	
Relinquished by	Date	Received by	Date
Signature		Signature	
Printed Name	Time	Printed Name	Time
Company		Company	

Total Number of Containers(this page):
Notes: Total:
Methods:
Matrices:

Total Number of Coolers:
Shipment Method:
Airbill No(s).:

Contractor Location
Street Address
City/State/Zip
Phone Number

White: Laboratory *Yellow: Field Project Manager*

Figure 6-5. Example of Chain of Custody Form

DATE ____________

DAY

S	M	T	W	T	F	S

DAILY QUALITY CONTROL REPORT

COE PROJECT MANAGER ____________

PROJECT ____________

JOB NO. ____________

CONTRACT NO. ____________

WEATHER	Bright Sun	Clear	Over-cast	Rain	Snow
TEMP	To 32	32-50	50-70	70-85	85 up
WIND	Still	Moder.	High	Report No.	
HUMIDITY	Dry	Moder.	Humid		

SUB-CONTRACTORS ON SITE:

EQUIUPMENT ON SITE:

WORK PERFORMED (INCLUDING SAMPLING):

Figure 10-1. Example of DCQCR to be Used for RVAAP AOC-Specific Investigations

PROJECT____________________ REPORT NO.____________________

JOB NO.____________________ DATE:____________________

QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS):

HEALTH AND SAFETY LEVELS AND ACTIVITIES:

PROBLEMS ENCOUNTERED/CORRECTIVE ACTION TAKEN:

SPECIAL NOTES:

TOMORROW'S EXPECTATIONS:

By:____________________
(Signature and date)

QA Check by:____________________
(Signature and date)

Figure 10-1. Example of DCQCR to be Used for RVAAP AOC-Specific Investigations (continued)

Field Change Request (FCR)

FCR NO.______________ DATE INITIATED________________

PROJECT____

CONTRACT NO.______________________________________

REQUESTOR IDENTIFICATION

NAME_____________________________________ ORGANIZATION___________________ PHONE___________________

TITLE_____________________________________ SIGNATURE____

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ○ Cost ○ Scope ○ Milestone ○ Method of Accomplishment

AFFECTED DOCUMENT (TITLE, NUMBER AND SECTION)______________________________________

DESCRIPTION OF CHANGE:

JUSTIFICATION:

IMPACT OF NOT IMPLEMENTING REQUEST:

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST:

COST ESTIMATE ($)____________ ESTIMATOR SIGNATURE____

PHONE__________________________ DATE______________________

PREVIOUS FCR AFFECTED ○ YES ○ NO; IF YES, FCR NO. ______________________

CLIENT PROJECT MANAGER ____ DATE______________

CLIENT QA SPECIALIST ____ DATE ____________________

SAIC H&S MANAGER SIGNATURE (IF APPLICABLE)____ DATE______________

Figure 11-1. Example of FCR to be Used for RVAAP AOC-Specific Investigations

NONCONFORMANCE REPORT	DATE OF NCR	NCR NUMBER
	LOCATION OF NONCONFORMANCE	PAGE ____ OF ____
INITIATOR (NAME/ORGANIZATION/PHONE)	FOUND BY	DATE FOUND
RESPONSIBLE ORGANIZATION/INDIVIDUAL		PROGRAM
		PROJECT

DESCRIPTION OF NONCONFORMANCE

CATEGORY: ____ ____ ____ ____ ____

A INITIATOR ______ DATE ______ QA/QC OFFICER ______ DATE ______ CAR REQ'D YES ☐ NO ☐

DISPOSITION:

PROBABLE CAUSE:

ACTIONS TAKEN TO PREVENT RECURRENCE:

B PROPOSED BY: ______ NAME ______ DATE

JUSTIFICATION FOR ACCEPTANCE

C INITIATOR: ______ NAME ______ DATE

VERIFICATION OF DISPOSITION AND CLOSURE APPROVAL

REINSPECTION/RETEST REQUIRED YES ☐ NO ☐ IF YES; ______ DATE ______ RESULT

D QUALITY ASSURANCE: ______ NAME ______ DATE

Figure 11-2. Example of NCR to be Used for RVAAP AOC-Specific Investigations

5.4.2.4.2 Photographs

For each photograph taken during the AOC-specific investigations, the following items will be noted in the field logbook:

- Date and time;
- Photographer (name and signature);
- Name of the AOC;
- General direction faced and description of the subject taken; and
- Sequential number of the photograph and the roll number.

While not required, it is recommended that all sampling points be documented via photographs. These photographs will include two or more permanent reference points to facilitate relocating the point at a later date. In addition to the information recorded in the field logbook, one or more site photograph reference maps will be prepared as required. An example of this map type is presented in Figure 5-11.

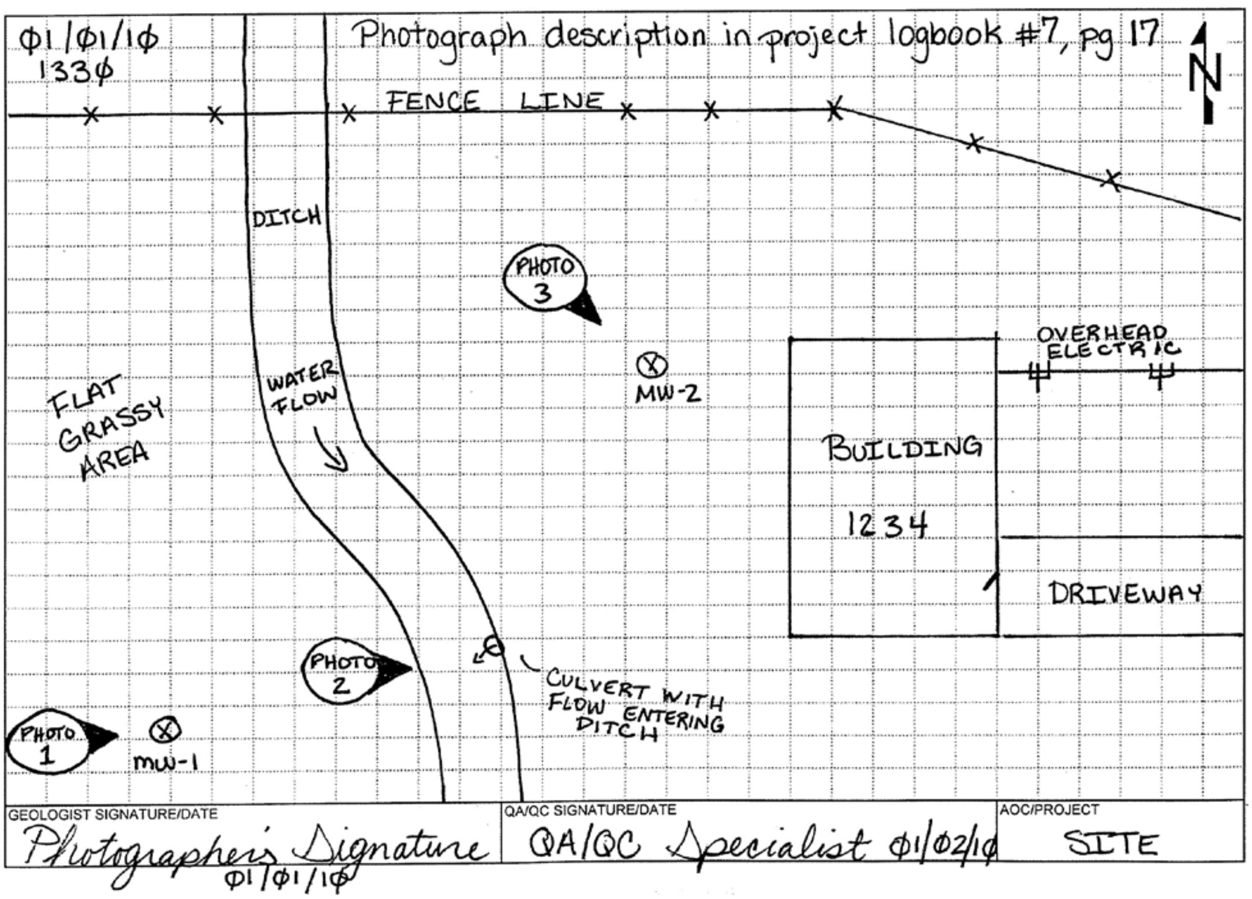

Figure 5-11. Example of Photograph Map to be Recorded in Field Logbooks

		Contractor Laboratory				Government Laboratory				Required Laboratory analyses					
Sample Locations	Sample Type	Sample Number	Associated QA Duplicate Number	Associated QC Rinsate Number	Associated QC Trip Blank Number	Sample Number	Associated QA Duplicate Number	Associated QC Rinsate Number	Associated QC Trip Blank Number	VOCs	SVOCs	RCRA Metals	TPH, Oil, and Grease	Ignitability, Corrosively, RCRA Metals	TCLP, VOAs, TCLP Metals

Figure 9-1. Example of QA Table to be Used for RVAAP AOC-Specific Investigations

PROJECT RVAAP

Sample ID:____

Station ID/Location:_______________________________________

Media:______________________ Sample Type:_______________

(*Barcode goes here)* Project No:________________________________

Sample Date:_________________ Sample Time: ______________

Analysis:____

Method:____

Container Size: _______________ Container: _________________

Preservative:_________________ Lab: ______________________

Collected By:_________________ Depth:_____________________

Comments:____

Figure 6-4. Example of Sample Container Label

6.4.2 Sample Analysis Request Form

A separate sample analysis request form will not be utilized. Sample analysis request information will be recorded on a single combination analysis request and COC form, which is discussed below.

6.4.3 Chain-Of-Custody Records

RVAAP will utilize USEPA Region 5 COC protocols for the AOC-specific environmental sampling activities as described in the *Manual of Custody and Non-Custody Sample Handling Procedures* (USEPA 1978) and COC instructions defined in Appendix F of the *Requirements for the Preparation of Sampling and Analysis Plans* (USACE 2001c). COC procedures implemented for the investigations will be in three parts: documenting the handling of each sample from the time of collection, through completion of laboratory analysis, and delivery of final evidence files. The COC form serves as a legal record of sample possession. A unique number printed or entered on the form will identify each COC. A sample or evidence file is considered to be under custody if when it is:

- o Project name and AOC identification;
- o Physical characteristic of the waste;
- o Generation date(s);
- o Address of waste generation;
- o Satellite or 90-day accumulation container; and
- o Contact information for a contractor contact and the RVAAP Environmental Manager.

- Record all information on container labels with indelible ink (permanent marker or paint pen) and record necessary information in a field logbook or on an appropriate field form.

- Protect all container labels so that damage or degradation of the recorded information is prevented.

- Drum labels will be photographed when affixed to the container. Photographs will be provided to the RVAAP Operating Contractor. New photographs will be collected whenever drum status is updated (i.e. pending analysis, final classification).

DRUM NUMBER: 2010-LL1sb-489

CONTENTS Unsaturated Soil Cuttings, 75% Full

SOURCE OF WASTE: LL1 Sewers Investigation

SOURCE LOCATION: Soil Boring LL1sb-489

GENERATION DATE(S) 04/07/10-04/08/10

ACCUMULATION CONTAINER TYPE: Satellite

ADDRESS: 8451 State Route 5, Ravenna OH 44266

CONTACT: First Last (Company) (555)-555-5555
First Last (RVAAP) (330)-555-5555
COMMENTS___________________________________

Figure 8-1. Example of Waste Storage Container Label

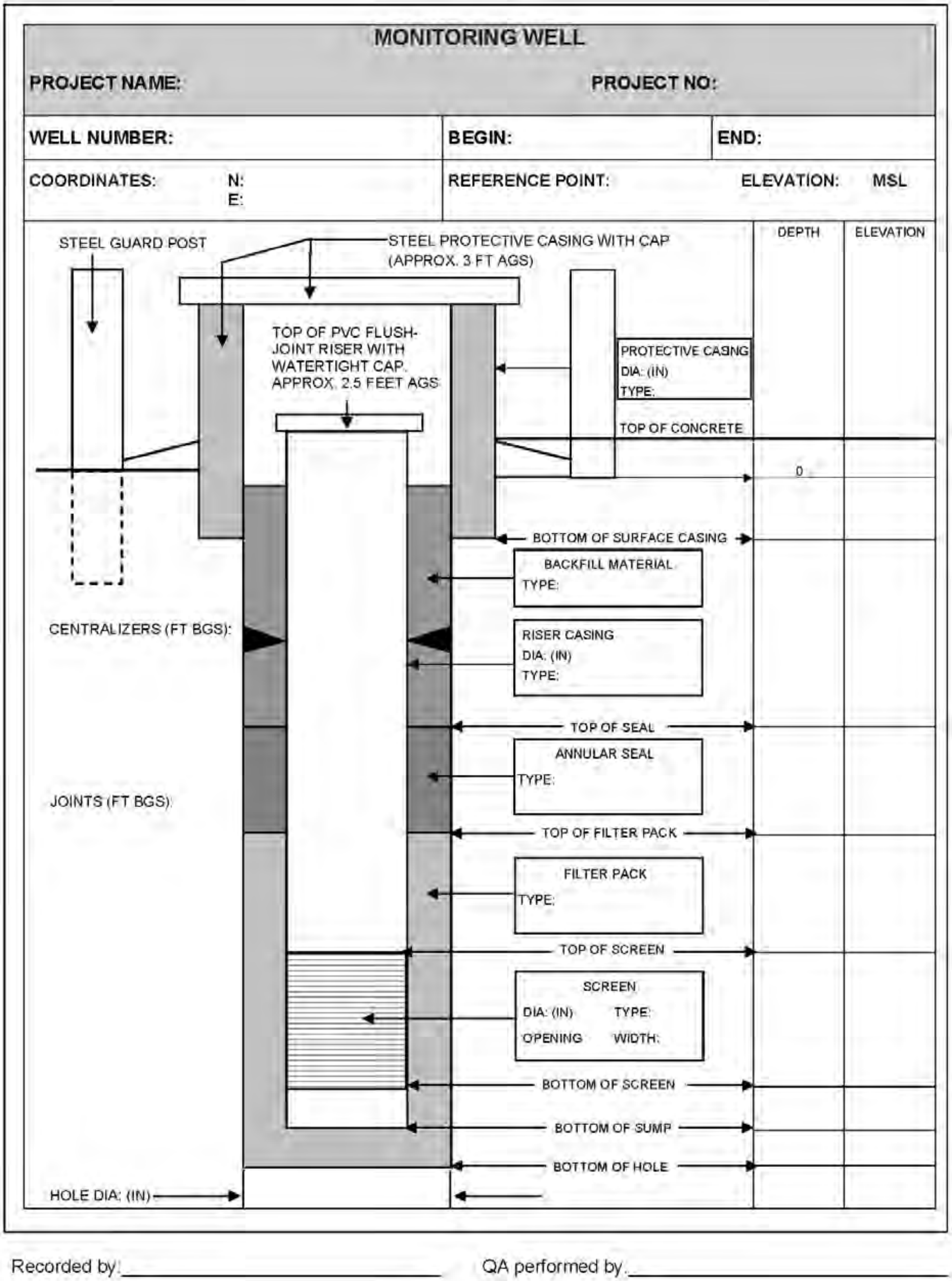

Figure 5-10. Example of Well Construction Diagram Used in Logbooks

GRANULAR FILTER PACK APPROVAL

Project for Intended Use:

Filter Material Brand Name:

Lithology:

Grain Size Distribution:

Source/pit or quarry of origin:

Manufacturer:

Manufacturer address:

Processing method:

Slot Size of Intended Screen:

SUBMITTED BY:

Company:

Person:

Telephone Number:

Date

FOR APPROVAL (A)/DISAPPROVAL (D)	(circle one)	
Project Officer/Date:	A	D
Project Geologist/Date:	A	D
U.S. Army Project Manager/Date:	A	D

Figure 5-2. Granular Filter Pack Description and Approval Form

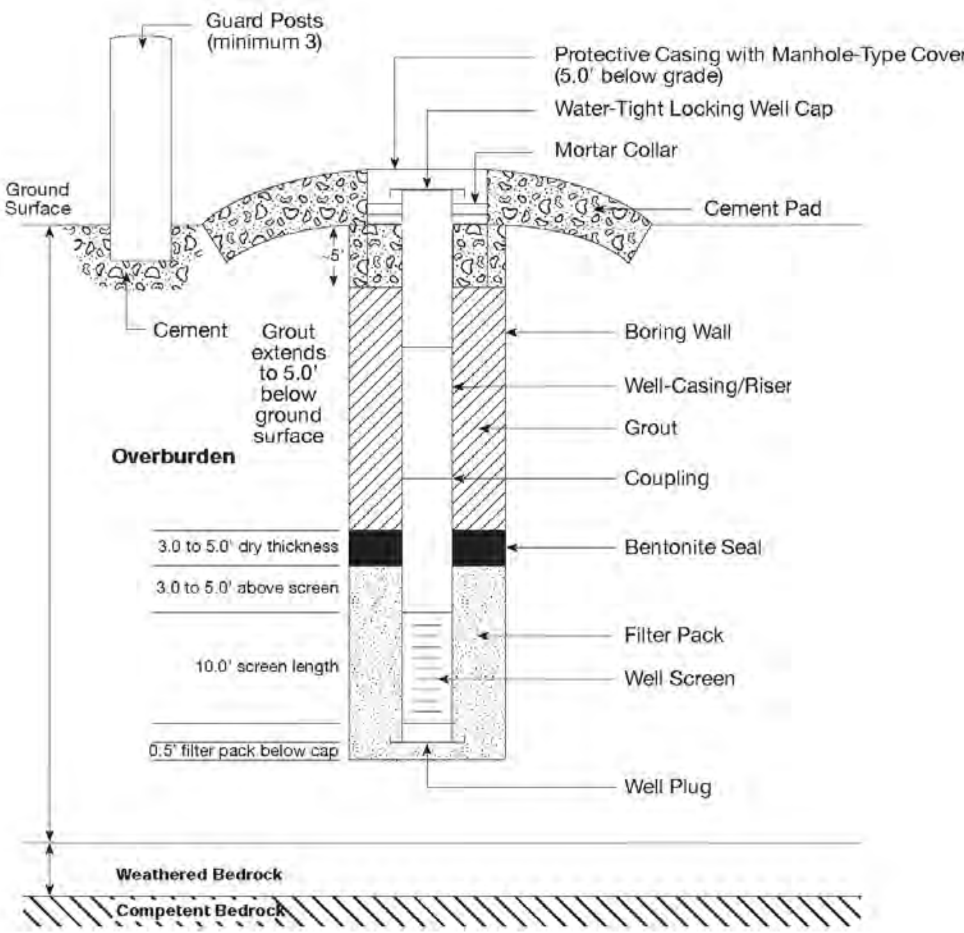

Figure 5-5. Example of Monitoring Well Completed in Overlying Unstable Soil (Overburden) with a Flush-mount Installation

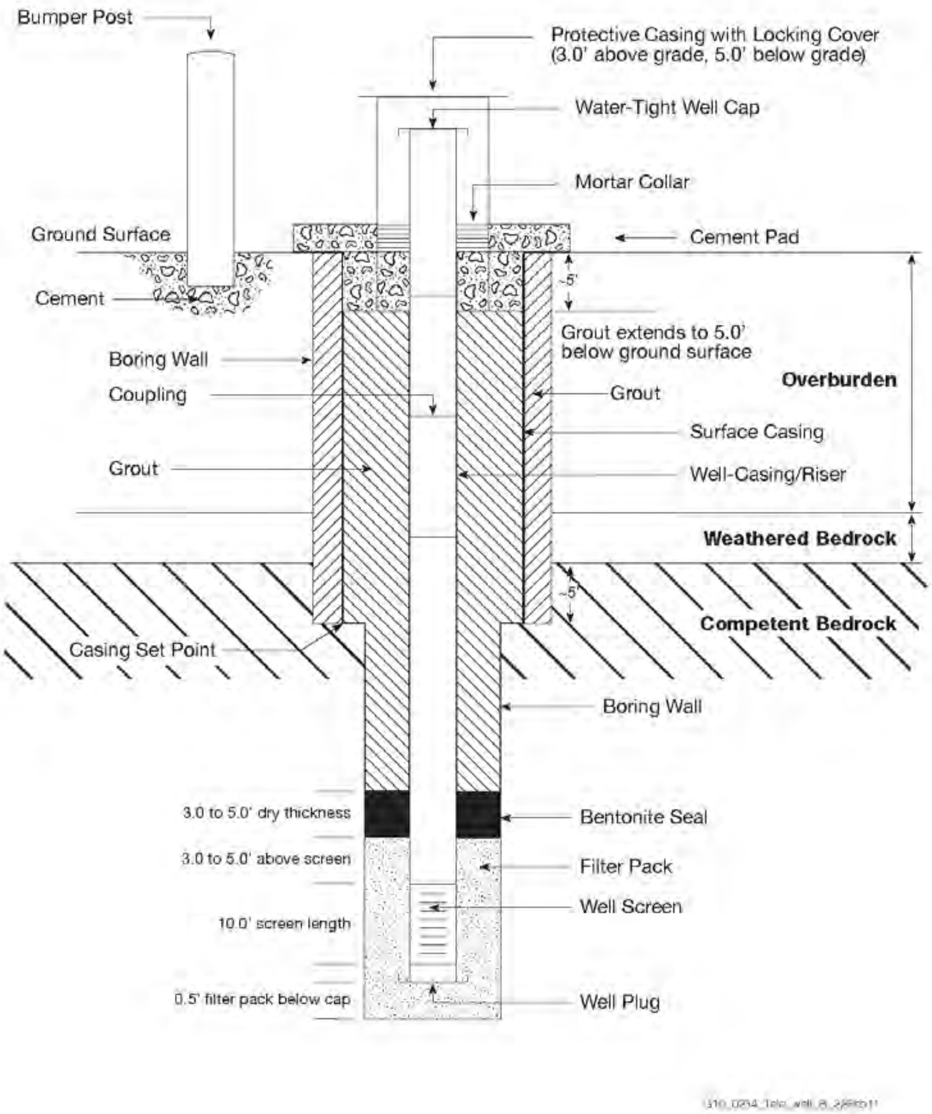

Figure 5-6. Example of Monitoring Well Completed in Underlying Bedrock with an Above-grade Installation
[Overlying Soil (Overburden) is Unstable and/or Contaminated]

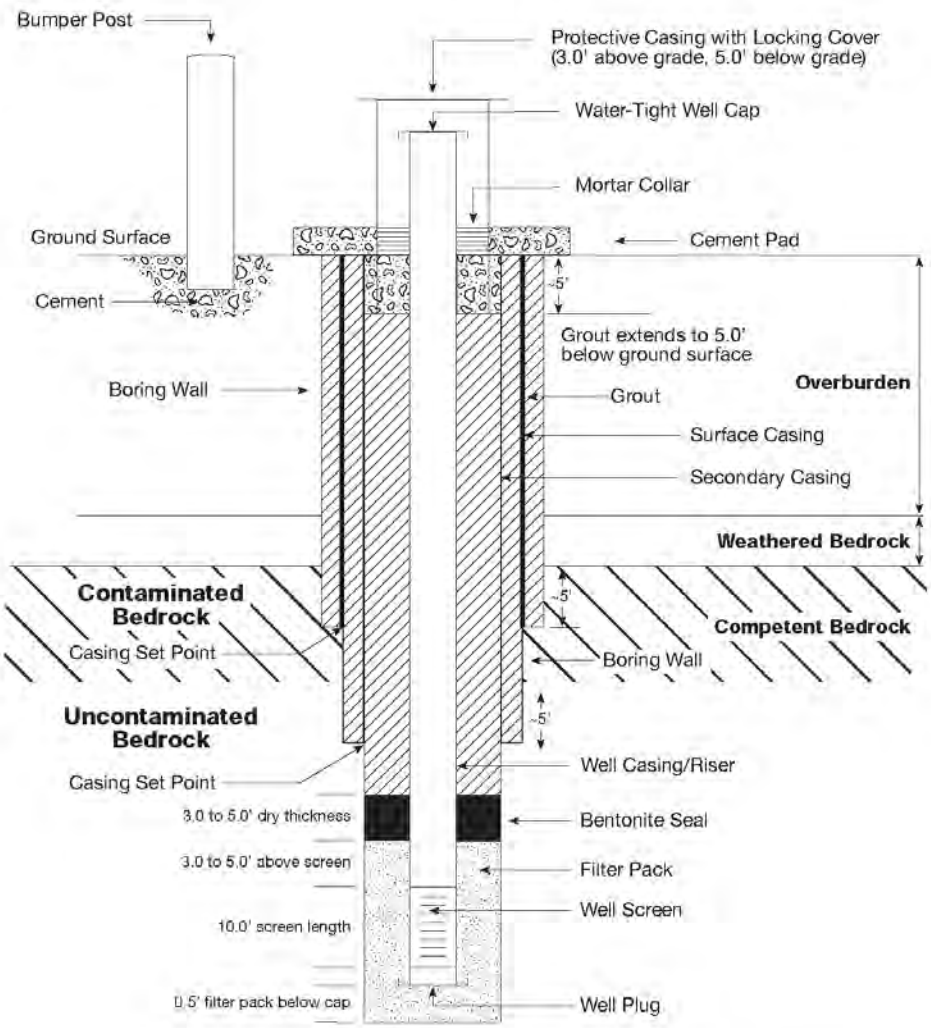

Figure 5-7. Example of Monitoring Well Completed in Underlying Bedrock with an Above-grade Installation
[Overlying Unstable and/or Contaminated Soil (Overburden) and Contaminated Bedrock]

DNR 7810.06

WATER WELL SEALING REPORT
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Water
2045 Morse Rd., Bldg B
Columbus, OH 43229-6693
Voice: (614) 265-6740 Fax: (614) 265-6767

LOCATION

County ____________ Township ____________ Section/Lot Number ____________ (Circle One or Both)

Owner/Builder ____________ (Circle One or Both)

Address of Well Location ____________ Number ____________ Street Name

City ____________ Zip Code ____________

Property Location Description ______ miles ______ (n, e, s, w) of ____________ nearest intersection

on the ______ (n, e, s, w) side of ____________ road name

Location of Well in either: State Plane N ☐ S ☐ X |_|_|_|_|_|_|_|.|_|_| +/- ______ ft. or m Y |_|_|_|_|_|_|_|.|_|_| +/- ______ ft. or m

OR

Latitude/Longitude: Check ONE ☐ In Decimal Degrees ☐ Degrees Minutes ☐ Degrees Min. Sec.
Latitude ____________ Longitude ____________

Elevation of Well |_|_|_|_|.|_|_| +/- ______ ft. or m Datum Plain: ☐ NAD27 ☐ NAD83

Source of Coordinates: ☐ GPS ☐ Survey ☐ Other ____________

ORIGINAL WELL ODNR Well Log Number ____________ Copy attached? Yes or No (circle one)

MEASURED CONSTRUCTION DETAILS Date of measurements ____________

Depth of Well ____________ Static Water Level ____________
Size of Casing ____________ Length of casing ____________
Well Condition ____________

SEALING PROCEDURE

Method of Placement ____________

Placement:			Sealing Material	Volume
From ______	To ______		______	______
From ______	To ______		______	______
From ______	To ______		______	______

Was Casing Removed? Yes or No (circle one)

Condition of Casing ____________
Perforations: From ______ To ______
From ______ To ______

Date Sealing Performed ____________
Reason(s) for Sealing ____________

CONTRACTOR

Name ____________ ODH Registration # ____________
Address ____________
City/State/Zip ____________

Signature ____________
I hereby certify the information given is accurate and correct to the best of my knowledge.

Completion of this form is required by section 1521.05 (B) (9), Ohio Revised Code - file within 30 days after completion of sealing.
ORIGINAL COPY TO - ODNR, DIVISION OF WATER, 2045 MORSE ROAD, COLS., OHIO 43229-6693
Blue - Customer's copy Pink - Driller's copy Green - Local Health Dept. copy

Figure 5-12. ODNR Well Sealing Report

Sampling Location Identification: XXXmm-NNN(n)					
XXX	=	Area Designator	Examples		
			TNT	-	TNT Manufacturing Area
			P11	-	Pond #11
mm	=	Sample Location Type	Examples		
			MW	-	Groundwater Monitoring Well
			SB	-	Soil Boring
			SW	-	Surface Water Location
			SD	-	Sediment Sample Location
			SS	-	Surface Soil Location
			TR	-	Trench Location
			SP	-	Seep Sample
			WP	-	Groundwater Well Point
NNN(n)	=	Sequential Sample Location Number	Examples		
Unique, sequential number for each sample location beginning with the following number from the last number used from previous investigation stations and extending into any subsequent investigative phases			004 012 099 107		
(n) Special identifier- Optional use (as needed) to identify special sample matrices or sample location characteristics. For example: Use a D to identify the well as an adjacent deep zone/aquifer well (004D) Use a B to identify the well as a background location (012B) Use an A to identify an abandoned well (099A) Use a M to identify an ISM (107M)					
Sample Identification: XXXmm-NNN(n)-####-tt					
###	=	Sequential Sample Number	Examples		
[must be unique for entire project site/AOC]			0001 0002 0003		
tt	=	Sample Type	Examples		
			GW	-	Groundwater Sample (unfiltered)
			GF	-	Groundwater Sample (filtered)
			SO	-	Soil Sample
			SW	-	Surface Water Sample
			SD	-	Sediment Sample
			PR	-	Free Product Sample
			SP	-	Seep Sample
			TB	-	Trip Blank
			FB	-	Field Blank
			ER	-	Equipment Rinsate

Figure 6-3. USACE, Louisville District Location/Sample Identification Naming Conventions

WATER APPROVAL

Project for intended use:

Water Source:

Owner:

Address:

Telephone Number:

Water Tap Location:

Operator:

Aquifer:

Well Depth:

Static water level from ground surface:

Date measured:

Type of treatment or filtration prior to tap:

Type of access:

Cost per cubic gallon charged for use:

Results and dates of chemical analyses for past 2 years:

Results and dates of chemical analyses for project analytes:

SUBMITTED BY:

Company:

Person:

Telephone Number:

Date

FOR APPROVAL (A)/DISAPPROVAL (D)	(circle one)	
Project Officer/Date	A	D
Project Geologist/Date	A	D
U.S. Army Project Manager /Date:	A	D

Figure 5-4. Water Description and Approval Form

RVAAP WEEKLY NON-HAZARDOUS & HAZARDOUS WASTE INVENTORY SHEET

Contractor: ______________________ Month: __________________ Year: ____________________

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
	Date: Time:	Date: Time:	Date: Time:	Date: Time:
Point of Contact (Name / Number)				
Contracting Agency - POC				
*Location on installation (map attached)				
Date Generated				
Satellite or 90 day storage area				
Waste generation site				
Number of Containers (size / type)				
Condition of Container				
Waste label properly (40 CFR 262.34 (c) (1)	yes / no	yes / no	yes / no	yes / no
Secondary containment yes / no	yes / no	yes / no	yes / no	yes / no
Photo's submitted yes / no	yes / no	yes / no	yes / no	yes / no
Printed Name:				
Signature:				

This form is required for Non-Hazardous and Hazardous waste including PCB and special waste.

CONTRACTOR'S ARE REQUIRED TO SUBMIT THIS FORM WEEKLY TO THE RVAAP OPERATING CONTRACTOR WHEN WASTE IS STORED ON SITE.

CONTRACTORS ARE ENCOURAGED TO INCLUDE PHOTOS WITH EACH WEEKLY INSPECTION SHEET WHEN WASTE IS STORED ON SITE.

*Draw detailed map showing location of waste within the site.

Figure 8-2. Weekly Waste Inventory and Inspection Sheet

FIELD USE ONLY
WELL LOG AND DRILLING REPORT
DO NOT FILE. NOT AN OFFICIAL RECORD.

DNR 7802.05e-f Page____ of____ for this record.

Well ID #: ______ Job Number: ______

Notes:

WELL LOCATION

County ______ Township ______

Owner/Builder

Address of Well Location

City ______ Zip Code +4 ______

Permit No. ______ Section; ______ and/or Lot No. ______

Use of Well ______

Coordinates of Well (Use only one of the below coordinate systems)

Latitude, Longitude Coordinates

Latitude: ______ Longitude: ______

State Plane Coordinates

N ☐ X ______ +/- ______ ft.

S ☐ Y ______ +/- ______ ft.

Elevation of Well in feet: ______ +/- ______ ft.

Datum Plane: ☐ NAD27 ☐ NAD83 Elevation Source ______

Source of Coordinates: ______

Well location written description:

Comments on water quality/quantity and well construction:

WELL TEST *

Pre-Pumping Static Level ______ ft. Date ______

Measured from ______

Pumping test method ______

Test Rate ______ gpm Duration of Test ______ hrs.

Feet of Drawdown ______ ft. Sustainable Yield ______ gpm

*(Attach a copy of the pumping test record, per section 1521.05, ORC)

Is Copy Attached? ☐ Yes ☐ No Flowing Well? ☐ Yes ☐ No

PUMP/PITLESS

Type of pump ______ Capacity ______ gpm

Pump set at ______ ft. Pitless Type ______

Pump installed by ______

I hereby certify the information given is accurate and correct to the best of my knowledge.

Drilling Firm ______

Address ______

City, State, Zip ______

Signed ______ Date ______

ODH Registration Number ______

CONSTRUCTION DETAILS

Drilling Method: ______

BOREHOLE/CASING (Measured from ground surface)

1 { Borehole Diameter ______ inches Depth ______ ft.
Casing Diameter ______ in. Length ______ ft. Thickness ______ in.

2 { Borehole Diameter ______ inches Depth ______ ft.
Casing Diameter ______ in. Length ______ ft. Thickness ______ in.

Casing Height Above Ground ______ ft.

Type { 1: ______
2: ______

Joints { 1: ______
2: ______

SCREEN

Diameter ______ in. Slot Size ______ in. Screen Length ______ ft.

Type ______ Material ______

Set Between ______ ft. and ______ ft.

GRAVEL PACK (Filter Pack)

Material/Size ______ Vol/Wt. Used ______

Method of Installation ______

Depth: Placed From: ______ ft. To: ______ ft.

GROUT

Material ______ Vol/Wt. Used ______

Method of Installation ______

Depth: Placed From: ______ ft. To: ______ ft.

DRILLING LOG*

FORMATIONS INCLUDE DEPTH(S) AT WHICH WATER IS ENCOUNTERED.

Color	Texture	Formation	From	To

Aquifer Type (Formation producing the most water.) ______

Date of Well Completion ______ Total Depth of Well ______ ft.

FOR FIELD USE ONLY. DO NOT FILE.

FIELD USE ONLY
WELL SEALING REPORT
DO NOT FILE. NOT AN OFFICIAL RECORD.

DNR 7810.12e-f   Page____ of ____ for this record.

Job Number:

Notes:

LOCATION

County ____________ Township ____________ Section No. ____________ Lot No. ____________

Owner ____________

Address of Well Location ____________

City ____________ Zip Code ____________

Well Location Description (120 Characters)

Location of Well in either: State Plane (N ☐ S ☐) X ______ . ___ +/- ______ ft. Y ______ . ___ +/- ______ ft.
OR
Latitude/Longitude **Latitude** ____________ **Longitude** ____________

Elevation of Well ______ . ___ +/- ______ ft. Datum Plane: ☐ NAD27 ☐ NAD83

Source of Coordinates: ☐ GPS ☐ Survey ☐ Other ____________

Source of Elevation: ☐ GPS ☐ Survey ☐ Other ____________

WELL IDENTIFICATION ODNR Well Log Number ____________ Project Well ID ____________

MEASURED CONSTRUCTION DETAILS

Date of measurements ____________

Depth of Well ____________ ft. Static Water Level ____________ ft.

Borehole Depth ____________ ft. Borehole Diameter ____________ in.

Casing Diameter ____________ in. Casing Length ____________ ft. Casing Type ____________

SEALING PROCEDURE

Placement:	Sealing Material	Volume/Weight Used (Units Required)	Placement Method
From ______ ft. To ______ ft.			
From ______ ft. To ______ ft.			
From ______ ft. To ______ ft.			
From ______ ft. To ______ ft.			

Condition of Casing ____________ Was Casing Removed? ☐ Yes or ☐ No (check one)

If casing **Not Removed**, was it Perforated? ☐ Yes or ☐ No (check one) Perforations: From ______ ft. To ______ ft.

Date Sealing Performed ____________

Comments/Reason for Sealing

CONTRACTOR

Name ____________ ODH Registration # ____________

Address ____________

City/State/Zip ____________

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APPENDIX B
UNIFORM FEDERAL POLICY -QUALITY ASSURANCE PROJECT PLAN

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APPENDIX C
ACCIDENT PREVENTION PLAN

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Final

Accident Prevention Plan
Additional Sampling for
CC RVAAP-69 Building 1048 Fire Station,
CC RVAAP-70 East Classification Yard, and
CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift
Former Ravenna Army Ammunition Plant
Camp Ravenna, Portage and Trumbull Counties, Ohio

November 30, 2017

Contract No.: W912QR-12-D-0002
Delivery Order: 0003

Prepared for:

U.S. Army Corps of Engineers, Louisville District
600 Dr. Martin Luther King Jr. Place
Louisville, Kentucky 40202-2267

Prepared by:

PARSONS
401 Diamond Drive NW
Huntsville, AL 35806
256-837-5200

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TABLE OF CONTENTS

LIST OF APPENDICES ..... **iv**

LIST OF EXHIBITS ..... **iv**

LIST OF TABLES ..... **iv**

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

ACRONYMS AND ABBREVIATIONS ..... **v**

1.0 SIGNATURE SHEET **1**

2.0 BACKGROUND INFORMATION **3**
2.1 Introduction 3
2.2 Contractor 3
2.3 Contract Number 3
2.4 Project Name 3
2.5 Brief Project Description 3
2.5.1 Description of Work to be Performed 4
2.5.2 Location 4
2.6 History 4
2.7 Areas of Concern Operational History/Description 5
2.8 Accident Experience 6
2.9 Phases of Work Requiring Activity Hazard Analysis 6

3.0 STATEMENT OF SAFETY AND HEALTH POLICY **11**

4.0 RESPONSIBILITIES AND LINES OF AUTHORITY **13**
4.1 Statement of Responsibility 13
4.1.1 Parsons Corporate Safety Personnel 13
4.1.2 Parsons Management and Supervisory Personnel 13
4.1.3 Parsons Employee Responsibility 13
4.2 Identification of Accountability 13
4.3 Competent and Qualified Persons 15
4.4 Competent Person Supervision 15
4.5 Pre-Task Safety and Health Analysis 15
4.6 Lines of Authority 15
4.7 Noncompliance with Safety Requirements 17
4.8 Managers and Supervisors Accountability for Safety 17

5.0 SUBCONTRACTORS AND SUPPLIERS **19**
5.1 Identification of Subcontractors 19
5.2 Safety and Responsibilities of Subcontractors 20

6.0 TRAINING 23
6.1 New Hire Training 23
6.2 Mandatory Training and Certifications 23
6.3 Periodic Safety and Health Training 24
6.4 Requirements for Emergency Response Training 25
6.5 Hearing Conversation Training 25

7.0 SAFETY AND HEALTH INSPECTIONS 26
7.1 Assignment of Responsibilities 27
7.2 External Inspections and Certifications 28

8.0 MISHAP REPORTING AND INVESTIGATION 29
8.1 Exposure Data 29
8.2 Mishap Reports, Investigations, and Documentation 29
8.3 Accident Notification 30

9.0 PLANS, PROGRAMS, AND PROCEDURES 33
9.1 Fatigue Management Plan 33
9.2 Emergency Response Plans 33
9.2.1 Procedures and Tests 33
9.2.2 Spill Plan 34
9.2.3 Fire Fighting Plan 34
9.2.4 Posting Emergency Phone Numbers 34
9.2.5 Medical Support 34
9.3 Site Sanitation Plan 35
9.4 Bloodborne Pathogen Program 35
9.5 Layout Plans 36
9.6 Access and Haul Road Plan 36
9.7 Hearing Conservation Plan 36
9.8 Respiratory Protection Plan 36
9.9 Health Hazard Control Program 36
9.10 Hazard Communication Plan 36
9.11 Process Safety Management Plan 36
9.12 Lead Compliance Plan 36
9.13 Asbestos Abatement Plan 36
9.14 Radiation Safety Program 36
9.15 Abrasive Blasting 37
9.16 Heat/Cold Stress Monitoring Program 37
9.17 Indoor Air Quality Management 37
9.18 Mold Remediation Plan 37
9.19 Chromium (VI) Exposure Evaluation 37
9.20 Crystalline Silica Evaluation 37
9.21 Lighting Plan for Night Operations 37
9.22 Traffic Control Plan 38
9.23 Fire Prevention Plan 38
9.24 Wild Land Fire Management Plan 38

9.25 Arc Flash Hazard Analysis 38
9.26 Assured Equipment Grounding Control Program........ 38
9.27 Hazardous Energy Control Program and Procedures 38
9.28 Standard Pre-Lift Plan—Load Handling Equipment........ 38
9.29 Critical Lift Plan 38
9.30 Naval Architectural Analysis—Load Handling Equipment 39
9.31 Floating Plan Inspection and Certification 39
9.32 Severe Weather Plan for Marine Activities 39
9.33 Emergency Plan for Marine Activities 39
9.33.1 Man Overboard/Abandon Ship Procedures 39
9.34 Float Plan for Launches, Motorboats, and Skiffs 39
9.35 Fall Protection and Prevention Plan........ 39
9.36 Demolition/Renovation Plan........ 39
9.37 Rope Access Work Plan........ 39
9.38 Excavation/Trenching Plan........ 40
9.39 Fire Prevention and Protection Plan for Underground Construction........ 40
9.40 Compressed Air Work Plan for Underground Construction........ 40
9.41 Erection and Removal Plan for Formwork and Shoring........ 40
9.42 Precast Concrete Plan 40
9.43 Lift-Slab Plans 40
9.44 Masonry Bracing Plan........ 40
9.45 Steel Erection Plan........ 40
9.46 Explosives Safety Site Plan 40
9.47 Blasting Plan 40
9.48 Dive Operations Plan 40
9.49 Safe Practices Manual for Diving Activities 40
9.50 Emergency Management Plan for Diving........ 40
9.51 Tree Felling and Maintenance Program........ 40
9.52 Aircraft/Airfield Construction Safety & Phasing Plan 40
9.53 Aircraft/Airfield Safety Plan Compliance Document........ 40
9.54 Site Safety and Health Plan for HTRW Work 41
9.55 Confined Space Entry 41
9.56 Plan for Prevention of Drug and Alcohol Abuse 41
9.56.1 Parsons Corporate Statements of Policy 41
9.56.2 Employee Personal Conduct 41
9.56.3 Confidentiality of Records........ 42
9.57 Contingency Plan for Severe Weather........ 42
9.58 Emergency Rescue (Tunneling)........ 42

10.0 RISK MANAGEMENT PROCESS 45

11.0 REFERENCES........ 47

LIST OF APPENDICES

Appendix C- 1 Site Safety and Health Plan
Appendix C- 2 Project Orientation
Appendix C- 3 Safety Statistics Summary
Appendix C- 4 Certification and Resume

LIST OF EXHIBITS

Exhibit 1 Employee/Subcontractor Training Acknowledgement
Exhibit 2 EM Form 3394 Accident Investigation Report
Exhibit 3 "Near Miss" Incident Investigation Report Form
Exhibit 4 Notice of Subcontractor Violation of Safety and Health Regulations Form
Exhibit 5 Notice of Noncompliance with Safety and Health Regulations Form
Exhibit 6 Pre-mobilization Safety Meeting Checklist
Exhibit 7 Remediation Safety and Health Inspection Checklist
Exhibit 8 Activity Hazards Analysis Training Record
Exhibit 9 Risk Mitigation Two-Week Look-Ahead Form
Exhibit 10 Online Safety Reporting System
Exhibit 11 Take 5 for Safety
Exhibit 12 2015 OSHA 300 Log
Exhibit 13 Parsons Hazard Communication
Exhibit 14 First Responder Spill Reporting Form

LIST OF TABLES

Table C-4-1 Parsons Project and Safety Personnel 14
Table C-5-1 Subcontractors and Suppliers 19

LIST OF FIGURES

Figure C-2-1 Site Location Map 9
Figure C-4-1 Lines of Authority 16
Figure C-9-1 Hospital Route to University Hospitals Portage Medical Center 43

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
AHA	Activity Hazard Analysis
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
AOC	Area of Concern
APP	Accident Prevention Plan
ARNG	Army National Guard
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
AST	Aboveground Storage Tank
BBP	Bloodborne Pathogen
bgs	below ground surface
Camp Ravenna	Camp Ravenna Joint Military Training Center
CC	Army Environmental Compliance-Related Cleanup Program
CEO	Chief Executive Officer
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental, Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
COR	Contracting Officer Representative
CPR	Cardiopulmonary Resuscitation
CQA	Certified Quality Auditor
DFFO	Director's Final Findings and Orders
DLA	Defense Logistics Agency
DOD	Department of Defense
EM	Engineering Manual
ERCP	Emergency Response and Contingency Plan
ESHARP	Environmental, Safety, Health, and Risk Program
FAR	Federal Acquisition Regulation
FMP	Fatigue Management Plan
FTE	Full-Time Equivalent
GBU	Global Business Unit
HAZWOPER	Hazardous Waste Operations and Emergency Response
HTRW	Hazardous, Toxic, Radioactive Waste
HVAC	Heating, Ventilation, and Air Conditioning
H&S	Health and Safety
IRP	Installation Restoration Program
KO	Contracting Officer
LHE	Load Handling Equipment
MRS	Munitions Response Site
NIOSH	National Institute for Occupational Safety and Health

ACRONYMS AND ABBREVIATIONS (CONTINUED)

OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
Parsons	Parsons Government Services, Inc.
PE	Professional Engineer
PEL	Permissible Exposure Limit
PGS	Parsons Government Services
PHSM	Project Health and Safety Manager
PM	Project Manager
PO	Purchase Order
PPE	Personal Protective Equipment
PWS	Performance Work Statement
RI	Remedial Investigation
ROD	Record of Decision
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SC	Subcontract
SH&E	Safety, Health and Environment
SI	Site Inspection
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
START	Supervisor Training in Accident Reduction Techniques
TBD	to be determined
TNT	2,4,6-trinitrotoluene
TO	Task Order
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USP&FFO	United States Property and Fiscal Officer
WP	Work Plan

1.0 SIGNATURE SHEET

Plan Preparer:

Jessica Click	________________________	26 May 2017
Associate Engineer	(Signature)	(Date)
Parsons		

Plan Approver:

Edward Heyse, Ph.D., P.E.	________________________	26 May 2017
Project Manager	(Signature)	(Date)
Parsons		

Plan Concurrence:

Ed Grunwald, CIH	________________________	26 May 2017
Safety Manager	(Signature)	(Date)
Parsons		

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2.0 BACKGROUND INFORMATION

2.1 Introduction

This Accident Prevention Plan (APP) and the attached Site Safety and Health Plan (SSHP) is submitted to the United States (U.S.) Army in accordance with Section 3 the Performance Work Statement (PWS) for environmental services at Areas of Concern (AOC) under the Ravenna Army Ammunition Plant (RVAAP) Restoration Program at Camp Ravenna, Ohio. The Task Order (TO) was issued by the United States Army Corps of Engineers (USACE), Louisville District on July 27, 2016.

This APP is Appendix C to the Work Plan (WP) and has been developed using the minimum basic outline provided in Appendix A of the USACE Engineering Manual (EM) 358-1-1, Safety and Health Requirements Manual (USACE, November 2014). The USACE EM 358-1-1 and the Occupational Safety and Health Administration (OSHA) will be the primary regulatory documents under which all operations will be conducted. The WP was prepared in accordance with Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) guidance and regulations. This document was also prepared in accordance with the Ohio Environmental Protection Agency (Ohio EPA) Director's Final Findings and Orders (DFFO, Ohio EPA, 2004) and the National Oil and Hazardous Substances Contingency Plan (NCP).

The EM 385-1-1 APP outline specifies that a SSHP be developed as a sub-plan of the APP for sites where the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard is applied. Therefore, an SSHP has been developed for this project and is presented in Appendix C-1 of this APP. As mandated by OSHA, the intent of an SSHP is to disseminate site- and task-specific hazard information and hazard control/mitigation procedures to on-site personnel.

2.2 Contractor

The contractor for the performance of this project is Parsons Government Services, Inc. (Parsons). Parsons will be responsible for the management of all resources required for the successful completion of Tasks listed in the PWS.

Parsons

401 Diamond Drive NW

Huntsville, AL 35803

2.3 Contract Number

The contract number for this project is W912QR-12-D-0002-0003.

2.4 Project Name

The name of this project is Multiple Compliance Restoration and Installation Restoration Program for AOCs.

2.5 Brief Project Description

The purpose of the WP and field work is to complete data gap investigations to prepare the Site Inspection (SI) at CC RVAAP-70 East Classification Yard and Remedial Investigations (RI) at CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift. Initial work has been done at all three sites, however, data gaps have been identified (or may be identified during the document review process) that require additional sampling to complete the SI and RIs.

2.5.1 Description of Work to be Performed

Field work is primarily associated with conducting environmental sampling to complete RI and SI at the sites included in this TO:

- Installing and developing monitoring wells
- Sampling groundwater monitoring wells
- Advancing soil borings and collecting subsurface soil and groundwater samples
- Removing, characterizing, and disposing of oily sludges from Building 47-40 (Round House) at CC RVAAP-70
- Characterizing and disposing of solid and liquid investigation-derived waste
- Surveying sample locations

Field work is currently anticipated at CC RVAAP-69, CC RVAAP-70 and CC-RVAAP-74. Field work may be required at other sites included in this TO depending on identification of data gaps during evaluation of data from SI and RI efforts. Additional potential field work could also include:

- Sampling surface soil, sediments and/or surface water
- Brush cutting to access sampling locations

2.5.2 Location

The former RVAAP, now known as the Camp Ravenna Joint Military Training Center (Camp Ravenna), located in northeastern Ohio within Portage and Trumbull counties, is approximately three (3) miles east/northeast of the City of Ravenna and one (1) mile north/northwest of the City of Newton Falls. The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland. Camp Ravenna is illustrated in Figure C-2-1.

2.6 History

When the RVAAP IRP began in 1989, RVAAP was identified as a 21,419-acre installation. The property boundary was resurveyed by the Ohio Army National Guard (OHARNG) over a 2-year period (2002 and 2003) and the total acreage of the property was found to be 21,683.289 acres.

As of September 2013, administrative accountability for the entire 21,683-acre facility has been transferred to the United States Property and Fiscal Officer (USP&FO) for Ohio and the property subsequently licensed to the OHARNG for use as a military training site, Camp Ravenna. The RVAAP restoration program involves cleanup of former production/operational areas throughout the facility related to former activities conducted under the RVAAP.

Industrial operations at the former RVAAP consisted of 12 munitions-assembly facilities referred to as “load lines.” Load Lines 1 through 4 were used to melt and load 2,4,6-trinitrotoluene (TNT) and Composition B into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building.

Periodically, the floors and walls were cleaned with water and steam. Following cleaning, the wastewater, containing TNT and Composition B, was known as “pink water” for its characteristic color. Pink water was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport to earthen settling ponds. Load Lines 5 through 11 were used to manufacture fuzes, primers, and boosters. Potential contaminants in these load lines include lead compounds, mercury compounds, and explosives. From 1946 to 1949, Load Line 12 was used to produce ammonium nitrate for explosives and fertilizers prior to use as a weapons demilitarization facility.

In 1950, the facility was placed in standby status and operations were limited to renovation, demilitarization, and normal maintenance of equipment, along with storage of munitions. Production activities were resumed from July 1954 to October 1957 and again from May 1968 to August 1972. In addition to production missions, various demilitarization activities were conducted at facilities constructed at Load Lines 1, 2, 3, and 12. Demilitarization activities included disassembly of munitions and explosives melt-out and recovery operations using hot water and steam processes. Periodic demilitarization of various munitions continued through 1992.

In addition to production and demilitarization activities at the load lines, other facilities at RVAAP include AOCs that were used for the burning, demolition, and testing of munitions. These burning and demolition grounds consist of large parcels of open space or abandoned quarries. Potential contaminants at these AOCs include explosives, propellants, metals, and waste oils. Other types of AOCs present at RVAAP include landfills, an aircraft fuel tank testing facility, and various general industrial support and maintenance facilities.

The Army is bound to the Director’s Final Findings and Orders (DFFO) issued June 10, 2004 by the Ohio Environmental Protection Agency (Ohio EPA) pursuant to the authority vested under Chapters 3734, 3745, and 6111 of the Ohio Revised Code. The objective of the Orders is to ensure that the public health, safety, and welfare, as well as the environment, is protected from the disposal, discharge, or release of contaminants. The former RVAAP is not on the United States Environmental Protection Agency (USEPA) National Priorities List, although it is in the USEPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database. The Ohio EPA is the lead environmental regulator for the RVAAP restoration program. The DFFOs form the basis for the implementation of a CERCLA based environmental remediation program at the installation.

2.7 Areas of Concern Operational History/Description

CC RVAAP-69, Building 1048 Fire Station

The fire station was located in the Plant Administration Area in the northwest quadrant of the intersection of George Road and South Service Road. In 1968, the fire station was referred to as the Fire and Guard Building and consisted of 12,130 square feet. The fire station building was demolished in late 2008, and the site currently remains undeveloped. Reportedly, it was common practice for the fire department to clean out fire extinguishers behind the west side of the fire building, and to allow the contents of the fire extinguishers (carbon tetrachloride) to spill onto the ground surface. The area of potential impact includes the ground surface behind the former building location.

CC RVAAP-70, East Classification Yard

The former RVAAP was originally equipped with east and west classification yards during the facility's early operational years. The classification yards were used for the switching and maintenance of railroad cars and locomotives. The east classification yard is located east of Load Line 1 and the Main Defense Logistics Agency (DLA) Ore Storage Area in close proximity to the intersection of Ramsdell Road and Irons Road. The east classification yard AOCs consist of Building 47-40 (Round House, still exists but is not actively used), the former herbicide storage shed (former Building 47-60), the containment area for former aboveground storage tank (AST) (documented spill of No. 5 fuel oil occurred within the containment area in 1986), and an outdoor open wash rack south of the East Classification Yard (north of Butts-Kistler Road). A railroad track complex is located east of the site and is currently used by the OHARNG. Potential sources of contamination include railroad maintenance activities, fuel releases, and herbicide storage and maintenance.

CC RVAAP-74, Building 1034 - Motor Pool Hydraulic Lift

An in-ground hydraulic floor lift system has been identified inside the existing Motor Pool building. The hydraulic floor lift system is described in a 1969 drawing as a twin-post lift system constructed of metal. The below-grade system consists of a cast in concrete "L" shaped pit measuring approximately 12 feet (long portion of the "L" shape) and 4 feet (short portion of the "L" shape) in length, 3 feet in width, and 4 feet in depth. The pit is reportedly buried at depths ranging from 4 feet below ground surface (bgs) to approximately 8 feet bgs. The twin- post lift reportedly has a clearance of 6 feet between the floor surface and the bottom of the lift (height in the air). The floor lift system remains in place. It is also believed that an additional floor lift system was historically used at the Building 1034 Motor Pool facility. The potential source of contamination is leaks of hydraulic fluid from the lift system.

2.8 Accident Experience

Parsons has a policy of compliance with all governing safety standards and regulations, and a safety performance goal of zero accidents, operational mishaps, and injuries/illnesses. As of January 1, 2016, Parsons' Experience Modification Rate is 0.52.

2.9 Phases of Work Requiring Activity Hazard Analysis

(1) Site Visits, Site Walks, and Surveying
(2) Vehicle and Heavy Equipment Operations
(3) Fueling Operations
(4) Decontamination Station
(5) Sample Collection
(6) Concrete Coring and Soil Sampling
(7) Investigation Derived Waste Sampling and Handling
(8) Power and Hand Tool Operation
(9) Drilling and Well Installation
(10) Drum Transport
(11) Mobilization/Demobilization
(12) Use of Ladders
(13) Excavation, Soil, and Sludge Management

(14) Weather Related Exposure
(15) Exposure to Allergic Flora (Vegetation)
(16) Enabling Works Clearing and Grubbing

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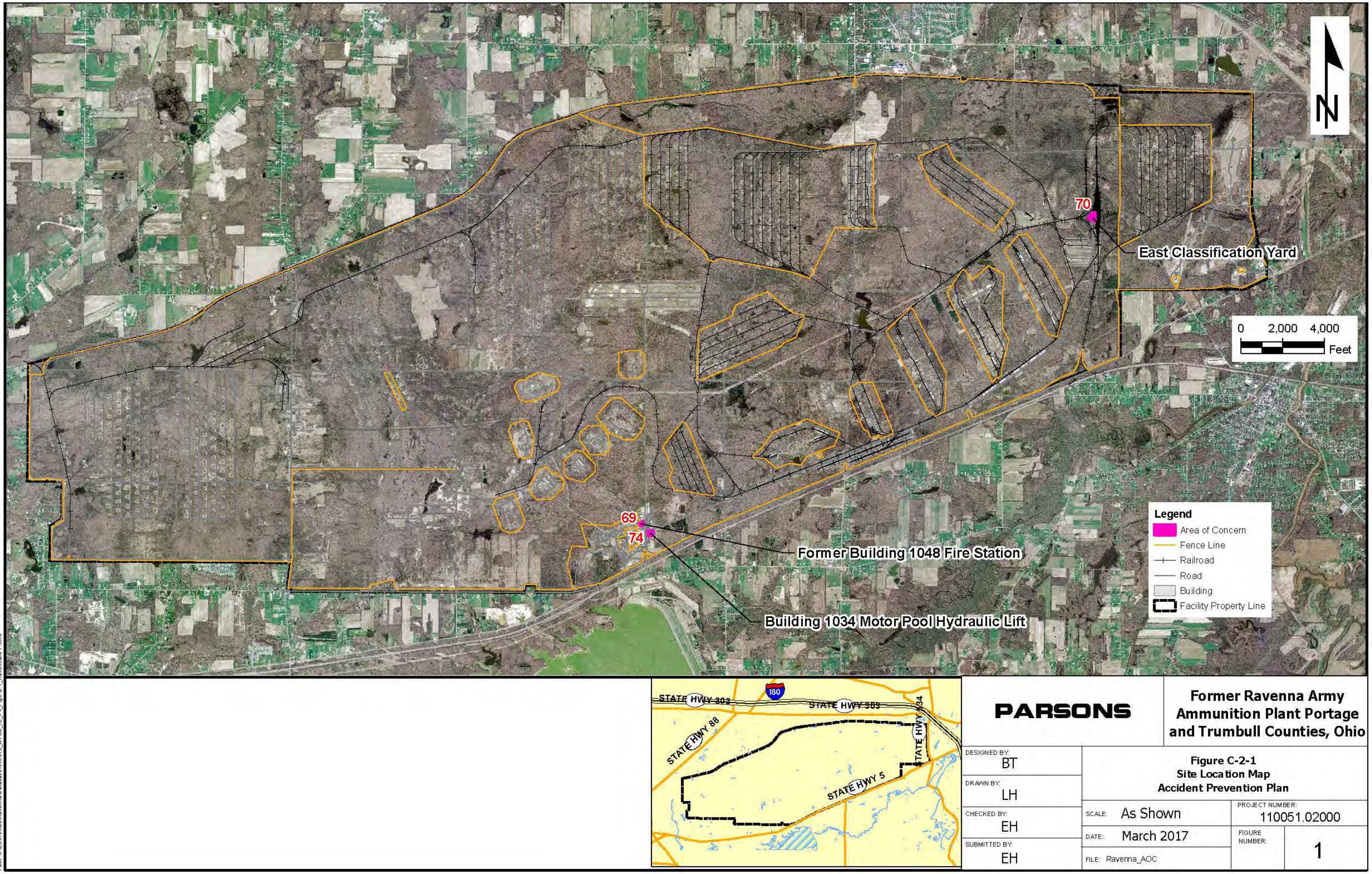

Figure C-2-1 Site Location Map

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3.0 STATEMENT OF SAFETY AND HEALTH POLICY

As an industry-leading engineering, construction and technical services firm, Parsons is firmly committed to maintaining a safe, healthy, and environmentally compliant workplace at all its offices and project facilities, guided by the following tenets:

- Safety, Health and Environment (SH&E) stewardship is a core value.
- Executive management will lead the SH&E process and strives to continually improve our SH&E management systems.
- SH&E will be a responsibility shared by all.
- SH&E performance will be a key business performance indicator.
- SH&E performance will be communicated openly.
- Employees are given the expectations, knowledge, and skills necessary to perform their work to ensure they achieve high levels of SH&E performance.
- Employees and stakeholders are authorized and expected to stop work when conditions warrant it.
- Our SH&E efforts extend beyond the workplace to include travel, our homes, and our communities.

To meet our SH&E performance objectives, all employees and stakeholders are expected to be actively engaged in SH&E issues. This requires the combined efforts of a concerned leadership team, responsible and knowledgeable supervisors, and conscientious, well-trained employees and stakeholders.

At regular intervals, the executive team shall lead, monitor and improve the performance of our SH&E management systems to ensure its continuing suitability, adequacy, and effectiveness.

Parsons will meet or exceed the legal and other requirements for SH&E to conform to the international standards legal to which we subscribe. We will continually monitor and improve operations, procedures, technologies, and programs that are conducive to maintaining safe, healthful, and environmentally sound workplaces.

Parsons has developed an Environmental, Safety, Health, and Risk Program (ESHARP) for the implementation of key safety initiatives on all Parsons' projects. All Parsons Project Managers (PM) maintain a copy of this document to ensure application and conformance on all projects. A strict zero incident approach to the project will be used.

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4.0 RESPONSIBILITIES AND LINES OF AUTHORITY

4.1 Statement of Responsibility

4.1.1 Parsons Corporate Safety Personnel

Parsons corporate safety personnel are required to develop, communicate, and oversee Parsons health and safety programs at all Parsons business units. These employees will assist Parsons business unit managers regarding health and safety regulations, reporting requirements, safety training, and other related issues. Corporate safety personnel are responsible for monitoring the effectiveness of Parsons health and safety programs, conduct audits, ensure that all injuries and near misses are fully investigated, and develop OSHA reporting and worker's compensation claim procedures. As part of corporate policy, safety information and statistics will be collected and maintained for all Parsons business units. Parsons corporate safety personnel also keep senior management informed of significant internal and external developments regarding safety and health.

4.1.2 Parsons Management and Supervisory Personnel

Supervisors and members of management, at all levels within Parsons, will comply with the Company's SH&E Policy and ensure that the applicable SH&E requirements at each domestic and international office and project facility are effectively implemented and monitored at all times. The supervisors and members of management will ensure that the policies are effectively integrated with the preparation of proposals, project planning, and project execution. The safety performance of subcontractors will also be monitored in accordance with contract specifications as required by the contract with the client. Safety information and statistics will be reported to Parsons Corporate Safety Manager by personnel serving as supervisors or managers on a consistent and regular basis.

4.1.3 Parsons Employee Responsibility

Safety and health is the responsibility of everyone at Parsons. The Parsons employee, to include subcontractors of Parsons, is required to exercise maximum appropriate care and good judgment at all times regarding safety and health, and adhere to safety procedures to prevent accidents and injuries. Any accidents or injuries either suffered by or witnessed by employees will be promptly reported to supervisory personnel. In order to better plan and avoid possible future accidents or injuries, the Parsons employee is required to promptly report any near misses or close calls. The employees are also required to promptly report any unsafe conditions, equipment, or practices to supervisory personnel in order to ensure a safe working environment.

4.2 Identification of Accountability

The names of project personnel and their accountability and responsibility for project safety are summarized in Table C-4-1.

Table C-4-1
Parsons Project and Safety Personnel

Project Personnel	Accountability and Responsibility
Program Manager ***John Ratz, PE***	Reports to upper-level management, has authority to direct response operations, assumes total control over Program/Project site activities.
Project Manager ***Ed Heyse, PhD, PE*** Deputy Project Manager ***Lauri Roché***	Reports to upper-level management, has authority to direct response operations, assumes total control over Project site activities.
Project Health and Safety Manager (PHSM) ***Ed Grunwald, CIH***	Advises the Program/Project Manager, Field Team Leader, and SSHO on all aspects of H&S.
Site Safety and Health Officer (SSHO) ***Morgan Todd (primary), Cheryl Huey (alternate)***	Reports to the PHSM on all aspects of Safety and Health onsite, performs day-to-day H&S tasks, and stops work if any operation threatens worker or public health and/or safety.
Subcontractor Corporate Leads ***Mike Franks (TestAmerica), Albert Chuang (EnviroCore Inc), Jim Wellert (Wellert Corp), Stephen Kilper (Avalon Holdings Corp.)***	Coordinate with Parsons Program/Project Manager on project-specific H&S.
Parsons Project Staff ***Dan Griffiths, Ed Heyse, Lauri Roché, Cheryl Huey, Morgan Todd, Jessica Click. Others TBD.***	Act proactively with regard to project-specific and general health.
Corporate Safety ***Brad Barber***	Provides technical and programmatic content to the CEO/President and company-wide direction and leadership on ESHARP Management processes.
PGS Safety Manager ***Steven Schoolcraft***	Provides oversight, technical guidance, training, and support to project safety managers; leads safety audit efforts; and implementation of safety initiatives.
Installation and Environment Division Manager ***Christopher Alexander***	Establishes division-level safety initiatives; monitors development and use of health and safety plans for all division projects and ensures they are in compliance with the GBU, and corporate H&S requirements
Environmental Services Sector Manager ***Julie Burdey***	Works closely with Project Managers to ensure health and safety implementation.

CEO = Chief Executive Officer; CIH = Certified Industrial Hygienist; ESHARP = Environmental, Safety, Health and Risk Program; GBU = Global Business Unit; H&S = Health and Safety; PE = Professional Engineer; PGS = Parsons Government Services; PHSM = Project Health and Safety Manager; SSHO = Site Health and Safety Officer; TBD = to be determined

4.3 Competent and Qualified Persons

In general, the competent person on site will be the Site Safety and Health Officer (SSHO). The competent person for investigation work is Morgan Todd. The competent person for groundwater monitoring is Cheryl Huey. Qualification and certifications for SSHOs and competent persons are included in Appendix E. In the future, other individuals with equal qualifications and certifications may serve as the SSHO and/or the competent person, and their certifications will be submitted to USACE prior to work being performed. Training and experience requirements for qualified persons are included in Activity Hazard Analyses (AHA) in the attached SSHP (Appendix C-1, Attachment C1-1). Documentation of qualified persons experience and certification will be attached to the SSHP and copies maintained by the SSHO on site.

4.4 Competent Person Supervision

All work shall be conducted under the direct supervision of the designated competent and/or qualified person. The competent and/or qualified person shall be present on the individual sites at all times when work is being conducted.

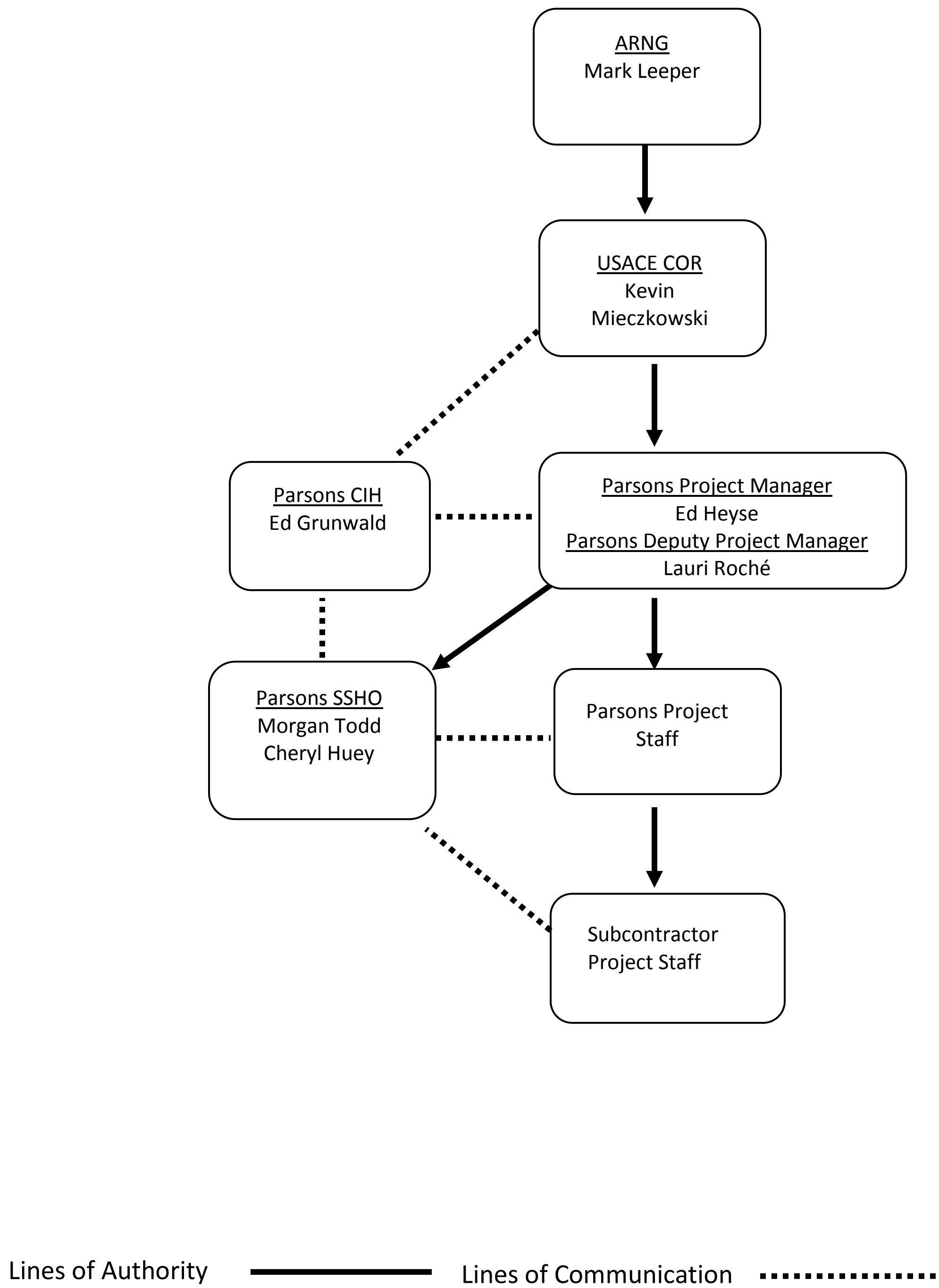
4.5 Pre-Task Safety and Health Analysis

The designated SSHO will develop a detailed AHA and conduct an AHA review with the field team prior to performing each task. The SSHO will document the date, time and personnel participating in the AHA training. Safety and health is the responsibility of everyone at Parsons. The Parsons employee, to include subcontractors of Parsons, is required to exercise maximum appropriate care and good judgment at all times regarding safety and health, and adhere to safety procedures to prevent accidents and injuries. Any accidents or injuries either suffered by or witnessed by employees will be promptly reported to supervisory personnel. In order to better plan and avoid possible future accidents or injuries, the Parsons employee is required to promptly report any near misses or close calls. The employees are also required to promptly report any unsafe conditions, equipment, or practices to supervisory personnel in order to ensure a safe working environment. The “Near Miss” Incident Investigation Report Form is included as Exhibit 3 of this APP.

4.6 Lines of Authority

It is important for each employee involved with the project to know and understand the lines of authority. The organizational structure of supervisory personnel for this project is outlined in Figure C-4-1. All personnel will be informed of this organization structure during the training phase of the project.

Figure C-4-1
Lines of Authority



4.7 Noncompliance with Safety Requirements

Parsons and its subcontractors will enforce all applicable requirements of OSHA 1910 and 1926 as well as EM 385-1-1. Parsons Corporate policies include a progressive discipline system for corrective action for performance or behavior that does not meet expectations. The corrective action used, the sequence, and the duration may vary depending on the issue and related circumstances. Progressive steps typically include counseling, written warning, unpaid suspension, and termination. Again, Program/Project Managers are responsible for the establishment and application of a fair and consistent project policy for the disciplinary process related to health and safety violations. However, the PM must ensure that the handling of disciplinary matters is consistent with applicable contracts or local and national collective bargaining agreements. Please see Exhibit 5 for the Notice of Noncompliance with Safety and Health Regulations Form.

The project has a formal Notice of Subcontractor Violation of Safety and Health Regulations form (Exhibit 4) to ensure that violations are issued as the result of an "immediately dangerous to life and health" situation or when the subcontractor repeatedly fails to comply with safety and health requirements.

Performance below expectations requires a response from subcontractor senior management. This notice contains five distinct levels of discipline, from submission of a recovery plan to contract termination.

4.8 Managers and Supervisors Accountability for Safety

The Program/Project Managers are fully responsible and accountable for the following safety related issues:

- Ensuring the Project APP/SSHP is in place and functioning from the beginning of the project and participating in plan development.
- Scheduling and conducting the stakeholder meeting prior to commencement of site work.
- Implementing the awareness campaign and ensuring that awareness materials are posted in a highly visible location or distributed to project employees.
- Working with project talent management and safety representatives to ensure that new and transferred employees promptly receive safety orientation.
- Ensuring that project employees receive appropriate general and project-specific safety training.
- Ensuring that all incidents are reported and investigated in a timely manner and that appropriate corrective actions are identified and implemented (may participate in or lead investigations).
- Submitting incident reports and monthly reports of hours, and providing reports of selected metrics to the project team.
- Ensuring that routine internal safety inspections are performed at least once a month or as applicable to the project; tracking corrective actions to completion; performing inspections.
- Ensuring that preconstruction safety planning and review are complete before request for proposal are issued.

- Developing the orientation program to ensure that safety and health policies and procedures are clearly communicated and understood.
- Scheduling and conducting the meetings (e.g., between unions, OSHA and other agencies).
- Ensuring a process is in place to review all subcontractor safety programs before construction begins.
- Ensuring that a pre-mobilization meeting takes place with every major subcontractor.
- Participating in progress meetings and reviewing mitigation plans (which include the following: upcoming scope of work risks and hazards, control measures, AHAs required, subcontractor mobilization or demobilization, scheduled audits or inspections, competent person changes or additions, planned orientations and training, recommendations, comments, concerns, and lessons learned).
- Ensuring that AHAs are included in the project schedule and are conducted as planned.
- Ensuring that all workers participate in required training, and participating, as available, in daily toolbox meeting as a trainer or participant.
- Ensuring that they or their staff conduct routine site walk-arounds daily.
- Ensuring that a comprehensive final safety report is developed and issued for projects where a final safety report is required.
- Appointing a records custodian and implementing a comprehensive records storage and retention plan.

5.0 SUBCONTRACTORS AND SUPPLIERS

5.1 Identification of Subcontractors

Selected subcontractors or suppliers may include drillers, contract analytical laboratory services, surveyors, waste handlers, etc. It is Parsons policy to strictly comply with all applicable requirements of the Federal Acquisition Regulations (FAR) and other Federal, state or local laws and regulations in the procurement of services (subcontracts, SC) or goods (purchase orders, PO) under federally funded contracts. The FARs establish and define uniform policies and procedures of acquisition by all federal executive agencies. The FARs are the primary document governing acquisitions by the federal government. The FARs are supplemented by individual agency regulations which prescribe additional policies and procedures as necessary to satisfy the specific needs of the agency. The FARs address all phases of procurement by the U.S. government including acquisition planning, contracting methods and types, socioeconomic programs, general and special contracting requirements, contract management, solicitation provisions, and contract clauses and forms. All federal contracts embody the policies and procedures mandated by the FARs, as reflected in the contract terms and conditions.

Program Managers/Project Managers, in conjunction with Subcontract Administrators and Purchasing Agents, are responsible for defining the FAR requirements of a particular contract and describing the flow down and other applicable and necessary provisions that must be incorporated in Parsons SCs and POs. Contract flow down provisions are to be appropriately tailored and incorporated into the "Special Provisions" section of the SC and PO forms.

Parsons procurement process under our contract vehicles with the Army includes defining technical and FARs TO subcontractor or supplier requirements, identifying potential sources, solicitation and evaluation/selection of the supplier or subcontractor, award of the PO or SC, PO/SC administration, and PO/SC close-out.

Table C-5-1 details the vendors and subcontractors currently anticipated to supply equipment or render services to the personnel working at Camp Ravenna. The actual subcontractors and suppliers used may vary from the list in Table C-5-1. All services and vendors will be selected based on government-approved procurement procedures.

Table C-5-1
Subcontractors and Suppliers

Subcontractor or Supplier	Service Provided	Subcontractor Contact
TestAmerica	Laboratory Analytical	Mike Franks 13715 Rider Trail North St. Louis, MO 63045 Tel 314.298.8566 | Fax 314.298.8757
EnviroCore Inc	Drilling and Direct Push	Albert Chuang 8250 Estates Parkway, Unit C Plain City Ohio 43064 Tel 614.733.0377

Wellert Corporation	Surveying	Jim Wellert 5136 Beach Road Medina, Ohio 44256 Tel 330.239.2699 Ext. 306
Avalon Holdings Corp.	Waste Handling / Disposal	Stephen Kilper One American Way Warren, Ohio 44484 Tel 330.856.8800

5.2 Safety and Responsibilities of Subcontractors

Parsons Health and Safety Program requires each subcontractor to submit with its proposal a completed Subcontractor Safety Data Questionnaire form. Projects should consider eliminating from consideration those suppliers that fail to complete or return partially completed questionnaires.

Each subcontractor to Parsons must submit a written subcontractor SSHP for review and approval; or review, accept, and sign-off on Parsons Accident Prevention Plan. The Program Manager/Project Manager reviews the subcontractor SSHP for compliance with contract safety specifications, quality, and applicability to risks of the work. At a minimum, the subcontractor SSHP shall comply with the contract and shall contain information to detail specific issues relating to the following topics (as applicable):

- Accountability/Responsibility/Key Line Personnel
- Statement of Subcontractor's Safety and Health Policy
- Identification of Competent/Qualified Persons
- Scope of Work Evaluation
- Hazard/Risk/Exposure Assessment
- Control Measures/Activity Hazard Analysis
- Subcontractor Periodic Safety Audits/Inspections
- Subcontractor's Weekly Safety Planning – Weekly Look Ahead Plan
- Compliance Requirements and Policy
- Written Progressive Disciplinary Program
- Hazard Correction System
- Training and Instruction
- Project Site Orientation
- Communication System
- Recordkeeping
- Accident/Exposure Investigation
- Emergency Action Plan
- Site-Specific Medical Emergency Plan

- Written Hazard Communication Program
- Written Trenching and Shoring Plan (if applicable)
- Written 100% Fall Protection Plan (if applicable)
- Other written programs as specified by regulatory agency or contract Requirements
- List of Attachments

Upon selection of subcontractors, the SSHP will be provided to the subcontractors which will summarize the health and safety hazards and activity hazards associated with that project task and indicate the safety equipment and safeguards suitable for the hazards involved.

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6.0 TRAINING

6.1 New Hire Training

The PM, PHSM, Field Team Leader, or SSHO will conduct the project and task-specific orientation for all new Parsons staff and subcontractor management personnel as described in the attached SSHP (Appendix C-1, Section 5.2). Visitor training is described in SSHP (Appendix C-1, SSHP Table C1-5-1).

6.2 Mandatory Training and Certifications

The project has a comprehensive health and safety training program tailored to the scope of work. All employees receive a general safety orientation as outlined in Appendix C-2 upon assignment to the project. All Parsons new hires shall receive a facility employee orientation within the first seven days of employment, provided by Talent Management, the Safety Representative and the Staff Coordinator. Depending on the employee assignment, specific training topics may also include:

- Cardiopulmonary Resuscitation (CPR) / First Aid / Automated External Defibrillator (AED) and bloodborne pathogens (BBP)
- Back Safety – lifting and carrying
- Defensive Driving
- Visitor Training
- Respiratory Protection
- Emergency Response
- Hazard Communication
- Initial Site Training
- Parsons Accident/Incident Reporting Procedures

All personnel engaged in hazardous substance removal or other activities that expose or potentially expose them to hazardous substances or health hazards shall receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120, including, but not limited to, initial 40-hour and annual 8-hour refresher training and will also be enrolled in a medical surveillance program. The SSHO will have additional training including 8-hour supervisory training and the 30-hour OSHA Construction Outreach Course.

Operators of heavy equipment must be certified by letter by their employer that they are qualified to operate the specific equipment. Letters will be submitted to USACE and attached to the APP/SSHP. Forklift operators must be certified in accordance with 29 CFR1910.178. Copies of operator certificates of training must be present onsite during forklift operation

OSHA regulations require specific training in certain circumstances. Based on the scope of work and meetings with regulatory officials, the following training topics are provided on the project:

- General – all workers engaged in activities which are potentially exposed to hazardous substances and health hazards must be trained to meet 1910.120(e)(1). Annual 8-hour refresher training as per 29 CFR 1910.120(e)(3) is required for workers and supervisors must be trained to meet 29 CFR 1910.120(e)(4).

- CPR/AED/First aid – provided to personnel based on project activities identified in the Scope of Work (i.e., life threatening)
- Respiratory protection – must meet 29 CFR 1910.134. Medical qualification by a physician is required to wear a respirator. Annual fit testing and training is also required.
- Others to be added as needed or determined.
- The PM determines the necessary training and coordinates the training with the PHSM.

The OSHA Regulations (29 CFR 1910.151 and 1926.50) state the employer shall ensure the ready availability of medical personnel for advice and consultation on matters of occupational health. In the absence of an infirmary, clinic, hospital, or physician, that is reasonably accessible in terms of time and distance to the worksite (i.e., four minutes for activities that can be expected to result in an accident involving suffocation, severe bleeding, or other life threatening or permanently disabling injury or illness and 15 minutes for other types of injuries), which is available for the treatment of injured employees, a person who has a valid certificate in first-aid training from the U.S. Bureau of Mines, the American Red Cross, or equivalent training that can be verified by documentary evidence, shall be available at the worksite to render first aid. First-aid supplies must be accessible for immediate use and be of sufficient size and number to handle common first aid incidents.

The response time and distance to the nearest hospital has been determined to be 10 to 30 minutes; however, this may vary depending location task. Based on the activities described in the SSHP (Appendix C-1) and the list of AHAs also included in Appendix C-1 as Attachment C1-1, the project could have the potential for an accident involving suffocation, severe bleeding, or other medical emergencies or permanently disabling injury or illness. Because the response time for Emergency Medical Services based on the activities for this project is not reasonably accessible at all times, the project will require at least two individuals at the work location to have a valid certificate in CPR and first aid. The employee(s) listed below are assigned to the project, will be on site during work activities and will have a valid certificate in CPR and first aid (documentation will be included in the site project files):

- Morgan Todd
- Cheryl Huey
- Others TBD as needed

During weekly progress meetings, the Field Team Lead, SSHO, and subcontractor on-site safety managers will review and summarize upcoming work tasks, audits and inspections, competent person changes, and training. The team will discuss and evaluate the risks of the upcoming work tasks and the planned mitigation measures for follow-on discussion during the daily tailgate safety meetings. Activities will be added to the summary at least two weeks in advance of the work. The Risk Mitigation Two-Week Look-Ahead Form, provided as Exhibit 9 in this APP, can be used to plan risk mitigation strategies at the weekly progress meetings.

6.3 Periodic Safety and Health Training

Consistent with Parsons corporate initiatives in safety training, the PM may decide to identify applicable personnel (i.e., managers, engineers and supervisors, including subcontractor personnel), that shall be current in the completion of on-line safety modules available at the

Parsons University (ParsonsU) Website and that should receive Supervisor Training in Accident Reduction Techniques (START) training to further Parsons' goal of zero incidents.

The Global Business Unit (GBU) and Division Safety Manager serve as the certified trainers for periodic START training sessions for new personnel. They should be contacted if personnel need to receive training.

When the AHA is complete, the Parsons PM, Field Team Leader, SSHO, or designated subcontractor will conduct a training session with all employees involved with the analyzed task. The training may be informal and at the site where the task is performed. Employees should be given an opportunity to provide input regarding task steps, hazards identified, and appropriate control measures.

The PM or designee documents and maintains the AHA training using Exhibit 8.

Parsons and its subcontractors conduct daily tailgate safety meetings at the beginning of each day. These meetings include topics relevant to upcoming work and may include reviews of recent incidents on the project. The Field Team Leader or the SSHO is responsible for the toolbox safety training content and documenting and retaining attendance records using the Employee/Subcontractor Training Acknowledgement Form (Exhibit 1).

One tool Parsons employs to ensure that employees understand the hazards and control measures associated with their assigned task is through the use of a Take 5 card (see example in Exhibit 11). The Take 5 card is employed by the SSHO as means to review safety concerns with team members prior to the start of an activity. The card is to be used by the SSHO as a guide highlighting the topics that should be discussed during the meeting. The card provides a list of questions that the SSHO can use to prompt employee involvement. Input by team members can provide the SSHO with insight into potential hazards or areas where safety and health protections systems can be improved. At the conclusion of the meeting the card is completed by the SSHO and signed by team members. A Take 5 meeting must be conducted whenever a new activity is started during the day (i.e. a team taken from one activity to assist on another activity must conduct a 2nd meeting prior to the start of the new operation). The Take 5 card can be incorporated into the morning safety brief that is performed by the SSHO. In this instance the card is completed by the SSHO which is then signed by team members.

6.4 Requirements for Emergency Response Training

See attached SSHP (Appendix C-1, Section 14).

6.5 Hearing Conversation Training

The SSHO will develop a hearing conservation training program for all employees assigned to noisy work. This training will be a component of the initial site safety training and as a minimum shall consist of:

- The effects of noise on hearing.
- The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care.
- The purpose of audiometric testing, and an explanation of the test procedures.

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7.0 SAFETY AND HEALTH INSPECTIONS

7.1 Assignment of Responsibilities

As part of the Parsons ESHARP Management, roles and responsibilities for safety audits, inspections and recordkeeping have been established. For each project, the Parsons PM is responsible for ensuring that routine internal safety inspections are performed, for tracking corrective actions to completion, and performing inspections. The Parsons PHSM is responsible for developing and implementing the project safety and health inspection program contained in this plan as well as conducting inspections.

The SSHO is responsible for conducting safety and health inspections or walk-arounds, identifying and reporting deficiencies, and working with the project team to develop corrections. The SSHO will follow-up on any deficiency in a timely manner and halt operations if necessary in order to ensure that individuals are not exposed to an unsafe environment.

