F I N A L

Remedial Action Completion Report
Load Lines 1, 2, 3, 4, and 12
(RVAAP-08 to 12)

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-12-D-0005
Delivery Order No. W912QR19F0952

Prepared for

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

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OCTOBER 2021

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
10/29/2021	Technical	October 2020 to February 2021

4. TITLE AND SUBTITLE

FINAL
Remedial Action Completion Report for
RVAAP Load Lines 1, 2, 3, 4, and 12 (RVAAP-08 to 12)
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

5a. CONTRACT NUMBER
W912QR-12-D-0005

5b. GRANT NUMBER
NA

5c. PROGRAM ELEMENT NUMBER
NA

6. AUTHOR(S)
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5d. PROJECT NUMBER
Delivery Order No. W912QR19F0952

5e. TASK NUMBER
NA

5f. WORK UNIT NUMBER
NA

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER
NA

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

The Remedial Action Completion Report presents the activities completed to implement ex situ thermal treatment of soil at RVAAP Load Lines 1, 2, 3, 4 and 12 per the Final Record of Decision Amendment for Soil, Sediment, and Surface Water at RVAAP Load Lines 1, 2, 3, 4, and 12 (Leidos, 2019).

15. SUBJECT TERMS
remedial action, completion report, CERCLA, ex situ thermal treatment, RVAAP- 08 Load Line 1, RVAAP- 09 Load Line 2, RVAAP- 10 Load Line 3, RVAAP- 11 Load Line 4, RVAAP- 12 Load Line 12

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	SAR	77 plus 23K	19b. TELEPHONE NUMBER *(Include area code)* 502-315-2624

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
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October 29, 2021

TRANSMITTED ELECTRONICALLY

Mr. Kevin Sedlak
Army National Guard
Installation and Environment
Clean-up Branch
IPA Designation
1438 State Route 534 SW
Newton Falls, OH 44444

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859263

Subject: **Receipt and Review of the Response to Ohio EPA Comments for the Draft Completion Report for RVAAP Load Lines 1 – 4 and 12 (RVAAP-08 through RVAAP-12), Dated October 27, 2021**

Dear Mr. Sedlak:

Ohio EPA, Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) received and reviewed your responses to our comments for the document entitled "Draft Completion Report" for RVAAP Load Lines 1 – 4 and 12.

Our comments were addressed. Please submit the document in final form.

This letter is an official response from Ohio EPA that will be maintained as a public record. If you have any questions or concerns, please do not hesitate to contact me at (330) 963-1201, or via email at Susan.Netzly-Watkins@epa.ohio.gov

Sincerely,

Sue Netzly-Watkins

Sue Netzly-Watkins
Site Coordinator
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STATEMENT OF INDEPENDENT TECHNICAL REVIEW

CH2M HILL Constructors, Inc. (CH2M) has completed the Draft Remedial Action Completion Report for Load Lines 1, 2, 3, 4, and 12 (RVAAP-08 to 12), Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio.

Notice is hereby given that an independent technical review has been conducted which 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, using 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. Significant concerns and an 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.

Date: October 29, 2021

Sarah Meyers
Project Manager, CH2M

Date: October 29, 2021

Jeffrey Minchak
Independent Technical Reviewer, CH2M

FINAL

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October 2021

DOCUMENT DISTRIBUTION
for the
FINAL
Remedial Action Completion Report
Load Lines 1, 2, 3, 4, and 12 (RVAAP 08 to 12)
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

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Notes:
ARNG = Army National Guard
CD = compact disc
CJAG = Camp James A. Garfield
ftp = file transfer protocol
OHARNG = Ohio Army National Guard
REIMS = Ravenna Environmental Information Management System
USACE = U.S. Army Corps of Engineers
WPAO = Wright Patterson Area Office

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Acronyms and Abbreviations

%	percent
+/-	plus or minus
<	less than
>	more than
≤	less than or equal to
°F	degrees Fahrenheit
µg/kg	microgram(s) per kilogram
2,4,6-TNT	2,4,6-trinitrotoluene
2,6-DNT	2,6-dinitrotoluene
3D	three-dimensional
ADR	Automated Data Review
amsl	above mean sea level
AOC	Area of Concern
ARNG	Army National Guard
B(a)a	benz(a)anthracene
BaP	benzo(a)pyrene
BbF	benzo(b)fluoranthene
bgs	below ground surface
BMP	best management practice
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH2M	CH2M HILL Constructors, Inc.
CJAG	Camp James A. Garfield
COC	contaminant of concern
CV	coefficient of variation
CY	cubic yard(s)
DA	dibenz(a,h)anthracene
DNT	dinitrotoluene
DU	decision unit
EPA	U.S. Environmental Protection Agency
EQM	Environmental Quality Management, Inc.
ETC	enhanced thermal conduction
ftp	file transfer protocol

ISM	incremental sampling methodology
km	kilometer(s)
LCS	laboratory control sample(s)
LCSD	laboratory control spike duplicate(s)
LUC	land use control
MCL	maximum contaminant level
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
MKM	MKM Engineers, Inc.
MS	matrix spike(s)
MSD	matrix spike duplicate(s)
NA	not applicable
ND	not detected
OAC	Ohio Administrative Code
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	polycyclic aromatic hydrocarbon
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
PCB	polychlorinated biphenyl
PMP	Property Management Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RACR	Remedial Action Completion Report
RAO	remedial action objective
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
REIMS	Ravenna Environmental Information Management System
RGO	remedial goal option
ROD	Record of Decision
RPD	relative percent difference
RSD	relative standard deviation
RSL	regional screening level
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation

SD	standard deviation
SDG	sample delivery group
SF	square foot or square feet
SVOC	semivolatile organic compound
SWE	Sidewall East
SWN	Sidewall North
SWS	Sidewall South
SW	Sidewall West
TAL	target analyte list
TCL	target compound list
TNT	2,4,6-trinitrotoluene or trinitrotoluene
U.S.	United States
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound
Work Plan	*Remedial Design Work Plan for RVAAP Load Lines 1, 2, 3, 4, and 12, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio*
WPAO	Wright Patterson Area Office

Executive Summary

The approved soil remedial action was completed for the former Ravenna Army Ammunition Plant (RVAAP) Load Lines 1, 2, 3, 4, and 12, designated as Areas of Concern RVAAP-08, -09, -10, -11, and -12, respectively, as described in the Final Record of Decision (ROD) Amendment (Leidos, 2019a)[1] and the *Remedial Design Work Plan for RVAAP Load Lines 1, 2, 3, 4, and 12, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio* (CH2M, 2020a). The ROD Amendment identified 24 locations at Load Lines 1, 2, 3, 4, and 12 that required removing soil to achieve the remedial action objective to reduce risk from contaminants of concern (COCs) in surface and subsurface soil to acceptable levels (remedial goal options [RGOs]) for likely future use (that is, Commercial/Industrial land use) that protect human health. COCs included polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), explosives, and metals. The approved remedy involved excavating soil from 24 locations, ex-situ thermal treatment of most excavated soil, off-site disposal of the remaining portion of the excavated soil (metals-contaminated), confirmation sampling, backfill, and site restoration. Representatives from the United States Army Corps of Engineers (USACE), Ohio Army National Guard, and the Army National Guard (collectively referred to herein as the Army) visited the site throughout the remedial action.

Load Lines 1, 2, 3, and 4 were all used during the 1940s and 1950s for various activities, including loading bulk explosives into munitions and completing munitions rehabilitation and demilitarization projects, with each line handling millions of munitions items. During the 1940s, Load Line 12 was used as an ammonium nitrate manufacturing facility and for munitions renovation and demilitarization operations. Beginning in the mid-1940s, various activities were conducted in Load Line 12, including production of fertilizer grade ammonium nitrate, aluminum chloride, and primers. A pinkwater treatment plant was also operated at Load Line 12. Load Lines 1, 2, 3, 4, and 12 are not known to contain munitions and explosives of concern.

Remediation activities were implemented over a period of approximately 5 months (October 2020 to February 2021). The 24 excavations were surveyed using the boundaries designated in the ROD Amendment (Leidos, 2019a). After the boundaries were established, topsoil and uncontaminated overburden soil was removed to access materials targeted for remediation.

Excavation locations with metals-impacted soil (CB-2 and the Outlet Channel in Load Line 1 for antimony and lead; CB-13B in Load Line 1 and the Former Water Tower in Load Line 4 for lead) were excavated, sampled for disposal characterization, loaded into lined roll-off boxes, and transported for off-site disposal. A total of approximately 88 cubic yards (CY) (160 tons) of soil was excavated from metals-contaminated locations and disposed off-site as non-hazardous waste per the analytical results at Republic Services Carbon Limestone Landfill at 8100 South Stateline Road, Lowellville, Ohio.

Soil designated for removal and thermal treatment in the 20 remaining excavations was excavated and directly loaded for transport to the ex-situ thermal treatment area constructed in Load Line 1. The COCs for these excavations consisted of PAHs (benz[a]anthracene, benzo(a)pyrene, benzo[b]fluoranthene, and/or dibenz[a,h]anthracene), PCB-1254, PCB-1260, and/or explosives (2,6-dinitrotoluene; 2,4,6-trinitrotoluene; and/or hexahydro-1,3,5-trinitro-1,3,5-triazine). A total of 2,528 CY of contaminated soil were excavated for on-site ex-situ thermal treatment. One composite treatment verification sample was collected per 150 CY of treated soil and analyzed for the applicable COCs; all treatment verification samples met the applicable RGOs. During the remedial action, treatment

[1] Load Lines 1 through 4 and 12 all had previous RODs signed by the U.S. Army that addressed the soil and dry sediment media (Shaw, 2007; SAIC, 2009). The remedial actions identified in the previous RODs have been implemented to achieve military training land use. The remedy described in the ROD Amendment (Leidos, 2019a)and discussed in this RACR was implemented to achieve Commercial/Industrial land use.

verification sample results were provided to the Army and Ohio Environmental Protection Agency (Ohio EPA) on a regular basis for review.

Soil was initially excavated to the extent identified in the ROD Amendment. Excavation confirmation soil samples were collected using incremental sampling methodology (ISM), with each sidewall or bottom constituting a decision unit. ISM samples collected for confirmation included 30 to 50 aliquots per sample. Excavation confirmation samples were analyzed for the COCs applicable to each excavation. During the remedial action, excavation confirmation sample results were provided to the Army and Ohio EPA on a regular basis for review. If an excavation confirmation sample met the applicable RGOs, in accordance with the Work Plan Quality Assurance Project Plan (QAPP), then the excavation was considered complete in that direction. If an excavation confirmation sample exceeded an applicable RGO, then USACE was informed, and additional soil was removed in the direction of the exceedance. After the additional soil was removed, an additional excavation confirmation sample was collected and analyzed for the COC that exceeded the RGO in the initial excavation confirmation sample. This was repeated until the RGOs were met.

Demolition of concrete was required for walkway and foundation structures located within some excavation areas. Concrete material was demolished and broken down to required debris sizing with excavator-mounted hydraulic concrete -breaking equipment. Composite disposal characterization samples were collected from the demolished concrete at a frequency of approximately one sample per 500 CY and analyzed for PCBs and Resource Conservation and Recovery Act metals. Analytical results for demolished concrete met requirements for off-site recycling. Approximately 400 tons of concrete was approved by the Army and recycler for off-site recycling and was transported to Acme Resources at 11600 Mahoning Avenue, North Jackson, Ohio.

After the RGOs were met, the treated soil was used to backfill excavations. Additional backfill material was also obtained from an approved off-site source as needed to backfill the excavations to match the surrounding grade. Disturbed areas were regraded as necessary and seeded with the approved permanent seed mix. The Army approved the 70-percent vegetative cover on all disturbed areas on June 29, 2021 and approved completion of all restoration requirements on July 6, 2021 when the remaining erosion controls were removed.

The approved remedy in the ROD Amendment also includes administrative land use controls that will be implemented separately by the Army.

SECTION 1

Introduction

1.1 Purpose

This Remedial Action Completion Report (RACR) describes the activities completed to implement the approved soil remedial action for the former Ravenna Army Ammunition Plant (RVAAP) Load Lines 1, 2, 3, 4 and 12, designated as Areas of Concern (AOCs) RVAAP-08, -09, -10, -11, and -12, respectively, as described in the Final Record of Decision (ROD) Amendment (Leidos, 2019a). Load Lines 1, 2, 3, 4, and 12 all had previous RODs signed by the Army that addressed the soil and dry sediment media (Shaw, 2007; SAIC, 2009). The remedial actions identified in the previous RODs have been implemented to achieve Military Training Land Use. The remedy described in the ROD Amendment and discussed in this RACR was implemented to achieve Commercial/Industrial Land Use.

1.2 Scope

The ROD Amendment identifies 24 locations at Load Lines 1, 2, 3, 4, and 12 which required soil removal in order to achieve the remedial action objective (RAO) to reduce risk from contaminants of concern (COCs) in surface and subsurface soil to acceptable levels (remedial goal options [RGOs]) for likely future use (that is, Commercial/Industrial Land Use) that are protective of human health. COCs included polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), explosives and metals. The approved remedy included excavation of soil from 24 locations, ex-situ thermal treatment of the majority of the excavated soil, off-site disposal of the remaining portion of the excavated soil (metals-contaminated), confirmation sampling, backfill and site restoration. On-site activities occurred over a period of approximately 5 months.

The approved remedy in the ROD Amendment also includes administrative land use controls (LUCs) as described in **Appendix A**. This will be included in the next version of the Property Management Plan (PMP) and LUC management will start.

SECTION 2

Site Description

2.1 Facility Description and History

The former RVAAP, currently named Camp James A. Garfield (CJAG), is located in northeastern Ohio within Portage and Trumbull counties, approximately 1.6 kilometers (km) (1 mile) northwest of the City of Newton Falls and 4.8 km (3 miles) east-northeast of the City of Ravenna (**Figure 2-1**). The facility is a parcel of property approximately 17.7 km (11 miles) long and 5.6 km (3.5 miles) wide bounded by State Route 5, the Michael J. Kirwan Reservoir, 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.

The former RVAAP was a load, assemble, and pack facility built to produce large caliber artillery projectiles and bombs. Administrative control of the facility (21,683 acres) has been 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. The RVAAP Installation Restoration Program, managed by the Army National Guard (ARNG) and the OHARNG, administers investigation and cleanup of past activities over the entire 21,683 acres of the former RVAAP.

The ROD Amendment provides a detailed site history for Load Lines 1, 2, 3, 4, and 12. **Figure 2-2** shows the locations of Load Lines 1, 2, 3, 4, and 12. Load Lines 1, 2, 3, and 4 were all used in the 1940s and 1950s for various activities including loading bulk explosives into munitions, munitions rehabilitation and demilitarization projects, with each line handling millions of munitions items. In the 1940s Load Line 12 was used as an ammonium nitrate manufacturing facility and for munitions renovation and demilitarization operations. Beginning in the mid-1940s, various activities were conducted in Load Line 12 including production of fertilizer grade ammonium nitrate, aluminum chloride, and primers. A pinkwater treatment plant was also operated at Load Line 12.

Load Lines 1, 2, 3, 4, and 12 are not known to contain munitions and explosives of concern.

Load Lines 1, 2, 3, 4, and 12 all had previous RODs signed by the Army that addressed the soil and dry sediment media (Shaw, 2007; SAIC, 2009). The remedial actions identified in the previous RODs for soil and dry sediment are described below and have been implemented, consisting of excavation with off-site disposal as an interim remedy to address COCs in soil that exceeded human health Facility wide Cleanup Goals established for the National Guard Trainee:

- **Load Lines 1, 2, 3, and 4—**Removal of approximately 1,752 tons of hazardous and 9,484 tons of nonhazardous contaminated soil occurred at Load Lines 1 through 4 from August to November 2007 to achieve Military Training Land Use (National Guard Mounted Training – No Digging land use). The buildings also were removed in 2007; however, removal of the floor slabs and associated foundation walls was not completed until 2009. A sampling program was implemented after the floor slab removal. Based on the sampling results, approximately 2,804 cubic yards (CY) of sub-slab soil were removed at Load Lines 1-3 in 2010.
- **Load Line 12—**Building demolition and slab removal occurred from 1998 to 2000. Removal of 1,181 tons of contaminated sediment from the Main Ditch at Load Line 12 was completed in 2010 to achieve Military Training Land Use for soil and dry sediment (National Guard Mounted Training – Digging to 4 feet below ground surface [bgs] land use) (Leidos, 2019b). A separate ROD for Load Line 12 selected no further action for wet sediment and surface water to attain Unrestricted (Residential) Land Use (Leidos, 2019a).

After the removal actions were completed to achieve Military Training Land Use, the Army conducted multiple sampling events to assess if additional remedial actions were necessary to achieve potential future Commercial/Industrial Land Use or Unrestricted (Residential) Land Use. Based on the investigation results, Load Lines 1- 4 and 12 were adequately characterized and the nature and extent of the contamination has been defined. The ecological risk assessment concluded that no further action is necessary to be protective of important ecological resources and no further action was recommended from the ecological risk perspective. Extensive investigations of each load line concluded that a portion of each load line did not require further action to attain Unrestricted (Residential) Land Use. Limited areas of surface and subsurface soil at each load line were identified as posing unacceptable risk to the Industrial Receptor and/or Resident Receptor. The Feasibility Study Addendum (Leidos, 2017), Proposed Plan (Leidos, 2018) and ROD Amendment (Leidos, 2019b) identified the preferred alternative to be Ex-Situ Thermal Treatment of Soil and Administrative LUCs for Commercial/Industrial Land Use and identified the excavation locations for this remedial action, which was completed as described in this report.

All buildings at Load Lines 1, 2, 3, 4, and 12 have been demolished. Currently vegetative cover is present throughout the load lines consisting of rough grass, scrub vegetation, immature hardwoods, wetland areas, and hardwood forest. Former production infrastructure features that remain consist mainly of asphalt and gravel access roads, man-made ditches, abandoned sanitary and storm sewer lines, manholes, elevated walkways and railroad ballast beds.

2.2 Nature and Extent Summary

Table 2-1 provides details of the excavations including the planned square footage per the ROD Amendment and COCs. The following sections include a description of each AOC and the excavations within.

2.2.1 Load Line 1

Load Line 1 is located in the southeastern portion of the former RVAAP and contains five (5) excavations included in this remedial action (**Figure 2-3**). Excavations within Load Line 1 are located adjacent to or beneath former buildings except for one small excavation located at an outlet channel immediately outside of the load line fence. The load line is characterized by moderately subdued topography and ground surface elevations range from approximately 975 to 1,016 feet above mean sea level (amsl). At Load Line 1, soil cover is very thin to nonexistent in the vicinity of Buildings CB-4, CB-4A, CA-6, CA-6A, and CB-14, as these buildings were constructed on excavated bedrock. The presence of soil greater than 0.5 feet in thickness is observed at locations where fill material was brought in or reworked during either the active life of the load line or during demolition. Native soil in the vicinity of Load Line 1 belongs to the Mahoning silt loam series, which is one of the five major soil types found within the RVAAP facility. Depths to groundwater range from 19 to 35 feet bgs (EQM, 2010).

2.2.2 Load Line 2

Load Line 2 is located in the southeastern portion of the former RVAAP and contains one (1) excavation included in this remedial action (**Figure 2-4**). The load line is characterized by moderately subdued topography and ground surface elevations range from approximately 990 to 1,010 feet amsl. However, topography decreases sharply to the south of the load line. The primary surface water conveyance at Load Line 2 drains to the south and ultimately discharges into Kelly's Pond; water from the pond is discharged to Sand Creek. Soil across Load Line 2 exhibits seasonal wetness, rapid runoff, and low permeability. During site investigations, bedrock was encountered at depths ranging from 4 to 16 feet bgs. Groundwater depths range from approximately 5 to 14.7 feet bgs (EQM, 2010).

