Final

Proposed Plan
for Sediment and Surface Water
at Six Areas of Concern/Munitions Response Sites

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-15-C-0046

Prepared for:

US Army Corps of Engineers®

U.S. Army Corps of Engineers
Louisville District

Prepared by:

leidos

Leidos
8866 Commons Boulevard, Suite 201
Twinsburg, Ohio 44087

May 10, 2019

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)*
10-05-2019	Technical	Nov 1978 - May 2019

4. TITLE AND SUBTITLE

Final
Proposed Plan for Sediment and Surface Water
at Six Areas of Concern/Munitions Response Sites
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

5a. CONTRACT NUMBER
W912QR-15-C-0046

5b. GRANT NUMBER
NA

5c. PROGRAM ELEMENT NUMBER
NA

6. AUTHOR(S)
Johnson, Sarika

5d. PROJECT NUMBER
NA

5e. TASK NUMBER
NA

5f. WORK UNIT NUMBER
NA

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

Leidos
8866 Commons Boulevard
Suite 201
Twinsburg, Ohio 44087

8. PERFORMING ORGANIZATION REPORT NUMBER
NA

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

USACE - Louisville District
U.S. Army Corps of Engineers
600 Martin Luther King Jr., Place
PO Box 59
Louisville, Kentucky 40202-0059

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

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
NA

12. DISTRIBUTION/AVAILABILITY STATEMENT

Reference distribution page.

13. SUPPLEMENTARY NOTES

None.

14. ABSTRACT

This Proposed Plan discusses sediment and surface water at six sites within the former Ravenna Army Ammunition Plant: RVAAP-01 Ramsdell Quarry Landfill Area 1, RVAAP-02 Erie Burning Grounds, RVAAP-04 Open Demolition Area No. 2, RVAAP-16 Fuze and Booster Quarry Landfill/Ponds, RVAAP-001-R-01 RQL MRS Area 2, and RVAAP-060-R-01 Block D Igloo MRS. This plan summarizes the findings of a Supplemental Remedial Investigation Report, which included a thorough assessment of each site. This plan also presents to the public the physical characteristics of each site pertaining to sediment and surface water. This plan summarizes contaminant fate and transport; and human health and ecological risk assessments. These evaluations indicate there are no chemicals of concern (COCs) that pose unacceptable risk. Therefore, this plan presents to the public a recommendation of No Further Action (NFA) with respect to sediment and surface water to attain Unrestricted (Residential) Land Use.

15. SUBJECT TERMS

proposed plan, no further action, land use, chemicals of concern

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Nathaniel Peters, II
U	U	U	U	62	19b. TELEPHONE NUMBER *(Include area code)* 502.315.2624

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Laurie A. Stevenson, Director

June 10, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859254

Mr. David Connolly
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 22204

Subject: **Final Proposed Plan (PP) for Sediment and Surface Water at Six Areas of Concern/Munitions Response Sites**

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the "Final Proposed Plan (PP) for Sediment and Surface Water at Six Areas of Concern/Munitions Response Sites at the Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio," dated May 10, 2019. It was prepared by Leidos.

Ohio EPA has no additional comments. Based on the information contained in the final PP document, other investigation documents and reports, and Ohio EPA's oversight participation during the investigation, Ohio EPA concurs with the final PP document for the Six Areas of Concern/Munitions Response Sites recommending no further action.

If you have any questions concerning this letter, please contact Nicholas Roope at (330) 963-1235.

Sincerely,

RECEIVED
JUN 10 2019

Melisa Witherspoon, Chief
Division of Environmental Response and Revitalization

NCR/MW/sc

ec: David Connolly, ARNG
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
Craig Coombs, USACE Louisville
Nathaniel Peters, USACE Louisville
Rebecca Shreffler, Chenega
Mark S. Johnson, Jr., Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
Tom Schneider, Ohio EPA, SWDO, DERR
William Damschroder, Ohio EPA, Legal

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Leidos has completed the Proposed Plan for Sediment and Surface Water at Six Areas of Concern/Munitions Response Sites at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing United States Army Corps of Engineers (USACE) policy. In addition, an independent verification was performed to ensure all applicable changes were made per regulatory and Army comments.

Sarika Johnson — May 10, 2019
Sarika Johnson — Date
Study/Design Team Leader

Rupa Price — May 10, 2019
Rupa Price — Date
Independent Technical Review Team Leader

Significant concerns and explanation of the resolutions are documented within the project file. As noted above, all concerns resulting from independent technical review of the project have been considered.

May 10, 2019
Lisa Jones-Bateman — Date
Senior Program Manager

Final

Proposed Plan
for Sediment and Surface Water
at Six Areas of Concern/Munitions Response Sites

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-15-C-0046

Prepared for:
U.S. Army Corps of Engineers
Louisville District

Prepared by:
Leidos
8866 Commons Boulevard, Suite 201
Twinsburg, Ohio 44087

May 10, 2019

DOCUMENT DISTRIBUTION
for the
Final
Proposed Plan for Sediment and Surface Water
at Six Areas of Concern/Munitions Responses Sites
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Name/Organization	Number of Printed Copies	Number of Electronic Copies
Nicholas Roope, Ohio EPA-NEDO	1	1
Mark Johnson, Ohio EPA-NEDO	Email transmittal letter only	
Bob Princic, Ohio EPA-NEDO	Email transmittal letter only	
Tom Schneider, Ohio EPA-SWDO	Email transmittal letter only	
David Connolly, ARNG, I&E-Cleanup Branch	0	1
Katie Tait, OHARNG, Camp James A. Garfield Kevin Sedlak, ARNG, Camp James A. Garfield	Email transmittal letter only	
Craig Coombs, USACE – Louisville District	Email transmittal letter only	
Nathaniel Peters II, USACE – Louisville District	1	1
Admin Records Manager – Camp James A. Garfield	2	2
Pat Ryan, Leidos-REIMS	Email transmittal letter only	
Jed Thomas, Leidos	1	1
Leidos Contract Document Management System	0	1

ARNG = Army National Guard.
I&E = Installations and Environment.
NEDO = Northeast District Office.
OHARNG = Ohio Army National Guard.
Ohio EPA = Ohio Environmental Protection Agency.
REIMS = Ravenna Environmental Information Management System.
SWDO = Southwest District Office.
USACE = U.S. Army Corps of Engineers.

TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF FIGURES

LIST OF ACRONYMS

ACM	Asbestos-containing Material
amsl	Above Mean Sea Level
AOC	Area of Concern
Army	U.S. Department of the Army
ARNG	Army National Guard
bgs	Below Ground Surface
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CJAG	Camp James A. Garfield
CMCOC	Contaminant Migration Chemical of Concern
COC	Chemical of Concern
COEC	Chemical of Ecological Concern
COI	Chemical of Interest
COPEC	Chemical of Potential Ecological Concern
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
EBG	Erie Burning Ground
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
FBQ	Fuze and Booster Quarry Landfill/Ponds
FS	Feasibility Study
FWCUG	Facility-wide Cleanup Goal
HEGP	High Explosive, General Purpose
HHRA	Human Health Risk Assessment
IRP	Installation Restoration Program
ISM	Incremental Sampling Methodology
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ODA2	Open Demolition Area No. 2
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbon

PCB	Polychlorinated Biphenyl
PP	Proposed Plan
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RI	Remedial Investigation
ROD	Record of Decision
RQL	Ramsdell Quarry Landfill
RRA	Rocket Ridge Area
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SERA	Screening Ecological Risk Assessment
SI	Site Inspection
SOR	Sum-of-Ratio
SRC	Site-related Contaminant
SVOC	Semi-volatile Organic Compound
TCRA	Time-critical Removal Action
TNT	2,4,6-Trinitrotoluene
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound

THIS PAGE INTENTIONALLY LEFT BLANK.

1.0 INTRODUCTION

This Proposed Plan (PP) presents the conclusions and recommendations for sediment and surface water within the following areas of concern (AOCs) and munitions response site (MRS) within the former Ravenna Army Ammunition Plant (RVAAP).

	Site Name
1	RVAAP-01 Ramsdell Quarry Landfill (RQL) and RVAAP-001-R-02 RQL MRS Area 1 North
2	RVAAP-02 Erie Burning Grounds (EBG) and RVAAP-002-R-01 EBG MRS
3	RVAAP-04 Open Demolition Area No. 2 (ODA2) and RVAAP-004-R-01 ODA2 MRS
4	RVAAP-16 Fuze and Booster Quarry Landfill/Ponds (FBQ) and RVAAP-016-R-01 FBQ MRS
5	RVAAP-001-R-01 RQL MRS Area 2
6	RVAAP-060-R-01 Block D Igloo MRS

The former RVAAP is now known as Camp James A. Garfield (CJAG) Joint Military Training Center and is located in Portage and Trumbull counties, Ohio (Figure 1).

The Army National Guard (ARNG), in coordination with the Ohio Environmental Protection Agency (Ohio EPA), issues this PP to provide the public with information necessary to comment on the no further action recommendation. The remedy will be selected after all comments submitted during the 30-day public comment period are considered. Therefore, the public is encouraged to review and comment on the no further action recommendation for these sites, as presented in this PP.

ARNG is issuing this PP as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and Section 300.430(f) (2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 *Code of Federal Regulations* 300). Selection and implementation of a remedy will also be consistent with the requirements of the Ohio EPA *Director's Final Findings and Orders*, dated June 10, 2004 (Ohio EPA 2004).

Public Comment Period:
August 12, 2019 to September 10, 2019

Public Meeting:
ARNG will hold an open house and public meeting to present the conclusions and additional details presented in the *Supplemental Remedial Investigation for Sediment and Surface Water at RVAAP-01, RVAAP-04, RVAAP-16, RVAAP-001-R-01* (Leidos 2017). Oral and written comments will also be accepted at the meeting. The open house and public meeting are scheduled for 6:00PM, August 29, 2019 at the Charlestown Town Hall, 6735 Rock Spring Road, Ravenna, Ohio 44266.

Information Repositories:
Information used in selecting the remedy is available for public review at the following locations:

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266
(330) 296-2827

Hours of operation:
9AM-9PM Monday-Thursday
9AM-6PM Friday
9AM-5PM Saturday
1PM-5PM Sunday

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444
(330) 872-1282

Hours of operation:
9AM-8PM Monday-Thursday
9AM-5PM Friday and Saturday

Online
http://www.rvaap.org/

The **Administrative Record File**, containing information used in selecting the remedy, is available for public review at the following location:

Camp James A. Garfield Joint Military Training Center (former Ravenna Army Ammunition Plant)
Environmental Office
1438 State Route 534 SW
Newton Falls, Ohio 44444
(614) 336-6136
Note: Access is restricted to Camp James A. Garfield, but the file can be obtained or viewed with prior notice.

This PP summarizes information about sediment and surface water that can be found in detail in the following documents:

- *Remedial Investigation Work Plan for Sediment and Surface Water at RVAAP-01, RVAAP-04, RVAAP-16, RVAAP-001-R-01, and Inventory of Sediment and Surface Water at Multiple Sites* (Leidos 2016, herein referred to as the Work Plan), and
- *Supplemental Remedial Investigation for Sediment and Surface Water at RVAAP-01, RVAAP-04, RVAAP-16, RVAAP-001-R-01* (Leidos 2017, herein referred to as the Supplemental Remedial Investigation [RI]).

The Administrative Record contains other documents pertaining to these sites. ARNG encourages the public to review applicable background documents to gain a more comprehensive understanding of the sites, activities that have been conducted to date, and the rationale for the no further action recommendation.

This PP proposes no further action for residual contamination in sediment and surface water at these sites. Soil and dry sediment are not included in the scope of this PP, as those media are being addressed separately.

2.0 SITE BACKGROUND

2.1 Facility Description and Background

The former RVAAP, now known as CJAG, located in northeastern Ohio within Portage and Trumbull counties, is approximately 3 miles east/northeast of the city of Ravenna and 1 mile north/northwest of the city of Newton Falls (Figures 1 and 2). The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garrett, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland. The facility is federal property, which has had multiple accountability transfers amongst multiple Army agencies, making the property ownership and transfer history complex. The most recent administrative accountability transfer occurred in September 2013 when the remaining acreage (not previously transferred) was transferred to the U.S. Property and Fiscal Officer for Ohio and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp James A. Garfield).

2.2 Facility-wide Sediment and Surface Water Assessment

In 2016, the U.S. Department of the Army (Army) developed the sediment and surface water Work Plan (Leidos 2016). The purpose of the Work Plan was to identify and assess sites that 1) required additional activities to attain a CERCLA decision for sediment and surface water, and 2) did not have a contract or Army-directed activity with a goal of attaining this CERCLA decision. The Work Plan identified six sites that met these criteria:

- Ramsdell Quarry Landfill (RQL) Area 1 North,
- Erie Burning Grounds (EBG),
- Open Demolition Area No. 2 (ODA2),
- Fuze and Booster Quarry Landfill/Ponds (FBQ),
- RQL MRS Area 2 South (RVAAP-001-R-01), and
- Block D Igloo MRS (RVAAP-060-R-01).

This PP addresses the AOC boundaries established in the Installation Restoration Program (IRP) and the MRS boundaries established in the Military Munitions Response Program (MMRP) at four of these sites: RQL Area 1 North, EBG, ODA2, and FBQ. This PP addresses the MRS boundaries for RQL MRS Area 2 South and Block D Igloo MRS; those sites did not have AOCs established in the IRP.

Based on information available at that time, the Work Plan (Leidos 2016) further

concluded that EBG and the Block D Igloo MRS can be recommended for no further action. In addition, the Work Plan contained a screen of historical sediment and surface water data and provided a method for evaluating human health and ecological risk at the other four sites.

The Army developed the Supplemental RI (Leidos 2017) after the Work Plan (Leidos 2016) to 1) investigate the potential presence of chemical constituents in sediment and surface water at RQL Area 1, ODA2, FBQ, and RQL MRS Area 2 as a result of historical activities; 2) determine the nature and extent of chemical constituents that may exist in sediment and surface water; 3) evaluate the fate and transport of contaminants in the environment; and 4) determine if the chemical constituents pose an unacceptable risk to human health or the environment.

Figure 2 depicts locations of the sites presented in this PP. The site histories and descriptions are described below.

2.3 Ramsdell Quarry Landfill Area 1

RQL is located in the northeastern portion of CJAG (Figure 3) and has an approximately 7-acre MRS assessed under the MMRP called RQL MRS Area 1 North. This site also has a 14-acre AOC assessed under the IRP called RQL. For clarity and added distinction from other sites discussed in this PP, this area will be called "RQL Area 1."

RQL Area 1 was used as a quarry until 1941. During that time, it was excavated to 30–40 ft below existing grade to provide road and construction ballast materials.

Between 1941 and 1989, the western and southern sections of the abandoned quarry were used for landfill operations. No information is available regarding landfill disposal activities from 1941–1976; however, only non-hazardous solid waste was deposited at the landfill from 1976–1989. The permitted sanitary landfill was closed in September 1990 under state of Ohio solid waste regulations. Based on available information, the permitted landfill cap covers approximately 4 of the 14 acres comprising the RQL AOC.

