Draft

Record of Decision
for Soil, Sediment, and Surface Water
at RVAAP-19 Landfill North of Winklepeck Burning Grounds

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

January 15, 2020

Draft

Record of Decision for Soil, Sediment, and Surface Water at RVAAP-19 Landfill North of Winklepeck Burning Grounds

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)*
15-01-2020	Technical	Nov 1978 - Jan 2020

4. TITLE AND SUBTITLE

Draft
Record of Decision for Soil, Sediment, and Surface Water
at RVAAP-19 Landfill North of Winklepeck Burning Grounds
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)

Spurr, Charles, A.

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 Record of Decision documents the selection of No Further Action (NFA) with respect to soil, sediment, and surface water to attain Unrestricted (Residential) Land Use at the Landfill North of Winklepeck Burning Grounds. In addition, this document presents the physical characteristics, geology, and hydrogeology of Landfill North of Winklepeck Burning Grounds. This document also summarizes the nature and extent of contamination in soil, sediment, and surface water; 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.

15. SUBJECT TERMS

record of decision, 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	60	19b. TELEPHONE NUMBER *(Include area code)* 502.315.2624

PLACEHOLDER FOR:

Documentation of Ohio EPA Concurrence of Final Document

(Documentation to be provided once concurrence is issued.)

DISCLAIMER STATEMENT

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

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Leidos has completed the Record of Decision for Soil, Sediment, and Surface Water at RVAAP-19 Landfill North of Winklepeck Burning Grounds 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 U.S. Army Corps of Engineers policy.

Charles Spurr — January 15, 2020
Study/Design Team Leader — Date

Sarika Johnson — January 15, 2020
Independent Technical Review Team Leader — Date

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

Lisa Jones-Bateman, REM, PMP — January 15, 2020
Senior Program Manager — Date

Draft

Record of Decision
for Soil, Sediment, and Surface Water
at RVAAP-19 Landfill North of Winklepeck Burning Grounds

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-15-C-0046

Prepared for:
U.S. Army Corps of Engineers
600 Martin Luther King, Jr. Place
Louisville, Kentucky 40202

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

January 15, 2020

DOCUMENT DISTRIBUTION
for the
Draft Record of Decision
for Soil, Sediment, and Surface Water at
RVAAP-19 Landfill North of Winklepeck Burning Grounds
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Name/Organization	Number of Printed Copies	Number of Electronic Copies
Ed D'Amato, Ohio EPA-NEDO	1	1
Natalie Oryshkewych, 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
Jed Thomas, Leidos	1	1

ARNG = Army National Guard.
I&E = Installations & 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 FIGURES ii
LIST OF APPENDICES ii
ACRONYMS AND ABBREVIATIONS iii

PART I: THE DECLARATION 1
A SITE NAME AND LOCATION 1
B STATEMENT OF BASIS AND PURPOSE 1
C DESCRIPTION OF THE SELECTED REMEDY 2
D STATUTORY DETERMINATIONS 2
E AUTHORIZING SIGNATURE 2

PART II: DECISION SUMMARY 3
A SITE NAME, LOCATION, AND DESCRIPTION 3
B SITE HISTORY AND ENFORCEMENT ACTIVITIES 4
C COMMUNITY PARTICIPATION 4
D SCOPE AND ROLE OF RESPONSE ACTIONS 5
E SITE CHARACTERISTICS 6
E.1 Physical Characteristics 6
E.1.1 Topography/Physiography 6
E.1.2 Geology 7
E.1.3 Hydrogeology 7
E.1.4 Ecology 7
E.2 Site Investigations 8
E.3 Nature and Extent of Contamination 9
E.3.1 Extent Assessment via Subsurface Anomaly Investigation 9
E.3.2 Contamination Assessment 10
E.3.2.1 Soil 10
E.3.2.2 Sediment and Surface Water 11
E.4 Conceptual Site Model 12
E.4.1 Primary and Secondary Contaminant Sources and Release Mechanisms 12
E.4.2 Contaminant Migration Pathways and Exit Points 12
E.4.3 Potential Human Receptors and Ecological Resources 14
F CURRENT AND POTENTIAL FUTURE LAND USES 14
G SUMMARY OF SITE RISKS 15
G.1 Human Health Risk Assessment 15
G.2 Ecological Risk Assessment 16
H DOCUMENTATION OF NO SIGNIFICANT CHANGE 17

PART III: RESPONSIVENESS SUMMARY FOR PUBLIC COMMENTS ON THE PROPOSED PLAN FOR RVAAP-19 LANDFILL NORTH OF WINKLEPECK BURNING GROUNDS 18
A OVERVIEW 19

TABLE OF CONTENTS (continued)

B SUMMARY OF PUBLIC COMMENTS AND LEAD AGENCY RESPONSES 19
B.1 Oral Comments from Public Meeting..... 19
B.2 Written Comments..... 19
C TECHNICAL AND LEGAL ISSUES 19

PART IV: REFERENCES..... 21

LIST OF FIGURES

Figure 1. General Location and Orientation of Camp James A. Garfield 25
Figure 2. Camp James A. Garfield Installation Map..... 26
Figure 3. Landfill North of Winklepeck Burning Grounds Site Features 28
Figure 4. Geologic Map of Unconsolidated Deposits on Camp James A. Garfield..... 29
Figure 5. Geologic Bedrock Map and Stratigraphic Description of Units on Camp James A. Garfield 30
Figure 6. Natural Resources Inside and Near Habitat Area at Landfill North of WBG..... 31
Figure 7. Phase I RI Sample Locations 33
Figure 8. Landfill North of Winklepeck Burning Grounds – All Sample Locations 34

LIST OF APPENDICES

Appendix A. Affidavits

ACRONYMS AND ABBREVIATIONS

amsl	Above Mean Sea Level
AOC	Area of Concern
AOI	Area of Investigation
ARNG	Army National Guard
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CJAG	Camp James A. Garfield
CMCOPC	Contaminant Migration Chemical of Potential Concern
COC	Chemical of Concern
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
ERA	Ecological Risk Assessment
FWCUG	Facility-wide Cleanup Goal
FWGMP	Facility-wide Groundwater Monitoring Program
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IRP	Installation Restoration Program
ISM	Incremental Sampling Methodology
LNWBG	Landfill North of Winklepeck Burning Grounds
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
ORAM	Ohio Rapid Assessment Method
PAH	Polynuclear Aromatic hydrocarbon
PBA08 RI	2008 Performance-based Acquisition Remedial Investigation
PCB	Polychlorinated Biphenyl
PMP	Project Management Professional
PP	Proposed Plan
REM	Registered Environmental Manager
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SEMS	Superfund Enterprise Management System
SL	Screening Level
SRC	Site-related Contaminant
SVOC	Semi-volatile Organic Compound
TR	Target Risk
USEPA	U.S. Environmental Protection Agency
USP&FO	U.S. Property and Fiscal Officer
VOC	Volatile Organic Compound

THIS PAGE INTENTIONALLY LEFT BLANK.

PART I: THE DECLARATION

A SITE NAME AND LOCATION

This Record of Decision (ROD) addresses soil, sediment, and surface water at the Landfill North of Winklepeck Burning Grounds (LNWBG) area of concern (AOC). LNWBG is designated as RVAAP-19 within the former Ravenna Army Ammunition Plant (RVAAP) (Figures 1 and 2).

The former RVAAP, now known as Camp James A. Garfield (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 (Figure 1). 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 (USP&FO) for Ohio and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp James A. Garfield).

LNWBG is in the central portion of CJAG that is accessed via gates on George Road. The Superfund Enterprise Management System (SEMS) Identifier for RVAAP is OH5210020736.

B STATEMENT OF BASIS AND PURPOSE

The Army National Guard (ARNG) is the lead agency and has chosen the selected remedy for LNWBG in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record file for the AOC.

The Ohio Environmental Protection Agency (Ohio EPA), the supporting state regulatory agency, concurred with the *Remedial Investigation Report for Soil, Sediment, and Surface Water at RVAAP-19 Landfill North of Winklepeck Burning Grounds* (Leidos 2018) (herein referred to as the LNWBG Remedial Investigation [RI] Report) and *Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-19 Landfill North of Winklepeck Burning Grounds* (Leidos 2019) (herein referred to as the LNWBG Proposed Plan [PP]). The RI Report evaluated soil, sediment, and surface water at LNWBG and recommended no further action for these media. The decision that no further action is required for soil, sediment, and surface water at LNWBG satisfies the requirements of the Ohio EPA *Director's Final Findings and Orders*, dated June 10, 2004 (Ohio EPA 2004).

C DESCRIPTION OF THE SELECTED REMEDY

No further action is necessary for soil, sediment, and surface water at LNWBG for Unrestricted (Residential) Land Use. Consequently, no further action is necessary for the future use of the site (Military Training). Groundwater at LNWBG will be addressed under future CERCLA decisions. Land use controls will not be implemented as part of this decision, as the human health risk assessment (HHRA) did not identify any chemicals of concern (COCs) that pose unacceptable risk to the Resident Receptor (Adult and Child) and the ecological risk assessment (ERA) recommended no further action.

D STATUTORY DETERMINATIONS

The recommendation of no further action for soil, sediment, and surface water is protective of human health and the environment and meets the statutory requirements for cleanup standards established in Section 121 of CERCLA. Because the HHRA did not identify any COCs that pose unacceptable risk to the Resident Receptor (Adult and Child) and the ERA recommended no further action, five-year reviews will not be required.

E AUTHORIZING SIGNATURE

Hallet Brazelton, Jr.
Acting Chief,
I&E, Army National Guard

Date

PART II: DECISION SUMMARY

A SITE NAME, LOCATION, AND DESCRIPTION

When the RVAAP Installation Restoration Program (IRP) began in 1989, RVAAP (SEMS Identifier OH5210020736) was identified as a 21,419-acre installation. In 2002 and 2003, OHARNG surveyed the property, and the total acreage of the property was found to be 21,683 acres. The RVAAP IRP encompasses investigation and cleanup of past activities over the entire 21,683-acre former RVAAP.

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 USP&FO for Ohio and subsequently licensed to OHARNG for use as a military training site (Camp James A. Garfield). ARNG is the lead agency for any remediation, decisions, and applicable cleanup at LNWBG. These activities are being funded and conducted under the IRP. Ohio EPA is the supporting state regulatory agency.

CJAG is located in northeastern Ohio within Portage and Trumbull counties, approximately 3 miles east-northeast of the city of Ravenna and approximately 1 mile northwest of the city of Newton Falls. References in this document to RVAAP relate to previous activities at the facility as related to former munitions production activities or to activities being conducted under the restoration/cleanup program.

CJAG is a parcel of property approximately 11 miles long and 3.5 miles wide, bounded by State Route 5 and the CSX System Railroad on the south; Garrett, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east (see Figures 1 and 2). CJAG is surrounded by several communities: Windham 7 miles to the north, Garrettsville 6 miles to the north, Newton Falls 1 mile to the southeast, Charlestown 6 miles to the southwest, and Wayland 3 miles to the south.

