Draft

Work Plan
for a Pilot Study and Feasibility Study
at RVAAP-50 Atlas Scrap Yard

Ravenna Army Ammunition Plant
Ravenna, Ohio

October 14, 2015

Contract No. W912QR-14-D-0001
Delivery Order No. 0004

Prepared for:

US Army Corps of Engineers

US Army Corps of Engineers
Louisville District
600 Martin Luther King Jr. Place
Louisville, Kentucky 40202

Prepared by:

ALLIANT

Alliant Corporation
320 N Cedar Bluff Road, Suite 200
Knoxville, Tennessee 37923

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
14-10-2015	Technical	October - December 2015

4. TITLE AND SUBTITLE

Work Plan
for a Pilot Study and Feasibility Study
at RVAAP-50 Atlas Scrap Yard
Ravenna Army Ammunition Plant, Ravenna, Ohio

5a. CONTRACT NUMBER
W912QR-14-D-0001

5b. GRANT NUMBER
N/A

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)
Price, Belinda

5d. PROJECT NUMBER
4296-001

5e. TASK NUMBER
Delivery Order 0004

5f. WORK UNIT NUMBER
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Alliant Corporation
320 N Cedar Bluff Road, Suite 200
Knoxville, Tennessee 37923

8. PERFORMING ORGANIZATION REPORT NUMBER
N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Corps of Engineers – Louisville District
600 Martin Luther King Jr. Place
Louisville, Kentucky 40201

10. SPONSOR/MONITOR'S ACRONYM(S)
USACE

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
N/A

12. DISTRIBUTION/AVAILABILITY STATEMENT
Reference distribution page

13. SUPPLEMENTARY NOTES
None

14. ABSTRACT

This Work Plan presents the field activities, and procedures to be implemented during field operations for a Pilot Study and Feasibility Study (FS) at the Atlas Scrap Yard area of concern (AOC) [Ravenna Army Ammunition Plant (RVAAP)-50]. This Work Plan details the field activities and procedures to be followed, and includes the Quality Assurance Project Plan, and the Site Safety and Health Plan for this pilot test, and FS.

15. SUBJECT TERMS
Work Plan, Site Safety and Health Plan, Quality Assurance Project Plan, Pilot Study, field activities and procedures.

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Belinda Price
UU	UU	UU	UU	14	19b. TELEPHONE NUMBER *(Include area code)* (865) 934-5143

DISCLAIMER STATEMENT

This document is a work plan prepared for the United States Government by Alliant Corporation (Alliant). In no event shall either the United States Government or Alliant have any responsibility or liability for any consequences of any use, misuse, inability to use, or reliance on the information contained herein, nor does either warrant or otherwise represent in any way the accuracy, adequacy, efficacy, or applicability of the contents hereof.

Draft

Work Plan
for a Pilot Study and Feasibility Study
at RVAAP-50 Atlas Scrap Yard

Ravenna Army Ammunition Plant
Ravenna, Ohio

October 14, 2015

Contract No. W912QR-14-D-0001
Delivery Order No. 0004

US Army Corps of Engineers
Louisville District
600 Martin Luther King Jr. Place
Louisville, Kentucky 40202

Prepared by:
Alliant Corporation
320 N Cedar Bluff Road, Suite 200
Knoxville, Tennessee 37923

DOCUMENT DISTRIBUTION
for the Draft Work Plan Pilot Study and Feasibility Study at RVAAP-50 Atlas Scrap Yard
Ravenna Army Ammunition Plant, Ravenna, Ohio

Name/Organization	Number of Printed Copies	Number of Electronic Copies
Justin Burke, Ohio EPA CO	1	1
Bob Princic, Ohio EPA DERR	1	1
Rod Beals, Ohio EPA DERR	1	1
Mark Leeper, ARNG	0	1
Kevin Sedlak, ARNG	0	1
Katie Tait, OHARNG	1	0
Greg Moore, USACE – Louisville District	Transmittal Letter Only	Transmittal Letter Only
Nathaniel Peters II, USACE – Louisville District	2	1
Gail Harris, Vista Sciences Corporation, RVAAP Administrative Record	2	2
Pat Ryan, Leidos-REIMS	Transmittal Letter Only	Transmittal Letter Only
Eric Cheng, USACE – Louisville District Contracting Officer's Representative (COR)	3	1

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

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

Alliant	Alliant Corporation
AHA	activity hazard analysis
AOC	area of concern
ARNG	Army National Guard
bgs	below ground surface
BMP	Best Management Practices
BRACD	Base Realignment and Closure Division
BSV	background screening value
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COC	chemicals of concern
COR	Contracting Officer's Representative
CY	cubic yard
DFFO	Director's Final Findings and Order
DO	Delivery Order
DoD	Department of Defense
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
Endpoint	Endpoint Consulting, Inc.
ERIS	Environmental Restoration Information System
FS	Feasibility Study
ft	foot
FWSAP	Facility-Wide Sampling and Analysis Plan
FWSHP	Facility-Wide Safety and Health Plan
FWQAPP	Facility-Wide Quality Assurance Plan
IDW	Investigation Derived Waste
Leidos	Leidos Engineering of Ohio, Inc.
LCG	Louisville Chemistry Guideline
mg/kg	milligrams per kilogram
NGB	National Guard Bureau
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
PAH	polycyclic aromatic hydrocarbon

PWS	Performance Work Statement
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
REIMS	Ravenna Environmental Information Management System
RI	Remedial Investigation
RSLs	residential screening levels
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SSHP	Site Safety and Health Plan
TAT	turnaround time
TCLP	Toxicity Characteristic Leaching Procedure
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VEG©	Vapor Energy Generation©
YD	yard

EXECUTIVE SUMMARY

This Work Plan presents the field activities, and procedures to be implemented during field operations for Alliant's task order under Contract No. W912QR-14-D-0001, Delivery Order (DO) No. 0004 for a Pilot Study and Feasibility Study (FS) at the Atlas Scrap Yard area of concern (AOC) [Ravenna Army Ammunition Plant (RVAAP)-50] at Camp Ravenna, Portage and Trumbull Counties, Ohio. The DO was issued by the United States Corps of Engineers, Louisville District on September 17, 2015. In accordance with the Performance Work Statement (PWS) dated August 26, 2015 Alliant is tasked with executing a pilot test and FS. This Work Plan details the field activities and procedures to be followed, and includes the Quality Assurance Project Plan, and the Site Safety and Health Plan for this pilot test, and FS.

1.0 BACKGROUND

This Work Plan outlines the activities to be conducted for a Pilot Study and Feasibility Study (FS) for impacted soils at the Atlas Scrap Yard area of concern (AOC) [Ravenna Army Ammunition Plant (RVAAP)-50] at Camp Ravenna, Portage and Trumbull Counties, Ohio (Figure 1-1).

Alliant Corporation (Alliant) has been tasked by the U. S. Army Corps of Engineers (USACE) to conduct the pilot study and prepare the FS Report and is submitting this Work Plan to the U.S. Army in accordance with the Performance Work Statement (PWS), Contract No. W912QR-14-D-0001, Delivery Order (DO) No. 0004. The DO was issued by the United States Corps of Engineers, Louisville District on September 17, 2015. The following subsections present descriptions for the installation and the Atlas Scrap Yard AOC.

1.1 INSTALLATION DESCRIPTION

The RVAAP (Federal Facility Identification number: OH213820736) is located in northeastern Ohio within Portage and Trumbull Counties, approximately 3 miles east-northeast of the city of Ravenna (Figure 1-1). The Installation is approximately 11 miles long and 3.5 miles wide bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garret, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east. The Installation 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 climate, geologic and hydrologic settings, and ecological setting for RVAPP are presented in the Facility Wide Sampling and Analysis Plan (FWSAP) [Science Applications International Corporation (SAIC) 2011a].

As of February 2006, administrative control of 20,403 acres of the former 21,683 acre RVAAP have been transferred to the National Guard Bureau (NGB) and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site. Currently, RVAAP consists of 1,280 acres in several distinct parcels scattered throughout the confines of the Camp Ravenna Joint Military Training Center (Camp Ravenna). These 1,280 acres consist of former industrial facilities that are being remediated and managed by the Base Realignment and Closure Division (BRACD).

During the operational years, prior to Camp Ravenna, the entire 21,683-acre property was a government-owned, contractor-operated industrial facility. The RVAAP Camp Ravenna Sites encompass investigation and remediation of past activities over the entire 21,683 acres of the former RVAAP; therefore, references to the RVAAP in this Work Plan are considered to be inclusive of the historical extent of the RVAAP, which is inclusive of the combined acreages of the current Camp Ravenna and RVAAP, unless otherwise specifically stated.

RVAAP is bound to the Director's Final Findings and Orders (DFFOs) 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 (ORC). 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. RVAAP is not on the U.S. Environmental Protection Agency (USEPA) National

1

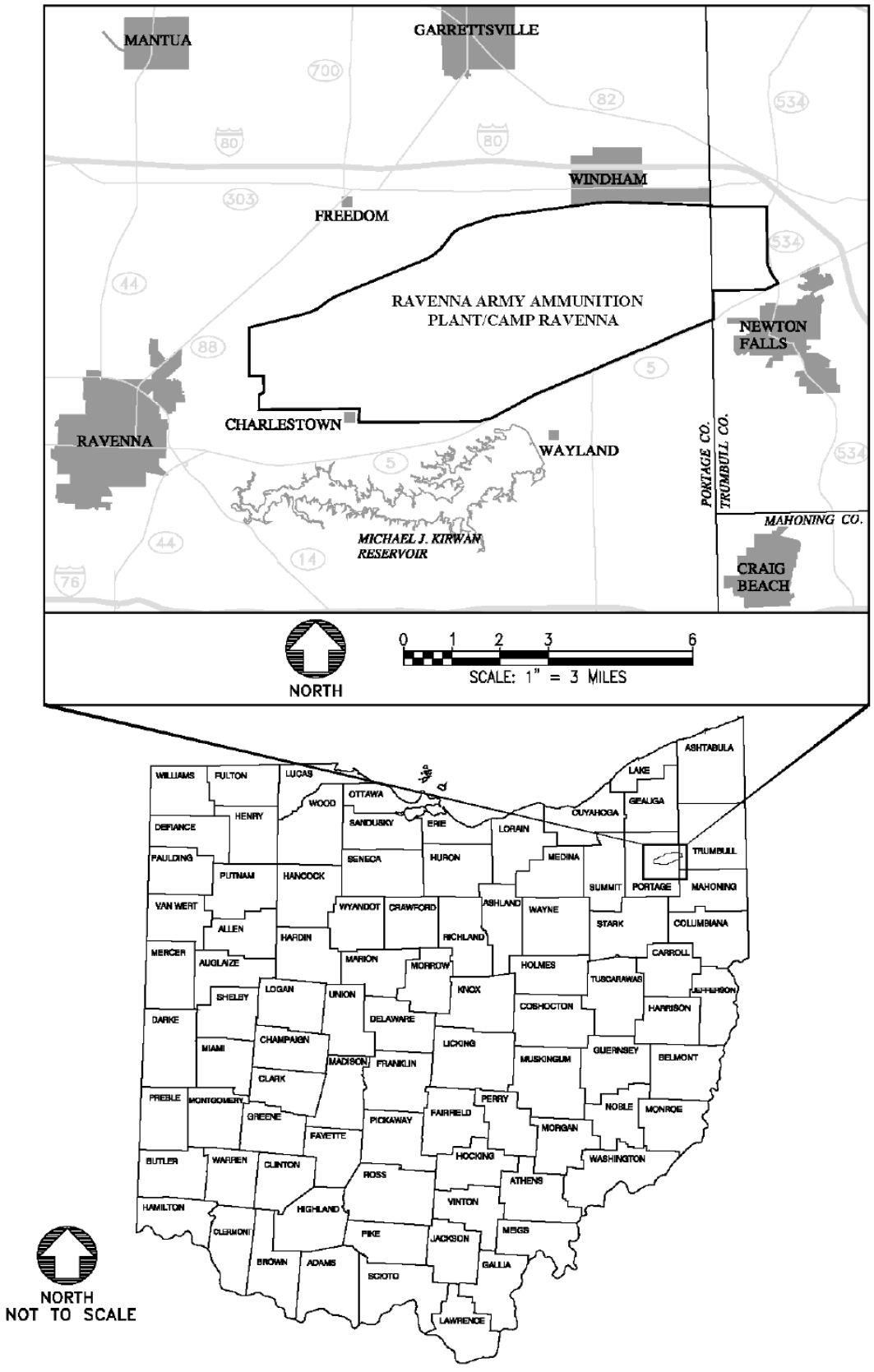


Figure 1-1 Location of Former RVAAP or Camp Ravenna, Portage and Trumbull Counties, Ohio

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 at the RVAAP. The Installation is bound to the DFFOs, issued on June 10, 2004 by the Ohio EPA. 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.

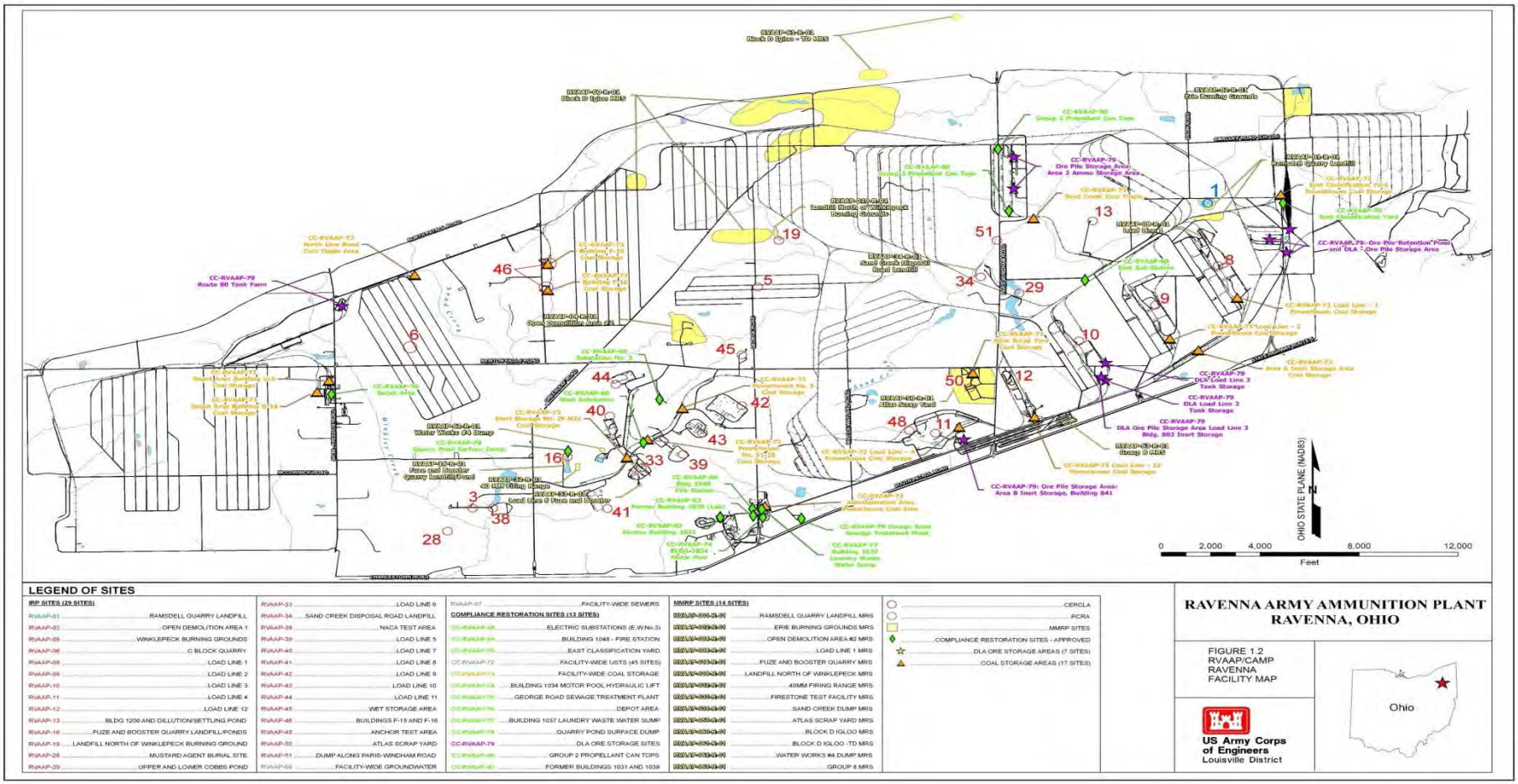
1.2 SITE DESCRIPTION

The Atlas Scrap Yard AOC (RVAAP-50), formerly known as the construction camp, is approximately 73 acres and is located in the southeastern portion of Camp Ravenna (Figure 1-2). The Atlas Scrap Yard has served several operational functions over the history of the former RVAAP, but the AOC was never used for munitions production activities. From 1940 to 1945, the Atlas Scrap Yard operated as a construction camp to house workers and their families while the facility was being constructed. By the end of World War II, the majority of buildings and structures at the Atlas Scrap Yard were demolished or relocated to other areas of the facility. The structures that remained were used to support roads and grounds maintenance activities. These remaining structures were razed after the Vietnam War. After the Vietnam War, the AOC became a stockpile storage area for bulk materials, including gravel, railroad ballasts, sand, and culvert pipes. Coal, used for building process heat, was piled in several areas of the AOC. The central-east portion of the AOC was a staging area for salvaged ammunition boxes from demilitarized Vietnam War-era munitions.

There is no fence around the AOC as a perimeter boundary, but the AOC is bordered by Newton Falls Road to the north and Paris-Windham Road to the east. Load Line 4 is located to the south of the AOC. The interior of the AOC is currently vegetated with shrub/scrub vegetation in unpaved areas and is forested around its perimeter. The north-central portion of the AOC is sparsely vegetated and has extensive gravel cover.

The Remedial Investigation (RI) [Leidos Engineering of Ohio, Inc. (Leidos), 2014] concluded that the Atlas Scrap Yard was adequately characterized. The RI identified eight (8) polycyclic aromatic hydrocarbon (PAHs) as chemicals of concern (COCs) at the site. The identified PAHs are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene. The PAH COCs were primarily identified in the 0-1 foot (ft) below ground surface (bgs) interval primarily in the approximate vicinity of the former T-4703 Roads and Grounds Maintenance Building. Additionally, a small area in the southern part of the site has been characterized by elevated lead concentrations, and constitutes a lead “hot spot.”

A Preliminary Draft FS for the Atlas Scrap Yard was completed (Leidos, 2015). However, since the completion of the Preliminary Draft FS Report, an additional technology has been identified as a potential remedial alternative. Therefore, the FS will be updated as a part of this project.



1

2 **Figure 1-2. Map of the Former RVAAP or Camp Ravenna, Portage and Trumbull Counties, Ohio**

2.0 PROJECT DESCRIPTION

2.1 PURPOSE

The purpose of this Work Plan is to provide the details and procedures necessary to conduct a pilot study and to obtain the data necessary to complete the FS Report for the Atlas Scrap Yard AOC (RVAAP-50).

Contaminated soils at the site will be tested for the suitability of using Vapor Energy Generation© (VEG©) technology to treat PAH-impacted soil in a sequence of a bench and pilot tests. Additionally a bench test only using steel slag will be conducted to test treatment of lead-impacted soil. The actual tests will be conducted by Alliant's subcontractor, Endpoint Consulting, Inc. (Endpoint), a California-based environmental company. VEG© technology is a sustainable, green remediation technology that involves ex-situ thermal treatment of impacted soils in an enclosed treatment chamber using steam. As an internal auger rotates the soil, the steam causes the contaminants to be released and captured by a vacuum system inside the chamber which then filters the gases out. The goal is to reduce contaminants to non-detect levels or to below regulatory standards. Using steel slag for treatment of lead-impacted soils involves mixing of the contaminated soils with steel slag to induce immobilization of lead through pH control, long term soil pH buffering, and the creation of insoluble lead compounds.

A Preliminary Draft FS Report was previously prepared for the Atlas Scrap Yard AOC (RVAAP-50) (Leidos, 2015). Since completion of the FS Report, additional technologies as discussed above have been identified as potential remedial alternatives. Therefore, the results from the pilot- and bench-scale studies will be used to complete the FS Report.

2.2 SCOPE

The scope of this Work Plan is to outline the activities to be conducted for the planned bench-scale and pilot-scale tests for impacted soils at the Atlas Scrap Yard AOC (RVAAP-50). This Work Plan also details health and safety specifications to minimize the potential for personnel injury or illness, and provides the quality assurance (QA) and quality control (QC) requirements to ensure data are usable and defensible.

This Work Plan was developed in accordance with the FWSAP and Facility-wide Quality Assurance Project Plan (FWQAPP) (SAIC 2011a), as well as the Facility-wide Safety and Health Plan (FWSHP) (SAIC 2011b). The project-specific Site Safety and Health Plan (SSHP) (Appendix A) presents the potential hazards, project-specific staff organization, qualifications, responsibilities, training requirements, activity hazard analyses (AHAs), and monitoring requirements that may be encountered during implementation of the Work Plan. The project-specific Quality Assurance Project Plan (QAPP) (Appendix B) has been prepared in accordance with the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) and presents the data quality objectives (DQOs) for sampling, laboratory analysis, and reporting, which will provide results to be used in finalizing the FS Report.

3.0 PROJECT ACTIVITIES

The project activities include performing bench-scale and pilot-scale studies for treatment of PAH and lead-impacted soils, preparing a Technical Memorandum which presents the results and conclusions of the tests, and completion of the FS Report.

The following subsections describe the project activities that will be conducted including the planned bench-scale and pilot-scale tests, and associated reporting, and completion of the FS Report. More detailed information concerning conduct of the bench- and pilot-scale tests may be found in the subcontractor Work Plan (Endpoint 2015) provided in Appendix C.

3.1 BENCH SCALE TESTING

The bench-scale portion of the activities will be conducted at the laboratories of Alliant's subcontractor (Endpoint). Bench-scale testing will include thermal treatment of PAH-impacted soils using VEG© remediation technology, and stabilization of lead in impacted soils via mixing with steel slag. The objectives of the bench-scale tests are to assess the potential applicability and effectiveness of the treatment options, and to identify optimal treatment conditions.

3.1.1 Pre-Treatment Sampling

To provide Endpoint with soil for the bench tests, Alliant will ship one 55-gallon drum of PAH-impacted soils, and one 10-gallon container of lead-impacted soils to their California laboratory. Soil in the drum will be obtained from the PAH-impacted area of the site as identified in Section 1.2. Soil in the 10-gallon container will be obtained from the lead impacted area of the site. Samples will be collected from the soils prior to shipment to characterize PAH, lead, and leachable lead in the soils prior to treatment. Profiles for shipping the contaminated soils will be based on previous analytical data obtained from the site and/or samples collected from the soils prior to shipment.

One 2-aliquot (or more) composite sample will be collected from soil contained in the 55-gallon drum. This sample will be submitted to the laboratory for analysis for PAHs using EPA Method 8270D SIM. Table 3-1 shows the Work Plan bench test and pilot study sample categories, analytical parameters, analytical methods, sample types and preservatives scheduled for the study. Additionally, one 2-aliquot (or more) composite sample will be collected from soil contained in the 10-gallon container. This sample will be submitted to the laboratory for analysis of: pH using method 9040, 9041, or 9045; lead using Method 6020A; and Leachable Lead using Methods 1311 (extraction) and 6010C (Lead by ICP). The aliquots will be collected from different locations in the containers, placed into a pre-cleaned disposable container, and mixed until sufficiently homogenized. After mixing, the soil samples will be placed in the appropriate sample containers, properly labeled, and preserved at 4ºC. Sample packaging, shipping and chain of custody will be conducted in accordance with the requirements of the project-specific QAPP (Appendix B). Additionally, laboratory analytical data will be subject to QC and certification in accordance with Department of Defense (DoD) requirements as described in the project-specific QAPP (Appendix B).