2.2.3 Load Line 3

Load Line 3 is located in the southeastern portion of the former RVAAP and contains ten (10) excavations included in this remedial action (**Figure 2-5**). All but one of the excavations within Load Line 3 are located adjacent to or beneath former buildings. The load line is characterized by sloping topography on a reworked sandstone bedrock surface. Elevations vary from approximately 980 to 1,020 feet amsl. Ditches comprise the primary surface water conveyance at Load Line 3, which, ultimately, drain into Upper and Lower Cobbs Ponds. Poorly drained, silty clay loam or clay loam is formed over glacial till, and bedrock is generally encountered at depths greater than 6 feet bgs. Runoff is typically medium to rapid, and the soil is seasonally wet. Groundwater depths range from approximately 8 to 27 feet bgs (EQM, 2010).

2.2.4 Load Line 4

Load Line 4 is located in the south-central portion of the former RVAAP and contains four (4) excavations included in this remedial action (**Figure 2-6**). Three of the excavations within Load Line 4 are located adjacent to or beneath former buildings. The final excavation is located adjacent to a former water tower and is characterized by its remote location within the load line. The topography is subdued on a glacial till surface. Elevations vary from approximately 980 to 1,000 feet amsl. A perennial stream crosses the AOC from northwest to southeast and flows into the large settling pond, which discharges to a surface stream that exits the facility at a point south of the load line. Poorly drained, silty clay loam or clay loam is formed over glacial till, and bedrock is generally encountered at depths greater than 6 feet bgs. Runoff is typically medium to rapid, and the soil is seasonally wet. Groundwater depths range from approximately. 3.4 to 15.8 feet bgs (EQM, 2010).

2.2.5 Load Line 12

Load Line 12 is located in the south-central portion of the former RVAAP and contains four (4) excavations included in this remedial action (**Figure 2-7**). The primary north-south drainage feature (Main Ditch) flows north until its intersection with the Active Area Channel, the primary surface water conveyance. Poorly drained, silty clay loam or clay loam is formed over glacial till, and bedrock is generally encountered at depths greater than 6 feet bgs. Runoff is typically medium to rapid, and the soil is seasonally wet. Depth to groundwater ranges from 3.25 to 18.21 feet below top of well casings. (USACE, 2004; MKM, 2007).

2.3 Anticipated Future Land Use

Load Lines 1 through 4 and 12 will be used for military training with the representative use of Commercial/Industrial Use.

Because unacceptable risk remain for the Resident Receptor, LUCs will be implemented to prevent residential use as described in **Appendix A**. This will be included in the next version of the PMP and LUC management will start.

Table 2-1. Planned Excavation Area Details

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Planned Excavation	Planned Area (SF)	Contaminated Interval (feet bgs)	Thickness of Contaminated Interval (feet)	Contaminants of Concern
1	CB-4	1,403	2 to 3	1	PCB-1254
1	CB-4A	9,212	1 to 5	4	RDX, 2,4,6-TNT
1	CB-2	400	0 to 2	2	Antimony, lead
1	CB-13B (LL1-252)	400	0 to 1.5	1.5	Lead
1	Outlet Channel D (LL1-049)	400	0 to 1.5	1.5	Antimony, lead
2	DB-4A	400	0 to 2	2	2,4,6-TNT
3	EB-10 (a)	9,962	3 to 5	2	PAHs: B(a)a, BaP, BbF, DA
3	EB-10 (b)	400	0 to 2	2	PCB-1254
3	EA-7	400	0 to 1	1	PCB-1254
3	EA-6 (a)	400	0 to 1	1	PAHs: B(a)a, BaP, BbF, DA
3	EA-6 (b)	400	0 to 1	1	PAHs: BaP, DA
3	EA-6 (c)	4,062	4.5 to 6	1.5	PAHs: B(a)a, BaP, BbF, DA
3	EB-4	6,996	1 to 3	2	PCB-1254
3	EB-9A	1,009	0 to 1	1	2,4,6-TNT
3	West Perimeter	625	0 to 0.5	0.5	PAHs: B(a)a, BaP, BbF, DA
3	EB-803	400	0 to 1	1	PCB-1254
4	Former Water Tower	400	0 to 1	1	Lead
4	Building G-16	400	0 to 1	1	PCB-1260
4	Building G-8 (a)	400	1 to 7	6	PAHs: B(a)a, BaP, BbF, DA
4	Building G-8 (b)	4,794	3 to 5	2	PAHs: B(a)a, BaP, BbF, DA
12	Active Area Channel	400	0 to 2	2	2,4,6-TNT, 2,6-DNT, BaP
12	FF-19 (a)	625	0 to 1	1	PAHs: B(a)a, BaP, BbF, DA
12	FF-19 (b)	625	0 to 4.5	4.5	PAHs: B(a)a, BaP, BbF, DA
12	FF-19 (c)	983	0 to 2.5	2.5	PAHs: B(a)a, BaP, BbF, DA

Notes:
Excavation confirmation samples were collected from the sidewalls and bottom of each excavation to confirm that the RGOs were met. If an RGO applicable to a particular excavation was exceeded, CH2M informed USACE and additional soil was removed in the direction of the exceedance, and an additional excavation confirmation sample was collected until the RGO was met.

B(a)a = benz(a)anthracene
BaP = benzo(a)pyrene
BbF = benzo(b)fluoranthene
bgs = below ground surface
CH2M = CH2M HILL Constructors, Inc.
DA = dibenz(a,h)anthracene
2,6-DNT = 2,6-dinitrotoluene
PAH= polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO = remedial goal option
SF = square feet
2,4,6-TNT = 2,4,6-trinitrotoluene
USACE = U.S. Army Corps of Engineers

SECTION 3

Remedial Action Activities

3.1 Remedial Action Objective

The RAO for Load Lines 1, 2, 3, 4, and 12 is to reduce risk from COCs in surface and subsurface soil to acceptable levels (RGOs) that are protective of human health and congruent with likely future land use (that is, Commercial/Industrial Land Use). The selected alternative to achieve the RAO includes ex-situ thermal treatment for soil with PAH, explosives, or PCB contamination above Industrial RGOs; and excavation of soil containing metals exceeding the RGOs for off-site disposal. Under this remedy, unacceptable risk will remain on site for the Resident Receptor at each load line; therefore, this alternative also will rely on LUCs to prevent Resident Receptor exposure to contaminants in soil in those areas as described in **Appendix A; t**his will be included in the next version of the PMP and LUC management will start.

The selected remedy was chosen because it is cost effective and it is premised on treatment, the statutory preference for alternatives capable of reducing the toxicity, mobility, and volume of environmental contaminants.

The following is a brief list of activities associated with implementing the selected remedy:

- Soil anticipated for treatment was excavated and placed into a thermal treatment system to remove COCs from soil.
- The excavated areas were sampled and analyzed, and the sample results compared to the RGOs. As required by sampling results, soil excavations were extended as needed until analytical results for sidewall and bottom samples indicated that the applicable RGOs were met at each excavation area.
- Thermally treated soil was sampled and analyzed, and the sample results were compared to the RGOs.
- Once the treated soil was sampled and confirmed to be below RGOs, the treated soil was used to backfill the excavated areas.
- Soil with metals concentrations above RGOs was excavated and disposed of off-site.
- Disturbed areas were restored to grade, using approved clean backfill, as necessary; revegetated using an OHARNG-approved seed mixture; and mulched.

3.2 Treatment Goals

Table 3-1 presents the RGOs for each Load Line. RGOs are cleanup goals that establish acceptable exposure levels to be protective of human health while considering potential land uses. In addition to the RGOs, applicable or relevant and appropriate requirements were developed to be applied during the evaluation of Feasibility Study alternatives.

3.3 Overview of Field Effort

The 24 excavations were field located using the boundaries designated in the ROD Amendment (Leidos, 2019a). Once the boundaries were established, topsoil and uncontaminated overburden soil was removed to access materials targeted for remediation.

Excavations with metals-impacted soil were excavated, loaded into lined roll-off boxes, and transported for off-site disposal. Boxes were covered after loading to eliminate potential contact and rain water

accumulation. Disposal characterization samples were collected from the excavated metals-impacted soil.

Soil designated for removal and thermal treatment in each area was excavated and directly loaded for transport to the ex-situ thermal treatment area. Treatment verification samples were collected from the thermally treated soil and analyzed for the applicable COCs. Once the RGOs were met, the treated soil was used to backfill excavations. Additional backfill material was also obtained from an approved off-site source as needed to backfill the excavations to match the surrounding grade.

Excavation areas remained open following soil removal to allow for excavation confirmation soil collection and to minimize the need for imported fill. The excavation boundary was bermed slightly to prevent the entry of surface runoff, and safety of open areas was maintained with signage and fencing to prevent accidental entry. Water accumulating in an uncovered excavation was collected and treated concurrently with soil in the enhanced thermal conduction (ETC) cell constructed on site.

If the analytical results of applicable COCs in the excavation confirmation samples collected from the sidewalls and bottom of the excavations indicated that an applicable RGO was exceeded, additional soil was removed and additional excavation confirmation samples were collected. Once the RGOs were met, the excavation was backfilled.

3.4 Premobilization

3.4.1 Plans

Prior to mobilization, the following plans were approved:

- Tree Cutting Plan for trees greater than or equal to 3 inches in diameter (Iron Creek Group, 2020)
- *Remedial Design Work Plan for RVAAP Load Lines 1, 2, 3, 4, and 12, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio* (Work Plan; CH2M, 2020a)
- Accident Prevention Plan/Site Safety and Health Plan (CH2M, 2020b)

3.4.2 Tree Removal

Removal of trees greater than 3 inches in diameter at breast height and limbs greater than 3 inches in diameter was conducted in March 2020.

3.4.3 Permitting

Remediation activities were performed under and are relieved from permitting requirements as stipulated by CERCLA Law, Chapter 103, Subchapter I, Section 9621(e).

The project complied with the substantive requirements of the Ohio Environmental Protection Agency (Ohio EPA) Authorization for Stormwater Discharges Associated with Construction Activity under the National Pollution Discharge Elimination System per the OAC Rule 3745-38-02 and implemented Stormwater Pollution Prevention best management practices (BMPs) in accordance with the rules as described in the Work Plan (CH2M, 2020a).

Rainwater that filled excavations prior to being deemed clean by the excavation confirmation samples, was removed and treated within the ETC cell constructed on site.

3.4.3.1 Air Permitting

The Work Plan included a review of the potential air regulatory requirements. The project complied with applicable Federal and state-specific requirements protective of air quality. The portable generator used

to power the ETC treatment cells was propane fired and meets the definition of nonroad engine in Code of Federal Regulations Title 40, Part 1068.30.

3.4.4 15-Day Notice to Ohio Environmental Protection Agency

A 15-day notice was provided to Ohio EPA prior to mobilization (**Appendix B**).

3.5 Mobilization and Site Preparation

Site preparation began on October 5, 2020. Heavy equipment, ex-situ ETC equipment (including piping, quonset hut panels, and thermal oxidizer) and support gear (portable office trailers, two 20-foot shipping containers (tool crib and crew shack), propane-fired 125-kilowatt generator, power distribution panel, portable light stands, and a wireless local area network (connected to a cellular data network to facilitate ETC process monitoring) were mobilized to the site. The ETC and general support areas were located at LL-1. All equipment was inspected prior to the start of daily activities.

The Construction Manager placed a call to Range Control to check in and out each day.

3.5.1 Preconstruction Photographs

Preconstruction photographs (**Appendix C**) were taken to document site conditions prior to work, including the excavation locations to document vegetation and general conditions, elevated walkways, the ETC treatment pad location and support facility areas, and roadways (paved and unpaved).

3.5.2 Utility Survey

An active power line is located in Load Line 2 outside of the excavation areas. All other utilities in the load lines have been abandoned. A third-party utility locate was performed prior to any ground disturbance. In addition, the OHARNG Restoration Representative checked with the CJAG Engineering Office regarding utilities prior to any ground disturbance.

3.5.3 Land Survey

Excavation areas within each of the five specified Load Lines were professionally surveyed in advance of excavation activities commencing so that complete excavation boundaries and depths were accurately identified prior to starting work.

3.5.4 Vegetation Removal

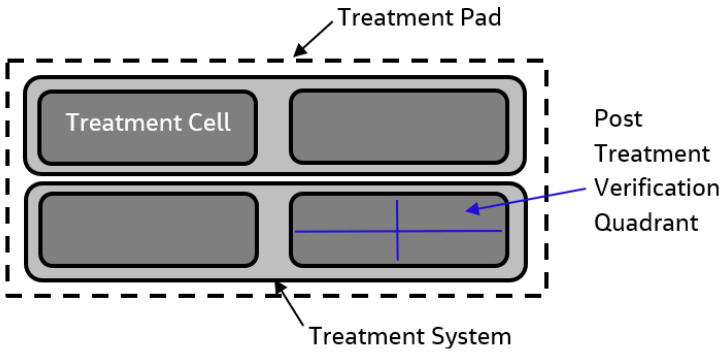
Removal of trees greater than 3 inches in diameter at breast height and limbs greater than 3 inches in diameter was conducted in March 2020. The felled trees were cut into eight-foot lengths and piled adjacent to where they were cut. Vegetation clean up, removal of smaller trees and brush clearing was performed as needed at the excavation areas, ETC treatment pad areas, support areas and access routes. Herbaceous vegetation was cut as necessary and piled adjacent to the removal area for eventual decomposition. Woody vegetation was chipped and broadcast across the surrounding area (not stockpiled). Every effort was made to separate contaminated soil from vegetation to ensure contaminants present in the excavation area were properly treated.

3.5.5 Enhanced Thermal Conduction Treatment Pad Construction

The lined ETC treatment pad was constructed on a clean portion of LL-1 in the vicinity of former building CB-801 (**Figure 3-1**). A lined staging area was established adjacent to the ETC pad for transient storage of treated soil, equipment and other materials required to implement the remedial action. A lined decontamination area was also constructed adjacent to the ETC treatment pad. There was one treatment pad, two treatment systems, and four treatment cells. **Exhibit 3-1** presents a schematic to

illustrate the difference between the ETC treatment pad, system, and cell. **Exhibit 3-2** illustrates a typical ETC treatment cell.

Exhibit 3-1. Typical Enhanced Thermal Conduction Soil Treatment Nomenclature Organization



In order to construct the ETC treatment pad, the following construction sequence was performed.

- Brush and tree removal was performed as required.
- The top layer of organic soil/vegetation was stripped and stockpiled.
- Site grading was completed to promote drainage. A 30-mil impervious liner was installed under the ETC cell locations. Each cell location was excavated to approximately 12 inches of soil where bedrock was then encountered. The liner was placed on the bedrock and the excavated soil was placed on top of the liner to provide a working surface for heavy equipment and preserve liner integrity.
- After installation of the 30-mil liner, 12-inch wide steel I-beams (base rails) were placed along both sides of the lined treatment cells and spaced approximately 37 feet apart. These I-beams ran the length of each treatment pad – approximately 190 feet.
- Once the ETC treatment pad was constructed, contaminated soil excavated from the load lines was piled between the base rails, covered with Quonset hut panels and thermally treated.

THE ANATOMY OF AN ENHANCED THERMAL CONDUCTION SOIL CELL AND HOW IT WORKS

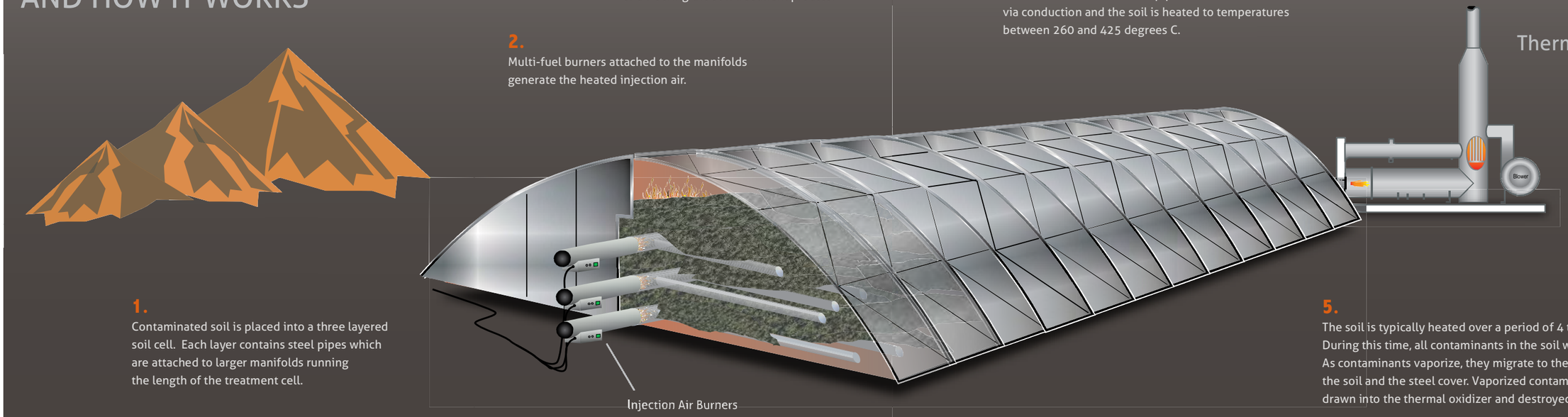
Exhibit 3-2. Typical Enhanced Thermal Conduction Soil Treatment Cell

1.
Contaminated soil is placed into a three layered soil cell. Each layer contains steel pipes which are attached to larger manifolds running the length of the treatment cell.

2.
Multi-fuel burners attached to the manifolds generate the heated injection air.

3.
A stainless steel Quonset Hut is assembled over the entire soil cell to prevent the escape of air during the soil treatment process.

4.
Heat is transferred from the pipes to the soil via conduction and the soil is heated to temperatures between 260 and 425 degrees C.



5.
The soil is typically heated over a period of 4 to 12 days. During this time, all contaminants in the soil will vaporize. As contaminants vaporize, they migrate to the space between the soil and the steel cover. Vaporized contaminants are drawn into the thermal oxidizer and destroyed.

SIDE VIEW OF BURNERS ATTACHED TO CELL

FRONT VIEW OF ASSEMBLED SOIL CELL

MULTI-FUEL BURNERS

THERMAL OXIDIZER

MULTIPLE CELLS RUNNING

800 CUBIC METER CELL

No additional roadways were constructed for this project. The existing roads in the load lines and South Service Road were built in the early 1940s as the facility was constructed. Many of the existing load line roads are old railroad beds that were used for area access following removal of the rails that formerly served facility operations. Access to the excavation and treatment areas was gained using existing travel paths within the various load lines (primarily the former rail beds). External travel between the load lines was via existing road infrastructure at the facility.

Signs and erect barricades were posted to provide traffic directions to key locations at the former RVAAP. Signs were placed along the traffic routes and at each excavation work area for vehicles and heavy equipment entering and exiting to ensure that traffic flowed with minimal interference. Transportation routes were established for incoming and outgoing vehicles and heavy equipment to minimize the impact on the former RVAAP and surrounding community. Haul route usage was coordinated with and approved by OHARNG.

The traffic plan was designed to limit the tracking of soil from the excavation areas and focus traffic to the abandoned railway lines where the road subbase was more competent than other abandoned roadways. Rumble strips or temporary construction entrances were utilized where dirt roads between Load Lines transitioned to paved roads. If dirt/mud was tracked out onto base road ways, roads were swept with a brush attachment on a skid steer as needed.

3.5.6 Stormwater Pollution Prevention

Stormwater controls were installed, as required, prior to initiating ground disturbing activities. BMPs were employed to protect the excavation areas, staging area, ETC treatment pad, and any other work areas from stormwater run-off and minimize stormwater run-on into disturbed areas. An inspection checklist was completed weekly and after rain events that exceeded ½-inch (**Appendix D**).

To further minimize erosion and sediment run-off potential, excavation activities were limited when working in areas that may have been impacted during or following periods of inclement weather. The existing Load Line entrances were the main access points for the remedial activities. These entrances were maintained to prevent rutting from soil trucking operations between Load Lines. Rumble strips or temporary construction entrances were utilized where dirt roads between Load Lines transitioned to paved roads. Existing asphalt surface roadways were inspected daily when working in that Load Line and an equipment mounted powered sweep was used to remove dirt or mud tracked onto the road as a result of remedial operations.