Previous reports and investigations had varying estimates of the location and acreage where activities took place at LNWBG. The LNWBG RI Report provided an estimate of the area used for operational activities. The LNWBG area of investigation (AOI) is approximately 28 acres and is located east of George Road and south of Smalley Road in the central portion of CJAG. A detailed evaluation of the AOI concluded that 3.4 acres (designated as “Area A” in the LNWBG RI Report [Leidos 2018]) appropriately defines the boundary of the LNWBG AOC.

The southernmost border of the AOI is 160 feet north of Winklepeck Burning Grounds. The distinct surface features of the AOI include two tributaries to Sand Creek, identified in the LNWBG RI Report as the East Tributary and South Tributary (Figure 3). Ground elevations at the AOI range from approximately 994–1054 ft above mean sea level (amsl). Previous site walks identified and documented the presence of surface debris. The site walks identified old drums, glass bottles, an old tire, wood fragments, and concrete on the ground surface along the slope overlooking the East Tributary.

B SITE HISTORY AND ENFORCEMENT ACTIVITIES

RVAAP was constructed in 1940 and 1941 for depot storage and ammunition assembly/loading and placed on standby status in 1950. The primary purpose of the former RVAAP was to load medium and major caliber artillery ammunition (i.e., bombs, mines, fuzes and boosters, primers, percussion elements) and store finished components.

The LNWBG operational dates provided in historical documents vary. Many of the documents indicate that the end use date of LNWBG was 1976. However, the 1982 Installation Reassessment (USATHAMA 1982) stated the following regarding activities at Winklepeck Burning Grounds and LNWBG:

> "An area within the Winklepeck Burning Grounds was used as landfill for general refuse from 1941–1969. Most of these wastes were burned and covered with earth. From 1969–1978 burning operations were moved to an area just north of Winklepeck Burning Grounds, and Winklepeck Burning Grounds were used for landfilling refuse only. Since 1978, the Ramsdell Quarry has been used for landfilling operations."

Using this information, the timeline below conservatively estimates operations specific to LNWBG:

- 1969–1978: An area within LNWBG was used for burning operations previously performed at Winklepeck Burning Grounds.
- After 1978: The only facility landfilling operations were performed at Ramsdell Quarry.

Aerial photography of LNWBG indicates that no additional activities were conducted after these stated timeframes, and there is no documentation of additional operations at LNWBG after 1978. In addition, per the 1982 Installation Reassessment (USATHAMA 1982) and findings from the RIs (i.e., mostly surficial waste was identified and limited risk was determined), it is evident that LNWBG was predominantly used for burning wastes, as opposed to trench and fill-type operations of a landfill.

No historical information exists to indicate LNWBG was used for any other processes other than what is presented above. No CERCLA enforcement actions related to LNWBG have occurred.

C COMMUNITY PARTICIPATION

Using the RVAAP community relations program, ARNG and Ohio EPA have interacted with the public through notices, public meetings, reading materials, direct mailings, an Internet website, and receiving and responding to public comments. Specific items in the community relations program include the following:

- **Restoration Advisory Board –** The Army established a Restoration Advisory Board in 1996 to promote community involvement in U.S. Department of Defense environmental cleanup activities and allow the public to review and discuss the progress with decision makers. Board meetings are generally held two to three times per year and are open to the public.

- **Community Relations Plan –** The *Community Relations Plan* (Chenega 2019) is maintained to establish processes to keep the public informed of activities at the former RVAAP. The plan is available in the Administrative Record at CJAG.
- **Internet Website –** The Army established an Internet website in 2004 for RVAAP. It is accessible to the public at www.rvaap.org.

In accordance with CERCLA Section 117(a) and NCP Section 300.430(f)(2), ARNG released the LNWBG PP (Leidos 2019) to the public on July 29, 2019. The PP and other project-related documents were made available to the public in the Administrative Record maintained at CJAG and in the Information Repositories at Reed Memorial Library in Ravenna, Ohio, and Newton Falls Public Library in Newton Falls, Ohio. A notice of availability for the PP was sent to radio stations, television stations, and newspapers (e.g., *Warren Tribune-Chronicle, Ravenna Record Courier*), as specified in the Community Relations Plan. The notice of availability initiated the 30-day public comment period beginning July 29, 2019 and ending August 27, 2019.

ARNG held a public meeting on August 15, 2019 at the Shearer Community Center, 9355 Newton Falls Road, Ravenna, Ohio 44266 to present the PP. At this meeting, representatives of ARNG provided information and were available to answer any questions. A transcript of the public meeting is available to the public and has been included in the Administrative Record. Responses to any verbal comments received at this meeting and written comments received during the public notification period are included in the Responsiveness Summary, which is Part III of this ROD.

ARNG considered public input from the public meeting on the PP when selecting the remedy.

D SCOPE AND ROLE OF RESPONSE ACTIONS

The overall program goal of the IRP at the former RVAAP is to clean up previously contaminated lands to reduce contamination to concentrations that are not anticipated to cause risks to human health or the environment.

This ROD addresses soil, sediment, and surface water. The concentrations of CERCLA-related contamination at LNWBG are considered protective of human health and do not represent a risk to the environment. Therefore, these media are already protective for Unrestricted (Residential) Land Use, and the program goal of the IRP at the former RVAAP has been met for LNWBG.

Potential impacts to groundwater from soil (e.g., contaminant leaching) were evaluated in the LNWBG RI Report (Leidos 2018), as protectiveness to groundwater was included in the fate and transport analysis. However, groundwater will be evaluated as an individual AOC for the entire facility (designated as RVAAP-66) under the Facility-wide Groundwater Monitoring Program (FWGWMP).

E SITE CHARACTERISTICS

This section presents the site characteristics, nature and extent of contamination, and conceptual site model for LNWBG. These characteristics and findings are based on investigations conducted from 1996–2011 and are further summarized in the LNWBG RI Report (Leidos 2018).

E.1 Physical Characteristics

This section describes the topography/physiology, geology, hydrogeology, and ecological characteristics of CJAG and LNWBG that were key factors in identifying the potential contaminant transport pathways, receptor populations, and exposure scenarios to evaluate human health and ecological risks.

E.1.1 Topography/Physiography

The topography of CJAG is gently undulating with an overall decrease in ground elevation from a topographic high of approximately 1,220 ft amsl in the far western portion of the facility to low areas at approximately 930 ft amsl in the far eastern portion.

The topography at LNWBG AOI is generally moderate with the topographic high at the western boundary near a former barn and the lowest points near the East Tributary and South Tributary. The elevation at the AOI ranges from 994–1054 ft amsl. The topographic relief dips moderately from the location of the former barn to the areas disturbed from operational activities. The most significant relief is located in the southern and eastern portions of the area disturbed by operational activities and sloping toward the two tributaries. The highest elevation at the area disturbed from operational activities is 1,032 ft amsl. The lowest elevation of 994 ft amsl is found where surface water exits the site into the East Tributary and South Tributary.

LNWBG is located east of George Road and is adjacent to and includes two tributaries of Sand Creek (East Tributary and South Tributary) in the central portion of CJAG. During review of historical aerial photographs, no structures were noted to be present during the time period of operational activities at LNWBG. A barn did exist at the highest area of relief at the western boundary of the AOI. Although no other structures were present, a site walk confirmed the presence of debris exposed at the surface (i.e., old concrete, glass bottles, wood fragments, old drums), which provide evidence of the previous operational activities.

Perennial surface water present at LNWBG is limited to the eastern and southern portions of the AOI noted as the East Tributary and South Tributary of Sand Creek. Surface water occurs intermittently as storm water runoff on the ground surface of the disturbed area. Surface water flow appears to primarily migrate through ditches and surface water drainage features that follow site topography toward the East Tributary and South Tributary.

E.1.2 Geology

The surface soil and sediment of CJAG consist of unconsolidated glacial deposits noted to have varying thickness and characteristics (Figure 4). The general bedrock underlying the unconsolidated sediment consists of Mississippian and Pennsylvanian age rock units (Figure 5).

LNWBG is located within Hiram Till glacial deposits. The primary soil types found at LNWBG are the Mahoning silt loam (2–6% slopes) on the western and southwestern portions of the site, and the Ellsworth silt loam (6–12% slopes) along the northern portion of the site, consisting of steep soil located adjacent to drainage ways (USDA 2010). Geologic descriptions and geotechnical analyses performed during previous field investigations indicate the soil consists predominantly of silty clay tills with trace gravel (Leidos 2018).

The bedrock underlying LNWBG is composed of the Pennsylvanian-age Pottsville Formation, Sharon Sandstone Member, or more commonly referred to as the Sharon Conglomerate (Winslow and White 1966). The Sharon Sandstone Member, the lowest unit of the Pottsville Formation, is a highly porous, loosely cemented, permeable, cross-bedded, frequently fractured and weathered orthoquartzite sandstone, which is locally conglomeratic. The Sharon Conglomerate exhibits thin shale lenses in the upper portion of the unit. Upper members of the Pottsville Formation are not present at the site.

E.1.3 Hydrogeology

Four monitoring wells are present at LNWBG, which were installed in 2004 during the Characterization of 14 AOCs (MKM 2007). During monitoring well installation, bedrock, if encountered, was observed at a depth as shallow as 10 ft below ground surface (bgs). Bedrock was encountered in one geotechnical boring at 21.65 ft bgs during the 2008 Performance-based Acquisition (PBA08) RI.

Based on well gauging data collected during the 2018 facility-wide groundwater event, the depths to groundwater varied from 3–11 ft bgs. The general groundwater flow pattern at LNWBG is to the east. Monitoring well groundwater elevations are continually collected under the FWGWMP. Additional information regarding monitoring wells, borings, and site hydrogeology are available in the LNWBG RI Report (Leidos 2018).

E.1.4 Ecology

The natural resources inside and near habitat area at LNWBG are presented in Figure 6. The dry, early-successional, herbaceous field habitat within the AOI is large enough to completely support cover and food for small birds and mammals that typically require approximately 1 acre of habitat (USEPA 1993). The American beech (*Fagus grandifolia*)/oak (*Quercus* spp.)/maple (*Acer* spp.) forest alliance is present within the LNWBG habitat area to the south of the access road. The temporarily flooded green ash (*Fraxinus pennsylvanica*)/American elm (*Ulmus Americana*)/hackberry [*Celtis (occidentalis, laevigata*)] forest alliance is limited in extent within the LNWBG habitat boundaries. Although only a small amount (0.09 acres) of green ash/American elm/hackberry forest alliance is within the terrestrial

habitat boundary along the northeastern border, the forest alliance extends to the north and southeast of the LNWBG habitat area along the East Tributary of Sand Creek.

The vegetation provides a habitat for birds, mammals, insects, and other organisms that typically require approximately 1 acre of habitat. The northern long-eared bat (*Myotis septentrionalis*; federally threatened) exists at CJAG. No other federally listed species or critical habitats exist on CJAG. LNWBG has not had a site-specific survey for federally listed or state-listed species. However, surveys have been conducted throughout the facility and have not identified state-listed, federally listed, threatened, or endangered species at the AOC (OHARNG 2014).