Safety and health inspections will be conducted either by the SSHO, the PSHM, or another qualified appointee. Personnel responsible for safety and health inspections will meet the criteria of an OSHA competent person. Safety and health inspections will be conducted daily during field operations and when any of the following events occur:

- The introduction of new substances, procedures, or equipment that presents potential new hazards into the workplace;
- New, previously unidentified hazards are recognized;
- Receipt of complaints of unsafe conditions; or
- In the event of an occupational injury or illness.

Safety inspections are conducted by physically walking around the work area(s) and observing conditions for routine and emergency access, evacuation technique, personal protective equipment (PPE), work practices, site access control, Safety Data Sheet availability, first aid equipment, firefighting equipment, and sanitation. The inspections may include conversations with workers and supervisors and review of certifications and training documentation.

All deficiencies or non-conformances will be documented. If safety hazards exist, it may be necessary to stop work until corrections are in place. Many deficiencies can be corrected immediately by placing barriers, installing signs, changing procedures, etc. The status of each deficiency will be tracked by the SSHO to ensure that a correction is made. If necessary, the SSHO will stop work until the deficiency is corrected. Follow-up reporting on deficiencies will be included on succeeding safety and health inspection documentation until the deficiency is resolved.

Safety inspections begin during the project mobilization phase, and continue through the life of the project, with the content and protocol changing based on the phase of work. Findings from the inspection are documented on an inspection form (e.g., Exhibit 7), and all corrective actions will be tracked to completion by the PM or the PHSM (refer to EM 385-1-1 section 01.A.07). The goal of the safety inspection process is to identify potential process failures and improvement opportunities.

All programs/projects must establish record keeping procedures consistent with the records retention policy on Parsons PWeb (under Corporate Policies). At a minimum, each project must maintain the following records to document their safety program (these records will be audited):

1. Records of hazard assessment inspections, including the name of the person conducting the inspection, unsafe conditions and work practices identified, and action taken to correct unsafe conditions and work practices. These data are recorded on a Remediation Safety and Health Inspection Checklist (Exhibit 7).
2. Documentation of safety and health training for each employee, including name or other identifier, training dates, type of training, and name of instructors are recorded on an Employee/Subcontractor Training Acknowledgement form (Exhibit 1). Inspection records and training documentation are maintained in the project office.
3. OSHA 300 Log (Report of Injuries and Illnesses).
4. Other records as required by Parsons or local, state, or federal regulation.

7.2 External Inspections and Certifications

No external safety and health inspections or certifications are required for this project.

8.0 MISHAP REPORTING AND INVESTIGATION

8.1 Exposure Data

All Parsons labor hours expended on programs and projects within Parsons are reported weekly within Parsons Webtime Management System or Deltek TESS. When needed, features within the Parsons Webtime or TESS application allow field labor hours expended on projects to be reported and tallied separate from non-field time labor hours within Parsons' Financial Reporting System. Parsons Managers, Program Managers, PMs and other employees can specify and access ad hoc labor hour reports directly from their computers. Such reports can be tailored to individual employee reports or Program/Project/Work Breakdown Structure reports on a weekly or multi-weekly basis. As part of our Monthly Progress Reports and Billing process, Parsons provides USACE with information pertinent to the labor hours expended on all projects performed.

In addition, Parsons requires programs/projects that meet or exceed one or more of the following criteria to submit internal Parsons monthly manhour reports to the GBU Safety Director:

- Parsons has five or more full-time equivalent (FTE) employees working in the field
- Subcontractors (all tiers) have 25 or more FTE employees working in the field
- Parsons is contractually responsible for construction on the project
- Parsons is contractually responsible for safety on the project

Projects not surpassing these baseline levels do not need to provide internal reports to GBU management.

Subcontractor hours will be tracked and entered into Industry safe system each month.

8.2 Mishap Reports, Investigations, and Documentation

Accident investigations are an important element of Parsons Safety program because they provide useful information to prevent similar incidents. Incident investigations identify root causes, system failures, unsafe acts and conditions, and noncompliance with or inadequacy of the APP. All significant near miss, injury, illness, or major equipment or property damage incidents (including work interruptions) require an investigation.

The PM and SSHO must conduct the onsite investigation immediately and prepare an incident investigation report in the event that one is required. The PM is responsible for ensuring that all incidents are reported and investigated in a timely manner and that appropriate corrective actions are identified and implemented. The SSHO will usually lead any investigation with the assistance of the Site Manager and PHSM. Additional participants may include the Project Controls Manager and the Project Human Resources Manager. The GBU Safety Manager or a designee completes the on-line safety reporting system incident investigation tab while Corporate Safety disseminates the results of the completed investigation throughout the Corporation as appropriate to implement lessons learned.

The general information collected by the accident investigation includes:

- Location, time, and date;
- Description of the operation being performed at the time of the accident;
- Outline of the sequence of events that led up to the accident;

- All personnel associated with the work task and incident; and
- All eyewitnesses.

The investigation team will proceed in the following manner:

1. Identify, secure, and document any evidence, tools, or other materials pertinent to the investigation.
2. Identify and interview all involved employees and eyewitnesses.
3. Provide a private place and time for each individual to prepare a written statement.
4. Prepare and issue a written report.

In the event an accident occurs at the site, the SSHO will investigate the accident after all emergency response actions have been taken. An on-line Parsons Incident/Accident Report Form will be completed by the SSHO and submitted to Parsons. A verbal notification will also be given to the PHSM that the form is being filled out. Subcontractors must investigate incidents involving their employees or activities and submit an investigation report to the Parsons PM within 48 hours of an incident.

If an incident results in a lost workday case or worse, the PM and immediate supervisor must call the GBU President within 4 hours. Any fatality, injury of a private citizen, property loss or damage in excess of $50,000 or a catastrophe (as defined by OSHA) requires immediate notification of the GBU or Corporate Safety Manager. The GBU Safety Manager or Corporate Safety Manager must notify the local OSHA office within eight hours.

8.3 Accident Notification

In accordance with EM 385-1-1, Section 01, Accident Reporting, paragraph D, all mishaps and accidents (property damage greater than $5,000, days away injuries, days away illness, and restricted/transfer injuries) will be reported to Range Control immediately so they may summon emergency services. Parsons will thoroughly investigate the mishap and submit the findings of the mishap along with the appropriate corrective actions to the contracting officer as soon as possible but no later than five working days following the mishap. Mishaps will be reported immediately if there is:

a) a fatal injury/illness;
b) a permanent totally disabling injury/illness;
c) a permanent partial disabling injury/illness;
d) the hospitalization (as inpatients) of one or more people resulting from a single occurrence;
e) property damage of $500,000 or more; or the occurrence of three or more individuals becoming ill or having a medical condition which is suspected to be related to a site condition or a hazardous or toxic agent on site.

Parsons has an online incident reporting tool for internal reporting (see Exhibit 10). This system can be used to file the initial report and the incident detail report; however, it is necessary to have access to the Parsons PWeb in order to use this tool. The incident reporting tool can be accessed at the following link: https://project1.parsons.com/Safety/login.htm

In the event an incident occurs at the site, the SSHO will investigate the incident after all emergency actions have been taken. ENG Form 3394 will be filled out by the SSHO and submitted to the Parsons PSHM and PM, who in turn will submit it to the KO. A verbal notification will be given to the SSHO that the form is being filled out. The ENG Form 3394 Accident Investigation Report is Exhibit 2 of this APP.

Parsons will notify OSHA within 8 hours when there is the occurrence of a fatality. Parsons will report all work-related in-patient hospitalizations, as well as amputations and losses of an eye, to OSHA within 24 hours of the event.

In accordance with Data Item Description Worldwide Environmental Services-011.01, Parsons will immediately report to the KO or government designated authority any accident that could bring adverse attention or publicity to the USACE.

Other lost-time or OSHA-recordable accidents/incidents will be formally reported (i.e., using a written report) to USAESCH within five working days. The onsite USAESCH representative will be notified within one day of any accident or injury that may require reporting. An OSHA 300 log of work-related injuries and illnesses will be maintained at the site. A copy of the OSHA 300 log is provided in Exhibit 12 of this APP.

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9.0 PLANS, PROGRAMS, AND PROCEDURES

9.1 Fatigue Management Plan

This Fatigue Management Plan (FMP) will be completed as part of this APP/Project SSHP whenever work hours:

1. Exceed 10-hours a day for more than 4 consecutive days;
2. Exceed 50-hours in a 7-day work week;
3. Exceed 12-hours a day for more than 3 consecutive days, or
4. Exceed 58-hours a week for sedentary (to include office) work.

The FMP shall address the following conditions for operator work hour limitations:

1. **Equipment Operators.** Operators of equipment, such as hoisting equipment and draglines, mobile construction equipment, electrical power systems, hydropower plants, industrial manufacturing systems, hydraulically operated equipment, powered vessels, and boats, shall not be permitted to exceed 12-hours of duty time in any 24-hour period, including time worked at another occupation. A minimum of 8 consecutive hours of rest between shifts in a 24-hour period is required.
2. **Motor Vehicle Operators.** Operators of motor vehicles, while on duty, shall not operate vehicles for a continuous period of more than ten 10-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 12-hours during any 24-hour period. A minimum of 8 consecutive hours shall be provided for rest in each 24-hour period.
3. **Floating Plant.** Not applicable to this project.

9.2 Emergency Response Plans

9.2.1 Procedures and Tests

The purpose of the Emergency Response and Contingency Plan (ERCP) is to define the general procedures to protect human health and the environment both in the event of an accident or emergency during the course of project activities at Camp Ravenna. The attached SSHP (Appendix C-1, Section 14) includes the emergency procedures and equipment associated with the project.

Pre-Emergency Planning

Situations requiring emergency response can be minimized by planning and approaching the circumstances in a calm, deliberate manner. The ERCP outlines whom and what means will be used to alert the local community if they are in jeopardy.

As conditions dictate, the PHSM or the SSHO will be the on-site emergency coordinator in case of an accident or incident requiring emergency response. All personnel will be briefed at the morning tailgate safety meetings of the location and use of the cellular telephones and who has on-site radio communications. The best communication device is a cell phone. Cell phone use while driving is also restricted according to Parsons policy unless the operator of the vehicle pulls off to the shoulder safely, then takes the call. This information will also be included in all visitor briefings.

Personnel Roles, Lines of Authority, and Training

Training requirements for site personnel, including site-specific training are discussed in the attached SSHP (Appendix C-1, Section 5).

Emergency Response Preparedness

Emergency Response Procedures are discussed in the attached SSHP (Appendix C-1, Section 14).

9.2.2 Spill Plan

Chemical spills are not expected to be a problem at the Camp Ravenna AOCs. Fuels and oils may be brought on site occasionally for equipment to be used on site. These will be brought on site in small quantity containers in the amounts needed for that day's operations. If a spill should occur while performing fueling on equipment, the spill would be a small quantity (under a gallon) and it will be cleaned up immediately. Small spill response kits (e.g., paper towel, diaper, etc.) will be on-hand to assist in the cleanup. Any spill and contaminated soil will be containerized and labeled, properly manifested, and shipped to an approved hazardous waste facility. Spills will be reported to Range Control immediately and to the Camp Ravenna Environmental Office via the First Responder Spill Reporting Form (Exhibit 14). All spills will be handled in accordance with the Camp Ravenna Integrated Contingency Plan.

9.2.3 Fire Fighting Plan

Fire prevention and protection is covered in the attached SSHP (Appendix C-1, Section 10.6).

9.2.4 Posting Emergency Phone Numbers

Emergency Phone numbers are listed in the attached SSHP (Appendix C-1, Table C1-14-1). Because Parsons has no site office at Camp Ravenna, emergency numbers will be kept in all vehicles while on site.

9.2.5 Medical Support

For any minor or serious injuries, the on-site first aid/CPR trained personnel will provide the initial first aid response. All medical emergencies will be reported to Range Control at 614-336-6041 so they may summon the emergency services, or the injured person will be transported by any available site personnel to University Hospitals Portage Medical Center (Figure C-9-1). Note that 911 may not be called in event of an emergency on the facility.

The attached SSHP (Appendix C-1, Section 14) presents the procedures required for medical emergencies, as well as a list of emergency and non-emergency phone numbers.

Parsons and WorkCare have partnered together to promote Incident Intervention™, a resource designed to provide Parsons employees with immediate access to qualified medical clinicians who are able to provide our employees with prompt medical assessment in the event of nonlife threatening, nonmedical emergency work related injury or illness. Through this process, Parsons can leverage clinical expert resources to coordinate appropriate treatment care. WorkCare serves as a "medical advocate" for the employee, the WorkCare clinician provides responsive evaluation of the incident, assists the employee/employer in determining the most appropriate course of action, and consults with the treating physician.

If the incident that occurs is serious/life threatening or requires emergency response, medical assistance will be summoned before contacting the GBU Safety Director, filing the IndustrySafe Online Incident Report, or involving WorkCare.

To coordinate the WorkCare triage process, Parsons employees will report all work-related injuries immediately to their supervisors.

For work-related injuries or illnesses that may require physician direction on appropriate treatment, Parsons employees will then promptly contact WorkCare, ideally before seeking medical care, as this will provide the greatest opportunity for appropriate intervention.

If an injured employee requires medical care for a work-related injury/illness, the Order for Treatment of Work-Related Injury/Illness Form MUST be sent with the injured worker and/or faxed to the occupational medicine clinic at the time of the initial evaluation.

WorkCare's Incident Intervention is available 24 hours a day, 7 days a week (24/7), and 365 days per year.

WorkCare contact number is 1-888-449-7787.

Employees should be prepared to provide the following:

- Injured employee's name
- Injured employee's contact number
- Injured employee's location (at a minimum include the city and state)
- Injured employee ID number
- Injured employee's GBU
- Injured employee's project or office location
- Functional manager's name

9.3 Site Sanitation Plan

Sanitation issues will be in accordance with Section 2 of EM 385-1-1 and are described in the attached SSHP (Appendix C-1, Section 10.13).

9.4 Bloodborne Pathogen Program

Parsons employees designated as responsible for rendering first aid or medical assistance will be included in this BBP program in accordance with 29 CFR 1910.1030 and will:

- Be instructed in the sources, hazards, and avoidance of BBPs and be provided the training specified in 29 CFR 1910.1030 and Section 39 Bloodborne Pathogens of the Parsons Corporate Safety and Health Manual;
- Be provided with, and shall use and maintain, PPE (i.e., breathing barrier, latex-free gloves, gowns, masks, eye protectors, and/or resuscitation equipment) when appropriate for rendering first aid or other medical assistance to prevent contact with blood or exposure to other potentially infectious materials.

9.5 Layout Plans

Parsons does not plan to rent a mobile office trailer for use in coordinating field activities, support for the field crew/personnel and temporary storage of field equipment. Instead, the field effort will be coordinated from Parsons Huntsville (Alabama) office, with support from Parsons offices in Cincinnati and Cleveland (Ohio), and equipment storage space will be rented as needed. Therefore, a formal Layout Plan is unnecessary for the Camp Ravenna Project. The attached SSHP (Appendix C-1, Section 11) covers site layout and control measures associated with the project.

9.6 Access and Haul Road Plan

All roads used during field activities at Camp Ravenna will be used in a safe manner to reduce any potential hazards involving vehicles. No construction of new roadways is planned during any of the fieldwork. Site vehicles will be driven in a safe manner by a licensed driver. All speed limits on public roads will be observed, and speed on the site will be adjusted as appropriate for existing road conditions.

9.7 Hearing Conservation Plan

Details on hearing protection are provided in Section 3.2.4 of the SSHP, and Hearing Conservation Training details are provided in Section 6.5 of this APP and the SSHP Section 5.1.

9.8 Respiratory Protection Plan

Use of respiratory protection is not anticipated for this work. Air monitoring will be conducted in accordance with the attached SSHP (Appendix C-1, Table C1-6-2). If action levels are exceeded, the team will stop work, evacuate the work area and allow it to ventilate. If the SSHO determines that respiratory protection is necessary, Parsons will institute a respiratory protection plan in accordance with the process described in the attached SSHP (Appendix C-1, Section 6.4 and Attachment C1-5).

9.9 Health Hazard Control Program

Health hazards for this project are analyzed and discussed in the attached SSHP (Appendix C-1, Section 3).

9.10 Hazard Communication Plan

The Hazard Communication Plan for this project is presented in the attached SSHP (Appendix C-1, Section 10.11). See Exhibit 13 for Parsons Hazard Communication procedures.

9.11 Process Safety Management Plan

Not applicable to this project.

9.12 Lead Compliance Plan

Not applicable to this project.

9.13 Asbestos Abatement Plan

Not applicable to this project.

9.14 Radiation Safety Program

Not applicable to this project.

9.15 Abrasive Blasting

Not applicable to this project.

9.16 Heat/Cold Stress Monitoring Program

The heat/cold stress monitoring program for this project is presented in the attached SSHP (Appendix C-1, Section 9).

9.17 Indoor Air Quality Management

Supervisors will report employee concerns or complaints of indoor air quality problems to the facility manager/owner or other designated representative. That individual will be responsible for investigating and resolving the indoor air quality complaint in a timely manner and reporting back to the supervisor. For leased facilities, procedures for resolving indoor air quality issues should ultimately be investigated and resolved by the lessor. An Industrial Hygienist or other qualified and competent person shall initiate an Indoor Air Quality investigation using appropriate guidelines published by the American Conference of Governmental Industrial Hygienists (ACGIH); American Industrial Hygiene Association (AIHA); American National Standards Institute (ANSI); American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE); USEPA; OSHA; National Institute for Occupational Safety and Health (NIOSH); or other Federal, Department of Defense (DOD), State, local, and host nation requirements. At a minimum the following shall be investigated:

- Ensure building activities, such as painting, roof repairs, carpet installation and repair and other activities likely to involve usage of chemicals or solvents, are conducted after normal working hours where possible or in a manner that will prevent exposure to occupants.
- Evaluate condition of the air-handling system for proper operation, make-up air supply, blocked dampers or diffusers, cleanliness of ducts and filters, and standing water or wet areas.
- Educate employees and supervisors concerning measures they can take to help maintain acceptable indoor air quality in their work areas. Employees shall be instructed not to make unauthorized modifications to the heating, ventilation, and air conditioning (HVAC) systems (i.e., blocking off vents, removing ceiling tiles).

9.18 Mold Remediation Plan

Not applicable to this project.

9.19 Chromium (VI) Exposure Evaluation

Not applicable to this project.

9.20 Crystalline Silica Evaluation

SSHO and field personnel will implement dust suppression practices (such as wetting the area with water) and administrative controls to reduce dust emissions during use of cement or bentonite by slowly pouring the bentonite or slowly mixing the cement. Exposure of workers to levels of crystalline silica above the OSHA permissible exposure limit (PEL) are not anticipated.

9.21 Lighting Plan for Night Operations

Not applicable to this project.

9.22 Traffic Control Plan

Parsons shall use traffic control measures to minimize inconvenience to the site and the risk of traffic accidents and pedestrian injuries if deemed appropriate by SSHO. These measures will include the use of flagmen, signs, barricades, and markings, as necessary, for the safe movement of traffic during the remediation activities. Any traffic control procedures or road blocks will be coordinated with Camp Ravenna Range Control. Traffic control measures will comply with the U.S. Department of Transportation (2009) *Manual on Uniform Traffic Control Devices*.

9.23 Fire Prevention Plan

To ensure adequate fire prevention, the SSHO will inspect the site to ensure flammable and combustible materials are being safely stored in appropriately configured storage areas and containers. The SSHO will also ensure that no flammable/combustible materials are stored near any sources of ignition, and that sources of ignition are removed a safe distance from storage areas. If needed, storage areas will be segregated from the remainder of the site using flagging. Portable fire extinguishers shall be located on site and in vehicles. Fire prevention activities are described in the attached SSHP (Appendix C-1, Section 10.6.1).

9.24 Wild Land Fire Management Plan

Not applicable to this project.

9.25 Arc Flash Hazard Analysis

Not applicable to this project.

9.26 Assured Equipment Grounding Control Program

All receptacle outlets (125-volt, 15-, 20-, 30-amperage and greater) that provide temporary electrical power during construction, remodeling, maintenance, repair, or demolition shall have ground-fault circuit-interrupter protection for personnel.

9.27 Hazardous Energy Control Program and Procedures

Not applicable to this project.

9.28 Standard Pre-Lift Plan—Load Handling Equipment

See attached SSHP (Appendix C-1, Section 10.24.1) for guidance on lifting material.

9.29 Critical Lift Plan

When using load handling equipment (LHE), the following are identified as critical lifts requiring detailed planning and additional or unusual safety precautions. Critical lifts are defined as:

- Lifts involving hazardous materials (e.g., explosives, highly volatile substances);
- Hoisting personnel with LHE;
- Lifts made with more than one LHE;
- Lifts where the center of gravity could change;
- Lifts made when the load weight is 75% of the rated capacity of the LHE load chart r more (not applicable to gantry, overhead or bridge cranes);
- Lifts without the use of outriggers using rubber tire load charts;

- Lifts using more than one hoist on the same LHE;
- Lifts involving Multiple Lift Rigging Assemblies or other non-routine or technically difficult rigging arrangements;
- Lifts involving submerged loads;
    - Exception: lifts that were engineered to travel in guided slots throughout the lift and have fixed rigging and/or lifting beams, i.e., intake gates, tailgates/logs);
- Lifts out of the operator's view;
- Exception: if hand signals used by a signal person in view of the operator or radio communications are available and in use, load does not exceed two tons AND is determined a routine lift by the lift supervisor;
- Load Tests;
- When land-based LHE mounted on barges, pontoons or other means of flotation are required to travel while lifting the load;
- Any lift the operator believes should be considered critical.

9.30 Naval Architectural Analysis—Load Handling Equipment

Not applicable to this project.

9.31 Floating Plan Inspection and Certification

Not applicable to this project.

9.32 Severe Weather Plan for Marine Activities

Not applicable to this project.

9.33 Emergency Plan for Marine Activities

Not applicable to this project.

9.33.1 Man Overboard/Abandon Ship Procedures

Not applicable to this project.

9.34 Float Plan for Launches, Motorboats, and Skiffs

Not applicable to this project.

9.35 Fall Protection and Prevention Plan

Not anticipated to be applicable to this project. If the SSHO determines that fall protection is necessary, a fall protection and prevention plan will be established using the information in the attached SSHP (Appendix C-1, Attachment C1-11).

9.36 Demolition/Renovation Plan

Not applicable to this project.

9.37 Rope Access Work Plan

Not applicable to this project.

9.38 Excavation/Trenching Plan

Not applicable to this project.

9.39 Fire Prevention and Protection Plan for Underground Construction

Not applicable to this project.

9.40 Compressed Air Work Plan for Underground Construction

Not applicable to this project.

9.41 Erection and Removal Plan for Formwork and Shoring

Not applicable to this project.

9.42 Precast Concrete Plan

Not applicable to this project.

9.43 Lift-Slab Plans

Not applicable to this project.

9.44 Masonry Bracing Plan

Not applicable to this project.

9.45 Steel Erection Plan

Not applicable to this project.

9.46 Explosives Safety Site Plan

Not applicable to this project.

9.47 Blasting Plan

Not applicable to this project.

9.48 Dive Operations Plan

Not applicable to this project.

9.49 Safe Practices Manual for Diving Activities

Not applicable to this project.

9.50 Emergency Management Plan for Diving

Not applicable to this project.

9.51 Tree Felling and Maintenance Program

Not applicable to this project.

9.52 Aircraft/Airfield Construction Safety & Phasing Plan

Not applicable to this project.

9.53 Aircraft/Airfield Safety Plan Compliance Document

Not applicable to this project.

9.54 Site Safety and Health Plan for HTRW Work

The SSHP is included as Appendix C-1 of this APP.

9.55 Confined Space Entry

Confined space entry is not anticipated for this project. If confined space entry is required, procedures are covered in the attached SSHP (Appendix C-1, Section 10.5 and Attachment C1-3.

9.56 Plan for Prevention of Drug and Alcohol Abuse

9.56.1 Parsons Corporate Statements of Policy

All employees must report to work in a fit condition in order to perform their duties at the utmost levels of safety and efficiency. Parsons is committed to providing a safe and healthy environment for its employees by promoting a drug and alcohol-free workplace. Parsons prohibits the use, distribution, manufacture or possession of controlled substances, unauthorized drugs, intoxicants or drug paraphernalia on any corporate premises or work sites, including company vehicles or private vehicles parked on company premises.

In addition, employees may not use or possess open containers of alcohol on company premises or work sites, except as permitted at company sponsored events. Parsons will reasonably accommodate the efforts of an employee to obtain medical treatment for substance abuse and to return to employment thereafter. However, no provisions of this policy will contravene the provision of the Employee Personal Conduct Policy or preclude the corporation from terminating an employee in accordance with this policy.

See Attachment C1-6 of the SSHP for Parsons Substance Abuse policies.

9.56.2 Employee Personal Conduct

Parsons provides exceptional service to its customers and the community by maintaining an orderly, safe, collaborative, cooperative and productive work environment for its employees and visitors to our offices. Parsons employees and managers represent the company inside our offices and in meetings and at project and customer facilities outside the office. Employees are expected to conduct themselves in a manner that projects and maintains a positive, safe, efficient and professional image of the company at all times and in all situations related to company business. Improper conduct, as further defined in company operating policies and procedures, will result in commensurate disciplinary action, up to and including immediate termination of employment.

Employees bear the primary responsibility for their own job performance and for taking any action or undergoing treatment necessary to maintain performance at a satisfactory level.

In addition, the Corporation may require an employee to submit to a test for alcohol or illegal drugs, based upon reasonable suspicion that the employee's performance or behavior is being adversely affected by use of such substance(s). Reasonable suspicion will be based upon physical manifestations of impairment, or unsatisfactory behavior or job performance (including on-the-job accident or injury) which causes the supervisor and Talent Management Representative to reasonably believe that alcohol or drug abuse may be a contributing factor. Refusal by an employee to take such a test will be viewed as an admission of such use by the employee.

9.56.3 Confidentiality of Records

All information concerning an applicant's or employee's medical condition or test results will be kept strictly confidential, with information released only upon a legitimate need-to-know basis.

9.57 Contingency Plan for Severe Weather

Severe weather is defined as high winds, electrical storms, tornadoes, extremely hot weather (> 100°F), or extremely cold weather (< 0°F). In the event that such conditions arise, it is likely that it will be necessary to cease operations and possibly evacuate the site. More information involving severe weather is detailed in the attached SSHP (Appendix C-1, Sections 3.3.2, 6.0, and 9.1; Attachment C1-2 AHA #19).

9.58 Emergency Rescue (Tunneling)

Not applicable to this project.

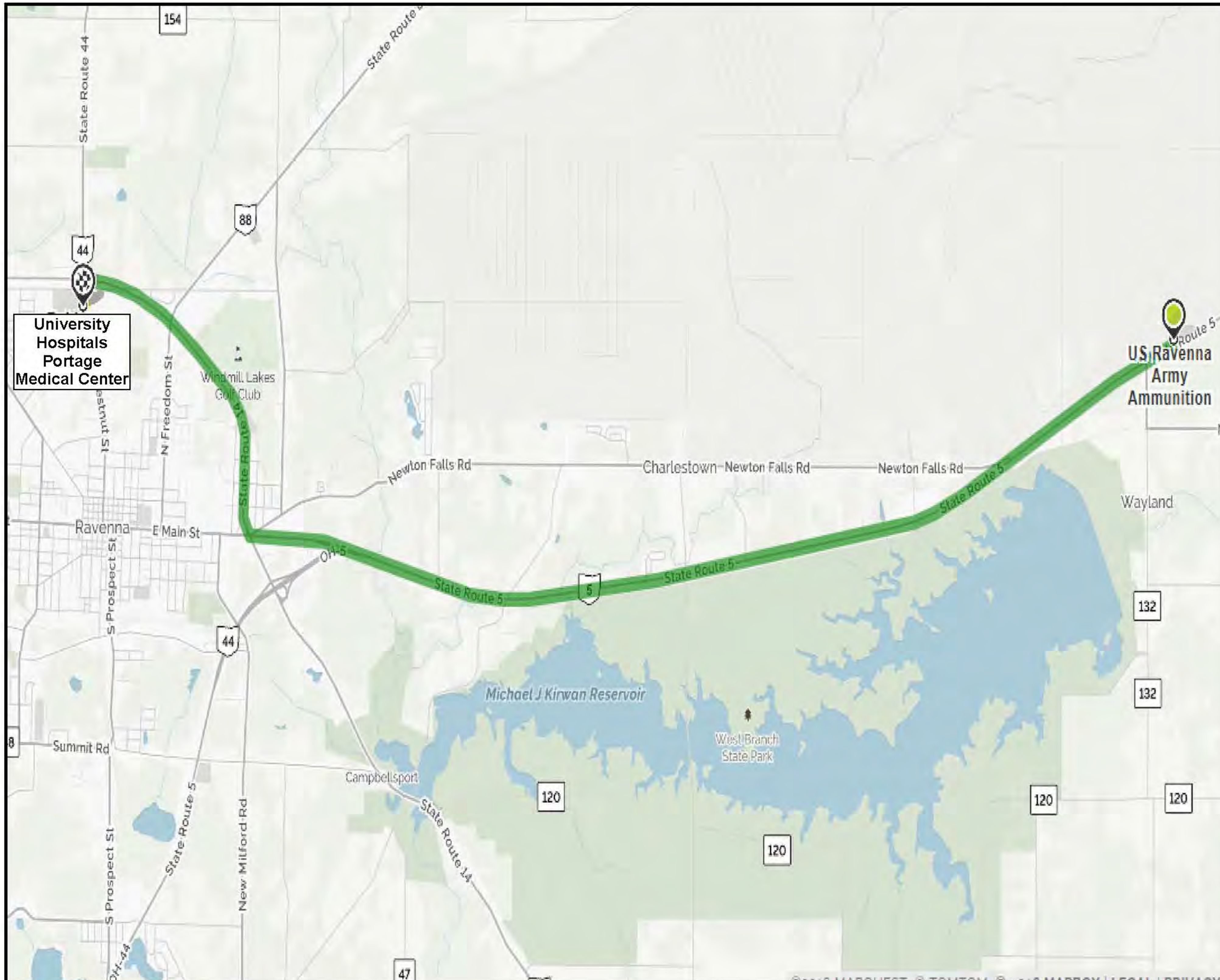

Figure C-9-1

Directions to University Hospitals Portage Medical Center 6847 North Chestnut Street Ravenna, OH 44266 (330) 297-0811

1. Start out going southwest on State Route 5/OH-5 toward Wayland Rd/County Hwy-132. Continue 7.51 miles.
2. Stay straight to go onto State Route 59/OH-59. Continue 0.78 miles.
3. Turn right onto State Route 14/OH-14/OH-44. Continue 2.38 miles.
4. Turn left onto N Chestnut St. Continue 0.18 miles.
5. University Hospitals Portage Medical Center is on the right.

N

PARSONS	Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio		
DESIGNED BY: BT	Hospital Route to University Hospitals Portage Medical Center for Ravenna Sites		
DRAWN BY: LH			
CHECKED BY: EH	SCALE: As Shown	PROJECT NUMBER: 110051.02000	
SUBMITTED BY: EH	DATE: March 2017	FIGURE NUMBER:	C-9-1
	FILE:		

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Figure C-9-1 Hospital Route to University Hospitals Portage Medical Center

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10.0 RISK MANAGEMENT PROCESS

Risk Management Process is the means by which project team members, both in the field and in the office, identify hazards and describe the appropriate steps to avoid mishaps. The PM will ensure that the SSHO and project field team reviews each field task, identifies the associated hazards, and formulates an AHA that documents the hazards and provides steps used to avoid each hazard.

The Risk Management Process starts with the development of the Work Plan and evolves throughout mobilization of the field crew and enactment of the work being conducted. The Work Plan will establish the work that needs to be accomplished to fulfill the contract, as well as the steps required to conduct the work. The SSHO and field team will discuss and define the steps being performed within each task, identifying work sequences, specific anticipated hazards, site conditions, equipment and materials needed, personnel involved (including Competent or Qualified persons), and the control methods to be implemented. These elements will be incorporated into an AHA which will be sent first to the PHSO for approval. Work involving new tasks will not be conducted prior to approval of the AHAs. Once the AHAs have been approved, Team Leaders will use them during their “Take 5” meeting.

It is important to note that AHAs are treated as “living documents” and can be changed throughout the project in order to address changing site conditions or operations. If the AHA has been changed in a manner which increases the Risk Assessment Code, it must be reviewed by the PHSM prior to conducting the activity. AHA changes that do not change the Risk Assessment Code should be sent to the PHSM for review. The change of a Competent Person (CP) or Qualified Person (QP) can be conducted as an administrative change which does not require review, provided that the new CP/QP acknowledges in writing that they have reviewed the AHA and are familiar with current site safety issues.

Workers should have the accepted AHAs in their possession while conducting work. The AHAs present will represent current site conditions and work must be conducted in accordance with the AHA. In the event that work is not being conducted in a safe manner, all work will stop until it is in compliance with the APP.

It is important to understand that the initial AHAs provided in Attachment C1-1 of the SSHP serve as a framework to be completed by the Field Team. Project-specific AHA for each major phase/activity of work for the Camp Ravenna project are provided in the attached SSHP (Appendix C-1, Attachment C1-1).

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11.0 REFERENCES

Ohio Environmental Protection Agency (Ohio EPA), 2004. Director's Final Findings and Orders (DFFO) for RVAAP, June 10.

U.S. Army Corps of Engineers (USACE), 2014. *EM 385-1-1 Safety and Health Requirements Manual*, November.

U.S. Department of Transportation, 2009. M*anual on Uniform Traffic Control Devices*. Revised 2012. http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf

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APPENDIX C- 1
SITE SAFETY AND HEALTH PLAN

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Final

Site Safety and Health Plan
Additional Sampling for
CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift
Ravenna Army Ammunition Plant Restoration Program
Camp Ravenna, Portage and Trumbull Counties, Ohio

November 30, 2017

Contract No.: W912QR-12-D-0002
Delivery Order: 0003

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TABLE OF CONTENTS

LIST OF ATTACHMENTS .... **v**

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

LIST OF FIGURES .... **v**

ACRONYMS AND ABBREVIATIONS .... **vi**

1.0 INTRODUCTION **1**

2.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION **3**
- 2.1 Facility Description 3
- 2.2 Project Tasks 3
- 2.3 Areas of Concern Operational History/Description 4
- 2.4 Contaminants 4

3.0 HAZARD / RISK ANALYSIS **5**
- 3.1 Chemical Hazards 5
- 3.2 Physical Hazards 13
  - 3.2.1 Heat Stress 13
  - 3.2.2 Cold-Related Illness 13
  - 3.2.3 Ultraviolet Radiation 13
  - 3.2.4 Noise 13
- 3.3 Safety Hazards 14
  - 3.3.1 Slip, Trip, and Fall Hazards 14
  - 3.3.2 Thunderstorm Hazards 14
  - 3.3.3 Fire Hazards 14
- 3.4 Biological Hazards 15
  - 3.4.1 Poison Ivy 15
  - 3.4.2 Ticks and Lyme Disease 16
    - 3.4.2.1 Introduction 16
    - 3.4.2.2 Prevention 16
    - 3.4.2.3 First Aid 17
  - 3.4.3 Snakes 17
    - 3.4.3.1 Introduction 17
    - 3.4.3.2 Prevention 18
    - 3.4.3.3 First Aid 19
  - 3.4.4 Spiders 20
    - 3.4.4.1 First Aid 20
  - 3.4.5 Mosquitoes 20
  - 3.4.6 Bees, Wasps, and other Arthropods 21
  - 3.4.7 Bloodborne Pathogens 21

4.0 STAFF ORGANIZATION, QUALIFICATION AND RESPONSIBILITIES 25
4.1 Staff Organization ... 25
4.2 Health and Safety Responsibilities ... 28
4.2.1 Parsons Program Manager ... 28
4.2.2 Parsons Certified Industrial Hygienist ... 28
4.2.3 Parsons Project Manager and Deputy Project Manager ... 28
4.2.4 Parsons Field Operations Manager ... 29
4.2.5 Parsons Site Safety and Health Officer ... 29
4.2.6 Field Personnel ... 30
4.2.7 Parsons Subcontractors ... 31
4.2.8 Site Visitors ... 31

5.0 TRAINING ... 33
5.1 Off-Site Training ... 33
5.2 Site Specific Training ... 34
5.3 Documentation ... 35

6.0 PERSONAL PROTECTIVE EQUIPMENT ... 37
6.1 Types of Equipment ... 37
6.2 Cleaning, Storage, and Program Verification ... 39
6.3 PPE Selection ... 39
6.4 Respiratory Protection ... 40
6.5 Equipment ... 40

7.0 MEDICAL SURVEILLANCE ... 43
7.1 Physical Examinations ... 43
7.2 Substance Abuse Tests ... 43

8.0 EXPOSURE MONITORING / AIR SAMPLING PROGRAM ... 45

9.0 HEAT / COLD STRESS MONITORING ... 47
9.1 Inclement Weather ... 47
9.2 Heat Stress Disorders ... 47
9.2.1 Early Symptoms of Heat Related Problems ... 47
9.2.2 Heat Rash ... 47
9.2.3 Heat Cramps ... 47
9.2.4 Heat Exhaustion ... 48
9.2.5 Heat Stroke ... 48
9.2.6 Preventive Measures ... 49
9.3 Heat Stress Monitoring ... 50
9.4 Cold-Related Illness ... 52
9.4.1 Hypothermia ... 52
9.4.2 Frostbite ... 53
9.4.3 Preventative Measures ... 53

10.0 STANDARD OPERATION SAFETY PROCEDURES, ENGINEERING CONTROLS, AND SAFE WORK PRACTICES ... 55
10.1 Safe Work Practices ... 55
10.2 Driving ... 56
10.3 Permit Requirements ... 56
10.4 Investigation-Derived Waste Drum / Container Handling ... 56
10.5 Confined Space Entry Procedures ... 57
10.6 Hot Work, Sources of Ignition, and Fire Control ... 57
10.6.1 Fire Prevention ... 57
10.6.2 Protection ... 57
10.7 Electrical Safety ... 58
10.8 Excavation and Trench Safety ... 58
10.9 Guarding of Machinery and Equipment ... 58
10.10 Lockout/Tagout ... 58
10.11 Hazard Communication Program ... 58
10.11.1 Hazardous Chemical Inventory List ... 58
10.11.2 Safety Data Sheets ... 59
10.12 Illumination ... 59
10.13 Sanitation ... 59
10.13.1 Drinking Water ... 59
10.13.2 Toilets ... 60
10.13.3 Personal Hygiene Practices ... 60
10.14 Drill Rig Operations ... 60
10.15 Histoplasmosis ... 61
10.16 Lyme Disease ... 62
10.17 Rocky Mountain Spotted Fever ... 62
10.18 Mosquito-Borne Viruses ... 62
10.19 Fuels ... 62
10.20 Work Permit Requirements ... 63
10.21 Site Inspections ... 63
10.22 Safe Work Practices for Drilling, Power Tool Operation, Hand Tool Operation, Material Lifting, Heavy Equipments Operation, and Motorized Equipment Operation ... 63
10.23 Labels and Signs ... 63
10.24 Material Handling Procedures ... 64
10.24.1 Material Lifting ... 64
10.24.2 Material Handling ... 64
10.25 Drum/Container Handling Procedures and Precautions ... 65
10.26 Engineering Controls ... 65

11.0 SITE CONTROL MEASURES ... 67
11.1 Work Zones ... 67
11.2 Exclusion Zone ... 68
11.3 Contamination Reduction Zone ... 68
11.4 Support Zone ... 69
11.5 Site Visitors ... 69

11.6 Site Communication 69

12.0 PERSONAL HYGIENE AND DECONTAMINATION 71
12.1 Prevention of Contamination 71
12.2 Level D Protection Decontamination 71

13.0 EQUIPMENT DECONTAMINATION 73

14.0 EMERGENCY PROCEDURES AND EQUIPMENT 75
14.1 Emergency Phone Numbers 75
14.2 Procedures and Equipment 75

15.0 LOGS, REPORTS, AND RECORD KEEPING 81

16.0 REFERENCES 83

LIST OF ATTACHMENTS

Attachment C1-1 Activity Hazard Analysis
Attachment C1-2 Reporting Forms
Attachment C1-3 Parsons Confined Space Work Policies and Procedures
Attachment C1-4 Biological Hazards
Attachment C1-5 Parsons Respiratory Protection Program
Attachment C1-6 Parsons Corporate Policy on Substance Abuse
Attachment C1-7 Parsons Cell Phone Policy
Attachment C1-8 Power and Hand Tool Operation
Attachment C1-9 Motor Vehicle and Heavy Equipment Operation
Attachment C1-10 Lock Out Tag Out
Attachment C1-11 Fall Protection
Attachment C1-12 Pre-Drilling Checklist
Attachment C1-13 Drum and Roll-Off Handling Standard Operating Procedure

LIST OF TABLES

Table C1-2-1 Sites and Field Work Objectives 4
Table C1-2-2 Potential Contaminants of Concern 4
Table C1-3-1 Hazards Inventory 6
Table C1-3-2 Activity Hazard Analysis 7
Table C1-3-3 Health Hazard Qualities of Hazardous Substances of Concern 9
Table C1-3-4 Snake Identification Features 19
Table C1-4-1 Project Team 25
Table C1-5-1 Training Requirements 33
Table C1-6-1 Action Levels for Changes in Respiratory Protection and Site Evacuation 39
Table C1-6-2 Required Equipment 41
Table C1-8-1 Monitoring Requirements and Action Limits 46
Table C1-9-1 Examples of Activities with Metabolic Rate Categories 51
Table C1-9-2 Recommended Work/Rest Cycle 51
Table C1-10-1 Minimum Number of Toilets 60
Table C1-10-2 Safe Work Practices 63
Table C1-14-1 Emergency Contact Phone Numbers 75

LIST OF FIGURES

Figure C1-3-1 Decision Diagram for Stings from Insects 23
Figure C1-4-1 Project Team Organizational Chart 27
Figure C1-14-1 Emergency Egress Route 77
Figure C1-14-2 Hospital Route to University Hospitals Portage Medical Center 79

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
AOC	Area of Concern
APP	Accident Prevention Plan
ARNG	Army National Guard
BEI	Biological Exposure Indices
Camp	Camp Ravenna Joint Military Training Center Ravenna
CC	Army Environmental Compliance-Related Cleanup Program
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental, Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CLP	Contract Laboratory Program
COR	Contracting Officer Representative
CPG	Certified Professional Geologist
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
dB	Decibel
DEET	N,N-diethyl-meta-toluamide
DFFO	Director's Final Findings and Orders
DLA	Defense Logistics Agency
DoD	Department of Defense
EM	Engineering Manual
FWFSP	Facility-Wide Field Sampling Plan
FWSHP	Facility-Wide Safety and Health Plan
GIS	Geographic Information System
HAZWOPER	Hazardous Waste Operations and Emergency Response
H&S	Health and Safety
IDLH	Immediately Dangerous to Life and Health
IDW	Investigation Derived Waste
IRP	Installation Restoration Program
kV	kilovolt
MEC	Munitions and Explosives of Concern
NIOSH	National Institute for Occupational Safety and Health
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
O&M	Operations and Maintenance
PAH	Polycyclic Aromatic Hydrocarbon
Parsons	Parsons Government Services, Inc.
PE	Professional Engineer

ACRONYMS AND ABBREVIATIONS (CONTINUED)

PEL	Permissible Exposure Limit
PHSM	Project Health and Safety Manager
PID	Proportional Integral Derivative
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts Per Million
PWS	Performance Work Statement
QA	Quality Assurance
QSM	Quality Systems Manual
RI	Remedial Investigation
ROD	Record of Decision
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheet
SI	Site Inspection
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TLV	Threshold Limit Value
TO	Task Order
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USP&FFO	United States Property and Fiscal Officer
UV	Ultraviolet Radiation
VOC	Volatile Organic Compound
WBGT	Wet Bulb Globe Temperature
WP	Work Plan

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1.0 INTRODUCTION

This investigation-specific Site Safety and Health Plan (SSHP) is submitted as an addendum to the Facility-Wide Safety and Health Plan (FWSHP, SAIC, 2011) to the United States (U.S.) Army in accordance with Section 3 of the Performance Work Statement (PWS) for environmental services at Areas of Concern (AOC) under the Ravenna Army Ammunition Plant (RVAAP) Restoration Program at Camp Ravenna, Ohio. The Task Order (TO) was issued by the United States Army Corps of Engineers (USACE), Louisville District on July 27, 2016.

This SSHP is Appendix C1 to the Accident Prevention Plan (APP) and is written in accordance with the USACE Safety and Health Requirement Manual (EM 358-1-1, USACE, November 2014), Occupational Safety and Health Administration (OSHA) standards (including 29 Code of Federal Regulations [CFR] 1910 and 29 CFR 1926), and the RVAAP FWSHP (SAIC, 2011).

The purpose of this SSHP is to establish personnel protection standards and mandatory safety practices and procedures for field activities conducted at Camp Ravenna Joint Military Training Center (Camp Ravenna). The plan assigns responsibilities, establishes standard operating procedures and safety practices that shall be followed by all personnel conducting work at Camp Ravenna. All Parsons Government Services (Parsons) and Parsons contract personnel who engage in project activities must be familiar with this plan and comply with its requirements. These personnel must sign-off on the Safety Program Acceptance form, which is included in Attachment C1-2 of this SSHP. The signed original forms will be kept on site for the duration of the project and will become part of the permanent project files (to be kept in the Parsons Huntsville, Alabama office following completion of project work). Copies of these forms will be submitted to the Project Health and Safety Manager (PHSM). Copies of the FWSHP and this SSHP will be present at the work site during all field work.

The Army is bound to the Director's Final Findings and Orders (DFFO) issued June 10, 2004 by the Ohio Environmental Protection Agency (Ohio EPA) pursuant to the authority vested under Chapters 3734, 3745, and 6111 of the Ohio Revised Code. The objective of the Orders is to ensure that the public health, safety, and welfare, as well as the environment, is protected from the disposal, discharge, or release of contaminants. The former RVAAP is not on the United States Environmental Protection Agency (USEPA) National Priorities List, although it is in the USEPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database. The Ohio EPA is the lead environmental regulator for the RVAAP restoration program. The DFFOs form the basis for the implementation of a CERCLA based environmental remediation program at the installation.

The ultimate purpose of the TO is to achieve a Record of Decision (ROD) by following the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process at each of seven AOCs at the Former RVAAP:

- RVAAP-03 Open Demolition Area#1
- CC RVAAP-69 Building 1048 Fire Station
- CC RVAAP-70 East Classification Yard
- CC RVAAP-73 Facility-Wide Coal Storage
- CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift
- CC RVAAP-76 Depot Area
- CC RVAAP-79 DLA Ore Storage Sites

A Site Inspection (SI) has been conducted at CC RVAAP-70 and Remedial Investigations (RI) have been conducted at the other six sites. However, data gaps have been identified (or may be identified during the document review process) that require additional sampling to complete the SI or RI. Field work is currently anticipated at CC RVAAP-69, CC RVAAP-70 and CC-RVAAP-74. Field work may be required at other sites included in this TO depending on identification of data gaps during evaluation of data from SI and RI efforts.

Field work is primarily associated with conducting environmental sampling to complete RI and SI at the sites included in this TO:

- Installing and developing monitoring wells
- Sampling groundwater monitoring wells
- Advancing soil borings and collecting subsurface soil and groundwater samples
- Removing, characterizing and disposing of oily sludges from Building 47-40 (Round House) at CC RVAAP-70
- Characterizing and disposing of solid and liquid investigation-derived waste
- Surveying sample locations

Additional potential field work could also include:

- Sampling surface soil, sediments and/or surface water
- Brush cutting to access sampling locations

2.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

2.1 Facility Description

The former RVAAP, now known as Camp Ravenna, located in northeastern Ohio within Portage and Trumbull counties, is approximately three (3) miles east/northeast of the City of Ravenna and one (1) mile north/northwest of the City of Newton Falls. The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland.

As of September 2013, administrative accountability for the entire 21,683-acre facility has been transferred to the United States Property and Fiscal Officer (USP&FO) for Ohio and the property subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site, Camp Ravenna. The RVAAP restoration program involves cleanup of former production/operational areas throughout the facility related to former activities conducted under the RVAAP.

2.2 Project Tasks

The field tasks listed below are those where site personnel may be exposed to site and job-related safety and health hazards. Additional information related to the physical steps and equipment that will be used to accomplish these tasks is presented in greater detail within the project Work Plan (WP). As part of the project training, all site personnel will read the WP and be familiar with the steps.

- Mobilization, site setup, demobilization;
- Prepare site for sampling to include vegetation and sludge removal.
- Advance soil borings and collect subsurface soil and groundwater point samples.
- Install and develop groundwater monitoring wells.
- Perform quarterly groundwater monitoring at the monitoring wells.
- Package and ship soil and groundwater samples to an analytical laboratory which will perform sample analysis for volatile organic compounds and hydraulic fluid.
- Characterization and disposal of investigation derived waste (IDW) as well as waste material (including oily sludges) removed from the surface of the sampling site prior to sample collection.
- Manage and validate data in accordance with USEPA Contract Laboratory Program (CLP) Level IV data validation to meet the requirements of Department of Defense (DoD) Quality Systems Manual (QSM).
- Survey and map the site.

The focus of Parsons' field efforts will take place at the AOCs provided in Table C1-2-1.

Table C1-2-1 Sites and Field Work Objectives

Area of Concern	Field Work Objectives
Field work under base tasks	
CC-RVAAP-69, Building 1048 Fire Station	o Address data gaps to complete the RI
CC-RVAAP-70, East Classification Yard	o Remove oily sludges to prevent contamination of subsurface samples o Address data gaps to complete the SI
CC-RVAAP-74, Building 1034 - Motor Pool Hydraulic Lift	o Address data gaps to complete the RI
Potential field work under optional tasks	
CC-RVAAP-70, East Classification Yard	o Conduct RI if SI recommends the need to define nature and extent of contamination
CC-RVAAP-73, Facility-Wide Coal Storage	o Address data gaps, if any are identified, during review of Draft RI
CC RVAAP-79, DLA Ore Storage Sites	o Address data gaps, if any are identified, during review of Draft RI

Although the TO includes report preparation for AOCs RVAAP-03 Open Demolition Area#1 and CC RVAAP-76 Depot Area, the RIs for each of these sites are being accomplished by a different contractor; therefore, no field work is anticipated under this TO.

2.3 Areas of Concern Operational History/Description

AOC operational history and descriptions are provided in Section 2.7 of the APP.

2.4 Contaminants

Contaminants that are potentially present at each AOC is shown in Table C1-2-2.

Table C1-2-2 Potential Contaminants of Concern

Area of Concern	Potential Contaminants of Concern
CC RVAAP-69 Building 1048 Fire Station	Carbon tetrachloride (and other chlorinated methanes), metals, VOCs, SVOCs, PCBs, explosives, propellants.
CC RVAAP-70 East Classification Yard	VOCs, SVOCs, Metals, Oily Sludge
CC-RVAAP-73, Facility-Wide Coal Storage	PAHs and Metals
CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift	Hydraulic Fluid, PAHs
CC RVAAP-79, DLA Ore Storage Sites	Metals, VOCs, SVOCs, Explosives, PAHs
PAH = polycyclic aromatic hydrocarbon; SVOC = semivolatile organic compound; VOC = volatile organic compound	

3.0 HAZARD / RISK ANALYSIS

The activity hazard analysis (AHA) identifies and assesses potential hazards that may be encountered by personnel and prescribes the required controls. Table C1-3-1 is a checklist of common hazards that may be posed during environmental investigations at Camp Ravenna, and indicates whether a particular major type of hazard is present. The tasks are expected to consist of clearing vegetation/sludge removal; collecting surface soil, subsurface soil, and groundwater samples; installing/developing monitoring wells; decontaminating equipment, and managing IDW. In general, given these tasks, the potential for unacceptable exposure to contaminants appears to be low. Expected tasks present a variety of physical hazards including biological, contact with equipment, noise, and heat/cold stress.

The chemical and physical hazards that may be encountered at Camp Ravenna AOCs are described by the AHAs. Table C1-3-2 presents a summary of AHAs for tasks that may be conducted at Camp Ravenna, including drilling, sampling, heavy equipment operation, and general site activities. The AHAs listed in Table C1-3-2 are included in Attachment C1-1.

3.1 Chemical Hazards

The primary sources of chemical exposure at Camp Ravenna AOCs will be groundwater and subsurface and surface soil. Contaminants of potential concern and site-related contaminants at each site are presented in Table C1-2-2. Health hazards and the exposure limits associated with chemicals of concern are presented in Table C1-3-3.

Table C1-3-1 Hazards Inventory

Yes	No	Hazard
	X	Confined space entry (Not anticipated. Parsons confined space work policies and procedures are included as Attachment C1-3. See Section 10)
	X	Excavation entry (Not anticipated. See Section 10)
X		Heavy equipment (i.e., drill rigs, Geoprobes)
X		Potential dangerous tools (i.e., brush clearing with chainsaws, clippers)
X		Heavy lifting (IDW handling)
X		Fire (fuels)
X		Spills or leaks
	X	Drowning
	X	Explosion (MEC)
X		Electrical shock (electrical equipment)
X		Exposure to chemicals (e.g., site contaminants and chemicals used during site work)
X		Temperature extremes
X		Biological hazards (i.e., poison ivy, Lyme disease, Histoplasmosis, and West Nile)
	X	Radiation or radioactive contamination
	X	Gunfire (No environmental contractors will perform work during OHARNG hunts)
X		Noise (equipment)
IDW = Investigation-Derived Waste MEC = Munitions and Explosives of Concern OHARNG = Ohio Army National Guard SSHP = Site Safety and Health Plan		

Table C1-3-2 Activity Hazard Analysis

Phases of Work Requiring AHAs:	Investigation Activities
AHAs	
1	Site Visits, Site Walks, and Surveying
2	Vehicle and Heavy Equipment Operations
3	Fueling Operations
4	Decontamination Station
5	Sample Collection
6	Concrete Coring and Soil Sampling
7	Investigation Derived Waste Sampling and Handling
8	Power and Hand Tool Operation
9	Drilling and Well Installation
10	Drum Transport
11	Mobilization/Demobilization
12	Use of Ladders
13	Excavation, Soil, and Sludge Management
14	Weather Related Exposure
15	Exposure to Allergic Flora (Vegetation)
16	Enabling Works Clearing and Grubbing

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Table C1-3-3 Health Hazard Qualities of Hazardous Substances of Concern

Polychlorinated Biphenyls (PCBs)					
PCB-1260 (Aroclor 1260)	0.5 mg/m^3	0.5 mg/m^3	5 mg/m^3	NA	Colorless to pale-yellow, viscous liquid or solid with a mild hydrocarbon odor. Irritates eyes and skin. Causes chloracne, liver damage, gastrointestinal disturbances, and reproductive effects. In animals, causes leukemia and tumors of the pituitary gland and liver. Carcinogen.
Volatiles, Semi-Volatiles, and PAHs					
Acenaphthene	NA	NA	NA	7.15	White solid needles. Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.
Acenaphthylene	NA	NA	NA	NA	Colorless crystalline solid. Irritates eyes, respiratory tract, digestive tract, and skin
Acetone	1000	250	2,500	9.69	Colorless liquid with a fragrant, mint-like odor. Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis.
Anthracene (Coal tar pitch volatiles)	0.2 mg/m^3	NA	80 mg/m^3	7.15	Black or dark-brown amorphous residue as a coal tar product. dermatitis, bronchitis, [potential occupational carcinogen
Benzo(a)anthracene	0.2 mg/m^3	NA	80 mg/m^3	7.53	Colorless, crystalline solid with greenish-yellow fluorescence. Irritates eyes, respiratory tract, and skin. Causes dermatitis, bronchitis, and lung, kidney, and skin cancer. Carcinogen.
Benzo(b)fluoranthene	0.2 mg/m^3	NA	80 mg/m^3	NA	Colorless, needle-like crystals. Irritates eyes, respiratory tract, and skin. Causes dermatitis, bronchitis, and lung, kidney, and skin cancer. Carcinogen.
Benzo(g,h,i)perylene	NA	NA	NA	NA	Pale yellow-green crystals or flakes. May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated.
Benzo(a)pyrene (Coal tar pitch volatiles)	0.2 mg/m^3	NA	80 mg/m^3	NA	Black or dark-brown amorphous residue as a coal tar product. Dermatitis, bronchitis, [potential occupational carcinogen. Otherwise Pale-yellow, crystalline solid with a faint aromatic odor. Irritates eyes, respiratory tract, and skin. Causes dermatitis, bronchitis, thickening and discoloration of the skin, and lung, kidney, and skin cancer. Mutagen, experimental teratogen, and carcinogen.
Benzo(k)fluoranthene	0.2 mg/m^3	NA	NA	NA	Pale yellow needle-like or colorless solid. May be a carcinogen in humans. Irritate skin and eyes.
Benzyl butyl phthalate	5 $mg./m^3$	5 mg/m^3	NA	NA	Colorless, oily liquid with a mild odor. Hazard to environment and toxic to fish. Fumes are toxic.
Bis(2-Ethylhexyl) Phthalate	5 mg/m^3	5.0 mg/m^3	5,000 mg/m^3	NA	Colorless, viscous liquid. May be carcinogenic, may impair fertility, cause harm to unborn child. Eye irritant, dermatitis.
Carbon Tetrachloride (Carbon chloride; tetrachloromethane)	10	5	200	11.47	Colorless liquid with a characteristic ether-like odor. Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]
Chloroform (Trichloromethane)	50	10	500	11.42	Colorless, heavy liquid with pleasant odor. Irritates eyes and skin. Anaesthetic. Causes dizziness, mental dullness, nausea, confusion, headache, fatigue, anesthesia, and enlarged liver. Also attacks kidneys and heart. In animals, causes liver and kidney cancer. Mutagen, experimental teratogen and carcinogen.
Chloromethane (Methyl chloride)	100	50	2000	11.28	Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations. [Note: Shipped as a liquefied compressed gas.] Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]
Chrysene (Coal tar pitch volatiles)	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3	NA	Black or dark-brown amorphous residue as coal tar product. Dermatitis, bronchitis, [potential occupational carcinogen]
Dibenz(a,h)anthracene	0.2 $mg/m^{3m/}$	NA	80 $mg/m^{3m/}$	NA	Colorless, plate- or leaf-like crystals. Irritates eyes, respiratory tract, and skin. Causes dermatitis, bronchitis, and lung, kidney, and skin cancer. Mutagen and carcinogen.
Dibenzofuran	NA	NA	NA	NA	Off-white powder solid. Eye irritant.
1,4-Dichlorobenzene	75	10	150	8.98	Colorless or white crystalline solid with a mothball-like odor. [Insecticide]. Eye irritant, swelling periorbital; profuse rhinitis; headache, anorexia nausea-vomiting; weight-loss, jaundice cirrhosis; in animals: liver, kidney; [potential occupational carcinogen]
Diesel Fuel	NA	100 mg/m^3	NA	NA	Clear or straw-yellow liquid with mild petroleum distillate odor. May cause skin irritation with prolonged contact, may cause mild eye irritation, ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea. Central nervous system effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.
2,4-Dinitrophenol	NA	NA	NA	9.57	Yellow crystalline (sand-like) powder, with a sweet, musty odor. Irritates skin, nose, eyes, lungs. Can cause headache, fatigue, nausea, vomiting, diarrhea, muscle cramps.

Table C1-3-3 Health Hazard Qualities of Hazardous Substances of Concern

Compound	PEL [a/] (ppm)	TLV [b/] (ppm)	IDLH [c/] (ppm)	Ionization Potential[e/] (eV)	Physical Description/ Health Effects/Symptoms
4,6-Dinitro-2-Methylphenol	0.2 mg/m^3	0.2 mg/m^3	5 mg/m^3	NA	Yellow solid. headaches; fever; lassitude; profuse sweating, excessive thirst; tachycardia; hyperpnea, coughing, shortness of breath; coma
Fluoranthene (Coal tar pitch volatiles)	0.2 mg/m^3	0.2 mg/m^3	NA	NA	Colorless cryst or pale yellow. Toxic to aquatic life. Harmful if swallowed.
Fluorene (Coal tar pitch volatiles)	0.2 mg/m^3	0.2 mg/m^3	NA	NA	Small white leaflets or flakes wit aromatic odor similar to naphthalene. Fluorescent when impure. Toxic to aquatic life. Known to the state of California to cause cancer.
Indeno(1,2,3-c,d)pyrene	0.2 mg/m^3	NA	80 mg/m^3	NA	Yellow, crystalline solid. Solutions show greenish-yellow fluorescence. Irritates eyes, respiratory tract, and skin. Causes dermatitis, bronchitis, and lung, kidney, and skin cancer. Mutagen and carcinogen.
2-Hexanone	100	5	1600	9.34	Colorless liquid with an acetone-like odor. Irritation to eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness
Hydraulic Oil	5 mg/m^3	5 mg/m^3	2500 mg/m^3	NA	Clear fluid, little odor. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing. Minimum eye or skin irritation.
Methylene Chloride (Dichloromethane, Methylene Dichloride)	25	50	2,300	11.32	Colorless liquid (gas>104°F) with a sweet, chloroform-like odor (not noticeable at dangerous concentrations). Irritates eyes and skin. Causes nausea, vomiting, fatigue, weakness, unnatural drowsiness, light-headedness, numbness, tingling limbs, and nausea. In animals, causes lung, liver, salivary and mammary gland tumors. Mutagen, experimental teratogen, and carcinogen.
2-Methylnaphthalene	NA	0.5	NA	7.96	Colorless gas or solid with a disagreeable garlic or rotten cabbage odor. Irritates eyes, skin, and upper respiratory tract. Causes lung damage.
4-Methyl-2-pentanone (MIBK)	100	20	500	9.30	Colorless liquid with a pleasant odor. Irritation to eyes, skin, respiratory system, central nervous system, liver, kidneys.
Naphthalene	10	10	250	8.12	Colorless to brown solid (shipped as a molten liquid) with a mothball-like odor. Irritates eyes, skin, upper respiratory tract, and bladder. Causes headaches, confusion, excitement, convulsions, coma, vague discomfort, nausea, vomiting, abdominal pain, profuse sweating, jaundice, hematoma, hemoglobin in the urine, renal shutdown, dermatitis, optic nerve disorders, and corneal and liver damage. Experimental teratogen and questionable carcinogen.
4-Nitrophenol	NA	NA	NA	9.52	Yellow to tan crystals or powder. Toxic if swallowed, inhaled or absorbed through skin. Eye, skin and respiratory irritant.
Phenanthrene (Coal tar pitch volatiles)	0.2 mg/m^3	NA	80 mg/m^3	7.9	Black or dark-brown amorphous residue as coal tar product. Dermatitis, bronchitis, [potential occupational carcinogen]
Pyrene (Coal tar pitch volatiles)	0.2 mg/m^3	NA	80 mg/m^3	7.4	Black or dark-brown amorphous residue as coal tar product. Dermatitis, bronchitis, [potential occupational carcinogen]
Trichloroethene (TCE)	50	10	1,000	9.45	Clear, colorless or blue liquid with chloroform-like odor. Irritates skin and eyes. Causes fatigue, giddiness, headaches, vertigo, visual disturbances, tremors, nausea, vomiting, drowsiness, dermatitis, skin tingling, cardiac arrhythmia, and liver injury. In animals, causes liver and kidney cancer. Mutagen, experimental teratogen, and carcinogen.
Explosives					
Nitroguanidine	NA	NA	NA	NA	Colorless or yellow, crystalline solid. Flammable solid. May cause skin, eye, and respiratory irritation.
Tetryl	1.5 mg/m^3	NA	750 mg/m^3	NA	Colorless to yellow, odorless, crystalline solid. Sensitization dermatitis, itch, erythema (skin redness); edema on nasal folds, cheeks, neck; keratitis (inflammation of the cornea); sneezing; anemia; cough, coryza; irritability; malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion), insomnia; nausea, vomiting; liver, kidney damage
Metals					
Barium (barium chloride)	0.5 mg/m^3	0.5 mg/m^3	50 mg/m^3	NA	White, odorless solid. Irritates eyes, skin, upper respiratory sys; skin burns; gastroenteritis; muscle spasms; slow pulse, extrasystoles; hypokalemia
Cadmium	5 ug/m^3	0.01 mg/m^3	9 mg/m^3	9	Lustrous, silver, white soil. It has a bluish white surface. Known human carcinogen. Diarrhea, vomiting, infertility, damage to central nervous system and immune system, possibly DNA damage or cancer development.
Chromium (II or III) [j/]	0.5 mg/m^3	0.5 mg/m^3	25 mg/m^3	NA	Potential Exposure Routes include inhalation, ingestion, skin and/or eye contact. Symptoms include irritation to eyes and sensitization dermatitis. Target Organs: Eyes, skin.
Chromium (VI)	0.005 mg/m^3	0.05 mg/m^3	15 mg/m^3	NA	
Cobalt (as metal dust and fume)	0.1 mg/m^3	0.02 mg/m^3	20 mg/m^3	7.88	Hard, ductile, lustrous bluish-gray solid. Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma
Copper (dusts and mists)	1 mg/m^3	1 mg/m^3	100 mg/m^3	7.7	Reddish, lustrous, malleable, odorless solid. Irritation to eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia

Table C1-3-3 Health Hazard Qualities of Hazardous Substances of Concern

Compound	PEL a/ (ppm)	TLV b/ (ppm)	IDLH c/ (ppm)	Ionization Potential e/ (eV)	Physical Description/ Health Effects/Symptoms
Lead	0.05 mg/m^3	0.05 mg/m^3	100 mg/m^3	NA	Noncombustible solid in bulk form. Exposure Routes include inhalation, ingestion, skin and/or eye contact. Symptoms include: lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension. Target Organs: Eyes, gastrointestinal tract, central nervous system, kidneys, blood, and gingival tissue.
Mercury	0.1 mg/m^3	0.01 mg/m^3	10 mg/m^3	10.4	Silver-white, heavy, odorless liquid. Irritation to eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
Nickel	1 mg/m^3	1.5 mg/m^3	10 mg/m^3	7.6	Lustrous, silvery, odorless solid. Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]
Thallium	0.1 mg/m^3	0.1 mg/m^3	15 mg/m^3	NA	Appearance and odor vary depending on the specific soluble thallium compound. Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peripheral neuritis, tremor; retrosternal tightness; chest pain; pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs
Silica	0.025 mg/m^3	0.025 mg/m^3	NA	NA	Visible dust present while mixing cement and/or bentonite. Exposure routes include inhalation, skin and/or eye contact. Symptoms include irritation to eyes, pneumoconiosis. Parsons will utilize administrative controls and dust suppression techniques to reduce dust emissions. This will include lightly misting the concrete/ bentonite with water during the process of breaking bag and pouring the concrete/bentonite into the mixer. The speed in which the mixer is charged will be reduced to reduce emissions. Also note that Parsons has conducted extensive crystalline silica compliance sampling. At one construction project managed by Parsons, sampling was conducted on a grout crew (whose activities include the breaking of bags of concrete and changing a mixer) over a year. During this period there were no exceedances above the OSHA PEL. Skin and eye contact with chromium contaminated F68water will be eliminate through use of proper PPE and clothing
Silver	0.01 mg/m^3	0.01 mg/m^3	10 mg/m^3	7.57	White, lustrous solid. Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance.
Zinc (as zinc oxide)	5 mg/m^3	2 mg/m^3	500 mg/m^3	9.39	Bluish-white, lustrous odorless solid. Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function

a/ PEL = Permissible Exposure Limit. OSHA-enforced average air concentration to which a worker may be exposed for an 8-hour workday without harm.
Vacated PELs published in 29CRF 1910.1000, 1989. Expressed as parts per million (ppm) unless noted otherwise. PELs are published in the NIOSH Pocket Guide to Chemical Hazards, 2005. Some states (such as California) may have more restrictive PELs. Check state regulations.
b/ TLV = Threshold Limit Value - Time-Weighted Average. Average air concentration (same definition as PEL, above) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), 2012 TVLs® and BEIs®.
c/ IDLH = Immediately Dangerous to Life or Health. Air concentration at which an unprotected worker can escape without debilitating injury or health effects. Expressed as ppm unless noted otherwise. IDLH values are published in the NIOSH Pocket Guide to Chemical Hazards, 2005.
d/ When a range is given, use the highest concentration.
e/ Ionization Potential, measured in electron volts (eV), used to determine if field air monitoring equipment can detect substance. Values are published in the NIOSH Pocket Guide to Chemical Hazards, June 2005.
f/ (ceiling) = Ceiling concentration which should not be exceeded at any time.
g/ NIOSH recommends reducing exposure to the lowest feasible concentration, and limiting the number of workers exposed.
h/ Refer to expanded rules for this compound.
i/ Exposure by all routes should be carefully controlled to levels as low as possible. j/ The lower NIOSH values for Cr(II) and Cr(III) are cited for PEL, TLV, and IDLH. k/ The TLV for soluble Cr(VI) is provided.
For COCs with TLV in mg/m3, if visible dust is present, workers will be encouraged to use dust masks. NA = Not Available

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3.2 Physical Hazards

3.2.1 Heat Stress

Heat stress is one of the most common (and potentially serious) illnesses that affect field personnel. When site personnel are engaged in operations involving hot environments, a number of physiological responses can occur which may seriously affect the health and safety of the workers. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death.

Sweating does not cool the body unless moisture is removed from the body. The use of personal protective equipment (PPE) reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks. Heat stress can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program (see Section 9).

3.2.2 Cold-Related Illness

Cold-related illness, like heat stress, is very common and can seriously affect field personnel if the appropriate controls are not established. Exposure to low temperatures presents a risk to employee safety and health, in the form of hypothermia and frostbite. Both can be controlled or eliminated by implementing employee training, periodic physiological screening, establishment of administrative controls, selecting proper work clothing, and wind-chill monitoring all contribute to the prevention of hypothermia and frostbite. Cold related illness, hypothermia and frost bite are discussed in detail in Section 9 of this document.

3.2.3 Ultraviolet Radiation

The sun emits ultraviolet radiation (UV). The skin's natural defense mechanisms attempt to reject the UV by distributing melanin pigmentation where needed. However, overexposure to direct sunlight can cause inflammation or blistering of the skin (sunburn). The use of sunscreen (minimum SPF 30), long sleeve shirts, and wide brim hats can help prevent sunburn. Chronic exposure to UV radiation is known to cause skin cancer. In case of sunburn, do not apply burn ointment, cold cream, or butter to relieve pain. Use a dry dressing and get medical attention for severe, extensive sunburns. Eye protection will be worn that blocks 99 to 100 percent of UVA and UVB radiation.

3.2.4 Noise

Operating heavy equipment can be a potential noise source. Hearing protection will be worn by personnel operating and working adjacent to heavy equipment. The Site Safety and Health Officer (SSHO) will ensure that hearing protection such as disposable earplugs, are made available to, and used by, personnel working in areas where high noise levels are present (≥ 85 A-weighted decibels [dbA]). Sound levels measurements will be collected by the SSHO using a noise level meter (or smart phone application such as "Sound Meter" by Smart Tools) whenever there is difficulty in communications with a fellow worker at a distance of two feet (without raising the voice). Hearing protection with a minimum noise reduction rating of 25db will be worn when sound levels are at or above 85dbA. If measurements indicate sound levels above 100dbA, double protection will be worn consisting of both ear muff and ear plugs.

3.3 Safety Hazards

3.3.1 Slip, Trip, and Fall Hazards

The sites may contain slip, trip, and fall hazards for site workers, such as:

- Holes, pits, or ditches
- Slippery surfaces
- Steep grades
- Uneven grades
- Sharp objects, such as nails, metal shards, and broken glass

Site personnel will be instructed to look for potential safety hazards and immediately contact the SSHO if hazards are discovered. The SSHO will inform team members of the locations of slip, trip, and fall hazards during daily site safety briefings.

3.3.2 Thunderstorm Hazards

During the course of field operations, severe weather may be encountered, including thunderstorms, lightening, rainstorms, and other unsafe weather conditions (i.e., high winds and tornadoes). Criteria indicating that severe weather conditions may exist include:

- High winds (greater than 40 miles per hour – depending on the tree cover and other site-specific conditions);
- Tornado watch or warning in place for the area including the site;
- Lightening and/or thunder;
- Extreme temperatures (e.g., greater than 100 degrees F); or
- Heavy rainfall that makes footing treacherous and visibility difficult.

The SSHO will decide if field activities should cease due to severe weather. After the severe weather hazard has passed, the SSHO will notify personnel that work may resume. The SSHO will monitor weather forecasts and reports of current weather conditions both before and during field activities to determine if severe weather is forecast or is imminent. Work must stop if lightening strike is within 10 miles of where work is being performed (may use smart phone application to identify location of nearest strike). Work may not resume until 30 minutes after the storm has passes, or since the last thunder or lightening strike per EM 385-1-1, paragraph 01.E.01.

3.3.3 Fire Hazards

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during the conduct of site activities, such as moving drums, mixing/bulking of site chemicals and during refueling of heavy or hand-held equipment. Some potential causes of explosions and fires include:

- Mixing of incompatible chemicals, which cause reactions that spontaneously ignite due to the production of both flammable vapors and heat;
- Ignition of explosive or flammable chemical gases or vapors by external ignition sources;
- Ignition of materials due to oxygen enrichment;

- o Agitation of shock or friction-sensitive compounds; and
- o Sudden release of materials under pressure.
- o Fire prevention and control are discussed in Section 10.6.

3.4 Biological Hazards

Biological hazards can result from encounters with mammals, insects, snakes, spiders, ticks, plants, parasites, and pathogens. Mammals can bite or scratch when cornered or surprised. The bite or scratch can result in local infection or infection with systemic pathogens or parasites. Insect and spider bites can result in severe allergic reactions in sensitive individuals. Exposure to poison ivy, poison oak or poison sumac results in skin rash. Ticks are vectors for a number of serious diseases. Dead animals, organic wastes, and contaminated soil and water can harbor parasites and pathogens. Pictures of poison ivy, snakes, spiders, and ticks are provided in Attachment C1-4.

3.4.1 Poison Ivy

The majority of skin reactions following contact with offending plants are allergic in nature and are characterized by:

- o General symptoms of headache and fever;
- o Itching;
- o Redness; and
- o A rash.

Some of the most common and severe allergic reactions result from contact with poison ivy, poison oak, and poison sumac. Contact with the poisonous sap of these plants produces a severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim also may develop a high fever and may be very ill. Ordinarily, the rash begin within a few hours after exposure, but it may be delayed for 24 to 48 hours.

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each (see figure in Attachment C1-4). In certain seasons, both plants also have greenish-white flowers and berries that grow in clusters. Poison sumac is a tall shrub or small tree with six-12 leaflets arranged in pairs with a single leaflet at the end. This plant grows in wooded, swampy areas.

Avoidance of plant/sap contact is the only effective means of preventing the poisoning. Site personnel should know how to recognize the poison ivy plant (see Attachment C1-4) and avoid walking through, or placing equipment and tools in areas of heavy growth. If you must walk through areas of poison ivy, keep extremities covered and avoid contact of bare skin with poison ivy leaves and stems. When digging in areas of poison ivy growth, avoid contact with the roots; these too can produce a reaction.

A person experiencing symptoms of poisoning should remove contaminated clothing; wash all exposed areas thoroughly with soap and water. Oils from the poison ivy plant can adhere to clothes. Wash clothes exposed to poison ivy before wearing again. Apply calamine or other poison ivy/oak lotion if the rash is mild. Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity. A more thorough washing of skin and clothing can be used after site work at the end of the day, or after potential exposure to reduce severity of irritation.

3.4.2 Ticks and Lyme Disease

3.4.2.1 Introduction

Ticks may be common during the spring and summer at Camp Ravenna. Two types of ticks may be encountered: the dog tick and the deer tick. The dog tick is the larger, more common tick. After biting, the dog tick will remain attached to the victim until engorged with blood. Dog ticks may transmit Rocky Mountain Spotted Fever and other diseases. The deer tick is much smaller, ranging from poppy seed to grape seed size, and does not remain attached to the skin for very long after biting. Deer ticks can transmit Lyme disease, which can have serious, long-term health effects if left untreated. Lyme disease is characterized by a bull's eye type rash; light in the center with an outer red area. Flu-like symptoms may also occur. These signs may occur at different times and the rash may not appear.

If you discover any bites on the skin, wash the affected area and seek medical attention if a rash or flu-like symptoms appear.

Lyme disease is caused by a bacterium that may be transmitted by the bite of a tick. Ticks carrying Lyme disease may be found throughout the U. S. living in grassy and wooded areas, and feeding on mammals such as mice, shrews, birds, raccoons, opossums, deer, and humans. Not all ticks are infected with the bacterium. When an infected tick bites, the bacterium is passed into the bloodstream of the host, where it multiplies. If detected early, Lyme disease can be treated with antibiotics.

The illness typically occurs in the summer months and is characterized by a slowly expanding red rash that develops a few days to a few weeks after the bite of an infected tick. The illness can be accompanied by flu-like symptoms, headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage, treatment by a physician is usually effective; but if left alone, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis; other problems include meningitis, neurological, and cardiac abnormalities.

NOTE: some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of follow-on symptoms is more difficult than early symptoms and is not always successful.

Rocky Mountain Spotted Fever is another tick-borne disease. Nearly all cases of infection occur in the spring and summer, generally several days after exposure to infected ticks. The onset of illness is abrupt and often accompanied by high fever, headache, chills, and severe weakness. After the fourth day of fever, victims develop a spotted pink rash that usually starts on the hands and feet and gradually extends to most of the body. Early detection and treatment significantly reduces the severity of illness. The disease responds to antibiotic therapy with tetracycline or chloramphenicol.

3.4.2.2 Prevention

The following steps should be taken to limit the likelihood of getting tick bites:

- Wear long pants and long-sleeved shirts that fit tightly at the ankles and wrists; tape cuffs if necessary. Tuck pants legs into socks.
- Wear hat and closed shoes.

- Wear light colored clothing so ticks can be easily spotted.
- Tick repellents such as DEET (N,N-diethyl-meta-toluamide, vapor-active repellant) and Permethrin may be useful. Apply DEET to any exposed skin surface (except eyes and lips) or clothes and permethrin to field clothing (allow to dry prior to wearing).
- Inspect clothing frequently while in tick habitat.
- Inspect head and body thoroughly when you return from the field.
- Shower immediately after work and wash work clothes daily.

3.4.2.3 First Aid

Embedded ticks should be removed using fine-tipped tweezers. DO NOT use petroleum jelly, a hot match, nail polish, or other products. Grasp the tick firmly and as closely to the skin as possible. With a steady motion, pull the tick’s body away from the skin. The tick’s mouthparts may remain in the skin, but do not be alarmed. If this happens, remove the mouth-parts with tweezers. If you are unable to remove the mouth easily with clean tweezers, leave it alone and let the skin heal. The bacteria that cause Lyme disease are contained in the tick’s midgut. Cleanse the area with an antiseptic. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired and take it to the Preventative Medicine Department for testing. Hot showers are to be taken as soon as possible after departure from the site to wash away all ticks that have not adhered to the skin.

For several days to several weeks after removal of the tick, look for the signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area, frequently seen with a small welt in the center. Also look for the signs of the onset of Rocky Mountain Spotted Fever, such as an inflammation that is visible in the form of a rash comprising many red spots under the skin, which appears three to 10 days after the tick bite.

3.4.3 Snakes

3.4.3.1 Introduction

Ohio has three species of venomous snakes. Descriptions of these snakes are presented in Attachment C1-4 Biological Hazards.

<u>Northern Copperhead:</u> This reddish or copper colored head snake is the most frequently encountered venomous snake in Ohio; however, it is not particularly aggressive. The copperhead will take a defensive posture only when directly threatened. The copperhead has a red, copper-colored head, but the rest of its body is shaded differently. The body is pinkish to gray-brown with a dark chestnut-colored hourglass shaped pattern on the body, and it usually 2-3 feet long. This pattern is narrow on top of the back and wider on portions of the side of the body. Like other venomous snakes, the copperhead has facial pits between its nostrils and eyes, and elliptical pupils. The copperhead is not, like many other venomous snakes, a rattlesnake. The copperhead will reside in a variety of areas including oak-hickory hillsides with rock crevices and slides, swamp borders, old slab piles from sawmill operations, and the abandoned foundations and wood structures of old buildings. They also show a preference for moist habitats.

<u>Timber Rattlesnake:</u> These are large, not particularly aggressive snakes with yellow through or gray to black, with dark back and side blotches on front of body and blotches fused to form crossbands on rear of body. Head is unmarked and the tail is black. They can be found in many

habitats including rocky hillsides, swampy areas, and canebrake thickets. These snakes are typically located in south Ohio.

Eastern Massasauga Rattlesnake: Eastern massasaugas are becoming increasingly rare in North America and are now endangered throughout much of their range. As with many other species, human disturbance of their habitat, particularly through farming, has led to their reduced numbers in the state. They have been recorded in as many as 22 counties; however, they are a rare sight. The Eastern massasauga is a medium-sized (20-30 inches), dark-colored, rattlesnake with 29 to 50 dark dorsal blotches on its gray or brownish gray body. There are three rows of smaller dark spots on each side of the body. The snake can be identified by its short, thick body. The head of this snake is thick and triangular, with black stripes. Its belly is black and irregularly marked with white or yellowish spots. The pupils of its eyes are elliptical. The triangular head and elliptical eyes are two features used to help identify a venomous snake. The most distinguishable feature of this snake is the stubby rattle on the end of its tail. This feature is associated with all species of venomous snakes, with the exception of the copperhead, which is also native to Ohio.

3.4.3.2 Prevention

The best snakebite treatment is to avoid getting bitten. The following suggestions will help in this process:

- Learn to identify poisonous snakes – this shall be reviewed during site-specific safety training. The features identified in Table C1-3-4 will assist in properly identifying a snake as poisonous or non-poisonous.
- Watch where you sit and place your hands and feet. Do not put hands and feet where you have not looked. Avoid rock piles, stacks of old boards, and weeds and brush in wooded areas. If movement is necessary, use a remote means to initially relocate the material. Prior to entering a heavily wooded or brush area, look and listen carefully
- Never handle "dead" snakes; they may not be completely dead. Do not attempt to capture or kill ANY snakes. Caution should be used if any snake is encountered.
- Step heavily. Snakes can feel footfalls through the ground and will avoid you if they can.
- Wear heavy leather boots and loose-fitting pants.

Table C1-3-4 Snake Identification Features

Feature	Poisonous	Non-Poisonous
Eye Pupils	Elliptical, or cat-like	Round
Sensing Pits	Pit between the eyes and nostrils	No pit between the eyes and nostrils
Teeth	Two enlarged teeth (fangs) in front of the upper jaw	All teeth are approximately the same size
Scales	Form a single row on the underside and below the tail	Arranged in a double row on the underside of the tail
Head	Head much wider than neck	Head slightly wider than the neck
Tail	Single anal plate	Divided anal plate

3.4.3.3 First Aid

A snake bite is usually characterized by extreme pain and swelling at the site of the bite; the presence of one or more puncture wounds created by the fangs; and a general skin discoloration. The manifestations of the bite include general weakness, rapid pulse, nausea and vomiting, shortness of breath, dimness of vision, tingling or numbness of the tongue, mouth or scalp, and shock.

Physical reactions are aggravated by acute fear, anxiety, the amount of venom injected and the speed of absorption of venom into the victim's circulation, the size of the victim, protection provided by clothing (including shoes and gloves), quick anti-venom therapy, and location of the bite.

The rules to follow if someone is bitten by a snake are:

1. DO NOT cut "Xs" over the bite area as this will intensify the effect of the venom.
2. DO NOT apply suction to the wound since this has a minimal effective in removing venom.
3. DO NOT apply a tourniquet since this will concentrate the venom and increase the amount of tissue damage in the immediate area.
4. If possible, try to get a good look at the snake so it can be identified for proper selection of anti-venom.
5. DO NOT allow the victim to run for help since running increases the heart rate and will increase the spread of the venom throughout the body.
6. Calm, reassure and keep the victim calm and immobile. Do not delay evacuation.

7. Have the victim hold the affected extremity lower than the body while waiting for medical assistance.
8. Transport the victim to medical attention immediately.

An incision through the fang marks is not advisable; this procedure is too hazardous to underlying structures and at best removes only 20% of the venom. Do not use cold compresses, ice, dry ice, chemical ice packs, spray refrigerants, or other methods of cold therapy. The caregiver must consider several other factors. A person bitten by a snake should try to lie still and be quiet. If the bite is in the arm or leg, keep the bite lower than the heart. Staying still and holding the bite lower than the heart will help to slow any poison spreading through the body. Get medical care as soon as possible, even if the snake was known to be non-poisonous. The use of snake bite kits is prohibited.

3.4.4 Spiders

The two poisonous spiders that may be encountered at Camp Ravenna are the Brown Recluse and the Black Widow. The Brown Recluse is up to one inch long with a violin or "fiddle" shaped mark on the top of the head. The Black Widow is a smaller, bulbous black spider with a red hourglass-shaped mark on the underside.

Reactions to a Brown Recluse spider bite include mild to severe pain within two to eight hours and a star shaped area around the bite within three to four days. Significant tissue death and loss accompanies a Brown Recluse spider bite. Reactions to a Black Widow spider include intense pain at the site of the bite after approximately 15 to 60 minutes, followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities. Pictures of the Brown Recluse or Black Widow can be found in Attachment C1-4 Biological Hazards.

Employees that have been bitten by a Brown Recluse or Black Widow spider should be immediately transported to a hospital. The spider should be collected (if possible) for confirmation of the species.

3.4.4.1 First Aid

If possible, catch the spider to confirm its identity. Even if the body is crushed, save it for identification.

- Clean the bitten area with soap and water or rubbing alcohol.
- To relieve pain, place an ice pack over the bite.
- Keep the victim quiet and monitor breathing.
- Seek immediate medical attention.

3.4.5 Mosquitoes

West Nile virus is spread by the bite of an infected mosquito, and can infect people, horses, many types of birds, and some other animals. Most people who become infected with West Nile virus will have either no symptoms or only mild ones. Mild flu-like symptoms include fever, headache, body aches, and possibly a rash.

On rare occasions, West Nile virus infection can result in a severe and sometimes fatal illness known as West Nile encephalitis (an inflammation of the brain). The risk of severe disease is higher for persons 50 years of age and older.

There is evidence to suggest that West Nile virus can be spread from person to person through blood transfusions and organ transplants.

Human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low.