Table 3-1 Atlas Scrap Yard AOC (RVAAP-50) Bench and Pilot Study Soil Sampling

Sample Category	Parameter	Analytical Method	No. of Samples	Duplicates	Sample Type[(1)]	Preservative	Turnaround Time
Pre-Treatment Sampling							
55-gal Drum Sample	PAHs	8270D SIM	1	N/A	2-Aliquot Composite	Cool 4ºC	15 Days
10-gal Container Sample[(2)]	Lead	6020A	1	N/A	2-Aliquot Composite	Cool 4ºC	15 Days
10-gal Container Sample	TCLP Lead	1311/6010C	1	N/A	2-Aliquot Composite	Cool 4ºC	28 Days
10-gal Container Sample	pH	9040, 9041, or 9045	1	N/A	Discrete	Cool 4ºC	15 Days
VEG© Technology Bench Scale Study							
Initial Post-Treatment Sampling (4 Stockpiles)	PAHs	8270D SIM	4 (1/ stockpile)	1	3-Point Composite	Cool 4ºC	24 hours
Final Post-Treatment Sampling (Single Combined Stockpile)	PAHs	8270D SIM	1 (1/ stockpile)	None	3-Point Composite	Cool 4ºC	24 hours
VEG© Technology Pilot Scale Study							
Pre-Treatment Sampling (2 Stockpiles)	PAHs	8270D SIM	2 (1/ stockpile)	None	3-Point Composite	Cool 4ºC	24 hours
Post-Treatment Sampling (2 Stockpiles)	PAHs	8270D SIM	2 (1/ stockpile)	None	3-Point Composite	Cool 4ºC	24 hours
Steel Slag Mixing Bench-Scale Study							
Initial Post-Treatment Sampling (5 Mix Designs)	TCLP Lead	1311/6010C	5 (1/mix design)	N/A	3-Point Composite	Cool 4ºC	28 Days
Final Post-Treatment Sampling (2 Mix Designs)	Long-term leachable Lead	Semi-Dynamic TLP 1315	2 (1/mix design)	N/A	3-Point Composite	Cool 4ºC	28 Days

(1) The number of aliquot/points is a minimum number, additional aliquots/points may be used
(2) Split between 2 x 5-gallon buckets for shipping

SIM Selective Ion Method
N/A not applicable
PAHs polycyclic aromatic hydrocarbons
TCLP Toxicity Characteristic Leaching Procedure
TLP Toxic Leaching Procedure

3.1.2 Bench-Scale Testing for Treatment of PAHs in Soils

Bench-scale ex-situ thermal treatment of PAHs in site soils will be conducted by testing a series of treatment temperatures and treatment residence times within the VEG© Technology remediation system as described in the subcontractor Work Plan (Appendix C). The objective of the bench-scale tests is to determine the optimal system treatment temperatures and residence times for effective treatment of the PAH-impacted soils.

Endpoint will evenly distribute the soil in the drum into four stockpiles using a shovel. Each stockpile will be used to test treatment options for the PAH-impacted soil. Variables for the bench-scale treatment of PAH-impacted soils include temperature and residence time. Temperature will range from of 600 to 800 °F and residence times in the treatment chamber will range from 15 to 30 minutes. The first stockpile will be treated at a temperature of 600˚F for 15 minutes. Temperatures and residence times for the subsequently treated stockpiles will be adjusted based on the results of the first treatment run.

Upon completion of the tests, Endpoint will conduct post-treatment sampling of the soils. Post-treatment samples will consist of 3-point (or more) composites (Table 3-1) and will be collected as described in the following paragraph. The composite samples will be collected from the bench-scale study stockpiles using pre-cleaned, disposable spoons. Soils will be collected from at least three different locations in the post-treatment soil stockpiles, placed into a pre-cleaned disposable container, and mixed until sufficiently homogenized. After mixing, the soils will be placed in the appropriate sample containers, properly labeled, and cooled to 4ºC. Soil samples will be submitted to TestAmerica, Sacramento, California, a DoD approved laboratory for 24-hour turnaround time (TAT) analysis of PAHs by EPA Method 8270SIM (Table 3-1). Sample packaging, shipping and chain of custody will be conducted in accordance with the requirements of the project-specific QAPP (Appendix B). Additionally, laboratory analytical data will be subject to QC and certification in accordance with DoD requirements as described in the project-specific QAPP (Appendix B).

3.1.3 Bench-Scale Testing for Treatment of Lead in Soils

Bench-scale testing activities for treatment of lead in soils will be conducted by testing various soil/steel slag mixing ratios, and slag particle sizes as specified in the subcontractor Work Plan (Appendix C). The objective of bench-scale tests for steel slag mixing is to determine the optimal mixing ratio for soils and slag that will effectively render lead immobile (non-leachable) in site soils.

A series of five mix designs will be conducted on soils in the bucket using two different sources of regionally available steel slag fines. Once the five mix designs are complete, post-treatment sampling of the soils will be conducted. The samples will consist of 3-point (or more) composite samples, and will be collected using the same methods described in Section 3.1.2. Soil samples collected from the treated soils will be submitted following methods described in Section 3.1.2 to TestAmerica for 28-day TAT analysis of Toxicity Characteristic Leaching Procedure (TCLP) by EPA Method 1311 (Table 3-1).

Based on a combination of leaching performance, dose and expected cost, two leading candidate mix designs will be advanced to a final stage of testing. The final round of testing will involve one-dimensional semi-dynamic leach testing (USEPA Method 1315) to assess the long-term leaching. Sample

packaging, shipping and chain of custody will be conducted in accordance with the requirements of the project-specific QAPP (Appendix B). Additionally, laboratory analytical data will be subject to QC and certification in accordance with DoD requirements (Appendix B).

3.2 PILOT SCALE TESTING

The specifics of the pilot-scale study at the Atlas Scrap Yard AOC (RVVAAP-50) will be based on the results of the VEG© bench-scale study. Alliant's subcontractor (Endpoint) will conduct the pilot testing in the field, and Alliant will provide oversight and field documentation services during the field effort. The objective of the pilot-scale test is to demonstrate the effectiveness of the VEG© technology for effective treatment of PAH-impacted site soils.

Endpoint will mobilize to RVAAP all necessary equipment and resources to excavate and manage (i.e, profile soils and provide erosion protection) up to 100 cubic yards (CY) of PAH-impacted soils, thermally treat (using the ex-situ component of Endpoint's VEG© Technology) 100 CY of soils, and to perform post-treatment soil sampling and associated laboratory analysis to evaluate the efficacy of the technology to treat PAH-impacted soils. This process will include obtaining necessary facility permits to perform this work.

3.2.1 Soil Excavation

Approximately 100 CYs of soil will be excavated using a backhoe for pilot-scale testing of the VEG© technology. Soils will be excavated in the approximate location of the former T-4703 Roads and Grounds Maintenance Building which has been formally recognized as a source area for the site as shown in Attachment B of the Endpoint Work Plan (Appendix C). Alliant and Endpoint will walk down the site with RVAAP personnel to confirm the field location of the PAH soil source area before excavation begins. The excavation will be conducted to a depth of no greater than 1 ft bgs in an 18 yard (YD) x 18 YD area. The location for the excavation was selected by Endpoint in conjunction with Ohio EPA, USACE, Army National Guard (ARNG), and Army personnel. The area is readily accessible, and the intended area of the excavation will be delineated using wooden stakes prior to the start of the excavation activities. Surveying of the excavation will use Global Positioning System coordinates collected at each of the four corners of the excavation to document the actual location.

Excavated soils will be stockpiled immediately adjacent to the VEG© system into two 50-CY stockpiles. The treated soils will be stockpiled on an 11-ml-thick tarp, and covered with plastic sheeting during times of inactivity, as necessary. The excavation area will be barricaded off to ensure safety.

Baseline levels of PAHs at the site will be determined prior to the treatment process by collecting soil samples from both of the soil stockpiles (one from each 50-CY stockpile). Baseline (pre-treatment) samples will consist of 3-point (or more) composites (Table 3-1) and will be collected using pre-cleaned, disposable spoons. Soils will be collected from three different locations in the stockpiles, placed into a pre-cleaned disposable container, and mixed until sufficiently homogenized. After mixing, the soils will be placed in the appropriate sample containers, properly labeled, and cooled to 4ºC. Stockpile soils will be sampled and submitted to TestAmerica for analysis of PAHs using EPA Method 8270SIM (Table 3-1). Sample packaging, shipping and chain of custody will be conducted in accordance with the requirements of the project-specific QAPP (Appendix B). Additionally, laboratory analytical data will be subject to QC

and certification in accordance with DoD requirements as described in the project-specific QAPP (Appendix B).

3.2.2 Onsite Treatment

Following pre-treatment sampling, soils from each 50-CY soil stockpile will be independently loaded into the VEG© system, and thermally treated using the ex-situ component of Endpoint's VEG© Technology. The estimated CO_2 emissions from the VEG© system (with and without Endpoint's patented CO_2 filter) have been calculated and are provided in Attachment C of the subcontractor Work Plan (Appendix C).

The duration of the pilot testing is estimated at 3 to 5 days. The pilot-scale test will be targeted for a period of time where weather conditions are expected to be dry. If inclement weather conditions are encountered during the field effort, testing may be temporarily suspended, and the stockpiles covered until dry conditions prevail. Prior to loading of soils, the system will be pre-heated to the optimal treatment temperature based on the bench-scale tests. Soil will be fed directly into the preheated chamber either using a shovel or by being placed onto a conveyor. Residence times for soils in the treatment chamber will be set as determined by the bench-scale testing. Soil treatment rates are expected to range from 10 to 30 CY/hour depending upon soil moisture, and weather conditions. After treatment, the soils will be independently re-stockpiled into two 50-CY stockpiles on uncontaminated 11-ml-thick tarp, and covered with plastic sheeting until analytical results determine if the soil meets the remedial objectives.

Endpoint will perform post-treatment soil sampling to evaluate the efficacy of the technology to treat PAH-impacted soils to non-detect levels, or to levels below residential screening levels (RSLs). Post-treatment samples will include collecting one 3-point (or more) composite sample from each 50-CY stockpile to be submitted to the laboratory for analysis for PAHs using EPA Method 8270SIM (Table 3-1). The 3-point (or more) composite samples will be collected as described in Section 3.2.1. Sample packaging, shipping and chain of custody will be conducted in accordance with the requirements of the Project-Specific QAPP (Appendix B). Additionally, laboratory analytical data will be subject to QC and certification in accordance with DoD requirements as described in the QAPP (Appendix B).

3.2.3 Soil Backfilling and Demobilization

Upon completion of the pilot testing, soils will be placed back into the excavation pit using a backhoe. The soils will be compacted using the backhoe bucket so that the ground surface elevation of the backfilled area is even with the surrounding area. Any water inadvertently collected in the excavation pit will be pumped out and containerized prior to backfilling the excavation.

Decontamination and demobilization activities will include removing of excess soils from all equipment used prior to removal from the site. This process will maximize the use of dry, clean vapors from the vapor energy generator system inherent to the VEG© technology, thereby eliminating any rinsate or other investigation derived wastes (IDW) during decontamination procedures. Any liquid IDW will be drummed, profiled, and shipped offsite.

3.3 REPORTING

Alliant and its subcontractor, Endpoint, will prepare and submit to the Army a Draft Technical Memorandum outlining all procedures, results, and conclusions relative to bench-scale and pilot-scale tests performed. The memorandum will include information on the feasibility of the VEG© technology to

treat PAHs and related optimal treatment conditions which may in turn be used for full-scale applications at the site. Similarly, the feasibility of the use of steel slag to stabilize lead impacted soils at the site at full-scale will be evaluated, with related conclusions and recommendations set forth in the memorandum. Alliant will respond to Army comments and prepare the Final Technical Memorandum which will incorporate the responses to Army comments. The Final Technical Memorandum shall be included as an appendix to the FS Report.

3.4 FEASIBILITY STUDY REPORT

Alliant will prepare a Revised Preliminary Draft, Draft, and Final FS Reports for RVAAP-50, Atlas Scrap Yard. Alliant will prepare a Revised Preliminary Draft FS Report for Army review and respond to Army comments. Alliant will then prepare a Revised Draft FS Report for Ohio EPA review and respond to Ohio EPA comments. Alliant will prepare a Final FS Report which incorporates the responses to Ohio EPA comments.

4.0 ENVIRONMENTAL PROTECTION PLAN

The environmental resources within the project boundaries and those affected outside the limits of the activities under this contract will be protected during this field effort. The following subsection present the plans for protection against sediment and erosion, spill control and prevention, protection of threatened and endangered species, potential wetlands (if any), and cultural and natural resources.

4.1 SEDIMENT AND EROSION CONTROL

Best Management Practices (BMP) will be implemented during the project to reduce and control sediment and erosion from the excavated area, as necessary. BMPs include installing straw bales and/or silt fence barriers in the potential path of stormwater flow to prevent impacted soils or sediments from entering on site storm sewers. If necessary, diversion ditches will be dug to divert stormwater towards barriers, and away from the excavation and/or storm grates. If installed, regular maintenance and inspection will be performed on barriers. This may include removal of collected soils and sediments and repair or replacement of damaged sections.

Soil stockpiles will be placed on 11-milli-inch thick tarpaulins, and covered with plastic sheeting during periods of inactivity to prevent rainwater infiltration. The purpose for this is to isolate contaminated soils from stormwater runoff and to prevent contamination movement via stormwater. Stockpile covers will be weighted and secured to prevent storm damage. Covers will extend over the edges of the stockpiles to prevent stormwater from impacting stockpiled soil. Straw bales will be placed, and diversion ditches will be constructed as necessary to control stormwater flow. Additionally, Alliant's subcontractor will avoid excavating wet soil.

The most likely source of erosion at the site will be from erosion of the soil stockpiles if the plastic sheeting is disturbed during a period of inactivity. The stockpile plastic sheeting will be secured as described above before any periods of unanticipated inactivity that may occur. Also movement of project vehicles and the backhoe may disturb soils. During on-site activities, the area will be inspected and ruts and soft areas will be smoothed with the backhoe as necessary to maintain a smooth surface to prevent soil erosion.

4.2 SPILL CONTROL AND PREVENTION

No chemicals will be used for the ex-situ thermal soil treatment activities. The most likely spills or leaks would occur during operation or refueling of the backhoe. The backhoe will arrive on site fully fueled to circumvent accidental spillage during refueling operations. In the event that the backhoe requires refueling, plastic sheeting will be placed under the fuel tank during refueling operations to prevent accidental spills from reaching the ground surface. Additionally, the backhoe will be inspected at arrival and daily for signs of hydraulic or fuel leaks. If leaks are observed then the backhoe will be removed from service immediately and repaired.

4.3 THREATENED OR ENDANGERED SPECIES

Alliant and their subcontractor will perform all site activities in such a manner as to avoid or minimize adverse effects on any rare or protected plant/wildlife species and resources discovered on the site. Listings of threatened and endangered species are provided in the document entitled *Final Characterization of 14 AOCs at Ravenna Army Ammunition Plant* (MKM Engineers, Inc. 2007). Most of the work is being performed on an industrialized site and no vegetation or animal habitats are anticipated to be disturbed for the planned work.

4.4 POTENTIAL WETLANDS

No wetland areas have been delineated within the Atlas Scrap Yard AOC, and no surface water bodies are present.

4.5 CULTURAL AND ARCHAEOLOGICAL RESOURCES

In the event that cultural materials, artifacts, or human remains are encountered during the excavation activities the COR will be contacted and all excavation activities will be suspended.

5.0 PROJECT DOCUMENTATION AND SAMPLE QA/QC

Alliant will ensure that the quality of all work performed or produced under this DO meets Army approval through the COR. Documentation of the pilot-test activities will consist of entries in a field logbook and field forms as appropriate. The logbook and forms will be reviewed for accuracy and completeness by the Field Oversight representative.

Chemical QC will be provided whenever sampling or analysis for chemical constituents is required in order to achieve milestones. The laboratory to be used by Alliant's subcontractor will be DoD-approved, will perform testing in accordance with requirements of the DoD Quality Systems Manual Version 5 (or the latest approved version), and will be compliant with the Louisville Chemistry Guideline (LCG) where it does not conflict. All samples collected and analyzed under this DO will be generated in Electronic Data Deliverable (EDD) format compatible with uploading requirements for Environmental Restoration Information System (ERIS) and other required databases. The EDD will accurately reflect all analytical quality requirements. All electronic data submitted by the contract laboratory is required to be error-free and in complete agreement with the hard copy data. Laboratories will provide the appropriate Chemical Abstracts Services number to a specific analyte. A Load Summary Report and a transmittal letter from the laboratory will accompany the hard copy data report, certifying that the EDD is in agreement with hard copy data reports and was found to be free of errors.

6.0 DISPOSITION OF INVESTIGATION DERIVED WASTE

Bench-scale Testing Soils Disposition - Soils used in the bench-scale studies, regardless of the levels of PAHs detected, will be considered as IDW. Alliant's subcontractor (Endpoint) will place these soils back into the original drums and dispose of them at an appropriate landfill using the post-treatment sample results as the profile for disposal. Endpoint will confirm the disposal approach with USACE and Alliant prior to offsite transport by Safety Kleen. In addition, Endpoint will provide the waste manifest confirming transport and disposal of the soil drums at the landfill to Alliant and USACE.

Pilot-Scale Testing Soils Disposition - Upon receipt of the post treatment results from the pilot study, the site excavation will be backfilled with the treated soils. Additionally, Alliant will collect and dispose of any non-soil IDW (i.e., personal protective equipment and/or trash generated during the pilot study) in accordance with facility procedures and regulations.

7.0 CLEAN UP LEVELS AND BACKGROUND CONCENTRATIONS

Cleanup levels for PAHs and lead at the Atlas Scrap Yard AOC will be in accordance with USEPA RSLs. Facility-wide background soil sampling was conducted at RVAAP in 1998 to determine background screening values (BSVs) for inorganic constituents (SAIC 2001). Although no background concentrations were determined for PAHs at RVAAP, several PAHs were detected in background sampling locations at concentrations ranging from a low of 0.0078 milligrams per kilogram (mg/kg) (dibenzo[a,h]anthracene) to a high of 51 mg/kg (benzo[b]fluoranthene). The BSV for lead in soil was determined to be 26.1 mg/kg.

8.0 DELIVERABLES

Project Deliverables will be as discussed in the PMP (Alliant 2015).

9.0 REFERENCES

Alliant Corporation, Inc. 2015. Draft Project Management Plan for a Pilot Study and Feasibility Study at RVAAP-50 Atlas Scrap Yard, Ravenna Army Ammunition Plant, Ravenna, Ohio, September 30, 2015.

Endpoint Consulting, Inc. 2015. Work Plan for Bench- and Pilot-Scale Testing- Ex-Situ Thermal Desorption of Polycyclic Aromatic Hydrocarbons in Soils, and Bench-Scale Testing of Lead Stabilization in Soils, RVAPP-50 Atlas Scrap Yard, Former Ravenna, Army Ammunition Plant, Ravenna, OH, October 7, 2015.

Leidos Engineering of Ohio, Inc. 2014. Draft Remedial Investigation Report for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard, Ravenna Army Ammunition Plant, Ravenna, Ohio, dated June 18.

Leidos Engineering of Ohio, Inc. 2015. Preliminary Draft Feasibility Study Report for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard, Ravenna Army Ammunition Plant, Ravenna, Ohio.

MKM Engineers, Inc., 2007. Final Characterization of 14 AOCs at Ravenna Army Ammunition Plant, MKM Engineers, Inc. March 2007.

Ohio Environmental Protection Agency (Ohio EPA) 2004. Director's Final Findings and Orders (DFFO) for RVAAP, dated June 10.

SAIC 2001. Phase II remedial Investigation Report for the Winklepeck Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio, April 2001.

SAIC 2011a. Facility-Wide Safety and Health Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio, dated February 24.

SAIC 2011b. Facility-Wide Sampling and Analysis Plan and Facility-wide Quality Assurance Project Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio, dated February 24.

USACE 2015. Performance work Statement for Pilot Study and Feasibility Study at the Atlas Scrap Yard Camp Ravenna, Portage and Trumbull Counties, Ohio, dated August 26.

Vista Sciences Corporation 2012. Submission Format Guidelines Ravenna Army Ammunition Plant Version 20, dated March 23.

APPENDIX A
PROJECT-SPECIFIC SITE SAFETY AND HEALTH PLAN

Draft

Site Safety and Health Plan
for a Pilot Study and Feasibility Study
at RVAAP-50 Atlas Scrap Yard

Ravenna Army Ammunition Plant
Ravenna, Ohio

October 14, 2015

Contract No. W912QR-14-D-0001
Delivery Order No. 0004

Prepared for:

US Army Corps of Engineers
Louisville District
600 Martin Luther King Jr. Place
Louisville, Kentucky 40202

Prepared by:

Alliant Corporation
320 N Cedar Bluff Road, Suite 200
Knoxville, Tennessee 37923

Draft

Site Safety and Health Plan
for a Pilot Study and Feasibility Study
at RVAAP-50 Atlas Scrap Yard

Ravenna Army Ammunition Plant
Ravenna, Ohio

October 14, 2015

Contract No. W912QR-14-D-0001
Delivery Order No. 0004

US Army Corps of Engineers
Louisville District
600 Martin Luther King Jr. Place
Louisville, Kentucky 40202

Prepared by:
Alliant Corporation
320 N Cedar Bluff Road, Suite 200
Knoxville, Tennessee 37923

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AOC	Area of Concern
Camp Ravenna	Camp Ravenna Joint Military Training Center
CDC	Center for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CIH	Certified Industrial Hygienist
COTR	Contracting Officer's Technical Representative
CPR	Cardiopulmonary Resuscitation
DEET	n,n-diethyl-m-toluamide
FWSAP	Facility-Wide Sampling and Analysis Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	Investigation Derived Waste
JHA	Job Hazard Analysis
MSDS	Material Safety Data Sheet
NIOSH	National Institute of Occupational Safety and Health
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
OJT	On-the-Job Training
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PPE	Personal Protective Equipment
RAC	Risk Assessment Code
RCRA	Resource Conservation and Recovery Act
RVAAP	Ravenna Army Ammunition Plant
Alliant	Alliant Corporation
SPF	Sun Protection Factor
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TLV	Threshold Limit Value
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
WBGT	Wet Bulb Globe Temperature

1.0 INTRODUCTION

Alliant Corporation (Alliant) prepared this Project-Specific Site Safety and Health Plan (SSHP) for the Pilot Study to be conducted as a part of the Pilot Study and Feasibility Study (FS) at the Atlas Scrap Yard area of concern (AOC) [Ravenna Army Ammunition Plant (RVAAP)-50] at Camp Ravenna, Portage and Trumbull Counties, Ohio under Contract No. W912QR-14-D-0001, Delivery Order (DO) No. 0004.

The pilot study will consist of testing contaminated soils at the site for the suitability of using Vapor Energy Generator© (VEG©) technology to treat Polycyclic Aromatic Hydrocarbon (PAH)-impacted soil. VEG© technology involves ex-situ thermal treatment of impacted soils in an enclosed treatment chamber using steam. As an internal auger rotates the soil, the steam causes the contaminants to be released and captured by a vacuum system inside the chamber which then filters the gases out. The goal of the treatment is to reduce contaminants to non-detect levels or to below regulatory standards.

Figure 1-1 depicts Camp Ravenna and the location of the Atlas Scrap Yard AOC (RVAAP-50) in the south-central portion of the facility. This Project-Specific SSHP was developed in accordance with U.S. Army and Ohio Environmental Protection Agency (Ohio EPA) guidance documents to meet the requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Resource Conservation and Recovery Act (RCRA); and other federal or state regulations that govern environmental restoration activities at RVAAP. This SSHP accompanies, and is to be used in conjunction with the Work Plan, and Project-Specific Quality Assurance Project Plan (QAPP) in addition to installation-wide plans to provide consistent programmatic and technical requirements for the field activities to be conducted for this project at RVAAP.

This SSHP sets forth the minimum requirements for protecting personnel involved in environmental field activities at the RVAAP. Standard procedures must be used to minimize the potential for personnel injury or illness. These will include on-site training, routine inspections, and enforcement of the health and safety requirements by project management. This plan follows and addresses requirements in the U. S. Army Corps of Engineers (USACE's) Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste and Ordnance and Explosive Waste Activities (USACE 2007). This SSHP complies with the requirements of the USACE Safety and Health Requirements Manual (USACE 2008); relevant Occupational Safety and Health Administration (OSHA) regulations; and other applicable federal, state, and local government safety and health requirements. This plan provides guidance on health and safety hazards and controls. A copy of this SSHP will be present at the work site.