Two large tributaries within the AOI have been evaluated. These tributaries are referred to as the East Tributary and South Tributary. The East Tributary has a riparian zone that includes a mix of aquatic, herbaceous, and forest habitat, including permanently flooded pondweed (*Potamogeton* spp.)/hornwort (*Ceratophyllum* spp.)/waterweed (*Elodea* spp.) herbaceous alliance and temporarily flooded green ash/American elm/hackberry forest alliance. The wetland associated with this tributary is called the East Wetland, which is 4.9 acres and is immediately north and east of the terrestrial habitat area, along a stream that is an unnamed tributary to Sand Creek. The South Tributary has a riparian zone consisting mostly of saturated dogwood (*Cornus* spp.)/willow (*Salix* spp.) shrubland habitat, with smaller areas of temporarily flooded green ash/American elm/hackberry forest habitat. The wetland associated with this tributary is called the South Wetland. The South Wetland is south of the terrestrial habitat area and stretches for 10.7 acres along another stream that is an unnamed tributary to Sand Creek.

E.2 Site Investigations

In 1978, the U.S. Army Toxic and Hazardous Materials Agency conducted an Installation Assessment of RVAAP to review the potential for contaminant releases at multiple former operations areas, as documented in the *Installation Assessment of Ravenna Army Ammunition Plant* (USATHAMA 1978). Since 1978, LNWBG has been included in various historical assessments and investigations conducted at the former RVAAP. The following environmental investigations have been completed for LNWBG:

- Installation Assessment of Ravenna Army Ammunition Plant (USATHAMA 1978),
- Resource Conservation and Recovery Act Facility Assessment (Jacobs 1989),
- Preliminary Assessment for the Characterization of Areas of Contamination (SAIC 1996),
- Relative Risk Site Evaluation for Newly Added Sites (USACHPPM 1996),
- Phase I Remedial Investigation (SAIC 1998),
- 2003 RVAAP Facility-wide Ecological Risk Work Plan (USACE 2003),
- 2004-2005 Characterization of 14 AOCs (MKM 2007), and
- 2010 PBA08 RI (Leidos 2018).

A collection of pertinent assessments and investigations that define previous operational activities; present the nature and extent of contamination; discuss fate and transport of contaminants in the environment; include risk assessments for soil, sediment, and surface water; and establish a final AOC boundary for LNWBG are summarized in the LNWBG RI Report (Leidos 2018).

E.3 Nature and Extent of Contamination

One purpose of the RI was to provide an estimate of the area at LNWBG that was used for operational activities. The LNWBG RI Report (Leidos 2018) established a 28-acre AOI that encompasses the locations of all samples collected and the area evaluated to assess and define the LNWBG AOC. Information for the whole AOI were presented to support the RI conclusions.

In addition, a newly designated 3.4-acre "Area A" that appropriately defined the boundary of the LNWBG AOC was defined in the report. The extent of the AOC was established from subsurface data collected during previous investigations and the PBA08 RI, geophysical surveys performed as part of the Phase I RI for High Priority AOCs (herein referred to as the Phase I RI), visual inspections, and other available pieces of information.

E.3.1 Extent Assessment via Subsurface Anomaly Investigation

A geophysical survey, covering approximately 4 acres of the site, was conducted during the Phase I RI in July 1996. The extent of the geophysical investigation, location of anomalies, and sample locations for the Phase I RI are presented in Figure 7.

Time-domain electromagnetic induction is a non-intrusive exploration technique that uses an alternative magnetic field to induce eddy currents in buried conductive materials. A Geonics EM-61 metal detector, capable of detecting metal targets to depths of 10 ft bgs, was used. In addition, frequency-domain electromagnetic induction was used to map electrical conductivity variations related to buried materials and near-surface geologic variations. A Geonics EM-31, which provides an effective exploration depth of approximately 15 ft bgs, was used.

The geophysical survey limit was defined by the tree line and slope leading toward the East Tributary. Continuous profiles using electromagnetic instruments and data loggers were collected by an operator walking a survey grid. Data reduction and analysis was performed in the field, and survey results were presented as contour maps showing subsurface geophysical anomalies.

The results of the geophysical survey were used to identify locations of five test trenches that then were used to collect nine soil samples. The objectives of the test trenches and subsurface soil sampling were to 1) evaluate the nature of buried materials, 2) confirm the presence or absence of contamination in soil adjacent to the burials, and 3) characterize the nature of potential contamination.

Five trenches were excavated using a backhoe at the location of anomalies identified during the geophysical investigation. The test trenches were approximately 15 ft × 2 ft wide × 3 ft deep and did not encounter groundwater. The Phase I RI Report indicated that encountered refuse was generally present within the upper 1 ft of soil, and there was no field evidence indicating the presence of potentially hazardous material.

The soil samples were collected from depths ranging from 0–3 ft bgs and were analyzed for inorganic chemicals, cyanide, explosives, volatile organic compounds (VOCs), semi-volatile organic compounds

(SVOCs), and polychlorinated biphenyls (PCBs)/pesticides. No widespread organic contamination was detected in the nine trench samples from the landfill area, and there does not appear to be a defined source of contamination or evidence of contaminant migration. Low levels of pesticides and PCBs (e.g., less than 0.1 mg/kg) were detected in some samples. One inorganic chemical (nickel) was detected in groundwater at a concentration (110 mg/L) above the risk screening level (SL) of 100 mg/L. Scattered detections of inorganic chemicals were observed above background concentrations in sediment from drainage leading to and from the beaver pond north of the landfill, with the highest concentrations occurring downstream from the pond.

E.3.2 Contamination Assessment

The sample locations from the Phase I RI, Characterization of 14 AOCs, and PBA08 RI are presented in Figure 8. The following subsections discuss the chemical concentrations within soil, sediment, and surface water at LNWBG. To support the evaluation of nature and extent of contamination, site-related contaminant (SRC) concentrations were compared to SLs corresponding to the lowest facility-wide cleanup goal (FWCUG) for the Resident Receptor (Adult and Child) and National Guard Trainee at a target hazard quotient (HQ) of 0.1 or target risk (TR) of 1E-06, as presented in the *Facility-wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2010).

E.3.2.1 Soil

The predominant SRCs for surface soil at LNWBG were inorganic chemicals and SVOCs; the majority of which were polynuclear aromatic hydrocarbons (PAHs). Nine inorganic chemicals (cadmium, chromium, copper, lead, mercury, nickel, silver, thallium, zinc) were identified as potential inorganic SRCs in surface soil at the site. Only chromium was detected above background concentrations and exceeded its SL. Since concentrations of chromium exceeded the SL for hexavalent chromium but did not exceed the SL for trivalent chromium, chromium is not considered a chemical of potential concern (COPC). SVOCs do not have background concentrations for chemical comparison, and as a result, 25 were identified as SRCs in surface soil with 17 of them being PAHs. Three SVOCs (benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene) exceeded their SLs and were identified as COPCs. Two explosives (nitroglycerin, tetryl), two propellants (nitrocellulose, nitroguanidine), two pesticides (BHC, 4,4′-DDE), and one VOC (acetone) were identified as SRCs in surface soil. However, none exceeded their respective SLs. No PCBs were identified as SRCs in surface soil.

Six inorganic chemicals (antimony, cadmium, cyanide, lead, thallium, zinc) were detected at concentrations that exceeded background levels in only 6 of 21 subsurface soil samples in the SRC screening set. Detections above background levels were found to be sporadic throughout the site and occurred within a narrow range of concentrations. Background concentrations have not been established for cadmium and cyanide. Thallium exceeded the SL in all four Phase I RI subsurface trench locations and is considered the only COPC in subsurface soil. Six SVOCs, three of which were PAHs (benzo[b]fluoranthene, chrysene, fluoranthene), were detected in subsurface soil. None of the SVOC detections exceeded their respective SLs. All VOC, pesticide, and PCB concentrations were detected below the Resident Receptor. No explosives or propellants were identified as SRCs for subsurface soil at the site.

In addition, within Area A, samples collected within proximity to anomalies identified during the 1996 geophysical investigation were assessed. Surface soil sample chemical concentration results indicated that all inorganic chemical concentrations were below the SL or background with the exception of thallium. Thallium was detected above the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-06, HQ of 0.1 (0.612 mg/kg) in 4 of 15 samples; with a maximum detection of 2.4 mg/kg. However, the thallium concentrations were detected below the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1. Two SVOCs (benzo[a]pyrene, benzo[a]pyrene) were detected above the Resident Receptor Adult in one sample; however, benzo(a)pyrene concentrations were detected below the Resident Receptor (Adult and Child). All other SVOCs, cyanide, explosives, pesticides, PCBs, and VOCs were below the SL.

E.3.2.2 Sediment and Surface Water

Incremental sampling methodology (ISM) and discrete sediment samples were collected at both the East Tributary and South Tributary. These samples were screened separately for SRCs due to the use of different sampling methodologies.

In the East Tributary discrete data, only one SVOC (benzo[a]pyrene) exceeded the SL and one inorganic chemical (cobalt) exceeded the SL at a TR of 1E-06. Only one SVOC (benzo[a]pyrene) once again exceeded the SL in the ISM data at three separate ISM locations. In the East Tributary, explosives were not identified as SRCs for either the ISM or discrete sediment data set. The propellant nitrocellulose was identified as an SRC but did not exceed the SL for the ISM sediment or the discrete data sets. In the East Tributary discrete data set, only one VOC (2-butanone) was detected as an SRC; however, it did not exceed the SL. The East Tributary ISM sediment data set contained no VOCs identified as SRCs. In addition, no pesticides or PCBs were identified as SRCs in either the ISM or discrete data set for the East Tributary sediment samples (Leidos 2018).

Fewer SRCs were identified at the South Tributary than observed in the East Tributary data sets. Cobalt was the only discrete sediment SRC to exceed the SL at a TR of 1E-06. However, cobalt did not exceed the Resident Receptor (Adult and Child). In the discrete sediment data set, one explosive (trinitrobenzene) was identified as an SRC but did not exceed the SL at a TR of 1E-06. The same case is present for one SVOC (fluoranthene), which was identified as an SRC but did not exceed the SL. No additional propellants, VOCs, pesticides, or PCBs were identified as SRCs for the South Tributary sediment discrete data set. In the South Tributary ISM data set, two inorganic chemicals (beryllium, mercury) were identified as SRCs; however, neither exceeded their respective SL at a TR of 1E-06. No explosives, propellants, SVOCs, VOCs, pesticides, or PCBs were identified as SRCs for the South Tributary sediment samples for the ISM data set.

Six surface water samples were collected in order to evaluate the East Tributary and South Tributary during the characterization of 14 AOCs (MKM 2007). Four additional surface water samples were collected during the PBA08 RI: three from the East Tributary and one from the South Tributary (Leidos 2018). The samples collected during the PBA08 RI were also co-located with adjacent sediment samples.