You can further reduce your chances of becoming ill by protecting yourself from mosquito bites. To avoid mosquito bites:

- Apply insect repellent containing DEET when you're outdoors.
- When possible, wear long-sleeved clothes and long pants treated with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing. Do not apply repellents containing permethrin directly to exposed skin. If you spray your clothing, there is no need to spray repellent containing DEET on the skin under your clothing.
- Consider staying indoors at dawn, dusk, and in the early evening, which are peak mosquito biting times.

3.4.6 Bees, Wasps, and other Arthropods

The main symptom of an insect bite or sting is normally a sharp, immediate pain in the affected body part. Poisonous or biting insects and insect-like creatures that may be encountered include the following:

- Bees and wasps;
- Scorpions;
- Centipedes/millipedes; and
- Biting flies (e.g., deer flies).
- Site personnel will comply with the following work practices:
- Personnel with a known hypersensitivity to bee, wasp, or hornet stings will inform the Project Manager (PM) or SSHO of this condition prior to performing site activities.
- Personnel with a known hypersensitivity condition will keep emergency medication in their possession.
- All personnel will remain vigilant for the presence of these stinging insects. Discovered nests will be flagged and their location reported to other site personnel.
- If stung, immediately inform the SSHO to receive treatment, per Figure C1-3-1.

3.4.7 Bloodborne Pathogens

Bloodborne pathogens enter the human body and blood circulation system through punctures, cuts or abrasions of the skin or mucous membranes. They are not transmitted through ingestion (swallowing), through the lungs (breathing), or by contact with whole, healthy skin. However, under the principle of universal precautions (see below) all blood should be considered infectious, and all skin and mucous membranes should be considered to have possible points of entry for pathogens.

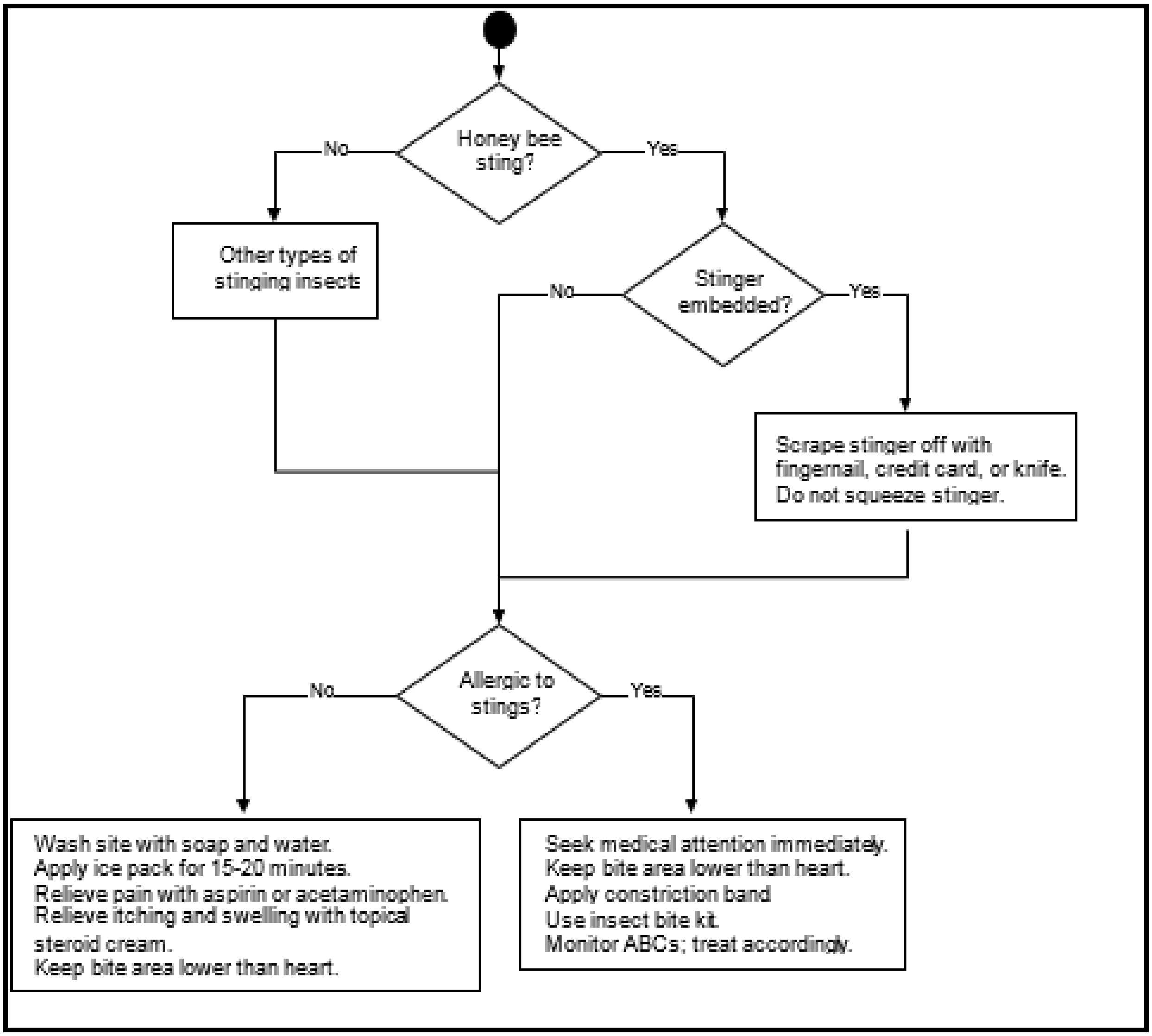
There are a number of infections that are transmitted by insects and arthropods where the infection cycle includes the human blood system. Examples include malaria and Lyme disease, which are transmitted by mosquitoes and ticks, respectively. These diseases are serious, and the possibility for infection should be considered in planning field operations in areas where these disease vectors are present. However, these diseases cannot be transmitted through personal contact with human blood, and are not covered by the OSHA Bloodborne Pathogen Standard.

Potential bloodborne pathogen exposures include:

- Contact with contaminated medical equipment, medical waste, sharps and other potential infectious material;
- Medical emergency response operations such as administering first aid or cardiopulmonary resuscitation (CPR);
- Contact with human wastes such as domestic sewage; and
- All body fluids in situations where it is difficult or impossible to differentiate between body fluid types.

An indoctrination to the bloodborne pathogens standard (29 CFR §1910.1030) will be provided to minimum of two field staff as part of first aid training. It is important to recognize the concept of universal precautions. Universal precautions require one to assume that all blood and bodily fluids contain pathogens and require the use of protective barriers to prevent exposure. Latex gloves and CPR barriers will be available in the first aid supplies stored at each site and should be used prior to attending to a victim’s needs. Additionally, washing any body part or surface that has been contaminated with blood is an important part of the universal precautions. The SSHO should be notified of any potential contact with blood or bodily fluids resulting from first aid or CPR administered on the job.

Figure C1-3-1 Decision Diagram for Stings from Insects



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4.0 STAFF ORGANIZATION, QUALIFICATION AND RESPONSIBILITIES

This section presents the general lines of authority, responsibilities, and communication procedures concerning site safety and health and emergency response. All Parsons site personnel and Parsons subcontractors performing duties or working in areas where there is potential for exposure to hazardous material will meet the training requirements of OSHA 29 CFR §1910.120 before working on-site.

4.1 Staff Organization

The project team is illustrated in Table C1-4-1 and Figure C1-4-1.

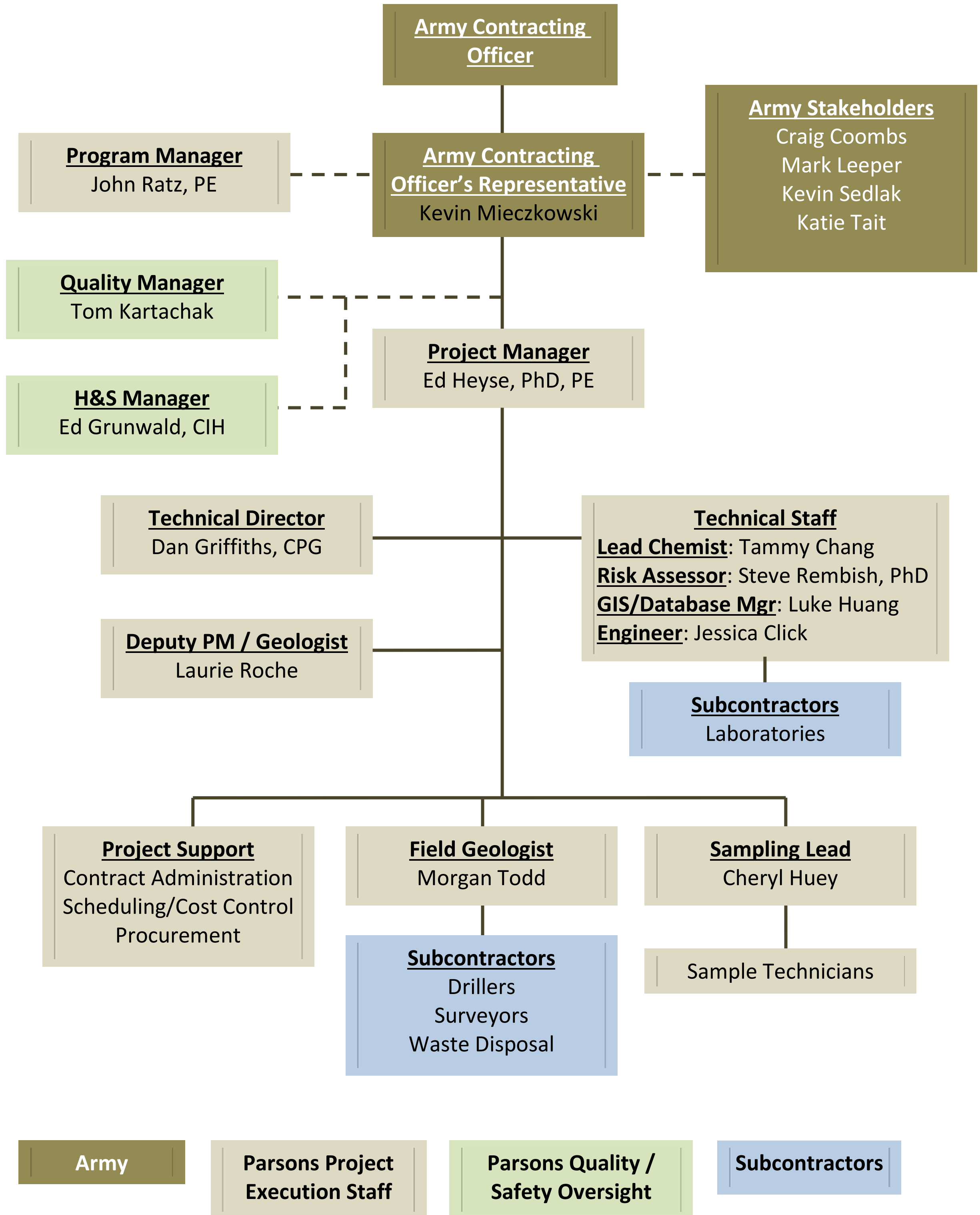
Table C1-4-1 Project Team

Name	Function	Location	Contact Information
Parsons Team			
John Ratz, PE	Program Manager	Parsons 1776 Lincoln Street Denver, CO 80203	T : (303) 764-8718 C: (808) 330-3432 E : John.Ratz@Parsons.com
Ed Heyse, PhD, PE	Project Manager	Parsons 401 Diamond Drive NW Huntsville, AL 35806	T : (256) 217-2573 C : (303) 563-9452 E : Ed.Heyse@Parsons.com
Lauri Roché	Deputy Project Manager/ Geologist	Parsons 2773 Detroit Road Niles, MI 49120	T : (269) 262-4997 C : (818) 281-6630 E : Lauri.Roche@Parsons.com
Dan Griffiths, CPG	Technical Director	Parsons 1776 Lincoln Street Denver, CO 80203	T : (303) 764-1940 E : Dan.Griffiths@Parsons.com
Tammy Chang	Senior Chemist	Parsons 8000 Centre Park Drive Austin, Texas 78754	T : (512) 719-6092 E : Tammy.Chang@Parsons.com
Luke Huang	Database/GIS Manager	Parsons 1776 Lincoln Street Denver, CO 80203	T : (303) 764-1909 E : Luke.Huang@Parsons.com
Steve Rembish, PhD	Risk Assessor	Parsons 8000 Centre Park Drive Austin, Texas 78754	T : (251) 719-6067 E : Steve.J.Rembish@Parsons.com
Jessica Click	Engineer	Parsons 401 Diamond Drive NW Huntsville, AL 35806	T: (256) 217-2563 C: (256) 295-4814 E : Jessica.Click@Parsons.com
Morgan Todd	Field Geologist / Field Operations Manager	Parsons 2442 Crowne Point Drive Sharonville, Ohio 45241	T : (513) 552-7017 C : (513) 284-9517 E : Morgan.Todd@Parsons.com
Cheryl Huey	Sampling Lead / Field Operations Manager	Parsons 26301 Curtis Wright Parkway Richmond Heights, Ohio 44143	T : (216) 912-2910 C : (216) 509-0611 E : Cheryl.Huey@Parsons.com

Table C1-4-1 Project Team Continued

Name	Function	Location	Contact Information
Parsons Team			
Tom Kartachak	Parsons Federal Quality Manager	Parsons Texas	C : (410) 596-9178 E : Tom.Kartachak@Parsons.com
Ed Grunwald, CIH	Health and Safety Manager	Parsons 3577 Parkway Lane Peachtree Corners, GA 30092	T: (678) 969-2394 C: (678) 429-6887 E : Ed.Grundwald@Parsons.com
Subcontractors			
Albert Chuang	Project Manager	EnviroCore Inc 8250 Estates Parkway, Unit C Plain City, Ohio 43064	T: (614) 733-0377 E: albert@envirocore.com
Mike Franks	Client Relations Manager	TestAmerica 13715 Rider Trail North St. Louis, MO 63045	T: (314) 298-8566 E: Mike.Franks@testamericainc.com
Stephen Kilper	President	Avalon Holdings Corp. One American Way Warren, Ohio 44484	T: (330) 856-8800 C: (330) 618-0259 E: skilper@avalonholdings.com
Jim Wellert	V.P. Surveying Services	Wellert Corporation 5136 Beach Road Medina, Ohio 44256	T: (330) 239-2699 Ext. 306 E: Jim.Wellert@wellert.com

Figure C1-4-1 Project Team Organizational Chart



4.2 Health and Safety Responsibilities

All Parsons site personnel and Parsons subcontractors performing duties or working in areas where there is potential for exposure to hazardous material will meet the training requirements of OSHA 29 CFR 1910.120 before working on-site. Site personnel and their duties are outlined in the following sections.

4.2.1 Parsons Program Manager

Parsons Program Manager (Mr. John Ratz, PE) is responsible for the safety and health of all Parsons personnel and for ensuring the conformance with Parsons corporate and USACE policies and procedures. Specific responsibilities of Parsons Program Manager are as follows:

- Coordinate with USACE personnel;
- Ensure PM satisfy USACE health and safety requirements;
- Ensure project staff implement the SSHP;
- Ensure projects have the necessary resources to operate safely;
- Ensure project personnel have the appropriate regard for safe job performance; and
- Exercise Stop Work Authority if unsafe work conditions develop.

4.2.2 Parsons Certified Industrial Hygienist

Parsons Certified Industrial Hygienist (CIH) (Mr. Ed Grunwald, CIH) manages the health and safety program. This includes establishing health and safety policies and procedures, supporting project and office activities, and verifying safe work practices and conditions. Specific responsibilities of Parsons CIH are as follows:

- Coordinate with USACE health and safety personnel;
- Review and approve SSHPs;
- Approve downgrades in PPE or protective procedures;
- Interface with project personnel through routine communications and audits of selected projects;
- Exercise Stop Work Authority if unsafe work conditions develop.

4.2.3 Parsons Project Manager and Deputy Project Manager

Parsons PM (Dr. Ed Heyse, PE) and Parsons Deputy PM (Lauri Roche) are responsible for the overall project execution. Specific responsibilities of Parsons PMs are as follows:

- Coordinate with USACE personnel, including reporting accidents and incidents to the USACE Project Manager immediately and submitting written reports within 2 working days;
- Ensure implementation of the FWSHP and all project specific addenda;
- Maintain auditable project documentation of all required records;
- Ensure that a qualified SSHO is designated;
- Maintain a current copy of the FWSHP and the project specific addenda;

- o Exercise Stop Work Authority if unsafe work conditions develop.

4.2.4 Parsons Field Operations Manager

Parsons Field Operations Manager (Morgan Todd or Cheryl Huey) will oversee the field activities associated with the project and is responsible for site accessibility, safety, and quality assurance (QA). They will enforce the field requirements the FWSHP and project specific addenda. Specific responsibilities of Parsons Field Operations Manager are as follows:

- o Enforce compliance with the FWSHP and the project specific addenda;
- o Coordinate on-site operations, including subcontractor activities;
- o Ensure that subcontractors follow the requirements of the FWSHP and the project specific addenda;
- o Coordinate and control any emergency response actions;
- o Ensure that at least one person per field team, who is currently certified in first aid, CPR, and blood borne pathogens, is on-site during site operations;
- o Maintain current copies of the FWSHP, the project specific addenda, and the USACE Safety and Health Requirements Manual (USACE, November 2014)
- o Exercise Stop Work Authority if unsafe work conditions develop.

4.2.5 Parsons Site Safety and Health Officer

Parsons SSHO (Morgan Todd or Cheryl Huey) will implement the FWSHP and this SSHP, make health and safety decisions for specific health and safety activities, and verify the effectiveness of the health and safety program. Parsons SSHO's qualifications include, at a minimum, experience with similar projects, knowledge of and understanding of this FWSHP and the project-specific addenda, and the ability to use the required monitoring equipment. Specific responsibilities of SSHO are as follows:

- o Stop work or upgrade protective measures (including protective clothing) if uncontrolled health and safety hazards are encountered. Indications of uncontrolled health and safety hazards include monitoring instrument readings in excess of the established action limits, heavy equipment without back-up alarms, exposed unexploded ordnance, unguarded moving/rotating equipment, exposed electrical connections, non-compliance with health and safety requirements, encountering liquids other than water, soil staining suggestive of unexpectedly high concentrations of non-volatile contaminants. The SSHO authorizes resumption of work following correction of the adverse condition(s).
- o Implement and verify compliance with the FWSHP and the project-specific addenda and report to the Field Operations Manager, PM, and Health and Safety Manager any deviations from anticipated conditions;
- o Conduct daily safety inspections using the form provided in Attachment C1-2 of this SSHP;
- o Document deficiencies identified in the daily inspections and responsible parties, procedures, and timetables for correction;
- o Ensure that site personnel have access to this plan and are aware of its provisions;

- Conduct a site-specific pre-entry health and safety briefing covering potential chemical and physical hazards, safe work practices, and emergency procedures;
- Maintain on-site auditable documentation of:
  - Safety Data Sheets (SDS) for applicable materials used at the site;
  - Daily tailgate and health and safety training for site workers and visitors (see Attachment C1-2 of this SSHP);
  - Calibration/maintenance of field instruments such as photoionization detectors, combustible gas indicators;
  - Calibration standards tracking;
  - Environmental and personal exposure monitoring results (Attachment C1-2 of this SSHP);
  - Notification of accidents/incidents (Exhibit 2 of the APP);
  - Reports of any overexposure or excessive levels;
  - Notification of employees of exposure data; and
  - Medical surveillance.
- Confirm that all on-site personnel have received the required training (see Section 5.0 of this SSHP).
- Issue respirators, as necessary, and ensure that all respirator users have received medical clearance within the last year, have been properly trained, and have been successfully fitted for respiratory protection.
- Verify that the FWSHP's and the project-specific addenda's emergency points of contact are correct and supply correcting information as necessary.
- Ensure that all monitoring equipment is operating according to the manufacturer's specifications and perform field checks of instrument calibration.
- Ensure monitoring for potential on-site exposures is conducted in accordance with the FWSHP and its project-specific addenda.
- Investigate accidents and near accidents and report (in concert with the Parsons Field Operations Manager) findings to the PM and CIH.
- Conduct daily "tailgate" safety briefings using the form provided in Attachment C1-2 of this SSHP.
- Control visitor access to the exclusion zone.
- Exercise Stop Work Authority if unsafe work conditions develop.

4.2.6 Field Personnel

Field personnel report to the Site Manager/Supervisor. Field personnel are responsible for understanding and abiding by the SSHP and performing work in a safe and responsible manner. Specific responsibilities of field personnel are as follows:

- Acting in a responsible manner at all times in order to prevent incidents, injury, and exposure to themselves and co-workers;
- Reporting all incidents, including near misses, and hazards to the SSHO;
- Attending and participating in all daily safety tailgate meetings;
- Following the instructions and directions of the SSHO;
- Utilizing the PPE provided;
- Following all field safety procedures for safe work practices;
- Performing tasks as instructed (unless the individual feels unqualified to perform the task(s) safely); and,
- Reporting any personal condition that could affect safety (e.g., fatigue, drowsiness, illness, impairment by medications, influence by drugs or alcohol, emotional stress).

4.2.7 Parsons Subcontractors

Parsons subcontractors report to the Site Manager/Supervisor. Subcontractors that perform work for Parsons under this SSHP are responsible for the health and safety of their employees. Specific responsibilities of subcontractors are as follows:

- Complying with the requirements of their SOW;
- Development of AHAs for their work activities;
- Maintaining a safe and healthy work environment;
- Complying with contract requirements, laws, regulations, and EM 385-1-1;
- Reviewing the SSHP to ensure that the health and safety requirements of their specific tasks are satisfied;
- Performing all work in accordance with the SSHP requirements;
- Providing trained and experienced workers for the specific work activities;
- Participating in the Daily Safety Tailgate Meetings;
- Identifying additional training needs for unique tasks;
- Enforcing company- and project-specific rules and procedures during work activities;
- Reporting all incidents and participating in the investigations;
- Participating in routine SI activities;
- Ensuring all equipment brought to the site is in a “new or like new” condition, routinely inspected, and maintained in safe working order; and,
- Setting a positive safety example for all project staff.

4.2.8 Site Visitors

USACE and Camp Ravenna personnel may visit the site without prior notification for safety and contract compliance QA. Site visitors will be required to wear appropriate PPE, as dictated by Parsons and the SSHP during the visit.

Once visitors have provided Parsons with documentation of Hazardous Waste Operations and Emergency Response (HAZWOPER) and current HAZWOPER refresher training to document their acceptability to visit a site, a qualified person will brief them on the hazards expected to be site and the health controls required. They will be escorted by the Field Team Leader, or his/her designee, and will sign the visitor sign-in/out log (Attachment C1-2). All visitors will be required to follow all advice and instructions provided by the Parsons' Team Leader and SSHO. Failure to follow instructions or guidance may endanger the health and safety of the site visitor and other site personnel. Visitors not complying with provided site guidance and instructions will be escorted off the site.

Visitors to the site not satisfying the above conditions will be denied access to active sites under Parsons control.

5.0 TRAINING

All site personnel participating in the investigation of on AOC are subject to the training requirements presented in Table C1-5-1 and discussed below.

Table C1-5-1 Training Requirements

Training	Worker	Supervisor	Site Visitor (exclusion zone)
HAZWOPER (40-hr, 3-day on-the-job training)	x	x	x
HAZWOPER Annual Refresher (8 hr)	x	x	x
HAZWOPER Supervisors Training (8 hr)		x	
CPR and First Aid Training (required for two personnel and a minimum of one person per field team)	x	x	x
General Hazard Communication Training (contained in 40- and 8-hr courses)	x	x	x
Respiratory Protection Training (required only if respirators are worn; contained in 40-hr course)	x	x	x
Hearing Conservation Training (for workers in hearing conservation program; contained in 40- and 8-hr courses)	x	x	x
Pre-entry Briefing	x	x	x
Site-specific Hazard Communication (contained in pre-entry briefing)	x	x	x
Safety Briefing (daily and whenever conditions or tasks change)	x	x	x
Equipment-specific Training (equipment operators)	x	x	
OSHA Construction Training (30-hour course)		x	
x = Required; CPR = Cardiopulmonary Resuscitation; HAZWOPER = Hazardous Waste Operations and Emergency Response			

The following paragraphs briefly summarize the training requirements as described in Section 5.0 of the FWSHP.

5.1 Off-Site Training

All site personnel involved in hazardous work will meet the training requirements set forth in 29 CFR §1910.120(e). All employees engaged in hazardous waste site work will have received 40 hours of training in hazardous waste site operations and emergency response. In addition, all field personnel will have had at least three days of field experience under the supervision of a trained supervisor (see Field Experience Documentation Form in Attachment C1-2 of this SSHP).

On-site personnel must be up to date on their annual 8-hour refresher training. Supervisors, SSHO, and Field Team Leader should have received an additional 8 hours of specialized training on the safe management of site operations. SSHOs will need to be approved by the PHSM, or his designee, and will have documentation of having obtained the 30-hr Outreach Construction Safety Training. SSHO's are required (as applicable) to the requirements listed in Section 3 of this SSHP. All site personnel will receive annual updated 8-hr HAZWOPER refresher training. Additional training should be provided to those personnel designated to respond to site emergencies. Additional training should be provided to those employees who may be exposed to unique or special hazards at the site.

General Hazard Communication Training is required for all site workers. This training must communicate the risks and protective measures for chemicals that employees may encounter. This requirement is met by taking the 40-hr Hazardous Waste Site Worker course and the site-specific hazard communication training addressing the chemicals in use on the project. SDSs must be kept on-site during field investigations for all chemicals expected to be encountered or used on-site.

At least two on-site employees must be certified in CPR and first aid. For multiple field teams working under the required buddy system, at least one field team member must be certified in CPR and first aid.

Respiratory Protection Training is required for all individuals who wear respirators. This requirement can be met by taking the 40-hr Hazardous Waste Site Worker course, annual refreshers, and site-specific training covering the types of respirators to be used on-site. Respirator fit-test certifications must be kept on-site for anyone who might wear one.

Hearing Conservation Training is required on an annual basis by *29 CFR 1910.95* for all employees enrolled in a hearing conservation program. This requirement includes all employees exposed to occupational noise in excess of 85 dB on a time-weighted average. This is usually provided onsite.

5.2 Site Specific Training

Personnel on-site must receive the investigation-specific safety training. Two versions of this training will be used. The site worker version will contain full information regarding site hazards, hazard controls, and emergency procedures. A shortened version will be used for visitors who will be on-site for short times and who will not do hands-on work. This shortened version will contain the hazard information that is directly relevant to the purpose of the visit. Signatures of those attending and the type of briefing must be entered in the field logbook before site access will be granted. Note that casual visitors (e.g., package deliverers, observers) to the support zone (Administration Area- Buildings 1036, 1037, and 1038) will not be required to have the site-specific training. The site-specific training will include the following site-specific information:

- Names of site health and safety personnel and alternates;
- Contents of this FWSHP and the appropriate addendum;
- Hazards and symptoms of contaminant exposure;
- Hazards and symptoms of exposure to chemicals present in the workplace;
- Physical hazards in the workplace;

- Recognition and avoidance of live ordnance;
- Site and task PPE (i.e., purpose, donning, doffing, and proper use);
- Safe work practices to minimize risks;
- Safe use of engineering controls and equipment;
- Medical surveillance requirements;
- Site control measures;
- Reporting requirements for spills and emergencies;
- Personnel decontamination procedures;
- Contingency plans (e.g., communications, phone numbers, emergency exits, assembly point);
- Verification of communication with Post 1 (cell phones);
- Spill containment procedures (e.g., reporting, cleanup methods); and
- Emergency equipment locations and use (e.g., fire extinguishers, spill kits).
- Safe work practices in the vicinity of National Guard Trainees.
- Convey base speed limit of 20 mph and importance of coordinating work with Range Control.

Safety briefings will be held at least daily and also when conditions or tasks change. These briefings will be conducted by the SSHO and/or Field Operations Manager and will be attended by all site workers and supervisors. These briefings will address site-specific safety issues and are used as an opportunity to refresh workers on specific procedures and to address new hazards and controls.

5.3 Documentation

Documentation of the required training must be maintained in the on-site project files. This documentation will include copies of 40-hr, 8-hr refresher, respirator fit-test certifications, and supervisor training certificates; copies of medical clearance reports; and entries in project logs showing the topics covered, trainer, and signatures of those attending on-site training. Use the training record form in Attachment C1-2. HAZWOPER certificates for all field personnel must be submitted to Becky Shreffler with Vista who maintains Camp Ravenna records.

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6.0 PERSONAL PROTECTIVE EQUIPMENT

Because we cannot know with certainty all of the hazards present prior to beginning work and conditions may change during various work activities, there may be a need to modify PPE requirements as work progresses. When changes in PPE become necessary, these changes shall be made in accordance with the action levels and criteria set forth in this plan. As a rule, levels of PPE will need to be reassessed if any of the following occur:

- Introduction of new types of equipment.
- Exceeding action limits.
- Appearance of previously unidentified or anticipated chemical conditions or task hazards.
- Ambient weather conditions change that affects the use of assigned PPE.
- A new task is introduced or a previously assigned and evaluated task is expanded in scope.

If work tasks are added to the SOW after approval of the SSHP, the PHSM or designee shall identify and assess the task hazards, complete and sign an AHA form and designate the level and type of PPE to be used during conduct of the task. The new AHAs, along with any other additions, changes or modifications to the approved SSHP shall be approved by the PM and the PHSM.

Routine site work at the Camp Ravenna AOCs will be performed in Level D protection, including safety glasses, steel toe boots, high visibility vest, gloves appropriate for the work activities (e.g., sampling, construction, etc.) and long pants or jeans. Conditions requiring Level C respiratory protection is not anticipated to be encountered at Camp Ravenna. If monitoring indicates a hazardous atmosphere, crews will evacuate the work site until respiratory conditions are safe for Level D operations.

The organic vapor monitor will be the primary instrument for determining contaminant concentrations that may trigger a change in respiratory protection. Action levels for changes in personal protection equipment are shown in Table C1-6-1.

In the event that PPE is ripped or torn, work shall stop and PPE shall be removed and replaced as soon as possible.

For sampling operations, gloves will be changed prior to sampling each monitoring well. Modified Level D may also include the addition of Tyvek coveralls (for sampling operations) and disposable boot coverings or rubber over boots. The SSHO will determine whether these modifications of Level D are needed at each AOC.

6.1 Types of Equipment

LEVEL D

Level D protection will be worn for initial entry on-site and for all activities unless otherwise noted by the SSHO. Level D protection will consist of:

- Standard work clothes with long pants;
- Steel-toe safety boots;
- Safety glasses (goggles or face shield [with safety glasses] must be worn when splash hazard is present);

- Hearing protection (when working around heavy equipment);
- Gloves (nitrile for sampling); and,
- Hard hat (when working near heavy equipment or overhead hazard is present).
- For sampling operations, gloves will be changed prior to sampling each monitoring well.

The SSHO will determine whether these modifications of Level D are needed at each site.

LEVEL C

Level C protection, unless otherwise specified by the SSHO, will consist of Level D equipment and the following additional equipment:

- Full-face air-purifying respirator;
- Combination P-100/organic vapor cartridges;
- Tyvek coveralls; and,
- PVC or nitrile inner and nitrile outer gloves.

If conditions require Level C protection, the work site will be evacuated and allowed to ventilate until conditions are once again safe for work in Level D.

Table C1-6-1 Action Levels for Changes in Respiratory Protection and Site Evacuation

Contaminant	Monitoring Instrument	Action Level	PPE	Action Taken
VOCs	PID (11.7 eV Lamp)	<0.5 ppm	Level D	None.
		0.5-2.5 ppm	Level D	Implement administrative and/or engineering controls to suppress vapor levels: o Work upwind o Allow site to ventilate naturally or use mechanical ventilation o Ensure exclusion zone includes all VOC concentrations > 0.5 ppm o If exclusion zone cannot include all VOC concentrations > 0.5 ppm, reduce VOC emissions and stop work until VOC levels are <0.5 ppm at exclusion zone boundary
		2.5-50 ppm	Level C	Take 3 consecutive readings. If confirmed, wear full face piece respirator. Continue engineering controls to suppress vapor levels.
		50-200 ppm		Stop work activities until engineering controls are implemented to suppress vapor levels.
Dust (Metals, Semi-Volatiles, Silica)		Sustained Visible Dust	Level D	Implement administrative and/or engineering controls to suppress dust levels: o Work upwind o Use engineered dust control including spraying with water
Note: All readings that will be used to determine the appropriateness of an upgrade in PPE shall be taken in the worker's breathing zone. PID readings shall be sustained readings of 30 seconds or more. Readings will be taken at the beginning of the day, changes in work activities and during all sampling activities (record on Health and Safety Monitoring Log in Attachment C1-2). If readings exceed Level D, then stop work, leave the area or allow to ventilate. If actions levels are maintained then consult with the PHSM on upgrading PPE appropriately				

6.2 Cleaning, Storage, and Program Verification

If site tasks require the use of chemical protective clothing, disposable clothing will be used and will be disposed as project-generated waste in accordance with Section 8.0 of the Facility-Wide Field Sampling Plan (FWFSP, SAIC 2011) and project-specific addenda. Unused chemical protective clothing will be stored in clean staging areas until needed. The SSHO will verify that the PPE in use is appropriate and is being used properly.

6.3 PPE Selection

Appropriate PPE shall be identified by SSHO based on site-specific conditions. In general, the following considerations shall be observed in the selection of PPE:

- Hard hats will be required when working around heavy equipment or when an overhead hazard exists;
- Steel toe/shank boots are required when working around heavy equipment;
- Safety glasses shall be selected to protect site personnel from potential hazards. Goggles or face shield with safety glasses is necessary to protect from splash hazards when present;
- Hearing protection should be used when working around heavy equipment or using power tools (sound levels >85 dBA);
- Leather gloves should be used when drilling is conducted;
- The SSHO shall continually evaluate site tasks to identify hazards and shall provide any PPE necessary to ensure the safety and health of site personnel, regardless of the activity they perform; and
- Other task-specific PPE based on site-specific conditions.

6.4 Respiratory Protection

Although Level C PPE is not anticipated during this project, respiratory protection is required whenever if it is determined necessary by the SSHO (in accordance with Table C1-6-1). The selection and use of respiratory protection must comply with the OSHA respirator standards and U.S. Army EM 385-1-1. All respirators must be National Institute for Occupational Safety and Health (NIOSH) approved and properly fit tested. Fit test forms are located in Attachment C1-5. Respirator use and maintenance must be documented. The respiratory protection program is presented in Attachment C1-5.

When usage of a respirator is deemed necessary, the following will be completed:

- All project personnel that will be required to wear a respirator will be fit tested;
- Used cartridges for Level C operation will be disposed at the end of the day and new cartridges will be used for the next working day; and
- Respirators will be cleaned daily by project personnel.

6.5 Equipment

First aid kits for the treatment of minor injuries and burns shall be maintained onsite. The first aid kits shall be inspected by the SSHO on a regular basis to ensure adequate supplies are available and in proper working order. The contents and number of first aid kits shall be determined by EM-385-1-1, Section 03.B and approved by the SSHO prior to the start of site activities. Table C1-6-2 lists what EM 385-1-1 requires.

At a minimum, the general emergency equipment in Table C1-6-2 will be available at the site at all times.

Table C1-6-2 Required Equipment

Equipment	Location
Wet Bulb Globe Temperature Meter	One at work site.
Fire Extinguishers	One in each field-use vehicle and one in each piece of heavy equipment
First Aid Kit	One in each field-use vehicle on-site
PID Meter	One at work site.
Note: A "field-use" vehicle means one that is designated for or used regularly for field work. This could include personal vehicles driven to the site, at the discretion of the SSHO.	

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7.0 MEDICAL SURVEILLANCE

All Parsons personnel (and field subcontractors) will participate in a medical surveillance program, which meets the criteria set forth in OSHA 29 CFR Part 1910.120. This rule requires that employees engaged in hazardous waste site work receive a medical examination at least biennially, and they be certified by the examining physician to wear a respirator without restrictions. Written certification of completion of medical exams will be maintained in the project files by the SSHO. The medical surveillance program requires that all field personnel receive medical examinations:

- Prior to site activities;
- At least biennially;
- Upon termination; and
- As needed on a case-specific basis.

7.1 Physical Examinations

OSHA (29 CFR Part 1910.120 [f]) requires the enrollment of personnel engaged in operations involving hazardous materials in a medical surveillance program. The content of the examination must be sufficiently detailed to determine an individual’s fitness for duty, including ability to work while wearing protective equipment (e.g., respirator, impermeable clothing, etc.). The results of these examinations will be kept on file at least 30 years after employment has been terminated.

All personnel who will be engaged in hazardous waste operations on this project will present to the PHSM or SSHO a physician’s certification of completion of a comprehensive medical monitoring examination within the 12 months prior to the beginning of activities. Additionally, the SSHO will ensure that workers remain current in their medical monitoring throughout the duration of the project as well as meet the medical surveillance inclusion criteria for their specific job assignments. The certification shall attest to the individual’s fitness for duty, including his or her ability to work while wearing PPE (e.g., respirator, impermeable clothing, etc.). Copies of employees’ Health Status Reports will be provided to the SSHO prior to the commencement of field operations.

7.2 Substance Abuse Tests

The Talent Management Department administers required substance abuse tests. Parsons Corporate Policy on Substance Abuse is provided as Attachment C1-6. Parsons expects all employees to report to work in a fit condition in order to perform their duties at the utmost levels of safety and efficiency. To that end, Parsons expressly prohibits the unlawful manufacture, distribution, dispensing, possession, use, or sale of a controlled substance or alcohol on its premises at any time.

All Parsons Subcontractors are required to complete a Contractor Health and Safety Evaluation as part of the initial request for proposal package. The evaluation requires information on the contractor’s drug and alcohol-free work place policies and pre-employment, random, and post-accident drug testing policies. The contractor’s responses are evaluated and considered by Parsons Health and Safety Department prior to the award of work.

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8.0 EXPOSURE MONITORING / AIR SAMPLING PROGRAM

Air monitoring will be used to identify and quantify airborne levels of hazardous substances. Periodic monitoring is required during some onsite activities. Only activities where personnel may encounter airborne contamination (i.e., drilling and groundwater sampling) require air monitoring. The primary contaminants expected to be encountered are carbon tetrachloride and other chlorinated methanes, and hydraulic fluid.

Assessment of airborne chemical concentrations will be performed, as appropriate, to ensure that exposures do not exceed acceptable levels. Action levels, with appropriate responses, have been established for this monitoring. All monitoring equipment will be approved, inspected, and maintained and calibrated per manufacturer's specifications prior to use. Calibration will be performed by a trained individual and results will be recorded per specifications of Section 06.A.03 of the USACE Safety and Health Requirement Manual. All monitoring and analysis will be performed using approved NIOSH or OSHA sampling and analytical methods, as specified in Section 06.A.03 of the USACE Safety and Health Requirement Manual. All personal exposure monitoring records will be maintained in accordance with 29 CFR 1910.20. The minimum monitoring requirements and action levels are presented in Table C1-8-1.

Field work is not expected to pose airborne exposure hazards for the following reasons:

- Work will either be performed in a well-ventilated building or in open areas with natural ventilation.
- Prior site sampling indicated that contaminant concentrations are unlikely to pose an occupational health hazard.
- The most probable contaminants (hydraulic fluid, carbon tetrachloride, polycyclic aromatic hydrocarbon [PAH], and metals) are materials with relatively low vapor pressures.

Table C1-8-1 Monitoring Requirements and Action Limits

Hazard or Measured Parameter	Area	Interval	Limit	Action	Tasks
Airborne **o**rganics	Breathing Zone	From 1 to 5 ft below ground surface and if site conditions, such as discolored soil or chemical odor, indicate that monitoring is necessary.	<0.5 ppm >0.5 and <5 ppm >5 ppm	Level D (<0.5 ppm) Level D with engineering controls (>0.5 and <5 ppm) Level C (>5 ppm) Withdraw and evaluate. Evaluate need for PPE upgrade. Identify contaminants Notify PM and H&S Manager.	Soil and subsurface soil sampling (hand auger and direct push), sediment sampling, and surface water sampling
Noise	All	Any area where there are elevated noise levels	≥85 dBA	Require the use of hearing protection	Hearing protection will be worn within the exclusion zone, around direct push rigs, or other motorized equipment
Visible Airborne Dust	All	Continuously	Visible dust generation	Stop work; use dust suppression techniques such as wetting the surface	All

9.0 HEAT / COLD STRESS MONITORING

Heat/cold stress is one of the most common (and potentially serious) illnesses that affect site personnel. When site personnel are engaged in operations involving hot or cold environments, a number of physiological responses can occur that may seriously affect the health and safety of the workers. These affects can be eliminated or controlled using a comprehensive heat/cold stress prevention and monitoring program.

9.1 Inclement Weather

When warnings or indications of impending severe weather exist (e.g., heavy rains, thunderstorms, damaging winds, tornados, hurricanes, floods, lightning), the SSHO will monitor the weather conditions using a weather notification system at a minimum of twice a day. Appropriate precautions will be taken to protect personnel and property from the effects of the severe weather.

9.2 Heat Stress Disorders

This section outlines the major heat related illness that may result from exposure to high heat environments, which include heat rash, fainting, heat cramps, heat exhaustion, and heat stroke. For the purpose of this program, reference to "liquids" will indicate the use of water or an electrolyte replacement solution, and not tea or coffee (unless it is decaffeinated) or carbonated soft drinks.

9.2.1 Early Symptoms of Heat Related Problems

Early symptoms of heat related problems include:

- Decline in task performance
- Lack of coordination
- Decline in alertness
- Unsteady walk
- Excessive fatigue
- Muscle cramps
- Dizziness

9.2.2 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by wet chafing clothing. This condition can decrease a worker's ability to tolerate hot environments.

Symptoms: Mild red rash, especially in areas of the body that sweat heavily.

Treatment: Decrease amount of time in protective gear and provide powder such as cornstarch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

9.2.3 Heat Cramps

Heat cramps are caused by a profuse rate of perspiration that is not balanced by adequate fluid and electrolyte intake. The occurrence of heat related cramps are often an indication that excessive water and electrolyte loss has occurred, which can further develop into heat exhaustion or heat stroke.

Symptoms: Acute, painful spasms of voluntary muscles such as the back, abdomen and extremities.

Treatment: Remove victim to a cool area and loosen restrictive clothing. Stretch and massage affected muscles to increase blood flow to the area. Have patient drink one to two cups (16 oz.) of liquids immediately, and every twenty minutes thereafter. Consult with physician if condition does not improve. If available, an electrolyte replacement solution should be taken along with liquids.

9.2.4 Heat Exhaustion

Heat exhaustion occurs due to the large fluid and salt loss from profuse sweating. It is a state of very definite weakness or exhaustion caused by increased stress on various organs to meet increased demands to cool the body due to excessive loss of fluids from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke, but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

Symptoms: Pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. Body temperature is basically normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache, be dizzy or nauseated.

Treatment: Remove the individual to a cool, air-conditioned place, loosen clothing, elevate feet and allow individual to rest. Consult physician, especially in severe cases. Have patient drink one to two cups of liquids immediately, and every twenty minutes thereafter. Total liquid consumption should be about one to two gallons per day. If the signs and symptoms of heat exhaustion do not subside, or become more severe, immediate medical attention will be required.

9.2.5 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by failure of the heat regulating mechanisms of the body. The failure of the individual’s temperature control system causes the perspiration system to stop working correctly. When this occurs, the body core temperature rises very rapidly to a point (105+ °F) where brain damage and death will result if the person is not cooled quickly.

Symptoms: The victim’s skin is hot, and may or may not be red, dry and spotted, due to the fact that the individual may still be wet from sweat that occurred while wearing protective clothing earlier; nausea; dizziness; confusion; extremely high body temperature; rapid respiratory and pulse rate; delirium; convulsions; unconsciousness or coma.

Treatment: Cool the victim immediately. If the body temperature is not brought down quickly, permanent brain damage or death may result. The victim should be moved to a shady area; he/she should lie down and keep head elevated. Cool the victim by either sponging or immersing the victim in very cool water to reduce the core temperature to a safe level (<102 °F). If conscious, give the victim cool liquids to drink. Observe the victim and obtain immediate medical help. Do not give the victim caffeinated or alcoholic beverages. Heat stroke is considered a medical emergency. Medical help should be summoned immediately. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH.

9.2.6 Preventive Measures

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat exhaustion, that person may become predisposed to additional heat injuries. In order to avoid heat related illnesses, proper preventive measures will be implemented whenever environmental conditions dictate the need, normally whenever the temperature reaches at least 75 °F. These preventive measures represent the minimal steps to be taken and will include the following procedures:

The SSHO will examine each site worker prior to the start of daily operations, and periodically throughout the day, to determine individuals that may be susceptible to heat induced stress. Evidence of extreme dehydration, illness or alcohol use may require the SSHO to restrict the worker's activities until such time as the worker is fit for duty. The SSHO will monitor workers for early signs of heat strain, such as fatigue, dizziness, lightheadedness, etc.

Personnel identified as being at high risk for heat stress who are allowed to participate in site operations will be monitored frequently by the SSHO.

Site workers will be trained to recognize and treat heat-related illnesses. This training will include the signs, symptoms and treatment of heat stress disorders as outlined in this document.

In order to maintain workers' body fluids at normal levels, workers will be encouraged to drink, as a minimum, approximately sixteen ounces of liquids prior to start of work in the morning, after lunch and prior to leaving the site at the conclusion of the day's activities. When the temperature exceeds 75°F (24°C), the SSHO will encourage site workers to drink small volumes (6-8 ounces) of liquids every 20 minutes. As temperatures increase, workers will also be required to consume liquids during work cycle recovery periods detailed in Table C1-9-2. Disposable four (4) to twelve (12) ounce cups and liquids will be provided on site. Liquids to be provided will include water and an electrolyte replacement solution, with the intake of each being equally divided. Liquids containing caffeine are to be avoided.

When ambient conditions and site workload requirements dictate, workers will be required to drink a minimum of 16 to 32 ounces of liquids during each rest cycle. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, workers shall be encouraged to drink even though they may not be thirsty.

A shelter or shaded area will be provided where workers may be protected from direct sunlight during rest periods.

Monitoring of ambient or physiological heat stress indices will be conducted by SSHO to allow prevention and/or early detection of heat induced stress. Monitoring will be conducted in accordance with applicable paragraphs of this SSHP.

Work schedules will be adjusted by SSHO as follows:

- Modify work/rest schedules according to monitoring requirements.
- Mandate work slowdowns as needed.
- Rotate personnel: alternate job functions to minimize over-stress or overexertion at one task.
- Add additional personnel to work teams.

- Perform work during cooler hours of the day if possible.

Workers will be encouraged to achieve and maintain an optimum level of physical fitness. Increased physical fitness will allow workers to better tolerate and respond to hot environments and heavy workloads. In comparison to an unfit person, a fit person will have: less physiological strain; a lower heart rate and body temperature; and a more efficient sweating mechanism.

Alcohol should not be consumed in a hot environment because the loss of body fluids increases the risk of heat stress.

The amount and type of PPE worn directly influence reduced work tolerance and the increased risk of excessive heat stress. PPE adds weight and bulk, severely reduces the body’s access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item’s benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following factors:

- Anticipated work rate.
- Ambient temperature and other environmental factors.
- Type of protective ensemble.
- Individual worker characteristics and fitness.

Sweating does not cool the body unless moisture is removed from the body. The use of PPE reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks. Level D PPE will be used during field work activities at the AOCs, thus providing minimal increase in the potential for heat stress. Level D PPE is defined as standard work clothes with long pants, hard hats (when overhead hazard is present), safety boots, high visibility vest and safety glasses. The selection of PPE is discussed in SSHP Section 6.

9.3 Heat Stress Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers shall be monitored by the SSHO. A wet bulb globe temperature (WBGT) monitor will be used to monitor for conditions that pose a threat of heat stress to workers. WBGT monitoring will be conducted hourly by the SSHO when workers are dressed in Level D or Modified Level D ensembles and the ambient temperature exceeds 75°F. Once the WBGT has been determined, the SSHO can estimate workers' metabolic heat load using Table C1-9-1 and C1-9-2 to determine the appropriate work-rest regimen. Modification to the work-rest schedule can be instituted by the SSHO based on physiological monitoring data. The values outlined in the Table C1-9-2 are designed for acclimated workers clothed in a permeable work ensemble. The WBGT is not a good predictor of heat stress when impermeable ensembles are worn. However, it is acceptable to use Table C1-9-2 for impermeable ensembles by using a WBGT correction factor of -10.

Table C1-9-1 Examples of Activities with Metabolic Rate Categories

Categories	Example Activities
Resting	Sitting quietly
Light	Sitting with moderate leg and arm movement Using table saw Standing with light or moderate work (at work bench or operating machine)
Moderate	Scrubbing in standing position Walking about with moderate lifting Walking on level surface while carrying 7 lb load
Heavy	Sawing by hand Shoveling Intermittent heavy lifting
Source: 2012 TLVs and Biological Exposure Indices (BEIs) booklet published by the American Conference of Governmental Industrial Hygienists (ACGIH)	

Table C1-9-2 Recommended Work/Rest Cycle

Work-Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous Work	87.8[b]	82.4	-
45 min work/15 min rest[a]	87.8	84.2	81.5
30 min work/30 min rest	89.6	86	8282.4
15 min work/45 min rest	90.5	88.7	86.9

[a]Non-work, sitting in the shade or air-conditioned area.
[b]Wet bulb globe temperature (WBGT) index expressed in degrees Fahrenheit or standard dry bulb temperature if WBGT is unavailable

One of the job-specific controls used to prevent heat stress is implementation and/or modification of the work/rest schedules (or work/rest "regimen). When the SSHO determines a heat stress situation may exist (see above), they may establish work/rest schedules to mandate specific shift durations and rest periods for various onsite workers. In these situations, the initial work/rest regimen for workers in Level C PPE or higher will be 50% work and 50% rest with work load limited to light and moderate only, though this work/rest regimen may be further modified by the SSHO based on site-specific factors such as temperature, working conditions, and worker acclimation/fitness.

Initial work/rest schedules may be adjusted by the SSHO in accordance with physiological monitoring results. If this is done, the SSHO must perform the monitoring or designate someone to do the monitoring and a record must be maintained for each person so that body temperature trends and heart rate can be monitored for symptoms of excessive heat strain. Body temperature will be measured tympanically. These symptoms are as follows:

- Sustained (several minutes) heart rate is in excess of 180 beats per minute minus the individual's age in years (i.e., 180 – age); or
- Body temperature for any unacclimated team member exceeds 38°C (100.4°F) or acclimated team member exceeds 38.5°C (101.3°F).

If at the end of a work period, any team member exhibits the above symptoms, then the SSHO will institute a less strenuous work/rest regimen for the next team (e.g., reduction from 50% work/50% rest to 40% work/60% rest. If no team member's body temperature exceeds 37.5°C (99.5°F), then the SSHO may institute a more strenuous work/rest regimen for the next team (e.g., increase from 50% work/50% rest to 75% work/25% rest). These modifications will be made by the SSHO based on their professional judgment and on site-specific factors such as temperature, working conditions, and worker acclimation fitness. The SSHO may make further adjustments to the work/rest regimen (up or down) based on subsequent work periods of medical monitoring.

The SSHO or onsite medics can prevent an employee from re-entering the exclusion zone when they exhibit signs of heat strain (disoriented or suffers from malaise or chills) or when physiological monitoring taken prior to entry indicates heat strain (elevated body temperature [>100.4°F for unacclimated workers and >101.3°F for acclimated workers]). The SSHO will review with the medics the heat stress prevention program during the site-specific training. During site operations the SSHO will coordinate with the medics the implementation of the program (review monitoring results and adjust downrange times as necessary).

If a worker appears to be disoriented or confused, suffers inexplicable irritability, malaise, or chills, the worker should be removed for rest in a cool location with rapidly circulating air and kept under skilled observation. Absent medical advice to the contrary, heat related illness will be treated as an emergency with immediate transport to a hospital.

9.4 Cold-Related Illness

Exposure to low temperatures presents a risk to employee safety and health both through the direct effect of the low temperature on the body and collateral effects such as slipping on ice, decreased dexterity, and reduced dependability of equipment. Work conducted in the winter months can become a hazard for field personnel due to cold exposure. All personnel must exercise increased care when working in cold environments to prevent accidents that may result from the cold. The symptoms of cold exposure include frostbite and hypothermia. Wind increases the impact of cold on a person's body. Work will cease under unusually hazardous conditions (e.g., wind chill less than 10°F, or wind chill less than 20°F with precipitation). Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally labeled frostbite. Recognition of the symptoms of cold-related illness will be discussed during the health and safety briefing conducted prior to the onset of site activities.

9.4.1 Hypothermia

Hypothermia is defined as a decrease in a person's core temperature below 96.8°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interferences with any of these mechanisms can result in hypothermia, even in the absence of "cold" ambient temperatures. The first symptom of systemic hypothermia is shivering. Maximum shivering starts when the core body temperature drops below 95°F. The next set of symptoms as the body's cooling progresses is apathy, listlessness, and sleepiness. The person remains conscious and responsive with normal blood pressure and a core temperature of 93.2°F. The person must be removed immediately to a facility with heat. As hypothermia advances beyond this point, the person has a glassy stare, slow pulse, slow respiratory rate, and may lose consciousness. Severe hypothermia starts when the core body temperature reaches 91.4°F. Finally, the extremities start to freeze hard and death could result.

9.4.2 Frostbite

Frostbite is both a general and medical term given to areas of local cold injury. Frostbite has progressive degrees and this progression may continue until systemic hypothermia occurs. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Frostbite symptoms are a sudden blanching or whitening of the skin; a waxy or white appearance of the skin and it is firm to the touch; tissues are cold, pale, and solid. Superficial frostbite occurs when the skin is white but the underlying tissue is firm. The skin will return to shape when depressed. Deep frostbite causes the underlying tissue to freeze. The skin will either not depress when pressed by the finger or it will depress but not return to the original contour. DEEP FROSTBITE IS A SERIOUS INJURY.

9.4.3 Preventative Measures

In preventing cold stress, the SSHO must consider factors relating both to the worker and the environment. Training, medical screening, establishment of administrative controls, selecting proper work clothing, and wind-chill monitoring all contribute to the prevention of hypothermia and frostbite.

Training - Recognizing the early signs and symptoms of cold stress can help prevent serious injury. Thus, workers will be trained to recognize the symptoms of hypothermia and frostbite and have appropriate first-aid instruction. When the air temperature is below 50°F, the SSHO will inform workers of the proper clothing requirements and any work practices that are in effect to reduce cold exposure.

Administrative Controls - The SSHO will establish a work/rest schedule based upon worker monitoring. At the first sign of uncontrollable shivering the worker will be rested in a heated shelter. Work will stop then the air temperature reaches 0°F.

Clothing - Workers will be encouraged to layer clothing when air temperature is below 50°F. Clothing that has a high insulation value will be worn under protective garments. Insulated gloves will be worn when the wind chill index is below 32°F.

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10.0 STANDARD OPERATION SAFETY PROCEDURES, ENGINEERING CONTROLS, AND SAFE WORK PRACTICES

Safe work practices and engineering controls shall be implemented to comply with OSHA 29 CFR §1910.120 to limit employee exposure to hazardous substances or conditions. The use of PPE has limitations and presents hazards of its own, such as physical stress and interference with peripheral vision, calling for the consideration and implementation of work practices and engineering controls prior to beginning site tasks and before the use of PPE is instituted.

The safe work practices and engineering controls discussed below apply to general site procedures.

10.1 Safe Work Practices

The following work practices are intended for use when site activities involve potential exposure to hazardous substances or conditions.

- Personnel must maintain contact with Camp Ravenna Range Control at all times through phones.
- Personnel shall coordinate with range control to avoid posing hazards to National Guard Trainees.
- Personnel shall observe the base speed limit of 20 mph and exercise caution while driving near pedestrians or other site workers.
- All work will be conducted in compliance with EM 385-1-1 (USACE 2014).
- Daily safety briefings ("tailgate") will be held during field activities to inform personnel of new hazards or procedures.
- The SSHO or Field Operations Manager will conduct and document daily safety inspections (see Attachment C1-2 of this SSHP).
- Personnel will notify the SSHO of any medical conditions (e.g., allergic to bee stings, diabetes, pregnancy) that require special consideration.
- Personnel will maintain proper workplace housekeeping to minimize the potential for tripping and other accidents.
- Contact with potentially contaminated substances will be avoided. Site personnel in the exclusion zone will avoid walking through puddles, pools, and mud; kneeling on the ground; and placing equipment on the ground.
- Spills will be prevented to the extent possible. If a spill occurs, the material will be contained.
- All injuries and accidents requiring first aid will be reported to the SSHO, Field Operations Manager, Contractor CIH, and the Restoration Project Manager.
- All workers will abide by a buddy system. Members of a buddy team will maintain verbal or visual contact.
- Ground fault circuit interrupters shall be used on all field electrical equipment. Improperly grounded/guarded tools shall be tagged out-of- service and the Field Team Leader shall be notified immediately.

- If a piece of equipment fails or is found to be in need of repair, it will be immediately tagged out-of-service and the Field Team Leader shall be notified. This equipment will not be returned to service until repairs have been completed and the equipment tested by a competent individual.
- Unsafe conditions shall be reported immediately.
- Unusual odors, emissions, or signs of chemical reaction shall be reported immediately.
- Workers will minimize contact with hazardous materials by:
    - Avoiding areas of obvious contamination
    - Using poly sheeting to help contain contaminants
    - Avoiding contact with toxic or hazardous materials
- Only essential personnel will be permitted in the work zones.
- Whenever possible, personnel will be located upwind during material handling.
- At the first sign of odors detected inside the face piece of a respirator, or if the employee begins experiencing any signs or symptoms of exposure to site toxic material (this information will be discussed during the daily meeting and can be found on the appropriate Chemical Hazard Evaluation Sheets), the employee will leave the area immediately and report the incident to the SSHO and Field Team Leader. The work site shall be evacuated whenever evidence of a situation that could result in possible hazardous condition is identified.
- Smoking and eating will be allowed only in designated areas of the support zone.
- Talking on cellular phones while driving is prohibited (see Parsons Cell Phone Policy Attachment C1-7).

10.2 Driving

All posted speed limits and state vehicle operation laws must be obeyed at all times. Parsons employees driving motor vehicles/equipment may not use hand-held cellular phones but may use hands-free telephones 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. This requirement does not preclude passenger(s) from using cellular phones while the vehicle is in motion. Using headphones and earphones is prohibited while operating a motor vehicle/equipment. Take care when driving in the vicinity of National Guard Trainees.

10.3 Permit Requirements

Contractors will coordinate with the Army to obtain, as necessary, all permits necessary for the safe execution of a project.

10.4 Investigation-Derived Waste Drum / Container Handling

Any drums used for the project will meet the requirements of the FWSAP and project-specific addenda. IDW movement from field sites to Building 1036 will be conducted by the drilling subcontractor using a backhoe equipped with forks and drum dollies. No personnel will be allowed under lifted loads. Lifts of greater than 50 lb will be made with two or more personnel or with lifting equipment in compliance hazardous waste safety training and Sections 14 and 16 of the USACE Safety and Health Requirements Manual.

10.5 Confined Space Entry Procedures

Confined space is not expected during the work at Camp Ravenna. If confined space entry becomes necessary during the implementation of the work, a confined space permit and AHA will be instituted prior to allowing any confined space entry. Parsons confined space work policies and procedures are included as Attachment C1-3.

10.6 Hot Work, Sources of Ignition, and Fire Control

Hot work is not anticipated in this project.

10.6.1 Fire Prevention

Explosions and fires not only pose the obvious hazards of intense heat, open flames, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment. Such releases can threaten both personnel on-site and members of the general public living or working nearby. Site personnel involved with potentially flammable material or operations will follow the guidelines listed below and EM 385-1-1, Section 9, to prevent fires and explosions:

- Potentially explosive/flammable atmospheres involving gases or vapors will be monitored using a combustible gas indicator;
- Prior to initiation of site activities involving explosive/flammable materials, all potential ignition sources will be removed or extinguished; Non-sparking and explosion-proof equipment will be used whenever the potential for ignition of flammable/explosive gases/vapors/liquids exists;
- Dilution or induced ventilation may be used to decrease the airborne concentration of explosive/flammable atmospheres;
- Smoking is prohibited at work sites, or in the vicinity of operations that may present a fire hazard;
- Flammable and/or combustible liquids must be handled only in approved, properly labeled metal safety cans equipped with flash arrestors and self-closing lids;
- Transfer of flammable liquids from one metal container to another will be done only when the containers are electrically interconnected (electrically bonded);
- The motors of all equipment being fueled will be shut off during the fueling operations;
- Metal drums used for storing flammable/combustible liquids will be equipped with self-closing safety faucets, vent bung fittings, grounding cables and drip pans, and will be stored outside buildings in an area approved by the SSHO.

10.6.2 Protection

The following safe work practices will be used to protect against fires:

- At least one portable fire extinguisher having a rating of not less than 20:ABC will be located at each work site; and

- At least one portable fire extinguisher having a rating of not less than 5: ABC will be located in vehicles used for site work.

10.7 Electrical Safety

This work will be conducted according to 29 CFR 1910 Subpart S and EM385-1-1 Section 11.

- Connect all portable 110-V electrical equipment through ground fault circuit interrupters.
- Keep conductive materials (drill rigs) clear of energized power lines. Observe the following minimum distances: 0 to 50 kilovolts (kV) (10 ft); 51 to 100 kV (12 ft); 101 to 200 kV (15 ft); 201 to 300 kV (20 ft); 301 to 500 kV (25 ft); 501 to 750 kV (35 ft); and 750 to 1000 kV (45 ft).

10.8 Excavation and Trench Safety

Excavation is not anticipated in this project.

10.9 Guarding of Machinery and Equipment

All machinery and equipment that is designed to have a guard will be equipped with a functional guard, and will be operated according to manufacturer's instructions. All reciprocating, rotating, and moving parts of equipment shall be guarded if exposed to contact by employees or otherwise create a hazard as required by EM 385-1-1.

10.10 Lockout/Tagout

Hazardous energy lockout/tagout is not anticipated. All potentially hazardous servicing or equipment repair will be governed by 29 CFR 1910.147 and EM 385-1-1 Section 12. Attachment C1-10 contains Parsons lockout/tagout energy control procedures.

10.11 Hazard Communication Program

The OSHA Hazard Communications Standard (29 CFR§ 1910.1200) was promulgated to ensure that all chemicals would be evaluated and information regarding the hazards associated with these chemicals would be communicated to employers and employees. The goal of the standard is to reduce the number of chemically related occupational illnesses and injuries.

In order to comply with the OSHA Hazard Communication Standard, this written program has been established by Parsons for work at Camp Ravenna, Ravenna, Ohio. All Parsons and subcontractor personnel working at Camp Ravenna are included in this program. Copies of this written program will be available for review by any employee at the field site, by contacting the SSHO, or from the PHSM.

See Exhibit 13 of the APP for Parsons Hazard Communication procedures.

10.11.1 Hazardous Chemical Inventory List

The Field Team Leader, SSHO, or his/her designee must compile a list of hazardous chemical substances that Parsons employees and subcontractors bring to the site. The list shall be maintained on-site. As new substances are purchased or old ones are discontinued, the inventory shall be updated to reflect these changes.

10.11.2 Safety Data Sheets

SDSs are prepared by manufacturers or producers to provide specific information on the safety precautions and health effects of a particular chemical or mixture. The SDS contains at a minimum the following information:

- Chemical and common names
- Physical and chemical characteristics
- Physical hazards
- Health hazards
- Primary routes of entry
- Exposure limits
- Carcinogenic potential
- Handling and protective precautions
- Control measures
- Emergency and first aid procedures
- Date of SDS preparation
- Name and address of manufacturer

If chemicals are ordered, the Field Team Leader or his designee will specify on the purchase order that chemicals are not to be shipped without corresponding SDSs. When chemicals and SDS arrive, the SSHO or his designee will review them for completeness. Should any SDS be incomplete, a letter or fax will be sent immediately to the manufacturer requesting the additional information, Parsons or its subcontractors will not accept any shipped chemical materials without an SDS.

A complete file of SDSs for all hazardous chemicals that an employee of Parsons may be exposed will be kept in labeled files in the main office and on-site. In the event that a SDS is missing the employee should immediately contact the SSHO or PHSM.

10.12 Illumination

It is expected that site activities will be conducted only during daylight hours (no earlier than 15 minutes after sunrise and no later than 15 minutes before sunset. Illumination requirements presented in EM 385-1-1 Section 7 shall be observed. Construction areas, stairs, ramps and storage areas where work is in progress must be lighted with either natural or artificial illumination.

10.13 Sanitation

10.13.1 Drinking Water

Only approved potable water systems shall be used for the distribution of drinking water. Drinking water supplied from other sources approved by Federal, State, or local health authorities can also be used. Drinking water coolers will be provided for the field teams.

Portable containers used to dispense drinking water shall be tightly closed, and equipped with a tap. Containers will be clearly marked as their contents and shall not be used for other purposes. Water shall not be dipped from containers. Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

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

10.13.2 Toilets

When sanitary sewers are not available, one of the following facilities, unless prohibited by local codes, shall be provided: chemical toilets; re-circulating toilets; combustion toilets, or other toilet systems as approved by state/local governments.

Unless mobile crews have transportation readily available to nearby toilet facilities, toilets shall be provided for the job sites according to the following:

Table C1-10-1 Minimum Number of Toilets

Number of Employees	Minimum Number of Toilets
1-15	one
16-35	two
36-55	three
Notes: Where toilets will not be used by women, urinals may be provided instead of commodes, except where the number of commodes shall not be reduced to less than 2/3 of the minimum number of specified above.	

Where toilet rooms may be occupied by no more than one person at a time, can be locked from the inside, and contain at least one toilet seat, separate toilet rooms for each sex need not be provided.

Under temporary field conditions, provisions shall be made to assure that at least one toilet facility is available.

10.13.3 Personal Hygiene Practices

The following personal hygiene practices will apply to field work conducted at Camp Ravenna:

- No smoking or chewing of tobacco or gum shall be allowed within the exclusion or decontamination zones.
- No eating or drinking shall be allowed in the exclusion or decontamination zones.
- On-site personnel shall remove protective clothing and wash face and hands prior to leaving the decontamination zone.
- Disposable outerwear will be placed in clearly labeled drums located in the personnel decontamination area. Drums will be staged on-site at a central location for later disposal.

10.14 Drill Rig Operations

General drilling practices will comply with EM 385-1-1 Section 18H.

- Operating manuals will be present on-site for each type of drill rig in use and rigs will be operated per the operating manuals.

- Drill rigs will have at least two functional emergency shutdown devices, one for the driller and one for the driller's helper. These switches will be confirmed to be functional each day that the rig will be used and the confirmation will be recorded in the daily task activity log.
- Drill rigs will have functional backup alarms.
- Drill rigs will be inspected weekly by the driller and recorded on the weekly drill rig inspection form; the SSHO will confirm this inspection.
- Only the driller, driller's helper, and personnel who have a critical need will be allowed near moving parts of the drill rig.
- Drill sites will be verified free of underground utilities by clearing each site with local utilities and/or appropriate installation personnel prior to beginning drilling. Drill sites will be evaluated for proximity to overhead utilities, and minimum distances will be maintained as specified in EM 385-1-1 Table 11-1.
- Drill-mounted fire-fighting equipment will be inspected monthly, will not be tampered with, and will not be removed for other than the intended fire-fighting purposes or for servicing.
- Drilling crews and personnel who work near the drill rig will be trained in the location and use of the emergency shutdown devices.
- Drilling will cease during electrical storms or when electrical storms are imminent.
- If lubrication fittings are not accessible with guards in place, machinery will be stopped and disabled (locked out or ignition key removed) for oiling and greasing.
- Work areas and walkways will not be obstructed.
- General hoisting operations comply with EM 385-1-1.
- The derrick (mast) will not be raised unless the area is free of overhead obstructions and far enough from power lines (see Section 10.7, Electrical Safety).
- The derrick will not be raised until the rig has been blocked, leveled, and chocked.
- Rigging equipment for material handling will be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging will be removed from service.
- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment unless it has been specifically designed for line contact.
- Workers will stand clear of the well bore when any wire line device is being run.
- No loads will be lifted over workers.
- Drill rods will not be run or rotated through rod slipping devices. No more than 1 ft of drill rod column will be hoisted above the top of the drill mast.

10.15 Histoplasmosis

Histoplasmosis is an infectious disease caused by inhaling the spores of a fungus called Histoplasma capsulatum. Histoplasmosis is not contagious; it cannot be transmitted from an infected person or animal to someone else. Histoplasmosis primarily affects a person's lungs, and its symptoms vary greatly. The vast majority of infected people are asymptomatic (have no apparent ill effects) or they experience symptoms so mild they do not seek medical attention and may not even realize that their illness was histoplasmosis. If symptoms do occur, they will usually start within 3 to 17 days after exposure, with an average of 10 days. Histoplasmosis can appear as a mild, flu-like respiratory illness and has a combination of symptoms, including malaise (a general ill feeling), fever, chest pain, dry or non-productive cough, headache, loss of appetite, shortness of breath, joint and muscle pains, chills, and hoarseness. Chronic lung disease due to histoplasmosis resembles tuberculosis and can worsen over months or years. Special antifungal medications are needed to arrest the disease.

H. capsulatum grows in soil throughout the world. In the United States, the fungus is endemic (more prevalent) and the proportion of people infected by H. capsulatum is higher in central and eastern states, especially along the valleys of the Ohio, Mississippi, and St. Lawrence Rivers and the Rio Grande. The fungus seems to grow best in soil having a high nitrogen content, especially that enriched with bat droppings or bird manure. Disturbances of contaminated material cause small H. capsulatum spores to become airborne or aerosolized.

The following actions must be taken to minimize the potential for infection:

- Workers who will disturb collections of bird or bat droppings must be trained in the potential hazard and control measures.
- Avoid disturbing collections of bird or bat droppings in any way that causes airborne dust.
- If collections of bird or bat droppings will be disturbed, wet droppings with water and surfactant before disturbing and continuously during disturbance.
- Stop work and take additional corrective action if visible airborne dust is observed.
- Use particulate respirators and disposable coveralls for work that may involve potentially significant or uncontrolled exposure to collections of droppings.

10.16 Lyme Disease

See Section 3.4.2 of this SSHP.

10.17 Rocky Mountain Spotted Fever

See Section 3.4.2 of this SSHP.

10.18 Mosquito-Borne Viruses

See Section 3.4.5 of this SSHP.

10.19 Fuels

Camp Ravenna procedures and applicable portions of EM 385-1-1 Section 9 for use and storage of fuels, such as gasoline and diesel fuel, must be followed. These include, but are not limited to:

- Secondary containment for containers with a capacity of 100 gal or more;
- All spills must be immediately reported to the Army;
- Spill response must comply with the current Installation Spill Contingency Plan for Camp Ravenna;

- Fuel storage areas will be posted with signs stating, "No Smoking, Matches, or Open Flame," and no ignition sources will be allowed within 50 ft.
- Only labeled/listed (by a nationally recognized testing laboratory) containers and portable tanks will be used for the storage of flammable and combustible liquids.

10.20 Work Permit Requirements

Permit Required Confined Space operations are not anticipated for work at Camp Ravenna. Should this change for any particular site, 29 CFR 1910.146 will be reviewed and a permit will be developed and implemented (a sample confined space permit is included in Attachment C1-3). Any work permits that may be required for the Camp Ravenna activities will be implemented as needed.

10.21 Site Inspections

SIs will be conducted daily by the SSHO to ensure that site work is accomplished in accordance with the approved safety plan, contract requirements and federal regulations. Daily inspections will be documented in the field log book.

10.22 Safe Work Practices for Drilling, Power Tool Operation, Hand Tool Operation, Material Lifting, Heavy Equipment Operation, and Motorized Equipment Operation

Safe practices for all anticipated work activities at Camp Ravenna are included as AHAs in Attachment C1-1 of this document. Additional information regarding Parsons' standard operating procedures and policies is provided as follows:

Table C1-10-2 Safe Work Practices

Subject	Source of Additional Information
Power and Hand Tool Operation	Attachment C1-8
Motor Vehicle and Heavy Equipment Operation	Attachment C1-9
Lock Out Tag Out	Attachment C1-10
Fall Protection	Attachment C1-11
Pre-Drilling Check List	Attachment C1-12

10.23 Labels and Signs

The Hazard Communication Standard requires that hazardous chemicals be labeled by manufacturers. The label must contain the following:

- Chemical identity
- Appropriate warnings
- Name and address of manufacturer, importer, or other responsible party.

If the labels are incomplete or missing, Parsons personnel will refuse the shipment. When chemicals are transferred from the manufacturer's container to secondary containers, the Field

Team Leader or SSHO will ensure that the containers are labeled with the identity of the chemicals and appropriate hazard warnings. Labels for secondary containers can be obtained from the SSHO.

Signs, tags, and labels shall be provided at the site to give adequate warning and caution of hazards and instruction and directions to on-site personnel and the public.

10.24 Material Handling Procedures

10.24.1 Material Lifting

Many types of objects are handled in normal day-to-day operations. Care should be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials to avoid joint and back injuries:

- The size, shape and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably;
- A firm grip on the object is essential, therefore the hands and object shall be free of oil, grease and water, which might prevent a firm grip;
- The hands, and especially the fingers shall be kept away from any points that cause them to be pinched or crushed, especially when setting the object down;
- The item will be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces and pinch points, and gloves shall be used, if necessary, to protect the hands;
- The feet will be placed far enough apart for good balance and stability;
- Personnel will ensure that solid footing is available prior to lifting the object;
- When lifting, get as close to the load as possible, bend the legs at the knees, and keep the back as straight as possible;
- To lift the object, the legs are straightened from their bending position;
- Never carry a load that you cannot see over or around;
- When placing an object down, the stance and position are identical to that for lifting: with the back kept straight and the legs bent at the knees, the object is lowered;
- If needed, back support devices will be provided to aid in preventing back injury during lifting activities; and
- Materials will not be moved over or suspended above personnel unless positive precautions have been taken to protect.

When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. One person will be designated as “leader”. The leader will direct the pickup, transfer, set down and release of the load, to ensure coordination. When carrying the object, each person, if possible, shall face the direction that the object is being carried.

10.24.2 Material Handling

On-site personnel shall avoid contact with potentially-contaminated substances. All wastes generated during activities on-site will be handled in accordance with Standard Operating Procedures in the Sampling and Analysis Plan, and Attachment C1-13.

10.25 Drum/Container Handling Procedures and Precautions

The handling of hazardous or toxic waste drums and containers shall be kept to the minimum. Drum/containers are bulky and heavy, and represent ergonomic hazards when trying to move them as well as pinching/crushing fingers and hands. Drums/containers also represent spill hazards. Drum/container handling procedures and precautions presented in EM 385-1-1 Section 14 shall be observed. An AHA for drum/container handling is included in Attachment C1-1, and drum and roll-off handling SOP is included as Attachment C1-13. If a forklift is used for drum/container handling, operators must be certified in accordance with 1910.178.

10.26 Engineering Controls

As part of the AHA that is performed prior to any field activity, the SSHO or PHSM will examine each task and recommend engineering controls for each action, as applicable. These controls will be followed by all site personnel to ensure tasks are completed in the safest possible manner.

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11.0 SITE CONTROL MEASURES

11.1 Work Zones

Based on known site history and the planned site activities, the SSHO will determine whether work zones consisting of an exclusion zone, contamination reduction zone (CRZ), and support zone are needed for the operation taking place. The SSHO shall consider at a minimum the following when evaluating the necessity for establishing work zones:

- Historical site use,
- Planned site activities,
- Existing soil and groundwater COC data,
- Potential for fugitive dust, combustible gasses and/or organic vapors, and
- Noise.

Many site activities, including SIs and system operation and maintenance are not intrusive therefore will not require establishing work zones. There are no physical, noise, or chemical hazards associated with those activities that would require establishment of formal work zones.

Groundwater sampling activities are intrusive, however, volatile organic compound (VOC)/hydraulic fluid concentrations (if any) in groundwater are expected to be low and no exposures are anticipated. The SSHO will direct site visitors to stay at least five feet away and upwind of any sampling activities.

Activities that require formal delineated work zones include drilling activities: The radius of the exclusion zone will be at a minimum twice the height of the drill rig or 50 feet for direct push rigs. The size of the exclusion zone for physical safety is anticipated to also be safe for chemical and noise hazards based on the nature of the sites and activities, however, the size of the exclusion zone may be increased based on conditions encountered during site activities. Noise will be monitored and, if hazardous noise is present, the exclusion zone will be increased so that noise outside the exclusion zone does not exceed 85 dBA. In some circumstances, the size of the exclusion zone may be reduced due to space limitations, existing site structures or roadways. The outer boundary of the exclusion zone (hotline) will be clearly marked using cones in remote areas and with boundary tape in more heavily trafficked areas.

The SSHO will be responsible for directing movement of site workers and equipment across the hotline. A CRZ will be established by the SSHO. Movement to and from the exclusion zone will be through one or more access control points established by the SSHO within the CRZ. Workers entering the CRZ from the exclusion zone will be required to remove any PPE/protective clothing. Within the CRZ, decontamination operations are anticipated to include only the removal/disposal of outer gloves (and Tyvek if used) into a trash bag upon completion of site activities. A hand washing facility will be located within the CRZ. A control line between the CRZ and support zone will be established by the SSHO. Workers entering the CRZ from the support zone will be required to wear the appropriate PPE at the direction of the SSHO.

If necessary, a separate access control point for vehicles and equipment exiting the exclusion zone will be established within the CRZ. Equipment exiting the exclusion zone through this access point will be inspected and decontamination will be conducted as necessary.

All non-essential activities (e.g. paperwork, lunch) will occur outside of the exclusion zone and CRZ within the support zone.

Most AOCs are in remote locations with limited activity. An exclusion zone may not be practical at these locations. The SSHO will be responsible for determining the need for establishing site controls and exclusion zones. An exclusion zone will be established if the work site will be left intact and unattended for an extended period of time (e.g., leaving a drill rig in place overnight). If the SSHO determines that a potential exists for unauthorized personnel to approach within 25 ft of a work zone or otherwise be at risk due to proximity, then exclusion zones will be established as described in the following sections.

11.2 Exclusion Zone

The exclusion (contamination) zone is the area where the greatest potential exists for exposure to contamination or physical hazards. The periphery of the exclusion zone will be identified by barricade tape or rope suspended above the ground. An entry and exit checkpoint will be visually defined to regulate the flow of personnel and equipment. The entry and exit checkpoint will be delineated with barricade tape/rope and signs. Signs may state "Construction Area," or "High Noise Area," as deemed appropriate by the SSHO. The number of people and equipment in the exclusion zone will be minimized to control physical hazards and the spread of contamination.

The following standard rules will apply to all entry into the exclusion zone:

- The SSHO or Field Operations Manager must approve (and log) entry into the exclusion zone.
- All personnel entering the exclusion zone will wear the prescribed level of protective clothing.
- All items and related paraphernalia intended to be placed on the face or in the mouth (e.g., cigarettes, lighters, matches, chewing tobacco, food, cosmetics) are prohibited in the exclusion zone.
- All personnel in the exclusion zone will follow the buddy system.

Exclusion zones will be established around drilling sites, areas of heavy equipment use, and all activities where contamination is a potential hazard. As a minimum, the exclusion zone will extend 25 ft from the hazard. For drilling operations, the exclusion zone will also be at least equal to the mast height in radius so that no part of an overturned drill rig will fall outside the zone. A larger exclusion zone will be used, as necessary, to protect bystanders and the public from chemical or other hazards. Exclusion zones for other activities will be appropriate to the hazard and surroundings.

11.3 Contamination Reduction Zone

A contamination reduction (buffer) zone will be established, as necessary, outside the exclusion zone to provide a transition from and a buffer between the exclusion zone and the support zone. A formal contamination reduction zone for personnel will not be established unless Level D PPE or higher level (C) is used or significant surface contamination is present or suspected. An entry and exit checkpoint will be visually defined at the periphery of the zone to regulate the flow of personnel and equipment. The entry and exit checkpoint and the perimeter of the zone will be delineated with the use of ropes/barricade tape and signs. A contamination reduction zone will be established around the central equipment decontamination pad.

All personnel entering the contamination reduction zone will wear the prescribed level of protective clothing required for that zone. All items intended to be placed on the face or in the mouth (e.g., cigarettes, chewing tobacco, food, cosmetics) are prohibited in the contamination reduction zone. Doffing of protective clothing and personnel decontamination will occur in the contamination reduction zones.

11.4 Support Zone

The support zone is the clean and relatively safe area surrounding the exclusion and contamination reduction zones. Entry requirements for the support zone consist of those required for entry into the general area of the facility. Primary functions of the support zone are

- Staging area for clean equipment and supplies; and
- Location for support services (e.g., office trailers, laboratory trailers, eating area[s], toilet facilities, parking, visitor area[s]).

11.5 Site Visitors

The Field Operations Manager will add all employees/visitors to the on-site access roster that is maintained by the Camp Ravenna O&M Contractor. The O&M Contractor will approve and coordinate site access with Guard Post 1. All visitors are required to sign-in with Guard Post 1 to gain site access. Visitors will not be allowed inside areas controlled by the Parsons without specific approval of the SSHO and Field Operations Manager. Visitors must meet all regulatory (specifically 29 CFR 1910.120) and site health and safety requirements (e.g., proof of training, medical surveillance) to be considered for Camp Ravenna entry. All visitors will receive a health and safety briefing appropriate to the nature of the visit and the potential hazards associated with the visit. All visitors must sign the daily tailgate and health and safety briefing form (Attachment C1-2).

11.6 Site Communication

Field personnel will be capable of contacting other field personnel and outside agencies. Communication on-site will be assured by hand-held radio, cellular phone, portable air horns, or vehicle horns. Best communication device is a cell phone. Short blasts (less than 1/2 sec) of an air horn or car horn will be used to request assistance. Prolonged blasts (more than 2 sec) will be used to signal an evacuation. If phone service is not immediately available on the site, the crew will be equipped with a cellular phone. If cell phone reception cannot be obtained at the site, available hand-held radios should be used.

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12.0 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination is the physical removal of contaminants from clothing and equipment or the chemical change of such contaminants to innocuous substances. All operations in this project are anticipated to occur using Level D PPE, therefore a decontamination zone will not be necessary. All gloves and/or outer garments used during sampling operations will be removed and disposed of prior to entering the support zone. Additional details on personal hygiene are provided in SSHP Section 10.13.

12.1 Prevention of Contamination

In an effort to minimize contact with waste and decrease the potential for contamination, the points outlined below will be adhered to during all phases of field investigation and sampling.

- Personnel will make every effort not to walk through puddles, mud, any discolored surface, and/or any area of obvious contamination.
- Personnel will not kneel or sit on the ground in the exclusion/work zone.
- Personnel will not place equipment on drums, containers, vehicles, or on the unprotected ground.
- Where appropriate, personnel will wear disposable outer garments and use disposable equipment.

A system of procedures will be used to control the spread of contamination from the exclusion (contamination) zone and to ensure that workers are sufficiently free of contamination to preclude adverse health effects. PPE doffing and personnel decontamination are part of this system. The SSHO will ensure the construction of a decontamination station, as necessary; instruct personnel on its proper use; and verify that personnel follow the appropriate steps. This section presents examples of basic requirements for personnel decontamination keyed to the level of protective clothing in use. It is the SSHO's responsibility to verify that personnel hygiene and decontamination processes are adequate to protect personnel and meet the requirements of EM 385-1-1 Sections 6 and 33.

12.2 Level D Protection Decontamination

Station 1: Tape removal. Remove all tape (if used) from outer clothing and place in appropriate waste container.

Station 2: Outer disposable garment and chemical-resistant gloves removal. Carefully remove outer contamination-resistant garment and gloves.

Station 3: Field wash. Wash hands and face prior to eating, drinking, or smoking. This step may be accomplished with soap and water or disposable disinfectant wipes.

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13.0 EQUIPMENT DECONTAMINATION

Equipment will be cleaned to remove gross contamination. Soap and water washes will be performed when required for sampling or for heavy contamination. Gross contamination, such as caked mud and dirt on augers and split spoons, will be removed at the work site and drummed with other drilling spoils if contaminant indicators (e.g., proportional integral derivative controller [PID] readings) warrant drumming of the soils. Activity Hazard Analyses 6, 7, and 8 address decontamination of personnel, heavy equipment, and portable tools, respectively.

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14.0 EMERGENCY PROCEDURES AND EQUIPMENT

In the event of an accident or incident, the Field Operations Manager must first notify Camp Ravenna Range Control (614-336-6041) who will coordinate the response. The Field Operations Manager should then notify the USACE Project Manager (Craig Coombs) immediately according to the requirements of the EM 385-1-1. The required Accident Report (ENG Form 3394, see APP Exhibit 2) must be completed and submitted to the USACE Project Manager (Craig Coombs) within 2 days.

All personnel working on-site will be trained in the applicable emergency response requirements. This includes recognizing emergencies, reporting emergencies to the Field Operations Manager or SSHO, and responding to emergencies. Employees will also be informed of any changes in potential emergencies or response plans.

14.1 Emergency Phone Numbers

Table C1-14-1 lists the emergency groups and their telephone numbers. A mobile phone will be present in the field and available for use at all times. All emergencies on-site will be coordinated first through Range Control (614-336-6041). Note, do not call 911 because that will only delay the response.

Table C1-14-1 Emergency Contact Phone Numbers

Position	Phone
Range Control (Police, Fire, Emergency Medical)	(614) 336-6041
Hazardous Materials Response	(614) 336-6041
ARNG Restoration Project Manager – Kevin Sedlak	(614) 336-6000 Ex 2053
USACE COR Kevin Mieczkowski	(502) 315-7447
USACE Project Manager Craig Coombs	(502) 315-6324
Ohio EPA Spill Hotline	(800) 282-9378
Parsons Project Manager Ed Heyse	(303) 563-9452
Parsons Health and Safety Manager Ed Grunwald	(678) 429-6887
WorkCare Incident Intervention Team	(888) 449-7787

14.2 Procedures and Equipment

Each team must have direct radio or telephone communication with the Field Operations Manager. For the purposes of this requirement, a team is any individual(s) not having a line of sight or within normal voice range of another individual(s) having means of communication with the Field Operations Manager. The best communication device to use at the site is a cell phone.