Straw wattles and/or bales were installed at excavations and any clean overburden soil stockpiles near drainage ditches or natural water features. The straw wattles/bales were inspected daily during active excavation and backfill operations. Ruts and depressions along equipment movement areas and ETC treatment pad support areas were regraded, seeded, and mulched where necessary. Erosion/sedimentation control features remained in place and post soil treatment stormwater control monitoring continued consistent with the Ohio EPA requirement of weekly and after a ½ inch rain event until 70-percent vegetative cover was established in each disturbed area.

3.6 Excavation

Excavation activities were conducted from October 2020 through January 2021. A total of 2,528 CY of contaminated soil were excavated for on-site ex-situ thermal treatment. A total of approximately 88 CY (160 tons) of soil was excavated from metals-contaminated locations and disposed off-site as non-hazardous waste. The maximum depth of excavation was 7 feet. In addition, approximately 400 tons of concrete located within the excavation areas (walkway and foundation structures) was demolished and recycled off-site. **Table 3-2** includes the square footage and volumes excavated for each area. **Appendix C** includes photographs of the field activities. Excavation was completed via tracked excavator, wheeled excavator or rubber-tired backhoe depending on site logistics considerations and intra-facility travel

requirements. As material was excavated it was loaded, transported and handled with wheel loaders and either all terrain or tandem gravel trucks.

3.6.1 Metals-Impacted Soils

Soil from the four metals-impacted excavations (CB-2, CB-13B and the Outlet Channel in Load Line 1; and the Former Water Tower in Load Line 4) was excavated and placed into roll off bins. Groundcover vegetation was not segregated from soil to be disposed; this material was loaded with the contaminated soil for off-site disposal. Composite disposal characterization samples were collected from the excavated metals-contaminated soils as described in **Section 3.8.3**. Excavation confirmation samples were collected from the sidewalls and bottoms of the excavations as described in **Section 3.8.1** to determine if the RGOs had been met. If a sidewall or bottom excavation confirmation sample exceeded an applicable RGO, then additional soil was excavated for treatment and addition excavation confirmation samples were collected until the RGOs were met, in accordance with the Work Plan Quality Assurance Project Plan (QAPP).

3.6.2 Soil for Ex-Situ Thermal Treatment

For each excavation area with soil to be thermally treated, the overlying uncontaminated surface soil, if applicable (see **Table 2-1**), was removed and stockpiled nearby; erosion/runoff mitigation for the stockpiled uncontaminated surface soil was implemented per the Work Plan. The impacted soils were excavated to the boundaries of the surveyed area as shown on **Figures 2-3 through 2-7**, and excavation confirmation samples were collected from the sidewalls and bottoms of the excavations as described in **Section 3.8.1** to determine if the RGOs had been met. If a sidewall or bottom excavation confirmation sample exceeded an applicable RGO, then additional soil was excavated for treatment and additional excavation confirmation samples were collected until the RGOs were met.

The excavated soil was placed into a truck to be transported immediately to the ETC pad. Once the material arrived at the ETC pad, wheel loaders were used to place it directly into one of the ETC cells for thermal treatment. Each ETC cell can contain a soil volume of approximately 525 CY; volume estimates for each ETC cell during this effort are shown in **Appendix E**. Stockpiling of the impacted pre-treatment soil was generally not required at either the excavation area or at the ETC treatment pad.

Upon completion of soil treatment, treatment verification samples were collected as described in **Section 3.8.2** to confirm applicable RGOs had been met. Upon approval from the Army, treated soil meeting the applicable RGOs was transported by truck and used as backfill.

3.6.3 Concrete Demolition and Recycling

Demolition of concrete was required for walkway and foundation structures located within excavation areas in Load Lines 1, 2, 3, 4, and 12 (**Table 2-1**). For areas where elevated walkways were within the footprint of the work, the footers were also removed and any soil present was knocked off during removal. Concrete material was demolished and broken down to required debris sizing with excavator mounted hydraulic concrete breaking equipment. Composite samples were collected for characterization as described in **Section 3.8.4** to determine appropriate disposition.

3.7 Thermal Treatment

The Work Plan describes the thermal treatment system used to accomplish the remedial action at Load Lines 1- 4 and 12. A total of 2,528 CY of contaminated soil were excavated for on-site ex-situ thermal treatment. Treatment was accomplished in eight treatment cells. Soil was heated for a duration of 3 to 12 days, with the average soil temperature at the end of treatment ranging from 479 to 624 degrees Fahrenheit. **Table 3-2** details the treatment cell information and **Appendix E** provides the ETC Operations Status Reports.

3.7.1 Stack Vent Parameters

Vapors collected and treated by the thermal oxidizer were discharged vertically to the atmosphere through an 18-inch (diameter) exhaust stack at a height of 14 feet above the ground surface. The exhaust stack was the only discharge point for the vapor treatment system. The maximum vapor flow rate during treatment was less than 4,100 dry standard cubic feet per minute.

3.7.2 Process Monitoring

To demonstrate and document that the air emissions-control equipment was operating within its intended operating range, the thermal oxidizer temperature was measured and recorded at least daily for the duration of system operation (see **Appendix E**). If the thermal oxidizer chamber temperature was to have fallen below its set-point, then the system would have alarmed and alerted site staff of deviations in system operations. Upon notification of set-point deviation(s), site personnel would have performed troubleshooting on system equipment using established standard operating procedures to correct the alarm conditions as required. However, no system alarms were experienced.

3.8 Sampling

Sampling activities were conducted according to the QAPP provided as Appendix C of the Work Plan. Excavation confirmation samples were collected to confirm that all soil exceeding the applicable RGOs had been removed. Treatment verification samples were collected to confirm soil treated in each ETC cell met the applicable RGOs. Disposal characterization samples were collected to characterize metals-contaminated soils and demolished concrete for off-site disposal. Off-site backfill samples were collected to obtain approval for use on site.

3.8.1 Excavation Confirmation Samples

Soil was initially excavated to the extent identified in the ROD Amendment as shown in **Figures 2-3 to 2-7**. Excavation confirmation soil samples were collected using ISM as described in the QAPP (Appendix C of the Work Plan). Each sidewall or bottom that was sampled constituted a decision unit. ISM samples collected for confirmation included 30 to 50 aliquots per sample. Excavation confirmation samples were analyzed for the COCs applicable to each excavation as shown in in **Table 2-1** and results compared to the applicable RGOs as shown in **Tables 3-1 and 3-2**.

Table 3-3 summarizes the analytical results for the excavation confirmation samples; **Appendix F** includes the analytical data reports; and **Figures 3-2 to 3-6** illustrate the excavation confirmation sample locations and results. During the remedial action, excavation confirmation sample results were provided to the Army and Ohio EPA on a regular basis for review. As described in the QAPP, 10 percent of the excavation confirmation ISM samples were collected in triplicate and the relative standard deviation (RSD) calculated. The protocol defined in the QAPP was followed to determine how the data was used depending on the calculated RSD (see **Table 3-3**).

If an excavation confirmation sample met the applicable RGOs, in accordance with the Work Plan QAPP, the excavation was considered complete in that direction.

If an excavation confirmation sample exceeded an applicable RGO, CH2M HILL Constructors, Inc. informed United States (U.S.) Army Corps of Engineers (USACE) and additional soil was removed in the direction of the exceedance. Following removal of the additional soil, an additional excavation confirmation sample was collected and analyzed for the COC that exceeded the RGO in the initial excavation confirmation sample. This was repeated until the RGOs were met. A total of 16 decision units initially exceeded an RGO when excavated to the initial extent identified in the ROD Amendment. These decision units are listed below, and **Table 3-2** describes the additional excavation performed at each location and the results of the additional confirmation samples collected:

- LL-1, CB-4A, Sidewall South for TNT
- LL-3, EA-6(a), Sidewall West for BaP
- LL-3, EB-4, Sidewall North for PCB-1254
- LL-3, West Perimeter, Bottom for BaP
- LL-3, West Perimeter, Sidewall North for B(a)A, BaP, BbF, and DA
- LL-3, West Perimeter, Sidewall West for BaP and BbF
- LL-3, West Perimeter, Sidewall South for BaP
- LL-3, West Perimeter, Sidewall East for B(a)A, BaP, BbF, and DA
- LL-4, G-8(b), Sidewall North for BaP
- LL-4, Former Water Tower, Sidewall East for lead
- LL-4, Former Water Tower, Sidewall West for lead
- LL-12, FF-19(a), Sidewall South for BaP
- LL-12, FF-19(a), Sidewall West for BaP
- LL-12, FF-19(c), Bottom1 for BaP
- LL-12, FF-19(c), Sidewall East 1 for BaP
- LL-12, FF-19(c), Sidewall West 1 for BaP

Analytical results were provided to the Army and Ohio EPA throughout the remedial action (**Appendix G).** Once an excavation met the applicable RGOs, in accordance with the Work Plan QAPP, and prior to backfill, a post-excavation three-dimensional (3D) laser scan was completed to establish the final volume of soil excavated (**Appendix H**) and treated (**Table 3-2**). **Figures 3-2 to 3-6** illustrate the final extent of soil excavated at each of the 24 locations and the results of the associated excavation confirmation samples.

3.8.2 Treatment Verification Samples

One composite treatment verification sample was collected per 150 CY of soil treated in the ETC cells. **Table 3-4** summarizes the analytical results for treatment verification samples; **Appendix I** includes the analytical data reports. Analytical results were provided to the Army and Ohio EPA throughout the remedial action (**Appendix J).** All treatment verification samples met the applicable RGOs. During the remedial action, treatment verification sample results were provided to the Army and Ohio EPA regularly for review.

3.8.3 Disposal Characterization Samples for Metals-Contaminated Soils

Composite disposal characterization samples were collected from the metals-contaminated soils from four excavations (one composite sample for excavations in Load Line 1: Building CB-2, Building CB-13B and the Outlet Channel; and one composite sample for the Former Water Tower in Load Line 4). The samples were analyzed for Toxicity Characteristic Leaching Procedure volatile organic compounds, semivolatile organic compounds, metals, pesticides, herbicides; PCBs; ignitability; and corrosivity. **Table 3-5** summarizes the analytical results for the excavated metals-contaminated soils; **Appendix** K includes the analytical data reports. The soil was determined to be non-hazardous, the waste profile was prepared by the Army and approved by the disposal facility (Republic Services Carbon Limestone Landfill at 8100 S. Stateline Road, Lowellville, Ohio) (**Appendix L**), and the soil was transported under signed manifests (**Appendix L**) for disposal.

3.8.4 Disposal Characterization Samples for Concrete

Composite disposal characterization samples were collected from the demolished concrete at a frequency of approximately one sample per 500 CY and analyzed for PCBs and Resource Conservation and Recovery Act metals. **Table 3-6** summarizes the analytical results for the demolished concrete; **Appendix M** includes the analytical data reports. The concrete was approved by the Army and recycler

for off-site recycling and was transported to Acme Resources at 11600 Mahoning Avenue, North Jackson, Ohio (**Appendix N**).

3.8.5 Off-Site Backfill Source

Backfill material located at Freedom Material, approximately 5 miles west of CJAG on Route 5, was sampled to obtain approval for use at the site. **Table 3-7** summarizes the analytical results for the composite sample collected from the off-site backfill source; **Appendix O** includes the analytical data reports. Results were provided in a Field Change Request (**Appendix P**) and approved for use at the load lines. Approximately 256 tons of off-site backfill material was used during site restoration.

3.9 Waste Management

Waste materials consisted of soils containing metal contamination and sized concrete. The waste tracking log is provided in **Appendix Q**.

3.9.1 Disposal of Metals-Contaminated Soils

Approximately 88 CY (160 tons) of soil excavated from four metals-contaminated locations were transported in 11 roll-offs by Maverick Trucking under signed manifests (**Appendix L**) to the Republic Services Carbon Limestone Landfill at 8100 S. Stateline Road, Lowellville, Ohio for disposal as non-hazardous waste.

3.9.2 Concrete Recycling

Analytical results for demolished concrete met requirements for off-site recycling. Approximately 400 tons of concrete were transported by CZ Trucking to Acme Resources at 11600 Mahoning Avenue, North Jackson, Ohio for recycling. The bills of lading are provided in **Appendix L**.

3.10 Backfill and Site Restoration

After excavation confirmation sample results met the applicable RGOs, in accordance with the Work Plan QAPP, individual excavations were scanned using 3D laser technology to measure actual dimensions and validate the volume of soil removed for treatment and/or disposal. The 3D laser scans for each excavation are provided in **Appendix H**. Excavations were backfilled using the treated soil and soil from the approved off-site backfill source. Backfill within each excavation was placed in the excavated areas in eight-inch lifts (+/- 25 percent) and mechanically compacted in place until the excavated area was restored to match surrounding grade. Grade stakes were placed within the excavation area and markers placed on the excavation walls for operator reference during backfill and compaction of the lifts. Any clean overburden soil previously stockpiled adjacent to an excavation was used as the top layer of backfill to promote revegetation. Once an excavation was backfilled, it was graded and seeded as described below.

Upon completion of excavation restoration, the ETC system and staging areas were decommissioned. ETC system components were demobilized, the 30-mil impervious liner was removed from the treatment cell subgrade, clean fill placed and the area graded to match surrounding conditions and promote positive drainage.

The remedial action finished in February 2021, therefore areas overturned were temporarily seeded in accordance with CJAG requirements and covered with a layer of straw to promote revegetation of the excavated areas. A site walkthrough was conducted on February 8, 2021 with Katie Tait (OHARNG), Kevin Sedlak (ARNG), and Randy Randolph (USACE) prior to demobilizing. Post soil treatment stormwater control monitoring was performed weekly and after rain events exceeding ½-inch in the interim between the temporary seeding and return to the site for final grading and permanent seeding.

In April 2021, disturbed areas were regraded as necessary and seeded with the approved permanent seed mix appropriate for each area per the Work Plan. **Appendix C** includes photographs of the restoration activities. The final grade of all areas disturbed during remedial activities was approved by the ARNG and OHARNG representatives. Post soil treatment stormwater control monitoring continued weekly and after rain events exceeding ½-inch until 70-percent vegetative cover was established in each disturbed area. The Army approved the 70-percent vegetative cover on June 29, 2021 and approved completion of all restoration requirements on July 6, 2021 when the remaining erosion controls were removed.

Table 3-1. Contaminants of Concern Remedial Goal Options for Soil at Load Lines 1, 2, 3, 4, and 12
Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Contaminants of Concern	Cleanup Goals (mg/kg) Industrial RGO
1	Antimony	470
	Lead	800
	TNT	510
	RDX	280
	B(a)a	29
	BaP	2.9
	BbF	29
	PCB-1254	9.7
2	2,4,6-TNT	510
3	2,4,6-TNT	510
	B(a)a	29
	BaP	2.9
	BbF	29
	DA	2.9
	PCB-1254	9.7
4	Lead	800
	B(a)a	29
	BaP	2.9
	BbF	29
	DA	2.9
	PCB-1260	9.9
12	2,4,6-TNT	510
	2,6-DNT	15
	B(a)a	29
	BaP	2.9
	BbF	29
	DA	2.9

Notes:

B(a)a = benz(a)anthracene
BaP = benzo(a)pyrene
BbF = benzo(b)fluoranthene
DA = dibenz(a,h)anthracene
2,6-DNT = 2,6-dinitrotoluene
mg/kg = milligram(s) per kilogram
PCB = polychlorinated biphenyl
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO = remedial goal option
2,4,6-TNT = 2,4,6-trinitrotoluene

Table 3-2. Excavation and Treatment Details

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Excavation	Planned Area (SF)	Contaminated Interval (feet bgs)	Contaminants of Concern	Actual Area Excavated (SF)	Estimated Contaminated In situ[d] Volume Excavated (CY)	Three-Dimensional Scan Total Volume Excavated (CY)	Dimensional Scan Calculated Contaminated Volume Excavated (CY)	Extension Volumes Not Included in the Three-Dimensional Scan (CY)	Sidewall/Bottom Confirmation Samples to Date (Sample Names)	RGOs Met in Sidewall/Bottom Confirmation Samples?	Treatment/Off-Site Disposal Dates	Average Soil Temperature at the End of Treatment (°F)	Treatment Verification/Disposal Characterization Samples to Date (Sample Names)	RGOs Met in Treatment Verification Samples?	Notes	Backfill Complete
1	CB-4	1,403	2 to 3	PCB-1254	1,403	0	56	0	NA	Shallow Bedrock - no samples	NA	NA	NA	NA	NA	Overburden removed to shallow bedrock encountered throughout before reaching treatment interval (treatment interval 2 to 3 feet bgs). Per Army direction excavation documented and backfilled, no samples.	1/25/2021
1	CB-4A	9,212	1 to 5	RDX, TNT	9,212	1,180	1,196	840		LL1CB4Acs-736-001-SO (SWW2) LL1CB4Acs-737-001-SO (SWE1) LL1CB4Acs-737-002-SO (SWE 1) LL1CB4Acs-737-003-SO (SWE 1) LL1CB4Acs-738-001-SO (SWS) LL1CB4Acs-738-002-SO (SWS) LL1CB4Acs-738-003-SO (SWS) LL1CB4Acs-739-001-SO (SWN1) LL1CB4Acs-739-002-SO (SWN1) LL1CB4Acs-739-003-SO (SWN1) LL1CB4Acs-740-001-SO (SWN2) LL1CB4ACS-741-001-SO (SWN3) LL1CB4ACS-742-001-SO (SWE2) LL1CB4ACS-743-001-SO (SWW1) Bedrock – no sample (floor)	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes NA	Cell 1A-1 – 11/3 to 11/13 (10 days) Cell 2A-2 - 11/10 to 11/19 (10 days)	529 479	LLEXSITUtv-001-001-SO LLEXSITUtv-002-001-SO LLEXSITUtv-003-001-SO LLEXSITUtv-004-001-SO LLEXSITUtv-005-001-SO LLEXSITUtv-005-002-SO LLEXSITUtv-006-001-SO LLEXSITUtv-007-001-SO LLEXSITUtv-008-001-SO LLEXSITUtv-008-002-SO	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Shallow bedrock encountered just below the overburden layer in approximately 90% of the planned excavation footprint. Bottom of excavation was all bedrock so no bottom sample. LL1CB4Acs-736-001-SO (SW West 2) not collected in triplicate due to small area of DU (0.5 to 1 foot thick instead of 4 feet thick due to shallow bedrock). All initial individual confirmation sample results were below the RGOs. The RSDs for the first two sets of triplicates (SWE1 and SWS) were greater than the goal of ≤35% for both RDX and TNT. The RSD for the third set of triplicates (SWN1) met the goal for RDX but was greater than the goal of ≤35% for TNT. A 12/7/20 call with Army - all data meets RGOs - submit to Ohio EPA – these walls are clean. 12/14/20 telecon with Army and Ohio EPA – For north sidewall, RSD > 100% for TNT, 95% UCL (Chebychev method) was less than RGO; no further excavation in this direction (north). For east sidewall, RSD > 100% for RDX and TNT, 95% UCL (Chebychev method) was less than RGO; no further excavation in this direction (east). *For south sidewall, - RSD > 100% for RDX and TNT;- 95% UCL (Chebychev method) was less than RGO for RDX but greater than RGO for TNT; additional excavation in this direction (south) for TNT and resample as ISM triplicate.	2/1/2021
1	CB-4A		1 to 5	TNT	250	37			37	LL1CB4Acs-765-001-SO (SWS1) LL1CB4Acs-765-002-SO (SWS1) LL1CB4Acs-765-003-SO (SWS1)	Yes Yes No	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	SWS EASTERN END - Additional soil excavated 5 feet southward for entire SWS, split the extend wall into three DUs for sampling, this was the first 50 feet from SE corner. - One replicate exceeded the RGO. - RSD <35%, per work plan compare the maximum field replicate concentration to the RGO - Additional soil excavated 5 feet further south for this portion of the SWS.(see below).	2/1/2021
1	CB-4A		1 to 5	TNT	250	37			37	Bedrock - no sample	NA	Cell 2A-8, 1/27/21 to 1/29/21 (3 days)	546	LLEXSITUtv-027-001-SO	Yes	SWS EASTERN END - Additional soil excavated 5 feet further south for this portion of the SWS. As discussed with the Army, there was no soil in the treatment interval (1 to 5 feet bgs) for the further extended sidewall in the eastern 50 feet, therefore no additional samples can be collected.	2/1/2021
1	CB-4A		1 to 5	TNT	250	37			37	LL1CB4Acs-766-001-SO (SWS2) LL1CB4Acs-766-002-SO (SWS2) LL1CB4Acs-766-003-SO (SWS2)	Yes Yes Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	SWS MID PORTION - Additional soil excavated 5 feet southward for entire SWS, split the extend wall into 3 DUs for sampling, this portion starts 50 feet from SE corner, then 50 feet wide along the extended SWS. - RGOs met in each individual replicate sample; - RSD >50% but <100%; - 95% UCL (Chebychev method) was less than the RGO; - no further excavation for this portion of the extended SWS	2/1/2021
1	CB-4A		1 to 5	TNT	175	26			26	LL1CB4Acs-767-001-SO (SWS3)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	SWS WESTERN PORTION - Additional soil excavated 5 feet southward for entire SWS, split the extend wall into three DUs for sampling, this portion extended 16 feet from SW corner (the next 16 feet along the extended south sidewall was rock). Westernmost 16 feet of the SWS 5-foot extension. RGO has been met for this portion of the SWS, no further excavation	2/1/2021
1	CB-2	400	0 to 2	Antimony, Lead	400	10	17	17		LL1CB2cs-759-001-SO (SWE) railroad ballast - no sample (SWN) railroad ballast - no sample (SWS) railroad ballast - no sample (SWW) bedrock- no sample (Floor)	Yes No Sample No Sample No Sample No Sample	1/12/21 (Manifest 1137877) 1/13/21 (Manifest 1137878 and 1137879)	NA	LL1dc-001-001-SO	Yes (non-hazardous)	Bedrock throughout at approximately 0.5 to 1 foot bgs - no bottom sample. Railroad ballast in two-thirds of the excavation. Sampled east sidewall that was soil, and wrapped around to portions of north and south that are soil to make one sidewall DU. RGOs met.	1/22/2021
1	CB-13B	400	0 to 1.5	Lead	400	22	28.88	28.88	NA	LL1CB13Bcs-760-001-SO (Floor) LL1CB13Bcs-760-002-SO (Floor) LL1CB13Bcs-760-003-SO (Floor) LL1CB13Bcs-761-001-SO (SWN) LL1CB13Bcs-762-001-SO (SWE) LL1CB13Bcs-763-001-SO (SWS) LL1CB13Bcs-764-001-SO (SWW)	Yes Yes Yes Yes Yes Yes Yes	1/13/21 (Manifests 1137883 and 1137885)	NA	LL1dc-001-001-SO	Yes (non-hazardous)	RGOs met.	1/14/2021
1	Outlet Channel D	400	0 to 1.5	Antimony, Lead	340	18.96	18.96	18.96	NA	LL1OCDcs-754-001-so (Floor) LL1OCDcs-754-002-so (Floor) LL1OCDcs-754-003-so (Floor) LL1OCDcs-755-001-so (SWW) LL1OCDcs-756-001-so (SWS) LL1OCDcs-757-001-so (SWE) LL1OCDcs-758-001-so (SWN)	Yes Yes Yes Yes Yes Yes Yes	1/12/21 (Manifest 1137876) 1/13/21 (Manifest 1137880)	NA	LL1dc-001-001-SO	Yes (non-hazardous)	RGOs met.	1/22/2021