In summary, for the East Tributary surface water samples, no inorganic SRCs exceeded their respective SLs. In addition, no propellants, explosives, PCBs, or pesticides were detected in surface water. The VOC acetone was detected, but the concentrations did not exceed the regional screening level (RSL) at a TR of 1E-06. One SVOC (bis[2-ethylhexyl]phthalate) was detected during the PBA08 RI but was below the RSL at a TR of 1E-05.

Regarding the surface water samples for the South Tributary, two inorganic chemicals (manganese, cobalt) were identified as COPCs and the SVOC (bis[2-ethylhexyl]phthalate) also was identified as a COPC. The concentrations of manganese, cobalt, and bis(2-ethylhexyl)phthalate were below the Resident Receptor (Adult and Child). The propellant nitrocellulose was detected but did not exceed its RSL. One VOC (acetone) was detected in the PBA08 RI data but did not exceed the RSL at a TR of 1E-06. No other explosives, PCBs, or pesticides were detected in surface water at the South Tributary.

E.4 Conceptual Site Model

Conceptual site model elements are discussed in this section, including primary and secondary contaminant sources and release mechanisms, contaminant migration pathways and discharge or exit points, potential receptors with unacceptable risk, and data gaps and uncertainties.

E.4.1 Primary and Secondary Contaminant Sources and Release Mechanisms

No primary contaminant sources (e.g., operational facilities) are currently located at LNWBG, and no structures are currently located anywhere within the AOI. The potential mechanisms for contaminant releases from secondary sources at LNWBG include:

- Eroding soil with sorbed contaminants and mobilization in turbulent surface water flow under heavy storm rainfall conditions,
- Dissolving soluble contaminants and transport in perennial and intermittent surface water,
- Re-suspending contaminated sediment during periods of high flow with downstream transport within the surface water system, and
- Contaminant leaching to groundwater.

E.4.2 Contaminant Migration Pathways and Exit Points

The potential for soil and sediment contaminants to impact surface water and groundwater was evaluated in a fate and transport evaluation presented in the LNWBG RI Report (Leidos 2018). Contaminants in surface soil may migrate to surface water via drainage ditches in the dissolved phase following a storm event, or as particulates in storm water runoff. Contaminants also may leach into the water table through the glacial tills and unconsolidated soil.

At LNWBG, surface runoff occurs intermittently and mostly through natural drainage ditches. The surface water entrains sediment and enters directly into the East Tributary and South Tributary, where its flow velocity rapidly decreases and the particulates settle out and accumulate. Any sediment- bound contaminants present may migrate during storm events or enter a dissolved phase in the surface water.

The SRC concentrations observed at both the East Tributary and South Tributary were comparable with the exception of inorganic chemical SRCs observed between the 2004 sampling and PBA08 RI in the South Tributary. In the East Tributary, only one SVOC and one VOC were noted to be SRCs. Propellants, explosives, PCBs, and pesticides were not detected in surface water samples collected from the East Tributary. SRCs identified in the South Tributary included one SVOC, one VOC, and one propellant. No other explosives, PCBs, or pesticides were detected in samples collected at the South Tributary.

The presence and condition of surface water within LNWBG indicate that groundwater-surface interactions are occurring. Dissolved phase contaminants in surface water are capable of migrating into groundwater through leaching processes. However, the surface water to groundwater pathway was evaluated, which indicated that a sediment-to-groundwater leaching pathway was not a concern.

Groundwater is estimated to flow east toward the East Tributary and South Tributary within LNWBG. The groundwater table occurs within the entirety of unconsolidated soil throughout the LNWBG AOI. In general, groundwater from the AOI discharges to surface water at AOI boundaries and into the two tributaries. Conservative transport modeling determined that 13 chemicals (antimony, cadmium, lead, thallium, nitroglycerin, benzo[b]fluoranthene, naphthalene, chlorobenzene, methylene chloride, 4,4′-DDD, 4,4′-DDE, PCB-1254, beta-BHC) may leach from soil and 3 (benzo[a]anthracene, benzo[b]fluoranthene, naphthalene) may leach from sediment. Only seven of the chemicals (antimony, cadmium, thallium, nitroglycerin, naphthalene, methylene chloride, beta-BHC) are predicted to migrate at concentrations that exceed maximum contaminant levels/RSLs and reach the East Tributary, which is the closest surface water located along the northeastern boundary of the site. None of these chemicals were detected above their groundwater criteria during the 2010–2011 FWGWMP sampling event.

Conclusions of the soil and sediment screening, leachate modeling, and groundwater modeling are as follows:

- No contaminant migration chemicals of potential concern (CMCOPCs) were identified for sediment; however, antimony, cadmium, thallium, nitroglycerin, naphthalene, methylene chloride, and beta-BHC were identified as CMCOPCs for soil.
- Only beta-BHC was predicted to exceed the screening criteria in groundwater at the downgradient receptor location.
- Qualitative assessment of sample results with consideration of the modeling concluded that no CMCOPCs are present within the soil, including areas that contain geophysical anomalies and/or sediment that may impact groundwater.

All SRCs identified in surface soil, subsurface soil, and sediment at LNWBG were evaluated through the stepwise fate and transport evaluation. All SRCs were eliminated as posing future impacts to groundwater, and no further action is necessary for surface soil, subsurface soil, and sediment to protect groundwater. Groundwater will be further evaluated under the FWGWMP.

E.4.3 Potential Human Receptors and Ecological Resources

In February 2014, the Army and Ohio EPA amended the risk assessment process to address changes in the RVAAP restoration program. The *Final Technical Memorandum: Land Uses and Revised Risk Assessment Process for the RVAAP Installation Restoration Program* (ARNG 2014) identified the following three Categorical Land Uses and Representative Receptors to be considered during the RI phase of the CERCLA process.

1. **Unrestricted (Residential) Land Use** – Resident Receptor (Adult and Child) (formerly called Resident Farmer).
2. **Military Training Land Use** – National Guard Trainee.
3. **Commercial/Industrial Land Use** – Industrial Receptor (U.S. Environmental Protection Agency [USEPA] Composite Worker).

An evaluation using Resident Receptor (Adult and Child) FWCUGs was used to provide an Unrestricted (Residential) Land Use evaluation. Unrestricted (Residential) Land Use is considered protective for all categories of land use at CJAG. Additional human health receptors associated with CJAG are the National Guard Trainee and Industrial Receptor. No COCs were identified as requiring remediation to be protective for the Resident Receptor or Unrestricted (Residential) Land Use. The receptor is assumed to be exposed to surface soil from 0–1 ft bgs and subsurface soil from 1–13 bgs.

LNWBG also contains habitats that support ecological receptors, and chemical contamination has been detected within the AOI. As a result, a Level I ERA was performed to determine current or past releases and whether important ecological resources are present at or near the AOI. Vegetation within LNWBG consists of grasses and scrub/shrub surrounded by mature forest. In addition, wetlands are located at both the eastern and southern slopes of the site directly linked to the East Tributary and South Tributary of Sand Creek. Chemical contamination is present in LNWBG, and the ERA identified 12 integrated chemicals of potential ecological concern (COPECs) for soil, 8 COPECs for sediment, and 2 COPECs for surface water within LNWBG. Although the two wetlands are present and considered important ecological resources, sampling results in and around the wetlands indicate that chemical concentrations present no concern for ecological receptors. The wetlands were classified as Ohio Rapid Assessment Method (ORAM) category 3, which indicates healthy, high quality wetlands. Downstream from the wetlands, biological and water quality data also indicate that contamination within LNWBG is not entering Sand Creek and affecting downstream resources.

F CURRENT AND POTENTIAL FUTURE LAND USES

LNWBG is currently managed by ARNG/OHARNG. The future use of LNWBG is Military Training. The Resident Receptor (Adult and Child) was evaluated in the HHRA to assess an Unrestricted (Residential) Land Use scenario. This ROD discusses future land use as it pertains to soil, sediment, and surface water and how it impacts human health, the environment, and groundwater.

G SUMMARY OF SITE RISKS

The HHRA and ERA estimated risks to human receptors and ecological resources; identified exposure pathways; identified COCs and COPECs, if any; and provided a basis for remedial decisions. This section of the ROD summarizes the results of the HHRA and ERA, which are presented in detail in the LNWBG RI Report (Leidos 2018) and LNWBG PP (Leidos 2019) located in the Administrative Record and Information Repositories.

G.1 Human Health Risk Assessment

The HHRA assessed chemical risk and hazards, and risk management analysis was conducted to identify any COCs and if they posed unacceptable risk. Soil data associated with LNWBG were aggregated into surface and subsurface soil. Surface water and sediment were evaluated at the East Tributary and South Tributary. Results of the HHRA indicated that no COCs for potential remediation within LNWBG and no unacceptable risks to human health within the AOI exist (Leidos 2018).

To conservatively assess risk at LNWBG, the HHRA assessed surface and subsurface soil samples within the designated Area A. Results of the chemical concentrations from these surface soil samples are summarized below:

- All inorganic chemical concentrations were below the SL or background with the exception of thallium. Thallium was detected above the Resident Receptor Child FWCUG at a TR of 1E-06, HQ of 0.1 (0.612 mg/kg) in 4 of 1 samples, with a maximum detection of 2.4 mg/kg. However, the thallium concentrations were detected below the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1.
- All cyanide, explosive, SVOC, pesticide, PCB, and VOC concentrations were below the SL or background concentration with the exception of benzo(a)pyrene. Benzo(a)pyrene was detected above the Resident Receptor Adult FWCUG of 0.022 mg/kg in 1 of 15 samples, with a maximum detection of 0.025 mg/kg. The benzo(a)pyrene concentrations were detected below the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1.

The sample locations used to evaluate subsurface soil within Area A are LNWsb-068 (2–4 ft bgs), LNWsb-064 (2–4 ft bgs), LNWsb-066 (4–6 ft bgs), LNWsb-067 (6–8 ft bgs), LNWtr-003 (1–3 ft bgs), LNWtr-004 (1.5–3 ft bgs), and LNWtr-005 (1.5–3 ft bgs). Results of the chemical concentrations from these subsurface soil samples are summarized below:

- All inorganic chemical concentrations were below the SL or background with the exception of thallium. Thallium was detected above its subsurface soil background concentration (0.91 mg/kg) in three of seven samples, with a maximum detection of 1.4 mg/kg, compared to the Resident Receptor Child FWCUG of 0.612 mg/kg. The thallium concentrations were detected below the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1.
- All cyanide, explosive, SVOC, pesticide, PCB, and VOC concentrations were below the SL or background concentration.

This specific assessment did not identify unacceptable risk to human health for those areas within Area A. No COCs were identified for the Resident Receptor (Adult and Child) in soil, sediment, or surface water; therefore, no other receptors were evaluated and no further action is recommended from a human health risk perspective.