In addition, from 1946 to the 1950s, the bottom of the quarry was used to burn waste explosives from Load Line 1. During this time, approximately 18,000 225-kg (500-lb) incendiary or napalm bombs were reportedly burned in the abandoned quarry. Liquid residues from annealing operations also were dumped in the quarry. No additional historical information is currently available on how the quarry was used, other than for landfill operations, from the 1950s until 1976, when operational records show that non-hazardous solid wastes were placed in RQL.

2.4 Erie Burning Grounds

EBG operated from 1941–1951 and was used for open burning of explosives and related materials. Prior to its acquisition by the Army in 1940, the area may have been used for brick manufacturing (Jacobs 1989).

2.5 Open Demolition Area #2

From 1948–1991, ODA2 was used to detonate large-caliber munitions and off-specification bulk explosives that could not be demilitarized or deactivated through any other means due to their condition. Past operations at ODA2 have also included burying munitions and ordnance components, including disposing of white phosphorus on the south side of Sand Creek. Known potential contamination source areas include areas used for open detonation, areas used to thermally destroy sludge, areas where projectiles were fired into targets, burial sites, and areas with munitions and explosives of concern (MEC) present on the surface [referred to as the Rocket Ridge Area (RRA)].

ODA2 is the only active Resource Conservation and Recovery Act (RCRA) unit at the CJAG under the RCRA Part A permit for the storage and treatment of off-specification munitions and munitions-related waste. The proposed remedy for sediment and

surface water at ODA2 does not have any effect on the facility's RCRA permit.

2.6 Fuze and Booster Quarry Landfill/Ponds

The quarry was reportedly used for open burning and as a landfill before 1976. The debris resulting from these activities was removed during construction of three quarry ponds in 1976.

2.7 Ramsdell Quarry Landfill MRS Area 2

RQL MRS Area 2 is an approximately 7-acre area that contains a small, inactive soil borrow pit and wooded area where installation personnel had previously found munitions debris (MD) (e2M 2008).

Information is not available regarding historical activities that occurred at RQL MRS Area 2, and it is unknown how MD arrived at this portion of the MRS. However, based on the debris found during RI fieldwork, it is suspected that this portion of the MRS may have been used as a disposal area for the munitions that were thermally treated at RQL Area 1, along with other debris (e2M 2008).

2.8 Block D Igloo MRS

The Block D Igloo MRS consists of the area contained within the suspected debris field that resulted when Igloo 7-D-15 ("D" Block) accidentally exploded on March 24, 1943. The explosion occurred as a result of 2,516 clusters of M-41 20-lb fragmentation bombs accidentally detonating. The side walls of the igloo were sheared off at the footings during the explosion, and the igloo's steel door was propelled 1,800 ft to the east. Concrete fragments were launched approximately 3,800 ft to the east of the igloo location. The slab of Igloo 7-D-15 is the only remaining part of the bunker.

3.0 SITE CHARACTERISTICS

The following subsections summarize the previous investigations at these sites and results that are pertinent to the sediment and surface water conclusions. For EBG and Block D Igloo MRS, the overall conclusions are presented in the Work Plan (Leidos 2016). For RQL Area 1, ODA2, FBQ, and RQL MRS Area 2, the overall conclusions are presented in the Supplemental RI (Leidos 2017). These documents are located in the restoration program Administrative Records.

3.1 Ramsdell Quarry Landfill Area 1

RQL is located in the northeastern portion of CJAG (Figure 3). Ground surface elevations range from approximately 955–990 ft above mean sea level (amsl). Because of former quarry operations, bedrock is often exposed on the ground surface, or the ground surface has a thin soil cover. RQL Area 1 is underlain by weathered, fractured, fine- to medium-grained orthoquartzite sandstone.

Generally, surface water at the site flows toward the quarry bottom, which is the lowest point in the area. No surface water drainage out of the quarry occurs. The quarry bottom has a pond (or multiple ponds) intermittently, but also has been observed to be dry for extended periods. No standing water was observed in the quarry bottom during the 2016 investigation.

RQL Area 1 has been part of multiple RIs. In 2013, the *Record of Decision Amendment for Soil and Dry Sediment at RVAAP-01 Ramsdell Quarry Landfill* (SAIC 2013, herein referred to as the RQL Record of Decision [ROD] Amendment) finalized decisions regarding soil and dry sediment at the site, but did not include final decisions for wet sediment and surface water. The selected remedy per the RQL ROD Amendment was to install a fence around the site to mitigate human exposure to soil and asbestos-containing material (ACM) contamination in the quarry bottom. In addition, 1,100 tons of contaminated soil in the

northeastern portion of the quarry bottom were removed.

The following subsections summarize investigations performed at RQL Area 1 to assess sediment and surface water.

3.1.1 1998 Phase I Remedial Investigation

In 1998, five sediment samples and nine surface water samples were collected to assess potential contamination within the RQL quarry bottom during the RQL Phase I RI. The sample results were assessed in the *Phase I Remedial Investigation Report for Ramsdell Quarry Landfill* (SAIC 2005b).

Using risk screening methodology available at that time, four chemicals of concern (COCs) (arsenic, chromium, manganese, benzo[a]pyrene) were identified in sediment, and three COCs (arsenic, manganese, aldrin) were identified in surface water. Based on the results of the human health risk assessment (HHRA) and ecological risk assessment (ERA), the site was recommended for further evaluation in a Feasibility Study (FS).

3.1.2 2006 Soil and Dry Sediment Feasibility Study

The *Feasibility Study for Ramsdell Quarry Landfill (RVAAP-01)* (SAIC 2006a) primarily focused on soil and dry sediment within the RQL quarry bottom. The FS provided an initial evaluation of sediment and surface water COCs and chemicals of potential ecological concern (COPECs) at the site; however, the scope of the FS did not include evaluation of remedial alternatives, if needed, for aqueous media (sediment, surface water, groundwater).

For soil and dry sediment, the RQL ROD Amendment (SAIC 2013) was finalized to select an alternative to install a fence around the site to mitigate human exposure to soil and ACM contamination in the quarry bottom. As part of this remedy for soil and dry sediment, 1,100 tons of contaminated soil in the northeast portion of the quarry bottom were removed. In addition, administrative land use controls are in place to restrict access and digging at the site.

3.1.3 2007 MMRP Site Inspection

The 2007 MMRP SI (e2M 2008) consisted of a meandering path magnetometer- and metal detector-assisted unexploded ordnance (UXO) survey, totaling approximately 3 acres.

Based on the findings of the UXO survey, buried MEC/MD were suspected to be present around the pond at the quarry bottom. Further characterization of MEC and munitions constituents (MC) in the pond in the northern quarry area was recommended.

3.1.4 2011 MMRP Remedial Investigation

The 2011 MMRP RI (CB&I 2015b) included a digital geophysical mapping (DGM) investigation, an intrusive investigation of anomalies, an underwater investigation to identify if MEC/MD were present in the pond sediment, and a determination of whether unacceptable risks to human or ecological receptors associated with MEC/MD would require further actions.

No MEC/MD were found at RQL Area 1; therefore, no samples were required to be collected for MC characterization in this portion of the MRS. No further action was recommended under the MMRP for Area 1 because no evidence of MEC/MD was found.

3.1.5 2016 Supplemental Remedial Investigation

The Work Plan (Leidos 2016) identified the need to collect additional samples due to the lack of sediment data for the southern ponded area and eastern side of the quarry. No surface water samples were collected during field activities because no water was present during the October 2016 sampling event.

Using all available information, including data from historical investigations, the Supplemental RI (Leidos 2017) identified chemicals of interest (COIs) for exposure of

Resident Receptors (Adult and Child) in sediment and surface water. These COIs are presented below.

- Semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs) were not detected in surface water. Fifteen metals were detected above the facility-wide background concentrations, along with three volatile organic compounds (VOCs) (acetone, methylene chloride, tetrachloroethene), nitrate/nitrite, sulfate, and a single explosive (4-nitrotoluene) and pesticide (aldrin). Of these COIs, six metals (aluminum, arsenic, cobalt, lead, manganese, thallium) and aldrin exceeded the tap water regional screening levels (RSLs) in surface water at RQL Area 1.
- A total of 19 metals, 6 explosives, 18 SVOCs (primarily polycyclic aromatic hydrocarbons [PAHs]), PCB-1260, and 7 VOCs are considered COIs for wet sediment at RQL Area 1. Of these COIs, three metals (arsenic, manganese, thallium) and one PAH (benzo[a]pyrene) exceeded the residential RSL in sediment at RQL Area 1.

The extent of metals and organic concentrations exceeding RSLs is shown in Figure 3.

3.2 Erie Burning Grounds

EBG is located in the northeastern portion of CJAG and was evaluated as an MRS and AOC (Figure 4).

The principal sources of contaminants are the ash residues derived from burning 2,4,6-trinitrotoluene (TNT); hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX); and propellants. These residues potentially contain small amounts of explosives and heavy metals. Estimates of the quantities of waste disposed of by burning at EBG have reached as high as 1 million pounds (Jacobs 1989), but it is unknown if this estimate is accurate.

EBG has been largely inundated with surface water since the early 1990s. Surface water flows from the north, entering from a culvert pipe beneath North Perimeter Road (also referred to as Blackberry Lane) and exits the site to the southwest via a culvert beneath Track 10. Three identified surface water basins (North Surface Water Basin, East Surface Water Basin, South Surface Water Basin) are shallow and subject to seasonal fluctuations in water level. The water level in the basins occasionally drops low enough so that no outflow occurs.

The areas that remain above water include: 1) the railroad embankment and track, 2) the gravel access road, 3) a portion of the elevated Burn Area D (also known as the T-Area) between the two pairs of parallel trenches, 4) the portion of the site northwest of the soil borrow area, and 5) a wooded area adjacent to the T-Area near the southeastern corner of EBG. Dense brush vegetation now covers the portions of the site that are not submerged.

EBG has been part of multiple RIs. In 2007, the *Record of Decision for Soil and Dry Sediment at Erie Burning Grounds* (SAIC 2007a) finalized the no further action decision for soil or dry sediment, but did not finalize decisions regarding wet sediment and surface water.

Since 1982, EBG has been included in various site evaluations and RIs. A Relative Risk Site Evaluation (USACHPPM 1996) classified EBG as a high-priority AOC, the surface water/human endpoint was assessed as a "high" relative risk, and the sediment/human endpoint was assessed as a "moderate" relative risk. The following subsections summarize investigations performed at the site to assess sediment and surface water.

3.2.1 1999 Phase I Remedial Investigation

During the 1999 EBG Phase I RI (SAIC 2001), 86 sediment samples were collected from 59 sample locations. Four additional sediment samples were collected outside of the AOC. Co-located surface water samples were

collected within 7 sub-areas at 18 of the sediment sample locations.

The results indicated levels of explosive, organic, and inorganic constituents that were above human health and ecological risk evaluation screening levels in sediment and surface water. Chemicals of potential concern were identified, and an additional characterization and a baseline risk assessment were recommended.

3.2.2 2003/2004 Phase II Remedial Investigation

During the 2003/2004 EBG Phase II RI field activities, seven discrete sediment samples and eight surface water samples were collected. The *Phase II Remedial Investigation Report for Erie Burning Grounds (RVAAP-02)* (SAIC 2005c) evaluated all available data and determined the nature and extent of contamination in soil, sediment, and surface water.

The HHRA assessed risks and hazards for two representative receptors evaluated within the RVAAP Restoration Program (Hunter/Trapper and Fire/Dust Suppression Worker). COCs were identified for the Resident Farmer in sediment and surface water; however, the focus of the Phase II RI was on the Hunter/Trapper and Fire/Dust Suppression Worker, as they were receptors applicable to the intended future land use at the time.

The EBG Phase II RI Report (SAIC 2005c) made the following recommendations: identify the need for any additional human health risk evaluation or preliminary cleanup goal development, and determine if further evaluation of ecological risks may be required or if ecological preliminary cleanup goals are required.

3.2.3 2006 Phase II RI Addendum

The *Addendum to the Phase II Remedial Investigation Report for Erie Burning Grounds (RVAAP-02)* (SAIC 2006b) was performed to 1) evaluate the fate and transport analysis conducted in the Phase II RI; 2) evaluate an Adult and Juvenile Trespasser scenario to supplement the baseline HHRA to provide information to support determination of the need for continued security at the facility; 3) develop preliminary cleanup goals and, based on land use considerations, apply risk management considerations to the HHRA completed during the Phase II RI; 4) incorporate further weight-of-evidence into the ERA completed during the Phase II RI; and 5) determine if EBG will require no further action or will be the subject of an FS to evaluate potential remedies and future actions using the results of the updated risk assessments.

The HHRA indicated no COCs required remediation for the Resident Receptor in surface water. Only one COC (antimony) was identified in wet sediment that required further evaluation for the Resident Receptor.

The ERA indicated that the terrestrial and aquatic ecosystems, including a Category 3 wetland, are relatively healthy and functioning, and no preliminary cleanup values for ecological resources were recommended. The ERA concluded that remediation or removal of soil or sediment to reduce COPEC concentrations was not warranted and would cause more ecological damage than the contaminant reduction was worth.

3.2.4 2007 MMRP Site Investigation

The 2007 MMRP SI (e2M 2008) consisted of a meandering path magnetometer- and metal detector-assisted UXO survey conducted at all accessible dry areas of the MRS. Several subsurface anomalies were detected in the central and northwestern portions of the MRS, but no MEC was observed. Anomalies also were detected in the southwestern portion of the MRS, and a partially buried potential MEC item was found in the northwestern portion.

Based on the results of the Site Inspection (SI), further investigation was recommended in the flooded areas of the MRS for MEC and MC in wet sediment.

3.2.5 2012 MMRP Remedial Investigation

The 2012 MMRP RI (CB&I 2014) included a DGM investigation, an intrusive investigation of anomalies identified during the DGM investigation, wet sediment and surface water sampling to characterize nature and extent of contamination, an evaluation to determine the presence of MC, and a determination of whether unacceptable risks to human or ecological receptors associated with MEC/MD would require further actions.

No MEC was identified during the intrusive investigation activities; however, 33 MD items were identified at 5 of the exploratory trenches, and 29 MD items were identified at the point-source anomaly locations.

Three surface water samples and six incremental sampling methodology (ISM) wet sediment samples were collected. Surface water samples were collected at each of the main surface water areas: the North Surface Water Basin, the South Surface Water Basin, and the East Surface Water Basin.

3.2.6 2016 Supplemental Remedial Investigation

Using all available information, the Work Plan (Leidos 2016) recommended no further action to address sediment and surface water at EBG. Recent sampling for MC in wet sediment and surface water at EBG was comprehensive and representative of potential site-related constituents for all IRP and MMRP site activities for the following reasons:

- Results in sediment and surface water are consistent with the previous investigations under the IRP (i.e., Phase I RI and Phase II RI), which determined that detected contaminants in soil and dry sediment required no further action.
- Sediment samples collected under the MMRP are representative of the basins in their entirety.
- Sediment and surface water samples collected under the MMRP were collected in 2012, providing a representation of current concentrations.
- Analytes evaluated from sediment ISM samples and surface water samples collected under the MMRP are not limited to MC and include the full range of site-related contaminants (SRCs) identified during the Phase II RI (i.e., no data gaps between the IRP Phase II RI and the MMRP RI).