Table 3-2. Excavation and Treatment Details

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Excavation	Planned Area (SF)	Contaminated Interval (feet bgs)	Contaminants of Concern	Actual Area Excavated (SF)	Estimated Contaminated In situ[d] Volume Excavated (CY)	Three-Dimensional Scan Total Volume Excavated (CY)	Dimensional Scan Calculated Contaminated Volume Excavated (CY)	Extension Volumes Not Included in the Three-Dimensional Scan (CY)	Sidewall/Bottom Confirmation Samples to Date (Sample Names)	RGOs Met in Sidewall/Bottom Confirmation Samples?	Treatment/Off-Site Disposal Dates	Average Soil Temperature at the End of Treatment (°F)	Treatment Verification/Disposal Characterization Samples to Date (Sample Names)	RGOs Met in Treatment Verification Samples?	Notes	Backfill Complete
2	DB-4A	400	0 to 2	TNT	400	30	30.93	30.93	NA	LL2DB4Acs-681-001-so (Floor) LL2DB4Acs-682-001-so (SWE) LL2DB4Acs-683-001-so (SWN) LL2DB4Acs-684-001-so (SWS) LL2DB4Acs-685-001-so (SWW)	Yes Yes Yes Yes Yes	Cell 2A-2 - 11/10 to 11/19 (10 days)	479	LLEXSITUtv-005-001-SO LLEXSITUtv-005-002-SO LLEXSITUtv-006-001-SO LLEXSITUtv-007-001-SO LLEXSITUtv-008-001-SO LLEXSITUtv-008-002-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/11/2021
3	EB-10 (a)	9,962	3 to 5	B(a)a, BaP, BbF, DA	9,962	185	1221.65	239.58		Shallow bedrock	NA	Cell 2B-4, 11/30 to 12/10 (12 days)	562	LLEXSITUtv-013-001-SO LLEXSITUtv-014-001-SO LLEXSITUtv-015-001-SO LLEXSITUtv-016-001-SO LLEXSITUtv-016-002-SO	Yes Yes Yes Yes Yes Yes	Bedrock encountered throughout bottom of excavation, no soil on sidewalls in treatment interval 3 to 5 feet bgs, no samples. Per Army direction excavation documented and backfilled, no samples.	1/26/2021
						168						Cell 2A-6 , 12/13 to12/21 (8 days)	*624*	LLEXSITUtv-021-001-SO LLEXSITUtv-022-001-SO LLEXSITUtv-022-002-SO LLEXSITUtv-023-001-SO LLEXSITUtv-024-001-SO LLEXSITUtv-024-002-SO	Yes Yes Yes Yes Yes Yes		
3	EB-10 (b)	400	0 to 2	PCB-1254	400	30	included with EB10a	included with EB10a		NA	NA	Cell 1B-3 - 11/19 to 11/30 (12 days)	548	LLEXSITUtv-009-001-SO LLEXSITUtv-009-002-SO LLEXSITUtv-010-001-SO LLEXSITUtv-010-002-SO LLEXSITUtv-011-001-SO LLEXSITUtv-012-001-SO	Yes Yes Yes Yes Yes Yes	Excavation was within EB-10(a). EB-10(b) soils excavated and treated with Cell 1B-3. East sidewall was concrete - no sample.	1/26/2021
												Cell 2A-6 , 12/13 to12/21 (8 days)	*624*	LLEXSITUtv-021-001-SO LLEXSITUtv-022-001-SO LLEXSITUtv-022-002-SO LLEXSITUtv-023-001-SO LLEXSITUtv-024-001-SO LLEXSITUtv-024-002-SO	Yes Yes Yes Yes Yes Yes	With associated concrete removal, sidewalls of EB-10(b) collapsed into surrounding EB-10(a). Therefore, no EB-10(b) sidewall samples. Excavated to EB-10(a) depth (bedrock encountered at 4 to 4.5 feet bgs) and all soils underlying and surrounding EB-10(b) were added to Cell 2A-6; treatment verification samples included the COC for EB-10(b) PCB-1254.	
3	EA-7	400	0 to 1	PCB-1254	400	15	17.29	17.29		LL3EA7CS-556-001-SO (SWN) LL3EA7CS-556-002-SO (SWN) LL3EA7CS-556-003-SO (SWN) LL3EA7CS-557-001-SO (SWE) LL3EA7CS-558-001-SO (SWS) LL3EA7CS-559-001-SO (SWW) LL3EA7CS-560-001-SO (Bottom)	Yes Yes Yes Yes Yes Yes Yes	Cell 1B-3 - 11/19 to 11/30 (12 days)	548	LLEXSITUtv-009-001-SO LLEXSITUtv-009-002-SO LLEXSITUtv-010-001-SO LLEXSITUtv-010-002-SO LLEXSITUtv-011-001-SO LLEXSITUtv-012-001-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/27/2021
3	EA-6 (a)	400	0 to 1	B(a)a, BaP, BbF, DA	400	15	included with EA6c		15	LL3EA6ACS-749-001-SO (SWW) LL3EA6ACS-750-001-SO (SWN) LL3EA6ACS-751-001-SO (SWS) LL3EA6ACS-752-001-SO (BOTTOM)	No Yes Yes Yes	Cell 2B-4, 11/30 to 12/10 (12 days)	562	LLEXSITUtv-013-001-SO LLEXSITUtv-014-001-SO LLEXSITUtv-015-001-SO LLEXSITUtv-016-001-SO LLEXSITUtv-016-002-SO	Yes Yes Yes Yes Yes Yes	SWW exceeded the RGO for BaP. Additional excavation to the west removed approximately 20 feet additional soil and down to bedrock at approximately 2 feet bgs, coincides with footprint of EA6c. Soil added to treatment cell. Beyond that 20 feet had already been excavated for EA6c. No additional samples collected. RGOs met.	1/28/2021
3	EA-6 (a)				400	30	included with EA6c		30	Shallow bedrock	NA	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Extension of EA6a west wall RGO exceedance for PCB-1254 into EA6C (20 feet west to bedrock at 2 feet bgs); excavated soil to the west of EA6a/north of EA6b to bedrock and staged soil for ETC treatment cell 2B-7.	1/28/2021
3	EA-6 (b)	400	0 to 1	BaP, DA	400	15	included with EA6c		15	LL3EA6Bcs-744-001-SO (SWW) LL3EA6Bcs-745-001-SO (SWN) LL3EA6Bcs-746-001-SO (SWS) LL3EA6Bcs-747-001-SO (SWE) LL3EA6Bcs-748-001-SO (Bottom)	Yes Yes Yes Yes Yes	Cell 2B-4, 11/30 to 12/10 (12 days)	562	LLEXSITUtv-013-001-SO LLEXSITUtv-014-001-SO LLEXSITUtv-015-001-SO LLEXSITUtv-016-001-SO LLEXSITUtv-016-002-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/28/2021
3	EA-6 (c)	4,062	4.5 to 6	B(a)a, BaP, BbF, DA	4,062	28.71	603.48	28.22		Shallow bedrock	NA	Cell 2A-6 , 12/13 to12/21 (8 days)	*624*	LLEXSITUtv-021-001-SO LLEXSITUtv-022-001-SO LLEXSITUtv-022-002-SO LLEXSITUtv-023-001-SO LLEXSITUtv-024-001-SO LLEXSITUtv-024-002-SO	Yes Yes Yes Yes Yes Yes	Shallow bedrock in the majority of EA6c at 4 feet bgs or less; One pocket had soils in the treatment interval (approximately 10 CY of impacted soils from an area just south of EA6b excavated to bedrock and added to treatment cell ETC 2A-6).	1/28/2021
3	EB-4	6,996	1 to 3	PCB-1254	6,996	518	705.97	440.22		LL3EB4CS-753-001-SO (SWW4) LL3EB4CS-555-001-SO (SWN1) LL3EB4cs-561-001-SO (SWS1) LL3EB4cs-562-001-SO (SWW1) LL3EB4cs-563-001-SO (SWE3) LL3EB4cs-564-001-SO (SWW2) LL3EB4cs-565-001-SO (SWS2) LL3EB4CS-566-001-SO (SWN2) LL3EB4CS-567-001-SO (SWW3) LL3EB4CS-568-001-SO (SWW3) LL3EB4CS-569-001-SO (SWE1) LL3EB4CS-570-001-SO (SWS3) LL3EB4CS-571-001-SO (FLOOR3) LL3EB4CS-572-001-SO (SWN3) bedrock- no sample (SWN4) bedrock- no sample (FLOOR2) concrete - no sample (SWE2)	Yes No Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes No Sample No Sample No Sample	Cell 1B-3 - 11/19 to 11/30 (12 days)	548	LLEXSITUtv-009-001-SO LLEXSITUtv-009-002-SO LLEXSITUtv-010-001-SO LLEXSITUtv-010-002-SO LLEXSITUtv-011-001-SO LLEXSITUtv-012-001-SO	Yes Yes Yes Yes Yes Yes	Additional soil excavated at SWN1 for treatment, and an additional ISM sample collected for the new northern sidewall.	1/27/2021
3	EB-4		1 to 3	PCB-1254	521	39			39	LL3EB4CS-586-001-SO (SWN1)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall North 1, 3-foot-wide extension	1/27/2021

Table 3-2. Excavation and Treatment Details

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Excavation	Planned Area (SF)	Contaminated Interval (feet bgs)	Contaminants of Concern	Actual Area Excavated (SF)	Estimated Contaminated In situ[d] Volume Excavated (CY)	Three-Dimensional Scan Total Volume Excavated (CY)	Dimensional Scan Calculated Contaminated Volume Excavated (CY)	Extension Volumes Not Included in the Three-Dimensional Scan (CY)	Sidewall/Bottom Confirmation Samples to Date (Sample Names)	RGOs Met in Sidewall/Bottom Confirmation Samples?	Treatment/Off-Site Disposal Dates	Average Soil Temperature at the End of Treatment (°F)	Treatment Verification/Disposal Characterization Samples to Date (Sample Names)	RGOs Met in Treatment Verification Samples?	Notes	Backfill Complete
3	EB-9A	1,009	0 to 1	TNT	1,009	37	41.44	41.44		LL3EB9ACS-573-001-SO (FLOOR) LL3EB9ACS-574-001-SO (SWS) LL3EB9ACS-575-001-SO (SWN) LL3EB9ACS-576-001-SO (SWE) LL3EB9ACS-577-001-SO (SWW)	Yes Yes Yes Yes Yes	Cell 2A-2 - 11/10 to 11/19 (10 days)	479	LLEXSITUtv-005-001-SO LLEXSITUtv-005-002-SO LLEXSITUtv-006-001-SO LLEXSITUtv-007-001-SO LLEXSITUtv-008-001-SO LLEXSITUtv-008-002-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/21/2021
3	West Perimeter	625	0 to 0.5	B(a)a, BaP, BbF, DA	625	12	14.7	10.16		LL3WPcs-581-001-SO (Floor) LL3WPcs-582-001-SO (SWN) LL3WPcs-582-002-SO (SWN) LL3WPcs-582-003-SO (SWN) LL3WPcs-583-001-SO (SWW) LL3WPcs-583-002-SO (SWW) LL3WPcs-583-003-SO (SWW) LL3WPcs-584-001-SO (SWS) LL3WPcs-585-001-SO (SWE)	No No No No No No No No No	Cell 2B-4, 11/30 to 12/10 (12 days)	562	LLEXSITUtv-013-001-SO LLEXSITUtv-014-001-SO LLEXSITUtv-015-001-SO LLEXSITUtv-016-001-SO LLEXSITUtv-016-002-SO	Yes Yes Yes Yes Yes Yes	Additional soil excavated from all sidewalls and the bottom, and additional ISM samples collected from the new sidewalls and bottom.	1/27/2021
3	West Perimeter		0 to 0.5	BaP		69			69	LL3WPcs-587-001-SO (Bottom)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Bottom, extended to total depth 3.5 feet with the sidewall extensions in all directions by 3 feet, the new bottom was 31x31	1/27/2021
3	West Perimeter		0 to 0.5	B(a)a, BaP, BbF, DA	75	10			10	LL3WPcs-588-001-SO (SWN) LL3WPcs-588-002-SO (SWN) LL3WPcs-588-003-SO (SWN)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall North, 3-foot-wide extension 3.5 feet bgs	1/27/2021
3	West Perimeter		0 to 3.5	BaP, BbF	75	10			10	LL3WPcs-589-001-SO (SWW) LL3WPcs-589-002-SO (SWW) LL3WPcs-589-003-SO (SWW)	Yes No (BaP) Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall West, 3-foot-wide extension 3.5 feet bgs	1/27/2021
3	West Perimeter		0 to 3.5	BaP	75	10			10	LL3WPcs-592-001-SO (SWW)	No	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall West - Additional soil excavated 3 feet west 3.5 feet bgs for treatment (total 6-foot extension to west), and an additional ISM sample collected from the new western sidewall for BaP. The extended excavation abutted an asphalt road, and an asphalt layer was visible in the sidewall of the extended excavation. In keeping with past practice at the installation, the Army was not going to extend the excavation further, in order to chase BaP at or beneath an asphalt road.	1/27/2021
3	West Perimeter		0 to 3.5	BaP	75	10			10	LL3WPcs-590-001-SO (SWS)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall South, 3-foot-wide extension 3.5 feet bgs	1/27/2021
3	West Perimeter		0 to 3.5	B(a)a, BaP, BbF, DA	75	10			10	LL3WPcs-591-001-SO (SWE)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall East, 3-foot-wide extension 3.5 feet bgs	1/27/2021
3	EB-803	400	0 to 1	PCB-1254		15	12.71	12.71		LL3EB803cs-578-001-SO (FLOOR) LL3EB803cs-579-001-SO (SWN) LL3EB803cs-580-001-SO (SWE) Railroad ballast – no sample (SWS) Railroad ballast – no sample (SWW)	Yes Yes Yes NA NA	Cell 2A-6 , 12/13 to12/21 (8 days)	*624*	LLEXSITUtv-021-001-SO LLEXSITUtv-022-001-SO LLEXSITUtv-022-002-SO LLEXSITUtv-023-001-SO LLEXSITUtv-024-001-SO LLEXSITUtv-024-002-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/8/2021