G.2 Ecological Risk Assessment

The ecological habitat at LNWBG consists of grasses and scrub/shrub surrounded by mature forest. LNWBG also features perennial surface water in the form of the East Tributary and South Tributary of Sand Creek and their associated wetlands. Intermittent surface water flows in natural drainage ditches typically during heavy rain storm events.

The vegetation provides a habitat for birds, mammals, insects, and other organisms that typically require approximately 1 acre of habitat. The northern long-eared bat (*Myotis septentrionalis*; federally threatened) exists at CJAG. No other federally listed species or critical habitats exist on CJAG. LNWBG has not had a site-specific survey for federally listed or state-listed species. However, surveys have been conducted throughout the facility and have not identified state-listed, federally listed, threatened, or endangered species at the AOC (OHARNG 2014).

The Level I Scoping Level ERA presented important ecological resources on or near the AOC and evaluated the potential for current contamination to impact ecological resources. Chemical contamination is present in soil, sediment, and surface water at LNWBG. This contamination was identified using ISM and discrete soil data collected for the historical ERA and PBA08 RI (Leidos 2018). Thirteen integrated soil, eight integrated sediment, and two integrated surface water COPECs are within LNWBG.

Two wetlands and the two Sand Creek tributaries are important ecological resources within LNWBG. Ecological significance is defined as an important resource that is subject to contaminant exposure. Although the wetlands and streams are important resources, they are not significant resources, as sediment and surface water sampling results in and around the wetlands and tributaries do not indicate chemicals are present at concentrations of concern for ecological receptors. In addition, the two wetlands have been classified as ORAM category 3, indicating that they are of high quality. Sampling stations downstream from the wetlands also indicate that LNWBG is not contributing contamination to Sand Creek.

Per USEPA guidance, sufficient justification exists to recommend that no further action is required to be protective of important ecological resources within LNWBG. Furthermore, the ERA for LNWBG concluded with a Level I Scoping Level Risk Assessment and a recommendation that no further action is required to be protective of ecological resources (Leidos 2018).

H DOCUMENTATION OF NO SIGNIFICANT CHANGE

The LNWBG PP (Leidos 2019) was released for public comment on July 29, 2019. The PP recommended no further action for soil, sediment, and surface water at LNWBG. After the public comment period, no significant changes were necessary or appropriate following the conclusion of the public comment period.

THIS PAGE INTENTIONALLY LEFT BLANK.

PART III: RESPONSIVENESS SUMMARY FOR PUBLIC COMMENTS ON THE PROPOSED PLAN FOR RVAAP-19 LANDFILL NORTH OF WINKLEPECK BURNING GROUNDS

A OVERVIEW

On July 29, 2019, ARNG released the LNWBG PP (Leidos 2019) for public comment. A 30-day public comment period was held from July 29, 2019 to August 27, 2019. ARNG hosted a public meeting on August 15, 2019 to present the PP and take questions and comments from the public for the record.

For soil, surface water, and sediment at LNWBG, ARNG recommended no further action. During the public meeting, Ohio EPA concurred with the recommendation of no further action. Comments provided during the public comment period and public meeting are summarized in the following section.

The community voiced no objections to the no further action recommendation. All public input was considered during the selection of the final remedy for soil, surface water, and sediment at LNWBG in this ROD.

B SUMMARY OF PUBLIC COMMENTS AND LEAD AGENCY RESPONSES

The following subsections summarize the oral and written comments provided during the public comment period and public meeting. The Army's responses provided below are considered final upon approval of the Final ROD.

B.1 Oral Comments from Public Meeting

No oral comments were received during the public meeting.

B.2 Written Comments

No technical or legal issues were raised during the public comment period.

C TECHNICAL AND LEGAL ISSUES

No technical or legal issues were raised during the public comment period.

THIS PAGE INTENTIONALLY LEFT BLANK.

PART IV: REFERENCES

ARNG (Army National Guard) 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.

Chenega (Chenega Tri-Services, LLC) 2019. *2019 Community Relations Plan for the Ravenna Army Ammunition Plant Restoration Program*. March 2019.

Jacobs (Jacobs Engineering Group, Inc.) 1989. *Resource Conservation and Recovery Act Facility Assessment, Preliminary Review/Visual Site Inspection Ravenna Army Ammunition Plant Ravenna, Ohio*. October 1989.

Leidos 2018. *Remedial Investigation Report for Soil, Sediment, and Surface Water at RVAAP-19 Landfill North of Winklepeck Burning Grounds.* April 2018.

Leidos 2019. *Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-19 Landfill North of Winklepeck Burning Grounds.* April 201.

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

OHARNG (Ohio Army National Guard) 2014. *Integrated Natural Resources Management Plan at the Camp Ravenna Joint Military Training Center, Portage and Trumbull Counties, Ohio.* December 2014.

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

SAIC (Science Applications International Corporation) 1996. *Preliminary Assessment for the Characterization of Areas of Contamination at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. February 1996.

SAIC 1998. *Phase I Remedial Investigation Report for High-Priority Areas of Concern at the Ravenna Army Ammunition Plant, Ravenna, Ohio.* February 1998.

USACE (U.S. Army Corps of Engineers) 2003. *RVAAP Facility Wide Ecological Risk Work Plan*. April 2003.

USACE 2010. *Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant, RVAAP, Ravenna, Ohio*. March 2010.

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

USATHAMA (U.S. Army Toxic and Hazardous Materials Agency) 1978. *Installation Assessment of Ravenna Army Ammunition Plant,* Records Evaluation Report No. 132. November 1978.

USATHAMA 1982. *Installation Reassessment of Ravenna Army Ammunition Plant, Ravenna Ohio Report No. 132R*. December 1982.

USEPA (U.S. Environmental Protection Agency) 1993. *Wildlife Exposure Factors Handbook. Office of Research and Development,* Washington, D.C., Volume 1 of 2. December 1993.

USDA (U.S. Department of Agriculture) 2010. Soil Map of Portage County, Version 4. Website: www.websoilsurvey.nrcs.usda.gov. January 2010.

Winslow, J.D. and G.W. White, 1966. *Geology and Ground-water Resources of Portage County, Ohio*. Geological Survey Professional Paper 511. 1966.

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK.