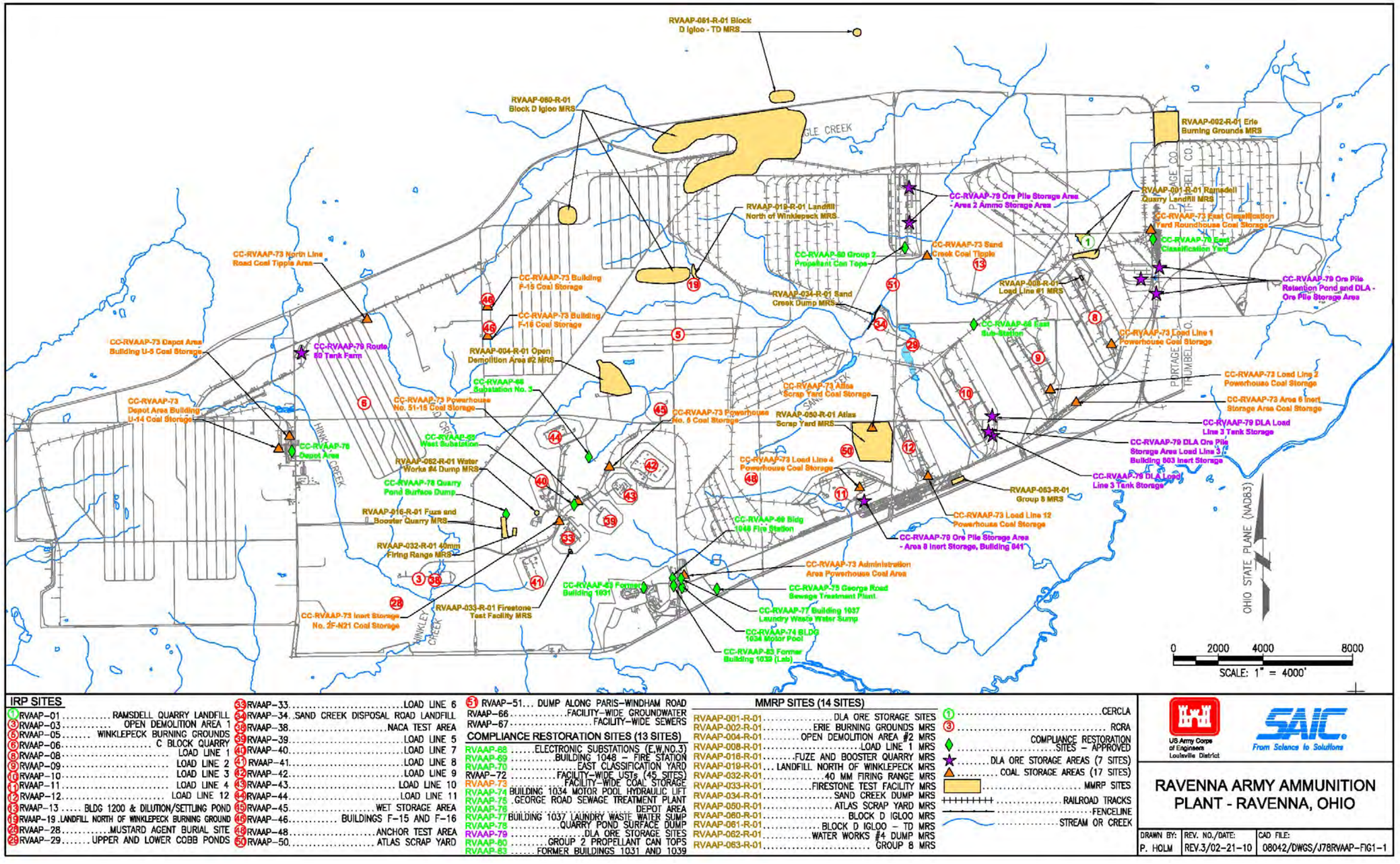


Figure 1-1. RVAAP Installation Map with Areas of Concern, Compliance Restoration Sites, and Munitions Response Site Locations

2.0 FACILITY DESCRIPTION AND CONTAMINATION CHARACTERIZATION

2.1 FACILITY DESCRIPTION

The RVAAP (Federal Facility Identification number: OH213820736) is located in northeastern Ohio within Portage and Trumbull Counties, approximately 3 miles east-northeast of the city of Ravenna (Figure 1-1). The Installation is approximately 11 miles long and 3.5 miles wide bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garret, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east. The Installation 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 climate, geologic and hydrologic settings, and ecological setting for RVAPP are presented in the Facility Wide Sampling and Analysis Plan (FWSAP) [Science Applications International Corporation (SAIC) 2011a].

As of February 2006, administrative control of 20,403 acres of the former 21,683 acre RVAAP have been transferred to the National Guard Bureau (NGB) and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site. Currently, RVAAP consists of 1,280 acres in several distinct parcels scattered throughout the confines of the Camp Ravenna Joint Military Training Center (Camp Ravenna). These 1,280 acres consist of former industrial facilities that are being remediated and managed by the Base Realignment and Closure Division (BRACD).

During the operational years, prior to Camp Ravenna, the entire 21,683-acre property was a government-owned, contractor-operated industrial facility. The RVAAP Camp Ravenna Sites encompass investigation and remediation of past activities over the entire 21,683 acres of the former RVAAP; therefore, references to the RVAAP in this Work Plan are considered to be inclusive of the historical extent of the RVAAP, which is inclusive of the combined acreages of the current Camp Ravenna and RVAAP, unless otherwise specifically stated.

RVAAP is bound to the Director's Final Findings and Orders (DFFOs) issued June 10, 2004 by the Ohio EPA pursuant to the authority vested under Chapters 3734, 3745, and 6111 of the Ohio Revised Code (ORC). 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. RVAAP is not on the U.S. 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 at the RVAAP. The Installation is bound to the DFFOs, issued on June 10, 2004 by the Ohio EPA. The DFFOs form the basis for the implementation of a CERCLA based environmental remediation program at the Installation.

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.

2.2 SITE DESCRIPTION

The Atlas Scrap Yard AOC (RVAAP-50), formerly known as the construction camp, is approximately 73 acres and is located in the southeastern portion of Camp Ravenna (Figure 1-2). The Atlas Scrap Yard has served several operational functions over the history of the former RVAAP, but the AOC was never used for munitions production activities. From 1940 to 1945, the Atlas Scrap Yard operated as a construction camp to house workers and their families while the facility was being constructed. By the end of World War II, the majority of buildings and structures at the Atlas Scrap Yard were demolished or relocated to other areas of the facility. The structures that remained were used to support roads and grounds maintenance activities. These remaining structures were razed after the Vietnam War. After the Vietnam War, the AOC became a stockpile storage area for bulk materials, including gravel, railroad ballasts, sand, and culvert pipes. Coal, used for building process heat, was piled in several areas of the AOC. The central-east portion of the AOC was a staging area for salvaged ammunition boxes from demilitarized Vietnam War-era munitions.

There is no fence around the AOC as a perimeter boundary, but the AOC is bordered by Newton Falls Road to the north and Paris-Windham Road to the east. Load Line 4 is located to the south of the AOC. The interior of the AOC is currently vegetated with shrub/scrub vegetation in unpaved areas and is forested around its perimeter. The north-central portion of the AOC is sparsely vegetated and has extensive gravel cover.

2.3 CONTAMINANTS

The Remedial Investigation (RI) [Leidos Engineering of Ohio, Inc. (Leidos), 2014] concluded that the Atlas Scrap Yard AOC was adequately characterized. The RI identified eight (8) PAHs as chemicals of concern (COCs) at the site. The identified PAHs are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene. The PAH COCs were primarily identified in the 0-1 foot (ft) below ground surface (bgs) interval primarily in the approximate vicinity of the former T-4703 Roads and Grounds Maintenance Building. Additionally, a small area in the southern part of the site has been characterized by elevated lead concentrations, and constitutes a lead “hot spot.”

Lead COCs will not be encountered during the field activities at the site. The onsite field activities will consist of conduction of a pilot-study for testing the efficacy of remediating PAH-impacted soils. The pilot study activities will take place in the northern area of the Atlas Scrap Yard AOC. Lead-impacted soils were discovered in the southern portion of the site in an area well away from the planned pilot study.

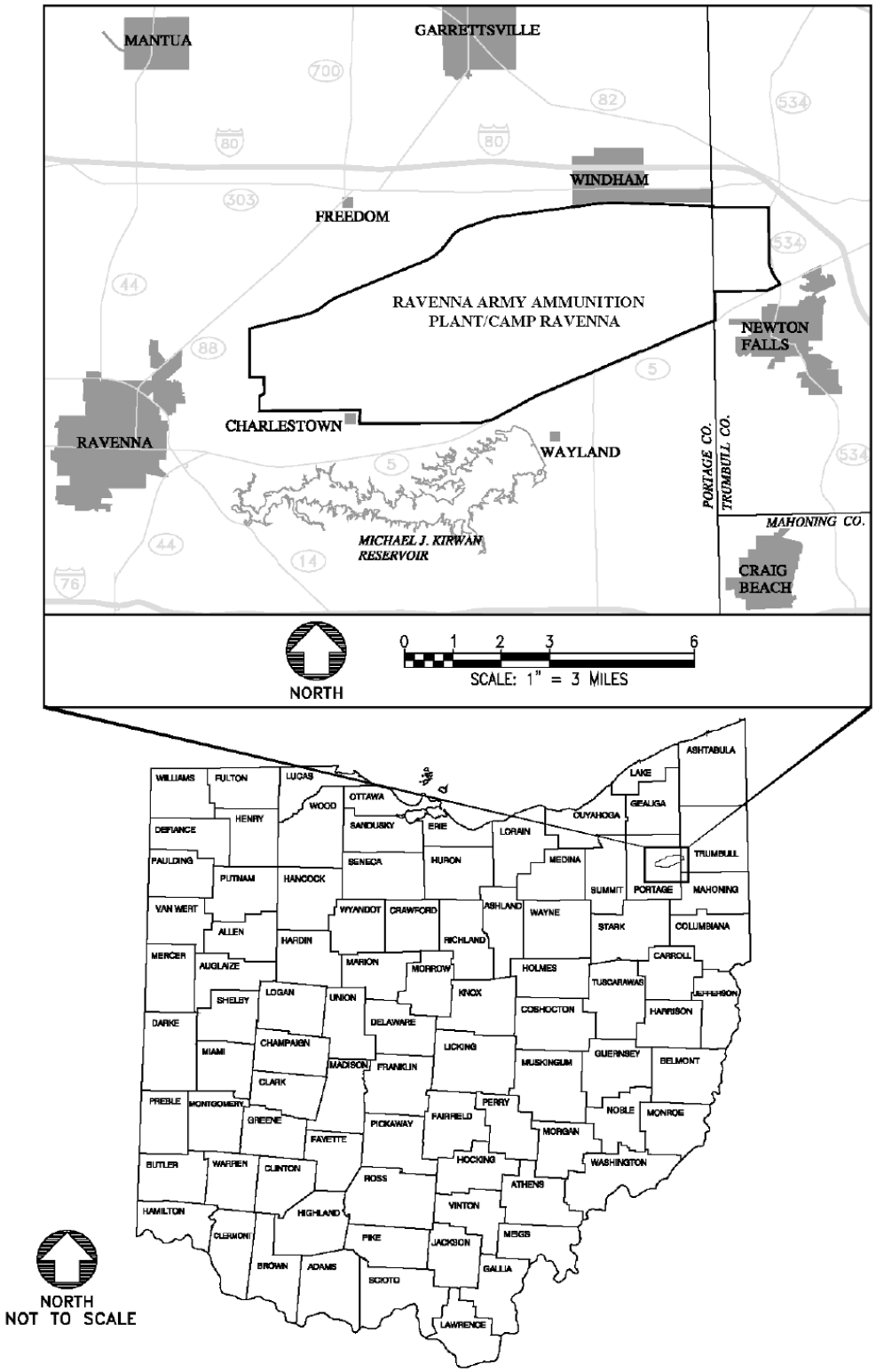


Figure 2-1. General Location and Orientation of RVAAP/Camp Ravenna

3.0 HAZARD/RISK ANALYSIS

The job hazard analysis (JHA) identifies and assesses potential hazards that may be encountered by personnel and prescribes the required controls. The JHAs provide the project-specific hazards based on completion of a hazard inventory. The tasks are expected to consist of excavating site soils (to a maximum depth of 1 ft, operating a backhoe and an ex-situ thermal treatment system for treatment of site soils. collecting stockpile soil samples; decontaminating equipment (as necessary), and managing investigation derived waste (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 or falls into the excavations, noise, and heat/cold stress.

3.1 TASK-SPECIFIC ACTIVITY HAZARD ANALYSIS

Tables 3-1 and 3-2 present the JHAs, including task-specific job steps, hazards, actions to eliminate or minimize hazards, equipment to be used, and inspection, and training requirements, if appropriate, for all of the planned field activities during the pilot test. Specific tasks considered in this document are as follows:

- Site mobilization and demobilization;
- Soil excavation and preparation of soil stockpiles using a backhoe;
- Soil sampling using spoons or scoops;
- Operation of the VEG treatment system;
- IDW handling; and
- Equipment decontamination.

The hazard assessments for each of these tasks are based on USACE expectations, as presented in the *USACE Safety and Health Requirements Manual* (USACE 2008), and some assumptions regarding the planned activities. Ultimately, the Alliant and the subcontractor will be responsible for ensuring that the hazards of each activity are adequately controlled.

3.2 POTENTIAL EXPOSURES

Table 3-3 provides information on potential exposures from the COCs (PAHs), and the chemicals that may be used during this field effort.

Table 3-1. Job Hazard Analysis – Ex-Situ Thermal Desorption

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.1
Revision:0

Work Package Number	4296-001.1	**JHA No.**	JHA-4296-001.1	**Revision No.**	0	**Permits**	NA	**JHA Issue Date**	10/13/2015
Description of Work	Ex-Situ Thermal Desorption							**Expiration Date**	10/12/2016
Location	Alliant - Knoxville			**Work Area**	Not Listed				
Work Site	Camp Ravenna			**Specific Area(s)**	Atlas Scrap Yard				

Risk Management Matrix

Severity \ Probability		A Frequent	B Likely	C Occasional	D Seldom	E Unlikely
Catastrophic	I	EXTREMELY HIGH RISK				
Critical	II		HIGH RISK			
Moderate	III			MODERATE RISK		LOW RISK
Negligible	IIII					

Risk Assessment Rating: C II

Required Tools and Equipment	• Fire Extinguisher
Required PPE	• Abrasion-resistant (ie. Leather) gloves for handling sharp or rough objects • Ear Plugs • Hard Hat • High-Visibility Shirt/Vest • Safety Glasses w/ Side Shields
Subcontractors	• Endpoint Consulting Inc.
Chemicals of Exposure Concern	• Benzo(k)fluoranthene (207-08-9) • Benz(a)anthracene (56-55-3) • Benzo(a)pyrene (50-32-8) • Benzo(b)fluoranthene (205-99-2) • Dibenz(a,h)anthrancene (53-70-3)

Page 1 of 6
ALLIANT

JHA No: JHA-4296-001.1
Author: Terry Douglas

Table 3-1. Job Hazard Analysis – Ex-Situ Thermal Desorption (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.1
Revision: 0

Competent Person: (See Attached Documentations)		
Name	Signature	Competent Areas

Qualified Person: (See Attached Qualifications)		
Name	Signature	Qualified Areas

Certified Person: (See Attached Certifications)		
Name	Signature	Certified Areas

Job Steps	Hazard(s)	Control(s)	Risk Assessment Code
1. Mobilization for Ex-Situ Thermal Desorption	Traffic accidents	• *Verify that driver has a valid operator's license.* • *Practice defensive driving whenever traveling in a vehicle.* • *Cell phones or other two-way communications (including text and handsfree devices) while driving are not permitted.* • *Do not exceed "truck with trailer" speed limits if towing additional equipment; maintain minimum 50 feet of separation at 50 miles per hour; allow extra braking distance, use spotter for backing up.* • *If equipment is being placed in the back of a truck, be aware of blind spots and adjust mirrors accordingly.*	D III
2. Working Near Treatment Chamber	Back/muscle strain	• *Use proper lifting techniques when manually handling rods and tools. Use mechanical equipment during lifting whenever possible. Use the buddy system when lifting tools and supplies.*	C II

Page 2 of 6
ALLIANT

JHA No: JHA-4296-001.1
Author: Terry Dongas

Table 3-1. Job Hazard Analysis – Ex-Situ Thermal Desorption (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.1
Revision: 0

Job Steps	Hazard(s)	Control(s)	Risk Assessment Code
		• Use good ergonomic techniques when lifting • Do not lift more than 50 pounds (lb) without assistance for a standard size person. The weight may be reduced based on the individual's size. • Step carefully on wet/muddy areas.	
	Noise	• Stand away from operating equipment whenever possible. • Wear ear plugs/ear muffs when conversation is difficult at an arm's length.	
3. Working Near the Renewal Chamber	Foreign Objects/Cuts, abrasions, and burns	• Use proper ANSI approved eye protection depending on the PPE level (safety glasses, goggles, face shield). • Use appropriate out and inner gloves for hazardous chemicals of concern. • Seek medical assistance via proper medical attention (First Aid)	D III
4. Ex-Situ Thermal Desorption Activities	Heavy Equipment Hazards	• Only trained and qualified personnel will operate heavy equipment. • Equipment will be inspected before each shift and documented. • Ground personnel and operators will be familiar with appropriate hand signals in the work area. • Personnel in the area where heavy equipment is operating will wear high visibility vests and hard hat. • Personnel involved with post-thermal treatment sampling will wear heat-proof gloves and goggles. Personnel will avoid continued contact with hot soil. • Heavy equipment will have roll over protection and back up alarms. • Operations will be planned. The operations will separate ground and heavy equipment operations as much as possible. • Backing up a vehicle with obstructed view, around ground personnel, near above-ground utilities, drop-offs, low light conditions or other hazard will require the use of a spotter.	D III

Page 3 of 6
ALLIANT

JHA No: JHA-4296-001.1
Author: Terry Douglas

Table 3-1. Job Hazard Analysis – Ex-Situ Thermal Desorption (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.1
Revision: 0

Special Instruction(s)

JHA Post Job Comments		
Revision	Date	Comments

Page 4 of 6
ALLIANT

JHA No: JHA-4296-001.1
Author: Terry Douglas

Table 3-1. Job Hazard Analysis – Ex-Situ Thermal Desorption (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.1
Revision: 0

Job Hazard Analysis Review Team			
Printed Name	Signature	Functional Role	Concurrence Date
Stout, Richard			
Job Hazard Analysis Approval			
Printed Name	Signature	Functional Role	Approval Date
Terry Douglas	Signature on File	President	10/13/2015
Price, Belinda		Project Oversite	
Signatures Based On Risk Score (Risk Score Total: 5)			
		(RIM Score: 1 to 34) Project Manager	

Page 5 of 6
ALLIANT

JHA No: JHA-4296-001.1
Author: Terry Douglas

Table 3-1. Job Hazard Analysis – Ex-Situ Thermal Desorption (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.1
Revision: 0

Job Hazard Analysis Briefing			
Printed Name	Signature	Functional Role	Approval Date
		JHA Briefer	
Assigned Workers			

Page 6 of6
ALLIANT

JHA No: JHA-4296-001.1
Author: Terry Douglas

Table 3-2. Job Hazard Analysis – Soil Sampling

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.2
Revision:0

Work Package Number	4296-001.2	**JHA No.**	JHA-4296-001.2	**Revision No.**	0	**Permits**	NA	**JHA Issue Date**	10/13/2015
Description of Work	Soil Sampling							**Expiration Date**	12/31/2016
Location	Alliant - Knoxville			**Work Area**	Not Listed				
Work Site	Camp Ravenna			**Specific Area(s)**	Atlas Scrap yard				

Risk Management Matrix

Risk Management Matrix

Severity \ Probability		Frequent A	Likely B	Occasional C	Seldom D	Unlikely E
Catastrophic	I	EXTREMELY HIGH RISK				
Critical	II		HIGH RISK			
Moderate	III		MODERATE RISK		LOW RISK	
Negligible	IIII					

Risk Assessment Rating: C III

Required Tools and Equipment

- Hand Tools (Shovel, Metal Garden Rake, Garden Hoe, Hand Trowel, Pick Axe, etc.)

Required PPE

- Abrasion-resistant (ie. Leather) gloves for handling sharp or rough objects
- Long sleeve coat/shirt
- Sturdy leather work boots/shoes with non-slip soles
- Long Pants
- Safety Glasses w/ Side Shields

Subcontractors

- Endpoint Consulting Inc.

Chemicals of Exposure Concern

- Lead

Page 1 of 5
ALLIANT

JHA No: JHA-4296-001.2
Author: Terry Douglas

Table 3-2. Job Hazard Analysis – Soil Sampling (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.2
Revision: 0

Competent Person: (See Attached Documentations)		
Name	Signature	Competent Areas
Qualified Person: (See Attached Qualifications)		
Name	Signature	Qualified Areas
Certified Person: (See Attached Certifications)		
Name	Signature	Certified Areas

Job Steps	Hazard(s)	Control(s)	Risk Assessment Code
1. Open drum/container - loosen the locking ring using a socket wrench, remove the ring, lift off the lid	Flying Objects (Debris, particles, etc.)	• Impact-resistant safety glasses with side shields are required.	C III
	Pinch points	• Keep hands clear of pinch points. • Leather/cut resistant gloves shall be worn when handling rough materials, cut hazards, or when pinch points are present.	
	Slip, trip, and fall hazards	• Be aware of unewen ground and pavement.	
2. Sample soil - use stainless steel spoon to scoop out soil -	Slip, trip, and fall hazards	• Be aware of unewen ground and pavement.	C III

Page 2 of 5
ALLIANT

JHA No: JHA-4296-001.2
Author: Terry Douglas

Table 3-2. Job Hazard Analysis – Soil Sampling (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.2
Revision: 0

Job Steps	Hazard(s)	Control(s)	Risk Assessment Code
take 2 aliquots and mix in stainless steel bowl. Scoop soil into laboratory prepared sample jars for shipment. Place unused soil back in the container where it came from			
3. Close drum/container - replace lid, place locking ring and tighten locking bolt with socket wrench	Flying Objects (Debris, particles, etc.)	• Impact-resistant safety glasses with side shields are required.	C III
	Pinch points	• Keep hands clear of pinch points. • Leather/ cut resistant gloves shall be worn when handling rough materials, cut hazards, or when pinch points are present.	
	Slip, trip, and fall hazards	• Be aware of uneven ground and pavement.	

Special Instruction(s)
This applies if the drum is staged and accessible without moving it. If unexpected conditions are encountered suspend work and contact Belinda Price.