Table 3-2. Excavation and Treatment Details

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Load Line	Excavation	Planned Area (SF)	Contaminated Interval (feet bgs)	Contaminants of Concern	Actual Area Excavated (SF)	Estimated Contaminated In situ[d] Volume Excavated (CY)	Three-Dimensional Scan Total Volume Excavated (CY)	Dimensional Scan Calculated Contaminated Volume Excavated (CY)	Extension Volumes Not Included in the Three-Dimensional Scan (CY)	Sidewall/Bottom Confirmation Samples to Date (Sample Names)	RGOs Met in Sidewall/Bottom Confirmation Samples?	Treatment/Off-Site Disposal Dates	Average Soil Temperature at the End of Treatment (°F)	Treatment Verification/Disposal Characterization Samples to Date (Sample Names)	RGOs Met in Treatment Verification Samples?	Notes	Backfill Complete
4	Former Water Tower	400	0 to 1	Lead	400	15	23.01	23.01		LL4FWTcs-538-001-SO (Floor) LL4FWTcs-539-001-SO (SWS) LL4FWTcs-540-001-SO (SWE) LL4FWTcs-541-001-SO (SWN) LL4FWTcs-542-001-SO (SWW)	Yes Yes No Yes No	1/13/21 (Manifests 1137881 and 1137882)	NA	LL4dc-001-002-SO	Yes (non-hazardous)	Additional soil excavated at SWE and SWW for off-site disposal and an additional ISM sample collected for the new eastern sidewall and an additional ISM sample collected for the new western sidewall.	2/1/2021
4	Former Water Tower		0 to 1	Lead	240	9			9	LL4FWTcs-544-001-SO (SWE)	No	2/2/21 (Manifests 1550284 and 1550351)		LL4dc-001-002-SO	Yes (non-hazardous)	Sidewall East, initial 3-foot-wide extension Per discussions with the Army, the eastern sidewall excavated 9 feet further to the east until it daylights due to the sloping topography. No additional sampling.	2/1/2021
4	Former Water Tower		0 to 1	Lead	60	2			2	LL4FWTcs-545-001-SO (SWW)	No	2/2/21 (Manifests 1550284 and 1550351)	NA	LL4dc-001-002-SO	Yes (non-hazardous)	Sidewall West, initial 3-foot-wide extension	2/1/2021
4	Former Water Tower		0 to 1	Lead	200	7			7	LL4FWTcs-546-001-SO (SWW)	Yes	2/2/21 (Manifests 1550284 and 1550351)	NA	LL4dc-001-002-SO	Yes (non-hazardous)	Sidewall West, second extension. Per discussions with the Army, the western sidewall was excavated further to the west an additional 10 feet approximately, beyond which large trees are present, and an additional ISM sample for lead collected for the further extended Sidewall West. RGOs met.	2/1/2021
4	Building G-16	400	0 to 1	PCB-1260	400	15	20.89	20.89		LL4G16cs-527-001-SO (FLOOR) LL4G16cs-528-001-SO (SWW) LL4G16cs-529-001-SO (SWN) LL4G16cs-530-001-SO (SWS) LL4G16cs-531-001-SO (SWE)	Yes Yes Yes Yes Yes	Cell 2A-6 , 12/13 to12/21 (8 days)	*624*	LLEXSITUtv-021-001-SO LLEXSITUtv-022-001-SO LLEXSITUtv-022-002-SO LLEXSITUtv-023-001-SO LLEXSITUtv-024-001-SO LLEXSITUtv-024-002-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/13/2021
4	Building G-8 (a)	400	1 to 7	B(a)a, BaP, BbF, DA	400	89	82.18	67.38		LL4G8ACS-522-001-SO (SWW) LL4G8ACS-523-001-SO (SWE) LL4G8ACS-524-001-SO (SWN) LL4G8ACS-525-001-SO (FLOOR) LL4G8ACS-526-001-SO (SWS)	Yes Yes Yes Yes Yes	Cell 1A-5 , 12/9 to 12/18 (9 days) Cell 2A-6 , 12/13 to12/21 (8 days)	541 *624*	LLEXSITUtv-017-001-SO LLEXSITUtv-018-001-SO LLEXSITUtv-019-001-SO LLEXSITUtv-020-001-SO LLEXSITUtv-021-001-SO LLEXSITUtv-022-001-SO LLEXSITUtv-022-002-SO LLEXSITUtv-023-001-SO LLEXSITUtv-024-001-SO LLEXSITUtv-024-002-SO	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	RGOs met.	1/19/2021
4	Building G-8 (b)	4,794	3 to 5	B(a)a, BaP, BbF, DA	4,794	355	950.69	425.79		LL4G8Bcs-532-001-SO (Floor1) LL4G8Bcs-533-001-SO (Floor2) LL4G8Bcs-534-001-SO (SWW) LL4G8Bcs-535-001-SO (SWN) LL4G8Bcs-536-001-SO (SWS) LL4G8Bcs-537-001-SO (SWE)	Yes Yes Yes No Yes Yes	Cell 1A-5 , 12/9 to 12/18 (9 days)	541	LLEXSITUtv-017-001-SO LLEXSITUtv-018-001-SO LLEXSITUtv-019-001-SO LLEXSITUtv-020-001-SO	Yes Yes Yes Yes	Additional soil excavated at SWN for treatment, and an additional ISM sample collected for the new northern sidewall.	1/19/2021
4	Building G-8 (b)		3 to 5	BaP	248	18			18	LL4G8Bcs-543-001-SO (SWN)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall North, 3-foot-wide extension	1/19/2021
12	Active Area Channel	400	0 to 2	TNT, 2,6-DNT, BAP	400	30	35.65	35.65		LL12AACcs-344-001-SO (SWN) LL12AACcs-343-001-SO (SWE) LL12AACcs-342-001-SO (SWS) LL12AACcs-342-002-SO (SWS) LL12AACcs-341-001-SO (SWW) LL12AACcs-340-001-SO (Floor)	Yes Yes Yes Yes Yes Yes	Cell 2A-6 , 12/13 to12/21 (8 days)	*624*	LLEXSITUtv-021-001-SO LLEXSITUtv-022-001-SO LLEXSITUtv-022-002-SO LLEXSITUtv-023-001-SO LLEXSITUtv-024-001-SO LLEXSITUtv-024-002-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/13/2021
12	FF-19 (a)	625	0 to 1	B(a)a, BaP, BbF, DA	332	23	24.66	24.66		LL12FF19Acs-338-001-SO (SWN) LL12FF19Acs-337-001-SO (SWS) LL12FF19Acs-337-002-SO (SWS) LL12FF19Acs-337-003-SO (SWS) LL12FF19Acs-339-001-SO (SWW) LL12FF19Acs-336-001-SO (Floor) railroad ballast - no sample (SWE)	Yes No No No No Yes NA	Cell 2B-4, 11/30 to 12/10 (12 days)	562	LLEXSITUtv-013-001-SO LLEXSITUtv-014-001-SO LLEXSITUtv-015-001-SO LLEXSITUtv-016-001-SO LLEXSITUtv-016-002-SO	Yes Yes Yes Yes Yes Yes	Additional soil excavated at SWS and SWW for treatment, and an additional ISM sample collected for the new southern sidewall and an additional ISM sample collected for the new western sidewall.	2/1/2021
12	FF-19 (a)		0 to 1	BaP	57	2			2	LL12FF19Acs-345-001-SO (SWS) LL12FF19Acs-345-002-SO (SWS) LL12FF19Acs-345-003-SO (SWS)	Yes Yes Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall South, 3-foot-wide extension RGOs met.	2/1/2021
12	FF-19 (a)		0 to 1	BaP	84	3			3	LL12FF19Acs-346-001-SO (SWW)	No	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall West, 3-foot-wide extension	2/1/2021
12	FF-19 (a)		0 to 1	BaP	84	3			3	LL12FF19Acs-350-001-SO (SWW)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Additional soil excavated in this direction for treatment, and an additional ISM sample collected from the new western sidewall for BaP. RGOs met.	2/1/2021
12	FF-19 (b)	625	0 to 4.5	B(a)a, BaP, BbF, DA	625	104	106.2	106.2		LL12FF19BCS-331-001-SO (Floor) LL12FF19BCS-332-001-SO (SWN) LL12FF19BCS-333-001-SO (SWS) LL12FF19BCS-333-002-SO (SWS) LL12FF19BCS-333-003-SO (SWS) LL12FF19BCS334-001-SO (SWW) LL12FF19BCS-334-002-SO (SWW) LL12FF19BCS-335-001-SO (SWE) LL12FF19BCS-335-002-SO (SWE) LL12FF19BCS-335-003-SO (SWE)	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Cell 2B-4, 11/30 to 12/10 (12 days)	562	LLEXSITUtv-013-001-SO LLEXSITUtv-014-001-SO LLEXSITUtv-015-001-SO LLEXSITUtv-016-001-SO LLEXSITUtv-016-002-SO	Yes Yes Yes Yes Yes Yes	RGOs met.	1/22/2021

Table 3-2. Excavation and Treatment Details

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Excavation	Planned Area (SF)	Contaminated Interval (feet bgs)	Contaminants of Concern	Actual Area Excavated (SF)	Estimated Contaminated In situ[d] Volume Excavated (CY)	Three-Dimensional Scan Total Volume Excavated (CY)	Dimensional Scan Calculated Contaminated Volume Excavated (CY)	Extension Volumes Not Included in the Three-Dimensional Scan (CY)	Sidewall/Bottom Confirmation Samples to Date (Sample Names)	RGOs Met in Sidewall/Bottom Confirmation Samples?	Treatment/Off-Site Disposal Dates	Average Soil Temperature at the End of Treatment (°F)	Treatment Verification/Disposal Characterization Samples to Date (Sample Names)	RGOs Met in Treatment Verification Samples?	Notes	Backfill Complete
12	FF-19 (c)	983	0 to 2.5	B(a)a, BaP, BbF, DA	983	91	92.54	92.54		LL12FF19CCS-324-001-SO (SWS1) LL12FF19CCS-325-001-SO (SWW1) LL12FF19CCS-326-001-SO (SWN1) LL12FF19CCS-327-001-SO (SWS2) LL12FF19CCS-328-001-SO (SWW2) LL12FF19CCS-329-001-SO (SWE2) LL12FF19CCS-329-002-SO (SWE2) LL12FF19CCS-329-003-SO (SWE2) LL12FF19CCS-330-001-SO (SWN2) LL12FF19ccs-322-001-SO (SWE1) LL12FF19ccs-321-001-SO (Floor1) LL12FF19ccs-323-001-SO (Floor2)	Yes No Yes Yes Yes Yes Yes Yes Yes No No Yes	Cell 2B-4, 11/30 to 12/10 (12 days)	562	LLEXSITUtv-013-001-SO LLEXSITUtv-014-001-SO LLEXSITUtv-015-001-SO LLEXSITUtv-016-001-SO LLEXSITUtv-016-002-SO	Yes Yes Yes Yes Yes Yes	Additional soil excavated at SWW1, SWE1, and Floor1 for treatment, an additional ISM sample collected for the new W1 sidewall, an additional ISM sample collected for the new E1 sidewall, and an additional ISM sample collected for the new Floor1 sidewall	1/22/2021
12	FF-19 (c)		0-3.5	BaP	75	10			10	LL12FF19Ccs-347-001-SO (SWW1)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall West 1, 3-foot wide extension	1/22/2021
12	FF-19 (c)		0 to 3.5	BaP	983	36			36	LL12FF19Ccs-348-001-SO (Bottom 1)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Bottom 1, extended additional 1 foot, total depth 3.5 feet with the sidewall extensions to east and west by 3 feet, the new bottom was 25 x 31	1/22/2021
12	FF-19 (c)		0 to 3.5	BaP	54	7			7	LL12FF19Ccs-349-001-SO (SWE1)	Yes	Cell 2B-7, 1/20/21 to 1/27/21 (8 days)	584	LLEXSITUtv-025-001-SO LLEXSITUtv-026-001-SO	Yes Yes	Sidewall East 1, 3-foot-wide extension	1/22/2021

Notes:

< = less than

> = more than

≤ = less than or equal to

% = percent

°F = degrees Fahrenheit

B(a)a = benz(a)anthracene

BaP = benzo(a)pyrene

BbF = benzo(b)fluoranthene

bgs = below ground surface

COC = contaminant of concern

CY = cubic yard

DA = dibenz(a,h)anthracene

2,6-DNT = 2,6-dinitrotoluene

DU = decision unit

ISM = incremental sampling methodology

NA = not applicable

PAH= polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

RGO = remedial goal option

RSD = relative standard deviation

SF = square feet

SWE = Sidewall East

SWN = Sidewall North

SWS = Sidewall South

SWW= Sidewall West

TNT = 2,4,6-trinitrotoluene

UCL = upper confidence limit

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

									Analyte/Units/RGO/Result																					
									Antimony		Lead		PCB-1254		PCB-1260		B(a)a		BaP		BbF		DA		RDX		TNT		2,6-DNT		
									mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		
Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	470		800		9.7		9.9		29		2.9		29		2.9		280		510		15		Notes	Action
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3	Sidewall North 1	11/24/2020	CT	158211	LL1CB4Acs-739-001-SO (SWN1)	-		-		-		-		-		-		-		-		0.2	U	13	J				
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3	Sidewall North 1	11/24/2020	CT	158211	LL1CB4Acs-739-002-SO (SWN1)	-		-		-		-		-		-		-		-		0.2	U	0.2	UJ				
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3	Sidewall North 1	11/24/2020	CT	158211	LL1CB4Acs-739-003-SO (SWN1)	-		-		-		-		-		-		-		-		0.2	U	0.2	UJ				
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**arithmetic mean**																	0.200		4.467					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**standard deviation**																	0.000		7.390					- RGOs met in each individual replicate sample;
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**CV = SD/mean**																	0%		165%				Laboratory subsample triplicate 3% RSD TNT, not calculated for RDX, all ND data, showed good control	- RSD >100% for TNT; - 95% UCL (Chebyshev method) was less than RGO;
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**count (r)**																	3		3					- no further excavation in thwas direction
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**alpha (95% = 0.05)**																	0.05		0.05					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**t (alpha, df = r-1)**																	2.92		2.92					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**Student's t UCL**																	0.20		16.93					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set3					**Chebyshev UCL**																	0.20		23.06					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2	Sidewall East 1	11/20/2020	CT	158141	LL1CB4Acs-737-001-SO (SW East 1)	-		-		-		-		-		-		-		-		5.4	J	71	J	-			
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2	Sidewall East 1	11/20/2020	CT	158141	LL1CB4Acs-737-002-SO (SW East 1)	-		-		-		-		-		-		-		-		0.21	J	270	J	-			
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2	Sidewall East 1	11/20/2020	CT	158141	LL1CB4Acs-737-003-SO (SW East 1)	-		-		-		-		-		-		-		-		0.2	UJ	1.2	J	-			
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**arithmetic mean**																	1.937		114.067					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**standard deviation**																	2.999		139.479					- RGOs met in each individual replicate sample;
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**CV = SD/mean**																	155%		122%				Laboratory subsample triplicate 14.9% RSD RDX and 8.7% TNT, showed good control	- RSD >100% for RDX and TNT; - 95% UCL (Chebyshev method) was less than RGOs;
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**count (r)**																	3		3					- no further excavation in thwas direction
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**alpha (95% = 0.05)**																	0.05		0.05					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**t (alpha, df = r-1)**																	2.92		2.92					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**Student's t UCL**																	6.99		349.21					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set2					**Chebyshev UCL**																	9.48		465.08					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1	Sidewall South	11/20/2020	CT	158141	LL1CB4Acs-738-001-SO (SW South)	-		-		-		-		-		-		-		-		0.2	UJ	2.2	J	-			
1	CB-4A	RDX, TNT	Excavation Sample - wasM TRIPLICATE set1	Sidewall South	11/20/2020	CT	158141	LL1CB4Acs-738-002-SO (SW South)	-		-		-		-		-		-		-		-		2.6	J	480	J	-			
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1	Sidewall South	11/20/2020	CT	158141	LL1CB4Acs-738-003-SO (SW South)	-		-		-		-		-		-		-		-		7.6	J	44	J	-			
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**arithmetic mean**																	3.467		175.400					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**standard deviation**																	3.775		264.618					- RGOs met in each individual replicate sample;
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**CV = SD/mean**																	109%		151%				Laboratory subsample triplicate 14.9% RSD RDX and 8.7% TNT, showed good control	- RSD >100% for RDX and TNT; - 95% UCL (Chebyshev method) was less than RGO for RDX but greater than RGO for TNT;
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**count (r)**																	3		3					- additional excavation 5' in thwas direction (south) for TNT and resample as ISM triplicate - see below.
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**alpha (95% = 0.05)**																	0.05		0.05					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**t (alpha, df = r-1)**																	2.92		2.92					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**Student's t UCL**																	9.83		621.51					
1	CB-4A	RDX, TNT	Excavation Sample - ISM TRIPLICATE set1					**Chebyshev UCL**																	12.97		841.34					

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

									Analyte/Units/RGO/Result												
Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Antimony mg/kg 470	Lead mg/kg 800	PCB-1254 mg/kg 9.7	PCB-1260 mg/kg 9.9	B(a)a mg/kg 29	BaP mg/kg 2.9	BbF mg/kg 29	DA mg/kg 2.9	RDX mg/kg 280	TNT mg/kg 510	2,6-DNT mg/kg 15	Notes	Action
1	CB-4A	TNT	Excavation Sample	Sidewall South EASTERN END	1/14/2021	CT	159240	LL1CB4Acs-765-001-SO (SWS1)	-	-	-	-	-	-	-	-	-	330	-		Extends 50 feet from SE corner - One replicate exceeded the RGO - RSD<35%, per work plan compared the maximum field replicate concentration to the RGO - Additional soil was excavated 5 feet in this direction for this 50-foot length of wall (the rest of the wall was sampled as separate DUs that meet the RGO - see below). As discussed with the Army, there was no soil in the treatment interval (1 to 5'bgs) for the further extended sidewall, therefore no additional samples collected. - Excavation backfilled.
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13	Sidewall South EASTERN END	1/14/2021	CT	159240	LL1CB4Acs-765-002-SO (SWS1)	-	-	-	-	-	-	-	-	-	460	-		
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13	Sidewall South EASTERN END	1/14/2021	CT	159240	LL1CB4Acs-765-003-SO (SWS1)	-	-	-	-	-	-	-	-	-	550	-		
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**arithmetic mean**										447			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**standard deviation**										110.604			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**CV = SD/mean**										25%			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**count (r)**										3			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**alpha (95% = 0.05)**										0.05			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**t (alpha, df = r-1)**										2.92			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**Student's t UCL**										633.13			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set13					**Chebyshev UCL**										725.01			
1	CB-4A	TNT	Excavation Sample	Sidewall South MID PORTION	1/14/2021	CT	159240	LL1CB4Acs-766-001-SO (SWS2)	-	-		-	-	-	-	-	-	3.8 J	-		Starts 50' from SE corner and extends 50' long - RGOs met in each individual replicate sample; - RSD >50% but <100%; - 95% UCL (Chebyshev method) was less than the RGO; - no further excavation for this portion of the SWS
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14	Sidewall South MID PORTION	1/14/2021	CT	159240	LL1CB4Acs-766-002-SO (SWS2)	-	-		-	-	-	-	-	-	0.88 J	-		
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14	Sidewall South MID PORTION	1/14/2021	CT	159240	LL1CB4Acs-766-003-SO (SWS2)	-	-		-	-	-	-	-	-	0.8 J	-		
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**arithmetic mean**										1.827			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**standard deviation**										1.709			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**CV = SD/mean**										94%		Laboratory subsample triplicate 2.13% RSD TNT, showed good control	
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**count (r)**										3			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**alpha (95% = 0.05)**										0.05			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**t (alpha, df = r-1)**										2.92			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**Student's t UCL**										4.71			
1	CB-4A	TNT	Excavation Sample - ISM TRIPLICATE set14					**Chebyshev UCL**										6.13			
1	CB-4A	TNT	Excavation Sample	Sidewall South WEST END	1/14/2021	CT	159240	LL1CB4Acs-767-001-SO (SWS3)	-	-	-	-	-	-	-	-	-	0.47	-		Westernmost 16' of the SWS RGO met for this portion of the SWS, no further excavation
1	CB-4A	RDX, TNT	Excavation Sample	Sidewall North 2 (bumpout)	11/24/2020	CT	158211	LL1CB4Acs-740-001-SO (SWN2)	-	-	-	-	-	-	-	-	0.2 U	0.15 J	-		RGOs met, no further excavation in this direction, Army and OEPA concur
1	CB-4A	RDX, TNT	Excavation Sample	Sidewall North 3	11/30/2020	CT	158269	LL1CB4Acs-741-001-SO (SWN3)	-	-	-	-	-	-	-	-	0.2 U	14 J	-		RGOs met, no further excavation in this direction
1	CB-4A	RDX, TNT	Excavation Sample	Sidewall East 2 (Bumpout)	11/30/2020	CT	158269	LL1CB4Acs-742-001-SO (SWE2, bumpout)	-	-	-	-	-	-	-	-	0.2 U	0.2 UJ	-		RGOs met, no further excavation in this direction
1	CB-4A	RDX, TNT	Excavation Sample	Sidewall West 2 (bumpout)	11/19/2020	CT	158139	LL1CB4Acs-736-001-SO (SWW2)	-	-	-	-	-	-	-	-	0.2 U	0.32 J	-		RGOs met, no further excavation in this direction, Army and OEPA concur
1	CB-4A	RDX, TNT	Excavation Sample	Sidewall West 1	12/1/2020	CT	158323	LL1CB4Acs-743-001-SO (SWW1)	-	-	-	-	-	-	-	-	8.3 U	2.1 J	-		RGOs met, no further excavation in this direction, Army and OEPA concur
1	CB-4A	RDX, TNT	Excavation Sample	Bottom	NA			no sample									NA	NA			No sample due to shallow bedrock throughout excavation
1	CB-4	PCB-1254	Excavation Sample	No Samples	NA	NA	NA	no samples	-	-	-	-	NA	NA	NA	NA	-	-	-		Overburden removed to bedrock encountered throughout at 2 feet bgs (treatment interval 2-3' bgs). Per Army direction excavateion documented and backfilled, no samples. RGOs met. Excavation backfilled.