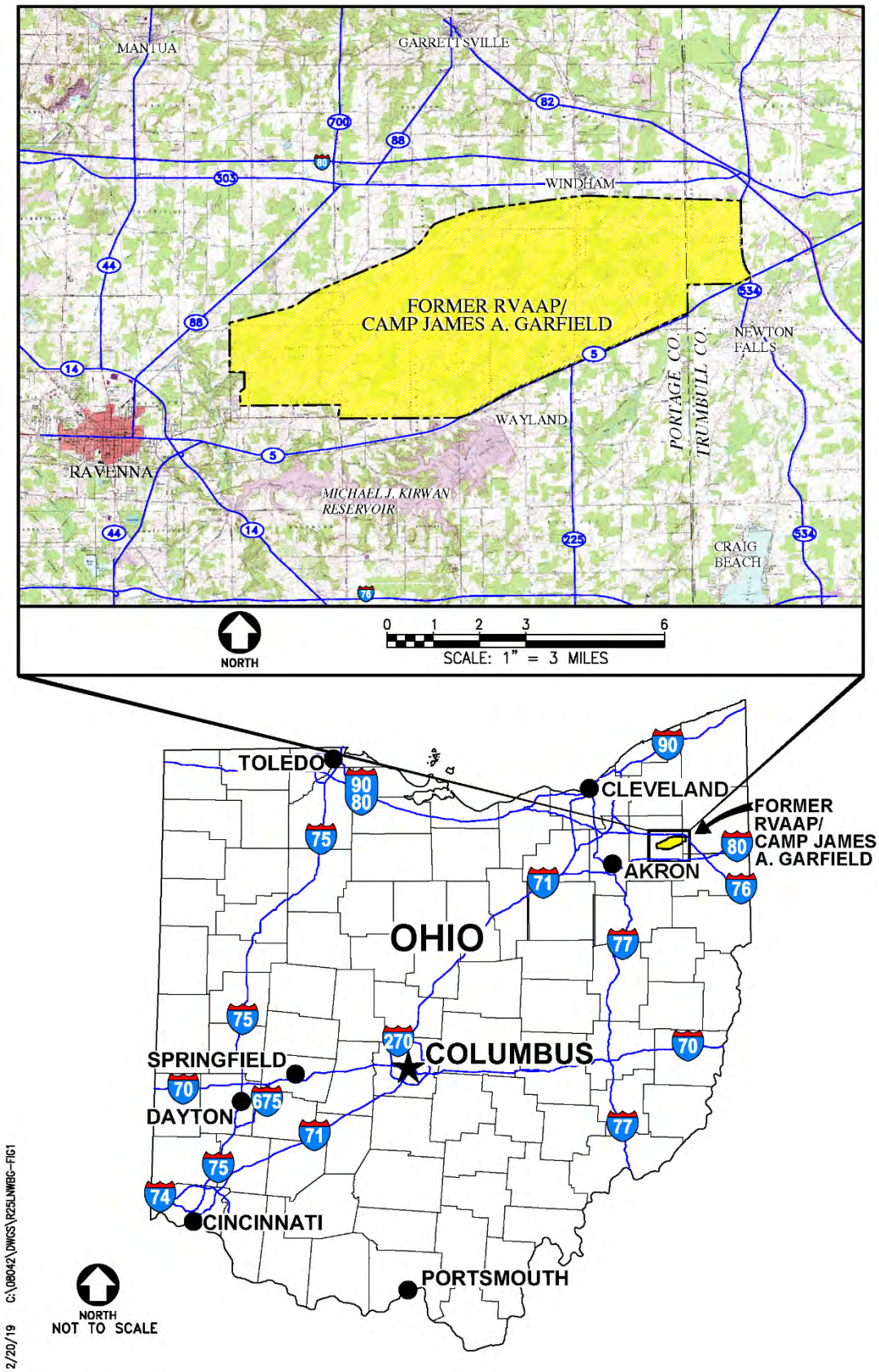


Figure 1. General Location and Orientation of Camp James A. Garfield

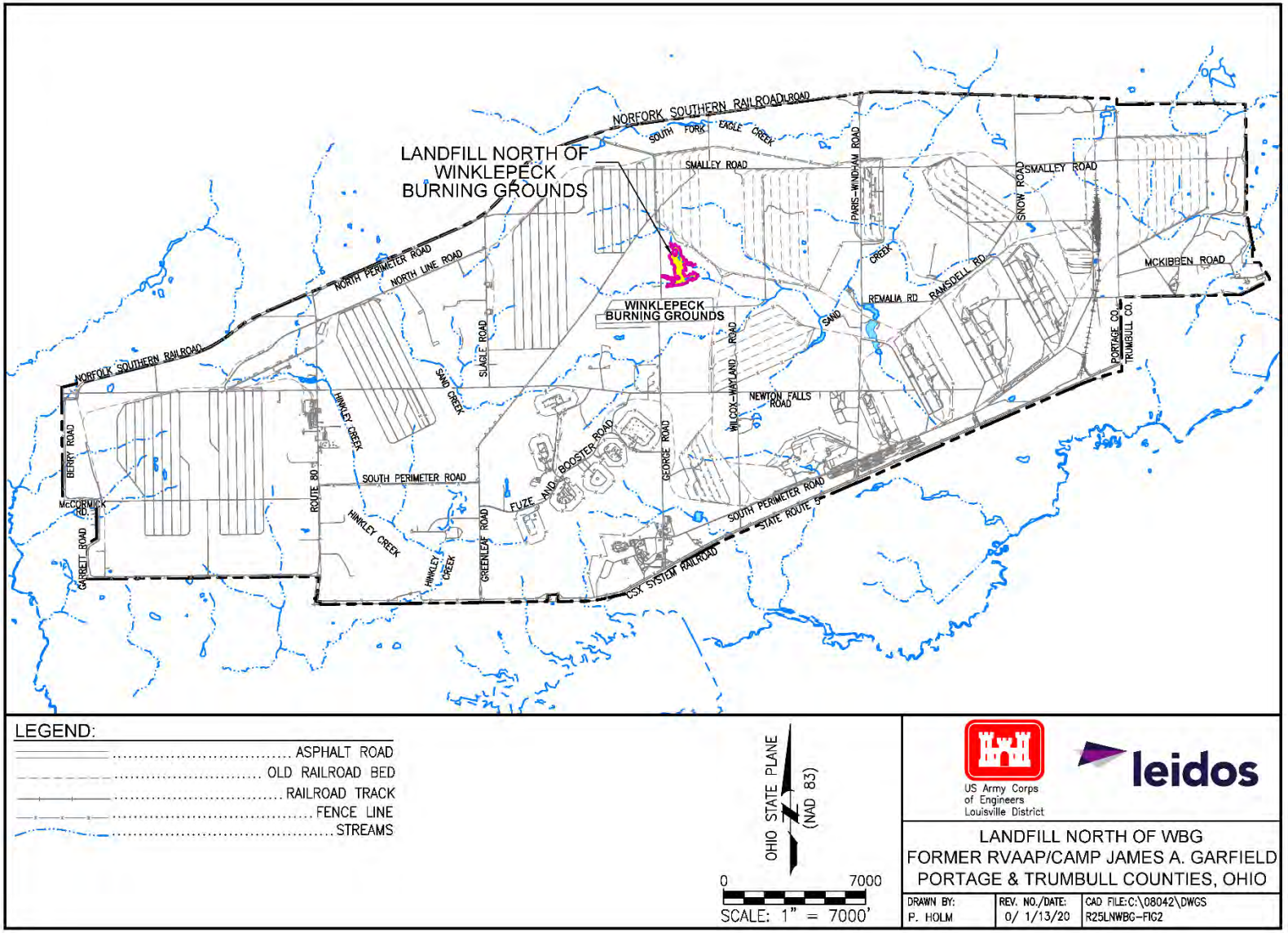


Figure 2. Camp James A. Garfield Installation Map

THIS PAGE INTENTIONALLY LEFT BLANK.

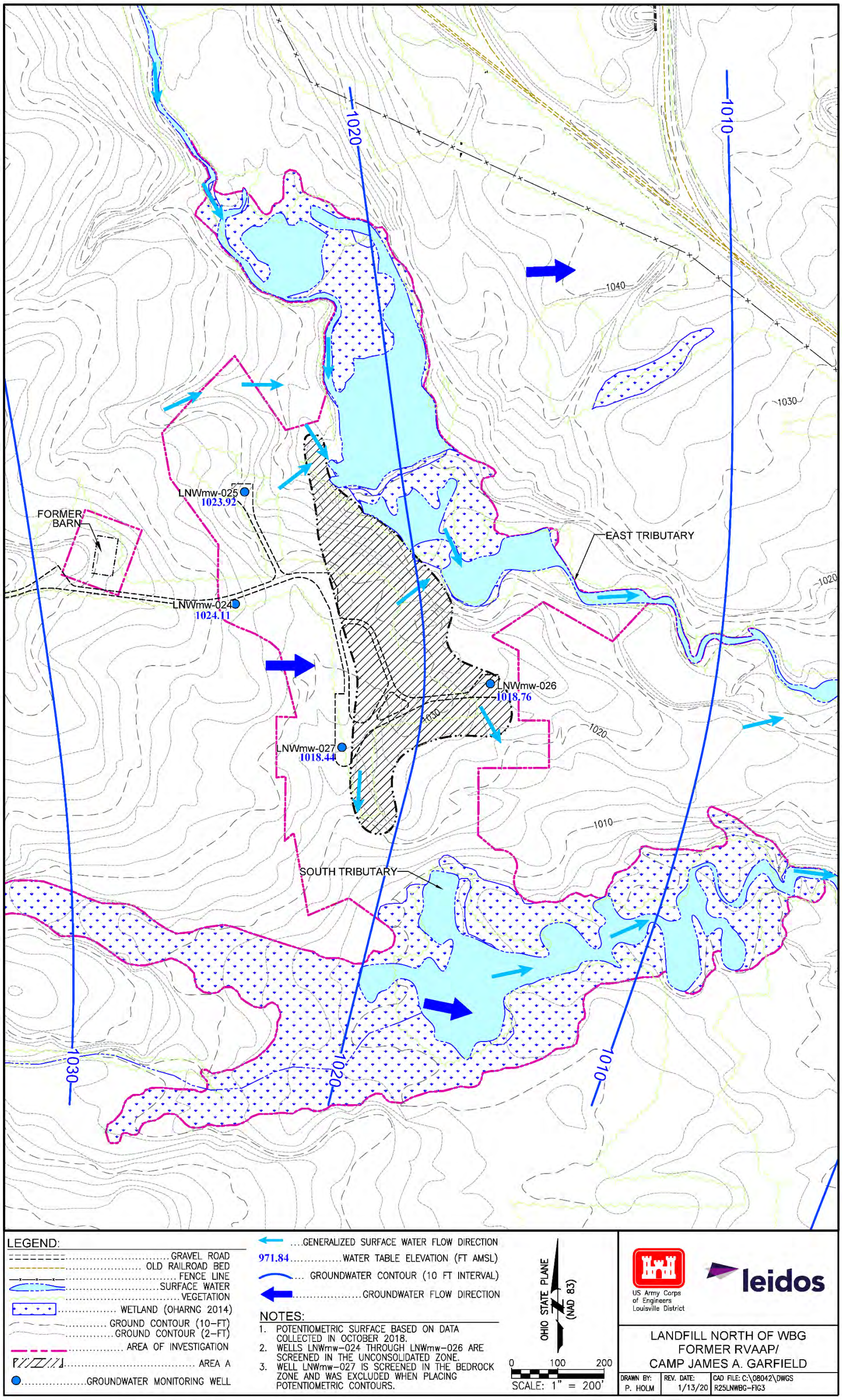
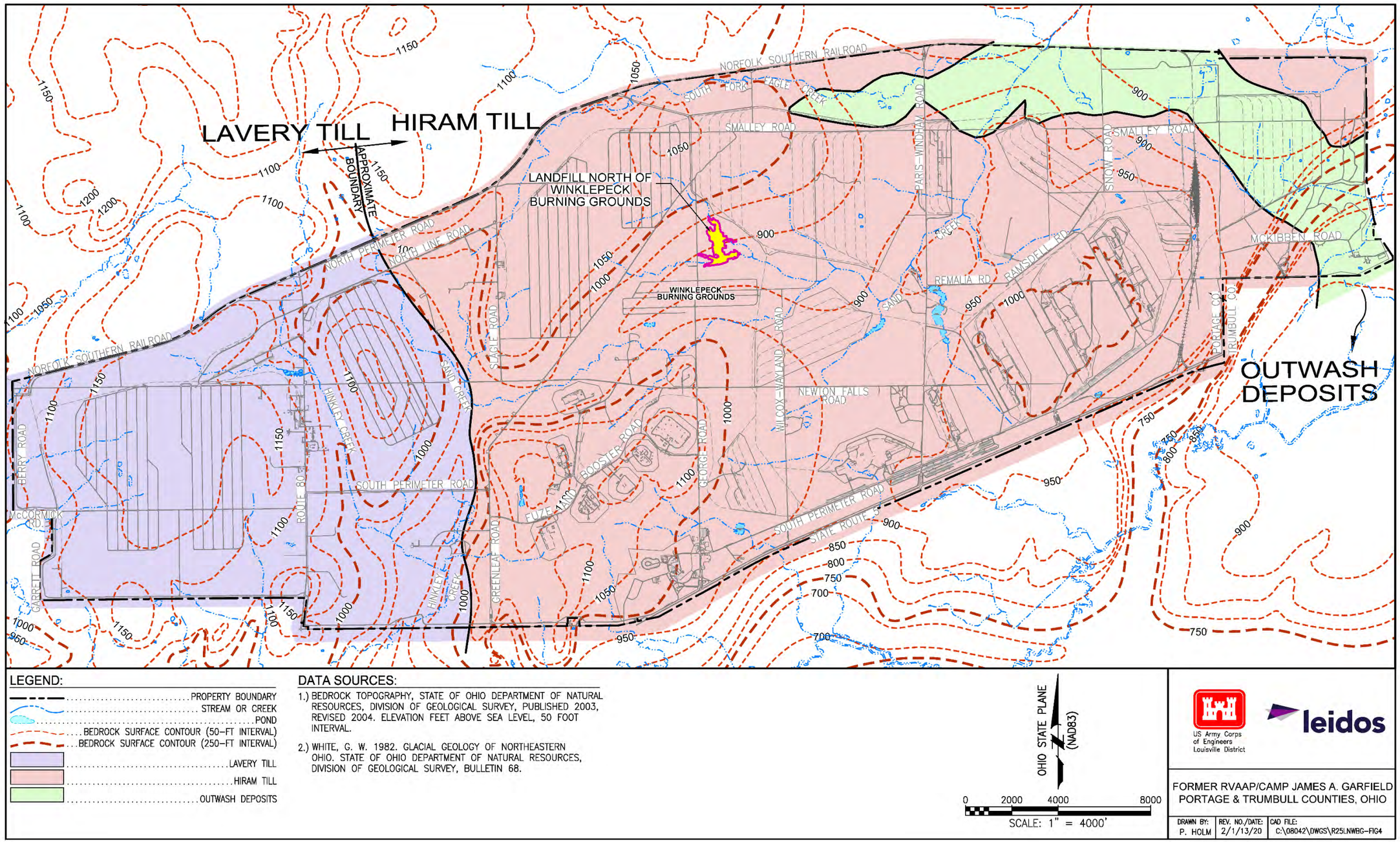


Figure 3. Landfill North of Winklepeck Burning Grounds Site Features



LEGEND:

- PROPERTY BOUNDARY
- STREAM OR CREEK
- POND
- BEDROCK SURFACE CONTOUR (50-FT INTERVAL)
- BEDROCK SURFACE CONTOUR (250-FT INTERVAL)
- LAVERY TILL
- HIRAM TILL
- OUTWASH DEPOSITS

DATA SOURCES:

1.) BEDROCK TOPOGRAPHY, STATE OF OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SURVEY, PUBLISHED 2003, REVISED 2004. ELEVATION FEET ABOVE SEA LEVEL, 50 FOOT INTERVAL.