In the event of medical emergency, University Hospitals Portage Medical Center is located approximately 10 miles from the site at 6847 North Chestnut Street in Ravenna, Ohio (Figure 13-

1 in the FWSHP and SSHP Figure C1-14-2). It can be reached by taking PA Street 1 (Paris-Windham Road) towards Highway 5 West/Ravenna Warren Road approximately 7.2 miles west, turn right at Cleveland East Liverpool Road/Highway 14 North/Highway 44 North approximately 2.4 miles, turn left at North Chestnut Street/Ravenna Painesville Road. Please see SSHP Figure C1-14-1 for an emergency egress route map and SSHP Figure C1-14-2 for a hospital route map. In the event of an emergency, Guard Post 1 will be the facility-wide assembly point as shown on SSHP Figure C1-14-1.

Several items of emergency equipment will be maintained at the work site. Any incident that is not clearly controllable by personnel wearing standard site clothing plus protective gloves and using the listed equipment will require re-evaluation by the SSHO. If the SSHO does not feel that on-site personnel can safely control the emergency with the available equipment, the crew will use an alternate approach such as allowing a small fire to burn out or evacuating the site. The required emergency equipment includes the following:

- Fully stocked first aid kit indoors or in a weather-proof container, inspected weekly;
- Compressed gas horns;
- Emergency eye wash to meet American National Standards Institute standard if corrosives (in water sample preservatives) are being poured;
- Fire extinguisher(s) 7.6-22.9 m (25-75 ft) from outside the flammables storage (or use) area;
- Basic spill kit suitable to handle small spills of decontamination fluids, hydraulic fluid, or fuels and containing sorbent pads, tubes, and nitrile or similar gloves; and
- Cell phone.

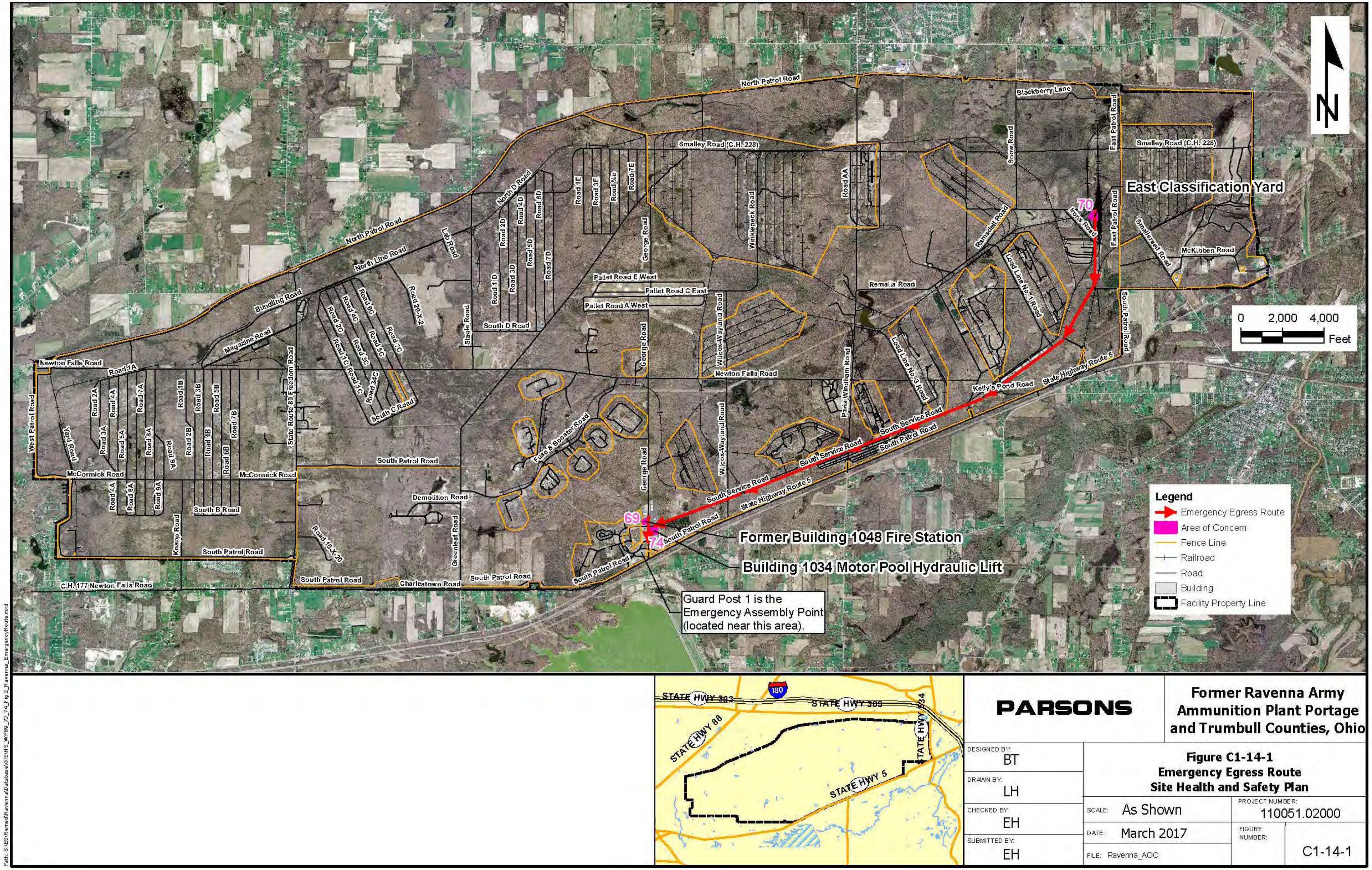

Figure C1-14-1 Emergency Egress Route

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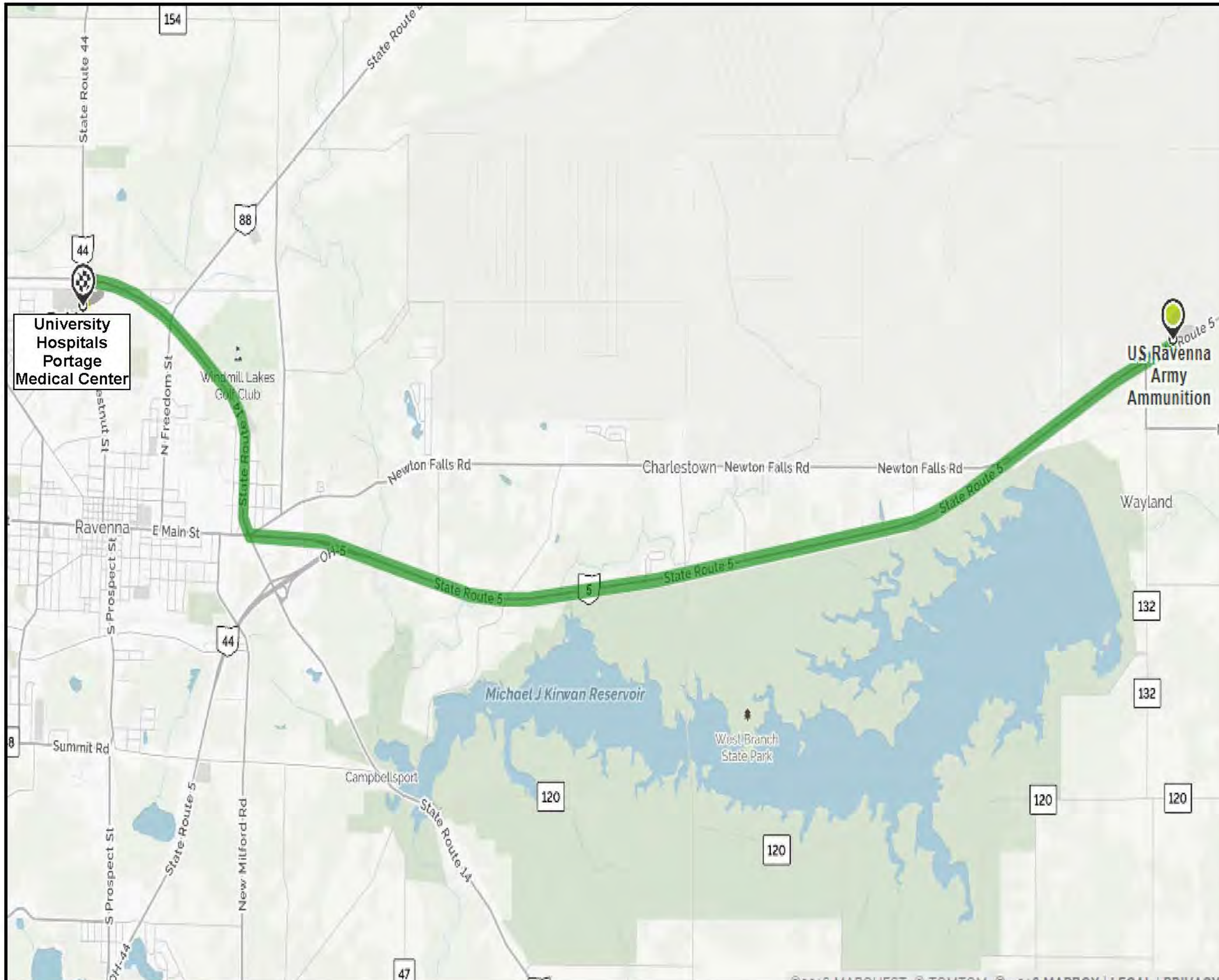

S:\ES\Remed\Ravenna\Database\GIS\HS_WP69_70_74_Fig3_Ravenna_HospitalRoute.mxd lxh 3/28/2017

Figure C1-14-2

Directions to
University Hospitals
Portage Medical Center
6847 North Chestnut Street
Ravenna, OH 44266
(330) 297-0811

1. Start out going southwest on State Route 5/OH-5 toward Wayland Rd/County Hwy-132. Continue 7.51 miles.
2. Stay straight to go onto State Route 59/OH-59. Continue 0.78 miles.
3. Turn right onto State Route 14/OH-14/OH-44. Continue 2.38 miles.
4. Turn left onto N Chestnut St. Continue 0.18 miles.
5. University Hospitals Portage Medical Center is on the right.

N

PARSONS	Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio			
DESIGNED BY: BT	Hospital Route to University Hospitals Portage Medical Center for Ravenna Sites			
DRAWN BY: LH				
CHECKED BY: EH	SCALE: As Shown		PROJECT NUMBER: 110051.02000	
SUBMITTED BY: EH	DATE: March 2017		FIGURE NUMBER:	C1-14-2
	FILE:			

Figure C1-14-2 Hospital Route to University Hospitals Portage Medical Center

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15.0 LOGS, REPORTS, AND RECORD KEEPING

Parsons will adhere to the documenting activities related to daily logs, reporting, and record keeping requirements as described in Section 14.0 of the FWSHP. The SSHO will lead the daily tailgate meetings. Please see Attachment C1-2 Reporting Forms for a copy of Parsons' Daily Tailgate Meeting Sign-In Sheet.

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16.0 REFERENCES

Science Applications International Corporation (SAIC), 2011. *Facility-Wide Field Sampling Plan (FWFSP) for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*, February 24.

SAIC, 2011. *Facility-Wide Safety and Health Plan (FWSHP) for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*, February 24.

ACGIH (American Conference of Governmental Industrial Hygienists) 2012. *(Threshold Limit Values) TLVs® and Biological Exposure Indices (BEIs) and Guide to Occupational Exposure Values*.

National Institute of Occupational Safety and Health (NIOSH) 2005. *NIOSH Pocket Guide to Chemical Hazards*. September 2005.

Ohio Environmental Protection Agency (Ohio EPA), 2004. *Director's Final Findings and Orders (DFFO) for the Ravenna Army Ammunition Plant*. June 10.

U.S. Army Corps of Engineers (USACE) 2014. *Safety and Health Requirements Manual. EM 385-1-1*, November.

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SSHP Attachments

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ATTACHMENT C1-1

ACTIVITY HAZARD ANALYSIS

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Activity Hazard Analysis (AHA) 1

Activity/Work Task: Site Visits, Site Walks, and Surveying	Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: Camp Ravenna, Ohio	Risk Assessment Code (RAC) Matrix					
Contract Number: W912QR-12-D-0002-0003	Severity	Probability				
Date Prepared : March 2017		Frequent (F)	Likely (L)	Occasional (O)	Seldom (S)	Unlikely (U)
Prepared by: Parsons SH&E Team	Catastrophic (C)	E	E	H	H	M
	Critical (Cr)	E	H	H	M	L
Reviewed by: Edward Grunwald, CIH	Marginal (M)	H	M	M	L	L
	Negligible (N)	M	L	L	L	L
	Step 1: Review each “Hazard” with identified safety “Controls” and determine RAC (See above) The RAC is developed after correctly identifying all the hazards and fully implementing all controls.					
Notes: (Field Notes, Review Comments, etc.)	P “Probability” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent (F), Likely (L), Occasional (O), Seldom (S) or Unlikely (U).					RAC Chart
	S “Severity” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic (C), Critical (Cr), Marginal (M), or Negligible (N)					E = Extremely High Risk H = High Risk
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.					M = Moderate Risk L = Low Risk

Job Steps	Hazards	Controls	P	S	RAC
1. Movement Across Site.	1.1 Unfamiliarization with site layout and emergency plans. 2.Observe the speed limit (20 mph) and take extra care when driving near pedestrians. Coordinate work with range control.	1.1.1 SH&E induction prior to any activity on site	S	M	L
2. Passing near Moving Plant and Vehicles.	2.1 Passing near Moving Plant and Vehicles.	2.1.1 Wear high-visibility vest 2.1.2 Use designated walkways 2.1.3 Do not stay behind plant/vehicles 2.1.4 Look out for moving plants and vehicles	S	Cr	M
3. Passing in a Dusty area, dust from activities.	3.1 Passing in a Dusty area, dust from activities.	3.1.1 Wear appropriate dust mask. 3.1.2 Ensure good visibility before any movement on site.	S	M	L
4. Walking in extreme temperatures/weather conditions.	4.1 Walking in extreme temperatures/weather conditions	4.1.1 Check for humidity/temperature outside before moving across site. 4.1.2 Wear correct clothing and PPE. 4.1.3 Reduce exposure. 4.1.4 Implement work rotations.	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		4.1.5 Stay hydrated during hot weather condition. 4.1.6 Use skin protection like sun block, etc. during hot weather conditions.			
5. Passing to a Noisy area.	5.1 Passing to a Noisy area	5.1.1 Check if the contractor has conducted noise survey. 5.1.2 Follow mandatory use of PPE. 5.1.3 Reduce exposure time.	S	M	L
6. Passing by excavation.	6.1 Excavations/ground openings	6.1.1 Follow mandatory signs on site. 6.1.2 Ensure edge protections are in place. 6.1.3 Use designated walkways.	S	Cr	M
7. Passing by lifting operations.	7.1 Lifting Operations	7.1.1 Stay out of cordon of lifting area. 7.1.2 Be aware of slewing crane/swing radius. 7.1.3 Where possible inform rigger/banksman of your presence. 7.1.4 Follow any instruction by lifting supervisor. 7.1.5 Never pass under a slung load.	S	Cr	M
8. Passing Concrete pumping activity.	8.1 Concrete Pumping	8.1.1 Be aware of pump movement 8.1.2 Follow any instruction by supervisor 8.1.3 Follow mandatory on sites 8.1.4 Maintain safe distance from tremie pipe 8.1.5 Wear basic PPE's. Hardhat, safety glasses, and safety shoes	S	Cr	M
9. Passing by live utilities.	9.1 Live utilities	9.1.1 Ask contractor if there is any live utilities and what are the control measures provided. 9.1.2 Maintain safe distance from live utilities 9.1.3 Follow mandatory signs and instructions by the supervisor in charge	S	Cr	M
10. Walking on sites.	10.1 Ground conditions: obstructions (tools, materials, cables, etc.)	10.1.1 Keep hands free (not in pocket) while walking on site 10.1.2 Be aware/look ahead 10.1.3 Ensure suitable lighting is provided on site 10.1.4 Keep shoe laces tied	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
10. Walking on sites. (Cont.)		10.1.5 Don't step over obstructions walk around			
	10.2 Slippery ground conditions.	10.2.1 Ensure that walking surface does not have oil, grease or water.	S	M	L
		10.2.2 Avoid slippery ground surfaces where possible			
	10.2 Slippery ground conditions. (Cont.)	10.2.3 Use alternate route	S	M	L
		10.2.4 Use suitable footwear			
	10.3 Uneven/unlevel ground.	10.3.1 Keep hands free (not in pocket) while walking onsite	S	M	L
		10.3.2 Be aware/look ahead.			
		10.3.3 Ensure suitable lighting is provided on site			
		10.3.4 Avoid unlevel/uneven ground and use alternate route			
	10.4 Falls on same level.	10.4.1 Use designated route/walkway	S	M	L
		10.4..2 Look ahead/be aware			
		10.4.3 Keep hands free (not in pocket) while walking on site			
		10.4.4 Follow mandatory signs on site			
		10.4.5 Avoid grease mud water on walking surfaces where possible.			
		10.4.6 Avoid stepping over obstacles such as tools, materials and cables.			
12 Working near National Guard Trainees	11 Personnel should take caution and coordinate when working near or driving past NGT trainees.				
13 Walking on elevated areas.	11.1 Falls from height.	11.1.1 Ensure that edge protection is in place	S	Cr	M
		11.1.2 Follow mandatory warning signs on site			
		11.1.3 Do not approach unprotected edge			
		11.1.4 Use designated routes and walkways			
		11.1.5 Do not stop on/over covered voids where possible			
		11.1.6 Where required use safety harness, ensuring suitable anchor point			

Equipment to be Used	Training Requirements/Competent or Qualified Personnel	Inspection Requirements

Job Steps	Hazards	Controls	P	S	RAC
1. Appropriate PPE for selection operation, at minimum: a. Long Sleeve Shirt b. Long Legged Pants c. Sturdy Work Boots d. Safety Glasses, when required e. Hard Hat, when required f. Safety Vest, when required 2. Designated Site vehicles will be equipped with the minimum: a. Map and Directions to site medical facility b. Project Emergency Contact Telephone Listing c. Serviceable First Aid Kit d. Serviceable ABC rated 2.5lb or larger fire extinguisher 3. Other vehicles designated as personnel conveyance will be equipped with: a. Map and Directions to site medical facility b. Project Emergency Contact telephone listing 4. Communications a. Project supplied or personal Cellular Phone	**Competent Person:** SSHO **Training:** Employees will sign the activity hazard analysis training record (Exhibit 2 of the APP), and attach it to the AHA for record of review. Visitors will report to the SSHO who will give a short health and safety orientation and require sign off on the health and safety plan. The SSHO will determine if the visitor can access the site based on verification of 40 training or if the visitor(s) will need to be escorted by a 40-hour trained individual onsite. All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). Additional training (such as first aid/CPR, bloodborne pathogens, respiratory protection, confined space entry, etc.) will be provided as applicable. Personnel will be trained in the safe use of required equipment and in the required PPE. Personnel will be trained in the site-specific decontamination procedures prior to commencement of Exclusion Zone work. Specific decontamination procedures will be outlined in the SSHP. All assigned employees are required to familiarize themselves with the contents of this AHA before starting a work activity.	SSHO will perform audits / inspections to ascertain that AHA requirements are met (i.e., that AHA is signed by all employees participating in site visit).			

Activity Hazard Analysis (AHA) 2

<table>
<tr><td colspan="2">Activity/Work Task: VEHICLE AND HEAVY EQUIPMENT OPERATIONS</td><td colspan="5">Overall Risk Assessment Code (RAC) (Use highest code)</td><td>M</td></tr>
<tr><td colspan="2">Project Location: Camp Ravenna, Ohio</td><td colspan="6">Risk Assessment Code (RAC) Matrix</td></tr>
<tr><td colspan="2">Contract Number: W912QR-12-D-0002-0003</td><td rowspan="2">Severity</td><td colspan="5">Probability</td></tr>
<tr><td colspan="2">Date Prepared: November 2016</td><td>Frequent</td><td>Likely</td><td>Occasional</td><td>Seldom</td><td>Unlikely</td></tr>
<tr><td colspan="2" rowspan="2">Prepared by (Name/Title): Parsons SH&E Team</td><td>Catastrophic</td><td>E</td><td>E</td><td>H</td><td>H</td><td>M</td></tr>
<tr><td>Critical</td><td>E</td><td>H</td><td>H</td><td>M</td><td>L</td></tr>
<tr><td colspan="2" rowspan="4">Reviewed by: Edward Grunwald, CIH</td><td>Marginal</td><td>H</td><td>M</td><td>M</td><td>L</td><td>L</td></tr>
<tr><td>Negligible</td><td>M</td><td>L</td><td>L</td><td>L</td><td>L</td></tr>
<tr><td colspan="6">Step 1: Review each “Hazard” with identified safety “Controls” and determine RAC (See above)</td></tr>
<tr><td colspan="4">“Probability” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.</td><td colspan="2">RAC Chart</td></tr>
<tr><td colspan="2" rowspan="2">Notes: (Field Notes, Review Comments, etc.)
Hard hat, steel-toe boots, safety glasses, gloves, high visibility apparel. Ear plugs/muffs, if necessary.</td><td colspan="4">“Severity” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible</td><td colspan="2">E = Extremely High Risk
H = High Risk</td></tr>
<tr><td colspan="4">Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.</td><td colspan="2">M = Moderate Risk
L = Low Risk</td></tr>
</table>

Job Steps	Hazards	Controls	P	S	RAC
1. General	1.1 Slip, trip, and fall	1.1.1 Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	S	M	L
	1.2 Biological hazards	1.2.1 Conduct a reconnaissance of the area to be used to ensure there are no biological hazards or endangered flora/fauna species present. The individual conducting the recon must take precautions and be certain that they are wearing a long sleeved shirt and have used the appropriate insect repellent if desired. Any biological hazards encountered will be noted in the log and if possible the site located to a more suitable area. 1.2.2 Hazardous Plants - PPE for avoidance of hazardous plants (specifically Poison Ivy/Oak and Sumac) will consist of long sleeved shirts and long pants, or coveralls; safety glasses; leather gloves;	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		and head cover such as hard hat, baseball cap or head scarf. Daily protective controls will consist of: o Field personnel applying a protective barrier cream (such as Ivy X©) to potentially exposed skin at the beginning of each day; o Use of a protective cover on automobile seats, to be replaced each day; o Field personnel washing with poison ivy/oak oil cleanser (such as Tecnu©) (following directions on bottle) at breaks and the end of each field day, or as soon as a rash appears (do not apply to broken skin); o Field personnel changing into clean clothing or removing coveralls and removing automotive seat covers before leaving the site each day; and o Any other protective measures deemed appropriate. 1.2.3 Ticks - PPE for avoidance of tick bites will consist of long sleeved shirts and long pants, or coveralls; leather gloves; and head cover such as a hard hat, baseball cap or head scarf. Daily protective controls will consist of: o Wearing light colored clothing to easily identify presence of ticks; o Application of a Permethrin©/Permanone© spray to clothing the day before field work. (Note: this is to be sprayed on **clothing only** and allowed to dry (Never apply directly on skin.) and application of insect repellant containing DEET© on exposed skin; o Use of Duct tape to blouse pants and create a protective seal; o Field tick-checks to be performed at breaks throughout the day using the Buddy System; and o Daily inspection of entire body to locate attached ticks after removal of clothing. If a tick is imbedded in the skin, tick removal will be performed with narrow			

Job Steps	Hazards	Controls	P	S	RAC
		headed tweezers available in each field kit. The tick will be grabbed where the mouthparts enter the skin and the tick gently pulled out and then crushed. The bite area and the hands will be cleansed with an antiseptic wipe found in the field kit or soap and water. 1.2.4 <u>Stinging/Biting Insects and Poisonous Snakes</u> - PPE for avoidance of stinging/biting insects (I.e. Spiders, Bees) and poisonous snakes will consist of long sleeved shirts and long pants, or coveralls; leather gloves; and head cover such as a hard hat, baseball cap or head scarf. SSHO will brief field crews on all potential stinging and biting insects and poisonous snakes that inhabit the work area. Descriptive Information Packets will be posted in the Field Office and given to Field Team Leaders. Daily protective controls will consist of: o Field personnel need to be aware of their surroundings; o Use of PPE (gloves) when moving or disturbing piles of old wood/logs and large rocks; o Nest of bees, wasps or hornets need to be identified and avoided; and o Consider all snakes to be poisonous and avoided			
	1.3 Endangered/threatened flora/fauna	1.3.1 Conduct reconnaissance IAW approved WP and avoid endangered and threatened species if at all possible.	U	M	L
	1.4 Cold/heat stress	1.4.1 All site activities must be conducted IAW the approved WP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	U	M	L

Job Steps	Hazards	Controls	P	S	RAC
	1.5 Contact with hazardous chemicals	1.5.1 Personnel will don the proper PPE commensurate with the chemical hazard encountered and the work is being accomplished.	U	Cr	L
	1.6 Vehicle and heavy equipment traffic in area	1.6.1 Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc. Use of "ground guides" will be used, when vehicle(s) are not equipped with an audible warning device and/or has an obstructed view. When transporting equipment by trailers, the trailer will be "chocked" with approved devices when unhooked from the transporting vehicle. When attempting to hook onto the trailer, "ground guides" will not place any part of their body between the trailer and vehicle.	U	Cr	L
	1.7 Noise in excess of OSHA standards	1.7.1 If the heavy equipment and/or power tools used are louder than 85dB then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	S	M	L
	1.8 Lifting hazards	1.8.1 Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		item that blocks your visibility or is cumbersome to carry alone.			
	1.9 Hand and power tool operation	1.9.1 When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1, Chapter 13.	U	Cr	L
2. General Operations of Motorized Vehicles	2.1 The hazards itemized in job step 1 are applicable to job step 2.	2.1.1 The controls itemized in job step 1 are also applicable to job step 2.			
	2.2 Pinch and cut hazard from operating near sharp edges	2.2.1 Operators will use good and serviceable leather gloves when performing service checks. Potential pinch and cut hazards when performing vehicle inspections inside the engine compartment; around doors; latches and lift gates.	S	M	L
	2.3 Failure of Integral Safety Equipment	2.3.1 During the inspection of the vehicle, if the operator notices that any of the vehicle's integral safety equipment (lights, brakes and turn-signals) is inoperable; that vehicle is no longer operational and cannot be used until repaired. Any issued safety equipment (first aid kit, fire extinguisher, etc) will be present and operational before the vehicle is operated. All vehicles, regardless of type, that are removed from the site for repairs will be re-inspected and accepted by a Competent person or assigned operator, IAW EM385-1-1.	U	Ca	M

Job Steps	Hazards	Controls	P	S	RAC
	2.4 Inclement Weather (Winds; Snow; Ice and Dust)	2.4.1 Vehicle operators need to be aware of special controls to safely operate vehicles in adverse weather conditions. This may include reducing speed to maintain control; braking distances and improve visibility.	U	Cr	L
	2.5 Operator Distractions (Cell Phones; Eating; Smoking; Road Rage; Traffic Flow and Exhaustion)	2.5.1 Vehicle Operators will follow and adhered to all local, state or foreign rules of Safe Vehicle Operations. Obeying posted speed limits; traffic signals and signs; weight and height restrictions for any over-weight or over-height vehicles, and common courtesy on the road. Defensive Driving habits are needed to be adhered to avoid the perils of Road Rage. Trip planning will assist the operator in avoiding construction and traffic hazards. Eating, smoking and use of cellular phones by the vehicle operator, while driving or during refueling operations is prohibited. Vehicle operators' conducting long distance hauls of over 8 hours in length; will take a mandatory Rest Halt at least once every four hours for 25 minutes. A Rest Halt can be taken by any vehicle operator should the need arise. During a Rest Halt, the vehicle operator will re-inspect the vehicle to ensure that all integral safety equipment is still operational. If any safety equipment fails, the operator will notify their supervisor; give their location and remain at that location, until repairs can be completed.	U	Ca	M
	2.6 Injury or Damage while backing	2.6.1 Use of "ground guides" will be used, when vehicle(s) are not equipped with an audible warning device and/or there is an obstructed view, or the vehicle is in a congested area. When transporting Heavy Equipment by trailers, the trailer will be "chocked" with approved devices when unhooked from the transporting vehicle.	U	Ca	M

Job Steps	Hazards	Controls	P	S	RAC
		When attempting to hook onto the trailer, “ground guides” will not place any part of their body between the trailer and vehicle.			
3. Fueling	3.1 The hazards itemized in job step 1 are applicable to job step 3.	3.1.1 The controls itemized in job step 1 are also applicable to job step 3.			
	3.2 Fire/explosion	3.2.1 Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time.	U	Cr	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Long sleeve shirt o Long legged pants o Sturdy work boots o Leather gloves o Safety glasses, when required o Hard hat, when required o High visibility safety vest, when required o Steel-toed boots, as directed o Additional PPE to conduct other operations, as directed	Training: o Project orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 briefings (APP Exhibit 11) o SSHP and AHA o OSHA 40 hour and applicable 8 hour o Equipment operation o Heat/cold stress o Biological hazards o Flora/Fauna endangered/threatened o Site visitor training	o Equipment will be inspected daily by operator prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. SSHO will perform audits and spot checks to verify compliance.

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
2. Heavy Equipment needed: (*e.g. backhoe/mini excavator*) o Standard ¾ ton trucks with hitches o Backhoe/Mini Excavator	Training: o Project safety orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Section 6.2); o Take 5 briefings (APP Exhibit 11) o Backhoe/excavator operator must be certified Competent/Qualified Person(s) (Backhoe/Excavator operator) ____________________ (name(s)) ____________________ (certification (s))	o Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of 385-1-1(refer to 385-1-1-18.G.02).Documentation of the annual crane inspection shall be available onsite. o All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions o Vehicles will be maintained IAW the manufacture's recommendations o All vehicles shall be checked daily (refer to 385-1-1 18.A.03) and inspected weekly by a competent person. 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 o The Competent/Qualified Person is required to sign the inspection checklist, which will be stored in the project files
3. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Serviceable A:BC rated 2.5lb or larger fire extinguisher for each vehicle o Communications (2-way radio and cellular phone)-with field team leader and SM o Map and directions to site medical facility o Project emergency contact telephone listing	Training: o First aid/ CPR training (2 people onsite) o Project safety orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Exhibit 11)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected weekly and maintained as specified in NFPA 10

Activity Hazard Analysis (AHA) 3

Activity/Work Task: **Fueling Operations**	Overall Risk Assessment Code (RAC) (Use highest code)					**L**
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**					
Contract Number: W912QR-12-D-0002-0003	**Severity**	**Probability**				
Date Prepared: November 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Parsons SH&E Team	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: Edward Grunwald, CIH	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**
	Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				**RAC Chart**	
Notes: (Field Notes, Review Comments, etc.) **Hard hat, steel-toe boots, safety glasses, gloves, high visibility apparel. Ear plugs/muffs, if necessary.**	**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				**E = Extremely High Risk** **H = High Risk**	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.				**M = Moderate Risk** **L = Low Risk**	

Job Steps	Hazards	Controls	P	S	RAC
1. General	1.1 Slip, trip, and fall	1.1.1 Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	S	M	L
	1.2 Biological hazards	1.2.1 Conduct a reconnaissance of the area to be used to ensure there are no biological hazards or endangered flora/fauna species present. The individual conducting the recon must take precautions and be certain that they are wearing a long sleeved shirt and have used the appropriate insect repellent if desired. Any biological hazards encountered will be noted in the log and if possible the site located to a more suitable area. 1.2.2 Hazardous Plants - PPE for avoidance of hazardous plants (specifically Poison Ivy/Oak and Sumac) will consist of long sleeved shirts and long pants, or coveralls; safety glasses; leather gloves;	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		and head cover such as hard hat, baseball cap or head scarf. Daily protective controls will consist of: o Field personnel applying a protective barrier cream (such as Ivy X©) to potentially exposed skin at the beginning of each day; o Use of a protective cover on automobile seats, to be replaced each day; o Field personnel washing with poison ivy/oak oil cleanser (such as Tecnu©) (following directions on bottle) at breaks and the end of each field day, or as soon as a rash appears (do not apply to broken skin); o Field personnel changing into clean clothing or removing coveralls and removing automotive seat covers before leaving the site each day; and o Any other protective measures deemed appropriate. 1.2.3 <u>Ticks</u> - PPE for avoidance of tick bites will consist of long sleeved shirts and long pants, or coveralls; leather gloves; and head cover such as a hard hat, baseball cap or head scarf. Daily protective controls will consist of: o Wearing light colored clothing to easily identify presence of ticks; o Application of a Permethrin©/Permanone© spray to clothing the day before field work. (Note: this is to be sprayed on **clothing only** and allowed to dry (Never apply directly on skin.) and application of insect repellant containing DEET© on exposed skin; o Use of Duct tape to blouse pants and create a protective seal; o Field tick-checks to be performed at breaks throughout the day using the Buddy System; and o Daily inspection of entire body to locate attached ticks after removal of clothing. If a tick is imbedded in the skin, tick removal will be performed with narrow			

Job Steps	Hazards	Controls	P	S	RAC
		headed tweezers available in each field kit. The tick will be grabbed where the mouthparts enter the skin and the tick gently pulled out and then crushed. The bite area and the hands will be cleansed with an antiseptic wipe found in the field kit or soap and water. 1.2.4 <u>Stinging/Biting Insects and Poisonous Snakes</u> - PPE for avoidance of stinging/biting insects (I.e. Spiders, Bees) and poisonous snakes will consist of long sleeved shirts and long pants, or coveralls; leather gloves; and head cover such as a hard hat, baseball cap or head scarf. SSHO will brief field crews on all potential stinging and biting insects and poisonous snakes that inhabit the work area. Descriptive Information Packets will be posted in the Field Office and given to Field Team Leaders. Daily protective controls will consist of: o Field personnel need to be aware of their surroundings; o Use of PPE (gloves) when moving or disturbing piles of old wood/logs and large rocks; o Nest of bees, wasps or hornets need to be identified and avoided; and o Consider all snakes to be poisonous and avoided			
	1.3 Endangered/threatened flora/fauna	1.3.1 Conduct reconnaissance IAW approved WP and avoid endangered and threatened species if at all possible.	U	M	L
	1.4 Cold/heat stress	1.4.1 All site activities must be conducted IAW the approved WP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	U	M	L

Job Steps	Hazards	Controls	P	S	RAC
	1.5 Contact with hazardous chemicals	1.5.1 Personnel will don the proper PPE commensurate with the chemical hazard encountered and the work being accomplished.	U	Cr	L
	1.6 Vehicle and heavy equipment traffic in area	1.6.1 Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses and a high visibility safety vest when working around heavy equipment. Establish arm and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc. Use of "ground guides" will be used, when vehicle(s) are not equipped with an audible warning device and/or has an obstructed view. When transporting equipment by trailers, the trailer will be "chocked" with approved devices when unhooked from the transporting vehicle. When attempting to hook onto the trailer, "ground guides" will not place any part of their body between the trailer and vehicle.	U	Cr	L
	1.7 Noise in excess of OSHA standards	1.7.1 If the heavy equipment and/or power tools used are louder than 85dB then the appropriate hearing attenuation PPE must be worn. This could be ear plugs, ear muffs or both depending on the noise level. The site safety officer will measure the noise level of the equipment and prescribe the applicable noise attenuation PPE to be worn.	S	M	L
	1.8 Lifting hazards	1.8.1 Ensure that you, and if there is another individual assisting you, both have solid footing, leather work gloves and use the proper lifting technique, bend at the knees keeping your back as straight as possible and lift with your knees, not your back. Ensure you have good visibility in the direction you are carrying an item. Do not attempt to carry anything by yourself in excess of 50 lbs. or any	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		item that blocks your visibility or is cumbersome to carry alone.			
	1.9 Hand and power tool operation	1.9.1 When operating power tools they will be handled, operated and maintained IAW the manufactures instructions, the approved WP and any applicable SOPs. The power tool will be inspected prior to use to ensure that all of the hand and safety guards are in place and that the chain, if present, is properly tightened and that the tool is otherwise in good working order. Depending on the power tool PPE will vary and it too must be serviceable, operable and free of any defect. PPE will be worn IAW the approved WP and inspected by the user prior to donning. Hand and power tool use will be IAW EM 385-1-1, Chapter 13.	U	Cr	L
2. Fueling operations	2.1 The hazards itemized in job step 1 are applicable to job step 2.	2.1.1 The controls itemized in job step 1 are also applicable to job step 2.			
	2.2 Fire/explosion	2.2.1 Refueling of all vehicles, heavy equipment and other fueled equipment will be conducted in accordance with the SSHP, applicable SOPs and EM 385-1-1. Proper fire extinguishers will be on site and serviceable. There will be no “Hot Fueling” authorized at any time. 2.2.2 Smoking or open flames within 50 feet of where flammables are being used or transferred or where equipment is being fueled is prohibited. Each service or fueling area will have at least one 20-B:C rated fire extinguisher within 75 feet of each pump. Clearly identified and easily accessible Emergency Cut-Off switch(es) will be installed and clearly marked at a location remote from dispensing devices to shut off the power to all dispensing devices in an emergency. Equipment using flammable liquid fuel shall be shut down	U	Cr	L

Job Steps	Hazards	Controls	P	S	RAC
		during refueling, servicing, or maintenance. Those vehicles or equipment without an internal grounding system will be bonded between the fueling system and themselves, prior to dispensing fuel.			

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Long sleeve shirt o Long legged pants o Sturdy work boots o Leather gloves o Safety glasses, when required o Hard hat, when required o High visibility safety vest, when required o Steel-toed boots, as directed o Additional PPE to conduct other operations, as directed	Training: o Project orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 briefings (APP Exhibit 11) o SSHP and AHA o OSHA 40 hour and applicable 8 hour o Equipment operation o Heat/cold stress o Biological hazards o Flora/Fauna endangered/threatened o Site visitor training	o Equipment will be inspected daily by operator prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. SSHO will perform audits and spot checks to verify compliance.
2. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Serviceable A:BC rated 2.5lb or larger fire extinguisher for each vehicle o Map and directions to site medical facility o Project emergency contact telephone listing	Training: o First aid/ CPR training (2 people onsite) o Project safety orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Section 6.2)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o o Fire extinguishers should be inspected weekly and maintained as specified in NFPA 10

Activity Hazard Analysis (AHA) 4

Activity/Work Task: **DECONTAMINATION STATION FOR PERSONNEL and EQUIPMENT**	Overall Risk Assessment Code (RAC) (Use highest code)	**L**

Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**					
Contract Number: W912QR-12-D-0002-0003	**Severity**	**Probability**				
Date Prepared: 10/19/2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Parsons SH&E Team	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: Edward Grunwald, CIH	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

Notes: (Field Notes, Review Comments, etc.)	**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E = Extremely High Risk** **H = High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.	**M = Moderate Risk** **L = Low Risk**

Job Steps	Hazards	Controls	P	S	RAC
1. Establish location for desired work area to conduct operations, to include: o Establish Work Area o Erection of PDS tent or shelter	1.1 Slip, trip, and falls	1.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 1.1.2 Make sure work area is well lit 1.1.3 Use boots with non slip soles 1.1.4 SSHO shall enforce good housekeeping practices 1.1.5 Review SSHP Chapter 3.3.1	O	N	L
	1.2 Biological hazards (insect bites, dermatitis from plant toxins, etc.)	1.2.1 Wear long sleeve shirts and pants to prevent exposure to UV light and plant toxins 1.2.2 Apply insecticides (permethrin) to clothing and repellant (DEET) to exposed skin following manufacturer application recommendations. 1.2.3 Conduct periodic body checks for ticks/chiggers 1.2.4 Review SSHP Chapter 3.4	O	N	L

Job Steps	Hazards	Controls	P	S	RAC
	1.3 Struck by vehicle	1.3.1 Be aware of any vehicles or heavy equipment in area and be certain to wear a high visibility safety vest when working around vehicles or heavy equipment 1.3.2 Use ground guide when backing vehicles and heavy equipment. 1.3.3 All heavy mechanized equipment shall be equipped with a back-up alarm	U	Cr	L
	1.4 Heat stress	1.4.1 Wear gloves when handling hot metal objects 1.4.2 Wear clothing pertinent to the weather and mandatory use of PPE 1.4.3 Drink water frequently when temperatures are elevated 1.4.4 Encourage workers to report heat related symptoms ASAP to SSHO 1.4.5 Encourage co-worker observation to detect signs and symptoms of heat strain in others 1.4.6 Review SSHP Chapter 9	S	M	L
	1.5 Injury from hand and power tools	1.5.1 Hand and power tools shall be used and maintained in accordance with the manufacturer's instructions 1.5.2 Hand and power tools shall be inspected and determined to be in safe operating condition before use by operator. Tools that are defective shall be tagged as defective and taken out of service until repaired or replaced. 1.5.3 Wear appropriate PPE when handling hand and power tool (safety glasses, hearing protection [as needed], gloves, etc) 1.5.4 Loose and frayed clothing shall not be worn while working with any power tool.	O	M	L
	1.6 Back injury	1.6.1 Use proper lifting techniques 1.6.2 Perform lift only on stable ground	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		1.6.3 Use lift assist device (hand cart) or perform multi-person lift when object to be lifted is greater than 50lbs. 1.6.4 Use lift assist device or perform multi-person lift when lifting object that is unstable or bulky			
	1.7 Electrical Shock	1.7.1 Due to the nature of PDS operations and the abundant use of water, the electrical services should be "hard-wired" into the PDS by a certified electrician. In the event that this cannot be accomplished, all electrical power lines need to be securely fastened to the upper frames of the structure or tent and used with GFCI connections. 1.7.2 If a generator is used to supply electricity, the generator will be operated by trained personnel. 1.7.3 Always plug electrical appliances directly into the generator using the manufacturer's supplied cords or extension cords that are grounded (3-pronged) 1.7.4 Inspect the cords to make sure they are fully intact and not damaged, cut or abraded.	U	Cr	L
2. PDS Tent is operational and ready for use for: o Processing of Personnel o Processing of Equipment	2.1 The Hazards itemized in Job step 1 are applicable to Job step 2.	2.1.1 The Controls itemized in job step 1 are applicable to Job step 2.			
	2.2 Contact with chemical agent	2.2.1 Decontamination team personnel will don the PPE and protective clothing specified for the task as stated in SSHP 2.2.2 The supervisor will monitor operations to ensure that personnel are proceeding though each step of the decontamination process so that cross contamination does not occur. 2.2.3 Personnel will process, clean and "double bag" all equipment, prior to turning these items over for continued evaluation. At no time, will personnel open and remove an item that was originally processed as "bagged". Should a bag appear to be	U	Cr	L

Job Steps	Hazards	Controls	P	S	RAC
		opened, cut or torn, the Supervisor will notify Site Safety for instructions. 2.2.4 Liquid waste will remain on the hot side 2.2.5 No drinking, eating, or smoking will be allowed in potentially contaminated areas			
3. Emergency operations – injured down range member	3.1 The Hazards itemized in Job Steps 1 and 2 are applicable to Hazard 3.	3.1.1 The Controls itemized in Job Steps 1 and 2 are also applicable to Job Step 3.			

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Long Sleeve Shirt o Long Legged Pants o Steel toed Boots o Nitrile gloves o Safety Glasses o Hard hat (as required) o Safety Vest, (when working near vehicles or heavy equipment)	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o Project orientation/startup training o Daily Tailgate Safety briefings (APP Section 6.2)	o PPE should be inspected prior to use, and replaced if unserviceable.
2. Decontamination Equipment – o Decontamination solution of 5% o bleach o Scrub Brushes o 5-gal Decontamination Buckets o Hand Sprayers o Shuffle Pans o 30-gal Trash bags o Detergent (Soap) o Water o 6-mil Plastic bags and sheeting o material o RCWM repackaging o Plastic bags (various sizes) o ________________________	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o Project orientation/startup training (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 Briefing (APP Exhibit 11)	o The supervisor will inspect the PDS and equipment daily prior to the start of high probability operations. Any equipment that is defective will be replace or repaired before the commencement of activities

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
3.List of Hand and Power Tools needed: (e.g. shovel wrench, drum dolly, etc) o Shovel o Drum Dolly o Wrenches o Generator (if used) o Wooden stakes o Hammer o Power drill o ______________________________	o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 5) o Take 5 briefing	o Hand tools shall be inspected, tested, and determined to be in safe operating condition before use by operator. o Tools having defects that will impair their strength or render them unsafe shall be removed from service.
4. Vehicle o Pick-up truck o ____________________________	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o Vehicles will be maintained IAW the manufacture's recommendations o o All vehicles shall be checked daily (refer to 385-1-1 18.A.03) and inspected weekly by a competent person. 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 o o The Competent/Qualified Person is required to sign the inspection checklist, which will be stored in the project files
5. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Fire Extinguishers – all vehicles and office o Communications (2-way radio or cellular phone) o Stretcher	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o First aid/CPR (two people onsite) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected monthly and maintained as specified in NFPA 10

Activity Hazard Analysis (AHA) 5

<table>
<tr><td>Activity/Work Task: Sample Collection</td><td colspan="5">Overall Risk Assessment Code (RAC) (Use highest code)</td><td>M</td></tr>
<tr><td>Project Location: Camp Ravenna, Ohio</td><td colspan="6">Risk Assessment Code (RAC) Matrix</td></tr>
<tr><td>Contract Number: W912QR-12-D-0002-0003</td><td rowspan="2">Severity</td><td colspan="5">Probability</td></tr>
<tr><td>Date Prepared: November 2016</td><td>Frequent</td><td>Likely</td><td>Occasional</td><td>Seldom</td><td>Unlikely</td></tr>
<tr><td rowspan="2">Prepared by (Name/Title): Parsons SH&E Team</td><td>Catastrophic</td><td>E</td><td>E</td><td>H</td><td>H</td><td>M</td></tr>
<tr><td>Critical</td><td>E</td><td>H</td><td>H</td><td>M</td><td>L</td></tr>
<tr><td rowspan="5">Reviewed by: Edward Grunwald, CIH</td><td>Marginal</td><td>H</td><td>M</td><td>M</td><td>L</td><td>L</td></tr>
<tr><td>Negligible</td><td>M</td><td>L</td><td>L</td><td>L</td><td>L</td></tr>
<tr><td colspan="6">Step 1: Review each “Hazard” with identified safety “Controls” and determine RAC (See above)</td></tr>
<tr><td colspan="4">“Probability” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.</td><td colspan="2">RAC Chart</td></tr>
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L = Low Risk</td></tr>
</table>

Job Steps	Hazards	Controls	P	S	RAC
1. Arrival and Equipment Setup	1.1 Rugged terrain	1.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 1.1.2 Make sure work area is well lit 1.1.3 Look ahead and be sure of footing 1.1.4 Keep hands free (not in pocket) while walking 1.1.5 Review SSHP Section 3.3.1	O	N	L
	1.2 Hot or cold weather	1.2.1 Wear gloves when handling hot or cold metal objects 1.2.2 Wear clothing pertinent to the weather and mandatory use of PPE 1.2.3 Review SSHP Section 9	S	N	L
	1.3 Vehicle and heavy equipment in area	1.3.1 Be alert when working around heavy equipment. 1.3.2 Use ground guide when backing vehicles and heavy equipment. 1.3.3 Wear a high-visibility vest when working around heavy equipment 1.3.4 Look out for moving equipment and vehicles 1.3.5 Do not walk behind moving equipment and vehicles 1.3.6 Make eye contact with operators or spotters	U	Ca	M

Activity/Work Task: Sample Collection		Overall Risk Assessment Code (RAC) Use highest code)			M
Project Location: Fort Leonard Wood					
Job Steps	**Hazards**	**Controls**	**P**	**S**	**RAC**
		1.3.7 Review SSHP			
	1.4 Unserviceable hand tools	1.4.1 Inspect tools prior to use. 1.4.2 Tag as out of service and segregate	O	N	L
	1.5 Excessive noise	1.5.1 Follow mandatory use of PPE (hearing protection) 1.5.2 Review SSHP Section 3.2.4	O	N	L
	1.6 Biological hazards	1.6.1 Wear long sleeve shirts and pants to prevent exposure to UV light and plant toxins 1.6.2 Use insecticides (permethrin) to clothing and repellant (DEET) to exposed skin following manufacturer application recommendations. 1.6.3 Conduct body checks for ticks/chiggers 1.6.4 Review SSHP Section 3.4	O	N	L
	1.7 Back injury	1.7.1 Use proper lifting and carrying techniques	S	M	L
	1.8 Severe weather	1.8.1 Review weather forecast for the work day 1.8.2 Notify SSHO when severe weather is spotted 1.8.3 Review SSHP Section 3.3.2	S	M	L
2. Site Reconnaissance	2.1 Rugged terrain	2.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 2.1.2 Make sure work area is well lit 2.1.3 Look ahead and be sure of footing 2.1.4 Keep hands free (not in pocket) while walking	O	N	L
	2.2 Hot or cold weather	2.2.1 Wear gloves when handling hot or cold metal objects 2.2.2 Wear clothing pertinent to the weather and mandatory use of PPE 2.2.3 Review SSHP Section 9	S	N	L
	2.3 Biological hazards	2.3.1 Wear long sleeve shirts and pants to prevent exposure to UV light and plant toxins 2.3.2 Use insecticides (permethrin) to clothing and repellant (DEET) to exposed skin following manufacturer application recommendations. 2.3.3 Conduct body checks for ticks/chiggers 2.3.4 Review SSHP Section 3.4	O	N	L
3. Collecting samples (soil, sediment, water)	3.1 Rugged terrain	3.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 3.1.2 Make sure work area is well lit 3.1.3 Look ahead and be sure of footing	O	N	L

		3.1.4 Keep hands free (not in pocket) while walking			
	3.2 Hot or cold weather	3.2.1 Wear gloves when handling hot or cold metal objects 3.2.2 Wear clothing pertinent to the weather and mandatory use of PPE 1.2.2 Review SSHP Section 9	S	N	L
	3.3 Biological hazards	3.3.1 Wear long sleeve shirts and pants to prevent exposure to UV light and plant toxins 3.3.2 Use insecticides (permethrin) to clothing and repellant (DEET) to exposed skin following manufacturer application recommendations. 3.3.3 Review SSHP Section 3.4	O	N	L
	3.5 Contact with hazardous chemicals	3.5.1 Personnel will don the appropriate PPE for the sampling activity conducted, including safety glasses during water sample collection and decontamination procedures to avoid splash hazard. 3.5.2 Review hazardous properties of potential site contaminants	O	M	M
	3.6 Back injury	3.6.1 Use proper lifting and carrying techniques	S	M	L
	3.7 Underground utilities	3.7.1 Ensure that the Utility Locator Service has conducted a utility clearance of the sample location 3.7.2 Hand dig first four feet, using a magnetic locator to screen for potential utility lines 3.7.3 Follow mandatory signs and out-of-bound areas (e.g., natural gas right-of-ways)	U	M	L
	3.8 Hand and Portable Power Tools	3.8.1 Tool users inspect tools before use, replacing or repairing damaged tools. Be sure that all safety guards are in place. 3.8.2 Depending on the tool, the appropriate PPE will vary and it, too, must be serviceable, operable, and free from defects. 3.8.3 Operate power tools in accordance with manufacturer's instructions, WP and SOPs. 3.8.4 Hand and power tool use will be in accordance with EM 385-1-1, Chapter 13.	S	M	L
4. Transport, packing and shipping samples	4.1 Rugged terrain	4.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 4.1.2 Make sure work area is well lit 4.1.3 Look ahead and be sure of footing 4.1.4 Keep hands free (not in pocket) while walking	O	N	L

	4.2 Hot or cold weather	4.2.1 Wear gloves when handling hot or cold metal objects 4.2.2 Wear clothing pertinent to the weather and mandatory use of PPE 4.2.3 Review SSHP Section 9	S	N	L
	4.3 Vehicle and heavy equipment in area	4.3.1 Be alert when working around heavy equipment. 4.3.2 Use ground guide when backing vehicles and heavy equipment. 4.3.3 Wear a high-visibility vest when working around heavy equipment 4.3.4 Look out for moving equipment and vehicles 4.3.5 Do not walk behind moving equipment and vehicles 4.3.6 Make eye contact with operators or spotters	U	Ca	M
	4.4 Excessive noise	4.4.1 Follow mandatory use of PPE (hearing protection) 4.4.2 Review SSHP Section 3.2.4	O	N	L
	4.5 Back injury	4.5.1 Use proper lifting and carrying techniques 4.5.2 Heavy coolers (>50 lbs) require 2 person lifts.	S	M	L
5. Policing site, cleanup, and departure	5.1 Rugged terrain	5.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 5.1.2 Make sure work area is well lit 5.1.3 Look ahead and be sure of footing 5.1.4 Keep hands free (not in pocket) while walking	O	N	L
	5.2 Hot or cold weather	5.2.1 Wear gloves when handling hot or cold metal objects 5.2.2 Wear clothing pertinent to the weather and mandatory use of PPE 5.2.3 Review SSHP Section 9	S	N	L
	5.3 Vehicle and heavy equipment in area	5.3.1 Be alert when working around heavy equipment. 5.3.2 Use ground guide when backing vehicles and heavy equipment. 5.3.3 Wear a high-visibility vest when working around heavy equipment 5.3.4 Look out for moving equipment and vehicles 5.3.5 Do not walk behind moving equipment and vehicles 5.3.6 Make eye contact with operators or spotters	U	Ca	M
	5.4 Excessive noise	5.4.1 Follow mandatory use of PPE (hearing protection) 5.4.2 Review SSHP Section 3.2.4	O	N	L
	5.5 Biological hazards	5.5.1 Wear long sleeve shirts and pants to prevent exposure to UV light and plant toxins 5.5.2 Use insecticides (permethrin) to clothing and repellant (DEET) to exposed skin following manufacturer application recommendations. 5.5.3 Conduct body checks for ticks/chiggers 5.5.4 Review SSHP Section 3.4	O	N	L

	5.6 Back injury	5.6.1 Use proper lifting and carrying techniques	S	M	**L**
	5.7 Contact with hazardous chemicals	5.7.1 Personnel will don the appropriate PPE for the cleanup activity conducted, including safety glasses for movement of decontamination waste water to avoid splash hazard. 5.7.2 Review hazardous properties of potential site contaminants	O	N	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Safety boots o Gloves - nitrile o Eye protection o Hearing protection (as needed)	Training: Site Safety Briefing (APP Section 5.2) and Daily Tailgate Safety briefings (APP Section 6.2); Review SSHP Chapter 5	o PPE should be inspected prior to use, and replaced if unserviceable. o
2. List of Hand and Power Tools needed: (e.g. hammer, post hole digger, auger) o Various ratchets/sockets o Trowel o Auger o Shovel o Knives	Training: Site Safety Briefing and Daily Tailgate Safety briefings	o Hand and power tools shall be inspected, tested, and determined to be in safe operating condition before use. Continued daily inspections shall be made to assure safe operating condition and proper maintenance. o Tools having defects that will impair their strength or render them unsafe shall be removed from service.
3. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Fire Extinguishers – all vehicles and office	Training: Site Safety Briefing and Daily Tailgate Safety Briefings	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected monthly and maintained as specified in NFPA 10

Activity Hazard Analysis (AHA) 6

Activity/Work Task: **CONCRETE CORING AND SOIL SAMPLING**	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**	
Contract Number: W912QR-12-D-0002-0003		
Date Prepared: November 2016		
Prepared by (Name/Title): Parsons SH&E Team		
Reviewed by: Edward Grunwald, CIH		
Notes: (Field Notes, Review Comments, etc.)		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

	RAC Chart
"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.	
"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E = Extremely High Risk** **H = High Risk**
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.	**M = Moderate Risk** **L = Low Risk**

Job Steps	Hazards	Controls	P	S	RAC
1. Concrete coring	1.1 Electrical hazard	1.1.1 If building power is used, personnel will ensure that the electrical cord used to supply power for the concrete coring machine is located in a dry area away from the water discharge by the coring machine. Flexible [extension] cord sets shall contain an equipment ground wire and no frayed electrical cords will be permitted on site. Flexible cords passing through work areas shall be protected from damage (including that caused by foot traffic, sharp corners, protections, and pinching). If a portable generator is used to power the concrete coring machine, the generator must be located outside the building. Proper lock-out/tag-out procedures will be used when repairing or installing electrical equipment. Proper lock-out/tag-out procedures will	U	Cr	L

Job Steps	Hazards	Controls	P	S	RAC
		be used when repairing or installing electrical equipment.			
	1.2 Slip, trip, fall hazard	1.2.1 Worker shall be aware of potential slippery surfaces and tripping and puncture hazards when working inside buildings.	S	M	L
	1.3 Contact with hazardous chemicals	1.3.1 HTW safety awareness will be conducted during site-specific orientation training and reviewed during morning tailgate briefings. Personnel will utilize a minimum of a level D protective ensemble during coring operations. The borehole and breathing zone will be monitored using a PID.	S	Cr	M
	1.4 Crystalline silica exposure	1.4.1 Airborne dust emissions will be suppressed below the OSHA PEL for crystalline silica through the use of wet coring methodology	U	Cr	L
	1.5 High noise levels	1.5.1 Noise levels during concrete coring operations are anticipated to exceed 85dBA. Personnel in the vicinity of coring operations must wear hearing protection consisting of earmuffs or ear plugs.	S	M	L
	1.6 Coring tool safety	1.5.2 Personnel involved in concrete coring and soil sampling will wear appropriate safety attire such as hard hats, steel toes safety shoes, goggles, work gloves, hearing protection and respiratory protection. General safety practices while coring will be followed such as: o Workers will pay attention of moving parts of the coring tool o Tools and other potential trip hazards will be kept out of the way of operations o Maintain visual contact with all other persons involved o Hand signals used for communication o Vapor monitoring will be routinely conducted around borehole o A portable blower may be used to direct potential harmful vapors away from the boring. Ventilation of	U	Cr	L

Job Steps	Hazards	Controls	P	S	RAC
		the site to help mitigate these vapors should also be maintained.			
	1.7 Heat/cold stress	1.7.1 The SSHO will implement heat stress/cold injury control program IAW the approved APP	S	M	L
2. Soil sampling	2.1 Contact with hazardous chemicals	2.1.1 HTW safety awareness will be conducted during site specific orientation training and reviewed during morning tailgate briefings. A minimum of a level D protective ensemble will be worn during sampling. The sample area and breathing zone will monitored using a PID.	S	Cr	M
	2.2 Slips, trips, and falls	2.2.1 Worker shall be aware of potential slippery surfaces and tripping and puncture hazards when working inside buildings.	S	M	L
	2.3 Injury incurred while handling tools	2.3.1 Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations. Inspections shall be performed prior to use by the tool operator to determine that the tool is operating safely. Tools with defects shall be taken out of service until repaired	S	M	L
	2.4 Heat/cold stress	2.4.1 The SSHO will implement heat stress/cold injury control program IAW the approved APP	S	M	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment, in accordance with the SSHP. May include: o Long Legged Pants o Nitrile gloves o Hard hat (during coring) o Additional PPE, as directed	Training: o Site-specific WP, SOP, and AHA o 40hr HAZWOPER and 8-hr HAZWOPER refresher (as applicable) o Project orientation/startup training (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2) o Heat/cold stress o Biological hazards o Flora/fauna endangered/threatened o Radiation protection o Site visitor training (as applicable) o HAZCOM	o PPE should be inspected prior to use, and replaced if unserviceable. o
2. List of Hand Tools needed: (e.g. trowel, etc) o Hand auger o ______________________________	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o Project orientation/startup training (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o Hand tools shall be inspected, tested, and determined to be in safe operating condition before use by operator. o Tools having defects that will impair their strength or render them unsafe shall be removed from service.

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
3. Mechanized equipment: o Concrete coring machine o ______________________ o ______________________	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2); o 30-hour construction outreach safety training (SSHO) o Supervisor training (SSHO)	o Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of 385-1-1(refer to 385-1-1- 18.G.02) o All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions o The mechanized equipment competent/Qualified Person is required to sign the inspection checklist, which will be stored in the project files
4. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles, PDS and office o Fire Extinguishers – all vehicles, PDS and office o Communications (2-way radio and/or cellular phone)-with field team leader and SSHO	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o First aid/CPR (two people onsite) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected monthly and maintained as specified in NFPA 10 o Communication systems will be checked daily prior to the commencement of operations

Activity Hazard Analysis (AHA) 7

Activity/Work Task: **INVESTIGATION-DERIVED WASTE SAMPLING AND DISPOSAL**	Overall Risk Assessment Code (RAC) (Use highest code)	L
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**	
Contract Number: W912QR-12-D-0002-0003		
Date Prepared: November 2016		
Prepared by (Name/Title): Parsons SH&E Team		
Reviewed by: Edward Grunwald, CIH		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

	RAC Chart
"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.	
"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E = Extremely High Risk** **H = High Risk**
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.	**M = Moderate Risk** **L = Low Risk**

Job Steps	Hazards	Controls	P	S	RAC
1.Transport of drums to staging area	1.1 Fall Hazard due to uneven/ slippery terrain	1.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 1.1.2 Make sure work area is well lit 1.1.3 Look ahead and be sure of footing. Choose path with gradual incline and stable ground 1.1.4 Keep hands free (not in pockets) while walking 1.1.5 Use boots with non-slip soles 1.1.6 Good housekeeping will be enforced by Site Safety 1.1.7 Review SSHP Chapter 3.3.1	O	N	L
	1.2 Heat stress	1.2.1 Wear gloves when handling hot metal objects 1.2.2 Wear clothing pertinent to the weather and mandatory use of PPE 1.2.3 Drink water frequently when temperatures are elevated 1.2.4 Encourage workers to report heat-related symptoms ASAP to SSHO	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		1.2.5 Encourage co-worker observation to detect signs and symptoms of heat strain in others 1.2.6 Review SSHP Chapter 9			
	1.3 Excessive noise	1.3.1 Monitor noise with sound level meter or smart phone sound level application 1.3.2 If sound levels are above 85dbA utilized hearing protection 1.3.3 Review SSHP	S	M	L
	1.4 Biological hazards (insect bites, dermatitis from plant toxins, etc.)	1.4.1 Wear long sleeve shirts and pants to prevent exposure to UV light and plant toxins 1.4.2 Apply insecticides (permethrin) to clothing and repellant (DEET) to exposed skin following manufacturer application recommendations. 1.4.3 Conduct periodic body checks for ticks/chiggers 1.4.4 Review SSHP Chapter 3.4	O	N	L
	1.5 Pinch and cut from sharp edges	1.5.1 Workers will use good and serviceable leather gloves when handling drum.	S	M	L
	1.6 Injury from hand and power tools	1.6.1 Hand and power tools shall be used and maintained in accordance with the manufacturer's instructions 1.6.2 Hand and power tools shall be inspected and determined to be in safe operating condition before use by the operator. Tools that are defective shall be tagged as defective and taken out of service until repaired or replaced. 1.6.3 Loose or frayed clothing shall not be worn while working with any power tool. 1.6.4 Wear appropriate PPE when handling hand and power tool (safety glasses, hearing protection [as needed], gloves, etc)	O	M	L
	1.7 Drum tips over during transport to staging area	1.7.1 Drums shall be lifted and moved using a drum truck/drum dolly 1.7.2 Drums shall be secured on the drum truck/drum dolly prior to movement	O	N	L

Job Steps	Hazards	Controls	P	S	RAC
		1.7.3 If drums are loaded on a truck for transport to staging area, the drums must be secure for transport (strapped to pallet)			
	1.8 Struck by vehicle or heavy equipment in area	1.8.1 Be alert when working around heavy equipment. 1.8.2 Use ground guide when backing vehicles and heavy equipment. 1.8.3 Wear a high-visibility vest when working around vehicles or heavy equipment 1.8.4 Vehicles and equipment shall be inspected to verify that they are in safe operating condition. Vehicles/equipment not meeting safe operating conditions shall be immediately removed from service 1.8.5 All heavy equipment shall be equipped with a back-up alarm 1.8.6 Trucks/Trailers must be chocked during loading and unloading	U	Cr	L
2. Drum Sampling	2.1 The hazards associated with step 1 are applicable to step 2	2.1.1 The controls associated with step one are applicable to step 2			
	2.2 Pressurized drum	2.2.1 Before opening drum assess the appearance of the drum for bulging or other signs of internal pressurization. Workers can test pressures within a drum without opening by attempting to flex down on the lid of the drum or by listening for differences in tone produced by tapping on the drum. 2.2.2 Pressurized drums will not be opened without the proper equipment	S	M	L
	2.3 Contact with chemical agent or other hazardous chemicals	2.3.1 CA and HTW safety awareness will be conducted during site specific orientation training and reviewed during morning tailgate briefings and take 5 meetings. 2.3.2 PPE and protective clothing selection will comply with SSHP requirements. (PPE and protective clothing requirements utilized during sampling is	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		dependent upon waste characterization. If water being sampled was used to decon workers after ring-off than level C PPE may be warranted)			
3. Loading waste hauling truck	3.1 The hazards associated with steps 1 and 2 are applicable to step 3	3.1.1 The controls associated with steps 1 and 2 are applicable to step 3			
	3.2 Drum punctured/leaking	3.2.1 Verify that drums are tightly sealed prior to loading 3.2.2 Secure drum to drum truck/drum dolly 3.2.3 Have overpack available in event drum is deteriorated	S	M	**L**
	3.3 Drum leaks/tips during transport	3.3.1 Make sure truck bed and walls are smooth to prevent damage to drums 3.3.2 Secure drums to prevent shifting during transport	S	M	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Long Sleeve Shirt o Long Legged Pants o Sturdy steel toed work Boots o Leather Gloves (set up) o Nitrile gloves (sampling) o Safety Glasses o Hard Hat o Safety Vest (when working near vehicles and forklift)	Training: o 40hr HAZWOPER o 8-hr HAZWOPER refresher (as applicable) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o PPE should be inspected prior to use, and replaced if unserviceable.
2. List of Hand and Power Tools needed: (e.g. hammer, post hole digger, auger) o Various ratchets/sockets o Drum bung o Drum truck/drum dolly o ______________________________	Training: o Project orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 briefings (APP Exhibit 11)	o Hand tools shall be inspected, tested, and determined to be in safe operating condition before use. Continued daily inspections shall be made to assure safe operating condition and proper maintenance. o Tools having defects that will impair their strength or render them unsafe shall be removed from service.
3. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Fire Extinguishers – all vehicles and office o Communications (2-way radio and cellular phone)-with field team leaders and SSHO	Training: o First aid/ CPR training (2 people onsite) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected monthly and maintained as specified in NFPA 10 o Communication systems will be checked daily prior to the commencement of operations

Activity Hazard Analysis (AHA) 8

Activity/Work Task: **Power/Hand Tool Operation**	Overall Risk Assessment Code (RAC) (Use highest code)					**L**
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**					
Contract Number: W912QR-12-D-0002-0003	**Severity**	**Probability**				
Date Prepared: November 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Parsons SH&E Team	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: Edward Grunwald, CIH	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**
	Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				**RAC Chart**	
Notes: (Field Notes, Review Comments, etc.) **Hard hat, steel-toe boots, safety glasses, gloves, high visibility apparel. Ear plugs/muffs, if necessary.**	**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				**E = Extremely High Risk** **H = High Risk**	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.				**M = Moderate Risk** **L = Low Risk**	

Job Steps	Hazards	Controls	P	S	RAC
1. Using Power/Hand Tools	1.1 Electric Fires/Shock/Burns	1.1.1 Use proper engineering controls when working with electricity (i.e., grounding, bonding, insulation, guarding, etc.) 1.1.2 Check insulation of wiring. 1.1.3 Install circuit protection devices (e.g. fuses, ground fault interrupters, circuit breakers, thermal sensors, etc.) 1.1.4 Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions.	U	Cr	L
	1.2 Wet Surfaces (slip/fall hazard)	1.2.1 Be aware of work conditions and do not work in wet areas with live electricity. Workers will be aware of potentially slippery surfaces and tripping hazards. 1.2.2 Work slowly during transit. Jumping, running, and horseplay are prohibited.	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		1.2.3 Workers will keep all areas clean and free of debris to deter any unnecessary trips and falls. 1.2.4 Clean up all spills immediately. 1.2.5 Personnel will notify the SSHO of any unsafe conditions.			
	1.3 Injury from Hand Tool Operation	1.3.1 Ensure that all tools used onsite are in proper working order and are in good condition, clean, oil free, and have insulated grips. 1.3.2 Do not leave hand tools lying around where they could become a hazard. 1.3.3 Personnel to inform SSHO if tools require repair or replacement. 1.3.4 Keep tools in non-conductive container and be aware of metal on tool belts. 1.3.5 Take tools out of service and remove from work vicinity if they are not working correctly.	S	M	L
	1.4 Injury from Power Tool Operation	1.4.1 All tools will be in good working order and properly grounded. 1.4.2 No damaged equipment will be issued until repaired or replaced. 1.4.3 When power operated tools are designed to accommodate guards, the guard must be in place on the tool. 1.4.4 Do not overload electrical circuits and use a GFCI. 1.4.5 Take tools out of service and remove from work vicinity if they are not working correctly. 1.4.6 Follow operations and maintenance procedures for each piece of equipment used on site.	U	Cr	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Long sleeve shirt o Long legged pants o Sturdy work boots o Leather gloves o Safety glasses, when required o Hard hat, when required o High visibility safety vest, when required o Steel-toed boots, as directed o Additional PPE to conduct other operations, as directed	Training: o Project orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Section 6.2); o Take 5 briefings (APP Exhibit 11) o SSHP and AHA o OSHA 40 hour and applicable 8 hour o Equipment operation o Heat/cold stress o Biological hazards o Site visitor training	o Equipment will be inspected daily by operator prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. SSHO will perform audits and spot checks to verify compliance.
2. List of Hand and Power Tools needed: (e.g. hammer, post hole digger, auger) o Various ratchets/sockets o Various wrenches/pliers o Knives o Power auger o ____________________________	Training: o Project orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Section 6.2); o Take 5 briefings (APP Exhibit 11) o SSHP and AHA o OSHA 40 hour and applicable 8 hour o Equipment operation o Heat/cold stress o Biological hazards o Site visitor training	o Hand and power tools shall be inspected, tested, and determined to be in safe operating condition before use. Continued daily inspections shall be made to assure safe operating condition and proper maintenance. o Tools having defects that will impair their strength or render them unsafe shall be removed from service.

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
3. Heavy Equipment needed: o Standard ¾ ton trucks with hitches o ___________________________	Training: o Project safety orientation (APP Appendix C-2) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 briefings (APP Exhibit 11)	o Vehicles will be maintained IAW the manufacture's recommendations o o All vehicles shall be checked daily (refer to 385-1-1 18.A.03) and inspected weekly by a competent person. 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 o o The Competent/Qualified Person is required to sign the inspection checklist, which will be stored in the project files
4. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Fire Extinguishers – all vehicles and office o Communications (2-way radio and cellular phone)-with field team leader, SM o Map and directions to site medical facility o Project emergency contact telephone listing	Training: o First aid/ CPR training (2 people onsite) o Project safety orientation (APP Section 5) o Daily Tailgate Safety briefings (APP Section 5)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected monthly and maintained as specified in NFPA 10

Activity Hazard Analysis (AHA) 9

Activity/Work Task: Drilling and Well Installation	**Overall Risk Assessment Code (RAC) (Use highest code)**						M
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**						
Job Number: W912QR-12-D-0002-0003		**Probability**					
Date Prepared: November 2016		Frequent	Likely	Occasional	Seldom	Unlikely	
Prepared by (Name/Title): Parsons SH&E Team	Catastrophic	E	E	H	H	M	
Reviewed by (Name/Title): Edward Grunwald, CIH	Critical	E	H	H	M	L	
	Marginal	H	M	M	L	L	
	Negligible	M	L	L	L	L	
	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above). **The RAC is developed after correctly identifying all the hazards and fully implementing all controls.**						
Notes: (Field Notes, Review Comments, etc.) **PPE Required:** Level D PPE: including steel toed boots, hard hat, leather work gloves, reflective vest, safety glasses, hearing protection, disposable dust mask, knee pads.	**P "Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: **Frequent, Likely, Occasional, Seldom or**				**RAC Chart**		
	S "Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as**: Catastrophic, Critical, Marginal, or Negligible**				E = Extremely High Risk H = High Risk		
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				M = Moderate Risk L = Low Risk		

Job Steps	Hazards	Controls	P	S	RAC
General Chemical Exposure	o Potential Chemicals.	o Inspect all PPE for abnormal wear and tears. o Wear proper PPE – latex inner glove and/or nitrile outer glove. o Safety glasses. o Long sleeve work shirt and long pants.	S	Ma	L
Accessing the work location	On Site Physical and Biological Hazards o Hidden Objects (i.e. abandoned utilities – conduit, pipes, etc)	Park vehicle outside the work-zone. Walk the area and Survey for potential hazards. o Wear steel toe boots and reflective vest.	S	Ma	L

	o Uneven or Wet Terrain (i.e. slopes, leaves, covered objects, holes/burrows, puddles, etc) o Insects, rodents, animals, etc.	o Assess the safest route to the work-zone o Do not drive vehicle into an area where it can become stuck. (Call SSHO if it is determined the work zone cannot be safely accessed)			
Environmental Conditions	o Cold/Hot temperatures, Rain, Wind, Lightning, etc. o Dehydration	o In case of adverse weather do not begin work or operate machinery if lightning and high winds are present. o Wear goggles if dust/debris is airborne. o Have warm clothes available for cold temperatures o Drink water periodically, and consume food/ liquids to replenish electrolytes. o Look for signs and symptoms of hypothermia or frostbite during cold weather o Look for signs and symptoms of heat exhaustion during warm weather o Apply sunscreen if working in direct sunlight o Show co-workers where the restrooms are located	S	Cr	M
Operating drill rig	o Moving vehicles o Falling objects o Pinch points o Slips, trips, and falls o Back injuries	o Always use a spotter when moving drill rig or other vehicles on site. o Clearly delineate drill site with high visibility cones. o Survey parking area for low overhead hazards, gates that open/close, firm ground without obstructions, etc. o Install physical barriers between workers and operating vehicles o Ensure equipment operators are notified of workers presence prior to entering area of equipment operation, o Wear proper PPE (hard hat, leather gloves, steel toed boots, long sleeves, pants, safety glasses).	S	Cr	M

		o Be aware of surroundings when walking around site. o Always ensure you notify equipment operators when entering the site. o Good housekeeping. o Use proper ergonomic techniques when moving drill rods.			
Leaving Site	o Vehicular Accident	o Be aware of surroundings while driving and look in all directions, including blind spots. o Follow all posted traffic signs and laws. o All vehicles used at the site, including personal and rental vehicles, must be inspected and decontaminated prior to leaving site	S	Cr	M

Training Requirements:

All personnel engaged in hazardous substance removal or other activities that expose or potentially expose them to hazardous substances or health hazards shall receive appropriate training as required by 29 CFR 1910.120(e), including, but not limited to, initial 40-hour, 8-hour Supervisor and annual 8-hour refresher training.

Medical qualification, training and fit-testing must be received on an annual basis for individuals that wear a respirator. If an individual wears a respirator more than 30 days per year, or they are exposed at or above the Permissible Exposure Limit (PEL) of a chemical for more than 30 days in a year, then they must participate in a Medical Surveillance Program as required by 29 CFR 1910.120(f).

Activity Hazard Analysis (AHA) 10

Activity/Work Task: **Drum Transport**	Overall Risk Assessment Code (RAC) (Use highest code)					**L**
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**					
Contract Number: W912QR-12-D-0002-0003	**Severity**	**Probability**				
Date Prepared: November 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Parsons SH&E Team	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: Edward Grunwald, CIH	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**
	Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.					**RAC Chart**
Notes: (Field Notes, Review Comments, etc.) **Hard hat, steel-toe boots, safety glasses, gloves, high visibility apparel. Ear plugs/muffs, if necessary.**	**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible					**E = Extremely High Risk** **H = High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.					**M = Moderate Risk** **L = Low Risk**

Job Steps	Hazards	Controls	P	S	RAC
1. General	1.1 Slip, trip, and fall	1.1.1 Worker awareness of potential slippery/uneven surfaces and tripping hazards plus inspection and policing of debris.	S	M	L
	1.2 Cold/Heat Stress	1.2.1 All site activities must be conducted IAW the approved WP ensuring that appropriate clothing and PPE is worn to assist in the prevention of cold and heat stress injuries. Use the buddy system at all times and have sufficient and appropriate fluids available for the conditions.	S	M	L
	1.3 Contact with hazardous chemicals	1.3.1 Personnel will don the proper PPE commensurate with the chemical hazard encountered and the work is being accomplished.	U	M	L
	1.4 Vehicle and heavy equipment traffic in area	1.4.1 Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses and a high visibility safety vest when working around heavy equipment. Establish arm	U	Cr	L

Job Steps	Hazards	Controls	P	S	RAC
		and hand signals or radio communication with the equipment operator and be certain the equipment is grounded and shut off when within the arc of the boom, shovel, etc. Use of "ground guides" will be used, when vehicle(s) are not equipped with an audible warning device and/or has an obstructed view. When transporting equipment by trailers, the trailer will be "chocked" with approved devices when unhooked from the transporting vehicle. When attempting to hook onto the trailer, "ground guides" will not place any part of their body between the trailer and vehicle.			
2. Transfer drums to/from transport vehicle:	2.1 The hazards itemized in job step 1 are applicable to job step 2.	2.1.1 The controls itemized in job step 1 are applicable to job step 2.	U	Cr	L
	2.2 Back injury	2.2.1 Utilize proper lifting techniques	U	M	L
3. Drum Transport	3.1 The hazards itemized in job step 1 are applicable to job step 3.	3.1.1 The controls itemized in job step 1 are applicable to job step 3.	U	Cr	L
	3.2 Noise	3.2.1 Hearing protection will be worn in hazardous noise areas (85dB or greater)	U	M	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Long sleeve shirt o Long legged pants o Sturdy work boots o Leather gloves o Safety glasses, when required o Hard hat, when required o High visibility safety vest, when required o Steel-toed boots, as directed o Additional PPE to conduct other operations, as directed	Training: o Site-specific WP, SOP and AHA o Take 5 briefings (APP Exhibit 11) o SSHP o OSHA 40 hour and applicable 8 hour o Heat/cold stress o Biological hazards o Flora/Fauna endangered/threatened o Enrollment in medical monitoring program o Current occupational physical and physician's certificate in accordance with 29 CFR 1910.120(f)	o Equipment will be inspected daily by operator prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement. SSHO will perform audits and spot checks to verify compliance.
2. List of Hand and Power Tools needed: (e.g. hammer, post hole digger, auger) o Drum truck/Drum dolly	Training: o Site-specific WP, SOP and AHA o Daily Tailgate Safety briefings o Take 5 briefings (APP Exhibit 11) o SSHP and AHA o OSHA 40 hour and applicable 8 hour o Equipment operation o Heat/cold stress o Biological hazards o Site visitor training o Heavy equipment operator, if applicable	o Tools having defects that will impair their strength or render them unsafe shall be removed from service. o Equipment will be inspected weekly.
o 3. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Serviceable A: BC rated 2.5lb or larger fire extinguisher for each vehicle o Map and directions to site medical facility o Project emergency contact telephone listing	Training: o First aid/ CPR training (2 people onsite) o Project safety orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected weekly and maintained as specified in NFPA 10.

Activity Hazard Analysis (AHA) 11

Activity/Work Task: **Project Mobilization/Site Preparation/ Demobilization**	Overall Risk Assessment Code (RAC) (Use highest code)					L
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**					
Contract Number: W912QR-12-D-0002-0003	**Severity**	**Probability**				
Date Prepared: November 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Parsons SH&E Team	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by: Edward Grunwald, CIH	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.	**RAC Chart**
"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	E = Extremely High Risk H = High Risk
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA (after controls are applied). Annotate the overall highest RAC at the top of AHA.	M = Moderate Risk L = Low Risk

Notes: (Field Notes, Review Comments, etc.)

Job Steps	Hazards	Controls	P	S	RAC
1. Receipt, Loading, and Unloading of Equipment	1.1 Fall Hazard due to uneven/ rugged/slippery terrain	1.1.1 Be aware of potential slippery surfaces, tripping hazards, and uneven ground 1.1.2 Make sure work area is well lit 1.1.3 Look ahead and be sure of footing. Choose path with gradual incline and stable ground 1.1.4 Use boots with non-slip soles 1.1.5 Good housekeeping will be enforced by Site Safety 1.1.6 Review SSHP Chapter 3.3.1	O	N	L
	1.2 Heat stress	1.2.1 Wear gloves when handling hot metal objects 1.2.2 Wear clothing pertinent to the weather and required PPE 1.2.3 Drink water frequently when temperatures are elevated 1.2.4 Encourage workers to report heat related symptoms ASAP to SSHO	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		1.2.5 Encourage co-worker observation to detect signs and symptoms of heat strain in others 1.2.6 Review SSHP Chapter 9			
	1.3 Struck by vehicle or heavy equipment in area	1.3.1 Be alert when working around heavy equipment. 1.3.2 Use ground guide when backing vehicles and heavy equipment. 1.3.3 Wear a high-visibility vest when working around vehicles or heavy equipment 1.3.4 Mechanized equipment shall be equipped with a back-up alarm 1.3.5 Trailers must be chocked when loading and unloading, or if unhooked	U	Cr	L
	1.4 Excessive noise	1.4.1 Monitor noise with sound level meter or smart phone sound level application 1.4.2 If sound levels are above 85dbA wear hearing protection 1.4.3 Review SSHP Chapter 3.2.4	S	M	L
	1.5 Biological hazards (insect bites, dermatitis from plant toxins, etc.)	1.5.1 Wear long sleeve shirts and pants to prevent exposure to UV light and plant toxins 1.5.2 Apply insecticides (permethrin) to clothing and repellant (DEET) to exposed skin following manufacturer application recommendations. 1.5.3 Conduct periodic body checks for ticks/chiggers 1.5.4 Review SSHP Chapter 3.4	O	N	L
	1.6 Back injury	1.6.1 Use proper lifting techniques 1.6.2 Perform lift only on stable ground 1.6.3 Use lift assist device (hand cart) or perform multi-person lift when object to be lifted is greater than 50lbs. 1.6.4 Use lift assist device or perform multi-person lift when lifting object that is unstable (example, liquid containers with shifting center of mass) or bulky	S	M	L
	1.7 Severe weather	1.7.1 Review weather forecast for the work day 1.7.2 Site Safety should monitor weather during the day via internet or smart phone application	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
		1.7.3 Personnel should notify Site Safety when severe weather is spotted and Site Safety should notify field teams when storm is approaching. 1.7.4 Review SSHP Chapter 3.3.2			
	1.8 Pinch and cut from sharp edges	1.8.1 Workers will use good and serviceable leather gloves when performing service checks. 1.8.2 Be aware of potential pinch and cut hazards when performing inspections of equipment. 1.8.3 Use knives cautiously, cut away from body, ensure nobody is around you, wear proper PPE (gloves).	S	M	L
	1.9 Injury from hand and power tools	1.9.1 Hand and power tools shall be used and maintained in accordance with the manufacturer's instructions 1.9.2 Hand and power tools shall be inspected and determined to be in safe operating condition before use by operator. Tools that are defective shall be tagged as defective and taken out of service until repaired or replaced. 1.9.3 Loose or frayed clothing shall not be worn while working with any power tool. 1.9.4 Wear appropriate PPE when handling hand and power tool (safety glasses, hearing protection [as needed], gloves, etc)	O	M	L
2. Connection and Disconnection of Utilities; Install Trailers, Storage Containers, Fencing.	2.1 The hazards identified in job step 1 are applicable to job step 2. Additional hazards associated with job step 2 are listed below	2.1.1 The controls stated in job step 1 are applicable to job step 2.			
	2.2 Underground utilities	2.2.1 Ensure that the Utility Locator Service has conducted a utility clearance of the fence location 2.2.2 Hand dig first four feet and screen with a magnetic locator for potential utility lines 2.2.3 Follow mandatory signs and out-of-bounds area (e.g., natural gas right-of-ways.	U	M	L

Job Steps	Hazards	Controls	P	S	RAC
	2.4 Electrical Shock	2.4.1 Ensure that electrical service connections are made by a licensed electrician. 2.4.2 All electrical appliances and equipment must have a third prong for proper grounding and all electrical outlets must have three-pronged receptacles and meet the requirements of EM 385-1-1, Chapter 11. 2.4.3 GFCIs must be used for all outdoor connections. 2.4.4 If there is an electrical problem that cannot be corrected by unplugging and re-plugging an item, resetting a circuit breaker, or replacing a blown fuse, an electrician must be called to correct the problem	U	Cr	L
3. Shutdown, Packing, and Removal of Equipment	3.1 The hazard presented in Job step 1 are applicable to job step 3	3.1.1 The controls established in job step 1 are applicable to job step 3			

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Personal Protective Equipment o Safety boots o Leather Gloves o Eye protection o High visibility vests o Hardhats (when heavy equipment nearby)	Training: o Project orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 briefings (APP Exhibit 11)	o PPE should be inspected prior to use, and replaced if unserviceable.
2. List of Hand and Power Tools needed: (e.g. hammer, post hole digger, auger) o Various ratchets/sockets o Various wrenches/pliers o Knives o Power auger o ______________________________	Training: o Project orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 briefings (APP Exhibit 11)	o Hand and power tools shall be inspected, tested, and determined to be in safe operating condition before use. Continued daily inspections shall be made to assure safe operating condition and proper maintenance. o Tools having defects that will impair their strength or render them unsafe shall be removed from service.
3. Heavy Equipment needed: o Standard ¾ ton trucks with hitches o ______________________________	Training: o Project orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2) o Take 5 briefings (APP Exhibit 11)	o Vehicles will be maintained IAW the manufacture's recommendations o All vehicles shall be checked daily (refer to 385-1-1 18.A.03) and inspected weekly by a competent person. 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 o The Competent/Qualified Person is required to sign the inspection checklist, which will be stored in the project files
4. Emergency equipment (list type of equipment and where equipment will be located) o First aid kits – all vehicles and office o Fire Extinguishers – all vehicles and office o Communications (2-way radio and cellular phone)-with field team leader, SM	Training: o First aid/ CPR training (2 people onsite) o Project orientation (APP Appendix C-1) o Daily Tailgate Safety briefings (APP Section 6.2)	o The contents of first aid kits should be checked prior to use on site and at least every three months to ensure they are complete, in good condition, and have not expired. o Fire extinguishers should be inspected monthly and maintained as specified in NFPA 10

Activity Hazard Analysis (AHA) 12

Activity/Work Task: Use of Ladders	**Overall Risk Assessment Code (RAC) (Use highest code)**	**L**
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**	
Contract Number: W912QR-12-D-0002-0003		
Date Prepared: November 2016		
Prepared by: Parsons SH&E Team		
Reviewed by: Edward Grunwald, CIH		

Severity	Probability				
	Frequent (F)	**Likely (L)**	**Occasional (O)**	**Seldom (S)**	**Unlikely (U)**
Catastrophic (C)	E	E	H	H	M
Critical (Cr)	E	H	H	M	L
Marginal (M)	H	M	M	L	L
Negligible (N)	M	L	L	L	L

Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)
The RAC is developed after correctly identifying all the hazards and fully implementing all controls.