JHA Post Job Comments		
Revision	Date	Comments

Page 3 of 5
ALLIANT

JHA No: JHA-4296-001.2
Author: Terry Douglas

Table 3-2. Job Hazard Analysis – Soil Sampling (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-001.2
Revision: 0

Job Hazard Analysis Review Team			
Printed Name	Signature	Functional Role	Concurrence Date
Stout, Richard			
Job Hazard Analysis Approval			
Printed Name	Signature	Functional Role	Approval Date
Terry Douglas	Signature on File	President	10/13/2015
Price, Belinda		Project Oversite	
Signatures Based On Risk Score (Risk Score Total: 0)			

Page 4 of 5
ALLIANT

JHA No: JHA-4296-001.2
Author: Terry Douglas

Table 3-2. Job Hazard Analysis – Soil Sampling (Continued)

ALLIANT

Job Hazard Analysis

Work Package Number: 4296-00 1.2
Revision: 0

Job Hazard Analysis Briefing			
Printed Name	Signature	Functional Role	Approval Date
		JHA Briefer	
Assigned Workers			

Page 5 of 5
ALLIANT

JHA No: JHA-4296-001.2
Author: Terry Douglas

Table 3-3. Potential Exposures

Chemical	Health Effects/Potential Hazards[a]	Chemical and Physical Properties[a]	Exposure Route(s)[a]
Benzo(a)anthracene	Known animal carcinogen, may cause skin irritation, cataracts, kidney and liver damage, and jaundice.	Yellow-blue solid; VP: $2.2x10^{-8}$ mmHg; FP: no data; IP: N/A	Absorption Ingestion Contact
Benzo(a)pyrene	Known animal carcinogen, may cause skin irritation, cataracts, kidney and liver damage, and jaundice.	Colorless solid; VP: $5.7x10^{-9}$ mmHg; FP: no data; IP: N/A	Inhalation Ingestion Contact
Benzo(b)fluoranthene	Known animal carcinogen, may cause skin irritation, cataracts, kidney and liver damage, and jaundice.	Colorless solid (needles); VP: $5.0x10^{-7}$ mmHg; FP: no data; IP: N/A	Inhalation Ingestion Contact
Benzo(k)fluoranthene.	Known animal carcinogen, may cause skin irritation, cataracts, kidney and liver damage, and jaundice.	Pale Yellow solid (needles); VP: $9.59x10^{-11}$ mmHg; FP: no data; IP: N/A	Inhalation Ingestion Contact
Dibenz(a,h)anthracene.	Known animal carcinogen, may cause skin irritation, cataracts, kidney and liver damage, and jaundice.	Colorless solid; VP: $1.0x10^{-10}$ mmHg; FP: no data; IP: N/A	Inhalation Ingestion Contact
Other Potential Exposures			
Diesel (used for fuel for heavy equipment)	Irritation of skin and inflammation, respiratory system; dizziness; headache; nausea; central nervous system	Brown, slightly viscous liquid, with characteristic odor; FP: 125.6°F	Inhalation Ingestion Contact
Diesel Exhaust	Irritation of eyes and respiratory system; potential occupational carcinogen	Appearance odor and properties vary depending upon the specific diesel exhaust component	Inhalation Contact
Gasoline (used for fuel)	Potential carcinogen per NIOSH, dizziness, eye irritation, dermatitis	Liquid with aromatic odor; FP: -45°F; VP: 38-300 mm	Inhalation Absorption Ingestion Contact

[a] From http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=122&tid=25

PAH = Polycyclic aromatic hydrocarbon.
SVOC = Semi-volatile organic compound.
VP = Vapor pressure.
FP = Flash point.
IP = Ionization potential.
NA = Not available.
NIOSH = National Institute of Occupational Safety and Health

4.0 STAFF ORGNIZATION, QUALIFICATION AND RESPONSIBILITIES

This section presents the general lines of authority, responsibilities, and communication procedures concerning site safety and health and emergency response. It includes key positions.

- Project Manager;
- Certified Industrial Hygienist (CIH);
- Field oversight representative;
- Site Safety and Health Officer (SSHO); and
- All subcontractors and suppliers.

4.1 PROGRAM MANAGER

The Program Manager will ensure conformance with corporate and USACE policies and procedures. Specific responsibilities of the Program Manager are as follows:

- Coordinate with USACE personnel;
- Ensure project managers satisfy USACE health and safety requirements;
- Ensure project staff implement the SSHP;
- Ensure projects have the necessary resources to operate safely; and
- Ensure project personnel have the appropriate regard for safe job performance.
- Exercise Stop Work Authority if unsafe work conditions develop.

4.2 CERTIFIED INDUSTRIAL HYGIENIST

The 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. The specific responsibilities of the CIH are as follows:

- Coordinate with USACE health and safety personnel;
- Review and approve SSHPs;
- Approve downgrades in personal protective equipment (PPE) or protective procedures; and
- Interface with project personnel through routine communications and audits of selected projects.
- Exercise Stop Work Authority if unsafe work conditions develop.

4.3 PROJECT MANAGER

The Project Manager will be responsible for overall project execution. The responsibilities of the Project Manager 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 this SSHP and all project-specific addenda;
- Maintain auditable project documentation of all required records;
- Ensure that a qualified SSHO is designated; and
- Maintain a current copy of this SSHP and the project-specific addenda.

- Exercise Stop Work Authority if unsafe work conditions develop.

4.4 FIELD OVERSIGHT REPRESENTATIVE

The field oversight representative will oversee the field activities associated with a project and is responsible for site accessibility, safety, and quality assurance. He will enforce the field requirements of this SSHP and project-specific addenda. Specific responsibilities of the Field oversight representative are as follows:

- Enforce compliance with this SSHP and the project-specific addenda;
- Coordinate on-site operations, including subcontractor activities;
- Ensure that subcontractors follow the requirements of this SSHP and the project-specific addenda;
- Coordinate and control any emergency response actions;
- Ensure that at least one person per field team, who is currently certified in first aid and cardiopulmonary resuscitation (CPR), is on-site during site operations; and
- Maintain current copies of this SSHP, the project-specific addenda, and the USACE Safety and Health Requirements Manual (USACE 2008) on-site.
- Exercise Stop Work Authority if unsafe work conditions develop.

4.5 CONTRACTOR SITE SAFETY AND HEALTH OFFICER

The Alliant field oversight representative/SSHO will implement this SSHP, make health and safety decisions for specific health and safety activities, and verify the effectiveness of the health and safety program. The SSHO's qualifications include, at a minimum, experience with similar projects, knowledge of and understanding of this SSHP and the project-specific addenda, and the ability to use the required monitoring equipment. The SSHO's primary responsibilities will be as follows:

- 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 (UXO), 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).
- Implement and verify compliance with this SSHP and the project-specific addenda and report to the field oversight representative, Project Manager, and Health and Safety Manager any deviations from anticipated conditions.
- Conduct daily safety inspections using the form provided in Appendix A.
- Document deficiencies identified in the daily inspections and responsible parties, procedures, and timetables for correction.
- 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:

- — Material Safety Data Sheets (MSDS) for applicable materials utilized at the site;
- — Daily tailgate and health and safety training for site workers and visitors (Appendix A);
- — Calibration/maintenance of field instruments such as photoionization detectors, combustible gas indicators;
- — Calibration standards tracking;
- — Environmental and personal exposure monitoring results (Appendix A);
- — Notification of accidents/incidents (Appendix A);
- — 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).
- 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 (respiratory protection is not anticipated for this field effort).
- Verify that this SSHP'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 this SSHP and its project-specific addenda.
- Investigate accidents and near accidents and report (in concert with the field oversight representative) findings to the Project Manager and CIH.
- Conduct daily "tailgate" safety briefings using the form provided in Appendix A.
- Control visitor access to the exclusion zone.
- Exercise Stop Work Authority if unsafe work conditions develop.

5.0 TRAINING

Personnel participating in the investigation of an AOC are subject to the training requirements presented in Table 5-1 and discussed below.

The following paragraphs briefly summarize the training requirements. These summaries include a course description and guidance on who must take each course.

5.1 OFF-SITE TRAINING

The 40-hr Hazardous Waste Site Worker course is required for hazardous, toxic, and radioactive waste activities in the exclusion (contamination) zone, contamination reduction (buffer) zone, or other hazardous areas on-site including areas of sample preparation and packaging. Three days of relevant field experience are required in conjunction with this training.

Table 5-1. Training Requirements

Training	Worker	Supervisor	Site Visitor (exclusion zone)
HAZWOPER (40-hr, 3-day OJT)	√	√	√
HAZWOPER Annual Refresher (8 hr)	√	√	√
HAZWOPER Supervisors Training (8 hr)		√	
CPR and First Aid Training (required for two personnel and a minimum of one person per field team)	√	√	√
General Hazard Communication Training (contained in 40- and 8-hr courses)	√	√	√
Respiratory Protection Training (required only if respirators are worn; contained in 40-hr course)	√	√	√
Hearing Conservation Training (for workers in hearing conservation program; contained in 40- and 8-hr courses)	√	√	√
Pre-entry Briefing	√	√	√
Site-specific Hazard Communication (contained in pre-entry	√	√	√
Safety Briefing (daily and whenever conditions or tasks change)	√	√	√
Equipment-specific Training (equipment operators)	√	√	

√ = Required
CPR = Cardiopulmonary Resuscitation
HAZWOPER = Hazardous Waste Operations and Emergency Response
OJT = On-the-Job Training

The 8-hr Hazardous Waste Refresher course is required annually to maintain currency in the 40-hr course.

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. MSDSs 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. The 43.5-hr American Red Cross Emergency Response training is no longer required.

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 Code of Federal Regulations (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.

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 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 SSHP 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 (two-way radios and cell phones);
- Spill containment procedures (e.g., reporting, cleanup methods); and
- Emergency equipment locations and use (e.g., fire extinguishers, spill kits).

Safety briefings will be held at least daily and also when conditions or tasks change. These briefings will be conducted by the field oversight representative/SSHO 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.

6.0 PERSONAL PROTECTIVE EQUIPMENT

PPE for site tasks is based on potential site-specific hazards. In cases where multiple hazards are present, a combination of protective equipment will be selected so that adequate protection is provided for each hazard. When a conflict exists with the PPE requirements, the more restrictive shall apply. This section emphasizes the programmatic requirements for PPE. For task-specific equipment, see Section 3.0 (Hazard/Risk Analysis). All task-specific PPE requirements will be listed in the SSHP Addendum.

6.1 PERSONAL PROTECTIVE EQUIPMENT PROGRAM

PPE use must comply with 29 CFR 1910, Subpart I and Section 5 of the USACE Safety and Health Requirements Manual (USACE 2009). The level of protection and types of materials selected for a particular task must be based on the following:

- Potential for exposure because of work being done;
- Route of exposure;
- Measured or anticipated concentration in the medium of concern;
- Toxicity, reactivity, or other measure of adverse effect; and
- Physical hazards such as falling objects and flying projectiles.

In situations where the type of contamination, concentration, and probability of contact are not known, the appropriate protection is selected based on the CIH's professional judgment until the hazards are further evaluated.

The SSHO may raise or lower the level of PPE worn by the teams depending upon the site-specific hazards encountered in the field. Prior to lowering the level of PPE, the field oversight representative and the CIH must be contacted/consulted and approval given and documented. If site conditions are such that the level of PPE is insufficient or work must be stopped, the SSHO will take appropriate action immediately, and the appropriate personnel (see above) will be contacted afterwards. The following criteria indicate a possible need for re-assessing the PPE selection:

- Introduction of new types of equipment;
- Commencement of an unplanned (hazard not previously assessed) work phase;
- Working in unplanned temperature extremes;
- Evidence of contamination such as discolored soil or elevated instrument readings near the soil;
- Exceeding the action limits; or
- Changing the work scope so that the degree of contact with contaminants changes.

6.1 TYPES OF EQUIPMENT

This section presents the types of protective clothing that may be used for the project. Requirements for task-specific levels of protective clothing are presented in Table 3-2. Levels of protection will be used to protect against chemical and physical hazards at this site are as follows:

- Level C Protective Equipment
  - — Full-face respirator and air-purifying cartridges capable of filtering out organic vapors, acid gasses, and radionuclides. A half-face respirator with appropriate protective eyewear

(e.g., goggles and faceshield) may be deemed protective under certain conditions, but such a determination may only be made by the CIH and SSHO in accordance with the Contractor's health and safety procedures and policies, approved by USACE, and documented in the project-specific SSHP addendum or field change order. Half-face respirators may only be used in environments where contaminants are not an exposure hazard to the eyes or exposed skin;

- Hooded chemical-resistant clothing (polyethylene-coated Tyvek® or equivalent) with all openings taped;
- Two pairs of chemical-resistant gloves (nitrile and exam gloves);
- Heavy duty leather, Kevlar, or equivalent gloves (in addition to chemical-resistant gloves) for materials handling or other tasks that pose physical hazards to the hands;
- Safety boots;
- Shoe covers; and
- Hard hat (if overhead hazards are present).

- Level D+ Protective Equipment
  - Tyvek® or equivalent coveralls;
  - Nitrile or polyvinyl chloride gloves;
  - Heavy duty leather, Kevlar, or equivalent gloves (in addition to chemical-resistant gloves) for materials handling or other tasks that pose physical hazards to the hands;
  - Safety boots;
  - Boot covers;
  - Hard hat (if overhead hazards are present); and
  - Safety glasses with side shields.
- Level D Protective Equipment
  - Coveralls/field clothes;
  - Safety boots;
  - Safety glasses with side shields;
  - Hard hat (if overhead hazards are present);
  - Nitrile or equivalent gloves if contaminated materials are handled; and
  - Heavy duty leather, Kevlar, or equivalent gloves (in addition to chemical-resistant gloves) for materials handling or other tasks that pose physical hazards to the hands.

6.1 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 FWSAP. 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.

7.0 MEDICAL SURVEILLANCE

All employees performing on-site hazardous waste-related work will be enrolled in a medical surveillance program to meet the requirements of 29 CFR 1910.120(f), 1910.134, 1910.20 and to assess and monitor

workers' health and fitness for employment in this field. Employees must be provided with summaries of medical examination results following each examination and must be provided more detailed information upon written request.

7.2 FREQUENCY OF EXAM

The frequency of employee medical exams will be as follows:

Prior to assignment to hazardous waste work that involves potential exposure above occupational exposure limits;

Once every 12 months for each employee covered unless the attending physician believes a shorter or longer interval (not to exceed 2 years) is appropriate;

At termination of employment or re-assignment to an area where the employee would not be covered if the employee has performed fieldwork since his/her last examination and has not had an examination within the last 6 months; and

As soon as possible upon notification by an employee that he/she has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limit or published exposure levels in an emergency situation.

7.3 MEDICAL EXAM CONTENT

Medical examinations will include a medical and work history (or updated history if one is available in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances. The examination will determine potential health impairments and fitness for duty, including the ability to wear any required PPE. As a minimum, the exam will include

- Collection of information on the employee's medical and work history;
- Hands-on examination;
- Audiometry;
- Blood screen such as Sequential Multiple Analyzer with Computer 24;
- Chest P/A X-ray at intervals specified by the attending physician;
- Complete blood count;
- Electrocardiogram for persons older than 45 or where medically indicated;
- Physical examination;
- Spirometry (forced expiratory volume/forced vital capacity); and
- Urinalysis (dipstick and microscopic).

8.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Airborne chemical concentrations will be assessed, as appropriate, to ensure exposures do not exceed acceptable levels, as specified in the most recent Threshold Limits Values and Biological Exposure Indices or by OSHA, whichever is more stringent. The USACE Safety and Health Requirement Manual

identifies this more stringent value as the Occupational Exposure Limit (OEL). Airborne contaminants are not anticipated for this field effort. The site has been extensively investigated during the RI [Leidos Engineering of Ohio, Inc.(Leidos), 2014], and no volatile organic compounds have been detected. Only low-level PAHs are present in the area of the pilot study. However, the area will be surveyed with a PID for the presence of photoionizable hydrocarbons during the excavation activities.

An action level of 5 ppm has been established for monitoring with the PID for this field effort. No photoionizable constituents (i.e., volatile organics) were detected at the Atlas Scrap Yard AOC during the RI (Leidos, 2014), and no exceedances of this action level are anticipated. However, if the action level is exceeded, work at the site will be suspended and the Project Manager and USACE COR will be contacted for further direction. 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.

9.0 HEAT/COLD STRESS

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. Appropriate precautions will be taken to protect personnel and property from the effects of the severe weather. In accordance with Section 6 of the USACE Safety and Health Requirements Manual (USACE 2008), project-specific SSHP addenda should include, at a minimum:

- Severe weather triggers to alert the Contractor SSHO to monitor weather conditions;
- Training on severe weather precautions and actions; and
- Identified area of retreat, preferably a substantial building.

9.2 HEAT/COLD STRESS MONITORING AND CONTROLS

Acclimatization, consumption of copious quantities of fluids, and appropriate work/rest cycles are important factors in preventing heat stress-induced illnesses. General controls will consist of making fluids readily available, using the buddy system, and taking scheduled and unscheduled breaks in a temperature-controlled environment as necessary. The following specific steps will be taken to reduce the potential for heat stress-induced illness:

- When possible, schedule work for cooler periods during the day.
- Provide site training to include controlling heat stress, recognizing heat stress-induced illness, and administering first aid for heat stress.
- Provide cool Gatorade™, equivalent drink, or water to site workers and encourage their consumption.

- Where employees are exposed to solar radiation for short periods and there is the potential for sunburn, or exposure for prolonged periods where long-term exposure could lead to health effects such as skin cancer, they shall be provided sun screen with a sun protection factor (SPF) appropriate for their skin type and exposure. Sunscreens shall be used only in accordance with the manufacturer's recommendations.
- Instruct workers to monitor their own and their buddy's condition relative to heat stress.
- Develop an initial work/rest cycle based on the site-specific conditions and the capabilities of the work crew. The American Conference of Governmental Industrial Hygienists (ACGIH) heat stress Threshold Limit Value (TLV) will be instituted per Table 9-1.

Table 9-1. Recommended Work/Rest Cycle

Work-Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous work	86[b]	80	77
45 min work/15 min rest[a]	87	82	78
30 min work/30 min rest	89	85	82
15 min work/45 min rest	90	88	86

[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.

- Provide a cool environment, such as a vehicle with air conditioning, for breaks.
- Encourage and allow workers to take unscheduled breaks, if needed.
- Monitor workers wearing Tyvek® or other impermeable clothing for heat stress by taking their pulses at the beginning of each rest period. If any worker's heart rate exceeds 110 beats per minute, the next work period will be shortened by one third (NIOSH et al 1985).

Adequate clothing and staying dry are critical factors in preventing cold stress disorders. The SSHO/field oversight representative will ensure the capability to quickly move individuals who become wet to a sheltered, warm area. The following specific steps will be taken (adapted from ACGIH 2010).

- If ambient temperatures are less than 40°F, provide site training on preventing cold injury, recognizing cold injury symptoms, and administering cold injury first aid.
- Provide a heated break area if ambient temperatures are less than 32°F.
- Implement breaks in a warm area every 120 min, at a minimum, if ambient temperatures are less than 32°F.
- Allow workers to take unscheduled breaks, if needed, in a warm area.
- Outdoor work will not be performed if the equivalent chill temperature (temperature combined with the effect of wind) is less than -29°F.

9.3 HEAT/COLD STRESS-INDUCED ILLNESS SIGNS AND SYMPTOMS

Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms are muscle spasms and pain in the hands, feet, and abdomen. Personnel exhibiting these symptoms should rest in a cool place and consume fluids and salt.

Heat exhaustion occurs from increased stress on various body organs. Signs and symptoms are:

- Pale, cool, moist skin;
- Heavy sweating;
- Dizziness and nausea; and
- Fainting.

Heat stroke is the most serious form of heat-related illness and should always be treated as a medical emergency. The body's temperature regulation system fails, and the body temperature rapidly rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. Signs and symptoms of heat stroke are:

- Red, hot, usually dry skin;
- Lack of or reduced perspiration;
- Nausea;
- Dizziness and confusion;
- Strong, rapid pulse and confusion; and
- Coma.

Hypothermia is the uncontrolled loss of body heat. As the body's core temperature decreases, bodily functions are slowed. The victim becomes weak and disoriented and may become comatose if steps are not taken to return the core temperature to the normal range. Hypothermia can occur whenever temperatures are below 45°F and is most common during wet, windy conditions, with temperatures between 40 and 30°F. The principal cause of hypothermia in these conditions is loss of insulating properties of clothing due to moisture, coupled with heat loss due to wind and evaporation of moisture on the skin.

Frostbite is the freezing of body tissue, which ranges from superficial freezing of surface skin layers to deep freezing of underlying tissue. Frostbite will only occur when ambient temperatures are below 32°F. The risk of frostbite increases as the temperature drops and wind speed increases.

10.0 STANDARD OPERATING SAFETY PROCEDURES

This section presents general safety rules applicable to the anticipated tasks. The provisions of the plan are mandatory for all on-site employees and visitors, including employees engaged in initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization. These standard operating procedures are offered for guidance. Alliant and subcontractors will be responsible for ensuring that the appropriate and sufficient procedures presented in project-specific SSHP addenda are used to protect employees.

10.1 SITE RULES

The following rules will apply to all site activities:

- Personnel must maintain contact with Post 1 at all times through two-way radios or phones.
- All work will be conducted in compliance with the *USACE Safety and Health Requirements Manual* (USACE 2008).
- Daily safety briefings ("tailgate") will be held during field activities to inform personnel of new hazards or procedures.
- The field oversight representative/SSHO will conduct and document daily safety inspections.
- 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 oversight representative, CIH, and the USACE Project Manager.
- All workers will abide by a buddy system. Members of a buddy team will maintain verbal or visual contact.

10.2 DRIVING

All posted speed limits and state vehicle operation laws must be obeyed at all times. Personnel 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.

10.3 PERMIT REQUIREMENTS

Alliant and subcontractors will coordinate with RVAAP to obtain, as necessary, all permits necessary for the safe execution of this project, which will include, at a minimum, digging permits/clearance from local utilities prior to any excavation activities.

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. RVAAP Operations and Maintenance personnel will provide any required fork truck services in the investigation-derived waste (IDW) staging area (Building 1036). 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 EXCAVATION AND TRENCH SAFETY

Trench excavation potentially poses the following hazards: contact with buried utilities, trench cave-in and engulfment, confined space hazards such as hazardous airborne concentrations of toxic chemicals, flammable concentrations of vapors or gases, and oxygen deficiency. The depth of the excavation and the nature of the excavated material significantly impact the potential hazard—the greater the depth, the greater the hazard. The excavation during this field effort will be a maximum of 1 ft in depth.

Prior to opening an excavation, the site will be verified free of underground utilities by contacting the local utility companies and/or appropriate base personnel. Notification will include submitting maps with planned excavation locations clearly marked for appropriate base personnel approval. If underground utilities are present, they will be located and protected from damage or movement.

Other location-specific hazards, such as the potential for UXO, building foundations, and unstable rocks will be controlled.

Cave-in hazards will be controlled by excluding personnel from inside or near (within 3 ft) excavations 5 ft or deeper. This restriction will not be applied to excavations less than 5 ft deep if the field oversight representative/SSHO has examined the excavations and determined there is no potential for cave-in.

If personnel must enter trenches deeper than 1.2 m (4 ft), the requirements of 29 CFR 1926.651 and Section 25 of the USACE Safety and Health Requirement Manual will be applied. This will include daily inspections of the excavation and shoring or sloping the trench sides. Shoring will be accomplished using a trench box with rigid sides to prevent engulfment. If a trench box is not utilized, the trench sides will be sloped at a 34° angle (one and one-half horizontal to one vertical). All spoils will be located at least 0.6 m (2 ft) from the edge of the excavation. Such entry also will be treated as confined space entry and procedures will comply with Section 10.5 (Confined Space Entry).

10.6 HAZARD COMMUNICATION

Hazard communication will be governed by 29 CFR 1910.1200 and Section 06.B of the *USACE Safety and Health Requirement Manual*. At a minimum, the following steps will be taken:

- All hazardous materials on-site will be labeled to comply with the hazard communication standard, and will include the following.
- Clear labeling as to the contents; and
- The appropriate hazard warning.
- MSDSs will be available on-site for all hazardous materials that are present.
- Site-specific training will be provided for the hazards posed by site chemicals, protective measures, and emergency procedures.
- Copies of MSDSs for all hazardous chemicals (chemicals brought on-site) will be maintained in the work area. MSDSs will be available to all employees for review during each work shift.

10.7 ILLUMINATION

All site fieldwork will be conducted during daylight hours (no earlier than 15 min after sunrise and no later than 15 min before sunset) and natural illumination will be used. Non-fieldwork conducted in buildings will be illuminated to meet the following minimums stated in Section 7 of the *USACE*

Safety and Health Requirement Manual: general outdoors - 33 lx, stairs and ladders - 110 lx, offices - 540 lx, and first aid areas - 325 lx.

10.8 SANITATION

- Sanitation will comply with 29 *CFR* 1910.120(n) and Section 2 of the *USACE Safety and Health Requirement Manual*.
- Provide means at the work site for washing hands and faces prior to eating.
- Provide potable drinking water in closed, labeled ("Drinking Water"), sanitary dispensers and protect them from contamination.
- Post any containers or dispensers of non-potable water with "Caution – Water Unsafe for Drinking, Washing, or Cooking."
- Provide toilets, except for mobile crews with transportation to adequate facilities, according to the following: 1 to 15 personnel = 1 toilet, 16 to 35 personnel = 2 toilets, 36 to 55 personnel = 3 toilets, and 56 to 80 personnel = 4 toilets. Toilet facilities must be lit, ventilated, and have areas for hand washing per Section 02.E of the *USACE Safety and Health Requirement Manual*.

10.9 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.

10.10 LYME DISEASE

Lyme disease is an infection caused by the corkscrew-shaped bacteria Borrelia burgdorferi that is transmitted by the bite of deer *(Ixodes scapularis)* and western black-legged *(Ixodes pacificus)* ticks. The deer tick, which normally feeds on the white-footed mouse, the white-tailed deer, other mammals, and birds, is responsible for transmitting Lyme disease bacteria to humans in the northeastern and north-central United States. On the Pacific Coast, the bacteria are transmitted to humans by the western black-legged tick. Ixodes ticks are much smaller than common dog and cattle ticks. In their larval and nymphal stages, they are no bigger than a pinhead. Adult ticks are slightly larger.