3.3 Open Demolition Area #2

ODA2 is situated in the central portion of CJAG and has an approximately 320-acre MRS assessed under the MMRP and a 35-acre AOC assessed under the IRP, as shown in Figure 5.

ODA2 is characterized by gently to steeply sloping topography on a weathered shale bedrock surface. Elevation across the AOC varies from approximately 1,017–1,071 ft amsl.

The primary surface water conveyance across the AOC is Sand Creek, which flows across the center of the site from west to east. Poorly drained soil is formed in silty clay loam or clay loam glacial till where bedrock is generally greater than 6 ft below ground surface (bgs). Runoff is typically medium to rapid, and the soil is seasonally wet.

ODA2 has been part of multiple RIs. In 2007, the *Record of Decision for Soil and Dry Sediment at Open Demolition Area #2 (RVAAP-04)* (SAIC 2007b) finalized the decisions regarding soil and dry sediment, but did not finalize decisions regarding wet sediment and surface water.

The Preliminary Assessment conducted in 1996 indicated that ODA2 is considered a high-priority AOC (USACE 1996). The following subsections summarize investigations performed at the site to assess sediment and surface water.

3.3.1 1998 Phase I Remedial Investigation

During a Phase I RI to assess high-priority AOCs (including ODA2), sediment samples were collected from three locations at areas north of Sand Creek. No explosives, pesticides, PCBs, or SVOCs were detected in the samples.

The Phase I RI Report (SAIC 1998) indicated that soil-related organic chemicals were not detected in stream sediment samples downstream from the AOC; therefore, it was assumed that contaminants are not migrating away from ODA2 via surface runoff.

3.3.2 2002/2003 Phase II Remedial Investigation

The ODA2 Phase II RI determined the nature and extent of sediment and surface water contamination. The HHRA and baseline ERA were summarized in the ODA2 Phase II RI Report (SAIC 2005d). One explosive, metals, SVOCs, and VOCs were identified as SRCs in sediment samples collected from the drainage ditches and Sand Creek. One explosive, metals, one SVOC, and VOCs were identified as SRCs in surface water samples collected from Sand Creek.

The HHRA evaluated risks and hazards for one receptor (Security Guard/Maintenance Worker). The Security Guard/Maintenance Worker receptor scenario included exposure to soil, but this receptor's scenario did not include exposure to sediment, surface water, or groundwater. One soil COC (arsenic) was identified for this receptor.

A Level II Screening Ecological Risk Assessment (SERA) was performed at ODA2 for soil, sediment, and surface water using Ohio EPA and guidance methods. The Level II SERA systematically removed chemicals from further consideration. Thirteen downstream COPECs and 12 upstream COPECs were retained for sediment. Nine downstream COPECs and seven upstream COPECs were retained for surface water. Based on the presence of multiple COPECs, the Phase II RI Report recommended further evaluation.

3.3.3 2006 Phase II Remedial Investigation Addendum

The *Addendum to the Phase II Remedial Investigation Report for Open Demolition Area #2 (RVAAP-04)* (SAIC 2006c) was performed to evaluate necessary CERCLA requirements with respect to chemical contamination in soil and dry sediment at ODA2. This investigation did not include the RCRA unit within the ODA2 boundary or the RRA. The Phase II RI Addendum did not address wet sediment, surface water, or groundwater.

The addendum recommended no further action with respect to soil chemical contamination to be protective of the Security Guard/ Maintenance Worker and the environment, which was further documented in the ODA2 ROD for soil and dry sediment (SAIC 2007b).

3.3.4 2007 MMRP Site Investigation

During MMRP SI fieldwork, a meandering path magnetometer- and metal detector-assisted UXO survey was conducted at all accessible dry areas of the MRS (e2M 2008). MEC items were found on and protruding through the ground surface at the RRA, Bomb Disposal Area, Burial Site 2, and on the hill across Sand Creek from the RRA.

3.3.5 2009/2011 Rocket Ridge Area Removal Actions

The RRA is located adjacent to Sand Creek within ODA2. The RRA was likely used for disposing of demilitarized munitions, although not all munitions had been completely demilitarized. The RRA was remediated under two time-critical removal actions (TCRAs) that occurred in 2009 and 2011. Between July and August 2009, the first TCRA was conducted within the RRA in order to mitigate immediate explosive hazards (PIKA 2009). Additional activities in 2009 included the following:

- Investigating three 500-lb high explosive, general purpose (HEGP) bombs and blow-in-place destruction of one 105-mm projectile;

- Removing acceptable-to-move AN-M Series 500-lb HEGP bombs or providing the best recommendation to address unacceptable-to-move (if required) AN-M Series 500-lb HEGP bombs;
- Performing a radiation screening survey of the RRA; and
- Conducting an instrument-assisted MEC/MD density survey of the RRA MRS to determine and mark linear site boundaries and to determine the extent of contamination to assess the potential explosive hazards known to be present.

The second TCRA, conducted between April and November 2011, was completed as a follow up to remove all of the material potentially presenting an explosives hazard from the RRA, including all soil found to contain explosives with concentrations greater than 10% explosives by weight for secondary explosives.

After the MEC operations, confirmation sampling was performed to verify that secondary explosives concentrations in surface soil were less than 10% by weight and to verify the removal of white phosphorus contamination. Two ISM surface soil samples and one ISM dry sediment sample were collected for confirmatory analyses following the TCRA at the RRA to assess the adequacy of the removal action and to ensure that no residual contamination remained after remediation activities were complete (CB&I 2015c).

3.3.6 2011 MMRP Remedial Investigation

In 2011, an RI under the MMRP was conducted (CB&I 2015c). This RI included a subsurface investigation led by a magnetometer (mag and dig), an intrusive investigation of anomalies identified during a DGM investigation, soil sampling to characterize nature and extent of contamination and evaluate for MC, and a determination of whether unacceptable risks to human or ecological receptors associated with MEC/MD would require further actions.

No MEC was found during the evaluation of accessible areas of the stream and wetlands. However, the MMRP RI (CB&I 2015c) indicated that due to the presence of MEC within the MRS, MEC could potentially be present in uninvestigated areas of Sand Creek and associated wetland areas in the MRS.

The HHRA indicated that detected MC in surface and subsurface soil are not present at concentrations great enough to pose risks to the Security Guard/Maintenance Worker and the National Guard Trainee, the representative receptors for the future land use. The ERA indicated that detected MC may pose potential threats to likely ecological receptors in the terrestrial environment, particularly to the short-tailed shrew and American robin in surface soil. The RI recommended an FS be conducted for ODA2 to address remaining MEC/MD.

3.3.7 2016 Supplemental Remedial Investigation

The Work Plan (Leidos 2016) determined that no additional surface water or sediment samples were required for ODA2 to determine nature and extent of contamination and make risk assessment decisions in the Supplemental RI.

The COIs for exposure of Resident Receptors (Adult and Child) identified in the Supplemental RI in sediment and surface water are presented below:

- SVOCs were not detected in surface water. Ten metals were detected above their facility-wide background concentrations, along with two VOCs (carbon disulfide and chloroform), nitrate/nitrite, sulfide, and five explosives/propellants (1,3,5-trinitrobenzene; octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine; nitro-benzene; nitrocellulose; RDX). Of these COIs, three metals (arsenic, manganese, thallium) exceeded the tap water RSLs in surface water at ODA2.

- Thirteen metals, nitrate/nitrite, sulfide, one propellant (nitrocellulose), two SVOCs (bis[2-ethylhexyl]phthalate, di-n-butyl phthalate), PCB-1260, and two VOCs (2-butanone, chloroform) were considered COIs for wet sediment at ODA2. Of these COIs, only hexavalent chromium exceeded the residential RSL in sediment at ODA2.

The extent of metals and organic concentrations exceeding RSLs is shown in Figure 5.

3.3.8 Time Critical Removal Action

A TCRA is being conducted at ODA2 to mitigate significant explosive safety hazards posed to the National Guard Trainee due to exposure to MEC/MPPEH that are a result of intentional detonations and potential burial of MEC and bulk explosives in site surface and subsurface soil. Although this TCRA does not take place in the sediment and surface water media discussed in this PP, best management practices (BMPs) are employed to ensure there is not a release of MC to the environment. These BMPs include site inspections, inspections of the stream, site restoration, and revegetation.

3.4 Fuze and Booster Quarry Landfill/Ponds

FBQ is located in the central portion of CJAG (Figure 6) and includes the approximately 5-acre MRS evaluated under the MMRP and the 45-acre AOC evaluated under the IRP. The site consists of 11 small, shallow settling basins at the western portion of the site; 3 man-made quarry ponds at the eastern portion of the site; a drainage ditch leading from the quarry ponds to the settling basins; gravel access roads; and debris piles.

The wet sediment and surface water at this site consist of the quarry ponds. Based on the underwater investigation performed during the MMRP RI (CB&I 2015a), the maximum depth of water at the ponds is approximately 10 ft at the northern portion of the southern pond, but the average water depth of the three quarry ponds was approximately 6–7 ft. The ponds are separated by earthen berms, and were constructed to receive spent brine regenerate, groundwater iron oxide filtrant, and sand filtration backwash water discharge from one of the former RVAAP water plants. The discharge continued until 1993 and was regulated under a National Pollutant Discharge Elimination System permit. The southern two quarry ponds are filled with water year round. Water is typically present in the northern pond; however, water levels can vary widely, and sometimes no water is present during very dry periods. Surface water flows in the ponds from north to south through a series of gated culverts between the three ponds. Surface water overflow exits the southernmost pond through a culvert to the drainage ditch at the southwestern corner of the pond (CB&I 2015a).

FBQ is characterized by gently sloping to relatively flat-lying topography on a weathered sandstone bedrock surface. Elevations across the areas vary from approximately 1,088–1,160 ft amsl. Surface water generally flows to the southwest where it eventually flows to the unnamed tributary to Hinkley Creek (SAIC 2005a). Poorly drained soil is formed in silty clay loam or clay loam glacial till where bedrock is generally greater than 6 ft bgs. Runoff is typically medium to rapid, and the soil is seasonally wet.

FBQ has been part of multiple RIs. In 2007, the *Record of Decision for Soil and Dry Sediment at the Fuze and Booster Quarry Landfill/Ponds* (SAIC 2007c) was finalized. The ROD addressed soil and dry sediment (which included the 11 settling basins and drainage ditch), resulting in the removal of 184 tons of contaminated dry sediment from the drainage ditch. Subsequent to this remedial action, no further action was required for soil or dry sediment to be protective of human health and the environment. The wet sediment and surface water media within the quarry ponds were not included in the final decisions associated with the ROD.

FBQ has been included in various site evaluations and RIs. A Relative Risk Site Evaluation (USACHPPM 1996) classified FBQ as a high-priority AOC. The following subsections summarize investigations performed at the site to assess sediment and surface water.

3.4.1 2003/2004 Phase I/Phase II Remedial Investigation

The FBQ Phase I/Phase II RI was performed to assess soil, sediment, surface water, and groundwater at FBQ. During the RI activities, 17 sediment samples and 4 surface water samples were collected from the quarry ponds.

The FBQ Phase I/Phase II RI Report (SAIC 2005a) recommended that decision makers carefully consider the need for further investigation or remedial action based on the calculated risks using these data.

3.4.2 2003 Facility-wide Biological Water Quality Study

Two surface water samples and one ISM sediment sample were collected from a quarry pond at FBQ during the 2003 *Facility-wide Biological Water Quality Study* (USACE 2005). The samples were analyzed for target analyte list metals, SVOCs, PCBs, pesticides, explosive compounds, percent solids, cyanide, ammonia, nitrate, and phosphorus. The report determined that surface water and sediment quality was sufficient to not adversely impact the biological community.

3.4.3 2006 Soil and Dry Sediment Feasibility Study

The *Feasibility Study for Fuze and Booster Quarry Landfill/Ponds (RVAAP-16)* (SAIC 2006d) primarily focused on soil and dry sediment at FBQ. The FS recommended remediation within the drainage ditch (west of and downstream from the quarry ponds), which resulted in the removal of 184 tons of contaminated dry sediment in 2009 (SAIC 2010). The settling basins at FBQ were also considered dry sediment and were determined not to have COCs requiring remediation.

The quarry ponds are rarely without surface water; therefore, the quarry pond sample aggregate was considered wet sediment. For the wet sediment within the quarry ponds, initial COCs were identified for the Resident Receptor, and no COCs were identified in surface water.

3.4.4 2007 MMRP Site Investigation

The MMRP SI (e2M 2008) included a meandering path with a magnetometer- and metal detector-assisted UXO survey, which was conducted on the banks and surrounding areas at all three ponds.

No MEC was observed; however, MD was found at the southeastern side of the southern pond. In addition, many subsurface anomalies, presumed to represent buried MD and potentially MEC, were detected along the eastern and northern sides of the northern pond, the east side of the central pond, and the southern and eastern sides of the southern pond.

Based on the results of the MMRP SI, further characterization of the ponds was recommended to assess the buried anomalies and the MRS footprint was reduced to the 4.92-acre area, including the three ponds and their associated banks.

3.4.5 2011 MMRP Remedial Investigation

In 2011, an MMRP RI (CB&I 2015a) was conducted. This RI included a DGM investigation, an intrusive investigation of anomalies identified during the DGM investigation, an underwater investigation to identify if MEC/MD were present in the quarry pond sediment, sampling of wet sediment to characterize nature and extent of contamination and evaluate for MC, and a determination of whether unacceptable risks to human or ecological receptors associated with MEC/MD would require further actions.

No MEC/MD were found in the ponds during the underwater investigation. Four wet sediment samples were collected from the quarry ponds during the RI field activities. No explosives or propellants were detected in the wet sediment samples. An HHRA was conducted to determine if the SRCs may pose a risk to the National Guard Trainee or Resident Receptor. The Resident Receptor COCs in wet sediment consisted of antimony, iron, lead, mercury, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and Aroclor-1254. No COCs were identified in the wet sediment samples for the National Guard Trainee. The potential for impact to ecological receptors in the aquatic environment from SRCs in wet sediment was identified in the ERA.

3.4.6 2016 Supplemental Remedial Investigation

The Work Plan (Leidos 2016) included a data gap analysis, and it was determined that no additional surface water or sediment samples were required for FBQ to determine nature and extent and make risk assessment decisions in the Supplemental RI.