Notes: (Field Notes, Review Comments, etc.)

P "Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent (F), Likely (L), Occasional (O), Seldom (S) or Unlikely (U).

S "Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic (C), Critical (Cr), Marginal (M), or Negligible (N)

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

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

Job Steps	Hazards	Controls	P	S	RAC
1. Inspection of ladder.	1.1 Sharp edges.	1.1.1 Ensure that there are no sharp edges. 1.1.2 Use hand protection (Hand Gloves).	S	M	L
	1.2 Hand fabricated ladder (Job made/ self constructed).	1.2.1 Hand Fabricated or self constructed ladders are not to be used. Unless constructed to set standards and certified by a 3rd party.	S	M	L
	1.3 Oversized ladder. (Distance between each rung).	1.3.1 Ensure that the distance between each rung does not exceed 12 inches/ 1 foot.	U	M	L

Job Steps	Hazards	Controls	P	S	RAC
1. Inspection of ladder. (Cont.)					
	1.4 Bends in ladder.	1.4.1 Ensure that the ladder is not bent or broken. 1.4.2 Ensure that the ladder is colour coded.	S	M	L
	1.5 Wrong positioning of ladder.	1.5.1 Ensure that the ladder is placed on firm, solid & level ground. 1.5.2 Ensure that the ladder is placed at 4:1 ratio. (75°) 1.5.3 Ensure that the ladder is not placed on any object or equipment to gain extra height/ reach. 1.5.4 Ensure ladder is not placed against glass or fragile surfaces. 1.5.5. Ensure that the ladder is not placed in the front of any entry/ exits. If required to be placed at any entry/ exit, ensure that the entry/ exit is properly locked.	S S	M M	L L
	1.6 Ladder placed near energized electrical lines.	1.6.1 Ensure that ladder is not placed on or near energized electrical lines. If required to be placed near electrical lines, ensure that all lines are de-energized (LOTO – Lock Out Tag Out system to be followed).	S	M	L
2. Climbing up & Down the ladder.	2.1 Unstable Ladder.	2.1.1 Ensure that the ladder is placed on firm, solid & level ground. 2.1.2 Ensure that the ladder is secured at both ends (Top & Bottom).	S	M	L
	2.2 Oily / Greasy/ Debary on ladder.	2.2.1 Ensure the ground that the ladder is placed on is not a slippery surface. 2.2.2 Ensure that foot wear of the user is cleaned from any oil, grease & slippery substances.	S	M	L

Job Steps	Hazards	Controls	P	S	RAC
2. Climbing up & Down the ladder. (Cont.).		2.2.3 Ensure that the area around the ladder is free from debris. 2.2.4 Hold onto the rungs, not the sides of the ladder in case you do slip.			
	2.3 Excess weight/ Over load on ladder.	2.3.1 Only one person at a time is allowed to climb the ladder. 2.3.2 Ensure that the ladder is placed at 4:1 ratio. (75°)	**S**	**M**	**L**
	2.4 Carrying of material while climbing the ladder.	2.4.1 Ensure that there is always a three point s of contact. 2.4.2 Material is not to be carried by hand while climbing the ladder. 2.4.3 Ensure that all material to be taken up to the landing platform is raised with the help of a tag line or a tool belt.	**S**	**M**	**L**
	2.5 Sharp edges.	2.5.1 Ensure that there are no sharp edges. 2.5.2 Use hand protection (Hand Gloves).	**S**	**M**	**L**
3. Inspecting from a ladder.	3.1 Over reaching from the ladder.	3.1.1 Ensure that the ladder is secured. 3.1.2. Ensure that there is at least 1 meter of ladder above the rung that the feet are on. (Do not step on the last three rungs at the top of the ladder). 3.1.3 Ensure that you do not over reach from the ladder. 3.1.4 If necessary ladder must be relocated to gain proper reach. 3.1.5 Ensure there is a three point contact always while on a ladder.	**S**	**M**	**L**
4. Stepping off and onto a ladder from a work platform	4.1 Falls from height.	4.1.1 Ensure you grip a rung with both hands when stepping off and onto a ladder.			

Job Steps	Hazards	Controls	P	S	RAC
		4.1.2 Ensure that the ladder projects 1 meter above the step off point onto the work platform. 4.1.3 Climb to the rung above the platform before stepping down onto it; Don't step up onto the platform.			

Equipment to be Used	Training Requirements/Competent or Qualified Personnel	Inspection Requirements
Personal Protective Equipment (PPE)	Site Safety Induction.	PPE should be inspected prior to use. Monthly inspection of ladder

Activity Hazard Analysis (AHA) 13

Activity/Work Task: Excavation, Soil, and Sludge Management	**Overall Risk Assessment Code (RAC) (Use highest code)**						**M**
Project Location: Camp Ravenna, Ohio	**Risk Assessment Code (RAC) Matrix**						
Project Number: W912QR-12-D-0002-0003	**Severity**	**Probability**					
Date Prepared: March 2017		**Frequent**	**Likely**	**Occasional**	**Seldom**	**Unlikely**	
Prepared by (Name/Title): Parsons SH&E Team	**Catastrophic**	E	E	H	H	M	
	Critical	E	H	H	M	L	
Reviewed by (Name/Title): Edward Grunwald, CIH	**Marginal**	H	M	M	L	L	
	Negligible	M	L	L	L	L	
	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above). **The RAC is developed after correctly identifying all the hazards and fully implementing all controls.**						
Notes: (Field Notes, Review Comments, etc.) **PPE Required:** Level D PPE: including steel toed boots, hard hat, leather work gloves, reflective vest, safety glasses, hearing protection.	**P "Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				**RAC Chart**		
	S "Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				**E = Extremely High Risk** **H = High Risk**		
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				**M = Moderate Risk** **L = Low Risk**		

Job Steps	Hazards	Controls	P	S	RAC
Utility clearance	Slip, trip fall	o Utility workers shall be vigilant of potential slippery/uneven surfaces and tripping hazards	U	M	L
Mobilization	Biological Hazard	o Stinging/Biting Insects– PPE to be used for mitigation of stinging/biting insects (I.e. Spiders, Bees) and will consist of long sleeved shirts and long pants, or coveralls. Personnel need to be aware of the locations bee's nests, and wasps or hornets in the area. And avoid those locations where possible.	U	M	L
	Noise	o If the heavy equipment and/or power tools used are louder than 85dBA then the appropriate hearing protection must be worn. This could be ear plugs, ear	U	N	L

Job Steps	Hazards	Controls	P	S	RAC
		muffs or both depending on the noise level. The site safety health officer will evaluate and prescribe the applicable noise attenuation PPE to be worn			
	Equipment failure	o Prior to the excavator/mechanized equipment being placed into service, it shall be inspected and tested in accordance with the manufacturer's recommendations and shall be certified in writing (by rental company or owner) as safe to operate. o Trucks used for soil transport shall be inspected randomly on a weekly basis by a truck inspection contractor at an offsite location to ensure road-worthiness and compliance with applicable regulations.	U	Cr	L
Excavation	Strike utilities	o Prior to the excavator/mechanized equipment being placed into service, it shall be inspected and tested in accordance with the manufacturer's recommendations and shall be certified in writing (by rental company or owner) as safe to operate	U	Ca	M
	Struck by equipment/falling load	o Machinery and mechanized equipment shall be operated only by designated qualified personnel. Documentation of the operator's qualifications shall be maintained at the site o Workers shall wear proper PPE and clothing when operating adjacent to mechanized equipment. This shall as a minimum include: hard hat, safety glasses, long sleeved shirts and long pants, high visibility vest, and steel toed boots. Personnel shall not approach an excavator until they have received confirmation from the operator o Personnel shall stand safely away from loading operations (i.e., outside of swing	U	Ca	M

Job Steps	Hazards	Controls	P	S	RAC
	Struck by equipment/falling load (Cont.)	radius and away from the truck being loaded). o Truck drivers shall remain in their truck until signaled by the operator that soil loading operations have ceased.			
	Material falling into excavation	o Spoils and equipment will be set back at least 2 feet from the edge of the excavation. A warning system will be established when equipment is operated near the edge of an excavation.	U	M	L
	Hazardous atmosphere	o Personnel will not be able to enter excavation greater than 4 feet in depth until the competent person tests the atmosphere. If a hazardous atmosphere exists engineering controls or appropriate PPE will be provided to workers.	U	Cr	L
	Cave-in	o A benching or sloping system will be developed based upon the soil classification determined by the competent person (refer to Trenching Plan). o The competent person will inspect the excavation: - Prior to the start of work (before entry into excavation) - After a rainstorm - When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom or other similar conditions occur. - As needed throughout the work day o If evidence of a situation that could result in possible cave ins, slides, failure of protective systems, hazardous atmospheres, or other hazardous condition is identified, exposed workers shall be removed from the hazard and all work in the excavation stopped until all	U	M	L

Job Steps	Hazards	Controls	P	S	RAC
		necessary safety precautions have been implemented			
	Falls	o To avoid fall injuries during normal entry or exit of the excavation ladders, ramps, or other means of egress will be provided in any excavation greater than 4 feet in depth. A means of egress will be placed as close as possible to but not more than 25 feet from any employee working inside the excavation	**U**	**Cr**	**L**
Sludge Removal	Hazardous atmosphere	o Field personnel will continually monitor the atmosphere in the breathing zone of the pit workers using a 4 gas meter. o Personnel will not enter any areas of the pit that are greater than 4 feet deep.	**U**	**M**	**L**

Training Requirements:

1. First Aid/CPR –site safety officer and one other individual.
2. Excavation competent person - oversee excavation operations and work in excavation. Will performs inspections, verify proper benching/sloping based upon soil classification, conduct atmospheric testing (as needed), perform excavation safety training for field team
3. Operator of mechanized equipment must be qualified. Documentation of qualifications must be present at site.

ATTACHMENT C1-2

REPORTING FORMS

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DAILY HEALTH AND SAFETY SUMMARY

PROJECT NAME: **PROJECT NO:**

NAME:	DATE: M Tu W Th F Sa Su	TIME:	
TASKS PERFORMED:			
OFF-NORMAL EVENTS:			

DAILY SAFETY INSPECTION

PROJECT:____ Page 1 of 2

N	Y	NA	Item
			Daily safety briefing conducted
			Emergency numbers and route to hospital posted
			FWSHP and project-specific Addenda on-site, available to employees, and complete
			Required exposure monitoring conducted and documented
			Monitoring instruments (PID, OVA, CGI) calibrated daily against known standard and documented
			First aid kit available and inspected weekly
			Personnel wearing PPE required by SSHP for fieldwork (at least safety shoes or boots, safety glasses with side shields, and nitrile or similar gloves to handle potentially contaminated material)
			Personnel using buddy system (maintain visual or verbal contact and able to render aid)
			If temperature >70°F: heat stress training conducted, cool fluids available, pulse rates of personnel wearing Tyvek® are being monitored, work/rest cycle in SSHP being followed
			If temperature <40°F: cold stress training conducted, controls in SSHP implemented
			Personnel using appropriate biological hazard controls (See SSHP)
			Drill rig operating manual on-site
			Drill rigs inspected weekly and documented
			Personnel near drill rig or other overhead hazards wearing hardhats
			Each of two drill rig emergency shutdown devices tested daily
			Employees excluded from under lifted loads
			Unnecessary personnel excluded from hazardous areas, specifically near heavy equipment
			Radius of exclusion zone around drill rig at least equal to mast height
			Personnel wearing hearing protection when within 25 ft of drill rigs, generators, or other noisy equipment
			Containers of flammable liquids closed and labeled properly
			Fully charged fire extinguisher available 25 to 50 ft from flammables storage area and inspected monthly
			Personnel exiting potentially contaminated areas washing hands before eating
			Personnel using steam washer wearing faceshield, hearing protection, heavy duty waterproof gloves, Saranax or rainsuit

DAILY SAFETY INSPECTION

PROJECT: ____________________

N	Y	NA	Item
			Portable electrical equipment plugged to a GFCI
			Electrical wiring covered by insulation or enclosure
			Three wire, UL approved, extension cords used
			Housekeeping adequate (walkways clear of loose, sharp or dangerous objects and trip hazards, work areas clear of objects that might fall on employees)
			Walking/working surfaces safe (not slippery, no unguarded holes, no trip hazards)
			Excavations deeper than 5 ft shored or sloped (if personnel will enter) and in compliance with SSHP
			Moving (rotating) machinery guarded to prevent employee contact
			Fall protection provided for work at elevations greater than 4 ft
			All containers of hazardous material labeled to indicate contents and hazards
			MSDSs for hazardous materials on-site
			All vehicles equipped with two-way radios and cellular phones
			15-min eyewash (accessible and full) within 100 ft of areas where corrosive sample preservatives are poured
			Potable and non-potable water labeled
			Chainsaws have anti kick-back protection, personnel wearing cut resistant gloves, protective chaps
			Visitor access controlled
			Site hazards and controls consistent with SSHP
			Site hazard controls appropriate and sufficient

Actions taken to correct or control any “N” responses

Name Signature Date

P A R S O N S

Field Experience Documentation Form

OSHA requires (29 CFR 1910.120(e)) that personnel involved in hazardous waste operations have 40 hours of initial training and a minimum of three days field experience working under the direction of a trained and experienced supervisor. This form serves to document the three days of additional field training/experience.

Employee Name:____

Employee Number (or Social Security No.):__________________________

Project Name(s):____

Project Number(s):____

Dates of Field Training:____

Summary of Activities Performed:_________________________________

Levels of Respiratory Protection Used:______________________________

Comments:

Field Supervisor Signature:______________________________________

Date:____

Return this form to:

Project Manager

P A R S O N S

Safety Program Acceptance Form

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the safety manager.

I have read and agree to abide by the contents of the Site Safety and Health Program and applicable Site Specific Addenda for the following project:

SITE SAFETY AND HEALTH PROGRAM

CAMP RAVENNA
OHIO

____

Signed

____

Date

RETURN TO:

Project Manager

PARSONS

Site Specific Training Record

Project: Camp Ravenna RVAAP Restoration Program

Project No.: W912QR-12-D-0002-0003

Date:_______________________________________

Trainer:_____________________________________

On this date, the following individuals were provided site-specific training in accordance with OSHA regulations contained in 29CFR1910.120(e):

Name (Print)	Employee No.	Employee Signature

Forward this form to:

Project Manager

TAILGATE SAFETY MEETING LOG

PROJECT NAME: **PROJECT NO:**

DATE:	M Tu W Th F Sa Su	TIME:
WEATHER:		
WORKING CONDITIONS:		
PPE:		
ITEMS DISCUSSED:		

THE FOLLOWING INDIVIDUALS ATTENDED THE DAILY TAILGATE SAFETY MEETING (SIGNATURES)

SITE SAFETY AND HEALTH OFFICER

VISITORS SIGN-IN SHEET

DATE	NAME (Print)	SIGNATURE	COMPANY	PHONE NUMBER	TIME IN	TIME OUT

HEALTH AND SAFETY MONITORING LOG

PROJECT NAME: PROJECT NO:

DATE	INSTRUMENT/NO.	RESULTS	TIME	REMARKS	NAME

Referenced from: **PARSONS INFRASTRUCTURE & TECHNOLOGY HEALTH AND SAFETY MANUAL**

ATTACHMENT C1-3
CONFINED SPACE WORK

TABLE OF CONTENTS

C1.3.1.0 Scope 3

C1.3.2.0 Definitions 3

C1.3.3.0 Preparation and Precautions 4
C1.3.3.1 Blinding 4
C1.3.3.2 Lockout and Tagout 4
C1.3.3.3 Mechanical Hazards 4
C1.3.3.4 Purging and Cleaning 4
C1.3.3.5 Fresh Air 4
C1.3.3.6 Hazard Notice 4
C1.3.3.7 Barricades 4
C1.3.3.8 Attendants 5
C1.3.3.9 Safety Harnesses 5
C1.3.3.10 Rescue Equipment 5
C1.3.3.11 Temporary Lighting/Ground Fault Circuit Interrupter (GFCI) 5

C1.3.4.0 Confined Space Training 5
C1.3.4.1 Authorized Entrants 5
C1.3.4.2 Attendants 6
C1.3.4.3 Entry Authorities 7
C1.3.4.4 Onsite Rescue Teams 8
C1.3.4.5 Outside Rescue Teams 8

C1.3.5.0 Unauthorized Entrants 8

C1.3.6.0 Permit Space Rescue Plan 8

C1.3.7.0 Confined Space Entry 9
C1.3.7.1 Ventilation 9
C1.3.7.2 Toxic Materials 9
C1.3.7.3 Flammable Gases, Vapors, or Mists 9
C1.3.7.4 Oxygen Levels 10
C1.3.7.5 Hot Work 11

C1.3.8.0 Toxic or Flammable Materials in Confined Spaces 11
C1.3.8.1 Quantities 12
C1.3.8.2 Containers and Dispensers 12
C1.3.8.3 Ventilation 12
C1.3.8.4 Testing 12
C1.3.8.5 Spray Operations 12

C1.3.8.6 Ignition Sources 12
C1.3.8.7 Respiratory Protection 12

C1.3.9.0 Monitoring 12

C1.3.10.0 Immediately Dangerous to Life and Health Conditions 12

C1.3.11.0 Signs 13

C1.3.12.0 Sign In/Out Sheet 13

TABLES

Table C1.3.7.1 Respiratory Protection Against Toxic Atmospheres 10

Table C1.3.7.2 Explosive Levels of Gases, Vapors, and Mists 10

Table C1.3.7.3 Permissible Oxygen Levels 11

ATTACHMENT

Confined Space Entry Permit

This section establishes the procedures that must be followed before personnel may enter a confined space.

C1.3.1.0 SCOPE

Before any person enters a confined space, a job task analysis (JTA) and an entry permit must be issued in accordance with this procedure. All other applicable permits, such as hot work permits, must also be obtained. Entry permits authorize specific work in specific locations.

All these permits and other authorities must certify that existing and potential hazards have been evaluated, and that all necessary protective measures have been taken to ensure the safety of each worker.

The JTA, entry permit, and all other applicable permits must be approved by the Construction Manager or authorized designate and issued by the relevant craft supervisor.

In addition, before any confined space entry can be permitted, a permit space rescue plan must be written for that space. Refer to subsection 6 for instructions on completing a confined space rescue plan. The confined space rescue plan should be generated as a self-contained document so it can be readily accessible to affected employees and be posted near the confined space it is designed for.

C1.3.2.0 DEFINITIONS

A permit-required confined space is any enclosed space that:

1. Is large enough and configured so that an employee can enter bodily and perform assigned work
2. Provides limited or restricted means for entry or exit (tanks, vessels, silos, storage bins, hoppers, vaults, pits, and diked areas)
3. Is not designed for continuous occupancy
4. Has one or more of the following characteristics:
    a) Contains or has a known potential to contain a hazardous atmosphere,
    b) Contains a material that could engulf an employee,
    c) Is internally configured in a way that could trap or asphyxiate an entrant because of its inwardly converging walls, or because its floor slopes downward and tapers to a smaller cross-section,
    d) Contains any other recognized serious safety or health hazard.

A **hazardous atmosphere** is any atmosphere that exposes employees to the risk of death, injury, or acute illness from one or more causes such as:

1. Flammable gases, vapor, or mist in excess of 10% (1/10) of the lower explosive limit (LEL),

2. A concentration of airborne combustible dust that meets or exceeds the LEL or that obscures vision at a distance of 5 ft or less,
3. An oxygen concentration less than 19.5% or greater than 23.5%,
4. A concentration of any substance above the threshold limit value (TLV),
5. Any other atmospheric condition considered immediately dangerous to life and health (IDLH).

C1.3.3.0 PREPARATION AND PRECAUTIONS

All preparatory work must be completed before an entry permit can be issued. Preparatory work includes but is not limited to the following steps.

C1.3.3.1 Blinding

Blind confined spaces properly to prevent the release of hazardous materials into the space or eliminate the potential for employees becoming engulfed by any liquid or solid material.

C1.3.3.2 Lockout and Tagout

Lockout and tagout any electrical connection, pipe, line, or duct into the confined space in accordance with the lockout/tagout procedure contained in section 10.

C1.3.3.3 Mechanical Hazards

In accordance with the lockout/tagout procedure, secure all mechanical hazards such as agitators, fans, and other power-driven moving parts in vessels and confined spaces. Entry is not permitted until such parts have been rendered motionless.

C1.3.3.4 Purging and Cleaning

Purge, steam, and wash a vessel or confined space as needed to free the area of all possible contaminants. Give special attention to removing liquid product, sludge, and residue; to controlling escaping gases and vapors in the surrounding area; to preventing access to the area by unauthorized personnel; and to controlling all ignition sources in the area.

C1.3.3.5 Fresh Air

Establish a flow of positive fresh air ventilation (eductor or blower) in the vessel or confined space. Natural ventilation is not sufficient.

C1.3.3.6 Hazard Notice

Ensure that all personnel are familiar with all job hazards, that all equipment is in good condition and compatible with the work involved, and that notice is given in the form of signage, during task training, and on permits to indicate specific hazards of the confined space.

C1.3.3.7 Barricades

Provide pedestrian, vehicle, or other necessary barriers to protect workers entering a confined space work area from external hazards.

C1.3.3.8 Attendants

Provide a trained attendant outside each vessel or confined space equipped with a suitable respirator as required. The attendant must be able immediately to perform all planned rescue duties. At no time may an attendant enter a confined space. Attendant duties include:

- Maintaining surveillance of personnel working in the confined space
- Maintaining the conditions and requirements stated on the confined space permit
- Evacuating personnel from a confined space if hazardous conditions are observed
- Maintaining communications with personnel working in a confined space through visual, voice, telephone, or two-way radio
- Obtaining additional assistance if necessary

C1.3.3.9 Safety Harnesses

Safety harnesses with lifelines are required if toxic or flammable atmospheres could exist, if an oxygen deficiency exists or could develop, if there is potential for engulfment, or if the work is to be performed at heights. Review PI&T Health and Safety Manual for specific tie-off requirements.

C1.3.3.10 Rescue Equipment

The person responsible for the work must implement procedures and provide the equipment necessary to rescue personnel working in confined spaces. Such equipment should include tripods, lifelines, hoists, and harnesses.

C1.3.3.11 Temporary Lighting/Ground Fault Circuit Interrupter (GFCI)

Ensure that all temporary lighting in confined spaces is no more than 12 volts, that lights are protected against damage, that cords are heavy duty, and that lights and light cords are kept clear of workspaces and walkways. However, 120-volt lights may be used if protected by a ground fault circuit interrupter. All electrical circuits, lighting, portable tools, and other equipment must be approved for the area classification in which they are used. Ground fault circuit interrupters must be placed outside a confined space.

C1.3.4.0 CONFINED SPACE TRAINING

The following paragraphs cover training requirements for confined space work for authorized entrants, attendants, persons authorizing or supervising confined space work, and rescue team members. All employees expected to engage in any aspect of confined space activities must meet the training requirements of these paragraphs before they may participate in the work.

C1.3.4.1 Authorized Entrants

Personnel qualifying as authorized entrants must be trained in the following areas:

1. **Hazard Recognition.** During training, entrants will:

a. Be informed of all hazards that might be encountered during entry or occupancy of a confined space;

b. Be trained to recognize the symptoms of exposure to chemical hazards and oxygen deficiency. Oxygen deficient atmospheres contain less than 19.5% oxygen;

c. Understand the results of exposure to confined space hazards.

2. **Communication.** Entrants will:

a. Understand need for maintaining contact with the attendant (hole watch) and the methods used for communication with an attendant;

b. Understand the requirement to notify the attendant when the entrants initiate evacuation.

3. Protective Equipment. Entrants will:

a. Be aware of all personal protective equipment requirements and the use of such equipment;

b. Be aware of the barriers needed to protect workers from external hazards.

4. **Self-Rescue.** Entrants will be aware that they must evacuate a confined space when directed by the attendant, when an alarm is sounded, or when an entrant perceives danger.

5. **Rescue Plan.** Entrants will be aware of the provisions of the rescue plan for the task.

C1.3.4.2 Attendants

Personnel qualifying as attendants must be trained in the following areas.

1. **Hole Watch.** Attendants will understand the requirement to remain outside a confined space at all times while authorized entrants are working in the space.

2. **Personnel Count.** Attendants will understand the need to maintain an accurate count of all persons in a confined space at all times.

3. **Hazard Recognition.** Attendants will be able to recognize the hazards associated with working in a confined space.

4. **Monitoring.** Attendants will be able to use and interpret any monitoring equipment and understand that monitoring is performed in accordance with specifications contained in the confined space entry permit.

5. **Communication.** Attendants will understand that they must maintain continuous contact with entrants, and understand the methods of communication.

6. **Evacuation.** Attendants will understand the circumstances requiring entrant evacuation. Those circumstances include:

a. Observing a condition that is not allowed for on a permit
b. Observing behavioral changes in entrants as a result of exposure to hazards

c. Detecting an external condition that could endanger entrants
d. Detecting an uncontrolled hazard in the permit space
e. Attendant leaving his or her station
f. Unauthorized personnel ignoring requests by the attendant to leave the permit area

7. **Emergency Notification.** Attendants will understand that they must notify emergency personnel as soon as they have determined the need to evacuate authorized entrants, either because of hazards in the confined space or because the entrants need assistance in the confined space.

8. **Unauthorized Entrants.** Attendants will understand that they are required to warn unauthorized persons away from a confined space, requesting that such persons leave the area, and advising authorized entrants that unauthorized persons have entered the space.

9. **Rescue Procedures.** Attendants will:

   a. Understand that they are not authorized to enter a permit space to attempt to rescue anyone inside the confined space

   b. Know how to use external rescue and protective equipment, and know their rescue responsibilities

   c. Understand the permit rescue plan outlined in the rescue plan document

C1.3.4.3 Entry Authorities

Individuals in charge of or authorizing entry are responsible for:

1. Determining whether the permit for entry is complete

2. Determining whether all necessary precautions, procedures, and equipment are in effect before authorizing entry into a confined space

3. Terminating any entry authorization for which the permit requirements are being violated

4. Concluding entry and terminating a permit upon work completion, including:

   a. Removing all tools and equipment from the confined space

   b. Verifying that all personnel and equipment have been removed from the confined space

   c. Removing all entry caution signs

   d. Closing and securing all entry points

5. Becoming familiar with the permit space rescue plan outlined in the confined space permit

Persons in charge of or authorizing entry may also serve as authorized entrants or attendants upon completing the appropriate training.

C1.3.4.4 Onsite Rescue Teams

The person responsible for the work must decide whether to use an onsite rescue team or an outside rescue team.

Onsite rescue teams must receive training about the site rescue plan, the hazards of working in a confined space, and the personal protective and rescue equipment required.

At least one team member must have current certification in first-aid procedures and cardio-pulmonary resuscitation (CPR) and training about bloodborne pathogens.

Onsite rescue personnel must receive the same training as authorized entrants.

C1.3.4.5 Outside Rescue Teams

Outside rescue team members must be made aware of the hazards they may encounter during a rescue so that they can equip themselves properly.

C1.3.5.0 UNAUTHORIZED ENTRANTS

Unauthorized entrants are not allowed in permit areas. If they enter a permit area, the confined space attendant or person authorizing entry must take the following actions.

1. **Request and Notify**. Request the unauthorized person or persons to leave, then notify the entrants that unauthorized personnel are in the permit area.
2. **Stop Operations and Evacuate**. If the unauthorized personnel fail to respond, stop operations and order evacuation of the permit area.
3. **Discipline**. Begin disciplinary procedures, including termination, for any unauthorized entrants who fail to leave a permit space upon request from the area authority.

C1.3.6.0 PERMIT SPACE RESCUE PLAN

Before entry into any confined space can be authorized, a task-specific rescue plan must be written specifically for that space. All employees involved in confined space work must be familiar with the rescue plan. All rescue plans must include at least the following:

1. Who is to perform the rescue; an onsite team (list names) or an outside team
2. How the rescue team is notified
3. Rescue equipment available
4. Special hazards of the permit space that could be encountered during a rescue

At no time may any authorized rescue person enter a confined space for rescue purposes unless wearing a self-contained breathing apparatus (SCBA) or an airline respirator with an escape pack, or unless atmospheric measurements have confirmed that the LEL and the levels of O2 and any hazardous gases are in the proper range to permit entry into the confined space without the aid of such equipment. Refer to the attached confined space entry permit.

C1.3.7.0 CONFINED SPACE ENTRY

The following general requirements must be completed before a confined space entry permit can be issued.

- A activity hazard analysis (AHA) is prepared
- All associated hazards are identified and controlled
- All employees engaged in confined space work are thoroughly trained
- A rescue plan is prepared
- All other applicable permits are obtained, including hot work permits or other task-specific work permits
- The confined space prepared

In addition, the Construction Manager or other designated authority issues the entry permit only after the following specific requirements have been met.

C1.3.7.1 Ventilation

The job supervisor or person in charge of entry must determine that proper ventilation is maintained at all times employees are operating in confined spaces.

- **Before Start of Work**. Ensure that proper venting and exhausting systems are in place.
- **Venting/Exhausting.** Ensure that air, not oxygen, is vented or exhausted before and during confined space work to avoid concentrations of toxic or hazardous gases or dusts that could exceed permissible limits or result in an oxygen-deficient atmosphere.
- **Explosive Atmospheres.** Ensure that fresh air is supplied to any space that may contain explosive vapors, rather than having the vapors be exhausted through the fan only.
- **Ventilation Ducting.** Ensure that ventilation ducting is arranged to avoid restricting personnel evacuation from the confined space and to prevent risk of exposure to hazardous conditions to persons working nearby.
- **Respiratory Protection.** Ensure that, where adequate venting or exhausting cannot meet standards, personnel are wearing appropriate respiratory protection.

C1.3.7.2 Toxic Materials

Table C1.3.7.1 provides definitions of the respiratory protections required for entering atmospheres containing various levels of toxic materials. Permissible levels for all these materials are defined in Material Safety Data Sheets supplied by the manufacturers of the materials.

C1.3.7.3 Flammable Gases, Vapors, or Mists

Table C1.3.7.2 provides definitions of requirements in regards to explosive levels of flammable gases, vapors, and mists. If there is potential for an explosive atmosphere, refer to the guidelines in paragraph C1.3.7.1, Ventilation. Also note that continuous monitoring of the atmosphere must be maintained.

Table C1.3.7.1 – Respiratory Protection Against Toxic Atmospheres

Atmosphere	Definition
Below Threshold Limit Value	Atmospheres containing toxic materials below the TLV may be entered without respiratory protection only after oxygen and flammable gases are determined to be at permissible levels.
Below IDLH/Above TLV	Atmospheres containing toxic materials below levels immediately dangerous to life or health (IDLH), but above the TLV, may be entered when respiratory equipment, as defined in the respiratory protection program, is worn and when flammable gases and oxygen are at permissible levels.
At IDLH (generally forbidden)	Atmospheres containing toxic materials IDLH may be entered only by employees protected by equipment approved for such exposure, when flammable gases are at permissible levels, and only after receiving written approval to enter the IDLH atmosphere from the Parsons construction manager and the designated client representative as well as any other project authority required. Emergency rescues may also be required in IDLH atmospheres.
Corrosive/Absorption Hazards	Atmospheres that contain or could contain corrosive materials or materials that are toxic through skin absorption require personal protective equipment to prevent skin and/or eye contact.
Unknown Toxins	Entry is prohibited in confined space atmospheres where the toxicity is unknown.

Table C1.3.7.2 – Explosive Levels of Gases, Vapors, and Mists

Level	Definition
Less than 10% LEL	Atmospheres containing flammable gases, vapors, or mists less than 10% (1/10) of the lower explosive limit (LEL) may be entered without respiratory equipment only after oxygen and toxic materials are determined to be at permissible levels.
At or Above 10% LEL	Atmospheres containing flammable gases, vapors, and mists above 10% (1/10) of the LEL may not be entered until the atmosphere is properly cleaned and purged and flammable gases, oxygen, and toxic materials are determined to be at permissible levels.

C1.3.7.4 Oxygen Levels

Table C1.3.7.3 provides definitions of entry requirements in regard to oxygen levels.

Table C1.3.7.3 – Permissible Oxygen Levels

Oxygen Level	Definition
19.5% to 23.5%	Atmospheres with an oxygen content of 19.5% to 23.5% at sea level may be entered without respiratory equipment if flammable and toxic materials are determined to be at permissible levels.
Deficient	Atmospheres with an oxygen content of less than 19.5% at sea level may be entered only by workers wearing respiratory equipment in accordance with the respiratory protection program, and after the introduction of a constant flow of fresh air. Respiratory equipment must be chosen for its ability to handle any toxins that may be present. Flammable materials must be at permissible levels. Pure oxygen must not be used to raise the level of oxygen in an atmosphere. Instead, air must be vented or exhausted before and during confined space work. Refer to paragraph 9.7.1.
Enriched	Atmospheres with an oxygen content greater than 23.5% at sea level may not be entered until it has been determined that no fire hazard exists, that flammable and toxic materials are at permissible levels, and until fresh air has been introduced to bring the oxygen level to within 19.5% to 23.5%.

C1.3.7.5 Hot Work

When hot work is required in a confined space, it must be in accordance with the hot work entry permit procedures. Hot work also requires a separate permit.

If hot work involves the generation of toxic gases, vapors, or fumes, ventilation or respiratory protection is required. The type of contaminant generated determines the type of respiratory equipment used.

In addition, the following precautions must be taken before any hot work is started.

- **Fire Extinguishers.** Fire extinguishers of the proper type are used.
- **Fuel Gas.** Oxygen, acetylene, or other fuel gas may not be taken into confined spaces.
- **Fuel Gas Shutoff.** The gas supply to a torch must be positively shut off at the cylinder whenever the torch is not in use or is left unattended. At change of shift and overnight, all torches and hoses must be removed from a confined space.
- **Flammable Gas Equipment.** Flammable gas equipment, gauges, and hoses must be inspected and found free of defects by the user before each use.

C1.3.8.0 TOXIC OR FLAMMABLE MATERIALS IN CONFINED SPACES

Frequently, work in confined spaces requires the use of toxic or flammable materials, including coatings, linings, paints, cements, and solvents. The following guidelines apply when using these materials.

C1.3.8.1 Quantities

Any toxic or flammable materials brought into or used in a confined space are limited to the smallest amount consistent with efficient use during each shift. Only approved containers and dispensers may be used. Toxic or flammable materials may not be stored in confined spaces.

C1.3.8.2 Containers and Dispensers

Containers must be designed to minimize evaporation and spillage. Safety cans or small squeeze bottles are preferable when appropriate.

C1.3.8.3 Ventilation

Continuous ventilation must be provided in sufficient quantity and design to control fire and health hazards.

C1.3.8.4 Testing

Atmospheres must be tested or evaluated for the existence of hazards. In no instance may flammable vapor concentrations exceed 10% (1/10) of the LEL. Confined space atmospheres must be evaluated at regular intervals to ensure that no hazardous materials build up.

C1.3.8.5 Spray Operations

Spraying toxic or flammable substances such as paint is not recommended.

C1.3.8.6 Ignition Sources

All ignition sources must be removed from a confined space when flammable liquids are being used.

C1.3.8.7 Respiratory Protection

Respiratory protective equipment must be used as defined in the respiratory protection program or as required by this procedure.

C1.3.9.0 MONITORING

Levels of oxygen, flammable gases, and toxic materials in a confined space must be monitored and logged. The frequency of monitoring must be specified on the confined space entry permit. Monitoring frequency can be continuous or intermittent.

- **Continuous Monitoring.** If there is a risk of an IDLH (immediately dangerous to life and health) atmosphere, monitoring should be conducted on a continuous, real-time basis.
- **Intermittent Monitoring.** Whether intermittent monitoring can be used depends on the degree of risk anticipated. Intermittent monitoring can range from four times each hour (every quarter hour) to once every four hours depending on the nature of the hazards.

C1.3.10.0 IMMEDIATELY DANGEROUS TO LIFE AND HEALTH CONDITIONS

Work in IDLH atmospheres is forbidden except in emergencies or when it is impossible to bring IDLH to acceptable levels. Work in IDLH atmospheres, other than emergency rescue, requires the written approval of the Parsons Construction Manager, the designated client representative, and any other necessary approvals. Atmospheres must be ventilated to lower the toxicity of IDLH atmospheres. The following precautions must be taken in IDLH conditions.

- **Respiratory Protection.** Only self-contained breathing apparatuses (SCBAs) or airline respirators with escape bottles may be used in IDLH atmospheres. All rescue personnel must be trained in the use of a self-contained breathing apparatus or airline respirators with escape bottles.
- **Airline Respirators.** In confined spaces where workers use only airline respirators, a breathing air attendant from or assigned by the department responsible for the work must be in constant attendance to monitor the breathing air stations or low pressure alarms near the workers.
- **Safety Harnesses.** Workers entering confined spaces with IDLH atmospheres must wear approved safety harnesses, wristlets, or vests with lifelines. Each employee/lifeline must be manned by an employee outside the enclosure.
- **Explosive Atmospheres.** No work may be done in environments containing explosive gas atmospheres greater than 10% (1/10) of the LEL indicated by a combustible gas indicator. Appropriate dilution ventilation must be provided.

C1.3.11.0 SIGNS

Signs must be posted near permit spaces notifying employees of the hazards present and that only authorized entrants may enter the permit area.

C1.3.12.0 SIGN IN/OUT SHEET

Authorized entrants must sign in and out when entering or leaving a confined space area.

CONFINED SPACE ENTRY PERMIT

TASK: ____________________ Issue Date: ______________
LOCATION: ____________________ Expiration : ______________

Note: This permit expires after one shift (8-12 Hours). A new permit must be issued for any change of shift. Return copy of completed permit to Office H&S Representative

Signature below indicates this permit has been read and understood.

Entrants

____________________ ☒ ____________________
____________________ ☒ ____________________
____________________ ☒ ____________________

Attendant(s)

____________________ ☒ ____________________
____________________ ☒ ____________________
____________________ ☒ ____________________

Entry Supervisor

(Usually H&S Representative)

____

Outside Contractor(s)

____________________ ☒ ____________________
____________________ ☒ ____________________

EMERGENCY CONTACTS

POLICE ______________	NEAREST HOSPITAL ______________
POISON CONTROL CENTER ______________	ADDRESS ______________
FIRE DEPARTMENT ______________	CROSS STREETS ______________
PLANT RESCUE SERVICE ______________ (IF APPLICABLE)	______________
_ EMERGENCY ROOM	______________
AMBULANCE______________	PHYSICIAN ______________

Prepared by: ____________________ ____________
Entry Supervisor Date

Approved by: ____________________ ____________
Health & Safety Representative Date

PERMIT MUST BE POSTED AT WORK SITE

CONFINED SPACE ENTRY PERMIT (Continued)

Safety Check List

(All boxes must be complete before entry is allowed)

Protective equipment	YES	NO
Full-body harness	☐	☐
Lanyard, life-line	☐	☐
Tripod and winch	☐	☐
Davit arm and winch	☐	☐
Ladder	☐	☐
Other (specify) ____________________		

Respirators	YES	NO
SCBA, 5-minute escape	☐	☐
SCBA, 30-minute	☐	☐
Air line	☐	☐
Air purifying, full-face	☐	☐
Other (specify) ____________________		

Protective Clothing	YES	NO
Face shield	☐	☐
Cotton coveralls	☐	☐
Rain suit	☐	☐
Reflective vest	☐	☐
Gloves		
Leather	☐	☐
Rubber, butyl	☐	☐
Boots		
Leather, safety	☐	☐
PVC knee	☐	☐

Head wear	YES	NO
Hard hat	☐	☐
Welding Helmet	☐	☐
Eye wear		
Safety glasses	☐	☐
Safety goggles	☐	☐
Welding goggles	☐	☐
Ear wear		
Earplugs	☐	☐
Muffs	☐	☐

Other (specify) ________________________________

Communication	YES	NO
Radio, 2-way	☐	☐
Other (specify) ____________________		

Lighting (UL and MSHA approved)	YES	NO
Flashlight	☐	☐
Lantern	☐	☐
Other (specify) ____________________		

First Aid	YES	NO
First Aid Kit	☐	☐
Fire Extinguisher	☐	☐
Eye Wash	☐	☐
Other (specify) ____________________		

Warning Equipment/Indicators	YES	NO
Barriers	☐	☐
Caution tape	☐	☐
Warning signs	☐	☐
Other (specify) ____________________		

CONFINED SPACE ENTRY PERMIT (Continued)

Isolation Checks	Yes	No	N/A	Date	Time
Lines blanked or disconnected	☐	☐	☐	__________	________
Lockout/tagout of electrical or mechanical hazard	☐	☐	☐	__________	________
Vessel purged, flushed and vented	☐	☐	☐	__________	________
Other (specify) ______________________________				__________	________

Ventilation Method	Yes	No	N/A
Venturi blower	☐	☐	☐
Electric or gasoline air blower with flexible hose	☐	☐	☐
Other (specify) ______________________________			

EMERGENCY RESPONSE RESCUE PROCEDURE

CONFINED SPACE ENTRY PERMIT (Continued)

Atmospheric Gas Test

Gas	Permissible Entry Level	Pre-entry Condition	Initial Reading	Periodic Conditions (in minutes) 30	60	90	120	150
Oxygen	19.5 to 23.5%							
Flammable gas	Less than 10% LEL							
Hydrogen sulfide	Less than 10 ppm							
Carbon monoxide	Less than 25 ppm							
Other (specify)								

Pre-entry condition: Reading collected prior to entry and before ventilation and isolation of space,
Initial condition: Reading collected after isolation and during ventilation (just prior to entry).
Periodic conditions: Reading results recorded continuously at 30 minute intervals.

Persons conducting air monitoring:

Name _ Date

Name _ Date

Instrument Calibration

Instrument	Serial Number	Calibration Date	Person Calibrating Instrument

ATTACHMENT C1-4

BIOLOGICAL HAZARDS

POISON IVY/POISON OAK/POISON SUMAC

Poison Ivy	Poison Oak	Poison Sumac
		

SNAKES

Copperhead

Closeup of head

24-36", up to 53"

The copperhead is a venomous snake with a broad triangular head, vertically elliptical pupils and a heat sensitive pit between each eye and nostril. The body is pinkish to grayish brown with brown or reddish-brown crossbands that are narrow on the back and widest on the sides. Small dark spots commonly occur between crossbands on the back. The unpatterned head is dull orange, copper or rusty-red. Body scales are keeled and the belly is pink or light brown with dark blotches along the sides. When young, a copperhead has a yellow-tipped tail.

SNAKES

Timber Rattlesnake

Closeup of head

Two Timber Rattlesnakes

36-60", up to 74"

Head and body are pinkish-gray to yellowish-brown with a pattern of dark bands on the back and a grayish-white belly. The tail is black with a rattle.

SNAKES

Eastern Massasauga Rattlesnake

Closeup of head

20-30"

The Eastern Massasauga Rattlesnake is generally 20-30 inches in length. It has a gray or brownish-gray background with larger darker splotches. Black bands run from the eyes to the corner of the mouth; another bank goes over the head.

SPIDERS

Brown Recluse
0.25-1.0"

Black Widow
0.12-0.75"

TICKS

Female Deer Tick with Dime for Size Comparison

Deer Tick Nymph with Dime for Size Comparison

Referenced from: **PARSONS INFRASTRUCTURE & TECHNOLOGY HEALTH AND SAFETY MANUAL**

ATTACHMENT C1-5
GENERIC RESPIRATORY PROTECTION PROGRAM

TABLE OF CONTENTS

C1.5.1.0 OBJECTIVE ... 3
C1.5.2.0 NEED FOR RESPIRATORY PROTECTION ... 3
C1.5.3.0 MINIMUM REQUIREMENTS OF AN ACCEPTABLE RESPIRATOR PROGRAM ... 3
C1.5.4.0 ESTABLISHMENT OF THE RESPIRATOR PROGRAM ... 3
C1.5.4.1 Facility Health and Safety Representative ... 3
C1.5.4.2 Project Health and Safety Officer (PHSO) ... 4
C1.5.4.3 Project Staff ... 4
C1.5.5.0 FACTORS TO CONSIDER WHEN SELECTING A RESPIRATOR ... 4
C1.5.5.1 Hazard Determination ... 5
C1.5.5.2 Immediately Dangerous to Life or Health (IDLH) ... 6
C1.5.5.3 Assigned Protection Factor and Maximum Use Concentration ... 6
C1.5.5.4 Eye Irritation ... 7
C1.5.5.5 Service Life Information ... 8
C1.5.6.0 RESPIRATOR TYPES ... 8
C1.5.6.1 Air Purifying Respirators (APRs) ... 10
C1.5.6.1.1 APR Configurations ... 10
C1.5.6.1.2 Aerosol Removing Respirators ... 11
C1.5.6.1.3 Gas and Vapor Removing Respirators ... 11
C1.5.6.2 Atmosphere Supplying Respirators (ASRs) ... 12
C1.5.6.2.1 Air-Line Respirator ... 12
C1.5.6.2.2 Self-Contained Breathing Apparatus (SCBA) ... 13
C1.5.6.3 Selection of Respirators Using Real-Time Measurements ... 14
C1.5.7.0 TRAINING ... 15
C1.5.7.1 Worker Training ... 15
C1.5.7.1.1 Initial Training ... 15
C1.5.7.1.2 Re-Training ... 16
C1.5.7.2 PHSO Training ... 16
C1.5.8.0 Respirator Fit Testing ... 16
C1.5.8.1 General Requirements ... 17
C1.5.9.0 DAILY QUALITATIVE FIT CHECKS AT THE SITE ... 19
C1.5.9.1 The Negative Pressure Check ... 19
C1.5.9.2 The Positive Pressure Check ... 19
C1.5.10.0 RESPIRATOR INSPECTION, CLEANING, MAINTENANCE, AND STORAGE 19
C1.5.10.1 Inspection for Defects ... 19
C1.5.10.1.1 Inspection of Air Purifying Respirators ... 20

C1.5.10.1.2 Inspection of Atmosphere Supplying Respirators 20
C1.5.10.2 Cleaning and Storage 21
C1.5.10.3 Maintenance 21
C1.5.11.0 MEDICAL ASPECTS OF RESPIRATOR USE 22
C1.5.12.0 EVALUATION OF THE RESPIRATOR PROGRAM 22

TABLES

Table C1.5.5.1 Assigned Respirator Protection Factors……………………………….6
Table C1.5.6.1 Estimate of Breakthrough Times………………………………………8
Table C1.5.8.1 Acceptable Fit Test Methods………………………………………17

FIGURES

Figure C1.5.6.1 Types of Respirators…………………………………………………14

ATTACHMENTS

Attachment C1-5.1 Fit Test Protocols
Attachment C1-5.2 Cleaning Protocols

C1.5.1.0 OBJECTIVE

The objective of this Respiratory Protection Program is to provide employees with sufficient information and guidance to adequately protect themselves from potential inhalation hazards during field operations. The use of respirators to protect personnel from inhalation hazards is permitted by OSHA under 29 CFR 1910.134 when other more positive methods of protection, such as engineering controls (e.g., ventilation) or work practices (e.g., substitution) are not feasible.

C1.5.2.0 NEED FOR RESPIRATORY PROTECTION

OSHA and ACGIH have established occupational exposure limits for various airborne contaminants. If there is the potential for workers to be exposed to airborne contaminants above occupational exposure limits, than feasible engineering controls and administrative measures should be instituted. If engineering controls are not feasible, employers are required to provide respirators for employee protection. Traditional industrial hygiene engineering controls are often not feasible for site work, hence, respirators must be relied upon as the primary means for respiratory protection during field investigations. All respiratory protection practices shall comply with this program.

C1.5.3.0 MINIMUM REQUIREMENTS OF AN ACCEPTABLE RESPIRATOR PROGRAM

The requirements for an acceptable respiratory protection program are outlined in 29 CFR 1910.134. An OSHA acceptable program includes the following elements:

- Procedures for selecting respirators for use in the workplace.
- Training of employees on the proper selection, use, and limitations of respirators.
- Procedures for proper maintenance, cleaning, storage, inspection and repair of respirators.
- Fit testing procedures for tight-fitting respirators.
- Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators.
- Medical screening of employees to determine if they are physically able to perform their assigned work using respiratory protective equipment.
- Procedures for regularly evaluating the effectiveness of the program.

C1.5.4.0 ESTABLISHMENT OF THE RESPIRATOR PROGRAM

Personnel with specific responsibilities for the implementation of the program include the following:

C1.5.4.1 Facility Health and Safety Representative

The Facility Health and Safety Representative is responsible for:

- Administering the respiratory protection program.

- Setting up and conducting training.
- Ensuring the office has the necessary respiratory protective equipment for the work performed by that office.
- Scheduling and conducting respirator fit testing.
- Maintaining fit test and medical records.
- Ensuring that respirators are properly stored and maintained in the office.
- Maintaining respirator repair records.
- Distributing respirators to field team members.
- Evaluating and updating the office respiratory protection program.

C1.5.4.2 Project Health and Safety Officer (PHSO)

All hazardous waste and industrial field investigations should have assigned to it a PHSO. The PHSO is responsible for:

- Ensuring that field team members assigned to wear respirators are trained in proper respirator selection and use.
- Performing site specific respiratory protection training.
- Evaluating the respirator requirements for each field task.
- Verifying that all field team members assigned to wear respirators have received appropriate fit-testing and are medically certified to wear the class of respirator assigned to them.
- Developing a project health and safety plan that specifies respiratory protection requirements for each anticipated site task.
- Ensuring that respirators are maintained and stored properly at the work site.
- Maintaining an adequate supply of cartridges when air purifying respirators are use and ensuring that Grade D or better breathing air is used to supply self-contained breathing apparatuses and airline respirators.

C1.5.4.3 Project Staff

All project team members must read and conform to the Project Health and Safety Plan. In the field, employees are responsible for performing daily inspections and cleaning of their assigned respirator and for storing them in a clean and sanitary location. Workers must report any problems with respiratory equipment to their PHSO immediately.

C1.5.5.0 FACTORS TO CONSIDER WHEN SELECTING A RESPIRATOR

Proper respirator selection is a complex process that takes into consideration a variety of factors. The workplace must be thoroughly evaluated prior to selecting a respirator. This evaluation must include a reasonable estimate of employee exposure to respiratory hazards and an identification of the contaminant’s chemical state and physical form. Additionally, work factors such as exposure time, temperature, relative humidity, and expected physical work effort must be evaluated when selecting a respirator.

C1.5.5.1 Hazard Determination

Identifying and evaluating potential respiratory hazards is key to proper respirator selection. In the project health and safety plan the respiratory hazards for each anticipated operation should be determined. Once the nature of the respiratory hazard or hazards present have been identified, the PHSO must evaluate the magnitude of the hazard to determine the potential exposure of each employee and the extent to which respirators of various types can reduce the harm caused by exposure. The steps for hazard determination are as follows:

1. Determine what contaminants may be present at the site (review site history or past environmental sampling data; know contaminants that are released from operation [welding fumes]).
2. Determine whether there are occupation exposure limits (OSHA permissible exposure limits or ACGIH threshold limit values) for the identified contaminants.
3. Determine if there is a comprehensive health standard (e.g., asbestos, lead) for the contaminant(s). If so, there may be specific respirators required that will influence the selection process.
4. Determine the IDLH levels for the contaminants (refer to section 5.2).
5. Evaluate if the operation involves entry into a potentially oxygen deficient environment.
6. Estimate the concentration of contaminants (use historical exposure sampling data or calculate exposure estimates using environmental sampling data).
7. Determine the physical state of the contaminants (are contaminants fumes, mists, vapors, or gases). If the contaminants are aerosols, estimate particle size based on whether the contaminants are fumes, mists, or dusts. If contaminants are vapors or gases, evaluate cartridge or canister efficiency in removing the contaminants.
8. Determine whether the contaminants are eye irritants.

Clearly, personal exposure monitoring data is the most reliable approach for assessing how much and what type of respiratory protection is required in a given circumstance. Parsons I&T has extensive personal monitoring data for UST removals, asbestos abatement, and lead paint removal operations that can be used by PHSOs to evaluate respiratory protection needs for employees assigned to similar operations. For hazardous waste and industrial field investigations, site specific exposure monitoring data may not be available, however results from previous environmental sampling investigations conducted at the site may be accessible. If available, review results of the sampling data to assess volatile contaminant(s) that may be encountered during anticipated operations. From this information calculate the potential for exposure above occupational exposure limits based on substance(s) concentration, vapor pressure, and solubility.

Many substances are not volatile (metals, PAH, PCBs, etc.), thus knowledge of the anticipated operation becomes critical in determining the need for respiratory protection.

For example, high concentrations of lead in soil by itself is not justification for wearing a respirator. The anticipated operation must create a dust hazard (such as the excavation of soil) for inhalation to occur. As mentioned above, knowledge of the particle size is important for determining proper respirator selection. If the contaminant is an aerosol with a particle size greater than 2 *u*m mass median aerodynamic diameter (MMAD), an air purifying respirator with any filter type (95, 99, or 100) may be used (refer to section 6.1.2). If the contaminant is an aerosol with an unknown particle size or a particle size less than 2 *u*m MMAD, than only a series 100 filter may be used.

The identification and evaluation of contaminants and operations provides the basis for the initial selection of a respirator. Once a level of respiratory protection has been selected the PHSO can change the respirator selection based on real-time air monitoring and professional judgment (refer to section 7).

C1.5.5.2 Immediately Dangerous to Life or Health (IDLH)

The definition of IDLH provided in 29 CFR 1910.134(b) is as follows:

Immediately Dangerous to Life or Health means 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.

The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape without injury or irreversible health effects in the event of failure of the respiratory protective equipment. Only the following respirators may be permitted in an IDLH atmosphere:

- A full face-piece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes; or
- A combination full face-piece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.

All oxygen-deficient atmospheres shall be considered IDLH environments. IDLH values for specific chemicals can be obtained from the NIOSH Pocket Guide to Chemical Hazards. Note OSHA states in 29 CFR 1910.134(c) that in "instances where the employer cannot identify or reasonably estimate the employee exposure, the employer shall consider the atmosphere to be IDLH." Thus, the sampling of an unknown drummed waste must be considered an IDLH operation.

C1.5.5.3 Assigned Protection Factor and Maximum Use Concentration

The assigned protection factor (APF) is the minimum anticipated protection provided by a properly functioning respirator or class of respirators to a given percentage of properly fitted and trained users. An APF of 10 for a respirator means that a user could expect to inhale no more than one tenth of the airborne contaminant present. It should be noted that APFs are based solely on laboratory fit testing and should be viewed and applied with particular caution. APFs are not based on measurements of actual field (workplace) performance. The protection factors listed in Table C1.5.5.1 are from the OSHA cadmium standard.

Protection factors are used to calculate the maximum use concentration (MUC) of a respirator for a particular substance. The APF of a given respirator for a specific user multiplied by the PEL or TLV for a given substance is the maximum use concentration of that substance for which the respirator may be used. For example, if the APF for a half face air purifying respirator is 10 and substance X has a PEL (or TLV) of 10 ppm, the half-face mask respirator will provide protection up to 100 ppm.

On a given site, individual exposures may vary widely between workers, during a workshift, and between days. The range of potential exposures should be appropriately determined for all workers and for all circumstances that can be reasonably anticipated. The highest anticipated exposure for each respirator wearer should be used to compute the protection factor required for each wearer.

Table C1.5.5.1
Assigned Respirator Protection Factors

Type of Respirator	OSHA Cadmium Standard
Air Purifying	
Filtering face-piece	10
Half-mask	10
Full-face	50
Powered Air Purifying	
Half-mask	50
Full face-piece	250
Loose fitting face-piece	25
Hood or helmet	25
Air Line	
Half-mask (demand)	10
Half-mask (continuous)	50
Half-mask (pressure demand)	1000
Full face-piece (demand)	50
Full face-piece (continuous flow)	250
Full face-piece (pressure demand)	1000
Self Contained Breathing Apparatus	
Demand	50
Pressure Demand	>1000

C1.5.5.4 Eye Irritation

The decision of whether to use a full-face, half-face or quarter-face respirator is often made by considering the chemical's potential for producing eye irritation or damage. The following guidelines should be used for selecting the proper mask. Any eye irritation is considered unacceptable for routine work activities. Therefore, only full face-piece respirators are permissible in contaminant concentrations that produce eye irritation. Some eye irritation is permissible when using an escape respirator if it is determined that such irritation would not inhibit escape and such irritation is reversible.

In instances where quantitative eye irritation data cannot be found in literature references and theoretical considerations indicate that the substance should not be an eye irritant, half face piece respirators are allowed. In cases where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, full face-piece respirators should be used.

C1.5.5.5 Service Life Information

Because human senses are not foolproof in detecting gases and vapors and because many gases and vapors found in the workplace do not have adequate warning properties (low odor thresholds), OSHA only permits the use of air purifying respirators for protection against vapors and gases when:

- The respirator is equipped with an end-of-service life indicator (ESLI) certified by NIOSH or
- The employer establishes a change out schedule for cartridges or canisters that will ensure that the cartridges or canisters are changed out before breakthrough.

To date, only five contaminant-specific ESLIs have been granted by NIOSH. Thus for most projects the PHSO will have to establish a cartridge or canister change out schedule to prevent contaminant breakthrough. Change out schedules may be established through a review of breakthrough test data or from recommendations provided by the respirator cartridge or canister manufacturer or supplier.

OSHA emphasizes that a conservative approach is recommended when evaluating service life testing data. Temperature, humidity, air flow through the sorbent, the work rate, and the presence of other potential interfering chemicals in the workplace all can have a serious effect on the service life of an air-purifying cartridge or canister. In establishing a schedule for cartridge replacement, it is important that the PHSO base the schedule on worst-case conditions. Assuming worst-case conditions will provide the greatest margin for safety in using air-purifying respirators for protection against gases and vapors.

Table C1.5.6.1 provides breakthrough times for 42 chemicals at various concentrations. These breakthrough times were derived from the Gerry O. Wood math model (Wood, G.O., Estimating Service Lives of Organic Vapor Cartridges, American Industrial Hygiene Association Journal, 55:11-15, 1994). Note the table uses the following standard conditions to calculate breakthrough times:

- Flow rate is 53.3 liters per minute
- Sorbent mass per cartridge is 26 grams
- Relative humidity is <50%
- Temperature is 72°F

If site conditions are significantly different from the standard conditions, the PHSO will need to make appropriate corrections to the times presented in Table C1.5.6.1.

C1.5.6.0 RESPIRATOR TYPES

The basic purpose of any respirator is, simply, to protect the respiratory system from inhalation of hazardous atmospheres. Respirators provide protection either by removing contaminants from the air before it is inhaled or by supplying an independent source of respirable air. The principal classifications of respirator types are based on these categories.

Table C1.5.6.1
Estimate of Breakthrough Times

Chemical	Concentration 50 ppm	Concentration 100 ppm	Concentration 500 ppm
Aromatics			
Benzene	Work Shift	Limited to 50 ppm for negative pressure APR	Limited to 50 ppm for negative pressure APR
Toluene	1018	562	135
Ethylbenzene	1133	604	135
m-Xylene	1143	608	136
Cumene	1122	586	126
Alcohols			
Methanol	Compound is not applicable to this calculation	Compound is not applicable to this calculation	Compound is not applicable to this calculation
Ethanol	123	105	60
Isopropanol	425	286	101
Propanol	551	364	123
Butanol	1073	615	156
2-Pentanol	1091	601	143
Monochlorides			
Vinyl chloride	Refer to vinyl chloride standard 1910.1017	Refer to vinyl chloride standard 1910.1017	Refer to vinyl chloride standard 1910.1017
Ethyl chloride	Not applicable, boiling point below ambient	Not applicable, boiling point below ambient	Not applicable, boiling point below ambient
2-Chloropropane	224	150	54
Chlorobenzene	1327	709	160
1-Chlorohexane	993	530	119
1-Chloroheptane	930	492	56
Dichlorides			
Dichloromethane	Refer to Methylene chloride standard 1910.1052	Refer to Methylene chloride standard 1910.1052	Refer to Methylene chloride standard 1910.1052
1,1-Dichloroethane	234	157	57
Cis 1,2-Dichloroethylene	356	236	82
1,2-Dichoroethane	482	310	101
1,2-Dichloropropane	776	452	121
Trichlorides			
Chloroform	409	263	87
Methyl chloroform	618	366	102
Trichloroethylene	749	441	122
1,1,2-Trichloroethane	976	558	143
Tetrachlorides			
Carbon tetrachloride	677	398	109
Perchloroethylene	1106	609	145
Ketones			
Acetone	118	92	44
2-Butanone	423	271	88
2-Pentanone	729	424	113
4-Methly-2-Pentanone	884	448	117

Chemical	Concentration 50 ppm	Concentration 100 ppm	Concentration 500 ppm
Cyclopentanone	1020	589	153
3-Heptanone	1061	561	123
Cyclohexanone	1257	683	157
Alkanes			
Pentane	332	581	136
Hexane	585	334	87
Heptane	769	420	99
Nonane	907	470	100
Decane	902	461	95
Amines			
Ethylamine	Not applicable, boiling point below ambient temperature	Not applicable, boiling point below ambient temperature	Not applicable, boiling point below ambient temperature
Proplamine	226	117	46

A respirator that removes contaminants from the ambient air is called an air-purifying respirator. A respirator that provides air from a source other than the surrounding atmosphere is an atmosphere-supplying respirator. Both types of respirators are described below.

C1.5.6.1 Air Purifying Respirators (APRs)

The air purifying device cleanses the contaminated atmosphere. Ambient air passes through a cartridge or canister that removes specific gases or vapors, aerosols, or a combination of these contaminants. An APR is limited to use in environments where there is sufficient oxygen to support life (>19.5% by volume), where contaminant levels are below IDLH levels, and the MUC for the specific respirator is not exceeded.

C1.5.6.1.1 APR Configurations

APRs are made of flexible molded rubber, silicone, neoprene, or other materials. Present designs incorporate rubber or woven elastic headstraps that are attached at two to six points. Face-pieces are available in three basic configurations. The first, called a “quarter mask,” covers the mouth and nose, and the lower sealing surface rests between chin and mouth. Good protection may be obtained with a quarter mask, but it is more easily dislodged than other types.

Quarter mask APRs may only be used at Parsons I&T sites for protection against nuisance dusts. A second type, the “half mask,” fits over the nose and under the chin. Half masks are designed to seal more reliably than quarter masks, so they are preferred for use against more toxic materials. Half mask APRs may be used for protection against low levels of vapors, gases, and aerosols, provided that these substances are not eye irritants.

A third type, the “full face-piece,” covers from roughly the hairline to below the chin. On the average they provide the greatest protection, usually seal most reliably, and provide eye protection as well. Full face-piece respirators are designed for use in higher concentrations of toxic materials than are quarter or half mask respirators. Because of their additional protection, most Parsons I&T operations requiring APRs are performed using full face-piece respirators.

C1.5.6.1.2 Aerosol Removing Respirators

Aerosol removing respirators offer protection against airborne particulate matter, including dusts, mists, and fumes. All aerosol filtering APRs use fibrous material (a filter) to remove the contaminant. As a particle is drawn onto or into the filter, it is trapped by the fibers. Currently, there are nine classes of filters (three levels of filter efficiency, with three categories of resistance to filter efficiency degradation). The three levels of filter efficiency are 95%, 99%, and 99.97% (series 95, 99, 100). The three categories of resistance to filter efficiency degradation are labeled N (Not resistant to oil), R (Resistant to oil), and P (oil Proof). These certification categories apply only to non-powered, air-purifying, particulate-filter respirators. Powered air-purifying respirators (PAPRs) for particulates are approved only with high-efficiency filters.

The selection process for using aerosol removing APRs is outlined below:

- The selection of N-, R-, and P-series filters depends on the presence or absence of oil particles, as follows:
- If no oil particles are present in the work environment, use a filter of any series (i.e., N-, R-, or P-series).
- If oil particles (e.g., lubricants, cutting fluids, glycerine, etc.) are present, use only R- or P-series filters.
- If oil particles are present and the filter is to be used for more than one work shift, use only a P-series filter.
- Selection of filter efficiency (i.e., 95%, 99%, or 99.97%) depends on how much filter leakage can be accepted. Higher filter efficiency means lower filter leakage. As stated earlier, if the contaminant is an aerosol with an unknown particle size or one with a MMAD less than 2 um, the highest efficiency filter must be used (N-, R-, or P-100 series filters). Always use a 100 series filter for protection against radioactive dust, metal fumes, asbestos, or when the substance specific standard specifies the use of HEPA or series 100 filters.
- The choice of face-piece depends on the level of protection needed-that is, the assigned protection factor (APF) required.

C1.5.6.1.3 Gas and Vapor Removing Respirators

These air purifying respirators protect against certain gases and vapors by using various chemical filters to purify the inhaled air. They differ from aerosol filters in that they use cartridge or canisters containing sorbents to remove harmful gases and vapors. The cartridges may be replaceable or the entire respirator may be disposable. Sorbents are granular, porous materials that interact with the gas or the vapor molecule to clean the air. In contrast to aerosol filters, which are effective to some degree no matter what the particle, sorbent cartridges are designed for protection against specific contaminants (mercury vapor or ammonia gas) or classes of contaminants (such as organic vapors or acid gases).

The basic difference between cartridges and canisters is the volume of sorbent. Cartridges are vapor and gas removing elements that may be used singly or in pairs on quarter and half masks and on full face-pieces. The sorbent volume of a cartridge is small, about 50–200 cm3 so its useful lifetime is usually short, particularly in high gas or vapor concentrations. Canisters have a larger sorbent volume (1000–2000 cm3) and can be used in higher vapor and gas concentrations (up to the IDLH level) than cartridges. Limitations to the use of sorbent cartridge or canister respirators include:

- A canister or cartridge respirator shall not be used when there is reason to suspect that the sorbent does not provide adequate efficiency against the removal of a specific contaminant(s) that may be encountered at the site.
- Where there is reason to suspect that a sorbent has a high heat of reaction with a substance present at the site.
- Where there is reason to suspect that a substance sorbed onto the surface of a cartridge or canister is shock sensitive.

C1.5.6.2 Atmosphere Supplying Respirators (ASRs)

Atmosphere supplying devices are the class of respirators that provide a respirable atmosphere to the wearer independent of the ambient air. The breathing atmosphere is supplied from an uncontaminated source. The air source for an ASR must as a minimum conform to grade D requirement as specified in the Compressed Gas Association Standard *G-7.1*. ASRs may be classified into two groups: air-line respirators and self-contained breathing apparatus.

C1.5.6.2.1 Air-Line Respirator

Air-line respirators deliver breathing air through a supply hose connected to a face-piece or head enclosure (welding helmet). Either a compressor or compressed air cylinders supply the breathing air. When air is supplied by a compressor it must be equipped with specific safety devices in accordance with OSHA requirements. For example, all compressors must have an alarm to indicate overheating and compressor failure. If the compressor is oil lubricated, a carbon monoxide alarm must be installed. All air-line respirators must comply with the following requirements:

- The maximum permissible inlet pressure is 125 psi.
- The hose length must be between 25 and 300 feet (review certification for specific respirator).
- Flow rates cannot be less than 115 liters per minute (lpm) or greater than 425 lpm (tight fitting face-piece).

Air-line respirators are available in demand, pressure-demand, and continuous-flow configurations.

Demand. Demand air-line respirators are equipped with either half or full face-pieces. They deliver airflow only upon inhalation. Due to their design, a negative pressure is created in the face-piece upon inhalation. These respirators shall not use by Parsons I&T employees.

Pressure demand. Pressure demand respirators are similar to demand respirators except that because of their design the pressure inside the face-piece is generally positive with respect to the outside air pressure during both inhalation and exhalation. The positive pressure means that when a leak develops in the face seal the leakage of air would be outward. Thus, these respirators provide a higher degree of protection to the user than air-line respirators that operate in the demand mode. Most Parsons I&T hazardous waste operations that require atmosphere supplying respirators use pressure demand air-line respirators because of their high degree of protection and long use time. When a pressure demand air-line respirator is equipped with an auxiliary SCBA, it may be used in IDLH environments. The auxiliary air supply can be engaged in the event that the primary air supply fails, allowing the worker to escape from the IDLH atmosphere.

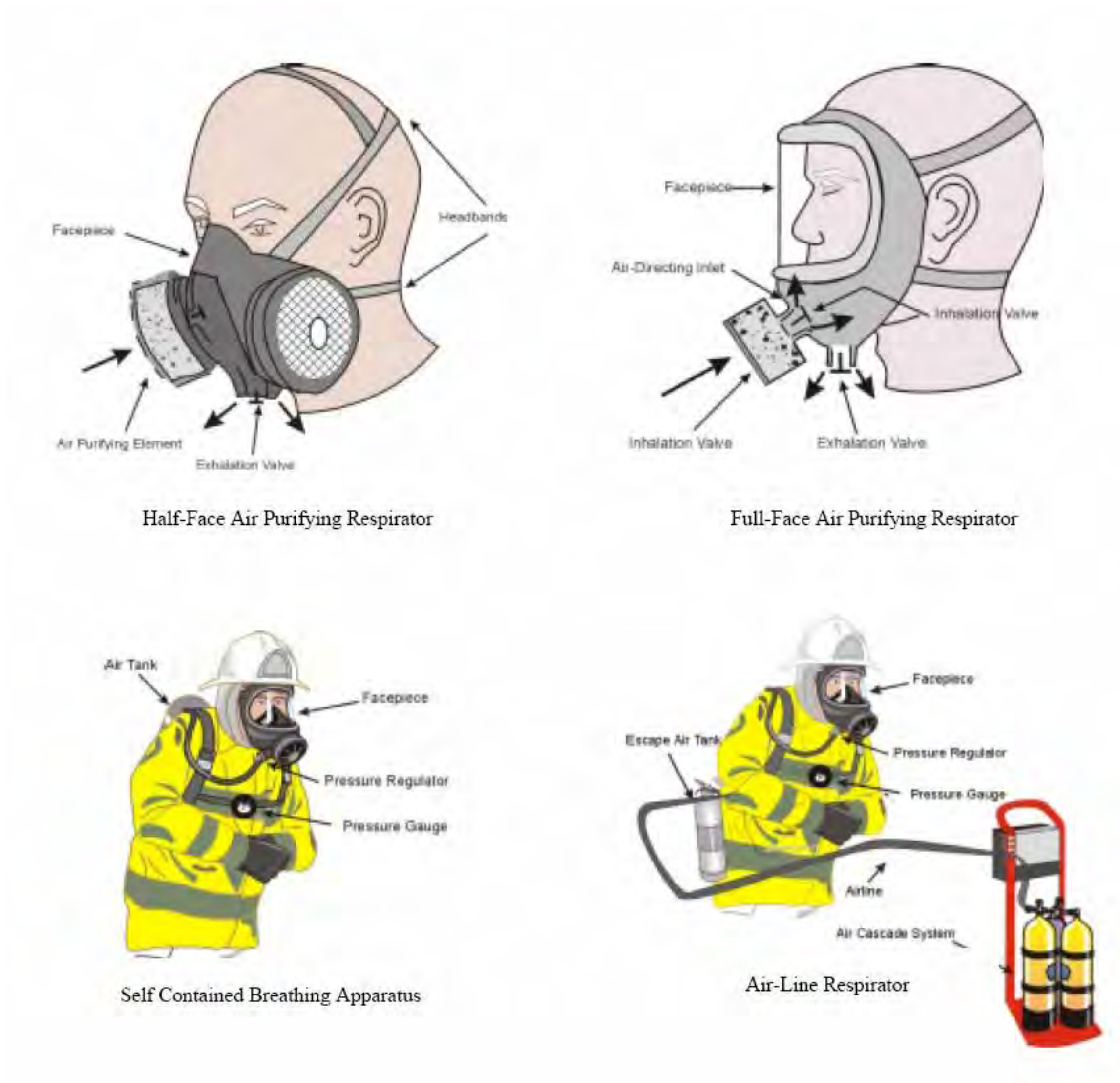
Continuous flow. A continuous flow respirator has a regulated amount of air delivered to the face-piece or head enclosure and is normally used where there is an ample air supply such as that provided by an air compressor. These respirators may be equipped with either tight fitting or loose fitting head enclosures. For tight fitting face-pieces, the air flow must be at least 115 lpm. For loose fitting hoods or helmets, the minimum flow is 170 lpm. Parsons I&T operations that involve the use of continuous flow air-line respirators include welding and abrasive blasting.

C1.5.6.2.2 Self-Contained Breathing Apparatus (SCBA)

The SCBA provides respiratory protection against gases, vapors, particulates and oxygen deficient environments. The wearer is independent of the surrounding environment because the breathing air is carried by the wearer. Pressure demand SCBAs may be used in IDLH and oxygen deficient environments either as escape only devices or for short-term entry. A full face piece is most commonly used with SCBAs. There are two major types of SCBAs: closed circuit and open circuit. Parsons I&T only uses open circuit pressure demand SCBAs.

In an open circuit SCBA the exhaled air is exhausted to the environment rather than being re-circulated (a closed circuit SCBA). A cylinder of high pressure (2000–4500 psi) compressed air supplies air to a regulator that reduces the pressure for delivery to the face-piece. Most open circuit SCBAs have a service life of 30 minutes to 60 minutes based on NIOSH breathing machine tests. However, a service life of 30 or 60 minutes is rarely obtained during field operations. The PHSO should plan for operations to be completed with no less than 20% of the air remaining in the tank.

Figure C1.5.6.1
Types of Respirators



Half-Face Air Purifying Respirator

Full-Face Air Purifying Respirator

Self Contained Breathing Apparatus

Air-Line Respirator

C1.5.6.3 Selection of Respirators Using Real-Time Measurements

The identification and evaluation of contaminants at a site provide the basis for the initial selection of a respirator. Once a level of respiratory protection has been selected it can be modified based on real-time air monitoring, supplemented with background information and professional judgment.

Below are the allowed modifications. Please note the qualifiers.

- **ASR (Level B) to No respirator (Level D):** This modification may be made by the PHSO when there is a sustained absence of volatiles or aerosols as measured on realtime equipment. A level D ensemble cannot be used in an oxygen deficient environment.

- **APR (Level C) to No Respirator (Level D):** Same as Level B to Level D
- **Level D to Level B:** May be made at the direction of the PHSO based on the magnitude of the measurements and action level requirements specified in the project health and safety plan.
- **Level C to Level B:** Permissible at the direction of the PHSO in instances where volatiles or aerosol measurements exceed the preset level B action level specified in the project health and safety plan. Level B (or engineering controls) shall be used when an oxygen deficient environment exists.
- **Level D to Level C:** Permissible at the direction of the PHSO when volatiles or aerosols exceed the preset action level specified in the project health and safety plan. (Contaminants must be known in order to wear an air purifying respirator).
- **Level B to Level C:** May be made at the direction of the PHSO only when the contaminants and their concentrations are known. This modification should not be made without knowledge of the chemicals on-site, their expected concentrations, and ability of the cartridges to absorb or filter out the chemicals.

C1.5.7.0 TRAINING

C1.5.7.1 Worker Training

Selecting the respirator appropriate for a given hazard is important, but equally important is using the selected device properly. Parsons I&T provides initial respiratory protection training for workers that are assigned to activities requiring respirator use.

C1.5.7.1.1 Initial Training

Employees must receive training in proper respirator selection and use prior to assignment to operations requiring respiratory protection. Initial respirator training may be provided by the Corporate H&S Staff (as part of the 40-hour HAZWOPER training class), the Facility H&S Representative, or the PHSO (as part of a site-specific training). In each case the following topics must be presented:

- 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.
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.
- The proper donning and doffing of the respirator.
- Procedures for inspecting and checking the respirator before donning.
- Procedures for the proper maintenance, cleaning, and storage of the respirator.
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.
- A general review of the OSHA Respiratory Protection Standard.

Training must involve classroom lecture and "hands-on" practice with the respirator. Training must be documented.

C1.5.7.1.2 Re-Training

Retraining shall be administered annually, and when the following situations occur:

- Changes in the workplace render previous training obsolete.
- Changes in the types of respirators used render previous training obsolete.
- Inadequacies in an affected employee's knowledge or use of an assigned respirator indicates that the employee has not retained the requisite understanding or skill.

Annual training shall be provided by the Facility H&S Representative or designee.

C1.5.7.2 PHSO Training

PHSOs that oversee site operations involving respirator use should have a comprehensive knowledge respiratory protection practices. Their training should include, but not necessarily be limited to, knowledge of the following:

- Initial worker training and instruction (see section 7.1.1);
- Basic respiratory protection practices;
- Selection and use of respirators to protect workers from the respiratory hazards to which they may be exposed;
- Factors that must be considered in establishing respiratory protection action levels for the project health and safety plan.
- Proper use of air monitoring equipment;
- The nature and extent of the respiratory hazards to which workers may be exposed; and
- The structure and operation of the entire respiratory protection program.

C1.5.8.0 Respirator Fit Testing

All respirators that rely on a mask-to-face seal need to be checked with either qualitative or quantitative methods to determine whether the mask provides an acceptable fit to a wearer. The qualitative fit test procedures rely on a subjective sensation (taste, irritation, smell) of the respirator wearer to a particular test agent while the quantitative test uses instruments to measure face seal leakage. The relative workplace exposure level determines what constitutes an acceptable fit and which fit test procedure is required. Qualitative fit testing may be used to fit test negative pressure air-purifying respirators, if they will be used in atmospheres less than ten times the PEL (Table C1.5.8.1). If exposures are anticipated to be greater than 10 times the PEL, quantitative fit testing must be used. The reason for this is because the qualitative fit test protocols established by OSHA are only valid to achieve a fit factor of 100 (an assigned protection factor of 10). When quantitative fit testing is used, all full face-piece respirators must meet or exceed a fit factor of 500, while quarter - and half-mask respirators must meet or exceed 100. For positive pressure, atmosphere-supplying respirators, either qualitative or quantitative fit testing may be used. The fit testing of tight-fitting atmosphere supplying respirators and tightfitting powered air-purifying respirators shall be accomplished by performing the fit test in the negative pressure mode. In all instances the employee must be fit tested with the same make, model, style, and size of respirator that will be used in the field.

Fit testing must occur prior to initial respirator use, whenever a different respirator face-piece (size, style, model or make) is used, and annually thereafter. The Facility H&S or his or her designated representative is responsible for performing fit testing in accordance with OSHA accepted protocol. Accepted protocols for qualitative and quantitative fit testing are presented in attachment 1.

Table C1.5.8.1
Acceptable Fit Test Methods

Respirator Type	Qualitative Fit Test	Quantitative Fit Test
Half-face, negative pressure, APR (<100 fit factor)	Yes	Yes
Full-face, negative pressure, APR, (<100 fit factor) used in atmospheres up to 10 times the PEL	Yes	Yes
Full-face, negative pressure, APR (>100 fit factor)	No	Yes
Supplied-air respirators (SAR), or SCBA used in negative pressure mode (demand mode) (>100 fit factor)	No	Yes
Supplied-air respirators (SAR), or SCBA used in positive pressure mode (pressure demand mode)	Yes	Yes

C1.5.8.1 General Requirements

The employee shall evaluate respirator fit using the following procedures:

- The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes. (By providing several sizes and models the subject is likely to find a respirator that fits correctly and is comfortable.)
- 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.
- The test subject shall be informed that he or 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.
- The test subject shall be instructed to hold each chosen face-piece up to the face and eliminate those that obviously do not give an acceptable fit.

- 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 evaluate comfort.

After the subject has determined the respirator of greatest comfort, that person shall conduct a negative and positive pressure fit check (section 9) or other fit checks recommended by the respirator manufacturer. Another face-piece shall be selected and re-tested if the test subject fails the fit checks.

Qualitative or quantitative fit testing shall not be conducted if there is any hair growth between the skin and the face-piece sealing surface, such as stubble beard growth, mustache, or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed. If the subject exhibits difficulty in breathing, the test shall be discontinued and the medical oversight contract (MOC) physician shall be contacted.

After the successful completion of the fit checks, the respirator fit shall be tested using the applicable method from attachment 1. No matter which test protocol is used, the employee shall be given a description of the fit test protocol and their responsibility during the test procedure. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit (ear muffs). The following test exercises must be performed during all fit testing methods prescribed in attachment 1:

- Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.
- Deep breathing, as during heavy exertion.
- Side-to-side and up-and-down head movements. These movements should not be exaggerated, but should approximate those that take place on the job.
- Talking. This is most easily accomplished by reading a prepared text (e.g., Rainbow Passage) loudly enough to be understood by someone standing nearby.
- Grimace. The test subject shall grimace by smiling or frowning. (this applies only to quantitative testing, it is not performed for qualitative fit testing).
- Bending over. The test subject shall bend at the waist as if to touch his or her toes.
- Normal breathing (repeat of first bullet).

Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the Facility H&S Representative or designee regarding the comfort of the respirator upon completion of the protocol. If the respirator is uncomfortable, another model respirator shall be tried. The respirator shall not be adjusted once the fit test begins. Any adjustment voids the test, and the process must be repeated. After the fit test has been successfully completed, a fit test log will be issued to the test subject. A copy of the log shall be maintained by the Facility Health and Safety Representative in accordance with section 7.6 of this manual.

C1.5.9.0 DAILY QUALITATIVE FIT CHECKS AT THE SITE

In the field, each employee is responsible for performing daily qualitative fit checks of their assigned APR respirator prior to entry into a hazardous atmosphere. The daily determination of fit will consist of a negative and positive pressure fit checks as described below.

C1.5.9.1 The Negative Pressure Check

In this test, the user closes off the inlet of the canister, cartridge, or filter by covering it with the palm of their hand; inhales gently so that the face-piece collapses slightly; and holds their breath for about 10 seconds. If the face-piece remains slightly collapsed and no inward leakage is detected, the respirator is probably functioning correctly.

C1.5.9.2 The Positive Pressure Check

This test is conducted by closing off the exhalation valve and exhaling gently into the facepiece. The fit is considered satisfactory if slight positive pressure can be built up inside the facepiece without any evidence of outward leakage.

C1.5.10.0 RESPIRATOR INSPECTION, CLEANING, MAINTENANCE, AND STORAGE

Respirator inspection is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all. The employee wearing a defective device thinks they are protected when, in reality, they are not. Emergency escape devices are particularly vulnerable to poor maintenance since they are generally used infrequently and often in the most hazardous and demanding circumstances. The possible consequences of wearing a defective emergency escape and rescue device are lethal.

The OSHA standards strongly emphasize the importance of an adequate maintenance program, but permit its tailoring to the type of working conditions and hazards involved. However, all programs are required to include at least:

- Inspection for defects (including a leak check)
- Cleaning and disinfecting
- Repair, and
- Storage.

A proper maintenance program ensures that the worker's respirator remains as effective as when it was new.

C1.5.10.1 Inspection for Defects

The Facility H&S Representative is responsible for inspecting respirators prior to assignment to individuals and upon receipt of the respirator after completion of field operations. Results of the inspection shall be recorded on form HS07-06 (Appendix A). In the field, the employee is responsible for inspecting his or her APR respiratory every day before and after use. The PHSO is responsible for performing daily inspections of actively used ASRs (air-line or SCBA) and for the monthly inspection of emergency escape respirators.

C1.5.10.1.1 Inspection of Air Purifying Respirators

Routinely used air-purifying respirators should be checked as follows before and after each use:

- Examine the face-piece for:
  - Excessive dirt;
  - Cracks, tears, holes, or distortion from improper storage;
  - Inflexibility (stretch and massage to restore flexibility);
  - Cracked or badly scratched lenses;
  - Incorrectly mounted full face-piece lens or broken or missing mounting clips; and
  - Cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s) (if required).
- Examine the head-straps or head harness for:
  - Breaks;
  - Loss of elasticity; and
  - Broken or malfunctioning buckles and attachments, and excessively worn serrations on the head harness which might permit slippage.
- Examine the exhalation valve for:
  - Foreign material, such as detergent residue, dust particles, or human hair under the valve seat;
  - Cracks, tears, or distortion in the valve material;
  - Improper insertion of the valve body in the face-piece;
  - Cracks, breaks, or chips in the valve body, particularly in the sealing surface;
  - Missing or defective valve cover; and
  - Improper installation of the valve in the valve body.
- Examine the air-purifying elements for:
  - Incorrect cartridge, canister, or filter for the hazard;
  - Incorrect installation, loose connections, missing or worn gaskets, or cross threading in holder;
  - Expired shelf-life date on cartridge or canister;
  - Cracks or dents in outside case of filter, cartridge, or canister; and
  - Evidence of prior use of sorbent cartridge or canister, indicated by absence of sealing material, tape, foil, etc., over inlet.

C1.5.10.1.2 Inspection of Atmosphere Supplying Respirators

For a routinely used atmosphere-supplying device, use the following procedures.

- If the device has a tight-fitting face-piece, use the procedures outlined above for air purifying respirators, except those pertaining to the air-purifying elements. If the device is a hood, helmet, blouse, or full suit, use the following procedures:

- Examine the hood, blouse, or full suit for rips and tears, seam integrity, etc.
- Examine the protective headgear, if required, for general condition, with emphasis on the suspension inside the headgear.
- Examine the protective face-shield for cracks or breaks or impaired vision due to rebounding abrasive particles.
- Make sure that the protective screen is intact and secured correctly over the faceshield of abrasive blasting hoods and blouses.
- Examine the air supply system for:
- Integrity and good condition of air supply lines and hoses, including attachments and end fittings, and
- Correct operation and condition of all regulators and valves.
- Self-contained breathing apparatuses must be inspected by the PHSO before initiating field operations. The results of the initial inspection must be documented on form HS07-07 (Appendix A). Each worker is responsible for inspecting his or her individual face-piece assembly for defects (e.g., frayed or cut hoses or straps) prior to use each day. Infrequently used respirators, such as emergency escape packs, must be inspected monthly. Inspection must include the following:
    - Examine air supply (ensure tank is fully charged).
    - Examine hood integrity (no cracks).
    - Ensure that the respirator is clean.
    - Examine air delivery hose for cuts and cracks.
    - Examine harness integrity.