Ticks search for host animals from the tips of grasses and shrubs (not from trees) and transfer to animals or persons that brush against vegetation. Ticks only crawl; they do not fly or jump. Ticks found on the scalp usually have crawled there from lower parts of the body. Ticks can attach to any part of the human body but often attach to the more hidden and hairy areas such as the groin, armpits, and scalp. Research in the eastern United States has indicated that, for the most part, ticks transmit Lyme disease to humans during the nymph stage, probably because nymphs are more likely to feed on a person and are rarely noticed because of their small size. Thus, the nymphs typically have ample time to feed and transmit the infection (ticks are most likely to transmit infection after approximately 2 or more days of feeding). Adult ticks can transmit the disease, but since they are larger and more likely to be removed from a person's body within a few hours, they are less likely than the nymphs to have sufficient time to transmit the infection.

The following control measures must be followed:

- Whenever possible, avoid entering areas that are likely to be infested with ticks, particularly in spring and summer when nymphal ticks feed. Ticks favor a moist, shaded environment, especially that provided by leaf litter and low-lying vegetation in wooded, brushy, or overgrown grassy habitat.
- Wear light-colored clothing so that ticks can be spotted more easily and removed before becoming attached.
- Wear long pants and tuck pant legs into socks or boot tops or close the pant legs with tape or other means.
- Apply insect repellents containing n,n-diethyl-m-toluamide (DEET) to clothes and exposed skin.
- If personnel must enter areas with known heavy infestation, consider applying permethrin (which kills ticks on contact) to clothes.
- Conduct daily checks for ticks. 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. The bacteria that cause Lyme disease are contained in the tick's midgut. Cleanse the area with an antiseptic.
- Note the date of removal of any imbedded tick and seek medical attention if any signs

and symptoms of early Lyme disease, Ehrlichiosis, or Babesiosis develop over the ensuing days or weeks.

10.11 ROCKY MOUNTAIN SPOTTED FEVER

Rocky Mountain Spotted Fever is a rickettsial disease caused by the organism *Rickettsia rickettsii*. It is transmitted by the bite of an infected tick and results in a systemic, febrile illness. Several ticks are responsible for the spread of this disease, and these vary by geographic region. The dog tick, *Dermacentor variabilis*, is probably the most common vector. According to the Ohio Department of Health, the incidence of Rocky Mountain Spotted Fever has increased in recent years.

The organism becomes infectious after the tick has been attached to the skin for at least 4 to 6 hr. It can also be transmitted in the process of tick removal if the tick is crushed, which allows infectious material to escape.

Symptoms of Rocky Mountain Spotted Fever include the sudden onset of a moderate to high fever (which can last 2 to 3 weeks if untreated), muscle pain, severe headache, and chills. A rash occurs in about half of the cases. It starts with the extremities and soon spreads to the palms of the hands and soles of the feet, then quickly spreads to the trunk and rest of the body.

Control measures are the same as those for Lyme disease ticks.

10.12 MOSQUITO-BORNE VIRUSES

According the Center for Disease Control, West Nile Virus (WNV) is a potentially serious illness. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall. Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite. The easiest and best way to avoid WNV is to prevent mosquito bites.

- When outdoors, use insect repellent containing an United States Environmental Protection Agency (USEPA)-registered active ingredient. Follow the directions on the package.
- Many mosquitoes are most active at dusk and dawn. Be sure to use insect repellent and wear long sleeves and pants at these times or consider staying indoors during these hours.

About 1 in 150 people infected with WNV will develop severe illness. The severe symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness, and paralysis. These symptoms may last several weeks, and neurological effects may be permanent. Up to 20% of the people who become infected have symptoms such as fever, headache, body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach, and back. Symptoms can last for as short as a few days; although, even healthy people have become sick for several weeks. Approximately 80% of people (about four out of five) who are infected with WNV will not show any symptoms at all. People typically develop symptoms between 3 and 14 days after they are bitten by the infected mosquito (CDC 2006).

10.13 FUELS

RVAAP procedures and applicable portions of Section 9 of the *USACE Safety and Health Requirements Manual* 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 RVAAP;
- Spill response must comply with the current Installation Spill Contingency Plan for RVAAP;
- 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.

10.14 POLYCYCLIC AROMATIC HYDROCARBONS (PAH)

PAHs are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances. PAHs are usually found as a mixture containing two or more of these compounds, such as soot. Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. Some PAHs are suspected human carcinogens.

PAHs can occur in air attached to dust particles. Some PAH particles can readily evaporate into the air from soil or surface waters. Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers. In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water. PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

In work areas where the potential for exposure to PAHs exists, the following steps will be taken as a minimum.

- Staying upwind of any dust-generating activities
- Avoiding skin and eye contact and any ingestion or inhalation contact with PAH contaminated air, water, soil or tools and equipment.
- Hazard communication training
- HAZWOPER training and medical clearance for hazardous waste work
- Decontamination of potentially contaminated equipment prior to servicing
- Monitoring - photoionization detector or other sampling as appropriate
- PPE (Level D) plus nitrile or equivalent gloves for contact with contaminated material.
- Washing face and hands prior to taking anything by mouth.
- Appropriate respiratory protection may be required if air sampling , site history data or a reasonable index of suspicion, indicate the presence of PAHs in the immediate work area.
- Waste containers and waste containment areas containing PAH contaminated material will be labeled to indicate contents and hazard.

10.15 10.15 THERMAL TREATMENT OF SOILS

The goal of Endpoint's patented VEG ex-situ thermal desorption technology is to thermally desorb (from soils into vapor phase) and/or otherwise decompose PAHs to non-hazardous materials. The process involves a mobile vapor energy generator, which utilizes propane, air, and water to generate steam at temperatures as high as 1,300 °F.

Profiled soils sent to Endpoint's laboratory by Alliant will then be removed from the drum using a shovel and placed onto a conveyor, which will in turn feed the soils directly into the preheated treatment chamber. Temperatures to be tested will range from 600 to 800 °F, with soil residence times ranging from 15 minutes to 30 minutes

As organic compounds (including PAHs) transition from solid phase adsorbed to soils to vapor phase within the renewal chamber, a vacuum system internal to the enclosed renewal chamber captures the organic vapors generated.

To properly remove any NOx, SOx and HCl compounds prior to rerouting of vapors back to the vapor generator, the desorbed vapors are first passed through a series of patented filters and caustic scrubber inserted in series within the pipeline that recycles desorbed material from the enclosing truck body back through the steam generator. The filter/scrubber system encompass an engineered mixture of caustic soda, zero valent iron (ZVI), lime, water, and steam and align in a slender packed column.

As the acid-laden vapor is pulled by vacuum up through the filter/scrubber column, any acidic compounds are neutralized by the filters and trickling down caustic soda (sodium hydroxide) liquid solution. Hence, any acid vapors (e.g., HNO3 (nitric acid) from NOx, H2SO4 (sulfuric acid) from SOx, and HCl are removed before the organic vapors are routed further downstream. Neutralization of the acidic compounds results in a benign dilute liquid solution of sodium nitrate (NaNO3), sodium bisulfate (NaHSO4), and sodium chloride (NaCl) for ultimate profiling and disposal offsite.

The optimal treatment temperature and residence time reflect conditions which will reduce PAH concentrations to low (i.,e below residential RSLs) or to non-detect levels.

Regardless of the levels of PAHs, if any, present in the treated soils, these soils will be considered as investigation derived wastes (IDW). These soils will be placed back into the original drums and disposed of at an appropriate landfill in accordance to the post-treatment concentrations serving as the profile for disposal.

The onsite pilot test will include mobilization to the site of the same VEG unit used at Endpoint's laboratory for the bench-scale test, housed on a 40-foot trailer. In addition, one conveyor for loading of soils into the VEG unit will be mobilized to the site, together with one 5-CY backhoe and a bobcat loader to be used for excavation, stockpile management, and loading of stockpiled soils onto the conveyor. Lastly, a 500-gallon propane tank and a 4,000-gallon water tank will also be brought onto the site for use in support of steam generation and thermal treatment by the VEG system.

The following precautions will be taken as a minimum to protect personnel and property during the thermal treatment process;

- Bulk propane tanks will be sited and placed in an approved location and at a safe distance from heat, flame or ignition sources and away from vehicle traffic or pedestrian movement. The tanks will be located at a safe and approved distance from areas occupied by personnel, including personnel trailers, offices, portable toilets and other areas where large numbers of personnel may be present.
- All motor vehicle operation, including powered lift trucks (forklifts), backhoes, front-end loaders, Bobcat skid steer devices and similar will require trained and qualified operators with

valid driver's license, seat belt use, routine vehicle inspections, and no cell phone use while driving. Compliance with applicable laws and regulations, and defensive driving are required.

- Trained spotter personnel shall be used to assist drivers when vehicles are maneuvering in congested areas or near personnel or fixed objects.
- High visibility clothing shall be worn by pedestrians working in the area of motor vehicles and approved back-up alarms shall be in use on all vehicles.
- Vehicle operators shall perform a visual inspection prior to use that includes the vehicle and any associated items such as trailers or external cargo carriers. The operator verifies that the following items are present and functional: seatbelt(s), lights, turn signals, operating brakes, speedometer, fuel gage, horn, windshield, windshield wiper, defrosting/defogging system, rear view mirror, cab, non-slip surfaces on steps, and tires.
- Conveyer belt operations shall be evaluated by the site safety officer prior to operation and only trained and qualified personnel shall work with and near conveyer systems.
- Personal protective equipment for protection from thermal burns and steam burns shall be used by workers with potential exposure to these hazards. These include thermal protective gloves, arm sleeves, face shields and similar devices as necessary.
- Steam valves, boilers, fittings and piping shall be plumbed, installed, operated and maintained by personnel with the required training and certifications to perform such work and authorized to work with pressure vessels.
- Exhaust vents discharging process vapor, smoke or steam from the thermal treatment process shall, as applicable, be directed away from occupied areas. Exhaust vents and stacks shall be installed with consideration of prevailing wind direction and at sufficient height to avoid discharge or re-entrainment of smoke, vapor or heat in occupied areas.
- Due to the relative newness of the thermal treatment process, the site safety officer shall periodically review existing safety precautions for adequacy and adjust them or implement new precautions to address changing conditions or emerging problems.

11.0 SITE CONTROL MEASURES

The field oversight representative will be responsible for establishing the site control zones, as necessary, around Contractor-controlled areas that present physical or chemical hazards. Implementation of the site control zones will help to minimize the number of employees potentially exposed and to minimize the potential for the spread of contamination. The field oversight representative/SSHO will monitor the implementation of the required site control work rules and will report any deviations from prescribed practice to the Project Manager or stop work, as appropriate.

The Atlas Scrap Yard AOC is in a remote location with limited activity. Therefore, an exclusion zone will likely be necessary. 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 an open excavation or 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.

11.1 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 field oversight representative/SSHO 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.

11.2 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 (A, B, 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.

11.3 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]).

11.4 SITE VISITORS

The field oversight representative will add all employees/visitors to the on-site access roster. Alliant and the subcontractor 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 Alliant and the subcontractor without specific approval of the field oversight representative/SSHO. 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 RVAAP 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 (Appendix A).

11.5 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. 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 RVAAP hand-held radios should be used.

12.0 PERSONNEL HYGIENE AND DECONTAMINATION

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 Sections 06.M and 28 of the *USACE Safety and Health Requirements Manual* (USACE 2008).

12.1 LEVEL D+ PROTECTION DECONTAMINATION

Station 1: Tape removal

- Remove all tape (if used) from outer clothing and place in appropriate waste container.

Station 2: Boot covers, outer disposable garment, and chemical-resistant gloves removal

- Carefully remove boot covers, 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.

12.2 LEVEL C PROTECTION DECONTAMINATION

Station 1: Segregated equipment drop

- Deposit equipment used on-site (e.g., tools, sampling devices, containers, monitoring instruments, clipboards) on plastic sheets or in different containers with plastic liners. Segregating the equipment at the drop site reduces the possibility of cross-contamination.

Station 2: Outer boot and glove removal

- Remove tape from outer boots and outer gloves.
- Remove outer boot covers and outer gloves. Deposit gloves and boot covers in plastic trash bags.

Station 3: Cartridge change

- If a worker has left the exclusion zone for the sole purpose of changing a canister/cartridge of the respirator, this is the last step of the decontamination procedure. Once the worker's canister/cartridge has been replaced, the outer boots and gloves will be replaced and re-taped so that all potential pathways to the skin are sealed.

Station 4: Disposable outer garment removal

- Remove the disposable outer garment, deposit in a plastic trash bag, and dispose of it in accordance with the FWSAP.

Station 5: Respiratory protection and disposable inner glove removal

- The respirator is the next-to-last item for removal. The cartridges/canisters are placed in a plastic trash bag and disposed of in accordance with the FWSAP. The respirator is placed in a plastic bag dedicated for used respirators only. Disposable inner gloves are the last item removed; deposit them in a plastic trash bag in accordance with the FWSAP.

Station 6: 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.

13.0 EMERGENCY PROCEDURES AND EQUIPMENT

If an emergency occurs, the field oversight representative/SSHO and the field team will participate in a post-emergency briefing to discuss the event, identify the causes, identify corrective measures, and evaluate the responses.

In the event of an accident or incident, the field oversight representative must first notify Guard Post 1 (330-358-2017) who will coordinate the response. The field oversight representative should then notify the USACE Project Manager immediately according to the requirements of the *USACE Safety and Health Requirements Manual* (USACE 2008). The required Accident Report (ENG Form 3394) must be completed and submitted to the USACE Project Manager 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 oversight representative/SSHO, and responding to emergencies. Employees will also be informed of any changes in potential emergencies or response plans.

13.1 POTENTIAL EMERGENCIES

Credible potential emergencies for this work include fires, minor chemical spills, and personnel injury.

13.1.1 Fires

Small quantities of flammable solvents [typically less than 18.9 L (5 gal)], gasoline, and diesel fuel may be present on-site. In the event of a fire, Guard Post 1 will be notified immediately. If it is safe to do so, on-site personnel may attempt to extinguish the fire with the available fire extinguishers and isolate any nearby flammable materials. If there is any doubt about the safety of extinguishing the fire, site personnel will evacuate the area. The supervisor or knowledgeable employee will provide the Guard Post 1 with relevant information when they arrive.

13.1.2 Spills

Potential spills include releases of fuels, lubricants, hydraulic fluids, and decontamination solvents. In the event of a spill or leak, the employee making the discovery will immediately notify the field oversight representative/SSHO. Field oversight will determine whether the leak poses an environmental risk or will exceed the capacity of on-site personnel and equipment. In the unlikely event that there is a probability that the spill will extend beyond the immediate area, result in an environmental insult, or exceed the capabilities of the on-site personnel, the field oversight representative will inform Guard Post 1. If this is not the case, the on-site spill kit will be utilized to cleanup the spill. All spills of reportable quantities will be reported to the Ohio EPA Spill Hotline (1-800- 282-9378).

13.1.3 Medical Emergencies

Field crews will use a variety of equipment that could cause injuries. In the event of a medical emergency, the field oversight representative will notify Guard Post 1. At least two first aid/ CPR- trained individuals will be on-site at all times, and these personnel will provide first aid pending release of the injured person to emergency medical staff. Automated External Defibrillators are located at Building 1037 and Guard Post 1. Contaminated injured personnel will be decontaminated to the extent feasible. Personnel with minor injuries will follow normal decontamination procedures. Personnel with serious injuries will be decontaminated, if necessary, by disrobing and wrapping in a blanket. Decontamination may be bypassed in the event of life-threatening injuries or illnesses.

13.2 EMERGENCY PHONE NUMBERS

Table 13-1 lists the emergency groups and their telephone numbers. A telephone and two-way radio will be present in the field and available for use at all times. All emergencies on-site will be coordinated first through Guard Post 1 (330-358-2017) who will coordinate the response.

At least one person (i.e., Project Manager or field oversight representative) must have a working two-way radio on the RVAAP frequency. The radio must be tested each morning before the start of work by radioing Security with a communication check. Each team must have direct radio or telephone

communication with the Project Manager or field oversight representative. 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 oversight representative.

Table 13-1. Emergency Contact Phone Numbers

Position	Phone
RVAAP Guard Post 1 (Police, Fire, Emergency Medical)	(330) 358-2017
Hospital (Robinson Memorial, Ravenna)	(330) 297-2449/0811
RVAAP Facility Manager (Currently) Mark Patterson	(330) 358-7311
RVAAP Operation and Maintenance Contractor (Currently) Jim McGee, Vista Sciences	(330) 358-3005
USACE COTR Eric Cheng	(502)315-7443
Ohio EPA (Currently) Eileen Mohr	(330) 963-1221
Ohio EPA Spill Hotline	(800) 282-9378
Contractor Project Manager Belinda Price	(865) 934-5143
Field Oversight Representative/SSHO Richard Stout	(865) 255-5540

COTR = Contracting Officer's Technical Representative. Ohio EPA = Ohio Environmental Protection Agency
USACE = United States Army Corps of Engineers. RVAAP = Ravenna Army Ammunition Plant.

Robinson Memorial Hospital is located approximately 32 km (20 miles) from the site at 6847 N. Chestnut Street in Ravenna, Ohio. It can be reached by taking Highway 5 E approximately 11 km (7 miles), Highway 5 approximately 3.2 km (2 miles), Highway 59, then right onto Highway 44 (Chestnut Street). Figure 13-1 contains a map and directions to Robinson Memorial Hospital.

13.3 EMERGENCY ALERTING

In the event of an emergency, contact Guard Post 1 through the two-way radio or call (330-358-2017). If these attempts fail, additional emergency alerting procedures are as follows. Each team will have a means for generating an audible alarm, which will consist of a compressed gas horn or vehicle horn. These devices will be used to signal to other project personnel in the event of accidents or emergencies. Short blasts (less than 1/2 sec) of the horn will be used to request assistance, while extended blasts (more than 2 sec) will signal an evacuation.

13.4 EVACUATION

The SSHP project-specific addenda must contain a map that illustrates assembly points and egress routes from each AOC included in the investigation. The field oversight representative/SSHO will inform all employees of the designated evacuation routes and assembly area. The facility-wide assembly point is Guard Post 1 as indicated on Figure 13-2.

13.5 EMERGENCY EQUIPMENT

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 (water sample preservatives) are being poured;
- Fire extinguisher(s) (at least 20-B) 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
- Telephone and two-way radios.

Robinson Memorial Hospital
6847 N. Chestnut Street
Ravenna, Ohio
(330) 297-0811

Directions: West on State Route 5. Stay straight onto OH-59 West. Turn Right onto OH-14/OH-44. Turn Left onto North Chestnut St.

Figure 13-1. Route Map and Directions to Pre-Notified Medical Facility

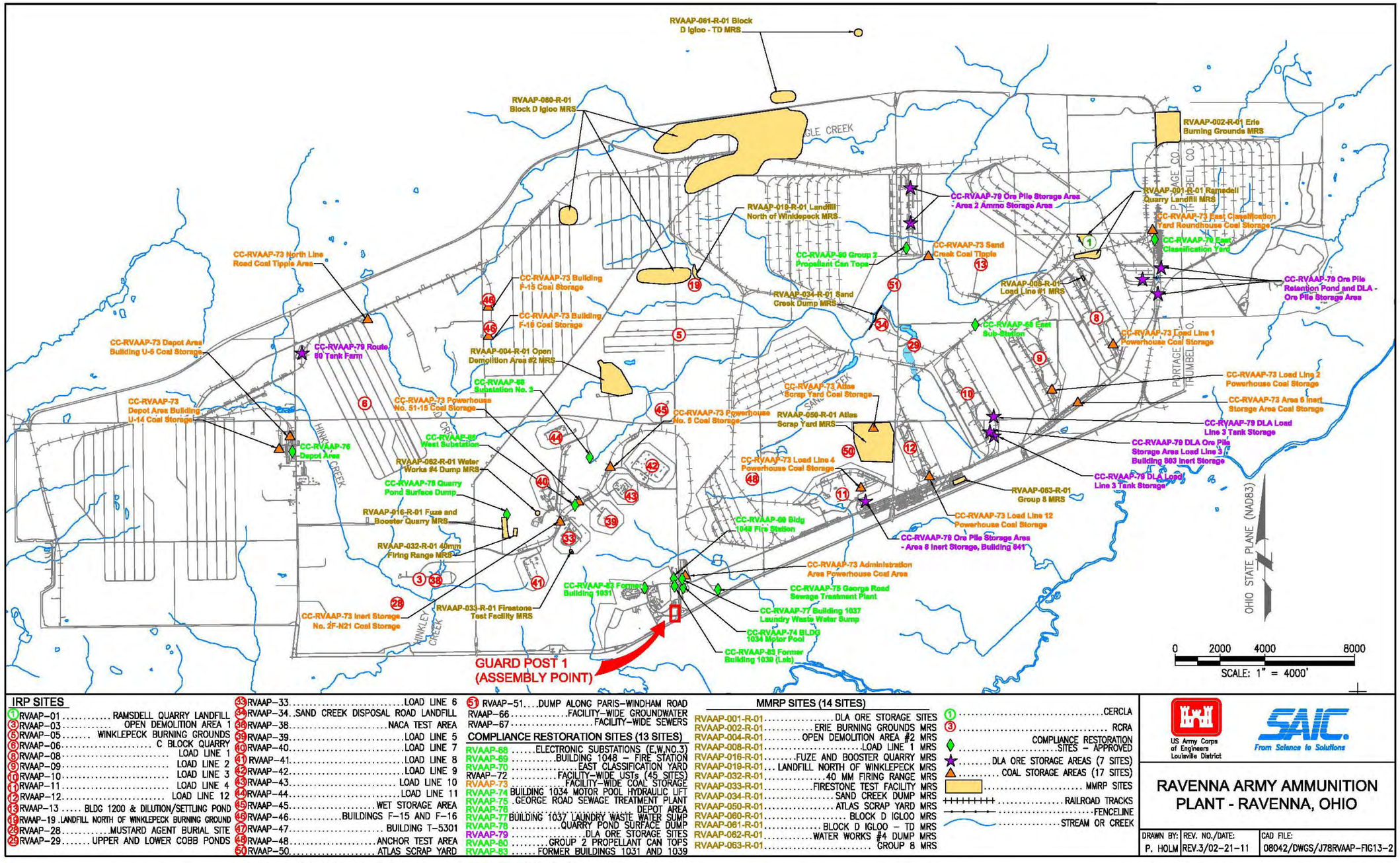


Figure 13-2. RVAAP Facility-Wide Assembly Area

14.0 LOGS, REPORTS, AND RECORD KEEPING

A system of reports and logs will be used to document activities related to site health and safety. The field oversight representative/SSHO will generate a brief weekly summary of health and safety issues and resolutions. These reports will include injuries, accidents, near accidents, interpretations of this SSHP or regulations, interactions with auditors/regulators/USACE personnel, and any off-normal events. These reports will be limited to one page or less.

In addition to the weekly reports, the following documents will be generated and submitted to the USACE Project Manager:

- Training logs will contain information covered and the signatures of the trainer and those attending. These logs will contain documentation of pre-entry (project start) training, routine ("tailgate") safety briefings, and visitor training.
- Daily safety inspection logs will contain the dates of inspections, identity of the person doing the inspection, the examined areas/activities/equipment, any deficiencies, and any corrective actions taken.
- Equipment maintenance logs will contain the dates and types of routine maintenance performed on-site equipment.
- The field oversight representative will add all employees/visitors to the on-site access roster. The roster includes the names of all personnel who will perform on-site work or visit the site and certification of required training. It will not contain the names of delivery or similar personnel.
- Environmental and personal exposure monitoring/sampling results will be maintained in a log that will contain monitoring data, location and time of monitoring, types of work being done, calibration records, and the identities of personnel performing monitoring.

Samples of reporting forms are included in Appendix A but any similar or equivalent forms may be used.

15.0 REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists) 2010. *2010 (Threshold Limit Values) TLVs® and Biological Exposure Indices (BEIs) and Guide to Occupational Exposure Values.*

CDC (Center for Disease Control) 2006. West Nile Virus: What You Need To Know. http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm. September 2006.

e2M (engineering-environmental Management) 2008. *Site Inspection Report for the Ravenna Army Ammunition Plant, Ohio, Military Munitions Response Program, Site Inspection Munitions Response Sites*. DACA-63-03-D0009. Final. May 2008.