The COIs for exposure of Resident Receptors (Adult and Child) identified in the Supplemental RI in sediment and surface water are presented below:

- PCBs were not detected in surface water. Ten metals were detected above the facility-wide background concentrations, along with two VOCs (acetone, methylene chloride), two SVOCs (bis[2-ethylhexyl]phthalate, di-n-butyl phthalate), nitrocellulose, and nitrate/ nitrite. Of these COIs, only antimony exceeded the tap water RSLs in surface water at FBQ.
- VOCs, explosives, or nitrate/nitrite were not detected in wet sediment. A total of 11 metals, PCB-1254, and 21 SVOCs (primarily PAHs) are considered COIs for wet sediment at FBQ. Of these COIs, antimony, lead, mercury, and benzo(a)pyrene exceeded the residential RSL in sediment at FBQ.

The extent of metals and organic concentrations exceeding RSLs is shown in Figure 6.

3.5 Ramsdell Quarry Landfill MRS Area 2

RQL MRS Area 2 is located in the northeastern portion of CJAG, south of RQL and north of Load Line 1 (Figure 7). RQL MRS Area 2 is an approximately 7-acre area that contains a small, inactive soil borrow pit and wooded area where Installation personnel had previously found MD (e2M 2008).

The topography at RQL Area 2 is relatively flat with ground surface elevations gradually ranging upgradient to the west from approximately 975–990 ft amsl. Approximately 0.5 acres of wetland were identifed in the former soil borrow pit at the eastern portion of RQL Area 2.

Surface water flows to the east toward the borrow pit during heavy rainfall events. Moderately deep, somewhat poorly drained soil is formed in glacial till overlying sandstone bedrock. The average soil depth to bedrock is approximately 5 ft bgs with areas of exposed bedrock at the former soil borrow pit (SAIC 2005b).

Since 2007, RQL MRS Area 2 has undergone an SI and RI under the MMRP. The following subsections summarize investigations performed at the site to assess sediment and surface water.

3.5.1 2007 MMRP Site Investigation

The MMRP SI (e2M 2008) consisted of a line abreast and a meandering path magnetometer- and metal detector-assisted UXO survey totaling approximately 2 acres. Debris items, including one empty 105-mm ceremonial shot cartridge and one empty 155-mm shot round, were found at two locations within the MRS, with one location at the soil borrow pit. Four

additional ISM surface soil samples were collected and analyzed for explosives, propellants, and target analyte list metals. Lead and manganese identified as MC were detected in one sample at concentrations greater than background values.

The SI Report (e2M 2008) stated additional characterization of MEC was necessary in the southern soil borrow pit based on the presence of MC.

3.5.2 2011 MMRP Remedial Investigation

Areas of concentrated MD were encountered during the intrusive investigation activities at RQL Area 2, and two ISM surface soil samples were collected at locations that were biased to where MC would be expected to be found (CB&I 2015b).

The risk assessments for MC indicated the detected SRCs in soil at RQL Area 2 did not pose risks to human or ecological receptors (CB&I 2015b), although sediment and surface water present at the former soil borrow pit and nearby wetlands were not sampled.

3.5.3 2016 Supplemental Remedial Investigation

Following the historical review of investigations conducted at RQL MRS Area 2, it was determined that further investigation was warranted to determine the nature and extent of any contamination resulting from previous activities concerning MD (Leidos 2017).

Four discrete sediment samples were collected in October 2016 and analyzed for metals, SVOCs, nitrocellulose, explosives/propellants, PCBs, total organic carbon, and pH. No surface water samples could be collected because no water was present during the October 2016 sampling event.

A total of 10 metals, PCB-1260, 16 SVOCs (primarily PAHs), and 2 explosives/propellants (nitrocellulose, nitroguanidine) were considered COIs for wet sediment at RQL MRS Area 2. There were no COIs for surface water at RQL MRS Area 2 because no surface water samples were collected.

None of the COIs exceeded the RSLs; thus, no data are presented in Figure 7.

3.6 Block D Igloo MRS

The Block D Igloo MRS is located in the north-central portion of CJAG (Figure 8). The Block D Igloo MRS consists of the area contained within the suspected debris field that resulted when Igloo 7-D-15 ("D" Block) accidentally exploded on March 24, 1943. The slab of Igloo 7-D-15 is the only remaining part of the bunker.

Surface water drainage for the MRS and surrounding area follows the topography toward the southeast. An unnamed tributary to Sand Creek begins approximately 1,000 ft southeast of the former igloo footprint and flows east to southeast. Sand Creek ultimately enters the downstream perennial headwater stream to the Michael J. Kirwan reservoir.

Since 2007, the Block D Igloo MRS has undergone an SI and RI under the MMRP. The following subsections summarize investigations performed at the site to assess sediment and surface water.

3.6.1 2007 MMRP Site Investigation

The MMRP SI (e2M 2008) consisted of a meandering path magnetometer-assisted UXO survey around the former igloo and at four documented locations where debris was found, totaling approximately 6 acres.

No MEC/MD were found lying on the ground within the interior of the former igloo and within a circumference of approximately 100 ft surrounding this area. Several subsurface anomalies were recorded within the former igloo and may be attributed to the remnants of the reinforced concrete floor, but no subsurface anomalies were detected in the 100-ft circumference surrounding the igloo.

At the four documented debris locations, no visual evidence of MEC/MD was found and very few subsurface anomalies were detected.

3.6.2 2011 MMRP Remedial Investigation

Sampling for MC conducted at the Block D Igloo MRS determined that none of the detected soil SRCs posed any risk to human or ecological receptors (CB&I 2015d). Sediment and surface water samples were not collected from several small wetlands and a floodplain along the unnamed tributary to Sand Creek; however, MEC/MD were not observed in surface water or sediment during the visual survey. The SRCs detected in the surrounding terrestrial environments were low and were determined not to pose risks to likely human or ecological receptors. Therefore, the aquatic environments, including sediment and surface water, are considered incomplete MC exposure pathways for the receptors.

3.6.3 2016 Supplemental Remedial Investigation

Using all existing information collected during the MMRP RI, the Work Plan (Leidos 2016) concluded that no additional investigation or sampling is needed. MEC/MD were not observed in sediment or surface water, and SRCs detected in the surrounding terrestrial environments were low and were determined not to pose risks to likely human or ecological receptors. Therefore, the aquatic environments, including sediment and surface water, are considered incomplete MC exposure pathways for the receptors.

4.0 SCOPE AND ROLE OF RESPONSE ACTION AND LAND USE

ARNG, in coordination with Ohio EPA, is implementing the IRP with the overall program strategy of addressing the principal environmental threats at each site posing a risk to applicable receptors. This PP addresses sediment and surface water. The response action for these media at these six sites is being conducted to meet this overall program strategy. Groundwater will be addressed under the RVAAP Facility-wide Groundwater AOC (RVAAP-66) as a separate decision. However, the selected remedy also must be protective of groundwater.

The potential future uses for these six sites are Military Training Land Use or Commercial/Industrial Land Use. Although residential use is not anticipated at CJAG or at these six sites, Unrestricted (Residential) Land Use was evaluated in accordance with the Defense Environmental Restoration Program (DERP) Manual 4715.20 (DoD 2012) in order to make appropriate risk management decisions.

Resident Receptor (Adult and Child) Facility-wide Cleanup Goals (FWCUGs) were used to conduct an Unrestricted (Residential) Land Use evaluation. Sites which meet the standards for Unrestricted (Residential) Land Use are considered protective for Military Training and Commercial Industrial Land Uses also. The proposed response actions at these six sites will be implemented under the authority of and in accordance with the requirements of the *Ohio EPA Director's Final Findings and Orders*, dated June 10, 2004 (Ohio EPA 2004).

5.0 SUMMARY OF SITE RISKS

The Work Plan (Leidos 2016) concluded that additional sampling was necessary at RQL Area 1 and RQL Area 2 to complete the assessment of sediment and surface water at these sites. No additional sampling was necessary at ODA2 and FBQ; these sites were recommended for risk assessment decisions. For these four sites, the Supplemental RI (Leidos 2017) summarized all sediment and surface water data, provided risk assessments, and evaluated the Resident Receptor (Adult and Child) and the Industrial Receptor (U.S. Environmental Protection Agency [USEPA] Composite Worker) to be protective of full-time occupational exposures, including Military Training Land Use. The following sections summarize the risk assessments.

Using information available prior to 2016, the Work Plan (Leidos 2016) concluded that EBG

and Block D Igloo did not require additional sampling or evaluation and can be recommended for no further action for sediment and surface water.

5.1 Human Health Risk Assessment

The media evaluated in the HHRA for the Resident Receptor (Adult and Child) were sediment and surface water at RQL Area 1, ODA2, FBQ, and RQL MRS Area 2.

The HHRA evaluated COIs identified in the Work Plan (Leidos 2016) to determine if there are sediment or surface water COCs requiring remediation at the four sites. The methodology of comparing exposure concentrations to RSLs and determining COCs generally follows guidance presented in the *Position Paper for Human Health Cleanup Goals* (USACE 2012) and Technical Memorandum (ARNG 2014) and includes calculating a sum-of-ratios (SOR) for all non-carcinogenic and carcinogenic chemicals. The reported concentration in each sample was compared to RSLs (i.e., the exposure point concentration [EPC] is the concentration in each individual sample).

COIs were identified as COCs for a given receptor if:

1. The EPC exceeds the most stringent RSL for either the 1E-05 target cancer risk or the target hazard quotient of 1; or
2. The SOR for all carcinogens or non-carcinogens that may affect the same organ is greater than 1. Chemicals contributing more than 5–10% to an SOR greater than 1 are also considered COCs.

The HHRA identified COCs and conducted risk management analysis to determine if COCs pose unacceptable risk to the Resident Receptor. If there is no unacceptable risk to the Resident Receptor, it can be concluded that no further action is required from a human health perspective. The results of the HHRA for the sites are provided below.

5.1.1 Ramsdell Quarry Landfill Area 1

Aluminum, arsenic, cobalt, lead, manganese, thallium, and aldrin exceed the tap water RSLs for the Resident Receptor and were identified as COCs in surface water. The EPCs of all COCs are well below calculated RSLs for seasonal use of surface water for recreation (e.g., wading) by a resident with the corresponding SORs less than 1. Thus, these COCs are not recommended for potential remediation.

Arsenic, manganese, thallium, and benzo(a)pyrene exceeded the residential soil RSLs and were identified as COCs in sediment. Cobalt and four additional PAHs contribute to SORs above 1 and were also identified as COCs. The EPCs of all COCs are well below calculated RSLs for seasonal use of surface water for recreation (e.g., wading) by a resident with the corresponding SORs less than 1. Thus, these COCs are not recommended for potential remediation.

5.1.2 Open Demolition Area #2

Arsenic, manganese, and thallium exceeded the tap water RSLs for the Resident Receptor and were identified as COCs in surface water. The maximum detected concentrations of all COCs are well below calculated RSLs for recreational use by a resident with the corresponding SORs less than 1. Thus, these COCs are not recommended for potential remediation.

The detected concentration of hexavalent chromium in one of six samples exceeded the soil RSL for the Resident Receptor and contributed to an SOR above 1. Hexavalent chromium was identified as a COC in sediment. The single hexavalent chromium detection is not recommended for potential remediation because the estimated risk is very close to the target risk even using the very conservative residential soil RSL.

5.1.3 Fuze and Booster Quarry Landfill/Ponds

The concentration of antimony slightly exceeded the tap water RSL for the Resident Receptor in one location; thus, antimony was identified as a COC in surface water. The detected concentration of antimony was well below the calculated RSL for recreational use by a resident with the corresponding SORs less than 1. Thus, this COC was not recommended for potential remediation.

Concentrations of antimony, lead, mercury, and benzo(a)pyrene exceed the soil RSLs for the Resident Receptor and were identified as COCs in sediment in one or more of the pond exposure units. While the detected concentrations slightly exceed the residential soil RSLs, they are well below the calculated sediment RSLs, and these metals and PAHs are not recommended for potential remediation. Hexavalent chromium and the PAHs benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene contribute to one or more SORs above 1. No COCs were identified for potential remediation within the Northern Pond, Central Pond, or Southern Pond at FBQ because the estimated risks are very close to the target risk even using the very conservative residential soil RSLs.

5.1.4 Ramsdell Quarry Landfill MRS Area 2

Because surface water was not present and no COCs were identified in sediment, no COCs were identified for further evaluation in an FS for surface water or sediment at RQL MRS Area 2.

5.2 Ecological Risk Assessment

To assess the potential ecological risk at RQL Area 1, ODA2, FBQ, and RQL MRS Area 2, the Supplemental RI included ERAs for sediment and surface water in accordance with the Level I Scoping ERA and Level II Screening ERA outlined in the *Guidance for Conducting Ecological Risk Assessments* (Ohio EPA 2008) with specific application of components from other ecological risk guidance such as *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA 1997).

A Level I ERA was conducted for RQL Area 1, ODA2, FBQ, and RQL MRS Area 2 to determine the presence/absence of important ecological places and resources and the presence of contamination. Perennial surface water in creeks and/or ponds and wetlands are important ecological resources at these four sites. Because contamination and important/significant ecological resources exist at RQL Area 1, ODA2, and FBQ, the ERAs continued to a Level II Screening ERA.

The Level II Screening ERA identified procedures to determine integrated COIs for each site and defined habitats/environmental setting, suspected contaminants, and possible exposure pathways. Technical and refinement factors were then used to refine the integrated COIs from the Level II Screening ERA. The factors included use of mean exposure concentrations and discussion of approved ecological screening values and other topics. This type of assessment is Step 3A in the ERA process (USEPA 1997). Step 3A refined the list of integrated COIs to determine if there are chemicals of ecological concern (COECs) requiring further evaluation in Level III or remediation to protect ecological receptors, or integrated COIs can be eliminated from further consideration. This evaluation is an important part of Level II and is adapted from USEPA Step 3A, outlined in the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA 1997) and *Risk Assessment Handbook Volume II: Environmental Evaluation* (USACE 2010).

For RQL Area 1, ODA2, and FBQ, the evaluation in Step 3A showed there is no ecological concern. Consequently, the ERAs for RQL Area 1, ODA2, and FBQ concluded with Level II that no further action is necessary to be protective of important ecological

resources. The ERA for the RQL MRS Area 2 AOC concluded with a Level I Scoping ERA and a recommendation that no further action is required to be protective of ecological resources.

5.3 Impacts to Groundwater

The potential for sediment contaminants to impact groundwater was evaluated in a fate and transport evaluation. All of the SRCs identified in sediment were evaluated through the stepwise fate and transport evaluation.

Sediment screening analysis was performed by calculating chemical-specific dilution attenuation factors using co-located sediment and surface water concentrations for sediment SRCs at RQL Area 1, ODA2, and FBQ. These dilution attenuation factors were used to identify the initial sediment contaminant migration chemicals of potential concern based on RVAAP facility-wide background concentrations and the lowest risk-based screening criteria. Because surface water was not present at RQL MRS Area 2, and concentrations of sediment SRCs in groundwater did not exceed any criteria, a fate and transport evaluation was not necessary for this MRS and no further action is required for sediment at RQL MRS Area 2 for the protection of groundwater.

A qualitative assessment of the sample results was performed and the limitations and assumptions of the models were considered to identify if constituents are present in sediment that may impact the groundwater. This qualitative assessment concluded that no constituents were present in sediment that may impact the groundwater beneath their respective sources or at the downstream receptor locations. Therefore, no further action is required for sediment at RQL Area 1, ODA2, FBQ, and RQL MRS Area 2 for the protection of groundwater.