2.) WHITE, G. W. 1982. GLACIAL GEOLOGY OF NORTHEASTERN OHIO. STATE OF OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL SURVEY, BULLETIN 68.

OHIO STATE PLANE (NAD83)

0 2000 4000 8000

SCALE: 1" = 4000'

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:
P. HOLM	2/1/13/20	C:\08042\DWGS\R25LNWBG-FIG4

Figure 4. Geologic Map of Unconsolidated Deposits on Camp James A. Garfield

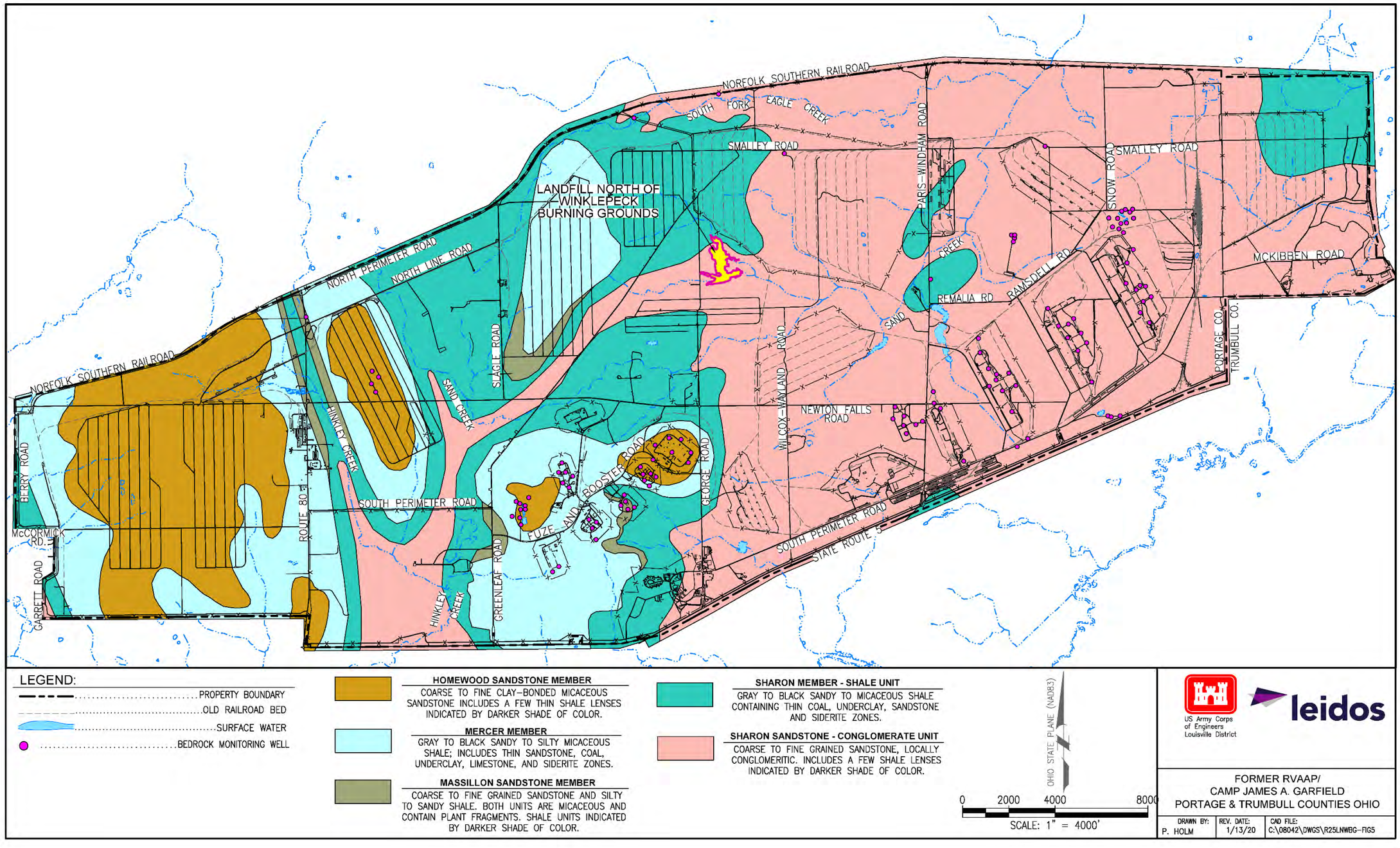


Figure 5. Geologic Bedrock Map and Stratigraphic Description of Units on Camp James A. Garfield

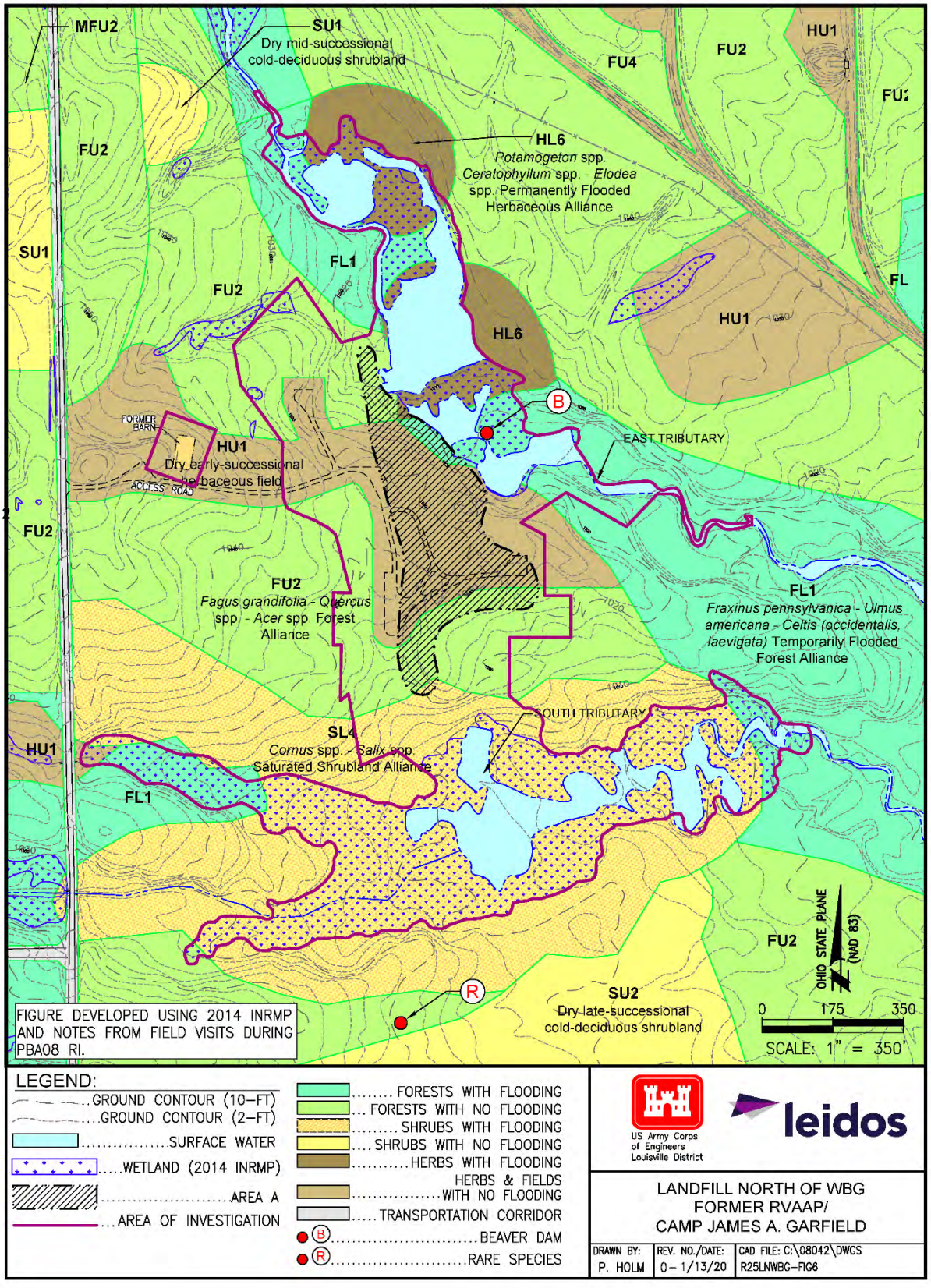


Figure 6. Natural Resources Inside and Near Habitat Area at Landfill North of WBG

THIS PAGE INTENTIONALLY LEFT BLANK.