International Occupational Heath and Safety Information Center 2008. International Chemical Safety Cards. December 2007.

Leidos Engineering of Ohio, Inc. 2014. *Draft Remedial Investigation Report for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard, Ravenna Army Ammunition Plant, Ravenna, Ohio*, dated June 18.

NIOSH (National Institute of Occupational Safety and Health)/OSHA/United States Coast Guard/United States Environmental Protection Agency 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.* October 1985.

NIOSH 2005. *NIOSH Pocket Guide to Chemical Hazards*. September 2005.

Ohio EPA (Ohio Environmental Protection Agency) 2004. *Director's Final Findings and Orders for the Ravenna Army Ammunition Plant*. June 2004.

USACE (United States Army Corps of Engineers) 2004a. *Facility-Wide Groundwater Monitoring Program for the Ravenna Army Ammunition Plant, Ravenna, Ohio*. Contract No. GS-10F-0350M. Deliver Order No. DACA27-03-F-0047. September 2004.

USACE 2004b. *Munitions and Explosives of Concern (MEC) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities* USACE Engineering Pamphlet EP 75-1-2. August 2004.

USACE 2007. *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste and Ordnance and Explosive Waste Activities*. ER-385-1-92. May 2007.

USACE 2008. *USACE Safety and Health Requirements Manual*. EM 385-1-1. September 2008.

APPENDIX A
REPORTING FORMS

DAILY SAFETY INSPECTION

PROJECT:_____

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/backhoe inspected weekly and documented
			Personnel near drill rig/backhoe 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,/backhoe, 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

DAILY HEALTH AND SAFETY SUMMARY **PROJECT NAME:** **PROJECT NO:**
NAME: DATE: M Tu W Th F Sa Su TIME:
TASKS PERFORMED:
OFF-NORMAL EVENTS:

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

HEALTH AND SAFETY MONITORING LOG

PROJECT NAME: **PROJECT NO:**

DATE	INSTRUMENT/NO.	RESULTS	TIME	REMARKS	NAME

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS** **ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items a, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE) #	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE) #
PRIMARY		TYPE	
SECONDARY	(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 FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE ☐☐ TRUCK ☐☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL
CORPS _____			
CONTRACTOR _____			

16. MANAGEMENT REVIEW *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10.	ACCIDENT DESCRIPTION *(Continuation)*

13a.	DIRECT CAUSE *(Continuation)*

APPENDIX B
PROJECT-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

Draft

Project-Specific Uniform Federal Policy - Quality Assurance Project Plan for a Pilot Study and Feasibility Study at RVAAP-50 Atlas Scrap Yard

Ravenna Army Ammunition Plant
Ravenna, Ohio

October 14, 2015

Contract No. W912QR-14-D-0001
Delivery Order No. 0004

Prepared for:

US Army Corps of Engineers
Louisville District
600 Martin Luther King Jr. Place
Louisville, Kentucky 40202

Prepared by:

Alliant Corporation
320 N Cedar Bluff Road, Suite 200
Knoxville, Tennessee 37923

This page intentionally left blank.

TABLE OF CONTENTS

INTRODUCTION

This Draft Project-Specific Uniform Federal Policy - Quality Assurance Project Plan (UFP-QAPP) presents or references the organization, objectives, functional activities, and specific quality assurance (QA) and quality control (QC) activities associated with the Work Plan for a Pilot Study and Feasibility Study at Ravenna Army Ammunition Plant (RVAAP)-50 Atlas Scrap Yard in Ravenna, Ohio. This UFP-QAPP was prepared in accordance with U. S. Environmental Protection Agency (USEPA) UFP guidance, and the Facility-Wide Quality Assurance Project Plan (FWQAPP) (SAIC 2011a). All QA/QC procedures are in accordance with applicable professional technical standards, USEPA requirements, government regulations and guidelines, and specific project goals and requirements.

Alliant Corporation (Alliant) was tasked by the U. S. Army Corps of Engineers (USACE) to prepare and submit this Project Specific UFP-QAPP to the U.S. Army in accordance with the Performance Work Statement (PWS), Contract No. W912QR-14-D-0001, Delivery Order (DO) No. 0004. The DO was issued by the United States Corps of Engineers, Louisville District on September 17, 2015. The following subsections present descriptions for the installation and the Atlas Scrap Yard area of concern (AOC).

Project Overview

A brief project overview is provided in the following paragraphs. Additional information concerning the site history and background may be found in the Project-Specific Work Plan.

A Remedial Investigation (RI) was conducted previously conducted at the Atlas Scrap Yard AOC (Leidos, 2014). The RI identified eight (8) PAHs as chemicals of concern (COCs) at the site. The identified PAHs are benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene. The PAH COCs were primarily identified in the 0-1 foot (ft) below ground surface (bgs) interval primarily in the approximate vicinity of the former T-4703 Roads and Grounds Maintenance Building. Additionally, a small area in the southern part of the site has been characterized by elevated lead concentrations, and constitutes a lead "hot spot."

Alliant has been tasked to 1) conduct a pilot study of the Vapor Energy Generator© (VEG©) technology for treatment of polycyclic aromatic hydrocarbon (PAH)-impacted soil, and steel slag for treatment of lead-impacted soil, 2) and to obtain the data necessary to complete an Feasibility Study (FS) Report for the Atlas Scrap Yard AOC.

Contaminated soils at the Atlas Scrap Yard AOC will be tested for the suitability of using VEG© technology to treat PAH-impacted soil, and steel slag to treat lead-impacted soil. The actual tests will be conducted by Alliant's subcontractor, Endpoint Consulting, Inc. (Endpoint), a California-based environmental company. VEG© technology is a sustainable, green remediation technology that involves ex-situ thermal treatment of impacted soils in an enclosed treatment chamber using steam. A Preliminary Draft FS Report was previously prepared for the Atlas Scrap Yard AOC [Leidos Engineering of Ohio, Inc. (Leidos), 2015]. Since completion of the FS Report, an additional technology has been identified as a potential remedial alternative. Therefore, the results from the pilot- and bench-scale studies will be used to complete the FS Report.

QAPP Worksheet #1
(UFP-QAPP Manual Section 2.1) -- Title and Approval Page

Project-Specific Quality Assurance Project Plant
Document Title

U.S. Army Corps of Engineers
Lead Organization

Richard Stout, Alliant Corporation
Preparer's Name and Organizational Affiliation

320 N Cedar Bluff Rd, Suite 200, Knoxville, TN 37923, 865-934-2222, rstout@alliantcorp.com
Preparer's Address, Telephone Number, and E-mail Address

15 October 2015
Preparation Date (Day/Month/Year)

Investigative Organization's Project Manager: _____
Signature

Belinda Price / Alliant Corporation / 15 October 2015
Printed Name/Organization/Date

Investigative Organization's Project QA Officer: _____
Signature

Terence Douglas / Alliant Corporation / 15 October 2015
Printed Name/Organization/Date

Lead Organization's Project Manager: _____
Signature

Eric Cheng / USACE COR /
Printed Name/Organization/Date

Approval Signatures: _____
Signature

_____
Printed Name/Title/Date

Approval Authority: _____

Other Approval Signatures: _____
Signature

_____
Printed Name/Title/Date

Document Control Number: N/A

QAPP Worksheet #2
(UFP-QAPP Manual Section 2.2.4) -- QAPP Identifying Information

Site Number/Code:
Operable Unit:
Contractor Name:
Contractor Number:
Contract Title:
Work Assignment Number:

1. Identify guidance used to prepare QAPP: Facility Wide Quality Assurance Project for Camp Ravenna and workbook for Uniform Federal Policy for Quality Assurance Project Plans

2. Identify regulatory program: CERCLA

3. Identify approval entity: CERCLA

4. Indicate whether the QAPP is a generic or a project-specific QAPP. (circle one)

5. List dates of scoping sessions that were held:

6. List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date
Not Applicable	

7. List organizational partners (stakeholders) and connection with lead organization: USACE, Ohio EPA, Army National Guard and Camp Ravenna

8. List data users: All of the above listed stakeholders

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion below:
3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 18, 29, 31, 32 or 33
Explanations are included on individual forms.

Circle QAPP elements and required information that are not applicable to the project. Provide an explanation in the QAPP.

Required QAPP Element(s) and Corresponding QAPP Section(s)	Crosswalk to Required Documents	Optional QAPP Worksheet # in QAPP Workbook	Required Information
Project Management and Objectives			
2.1 Title and Approval Page		1	- Title and Approval Page
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	QAPP/Work Plan	2	- Table of Contents - QAPP Identifying Information
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	Project Management Plan	3 4	- Distribution List - Project Personnel Sign-Off Sheet
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	Project Management Plan	5 6 7 8	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	Project Management Plan	9 10	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria		11 12	- Site-Specific PQOs - Measurement Performance Criteria Table

Required QAPP Element(s) and Corresponding QAPP Section(s)	Crosswalk to Required Documents	Optional QAPP Worksheet # in QAPP Workbook	Required Information
2.7 Secondary Data Evaluation	N/A	13	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	Project Management Plan	14 15 16	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table
Measurement/Data Acquisition			
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures		17 18 19 20 21 22	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/ SOP Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures		23 24 25	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Required QAPP Element(s) and Corresponding QAPP Section(s)	Crosswalk to Required Documents	Optional QAPP Worksheet # in QAPP Workbook	Required Information
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	Work Plan	26	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	Work Plan & Laboratory SOPs	27	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	N/A	28 29	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs
Assessment/Oversight			
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	N/A	30 31	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table
4.2 QA Management Reports	N/A	32	- QA Management Reports Table
4.3 Final Project Report			
Data Review			
5.1 Overview			
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities		33 34 35 36	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table

Required QAPP Element(s) and Corresponding QAPP Section(s)	Crosswalk to Required Documents	Optional QAPP Worksheet # in QAPP Workbook	Required Information
5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities			- Usability Assessment
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	N/A		

QAPP Worksheet #3
(UFP-QAPP Manual Section 2.3.1) -- Distribution List

List those entities to whom copies of the approved QAPP, subsequent QAPP revisions, addenda, and amendments.

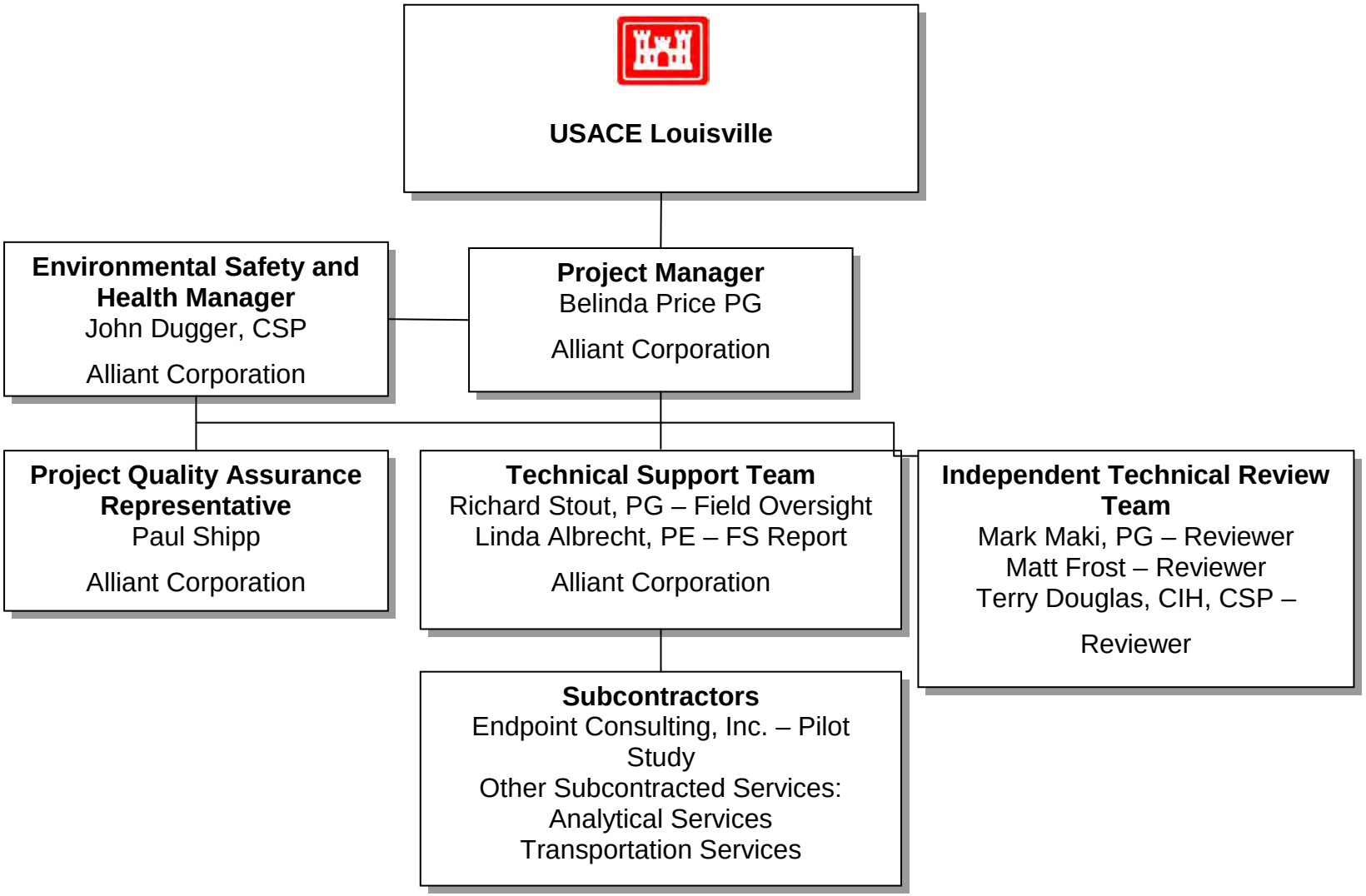
Name/Organization	Title	Address	Phone Number and Email
Justin Burke, Ohio EPA CO	Environmental Specialist III	50 West Town Street Suite 700 Columbus, OH 43216	T: (614) 644-2902 E: Justin.burke@epa.state.og.us
Bob Princic, Ohio EPA DERR		2110 East Aurora Road Twinsburg, OH 44087	T: (330) 963-1230 F: (330) 487-0769 E: bob.princic@epa.ohio.gov
Rod Beals, Ohio EPA DERR	Environmental Manager	2110 East Aurora Road Twinsburg, OH 44087	T: (330) 963-1218 E: rod.beals@epa.state.oh.us
Mark Leeper, ARNG	ARNG Directorate	111 S. George Mason Drive Arlington, VA 22204	T: (703) 607-7955 E: mark.s.leeper.civ@mail.mil
Kevin Sedlak, ARNG	Restoration Project Manager Camp Ravenna	1438 State Route 534 SW Newton Falls, OH 44444	T: (614) 336-6000 ext. 2053 E: kevin.m.sedlak.ctr@mail.mil
Katie Tait, OHARNG	Environmental Specialist	1438 State Route 534 SW Newton Falls, OH 44444	T : (614) 336-6136 F : (614) 336-6135 E : kathryn.s.tait@us.army.mil
Greg Moore, USACE – Louisville District	Project Manager	600 Martin Luther King Jr. Place Louisville, KY 40201	T: (502) 315-6902 E: gregory.f.moore@usace.army.mil
Nathaniel Peters II, USACE – Louisville District	Contracting Officer	600 Martin Luther King Jr. Place Louisville, KY 40201	T: (502) 315-2624 E: nathaniel.peters.ii@usace.army.mil
Gail Harris, Vista Sciences Corporation, RVAAP Administrative Record	Archivist / Technical Librarian	1438 State Route 534 SW Newton Falls, OH 44444	T: (330) 872-8003 E: gail.harris@vistasciences.com
Pat Ryan, Leidos-REIMS	Senior Environ-mental Scientist	301 Laboratory Road Oak Ridge, TN 37830	T: (865) 481-4664 E: patrick.f.ryan@leidos.com
Eric Cheng, USACE – Louisville District	COR Technical Manager	600 Martin Luther King Jr. Place Louisville, KY 40201	T : (502) 315-7443 F : (502) 315-6309 E : eric.s.cheng@usace.army.mil
Belinda Price, Alliant	Project Manager	320 N Cedar Bluff Road, Suite 200 Knoxville, TN 37923	T: (865) 934-5143 F: (865) 769-0946 E: bprice@alliantcorp.com

QAPP Worksheet #4
(UFP-QAPP Manual Section 2.3.2) -- Project Personnel Sign-Off Sheet

Have copies of this form signed by key project personnel from each organization to indicate that they have read the applicable QAPP sections and will perform the tasks as described. Ask each organization to forward signed sheets to the central project file.

Name	Organization	Signature	Date

QAPP Worksheet #5
(UFP-QAPP Manual Section 2.4.1) -- Project Organizational Chart



.

QAPP Worksheet #6
(UFP-QAPP Manual Section 2.4.2) -- Communication Pathways

Describe the communication pathways and modes of communication that will be used during the project, after the QAPP has been approved. Describe the procedures for soliciting and/or obtaining approval between project personnel, between different contractors, and between samplers and laboratory staff. Describe the procedure that will be followed when any project activity originally documented in an approved QAPP requires real-time modification to achieve project goals or a QAPP amendment is required. Describe the procedures for stopping work and identify who is responsible.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (timing, pathways, etc.)

This information is provided in the Project Management Plan Section 3.2 Coordination and Communication.

QAPP Worksheet #7
(UFP-QAPP Manual Section 2.4.3) -- Personnel Responsibilities and Qualifications Table

Identify project personnel associated with each organization, contractor, and subcontractor participating in responsible roles.

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Belinda Price, P.G.	Project Manager	Alliant	Management of Project	MS, PG
Mehrdad Javaherian	Engineer	Endpoint Consulting, Inc.	Conduct Bench and Pilot Tests	PhD, PE, LEED-GA

See Worksheet #5 for additional personnel.

QAPP Worksheet
(UFP-QAPP Manual Section 2.4.4) -- Special Personnel Training Requirements Table

Provide the following information for those projects requiring personnel with specialized training. Attach training records and/or certificates to the QAPP or note their location.

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates[1]

There are no special personnel training requirements for this project.

[1] If training records and/or certificates are on file elsewhere, document their location in this column. If training records and/or certificates do not exist or are not available, then this should be noted.

QAPP Worksheet #9
(UFP-QAPP Manual Section 2.5.1) -- Project Scoping Session Participants Sheet

Complete this worksheet for each project scoping session held. Identify project team members who are responsible for planning the project. The following is the generic form used for scoping meetings.

Project Name: Projected Date(s) of Sampling: _____ Project Manager:	Site Name: Site Location:

Date of Session:
Scoping Session Purpose:

Name	Title	Affiliation	Phone #	E-mail Address	Project Role

This project involves conducting Bench and Pilot Studies as well as preparation of a Feasibility Study and there were no formal project scoping sessions.

Comments/Decisions:

Action Items:

Consensus Decisions:

QAPP Worksheet #10
(UFP-QAPP Manual Section 2.5.2) -- Problem Definition

The problem to be addressed by the project:

- This project will address the efficacy of the treatment of PAH impacted soils at the site with ex-situ thermal treatment and lead impacted soil treatment by mixing the soil with steel slag

The environmental questions being asked:

- No questions are being asked other than whether or not the treatment options will effectively treat site soils. The information from the Pilot Study will be used in preparation of the Atlas Scrap Yard FS Report.

Observations from any site reconnaissance reports:

- There are no relevant observations other than the site description.

A synopsis of secondary data or information from site reports:

- There are no relevant secondary data.

The possible classes of contaminants and the affected matrices:

- Past practices at the site were the likely cause of the impacted soils. The Atlas Scrap Yard site soil is impacted with PAH and lead.

The rationale for inclusion of chemical and nonchemical analyses:

- Chemical analyses will be conducted to determine the effectiveness of the soil treatment pilot study.

QAPP Worksheet #10
(UFP-QAPP Manual Section 2.5.2) -- Problem Definition (continued)

Information concerning various environmental indicators:

A Preliminary Draft FS Report was previously prepared for the Atlas Scrap Yard AOC (RVAAP-50) (Leidos, 2015). Since completion of the FS Report, additional technologies as discussed above have been identified as potential remedial alternatives. Therefore, the results from the pilot- and bench-scale studies will be used to complete the FS Report.

Project decision conditions (If..., then...@ statements): [complete during in-class exercise]

Contaminated soils at the site will be tested for the suitability of using Vapor Energy Generation© (VEG©) technology to treat PAH-impacted soil in a sequence of a bench and pilot tests. Additionally a bench test only using steel slag will be conducted to test treatment of lead-impacted soil.

Samples will be collected from the soils prior to shipment to characterize PAH, lead, and leachable lead in the soils prior to treatment.

Bench-scale ex-situ thermal treatment of PAHs in site soils will be conducted by testing a series of treatment temperatures and treatment residence times within the VEG© Technology remediation system as described in the subcontractor Work Plan (Appendix C). The objective of the bench-scale tests is to determine the optimal system treatment temperatures and residence times for effective treatment of the PAH-impacted soils.
The specifics of the pilot-scale study at the Atlas Scrap Yard AOC (RVVAAP-50) will be based on the results of the VEG© bench-scale study. The objective of the pilot-scale test is to demonstrate the effectiveness of the VEG© technology for effective treatment of PAH-impacted site soils.

Upon completion of the tests, Endpoint will conduct post-treatment sampling of the soils.
The testing information will be used to prepare and submit to the Army a Draft Technical Memorandum outlining all procedures, results, and conclusions relative to bench-scale and pilot-scale tests performed.
The Army will prepare and submit a Revised Preliminary Draft, Draft, and Final FS Reports for RVAAP-50, Atlas Scrap Yard.

QAPP Worksheet #11
(UFP-QAPP Manual Section 2.6.1) -- Project Quality Objectives/Systematic Planning Process Statements

Use this worksheet to develop project quality objectives (PQOs) in terms of type, quantity, and quality of data determined using a systematic planning process. Provide a detailed discussion of PQOs in the QAPP. List the PQOs in the form of qualitative and quantitative statements. These statements should answer questions such as those listed below. These questions are examples only, however; they are neither inclusive nor appropriate for all projects.

Who will use the data?

Alliant's Subcontractor (Endpoint), Alliant and Stakeholders

What will the data be used for?

To determine the efficiency of the VEG® System and steel slag mixing for remediation of polycyclic aromatic hydrocarbons and metals in soils.

What type of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?

Off-site laboratory data and 3-point composite soil sampling.

How "good" do the data need to be in order to support the environmental decision?

The data quality will be sufficient to support the decision to evaluate the tested remedial actions and support preparation of the FS Report.

How much data are needed (number of samples for each analytical group, matrix, and concentration)?

Soil: (9) SVOC (PAHs) samples; (7) TCLP (Lead) samples.

Where, when, and how should the data be collected/generated?

The data will be collected during the bench-scale and pilot-scale testing

QAPP Worksheet #11
(UFP-QAPP Manual Section 2.6.1) -- Project Quality Objectives/Systematic Planning Process Statements (continued)

Who will collect and generate the data?

Alliant's Subcontractor (Endpoint).

How will the data be reported?

The data will be reported in a Technical Memorandum and also included the Atlas Scrap Yard FS Report.

How will the data be archived?

The data will be archived in ERIS.

QAPP Worksheet #12
(UFP-QAPP Manual Section 2.6.2) -- Measurement Performance Criteria Table

Complete this worksheet for each matrix, analytical group, and concentration level. Identify the data quality indicators (DQIs), measurement performance criteria (MPC), and QC sample and/or activity used to assess the measurement performance for both the sampling and analytical measurement systems. Use additional worksheets if necessary. If MPC for a specific DQI vary within an analytical parameter, i.e., MPC are analyte-specific, then provide analyte-specific MPC on an additional worksheet.

Matrix	Soil
Analytical Group[1]	
Concentration Level	

Sampling Procedure[2]	Analytical Method/SOP[3]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
3-pt Composite	8270 SIM	Field Duplicate	Laboratory QC	Reproducibility	Sampling
3-pt Composite	1311	N/A	Laboratory QC	N/A	Analytical

[1]If information varies within an analytical group, separate by individual analyte.