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Analyte/Units/RGO/Result: Antimony mg/kg 470	Lead mg/kg 800	PCB-1254 mg/kg 9.7	PCB-1260 mg/kg 9.9	B(a)a mg/kg 29	BaP mg/kg 2.9	BbF mg/kg 29	DA mg/kg 2.9	RDX mg/kg 280	TNT mg/kg 510	2,6-DNT mg/kg 15	Notes	Action
1	CB-2	Antimony, Lead	Excavation Sample	Sidewall East/ North/ South	12/16/2020	CT	158721	LL1CB2cs-759-001-SO (SWE)	9	115	-	-	-	-	-	-	-	-	-		Bedrock throughout at approximately 0.5' to 1' bgs - no bottom sample. Railroad ballast in two-thirds of the excavation. Sampled east sidewall that was soil, and wrap around to portions of north and south that were soil to make one sidewall DU.
1	CB-2	Antimony, Lead	Excavation Sample	Sidewall West	NA	NA	NA	no sample - railroad ballast	NA	NA	-	-	-	-	-	-	-	-	-		
1	CB-2	Antimony, Lead	Excavation Sample	Bottom	NA	NA	NA	no sample - bedrock	NA	NA	-	-	-	-	-	-	-	-	-		RGOs met, no further excavation in this direction. Excavation backfilled.
1	CB-13B	Lead	Excavation Sample	Sidewall North	12/21/2020	CT	158799	LL1CB13Bcs-761-001-SO (SWN)	-	20.1	-	-	-	-	-	-	-	-	-		RGOs met, no further excavation in this direction
1	CB-13B	Lead	Excavation Sample	Sidewall East	12/21/2020	CT	158799	LL1CB13Bcs-762-001-SO (SWE)	-	15.8	-	-	-	-	-	-	-	-	-		RGOs met, no further excavation in this direction
1	CB-13B	Lead	Excavation Sample	Sidewall South	12/21/2020	CT	158799	LL1CB13Bcs-763-001-SO (SWS)	-	23.2	-	-	-	-	-	-	-	-	-		RGOs met, no further excavation in this direction
1	CB-13B	Lead	Excavation QA Split 10	Sidewall South	12/21/2020	GEL	530877	LL1CB13Bcs-763-002-SO (SWS)	-	25.5	-	-	-	-	-	-	-	-	-		
1	CB-13B	Lead	Excavation Sample	Sidewall West	12/21/2020	CT	158799	LL1CB13Bcs-764-001-SO (SWW)	-	23.1	-	-	-	-	-	-	-	-	-		RGOs met, no further excavation in this direction
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12	Bottom	12/21/2020	CT	158799	LL1CB13Bcs-760-001-SO (Bottom)	-	12.6 J	0.04 U	-	-	-	-	-	-	-	-		- RGOs met in each individual replicate sample; - RSD <35%; - no further excavation in this direction; excavation backfilled.
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12	Bottom	12/21/2020	CT	158799	LL1CB13Bcs-760-002-SO (Bottom)	-	11.3	0.039 U	-	-	-	-	-	-	-	-		
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12	Bottom	12/21/2020	CT	158799	LL1CB13Bcs-760-003-SO (Bottom)	-	13.8	0.041 U	-	-	-	-	-	-	-	-		
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**arithmetic mean**		12.567											
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**standard deviation**		1.250											
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**CV = SD/mean**		10%											
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**count (r)**		3											
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**alpha (95% = 0.05)**		0.05											
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**t (alpha, df = r-1)**		2.92											
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**Student's t UCL**		14.67											
1	CB-13B	Lead	Excavation Sample - ISM TRIPLICATE set 12					**Chebyshev UCL**		15.71											
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5	Bottom	12/16/2020	CT	158721	LL1OCDcs-754-001-SO (Bottom)	0.42 U	66.2 J	-	-	-	-	-	-	-	-	-		
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5	Bottom	12/16/2020	CT	158721	LL1OCDcs-754-002-SO (Bottom)	0.43 U	19.1 J	-	-	-	-	-	-	-	-	-		
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5	Bottom	12/16/2020	CT	158721	LL1OCDcs-754-003-SO (Bottom)	0.43 U	18.9 J	-	-	-	-	-	-	-	-	-		
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**arithmetic mean**	0.427	34.733											
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**standard deviation**	0.006	27.251											
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**CV = SD/mean**	1%	78%										Lead laboratory duplicate in control Laboratorysubsample duplicate 4% RPD, showed good control; LCS in control.	- RGOs met in each individual replicate sample; - RSD >50% but <100% for Lead; - 95% UCL (Chebyshev method) was less than the RGO; - no further excavation in this direction; excavation backfilled.
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**count (r)**	3	3											
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**alpha (95% = 0.05)**	0.05	0.05											
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**t (alpha, df = r-1)**	2.92	2.92											
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**Student's t UCL**	0.44	80.67											
1	Outlet Channel D	Antimony, Lead	Excavation Sample - ISM TRIPLICATE set 5					**Chebyshev UCL**	0.44	103.31											
1	Outlet Channel D	Antimony, Lead	Excavation Sample	Sidewall West	12/16/2020	CT	158721	LL1OCDcs-755-001-SO (SWW)	0.43 UJ	19.5 J	-	-	-	-	-	-			-		RGOs met.Excavation backfilled.
1	Outlet Channel D	Antimony, Lead	Excavation QA Split 4	Sidewall West	12/16/2020	GEL	530526	LL1OCDcs-755-002-SO (SWW)	2.22	26.2	-	-	-	-	-	-	-	-	-		
1	Outlet Channel D	Antimony, Lead	Excavation Sample	Sidewall South	12/16/2020	CT	158721	LL1OCDcs-756-001-SO (SWS)	0.42	14	-	-	-	-	-	-	-	-	-		
1	Outlet Channel D	Antimony, Lead	Excavation Sample	Sidewall East	12/16/2020	CT	158721	LL1OCDcs-757-001-SO (SWE)	0.41 U	18.1	-	-	-	-	-	-	-	-	-		
1	Outlet Channel D	Antimony, Lead	Excavation Sample	Sidewall North	12/16/2020	CT	158721	LL1OCDcs-758-001-SO (SWN)	0.41 U	22.8	-	-	-	-	-	-	-	-	-		

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Antimony	Lead	PCB-1254	PCB-1260	B(a)a	BaP	BbF	DA	RDX	TNT	2,6-DNT	Notes	Action
								Analyte/Units/RGO/Result	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		
									470	800	9.7	9.9	29	2.9	29	2.9	280	510	15		
2	DB-4A	TNT	Excavation Sample	Bottom	12/15/2020	CT	158721	LL2DB4acs-681-001-SO (Bottom)	-	-	-	-	-	-	-	-	-	0.2 U	-		RGOs met. Eexcavation backfilled.
2	DB-4A	TNT	Excavation Sample	Sidewall East	12/15/2020	CT	158721	LL2DB4acs-682-001-SO (SWE)	-	-	-	-	-	-	-	-	-	0.2 U	-		
2	DB-4A	TNT	Excavation Sample	Sidewall North	12/15/2020	CT	158721	LL2DB4acs-683-001-SO (SWN)	-	-	-	-	-	-	-	-	-	0.2 U	-		
2	DB-4A	TNT	Excavation Sample	Sidewall South	12/15/2020	CT	158721	LL2DB4acs-684-001-SO (SWS)	-	-	-	-	-	-	-	-	-	0.2 U	-		
2	DB-4A	TNT	Excavation QA Split 3	Sidewall South	12/15/2020	GEL	530201	LL2DB4acs-684-002-SO (SWS)	-	-	-	-	-	-	-	-	-	0.121 U	-		
2	DB-4A	TNT	Excavation Sample	Sidewall West	12/15/2020	CT	158721	LL2DB4acs-685-001-SO (SWW)	-	-	-	-	-	-	-	-	-	0.2 U	-		
3	EA-6 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall West	12/2/2020	CT	158363	LL3EA6Acs-749-001-SO (SWW)	-	-	-	-	6.37	4.42	5.86	0.374	-	-	-		Additional excavation removed approximately 20 feet additional to the west and down to bedrock at approximately 2' bgs, coincides with footprint of EA6c. Soil added to treatment cell. Beyond that 20 feet had already been excavated for EA6c. No additional samples collected.
3	EA-6 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North	12/2/2020	CT	158363	LL3EA6Acs-750-001-SO (SWN)	-	-	-	-	0.445	0.308	0.391	0.0331	-	-	-		RGOs met. Excavation backfilled. Army and OEPA concur.
3	EA-6 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall South	12/2/2020	CT	158363	LL3EA6Acs-751-001-SO (SWS)	-	-	-	-	1.72	1.24	1.56	0.128	-	-	-		
3	EA-6 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall East	NA	CT	158363		No sample (due to topography there is not an eastern sidewall for this excavation)												
3	EA-6 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom	12/2/2020	CT	158363	LL3EA6Acs-752-001-SO (Bottom)	-	-	-	-	0.801	0.576	0.707	0.0552	-	-	-		
3	EA-6 (b)	BaP, DA	Excavation Sample	Sidewall West	12/1/2020	CT	158323	LL3EA6Bcs-744-001-SO (SWW)	-	-	-	-	0.162 J	0.114	0.174	0.015 J	-	-	-		RGOs met. Excavation backfilled. Army and OEPA concur.
3	EA-6 (b)	BaP, DA	Excavation Sample	Sidewall North	12/1/2020	CT	158323	LL3EA6Bcs-745-001-SO (SWN)	-	-	-	-	1.51	1.01	1.45	0.0839	-	-	-		
3	EA-6 (b)	BaP, DA	Excavation Sample	Sidewall South	12/1/2020	CT	158323	LL3EA6Bcs-746-001-SO (SWS)	-	-	-	-	0.29	0.168	0.267	0.0227	-	-	-		
3	EA-6 (b)	BaP, DA	Excavation Sample	Sidewall East	12/1/2020	CT	158323	LL3EA6Bcs-747-001-SO (SWE)	-	-	-	-	0.235	0.156	0.18	0.02	-	-	-		
3	EA-6 (b)	BaP, DA	Excavation Sample	Bottom	12/1/2020	CT	158323	LL3EA6Bcs-748-001-SO (Bottom)	-	-	-	-	1.39	0.925	1.32	0.0822	-	-	-		
3	EA-6 (c)	B(a)a, BaP, BbF, DA	Excavation Sample	No Samples	NA	NA	NA	no samples	-	-	-	-	NA	NA	NA	NA	-	-	-		Bedrock encountered - one pocket had soils in the treatment interval (approximately 10CY of impacted soils from an area just south of EA6b excavated to bedrock and added to treatment cell ETC 2A-6). Bedrock throughout bottom of excavation, no soil on sidewalls in treatment interval 4.5-6'bgs, no samples. Per Army direction excavateion documented and backfilled, no samples. Excavation backfilled.
3	EA-7	PCB-1254	Excavation Sample - ISM TRIPLICATE set 4	Sidewall North	12/3/2020	CT	158405	LL3EA7cs-556-001-SO (SWN)	-	-	0.229	-	-	-	-	-	-	-	-		- RGO met in each individual replicate sample; - RSD <35% - no further excavation in this direction; excavation backfilled. Army and OEPA concur.
3	EA-7	PCB-1254	Excavation Sample - ISM TRIPLICATE set 4					LL3EA7cs-556-002-SO (SWN)	-	-	0.395	-	-	-	-	-	-	-	-		
3	EA-7	PCB-1254	Excavation Sample - ISM TRIPLICATE set 4					LL3EA7cs-556-003-SO (SWN)	-	-	0.27	-	-	-	-	-	-	-	-		
3	EA-7	PCB-1254	Excavation Sample - ISM TRIPLICATE set 4					**arithmetic mean**			0.298										
3	EA-7	PCB-1254	Excavation Sample - ISM TRIPLICATE set 4					**standard deviation**			0.086										
3	EA-7	PCB-1254	Excavation Sample - ISM TRIPLICATE set 4					**CV = SD/mean**			29%										
3	EA-7	PCB-1254	Excavation Sample - ISM TRIPLICATE set 4					**count (r)**			3										
3	EA-7	PCB-1254	Excavation Sample	Sidewall East	12/4/2020	CT	158423	LL3EA7cs-557-001-SO (SWE)	-	-	1.27	-	-	-	-	-	-	-	-		RGOs met. Excavation backfilled.
3	EA-7	PCB-1254	Excavation Sample	Sidewall South	12/4/2020	CT	158423	LL3EA7cs-558-001-SO (SWS)	-	-	0.622	-	-	-	-	-	-	-	-		
3	EA-7	PCB-1254	Excavation Sample	Sidewall West	12/4/2020	CT	158423	LL3EA7cs-559-001-SO (SWW)	-	-	0.716	-	-	-	-	-	-	-	-		
3	EA-7	PCB-1254	Excavation Sample	Bottom	12/4/2020	CT	158423	LL3EA7cs-560-001-SO (Bottom)	-	-	0.429	-	-	-	-	-	-	-	-		

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Analyte/Units/RGO/Result														Notes	Action
									Antimony		Lead		PCB-1254		PCB-1260		B(a)a		BaP		BbF		DA		RDX		TNT		2,6-DNT			
									mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg			
									470		800		9.7		9.9		29		2.9		29		2.9		280		510		15			
3	EB-4	PCB-1254	Excavation Sample	Sidewall West 4	12/2/2020	CT	158363	LL3EB4cs-753-001-SO (SWW4)	-		-		0.348		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction. Army and OEPA concur.
3	EB-4	PCB-1254	Excavation Sample	Sidewall North 1	12/3/2020	CT	158405	LL3EB4cs-555-001-SO (SWN1)	-		-		11.3		-		-		-		-		-		-		-		-			Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new north1 sidewall for PCB-1254 - see below.
3	EB-4	PCB-1254	Excavation Sample	Sidewall North 1	1/13/2021	CT	159189	LL3EB4cs-586-001-SO (SWN1)	-		-		2.92		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction. Excavation backfilled.
3	EB-4	PCB-1254	Excavation QA Split 11	Sidewall North 1	1/13/2021	GEL	532039	LL3EB4cs-586-002-SO (SWN1)	-		-		1.57		-		-		-		-		-		-		-		-			
3	EB-4	PCB-1254	Excavation Sample	Sidewall South 1	12/7/2020	CT	158449	LL3EB4cs-561-001-SO (SWS1)	-		-		1.68		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall West 1	12/7/2020	CT	158449	LL3EB4cs-562-001-SO (SWW1)	-		-		1.13		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall East 3	12/7/2020	CT	158449	LL3EB4cs-563-001-SO (SWE3)	-		-		1.33		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall West 2	12/7/2020	CT	158449	LL3EB4cs-564-001-SO (SWW2)	-		-		0.0943		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall South 2	12/7/2020	CT	158449	LL3EB4cs-565-001-SO (SWS2)	-		-		0.041	U	-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall North 2	12/8/2020	CT	158489	LL3EB4cs-566-001-SO (SWN2)	-		-		0.0573		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall West 3	12/8/2020	CT	158489	LL3EB4cs-567-001-SO (SWW3)	-		-		2.16		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Bottom 1	12/8/2020	CT	158489	LL3EB4cs-568-001-SO (Bottom1)	-		-		9		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall East 1	12/8/2020	CT	158489	LL3EB4cs-569-001-SO (SWE1)	-		-		0.487		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall South 3	12/8/2020	CT	158489	LL3EB4cs-570-001-SO (SWS3)	-		-		0.571		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Bottom 3	12/10/2020	CT	158584	LL3EB4cs-571-001-SO (Bottom3)	-		-		0.752		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation Sample	Sidewall North 3	12/10/2020	CT	158584	LL3EB4cs-572-001-SO (SWN3)	-		-		1.37		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
3	EB-4	PCB-1254	Excavation QA Split 2	Sidewall North 3	12/10/2020	GEL	529860	LL3EB4cs-572-002-SO (SWN3), QA Split	-		-		1.18		-		-		-		-		-		-		-		-			
3	EB-803	PCB-1254	Excavation Sample	Bottom	12/11/2020	CT	158590	LL3EB803cs-578-001-SO (Bottom)	-		-		0.0729		-		-		-		-		-		-		-		-			RGOs met. Excavation backfilled.
3	EB-803	PCB-1254	Excavation Sample	Sidewall North	12/11/2020	CT	158590	LL3EB803cs-579-001-SO (SWN)	-		-		0.0355	J	-		-		-		-		-		-		-		-			
3	EB-803	PCB-1254	Excavation Sample	Sidewall East	12/11/2020	CT	158590	LL3EB803cs-580-001-SO (SWE)	-		-		0.04	U	-		-		-		-		-		-		-		-			
3	EB-803	PCB-1254	Excavation Sample	Sidewall West	NA	NA	NA	no sample - railroad ballast	-		-		NA		-		-		-		-		-		-		-		-			
3	EB-803	PCB-1254	Excavation Sample	Sidewall South	NA	NA	NA	no sample - railroad ballast	-		-		NA		-		-		-		-		-		-		-		-			
3	EB-9A	TNT	Excavation Sample	Bottom	12/10/2020	CT	158584	LL3EB9Acs-573-001-SO (Bottom)	-		-		-		-		-		-		-		-		-		11	J	-			RGOs met. Excavation backfilled.
3	EB-9A	TNT	Excavation Sample	Sidewall South	12/10/2020	CT	158584	LL3EB9Acs-574-001-SO (SWS)	-		-		-		-		-		-		-		-		-		0.34	J	-			
3	EB-9A	TNT	Excavation Sample	Sidewall North	12/10/2020	CT	158584	LL3EB9Acs-575-001-SO (SWN)	-		-		-		-		-		-		-		-		-		0.1	J	-			
3	EB-9A	TNT	Excavation Sample	Sidewall East	12/10/2020	CT	158584	LL3EB9acs-576-001-SO (SWE)	-		-		-		-		-		-		-		-		-		0.15	J	-			
3	EB-9A	TNT	Excavation Sample	Sidewall West	12/10/2020	CT	158584	LL3EB9acs-577-001-SO (SWW)	-		-		-		-		-		-		-		-		-		0.2	UJ	-			

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

									Analyte/Units/RGO/Result													
									Antimony	Lead	PCB-1254	PCB-1260	B(a)a	BaP	BbF	DA	RDX	TNT	2,6-DNT		
Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	Notes	Action
									470	800	9.7	9.9	29	2.9	29	2.9	280	510	15		
3	EB-10 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	No Samples	NA	NA	NA	no samples	-	-	-	-	NA	NA	NA	NA	-	-	-		Bedrock encountered - bedrock throughout bottom of excavation, no soil on sidewalls in treatment interval 3-5'bgs, no samples. Per Army direction excavateion documented and backfilled, no samples. Excavation backfilled.
3	EB-10 (b)	PCB-1254	Excavation Sample	No Samples	NA	NA	NA	no samples	-	-	-	-	NA	NA	NA	NA	-	-	-		Excavation was within EB-10(a). Soils within EB-10(b) 0-2'bgs treatment interval excavated and treated with Cell 1B-3. East sidewall was concrete: no sample. With associated concrete removal, sidewalls of EB-10(b) collapsed into surrounding EB-10(a). Therefore, no EB-10(b) sidewall samples. Excavated to EB-10(a) depth (bedrock encountered) and all soils underlying and surrounding EB-10(b) were added to Cell 2A-6; treatment verification samples included the COC for EB-10(b) PCB-1254. Excavation backfilled.
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom	12/21/2020	CT	158799	LL3WPcs-581-001-SO (Bottom)	-	-	-	-	15.5	12	15.9	1.3	-	-	-		Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new bottom for BaP.
3	West Perimeter	BaP	Excavation Sample	Bottom	1/13/2021	CT	159189	LL3WPcs-587-001-SO (Bottom)	-	-	-	-	-	1.18	-	-	-	-	-		RGOs met, no further excavation in this direction.
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10	Sidewall North	12/21/2020	CT	158799	LL3WPcs-582-001-SO (SWN)	-	-	-	-	69.3	73.7	101	10.7	-	-	-		- RGOs exceeded for all PAHs (B(a)a, BaP, BbF, DA); - RSDs <35%; - Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected in triplicate from the new sidewall north for B(a)a, BaP, BbF, DA - see below.
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10	Sidewall North	12/21/2020	CT	158799	LL3WPcs-582-002-SO (SWN)	-	-	-	-	63.6	67	86	9.89	-	-	-		
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10	Sidewall North	12/21/2020	CT	158799	LL3WPcs-582-003-SO (SWN)	-	-	-	-	67.7	68.6	95.7	10.5	-	-	-		
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**arithmetic mean**					66.867	69.767	94.233	10.363					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**standard deviation**					2.940	3.499	7.607	0.422					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**CV = SD/mean**					4%	5%	8%	4%					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**count (r)**					3	3	3	3					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**alpha (95% = 0.05)**					0.05	0.05	0.05	0.05					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**t (alpha, df = r-1)**					2.92	2.92	2.92	2.92					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**Student's t UCL**					71.82	75.67	107.06	11.07					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 10					**Chebyshev UCL**					74.27	78.57	113.38	11.43					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North	1/12/2021	CT	159157	LL3WPcs-588-001-SO (SWN)	-	-	-	-	1.4	1.23	1.62	0.15	-	-	-		- RGOs met in each individual replicate sample; - RSDs <35% - no further excavation in this direction
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14	Sidewall North	1/12/2021	CT	159157	LL3WPcs-588-002-SO (SWN)	-	-	-	-	1.91	1.59	2.24	0.202	-	-	-		
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14	Sidewall North	1/12/2021	CT	159157	LL3WPcs-588-003-SO (SWN)	-	-	-	-	1.88	1.53	2.03	0.186 J	-	-	-		
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**arithmetic mean**					1.730	1.450	1.963	0.179					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**standard deviation**					0.286	0.193	0.315	0.027					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**CV = SD/mean**					17%	13%	16%	15%					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**count (r)**					3	3	3	3					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**alpha (95% = 0.05)**					0.05	0.05	0.05	0.05					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**t (alpha, df = r-1)**					2.92	2.92	2.92	2.92					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**Student's t UCL**					2.21	1.78	2.49	0.22					
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 14					**Chebyshev UCL**					2.45	1.94	2.76	0.25					