6.0 CONCLUSIONS

Based on the investigation results, sediment and surface water at RQL Area 1, EBG, ODA2, FBQ, RQL MRS Area 2, and Block D Igloo MRS have been adequately characterized and the recommended path forward is no further action for sediment and surface water to attain Unrestricted (Residential) Land Use.

Further investigation is not warranted at these sites because 1) the current nature and extent of impacted media has been sufficiently characterized, 2) the fate and transport modeling did not identify sediment contaminant migration chemicals of concern (CMCOCs) requiring further evaluation or remediation to protect groundwater, 3) no CERCLA release-related human health COCs were identified in surface water or sediment requiring evaluation in an FS or remediation, and 4) remedial actions to protect ecological resources are not warranted.

7.0 COMMUNITY PARTICIPATION

ARNG, in coordination with Ohio EPA, is soliciting input from the community on the no further action recommendation for the sites in this PP.

7.1 Public Comment Period

The 30-day comment period is from August 12, 2019 to September 10, 2019, and provides an opportunity for public involvement in the decision-making process for the proposed action. This period includes a public meeting at which ARNG will present this PP.

All public comments will be considered by ARNG and Ohio EPA before selecting a remedy. During the comment period, the public is encouraged to review documents pertinent to RQL Area 1, EBG, ODA2, FBQ, RQL MRS Area 2, and Block D Igloo.

This information is available at the Information Repositories and online at www.rvaap.org. To obtain further information, contact Kathryn Tait of the CJAG Environmental Office at kathryn.s.tait.nfg@mail.mil.

7.2 Written Comments

If the public would like to comment in writing on this PP or other relevant issues, please deliver comments to ARNG at the public meeting or mail written comments (postmarked no later than September 10, 2019).

POINT OF CONTACT FOR WRITTEN COMMENTS

Mailing Address:
Camp James A. Garfield Joint Military Training Center
Environmental Office
Attn: Kathryn Tait
1438 State Route 534 SW
Newton Falls, Ohio 44444

Email Address:
kathryn.s.tait.nfg@mail.mil

7.3 Public Meeting

ARNG will hold an open house and public meeting on this PP on August 29, 2019, at 6:00PM, in the Charlestown Town Hall, 6735 Rock Spring Road, Ravenna, Ohio 44266 to accept comments.

This meeting will provide an opportunity for the public to comment on the proposed action. Comments made at the meeting will be transcribed.

7.4 Review of Public Comments

ARNG will review the public's comments as part of the process in reaching a final decision for the most appropriate action to be taken.

The Responsiveness Summary, a document that summarizes ARNG's responses to comments received during the public comment period, will be included in the ROD.

ARNG's final choice of action will be documented in the ROD. The ROD will be added to the RVAAP Restoration Program Administrative Record and Information Repositories.

INFORMATION REPOSITORIES

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266
(330) 296-2827

Hours of operation:
9AM-9PM Monday-Thursday
9AM-6PM Friday
9AM-5PM Saturday
1PM-5PM Sunday

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444
(330) 872-1282

Hours of operation:
9AM-8PM Monday-Thursday
9AM-5PM Friday and Saturday

Online
http://www.rvaap.org/

ADMINISTRATIVE RECORD FILE

Camp James A. Garfield Joint Military Training Center (former Ravenna Army Ammunition Plant)
Environmental Office
1438 State Route 534 SW
Newton Falls, Ohio 44444
(614) 336-6136

Note: Access is restricted to Camp James A. Garfield, but the file can be obtained or viewed with prior notice.

GLOSSARY OF TERMS

Administrative Record: a collection of documents, typically reports and correspondence, generated during site investigation and remedial activities. Information in the Administrative Record represents the information used to select the preferred alternative.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): a Federal law passed in 1980, commonly referred to as the Superfund Program. It provides liability, compensation, cleanup, and emergency response in connection with the cleanup of inactive hazardous substance release sites that endanger public health or the environment.

Contaminant Migration Chemical of Concern (CMCOC): a chemical substance specific to an area of concern that potentially poses significant potential to leach to groundwater at a concentration above human health risks goals. CMCOCs are typically further evaluated for remedial action.

Chemical of Concern (COC): a chemical substance specific to an area of concern that potentially poses significant human health or ecological risks. COCs are typically further evaluated for remedial action.

Chemical of Ecological Concern (COEC): a chemical substance specific to an area of concern that potentially poses ecological risks and requires further evaluation in the RI. COECs are typically not evaluated for remedial action.

Ecological Receptor: a plant, animal, or habitat exposed to an adverse condition.

Exposure Point Concentration (EPC): in accordance with the *RVAAP Facility-wide Human Health Risk Assessors Manual – Amendment 1* (USACE 2005), the EPC is the calculated 95 percent upper confidence limit of the mean concentration of a chemical or the maximum detected concentration of a chemical, whichever value is lowest.

Human Receptor: a hypothetical person, based on current or potential future land use, who may be exposed to an adverse condition. For example, the National Guard Trainee is considered the hypothetical person when evaluating Military Training Land Use at the former RVAAP.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): the set of regulations that implement CERCLA and address responses to hazardous substances and pollutants or contaminants.

Record of Decision (ROD): a signed legal record that describes the cleanup action or remedy selected for a site, the basis for selecting that remedy, public comments, and responses to comments.

Remedial Investigation (RI): a CERCLA investigation that involves sampling environmental media, such as air, soil, and water, to determine the nature and extent of contamination and to calculate human health and environmental risks that result from the contamination.

Responsiveness Summary: a section of the ROD that documents and responds to written and oral comments received from the public about the PP.

Risk Assessment: an evaluation that determines potential harmful effects, or lack thereof, posed to human health and the environment due to exposure to chemicals found at a CERCLA site.

Sum-of-Ratio (SOR): to adjust for multiple chemicals, divide the standard for each COC by the number of COCs. The adjusted value can then be compared to the single chemical value, and each ratio summed. If the summed ratios are less than one, the applicable standards are met. If summed ratios exceed one, the applicable standards are not met.

Target Risk: the Ohio Environmental Protection Agency (2009) identifies 1E-05 as a target for cancer risk for carcinogens and an acceptable target hazard quotient of 1 for non-carcinogens.

Unrestricted (Residential) Land Use: defined for the former RVAAP restoration that is considered protective for all three land uses at Camp James A. Garfield. If an AOC meets the requirements for Unrestricted (Residential) Land Use, then the AOC can also be used for Military Training and Commercial/Industrial purposes.

REFERENCES

ARNG (Army National Guard-ILE Cleanup) 2014. *Final Technical Memorandum: Land Uses and Revised Risk Assessment Process for the Ravenna Army Ammunition Plant (RVAAP) Installation Restoration Program, Portage/Trumbull Counties, Ohio*. Memorandum between ARNG-ILE Cleanup and the Ohio Environmental Protection Agency. February 2014.

CB&I (CB&I Federal Services, LLC) 2014. *Final Remedial Investigation Report for RVAAP-002-R-01 Erie Burning Grounds MRS0*. August 2014.

CB&I 2015a. *Final Remedial Investigation Report for RVAAP-016-R-01 Fuze and Booster Quarry MRS.* June 2015.

CB&I 2015b. *Final Remedial Investigation Report for RVAAP-001-R-01 Ramsdell Quarry Landfill MRS.* January 2015.

CB&I 2015c. *Final Remedial Investigation Report for RVAAP-004-R-01 Open Demolition Area #2 MRS*. February 2015.

CB&I 2015d. *Remedial Investigation Report for RVAAP-019-R-01 Landfill North of Winklepeck MRS and RVAAP-060-R-01 Block D Igloo MRS*. March 2015.

DoD (U.S. Department of Defense) 2012. *Defense Environmental Restoration Program (DERP) Management Manual*. Number 4715.20. March 2012.

e2M (Engineering-Environmental Management, Inc.) 2008. *Final Site Inspection Report, Ravenna Army Ammunition Plant, Ohio, Military Munitions Response Sites.* May 2008.

Jacobs (Jacobs Engineering Group, Inc.) 1989. *Environmental Protection Agency Technical Enforcement Support at Hazardous Waste Sites, Ravenna Army Ammunition Plant, Ravenna, Ohio, RCRA Facility Assessment, RR/VSI Report*. October 1989.

Leidos 2016. *Remedial Investigation Work Plan for Sediment and Surface Water at RVAAP-01, RVAAP-04, RVAAP-16, RVAAP-001-R-01, and Inventory of Sediment and Surface Water at Multiple Sites Ravenna Army Ammunition Plant, Ravenna, Ohio*. August 2016.

Leidos 2017. *Supplemental Remedial Investigation for Sediment and Surface Water at RVAAP-01, RVAAP-04, RVAAP-16, RVAAP-001-R-01, Ravenna Army Ammunition Plant, Ravenna, Ohio*. November 2017.

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

Ohio EPA 2008. *Guidance for Conducting Ecological Risk Assessments.* Ohio EPA Division of Environmental Response and Revitalization: April 2008.

Ohio EPA 2009. *Technical Decision Compendium: Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for DERR Remedial Response Program*. August 2009.

PIKA (PIKA International, Inc.) 2009. *Removal Action Report for the Time Critical Removal Action (TCRA) at the Rocket Ridge Area (RRA) within RVAAP-004-R-01 Open Demolition Area #2 MRS*. December 2009.

SAIC (Science Applications International Corporation) 1998. *Phase I Remedial Investigation Report for the Phase I Remedial Investigation of High Priority Areas of Concern at the Ravenna Army Ammunition Plant, Volume 1, Ravenna, Ohio*. February 1998.

SAIC 2001. *Phase I Remedial Investigation Report for the Erie Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. December 2001.

SAIC 2005a. *Phase I/Phase II Remedial Investigation of the Fuze and Booster Quarry Landfill/Ponds (RVAAP-16) Volume 1-Main Report*. November 2005.

SAIC 2005b. *Phase I Remedial Investigation Report, Ramsdell Quarry Landfill at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. September 2005.

SAIC 2005c. *Phase II Remedial Investigation Report for Erie Burning Grounds (RVAAP-02) at the Ravenna Army Ammunition Plant*. September 2005.

SAIC 2005d. *Phase II Remedial Investigation Report for the Open Demolition Area #2 (RVAAP-04) at the Ravenna Army Ammunition Plant, Ravenna, Ohio,* Volume 1. September 2005.

SAIC 2006a. *Feasibility Study for Ramsdell Quarry Landfill (RVAAP-01), Ravenna Army Ammunition Plant, Ravenna, Ohio*. October 2006.

SAIC 2006b. *Addendum to the Phase II Remedial Investigation Report for Erie Burning Grounds (RVAAP-02)*. September 2006.

SAIC 2006c. *Addendum to the Phase II Remedial Investigation Report for Open Demolition Area #2 (RVAAP-04), Ravenna Army Ammunition Plant, Ravenna, Ohio*. September 2006.

SAIC 2006d. *Feasibility Study for Fuze and Booster Quarry Landfill/Ponds (RVAAP-16), Ravenna Army Ammunition Plant, Ravenna, Ohio*. July 2006.

SAIC 2007a. *Record of Decision for Soil and Dry Sediment at Erie Burning Grounds (RVAAP-02).* September 2007.

SAIC 2007b. *Record of Decision for Soil and Dry Sediment at the Open Demolition Area #2 (RVAAP-04).* September 2007.

SAIC 2007c. *Record of Decision for Soil and Dry Sediment at the Fuze and Booster Quarry Landfill/Ponds (RVAAP-16)*. September 2007.

SAIC 2010. *Remedial Action Report for the RVAAP-16 Fuze and Booster Quarry Landfill/Ponds*. March 2010.

SAIC 2013. *Record of Decision Amendment for Soils and Dry Sediment at the RVAAP-01 Ramsdell Quarry Landfill, Ravenna Army Ammunition Plant, Ravenna, Ohio*.

USACE (U.S. Army Corps of Engineers) 1996. *Preliminary Assessment for the Characterization of Areas of Contamination Ravenna Army Ammunition Plant, Ravenna, Ohio*. February 2006.

USACE 2005. *RVAAP Facility-wide Human Health Risk Assessors Manual – Amendment 1*. December 2005.

USACE 2010. *Risk Assessment Handbook Volume II: Environmental Evaluation*. December 2010.

USACE 2012. *Final (Revised) Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals at the Ravenna Army Ammunition Plant*. February 2012.

USACHPPM (U.S. Army Center for Health Promotion and Preventative Medicine) 1996. *Relative Risk Site Evaluation, Hazardous and Medical Waste Study No. 37-EF-5360-97 at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. November 1996.

USEPA (U.S. Environmental Protection Agency) 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*. Interim Final. June 1997.

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK.