C1.5.10.2 Cleaning and Storage

The Facility H&S Representative or designee is responsible for inspecting and cleaning all respirators returning from the field. Cleaning is accomplished by using the procedures presented in Attachment 2. After cleaning, sanitizing and inspecting the respirator, the Facility H&S Representative will repackage and store the respirator in an area protected against dust, sunlight, heat, extreme cold, excessive moisture or damaging chemicals. Respirators must be packed and stored so that the exhalation valve will rest in a normal position. When a respirator is used in the field, it must be cleaned each day by the respirator user.

C1.5.10.3 Maintenance

Continued usage of respirators will require periodic repair or replacement of component parts. Replacement of parts and repair of air purifying respirators, in most cases, present few problems. Replacement parts for respiratory protective devices **must** be those from the manufacturer of the equipment. Substitution of parts from a different brand or type of respirator will void the respirator's NIOSH approval. An SCBA is more difficult to maintain than an APR primarily because of the SCBA's valve and regulator assembly. For this reason, SCBA repairs and adjustments must be performed by a certified technician. Respirator maintenance must be documented.

C1.5.11.0 MEDICAL ASPECTS OF RESPIRATOR USE

No employee will be permitted to wear a respirator without clearance from the MOC physician. The diagnostic protocol for a fit-to-work classification includes an assessment of the worker's ability to wear an air purifying respirator, an airline respirator, and a SCBA. The Facility Health and Safety Representative shall not assign a worker to perform a task requiring respirator use unless he or she has received the medical report from the MOC physician that states that the employee has no limitation in wearing the assigned respirator.

C1.5.12.0 EVALUATION OF THE RESPIRATOR PROGRAM

The respirator program will be periodically evaluated by the Facility Health and Safety Representative and modified as appropriate. The auditing of respirator practices will be used to assess whether respirators are being selected and worn properly. Examination of respirators in use and in storage will indicate how well the equipment is being maintained. The results of periodic audits will be used to assess the effectiveness of the program and aid the Facility Health and Safety Representative in identifying areas that need improvement.

ATTACHMENT C1-5.1

FIT TEST PROTOCOLS

QUALITATIVE FIT TEST (QLFT) PROTOCOLS

General

The Facility H&S Representative administering the QLFT must be able to prepare test solutions, calibrate equipment, perform the tests properly, recognize invalid tests, and ensure that the test equipment is working properly**.** QLFT equipment must be kept clean and well maintained so it operates within the parameters for which it was designed

Isoamyl Acetate Protocol

This protocol is appropriate for the fit testing of respirators with organic vapor cartridges or canisters.

Odor Threshold Screening

Odor threshold screening is performed without the subject wearing a respirator. The screening is intended to determine if the subject can detect the odor of isoamyl acetate at low levels.

1. Three 1 liter glass jars with metal lids are required.

2. Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions.

3. The isoamyl acetate (IAA) (also known at isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 mls of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.

4. The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.

5. The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 mls of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

6. A test blank shall be prepared in a third jar by adding 500 mls of odor-free water.

7. The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.

8. The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the Facility Health and Safety Representative which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

11. If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

Isoamyl Acetate Fit Test

1. The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2- foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.

2. Each respirator used for the fit test shall be equipped with organic vapor cartridges or an organic vapor canister.

3. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room.

4. A copy of the test exercises (section 8.1) and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

5. Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA.

6. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

7. Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. At this time the Facility Health and Safety Representative should explain the fit test exercises.

8. If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

9. If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure. The process continues until a respirator that fits has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before re-testing. Odor sensitivity will usually have returned by this time.

10. If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

11. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

Irritant Smoke (Stannic Chloride) Protocol

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. The respirator to be tested must be equipped with a P-, R, or N- 100 series filter. An enclosure shall not be used for this test. The smoke can be irritating to the eyes, lungs, and nasal passages, thus the Facility H&S Representative shall take precautions to minimize the test subject's exposure to the irritant smoke by performing the test in a well-ventilated area.

Sensitivity Screening Check

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

1. The Facility Health and Safety Representative 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 an aspirator squeeze bulb. The Facility Health and Safety Representative shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury to the subject from the jagged end of the smoke tube.

2. The Facility Health and Safety Representative 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 or her eyes closed while the test is performed.

3. 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 or she can detect the irritating properties of the smoke. The Facility Health and Safety Representative shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he or she can detect it.

Irritant Smoke Fit Test Procedure

1. The person being fit tested shall don the respirator without assistance, and perform the required negative and positive pressure fit check(s).

2. The test subject shall be instructed to keep his or her eyes closed.

3. The Facility Health and Safety Representative 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 Facility Health and Safety Representative shall begin at least 12 inches from the face-piece and move the smoke stream around the whole perimeter of the mask. The Facility Health and Safety Representative shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

4. If the person being tested has not had an involuntary response to the irritant smoke, proceed with the test exercises.

5. The exercises identified in section 8.1 shall be performed by the test subject while the respirator seal is being continually challenged by the smoke. Smoke shall be directed around the perimeter of the respirator at a distance of six inches.

6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being tested must repeat the entire sensitivity check and fit test procedure.

7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check. This check involves squeezing a small smoke stream from the tube after the respirator has been removed. If the test subject fails to evoke a response, the fit test is voided.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

QUANTITATIVE FIT TEST (QNFT) PROTOCOL

General

The Facility H&S Representative administering the QNFT must able to calibrate equipment, perform the tests properly, recognize invalid tests, and ensure that test equipment is working properly**.** QNFT equipment must be kept clean and well maintained so it operates within the parameters for which it was designed.

Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol.

The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount TM) protocol quantitatively fit tests respirators by collecting samples from the inside of the mask. To perform the quantitative fit test a respirator with a sampling probed is used. The probed respirator has a special sampling device that allows the probe to sample 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 using the employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a negative pressure half-mask respirator and a minimum fit factor pass level of at least 500 is required for a negative pressure full face-piece respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

Portacount Fit Test Requirements

1. 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 per manufacturer's instruction.

2. 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.

3. 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; and Tendency of the respirator to slip.

4. Have the person wearing the respirator perform negative and positive fit checks. If leakage is detected, determine the cause. If leakage is from a poorly fitting face-piece, try another size respirator.

5. Follow the manufacturer's instructions for operating the Portacount and proceed with the test.

6. The test subject shall be instructed to perform the exercises in section 8.1 of this Appendix.

7. After the test exercises, the test subject shall be questioned by the Facility Health and Safety Representative regarding the comfort of the respirator upon completion of the protocol. If the respirator has become uncomfortable, another model should be used.

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 passed, the fit test is over. Since the pass or fail criterion of the Portacount is user programmable, the Facility H&S Representative shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance (fit factor of 100 for half face mask, fit factor of 500 for full face mask). A record of the test needs to be maintained in accordance with section 7.6 of this manual. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; the fit test operator's name, and the date of testing.

ATTACHMENT C1-5.2

CLEANING PROTOCOL

These procedures are provided for use when cleaning respirators. They are general in nature, and should be used as an alternative to the procedures provided by the manufacturer of the respirator.

- Remove filters, cartridges, or canisters. Disassemble face-pieces by removing speaking diaphragms, demand and pressure- demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm (43 deg. C [110 deg. 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.
- Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.
- 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 deg. C (110 deg. 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 deg. C (110 deg. 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.
- Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized since detergents or disinfectants that dry on face-pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
  - Components should be hand-dried with a clean lint-free cloth or air-dried.
  - Reassemble face-piece, replacing filters, cartridges, and canisters where necessary.
  - Test the respirator to ensure that all components are working properly

RESPIRATOR FIT TEST LOG

Maintain a copy of this record in the project files in the Parsons Field office/trailer.

Employee: ____________________________ Date of Test: _________________________

Fit Test
Administrator: _________________________ Date of Last Physical: __________________

RESPIRATOR INFORMATION

Manufacturer: ________________________ Model: ______________________________

Size: _______________________________ I.D. Number: _________________________

TEST RESULTS

Test Protocol

Pressure fit check:

positive _________

negative _________

Test atmosphere:

isoamyl acetate _________

stannic oxychloride _________

Comfort

comfortable _________________________

intolerable __________________________

needs prescription inserts: yes / no
(full-face respirator only)

fit _________
no fit ___________

Date of next fit test: __________________

Remarks:

____
____
____
____
____
____
____

1.0 EXECUTIVE SUMMARY

The Company is committed to providing a safe and healthy work environment for all employees. Abuse of alcohol or drugs could directly affect an employee's job performance, the safety of others, and relationships with our clients. The goal of the Company is to establish a work environment that is free from the effects of alcohol and drug abuse.

2.0 PURPOSE AND POLICY

The purpose of this procedure is to identify the Parsons Infrastructure and Technology's (PI&T) procedure for addressing substance abuse in the work place in conjunction with the Corporate Policy and the Drug-Free Workplace Act of 1988. This procedure applies to all applicants for employment and all employees of PI&T, regardless of assignment location.

3.0 RESPONSIBILITIES

rocedures	Contracts	BD	Engr	Legal	Finance	SQR	Talent Management	Government Security	Project Controls	Div\Dept Mgmt	Procurement	Operations	IS	Project Mgmt	President
TM-P-2.4	I	I	I	I	I	I	C	I	I	A	I	I	I	I	I
R – Responsibility, A – Approval, C – Coordination, I – Information, S – Support.															

Supervisor:

1. Responsible for immediately notifying the Talent Management of any employee convicted for a drug-related crime occurring in the work place.
2. Responsible for taking appropriate corrective action within 30 calendar days upon receiving notice of an employee's conviction of a criminal drug statute occurring in the workplace.
3. Responsible for notifying Talent Management when there is reasonable suspicion of substance abuse in the workplace.
4. Meets with Talent Management to evaluate information on unsatisfactory performance or behavior and determines appropriate course of action.
5. Supervisor, with a Talent Management representative present, conducts counseling session with employee.
6. Responsible for notifying Talent Management when an accident that requires a substance abuse test occurs in the workplace.

Talent Management:

1. Responsible for informing applicants and scheduling pre-employment tests of all candidates for placement, after acceptance of a written offer of employment.
2. Assures consistent and uniform application of this procedure. Talent Management is responsible for interfacing with the supervisor and the employee to evaluate performance and behavior, and for determining appropriate corrective action with the supervisor, should the employee be unwilling to undertake or complete a medical treatment program.
3. Responsible for ascertaining whether an employee is or was working on a government contract at the time of a drug conviction for a crime occurring in the work place. When this has occurred, Talent Management will immediately notify the Contracts Department.

Contracts Department

1. The Contracts Department is responsible for providing written notification to the government contracting agency within 10 calendar days of receiving notice of any employee conviction of a criminal drug statute occurring in the work place.

4.0 DEFINITIONS

Test: Urinalysis, blood test, saliva test, hair test or other similar examinations to determine presence and concentration of alcohol or illegal drugs in the human system.

Controlled Substance: A drug or chemical substance whose possession and use are regulated under the Controlled Substances Act.

Reasonable Suspicion: defined as unsatisfactory behavior or job performance (including on-the-job accident or injury) which gives rise to the supervisor and Talent Management's belief that alcohol or drug abuse may be a contributing factor.

5.0 PROCEDURE

5.1 EMPLOYMENT OFFERS

Once an offer has been extended, all applicants for employment, regardless of employment category will be required to pass an alcohol/drug screening test prior to placement. Failure to submit to or pass the test will result in immediate disqualification from consideration for placement. In support of employment offers, Talent Management will:

a) Advise applicants of the testing requirements and procedures and will obtain signed consent from applicants prior to testing.

b) Extend written offer of employment with placement contingent upon the applicant passing a substance abuse test.

c) Obtain signed consent from applicant for the substance abuse test.

d) Verbally notify applicant of the test results.

e) Upon receipt of final results, notify the hiring supervisor of the final results.

f) A written record of the test is to be segregated from the applicant's personnel file.

In the case of an inconclusive or positive test result the laboratory will:

a) Send the results to the medical review officer MRO for further evaluation.

b) The MRO will contact the applicant directly and discuss inconclusive or positive tests.

5.2 EMPLOYEE PERSONAL CONDUCT

Employees bear the primary responsibility for their own job performance and for taking any action or undergoing treatment necessary to maintain performance at a satisfactory level.

An employee who has a substance abuse problem is encouraged to discuss his/her problem in confidence with the supervisor and/or with a representative of Talent Management. Employees who voluntarily request treatment for an alcohol or drug problem will be given assistance by Talent Management in identifying a suitable treatment program. The employee will be required to submit documentation of participation in a treatment program. During treatment, the employee will be eligible for benefits under the Corporate Leaves of Absence – Paid and Unpaid – U.S. Payrolls Policy.

An employee must notify his/her supervisor within five calendar days of a drug conviction occurring in the workplace.

5.3 REASONABLE SUSPICION TESTING

The Company may require an employee to submit to a test for alcohol or illegal drugs, based upon reasonable suspicion that the employee's performance or behavior is being adversely affected by use of such substance(s). Reasonable suspicion is defined as unsatisfactory behavior or job performance (including on-the-job accident or injury) which gives rise to the supervisor and Talent Management's belief that alcohol or drug abuse may be a contributing factor. Refusal by an employee to take such a test will be viewed as an admission of such use by the employee and the companies' normal corrective action procedures will apply. Should the employee fail to pass the test, or should the employee admit that the use of alcohol or illegal drugs has affected his/her job performance or behavior, the employee will be offered the opportunity to seek medical treatment for substance abuse. The employee will be offered assistance by Talent Management in identifying a treatment program and will be eligible for benefits under the Corporate Leaves of Absence – Paid and Unpaid – U.S. Payrolls Policy.

Prior to treatment, employee agrees to adhere to the Corporate Substance Abuse Policy and the PI&T Substance Abuse Procedure and to maintain his/her job performance and/or behavior at a satisfactory level in the future or face corrective action which may include termination. The Company will reasonably accommodate an employee's efforts to obtain and follow a course of treatment for substance abuse, but will not be obligated to offer or accommodate successive courses of treatment for substance abuse.

Upon successful completion of a treatment program, an employee will be subject to one unannounced test per month for a three month period, with subsequent testing determined on an individual case basis. Should subsequent testing produce positive results, or the employee refuses to take the test for substance abuse, or; refuse medical treatment upon failing the examination, or; after commencing medical treatment, fail to complete such treatment, or; refuse medical treatment after admitting substance abuse; the Company's normal corrective action procedures will apply.

5.4 APPEALS

Any appeal actions by employees pertinent to the administration of this policy will be handled in accordance with the provisions of the Company's EDR Program.

5.5 CONFIDENTIALITY OF RECORDS

All information concerning an applicant or employee's medical condition or test results will be kept strictly confidential, with information released only upon a legitimate need-to-know basis.

6.0 REFERENCES

Corporate Substance Abuse Policy
Employee Personal Conduct Policy
Corporate Leaves of Absence Policy
Drug-Free Workplace Act of 1988

7.0 EXHIBITS

N/A

POLICY: WIRELESS DEVICE / CELLULAR PHONE USAGE

BACKGROUND:

In line with Parsons' *Zero Accident* goals, the Company has reviewed the available evidence and statistical data regarding the use of cellular telephones, PDA's or other wireless devices (collectively referred to as "wireless devices") while operating motor vehicles. The over-whelming conclusion is that using wireless devices while driving a car significantly increases the risk of a crash.

STATEMENT OF POLICY:

Therefore, it is Company policy that all wireless device use, whether "hand-held" or "hands free", ***is prohibited*** while driving any vehicle at any time as follows:

a. For business use *at any time*; or

b. For *personal use* <u>during business hours</u>; and

c. As defined by law

Communication devices in vehicles for constant use for access control and emergency response purposes are exempted from this policy.

RESPONSIBILITIES OF EMPLOYEES:

- Refrain from using wireless devices <u>as described above.</u>
- If wireless communications are required, drive to a safe parking area and use the device from that location while parked.
- This policy applies only to drivers, not to passengers in the vehicle.

REFERENCES:

This policy is maintained on the PWeb for ease of access.

APPROVED: 7/1/04

Referenced from: **PARSONS INFRASTRUCTURE & TECHNOLOGY HEALTH AND SAFETY MANUAL**

ATTACHMENT C1-8
HAND AND POWER OPERATED TOOLS

TABLE OF CONTENTS

C1.8.1.0 Hand Tools **2**

C1.8.2.0 Electric Power Tools **2**

C1.8.3.0 Pneumatic Power Tools **3**

C1.8.4.0 Fuel Powered Tools **3**

C1.8.5.0 Abrasive Wheels and Tools **4**

C1.8.6.0 6 Woodworking Tools **4**

C1.8.7.0 Powder Actuated Tools **4**
- C1.8.7.1 Tool Selection 5
- C1.8.7.2 Operating Recommendations 5
- C1.8.7.3 Operating Limitations 7

C1.8.8.0 Captive Stud Tools **7**

C1.8.9.0 Identification of Cased Loads **7**

C1.8.10.0 Tool Design Requirements **8**

TABLE

Table C1.8.10.1 Recommended Power Loads **9**

HAND AND POWER OPERATED TOOLS

All tools must be maintained in a safe condition.

When power operated tools are designed to accommodate guards, the guard must be in place on the tool.

The point of operation (the area on the machine where the work is being performed) must be guarded to prevent the operator from having any part of his or her body in the danger zone when there is exposure that could cause injury to the operator.

Belts, sprockets, gears, chains, spindles, drums, flywheels, or any moving or rotating part of equipment must be guarded if the parts could injure employees or otherwise create a hazard.

The periphery of blades must be guarded. The guards may not have openings larger than 1/2 in.

Employees must use the specific personal protective equipment necessary to protect against hazards such as dusts, fumes, mists, vapors, gases, falling objects, or flying, abrasive, and splashing objects.

Circular saws, chain saws, and percussion tools without positive accessory holding means, must be equipped with a switch that will shut the power off when it is released.

Machines designed for fixed locations must be anchored to prevent moving or walking.

C1.8.1.0 **HAND TOOLS**

The use of unsafe hand tools is prohibited.

Wrenches such as adjustable, pipe, end, and socket wrenches may not be used when the jaws are sprung and slippage could occur.

Impact tools such as drift pins, wedges, and chisels must be kept free of mushroomed heads.

Wooden-handled tools must be replaced if the handles become splintered or cracked. Wooden handles must be tight.

C1.8.2.0 **ELECTRIC POWER TOOLS**

Electric power hand tools must be of the approved double insulated type or must be in conformance with the assured grounding program requirements defined in section 11 of this manual.

Electric cords must not be used for hoisting, lowering, or any purpose other than their intended use.

Electric power tools that are damaged in any way must be taken out of service immediately.

C1.8.3.0 **PNEUMATIC POWER TOOLS**

Pneumatic power tools must be secured to their hoses or whips by a positive means to prevent the tools from being disconnected accidentally.

Pneumatic impact tools must have safety clips or retainers securely installed to prevent attachments from accidentally disconnecting.

All pneumatic nailers (or other similar equipment with automatic fastener feeds that operate at 100 psi) must have a device that will allow only fasteners to eject when the muzzle is in contact with the work surface and when a triggering device that is separate from the muzzle is activated simultaneously.

Compressed air used for cleaning purposes must be less than 30 psi. Effective chip guarding and personal protective equipment such as safety glasses or face shields must be used during cleaning.

Compressed air may not be used to clean the pneumatic tool operator or other persons.

The manufacturer’s guidelines for hose types, pipe valves, filters and other fittings must be followed at all times.

Hoses must not be used for hoisting and lowering objects.

All hoses having an inside diameter of more than 1/2 in. must have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

Airless spray guns that atomize paint or other fluids at high pressures (1,000 psi or more) must have a manual or automatic device that prevents the trigger from being pulled until the safety device is manually released.

In lieu of the above requirement, a diffuser nut may be used that prevents high-pressure, high-velocity release and a nozzle tip guard that prevents the tip from coming into contact with the operator.

Abrasive blast cleaning nozzles must have a valve that must be manually held open.

C1.8.4.0 **FUEL POWERED TOOLS**

Fuel powered tools may be refueled, serviced, or maintained only while the tools are stopped and not operating.

Fuels must be transported, handled, and stored in accordance with *29 CFR 1926, subpart F*.

When fuel powered tools are used indoors, extreme caution must be taken to prevent the buildup of carbon monoxide or other hazardous gases to concentrations that exceed established safe levels. Air movers, ventilation, and exhaust ducts are some controls required to reduce unsafe levels of hazardous gases. Personal protective equipment such as respirators must be used only after it has been determined that engineering controls will not reduce hazardous gas concentrations to safe levels.

C1.8.5.0 ABRASIVE WHEELS AND TOOLS

Floor-stand and bench-mounted abrasive wheels must be provided with substantial guards. The maximum angular exposure must not be more than 90 degrees. When the work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure must not exceed 125 degrees. Exposure must not begin at more than 65 degrees above the horizontal plane of the spindle.

Floor- and bench-mounted grinders must be provided with work rests adjusted to no more than 1/8 in. from the surface of the wheel.

Portable grinders must be guarded. The maximum angular exposure of the grinding wheel must not exceed 180 degrees. Exceptions are:

- When the work location makes the use of such guards impossible. In such circumstances, a wheel equipped with safety flanges must be used for wheels designed to fit the flanges.
- When wheels of 2 in. or less in diameter securely mounted on the steel mandrel are used. In such circumstances, a wheel equipped with safety flanges must be used for wheels designed to fit the flanges.
- When the wheel is entirely within the work being ground. In such circumstances, a wheel equipped with safety flanges must be used for wheels designed to fit the flanges.

Abrasive wheels must be inspected and ring-tested before mounting to ensure that the wheels are free of cracks or defects.

Do not force abrasive wheels onto spindles or overtighten the wheels onto the spindles.

The operating speeds indicated on the abrasive wheel must not be exceeded.

Safety glasses and face shields must be worn when grinding with abrasive wheels.

C1.8.6.0 WOODWORKING TOOLS

All fixed woodworking tools must be equipped with a disconnect that can be locked in the *OPEN* position only.

The operating speeds indicated on the saw blades must not be exceeded.

All portable power saws must be equipped with guards above and below the baseplate shoe. When the tool is withdrawn from the work, the lower guard must automatically and instantly return to the covering position.

C1.8.7.0 POWDER ACTUATED TOOLS

A number of tools using explosive charges to drive fastenings and perform similar functions are in wide use throughout the industry. The manufacturers of these devices provide detailed instructions regarding their use. Those instructions should be followed at all times.

The two types of powder actuated tools are direct acting and indirect acting.

- **Direct Acting Tool.** A tool in which the expanding gas of the power load acts directly on the fastener to be driven.
- **Indirect Acting Tool.** A tool in which the expanding gas of the power load acts on a captive piston, which in turn drives the fastener.

The three classes of tools are low velocity, medium velocity, and high velocity.

- **Low Velocity Tool.** A tool whose test velocity has been measured 10 times while using the highest velocity combination of:
  - The lightest commercially available fastener designed for that specific tool
  - The strongest commercially available power load that will properly chamber in the tool
  - The piston designed for that tool and appropriate for that fastener that will produce an average test velocity from the 10 tests not in excess of 10 meters per second (m/s) or 328 feet per second (ft/s) with no single test showing a velocity of more than 108 m/s (354 ft/s).
- **Medium Velocity Tool.** A tool whose test velocity has been measured 10 times while using the highest velocity combination of:
  - The lightest commercially available fastener designed for the tool
  - The strongest commercially available power load that will properly chamber in the tool
  - The piston designed for that tool and appropriate for that fastener that will produce an average test velocity from 10 tests in excess of 100 m/s (328 ft/s) but not in excess of 150 m/s (492 ft/s), with no single test having a velocity of 160 m/s (525 ft/s).
- **High Velocity Tool.** A tool whose test velocity has been measured 10 times while using a combination of:
  - The lightest commercially available fastener designed for the tool
  - The strongest commercially available power load that will properly chamber in the tool that will produce an average velocity from the 10 tests in excess of 150 m/s (492 ft/s)

C1.8.7.1 Tool Selection

Many applications requiring powder actuated tools can be successfully accomplished using the low velocity piston tool (trigger or hammer actuated). The low velocity piston tools should be used whenever possible because they impose the least potential risk to operator safety.

Only tools approved by a state or other governing agency should be used.

C1.8.7.2 Operating Recommendations

The assistance and services of the tool manufacturer or authorized distributor should be called on whenever doubt exists concerning proper use or service, or if operator training is required.

1. Powder actuated tools must only be used by properly trained and qualified operators. Users must possess qualified operator's cards which are issued by a particular manufacturer's authorized dealer or distributor or other competent source only after thorough training. Instructors must be authorized by the manufacturer.

2. Safety goggles must be worn by operators and assistants at all times while operating powder actuated tools. If a potential hazard could cause injury to an operator's face, transparent face shields must be used in addition to safety goggles.

3. Hearing protection must be used when operating the tools.

4. A loaded tool must never be carried away from a worksite. Tools must always be left unloaded until ready for use. Loaded tools must never be left unattended. Tools not in use must be kept in a locked case labeled *POWDER ACTUATED TOOL*.

5. Tools must never be pointed at anyone, whether loaded or unloaded, and hands must be kept clear of the open muzzle end at all times.

6. Powder actuated tools must never be stored or used in explosive atmospheres, in the vicinity of highly flammable materials, or where nonsparking tools are required.

7. Tools must be held firmly against and perpendicular to the surface being driven into, except for specific applications recommended by the tool manufacturer.

8. In the event of jamming or obstruction in the bore, the manufacturer's instructions must be carefully followed.

9. Tools must be inspected in accordance with manufacturers' recommendations before each use to ensure that:

   a. Safety devices are in proper working condition
   b. Tools are clean
   c. All moving parts operate freely

   Barrels are free from obstruction

Any tool not in working order or that develops a defect during use must be removed immediately from service and not used until proper repairs have been made by competent personnel. Before testing, check to make sure the tool is not loaded. Any tools found to be defective must be removed from service and from power loads and tagged *DEFECTIVE, DO NOT USE*.

1. Tools must be inspected and maintained on a regular basis and inspection documentation must be maintained at the site.

2. As required, use the appropriate safety guards supplied by manufacturers. Also follow the safety guard requirements in *ANSI A10.3-1985*.

3. Always use the proper type and powder level load. The preferred power loads are recommended by the manufacturer of each tool being used. To decrease power, use a lower number; to increase power, use a higher number.

4. In areas where powder actuated tools are being used extensively, warning signs (available from manufacturers) and barriers, if necessary, identifying the hazard area are recommended.
5. An operator's instruction manual must be kept in the carrying case for the specific tool being used for reference, when necessary, concerning proper operation, service, etc.
6. Only fasteners that are specially designed and manufactured for use in powder actuated tools may be used.

C1.8.7.3 Operating Limitations

Manufacturer's recommendations must be referred to if doubt exists about a fastening application. Do not drive into hard or brittle materials such as cast iron, glazed tile, surface-hardened steel, glass brick, live rock-face brick, and hollow tile.

To prevent flying hazards, no stud or attachment should be driven without first making sure that it will not pass completely through the material into which it is being driven.

Only fasteners specially designed and manufactured for use in powder actuated tools may be used.

Fasteners driven by standard velocity tools must not be driven directly into masonry materials closer than 3 in. from an unsupported edge or corner, or into steel closer than 1/2 in. from an edge or corner. Specific applications recommended by tool manufacturers are the only exceptions.

Fasteners may not be driven through existing holes unless the holes are used solely as guides, as recommended by tool manufacturers, and to ensure positive alignment.

Fasteners must not be driven into concrete unless material thickens and is at least three times the penetration depth of the fastener shank.

In the event of a misfire, tools must not be removed from the working surface for a minimum of 30 seconds. Then, the explicit instructions in the manufacturer's manual for the specific tool must be carefully followed.

C1.8.8.0 CAPTIVE STUD TOOLS

These tools are designed to stop a stud or pin in its tracks should it be fired mistakenly into soft or insubstantial materials. The stud is prevented from free flight by a piston and buffer in the guard assembly. A partial turn of the tool frees it from a stud properly set in the work surface. Captive stud tools have been replaced by low velocity powder actuated tools and are no longer available. However, some may still be in use in the field.

C1.8.9.0 IDENTIFICATION OF CASED LOADS

The standard means of identifying power levels of loads used in tools uses the uniform colors and printed descriptions shown in Table C1.8.10.1. The color codes are strikingly printed on the load containers to provide a visual indication of the power level of the load.

C1.8.10.0 TOOL DESIGN REQUIREMENTS

Among other requirements, the following design criteria must be complied with.

1. The tool must be designed to prevent inadvertent actuation.
2. The tool must be designed to prevent actuation that could propel a fastener or any part thereof into the air when dropped from a height of 3 meters (10 ft) onto a smooth, hard surface such as concrete or steel.
3. Actuation of any tool must depend on at least two separate and distinct operations by the operator, with at least one operation being other than the operation of holding the tool against the work surface.
4. The tool must be designed not to be operable other than against a work surface with a force on the work surface equal to 22 newtons (N) 5 lb greater than the weight of the tool, or a minimum impact energy of 4 joules (3 ft-lb).
5. All tools must be designed so that compatible protective shields or fixtures designed, built, and supplied by the tool manufacturer can be used.
6. Tools must be designed so that a determinable means of varying the power levels is available for selecting a power level adequate to perform the desired work.
7. Tools must be designed so that all principal functional parts can be checked for any foreign matter that may affect operation.
8. Tools must be designed so that all parts are of adequate strength to resist maximum stresses on actuation when the tool is used in accordance with the manufacturer’s instruction and is powered by any commercially available power load that will properly chamber in the tool.

Table C1.8.10.1 – Recommended Power Loads

Power Level	Color Identification		Nominal Velocity (ft/sec)
	Case Color	Load Color	
1	Brass	Gray	300
2	Brass	Brown	390
3	Brass	Green	480
4	Brass	Yellow	570
5	Brass	Red	660
6	Brass	Purple	750
7	Nickel	Gray	840
8	Nickel	Brown	930
9	Nickel	Green	1,020
10	Nickel	Yellow	1,110
11	Nickel	Red	1,200
12	Nickel	Purple	1,290
The nominal velocity applies to 3/8-in. diameter, 350 grain ballistic slug fired in a test device. It has no reference to the actual fastener velocity developed in any specific size or type of tool.			

Referenced from: **PARSONS INFRASTRUCTURE & TECHNOLOGY HEALTH AND SAFETY MANUAL**

ATTACHMENT C1-9
MOTOR VEHICLES AND HEAVY EQUIPMENT SAFETY

TABLE OF CONTENTS

MOTOR VEHICLES AND HEAVY EQUIPMENT SAFETY

C1.9.1.0 Earthmoving and Excavation Equipment 2
C1.9.2.0 Dump Trucks 2
C1.9.3.0 Powered Industrial Trucks 3
C1.9.3.1 Truck Related Topics 4
C1.9.3.2 Workplace related topics 4

Working with large motor vehicles and heavy equipment can be a major hazard at construction sites. Injuries can result from equipment hitting or running over personnel or from the overturning vehicles. Vehicle and heavy equipment design and operation must be in accordance with 29 CFR 1926.600 through 1926.602. In particular, the following precautions must be used to help prevent injuries:

- Vehicle operators must check brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices at the beginning of each shift.
- Large, construction motor vehicles will not be backed up unless:
- The vehicle has a reverse signal alarm audible above the surrounding noise level.
- The vehicle is backed up under the direction of a signalman.
- Heavy equipment or motor vehicle cabs must be kept free of all nonessential items, and all loose items must be secured.
- Safety glass must be used in windshields, windows, and doors. Cracked or broken glass must be replaced.
- Large construction motor vehicles and heavy equipment must be provided with necessary safety equipment (seat belts, rollover protection, emergency shutoff in case of rollover, and backup warning lights and audible alarms).
- Blades and buckets must be lowered to the ground and parking brakes set before shutting off a heavy equipment or vehicle.
- Any person operating a motor vehicle must hold a permit valid for the equipment being operated.

C1.9.1.0 EARTHMOVING AND EXCAVATION EQUIPMENT

The first operation performed at most construction sites is to change the landscape. Land is cleared and reshaped by excavating and moving earth. Equipment used to move earth must conform to OSHA requirements in 29 CFR 1926.602 and 1926.1001. Excavators, bulldozers, graders, compactors, road rollers, and other mobile equipment require rollover protective systems (ROPS). ROPS must comply with the performance criteria set forth in Society of Automotive Engineers Standard J1040 (adopted by OSHA in 29 CFR 1926.1001). Additionally, seat belts must be provided for vehicles equipped with ROPS. Large excavators working next to water should have an alternate escape route from the cab so the operator has a way out if the vehicle overturns in the water.

C1.9.2.0 DUMP TRUCKS

Dump trucks brought onto a construction site must comply with the requirements specified below before being place into service.

- All dump trucks must be equipped with a holding device to prevent accidental lowering of the body while maintenance or inspection is being performed.

- All hoist levels must be secured to prevent accidental slipping or tripping of the mechanism.
- All off-highway end-dump trucks must be equipped with a means (plainly visible from the operator's position when looking ahead) to determine whether the dump box is lowered.
- Trip handles for tailgates on all dump trucks must be positioned to keep the operator in the clear when the gate is opened.
- Brakes, tires, horn, steering mechanism, seat belts, operating controls, safety devices, and accessories must be operating correctly.

C1.9.3.0 POWERED INDUSTRIAL TRUCKS

Powered industrial truck accidents cause approximately 100 fatalities and 36,000 serious injuries each year. Forklifts must be selected based on fire hazard designation, carrying capacity, reach capability, terrain over which loads will be carried, atmospheric conditions in the workplace, and design of the workplace. For example, gasoline- or diesel-operated lift trucks are not recommended for use in locations where explosive concentrations of flammable gases or vapors may be present.

Forklifts that can elevate a load above the operator's head or forklifts used in locations where objects may fall on the operator must be equipped with an overhead falling object protective system (FOPS). FOPSs must comply with the design criteria specified in American National Standard for Powered Industrial Trucks, Part II, ANSI B56.1. Additionally, the Construction Safety Manager or a designee ensures that forklifts are equipped with the following safety features:

- Warning devices (backup alarm) and lights appropriate for the work environment.
- Seat belt or other restraining device.
- A load chart showing the maximum rated load and the variation of the rated safe load capacity with the reach of the equipment must be present in the operator's cab.

Violations of regulatory requirements for work practices and traffic management are frequently cited as contributing factors in a number forklift fatalities. Thus, as a minimum, the following requirements must be met:

- No part of a load may pass over any worker.
- A lift truck left unattended must be immobilized and secured against accidental movement.
- Forks, buckets, or other attachments must be in the lowered position.
- The maximum rated load for the lift truck may not be exceeded. Loads must be handled in accordance with the height and weight restrictions on the load chart.
- When a load is in the raised position, an operator must attend the controls.

- If an operator does not have a clear view of the path, a signalman must be used.
- Loads must be carried as close to the ground or floor as the situation permits.
- Loads that might tip or fall and endanger workers must be secured.
- A lift truck must not be used to support, raise, or lower a worker.
- Barriers, warning signs, designated walkways, or other safeguards must be provided where pedestrians are exposed to the risk of collision.

An estimated 25 percent of powered industrial truck-related injuries result from inadequate operator training. In 1998, OSHA promulgated training requirements for forklift operators.

Powered industrial truck operators must receive initial training in the topics listed below that are applicable to their work.

C1.9.3.1 Truck Related Topics

- Operating instructions, warnings, and precautions for type of truck being used
- Similarities to and differences from automobiles
- Control and instrumentation location and use
- Engine or motor operation
- Steering and maneuvering
- Visibility
- Fork and attachment limitations and use
- Vehicle capacity
- Vehicle stability
- Vehicle inspection, maintenance, and refueling
- Operating limitations
- Other operating instructions, warnings, or precautions listed in the operation manual

C1.9.3.2 Workplace related topics

- Surface conditions where truck is used
- Load composition and stability
- Load stacking, un-stacking, and transport
- Pedestrian traffic
- Narrow aisle and restricted area operation
- Operation in hazardous locations

- Ramp and sloped surface operation
- Unique or potentially hazardous conditions
- Operating the vehicle in closed environments

The employer must evaluate the performance of each powered industrial truck operator every three years. If the operator receives a deficient evaluation, then the operator must receive refresher training. Retraining must also be conducted when:

- There is reason to believe that an unsafe act has been committed.
- An accident or near-miss occurs.
- The operator is assigned to a different type of truck.
- A workplace condition changes that could affect truck operation.

Employers must provide certification that each operator has been trained and evaluated in accordance with OSHA requirements. The Construction Safety Manager must obtain copies of operator training certificates before forklift operation is permitted.

Referenced from: **PARSONS INFRASTRUCTURE & TECHNOLOGY HEALTH AND SAFETY MANUAL**

ATTACHMENT C1-10
LOCKOUT/ TAGOUT ENERGY CONTROL

TABLE OF CONTENTS

C1.10.1 Definitions 2
C1.10.2 Lockout Steps 2
C1.10.3 Tagout Tag Properties 2
C1.10.4 Lockout/Tagout Situations 3
C1.10.5 Parsons Lockout/Tagout 3
C1.10.6 Energy 3
C1.10.7 Protective Engineering 3
C1.10.8 Applying and Enforcing Energy Control 4
C1.10.9 Basic Work Rules 4
C1.10.10 Lockout/Tagout Removal 4
C1.10.11 Service, Maintenance, and Temporary Reactivation 8
C1.10.12 Special Lockout Precautions 8

TABLE

Table C1.10.10.1 Lockout/Tagout Steps 4

LOCKOUT/ TAGOUT ENERGY CONTROL

To perform work on industrial equipment safely, all employees must understand the importance of energy control and the requirements of the *OSHA Lockout and Tagout Standard*. They must also know how to apply energy isolation and lockout/tagout procedures.

The following procedures must be followed on all Parsons sites, except in those cases where client procedures supersede the Parsons requirements.

All lockout/tagout materials are supplied by Parsons unless client procedures or requirements supersede Parsons requirements.

C1.10.1 DEFINITIONS

- **Energy Source.** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other source of energy.
- **Lockout.** A lockout is a method of keeping equipment from being set in motion and endangering workers.
- **Tagout.** The energy isolation device is placed in the safe position and a written warning is attached to it.

C1.10.2 LOCKOUT STEPS

The following steps must be used to ensure that lockout is performed safely and effectively.

1. Ensure that a disconnect switch, circuit breaker, valve, or other energy isolating mechanism is in the *SAFE* or *OFF* position.
2. Ensure that any protective device placed over the energy isolating mechanism is in the *OFF* position.
3. Attach a lock to ensure that the equipment cannot be energized or actuated.

C1.10.3 TAGOUT TAG PROPERTIES

Tagout tags must have the following characteristics to ensure compliance with applicable OSHA and Parsons standards:

- Durable, to withstand wear;
- Substantial, so it cannot easily come off;
- Contains identifying information about the person who applies it.

Tagout/lockout should be used when an employee is performing service or maintenance around any machine which, if suddenly set in operation or motion, could cause injury. For example, unexpected startup of equipment or release of stored energy could cause injury to any person in close proximity to that machinery.

C1.10.4 LOCKOUT/TAGOUT SITUATIONS

Situations that are most likely to need lockout/tagout include:

- When a guard or other safety device must be removed or bypassed;
- When someone working in close proximity to moving machinery risks catching a body part in that machinery;
- During repair of electrical circuits;
- When cleaning or oiling machinery having moving parts;
- When clearing jammed mechanisms.

C1.10.5 PARSONS LOCKOUT/TAGOUT

Parsons uses lockout/tagout in combination on all equipment. The single use of a tag without a lock, or a lock without a tag, is not permitted. In addition, locks and tags by themselves do not de-energize equipment. They must be attached only after a machine has been isolated from its sources.

Parsons uses two methods to determine that its lockout/tagout procedures are properly understood.

- **Documentation:** a written statement of Parsons' energy control program.
- **Employee training:** to help employees understand how to use the energy control program.

C1.10.6 ENERGY

For purposes of this manual, energy is defined as movement or the possibility of movement. Whether a power switch is *ON* or *OFF*, energy of some sort is always present in any powered equipment. The two most common types of energy are:

- **Kinetic energy**: the force caused by the motion of an object.
- **Potential energy**: the force in an object that is not moving.

C1.10.7 PROTECTIVE ENGINEERING

Examples of protective engineering include:

- Machine guards

- Electrical disconnects
- Mechanical stops such as pins and valves
- Point-of-operation guards, which provide automatic protection against human error

Engineering guards and engineering safety features can be defeated. Engineering guards are designed specifically to provide automatic protection against human error. Never bypass a point-of-operation guard or let a coworker do so, and never rely solely on engineering safety features.

C1.10.8 APPLYING AND ENFORCING ENERGY CONTROL

Procedures for applying an energy control program include:

- Ensuring that energy isolation and lockout/tagout are applied only by trained employees authorized to perform service or maintenance
- Notifying all employees who work in an affected area before lockout/tagout is applied

Procedures for enforcing compliance with an energy control program include:

- Inspections at least once each month to determine that energy control procedures are being carried out
- Fair and uniform enforcement of safety rules
- Penalties for failure to follow written procedures

The OSHA regulation requires that control of hazardous energy be done according to a 6-step procedure. Components of the 6-step procedure and guidelines for successfully completing each step are shown in Table C1.10.10.1.

C1.10.9 BASIC WORK RULES

Basic common sense should govern work around potentially hazardous power operated equipment. Fundamentals include:

- Look ahead, and avoid doing anything that could re-activate the equipment
- Do not bypass the lockout when installing new pipe or wiring

C1.10.10 LOCKOUT/TAGOUT REMOVAL

This procedure must be followed when removing lockout/tagout.

- Determine that the equipment is safe to operate by removing all tools from the work area and verifying that the system is fully assembled.

- Safeguard all employees by conducting a headcount to make sure everyone is clear of the equipment; also, notify everyone in the area that lockout/tagout is being removed.
- Remove the lockout/tagout devices. Except in emergencies *each device must be removed by the person who attached it*.

Table C1.10.10.1

Lockout/Tagout Steps

OSHA Lockout/Tagout Procedure	Precautions
1. Preparation for Shutdown	Know the types and amounts of energy that power the equipment being shut down Know the hazards of that energy Know how the energy can be controlled
2. Equipment Shutdown	Shut the system down using its operating controls Follow the correct procedure for the equipment to avoid endangering anyone during shutdown
3. Equipment Isolation	Operate all energy isolating devices so that the equipment is isolated from its energy source Be sure to isolate all energy sources; secondary power supplies as well as the main one Never pull an electrical switch while it is under load Never remove a fuse instead of disconnecting it
4. Applying Lockout/Tagout Devices	Ensure that all energy isolating devices are locked and tagged Use only standard devices supplied by Parsons (or, in some cases, by the client) for lockout/tagout. Do not use such devices for any other purpose Use a lockout device if a lock cannot be placed directly on the energy control When using lockout, each employee working on a system must attach his or her personal lock to that system More than one employee can lock out a single energy isolating device by using a multiple-lock hasp Attach tags at the same point as the lock Tags must be filled out completely and correctly

Table C1.10.10.1

Lockout/Tagout Steps (Continued)

OSHA Lockout/Tagout Procedure	Precautions
5. Control of Stored Energy	Inspect each system to ensure all parts have stopped moving Install ground wires Relieve trapped pressure Release the tension on springs or block the movement of spring-driven parts Block or brace parts that could fall Block parts in hydraulic and pneumatic systems that could move from loss of pressure. Bleed lines and leave vent valves open. Drain process piping systems and close valves to prevent hazardous material flow If a line must be blocked where there is no valve, use a blank flange Purge reactor tanks and process lines Allow dissipation of extreme cold or heat. If time does not allow full dissipation, wear protective clothing to perform this step If stored energy can reaccumulate, monitor it to make sure it stays below hazardous levels
6. Verifying Isolation	Ensure that all dangerous areas are clear of personnel of equipment Verify that the main disconnect switch or circuit breaker cannot be moved to the *ON* position Use a voltmeter or other equipment to check that the switch is not hot Press all start buttons and other activating controls on the equipment to ensure that equipment has been isolated from its energy sources Shut down all machine controls when the testing is finished

- In some workplaces, the last person to remove a lock may have extra duties, such as removing the hasp and lockout device, and removing tags, signing them, and turning them in. In addition, the Parsons supervisor in charge of the work generally the last one to remove his or her tag and lock. The exception to this is the case where the client's designated personnel remove their locks and tags last.
- Develop and follow a checklist of required steps to re-energize the system.

C1.10.11 SERVICE, MAINTENANCE, AND TEMPORARY REACTIVATION

In certain cases where service or maintenance must be performed by others during lockout/tagout, the outside contractor and the onsite employer must exchange lockout/tagout information. Employees onsite must understand the rules used in other companies' energy control programs. Field personnel should be alert for new types and styles of lockout/tagout devices.

If equipment must be temporarily re-activated, remove unnecessary tools from the work area and make sure everyone is clear of the equipment. Then remove all lockout/tagout devices and re-energize the system. As soon as the energy is no longer needed, isolate the equipment and re-apply lockout/tagout, using the OSHA 6-step procedure in Table C1.10.10.1.

If servicing equipment requires more than one work shift, lockout/tagout protection must not be interrupted. Employees leaving work must not remove their locks until the next shift arrives and is ready to lock out.

C1.10.12 SPECIAL LOCKOUT PRECAUTIONS

When the person who installed a lock is not available to remove it:

- The lock can be removed only in an emergency, and only under the direction of the Parsons supervisor in charge of the work.
- The lock may not be removed until the person removing it makes sure it is absolutely safe.

These procedures give onsite employees the tools needed to work safely around hazardous energy sources. It is essential that these rules be followed to guard lives and health.

Referenced from: **PARSONS INFRASTRUCTURE & TECHNOLOGY HEALTH AND SAFETY MANUAL**

ATTACHMENT C1-11
FALL PROTECTION

TABLE OF CONTENTS

C1.11.1.0 Applicability 2

C1.11.2.0 Requirements 2
C1.11.2.1 Responsibilities 2
C1.11.2.2 General 3
C1.11.2.3 Conditions 4
C1.11.2.4 Work on Low-Slope Roofs 4
C1.11.2.5 Protection from Falling Objects 4
C1.11.2.6 Overhand Bricklaying and Related Work (See Definition) 5
C1.11.2.7 Inspections (Pre-Use and Formal) 5
C1.11.2.8 Facility Fall Hazard Prevention Analysis (FHPA) 6
C1.11.2.9 Climbing 6
C1.11.2.10 Aerial Lifts 6
C1.11.2.11 Scaffolds 6
C1.11.2.12 Compatibility of Equipment 7
C1.11.2.13 Personal Fall Arrest Systems (PFASs) 7
C1.11.2.14 Lifelines 7
C1.11.2.15 Anchors 8
C1.11.2.16 Warning Lines 8
C1.11.2.17 Controlled Access Zones (CAZ) 9
C1.11.2.18 Safety Monitors 9
C1.11.2.19 Holes, Openings, and Covers 10
C1.11.2.20 Fall Protection Plan 10

C1.11.3.0 Definitions 11

C1.11.4.0 References 14

FALL PROTECTION

This section provides the minimum requirements necessary to prevent or reduce the risk of injury from fall hazards.

C1.11.1.0 APPLICABILITY

This section is applicable to all types of work (including maintenance, operations, construction, and research) where an employee may be exposed to a fall hazard.

This section is not applicable to employees performing steel erection work on buildings. Steel erection is covered in section 5 of this manual.

This section is not applicable to employees engaged in the construction of electric transmission and distribution lines and equipment.

The requirements of this document may not apply when employees are making an inspection, investigation, or assessment of workplace conditions before the actual start of work or after all work has been completed with the construction manager's approval and Safety Representative's concurrence.

Stricter requirements may be imposed upon subcontractors by the directing client, project management, or contract terms.

C1.11.2.0 REQUIREMENTS

C1.11.2.1 Responsibilities

Responsible managers (see definition) are responsible for ensuring that:

- Walking/working surfaces (see definition) on which employees are to work have the strength and structural integrity to support employees safely.
- Prompt rescue of employees is provided in the event of a fall.
- Competent persons (see definition), qualified persons (see definition), and safety monitors (see definition) are designated for their area of responsibility.
- Training is provided for each Parsons employee who might be exposed to fall hazards.
- Fall hazard issues are considered and resolved in the design review of new equipment and facilities.

Construction Safety representatives (competent persons) are responsible for:

- Facilitating the implementation of this section.
- Resolving any misunderstanding concerning this section.
- Developing a fall hazard prevention analysis (FHPA) for routine tasks in assigned areas.

- Assisting the qualified person in developing Fall Protection Plans (FPPs).
- Assigning appropriate protective measures for fall hazards on work central documents.

Supervisors are responsible for:

- Enforcing compliance with the requirements of this section.
- Monitoring employee safety performance.
- Notifying the Safety Representative of the need for retraining of employees when:
  - There is reason to believe an affected employee’s knowledge and use of fall protection systems or equipment indicate that the employee does not possess adequate understanding or skill.
  - Changes in the workplace render previous training obsolete.
  - Changes in the types of fall protection systems or equipment to be used render previous training obsolete.

All employees are responsible for:

- Inspecting their personal fall protection equipment for wear, damage, and other deterioration prior to each use.
- Reporting and removing defective components from service.
- Using only the fall protection equipment for which they have been trained.
- Complying with the requirements of this section.

C1.11.2.2 General

Any employee exposed to a fall hazard greater than 6 feet must be protected by a conventional fall protection system (see definition).

EXCEPTION 1

Employees may be exposed to falls from heights greater than 6 feet with an approved FPP.

EXCEPTION 2

A travel restriction system (see definition) may be used to prevent exposure to a fall hazard.

Employees working off portable ladders above 10 feet use a personal fall arrest system (PFAS).

Three-point contact (see definition) must be maintained at all times when an employee works above 6 feet.

All fall protection equipment must meet the requirements of *ANSI A10.14-1991* or *ANSI 359.1-1992*.

Employees are allowed to work on only those surfaces that have adequate strength and structural integrity.

C1.11.2.3 Conditions

Working at heights outdoors is not permitted during bad weather (see definition).

Note: If there is any question concerning safe weather conditions, the area Safety Representative should be consulted

Employees working less than 6 feet above dangerous equipment (see definition) must be protected from falling into or onto the dangerous equipment by a guardrail system (see definition) or by equipment guards.

Employees working more than 6 feet above dangerous equipment must be protected by conventional fall protection.

C1.11.2.4 Work on Low-Slope Roofs

- Employees working within 6 feet of the roof edge must be protected by one of the following:

  A conventional fall protection system.
  A travel restriction system.
  A warning line system (see definition) in combination with a safety monitor.
  A safety monitor alone, on roofs with a width of less than 50 feet.

Materials and equipment may not be stored within 6 feet of a roof edge unless guardrails are erected at the edge.

Mechanical equipment (see definition) on roofs is used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system (CFAS; (see definition).

C1.11.2.5 Protection from Falling Objects

When an employee is exposed to potential falling objects, that employee must wear a hard hat. One of the following must be implemented:

- Toeboards (see definition), screens, or guardrail systems must be erected:
  - With opening sizes in the barrier smaller than the size of the potential falling objects.
  - At a sufficient distance to prevent objects from falling from higher levels.

OR

- A canopy structure of sufficient strength to prevent collapse or penetration must be erected.

OR

- The area to which objects could fall must be barricaded and employees prohibited from entering the barricaded area.

Objects that may fall from a higher to a lower level must be kept far enough away from the edge of the higher level so that those objects would not go over the edge if they were accidentally displaced.

Materials which are piled, grouped, or stacked near a roof edge must be stable, self-supporting, and secured.

C1.11.2.6 Overhand Bricklaying and Related Work (See Definition)

No materials or equipment except masonry and mortar must be stored within 4 feet of the working edge.

Excess mortar, broken or scattered masonry units, and all other materials and debris must be kept clear from the work area by removal at regular intervals.

A controlled access zone (CAZ; see definition) must be erected around the area to which objects could fall.

- The CAZ must be defined by a control line erected not less than 10 feet or more than 15 feet from the working edge.
- The control line should extend for a distance sufficient for the CAZ to enclose all employees performing overhand bricklaying and related work at the working edge.

The control line be approximately parallel to the working edge.

Additional control lines be erected at each end to enclose the CAZ.

On floors and roofs where guardrail systems are not in place before the beginning of overhand bricklaying operations, CAZs must be enlarged, as necessary, to enclose all points of access, material handling areas, and storage areas.

On floors and roofs where guardrail systems are in place but need to be removed to allow overhand bricklaying work or leading edge (see definition) work to take place, only that portion of the guardrail needed to accomplish that day’s work may be removed.

Only employees engaged in overhand bricklaying or related work are permitted in the CAZ.

C1.11.2.7 Inspections (Pre-Use and Formal)

Employees must conduct pre-use inspections on all fall protection gear prior to each use.

When gear fails its pre-use inspection, it must be removed from service and taken to the competent person responsible for the gear in that area.

A competent person must conduct a formal inspection of all fall protection gear every six months.

Fall protection gear must be marked to indicate the six-month inspection has been performed.

C1.11.2.8 Facility Fall Hazard Prevention Analysis (FHPA)

Note: A job hazard analysis (JHA) or other work control documents that meet the requirements of this section may be used as the FHPA.

FHPAs are attached to and retained with (standard work control records retention) other applicable work control documents associated with the task.

Each facility must conduct an FHPA for routine tasks.

The FHPA must identify, as a minimum:

- Each fall hazard associated with a routine task.
- The conventional fall protection system that will be used to mitigate the consequences of a fall.
- Anchor points.
- The fall protection equipment for each individual fall hazard.

The FHPA must be approved by the job supervisor, responsible manager, and a Safety Representative (competent person).

Employees working under the FHPA must sign and date the FHPA to indicate that they have read and will comply with the instructions of the FHPA.

C1.11.2.9 Climbing

Employees climbing to work locations must be provided fall arrest protection when climbing above 6 feet without a standard access route (such as portable or fixed ladders and stairs).

C1.11.2.10 Aerial Lifts

A body harness (see definition) with a positioning lanyard (see definition) must be worn when operating or working from the platform of all aerial lift devices (see definition).

Lanyards must be adjusted to restrict travel to the inside of the platform basket.

Employees must use only the floor of the platform as the walking/working surface.

Employees must not anchor off to an adjacent structure or equipment while in the lift.

C1.11.2.11 Scaffolds

Employees erecting scaffolds or working on completed scaffolds above 6 feet must be provided with a PFAS.

EXCEPTION

> This requirement is not applicable when working on scaffolds erected in compliance with *29 CFR 1926.451*.

C1.11.2.12 Compatibility of Equipment

Note: Fall protection components from different manufacturers, meeting *ANSI 359.1* and used as designed, may be mixed together to provide a PFAS.

All fall protection equipment used in a PFAS must be compatible (see definition).

C1.11.2.13 Personal Fall Arrest Systems (PFASs)

Only full body harnesses may be used.

Only self-closing, self-locking type snaphooks (see definition) may be used.

Only ropes and straps (webbing) made from synthetic fibers may be used in fall protection components.

PFASs must be rigged such that an employee can neither free fall (see definition) more than 6 feet, nor contact any lower level.

PFASs may be used only by an employee having a combined person and tool weight of less than 310 pounds.

PFASs and associated components subjected to impact loading (see definition) must be immediately removed from service.

- A competent person must inspect the PFAS or components for damage and suitability for reuse.
- The PFAS and associated components may not be used for employee protection until the equipment is certified for reuse by a Safety Representative (competent person) or the manufacturer.

PFASs may not be attached to guardrail systems or hoists.

When a PFAS is used at hoist areas, it must be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.

A positioning system (see definition) must be used in addition to the PFAS when the task demands the use of both hands.

C1.11.2.14 Lifelines

On suspended scaffolds or similar work platforms with horizontal lifelines (see definition) which may become vertical lifelines, the devices used to connect to a horizontal lifeline must be capable of locking in both directions on the lifeline.

Horizontal lifelines must be designed, installed, and used, under the supervision of a qualified person, as part of a complete PFAS, which maintains a safety factor of at least two.

When vertical lifelines are used, each employee must be attached to a separate lifeline.

During construction or maintenance of elevator shafts, two employees must be allowed to be attached to the same lifeline in the hoistway, provided:

- Both employees are working atop a false car that is equipped with guardrails.
- The strength of the lifeline is 10,000 pounds (5,000 pounds per employee attached) or a two to one safety factor.
- All other criteria specified in this section for lifelines have been met.

C1.11.2.15 Anchors

Anchors used for attachment of personal fall arrest equipment must be independent of any anchorage (see definition) being used to support or suspend platforms.

Anchors must be designed to at least one of the following criteria

- Anchors must be capable of supporting at least 5,000 pounds per employee attached.

OR

- Anchors must be designed, installed, and used as follows:
  - As part of a complete PFAS which maintains a safety factor of at least two.
  - Under the supervision of a qualified person.

Anchors must have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet or the free fall distance (see definition) permitted by the system, whichever is less.

Anchors for travel restriction must be capable of supporting at least 500 pounds.

Note: The requirement in the preceding paragraph is an exception to the anchorage requirements in subsection 2.16 of this section. This requirement is applicable to work in elevator shafts only.

C1.11.2.16 Warning Lines

Where warning lines are used, they must be designed to the performance criteria in Exhibit 2 and the following:

- The warning line must be erected around all sides of the roof or work area.
- When mechanical equipment is not being used, the warning line must be erected not less than 6 feet from the roof edge.
- When mechanical equipment is being used, the warning line must be erected:
- Not less than 6 feet from the roof edge which is parallel to the direction of mechanical equipment operation, and
- Not less than 10 feet from the roof edge which is perpendicular to the direction of mechanical equipment operation.

Points of access, materials handling areas, storage areas, and hoisting areas must be connected to the work area by an access path formed by two warning lines.

When the path to a point of access is not in use, one of the following must be performed.

- A rope, wire, chain, or other barricade equivalent (see definition) in strength and height to the warning line must be placed across the path at the point where the path intersects the warning line erected around the work area.

OR

- The path must be offset such that a person cannot walk directly into the work area.

No employee is allowed in the area between a roof edge and a warning line unless that employee is performing roofing work in that area.

C1.11.2.17 Controlled Access Zones (CAZ)

Where CAZ lines are used, they must be designed to the performance criteria and comply with the following:

- When used to control access to areas where leading edge and other operations are taking place, the CAZ must be defined by a control line or by any other means that restricts access.
- When control lines are used, they must be erected not less than 6 feet nor more than 25 feet from the unprotected edge (see definition) or leading edge, except when erecting precast concrete members.
- When erecting precast concrete members, the control line must be erected not less than 6 feet nor more than 60 feet or half the length of the member being erected, whichever is less, from the leading edge.

The control line must extend along the entire length of, and approximately parallel to, the unprotected or leading edge.

The control line must be connected on each side to a guardrail system or wall.

C1.11.2.18 Safety Monitors

The safety monitor must be competent to recognize fall hazards.

The safety monitor must warn the employee when it appears that an employee is unaware of a fall hazard or is acting in an unsafe manner.

The safety monitor must be on the same walking/working surface and within visual sighting distance of the employee being monitored.

The safety monitor must be close enough to communicate orally with the employee.

The safety monitor must not be assigned other responsibilities which could take the monitor’s attention from the monitoring function.

Mechanical equipment may not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs (see definition).

Only employees engaged in roofing work (see definition) on low-sloped roofs or those covered by an FPP, are allowed in an area where an employee is being protected by a safety monitoring system.

Employees must comply with the safety monitor's instructions.

C1.11.2.19 Holes, Openings, and Covers

Holes (see definition) and openings (see definition) must be barricaded or covered whenever work is not being actively performed in the hole or opening.

Note: Skylights are considered to be a type of a hole.

Covers in floors, roofs, and other walking/working surfaces (including roadways and vehicular aisles) must be capable of supporting at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

All covers must be secured when installed so as to prevent accidental displacement.

All temporary covers must be color coded or marked with the word "HOLE" or "COVER" to warn of the hazard.

EXCEPTION

> This requirement does not apply to cast iron manhole covers or steel grates used on streets or roadways, nor to confined space accesses or equipment access hatchways.

C1.11.2.20 Fall Protection Plan

Note: Other forms of work control may be used as an FPP provided they conform to the criteria in this section.

Fall protection plans (FPPs) must be attached to and retained with (standard work control records retention) other applicable work control documents associated with the task.

Only those employees engaged in leading edge work, precast concrete erection work or who can demonstrate that it is unfeasible (see definition) or it creates a greater hazard to conventional fall protection system are allowed to work under an FPP (see Exhibit 19-3 for a standardized FPP).

Note: There is a presumption that the use of conventional fall protection system is feasible and will not create a greater hazard to implement. Accordingly, Parsons has the burden of establishing that it is appropriate to implement an FPP for a particular workplace situation.

An FPP must document the reasons why the use of conventional fall protection systems are infeasible or why their use would create a greater hazard.

The FPP must include a written discussion of other measures that will be taken to reduce or eliminate the identified fall hazard.

The FPP must identify each location where conventional fall protection systems cannot be used.

These locations must be classified CAZs.

Where no other alternative measure has been implemented, the employer must implement safety monitoring.

Each employee working under an FPP must be identified by name.

Only designated employees are allowed to enter CAZs.

The FPP must be developed specifically for the site where the work is being performed.

The FPP must be kept up to date.

Any changes to the FPP must be approved by a qualified person.

A copy of the FPP with all approved changes must be maintained at the jobsite.

The implementation of the FPP must be under the supervision of a Safety Representative (competent person).

In the event an employee falls or some other related, serious incident occurs (such as a near miss), the employer must investigate the circumstances of the fall or other incident to determine if the FPP needs to be revised.

The employer must implement identified changes to prevent similar types of falls or incidents.

C1.11.3.0 DEFINITIONS

Aerial lift devices	Any vehicle mounted device, telescoping, articulated, or both, used to position personnel above a lower level.
Anchorage	A secure point of attachment for lifelines, lanyards, or deceleration devices.
Bad weather	For the purposes of this section, any weather condition that may increase the hazard of falling for personnel working from heights including snow, rain, icing or wind gusts of 35 miles per hour or sustained winds of 25 miles per hour.
Body harness	An arrangement of straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a PFAS.
Compatible	For the purposes of this document, system subcomponents are used and arranged in the system based on their design intent and that subcomponent connectors are arranged so that no combination of twisting and pressure between snaphooks, carabiners, etc., can cause rollout.

Competent person	An individual capable of identifying hazardous or dangerous conditions in a PFAS or any component thereof, capable of identifying hazardous or dangerous conditions in the application and use of the PFAS or any component thereof with related equipment, and knowledgeable in the requirements of *29 CFR 1926, subpart M.*
Controlled access zone	An area in which certain work (for example, overhand bricklaying) may take place without the use of guardrail systems, PFASs, or safety net systems and access to the zone is controlled.
Conventional fall protection system	The use of a PFAS, guardrail system, or safety nets to protect employees from the consequences of a fall.
Dangerous equipment	Equipment (such as pickling or galvanizing tanks, degreasing units, machinery, and open electrical equipment) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.
Equivalent	Alternative designs, materials, or methods to protect against a hazard which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in this section or *29 CFR 1926, subpart M.*
Free fall	The act of falling before a PFAS begins to apply force to arrest the fall.
Free fall distance	The vertical displacement of the fall arrest attachment point on an employee's body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline or lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline or lanyard extension before they operate and fall arrest forces occur.
Guardrail system	A physical barrier erected to prevent employees from falling to lower levels.
Holes	Gaps or voids in a floor, roof, or other walking/working surface.
Infeasible	For the purposes of this section, a term used to indicate that it is impossible to perform work using a conventional fall protection system (for example, a guardrail system or PFAS) or that it is technologically impossible to use any one of these systems to provide fall protection.
Impact loading	A component or components of a PFAS or a PFAS that has received the forces generated by someone falling while connected to the system.
Lanyard	A flexible line or strap which generally has a connector at each end for connecting the body harness to a deceleration device, lifeline, or anchorage.
Leading edge	The edge of a floor, roof, or form work for a floor or other walking/working surface (such as a deck) which changes location as additional floor, roof, decking, or form work sections are placed, formed, or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.
Lifelines	Components consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a PFAS to the anchorage.

Low-slope roofs Roofs having a slope less than or equal to 4 in 12 (vertical to horizontal).

Mechanical equipment For the purposes of this section, all motor or human propelled, wheeled equipment used for roofing work except wheelbarrows and mop carts.

Opening A gap or void 30 inches or more high and 18 inches or more wide, in a wall or partition, through which employees can fall to a lower level.

Overhand bricklaying and related work The process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

Personal fall arrest system (PFAS) A system used to arrest an employee in a fall from a working level It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Positioning system A body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning. It is a one type of a personal restraint system.

Qualified persons Individuals with a recognized degree or professional certificate and extensive knowledge and experience in the subject field and who are capable of design, analysis, evaluation and specifications in the subject work, project, or product.

Responsible manager Any person directing activities of personnel exposed to fall hazards. This includes construction management, facility managers and project managers.

Roofing work The hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal and vapor barrier work, but not including the construction of the roof deck.

Safety monitors Competent persons assigned to observe other employees and who are responsible for recognizing and warning employees of fall hazards.

Snaphooks Connector comprised of hook-shaped members with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks are generally one of two types:

1. The **locking type** has a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection.
2. The **nonlocking type** has a self-closing keeper which remains closed until pressed open for connection or disconnection. This type of snaphook is not used on Parsons projects.

Three-point contact The process of maintaining at least three points of contact with a ladder; for example, two feet and one hand in contact with the ladder.

Toeboards Low protective barriers that will prevent the fall of materials and equipment to lower levels and provide some protection from falls for personnel and stepping into small floor holes

Travel restriction system	A type of personal restraint system which prevents one from reaching a location where a fall hazard exists. Travel restriction is a type of exposure prevention and is preferred over the use of a fall arrest system.
Unprotected side	For the purposes of this section, any side or edge (except at entrances to points of access) of a walking/working surface, (such as a floor, roof, ramp, or runway) where there is no wall or guardrail system at least 39 inches high.
Walking/working surface	A term used to describe any surfaces, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, form work and concrete reinforcing steel. This type of surface does not include ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.
Warning line system	A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of conventional fall protection systems to protect employees in the area.

C1.11.4.0 REFERENCES

- 29 CFR 1926, Subpart M, Fall Protection
- 29 CFR 1910.66 Attachment C, Powered Platforms, Manlifts, and Vehicle Mounted Work Platforms
- ANSI A10.161991, Requirements for Safety Belts, Harnesses, Lanyards, and Lifelines for Construction and Demolition Use
- ANSI Z359.1-1992, Safety Requirements for Personal Fall Arrest Systems, subsystems and components

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

Site Name: ______________________ **Job Number:** ______________
Site Phone Number: ______________________
Site Address: ______________________ **County:** ______________
Client Proj. Mgr.: ______________________ **Phone:** ______________
Site Manager Contacted Date: ______________ **By:** ______________
Site Drawings (yes / no / NA) ________ **(please attach)** **Historical Drawings (yes / no / NA)** ________
Third Party Construction/Redevelopment Plans (Yes/No/NA)

***ATTACH SITE FIGURE WITH PROPOSED BORING LOCATIONS

Subcontractor's (drillers, concrete, etc…) **Company** ______________________
Subcontractor's Contact Person ______________________ **Phone** ______________
Meeting / Start Date ______________________ **Time** ______________

1) Health and Safety Signoff Form Completed? (Yes/No) **Date** ______________

2) Utility Protection Services (Minimum 48 Hrs. Advance Notice, State Specific Notification Period Supercedes)
Called: Date __________ **Time** ______________ **Initials** __________
Reference # ______________________
Proposed Drilling Locations Premarked for Locating Service. **Y / N**

3) Private or In-House Utility Locating Service Performed? **Y / N** ________
Called: Date __________ **Time** ______________ **Initials** __________
Name of Locating Service: ______________________
Telephone #/ contact: ______________________
Name of Supplier Locating Technician: ______________________
Type of sensing equipment used: ______________________
Proposed Drilling Locations Premarked **Y / N**

4) Other Potential Underground Structures
Name of City Engineer/Utility Representative: ______________________
Telephone #: ______________________
Date Notified ______________________ **Maps:** **Y / N**
Cleared: **Y / N**

5) COMPLETED SITE WALKOVER W/ SITE MANAGER/DESIGNEE OR OWNER/TENANT REP. **Y / N**
Name of Site Manager: ______________________
Name of Property Owner/Tenant Representative:_________________________
Cleared: **Yes / No**
Building Utility Service Line Connections Identified: **Y / N**
(Hand sketch on site map w/proposed boring locations and most likely utility trench locations)

6) Utility Inventory: **Y / N**

Utility	Name	Depth (ft) (If Available)	Phone	Notified	Date	Marked
Above Ground Services						
Electric		NA		Y / N		Y / N
Telephone		NA		Y / N		Y / N
Cable		NA		Y / N		Y / N
Overhead Supports		NA		Y / N		Y / N
Traffic light cables		NA		Y / N		Y / N

6) Utility Inventory Continued:

Below Ground Services:

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

Electric				**Y / N**		**Y / N**
Telephone				**Y / N**		**Y / N**
Cable				**Y / N**		**Y / N**
Gas				**Y / N**		**Y / N**
Water				**Y / N**		**Y / N**
UST System				**Y / N**		**Y / N**
Storm				**Y / N**		**Y / N**
Sanitary				**Y / N**		**Y / N**
Steam				**Y / N**		**Y / N**
Pipeline Companies				**Y / N**		**Y / N**
Other:						
				Y / N		**Y / N**
				Y / N		**Y / N**
				Y / N		**Y / N**

7) **Site-Specific Emergency Contingency Plan Incorporated in Health & Safety Plan** **Y / N**

8) **Drilling Locations Approved by Client Project Manager Named Above?** **Y / N**

9) **Signature of Parsons' Project Mgr. (required to begin fieldwork):**

Name of Project Manager	**Signature of Project Manager**
Name of Parsons Field Personnel	**Signature of Field Personnel**

(This document to be included with the site H&S Plan and should be available upon request.)

ADDITIONAL COMMENTS / NOTES:

Referenced from: **PARSONS INFRASTRUCTURE & TECHNOLOGY HEALTH AND SAFETY MANUAL**

ATTACHMENT C1-13
DRUM AND ROLL-OFF HANDLING

TABLE OF CONTENTS

C1.13.1 INTRODUCTION 2

C1.13.2 EQUIPMENT 2

C1.13.3 GENERAL REQUIREMENTS 2

C1.13.4 DRUMS 3

C1.13.5 ROLL-OFFS 3

C1.13.6 OTHER CONTAINERS 4

HANDLING OF DRUMS, ROLL-OFFS AND OTHER CONTAINERS

C1.13.1 INTRODUCTION

Operations for handling potentially contaminated soil must follow a basic set of rules or procedures. This SOP provides the necessary guidelines for placing potentially contaminated soil in drums, roll-offs, or other containers.

C1.13.2 EQUIPMENT

The following equipment will be needed:

- Excavator, to move soil from excavation or soil pile.
- Skid-steer loader or forklift to move pallets and drums.
- Drum funnel.
- Hand tools, for moving soil from excavator bucket to drum, sealing drums, etc.
- Air monitoring equipment including PID.

C1.13.3 GENERAL REQUIREMENTS

- Drums should be staged in one of three locations based on their status:
- Clean, empty drums may be staged where convenient but not with drums that have been used.
- Drums that have been filled but have not been cleared based on head-spacing or low-level analysis of samples must remain in a down range holding area
- Drums, for which head-spacing and low-level results of samples are available, may be staged to the Drum Staging Area to await offsite disposition.
- Drums should be placed on pallets close to the excavation and within reach of the excavator.
- Roll-off containers should be placed within reach of the excavator, or a loader can be filled by the excavator and then used to dump the soil into the roll-off.
- PPE Levels worn will be determined based on air monitoring as described in the work plan.
- Drums should remain down range until the following criteria are met:
  - the drum exteriors are decontaminated, if required
  - the results of headspacing and/or sampling indicate the disposition of the drum, *i.e.* - whether the contents require decontamination, or that they may be staged for disposal.

C1.13.4 DRUMS

The following steps will be followed when moving soil from the excavation or from a soil pile:

1. The day's operation of pallets and drums will be staged near the area of the excavation or soil pile to be drummed.
2. A pallet will be placed on an elevated platform (such as two 4x4 boards) and the drums placed on the pallet.
3. The drums will be pre-marked IAW the work plan so that proper tracking can be accomplished.
4. Perforated pipes with end caps will be placed within the drums for future decontaminating, if it becomes necessary.
5. A soil funnel will be placed in the first drum to be filled.
6. The excavator will extract a bucket of soil from the excavation or soil pile and hold it over the drum. The soil/drum handlers will pull the soil off of the bucket with hand tools while the operator gently shakes the soil out. The handlers will watch for anything unusual such as metal, glass, big limbs, etc. Soil samples may be collected during this process.
7. Once the drum is approximately 1/2 to 2/3 full, the funnel will be moved to the next drum and the procedure repeated until the drums on the pallet are all 1/2 to 2/3 full, or the specified soil has been drummed.
8. When all the drums are filled, they will be sealed and secured to the pallet. The pallet will then be moved to the Holding Area.
9. Any soil samples collected in association with the pallet being moved to the Holding Area can be given to the loader/forklift operator who will deliver it to the PDS. The pallets with drums will be staged in the Holding Area on the east side of road in a designated area depending on disposition. The drums that require decontamination will be kept separate and will be accumulated until either room is needed or the excavation operation is completed; at that time bleach can be added to decontaminate the soil.

C1.13.5 ROLL-OFFS

Materials from the excavation or soil pile will be placed in a roll-off container with the following considerations.

- Roll-offs will be used for wastes that will be sent to a landfill for disposal.
- The excavator will fill the roll-off directly while the handler and safety observer watch the excavation hole for unusual debris.
- Following completion of the day's activities, the roll-off must be covered with a lid or tarp to prevent the infiltration of rainwater or other materials.
- Once the roll-off is full it will be staged for further disposition.

C1.13.6 OTHER CONTAINERS

Other containers, such as one cubic yard containers, may be used instead of roll-offs.

APPENDIX C- 2
PROJECT ORIENTATION

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PROJECT ORIENTATION OUTLINE

*The Project Orientation Outline will be modified by the Project Health and Safety Manager, Field Team Leader or the Site Health and Safety Officer as appropriate. A task-specific orientation will be prepared to discuss health and safety requirements related to specific work activities.

I. Names of personnel responsible for site safety and health

a. Project Manager, Safety Manager, Site Safety Officer, and Field Team Leader
b. Contact Information

II. Emergencies

a. Call 911 or your Program Manager, Project Manager, Safety Manager for emergencies.
b. Route to Hospital
c. Other Emergency numbers

III. Incidents

a. Parsons Accident/Incident- Reporting Procedures

IV. Safety, health, and other hazards at the site

a. Review specific AHAs as appropriate to the worker's activities.
b. Review chemicals of concern and associated hazards
c. Other hazards(e.g. slips, trips, weather, equipment, etc.)

V. Proper use of personal protective equipment

a. Review Minimum Personal Protective Equipment – (i.e., hard hat, safety glasses, work boots).
b. Review Additional Personal Protective Equipment- (i.e., tyvek, latex and rubber gloves when potential with contaminates of concern in soil or groundwater.)

VI. Work practices by which the employee can minimize risk from hazards

a. Training - all personnel must receive site-specific training and attend/review daily toolbox safety meetings.
b. Contamination - no eating, drinking or smoking in the work zone.
c. Proper hygiene – wash hands and face before eating, drinking and smoking and only in designated areas.
d. "Buddy System" – use two-way radio/ cell phone for communicating and reporting emergencies.

VII. Safe use of engineering controls and equipment on the site

a. Mobile equipment – use horns to alert others, mirrors and back-up/travel alarm must be functional.

VIII. Decontamination procedures

a. Review Decontamination Procedures for work zones, equipment, PPE (e.g. coveralls, gloves, footwear) must be decontaminated or disposed before leaving the exclusion zone. Tyvek coveralls and gloves cannot be worn outside the exclusion zone, even if they are clean. Use boot wash stations when appropriate. Exclusion zones exist around the perimeter of intrusive activities. Support zones are at the perimeter of the exclusion zone.

PROJECT ORIENTATION ATTENDANCE SHEET

(FOR ALL PARSONS AND SUBCONTRACT EMPLOYEES ON SITE)

I hereby confirm that site / task-specific health and safety training has been conducted by the site health and safety officer which included:

- Names of personnel responsible for site safety and health
- Safety, health, and other hazards at the site
- Proper use of personal protective equipment
- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment on the site
- Acute effects of compounds at the site
- Decontamination procedures

For the following project:

____________________	____________________	____________________
(Project Title)	(Project Number)	(City, State)

Name (print)	**Signature**	**Company**	**Date**

Maintain in Site Safety & Heal Plan file.

(Use additional sheets if necessary)

APPENDIX C- 3
SAFETY STATISTICS SUMMARY

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Form 300A (Rev. 01/2004)

Year: 2015

Overall Summary of Work-Related Injuries and Illnesses

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

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."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

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	4	6	13
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
25	221
(K)	(L)

Injury and Illness Types

Total Number of ...
(M)

(1) Injuries	23	(4) Poisonings	0
(2) Skin Disorders	0	(5) Hearing Loss Cases	0
(3) Respiratory Conditions	0	(6) All Other Illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send completed forms to this office.

Establishment Information

Your Establishment Name – Parsons Government Services
Street – 100 West Walnut Street
City - Pasadena State - CA Zip Code - 91124

Industry description *(e.g., Manufacture of motor truck trailers)* – Engineering Services

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

OR

North American Industrial Classification (NAICS), if known (e.g., 336212) - 541330

Employment Information

(If you don't have these figures, see the Worksheet on the back of this page to estimate.)

Annual average number of employees - 4,073
Total hours worked by all employees last year - 8,312,224

Sign Here

Knowingly falsifying this document may result in a fine.

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

[signature]	VP, Safety, Health, and Environment
Company Executive	Title
(312) 930-5117	01 / 22 / 2016
Phone	Date

Appendix C-3
Safety Statistics

2015 Accident Rates

Total Recordable Incident Rate (TRIR)	**-0.55**
Lost Workday Incident Rate (LWIR)	**-0.096**
Days Away, Restricted, or Transfer Rate (DART)	**-0.24**

APPENDIX C- 4
CERTIFICATION AND RESUME

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CHERYL A. HUEY
Field Technician

Experience Summary

Experienced in portable air monitoring, groundwater and soil vapor sample collection, remediation pilot tests, hydrotest water treatment, well decommissioning, some stormwater sampling, site investigations, quality control charts and report forms. Remediation systems operations and maintenance of equipment. Safety officer for 2 field projects. Previous experience in factory work; all phases of finishing department at a fiberglass plant.

Years of Experience

36

Years with Parsons

25

Education

Edgewood Senior High School (Ashtabula, Ohio)
Diploma, 1978

Special Training

Certificate in Hazardous Waste Operations (40-Hour 29 CFR Course)

Continuing Education Classes, sponsored by Molded Fiber Glass

Zenger Miller Frontline Leadership Training System:
- Process Flow Charting
- Statistics
- Industrial Mathematics
- Process Flow Diagramming
- Blueprint Reading and Understanding

Certificate in Supervisory Instruction (8 Hour – 29 CFR 1910.120(e))

Certificate of Completion (44-Hour Electrical Program) Spring 2000

OSHA 10HR general industry & 10/30 HR Construction H&S Certificate

Frist Aid/CPR/AED certificate March 2017

Current BloodBourne Pathogens certificate

Completed over 60 online H&S modules.

Smith System Defensive Driving course with refresher every 2 years.

Primary Experience

2003-Date. Parsons. **Field Tech IV**. Worked on hydrotest water treatment systems for a major petroleum client. Responsible for setup, operation and maintenance, and demobilization of the water treatment system for tank and line hydrotesting. Site investigations for Chevron project including hand augering, boring logging, excavation oversight of petroleum contaminated soils, and site characterization. Also, set up and operated a pilot test study with air sparging at ExxonMobil research facility.

1994-Date Parsons. **Field Tech IV**. Responsible for site monitoring of remediation systems. Activities include routine maintenance of air compressors, vacuum blowers, pumps (pneumatic & electrical), water sampling, surveying, groundwater monitoring and sampling, site checks, SVE monitoring, sample collection, and site historical evaluations. Monthly sampling done at 15 sites for NPDES/ EPA permitting (includes system sampling, outfall sampling-pond and stream). Groundwater monitoring and sampling for sites for AFCEE and Army Corp of Engineers. Responsibilities include site safety officer for Ohio PBC sites, back-up site safety officer for Altus AFB sampling team. MNA monitoring (field testing), veg oil injections and monitoring at Ft. Bragg as well as site safety officer for sampling team. **1991-1993 Air Monitoring Field Technician**. Responsible for portable air monitoring surveys at Laskin/Poplar Oil Company Superfund Site in Jefferson, Ohio. Activities include calibrating portable equipment before each survey and filling out reports and quality control charts. Assist on preparing and collecting samples for off-site analysis at Laskin/Poplar Superfund Site. Assist in general maintenance of high-volume samplers. Responsible for inventory control of sample media. Assisted on calibrating gas chromatographs for on-site VOC analysis.

Other Experience

1988-1991 Molded Fiber Glass Companies, Ashtabula, Ohio. **Receiving-Warehouse (1988-1991)**. Duties included unloading trucks with supplies from vendors, keeping inventory of stock, and making sure all needed materials were available for job completion.

Group Leader (1981-1988). Duties included supervision of other workers, problem solving, scheduling and recordkeeping.

Material Hander (1979-1981). In charge of setting up press and finishing areas with needed materials and moving finished products to storage area.

Finisher (May 1979-Sept. 1979). Prepared various fiberglass products for the paint department.

8

1/24/2013

Congratulations!

Parsons Cheryl Huey
Parsons

You have successfully completed the online OSHA course

Construction Industry 30 Hour

through Summit Training Source, Inc. with a final score of

84.93%.

Your paper work is being processed and you will receive your card within 6-9 weeks.

Please use this certificate as proof of completion until you receive your card.

If you have any questions re
1-800-842-0466 or

DOT Hazardous Materials General Awareness Training
CERTIFICATE OF COMPLETION

Cheryl Huey

Certificate Number: Parsons DOT49454

Has received training on items specified in 49 CFR 172.704 through the completion of seven modules on ParsonsU in order to become familiar with the DOT hazardous materials regulations related to packaging, marking, labeling, shipping papers, and security requirements.

PARSONS
Somerset, New Jersey

January 29, 2013	January 31, 2016	
Date of Course Completion	Date of Expiration	Gregory H. Beck, CSP Division Safety Manager

ENGINEERING-SCIENCE
CERTIFICATE OF TRAINING

This Certifies That

Cheryl Huey

Employee Number: 283-68-9329

Has Successfully Completed a 24 Hour Course of Instruction In

HAZARDOUS WASTE OPERATIONS

In Accordance with 29CFR Part 1910.120(e)

Prepared and Conducted By

ENGINEERING-SCIENCE, INCORPORATED
Pasadena, California

February 18-20, 1991	Ashtabula, Ohio	Timothy S Mustard
Dates of Instruction	Course Location	Coordinator/Instructor

Certificate Of Completion

PRESENTED TO

Cheryl Huey

In Recognition of Successful Completion of Requirements In

CPR/AED (Adult / Child / Infant)
Universal First Aid

3/13/2015
CERTIFICATION DATE

3/13/2017
EXPIRATION DATE

HOLDER'S SIGNATURE

AUTHORIZED SIGNATURE

www.AmericanSTI.org

This certifies participant listed above has successfully passed skills evaluation in accordance with national cognitive skills examination standards and American Safety Training Institute certification terms and conditions. American Safety Training Institute courses follow national guidelines set by the American Heart Association (AHA), and the International Liaison Committee on Resuscitation (ILCOR). The American Safety Training Institute is not associated, affiliated with, sponsored, or endorsed by, American Safety and Health Institute (ASHI), American Heart Association (AHA), or American Red Cross (ARC), and unless otherwise specified no affiliation or endorsement is implied. SUCCESSFUL COMPLETION DOES NOT GUARANTEE FUTURE PERFORMANCE.

Hazardous Waste Operations and Emergency Response
CERTIFICATE OF COMPLETION

Cheryl Huey

Certificate Number: Parsons HAZ16-49454

Has completed 8 hours of refresher training on items specified in 29 CFR 1910.120(e)(2), including the critique of Parsons incidents that have occurred over the past 12 months and satisfactorily passing an examination demonstrating an understanding of the material.

PARSONS
Somerset, New Jersey

August 29, 2016	August 31, 2017	
Date of Course Completion	Date of Expiration	John R. Barker, CSP V.P. Safety, Health, Environment

CERTIFICATE
OF COMPLETION

This is to certify that

CHERYL HUEY

has completed the course

Bloodborne Pathogens v3 - _scorm12_sppubparsons_ps44511

on

Mar 28, 2016

ParsonsU

COMPLETION

WorkCare™
MAKING HEALTH COUNT

WORK STATUS REPORT

Employer Copy

TYPE OF EXAMINATION: **Annual Exam**
EXAM CLASSIFICATION: **Periodic Examination**

EMPLOYEE:	**Huey, Cheryl**	**COMPANY:**	**Parsons Corporation**
ID:	**49454**	**POSITION:**	**Field Technician**
DATE OF EXAM:	**06/27/2016**	**LOCATION:**	**Parsons - (PGS)**
EXPIRATION DATE:	**06/27/2018**	**SITE:**	

The following recommendations includes review of the following exam components:

- *Audiogram*
- *Blood Hemoglobin A1C*
- *Electrocardiogram (EKG)*
- *Spirometry*
- *Vision - Near & Far*
- *Blood Chemistry Panel*
- *CBC with Differential*
- *History & Physical*
- *Urinalysis with Micro (UA)*

	Yes	**No**	**Undecided**
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120 (Hazwoper)?	☐	☒	☐
Has the employee any contraindication for work in accordance with 29 CFR §1910.95(g)1926.52 (Hearing Conservation)?	☐	☒	☐
Has the employee any limitations in accordance with 29 CFR §1910.134 (Respirator)?	☐	☒	☐

STATUS

☒ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.

☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:

☐ **NOT QUALIFIED**

☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

Qualified for biennial frequency.

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Dennis W Stephens, M.D. Date: 06/30/16

Signature: [signature]

300 S. Harbor Blvd., Ste. 600, Anaheim, CA 92805

OEC-11584773

CERTIFICATE OF COMPLETION

OSHA EDUCATION CENTER

American Safety Council

CHERYL HUEY

Has diligently and with merit completed a

OSHA 10-Hour Hazard Recognition for the General Industry Course
on 3/10/2016

from the OSHA Education Center and the American Safety Council Inc., and is awarded 1.0 IACET CEU.