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Analyte/Units/RGO/Result														Notes	Action
									Antimony		Lead		PCB-1254	PCB-1260	B(a)a		BaP		BbF		DA		RDX		TNT		2,6-DNT			
									mg/kg		mg/kg		mg/kg	mg/kg	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg			
									470		800		9.7	9.9	29		2.9		29		2.9		280		510		15			
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11	Sidewall West	12/21/2020	CT	158799	LL3WPcs-583-001-SO (SWW)	-		-		-	-	24.9		24.3		27.9		2.54		-		-		-			- RGOs exceeded for BaP and BbF; - RSDs<35%; - Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected in triplicate from the new sidewall west for BaP and BbF - see below.
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11	Sidewall West	12/21/2020	CT	158799	LL3WPcs-583-002-SO (SWW)	-		-		-	-	26.6		25.7		32.6		2.63		-		-		-			
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11	Sidewall West	12/21/2020	CT	158799	LL3WPcs-583-003-SO (SWW)	-		-		-	-	22.2		21.6		25.5		1.97		-		-		-			
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**arithmetic mean**							24.567		23.867		28.667		2.380									
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**standard deviation**							2.219		2.084		3.612		0.358									
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**CV = SD/mean**							9%		9%		13%		15%									
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**count (r)**							3		3		3		3									
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**alpha (95% = 0.05)**							0.05		0.05		0.05		0.05									
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**t (alpha, df = r-1)**							2.92		2.92		2.92		2.92									
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**Student's t UCL**							28.31		27.38		34.76		2.98									
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 11					**Chebyshev UCL**							30.15		29.11		37.76		3.28									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample	Sidewall West	1/12/2021	CT	159157	LL3WPcs-589-001-SO (SWW)	-		-		-	-	2.84		2.53		3.33		0.252		-		-		-			- One replicate slightly exceeded the RGO for BaP - RSD<35%, per work plan compared the maximum field replicate concentration to the RGO - Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new sidewall west for BaP - see below.
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15	Sidewall West	1/12/2021	CT	159157	LL3WPcs-589-002-SO (SWW)	-		-		-	-	3.12		2.93		3.96		0.323		-		-		-			
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15	Sidewall West	1/12/2021	CT	159157	LL3WPcs-589-003-SO (SWW)	-		-		-	-	1.84		1.76		2.5		0.228		-		-		-			
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**arithmetic mean**							2.600		2.407		3.263		0.268									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**standard deviation**							0.673		0.595		0.732		0.049									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**CV = SD/mean**							26%		25%		22%		18%									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**count (r)**							3		3		3		3									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**alpha (95% = 0.05)**							0.05		0.05		0.05		0.05									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**t (alpha, df = r-1)**							2.92		2.92		2.92		2.92									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**Student's t UCL**							3.73		3.41		4.50		0.35									
3	West Perimeter	BaP, BbF - add B(a)a, DA	Excavation Sample - ISM TRIPLICATE set 15					**Chebyshev UCL**							4.29		3.90		5.11		0.39									
3	West Perimeter	BaP	Excavation Sample	Sidewall West	1/22/2021	CT	159381	LL3WPcs-592-001-SO (SWW)	-		-		-	-	-		4.48		-		-		-		-		-			The extended excavation abutted an asphalt road, and an asphalt layer was visible in the sidewall of the extended excavation. In keeping with past practice at the installation, the Army did not extend the excavation further to chase BaP at or beneath an asphalt road.
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall South	12/21/2020	CT	158799	LL3WPcs-584-001-SO (SWS)	-		-		-	-	3.22		3.14		4.15		0.369		-		-		-			Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new sidewall south for BaP - see below.
3	West Perimeter	BaP	Excavation Sample	Sidewall South	1/13/2021	CT	159189	LL3WPcs-590-001-SO (SWS)	-		-		-	-	-		0.364		-		-		-		-		-			RGOs met, no further excavation in this direction.
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall East	12/21/2020	CT	158799	LL3WPcs-585-001-SO (SWE)	-		-		-	-	37.1		32.1		41.4		4.65		-		-		-			Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new sidewall east for B(a)a, BaP, BbF, DA - see below.
3	West Perimeter	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall East	1/13/2021	CT	159189	LL3WPcs-591-001-SO (SWE)	-		-		-	-	0.489		0.413		0.601		0.0485		-		-		-			RGOs met, no further excavation in this direction.

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

									Analyte/Units/RGO/Result																							
									Antimony		Lead		PCB-1254		PCB-1260		B(a)a		BaP		BbF		DA		RDX		TNT		2,6-DNT			
									mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg			
Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	470		800		9.7		9.9		29		2.9		29		2.9		280		510		15		Notes	Action
4	Building G-8 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall West	12/9/2020	CT	158521	LL4G8Acs-522-001-SO (SWW)	-		-		-		-		0.87		0.707		0.883		0.0696		-		-		-			RGOs met. Excavation backfilled.
4	Building G-8 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall East	12/9/2020	CT	158521	LL4G8Acs-523-001-SO (SWE)	-		-		-		-		0.0046	J	0.00417	J	0.00622		0.0025	U	-		-		-			
4	Building G-8 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North	12/9/2020	CT	158521	LL4G8Acs-524-001-SO (SWN)	-		-		-		-		0.00214	J	0.0015	J	0.00263	J	0.0025	U	-		-		-			
4	Building G-8 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom 1	12/10/2020	CT	158584	LL4G8Acs-525-001-SO (Bottom)	-		-		-		-		0.00168	J	0.00157	J	0.00264	J	0.0024	U	-		-		-			
4	Building G-8 (a)	B(a)a, BaP, BbF, DA	Excavation QA Split 1	Bottom 1	12/10/2020	GEL	529860	LL4G8Acs-525-002-SO (Bottom), QA Split	-		-		-		-		0.017		0.018		0.0233		0.00333		-		-		-			
4	Building G-8 (a)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall South	12/10/2020	CT	158584	LL4G8Acs-526-001-SO (SWS)	-		-		-		-		0.0168		0.0157		0.0214		0.00195	J	-		-		-			
4	Building G-8 (b)	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom 1	12/14/2020	CT	158622	LL4G8Bcs-532-001-SO (Bottom1)	-		-		-		-		0.00197	J	0.00207	J	0.00476	J	0.0026	U	-		-		-			RGOs met, no further excavation in this direction
4	Building G-8 (b)	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom 2	12/14/2020	CT	158622	LL4G8Bcs-533-001-SO (Bottom2)	-		-		-		-		0.0297		0.0257		0.0346		0.00277	J	-		-		-			RGOs met, no further excavation in this direction
4	Building G-8 (b)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall West	12/14/2020	CT	158622	LL4G8Bcs-534-001-SO (SWW)	-		-		-		-		0.00399	J	0.00459	J	0.00774		0.0025	U	-		-		-			RGOs met, no further excavation in this direction
4	Building G-8 (b)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North	12/14/2020	CT	158622	LL4G8Bcs-535-001-SO (SWN)	-		-		-		-		8.03		6.69		8.37		0.519		-		-		-			Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new northern sidewall for BaP - see below.
4	Building G-8 (b)	BaP	Excavation Sample	Sidewall North	1/13/2021	CT	159189	LL4G8Bcs-543-001-SO (SWN)	-		-		-		-		-		2.02		-		-		-		-		-			RGOs met, no further excavation in this direction. Excavation backfilled.
4	Building G-8 (b)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall South	12/14/2020	CT	158622	LL4G8Bcs-536-001-SO (SWS)	-		-		-		-		0.0116		0.0125		0.0209		0.00193	J	-		-		-			RGOs met, no further excavation in this direction
4	Building G-8 (b)	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall East	12/14/2020	CT	158622	LL4G8Bcs-537-001-SO (SWE)	-		-		-		-		0.021	J	0.0185	J	0.0265	J	0.00244	J	-		-		-			RGOs met, no further excavation in this direction
4	Building G-16	PCB-1260	Excavation Sample	Bottom	12/11/2020	CT	158590	LL4G16cs-527-001-SO (Bottom)	-		-		-		0.0232	J	-		-		-		-		-		-		-			RGOs met. Excavation backfilled.
4	Building G-16	PCB-1260	Excavation Sample	Sidewall West	12/11/2020	CT	158590	LL4G16cs-528-001-SO (SWW)	-		-		-		0.0965	J	-		-		-		-		-		-		-			
4	Building G-16	PCB-1260	Excavation Sample	Sidewall North	12/11/2020	CT	158590	LL4G16cs-529-001-SO (SWN)	-		-		-		0.0395	J	-		-		-		-		-		-		-			
4	Building G-16	PCB-1260	Excavation Sample	Sidewall South	12/14/2020	CT	158622	LL4G16cs-530-001-SO (SWS)	-		-		-		0.02	U	-		-		-		-		-		-		-			
4	Building G-16	PCB-1260	Excavation Sample	Sidewall East	12/14/2020	CT	158622	LL4G16cs-531-001-SO (SWE)	-		-		-		0.0581	J	-		-		-		-		-		-		-			
4	Former Water Tower	Lead	Excavation Sample	Bottom	12/15/2020	CT	158721	LL4FWTcs-538-001-SO (Bottom)	-		203		-		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
4	Former Water Tower	Lead	Excavation Sample	Sidewall South	12/15/2020	CT	158721	LL4FWTcs-539-001-SO (SWS)	-		147		-		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
4	Former Water Tower	Lead	Excavation Sample	Sidewall North	12/15/2020	CT	158721	LL4FWTcs-541-001-SO (SWN)	-		442		-		-		-		-		-		-		-		-		-			RGOs met, no further excavation in this direction
4	Former Water Tower	Lead	Excavation Sample	Sidewall East	12/15/2020	CT	158721	LL4FWTcs-540-001-SO (SWE)	-		843		-		-		-		-		-		-		-		-		-			Additional soil excavated 3' in this direction for off-site disposal, and an additional ISM sample collected from the new western sidewall for lead - see below.
4	Former Water Tower	Lead	Excavation Sample	Sidewall East	1/12/2021	CT	159157	LL4FWTcs-544-001-SO (SWE)	-		1120	J	-		-		-		-		-		-		-		-		-			Per discussions with the Army, the eastern sidewall excavated 9' further to the east until it daylighted due to the sloping topography (i.e., no east sidewall). No additional sampling.
4	Former Water Tower	Lead	Excavation QA Split 12	Sidewall East	1/12/2021	GEL	531900	LL4FWTcs-544-002-SO (SWE)	-		1170	J	-		-		-		-		-		-		-		-		-			
4	Former Water Tower	Lead	Excavation Sample	Sidewall West	12/15/2020	CT	158721	LL4FWTcs-542-001-SO (SWW)	-		1110		-		-		-		-		-		-		-		-		-			Additional soil excavated 3' in this direction for off-site disposal, and an additional ISM sample collected from the new western sidewall for lead - see below.
4	Former Water Tower	Lead	Excavation Sample	Sidewall West	1/12/2021	CT	159157	LL4FWTcs-545-001-SO (SWW)	-		2120		-		-		-		-		-		-		-		-		-			Per discussions with the Army, the western sidewall was excavated further to the west approximately 10', beyond which large trees are present, and an additional ISM sample for lead was collected for the further extended Sidewall West.
4	Former Water Tower	Lead	Excavation Sample	Sidewall West	1/26/2021	CT	159436	LL4FWTcs-546-001-SO (SWW)	-		117	J	-		-		-		-		-		-		-		-		-			RGOs met. Excavation backfilled.

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Analyte/Units/RGO/Result: Antimony mg/kg 470	Lead mg/kg 800	PCB-1254 mg/kg 9.7	PCB-1260 mg/kg 9.9	B(a)a mg/kg 29	BaP mg/kg 2.9	BbF mg/kg 29	DA mg/kg 2.9	RDX mg/kg 280	TNT mg/kg 510	2,6-DNT mg/kg 15	Notes	Action
12	Active Area Channel	TNT, 2,6-DNT, BaP	Excavation Sample	Bottom	12/18/2020	CT	158762	LL12AACcs-340-001-SO (Bottom)	-	-	-	-	-	0.0172	-	-	-	0.65	0.2 U		RGOs met. Excavation backfilled.
12	Active Area Channel	TNT, 2,6-DNT, BaP	Excavation Sample	Sidewall West	12/18/2020	CT	158762	LL12AACcs-341-001-SO (SWW)	-	-	-	-	-	0.00398 J	-	-	-	2	0.1 J		
12	Active Area Channel	TNT, 2,6-DNT, BaP	Excavation Sample	Sidewall South	12/18/2020	CT	158762	LL12AACcs-342-001-SO (SWS)	-	-	-	-	-	0.0015 J	-	-	-	0.71	0.091 J		
12	Active Area Channel	TNT, 2,6-DNT, BaP	Excavation QA Split 9	Sidewall South	12/18/2020	GEL	530563	LL12AACcs-342-002-SO (SWS)	-	-	-	-	-	0.00198 J	-	-	-	0.536	0.128 U		
12	Active Area Channel	TNT, 2,6-DNT, BaP	Excavation Sample	Sidewall East	12/18/2020	CT	158762	LL12AACcs-343-001-SO (SWE)	-	-	-	-	-	0.00654	-	-	-	0.88	0.2 U		
12	Active Area Channel	TNT, 2,6-DNT, BaP	Excavation Sample	Sidewall North	12/18/2020	CT	158762	LL12AACcs-344-001-SO (SWN)	-	-	-	-	-	0.015	-	-	-	0.35	0.2 U		
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom	12/18/2020	CT	158762	LL12FF19Acs-336-001-SO (Bottom)	-	-	-	-	0.605	0.496	0.65	0.0898	-	-	-		RGOs met, no further excavation in this direction
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9	Sidewall South	12/18/2020	CT	158762	LL12FF19Acs-337-001-SO (SWS)	-	-	-	-	6.68	5.35	6.07	0.864	-	-	-		- RGO exceeded for BaP in each individual replicate sample; - RSD <35% for all analytes - Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected for the new southern sidewall and resampled as ISM triplicate for BaP - see below.
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9	Sidewall South	12/18/2020	CT	158762	LL12FF19Acs-337-002-SO (SWS)	-	-	-	-	4.82	3.65	4.59	0.619	-	-	-		
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9	Sidewall South	12/18/2020	CT	158762	LL12FF19Acs-337-003-SO (SWS)	-	-	-	-	4.96	3.72	4.55	0.629	-	-	-		
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**arithmetic mean**					5.487	4.240	5.070	0.704					
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**standard deviation**					1.036	0.962	0.866	0.139					
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**CV = SD/mean**					19%	23%	17%	20%					
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**count (r)**					3	3	3	3					
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**alpha (95% = 0.05)**					0.05	0.05	0.05	0.05					
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**t (alpha, df = r-1)**					2.92	2.92	2.92	2.92					
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**Student's t UCL**					7.23	5.86	6.53	0.94					
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 9					**Chebyshev UCL**					8.09	6.66	7.25	1.05					
12	FF-19 A	BaP	Excavation Sample	Sidewall South	1/12/2021	CT	159157	LL12FF19Acs-345-001-SO (SWS)	-	-	-	-	-	1.72 J	-	-	-	-	-		- All replicates meet the RGO - RSD >35% but <50%, per work plan compared the maximum field replicate concentration to the RGO - no further excavation in this direction
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16	Sidewall South	1/12/2021	CT	159157	LL12FF19Acs-345-002-SO (SWS)	-	-	-	-	-	0.559 J	-	-	-	-	-		
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16	Sidewall South	1/12/2021	CT	159157	LL12FF19Acs-345-003-SO (SWS)	-	-	-	-	-	1.55 J	-	-	-	-	-		
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**arithmetic mean**						1.276							
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**standard deviation**						0.627							
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**CV = SD/mean**						49%							
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**count (r)**						3							
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**alpha (95% = 0.05)**						0.05							
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**t (alpha, df = r-1)**						2.92							
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**Student's t UCL**						2.33							
12	FF-19 A	BaP	Excavation Sample - ISM TRIPLICATE set 16					**Chebyshev UCL**						2.85							
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North	12/18/2020	CT	158762	LL12FF19Acs-338-001-SO (SWN)	-	-	-	-	1.69	1.28	1.63	0.237 J	-	-	-		RGOs met, no further excavation in this direction
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall West	12/18/2020	CT	158762	LL12FF19Acs-339-001-SO (SWW)	-	-	-	-	3.73	3.09	4.26	0.54	-	-	-		Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new western sidewall for BaP - see below.
12	FF-19 A	B(a)a, BaP, BbF, DA	Excavation QA Split 8	Sidewall West	12/18/2020	GEL	530563	LL12FF19Acs-339-002-SO (SWW)	-	-	-	-	3.81	4.04	5.43	0.947	-	-	-		
12	FF-19 A	BaP	Excavation Sample	Sidewall West	1/12/2021	CT	159157	LL12FF19Acs-346-001-SO (SWW)	-	-	-	-	-	3.56	-	-	-	-	-		Additional soil was excavated 3' in this direction for treatment, and an additional ISM sample was collected from the new western sidewall for BaP - see below.
12	FF-19 A	BaP	Excavation Sample	Sidewall West	1/22/2021	CT	159381	LL12FF19Acs-350-001-SO (SWW)	-	-	-	-	-	0.543 J	-	-	-	-	-		RGOs met, no further excavation in this direction