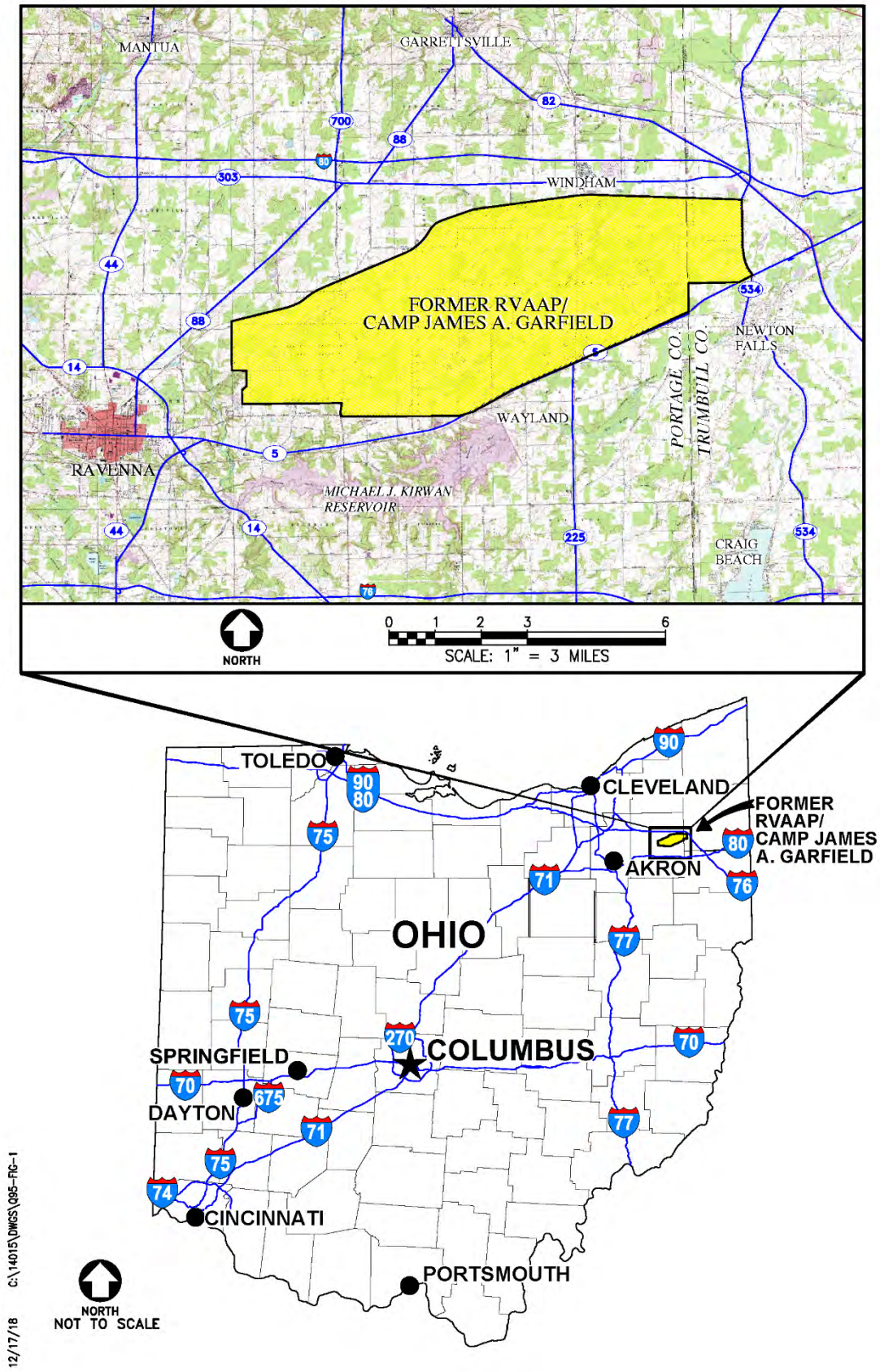
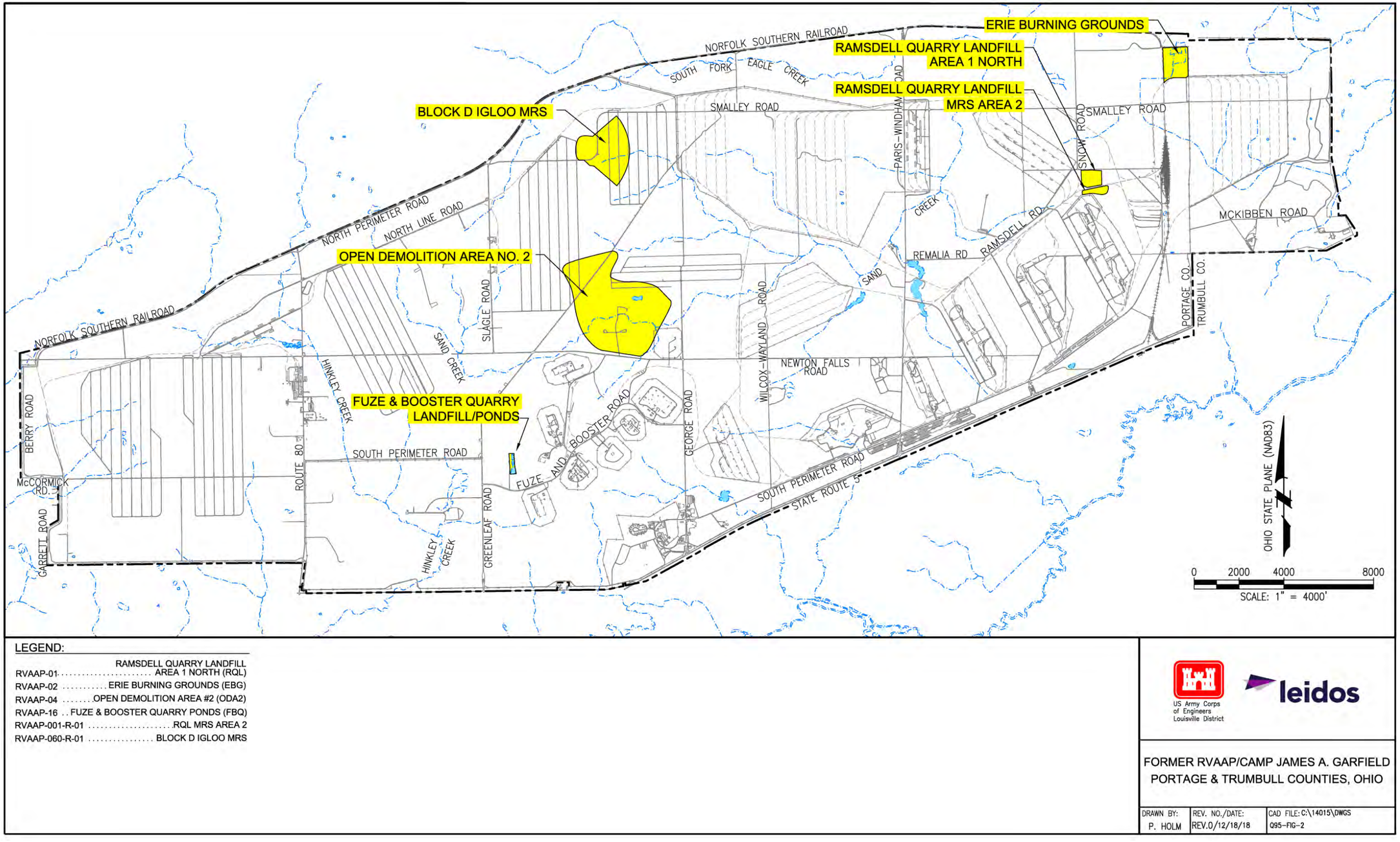


Figure 1. Location and Orientation of Former RVAAP/Camp James A. Garfield

THIS PAGE INTENTIONALLY LEFT BLANK.



LEGEND:

RVAAP-01	RAMSDELL QUARRY LANDFILL AREA 1 NORTH (RQL)
RVAAP-02	ERIE BURNING GROUNDS (EBG)
RVAAP-04	OPEN DEMOLITION AREA #2 (ODA2)
RVAAP-16	FUZE & BOOSTER QUARRY PONDS (FBQ)
RVAAP-001-R-01	RQL MRS AREA 2
RVAAP-060-R-01	BLOCK D IGLOO MRS

US Army Corps of Engineers Louisville District

leidos

FORMER RVAAP/CAMP JAMES A. GARFIELD
PORTAGE & TRUMBULL COUNTIES, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE: C:\14015\DWGS
P. HOLM	REV.0/12/18/18	Q95-FIG-2