Director: **Jeffrey Pairan**

ACCREDITED IACET PROVIDER

As an IACET Accredited Provider, American Safety Council Inc. offers CEUs for its programs that qualify under the ANSI/IACET Standard.

Certificate of Training

This Document Certifies That

CHERYL HUEY

Has Successfully Completed The OSHA Required 16 Hour

HEALTH AND SAFETY TRAINING

Complying with OSHA STANDARD 29CFR 1910.120

SUPPLEMENTAL TRAINING

Patrick T. Thornton
Course Director

EPT inc.
Environmental Protection Training, inc.

MARCH 16, 1993
Date of Completion

005689

ENGINEERING-SCIENCE
CERTIFICATE OF TRAINING

This Certifies That

CHERYL A. HUEY

Employee Number: 49454

Has Successfully Completed Eight Hours of

SUPERVISORY INSTRUCTION

In Accordance with 29 CFR 1910.120 (e)

Prepared and Conducted By

ENGINEERING-SCIENCE, INCORPORATED
Syracuse, New York

June 14, 1994	Cleveland, Ohio	Brian J. [illegible], CIH
Dates of Instruction	Course Location	Instructor

Years of Experience:

10

Education:

BS, Geology and Biology, 2004, Bowling Green State University, Bowling Green, Ohio

Morgan Todd

Geologist

Summary of Relevant Qualifications

Mr. Morgan Todd has performed numerous site assessments including installation of monitoring wells and soil and water sampling. He has provided installation oversight of barrier walls and tie-backs at a former manufactured gas plant. Morgan has performed slug tests, tidal influence monitoring, and air quality monitoring. He has experience operating a Geoprobe™ 5410 using Macro-Core and dual tube techniques. Morgan also has experience with outfall sample collection and data collection, underground storage tank closure assessments, and field application of in-situ chemical oxidation reagents.

Work Experience

Associate Geologist. DuPont, Circleville Plant, Circleville, Ohio. Associate geologist for bioremediation pilot test for a large chemical plant with a complex operational history. Responsible for assisting with injection of vegetable oil, lactate, and whey, and in the ongoing monitoring utilizing low flow groundwater sampling techniques.

Associate Geologist. Rohm and Haas, Rohm and Haas Plant RCRA RFI, Louisville, Kentucky. Associate geologist for the RCRA Facility Investigation (RFI) for a large chemical plant with a complex operational history. Responsible for assisting in the RFI Implementation and report writing. RFI activities included soil sampling via hand auger and Geoprobe™ 5410, groundwater sampling utilizing low flow techniques, and surface water sampling on the Ohio River.

Associate Geologist. Newmark, Inc. Former Van Dyne Crotty Facility, Dayton, Ohio. Associate geologist for the investigation and remediation of a large dissolved chlorinated plume within a municipal well field protection plan area that has migrated under a residential area. Responsible for assisting with confirmatory soil sampling, vapor monitoring, and groundwater monitoring. Responsible for assisting with injection of vegetable oil, lactate, and whey, and in the ongoing monitoring utilizing low flow groundwater sampling techniques.

Associate Geologist. BP, Sebree Hazardous Waste Landfill, Sebree, Kentucky. Responsible for assisting with ground and surface water sampling and grounds maintenance. Assisted with installation of a water collection trench and associated piping. Assisted with the installation of several wells and piezometers both in the native sediments, bedrock, and waste material with an emphasis on maintaining, calibrating, and monitoring gas meters. Received training to wear full face respirator.

Associate Geologist. BP, Former SOHIO Refinery, Fort Wright, Kentucky. Responsible for assisting with report writing, Mann-Kendall statistical tests, site O&M, grounds maintenance, and groundwater sampling utilizing purge and sample techniques at a former refinery.

Associate Geologist. BP, Sand Springs Petrochemical Complex Landfill, Sand Springs, OK. Performed Mann-Kendall statistical analyses to determine the trends, or lack thereof, within analytical data sets in response to the 2015 Five Year Review Report.

Associate Geologist. DuPont, East Chicago Remedial Action, East Chicago, Indiana. Responsible for assisting with site clearing, site O&M, GPS surveying, logging of more than 500 shallow borings, operating a Geoprobe™ 5410, slug testing, well redevelopment, and ground water sampling to determine the extent, magnitude, and distribution of soil contamination and the effectiveness of the permeable reactive barrier installed on the site.

Associate Geologist. ExxonMobil, Bayonne FORP and Bayonne RI, Bayonne, New Jersey. Responsible for well installation oversight, assisting with ground water sampling, slug testing, and tidal influence monitoring at a large former refinery and take terminal with large amounts of NAPL contamination.

Associate Geologist. IMTT, Vapor Intrusion Investigation, Bayonne, New Jersey. Responsible for assisting with air quality sampling deploying and recovering Summa canisters and setting up and monitoring a weather station to determine the extent of vapor intrusion into buildings due to NAPL contaminated groundwater.

Public Relations Specialist. BP, Vessels of Opportunity Program – Mississippi Canyon 252 response, Bayou La Batre, Alabama. Assisted with staging of the local marina facility, ensuring proper deployment and organization of more than 20 boats, assisted with record keeping, logistics, safety, and reporting for the VOO program in Bayou La Batre.

Associate Geologist. DuPont, RFI Phase II, Dayton, Ohio. Assisted with camera surveys of existing wells and storm drains, oversight of geophysical survey utilizing EM and ground penetrating radar, marking and utility clearance for new monitoring wells, and confirmatory elevation survey of new wells.

Associate Geologist. Marathon North Bend Asphalt Terminal, Discharge Sampling, North Bend, Ohio. Responsible for collecting water samples from storage tanks and outfalls undergoing hydrostatic testing to ensure the water met discharge requirements.

Associate Geologist. DuPont, RCRA Investigation, Toledo, Ohio. Responsible for operating a Geoprobe™ 5410 to collect near surface samples from approximately 30 locations.

Associate Geologist. BUSTR, Tier 1 and Interim Response Action Implementation, Cincinnati, Ohio. Oversaw the installation of monitoring wells and performed groundwater sampling and slug tests of wells in support of the Tier 1 activities. Wrote the Tier 1 report. Assisted with oversight of the removal of 2,200 tons of petroleum contaminated soil from the site and filling the excavation with clean fill. Oversaw the abandonment of onsite monitoring wells.

Associate Geologist. Gem City Chemicals, Monthly Sampling, Dayton, Ohio. Perform monthly water sampling of the influent and effluent from the onsite air stripper tower as well as the semi-annual site wide groundwater sampling. Write the quarterly and semi-annual progress reports.

Associate Geologist. BP Rumsey, Request for Closure (2014), Calhoun, Kentucky. Performed Mann-Kendall statistical analyses to determine the trends, or lack thereof, within analytical data sets in support of a Request for Closure for a 1991 pipeline release.

Other Environmental Experience:

Associate Geologist. Liberty Gap Wind Energy Facility, Bat Survey, West Virginia. Assisted with mist-net surveying for endangered bat species, particularly the Indiana bat, and attaching identification bands to bats.

Associate Geologist. **Yellow Springs Instruments, Investigation and Bioremediation, Yellow Springs, Ohio.** Associate geologist for the groundwater monitoring and Enhanced In-Situ Bioremediation of a chlorinated solvents plume. Responsible for well installation oversight, ground water sampling and assisting with implementation of full-scale organic substrate (vegetable oil) injection and groundwater monitoring to determine efficacy of remediation. Also performed a wildlife survey that consisted of a visual survey of consisted of recording the mammals, birds, reptiles, and amphibians seen on the site.

Associate Geologist. **Givaudan, Air Quality and Noise Survey, Cincinnati, Ohio.** Responsible for assisting with breathing zone air quality monitoring utilizing Dräger sampling tubes and for conducting noise level surveys at a flavor manufacturing and research plant.

Associate Geologist. Various Gasoline Retail Sites, and various facilities impacted with petroleum hydrocarbons and chlorinated VOCs, Ohio. Performed field screening of excavated soil for organic vapors, installation of monitoring wells, surveying elevations of wells, and water sampling. Prepared monthly data updates, quarterly monitoring reports and site assessment reports.

Associate Geologist. Phase I Archeology Survey, Missouri. Assisted with a Phase I archeological survey along a petroleum pipe line involving record searches and excavating shovel test pits along an active pipeline.

Associate Geologist. Monsanto Corporation, Phase II, Columbia, Tennessee. Conducted soil sampling to determine extent and concentration of PCBs, fertilizer, and elemental phosphorus contamination in soil. Oversaw well installation to determine extent and concentration of the above chemicals/element.

Other Experience

QA Lab Technician. JohnsonDiversey, Cincinnati, Ohio. Tested batches of product during mixing, before packaging, and during packing to insure the product met specifications. Conducted lab batching to confirm mix ratios, identify problems and any adjustments that needed to be made in a small scale setting before large scale production began.

PureSafety®

Certificate of Completion

Presented to

Morgan Todd

of

Parsons_OSHA

for successful completion of

OSHA 10-Hour Online Course for Construction (CEU = 1.0) v2

on

10/12/2010

CERTIFICATE
OF COMPLETION

This is to certify that

MORGAN TODD

has completed the course

Bloodborne Pathogens v3 - _scorm12_sppubparsons_ps44511

on

Jan 18, 2016

ParsonsU

Certificate Of Completion

PRESENTED TO

Morgan Todd

In Recognition of Successful Completion of Requirements In

CPR/AED (Adult / Child / Infant)
Universal First Aid

06/03/2016

CERTIFICATION DATE

06/03/2018

EXPIRATION DATE

HOLDER'S SIGNATURE

AUTHORIZED SIGNATURE

www.AmericanSTI.org

This certifies participant listed above has successfully passed skills evaluation in accordance with national cognitive skills examination standards, and American Safety Training Institute certification terms and conditions. American Safety Training Institute courses follow national guidelines set by the American Heart Association (AHA), and the International Liaison Committee on Resuscitation (ILCOR). The American Safety Training Institute is not associated, affiliated with, sponsored, or endorsed by, American Safety and Health Institute (ASHI), American Heart Association (AHA), or American Red Cross (ARC), and unless otherwise specified no affiliation or endorsement is implied. SUCCESSFUL COMPLETION DOES NOT GUARANTEE FUTURE PERFORMANCE.

PARSONS

THIS CERTIFIES THAT

Todd Morgan

HAS RECEIVED EIGHT HOURS OF REFRESHER TRAINING ON ITEMS SPECIFIED IN 29 CFR 1910.120(E)(2), WHICH ALSO INCLUDED THE CRITIQUE OF PARSONS INCIDENTS THAT OCCURRED OVER THE PAST 12 MONTHS. THIS CERTIFICATE EXPIRES ONE YEAR FROM THE DATE OF COURSE COMPLETION.

HAZWOPER REFRESHER

PARSONS IS AUTHORIZED BY IACET TO AWARD .9 CONTINUING EDUCATION UNITS (CEUs) FOR COMPLETION OF THIS PROGRAM

Carolyn M. Schiers

Carrie Schiers
Vice President, Corporate Training & Development

JANUARY 19, 2016

AUTHORIZED IACET PROVIDER

Parsons has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 8405 Greensboro Drive, Suite 800, McLean, VA 22102

THE NATIONAL ENVIRONMENTAL TRAINERS

Morgan Todd

has satisfactorily passed an exam and completed an 8 hour Supervisor training course entitled
Hazardous Waste Operations and Emergency Response
meeting the requirements identified in Title 29 CFR 1910.120 (OSHA HAZWOPER Regulations).
This course has been awarded 1.0 Industrial Hygiene CM Points by the American Board of Industrial Hygiene-Approval Number 13334. This course is eligible for .66 Continuance of Certification (COC) points from the Board of Certified Safety Professionals.

NATIONAL ENVIRONMENTAL TRAINERS, Inc.

January 03, 2011

Course Number 1002, Awarded 8 PDH's
Florida Board of Professional Engineers CEU Provider Number 0004284

www.nationalenvironmentaltrainers.com

Signature of Instructor

Clay A. Bednarz, MS, RPIH

Specimen Result Certificate

ID Number: 1124058 Report printed on 3/9/2016 9:13:24 AM

Attention
Lorena Raybuck
Parsons Exxon Mobil Program
40 La Riviere Dr Ste 350
Buffalo, NY 14202

Collection Site:
1253 - Concentra Medical Center - Sharonville

Verification Date 3/5/2016 02:47 PM

Medical Review Officer:
Dr. Stephen Kracht
7500 W. 110th St. Ste 400A PO Box 25903
Overland Park, KS 66225
888-382-2281

Donor Name:	Todd, Morgan	Donor SSN:	XXX-XX-4037
Date Of Test:	3/4/2016	Donor ID:	
		Reason for Test:	Random
ID Number:	1124058		
Laboratory:	Quest Diagnostics	Regulation:	Non-DOT
		Specimen Type:	Urine

Drugs Tested:

Drug Name	Result	Screening Cutoff	Confirmation Cutoff	Drug Name	Result	Screening Cutoff	Confirmation Cutoff
Marijuana	Negative	50	15	PCP	Negative	25	25
Cocaine	Negative	150	100	Barbiturates	Negative	300	200
Amphetamines	Negative	500	250	Benzodiazepines	Negative	300	200
Opiates	Negative	2000	2000	Methadone	Negative	300	200
6-Monoacetylmorphine	Negative	10	10	Ecstasy	Negative	500	250
Propoxyphene	Negative	300	200				

Final Result Disposition: **Negative**

TO BE COMPLETED BY THE MEDICAL REVIEW OFFICER

I have reviewed the laboratory results for the specimen identified by this form in accordance with applicable Federal requirements. My determination/verification is:

- [x] Negative
  - [ ] Dilute
- [ ] Positive
- [ ] Test Cancelled
- [ ] Refusal to test because
  - [ ] Adulterated
  - [ ] Substituted

REMARKS:

Dr. Stephen Kracht	Stephen J. Kracht D.O.	3/5/2016 02:47 PM
(PRINT) Medical Review Officer's Name	Signature of Medical Review Officer	Date (Mo./Day/Yr.)

Compliance Solutions

"Today's Training... Tomorrow's Solution"

10515 E 40th Ave, Suite 116, Denver Colorado 80239 800-711-2706

Student Affiliation:
BHE Environmental Inc
2910

Certificate of Completion

This is to certify that

Morgan Todd

has successfully completed the classroom requirements for

40 Hour HAZWOPER

29 CFR 1910.120(e)

Presented

Friday, March 11, 2005

Compliance Solutions Occupational Trainers, Inc.

Certificate Number: *66986*

Neval Gupta
Vice President

David Burry
Instructor

EXHIBITS

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EXHIBIT 1

PARSONS

Employee/Subcontractor Training Acknowledgement

Name of Trainer: ______________________________

Training Subject: Camp Ravenna RVAAP Restoration Program

Training materials used: ______________________________

Name of employee: ______________________________

Date of hire/assignment: ______________________________

I, ____________________, hereby certify that I have received training as described above in the following areas:

- Names of personnel responsible for site safety and health.
- Safety, health or other hazards at the site.
- The proper use of personal protective equipment.
- The potential occupational hazards in general in the work area and associated with my job assignment.
- Work practices by which a worker can minimize risks from hazards.
- Safe use of engineering controls and equipment on the site.
- Acute effects of compounds on the site.
- Decontamination procedures.
- General safety requirements indicate the safe work conditions, safe work practices, and personal protective equipment required for my work.
- The hazards of any chemicals to which I may be exposed and my right to information contained on material safety data sheets for those chemicals, and how to understand this information.
- My right to ask questions, or provide any information to the employer on safety either directly or anonymously without any fear of reprisal.
- Disciplinary procedures the employer will use to enforce compliance with general safety requirements.

I understand this training and agree to comply with general safety requirements for my work area.

______________________________	______________________________
Employee Signature	Date

Print Form | E-mail

(For safety staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT** For use of this form, see Help Menu and USACE Supplement to AR 385-40 The proponent agency is CESO	REQUIREMENT CONTROL SYMBOL: CEEC-S-8 *(R2)*

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE		MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED	☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED	☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER			☐	

2. PERSONAL DATA

a. NAME *(Last, First MI.)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	ARMY ACTIVE ARMY RESERVE VOLUNTEER PERMANENT FOREIGN NATIONAL SEASONAL TEMPORARY STUDENT OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(YYYYMMDD)*	b. TIME OF ACCIDENT *(Military Time)* hrs.	c. EXACT LOCATION OF ACCIDENT		d. CONTRACTOR'S NAME (1) PRIME
e. CONTRACT NUMBER ☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*		f. TYPE OF CONTRACT ☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	g. HAZARDOUS/TOXIC WASTE ACTIVITY ☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*	(2) SUBCONTRACTOR

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY (CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT (CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY (CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	g. TYPE AND SOURCE OF INJURY/ILLNESS
PRIMARY (CODE) #	TYPE (CODE) #
SECONDARY (CODE) #	SOURCE (CODE) #
f. NATURE OF ILLNESS / INJURY (CODE) #	

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT (CODE) #	b. PERSONAL FLOTATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT					
a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT APPLICABLE
PICKUP/VAN AUTOMOBILE	SIDE SWIPE HEAD ON REAR END	(1) FRONT SEAT			
TRUCK OTHER *(Specify)*	BROADSIDE ROLL OVER BACKING	(2) REAR SEAT			
	OTHER *(Specify)*				

8. PROPERTY MATERIAL INVOLVED		
a. NAME OF ITEM	b. OWNERSHIP	c. AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE)	a. ACTIVITY AT TIME OF ACCIDENT	(CODE)
	#		#

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary, see attached page 4.)*

11. CAUSAL FACTOR*(s)* *(Read instructions before completing)*

a. *(Explain YES answers in item 13)*	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?		
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?		
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?		
OPERATING PROCEDURES: Were operating procedures a factor?		
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?		
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?		
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?		
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?		
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?		
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?		
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?		
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident?		
b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT? *(If yes, attach a copy.)*		

12. TRAINING		
a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING	c. DATE OF MOST RECENT FORMAL TRAINING *(YYYYMMDD)*
YES NO	CLASSROOM ON JOB	

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE*(s)* *(Attach additional sheets as needed, See page 4)*

b. INDIRECT CAUSE*(s)* *(Attach additional sheets as needed, See page 5)*

14. ACTION(s) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(s)		
DESCRIBE FULLY *(Attach additional sheets as necessary, See page 5)*		

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.		
a. BEGINNING *(YYYYMMDD)*	b. ANTICIPATED COMPLETION *(YYYYMMDD)*	
c. DATE SIGNED *(YYYYMMDD)*	d. TITLE OF SUPERVISOR COMPLETING REPORT	e. CORPS SIGNATURE, SUPERVISOR COMPLETING REPORT
c. DATE SIGNED *(YYYYMMDD)*	d. TITLE OF SUPERVISOR COMPLETING REPORT	e. CONTRACTOR SIGNATURE, SUPERVISOR COMPLETING REPORT
f. ORGANIZATION IDENTIFIER *(Division, Branch, Section, etc.,)*		g. OFFICE SYMBOL

16. MANAGEMENT REVIEW *(1st)*		
a. ☐ CONCUR b. ☐ NONCONCUR	c. COMMENTS	
DATE *(YYYYMMDD)*	TITLE	SIGNATURE

17. MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.,)*		
a. ☐ CONCUR b. ☐ NONCONCUR	c. COMMENTS	
DATE *(YYYYMMDD)*	TITLE	SIGNATURE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW		
a. ☐ CONCUR b. ☐ NONCONCUR	c. ADDITIONAL ACTIONS/COMMENTS	
DATE *(YYYYMMDD)*	TITLE	SIGNATURE

19. COMMAND APPROVAL	
COMMENTS	
DATE *(YYYYMMDD)*	COMMANDER SIGNATURE

10. ACCIDENT DESCRIPTION *(Continuation)*

13a. DIRECT CAUSE(s) *(Continuation)*

13b.	INDIRECT CAUSE(*s*) (*Continuation*)

14.	ACTION(*s*) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(*s*) (*Continuation*)

GENERAL. Complete a separate report for each person who was injured, caused, or contributed to the accident *(excluding uninjured personnel and witnesses)*. Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs *(OWCP)* shall be at the discretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16 and 17.

INSTRUCTIONS FOR SECTION 1 - ACCIDENT CLASSIFICATION

(Mark All Boxes That Are Applicable)

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY - Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 *(injury)*, CA-2 *(illness)* or CA-6 *(fatality)* to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) PROPERTY DAMAGE - Mark the appropriate box if accident resulted in any damage of $1000 or more to government property *(including motor vehicles)*.

(3) VEHICLE INVOLVED - Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY - Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY/ILLNESS/FATALITY - Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE - Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property *(including motor vehicles)*.

(3) VEHICLE INVOLVED - Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY - Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY/ILLNESS/FATALITY - Mark if accident resulted in public fatality or permanent total disability. *(The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander)*.

(2) VOID SPACE - Make no entry.

(3) VEHICLE INVOLVED - Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) VOID SPACE - Make no entry.

INSTRUCTIONS FOR SECTION 2 - PERSONAL DATA

a. NAME - *(MANDATORY FOR GOVERNMENT ACCIDENTS, OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS)*. Enter last name, first name, middle initial of person involved.

b. AGE - Enter age.

c. SEX - Mark appropriate box.

d. SOCIAL SECURITY NUMBER - *(FOR GOVERNMENT PERSONNEL ONLY)* Enter the social security number *(or other personal identification number if no social security number issued)*.

e. GRADE - *(FOR GOVERNMENT PERSONNEL ONLY)* Enter pay grade. Example: 0-6; E-7; WG-8; WS-12; GS-11; etc.

f. JOB SERIES/TITLE - For government civilian employees enter the pay plan, full series number, and job title, e.g., GS-0810/Civil Engineer. For military personnel enter the primary military occupational specialty *(PMOS)*, e.g., 15A30 or 11G50. For contractor employees enter the job title assigned to the injured person, e.g., carpenter, laborer, surveyor, etc.

g. DUTY STATUS - Mark the appropriate box.

(1) ON DUTY - Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) OFF DUTY - Person was not on official business at time of accident.

h. EMPLOYMENT STATUS - *(FOR GOVERNMENT PERSONNEL ONLY)* Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 - GENERAL INFORMATION

a. DATE OF ACCIDENT - Enter the month, day, and year of accident.

b. TIME OF ACCIDENT - Enter the local time of accident in military time. Example: 1430 hrs *(not 2:30 p.m.)*.

c. EXACT LOCATION OF ACCIDENT - Enter facts needed to locate the accident scene, *(installation/project name, building number, street, direction and distance from closest landmark, etc.)*.

d. CONTRACTOR NAME

(1) PRIME - Enter the exact name *(title of firm)* of the prime contractor.

(2) SUBCONTRACTOR - Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER - Mark the appropriate box to identify if contract is civil works, military, or other. If "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT - Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY *(HTW)* - Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program *(IRP)* HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site *(FUDS)* activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 - CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY - Select the most appropriate construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION
2. SITE PREPARATION
3. EXCAVATION/TRENCHING
4. GRADING (EARTHWORK)
5. PIPING/UTILITIES
6. FOUNDATION
7. FORMING
8. CONCRETE PLACEMENT
9. STEEL ERECTION
10. ROOFING
11. FRAMING
12. MASONRY
13. CARPENTRY
14. ELECTRICAL
15. SCAFFOLDING/ACCESS
16. MECHANICAL
17. PAINTING
18. EQUIPMENT/MAINTENANCE
19. TUNNELING
20. WAREHOUSING/STORAGE
21. PAVING
22. FENCING
23. SIGNING
24. LANDSCAPING/IRRIGATION
25. INSULATION
26. DEMOLITION

b. TYPE OF CONSTRUCTION EQUIPMENT - Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER
2. DRAGLINE
3. CRANE *(ON VESSEL/BARGE)*
4. CRANE *(TRACKED)*
5. CRANE *(RUBBER TIRE)*
6. CRANE *(VEHICLE MOUNTED)*
7. CRANE *(TOWER)*
8. SHOVEL
9. SCRAPER
10. PUMP TRUCK *(CONCRETE)*
11. TRUCK *(CONCRETE/TRANSIT MIXER)*
12. DUMP TRUCK *(HIGHWAY)*
13. DUMP TRUCK *(OFF HIGHWAY)*
14. TRUCK *(OTHER)*
15. FORKLIFT
16. BACKHOE
17. FRONT-END LOADER
18. PILE DRIVER
19. TRACTOR *(UTILITY)*
20. MANLIFT
21. DOZER
22. DRILL RIG
23. COMPACTOR/VIBRATORY ROLLER
24. OTHER

INSTRUCTIONS FOR SECTION 5 - INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY/ILLNESS - Reference paragraph 2-10 of USACE Supplement 1 to AR 385-40 and enter code and description from list below.

NOI	NO INJURY
FAT	FATALITY
PTL	PERMANENT TOTAL DISABILITY
PPR	PERMANENT PARTIAL DISABILITY
LWD	LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW	RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA	RECORDABLE FIRST AID CASE
NRI	NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST - Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED - Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY - Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED - Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCKS	LB	BOTH LEGS/HIPS/ ANKLES/
BUTTOCK	LS	SINGLE LEG/HIP/ ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM *(BREAST BONE)*
	RV	VERTEBRAE *(SPINE; DISC)*
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury/illness from the list below. This nature of injury/illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury/illness name on the line and place the corresponding CODE letters in the box provided.
* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/INFECTIVE/ PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER, STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY - OTHER *(EXCEPT DISEASE, ILLNESS)*

** A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which does not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME			
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY					
RESPIRATORY DISEASE	RA	ASBESTOSIS		DD	ENDEMIC DISEASE *(OTHER THAN CODE TYPES R&S)*
	RB	BRONCHITIS			
	RE	EMPHYSEMA		DE	EFFECT OF ENVIRONMENTAL
	RP	PNEUMOCONIOSIS	CONDITION		
	RS	SILICOSIS		DH	HEARING LOSS
	R9	RESPIRATORY DISEASE, OTHER		DK	HEART CONDITION
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES				DM	MENTAL DISORDER, EMOTIONAL STRESS, NERVOUS CONDITION
	VB	BRUCELLOSIS		DR	RADIATION
	VC	COCCIDIOMYCOSIS		DS	STRAIN, MULTIPLE
	VF	FOOD POISONING		DU	ULCER
	VH	HEPATITIS		DV	OTHER VASCULAR CONDITIONS
	VM	MALARIA		D9	DISABILITY, OTHER
	VS	STAPHYLOCOCCUS			
	VT	TUBERCULOSIS	SKIN DISEASE OR CONDITION		
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC - OTHER		SB	BIOLOGICAL
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS		SC	CHEMICAL
	DB	BACK STRAIN, BACK SPRAIN		S9	DERMATITIS, UNCLASSIFIED
	DC	CEREBRAL VASCULAR CONDITION; STROKE			

g. TYPE AND SOURCE OF INJURY/ILLNESS *(CAUSE)* - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident *(see example 1, below)*. Examples:

(1) An employee tripped on carpet and struck his head on a desk. TYPE: 210 *(fell on same level)* SOURCE: 0110 *(walking/working surface)*.

NOTE: This example would NOT be coded 120 *(struck against)* and 0140 *(furniture)*.

(2) A Park Ranger contracted dermatitis from contact with poison ivy/oak.

TYPE: 510 *(contact)* SOURCE: 0920 *(plant)*

(3) A lock and dam mechanic punctured his finger with a metal silver while grinding a turbine blade.

TYPE: 410 *(punctured by)* SOURCE: 0630 *(metal)*

(4) An employee was driving a government vehicle when it was struck by another vehicle.

TYPE: 800 *(traveling in)* SOURCE: 0421 *(government-owned vehicle, as driver)*

NOTE: The Type Code 800, "Traveling in" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED *(NO FALL)*
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH *(INJURED PERSON MOVING)*
0520	CONTACTED BY *(OBJECT WAS MOVING)*
	EXERTED
0610	LIFTED, STRAINED BY *(SINGLE ACTION)*
0620	STRESSED BY *(REPEATED ACTION)*
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE *(FLOOR, STREET, SIDEWALKS, ETC.)*
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT *(ERGONOMIC)*
0170	WINDOWS, DOORS
0180	ELECTRICITY

0200	ENVIRONMENTAL CONDITION	0631	CARBON MONOXIDE
0210	TEMPERATURE EXTREME *(INDOOR)*	0640	MIST, STEAM, VAPOR, FUME
0220	WEATHER *(ICE, RAIN, HEAT, ETC.)*	0641	WELDING FUMES
0230	FIRE, FLAME, SMOKE *(NOT TOBACCO)*	0650	PARTICLES *(UNIDENTIFIED)*
0240	NOISE	0700	CHEMICAL, PLASTIC, ETC.
0250	RADIATION	0711	DRY CHEMICAL - CORROSIVE
0260	LIGHT	0712	DRY CHEMICAL - TOXIC
0270	VENTILATION	0713	DRY CHEMICAL - EXPLOSIVE
0271	TOBACCO SMOKE	0714	DRY CHEMICAL FLAMMABLE
0280	STRESS *(EMOTIONAL)*	0721	LIQUID CHEMICAL - CORROSIVE
0290	CONFINED SPACE	0722	LIQUID CHEMICAL - TOXIC
0300	MACHINE OR TOOL	0723	LIQUID CHEMICAL - EXPLOSIVE
0310	HAND TOOL *(POWERED; SAW, GRINDER, ETC.)*	0724	LIQUID CHEMICAL - FLAMMABLE
0320	HAND TOOL *(NONPOWERED)*	0730	PLASTIC
0330	MECHANICAL POWER TRANSMISSION APPARATUS	0740	WATER
0340	GUARD, SHIELD *(FIXED, MOVEABLE, INTERLOCK)*	0750	MEDICINE
0350	VIDEO DISPLAY TERMINAL	0800	INAMINATE OBJECT
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL	0810	BOX, BARREL, ETC.
0370	HEATING EQUIPMENT	0820	PAPER
0380	WELDING EQUIPMENT	0830	METAL ITEM, MINERAL
0400	VEHICLE	0831	NEEDLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE	0840	GLASS
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE	0850	SCRAP, TRASH
0421	DRIVER OF GOVERNMENT VEHICLE	0860	WOOD
0422	PASSENGER OF GOVERNMENT VEHICLE	0870	FOOD
0430	COMMON CARRIER *(AIRLINE, BUS, ETC.)*	0880	CLOTHING, APPAREL, SHOES
0440	AIRCRAFT *(NOT COMMERCIAL)*	0900	ANIMATE OBJECT
0450	BOAT, SHIP, BARGE	0911	DOG
0500	MATERIAL HANDLING EQUIPMENT	0912	OTHER ANIMAL
0510	EARTHMOVER *(TRACTOR, BACKHOE, ETC.)*	0920	PLANT
0520	CONVEYOR *(FOR MATERIAL AND EQUIPMENT)*	0930	INSECT
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST	0940	HUMAN *(VIOLENCE)*
0540	HOIST, SLING CHAIN, JACK	0950	HUMAN *(COMMUNICABLE DISEASE)*
0550	CRANE	0960	BACTERIA, VIRUS *(NOT HUMAN CONTACT)*
0551	FORKLIFT	1000	PERSONAL PROTECTIVE EQUIPMENT
0560	HANDTRUCK, DOLLY	1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
0600	DUST, VAPOR, ETC.		
0610	DUST *(SILICA, COAL, ETC.)*	1020	RESPIRATOR, MASK
0620	FIBERS	1021	DIVING EQUIPMENT
0621	ASBESTOS	1030	SAFETY BELT, HARNESS
0630	GASES	1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 - PUBLIC FATALITY

a. **ACTIVITY AT TIME OF ACCIDENT** - Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the most appropriate primary activity area *(water related, non-water related or other activity)*, the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating-powered
3. Boating-unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities *(skin diving, scuba, etc.)*
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing *(general)*
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer *(baseball, football, etc.)*
24. Sports/winter *(skiing, sledding, snowmobiling etc.)*
25. Cycling *(bicycle, motorcycle, scooter)*
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts *(fights, riots, vandalism, etc.)*
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED - If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7 - MOTOR VEHICLE ACCIDENT

a. **TYPE OF VEHICLE** - Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION - Mark appropriate box.

c. SEAT BELT - Mark appropriate box.

INSTRUCTIONS FOR SECTION 8 - PROPERTY/MATERIAL INVOLVED

a. **NAME OF ITEM** - Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number *(NSN)* whenever applicable.

b. **OWNERSHIP** - Enter ownership for each item listed. *(Enter one of the following: USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE)*

c. **$ AMOUNT OF DAMAGE** - Enter the total estimated dollar amount of damage *(parts and labor)*, if any.

INSTRUCTIONS FOR SECTION 9 - VESSEL/FLOATING PLANT ACCIDENT

a. **TYPE OF VESSEL/FLOATING PLANT** - Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL, BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP - Select from the list below the object*(s)* that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEPT DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10 - ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT - Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role*(s)* in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11 - CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN - Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE - Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION - Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES - Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES - Were any of the provisions of the Safety and Health Requirements Manual *(EM 385-1-1)* violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice *(including EM 385-1-1)* fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS - Was the person under undue stress *(either internal or external to the job)*? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS - Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS - Did exposure to chemical agents *(either single shift exposure or long-term exposure)* such as dusts, fibers *(asbestos, etc.)*, silica, gases *(carbon monoxide, chlorine, etc.,)*, mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation *(UV radiation created during welding, etc.)* contribute to the accident/incident?

(9) OFFICE FACTORS - Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS - Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources *(in terms of employee skills, number of workers, and adequate supervision)* available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc.?

(11) PERSONAL PROTECTIVE EQUIPMENT - Did the person fail to use appropriate personal protective equipment *(gloves, eye protection, hard-toed shoes, respirator, etc.)* for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard*(s)*? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL - Is there any reason to believe the person's mental or physical capabilities, judgment, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS - Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. If one was performed, attach a copy of the analysis to the report.

INSTRUCTIONS FOR SECTION 12 - TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? - For the purpose of this section "trained" means the person has been provided the necessary information *(either formal and/or on-the-job (OJT) training)* to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING - Mark the appropriate box that best indicates the type of training; *(classroom or on-the-job)* that the injured person received, before the accident happened.

c. DATE OF MOST RECENT TRAINING - Enter YYYYMMDD of the last formal training completed that covered the activity task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13 - CAUSES

a. DIRECT CAUSES - The direct cause is that single factor, which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES - Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.

Direct cause: failure to provide fall protection at elevation. Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee *(possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety)*; failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. *(Note: USACE vehicle was in proper/safe working condition).*

Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.

Indirect cause: failure of employee to pay attention to driving *(defensive driving)*.

INSTRUCTIONS FOR SECTION 14 - ACTION TO ELIMINATE CAUSE*(s)*

DESCRIPTION - Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/ illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15 - DATES FOR ACTION

a. **BEGIN DATE** - Enter the date YYYYMMDD when the corrective action(s) identified in section 14 will begin.

b. **COMPLETE DATE** - Enter the date YYYYMMDD when the corrective action(s) identified in section 14 will be completed.

c. **DATE SIGNED** - Enter YYYYMMDD that the report was signed by the responsible supervisor.

d.e.. **TITLE AND SIGNATURE** - Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE supervisor shall also sign the report. Upon entering the information required in 15c., 15d., 15e., 15f. and 15g. below, the responsible USACE supervisor shall forward the report for management review as indicated in section 16.

f. **ORGANIZATION NAME** - For GOVERNMENT employee accidents enter the USACE organization name *(Division, Branch, Section, etc.)* of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15d. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

g. **OFFICE SYMBOL** - Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15f.

INSTRUCTIONS FOR SECTION 16 - MANAGEMENT REVIEW (1st)

1ST REVIEW - Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15d. shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief *(2nd review)* for review and comment.

INSTRUCTIONS FOR SECTION 17 - MANAGEMENT REVIEW (2nd)

2ND REVIEW - The FOA Staff Chief *(i .e., FOA Chief of Construction, Operations, Engineering, Planning, etc.)* shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18 - SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW - The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc. are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19 - COMMAND APPROVAL

4TH REVIEW - The FOA Commander shall *(to include the person designated Acting Commander in his absence)* review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

EXHIBIT 3

PARSONS

"Near Miss" Incident Investigation Report Form

1) Project name and number:____

2) "Near miss" location:____

3) Incident date and time:____

4) Personnel present (optional):____________________________________

5) Describe incident:____

6) What action or condition contributed to incident?____________________

7) What action was taken or suggested to prevent reoccurrence?____________

8) Comments____

9) Date of report________________ Prepared by____________________

10) Office health and safety representative review:

________________________ ________________________

Signature Date

EXHIBIT 4

PARSONS

Notice of Subcontractor Violation of Safety and Health Regulations

Date: ______________________________

Contractor Name: ____

Address: ____

____

____

Attention: ____

This letter officially notifies you that you have been found to be in violation of the following Safety Regulations:

____

on (date) ____________________, by ____.

Confined Space Entry		Lockout/Tagout		Hot Work		Personal Protective Equipment	
Knowledge of the environment		Awareness of warning alarms		Evacuation routes		Back-up Alarms	
Assembly locations		Fall Protection		Scaffolding		Environmental/Hazardous Material Storage	
Trenching		Safe Work Practices		Security Practices			

Other: ____

____

____

This/These violations occurred at the following locations: ____

____

at the following times ______________________________ and dates ____

The name of the employees was/were ____

under the supervision of ____.

EXHIBIT 5

PARSONS

Notice of Noncompliance with Safety and Health Regulations

Under conditions of this enforcement procedure, check all items that apply:

_____ 1. You are being notified of this violation and should take corrective action to prevent a reoccurrence. The corrective action shall be documented to the Parsons Construction Management representative immediately.

_____ 2. You must submit a plan for compliance to your Parsons Construction Management representative and the Construction Safety Manager within two days of receipt of this letter. The compliance plan must include the means or methods of compliance and the date that the requirements for compliance will be completed. Once compliance has been achieved, a follow up letter must be sent to the Parsons Construction Management representative and Construction Safety Manager. Failure to comply will result in disciplinary action against your Company.

_____ 3. You are required to review the stated procedures with your Parsons Construction Management representative. Work may not commence on the site until the review is complete and the Subcontractor responds formally that the procedure is understood and will comply.

_____ 4. You are required to review the stated procedures with your Parsons Construction Management representative. Work may not commence on the site until the review is complete and you must confirm formally the disciplinary action to be taken against the supervisor and employees.

_____ 5. All work on the site will stop until the Parsons Construction Management representative reviews all the facts with the Subcontractor and determines if the contract between the parties will be terminated.

Sincerely,

____

Parsons Representative

cc: Job File

GBU Safety Manager

Project Manager

EXHIBIT 6

P A R S O N S

Pre-mobilization Safety Meeting Checklist

Date: ______________________ Project/Location:____

Parsons Representative: __________________Subcontractor Representative: _____________________________

The following project site safety, health and security requirements, procedures, and hazards have been identified and reviewed with the Subcontractor.

SSP/Emergency Planning/Response Plan			Demolition	
Competent/Qualified Person			Personal Protective Equipment	
Hazardous Materials/Waste			Cranes/Hoists/Annual Inspection Certificate	
Vehicle/Heavy Equipment			Overhead Power Lines	
Lockout/Tagout			Confined Spaces (Permit/Non-Permit)	
Electrical			Excavations/Trenching	
Fire Protection			Site Security/Visitor Control/Public Exposure	
Hot Work/Welding/Cutting			Process Safety Management (PSM)	
Fall Protection/Guardrails/ Scaffolding/Ladders			Permits (Excavation/Scaffolding/Demolition/Traffic/ Confined Space/etc.)	

Additional Project Concerns:

____

____

____

____

____

Other Attendees:

Name	Title	Company

EXHIBIT 7

P A R S O N S

Remediation Safety and Health Inspection Checklist

Project: _______ Date: __
Inspector: _____ Time: __

Any items that have been found deficient must be corrected before work or use.
This checklist includes, but is not limited to, the following:

	Yes	No
Safe Access and Workspace		
Are safe access and adequate space for movement available for:		
Emergencies		
Work area		
Walkways and passageways		
The traffic control plans and/or pedestrian control plans in place, if necessary?		
Is overhead protection provided for all areas of exposure?		
Is lighting adequate?		
Planning Work for Safety		
Are employees provided with all required personal protective equipment (PPE)?		
Have other contractors and trades been coordinated with to prevent congestion and avoid hazards?		
Is air monitoring necessary to determine whether any chemical exposure exists?		
Utilities and Services Identification		
Has the Parsons Drilling Protocol been followed?		
Have all utilities been identified by signs/markout?		
Have high voltage lines been moved or de-energized, or barriers erected to prevent employee contact?		
Sanitary Facilities		
Is drinking water available?		
Are toilet facilities adequate?		
Work Procedures – Materials Handling		
Is material handling space adequate?		
Is material handling equipment adequate and proper?		
Is material handling equipment in good condition?		
Are workers properly trained to operate equipment and handle hazardous materials?		
Comments:		

EXHIBIT 8

PARSONS

Activity Hazards Analysis Training Record

JOB NUMBER____________________
AHA NUMBER____________________

JOB LOCATION____________________

DATE:______________________________

NAME OF TRAINER:____

SUBJECTS COVERED:____

TRAINING AIDS USED:____

ATTENDEES (PLEASE SIGN NAME LEGIBLY):

(Use additional sheets if necessary)

EXHIBIT 9

P A R S O N S

Risk Mitigation Two-Week Look-Ahead Form

Safety plan for week ending:	______________________	Subcontractor:	______________________
Project/ Location:	______________________	Meeting date:	______________________
Plan Prepared by:	______________________	Dated:	______________________

Next Two Weeks Scope of Work:

Identified Risks/Exposures/Hazards:

Control Measures:

Additional Activity Hazards Analysis Required:

Subcontractors Mobilizing/Demobilizing:

Audit/Inspections Scheduled:

Competent Person Changes:

Planned Orientation/Training :

Recommendations/Comments/Concerns:

Note: This information should be incorporated into the meeting minutes.

On-Line Safety Reporting System

Policy Requirements

- Initial incident reports for all incidents, including near misses, shall be reported within 4 hours.
- Detail incident reports are required within 24 hours.
- Reporting is done via on-line (PWeb) incident report form.
- Injuries with Days Away from Work - immediate supervisor and PM must teleconference with GBU President within 4 hours.
- Projects enter hours via on-line form by FIRST Friday of new period.

Reporting Incidents

Corporate policy requires that all employees report safety incidents to their supervisor immediately. Supervisors must report all incidents to the appropriate Project Manager (Department Manager if the incident is not related to a project), who must officially report the incident to the GBU within four hours. This official reporting is done via the PWeb, unless PWeb is unavailable, in which case the incident can be reported by email, fax or telephone.

"Incidents" include work related injuries, work related illness, accidents with property damage only and near misses. "Near misses" are any unplanned event that had the potential to (but did not) result in injury or property damage.

Incident reports should reflect the best available information at the time. Where exact information is not known (recordability, days away from work, etc.) the PM's best judgment should be used when completing the initial incident report. This information can be subsequently revised when the detail incident report is submitted.

When in doubt, submit an initial report or contact the GBU Safety Manager.

On-line Reporting System

The on-line reporting system can be found on the PI&T Safety Page on PWeb. To locate the system, follow these steps:

1. From the Corporate PWeb Homepage, select PI&T from the Org Units menu
2. Locate and select "Safety" from the list of pages in the right hand column
3. Select the "Incident Reporting Form" link

To create and submit a new incident report, select the orange "Add" button from the main page of the reporting system. To update and existing incident report or complete the Detail Incident page, locate and select the appropriate incident from the list.

Creating or Updating Incidents

The Initial Incident page of the report must be completed within four hours of the incident occurring. This page includes basic information needed for the first notification to our insurance carriers. If possible, all of the fields should be completed in the initial report. A list is provided at the end of this document describing all fields contained on the initial incident page.

Incident Detail Reports

Within 24 hours of the incident occurring, the Incident Detail page of the on-line report must be completed. This page includes detailed information about the injured party, the nature and extent of injuries, medical treatment provided, corrective actions taken, and witness statements. In the event of property damage, this page also includes descriptive information on the property owner. Finally, the page includes a section to include electronic attachments. These might include photographs, signed witness statements, etc.

Monthly Reporting of Hours

Hours must be entered into the on-line reporting system no later than the first Friday of the new period. If an accurate accounting of hours is not available, estimated hours are submitted into the system. The estimated hours can be revised later in the month, or the following month, when accurate data is available.

From the "Hours" page, select the GBU and the period (month and year) that is being reported. The system only allows hours to be entered for the period selected. MTD and PTD figures are calculated totals based on the sum of all monthly entries. To enter or correct a prior period entry, simply select that month from the drop-down box and correct the figures for that month.

Be sure to select the correct month and year when entering hours.

Hours must be entered for each (as applicable) of six different labor categories. The categories are as follows:

- Contractor (Field/Craft)
- Contractor (Office/Admin)
- JV Partner (Field/Craft)
- JV Partner (Office/Admin)
- Parsons Employee (Field/Craft)
- Parsons Employee (Office/Admin)

Monthly Statistics Summary Reports

The on-line reporting system automatically calculates incident rates based on incidents and hours entered into the system. To view the statistics, select the "Reports" page from the on-line system. Select "Parsons Safety Statistics Summary", the appropriate GBU, and the appropriate period. (NOTE: The system does not yet provide reports at the Division and Sector level. That enhancement is pending.) Use the checkboxes to select the labor categories desired.

Contact Jeff Kleinfelter for Assistance

Initial Incident Report Fields

1. GBU – Select the GBU from the drop down box. Incidents are reported primarily by project, and the GBU should reflect the unit responsible for the project. This may be different from the GBU that employees the person injured.
2. Field Project Name, Office Location or Other – If the applicable project is listed in the "Field Project" list, select from that box. If not, and if the incident occurred in a Parsons corporate office, select the office from the drop box. Otherwise, type in the name of the responsible organizational unit in the "Other" field. The GBU must be selected BEFORE attempting to select a Project/Office. Do NOT select both a field project AND an Office Location (or Other). If the appropriate Project or Office name can not be found, manually enter it into the "Other" field.
3. Job and WBS Numbers – These fields should reflect the charge number responsible for the incident. In general, that will be the number that the employee was charging at the time of the incident. Projects are responsible for visitors, regardless of what charge number they use while visiting the job. For example, if the Division Manager is injured while visiting Project X, the project number is entered, not the division overhead account.
4. Near Miss – Check this box if the report is for a near miss only (no injury or property damage occurred).
5. Emergency Response Notified – Check this box if fire, police or ambulance was called as a result of the incident.
6. Three or More Employees Hospitalized – Check this box if three or more employees were injured as the result of a single incident. In this case, the GBU or Corporate Safety Manager must also be immediately notified by telephone.
7. Extent of Injury – Select the appropriate radio button. First aid cases are as defined by OSHA 1904 criteria. All other injuries are considered recordable.
8. Restricted Duty (# of days) – If the injured person was limited (by a physician) to less than normal work duration or duties, enter the number of days. Estimate the days if unknown, and correct the number later. NOTE: this is the number of CALENDAR days (not scheduled work days), and it does NOT include the day of the injury.
9. Days Away From Work (# of days) – If the injured person was ordered by a physician not to return to work, enter the number of days missed. Estimate the days if unknown, and correct the number later. NOTE: this is the number of CALENDAR days (not scheduled work days), and it does NOT include the day of the injury. Injuries with Days Away From Work require a phone call to the GBU President within 4 hours.
10. Fatality (Date of Death) – In the event of a work related fatality, enter the date of death here. NOTE: Fatalities require immediate phone notification of the Division Manager, GBU President, GBU Safety Manager, and Corporate Safety Manager.
11. Property Damage – Check the appropriate boxes if applicable.
12. Place – Describe the exact location that incident occurred. For example, "in the north stairwell of building 21, between the second and third floor."
13. Date – This field reflects the date the incident occurred, not necessarily the date it was reported. If the exact date is not known, an estimate should be used.
14. Time – This field reflects the time of day that the incident occurred. If the exact time is not known, an estimate should be used.
15. Incident Description – Provide a detailed description of the incident. This is a memo field and text will scroll down the window as it is entered. Use as much space as needed to accurately describe the incident and the resulting injuries.

16. Reported by – This field defaults to the employee login ID that was used to access PWeb. However, the field can be over-written if needed.
17. Name – First and last name of the injured party.
18. Status – Select the most appropriate category from the drop box (Employee - Field, Subcontractor - Field, Partner - Field, Employee - Office, Subcontractor - Office, Partner - Office or 3rd Party).
19. Trade/Function – Select the most appropriate category from the drop box.

PARSONS Take 5 for Safety!

Date: ______

Job Description: ______

Employee Name: ______

Supervisor: ______

Work Location: ______

Job - Basic sequence of steps

Sequence

1. ______
2. ______
3. ______
4. ______

Job Hazards? (Direct hazard of job duties)

1. Hazards: ______

Mitigation: ______

2. Hazards: ______

Mitigation: ______

3. Hazards: ______

Mitigation: ______

4. Hazards: ______

Prevention: ______

Pre-Work Controls	YES	NO	N/A
Permits attained?	☐	☐	☐
Body harness/Lanyard needed?	☐	☐	☐
Sufficient railings?	☐	☐	☐
Lockout/Tagout in place?	☐	☐	☐
Work area clean?	☐	☐	☐
Proper PPE worn?	☐	☐	☐
Work place lighting adequate?	☐	☐	☐
Confined space?	☐	☐	☐
Applicable AHAs reviewed?	☐	☐	☐

Standard PPE (Hat, glasses, gloves, safety-toed boots)

Additional PPE: ______

Briefly review hazards and mitigations after lunch.

PARSONS Take 5 for Safety!

Before you begin any new task pause for 30 seconds and ask yourself the following questions:

- ☐ Do I have the skills and competencies to safely perform my assigned tasks?
- ☐ Do I fully understand the procedures relating to this job?
- ☐ Do I have a safe means of access/egress to my work area?
- ☐ I have the means and know how to summon emergency assistance?
- ☐ Do I have any unanswered questions for my supervisor today?
- ☐ Have today's tasks been coordinated with other contractors on-site?
- ☐ Do I have the correct tools and equipment for today's tasks?
- ☐ Can I focus on my work today–or am I distracted?
- ☐ Do I have all the required PPE?
- ☐ What are the unsafe behaviors that can cause an injury?
- ☐ Have I been properly trained to safely perform my assigned task?
- ☐ Have I inspected my work area for safety hazards?
- ☐ Would I let my son, daughter, brother, or sister do my job today?

Each of these questions should be answered to your full satisfaction before you proceed with the work. Remember, no job is so important that you cannot take time to do it safely – **THE FIRST TIME!**

Other hazards

1. ______
2. ______

Mitigation of hazards

1. ______
2. ______

Crew members

Print:	Signature:
1. ______	______
2. ______	______
3. ______	______
4. ______	______
5. ______	______
6. ______	______

Supervisors Signature ______

Auditor Signature ______

Auditor Signature ______

Briefly review hazards and mitigations after lunch.

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Year: 2015

U.S. Department of Labor

Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any specific criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment Name: Parsons Corporation
City: Pasadena State: CA

Identify the person			Describe the Case			Classify the case (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:					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g. Welder)	(D) Date of injury or onset of illness	(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)	Death	Days away from work	Remained at Work: Job transfer or restriction	Remained at Work: Other record-able case	Away From Work	On Job Transfer or Restriction	(M) Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All Other Illnesses
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
FY15-0011	PEI	LANE TECH. ASSOCIATE	1/08	Deptford, New Jersey - MVP	Strain or Tear of Shoulder on Left Side - fall on ice		X			49 days	days	X					
FY15-0106	PGS	PIPEFITTER JOURNEYMAN	1/16	Aiken, SC - South laydown area outside fence of SWPF	Strain Pelvis, Right Side - team lift of stainless steel pipe				X	days	days	X					
FY15-0105	PGS	ELECTRICIAN	1/16	Springfield, VA - High Voltage Shop	Laceration of Hand requiring stitches - splicing an electrical cable to when the splicing knife slipped, cutting his right palm				X	days	days	X					
FY15-0124	PGS	SGA-ENGRG TECH III	1/20	Atlantic City, NJ - FAA Tech Center lab	Foreign Body to eye requiring Rx - gust of wind resulting in dust in eye				X	days	days	X					
FY15-0119	PEI	PROGRAM DIRECTOR	1/23	Pasadena, CA - Office work station	Right wrist - de Quervain's tenosynovitis requiring injection				X	days	days						X
FY15-0263	PGS	CARPENTER JOURNEYMAN	2/05	Aiken, SC - South wall of room	Sprain of right ankle - twisted when jumping from scaffold to floor			X		days	43 days	X					
FY15-0309	PTG	INSPECTOR	2/11	Baltimore, MD - BWI Project	Shoulder sprain on right side - slipped on ice on roof, Rx given				X	days	days	X					
FY15-0438	PTG	INSPECTOR	3/03	Memphis, TN - MS river bank	Lower Back strain/hip pain requiring Rx - fall over debris		X			5 days	days	X					
					Page totals	0	2	1	5	54	43	7	0	0	0	0	1
												Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All Other Illnesses
												(1)	(2)	(3)	(4)	(5)	(6)

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed form to this office.

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Identify the person			Describe the Case			Classify the case: 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:					
							Remained at Work					(M)					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g. Welder)	(D) Date of injury or onset of illness	(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)	Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other record-able case (J)	Away From Work (K)	On Job Transfer or Restriction (L)	Injury (1)	Skin Disorder (2)	Respiratory Condition (3)	Poisoning (4)	Hearing Loss (5)	All Other Illnesses (6)
FY15-0534	PGS	GEOLOGIST	3/11	Marpi - Saipan USA - Mariana Islands	Wasp sting to thigh - Required steroid injection	☐	☐	☐	☒	___ days	___ days	☒	☐	☐	☐	☐	☐
FY15-0604	PGS	ELECTRICIAN JOURNEYMAN	3/18	Aiken, SC - SWPF AFF	Strain of right calf when descending ladder, - Rx given	☐	☐	☐	☒	___ days	___ days	☒	☐	☐	☐	☐	☐
FY15-0752	PGS	SERVICE TECH	4/01	Warner Robins, GA - Load Bank area	Laceration of lower left arm requiring stitches - Grinder cutting disk disintegrated	☐	☐	☐	☒	___ days	___ days	☒	☐	☐	☐	☐	☐
FY15-0803	PTG	SAFETY SV PATROL OPER	4/07	Honolulu, Hawaii - H-1 Freeway	Inflammation of Lower Back Requiring Rx - Rear ended in motor vehicle accident	☐	☐	☐	☒	___ days	___ days	☒	☐	☐	☐	☐	☐
FY15-0948	PGS	PIPEFITTER JOURNEYMAN	4/24	Aiken, SC - SWPF	Hernia Right Side - Lifting welding machine onto pipe rack	☐	☐	☒	☐	___ days	1 days	☒	☐	☐	☐	☐	☐
FY15-1056	PTG	TECHNICIAN	5/04	Honolulu, Hawaii - H-1 Freeway	Neck and shoulder sprain - rear ended in motor vehicle accident	☐	☒	☐	☐	2 days	___ days	☒	☐	☐	☐	☐	☐
FY15-1097	PGS	CONSTR ENGR	5/08	Atlantic City, NJ - WJHTC Building 300 Rooftop	Strain to left calf during walking - requiring PT	☐	☐	☐	☒	___ days	___ days	☒	☐	☐	☐	☐	☐
					Page totals	0	1	1	5	2	1	7	0	0	0	0	0

Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All Other Illnesses
(1)	(2)	(3)	(4)	(5)	(6)

OSHA's Form 300 *(Rev. 01/2004)*

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Identify the person			Describe the Case			Classify the case — 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)					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g. Welder)	(D) Date of injury or on set of illness	(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)	(G) Death	(H) Days away from work	(I) Remained at Work: Job transfer or restriction	(J) Remained at Work: Other recordable case	(K) Away From Work	(L) On Job Transfer or Restriction	(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) Hearing Loss	(6) All Other Illnesses
FY15-1133	COR	ACCOUNTING ASST	5/12	Pasadena, California - office	Trigger finger to right hand and thumb from mouse use - Requiring PT				X	___ days	___ days	X					
FY15-1172	PTG	ENGINEER, ASSOCIATE	5/15	San Diego, CA - office	Pain in dominant right hand from using mouse - Rx given				X	___ days	___ days	X					
FY15-1381	PGS	ELECTRICIAN JOURNEYMAN	6/02	Aiken, SC - lower level AFF	Injury to left wrist from fall - restricted work day			X		___ days	25 days	X					
FY15-1740	PTG	SAFETY SV PATROL OPER	7/04	Virginia Beach, VA - Westbound I264 road shoulder	Fracture of Foot, Left Side - stumble/fall from divot in road shoulder			X		___ days	3 days	X					
FY15-1873	COR	ADMIN AIDE	7/16	San Francisco, CA - Office	Meniscus fracture of Knee, Right Side - knee popped during walking			X		___ days	63 days	X					
FY15-1880	PEI	LANE TECHNICIAN	7/20	Cherry Hill, NJ - MV Inspection center	Sprain to left knee - Right Side - Knee popped upon standing		X			180 days	0 days	X					
FY15-1891	PEI	LANE TECHNICIAN	7/21	Rahway NJ Inspection Station	Sprain to left ankle - Stepped back into a wheel dip, work restriction		X			7 days	1 days	X					
FY15-1901	PGS	PIPEFITTER JOURNEYMAN	7/22	Aiken, SC - First floor 136	Fractured right index finger tip bone and broke skin requiring stitches - Pinch from handling portable staircase			X		___ days	61 days	X					
					Page totals	0	2	4	2	187	153	8	0	0	0	0	0

Injury (1) | Skin Disorder (2) | Respiratory Condition (3) | Poisoning (4) | Hearing Loss (5) | All Other Illnesses (6)

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Establishment Name: Parsons Corporation
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Identify the person			Describe the Case			Classify the case — 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)					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g. Welder)	(D) Date of injury or onset of illness	(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)	(G) Death	(H) Days away from work	Remained at Work: (I) Job transfer or restriction	Remained at Work: (J) Other recordable case	(K) Away From Work	(L) On Job Transfer or Restriction	(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) Hearing Loss	(6) All Other Illnesses
FY15-1930	PGS	SCA - Pipefitter	7/29	Washington DC - Laydown area	Flash burn to both eyes requiring Rx - proximity to welding operation		X			2 days	days	X					
~~FY15-2064~~	~~PGS~~	~~FIELD EQUIP OPERATOR~~	~~8/07~~	~~Aiken, SC - SWPF J Area~~	~~Abscess to left lower leg, received antibiotics~~				X	days	days						
FY15-2341	PGS	PIPEFITTER APPRENTICE	8/26	Aiken, SC - Room 193	Broken rib incurred during fall - handling scaffolding			X		days	42 days	X					
FY15-2412	PCG	PIPEFITTER APPRENTICE	9/08	Honolulu, Hawaii, - SA5	Infection of right arm from insect bite - Rx received				X	days	days	X					
~~FY15-2421~~	~~PEI~~	~~LANE TECHNICIAN,~~	~~9/09~~	~~Deptford, NJ - MV Inspection~~	~~Knee pain upon entering vehicle~~			X		days	~~20~~ days	X					
FY15-2443	PGS	PAINTER JOURNEYMAN	9/10	Aiken, SC - Stairwell 3 in SWPF	Sprain to left knee while carrying load - Rx received		X			7 days	13 days	X					
FY15-2615	PGS	PAINTER	9/28	Warner Robins, GA - Large garnet media blast bay	Laceration to right arm - hose whip during blasting				X	days	days	X					
FY15-2657	PTG	TECHNICIAN	9/30	Honolulu, HAWAII -DOT FSP	Laceration to head - removing dollies from towed vehicle				X	days	days	X					
					Page totals	0	2	1	3	9	55	6	0	0	0	0	0

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Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All Other Illnesses
(1)	(2)	(3)	(4)	(5)	(6)

OSHA's Form 300 *(Rev. 01/2004)*

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year: 2015

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any specific criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment Name: Parsons Corporation
City: Pasadena State: CA

Identify the person			Describe the Case			Classify the case: 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)					
								Remained at Work									
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g. Welder)	(D) Date of injury or onset of illness	(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)	(G) Death	(H) Days away from work	(I) Job transfer or restriction	(J) Other recordable case	(K) Away From Work	(L) On Job Transfer or Restriction	(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) Hearing Loss	(6) All Other Illnesses
FY15-2806	PGS	PLANNER	10/13	Annville , PA -Training Support Center Warehouse	Inflammation of left lower back - using pallet jack - Restricted work days	☐	☒	☐	☐	5 days	14 days	☒	☐	☐	☐	☐	☐
FY15-2793	PGS	CONSTR ENGR	10/14	El Paso, TX - USACE Fort Bliss Hospital Construction Site	Sprain to Right Knee - slip on plastic	☐	☐	☐	☒	days	days	☒	☐	☐	☐	☐	☐
FY15-2768	PTG	REGIONAL SAFETY SV	10/14	Honolulu, Hawaii - DOT FSP Side of the freeway	Contusion/Bruise of Soft Tissue to head - removing equipment from tow truck	☐	☒	☐	☐	1 days	days	☒	☐	☐	☐	☐	☐
FY15-2884	COR	TM CONSULTANT	10/26	Lake Forest, CA -Office	Repetitive motion strain to right wrist - office work	☐	☐	☐	☒	days	days	☒	☐	☐	☐	☐	☐
FY15-2952	PGS	SYSTEMS ANALYST,	11/03	Kauai , Hawaii -Pacific Missile Range Facility	Sprain to right knee - stepped in hole while walking	☐	☒	☐	☐	11 days	days	☒	☐	☐	☐	☐	☐
FY15-2976	PGS	LABORER	11/10	Greenbelt, MD - NASA Goddard Space Flight Center	Laceration to left thumb requiring stitches - utility knife use	☐	☐	☐	☒	days	days	☒	☐	☐	☐	☐	☐
FY15-3077	PEI.	LABOR RELATIONS	11/20	San Diego, CA- Client office	Carpal Tunnel Syndrome of Finger, thumb, and wrist, Left Side - office work	☐	☐	☐	☒	days	days	☒	☐	☐	☐	☐	☐
					Page totals	0	3	0	4	17	14	7	0	0	0	0	0
												(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) Hearing Loss	(6) All Other Illnesses

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Establishment Name: Parsons Corporation
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Identify the person			Describe the Case			Classify the case — 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:					
								Remained at Work				(M)					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g. Welder)	(D) Date of injury or onset of illness	(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)	(G) Death	(H) Days away from work	(I) Job transfer or restriction	(J) Other recordable case	(K) Away From Work	(L) On Job Transfer or Restriction	(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) Hearing Loss	(6) All Other Illnesses
FY15-3129	PGS	ELECTRICIAN APPRENTICE	12/01	Aiken, SC -Under AFF catwalk	Fracture of front teeth - tool slipped impacting face				X	days	days	X					
FY15-3155	PGS	ADMINISTRATIVE AIDE	12/03	Arlington, Virginia -Office	Corneal abrasion - foreign Body to right eye, prescription eye drops given				X	days	days	X					
FY15-3273	PGS	GIS SPECIALIST	12/16	Hawaii - Schofield Barracks, Army installation field office	Scratched cornea - foreign body to eye, prescription eye drops given				X	days	days	X					
FY15-3314	PGS	ENGINEER	12/21	Chadron, NE - Pine Ridge Civilian Conservation Center	Strain to right side to right leg - slip/fall on ice			X		days	22 days	X					
					Page totals	0	0	1	3	0	22	4	0	0	0	0	0
					Report totals	0	10	8	22	269	288	39	0	0	0	0	1

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Injury (1) | Skin Disorder (2) | Respiratory Condition (3) | Poisoning (4) | Hearing Loss (5) | All Other Illnesses (6)

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1. Purpose

This procedure describes the process, tools, roles, and responsibilities for providing guidelines to inform employees of potentially hazardous chemicals used on Parsons' projects.

2. Scope

2.1. This procedure applies to Parsons Corporation and all Parsons' businesses and subsidiaries worldwide, including joint ventures and similar partnerships managed by Parsons.

2.2. The goal of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) is to identify the intrinsic hazards found in chemical substances and mixtures, and to convey information about these hazards.

2.3. This element does not address storage and handling of hazardous materials, which are covered in the Hazardous Waste Operations Procedure. This element does not address the hazards of exposure to exhaust byproducts from diesel engines, or materials designated as waste or emissions from waste. These hazards are regulated by other procedures or standards. Further, this element does not apply to the following substances:

- Agricultural products or vegetable seed treated with pesticides
- Alcoholic beverages
- Articles not modified (whole components, such as screws to be plated)
- Biological hazards (first aid waste)
- Chemicals or mixtures regulated by the Toxic Substances Control Act (TSCA) (polychlorinated biphenyls [PCBs])
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) hazardous substances being remediated
- Consumer products (e.g., "white-out," spray paint)
- Consumer products used at work where exposure is no more than consumer use (spray paint used only as much and as long as a person would at home). NOTE: See Pesticides below.
- Cosmetics
- Drugs in retail packaging and in packaging designed for personal consumption
- Dust, if not hazardous
- Food and food ingredients
- Hazardous wastes
- Personal food consumed at work
- Pesticides – NOTE: Some states may only allow the application of pesticides (i.e. wasp spray, Raid™, etc) for commercial use (i.e. non-private or non-residential) by a licensed/certified individual. Check your local/city and state/provincial regulations.

- Radiation
- Retail food or alcohol
- Tobacco or tobacco products
- Wood or wood products (unless treated and/or sawed or cut, creating dust)

3. References

3.1. 29 CFR 1910.1200 – Hazard Communication (General Industry)

3.2. 29 CFR 1926.59 – Hazard Communication (Construction)

3.3. American Conference of Governmental Industrial Hygiene (ACGIH) Threshold Limit Values for Chemical Substances (latest edition)

3.4. EM 385-1-1, Safety – Safety and Health Requirements, Section 01.B.06, Indoctrination and Training

3.5. NIOSH, Registry of Toxic Effects of Chemical Substances

3.6. *Parsons ESHARP Guidebooks,* Volumes 1 & 2

3.7. Hazardous Waste Operations Procedure

3.8. Project Document/Records Management Procedure

3.9. United Nations - Global Harmonization System of Classification and Labelling of Chemicals (GHS) – "Purple Book"

3.10. New York State Department of Environmental Conservation, Part 325: Application of Pesticides

4. Procedures

4.1. Project Hazard Communication Plan

4.1.1. The Project Safety, Health, and Environmental Manager (PSHEM) leads the development and implementation of a project-specific hazard communication plan in accordance with state and local regulations and this procedure. The Project Manager (PM) reviews and approves the plan. The PM facilitates implementation and compliance with the program, designating personnel to conduct the inventory and maintain Safety Data Sheets (SDS) and labels.

4.1.2. The Project Hazard Communication Plan is included in the Project Safety, Health, and Environmental Plan (PSHEP) in accordance with Parsons ESHARP Guidebook, Volume 1.

4.1.3. A sample hazard communication plan is provided as Exhibit 8.1. It is a template only and must be modified to address specific project sites.

4.1.4. The PSHEM audits the activities of Parsons' employees and subcontractors to ensure compliance with the plan. At a minimum, the project hazard communication plan must include the following information:

- Name of the person responsible for maintaining the program, and communicating program requirements to employees

- Name(s) of the personnel assigned responsibility for conducting activities within the program (e.g., training employees, conducting an inventory, labeling containers, and maintaining SDSs)
- Inventory of hazardous substances located on the project site
- Locations of, and access to, SDSs
- Outline of methods to be used for:
  - Labeling and other forms of warning
  - SDSs
  - Training employees and visitors
  - Subcontractor hazard communication
  - Non-routine tasks

4.2. Multi-Employer Worksites

4.2.1. For worksites occupied by employees of more than one employer, the requirement for the exchange of information is limited to those situations in which other contractors' employees may be exposed. It does not relieve contractors from maintaining their own hazard communication programs. This effort helps to ensure that all employees have sufficient information to protect themselves in the workplace, regardless of which contractor uses the hazardous chemical.

4.2.2. During the pre-job safety orientation, the PSHEM and superintendent review the project hazard communication plan with each subcontractor's safety representative. A copy of the chemical inventory must be furnished to the subcontractors' safety representative upon request.

4.2.3. The subcontractor submits to the PSHEM copies of its hazard communication program and any SDSs for chemicals to be brought onto the project site. The project subcontract manager provides comments to the subcontractor.

4.3. Hazardous Substance Inventory

4.3.1. Where Parsons operates on client sites, the PSHEM requests a copy of the hazardous substance inventory from the client.

4.3.2. If a current hazardous substance inventory is not available, the designated person coordinates with Parsons' superintendent to conduct a complete physical inventory at the beginning of the project, and quarterly thereafter, of all products (liquids, solids, powders, pastes, gases). The PSHEM assists, as necessary.

4.3.3. The PSHEM (or designee) records each product on the Hazardous Substance Inventory Sheet (see Exhibit 8.2), forwards all completed inventory sheets for current and future products to the PSHEM, and maintains the sheets on file until completion of the project.

4.3.4. Parsons superintendent and the designated person conduct the inventory using a wall-to-wall system for collecting all products for inclusion on the list. Foremen assist the designated person by submitting a list of hazardous substances used by their employees. Review process flow diagrams, if necessary. Unless all materials are included in this list, some hazardous substances might be overlooked.

- Include products in small quantities or in small containers. Small quantities of materials are frequently more hazardous than larger quantities because of the risk of their being overlooked and their potential hazards thus being disregarded.
- Include welding rods, grinding wheels, compressed gases, paints, epoxies, glues, and mixtures.
- Do not include materials exempt from the hazard communication procedure identified in Section 2 above.

4.3.5. Include the approximate quantities (e.g., liters, kilograms, gallons, pounds) for each product that will be on site at any given time.

4.3.6. Attach a site map to the inventory showing where inventoried hazardous substances are stored.

4.3.7. Include a list of all products from the inventory at the front of the SDS binder as an index for locating an SDS. The list must include the SDS number assigned for location in the binder, the product name, manufacturer, and status of the SDS on file. The list must also include any common name that employees use for the product.

4.4. Hazard Classification

4.4.1. It is recommended that the person responsible for GHS implementation consult the GHS Document or "Purple Book" for more complete information.

4.4.2. Physical Hazard - the GHS physical hazard criteria apply to mixtures. It is assumed that mixtures will be tested for physical hazards. In developing GHS criteria for physical hazards it was necessary to define physical states.

- Gas - a substance or mixture which at 50°C has a vapor pressure greater than 300 kPa; or is completely gaseous at 20°C and a standard pressure of 101.3 kPa.
- Liquid - a substance or mixture that is not a gas and which has a melting point or initial melting point of 20°C or less at standard pressure of 101.3 kPa.
- Solid - a substance or mixture that does not meet the definitions of a liquid or a gas.

4.4.3. Health Hazard - health and environmental criteria were established for substances and mixtures.

4.4.4. Environmental Hazard – hazardous to the Aquatic Environment

4.5. Safety Data Sheets

4.5.1. Compile and Update the SDSs

- The PSHEM ensures that an SDS is available for each hazardous substance on the inventory. The designated personnel compile and update the SDSs.
  - PSHEM: Request SDSs for products on the hazardous substance inventory for which no SDS is on hand. Fax and mail a Manufacturer SDS Request Letter (see Exhibit 8.3) to the manufacturer/supplier. Keep a dated copy of this request in the project file. If a project employee has a telephone conversation with a manufacturer or supplier, he must record the conversation as a dated memo and include at the memo in the project file.

- Employees or subcontractors purchasing or receiving products: Submit SDSs to the PSHEM.
- PSHEM: Review each SDS to ensure that all information is provided. The names of substances listed on the SDS must be the same as those printed on container labels and on the hazardous substance inventory. The SDS must be specific to the substances provided by suppliers rather than representative or generic.

4.5.2. Evaluate SDSs

- The PSHEM evaluates each new SDS to ascertain whether products present an acceptable hazard, unacceptable hazard, or need further assessment. This assessment includes the following tasks:
  - Identify the chemical components, potential hazards, and recommended controls.
  - Evaluate hazard(s) identification and classification for any carcinogens or chemicals warranting further assessment.
  - Identify recommended controls and consider their inclusion in an Activity Hazard Analysis (AHA).
  - Investigate equivalent substitute materials with fewer or less serious hazards.
- If the hazard is unacceptable, the PSHEM works with the requestor to find an alternative, less hazardous chemical product.
- If the hazard needs further assessment, the PSHEM contacts the GBU SH&E Director.

4.5.3. SDS Employee Access

- An employee may view the SDS at any time. Therefore, the project must adopt a reasonable method for allowing an employee, subcontractor, collective bargaining representative, or the employee's physician to access the SDS without interruption of normal work operations. Such methods could include:
  - Electronic system: Internet or intranet
  - SDS binder: Locate hard copies of updated, applicable SDSs in employee-accessible areas
  - SDS request system: The PSHEM provides a copy of the SDS for each product requested on the Employee SDS Request Form (Exhibit 8.4)

4.6. Non-Routine Tasks

4.6.1. Priority is given to conducting AHAs for non-routine tasks. Examples of non-routine tasks are cleaning reactor vessels, performing maintenance, and working on unlabeled piping systems. AHAs identify and address chemical safety issues, including employee exposure, storage, and use. The PSHEM ensures that an SDS is available for all products identified in AHAs.

4.7. Testing

4.7.1. Test data already generated for the classification of chemicals under existing systems should be accepted when classifying these chemicals under the GHS, thereby avoiding duplicative testing and the unnecessary use of test animals.

4.7.2. The GHS criteria for determining health and environmental hazards are test method neutral, allowing different approaches as long as they are scientifically sound and validated according to international procedures and criteria already referred to in existing systems.

4.8. Labeling

4.8.1. The project hazard communication plan defines the method for labeling each container of hazardous material on the project. The plan designates an employee responsible for labeling all containers as detailed below.

4.8.2. Review all containers of products on the hazardous substance inventory to ensure that the containers are properly labeled in accordance with Section 4.8.4 below. If a container is not properly labeled, obtain a label from the supplier or create one from the information on the SDS. Local safety equipment vendors may supply labels.

4.8.3. If hazardous materials are received at the project without proper labels, set them aside; do not distribute them for use until they are properly labeled. If an unlabeled container is found in the workplace, test and label it accordingly or dispose of it properly.

4.8.4. General Labeling Requirements

- Labels must be legible and accessible to all employees:
  - Locate labels prominently on the container so that the label can be read when the container is in its usual upright position for use.
  - If labels on containers are exposed to the weather, the label information must be clear and conspicuous at all times. The label must be of a material that cannot be defaced or obliterated by rain, snow, or other adverse elements of the weather.
  - For non-English speaking employees, information must be presented in an indigenous language.
- Containers of mixed products are labeled with the chemical name listed on the SDS for each toxic or hazardous substance in the mixture. It is recommended that containers of mixtures also be labeled with the common name of the mixture.
- Rather than labeling individual workplace containers or vessels, label information such as signs, placards, process sheets, batch tickets, operating procedures, or other such written materials may be displayed in the work area. Each alternative method must identify the container or containers to which it applies, identify the hazardous substance(s) in the container, and show appropriate hazard warnings. These written materials must be readily accessible to employees in the work area during each shift.
- Pipelines containing hazardous substances are not considered containers and need not be labeled. However, AHAs will address how employees working on unlabeled pipelines are protected from chemical hazards.

4.8.5. Primary Container Labeling Requirements

- Labels on primary containers must include the following information:
  - Product identifier or chemical name of the product;

- Signal word;
- Hazard statement(s;
- Precautionary statements(s); and,
- Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.

4.8.6. Secondary Container Labeling Requirements

- A secondary label is not required on a container that an employee fills and immediately uses if the container remains under his/her direct control until it is empty.
- Labels on secondary containers that *do not meet the exclusion above* must meet section 4.8.5.
- If a labeled container is covered by a secondary container or a covering that remains in place while the contents of the container are withdrawn or used, the required labels must also appear on the secondary container or covering.

4.8.7. Hazard Communication Pictograms and Hazards

Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	**Flame**  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	**Exclamation Mark**  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  • Gases Under Pressure	**Corrosion**  • Skin Corrosion/Burns • Eye Damage • Corrosive to Metals	**Exploding Bomb**  • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  • Oxidizers	**Environment** **(Non-Mandatory)**  • Aquatic Toxicity	**Skull and Crossbones**  • Acute Toxicity (fatal or toxic)

4.9. Training

4.9.1. Parsons notifies its employees of the hazards of chemicals to be used on the worksite. Subcontractors must train their own employees.

4.9.2. The PSHEM arranges employee training at the time of the employee's initial assignment, annually, and when a new hazard is introduced to the jobsite. This training can be organized and presented to groups or on a work area by work area basis, depending on the operation.

4.9.3. In accordance with Parsons ESHARP Guidebooks, Volumes 1 & 2, the PSHEM discusses the project hazard communication plan during the initial orientation of occasional and business visitors, as well as contractors, who are subject to exposure to hazardous substances.

4.9.4. Specific training for non-routine tasks and the hazards associated with chemicals contained in unlabeled pipes in the employees' immediate work area is provided to affected employees. Supervisors are responsible for identifying training needs during risk mitigation planning (2 week look-ahead) in accordance with the ESHARP Guidebook.

4.9.5. Employees are advised of their rights to chemical hazard information and to specific training with respect to hazardous substances in the workplace. At a minimum, the information and training includes the following topics:

- Details of the project Hazard Communication Plan.
- Whom to contact for questions regarding chemicals.
- How to obtain a copy of an SDS.
- How to read SDSs, labels, and NFPA hazard classifications (Exhibit 8.5).
- Details on specific chemicals present at the workplace.
    - Identity and location of hazardous substances in the workplace.
    - Physical and health hazards of hazardous substances and potential exposure routes.
    - Methods and observations available for detecting the presence or release of a hazardous chemical in the workplace. Methods can include monitoring conducted by a designated employee. Observations may include the appearance of or the detection of odors of substances.
    - Symptoms of overexposure.
    - Procedures to follow if employees are overexposed to hazardous chemicals.
    - How to handle substances safely.
    - Steps employees must take to protect themselves from hazards, including control procedures, work practices, and PPE.
    - Steps the employer has taken to reduce or prevent exposure to hazardous chemicals.
    - Emergency response procedures.

4.9.6. The records custodian maintains a record of all training or instruction given to employees, using an acceptable training form. Each employee must sign the Employee Acknowledgment Form (Exhibit 8.6). This form is also maintained as a record of training.

5. Definitions

Term	Definition
Activity Hazard Analysis (AHA)	A procedure, described in Parsons' ESHARP Guidebook, used to identify the hazards or potential hazards associated with each step of a job or work plan to uncover hazards and then eliminate, control, or remove them before the work is started.
Alloy	An alloy is a metallic material, homogeneous on a macroscopic scale, consisting of two or more elements so combined that they cannot be readily separated by mechanical means. Alloys are considered to be mixtures for the purpose of classification under the GHS.
Carcinogen	A chemical known or believed to cause cancer in humans
CAS Number	The identification number assigned by the Chemical Abstracts Service (CAS) to specific chemical substances.
CFR	Code of Federal Regulations
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 CAS.
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.
EM	Engineering Manuals
Expose or Exposure	In the course of employment, an employee is subject to a hazardous chemical through any route of entry, including inhalation, ingestion, skin contact, or absorption, and includes potential, possible, or accidental exposure
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
Hazard Statements	Standard phrases assigned to a hazard class and category that describe the nature of the hazard
Hazardous Substance	Any element, chemical, compound or mixture of elements or compounds that is a physical hazard or health hazard, excluding those exempted by other regulations.
Hazardous Materials Identification System (HMIS)	Hazard labeling system developed by the National Paint and Coatings Association (NPCA) to help employers comply with the OSHA Hazard Communication standard.
Label	Any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.
Mixture	Mixtures or solutions composed of two or more substances in which they do not react.
NIOSH	National Institute of Occupational Safety & Health
Safety Data Sheet (SDS)	The written document that sets forth the specific information about a toxic or hazardous substance.
Signal Word	A word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in this procedure are "danger" and "warning." "Danger" is used for the more severe hazards, while "warning" is used for the less severe.

Term	Definition
Substance	Chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition;

6. Responsibilities

6.1. **SH&E Director, Corporate SH&E:** Responsible for developing and maintaining this procedure and conducting periodic reviews and updates to ensure alignment and integration with related or referenced policies and procedure; Coordinating reviews by individuals and organizations responsible for and supported by implementation, including resolution of comments received; Develops training materials, forms, and templates necessary to implement the procedure; and providing safety subject matter expertise and guidance to help ensure the success of this procedure.

6.2. **GBU SH&E Director:** Responsible for providing support to ensure the success of this procedure and auditing its effectiveness.

6.3. **Project Manager (PM):** Ultimately responsible for delivering the project and assigning roles and responsibilities to discipline managers and the Project Management Team; Responsible for reviewing, approving, implementing, and enforcing project Hazard Communication Plan; Designate personnel to conduct project hazard communication plan activities.

6.4. **Records Custodian:** Responsible for documenting employee training and serving as records custodian, maintaining and archiving related documentation.

6.5. **Superintendent:** Responsible for facilitating compliance with and enforcement of this procedure and the hazard communication plan; Review subcontractor hazard communication program with subcontractor.

6.6. **Project Safety Health and Environmental Manager (PSHEM):** Responsible for developing, monitoring and assisting in the implementation of this procedure and the project hazard communication plan on the jobsite; Conducting orientations, including details of the project hazard communication plan, for subcontractors and new employees; Determining training needs and coordinating training for affected employees; Providing the regulatory expertise to ensure that activities are conducted in compliance with the applicable codes, standards, and regulations; and ensuring that AHAs are performed; Identify and address chemical safety issues during site inspections and AHAs; Assist and oversee the designated personnel in conducting a hazardous substance inventory, maintaining SDSs, and labeling; Review, approve, or designate the need for further assessment of SDS for hazardous chemicals; Exchange hazard communication documentation with subcontractors; Coordinate hazard communication training; Reviews client/subcontractor hazard communication program and provides comments.

6.7. **Foreman/Supervisor:** Responsible for supervising work and enforcing this procedure; and conducting daily safety huddles emphasizing hazard communication; Facilitate hazardous substance inventory; Submit SDS copies of new products; Schedule non-routine tasks.

6.8. **Designated Person(s):** Responsible for conducting hazardous substance inventory; Compile and update SDS; Maintain labeling.

6.9. **Employees:** Responsible for complying with the requirements of this procedure; Safely handle hazardous chemicals as instructed on AHA, container label, in SDS, and in training; Ask questions regarding the hazards of chemical products if the hazard, procedure, or work instruction is unclear..

6.10. **Subcontractors:** Responsible for complying with all Parsons' requirements; Develop, implement, and submit subcontractor hazard communication program; Maintain labels and submit copies of SDSs for all hazardous substances brought on site; Training their own employees in applicable Parsons' procedures.

7. Exceptions

7.1. The PM may request or require a more stringent process if required by the contract or is beneficial to the project.

8. Exhibits

8.1. Sample Project Hazard Communication Plan

8.2. Hazardous Substance Inventory Sheet

8.3. Manufacturer's SDS Request Letter

8.4. Employee SDS Request Form

8.5. NFPA Hazard Classifications

8.6. Employee Acknowledgment Form

9. Revision History

Revision	Changes	Approver	Approval Date
0	Original Issue	Barber, Brad	4/10/2014

Exhibit 8.1: Sample Project Hazard Communication Plan

The most current version of this form is available for download and use on the Parsons Corporate Policy Center.

Page 1 of 4

PARSONS Project Hazard Communication Plan

Sample Project Hazard Communication Plan Instructions

The PSHEM may use this sample plan as a format to develop, establish, and implement site-specific hazard communication requirements and rules. This sample plan may be copied, expanded, and modified to customize it to a workplace or project. The plan should be in accordance with all state and local regulations as well as Parsons Hazard Communication Procedure.

Sample Project Hazard Communication Plan

Page 2 of 4

PARSONS Project Hazard Communication Plan

GBU: ____________________

Project/Location: ____________________

Project Start Date: ____________________

A.Company Policy

_____ is committed to the prevention of exposures that result in injury and/or illness, and to comply with all applicable state health and safety rules. To make sure that all affected employees know about information concerning the dangers of all hazardous chemicals used by _____, the following Hazardous Communication Plan has been established.

All work units of _____ will participate in the Hazard Communication Plan. This written plan is available in _____ for review by any interested employee.

B.Container Labeling

_____ is responsible for container labeling procedures, reviewing, and updating. The labeling system used is as follows:

[*Describe the labeling system, including the labels or other forms of warning used and written alternatives to labeling, if any.*]

The procedures for proper labeling, review, and updating of all container warnings are as follows:

[*Also include a description of the procedures for labeling of secondary containers used, making sure that they have the appropriate identification and hazard warning, description of procedures for reviewing and updating label warnings, how often the review is conducted, and the name of the person and position who is responsible for reviewing and updating label warnings.*]

It is the policy of _____ that no container will be released for use until the above procedures are followed.

C. Safety Data Sheets (SDS)

_____ is responsible to establish and monitor the employer's SDS Plan. This person will make sure procedures are developed to obtain the necessary SDSs and will review incoming SDSs for new or significant health and safety information. This person will see that any new information is passed on to affected employees. The procedures to obtain SDSs and review incoming SDSs for new or significant health and safety information are as follows:

[*Include procedures on how to make sure copies are current and updated, how any new information is passed on to affected employees, and the procedures for employee access in work area.*]

Copies of SDSs for all hazardous chemicals in use will be kept in:

[*List location.*]

SDSs are available to all employees during each work shift. If an SDS is not available or a new chemical in use does not have an SDS, immediately contact _____.

Note: If an alternative to printed SDS is used (e.g., computer data), describe the format.

Sample Project Hazard Communication Plan

Page 3 of 4

D. Employee Information and Training

_____ is responsible for the employer/employee training plan.

The procedures for how employees will be informed and trained are as follows:

[*Include methods used for general and site-specific training, and how employees will be informed when nonroutine tasks arise. If your employees work at other employers' jobsites, specify where and how these employees will have access to SDSs and labels, and how they will be informed of precautionary measures to take during normal or emergency operations, if any.*]

_____ ensures that, before starting work, each new employee of _____ attends a health and safety orientation that includes information and training on the following topics:

- Overview of the requirements contained in the Hazard Communication Standard.
- Hazardous chemicals present at his or her workplace.
- Physical and health risks of the hazardous chemical.
- Symptoms of overexposure.
- How to determine the presence or release of hazardous chemicals in his or her work area.
- How to reduce or prevent exposure to hazardous chemicals through use of control procedures, work practices, and personal protective equipment (PPE).
- Steps the employer has taken to reduce or prevent exposure to hazardous chemicals.
- Procedures to follow if employees are overexposed to hazardous chemicals.
- How to read labels and review SDSs to obtain hazard information.
- Location of the SDS file and written Hazard Communication Plan.