[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).

[3]Reference number from QAPP Worksheet #23 (see Section 3.2).

QAPP Worksheet #13
(UFP-QAPP Manual Section 2.7) -- Secondary Data Criteria and Limitations Table

Identify all secondary data and information that will be used for the project and their originating sources. Specify how the secondary data will be used and the limitations on their use. Each project specific area must include any limitations on use of the data in the final report. Data from each project specific area is accumulated in the final site report and the limits on data use must be presented.

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
There are no secondary data relevant to this project.				

QAPP Worksheet #14
(UFP-QAPP Manual Section 2.8.1) -- Summary of Project Tasks

Provide a brief overview of the listed project activities. The following table must be completed for each project area.

Sampling Tasks:

Collect 2-aliquot (or more) samples of soil Pre-Treatment. Collect 3-point (or more) composite samples for post-treatment analysis after the bench scale tests. Collect 3-point (or more) composite for both pre and post treatment analysis after pilot testing.

Analysis Tasks:

See Table 3-1 in Work Plan

Quality Control Tasks:

Collect one (1) duplicate sample for analysis of PAHs using USEPA Method 8270D SIM.

Secondary Data:

Not Applicable.

Data Management Tasks:

Data will be filed electronically on the Alliant server until submission to USACE. Otherwise, there are no data management tasks.

Documentation and Records:

Data will be submitted to USACE in Electronic Data Deliverable (EDD) format compatible with the Environmental Restoration Information System (ERIS).

Assessment / Audit Tasks

No Audits or Assessments are formally planned. The Alliant Project Manager will ensure compliance with the Work Plan, QAPP and Project Management Plan.

Data Review Tasks:

Data will be reviewed by the laboratory prior to submission. Additionally, data will be validated/reviewed by Alliant's subcontractor in accordance with EPA 540-R-08-005.

QAPP Worksheet #15
(UFP-QAPP Manual Section 2.8.1) -- Reference Limits and Evaluation Table

Compound	CAS Number	Project Reporting Levels
		Soil (µg/kg)
Acenaphthene	83-32-9	6.50
Acenaphthylene	208-96-8	6.60
Anthracene	120-12-7	6.60
Benz(*a*)anthracene	56-55-3	6.60
Benzo(*a*)pyrene	50-32-8	6.60
Benzo(*b*)fluoranthene	205-99-2	6.60
Benzo(*ghi*)perylene	191-24-2	6.60
Benzo(*k*)fluoranthene	207-08-9	6.60
Chrysene	218-01-9	6.60
Dibenz(*a,h*)anthrancene	53-70-3	6.60
Fluoranthene	206-44-0	6.60
Fluorene	86-73-7	6.60
Indeno(1,2,3-*cd*)pyrene	193-39-5	6.60
Phenanthrene	85-01-8	6.60
Pyrene	129-00-0	6.60
Compound	**CAS Number**	**Project Reporting Levels**
		Soil (mg/kg)
Lead	7439-92-1	0.300

QAPP Worksheet #16
(UFP-QAPP Manual Section 2.8.2) -- Project Schedule / Timeline Table

List all project activities as well as the QA assessments that will be performed during the course of the project. Include the anticipated start and completion dates.

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		

The project Schedule is presented in the Project Management Plan in Appendix A.

QAPP Worksheet #17
(UFP-QAPP Manual Section 3.1.1) -- Sampling Design and Rationale

Describe the project sampling approach. Provide the rationale for selecting sample locations and matrices for each analytical group and concentration level.

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

Samples will be collected during the bench-scale and pilot-scale tests as necessary to establish pre-treatment conditions. Samples will also be collected to establish post-treatment conditions. Samples will be collected as 3-point (or more) composites from stockpiles to effectively allow for representative samples.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [May refer to map or Worksheet #18 for details]:

All of the samples will consist of stockpiles soils. There will be nine (9) PAH samples, five (5) TCLP samples and two (2) semi-dynamic TLP samples. The field activities will be conducted during the dry weather periods. Since these samples will help determine the efficiency of remedial alternatives, no background sampling will be necessary. Pretreatment profiles and sampling will establish baseline conditions.

QAPP Worksheet #18
(UFP-QAPP Manual Section 3.1.1) -- Sampling Locations and Methods/SOP Requirements Table

List all site locations that will be sampled and include sample/ID number, if available. (Provide a range of sampling locations of ID numbers if a site has a large number.) Specify matrix and, if applicable, depth at which samples will be taken. Only a short reference for the sampling location rationale is necessary for the table. The text of the QAPP should clearly identify the detailed rationale associated with each reference. Complete all required information, using additional worksheets if necessary

Sampling Location / ID Number	**Matrix**	**Depth** (units)	**Analytical Group**	**Concentration Level**	**Number of Samples** (identify field duplicates)	**Sampling SOP Reference**[1]	**Rationale for Sampling Location**
		This information is provided in the Project-Specific Work Plan in Table 3-1.					

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #19
(UFP-QAPP Manual Section 3.1.1) -- Analytical SOP Requirements Table

For each matrix, analytical group, and concentration level, list the analytical and preparation method/SOP and associated sample volume, container specifications, preservation requirements, and maximum holding time.

Matrix	**Analytical Group**	**Concentration Level**	**Analytical and Preparation Method / SOP Reference**[1]	**Sample Volume**	**Containers** (number, size, and type)	**Preservation Requirements** (chemical, temperature, light protected)	**Maximum Holding Time** (preparation / analysis)
Soil	PAHs	Low	8270 SIM/3550 (Ref 1)	Fill container full	250-ml glass w/PTFE Liner	Cool to 4°C	Extraction: 14 d Analysis: 40 d
Soil	Lead TCLP	N/A	1311/6010C (Ref 2/4)	200g	1-Liter glass, plastic or PTFE	Cool to 4°C	6 months
Soil	Lead TLP	N/A	1315/6010C (Ref 3/4)	200g	250-ml glass, plastic or PTFE	Cool to 4°C	6 months
Soil	Inorganics	N/A	6020A (Ref 5)	200g	250-ml glass, plastic or PTFE	Cool to 4°C	6 months

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #20
(UFP-QAPP Manual Section 3.1.1) -- Field Quality Control Sample Summary Table

Summarize by matrix, analytical group, and concentration level the number of field QC samples that will be collected and sent to the laboratory.

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Duplicate Pairs	No. of MS	No. of Field Blanks	No. of Equip. Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil	SVOCs-PAHs	Low	8270 SIM	(9) Soil Stockpiles	1	0	0	0	0	10

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

[2]If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location or station.

QAPP Worksheet #21
(UFP-QAPP Manual Section 3.1.2) -- Project Sampling SOP References Table

List all SOPs associated with project sampling including, but not limited to, sample collection, sample preservation, equipment cleaning and decontamination, equipment testing, inspection and maintenance, supply inspection and acceptance, and sample handling and custody. Include copies of the SOPs as attachments or reference all in the QAPP. Sequentially number sampling SOP references in the Reference Number column. The reference number can be used throughout the QAPP to refer to a specific SOP.

Reference Number	Title, Revision Date and / or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
1	Work Plan for Pilot Study and FS at RVAAP-50	Alliant	Spoon/Scoops/Bowls	N	
2	Work Plan for Bench-End Pilot Scale Testing	Endpoint		N	
3	Project-Specific Quality Assurance Project Plan	Alliant		N	

QAPP Worksheet #22
(UFP-QAPP Manual Section 3.1.2.4) -- Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Identify all field equipment and instruments (other than analytical instrumentation) that require calibration, maintenance, testing, or inspection and provide the SO reference number for each type of equipment. In addition, document the frequency of activity, acceptance criteria, and corrective action requirements on the worksheet.

Field Equipment	Calibration Activity	Maint. Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference[1]
PID	Calibration Check	Charge or Change Batteries	None	Check Operation Status	Daily	Pass or Fail	Re-Calibrate	Alliant	Manufacturer's Instructions

[1]Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #23
(UFP-QAPP Manual Section 3.2.1) -- Analytical SOP References Table

List all SOPs that will be used to perform on-site or off-site analysis. Indicate whether the procedure produces screening or definitive data. Sequentially number analytical SOP references in the Reference Number column. Include copies of the SOPs as attachments or reference in the QAPP. The reference number can be used throughout the QAPP to refer to a specific SOP.

Reference Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
1	SW 846 8270 SIM	Definitive	Organics	GC/MS	TestAmerica	N
2	SW 846 1311	Definitive	Inorganics	ICP	TestAmerica	N
3	SW 846 1315	Definitive	Inorganics	ICP	TestAmerica	N
4	SW 846 6010C	Definitive	Inorganics	ICP	TestAmerica	N
5	SW 846 6020A	Definitive	Inorganics	ICP	TestAmerica	N
6	SW 846 9040, 9041 or 9045	Screening	N/A	pH Meter	Endpoint	N

QAPP Worksheet #24
(UFP-QAPP Manual Section 3.2.2) -- Analytical Instrument Calibration Table

Identify all analytical instrumentation that requires calibration and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet.

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]

TestAmerica, the laboratory selected for this project is DoD-approved. Laboratory analyses for this project will be conducted in accordance with Quality Services Manual (QSM) 5.0 or later.

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #25
(UFP-QAPP Manual Section 3.2.3) -- Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Identify all analytical instrumentation that requires maintenance, testing, or inspection and provide the SOP reference number for each. In addition, document the frequency, acceptance criteria, and corrective action requirements on the worksheet.

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]

TestAmerica, the laboratory selected for this project is DoD-approved. Laboratory analyses for this project will be conducted in accordance with Quality Services Manual (QSM) 5.0 or later.

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26
(UFP-QAPP Manual Appendix A) -- Sample Handling System

Use this worksheet to identify components of the project-specific sample handling system. Record personnel, and their organizational affiliations, who are primarily responsible for ensuring proper handling, custody, and storage of field samples from the time of collection, to laboratory delivery, to final sample disposal. Indicate the number of days field samples and their extracts/digestates will be archived prior to disposal.

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization):
Sample Packaging (Personnel/Organization):
Coordination of Shipment (Personnel/Organization):
Type of Shipment/Carrier:
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization):
Sample Custody and Storage (Personnel/Organization):
Sample Preparation (Personnel/Organization):
Sample Determinative Analysis (Personnel/Organization):
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection):
Sample Extract/Digestate Storage (No. of days from extraction/digestion):
Biological Sample Storage (No. of days from sample collection):
SAMPLE DISPOSAL
Personnel/Organization:
Number of Days from Analysis:

TestAmerica, the laboratory selected for this project is DoD-approved. Laboratory analyses for this project will be conducted in accordance with Quality Services Manual (QSM) 5.0 or later.

QAPP Worksheet #27
(UFP-QAPP Manual Section 3.3.3) -- Sample Custody Requirements Table

Describe the procedures that will be used to maintain sample custody and integrity. Include examples of chain-of-custody forms, traffic reports, sample identification, custody seals, laboratory sample receipt forms, and laboratory sample transfer forms. Attach or reference applicable SOPs.

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):

Samples will be collected, packaged and shipped from Camp Ravenna. Sample containers will be labeled and placed in a cooler with bagged ice to cool to 4°C. Bubble wrap or other types of packaging material will be placed in the cooler to prevent breakage. The Chain of Custody form will be taped under the cooler lid. Samples will be shipped by a commercial courier to the laboratory for next day delivery.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal):

The analytical laboratory will be responsible for receipt of samples and for disposal of sample after analysis.
Soils used in the bench-scale studies, regardless of the levels of PAHs detected, will be considered as IDW. The soils will be placed back into the original drums and disposed of at an appropriate landfill using the post-treatment sample results as the profile for disposal prior to offsite transport by Safety Kleen. The waste manifest confirming transport and disposal of the soil drums at the landfill will be included in the Technical Memorandum.

Sample Identification Procedures:

Samples will be identified with unique sample identification numbers which reference the location and type of sample.

Chain-of-custody Procedures:

Chain of custody will be maintained from the time of sample collection through analysis and documented on a Chain-of-Custody Form. The original form will accompany all samples from the time of collection through laboratory receipt. Each custody transfer by hand delivery shall be documented by signature of the relinquishing and receiving individuals and the date and time of transfer. Forms will be placed in a sealing plastic bag inside the cooler or shipping container. The airbill number will be entered on the Chain-of-Custody Form. Samples will be considered to be under custody if: (1)They are in the sampler's possession, or (2) They are in the sampler's line of sight after being in possession, or (3) They are in a designated controlled secure area. The person collecting the samples will have the overall responsibility for ensured the care and custody of the samples is maintained until they are transferred or properly dispatched to the laboratory.

QAPP Worksheet #28
(UFP-QAPP Manual Section 3.4) -- QC Samples Table

Complete a separate worksheet for each sampling technique, analytical method/SOP, matrix, analytical group, and concentration level. If method/SOP QC acceptance limits exceed the measurement performance criteria, the data obtained may be unusable for making project decisions.

Matrix	
Analytical Group	
Concentration Level	
Sampling SOP	
Analytical Method / SOP Reference	
Sampler's Name	
Field Sampling Organization	
Analytical Organization	
Number of Sample Locations	

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Equip blank						
MS (Lab QC)						
Field Duplicate						
LFB (QL)						

QAPP Worksheet #29
(UFP-QAPP Manual Section 3.5.1) -- Project Documents and Records Table

Identify the documents and records that will be generated for all aspects of the project including, but not limited to, sample collection and field measurement, on-site and off-site analysis, and data assessment.

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
Sample Collection Logs, Chain-of-Custody	Field Log Book	Analytical Lab (TestAmerica) EDD ERIS Data Management	Technical Memorandum Feasibility Study Report	

QAPP Worksheet #30
(UFP-QAPP Manual Section 3.5.2.3) -- Analytical Services Table

Identify all laboratories or organizations that will provide analytical services for the project, including on-site screening, on-site definitive, and off-site laboratory analytical work. Group by matrix, analytical group, concentration, and sample location or ID number. If applicable, identify the subcontractor laboratories and backup laboratory or organization that will be used if the primary laboratory or organization cannot be used.

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Number	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization (name and address, contact person and telephone number)
Soil	Organic	Low	9 Samples	EPA SW-846 8270 SIM	24-hr	TestAmerica	NA
Soil	Inorganic	Low	9 Samples	EPA SW-846 6010C	28-day	TestAmerica	NA
Soil	Inorganic	Low	2 Samples	SW 846 1315	28-day	TestAmerica	NA
Soil	Inorganic	Low	6 Samples	SW 846 1311	28-day	TestAmerica	NA
Soil	Inorganic	Low	1 Sample	SW 846 6020A	24-hr	TestAmerica	NA

A single laboratory (TestAmerica) will provide analytical services for this project. TestAmerica is DoD-approved and compliant with QSM version 5.0 or later.

QAPP Worksheet #31
(UFP-QAPP Manual Section 4.1.1) -- Planned Project Assessments Table

Identify the type, frequency, and responsible parties of planned assessment activities that will be performed for the project.

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (title and organizational affiliation)	Person(s) Responsible for Responding to Assessment Findings (title and organizational affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (title and organizational affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (title and organizational affiliation)
Technical Memorandum	D, DF, F	Internal	Alliant / Endpoint	Belinda Price / Alliant / PM	Belinda Price / Alliant / PM	Belinda Price / Alliant / PM	Belinda Price / Alliant / PM
FS Report	D, DF, F	Internal	Alliant / Endpoint	Belinda Price / Alliant / PM	Belinda Price / Alliant / PM	Belinda Price / Alliant / PM	Belinda Price / Alliant / PM

This is a project with a short time frame and limited scope. The assessments planned for this project are also limited.

QAPP Worksheet #32
(UFP-QAPP Manual Section 4.1.2) -- Assessment Findings and Corrective Action Responses

For each type of assessment describe procedures for handling QAPP and project deviations encountered during the planned project assessments.

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (name, title, organization)	Timeframe for Response
ITIR	Technical Memorandum and FS Report ITIR	Belinda Price / Alliant / PM	Immediate	Response to Comments	Mehrdad Javaherian / Endpoint / PM	10-days
Analytical Data Review	Data Load Report and Data Review	Belinda Price / Alliant / PM	Immediate	Analytical Review, re-test analytical results, reload data in EDD	Mehrdad Javaherian / PM / Endpoint & TestAmerica	10-days

This is a project with a short time frame and there are no planned assessments for this project. The assessments planned for this project are also limited.

QAPP Worksheet #33
(UFP QAPP Manual Section 4.2) -- QA Management Reports Table

Identify the frequency and type of planned QA Management Reports, the project delivery dates, the personnel responsible for report preparation, and the report recipients.

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (title and organizational affiliation)	Report Recipient(s) (title and organizational affiliation)

There are no QA reports planned for this project. However, Monthly Progress Reports will be prepared as discussed in Section 3.2.1 of the Project Management Plan.

QAPP Worksheet #34
(UFP-QAPP Manual Section 5.2.1) -- Verification (Step I) Process Table

Describe the processes that will be followed to verify project data. Describe how each item will be verified, when the activity will occur, and what documentation is necessary, and identify the person responsible. *Internal* or *external* is in relation to the data generator.

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Data Review	The data will be checked for completeness, correctness, consistency, and conformance to the analytical procedures and contractual agreements, and to ensure that holding times for the analyses have been met upon receipt. Formal data validation will not be conducted for this project.	External	Belinda Price, Alliant Corporation Mehrdad Javaherian / PM / Endpoint & TestAmerica

QAPP Worksheet #35
(UFP-QAPP Manual Section 5.2.2) -- Validation (Steps IIa and IIb) Process Table

Describe the processes that will be followed to validate project data. Validation inputs include items such as those listed in Table 9 of the UFP-QAPP Manual (Section 5.1). Describe how each item will be validated, when the activity will occur, and what documentation is necessary and identify the person responsible. Differentiate between steps IIa and IIb of validation.

Step Iia / IIb	Validation Input	Description	Responsible for Validation (name, organization)

Formal data validation will not be conducted as part of the DQOs for this pilot study project.

QAPP Worksheet #36
(UFP-QAPP Manual Section 5.2.2) -- Validation (Steps IIa and IIb) Summary Table

Identify the matrices, analytical groups, and concentration levels that each entity performing validation will be responsible for, as well as criteria that will be used to validate those data.

Step IIa / IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)

Formal data validation will not be conducted as part of the DQOs for this pilot study project.

QAPP Worksheet #37
(UFP-QAPP Manual Section 5.2.3) -- Usability Assessment

Describe the procedures / methods / activities that will be used to determine whether data are of the right type, quality, and quantity to support environmental decision-making for the project. Describe how data quality issues will be addressed and how limitations on the use of the data will be handled.

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

Describe the evaluative procedures used to assess overall measurement error associated with the project:

Identify the personnel responsible for performing the usability assessment:

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

APPENDIX C
SUBCONTACTOR WORK PLAN

Endpoint.
Strategy. Science. Sustainability.

TECHNICAL MEMORANDUM

To: Eric Cheng, PE
US Army Corps of Engineers-Louisville District (USACE)

From: Mehrdad Javaherian, Ph.D., PE, LEED®GA
Endpoint Consulting, Inc. (Endpoint)

Cc: Belinda Price, PG
Alliant Corporation (Alliant)

Date: 10/07/15

Re: **Workplan for Bench- and Pilot-Scale Testing- Ex-Situ Thermal Desorption of Polycyclic Aromatic Hydrocarbons in Soils, and Bench-Scale Testing of Lead Stabilization in Soils,** RVAPP-50 Atlas Scrap Yard, Former Ravenna Army Ammunition Plant, Ravenna, OH

This Technical Memorandum (Memo) has been prepared by Endpoint as a subcontractor to Alliant Corporation. This Memo sets forth the approach for implementing bench- and pilot-scale studies for ex-situ thermal treatment of polycyclic aromatic hydrocarbons (PAHs) in soils at the above-referenced site. The Memo also includes the proposed approach for performing a focused bench-scale study on stabilization of lead in soil using steel slag.

1.0 Ex-Situ Thermal Desorption Bench-Scale Testing

This section summarizes the proposed approach to bench-scale testing of PAH-impacted soils using Endpoint's patented VEG ex-situ thermal desorption technology. Included are the purpose of the bench-scale testing, approach to pre- and post-treatment sampling of soils, and approach to thermal treatment of PAHs in soils. Much of the information presented for the bench-scale test is directly referenced later herein in support of summarizing the pilot-scale test activities.

1.1 Purpose and Objectives

The purpose and objectives of the bench-scale study are twofold:

1) To determine the potential for and magnitude of reductions in PAH soil concentrations resulting from ex-situ thermal treatment, particularly relative to industrial and residential regional screening levels (RSLs) protective of direct exposure pathways to soil as adopted by the US Environmental Protection Agency (USEPA). This finding, together with those of the pilot-scale test discussed later herein, will help assess the potential applicability of thermal treatment as a practical and effective remedial alternative for treatment of PAHs at the RVAAP-50 Atlas Scrap Yard (Scrap Yard) site, particularly for shallow, surficial soils where direct human exposure may remain a complete exposure

pathway and where significant reductions in PAH concentrations will be sought through the final soil remedy for the site. Treatment of PAHs to non-detect levels or below residential standards, followed by reuse of soils onsite may accordingly be evaluated as a potential remedial alternative for further consideration at the site.

2) To identify optimal treatment conditions, including treatment temperature and the residence time of soils within the VEG treatment chamber, deemed necessary to achieve the aforementioned numerical treatment objectives. The optimal treatment conditions will accordingly be implemented as part of pilot-scale testing activities referenced later herein.

The approach to the ex-situ thermal treatment bench-scale study, discussed in more detail in the following sections, has been developed to meet the objectives referenced above.

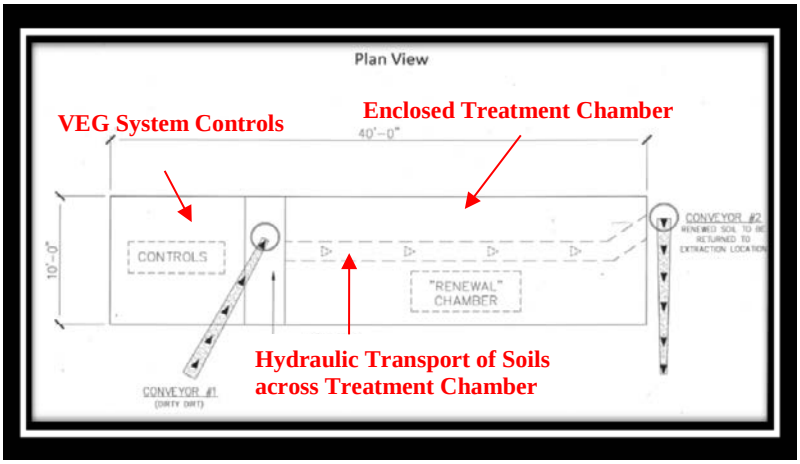
1.2 Approach to Thermal Treatment of Soils

Ex-situ thermal treatment of one pre-profiled drum of PAH-impacted soil will be performed using Endpoint's patented VEG technology at its laboratories in CA. This technology allows for application of steam for both in-situ and ex-situ thermal desorption. The goal of this treatment is to desorb (from soils into vapor phase) and/or otherwise decompose PAHs to non-hazardous materials. Thermal treatment of PAHs has been successfully used as a means of achieving this goal (e.g., see http://www.enviroklean.com/files/thermal_desorption_navy_report.pdf).

The thermal treatment process implemented by the VEG technology is summarized below.

1.2.1 VEG Thermal Treatment Process

At the core of the VEG treatment system is a highly efficient, patented mobile vapor energy generator, which utilizes propane, air, and water to generate steam at temperatures as high as 1,300 °F. For ex-situ thermal treatment applications, the vapor generator serves as an independent heat source to the enclosed thermal treatment chamber, through which soils are passed and subsequently treated (see graphics below).



VEG Soil Remediation System Layout and Internals Diagram

Target temperatures for ex-situ thermal treatment of PAHs have been defined in the range of 700 to 900 °F; however, due to the highly efficient nature of the patented vapor generator, and the fully enclosed system design inherent to the VEG system, Endpoint has successfully treated PAHs at lower temperatures. Properties of chemicals similar to those at the site and which have been successfully treatment via the VEG technology are summarized in the matrix below.