Figure 2. Location of the AOCs and MRSs within Camp James A. Garfield

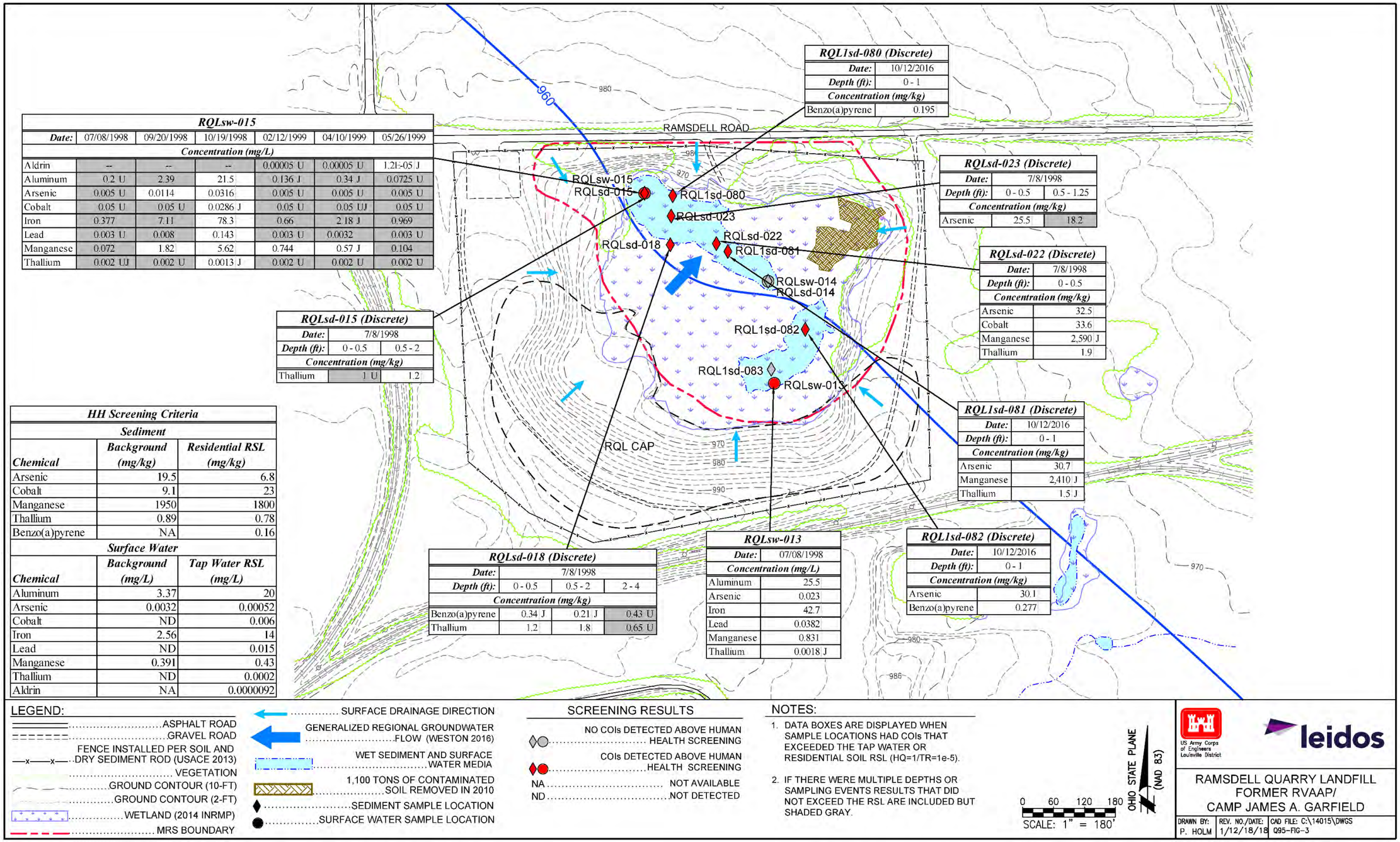


Figure 3. Ramsdell Quarry Landfill Area 1 Site Features

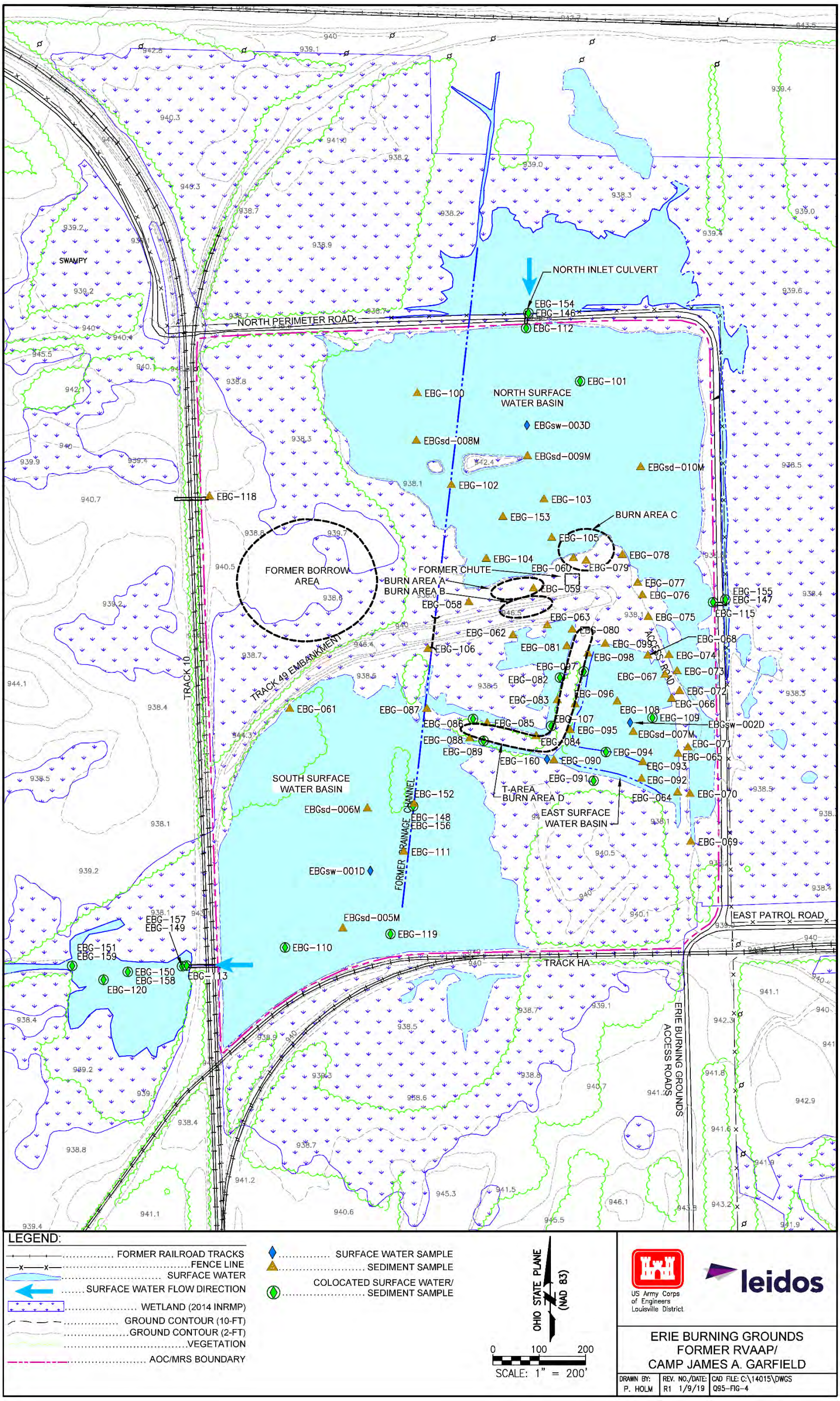


Figure 4. Erie Burning Grounds Site Features

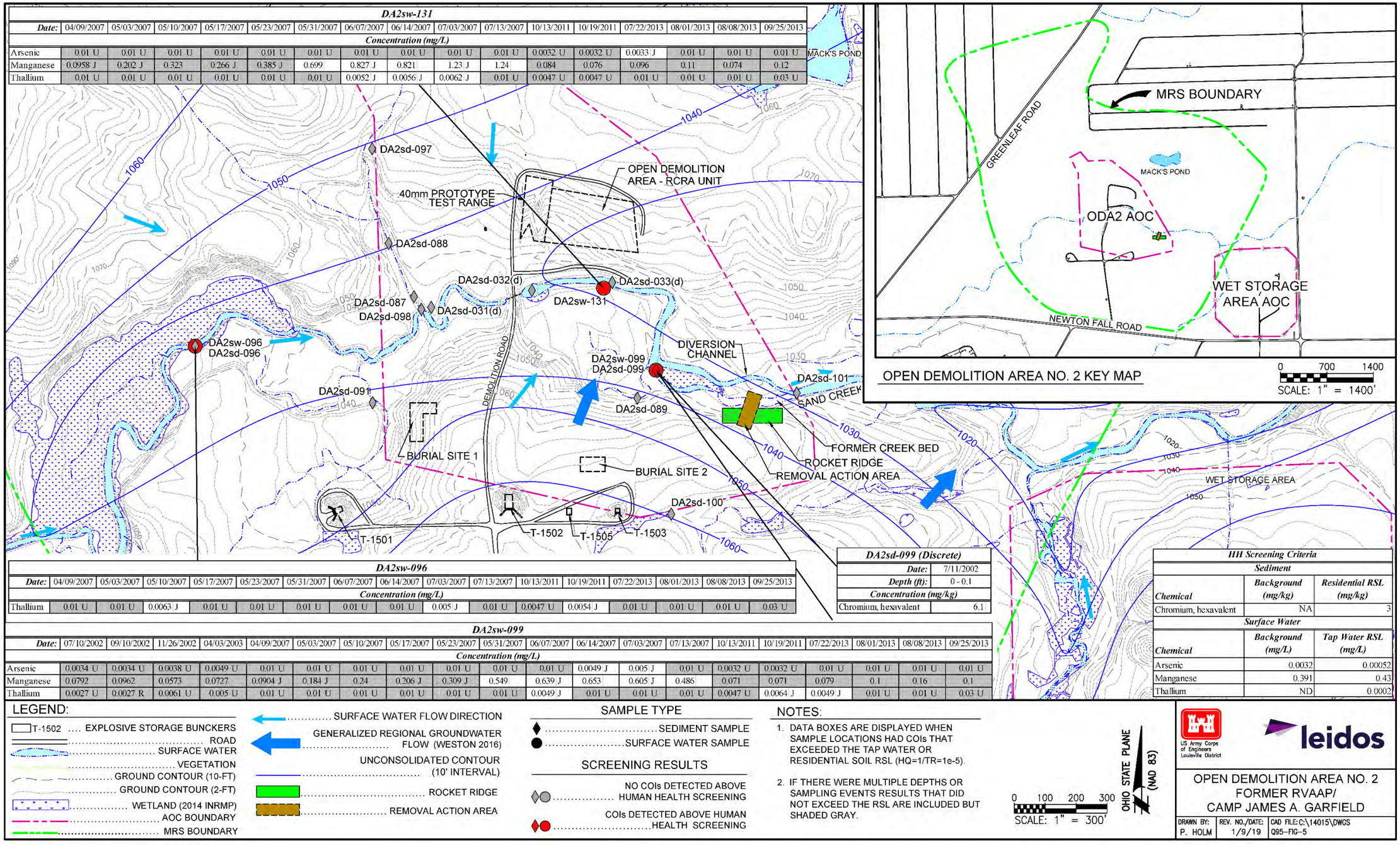


Figure 5. Open Demolition Area #2 Site Features

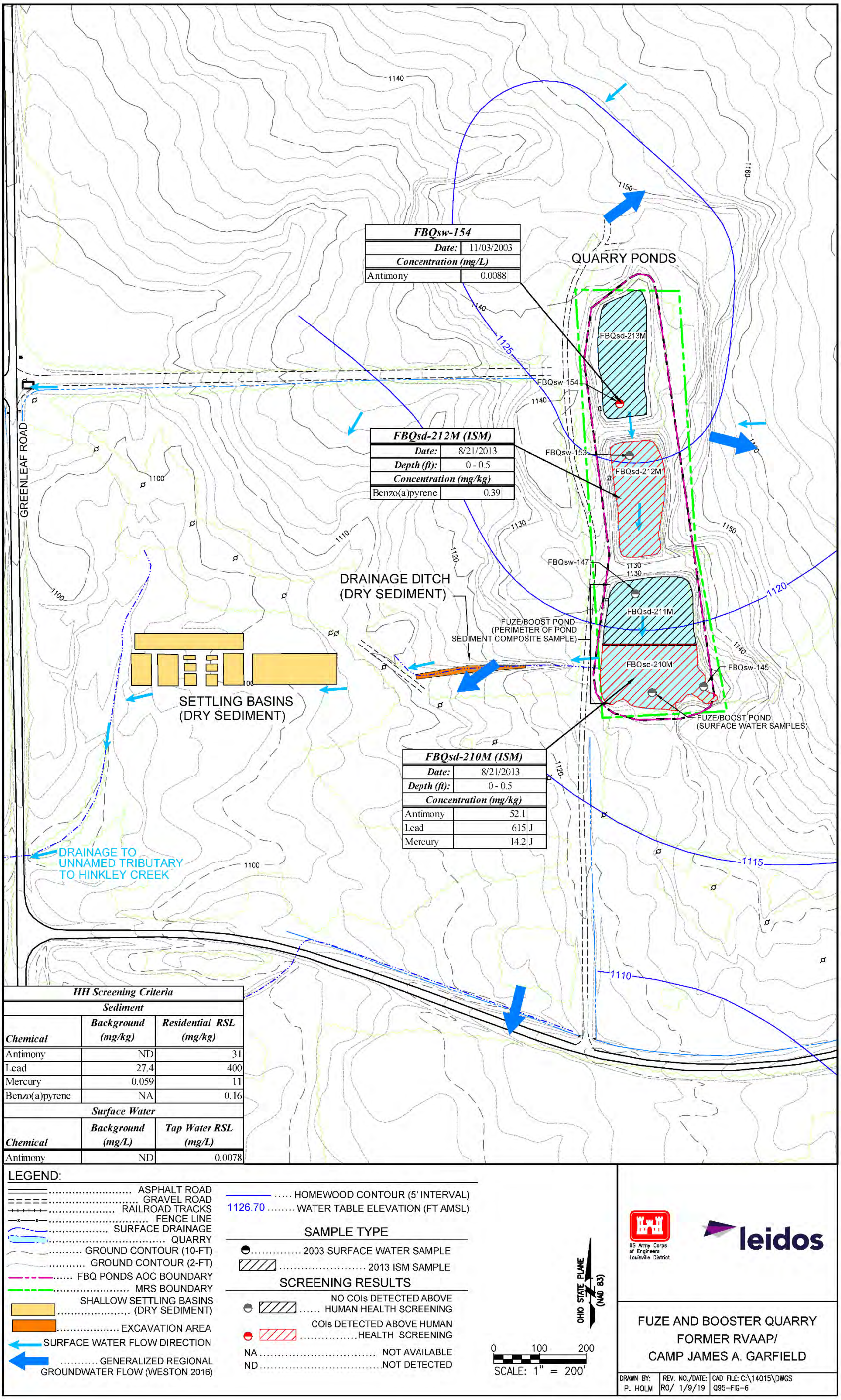


Figure 6. Fuze and Booster Quarry Landfill/Ponds Site Features

THIS PAGE INTENTIONALLY LEFT BLANK.

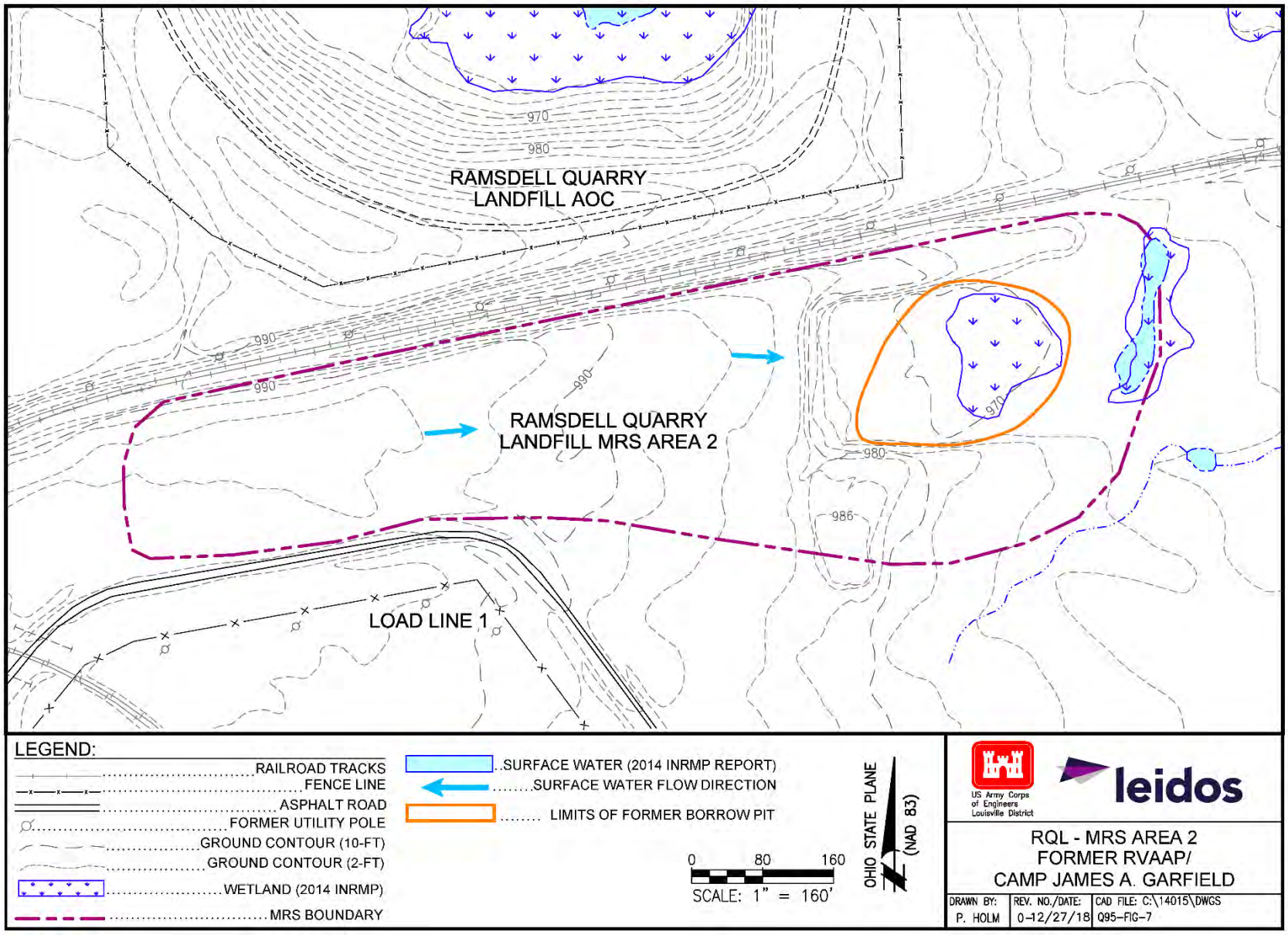


Figure 7. Ramsdell Quarry Landfill MRS Area 2 Site Features

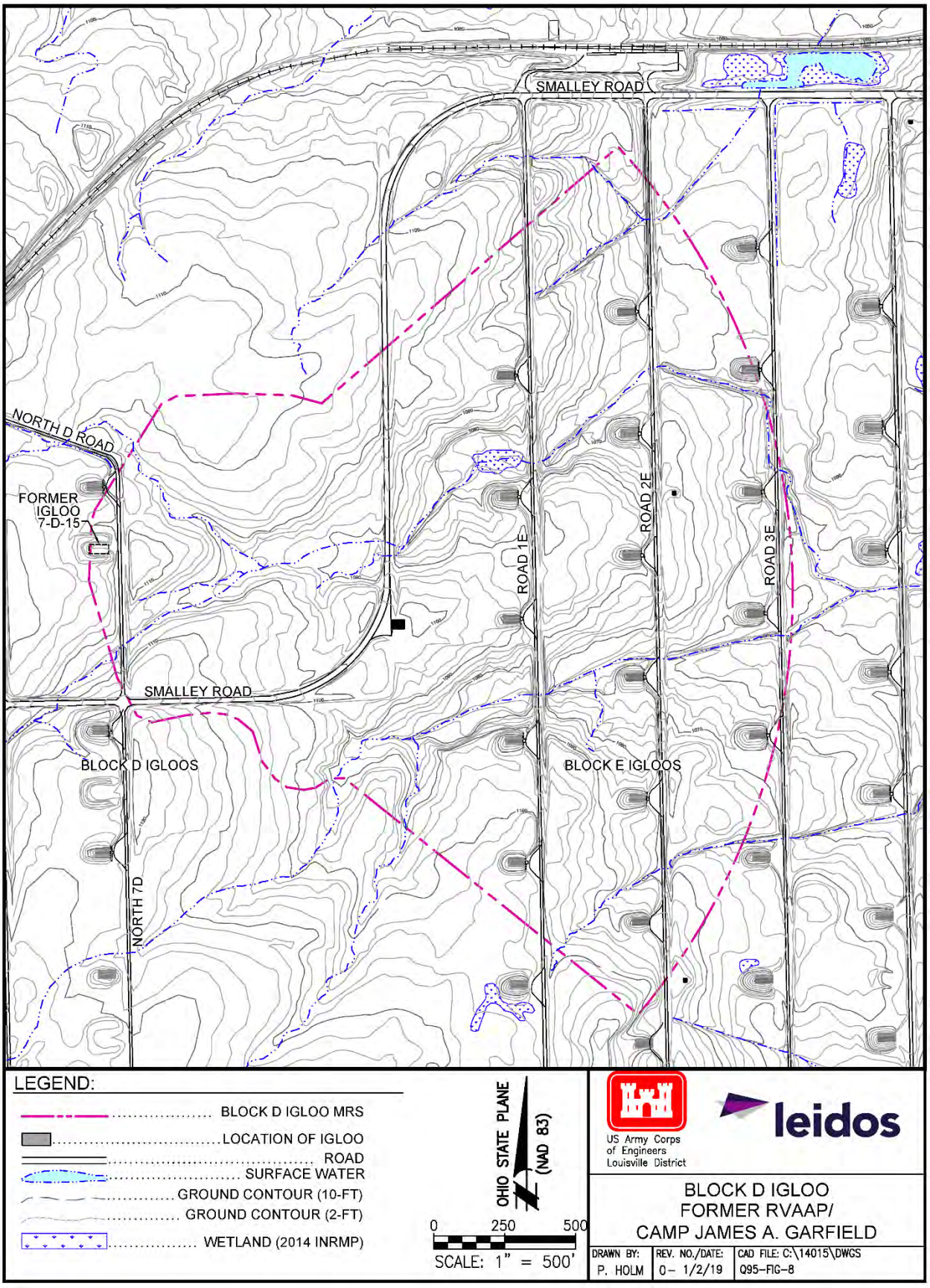


Figure 8. Block D Igloo MRS Site Features

APPENDIX A

Ohio EPA Comments

THIS PAGE INTENTIONALLY LEFT BLANK.

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Laurie A. Stevenson, Director

May 3, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Plans
Remedial Response
Portage County
ID # 267000859254

Mr. David Connolly
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 22204

Subject: Receipt and Review of the Responses to Comments for the Draft Proposed Plan for Sediment and Surface Water at Six Areas of Concern/Munitions Response Sites

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the document entitled, "Six Areas of Concern/Munitions Response Sites, Responses to Comments on the Draft Proposed Plan" dated April 26, 2019. This document was received by Ohio EPA, NEDO on April 26, 2019.