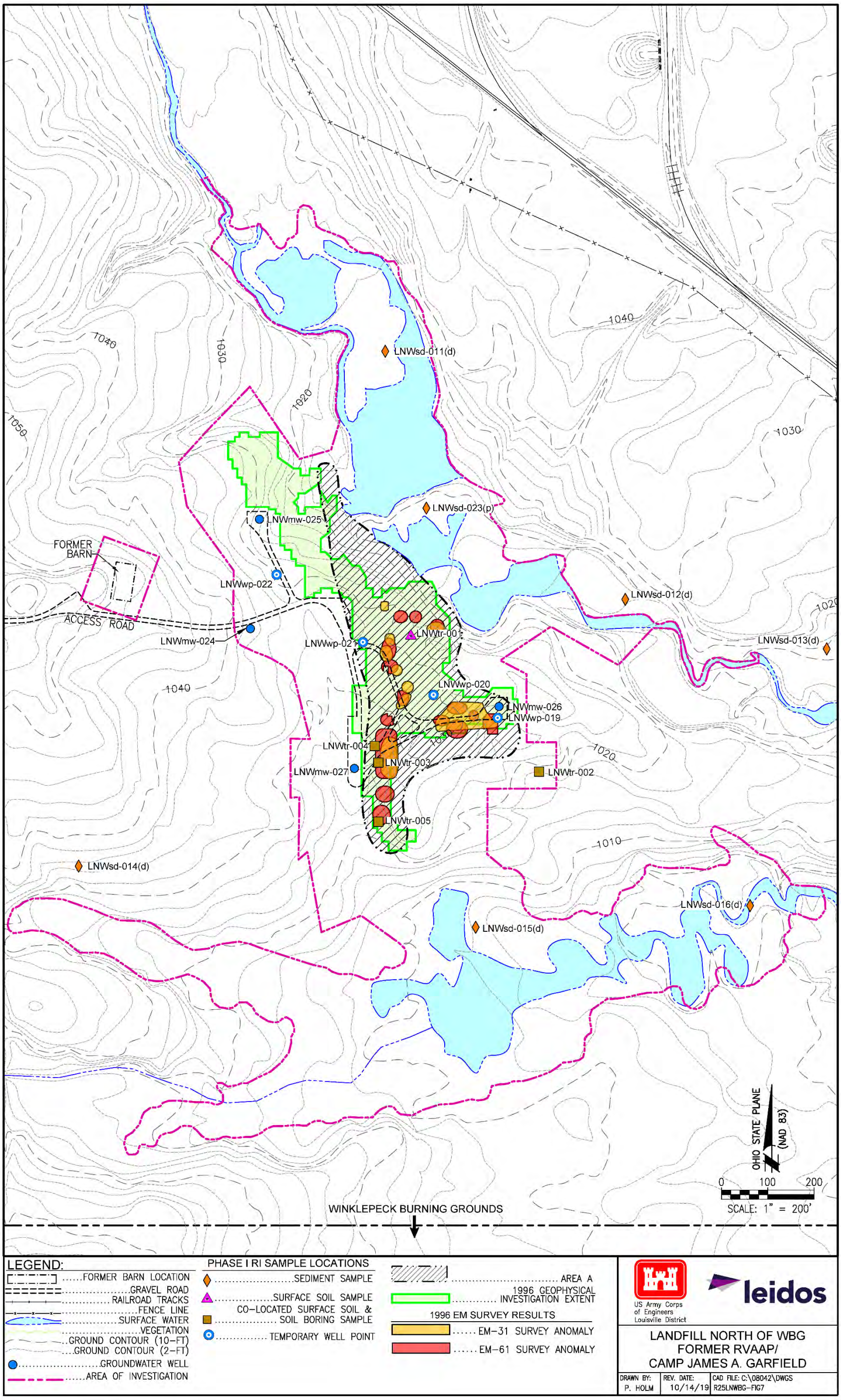


Figure 7. Phase I RI Sample Locations

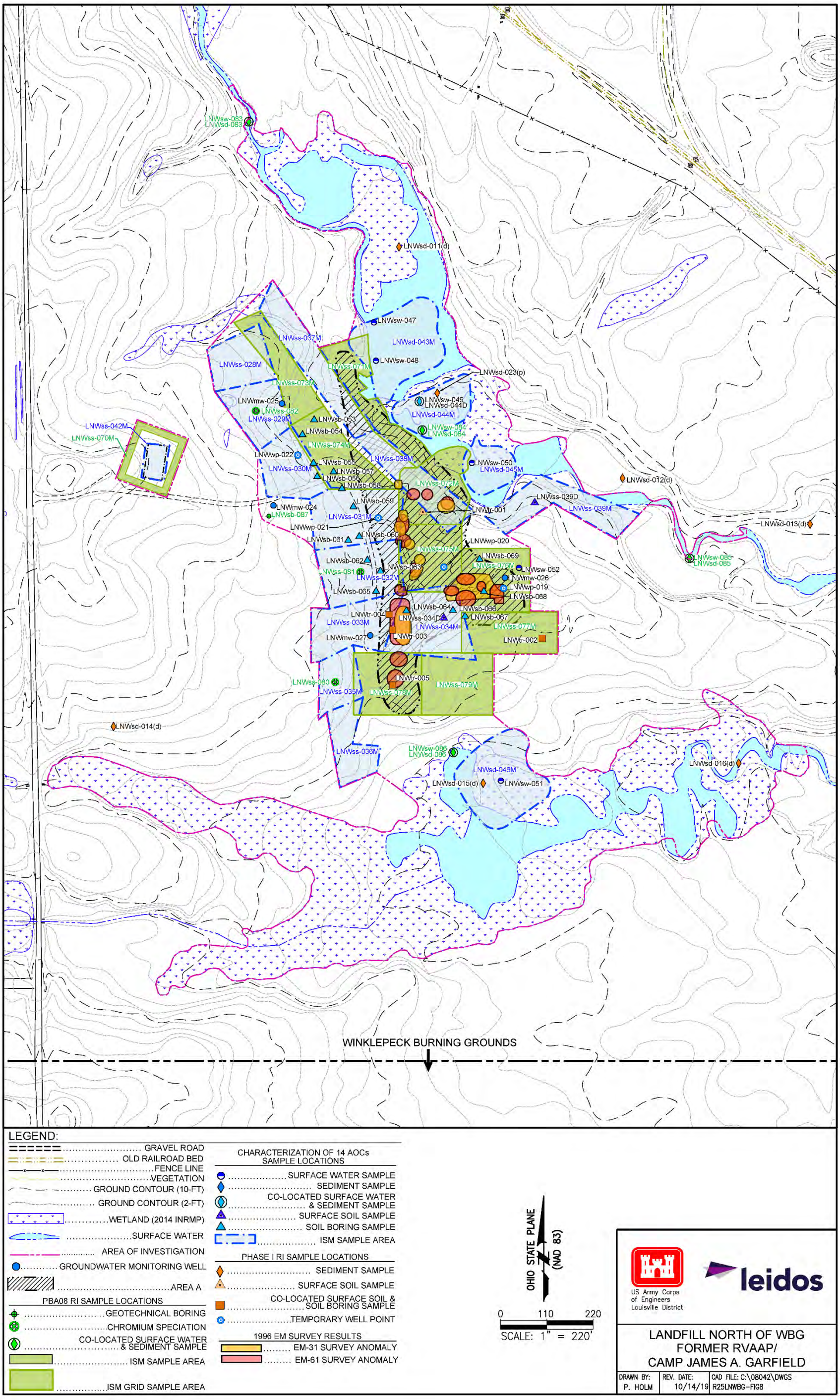


Figure 8. Landfill North of Winklepeck Burning Grounds – All Sample Locations

APPENDIX A

Affidavits

THIS PAGE INTENTIONALLY LEFT BLANK.

Affidavit of Publication, Tribune Chronicle, August 2, 2019

PROOF OF PUBLICATION

STATE OF OHIO
TRUMBULL COUNTY SS CONNIE PACEK

BEING DULY SWORN, UPON OATH STATES THAT SHE IS AN AUTHORIZED REPRESENTATIVE OF THE TRIBUNE CHRONICLE, (A DIVISION OF EASTERN OHIO NEWSPAPERS INC) A DAILY NEWSPAPER PRINTED IN THE CITY OF WARREN, COUNTY OF TRUMBULL, STATE OF OHIO AND OF GENERAL CIRCULATION IN THE CITY OF WARREN, TRUMBULL COUNTY, OHIO AND IS INDEPENDENT IN POLITICS.

THAT THE ATTACHED ADVERTISEMENT WAS PUBLISHED IN THE TRIBUNE CHRONICLE EVERY FRIDAY FOR ONE CONSECUTIVE WEEKS AND THAT THE FIRST INSERTION WAS ON FRIDAY THE 2ND DAY OF August 2019

CONNIE PACEK

SWORN TO BEFORE ME AND SUBSCRIBED IN MY PRESENCE ON THIS 7TH DAY OF August 2019

NOTARY PUBLIC

SEAL

LAWRENCE J. KOVACH, Notary Public
STATE OF OHIO
MY COMMISSION EXPIRES SEPTEMBER 23, 2022

ADVERTISING COST $ 301.59

NOTICE OF DOCUMENT AVAILABILITY
Proposed Plans for National Advisory Committee for Aeronautics (NACA) Test Area, Landfill North of Whitespeck Burning Grounds (LNWBG), and Buildings F-15 and F-16 at the Former Ravenna Army Ammunition Plant (RVAAP)

The Proposed Plan for NACA Test Area presents a recommendation of Ex-situ Thermal Treatment of Contaminated Soil. The Proposed Plans for LNWBG and Buildings F-15 and F-16 present a recommendation of No Further Action. Each Proposed Plan provides the rationale for these recommendations. The Proposed Plans are available for public review from July 29, 2019 to August 27, 2019.

The Proposed Plans are available at:

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266

The Proposed Plans are also available at: www.rvaap.org

Please join us for an OPEN HOUSE and PUBLIC MEETING

The Army National Guard will host an informational open house and a public meeting to explain the recommendations in the Proposed Plans. Oral and written comments will be accepted at the meeting. Written comments may also be mailed to the Camp James A. Garfield Environmental Office 1438 State Route 534 SW, Newton Falls, OH 44444. Comments will be accepted during the public comment period from July 29, 2019 to August 27, 2019

The public meeting is scheduled for:
Thursday August 15, 2019
6:00 pm Open House
6:30 pm Public Meeting

at:
Sheaver Community Center
(Paris Township Hall)
9355 Newton Falls Road
Ravenna, OH 44266

For more information or if you need special accommodations to attend, please contact Katie Tait at 814-336-6136.

#214-1T-August 2, 2019 #4203

Affidavit of Publication, Record-Courier, August 5, 2019

31193993

Proof of Publication
Record Publishing Company
1050 W. Main Street,
Kent, OH 44240
Phone (330) 541-9400
Fax (330) 673-6363

I, Matthew Dyer being first duly sworn depose and say that I am Advertising Clerk of
Record Publishing Company

30 Record-Courier a newspaper printed and published in the city of Kent, and of General circulation in the County of Portage, State of Ohio, and personal knowledge of the facts herein stated and that the notice hereto annexed was Published in said newspapers for 1 insertions on the same day of the week from and after the 5th day of August, 2019 and that the fees charged are legal.

Name of Account: Leidos
Ad Number: 12580840
No. of Lines: 28

Day(s) Published: 08/05.
Printers Fee: $115.20

Sworn to and subscribed before this 5th day of August, 2019.

Elizabeth McDaniel
Notary Public
Commission Expires June 19, 2021

Notice of Document Availability

Proposed Plans for National Advisory Committee for Aeronautics (NACA) Test Area, Landfill North of Winklepeck Burning Grounds (LNWBG), and Buildings F-15 and F-16 at the Former Ravenna Army Ammunition Plant (RVAAP)

The Proposed Plan for NACA Test Area presents a recommendation of Ex-situ Thermal Treatment of Contaminated Soil. The Proposed Plans for LNWBG and Buildings F-15 and F-16 present a recommendation of No Further Action. Each Proposed Plan provides the rationale for these recommendations. The Proposed Plans are available for public review from July 29, 2019 to August 27, 2019.

The Proposed Plans are available at:

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266

The Proposed Plans are also available at: www.rvaap.org

Please join us for an OPEN HOUSE and PUBLIC MEETING.

The Army National Guard will host an informational open house and a public meeting to explain the recommendations in the Proposed Plans. Oral and written comments will be accepted at the meeting. Written comments may also be mailed to the Camp James A. Garfield Environmental Office; 1438 State Route 534 SW, Newton Falls, OH 44444. Comments will be accepted during the public comment period from July 29, 2019 to August 27, 2019.

The public meeting is scheduled for:

Thursday August 15, 2019
6:00 pm Open House
6:30 pm Public Meeting

at:

Shearer Community Center (Paris Township Hall)
9355 Newton Falls Road
Ravenna, OH 44266

For more information or if you need special accommodations to attend, please contact Katie Tait at 614-336-6136.

RC Aug 5, 2019 12550R40

THIS PAGE INTENTIONALLY LEFT BLANK.