Before introducing a new chemical hazard into any work area, each employee in that area will be given information and training as outlined above for the new chemical.

E. Hazardous Nonroutine Tasks

Employees are periodically required to perform hazardous nonroutine tasks. (Some examples of nonroutine tasks are confined space entry, tank cleaning, and painting reactor vessels.) Nonroutine tasks that are performed at _____ include:

-
-
-

Before starting work on such projects, _____ gives each affected employee information about the hazardous chemicals he or she may encounter during these activities.

[*For each activity, list the specific chemical hazards, protective and safety measures the employee can use, and the steps the employer has taken to reduce the hazards, including ventilation, respirators, presence of another employee, and emergency procedures.*]

-
-
-

Sample Project Hazard Communication Plan

Page 4 of 4

PARSONS Project Hazard Communication Plan

- _____

F. Multiemployer Workplaces

_____ is responsible for providing employers of any other employees at the jobsite with the following information:

- Provide copies of SDSs (or make them available at a central location) for any hazardous chemicals that the other employer(s) employees may be exposed to while working.
- Inform other employers of any precautionary measures that must be taken to protect employees during normal operating conditions or in foreseeable emergencies.
- Provide other employers with an explanation of the labeling system that is used at the jobsite.

_____ is also responsible for identifying and obtaining SDSs for the chemicals that the contractor is bringing into the workplace.

G .List of Hazardous Chemicals

The following is a list of all known hazardous chemicals used at this project location and/or by our employees. Further information on each chemical may be obtained by reviewing SDSs located at _____.

SDS identity: [*Include the chemical list developed during the inventory. Arrange this list so that you can cross reference it with your SDS file and the labels on your containers.*]

The following criteria (e.g., label warnings, SDS information) are used to evaluate the chemicals:

Chemical Name	Manufacturer	Location Used
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

8.2: Hazardous Substance Inventory Sheet

The most current version of this form is available for download and use on the Parsons Corporate Policy Center.

PARSONS Hazardous Substance Inventory Sheet

Department:	Supervisor:	Date:
Product Name:		
Chemical(s) as Listed on Label		
Product ID or Stock No.		
Location (pipe shop, etc.)		
Manufacturer's Name:	Telephone:	
Manufacturer's Address:		
Distributor's Name(If on container):	Telephone:	
Distributor's Address:		
Container Size:	Container Count:	
Estimated Quantity:		
Does product have a warning or caution label (e.g., flammable, combustible, toxic)?	Yes ☐	No ☐
Indicate product type:		
Product used for:		
Trades involved in use are:		
Do you have a recent (within 3 years) safety data sheet (SDS) on file for this project? If yes, attach copy to this form.	Yes ☐	No ☐

A hazardous chemical is any chemical that carries a manufacturer's warning on the container label, such as "Warning: this Product is Hazardous to your Health," or a chemical listed as hazardous on the product's SDS. When determining whether a chemical is hazardous, refer to the Hazard Communication Procedure for definition of chemicals classified as hazardous.

A nonhazardous chemical is one that either has no warning language on the label or one that does not meet the criteria for a hazardous chemical. **If the manufacturer does not provide a warning label on the container or an SDS for the product, the employer can treat it as a nonhazardous chemical.**

Consumer Product: A chemical defined as a consumer product and regulated under provisions of the Consumer Product Safety Commission is not included in coverage of hazardous chemicals. If you purchase a product, kept it in the same packaging, and use that product for its intended use in accordance with consumer warning labels, the product is a consumer product and thus exempt. However, if you use any consumer product in a manner it was not designed for or in circumstances that a consumer would not be exposed to (e.g., confined-space use), the chemical should be treated as hazardous.

8.3: Manufacturer's SDS Request Letter

The most current version of this form is available for download and use on the Parsons Corporate Policy Center.

PARSONS Manufacturer's SDS Request Letter

Date: ___________________________

To: ______________________________

RE: Request for SDS, Job No. ____

Dear Sirs:

We have recently purchased or have come to be aware of the following item(s) or substance(s) at our jobsite:

____

We hereby request two copies of the Safety Data Sheets (SDSs), which relate to the above items:

- ☐ The items were purchased _______ by us with Purchase Order No. _______ issued to ____________.
- ☐ The item(s) may have been brought to our jobsite by a subcontractor but are nonetheless on our jobsite.
- ☐ The item(s) are on the jobsite and the law requires that we obtain the MSDSs for them.

Please forward two copies each to:

Parsons

____

(Mailing Address)

Your early attention to this request will be appreciated.

Very truly yours,

____

Parsons

8.4: Employee SDS Request Form

The most current version of this form is available for download and use on the Parsons Corporate Policy Center.

PARSONS

Employee SDS Request Letter

This form is provided to assist employees in requesting Safety Data Sheets (SDSs) concerning the safety and health hazards of toxic substances found in the workplace.

1. Project:____________________
2. Name:____________________
3. Job Title/Craft:____________________
4. Supervisor:____________________
5. Specific Work Location:____________________
6. Phone Number:____________________

Describe briefly the toxic substances you are exposed to:

1. Trade Name:____________________
2. Chemical Name or Ingredients (if known):____________________
3. Manufacturer (name and address, if known):____________________
4. Does substance have a label? ☐ Yes ☐ No
   If yes, attach a label or a copy of information on label.
5. Physical form of substance: ☐ Gas ☐ Liquid ☐ Solid ☐ Dust ☐ Other
6. Any other information that identifies the substance (the circumstances of exposure, other characteristics of the substance, etc.):____________________

If you have specific questions, write them below: ____________________

Submitted by (Signature)Received by (Signature)

DateDate/Time

Issued by (Signature)

Date

8.5: Hazard Classifications (NFPA vs. HazCom2012)

The most current version of this form is available for download and use on the Parsons Corporate Policy Center.

PARSONS — Hazard Classifications

Hazard Classifications - Comparison of NFPA 704 and HazCom 2012 Labels

	NFPA 704	HazCom 2012
Purpose	Provides basic information for emergency personnel responding to a fire or spill and those planning for emergency response.	Informs workers about the hazards of chemicals in workplace under normal conditions of use and foreseeable emergencies.
Number System: NFPA Rating and OSHA's Classification System	0-4 0-least hazardous 4-most hazardous	1-4 1-most severe hazard 4-least severe hazard • The Hazard category numbers are NOT required to be on labels but are required on SDSs in Section 2. • Numbers are used to CLASSIFY hazards to determine what label information is required.
Information Provided on Label	• Health-Blue • Flammability-Red • Instability-Yellow • Special Hazards*-White * OX Oxidizers W Water Reactives SA Simple Asphyxiants	• Product Identifier • Signal Word • Hazard Statement(s) • Pictogram(s) • Precautionary statement(s); and • Name address and phone number of responsible party.
Health Hazards on Label	Acute (short term) health hazards ONLY. Acute hazards are more typical for emergency response applications. Chronic health effects are not covered by NFPA 704.	Acute (short term) and chronic (long term) health hazards. Both acute and chronic health effects are relevant for employees working with chemicals day after day. Health hazards include acute hazards such as eye irritants, simple asphyxiants and skin corrosives as well as chronic hazards such as carcinogens.
Flammability/ Physical Hazards on Label	NFPA divides flammability and instability hazards into two separate numbers on the label. Flammability in red section Instability in yellow section	A broad range of physical hazard classes are listed on the label including explosives, flammables, oxidizers, reactives, pyrophorics,combustible dusts and corrosives.
Where to get information to place on label	Rating system found in NFPA Fire Protection Guide to Hazardous Materials **OR** NFPA 704 Standard System for Identification of the Hazards of Materials for Emergency Response 2012 Edition. Tables 5.2, 6.2, 7.2 and Chapter 8 of NFPA 704	OSHA Hazard Communication Standard 29 CFR 1910.1200 (2012). 1) Classify using Appendix A (Health Hazards) and Appendix B (Physical Hazards) 2) Label using Appendix C
Other	The hazard category numbers found in section 2 of the HC2012 compliant SDSs are NOT to be used to fill in the NFPA 704 diamond.	Supplemental information may also appear on the label such as any hazards not otherwise classified, and directions for use.

8.6: Employee Acknowledgment Form

The most current version of this form is available for download and use on the Parsons Corporate Policy Center.

PARSONS

Employee Acknowledgment Form

I know where the safety data sheets (SDSs) for my work are kept and how to access them.

☐ Yes ☐ No

I understand the safe work procedures and precautions to be taken when working with these products, including use of protective equipment and/or apparel.

☐ Yes ☐ No

I know where the emergency supplies are kept and how to access them.

☐ Yes ☐ No

I know where the emergency phone numbers and hazard communication information are posted.

☐ Yes ☐ No

I am aware that I may review copies of the hazard chemical list, the company's written program, and SDSs.

☐ Yes ☐ No

Print Employee Name____ Date______________________

Employee Signature____

Project/Location ____

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APPENDIX D
WASTE MANAGEMENT PLAN

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Final

Waste Management Plan
Additional Sampling for
CC RVAAP-69 Building 1048 Fire Station,
CC RVAAP-70 East Classification Yard, and
CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift
Ravenna Army Ammunition Plant Restoration Program
Camp Ravenna, Portage and Trumbull Counties, Ohio

November 30, 2017

Contract No.: W912QR-12-D-0002
Delivery Order: 0003

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TABLE OF CONTENTS

LIST OF ATTACHMENTS .... **i**
ACRONYMS AND ABBREVIATIONS .... **ii**

1.0 INTRODUCTION **1**
1.1 Project Description 1
1.2 Areas of Concern Operational History/Description 2

2.0 TYPES OF WASTE MATERIALS **5**

3.0 WASTE HANDLING, STORAGE, AND ACCUMULATION FOR EACH WASTE TYPE **7**
3.1 Management of Soil Investigation-Derived Waste 7
3.2 Management of Liquid Waste 8

4.0 WASTE CLASSIFICATION **9**

5.0 INSPECTION REQUIREMENTS FOR TRANSFERS **11**

6.0 DISPOSAL FACILITY **13**

7.0 WASTE MINIMIZATION METHODS **15**

8.0 REFERENCES **17**

LIST OF ATTACHMENTS

Attachment D-1 Camp Ravenna Waste Management Guidelines and Waste Inspection Form
Attachment D-2 Container Tracking Log
Attachment D-3 Camp Ravenna Waste Tracking Log
Attachment D-4 Camp Ravenna Discharge Form

ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
ARNG	Army National Guard
AST	Aboveground Storage Tank
bgs	below ground surface
Camp Ravenna	Camp Ravenna Joint Military Training Center
CC	Army Environmental Compliance-Related Cleanup Program
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
DFFO	Director's Final Findings and Orders
DLA	Defense Logistics Agency
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Service
IDW	Investigation-Derived Waste
NCP	National Oil and Hazardous Substances Contingency Plan
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
POC	Point-of-Contact
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RVAAP	Ravenna Army Ammunition Plant
SSHP	Site Safety and Health Plan
SVOC	Semi-volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordinance
VOC	Volatile Organic Compound
WMP	Waste Management Plan
WP	Work Plan

1.0 INTRODUCTION

This Waste Management Plan (WMP) is submitted as an appendix to the Work Plan (WP) Additional Sampling for Areas of Concern (AOC), CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034-Motor Pool Hydraulic Lift, Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Camp Ravenna, Portage and Trumbull Counties, Ohio. The Task Order for this project was issued by the United States Army Corps of Engineers (USACE), Louisville District on July 27, 2016. This WMP is prepared in accordance with Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) guidance and regulations and the Camp Ravenna Waste Management Guidelines (OHARNG, 2016, and included as Attachment D-1 to this document). This document is also prepared in accordance with the Ohio Environmental Protection Agency (Ohio EPA) Director's Final Findings and Orders (DFFO, Ohio EPA, 2004) and the National Oil and Hazardous Substances Contingency Plan (NCP). This WMP includes only the tasks and actions required for field work at three AOCs at Camp Ravenna Joint Military Training Center (Camp Ravenna) under Contract No. W912QR-12-D-0002-0003.

The management and handling of waste will be performed in a manner protective of human health and the environment; in compliance with applicable hazardous wastes laws and regulations, and in accordance with the approved project Site Safety and Health Plan (SSHP, Appendix C of the WP). The SSHP provides phone numbers and initial actions to be followed in the event of a spill or a leak. Spill response is handled in accordance with the Camp Ravenna Spill Response Plan as outlined by the Camp Ravenna Waste Management Guidelines (Attachment D-1). These plans are required for hazardous waste operations under federal and state regulations for generators of hazardous waste. Emergency response equipment and supplies to be maintained on site in accordance with these plans will include communications equipment, information postings of emergency contacts and procedures, portable fire extinguishers, spill containment equipment, and decontamination equipment.

1.1 Project Description

Field investigations are currently planned and described in the WP to support completion of a Site Inspection at AOC CC RVAAP-70 East Classification Yard and Remedial Investigations at CC RVAAP-69 Building 1048 Fire Station and CC RVAAP-74 Building 1034 - Motor Pool Hydraulic Lift. As part of this task order in the future, the WP may be amended to include field investigations to complete Remedial Investigations at AOCs CC RVAAP-70 East Classification Yard, CC RVAAP-73 Facility-Wide Coal Storage, and CC RVAAP-79 DLA Ore Storage Sites.

During investigation activities, three primary waste streams will be generated – soil, oily sludge/sediment, and liquid wastes. The scope of work covered under this WMP includes waste management activities consisting of temporary storage, inspection, characterization, transportation and disposal of solid waste (non-hazardous soil) and liquid waste (non-hazardous water). It is not anticipated that hazardous waste will be generated during this investigation. However, if hazardous waste is generated it will be segregated from other waste streams at the site. Project generated soil waste will be disposed of in accordance with local, state, and federal rules, laws, and regulations at a licensed disposal facility. It is anticipated that the contaminated soil will be characterized as nonhazardous solid waste. The liquid waste derived from decontamination, well development, and groundwater purging will be disposed properly as liquid waste at a licensed disposal facility after it is analyzed. Decontamination water will be kept separate from IDW. Personal protective equipment will be managed and disposed of as municipal waste. Waste characterization will determine whether a soil or liquid waste is hazardous or non-hazardous and will dictate the disposal option and facility where the waste will be disposed.

All waste must be moved and managed at Building 1036 (nonhazardous) and Building 1047 (hazardous). The transportation of the contaminated soil will be performed by a subcontractor to be determined (TBD) and the disposal of the contaminated soil will be at an appropriate disposal location TBD. The generator of record for the waste streams generated, stored, transported, and disposed will be the former RVAAP. The Ohio Army National Guard (OHARNG) Restoration Representative will sign the waste profiles and manifests. The Camp Ravenna Compliance Manager is the alternate if the OHARNG Restoration Representative is not available.

The field work will be accomplished in a manner which ensures the health and safety of the workforce and the public at large are not affected or impacted. As such, the work will be completed in accordance with the WP, Sampling and Analysis Plan (Appendix A of the WP), The Quality Assurance Project Plan (Appendix B of the WP), the SSHP (Appendix C of the WP), this WMP, and applicable federal, state and local rules, laws and regulations. Parsons will perform the project in a manner that minimizes the environmental impact to the site and its surroundings.

1.2 Areas of Concern Operational History/Description

CC RVAAP-69, Building 1048 Fire Station

The fire station was located in the Plant Administration Area in the northwest quadrant of the intersection of George Road and South Service Road. In 1968, the fire station was referred to as the Fire and Guard Building and consisted of 12,130 square feet. The fire station building was demolished in late 2008, and the site currently remains undeveloped. Reportedly, it was common practice for the fire department to clean out fire extinguishers behind the west side of the fire building, and to allow the contents of the fire extinguishers (carbon tetrachloride) to spill onto the ground surface. The area of potential impact includes the ground surface behind the former building location.

CC RVAAP-70, East Classification Yard

The former RVAAP was originally equipped with east and west classification yards during the facility's early operational years. The classification yards were used for the switching and maintenance of railroad cars and locomotives. The east classification yard is located east of Load Line 1 and the Main Defense Logistics Agency (DLA) Ore Storage Area in close proximity to the intersection of Ramsdell Road and Irons Road. The east classification yard AOCs consist of Building 47-40 (Round House, still exists but is not actively used), the former herbicide storage shed (former Building 47-60), the containment area for former aboveground storage tank (AST) (documented spill of No. 5 fuel oil occurred within the containment area in 1986), and an outdoor open wash rack south of the East Classification Yard (north of Butts-Kistler Road). A railroad track complex is located east of the site and is currently used by the OHARNG. Potential sources of contamination include railroad maintenance activities, fuel releases, and herbicide storage and maintenance.

CC RVAAP-74, Building 1034 - Motor Pool Hydraulic Lift

An in-ground hydraulic floor lift system has been identified inside the existing Motor Pool building. The hydraulic floor lift system is described in a 1969 drawing as a twin-post lift system constructed of metal. The below-grade system consists of a cast in concrete "L" shaped pit measuring approximately 12 feet (long portion of the "L" shape) and 4 feet (short portion of the "L" shape) in length, 3 feet in width, and 4 feet in depth. The pit is reportedly buried at depths ranging from 4 feet below ground surface (bgs) to approximately 8 feet bgs. The twin- post lift reportedly has a clearance of 6 feet between the floor surface and the bottom of the lift (height in the air). The floor lift system remains in place. It is also believed that an additional floor lift system was historically used at the Building 1034 Motor Pool facility. The potential source of contamination is leaks of hydraulic fluid from the lift system.

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2.0 TYPES OF WASTE MATERIALS

Waste type anticipated to be generated during the investigation will include the following:

- Soil – generated as IDW including drill cuttings from all sites. This soil is anticipated to be characterized as non-hazardous waste.
- Oily sludge/sediment—approximately 10 cubic yards of oily sludge/sediment from the floor and pit of the classification yard (Building 47-40 at CC-RVAAP-70).
- Liquid waste – generated as IDW from well development, groundwater purging and sampling activities, and decontamination of equipment from all sites. This liquid waste is anticipated to be characterized as non-hazardous waste.

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3.0 WASTE HANDLING, STORAGE, AND ACCUMULATION FOR EACH WASTE TYPE

This section discusses the rationale for on-site management of each expected waste type discussed in Section 2.0, which includes soil, sludge/sediment, and liquid waste. In general, the contaminated material will be stored in 55-gallon drums on site until it can be sampled and analyzed to characterize for disposal. Approximately 10 cubic yards of oily sludges and sediment will be removed from Building 47-40 at CC RVAAP-70. This material will be placed in a closed top storage bin (roll-off) container pending characterization and disposal.

The facility is in a rural area and is secured with a perimeter fence. The former RVAAP has been assigned an Ohio EPA Identification Number (OH5210020736) for the generation and storage of hazardous wastes as a small-quantity generator. The waste generated as part of this project is anticipated to be non-hazardous; however, storage will not exceed 90 days from the accumulation start date for each waste. After Parsons has received acceptance of the IDW report and profile by the ARNG, OHARNG and USACE and acceptance of the waste profile by the disposal facility for the waste, Parsons will schedule transport in a timely manner to ensure the 90 days storage limit will not be exceeded.

The temporary storage areas (Building 1036 and/or Building 1047) will be inspected on a weekly basis in accordance with Camp Ravenna Waste Management Guidelines (Attachment D-1) with waste inspection form being completed and submitted to the OHARNG.

3.1 Management of Soil Investigation-Derived Waste

Soil generated as IDW will be placed into Department of Transportation (DOT)-approved 55-gallon drums or 10- or 20-cubic-yard closed-top storage bins, as appropriate. Soil will be screened using a photoionization detector during drilling, and any suspected contaminated soil will be segregated from drill cuttings believed to be uncontaminated. Upon generation, drums will be properly labeled with the date of generation, generator name, site name, contents (i.e., soil cuttings), boring numbers, and point-of-contact (POC) phone number(s). Drums and storage bins will be tracked on Container Tracking Logs (Attachment D-2) as the waste containers are filled. Estimated amounts of waste generated will be reported to the OHARNG on a monthly basis in the Monthly Report. The POC must have knowledge of where and when the IDW was created.

Waste will be characterized based on analytical data, not generator knowledge. An "Analysis Pending" label will be affixed to each container of waste. Once analytical results and waste profiling confirm the waste classification, it will be relabeled for transport, and it is anticipated that the waste will be labeled "Non-hazardous". If the waste classifies as Resource Conservation and Recovery Act (RCRA) hazardous, then appropriate "Hazardous Waste" labels will be used in place of the "Nonhazardous Waste" labels.

An inventory of waste containers (e.g. drums, bins) will be maintained with unique container number and other information from the labels shall be documented on a Container Tracking Log (Attachment D-2). A container label will be securely affixed to a clean surface, and the label will be covered with clear packing tape to protect it from weather/sun exposure. Drums will be properly stored on secondary containment in Building 1036 or 1047.

To minimize complications in waste disposal, the soil IDW in the drums and bins will not contain free liquids (i.e., water).

3.2 Management of Liquid Waste

Liquid waste will consist of groundwater and decontamination fluids. The liquid waste will be collected and pumped directly into labeled, DOT-approved 55-gallon drums or polyethylene tanks. Drum labeling, inventory, and storage will follow the same protocol as described in Section 3.1. The water will be temporarily stored in the drums or tank on site to allow testing, classification, and waste characterization prior to off-site shipping. Secondary containment will be used for all liquid waste generated from this project. Precipitation accumulated in secondary containment areas can be discharged to ground surface only if there is no sheen. A discharge form (Attachment D-4) must be completed and turned into the OHARNG. Before any liquid waste is discharged to the ground surface, it must be analyzed for disposal options. If the analytical results are acceptable, then the Ohio EPA must approve the discharge in advance. If the waste is only hazardous because of pH, it can be neutralized and turned non-hazardous.

4.0 WASTE CLASSIFICATION

The waste characterization will not be based on generator knowledge and will depend on the waste characterization sampling results and results from the project samples. All waste will be classified based on the results of the sampling analysis performed by Parsons for each waste stream. Hazardous wastes will be disposed at a licensed RCRA hazardous waste facility. Non-hazardous waste will be disposed of at an off-site permitted landfill. Although not anticipated, if hazardous waste is generated it must be transported and disposed by Defense Reutilization Marketing Office-approved transporters and disposal facilities as stated in the Camp Ravenna Waste Management Guidelines (Attachment D-1).

Potential contaminants in soil and liquid waste vary by AOC:

- CC RVAAP-69: carbon tetrachloride,
- CC RVAAP-74: hydraulic fluid (mineral oil),
- CC RVAAP-70: oil, polycyclic aromatic hydrocarbons, and metals.

The oily sludge/sediment from Building 47-40 to be removed may be contaminated from on-site historical practices such as locomotive maintenance. It is not related to the disposal of chemical agent, agent-contaminated material, or biological agents. No Unexploded Ordinance (UXO) is present at these sites. No biological screening is proposed for this site. The contaminated soil and liquid waste are anticipated to be non-hazardous waste, but samples will be collected and analyzed prior to disposal. With the information from the site history, the soil, oily sludge/sediment, and liquid waste will be tested for Toxicity Characteristic Leaching Procedure (TCLP) (Method 1311) metals, TCLP volatile organic compounds (VOCs), TCLP semi-volatile organic compound (SVOCs), TCLP herbicides, TCLP pesticides, total sulfide, total cyanide, corrosivity (pH), and flashpoint. The contaminated soil is not a listed hazardous waste on the F, K, P, or U lists of specific waste streams from industrial or manufacturing processes or discarded commercial chemical products. The contaminated soil would only be considered hazardous solid waste if it exhibits any of the four characteristics: ignitability, corrosivity, reactivity, or toxicity.

The waste characterization data will be included with the waste profile that is submitted to the disposal facility (TBD Landfill) for approval prior to disposal. All data must be submitted in an IDW letter report that is submitted to the ARNG, OHARNG and USACE and must be approved prior to disposal. The waste profile must also be reviewed and approved by the ARNG, OHARNG and USACE prior to disposal.

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5.0 INSPECTION REQUIREMENTS FOR TRANSFERS

All containers will be inspected on a weekly basis and documented. The inspection will document the container ID number, label information, condition of secondary containment structures, and condition of the containers. The IDW soil drums and containers will be loaded out for off-site disposal as soon as practical following the sampling operations. The IDW soil will most likely be loaded, transported, and disposed of off-site as non-hazardous contaminated material.

Before loading, trucks will be inspected and surveyed for damage and residual contamination by Parsons personnel. Decontamination will be conducted if required. Daily vehicle inspections will be performed prior to loading. Inspections will be conducted from the ground only.

Federal DOT regulations will be followed during transport activities. The soil and oily sludge/sediment will be DOT-classified based on direct sample results. The DOT labeling requirements will be followed; and appropriate placards, bill of lading, and waste profile approval to transport contaminated soil from the RVAAP will be in place.

Liquid waste will be disposed off-site based on the disposal facility waste characterization analytical requirements. Precipitation with no visible sheen accumulated in secondary containment areas may be discharged to the ground surface. Ground surface discharges are subject to strict state and federal discharge conditions as well as Camp Ravenna specific guidelines. Ground surface discharges are allowed after a Camp Ravenna rain water release form is completed. Liquid waste will be generated and handled in accordance with local, state, and federal regulations.

Off-site transportation routes will pre-determined by the transporter. A primary and secondary route to the facility will be identified. The secondary route will be used only if the primary becomes impassible due to weather or road conditions or blockage from construction or accidents.

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6.0 DISPOSAL FACILITY

All wastes must be compared to all characteristic regulatory limits for reactivity, corrosivity, toxicity, and ignitability. Transporters and disposal facilities will be determined and detailed in the IDW report and waste profile. Off-site disposal facilities will be selected based on waste characterization data collected from the contaminated soil, oily sludge/sediment, and liquid waste. It is anticipated that the contaminated media will not exceed TCLP limits or be characteristically hazardous for reactivity, ignitability or corrosivity, and, therefore, will be profiled as non-hazardous waste for disposal at a disposal facility TBD.

If waste characterization results determine soil, sludge, or liquid waste to be hazardous, it will be disposed at an approved hazardous waste treatment, storage, or disposal facility within 90 days of the accumulation start date on each container or stockpile. Waste containers will be inspected on a weekly basis prior to off-site transport. Shipments of waste will be coordinated through the OHARNG Restoration Representative. Defense Reutilization and Marketing Service (DRMO) transporters and disposal facilities will be used for hazardous waste.

For the wastes shipped off-site, records will be maintained in accordance with local, state, and federal regulations. A Waste Tracking log will be maintained to document the shipping and disposal of all wastes generated under this project (Attachment D-3).

The waste management subcontractor contact information is:

Stephen Kilper
Avalon Holdings Corp.
One American Way
Warren, Ohio 44484
Tel 330.856.8800

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7.0 WASTE MINIMIZATION METHODS

The generation of waste will be minimized to the maximum extent practicable, and necessary precautions will be in place to avoid mixing clean and contaminated wastes. Runoff from secondary containment areas will be collected and analyzed for disposal options. If analytical results are acceptable, Parsons will discharge the collected runoff to ground surface assuming there is no sheen on the water and it consists of only precipitation following approval by USACE and the OHARNG in accordance with local, state, and federal regulations and Camp Ravenna specific discharge parameters. Waste minimization procedures will include:

- Re-using materials that do not require decontamination, to the extent practicable;
- Minimizing the volume of decontamination fluids;
- Minimizing contact with potentially contaminated materials;
- Minimizing foot and vehicle traffic through potentially contaminated areas; and
- Using good housekeeping practices.

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8.0 REFERENCES

Ohio Army National Guard (OHARNG), 2016. Camp Ravenna Waste Management Guidelines and Waste Inspection Form. May.

Ohio Environmental Protection Agency (Ohio EPA), 2004. *Director's Final Findings and Orders (DFFO) for RVAAP*, June 10.

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ATTACHMENTS

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ATTACHMENT D-1

CAMP RAVENNA WASTE MANAGEMENT GUIDELINES AND WASTE INSPECTION FORM

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CAMP RAVENNA WASTE MANAGEMENT GUIDELINES

PURPOSE: Guidelines to be followed by contractors working at Camp Ravenna Joint Military Training Center who are generating/shipping Hazardous, Non-Hazardous, Special or Universal Waste.

POLICY: The policy at Camp Ravenna is to comply with all local, state, federal and installation requirements. Contractor is responsible for waste minimization and is required to recycle materials if possible.

Restoration Program POC: Katie Tait (614) 336-6136 **Military & Non-Restoration POC: Brad Kline (614) 336-4918**

Coordination:

- Coordinate all waste generation and shipments with the appropriate Camp Ravenna POC listed above or the Environmental Supervisor in their absence at (614) 336-6568.
- Notify Camp Ravenna POC prior to waste sampling for characterization. Details about sampling activities must be included (i.e., number of sample, analyticals, etc.).
- All Hazardous and Non-Hazardous waste management storage locations must be pre-approved prior to generation.
- Ensure all labels include: Date, Contractor, and Waste Type.
- When contractors have waste onsite, a weekly Inspection inventory must be completed and submitted to the appropriate POC in the Camp Ravenna environmental office.
- All wastes shall be tracked and logged throughout the duration of the project. Contractor will provide Camp Ravenna POC with a monthly rollup report of all waste and recycled streams generated by no later than the 10th day of the following month.

Hazardous Waste Treatment, Storage and Disposal Facilities and Waste Haulers: Contractors are required to utilize hazardous waste haulers and Treatment, Storage, and Disposal Facilities on the latest Defense Reutilization Marketing Office (DRMO) approved list. The current qualified waste hauler and TSDF list can be viewed by following the "Qualified Facilities" and "Qualified Transporters" links found on the DLA Hazardous Waste Disposal Homepage, http://www.dispositionservices.dla.mil/newenv/hwdisposal.shtml.

Hazardous or Non-Hazardous manifest form, the following must be included:

- Military and non-restoration operations waste Site Name = Camp Ravenna Joint Military Training Center. Mailing and Site address: Camp Ravenna ENV, 1438 State Route 534 SW, Newton Falls, Ohio 44444, (614) 336-4918. Ohio EPA ID # – OHD981192925.
- Restoration Program waste Site Name = Former Ravenna Army Ammunition Plant. Mailing address is same as address above. Site address: 8451 State Route 5, Ravenna, Ohio 44266, (614) 336-6136. Ohio EPA ID # – OH5210020736.
- Contractor's shipping Hazardous Waste must provide a Land Disposal Restriction (LDR) in accordance with 40 CFR Part 268.
- Profiling:
  - The required shipping documentation (i.e. waste profile and executive summary of lab reports (if available)) need to be submitted to appropriate Camp Ravenna POC or designee(s) for approval and signature prior to shipping.
  - Results of characterization must be submitted to appropriate Camp Ravenna POC within 30 days after collecting sample.
- Manifests - Hazardous and Non-Hazardous:
  - The waste carrier/transporter provides appropriate manifest to the contractor.
  - The contractor is required to:
    - Ensure that Camp Ravenna POC or designee(s) is available to sign the manifest on the scheduled day of shipment;
    - Verify that each manifest is properly completed and signed by Camp Ravenna POC or designee(s);
    - Provide the Generator copy of the manifest to Camp Ravenna POC or designee(s); and
    - Ensure that the original Generator copy of the manifest signed by the treatment storage disposal facility is returned to Camp Ravenna within 30 days of the shipping date for Hazardous and Non-Hazardous Waste.
    - The use of a Bill of Lading, in lieu of a waste manifest, must be approved by the Camp Ravenna environmental office.

All satellite accumulation storage sites and containers will comply with 40CFR 262.34(c)(1):

- Any material that is subject to Hazardous Waste Manifest Requirements of the US Environmental Protection Agency must comply with 40 CFR Part 262.
- From the time any waste is placed in a satellite storage container, proper labeling must be on the container (proper labeling includes date, contractors name and product type).
- Pending analysis label is to be used from the time the sample is taken until the results are received.
- In no case will waste labeled pending analysis exceed 45 days.

All Camp Ravenna Hazardous and Non-Hazardous records are maintained at the Camp Ravenna environmental office, point of contacts are Katie Tait at (614) 336-6136 and Brad Kline at (614) 336-4918.

CAMP RAVENNA WEEKLY NON-HAZARDOUS & HAZARDOUS WASTE INSPECTION/INVENTORY SHEET

Contractor: ____________ **Month:** ________________ **Year:** ___________ **Waste Description:** ___________

Container Nos. ____

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
	Date: **Time:**	**Date:** **Time:**	**Date:** **Time:**	**Date:** **Time:**
Point of Contact (Name / Number)				
Project Name:				
Contracting Agency and POC:				
Waste Determination: Pending Analysis, Hazardous, Non-Hazardous, etc.				
*Location on installation:				
Date Generated:				
Projected date of disposal:				
Non-Haz, Satellite, 90 day storage area				
Waste generation site:				
Number of Containers (size / type):				
Condition of Container:				
Containers closed, no loose lids, no loose bungs?	yes / no	yes / no	yes / no	yes / no
Waste labeled properly and visible (40 CFR 262.34 (c) (1):	yes / no	yes / no	yes / no	yes / no
Secondary containment	yes / no	yes / no	yes / no	yes / no
Incompatibles stored together?	yes / no	yes / no	yes / no	yes / no
Any spills?	yes / no	yes / no	yes / no	yes / no
Spill kit available?	yes / no	yes / no	yes / no	yes / no
Fire extinguisher present and charged?	yes / no	yes / no	yes / no	yes / no
Containers grounded if ignitables?	yes / no / na	yes / no / na	yes / no / na	yes / no / na
Emergency notification form/info present?	yes / no	yes / no	yes / no	yes / no
Container log binder present?	yes / no	yes / no	yes / no	yes / no
Signs posted if required?	yes / no	yes / no	yes / no	yes / no
Photo's submitted	yes / no	yes / no	yes / no	yes / no
Printed Name:				
Signature:				

This form is required for Non-Hazardous and Hazardous waste including PCB and special waste.

CONTRACTORS ARE REQUIRED TO SUBMIT THIS FORM WEEKLY TO THE CAMP RAVENNA ENV OFFICE WHEN WASTE IS STORED ON SITE.

CONTRACTORS ARE ENCOURAGED TO INCLUDE PHOTOS WITH EACH WEEKLY INSPECTION SHEET WHEN WASTE IS STORED ON SITE.

*Draw detailed map showing location of waste within the site.

Attachment D-2 Container Tracking Log
Ohio EPA ID # OH5210020736
For CC RVAAP-69, CC RVAAP-70, and CC RVAAP-74
Waste Management Plan - Additional Sampling Work Plan Field Activities - 2017

CONTAINER ID #	WASTE TYPE (SOIL/ LIQUID/ SLUDGE)	DATE WASTE IS PLACED IN CONTAINER	ORIGIN OF WASTE (SITE WHERE GENERATED)	WASTE CHARACTERIZATION (HAZ OR NONHAZ)	WASTE AMOUNT (CY/LBS/GAL ETC)

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Attachment D-3 Camp Ravenna Waste Tracking Log

Ohio EPA ID # OH5210020736

For CC RVAAP-69, CC RVAAP-70, and CC RVAAP-74

Waste Management Plan - Additional Sampling Work Plan Field Activities - 2017

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Attachment D-4 Camp Ravenna Discharge Form

Ohio EPA ID # OH5210020736

For CC RVAAP-69, CC RVAAP-70, and CC RVAAP-74

Waste Management Plan - Additional Sampling Work Plan Field Activities - 2017

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APPENDIX E
REGULATORY CORRESPONDENCE
AND COMMENT RESPONSE TABLES

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Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

August 24, 2017

Mr. Mark Leeper, P.G., MBA
Team Lead, Cleanup and Restoration Branch
Army National Guard Directorate
111 South George Mason Drive
Arlington, VA 22204

Re: US Army Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
267000859214

Subject: **Ravenna Army Ammunition Plant, Portage/Trumbull Counties. Ohio EPA Comments on the "Draft Work Plan Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift" at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio, Dated June 28, 2017 Ohio EPA ID# 267-000859-214**

Dear Mr. Leeper:

The Ohio Environmental Protection Agency (Ohio EPA) has received and reviewed the "Draft Work Plan Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift" at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. This document was received at Ohio EPA's Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) on June 29, 2017. The plan was prepared for the National Guard Bureau by PARSONS under Contract Number W912QR-12-D-0002.

Comments on the document based on Ohio EPA's review are provided below. Please provide responses to the enclosed comments in accordance with the Directors Findings and Orders.

COMMENTS

CC RVAAP-69 Building 1048 Fire Station

1. The Field Sampling Plan (Appendix A) does not contain special field procedures to minimize sampling errors when sampling ground water and soil for perfluorinated compounds (PFCs). PFCs are analyzed with detection limits that are three orders of magnitude lower than those used for most other analytical methods (e.g., parts per trillion (ppt) vs parts per billion (ppb)). Also, PFCs are ubiquitous in our surroundings. This

requires that field personnel be especially aware of their surroundings, equipment, and in particular, that sampling procedures are followed in order to minimize the potential for cross-contamination and false positives. Please include additional provisions specific to minimizing cross-contamination and false positives when sampling for PFCs. Below is a list of references that may be helpful in providing special sampling procedures when sampling for PFCs. Also, attached for reference is *DDAGWs May 2017 Draft Standard Operating Procedure for PFAS Sampling*.

AECOM, 2016 PFAS Sampling Webinar: Technical Training for Waste Site Cleanup Professionals. Chiang, D., presenter. AECOM, Aug 3, 2016.

AECOM, *Poly- and Perfluoroalkyl Substance (PFAS) Sampling and Analysis: Truths, Traps, and Consequences;* June, 2016; AECOM PFAS Client Webinar.

Aerostar SES LLC Standard Operating Procedure 002P Groundwater Sampling at Perfluorinated Compound (PFC) Sites, July 2016 (Revision 2)

Aerostar SES LLC Standard Operating Procedure 028P Field Sampling Protocols to Avoid Cross-Contamination at Perfluorinated Compound (PFC) Sites, July 2016 (Revision 2)

Fujii et al., 2013, Occurrence of perfluorinated carboxylic acids (PFASAs) in personal care products and compounding agents. Chemosphere 2013 Sep; 93(3): 538-44. 10.1016/j.chemosphere.2013.06.049. Epub 2013 Aug 6

Technical Guidance Manual for Ground Water Investigations, Chapter 10, *Ground Water Sampling*, Ohio Environmental Protection Agency, May 2012.

Tetra Tech, *Standard Operating Procedure, Field Sampling at Per- and Polyfluorinated Compounds (PFAS) Sites*, Tetra Tech PFAS SOP.

Transport Canada, *Perfluorochemical (PFAS) Field Sampling Protocol;* Revised, May 2013; TC PFAS Sampling Protocol.

2. It is not clear that soil boring and borings from monitoring wells are going to be continuously logged. Please clarify. Ohio EPA recommends that soil borings/monitoring wells be continuously logged from the surface to their terminal depth.

3. The plan indicates that soil samples will be taken at five-foot intervals in new soil borings to be installed near existing soil borings SB-101, RV5-SB-2, SB-102, SB-103, and SB-105 from a depth of 10 feet below ground surface (bgs) to the terminal depths indicated in the plan. Collecting samples on five-foot intervals is rather arbitrary. DDAGW recommends that where soil samples are collected, the sample interval should be determined based on PID screenings, odor, and staining. It is not clear why the plan does not require biasing the soil samples in a given sample interval to the depth interval where

the greatest apparent contamination occurs based on PID readings, odor, and/or staining. Please explain.

4. Figure 2-1 entitled *CC RVAAP-69 Building 1048 Fire Station Existing Sample Locations and Previous Carbon Tetrachloride Detections* is illegible. Since the results of the 2012/2015 RI were used to determine the data gaps and scope of work for the submitted plan, it would be helpful for the plan to be revised with a clearer version of Figure 2-1 to facilitate a thorough review of the plan. Please submit a legible copy.

5. Page x states that previous RI results indicated that SB-101 and RV5-SB2 had the highest concentrations of carbon tetrachloride. Page xi states that previous RI results indicated the maximum concentrations of carbon tetrachloride were in SB-101 and SB-104. In addition, Figure 2-1 summarizing carbon tetrachloride concentrations is illegible. Therefore, it is not clear where beneath CC RVAAP-69 the previous RI soil data had the highest concentrations of carbon tetrachloride. Please clarify this.

6. Ohio EPA agrees with the planned use of grab ground water samples to initially estimate the extent of ground water contamination and guide the installation of permanent monitoring wells. However, if carbon tetrachloride and/or its decay products are detected in ground water, more than the proposed minimum of three permanent monitoring wells may be needed to confirm the extent of carbon tetrachloride and daughter product contamination beneath CC RVAAP-69.

7. The plan does not contain provisions for determining the presence or thickness of possible dense non-aqueous phase layers (DNAPL) or free product in the bottom of wells installed in CC RVAAP-69. As indicated on page 39 of the plan, carbon tetrachloride is denser than water. A cursory review of historical carbon tetrachloride fire equipment indicates that carbon tetrachloride fire extinguishers contained carbon tetrachloride (typically a minimum of 25%) pressurized either by air or nitrogen and that fire grenades contained nearly pure carbon tetrachloride. Many carbon tetrachloride fire extinguishers are marked: "never use with water." Carbon tetrachloride from such equipment was likely released to the environment in a free product form, not as a dissolved phase in water as indicated on page 39 of the plan. Please include a provision for checking wells in CC RVAAP-69 for DNAPL free product in the bottom of the wells. Please note if such a DNAPL is present, its thickness needs to be measured.

8. According to page xi, "if a carbon tetrachloride plume is not indicated by the grab samples, at a minimum one monitoring well will be installed near SB-101 (where maximum concentrations have been detected in soil). Additional monitoring wells will be installed to ensure that the local potentiometric surface can be mapped."

   To be clear, a minimum of three monitoring wells will be needed to establish ground water flow direction. Please modify the plan to clearly state the minimum number of wells that will be installed to determine ground water flow direction.

9. The plan refers to May 2016 U.S. EPA RSLs. Please update the plan to reference the most recent version of U.S. EPA RSL (at this writing, June 2017).

10. According to the plan, CC RVAAP-69 monitoring wells will be monitored quarterly for the period of one year. Depending on the results from the CC RVAAP-69 wells, sampling of aforementioned wells may be warranted beyond the first year, although perhaps at a different sampling frequency.

CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

11. To avoid confusion, the TPH - C_{10} to C_{20} distillate range described in the plan as "diesel range organics" or "DRO" should be more accurately described as "middle distillates range." A full DRO scan is $C_{10}$to C_{28}. Also, the TPH - C_{20} to C_{34}distillate range described in the plan is "motor oil range" or "MRO" (not to be confused with middle rage organics or distillates) is more accurately described as "heavy distillates range." The full "used motor oil" range would include light (C_6 to C_{12}), middle (C_{10} to C_{20}), and heavy (C_{20} to C_{34}). Please revise the TPH descriptions accordingly.

12. According to the U.S. EPA (2017) and United Nations, hydraulic fluid produced prior to 1977 may contain polychlorinated biphenyls (PCBs) as sometimes PCBs were included as additives to improve thermal resistance. Please update the plan to include testing of the proposed soil and ground water samples for PCBs (EPA Method SW-846-8082A).

13. The plan indicates that ground water samples from temporary and permanent monitoring wells will be analyzed for TPH - C_{10} to C_{20} and C_{20} to C_{34} distillate ranges (U.S. EPA Method SW 846-8015B). Since ground water samples are not typically analyzed for TPH, it is not clear which appropriate and relevant standards such TPH ground water results would be compared to. Please clarify.

14. Figure 2-3 shows a "hydraulic lift" and a "rear axle lift." It is not clear if the rear axle lift is also an in-ground hydraulic lift. The text appears to refer to a single hydraulic lift. Please clarify.

15. It is not clear why the plan does not include testing of the proposed soil and ground water samples for the BUSTR list of SVOCs/polynuclear aromatic (PNA) compounds. PNAs are constituents in diesel. According to the plan, soil samples obtained for 2013 RI of CC RVAAP-74 included SVOCs. The current work plan does not include the 2013 SVOC soil results for CC RVAAP-74. Soil samples from in seven of the 21 borings installed the 2013 RI had detectable concentrations of middle range organic (C_{10} to C_{20}) which may be indicative of hydraulic oil or diesel. Please include the BUSTR list of SVOCs/PNAs (EPA Method SW-846-8270).

16. The discussion about free product on page xvi requires clarification. The definition of "free product" given in the plan: "...oil that flows out of the formation versus residual saturation or oil that is essentially immobile and held in capillary spaces" does not conform to the

general understanding of what "free product" is, and confuses the issues of free product and free product mobility.

Free product is generally understood to be is a non-aqueous phase liquid (versus dissolved phase). During the 2013 RI, concentrations of TPH - heavy distillate range (C_{20} to C_{34}) in borings SB-17 (6.0 to 6.5 feet bgs interval) and SB-18 (8.0 to 8.5 feet interval) exceed BUSTR's soil saturation Action Level of 5,000 mg/kg for Class 1 Soil (e.g., coarse-grained soils such as gravels and sandy soils). The concentration of TPH - heavy distillate range (C_{20} to C_{34}) in soil sample from SB-18, 8.0 to 8.5 feet interval also exceeds BUSTR's soil saturation Action Level of 20,000 mg/kg for Class 2 soils (e.g., fine-grained soils such as silts and clays). Exceedance of soil saturation Action Levels is a good indicator that free product is mobile. Also, during the 2013 RI, free product was noted in the soil sample from the 7.5 to 8.5 feet level in boring SB-18.

Ohio EPA agrees that the plan's proposal to photograph the presence of oil on the surface of soil in the vadose zone and measure light non-aqueous phase liquid (LNAPL) at the water table will verify that free product has mobilized. However, the lack of LNAPL at the water table does not mean that free product in the vadose zone cannot migrate to the water table. If LNAPL is not present at the water table, it is not clear how the Army will demonstrate that free product in the vadose zone will not likely migrate to the water table. Please revise this section to conform to the general understanding of what free product is.

17. It is not clear if the borings to be installed in the immediate vicinity of previous borings SB-14, SB-18, SB-19 and other borings to be converted to monitoring wells are going to be continuously logged to their terminal depths. Ohio EPA recommends that these borings be continuously logged to help determine the nature and extent of TPH contamination at that location. Please clarify whether these borings are will be continuously logged.

18. The plan proposes additional investigation of the mobility of free product in the vicinity of SB-18 where results from the 2013 RI indicate soil (8.0 to 8.5 feet bgs interval) had a concentration of TPH - C_{20} to C_{34} distillate range exceeding BUSTR's soil saturation Action Level for Class I Soil. The plan does not contain provisions for investigation of the mobility of free product in the vicinity of previous boring SB-17 in which results from the 2013 RI indicate a soil sample (6.0 to 6.5 feet bgs) had a concentration of TPH C_{20} to C_{34} distillate range exceeding BUSTR's soil saturation Action Level for Class I Soil. Please explain.

19. Ohio EPA agrees with the planned use of grab ground water samples to initially estimate the extent of ground water contamination beneath CC RVAAP-74 and guide the installation of permanent monitoring wells. However, if LNAPL free product, TPH, VOCs, or other COPCs are detected in ground water, more than the proposed minimum of three permanent monitoring wells may be needed to confirm the extent of the aforementioned COPCs in ground water beneath CC RVAAP-74.

20. If hydraulic oil is not contaminated with fuel or motor oil, it may not contain enough volatile compounds to be readily detected by a PID. Also, if hydraulic oil is not degraded or contaminated, it may not produce visible soil staining. Ohio EPA recommends that an ultraviolet light (UV) light be used to help screen for the presence of hydraulic oil. Petroleum oils will fluoresce colors ranging from yellow through blue. Please revise the report to include the use of UV light as a screening tool.

21. Section 4.4.5.2 of the *Field Sampling Plan* found in Appendix A of the *Draft Work Plan* indicates that "as built well construction diagrams" will be prepared for each monitoring well and submitted to the Army's Restoration Project Manager (RPM).

Ohio Revised Code (ORC) 1521(B) requires that a well construction log meeting the requirements of ORC 1521(B)(1) through (B)(9) be submitted to ODNR within 30 days of construction of the well. The well construction diagrams described in Section 4.4.5.2 do not meet the requirements of ORC 1521(B)(1) through (B)(4) or ORC 1521 (B)(7) through (B)(9). The well construction diagrams described in Section 4.4.5.2 of the plan need to be consistent with Ohio code. Also, the plan does indicate that well construction logs will be submitted to ODNR in accordance with ORC 1521(B). Please revise the work plan to address these issues.

22. Section 4.4.6 of the *Field Sampling Plan* found in Appendix A of the *Draft Work Plan* indicates that abandonment of each well/borehole will follow field procedure outlined in Chapter 9 of Ohio EPA's *Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring (TGM)*. Note: According to Ohio Administrative Code (OAC) Rule 3745-9-01(B) "abandoned well" means a well, test hole, or dry hole whose use has been permanently discontinued.

Section 4.4.6 of the *Field Sampling Plan* (page 24) states that: "Ohio Revised Code 1521.05(B)(9) requires that a well sealing report be filed with Ohio Department of Natural Resources." The aforementioned code citation is incorrect. ORC 1521.05(C) requires the submission of sealing reports to ODNR within 30 days after completion of the sealing. Please correct the rule citation.

While Section 4.4.6 of the *Field Sampling Plan* (page 24 - 25) indicates that a well sealing report will be prepared for each abandoned well or borehole and submitted to the Army's Restoration Project Manager, it does not indicate that sealing reports for each abandoned well or borehole will be submitted to ODNR in accordance with ORC 1521.05(C). Please revise this section to indicate the well sealing logs will be submitted to ODNR in accordance with ORC 1521.05(C).

23. According to the plan, CC RVAAP-74 monitoring wells will be monitored quarterly for the period of one year. Depending on the results from the CC RVAAP-74 wells, sampling of aforementioned wells may be warranted beyond the first year, although perhaps at a different sampling frequency.

Once the quarterly groundwater data from the first year of sampling is completed and evaluated, the decision to stop monitoring in the hydraulic lift area at the Motor Pool Building should be based on whether there are free hydrocarbons (i.e. light non-aqueous phase liquids (LNAPL)), or significant concentrations of dissolved compounds. Therefore, the decision on when the monitoring stops should be delayed until the data is available. Please incorporate this approach into the work plan.

CC RVAAP-70 – East Classification Yard

24. The plan does not identify any data gaps or additional work directly related to ground water for CC RVAAP-70. Considering that the 2012 SI sampling results indicated concentrations of PNAs and PCBs above FWCUGs and/or May 2016 RSLs, and also identified areas of soil staining, it is not clear why potential impacts to groundwater were not identified as a potential data gap to be addressed by ground water sampling. Please explain.

This work plan was reviewed by personnel from Ohio EPA DERR and DDAGW. Additional information is necessary to approve the document. If you have questions, or would like to set up a meeting to discuss these comments, please call me at (330) 963-1170.

Sincerely,

Edward D'Amato
Environmental Specialist
Division of Environmental Response and Revitalization

ED:cla

cc: Katie Tait/Kevin Sedlak, ARNG, Camp Ravenna
Gail Harris/Rebecca Shreffler, Vista Sciences
Greg Moore, USAGE Louisville

ec: Mark Leeper, Restoration/Cleanup Manager, ARNGD
Rod Beals, Manager, Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
Vanessa Steigerwald Dick, Ohio EPA, NEDO, DERR
Kevin Palombo, Ohio EPA, NEDO, DERR
Kelly Kaletsky, Supervisor, Ohio EPA, Central Office, DERR
Tom Schneider, Supervisor, Ohio EPA, Central Office, DERR
Brian Tucker, Ohio EPA, Central Office, DERR
Carrie Rasik, Ohio EPA, Central Office, DERR

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NATIONAL GUARD BUREAU
111 SOUTH GEORGE MASON DRIVE
ARLINGTON VA 22204-1373

October 16, 2017

Ohio Environmental Protection Agency
DERR-NEDO
Attn: Edward J. D'Amato, Project Coordinator
2110 East Aurora Road
Twinsburg, Ohio 44087-1924

Subject: Responses to Comments (dated August 24, 2017) on the *Draft Work Plan Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio,* Dated June 28, 2017 Ohio EPA ID# 267-000859-214

Dear Mr. D'Amato:

The Army appreciates your time and comments (dated August 24, 2017) on the *Draft Work Plan Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio,* dated June 28, 2017. Enclosed for your review are responses to your comments.

Upon final resolution of these responses to comments, the Army will update the report, and distribute final version of this report for Ohio EPA approval.

Please contact the undersigned at (703) 607-7955 or Mark.S.Leeper.civ@mail.mil if there are issues or concerns with this submission.

Sincerely,

Mark S. Leeper
RVAAP Restoration Program Manager
Army National Guard Directorate

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Responses to Ohio EPA Comments (dated August 24, 2017)
***Draft Work Plan Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio, Dated June 28, 2017.* Ohio EPA ID# 267-000859-214**

CC RVAAP-69 Building 1048 Fire Station

1.) The Field Sampling Plan (Appendix A) does not contain special field procedures to minimize sampling errors when sampling ground water and soil for perfluorinated compounds (PFCs). PFCs are analyzed with detection limits that are three orders of magnitude lower than those used for most other analytical methods (e.g., parts per trillion (ppt) vs parts per billion (ppb)). Also, PFCs are ubiquitous in our surroundings. This requires that field personnel be especially aware of their surroundings, equipment, and in particular, that sampling procedures are followed in order to minimize the potential for cross-contamination and false positives. Please include additional provisions specific to minimizing cross-contamination and false positives when sampling for PFCs. Below is a list of references that may be helpful in providing special sampling procedures when sampling for PFCs. Also, attached for reference is *DDAGWs May 2017 Draft Standard Operating Procedure for PFAS Sampling.*

AECOM, 2016 PFAS Sampling Webinar: Technical Training for Waste Site Cleanup Professionals. Chiang, D., presenter. AECOM, Aug 3, 2016.

AECOM, *Poly-and Perfluoroalkyl Substance (PFAS) Sampling and Analysis: Truths, Traps, and Consequences*; June, 2016; AECOM PFAS Client Webinar.

Aerostar SES LLC Standard Operating Procedure 002P Groundwater Sampling at Perfluorinated Compound (PFC) Sites, July 2016 (Revision 2)

Aerostar SES LLC Standard Operating Procedure 028P Field Sampling Protocols to Avoid Cross-Contamination at Perfluorinated Compound (PFC) Sites, July 2016 (Revision 2)

Fujii et al., 2013, Occurrence of perfluorinated carboxylic acids (PFASAs) in personal care products and compounding agents. Chemosphere 2013 Sep; 93(3): 538-44. 10.1016/j.chemosphere.2013.06.049. Epub 2013 Aug 6

Technical Guidance Manual for Ground Water Investigations, Chapter 10, Ground Water Sampling, Ohio Environmental Protection Agency, May 2012.

Tetra Tech, *Standard Operating Procedure, Field Sampling at Per-and Polyfluorinated Compounds (PFAS) Sites*, Tetra Tech PFAS SOP.

Transport Canada, *Perfluorochemical (PFAS) Field Sampling Protocol*; Revised, May 2013; TC PFAS Sampling Protocol.

***Response*: Correction.** *The Army appreciates the information that Ohio EPA provided regarding perfluorinated compounds (PFCs) in their Comment 1 on the Work Plan (WP). However, we believe that analysis of PFCs in soil and groundwater at the CC RVAAP-69 Building 1048 Fire Station is not needed. The type of fire suppressants that contain PFCs were not used on RVAAP. The PFC-containing fire suppressants were developed in the 1970's specifically by the military for suppression of fires associated with airplane fires, specifically crashes and jet fuel. The National Advisory Committee on Aeronautics (NACA) Test Area is the only place on Ravenna* *where airplanes were used or tested and where there could have been a need to suppress fires associated with airplanes. The NACA Test Area was used from 1947 to 1953. There is no basis for analysis for PFCs based on review of historical records and various types of fire suppressants.*

The WP included this analysis because it was listed as a requirement for soil and groundwater in the Army's Scope of Work (SOW) for this project. When the SOW was prepared, the Army was still trying to establish a policy to address PFCs and criteria to identify when analyses would be needed. Since then, the Department of Defense has published a definitive timeline that shows anti-foam fighting films and the aqueous film-forming foam (AFFF) were not commercially available until the 1970's. The AFFFs have chemicals that contain various PFCs and can also form PFCs through interaction of the foam with organic materials and fires. These aqueous film-forming foams were water-based foams used primarily to fight flight-deck fires aboard ships that carry aircraft and for airplane crashes. These types of fire suppressants would not have been used at the fire station or used in fire extinguishers. The Army included this requirement in the Scope of Work for the WP because it was assumed that PFCs could have been used at the Fire Station without considering the historical records or fire suppressants that would have been available at the time of operations of the former RVAAP when this Fire Station was in use.

Most of the former RVAAP was not used after October 1957. Load Line 12 was reactivated for a few months in 1961. After 1972, the facility was deactivated. The Ohio Army National Guard (OHARNG) has used the facility from the late 1970's to present. The OHARNG never used Building 1048 and by the time it was demolished, it was very dilapidated and not useable. The Fire Station was constructed and became operational in the 1940's. Most of the structures on the AOC were in great disrepair and some had already been dismantled by 1993. The remaining Building 1048 Fire Station was demolished in 2008 by the OHARNG. The only record of any type of hazardous material at the AOC was of carbon tetrachloride being used and stored at the AOC. This record was from an interview of a former RVAAP worker during the Historical Records Review (HHR).

PFC sampling and analysis has been removed from the WP.

2.) It is not clear that soil boring and borings from monitoring wells are going to be continuously logged. Please clarify. Ohio EPA recommends that soil borings/monitoring wells be continuously logged from the surface to their terminal depth.

***Response:* Clarification.** *Soil borings and borings for monitoring wells will be continuously logged. The text has been revised for clarity, for example, in the Executive Summary, CC RVAAP-69 Building 1048 Fire Station, the following sentence has been added to the first bullet listing data gaps:*

> *"All new borings will be continuously logged."*

Similar text has been added throughout the Work Plan, FSP (Appendix A), and Quality Assurance Project Plan (QAPP, Appendix B) for clarity.

3.) The plan indicates that soil samples will be taken at five-foot intervals in new soil borings to be installed near existing soil borings SB-101, RV5-SB-2, SB-102, SB-103, and SB-105 from a depth of 10 feet below ground surface (bgs) to the terminal depths indicated in the plan. Collecting samples on five-foot intervals is rather arbitrary. DDAGW recommends that where soil samples are collected, the sample interval should be determined based on PID screenings, odor, and staining. It is not clear why the plan does not require biasing the soil samples in a given sample interval to the depth interval where the greatest apparent contamination occurs based on PID readings, odor, and/or staining. Please explain.

***Response:* Correction.** *The purpose of sampling every five feet was to ensure that contaminants are vertically and laterally delineated. Many of these samples are expected to be below detection limits and therefore are unlikely to exhibit elevated PID readings, odor or staining. However, we will bias sampling within each five-foot interval to the sample interval that exhibits the highest PID screenings, odor, and staining (if present). The following text has been added to the Executive Summary, CC RVAAP-69, First Bullet:*

> *"The length of the core will be screened with a PID monitor. Discrete soil samples will be collected every 5 feet from the length of the core in each boring beginning at 10 feet bgs. If a contaminant presence is observed within any five-foot interval based on odor, staining or elevated PID, then the discrete soil sample will be collected from the location within the five-foot interval where the chemical presence is indicated."*

Similar text has also been added to Executive Summary, CC RVAAP-69, second bullet, Section 4.1, Section 5.3, and the QAPP (Appendix B).

4.) Figure 2-1 entitled *CC RVAAP-69 Building 1048 Fire Station Existing Sample Locations and Previous Carbon Tetrachloride Detections* is illegible. Since the results of the 2012/2015 RI were used to determine the data gaps and scope of work for the submitted plan, it would be helpful for the plan to be revised with a clearer version of Figure 2-1 to facilitate a thorough review of the plan. Please submit a legible copy.

***Response:* Correction.** *A revised Figure 2-1 is attached to these responses and will be included in the Final Work Plan.*

5.) Page x states that previous RI results indicated that SB-101 and RV5-SB2 had the highest concentrations of carbon tetrachloride. Page xi states that previous RI results indicated the maximum concentrations of carbon tetrachloride were in SB-101 and SB-104. In addition, Figure 2-1 summarizing carbon tetrachloride concentrations is illegible. Therefore, it is not clear where beneath CC RVAAP-69 the previous RI soil data had the highest concentrations of carbon tetrachloride. Please clarify this.

***Response:* Clarification.** *Soil boring SB-101 was installed directly adjacent to soil boring RV5-SB2. Concentrations of carbon tetrachloride were greatest at RV5-SB2, SB-101 and SB-104, all of which are located within the footprint of former Building 1048 Fire Station. The area encompassing RV5-SB2, SB101 and SB104 is the starting point for completing investigation to characterize nature and extent of carbon tetrachloride in soil and groundwater. Boring SB-101 is the most downgradient of these locations, and the vertical extent of carbon tetrachloride has yet to be defined at this location. Text has been revised to clarify.*

Page x has been revised to state the following:

"A new boring will be installed in the immediate vicinity of the earlier borings SB101 and RV5-SB2."

Page xi has been revised to state the following:

"Carbon tetrachloride concentrations from borings SB101 and SB104 were highest in the vertical interval of 5 and 10 feet bgs (1015 to 1020 feet amsl).

A revised Figure 2-1 is attached to these responses and will be included in the Final Work Plan.

6.) Ohio EPA agrees with the planned use of grab ground water samples to initially estimate the extent of ground water contamination and guide the installation of permanent monitoring wells. However, if carbon tetrachloride and/or its decay products are detected in ground water, more than the proposed minimum of three permanent monitoring wells may be needed to confirm the extent of carbon tetrachloride and daughter product contamination beneath CC RVAAP-69.

Response: ***Agree.*** *Additional wells may be needed. The purpose of the grab groundwater sampling is to optimize the number of permanent monitoring wells to be installed. The following sentence has been added to the Executive Summary, CC RVAAP-69, Third Bullet:*

"More than the minimum of three monitoring wells may be needed to confirm the extent of potential carbon tetrachloride contamination beneath CC RVAAP-69."

The sentence has also been added to Section 4.1, Data Gap 3, Fourth Paragraph, the Field Sampling Plan (Appendix A), and QAPP (Appendix B).

7.) The plan does not contain provisions for determining the presence or thickness of possible dense non-aqueous phase layers (DNAPL) or free product in the bottom of wells installed in CC RVAAP-69. As indicated on page 39 of the plan, carbon tetrachloride is denser than water. A cursory review of historical carbon tetrachloride fire equipment indicates that carbon tetrachloride fire extinguishers contained carbon tetrachloride (typically a minimum of 25%) pressurized either by air or nitrogen and that fire grenades contained nearly pure carbon tetrachloride. Many carbon tetrachloride fire extinguishers are marked: "never use with water." Carbon tetrachloride from such equipment was likely released to the environment in a free product form, not as a dissolved phase in water as indicated on page 39 of the plan. Please include a provision for checking wells in CC RVAAP-69 for DNAPL free product in the bottom of the wells. Please note if such a DNAPL is present, its thickness needs to be measured.

Response: ***Agree.*** *Carbon tetrachloride has been detected in the subsurface within the former building footprint, which is inconsistent with the anecdotal history of emptying fire extinguishers behind (outside) the building. Therefore, there is uncertainty about how carbon tetrachloride was released to the environment. However, agree that if DNAPL is present in monitoring wells, its thickness will be measured. The text in the executive summary and Section 5.3, Item 4 has been revised as follows:*

"If dense non-aqueous phase liquid (DNAPL) is present in the bottom of the CC RVAAP-69 monitoring wells, its thickness will be measured with an oil/water interface probe capable of detecting the presence of non-aqueous phase liquid within the well casing."

Other sections in the Work Plan, FSP (Appendix A), and QAPP (Appendix B) have also been revised accordingly.

8.) According to page xi, "if a carbon tetrachloride plume is not indicated by the grab samples, at a minimum one monitoring well will be installed near SB-101 (where maximum concentrations have been detected in soil). Additional monitoring wells will be installed to ensure that the local potentiometric surface can be mapped."

To be clear, a minimum of three monitoring wells will be needed to establish ground water flow direction. Please modify the plan to clearly state the minimum number of wells that will be installed to determine ground water flow direction.

***Response:* Agree.** *AOCs CC RVAAP-69 and CC RVAAP-74 are adjacent to each other and measurements at wells from both sites will be used to map the potentiometric surface. The Executive Summary has been revised (highlighted) as follows:*

> *"If a carbon tetrachloride groundwater plume is not indicated by the grab samples, at minimum one monitoring well will be installed near RV5-SB2 (where maximum concentrations have been detected in soil). At least two additional monitoring wells will be installed to ensure that the local potentiometric surface can be mapped."*

The text has also been corrected in Data Gap 3, Fifth Paragraph, and the QAPP (Appendix B).

9.) The plan refers to May 2016 U.S. EPA RSLs. Please update the plan to reference the most recent version of U.S. EPA RSL (at this writing, June 2017).

***Response:* Correction.** *The document has been updated to refer to the June 2017 U.S. EPA RSLs.*

10.) According to the plan, CC RVAAP-69 monitoring wells will be monitored quarterly for the period of one year. Depending on the results from the CC RVAAP-69 wells, sampling of aforementioned wells may be warranted beyond the first year, although perhaps at a different sampling frequency.

***Response:* Clarification.** *This WP addresses only the additional sampling necessary to complete the RI at CC RVAAP-69. Four quarters of groundwater monitoring are proposed to complete the RI. The RI report will evaluate and recommend post-RI monitoring. We anticipate that following the four quarterly groundwater sampling events, the groundwater monitoring wells will be addressed as part of the facility-wide groundwater monitoring program. The following sentence has been added to the end of the Executive Summary, CC RVAAP-69, Third Bullet:*

> *"The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program."*

The sentence has also been added to Section 4.1, Data Gap 3, Seventh Paragraph, and the QAPP (Appendix B).

CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift

11.) To avoid confusion, the TPH-C_{10} to C_{20} distillate range described in the plan as "diesel range organics" or "DRO" should be more accurately described as "middle distillates range." A full DRO scan is C_{10} to C_{28}. Also, the TPH-C_{20} to C_{34} distillate range described in the plan is "motor oil range" or "MRO" (not to be confused with middle rage organics or distillates) is more accurately described as "heavy distillates range." The full "used motor oil" range would include light (C_6 to C_{12}), middle (C_{10} to C_{20}), and heavy (C_{20} to C_{34}). Please revise the TPH descriptions accordingly.

***Response:* Agree.** *The text has been revised using TPH-C_{10} to C_{20} middle distillates range and TPH-C_{20} to C_{34} heavy distillates range, or TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges. Text is added to the Executive Summary, Section 3.3.4 of the WP, and QAPP (Appendix B) as follows:*

> *"To avoid confusion, the TPH-C_{10} to C_{20} distillate range previously described in the Draft RI as "diesel range organics" or "DRO" will be more accurately described in this WP as "middle distillates range." Also, the TPH-C_{20} to C_{34} distillate range described in the Draft RI is "motor oil range" or "MRO" (not to be confused with middle rage organics or distillates) will be more accurately described in this WP as "heavy distillates range."*

12.) According to the U.S. EPA (2017) and United Nations, hydraulic fluid produced prior to 1977 may contain polychlorinated biphenyls (PCBs) as sometimes PCBs were included as additives to improve thermal resistance. Please update the plan to include testing of the proposed soil and ground water samples for PCBs (EPA Method SW-846-8082A).

***Response:* Clarification.** *The hydraulic fluid used in for the hydraulic lift would not need thermal resistance additives because it was not a high temperature application. CC RVAAP-74 soil sample 74-1034-HL-SB8 collected on 3 April 2013 was analyzed for PCBs and none were detected. Therefore, the Army believes that it is unlikely that PCBs were additives to hydraulic fluid used at this site. However, we will add PCB analysis to soil samples collected from locations where hydraulic fluid concentrations are expected to be greatest (near former boring SB18). PCB analysis has been added to the analytical testing for proposed sample locations 74-1034-HL-SB23 (7.5 to 8.5 feet bgs). PCB analysis is also added to groundwater samples from monitoring wells.*

13.) The plan indicates that ground water samples from temporary and permanent monitoring wells will be analyzed for TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges (U.S. EPA Method SW 846-8015B). Since ground water samples are not typically analyzed for TPH, it is not clear which appropriate and relevant standards such TPH ground water results would be compared to. Please clarify.

Response: Clarification. *The text has been revised to indicate that CC RVAAP-74 groundwater grab samples and monitoring well samples will be analyzed for VOCs by U.S. EPA Method SW8260C and polycyclic aromatic hydrocarbons (PAHs) by Method SW8270D-SIM to indicate hydraulic fluid contamination in groundwater. Groundwater samples from CC RVAAP-74 monitoring wells will also be analyzed for PCBs by Method SW8082A which could be an additive to hydraulic fluid. If a detected compound has a BUSTR Action Level, its concentration will be compared to its BUSTR Action Level. Constituents that do not have BUSTR Action Levels will be compared to FWCUGs or the current RSLs. Groundwater will not be analyzed for TPH.*

14.) Figure 2-3 shows a "hydraulic lift" and a "rear axle lift." It is not clear if the rear axle lift is also an in-ground hydraulic lift. The text appears to refer to a single hydraulic lift. Please clarify.

***<u>Response:</u>* Clarification.** *The following text has been added to the first paragraph of Executive Summary, CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift, to the first paragraph of Section 2.3.1, and to the QAPP (Appendix B).*

> *"There is one in-ground hydraulic lift that is composed of two cylinders; each in its own underground vault. The smaller (eastern) vault contains a hydraulic cylinder the portion of the lift that fitted under the rear axle of a vehicle. The larger, "L" shaped (western) vault contained a separate hydraulic cylinder for the front axle and a storage tank that stored the hydraulic fluid. The position of the front axle lift could be adjusted to accommodate different sized vehicles."*

15.) It is not clear why the plan does not include testing of the proposed soil and ground water samples for the BUSTR list of SVOCs/polynuclear aromatic (PNA) compounds. PNAs are constituents in diesel. According to the plan, soil samples obtained for 2013 RI of CC RVAAP-74 included SVOCs. The current work plan does not include the 2013 SVOC soil results for CC RVAAP-74. Soil samples from in seven of the 21 borings installed the 2013 RI had detectable concentrations of middle range organic (C_{10} to C_{20}) which may be indicative of hydraulic oil or diesel. Please include the BUSTR list of SVOCs/PNAs (EPA Method SW-846-8270).

***<u>Response:</u>* Clarification.** *All 33 soil samples collected in 2013 were analyzed for polycyclic aromatic hydrocarbons (PAHs) using EPA Method SW-846-8270. A total of 18 PAHs were detected and identified as SRCs (including all 7 PAHs regulated under BUSTR). However, none of the PAH SRCs exceeded their BUSTR Soil Action Limits or FWCUGs. Therefore, the horizontal and vertical extent of SVOCs/PAHs has been delineated at this AOC, and delineation of PAHs in soil is not a data gap. No further sampling or analysis for PAHs in soil is proposed. Text in the Executive Summary, Section 2.3.2.2, and Section 3.3.3 of the Work Plan, as well as the Executive Summary of the QAPP has been expanded to clarify the results of PAH sampling to date.*

To date, groundwater has not been analyzed for PAHs. Groundwater samples will be analyzed for PAHs using EPA Method SW8270D-SIM and concentrations will be compared to BUSTR Action Levels.

16.) The discussion about free product on page xvi requires clarification. The definition of "free product" given in the plan: "...oil that flows out of the formation versus residual saturation or oil that is essentially immobile and held in capillary spaces" does not conform to the general understanding of what "free product" is, and confuses the issues of free product and free product mobility.

Free product is generally understood to be is a non-aqueous phase liquid (versus dissolved phase). During the 2013 RI, concentrations of TPH-heavy distillate range (C_{20} to C_{34}) in borings SB-17 (6.0 to 6.5 feet bgs interval) and SB-18 (8.0 to 8.5 feet interval) exceed BUSTR's soil saturation Action Level of 5,000 mg/kg for Class 1 Soil (e.g., coarse grained soils such as gravels and sandy soils). The concentration of TPH-heavy distillate range (C_{20} to C_{34}) in soil sample from SB-18, 8.0 to 8.5 feet interval also exceeds BUSTR's soil saturation Action Level of 20,000 mg/kg for Class

2 soils (e.g., fine-grained soils such as silts and clays). Exceedance of soil saturation Action Levels is a good indicator that free product is mobile. Also, during the 2013 RI, free product was noted in the soil sample from the 7.5 to 8.5 feet level in boring SB-18.

Ohio EPA agrees that the plan's proposal to photograph the presence of oil on the surface of soil in the vadose zone and measure light non-aqueous phase liquid (LNAPL) at the water table will verify that free product has mobilized. However, the lack of LNAPL at the water table does not mean that free product in the vadose zone cannot migrate to the water table. If LNAPL is not present at the water table, it is not clear how the Army will demonstrate that free product in the vadose zone will not likely migrate to the water table. Please revise this section to conform to the general understanding of what free product is.

Response: ***Clarification.*** *Agree that the notation of free product on the boring log and the concentrations that exceed soil saturation levels are indications that mobile organic liquid may be present. However, this means that mobile organic liquid could be trapped within the vadose zone. The first data gap is simply to confirm whether or not the "free product" is mobile in the vadose zone. Use of the antiquated term "free product" will be avoided moving forward as this term is non-specific and can be misleading. In the future terminology consisting of much more descriptive "mobile NAPL", defined as NAPL that is capable of flowing, and "residual NAPL", defined as NAPL that is immobile, will be used.*

The proposed approach to determine mobility includes visual inspection a new boring log at SB-18, and placing a temporary well screened at the elevation where "free product" was noted on the original boring log. Note that temporary well 074TW-001 is not completed to the water table, but rather is screened across the gravel layer at 6-10 feet bgs to determine if mobile NAPL is trapped in this gravel layer between clay layers. Agree that mobile NAPL, if present in the vadose zone, could migrate to the water table.

The third data gap includes an assessment of whether or not mobile NAPL has accumulated at the water table. Note that the well to assess impact to the water table is located a few feet to the east of SB18 to try to avoid creating a conduit for mobile NAPL to migrate from the vadose zone to the water table.

Updated text for Executive Summary and in Section 4.3:

> *"It is unclear if the "free product" historically identified in 74-1034-HL-SB18 at 7.5 to 8.5 feet bgs is mobile NAPL or residual NAPL. The historic boring log for SB18 noted "free product," and the concentration of TPH-C_{20} to C_{34} heavy distillates range in soil exceeds the saturation level for Class 1 soil. These results could indicate the presence of mobile NAPL. However, the results could also represent residual NAPL only. A new boring will be installed in the immediate vicinity of the earlier boring 74-1034-HL-SB18; the soil will be photographed, visually inspected, and scanned with a UV light and PID to evaluate if mobile NAPL flows out of the formation versus residual NAPL or oil that is essentially immobile and held in capillary spaces. A soil sample will be collected from 7.5 to 8.5 feet bgs to confirm what was found by evaluating the chromatograph to a known sample of hydraulic fluid (i.e., mineral oil). Soil samples will be analyzed for VOCs, TPH-C_{10} to C_{20} and C_{20} to C_{34} distillate ranges, and PCBs. A temporary well will be installed in the*

borehole to a depth of approximately 10 feet bgs and screened across the vertical interval where "free product" was noted historically in the gravel layer on the SB18 boring log. The temporary well will be developed. Measurements (depth to NAPL and/or water) will be made to determine if mobile NAPL flows into the well, indicating the presence or absence of mobile NAPL."

17.) It is not clear if the borings to be installed in the immediate vicinity of previous borings SB-14, SB-18, SB-19 and other borings to be converted to monitoring wells are going to be continuously logged to their terminal depths. Ohio EPA recommends that these borings be continuously logged to help determine the nature and extent of TPH contamination at that location. Please clarify whether these borings are will be continuously logged.

***Response:* Clarification.** *Soil borings and borings for monitoring wells will be continuously logged. The text has been revised for clarity, for example, in the Executive Summary, CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift, the following sentence has been added to the first bullet listing data gaps:*

"All new borings will be continuously logged."

Similar text has been added throughout the Work Plan and Field Sampling Plan (Appendix A) for clarity.

18.) The plan proposes additional investigation of the mobility of free product in the vicinity of SB-18 where results from the 2013 RI indicate soil (8.0 to 8.5 feet bgs interval) had a concentration of TPH-C_{20} to C_{34} distillate range exceeding BUSTR's soil saturation Action Level for Class I Soil. The plan does not contain provisions for investigation of the mobility of free product in the vicinity of previous boring SB-17 in which results from the 2013 RI indicate a soil sample (6.0 to 6.5 feet bgs) had a concentration of TPH-C_{20} to C_{34} distillate range exceeding BUSTR's soil saturation Action Level for Class I Soil. Please explain.

***Response:* Clarification.** *Borings SB-17 and SB-18 are less than 6 feet apart, and are located east and west of the rear axle lift vault. Because these sample locations are very close together, one monitoring well should be sufficient to determine if mobile NAPL has migrated to the water table at either location. The monitoring well is proposed a few feet from SB-18 because concentrations of TPH-C_{20} to C_{34} heavy distillates range were highest in SB-18 and "free product" was described historically on the log. The well will be installed as close as possible to SB-18 but also a few feet to the east to try to avoid creating a conduit for potential mobile NAPL to migrate from the vadose zone to the water table.*

19.) Ohio EPA agrees with the planned use of grab ground water samples to initially estimate the extent of ground water contamination beneath CC RVAAP-74 and guide the installation of permanent monitoring wells. However, if LNAPL free product, TPH, VOCs, or other COPCs are detected in ground water, more than the proposed minimum of three permanent monitoring wells may be needed to confirm the extent of the aforementioned COPCs in ground water beneath CC RVAAP-74.

***Response:* Agree.** *Agree that additional wells may be needed. The following sentence has been added to the Executive Summary, CC RVAAP-74, Third Bullet:*

> *"More than the minimum of three monitoring wells may be needed to confirm the extent of potential contamination beneath CC RVAAP-74."*

The sentence has also been added to Section 4.3, Data Gap 3, Fifth Paragraph, and also the Field Sampling Plan (Appendix A) and QAPP (Appendix B). Please note that the groundwater sampling strategy has been revised to analyze groundwater samples for PCBs, VOCs, and SVOCs. TPH analysis in groundwater is no longer proposed.

20.) If hydraulic oil is not contaminated with fuel or motor oil, it may not contain enough volatile compounds to be readily detected by a PID. Also, if hydraulic oil is not degraded or contaminated, it may not produce visible soil staining. Ohio EPA recommends that an ultraviolet light (UV) light be used to help screen for the presence of hydraulic oil. Petroleum oils will fluoresce colors ranging from yellow through blue. Please revise the report to include the use of UV light as a screening tool.

***Response:* Agree.** *The use of UV light has been added as a screening tool, and the following sentence has been added to the Executive Summary, CC RVAAP-74, First Bullet:*

> *"An ultraviolet light (UV) light will also be used to help screen for the presence of hydraulic oil."*

The sentence has also been added to Section 4.3, Data Gap 1, First Paragraph, and also the Field Sampling Plan (Appendix A) and QAPP (Appendix B).

21.) Section 4.4.5.2 of the *Field Sampling Plan* found in Appendix A of the *Draft Work Plan* indicates that "as built well construction diagrams" will be prepared for each monitoring well and submitted to the Army's Restoration Project Manager (RPM).

Ohio Revised Code (ORC) 1521(B) requires that a well construction log meeting the requirements of ORC 1521(B)(1) through (B)(9) be submitted to ODNR within 30 days of construction of the well. The well construction diagrams described in Section 4.4.5.2 do not meet the requirements of ORC 1521(B)(1) through (B)(4) or ORC 1521(B)(7) through (B)(9). The well construction diagrams described in Section 4.4.5.2 of the plan need to be consistent with Ohio code. Also, the plan does indicate that well construction logs will be submitted to ODNR in accordance with ORC 1521(B). Please revise the work plan to address these issues.

***Response:* Clarification.** *The well construction log referenced in ORC 1521.05(B) will be completed and signed by the drilling subcontractor and submitted to ODNR in 30 days. A copy will also be included with the boring logs and well completion diagrams in the RI Report. The following sentence has been added to the last paragraph in Section 4.4.5.2 of the Field Sampling Plan (Appendix A):*

> *"Well construction logs (see Attachment A-1, Field Forms) will also be submitted by the drilling subcontractor to ODNR within 30 days in accordance with ORC 1521.05(B)."*

22.) Section 4.4.6 of the *Field Sampling Plan* found in Appendix A of the *Draft Work Plan* indicates that abandonment of each well/borehole will follow field procedure outlined in Chapter 9 of Ohio EPA's *Technical Guidance Manual for Hydrogeologic Investigations and Ground Water*

Monitoring (TGM). Note: According to Ohio Administrative Code (OAC) Rule 3745-9-01(B) "abandoned well" means a well, test hole, or dry hole whose use has been permanently discontinued.

Section 4.4.6 of the *Field Sampling Plan* (page 24) states that: "Ohio Revised Code 1521.05(B)(9) requires that a well sealing report be filed with Ohio Department of Natural Resources." The aforementioned code citation is incorrect. ORC 1521.05(C) requires the submission of sealing reports to ODNR within 30 days after completion of the sealing. Please correct the rule citation.

While Section 4.4.6 of the *Field Sampling Plan* (page 24-25) indicates that a well sealing report will be prepared for each abandoned well or borehole and submitted to the Army's Restoration Project Manager, it does not indicate that sealing reports for each abandoned well or borehole will be submitted to ODNR in accordance with ORC 1521.05(C). Please revise this section to indicate the well sealing logs will be submitted to ODNR in accordance with ORC 1521.05(C).

***Response:* Correction.** *The text has been corrected as requested. Field Sampling Plan (Appendix A), Section 4.4.6, Third Paragraph has been revised (highlighted) as follows:*

> *"Ohio Revised Code 1521.05(C) requires that a well sealing report be filed with Ohio Department of Natural Resources (Attachment A-1, Field Forms). For each abandoned well/borehole, a record containing the following information will be prepared and submitted to the RPM:"*

And Field Sampling Plan (Appendix A), Section 4.4.6, Last Paragraph, Second Sentence has been corrected (highlighted) as follows:

> *"Original borehole abandonment records will be submitted to the RPM and the Ohio Department of Natural Resources (ODNR) in accordance with ORC 1521.05(C)."*

23.) According to the plan, CC RVAAP-74 monitoring wells will be monitored quarterly for the period of one year. Depending on the results from the CC RVAAP-74 wells, sampling of aforementioned wells may be warranted beyond the first year, although perhaps at a different sampling frequency.

Once the quarterly groundwater data from the first year of sampling is completed and evaluated, the decision to stop monitoring in the hydraulic lift area at the Motor Pool Building should be based on whether there are free hydrocarbons (i.e. light non-aqueous phase liquids (LNAPL)), or significant concentrations of dissolved compounds. Therefore, the decision on when the monitoring stops should be delayed until the data is available. Please incorporate this approach into the work plan.

***Response:* Clarification.** *This WP addresses only the additional sampling necessary to complete the RI at CC RVAAP-74. Four quarters of groundwater monitoring are proposed to complete the RI. The RI report will evaluate and recommend post-RI monitoring. We anticipate that following the four quarterly groundwater sampling events, the groundwater monitoring wells will be addressed as part of the facility-wide groundwater monitoring program. The following sentence has been added to the end of the Executive Summary, CC RVAAP-74, Third Bullet:*

> *"The RI report will evaluate and recommend any post-RI monitoring requirements. Post-RI monitoring will be addressed as part of the facility-wide groundwater monitoring program."*

The sentence has also been added to Section 4.3, Data Gap 3, Last Paragraph, and also the Field Sampling Plan (Appendix A) and QAPP (Appendix B).

CC RVAAP-70 - East Classification Yard

24.) The plan does not identify any data gaps or additional work directly related to ground water for CC RVAAP-70. Considering that the 2012 SI sampling results indicated concentrations of PNAs and PCBs above FWCUGs and/or May 2016 RSLs, and also identified areas of soil staining, it is not clear why potential impacts to groundwater were not identified as a potential data gap to be addressed by ground water sampling. Please explain.

Response:* *Clarification. *A Site Inspection (SI) is being conducted for CC RVAAP-70. The goal of SI sampling is to determine the presence or absence of contamination. Additional sampling is proposed to address data gaps in the SI sampling at potential release areas. The SI report will assess the data to evaluate whether or not any contaminant releases have occurred. If releases have occurred, the AOC will proceed to the Remedial Investigation (RI) phase to determine the nature and extent of contamination. Groundwater will be evaluated as part of the RI if the SI determines that a release has occurred.*

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Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

RECEIVED 11/16/17

November 14, 2017

Mr. Mark Leeper, P.G., MBA
Team Lead
Cleanup and Restoration Branch
111 South George Mason St.
Arlington, VA 22204

Re: US Army Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
267000859214

Subject: Ravenna Army Ammunition Plant, Portage/Trumbull Counties. Ohio EPA Comments on the "Draft Work Plan Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift" at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio, Dated June 28, 2017 Ohio EPA ID # 267-000859-211, 267-000859-214, and 267-000859-220

Dear Mr. Leeper:

Thank you for your October 16, 2017 response to the Ohio Environmental Protection Agency's (Ohio EPA's) August 24, 2017 comment letter on the "Draft Work Plan Additional Sampling for CC RVAAP-69 Building 1048 Fire Station, CC RVAAP-70 East Classification Yard, and CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift" at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. Your letter was received at Ohio EPA's Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR), on October 18, 2017.

All of Ohio EPA's comments have been adequately addressed. Please incorporate all of the suggested changes from your response into the final document.

If you have questions, or would like to set up a meeting to discuss these comments, please call me at (330) 963-1170.

Sincerely,

Edward D'Amato, Environmental Specialist
Division of Environmental Response and Revitalization

ED/nvp

cc: Katie Tait/Kevin Sedlak, ARNG, Camp Ravenna
Gail Harris/Rebecca Shreffler, Vista Sciences
Greg Moore, USACE Louisville

ec: Mark Leeper, Restoration/Cleanup Manager, ARNGD
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