Ohio EPA concurs with the edits to the draft proposed plan and has no further comments. Please submit the final version of the proposed plan with the selected date of the public meeting.

If you have any questions or concerns, please do not hesitate to contact me at (330) 963-1235.

Sincerely,

For

Nicholas Roope
Site Coordinator
Division of Environmental Response and Revitalization

NCR/sc

RECEIVED
MAY 03 2019

ec: David Connolly, ARNG
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
Craig Coombs, USACE Louisville
Nathaniel Peters, USACE Louisville
Rebecca Shreffler, Chenega
Mark Johnson, Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
Tom Schneider, Ohio EPA, SWDO, DERR

NATIONAL GUARD BUREAU
111 SOUTH GEORGE MASON DRIVE
ARLINGTON VA 22204-1373

April 26, 2019

Ohio Environmental Protection Agency
DERR-NEDO
Attn: Mr. Nicholas Roope, Site Coordinator
2110 East Aurora Road
Twinsburg, OH 44087-1924

Subject: Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, Six Areas of Concern/Munitions Response Sites, Responses to Comments on the Draft Proposed Plan (Work Activity No. 267-000-859-254)

Dear Mr. Roope:

The Army appreciates your time and comments on the Draft Proposed Plan for Sediment and Surface Water at Six Areas of Concern/Munitions Response Sites. Enclosed for your review are responses to your comments. Upon the final resolution of these responses to comments, the Army will distribute the final version of this plan.

This plan was prepared for the Army in support of the RVAAP restoration program. Please contact the undersigned at (703) 607-7589 or david.m.connolly8.civ@mail.mil if there are issues or concerns with this submission.

Sincerely,

Date: 2019.04.26 14:04:45 -04'00'

Mr. David Connolly
RVAAP Restoration Program Manager
Army National Guard Directorate

cc: Mark Johnson, Ohio EPA, NEDO
Bob Princic, Ohio EPA, NEDO
Tom Schneider, Ohio EPA, SWDO
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
Craig Coombs, USACE Louisville
Nathaniel Peters, II, USACE Louisville
Jed Thomas, Leidos
Rebecca Shreffler, Chenega
Gail Harris, Vista Sciences Corporation

Subject: Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, Six Areas of Concern/Munitions Response Sites (Work Activity No. 267-000-859-254)

Comment 1: No Munitions and Explosives of Concern (MEC) or Munitions Debris (MD)
On Page 10, Section 3.3.6, lines 52 through 54; the text states, "No MEC/MD were found during the evaluation of accessible areas of the stream and wetlands." However, in October 2016, Ohio EPA staff along with USACE Baltimore District Unexploded Ordinance specialists performed a creek walk through Open Demolition Area #2 (ODA2) in search of Munitions and Explosives of Concern/Munitions Debris (MEC/MD); multiple fuses, and additional Munitions Potentially Presenting an Explosive Hazard were discovered. During the culvert removal project in February 2017 within the ODA2 boundary, additional MD was discovered. In addition, ODA2 has an ongoing non-time critical removal action taking place to address the existing MEC/MD in soil and dry sediment areas surrounding the creek.

Please explain the apparent contradiction between the two discoveries of MEC/MD and the statement that "No MEC/MD were found .... " Please verify that the risk of exposure to potential munitions constituents (MC) as it relates to the MEC/MD discovered has been addressed. Additionally, an explanation of best management practices being implemented to prevent additional MC releases or contamination during the non-time critical removal action currently taking place in the ODA2 is recommended.

Army Response:
Clarification and agree. The referenced Section 3.3.6 was a summary of the 2011 MMRP Investigation, as was summarized in the 2015 MMRP RI for ODA2 (CB&I 2015). This predated the referenced October 2016 site walk. During the 2011 investigation, no MEC was found during the evaluation of accessible areas of the stream and wetlands. For further clarity and to add supplemental text, revisions have been made as follows:

> "No MEC was found during the evaluation of accessible areas of the stream and wetlands. However, the MMRP RI (CB&I 2015c) indicated that due to the presence of MEC within the MRS, MEC could potentially be present in uninvestigated areas of Sand Creek and associated wetland areas in the MRS.
>
> The HHRA indicated that detected MC…"

Regarding the risk of exposure to chemicals, the 2016 Supplemental RI assessed the results of all available sediment and surface water data at ODA2. This included samples as early as 1996 to as recent as 2013. These available samples were assessed and it was concluded that no sediment or surface water COCs required evaluation in an FS due to impacts to groundwater, human health risk, or from an ecological perspective.

Regarding the BMPs implemented during the time critical removal action at ODA2, a new subsection 3.3.8 has been added to the plan as follows:

> 3.3.8 Time Critical Removal Action
>
> A TCRA is being conducted at ODA2 to mitigate significant explosive safety hazards posed to National Guard Trainee due to exposure to MEC/MPPEH that are a result of intentional detonations and potential burial of MEC and bulk explosives in site surface and subsurface soil. Although this TCRA does not take place in the sediment and surface water media discussed in this PP, best management practices (BMPs) are employed to ensure there is not a release of MC to the environment. These BMPs include site inspections, inspections of the stream, site restoration, and revegetation.

Subject: Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, Six Areas of Concern/Munitions Response Sites (Work Activity No. 267-000-859-254)

Comment 2: Including the Munitions Response Sites
On Page 15, Section 5.0, Lines 78 through 83; the text states, "Using information available prior to 2016, the Work Plan (Leidos 2016) concluded that Erie Burning Grounds and Block D Igloo did not require additional sampling or evaluation and can be recommended for no further action for sediment and surface water." However, on Page 18, Section 7.1, lines 62 through 65, the public is encouraged to review documents pertinent to RQL Area 1, ODA2, Fuze and Booster Quarry (FBQ), and Ramsdell Quarry RQL MRS Area 2. Please revise the text to include all six Areas of Concern (AOCs) for which no further action is being proposed.

Army Response:
Agree. EBG and Block D Igloo have been added to the list of AOCs presented in the second paragraph of Section 7.1

Comment 3: Identifying Receptors
On Page 8, Section 3.2.6, lines 44 through 45; the text states," ... pose risks to likely human or ecological receptors." Please provide which receptor this statement applies to specifically following the Facility-wide Cleanup Goals.

Army Response:
Agree. The specific receptors evaluated since the time of the Phase I and Phase II RIs have evolved under the restoration program (e.g., Resident Farmer versus Resident Receptor). Therefore, this bullet has been revised as follows to simplify:

> "Results in sediment and surface water are consistent with the previous investigations under the IRP (i.e., Phase I RI and Phase II RI), which determined that detected contaminants in soil and dry sediment required no further action."

Comment 4: Installation Restoration Program (IRP) versus the Military Munitions Response Program (MMRP)
On Page 8, Section 3.3, lines 64 through 67; the text states, "ODA2 is situated in the central portion of the facility (Figure 5) and has an approximately 320-acre MRS assessed under the MMRP and a 35-acre AOC assessed under the IRP." Thereafter, it is unclear what work was completed under the IRP, and where that work was performed in relationship to the work being completed under the MMRP. Please provide additional information summarizing the IRP investigation in greater detail.

Army Response:
Clarification. A description of the remedial investigations performed under the IRP are described in the following Section 3.3.1: 1998 Phase I Remedial Investigation, Section: 3.3.2: 2002/2003 Phase II Remedial Investigation, and Section 3.3.3: 2006 Phase II Remedial Investigation Addendum. Figure 5 depicts the AOC boundary established in the IRP and the MRS boundary established in the MMRP.

Comment 5: Defining the MMRP Boundaries

On Page 2, Section 2.2, lines 95 through 99; the text states, "This PP addresses the MRS boundary for RQL MRS Area 2 South and Block D Igloo MRS, as those sites did not have AOCs established in the MMRP." This appears to be incorrect, as an AOC would have to be established to be addressed through the MMRP for an investigation to occur. Please revise the section to reflect the presence of a site boundary that was established and addressed consistent with the MMRP.

Army Response:

Agree. The text is revised as follows: "This PP addresses the MRS boundaries for RQL MRS Area 2 South and Block D Igloo MRS; those sites did not have AOCs established in the IRP."

Comment 6: General Text

Please address the following formatting, grammatical, and general inconsistencies in the text:

- The general naming convention for each site should be consistent through the text, specifically, Ramsdell Quarry Area 1. For example, In the abstract RVAAP-01 Ramsdell Quarry Landfill Area 1 is used, followed by both RVAAP-01 Ramsdell Quarry Landfill (RQL) and RVAAP-001-R-02 RQL MRS Area 1 North, followed by Ramsdell Quarry Landfill (RQL) Area 1 North, which is lastly followed by RQL Area 1. To the public, this may appear as potentially five different sites instead of the two sites addressed under their respective programs that were merged due to their proximity to one another. Please revise the text for consistency.

Army Response:

Clarification and agree. Given the differences in naming conventions of the same area (northern portion of RQL), the text below was presented in Section 3.1 to streamline the name of this area. The PP has been revised to move this text earlier in the plan into Section 2.3 Ramsdell Quarry Landfill Area 1. However, it is recommended that the actual names of the sites (e.g., RQL and RQL MRS Area 1 North) remain in Section 1.0.

> RQL is located in the northeastern portion of CJAG (Figure 3) and has an approximately 7-acre MRS assessed under the MMRP called RQL MRS Area 1 North. This site also has a 14-acre AOC assessed under the IRP called RQL. For clarity and added distinction from other sites discussed in this PP, this area will be called "RQL Area 1".

- Page 2, Section 2.2, lines 90 and 92 -The use of boundary versus boundaries. Please revise the text to reflect the multiple sites.

Army Response:

Agree. "Boundary" has been replaced with "boundaries".

- Page 8, Section 3.2.5, line 13 -Please revise the text by adding a space for the paragraph.

Army Response:

Agree. A space has been added between the first and second paragraphs within Section 3.2.5.

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Laurie A. Stevenson, Director

March 13, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Plans
Remedial Response
Portage County
ID #267000859254

Mr. David Connolly
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 22204

Subject: Receipt and Review of the "Draft Proposed Plan for Sediment and Surface Water at Six Areas of Concern/Munitions Response Sites" Dated February 6, 2019

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the document titled "Draft Proposed Plan for Sediment and Surface Water at Six Areas of Concern/Munitions Response Sites." This document, received by Ohio EPA, NEDO on February 6, 2019, was prepared for the United States Army Corps of Engineers (USACE), Louisville District, by Leidos. Ohio EPA has compiled a list of comments in response to the review found below.

Comment 1: No Munitions and Explosives of Concern (MEC) or Munitions Debris (MD)

On Page 10, Section 3.3.6, lines 52 through 54; the text states, "No MEC/MD were found during the evaluation of accessible areas of the stream and wetlands." However, in October 2016, Ohio EPA staff along with USACE Baltimore District Unexploded Ordinance specialists performed a creek walk through Open Demolition Area #2 (ODA2) in search of Munitions and Explosives of Concern/Munitions Debris (MEC/MD); multiple fuses, and additional Munitions Potentially Presenting an Explosive Hazard were discovered. During the culvert removal project in February 2017 within the ODA2 boundary, additional MD was discovered. In addition, ODA2 has an ongoing non-time critical removal action taking place to address the existing MEC/MD in soil and dry sediment areas surrounding the creek.

Please explain the apparent contradiction between the two discoveries of MEC/MD and the statement that "No MEC/MD were found ...." Please verify that the risk of exposure to potential munitions constituents (MC) as it relates to the MEC/MD discovered has been addressed. Additionally, an explanation of best management practices being implemented

to prevent additional MC releases or contamination during the non-time critical removal action currently taking place in the ODA2 is recommended.

Comment 2: Including the Munitions Response Sites

On Page 15, Section 5.0, Lines 78 through 83; the text states, "Using information available prior to 2016, the Work Plan (Leidos 2016) concluded that Erie Burning Grounds and Block D Igloo did not require additional sampling or evaluation and can be recommended for no further action for sediment and surface water." However, on Page 18, Section 7.1, lines 62 through 65, the public is encouraged to review documents pertinent to RQL Area 1, ODA2, Fuze and Booster Quarry (FBQ), and Ramsdell Quarry RQL MRS Area 2. Please revise the text to include all six Areas of Concern (AOCs) for which no further action is being proposed.

Comment 3: Identifying Receptors

On Page 8, Section 3.2.6, lines 44 through 45; the text states, "...pose risks to likely human or ecological receptors." Please provide which receptor this statement applies to specifically following the Facility-wide Cleanup Goals.

Comment 4: Installation Restoration Program (IRP) versus the Military Munitions Response Program (MMRP)

On Page 8, Section 3.3, lines 64 through 67; the text states, "ODA2 is situated in the central portion of the facility (Figure 5) and has an approximately 320-acre MRS assessed under the MMRP and a 35-acre AOC assessed under the IRP." Thereafter, it is unclear what work was completed under the IRP, and where that work was performed in relationship to the work being completed under the MMRP. Please provide additional information summarizing the IRP investigation in greater detail.

Comment 5: Defining the MMRP Boundaries

On Page 2, Section 2.2, lines 95 through 99; the text states, "This PP addresses the MRS boundary for RQL MRS Area 2 South and Block D Igloo MRS, as those sites did not have AOCs established in the MMRP." This appears to be incorrect, as an AOC would have to be established to be addressed through the MMRP for an investigation to occur. Please revise the section to reflect the presence of a site boundary that was established and addressed consistent with the MMRP.

Comment 6: General Text

Please address the following formatting, grammatical, and general inconsistencies in the text:

- The general naming convention for each site should be consistent through the text, specifically, Ramsdell Quarry Area 1. For example, In the abstract RVAAP-01 Ramsdell Quarry Landfill Area 1 is used, followed by both RVAAP-01 Ramsdell

Quarry Landfill (RQL) and RVAAP-001-R-02 RQL MRS Area 1 North, followed by Ramsdell Quarry Landfill (RQL) Area 1 North, which is lastly followed by RQL Area 1. To the public, this may appear as potentially five different sites instead of the two sites addressed under their respective programs that were merged due to their proximity to one another. Please revise the text for consistency.

- Page 2, Section 2.2, lines 90 and 92 – The use of boundary versus boundaries. Please revise the text to reflect the multiple sites.
- Page 8, Section 3.2.5, line 13 – Please revise the text by adding a space for the paragraph.

If you have any questions or concerns, please do not hesitate to contact me at (330) 963-1235.

Sincerely,

Nicholas Roope
Site Coordinator
Division of Environmental Response and Revitalization

NCR/sc

ec: Nat Peters, USACE
Craig Coombs, USACE
Katie Tait, OHARNG RTLS
Kevin Sedlak, OHARNG RTLS
Rebecca Shreffler, Chenega
David Connolly, ARNG
Mark Johnson Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
Tom Schneider, Ohio EPA, Southwest District Office, DERR