Properties of Key PAHs, PCBs, and Munitions Constituents

Chemical	Molecular Weight (g/mol)	Melting Point (°F)	Boiling Point (°F)	Vapor Pressure (Pa @ 20 °C)
TNT	227	178	563	1.60E-04
RDX	222	399	453	4.00E-07
DNT	182	156	527	9.90E-01
PETN	316	286	356	8.00E-04
Benzo(a)Pyrene	253	354	923	6.40E-07
Aroclor 1260	376	Not Available	759	3.08E-04

For the subject bench-scale test, the treatment chamber of the VEG system will be preheated by adding steam into the chamber until the initial target temperature range of 600 °F is reached within the treatment chamber. Profiled soils sent to Endpoint's laboratory by Alliant will then be removed from the drum using a shovel and placed onto a conveyor, which will in turn feed the soils directly into the preheated treatment chamber. Profile data used by Alliant in support of shipping the drums will be used as the pre-treatment concentration of PAHs in soils to be treated.

Target temperatures and the residence time of soils within the treatment chamber are adjustable and defined based on the properties of the soil, target organic chemicals to be treated, and target cleanup goals; both parameters will be adjusted during the bench-scale test to help determine the optimal temperature and residence time for maximum treatment of PAHs in soils. Temperatures to be tested will range from 600 to 800 °F, with soil residence times ranging from 15 minutes to 30 minutes based on successful applications of the technology to PAHs at other sites.

As organic compounds (including PAHs) transition from solid phase adsorbed to soils to vapor phase within the renewal chamber, a vacuum system internal to the enclosed renewal chamber captures the organic vapors generated. To the extent that there may be unknown organic compounds such as heavier-end petroleum hydrocarbons present in the soil subjected to treatment, it is also possible that desorbed acid compounds such as nitrous oxides (NOx) and sulfur oxides (SOx) may also be present within the renewal chamber in concert with the organic vapors. To properly remove the NOx, SOx and HCl compounds prior to rerouting of vapors back to the vapor generator, the desorbed vapors are first passed through a series of patented filters and caustic scrubber inserted in series within the pipeline that recycles desorbed material from the enclosing truck body back through the steam generator. The filter/scrubber system encompass an engineered mixture of caustic soda, zero valent iron (ZVI), lime, water, and steam and align in a slender packed column, which is six feet tall and six inches in diameter. As the acid-laden vapor is pulled by vacuum up through the filter/scrubber column, any acidic compounds are neutralized by the filters and trickling down caustic soda (sodium hydroxide)

liquid solution. Hence, any acid vapors (e.g., HNO_3 (nitric acid) from NOx, H_2SO_4 (sulfuric acid) from SO_x, and HCl are removed before the organic vapors are routed further downstream. Neutralization of the acidic compounds results in a benign dilute liquid solution of sodium nitrate ($NaNO_3$), sodium bisulfate ($NaHSO_4$), and sodium chloride (NaCl) for ultimate profiling and disposal offsite.

Based on the patented design of the VEG system, following treatment through the patented filter/scrubber system, the treated vapors form a synthetic gas comprised largely of hydrogen and are routed back to the vapor generator to successfully replace the propane as fuel for ongoing treatment operations, with Endpoint's carbon dioxide (CO_2) filter serving to reduce CO_2 emissions by approximately 90% and to levels below ambient concentrations.

Treated soils emanating from this process will leave the treatment chamber and either fed directly into a loader bucket, or will be stockpiled on the lined (11 mil-thick tarp) ground surface via a second conveyor in support of post-treatment sampling, discussed in more detail below.

1.2.2 Treatment of PAHs in Soil

The bench-scale thermal treatment of the PAH-impacted soils will be initiated by evenly distributing the drum of soils into four equal stockpiles. The first batch of soil will be treated at a temperature of 600 F for 15 minutes. After this treatment run, these soils will be stockpiled and resampled and analyzed using EPA Method 8270SIM, with data to be validated to S2aVEM (EPA 540-R-08-005). Sampling of soils will occur in accordance to the SOPs included as Attachment A herein, including collection of one 3-point composite from each treated soil stockpile.

Depending on the post-treatment analytical results from the first treatment run, the temperature and residence time for treating the second batch of soils may be adjusted (likely increased temperature and/or residence times) to help define the optimal treatment conditions. It is expected that 50 to 100 F increases in temperature and potentially 5 to 10-minute increases in residence times will be tested using subsequent batches of soil to identify the optimal treatment conditions.

The optimal treatment temperature and residence time reflect conditions which will reduce PAH concentrations to low (i.e., below residential RSLs) or to non-detect levels. With the benefit of results from more than 10,000 soil treatment runs using the VEG system, it is evident that less thermal energy (i.e. lower temperatures and shorter residence times) is necessary to reduce chemical concentrations from high concentrations to relatively low concentrations, while it typically takes far greater thermal energy (i.e., higher temperatures and longer residence times) to reduce chemical concentrations from low levels to very low or non-detect levels. The same relationship has been observed in past treatment of PAHs using the VEG technology.

The hierarchy of the desired treatment results is defined as follows, with RSLs representing the PALs for this pilot study:

- Post-treatment levels are below detection limits (highest goal);
- Post-treatment levels are below residential RSLs (second highest goal);
- Post-treatment levels are below commercial RSLs (third-highest goal);
- Post-treatment results are below pre-treatment results, while still exceeding the commercial RSLs (fourth-highest goal).

Once the optimal temperature and residence time of soils have been defined, Endpoint will combine all soils together into one stockpile, and treat the entire soil stockpile under the optimal treatment conditions to ensure that all soils provided for this bench-scale study are treated to levels below detection limits and/or residential RSLs. Post-treatment sampling of the combined soil stockpile will be performed in accordance to the SOPs attached herein, including collection of one 3-point composite sample from the soil stockpile.

1.2.3 Disposal of Investigation Derived Wastes

Regardless of the levels of PAHs, if any, present in the treated soils, these soils will be considered as investigation derived wastes (IDW). These soils will be placed back into the original drums and disposed of at an appropriate landfill in accordance to the post-treatment concentrations serving as the profile for disposal. Soil profiles will be shared with Alliant and USACE to confirm disposal approach prior to offsite transport by Safety Kleen. In addition, the waste manifest confirming transport and disposal of the soil drums at the landfill will be provided to Alliant and USACE.

2.0 Ex-Situ Thermal Desorption Pilot-Scale Testing

Following completion of the bench-scale test, Endpoint will mobilize to the Scrap Yard site all necessary equipment to perform a pilot-test scale for thermal treatment of PAHs in soils. To summarize, the pilot-scale test will encompass onsite treatment of 100 cubic yards (CY) of soils, which will be placed back into the ground following completion of the pilot test. The pilot test will make use of the optimal treatment conditions (i.e, treatment temperature and residence time) identified through the bench-scale testing as capable of achieving the targeted goal of reducing PAHs to below residential RSLs, or below laboratory detection limits. The purpose of the pilot-scale test is to build on the bench-scale activities and further evaluate the potential for the feasibility of ex-situ thermal treatment as a viable remediation option for the site.

The onsite pilot test will include mobilization to the site of the same VEG unit used at Endpoint's laboratory for the bench-scale test, housed on a 40-foot trailer. In addition, one conveyor for loading of soils into the VEG unit will be mobilized to the site, together with one 5-CY backhoe and a bobcat loader to be used for excavation, stockpile management, and loading of stockpiled soils onto the conveyor. Lastly, a 500-gallon propane tank and a 4,000-gallon water tank will also be brought onto the site for use in support of steam generation and thermal treatment by the VEG system.

2.1 Soil Excavation

Excavation of soils will occur across an 18-yard by 18-yard square, extending to 1 foot below ground surface (bgs) where the majority of PAH impacts have been reported at the Scrap Yard site (Leidos, 2015)[1]. The excavation area will correspond to the approximate location of the former T-4703 Roads and Grounds Maintenance Building, formally recognized as a source area at the Scrap Yard site (see Figure 4-4 of Leidos, 2015, included herein as Attachment B); selection of this location was based on a field reconnaissance visit conducted by Endpoint, the Ohio Environmental Protection Agency, USACE, and personnel from the Ravenna AAP and the Army National Guard Bureau, recognizing that PAHs are ubiquitous in shallow soils across the entire Scrap Yard site. The selected location is readily accessible from existing roads, will be staked in support of excavation activities, and will be noted further with hand-held GPS coordinates for each of its four corners.

Soils will be excavated via a backhoe, targeting depths of no more than 1 foot bgs within the defined 18-foot by 18-foot area. Excavated soils from the target excavation location will be stockpiled immediately adjacent to the VEG system, which in turn will be placed no more than 25 feet from the target excavation area. The 100 CY of excavated soils will be stockpiled into two 50-CY stockpiles, each to be sampled prior to treatment via collection of one 3-point composite sample per stockpile and per the SOPs attached herein. As outlined in the SOP, the two soil samples (one from each 50-CY stockpile) will be submitted to the laboratory (Test America located in St. Louis, MO), with analyses (EPA Method 8270SIM) to be performed on a 24-hour turnaround time (TAT). During times of inactivity, stockpiles will be covered by plastic tarps, and the excavation area will be taped off to ensure safety.

2.2 Onsite Soil Treatment

Following completion of pre-treatment sampling, soils from each stockpile will be independently loaded into the VEG system pre-heated to the optimal treatment temperature identified from the bench-scale test. Soils will be treated using the same process outlined in Section 1.2.1 herein. Treated soils will be independently re-stockpiled (two 50-CY stockpiles) and subjected to post-treatment sampling. Post-treatment samples will also correspond to the SOPs attached herein, including one 3-point composite sample from each 50-CY stockpile to be overnighted to the laboratory for 24-hr TAT analyses for PAHs (8270SIM). This process will be duplicated for each of the two stockpiles, with soil treatment rates expected at 10 to 30 CY/hour depending on soil moisture and weather conditions.

The pilot-scale test will be targeted for a period of time where weather conditions are dry; however, should unexpected precipitation occur during testing, a decision will be made by Endpoint as to whether the pilot test should continue or whether the treatment should be stopped (and stockpiles covered) until dry conditions prevail. Although highly unexpected, it is possible

[1] Leidos, 2015. Final Remediation Investigation Report, for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard, Former Ravenna Army Ammunition Plant, Ravenna, OH.

that excess moisture introduced by precipitation events may cause the need to treat one or more stockpiles more than once. Under such conditions, Endpoint is prepared to treat each stockpile as much as 3 times, although this is highly unlikely nor necessary given the predetermination of optimal treatment conditions during bench-scale testing, and the ability to increase temperatures and residence times within the treatment chamber during pilot testing. Moreover, should unforeseen precipitation events occur during the pilot test, the stockpiles will be protected from erosion using necessary measures, including erection of silt fences as necessary, and any excess water potentially forming in the excavation pit will be pumped out prior to replacement of soils following completion of treatment.

The duration of the pilot test is estimated at 3 to 5 days, depending on weather conditions and associated rate of soil treatment (3 to 10 CY/hour). The estimated CO_2 emissions from the VEG system (with and without Endpoint's patented CO_2 filter) have been calculated in Attachment C.

2.3. Soil Backfilling and Demobilization

Upon completion of the soil treatment (marked by one round of treatment of each stockpile under dry conditions, or up to 3 rounds of treatment of each stockpile under wet conditions), soils will be placed back into the excavation hole using the backhoe, ensuring that the soils are compacted (using the backhoe bucket) such that the ground surface elevation of the backfilled area is even with the surrounding area.

Decontamination and demobilization activities will encompass removal of excess dirt and soils from all equipment used prior to removal from the site. This process will maximize the use of dry, clean vapors from the vapor energy generator system inherent to the VEG technology, thereby eliminating any rinsate or other IDW during decontamination procedures. All liquid IDW will be drummed, profiled, and shipped offsite, including fluid from the patented filtration system employed by Endpoint for the pilot test.

3.0 Lead Stabilization Bench-Scale Test

It is understood that a small focused area in the southern part of the Scrap Yard site has been characterized by elevated lead levels, constituting a lead "hot spot" in soils at the site. To assess the potential for onsite stabilization of lead in soils, a bench-scale study will be conducted to determine if steel slag fines (3/8-inch minus fraction) can effectively immobilize the lead-impacted soils from the Scrap Yard site.

The approach to bench-scale testing will be to evaluate mix designs using up to 30 % by weight maximum for potential onsite soil blending and encapsulation as a soil berm, as steel slag is far more cost effective than other proprietary reagents used for lead immobilization (e.g. phosphate compounds which must be overdosed and introduce water quality concerns). The steel slag fines will be used to create a compactable soil mixture that targets the immobilization of lead by a combination of pH control, long term soil pH buffering, and the creation of insoluble lead compounds that will be non-leachable under typical soil conditions. A series of five mix designs using two different sources of regionally available steel slag fines will be tested on soils (10-gallon bucket) provided to Endpoint by Alliant from the lead "hot spot" area at the Scrap Yard

site, helping establish the upper dosing limit. Toxicity Characteristic Leaching Procedure (TCLP) and deionized (DI) water extractions will be performed in duplicate to assess lead immobilization potential on 28-day cured samples. Based on a combination of leaching performance, dose and expected cost, two leading candidate mix designs will be advanced to a final stage of testing. The final round of testing will involve one-dimensional semi-dynamic leach testing (EPA Method 1315) to assess the long-term leaching of the stabilized soil based on 28-day cured samples compacted to the equivalent of minimum 90% relative compaction by the modified Proctor test (ASTM D1557).

4.0 Reporting

The ex-situ bench-scale and pilot-scale tests referenced in prior sections will be documented in detail in an Implementation Memorandum (Implementation Memo), outlining all procedures implemented, and data collected, validated, and evaluated. Conclusions relative to the ability of ex-situ thermal desorption to treat PAHs in soils at the Scrap Yard site will be set forth, as will observed optimal temperatures and residence times relative to PAH treatment for the subject site. It is understood that the feasibility study (FS) for the site may be revised by Alliant under separate cover to potentially include ex-situ thermal treatment as one of the remedial alternatives for the Scrap Yard site, and the information in the Implementation Report may be used in support of those activities. Similarly, the potential for steel slag to immobilize lead in soils from the site will be documented in the Implementation Memo, including recommendations relative to full-scale application at the Scrap Yard site.

5.0 Schedule

A detailed scheduled for the bench and pilot-scale tests is included in the Uniform Federal Policy (UFP) Quality Assurance and Project Plan (QAPP) prepared under separate cover by Alliant. However, it is anticipated that the bench-scale test will be completed within 10 days of receipt of the soil drum, and the VEG pilot-sale test may be completed within 5 to 10 days following mobilization to the site. The steel slag bench-scale study will be completed within 60 days following receipt of the site soils.

ATTACHMENTS

Attachment A- Standard Operating Procedures Soil Sample Collection, Handling, Custody, and Shipment
Attachment B- Figure 4-4 (Leidos, 2015)
Attachment C- Estimation of Carbon Dioxide Emissions from Pilot-Scale Thermal Treatment of Soils

STANDARD OPERATING PROCEDURES
SOIL SAMPLE COLLECTION, HANDLING, CUSTODY, AND SHIPMENT

The field technical lead (FTL) or designee will be responsible for completing the sample bottle label and chain-of-custody form, sample collection, sample packing, and coordination of sample shipment. The samples will be sent to the appropriate laboratory via FedEx overnight. The sample packing and shipping procedures are provided below.

Sample Collection:

Sample collection from stockpile soils will involve collection of one 3-point composite soil sample from each of the post-treated soil stockpiles. In the field, a 3-point composite sample will be collected from each stockpile by partially filling an 8-ounce glass jar with a large opening provided by the laboratory, with equal amounts of soil from each of the three locations within a given stockpile. The jar will be inserted approximately 6 inches into the surface of the stockpile when collecting soil from each of the three locations. The 4-ounce jars will be sent to the laboratory to be analyzed for PAHs (Method 8270SIM).

Sample Identification:

Each sample collected will be given a unique sample ID number that is stockpile-specific and also reflects pre- or post-treatment status. A record of sample ID numbers will be kept with the field records and recorded on chain-of-custody forms.

Sample Labels:

The sample labels will be affixed to sample containers.

The label will be completed with the following information written in indelible ink:

- Project name and location
- Sample ID number
- Date and time of sample collection
- Preservative used
- Sample collector's initials
- Analysis required

Chain of Custody Form: Standard sample custody procedures will be used to maintain and document sample integrity during sample collection, transportation, storage, and analysis. A sample will be considered to be in custody if one of the statements below applies.

- It is in a person's physical possession or view.

- It is in a secure area with restricted access.
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Chain-of-custody procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory. The chain-of-custody record also will be used to document samples collected and the analyses requested. The field personnel will record the following information on the chain-of-custody record:

- Project name and number
- Sampling location
- Name and signature of sampler
- Destination of samples (laboratory name)
- Sample ID number
- Date and time of collection
- Number and type of containers filled
- Analysis requested
- Preservatives used (if applicable)
- Sample designation (grab or composite)
- Signatures of individuals involved in custody transfer, including the date and time of transfer

Sample Packaging and Shipping: After labeling, soil samples will be placed in a cooler that contains ice to maintain the sample temperature at 4 ± 2 ºC. A temperature blank will be provided in each cooler for the laboratory to confirm storage temperature upon sample receipt. Openings will be taped shut to prevent potential leakage during transport.

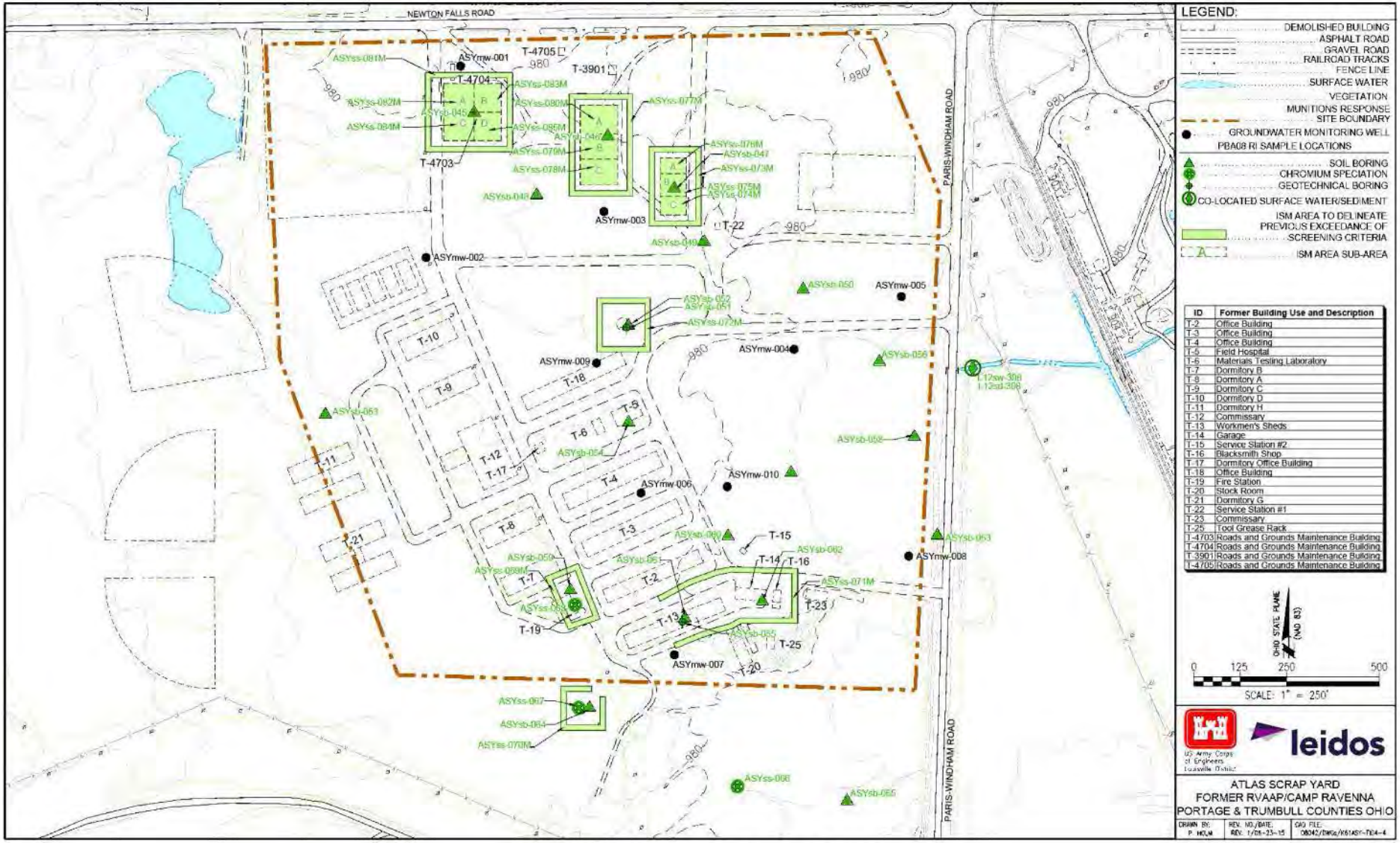


Figure 4–4. PBA08 RI – April 2010 Source Area Sampling Locations

Estimation of Carbon Dioxide Emissions from Pilot-Scale Thermal Treatment of Soils
Scrap Yard Site, Former Ravenna Army Ammunition Plant, Ravenna, OH

Polycyclic aromatic hydrocarbon (PAH) vapors induced from thermal treatment of the estimated 100 cubic yards of soil at the Scrap Yard site will be subject to treatment via a patented filter/scrubber system, which will target removal of desorbed acidic compounds such as nitrous oxides (NOx), sulfur oxides (SOx), and hydrogen chloride (HCl). The patented scrubber/filter system incorporates the use of an engineered mix of sodium hydroxide, lime, zero valent iron (ZVI), and water within a slender packed column which is approximately 6 feet in height and over six inches in diameter. Within the fully enclosed treatment chamber of the VEG thermal desorption system, as the acid-laden vapor is pulled by vacuum up through the filter/scrubber column, the acidic compounds are neutralized and any acid vapors (e.g., nitric acid from NOx, sulfuric acid from SOx, and hydrogen chloride) are removed before the VOC vapors are recycled to the VEG steam generator.

As the treated, hot vapor is then redirected back to the vapor generator and replaces the propane as the fuel to continue the thermal treatment process, nothing passes to the atmosphere in this continually looped system. Once the final component of soil treatment is completed and the system operations terminated, the sole emission to the atmosphere from the looped system is low levels of Carbon Dioxide (CO_2). The CO_2 emissions from operation of the thermal desorption operations may be estimated as the emissions from a stationary combustion source per the equation below:

Total GHG emissions [metric tons of CO_2) = emission factor [kg CO_2/MMBTU] x fuel consumed [MMBTU] x 0.001

where,

MMBTU = million British Thermal Units

Typical emission factors for propane approximate 61.46 kg CO_2/MMBTU, while that of landfill gases, which most closely resembles the expected fingerprint of the induced vapors from thermal treatment of PAH-impacted soils, approximates 52.07 kg CO_2/MMBTU (USEPA, 2014)[1].

Treatment rates during thermal treatment of the estimated 100 cubic yards of soils are expected to range between 5 to 30 cubic yards per hour, depending on soil types, soil moisture, and weather conditions. Assuming an average treatment rate of 5 cubic yards per hour and an average treatment time of 8 hours per day, the treatment operational period may be estimated at approximately 5 days. Over this period the patented vapor energy generator is expected to consume no more than 0.96 MMBTUs, nearly 75% of which will be met by the treated vapor stream from the thermal remediation activities.

Based on the above, the estimated CO_2 emissions from the treatment operations, 25% of which will be fueled by propane and 75% of will be fueled by the treated vapors, may be defined as follows:

GHG Emissions-(Propane) = 61.46 kg CO_2/MMBTU X 0.25(0.96 MMBTU) x 0.001 = 0.015 metric tons (MT)

GHG Emissions-(Treated Vapors) = 52.07 kg CO_2/MMBTU X 0.75(0.96 MMBTU) x 0.001 = 0.037 MT

The total estimated GHG emissions is therefore estimated as the sum of the above-referenced values, totaling an estimated 0.052 MT. It should be noted that as necessary, Endpoint's CO_2 emission-reducing

[1] USEPA, 2014. Emission Factors for Greenhouse Gas Inventories, April 4th. Online at: http://www.epa.gov/climateleadership/documents/emission-factors.pdf

filter may also be used to further reduce the CO_2 emissions by an estimated 80 to 90%, further reducing the estimated CO_2 emissions to approximately 0.04 MT and to levels well below background.