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Analyte/Units/RGO/Result																				Notes	Action
									Antimony		Lead		PCB-1254		PCB-1260		B(a)a		BaP		BbF		DA		RDX		TNT		2,6-DNT		
									mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		
									470		800		9.7		9.9		29		2.9		29		2.9		280		510		15		
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom	12/17/2020	CT	158760	LL12FF19bcs-331-001-SO (Bottom)	-		-		-		-		0.734		0.691		0.976		0.0746		-		-		-			RGOs met, no further excavation in this direction
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North	12/17/2020	CT	158760	LL12FF19bcs-332-001-SO (SWN)	-		-		-		-		1.36		1.13		1.49		0.156		-		-		-			RGOs met, no further excavation in this direction
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation QA Split 7	Sidewall North	12/17/2020	GEL	530480	LL12FF19bcs-332-002-SO (SWN)	-		-		-		-		1.83		2.07		2.59		0.417		-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8	Sidewall South	12/17/2020	CT	158760	LL12FF19bcs-333-001-SO (SWS)	-		-		-		-		2.38		1.94		2.59		0.259	J	-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8	Sidewall South	12/17/2020	CT	158760	LL12FF19bcs-333-002-SO (SWS)	-		-		-		-		1.47		1.29		1.71		0.122	J	-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8	Sidewall South	12/17/2020	CT	158760	LL12FF19bcs-333-003-SO (SWS)	-		-		-		-		1.89		1.54		1.82		0.204	J	-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**arithmetic mean**									1.913		1.590		2.040		0.195								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**standard deviation**									0.455		0.328		0.479		0.069								- RGOs met for all analytes in each individual replicate sample;
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**CV = SD/mean**									24%		21%		24%		35%								- RSD <35% for all analytes;
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**count (r)**									3		3		3		3								- no further excavation in this direction;excavation backfilled.
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**alpha (95% = 0.05)**									0.05		0.05		0.05		0.05								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**t (alpha, df = r-1)**									2.92		2.92		2.92		2.92								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**Student's t UCL**									2.68		2.14		2.85		0.31								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 8					**Chebyshev UCL**									3.06		2.42		3.25		0.37								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall West	12/17/2020	CT	158760	LL12FF19bcs-334-001-SO (SWW)	-		-		-		-		1.45		1.19		1.48		0.148		-		-		-			RGOs met, no further excavation in this direction
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation QA Split 6	Sidewall West	12/17/2020	GEL	530480	LL12FF19bcs-334-002-SO (SWW)	-		-		-		-		1.3		1.42		1.78		0.274		-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7	Sidewall East	12/17/2020	CT	158760	LL12FF19bcs-335-001-SO (SWE)	-		-		-		-		2.64		1.66		2		0.23	J	-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7	Sidewall East	12/17/2020	CT	158760	LL12FF19bcs-335-002-SO (SWE)	-		-		-		-		2.69	J	2.38		2.95		0.472		-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7	Sidewall East	12/17/2020	CT	158760	LL12FF19bcs-335-003-SO (SWE)	-		-		-		-		3.33		2.6		3.23	J	0.494		-		-		-			
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**arithmetic mean**									2.887		2.213		2.727		0.399								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**standard deviation**									0.385		0.492		0.645		0.146								- RGOs met for all analytes in each individual replicate sample;
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**CV = SD/mean**									13%		22%		24%		37%								- RSD <35% for B(a)a, BaP, BbF - RSD>35% but <50% DA . Results are <RGO
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**count (r)**									3		3		3		3								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**alpha (95% = 0.05)**									0.05		0.05		0.05		0.05								- no further excavation in this direction; excavation backfilled.
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**t (alpha, df = r-1)**									2.92		2.92		2.92		2.92								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**Student's t UCL**									3.54		3.04		3.81		0.65								
12	FF-19 B	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 7					**Chebyshev UCL**									3.85		3.45		4.35		0.77								Laboratory subsample duplicate RPD in control less than 20%; LCS data in control
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom 1	12/16/2020	CT	158721	LL12FF19ccs-321-001-SO (Bottom1)	-		-		-		-		5.41		4.04		4.94		0.391		-		-		-			Additional soil excavated 3' in this direction for treatment, and an additional ISM sample collected from the new bottom1 for BaP - see below.
12	FF-19 C	BaP	Excavation Sample	Bottom 1	1/13/2021	CT	159189	LL12FF19Acs-348-001-SO (Bottom 1)	-		-		-		-		-		0.364		-		-		-		-		-			RGOs met, no further excavation in this direction. Excavation backfilled.
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall East 1	12/16/2020	CT	158721	LL12FF19ccs-322-001-SO (SWE1)	-		-		-		-		4.16		3.58		6.14		0.438		-		-		-			Additional soil excavated I 3' in this direction for treatment, and an additional ISM sample collected from the new eastern1 sidewall for BaP - see below.
12	FF-19 C	BaP	Excavation Sample	Sidewall East 1	1/13/2021	CT	159189	LL12FF19Acs-349-001-SO (SWE1)	-		-		-		-		-		0.182		-		-		-		-		-			RGOs met, no further excavation in this direction. Excavation backfilled.
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Bottom 2	12/16/2020	CT	158721	LL12FF19ccs-323-001-SO (Bottom2)	-		-		-		-		1.81		1.34		1.65		0.185		-		-		-			RGOs met, no further excavation in this direction
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall South 1	12/17/2020	CT	158760	LL12FF19ccs-324-001-SO (SWS1)	-		-		-		-		1.16		0.863		1.07		0.108		-		-		-			RGOs met, no further excavation in this direction

Table 3-3. Excavation Confirmation Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Load Line	Remediation Area	Contaminants of Concern	Description/Rationale	Location	Sample Date	Lab	Lab SDG Number	Sample Identification/Location	Analyte/Units/RGO/Result: Antimony mg/kg 470	Lead mg/kg 800	PCB-1254 mg/kg 9.7	PCB-1260 mg/kg 9.9	B(a)a mg/kg 29	BaP mg/kg 2.9	BbF mg/kg 29	DA mg/kg 2.9	RDX mg/kg 280	TNT mg/kg 510	2,6-DNT mg/kg 15	Notes	Action
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall West 1	12/17/2020	CT	158760	LL12FF19ccs-325-001-SO (SWW1)	-	-	-	-	4.96	3.96	4.85	0.368	-	-	-		Additional soil excavated in this direction for treatment, and an additional ISM sample collected for the new western1 sidewall for BaP - see below.
12	FF-19 C	BaP	Excavation Sample	Sidewall West 1	1/12/2021	CT	159157	LL12FF19ccs-347-001-SO (SWW1)	-	-	-	-	-	1.73	-	-	-	-	-		RGOs met, no further excavation in this direction. Excavation backfilled.
12	FF-19 C	BaP	Excavation QA Split 13	Sidewall West 1	1/12/2021	GEL	531900	LL12FF19ccs-347-002-SO (SWW1)	-	-	-	-	-	4.31	-	-	-	-	-		
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North 1	12/17/2020	CT	158760	LL12FF19ccs-326-001-SO (SWN1)	-	-	-	-	2.11	1.45	1.93	0.198	-	-	-		RGOs met, no further excavation in this direction
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall South 2	12/17/2020	CT	158760	LL12FF19ccs-327-001-SO (SWS2)	-	-	-	-	0.388	0.265	0.363	0.0361	-	-	-		RGOs met, no further excavation in this direction
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall West 2	12/17/2020	CT	158760	LL12FF19ccs-328-001-SO (SWW2)	-	-	-	-	0.371 J	0.335 J	1.07 J	0.0821 J	-	-	-		RGOs met, no further excavation in this direction
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6	Sidewall East 2	12/17/2020	CT	158760	LL12FF19ccs-329-001-SO (SWE2)	-	-	-	-	0.0504 J	0.0275 J	0.0469 J	0.00649 J	-	-	-	Laboratory subsample duplicate RPD all in control less than 20%, showed good control, LCS data in control.	
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6	Sidewall East 2	12/17/2020	CT	158760	LL12FF19ccs-329-002-SO (SWE2)	-	-	-	-	0.276 J	0.164 J	0.199 J	0.0213 J	-	-	-		
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6	Sidewall East 2	12/17/2020	CT	158760	LL12FF19ccs-329-003-SO (SWE2)	-	-	-	-	0.0482 J	0.0341 J	0.0676 J	0.00573 J	-	-	-		
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**arithmetic mean**					0.125	0.075	0.105	0.011					- RGOs met for all analytes in each individual replicate sample;
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**standard deviation**					0.131	0.077	0.082	0.009					- RSD >100% for B(a)a and BaP - 95% UCL (Chebyshev method) was less than RGO;
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**CV = SD/mean**					105%	102%	79%	79%					- RSD >50% but <100% for BbF and DA: - 95% UCL (Chebyshev method) was less than the RGO;
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**count (r)**					3	3	3	3					- no further excavation in this direction; excavation backfilled.
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**alpha (95% = 0.05)**					0.05	0.05	0.05	0.05					
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**t (alpha, df = r-1)**					2.92	2.92	2.92	2.92					
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**Student's t UCL**					0.35	0.20	0.24	0.03					
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample - ISM TRIPLICATE set 6					**Chebyshev UCL**					0.45	0.27	0.31	0.03					
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation Sample	Sidewall North 2	12/17/2020	CT	158760	LL12FF19ccs-330-001-SO (SWN2)	-	-	-	-	0.243	0.158	0.248	0.0229	-	-	-		RGOs met, no further excavation in this direction
12	FF-19 C	B(a)a, BaP, BbF, DA	Excavation QA Split 5	Sidewall North 2	12/17/2020	GEL	530480	LL12FF19ccs-330-002-SO (SWN2)	-	-	-	-	0.205	0.193	0.265	0.036	-	-	-		

Notes:

1 GEL Laboratory performed analysis of QA split samples (shown in blue font)

B(a)a = benz(a)anthracene
BaP = benzo(a)pyrene
BbF = benzo(b)fluoranthene
COC = contaminant of concern
CV = coefficient of variation
DA = dibenz(a,h)anthracene
2,6-DNT = 2,6-dinitrotoluene
ISM = incremental sampling methodology
LCS = laboratory control sample
mg/kg = milligram(s) per kilogram
PCB = polychlorinated biphenyl
QA = quality assurance
QC = quality control
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO = remedial goal option
RPD = relative percent difference
SD = standard deviation
SDG = sample delivery group
TNT = 2,4,6-trinitrotoluene
UCL = upper confidence limit

RGO exceeded, further action needed

Sample collected after additional soil excavated

Parameter exceeded, no further action as noted (for example, due to additional data evaluation or additional excavation)

QC qualifiers:
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed but was not detected above the reported sample quantitation limit or was qualified as not detected due to blank contamination.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 3-4. Treatment Verification Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Treatment Start Date	Treatment End Date	Remediation Area	Contaminants of Concern (COCs), based on source of soil	Description	Sample Date	Lab [1]	Lab SDG #	Sample ID	Analyte/units/RGO/Result																	
									Antimony		Lead		PCB-1254		PCB-1260		B(a)a		BaP		BbF		DA		RDX		TNT		2,6-DNT
									mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg
									470		800		9.7		9.9		29		2.9		29		2.9		280		510		15
11/3/2020	11/13/2020	CB-4A	RDX, TNT	CB4A, Treatment Cell 1A-1	11/19/2020	CT	158121	LLEXSITUtv-001-001-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/3/2020	11/13/2020	CB-4A	RDX, TNT	CB4A, Treatment Cell 1A-1	11/19/2020	CT	158121	LLEXSITUtv-002-001-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/3/2020	11/13/2020	CB-4A	RDX, TNT	CB4A, Treatment Cell 1A-1	11/19/2020	CT	158121	LLEXSITUtv-003-001-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/3/2020	11/13/2020	CB-4A	RDX, TNT	CB4A, Treatment Cell 1A-1	11/19/2020	CT	158121	LLEXSITUtv-004-001-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/10/2020	11/19/2020	CB4A, DB4A, EB9A	RDX, TNT	CB4A, DB4A, EB9A Treatment Cell 2A-2	11/20/2020	CT	158142	LLEXSITUtv-005-001-SO	-		-		-		-		-		-		-		-		0.16	J	0.19	J	-	
11/10/2020	11/19/2020	CB4A, DB4A, EB9A	RDX, TNT	CB4A, DB4A, EB9A Treatment Cell 2A-2 QA Split	11/19/2020	GEL	528264	LLEXSITUtv-005-002-SO	-		-		-		-		-		-		-		-		0.242		0.242		-	
11/10/2020	11/19/2020	CB4A, DB4A, EB9A	RDX, TNT	CB4A, DB4A, EB9A Treatment Cell 2A-2	11/20/2020	CT	158142	LLEXSITUtv-006-001-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/10/2020	11/19/2020	CB4A, DB4A, EB9A	RDX, TNT	CB4A, DB4A, EB9A Treatment Cell 2A-2	11/20/2020	CT	158142	LLEXSITUtv-007-001-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/10/2020	11/19/2020	CB4A, DB4A, EB9A	RDX, TNT	CB4A, DB4A, EB9A Treatment Cell 2A-2	11/20/2020	CT	158142	LLEXSITUtv-008-001-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/10/2020	11/19/2020	CB4A, DB4A, EB9A	RDX, TNT	CB4A, DB4A, EB9A Treatment Cell 2A-2	11/20/2020	CT	158142	LLEXSITUtv-008-002-SO	-		-		-		-		-		-		-		-		0.2	U	0.2	U	-	
11/19/2020	11/30/2020	EB4, EA7, EB10b	PCB-1254	EB4, EA7, EB10b; Treatment Cell 1B-3	12/2/2020	Chemtech	L4940	LLEXSITUtv-009-001-SO	-		-		0.013	U	-		-		-		-		-		-		-		-	
11/19/2020	11/30/2020	EB4, EA7, EB10b	PCB-1254	EB4, EA7, EB10b; Treatment Cell 1B-3	12/2/2020	Chemtech	L4940	LLEXSITUtv-009-002-SO	-		-		0.013	U	-		-		-		-		-		-		-		-	
11/19/2020	11/30/2020	EB4, EA7, EB10b	PCB-1254	EB4, EA7, EB10b; Treatment Cell 1B-3	12/2/2020	Chemtech	L4940	LLEXSITUtv-010-001-SO	-		-		0.013	U	-		-		-		-		-		-		-		-	
11/19/2020	11/30/2020	EB4, EA7, EB10b	PCB-1254	EB4, EA7, EB10b; Treatment Cell 1B-3 QA Split	12/2/2020	GEL	529093	LLEXSITUtv-010-002-SO	-		-		0.0033		-		-		-		-		-		-		-		-	
11/19/2020	11/30/2020	EB4, EA7, EB10b	PCB-1254	EB4, EA7, EB10b; Treatment Cell 1B-3	12/2/2020	Chemtech	L4940	LLEXSITUtv-011-001-SO	-		-		0.0131	U	-		-		-		-		-		-		-		-	
11/19/2020	11/30/2020	EB4, EA7, EB10b	PCB-1254	EB4, EA7, EB10b; Treatment Cell 1B-3	12/2/2020	Chemtech	L4940	LLEXSITUtv-012-002-SO	-		-		0.0107	J	-		-		-		-		-		-		-		-	
11/30/2020	12/10/2020	EB10A, EA6A, EA6B, WP, FF19abc	PAHs: B(a)a, BaP, BbF, DA	EB10A, EA6A, EA6B, WP, F19abc Treatment Cell 2B-4	12/14/2020	Chemtech	L5102	LLEXSITUtv-013-001-SO	-		-		-		-		0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
11/30/2020	12/10/2020	EB10A, EA6A, EA6B, WP, FF19abc	PAHs: B(a)a, BaP, BbF, DA	EB10A, EA6A, EA6B, WP, F19abc Treatment Cell 2B-4	12/14/2020	Chemtech	L5102	LLEXSITUtv-014-001-SO	-		-		-		-		0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
11/30/2020	12/10/2020	EB10A, EA6A, EA6B, WP, FF19abc	PAHs: B(a)a, BaP, BbF, DA	EB10A, EA6A, EA6B, WP, F19abc Treatment Cell 2B-4	12/14/2020	Chemtech	L5102	LLEXSITUtv-015-001-SO	-		-		-		-		0.16	J	0.18	J	0.29	J	0.13	UJ	-		-		-	
11/30/2020	12/10/2020	EB10A, EA6A, EA6B, WP, FF19abc	PAHs: B(a)a, BaP, BbF, DA	EB10A, EA6A, EA6B, WP, F19abc Treatment Cell 2B-4	12/14/2020	Chemtech	L5102	LLEXSITUtv-015-002-SO	-		-		-		-		0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
11/30/2020	12/10/2020	EB10A, EA6A, EA6B, WP, FF19abc	PAHs: B(a)a, BaP, BbF, DA	EB10A, EA6A, EA6B, WP, F19abc Treatment Cell 2B-4	12/14/2020	Chemtech	L5102	LLEXSITUtv-016-001-SO	-		-		-		-		0.13	U	0.13	U	0.13	U	0.13	U	-		-		-	
11/30/2020	12/10/2020	EB10A, EA6A, EA6B, WP, FF19abc	GT002; SW8270D	EB10A, EA6A, EA6B, WP, F19abc Treatment Cell 2B-4 QA Split	12/14/2020	GEL	530102	LLEXSITUtv-016-002-SO	-		-		-		-		0.0146		0.0222		0.0589		0.0103		-		-		-	

Table 3-4. Treatment Verification Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Treatment Start Date	Treatment End Date	Remediation Area	Contaminants of Concern (COCs), based on source of soil	Description	Sample Date	Lab [1]	Lab SDG #	Sample ID	Analyte/units/RGO/Result																	
									Antimony		Lead		PCB-1254		PCB-1260		B(a)a		BaP		BbF		DA		RDX		TNT		2,6-DNT	
									mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
									470		800		9.7		9.9		29		2.9		29		2.9		280		510		15	
12/9/2020	12/18/2020	G8b, G8a	PAHs: B(a)a, BaP, BbF, DA	G8b, G8a Treatment Cell 1A-5	12/18/2020	Chemtech	L5160	LLEXSITUtv-017-001-SO	-		-		-		-		0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
12/9/2020	12/18/2020	G8b, G8a	PAHs: B(a)a, BaP, BbF, DA	G8b, G8a Treatment Cell 1A-5	12/18/2020	Chemtech	L5160	LLEXSITUtv-018-001-SO	-		-		-		-		0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
12/9/2020	12/18/2020	G8b, G8a	PAHs: B(a)a, BaP, BbF, DA	G8b, G8a Treatment Cell 1A-5	12/18/2020	Chemtech	L5160	LLEXSITUtv-019-001-SO	-		-		-		-		0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
12/9/2020	12/18/2020	G8b, G8a	PAHs: B(a)a, BaP, BbF, DA	G8b, G8a Treatment Cell 1A-5	12/18/2020	Chemtech	L5160	LLEXSITUtv-020-001-SO	-		-		-		-		0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
12/13/2020	12/21/2020	EB10a/b, EB803, AAC, G8a, G16, EA6c	PAHs: B(a)a, BaP, BbF, DA	EB10a/b, EB803, AAC, G8a, G16, EA6c Treatment Cell 2A-6	12/21/2020	Chemtech	L5193	LLEXSITUtv-021-001-SO	-		-		0.0130	U	0.0083	U	0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
						CT	158800		-		-		-		-		-		-		-		-		-		0.19	U	0.19	U
12/13/2020	12/21/2020	EB10a/b, EB803, AAC, G8a, G16, EA6c	PAHs: B(a)a, BaP, BbF, DA	EB10a/b, EB803, AAC, G8a, G16, EA6c Treatment Cell 2A-6	12/21/2020	Chemtech	L5193	LLEXSITUtv-022-001-SO	-		-		0.0130	U	0.0083	U	0.13	U	0.13	U	0.13	U	0.13	U	-		-		-	
						CT	158800		-		-		-		-		-		-		-		-		-		0.2	U	0.2	U
12/13/2020	12/21/2020	EB10a/b, EB803, AAC, G8a, G16, EA6c	PAHs: B(a)a, BaP, BbF, DA	EB10a/b, EB803, AAC, G8a, G16, EA6c Treatment Cell 2A-6	12/21/2020	Chemtech	L5193	LLEXSITUtv-022-002-SO	-		-		0.0130	U	0.0083	U	0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
						CT	158800		-		-		-		-		-		-		-		-		-		0.2	U	0.2	U
12/13/2020	12/21/2020	EB10a/b, EB803, AAC, G8a, G16, EA6c	PAHs: B(a)a, BaP, BbF, DA	EB10a/b, EB803, AAC, G8a, G16, EA6c Treatment Cell 2A-6	12/21/2020	Chemtech	L5193	LLEXSITUtv-023-001-SO	-		-		0.0131	U	0.0083	U	0.13	U	0.13	U	0.13	U	0.13	U	-		-		-	
						CT	158800		-		-		-		-		-		-		-		-		-		0.2	U	0.2	U
12/13/2020	12/21/2020	EB10a/b, EB803, AAC, G8a, G16, EA6c	PAHs: B(a)a, BaP, BbF, DA	EB10a/b, EB803, AAC, G8a, G16, EA6c Treatment Cell 2A-6	12/21/2020	Chemtech	L5193	LLEXSITUtv-024-001-SO	-		-		0.0131	U	0.0084	U	0.13	UJ	0.13	UJ	0.13	UJ	0.13	UJ	-		-		-	
						CT	158800		-		-		-		-		-		-		-		-		-		0.2	U	0.2	U
12/13/2020	12/21/2020	EB10a/b, EB803, AAC, G8a, G16, EA6c	PAHs: B(a)a, BaP, BbF, DA	EB10a/b, EB803, AAC, G8a, G16, EA6c Treatment Cell 2A-6 QA Split	12/21/2020	GEL	530876	LLEXSITUtv-024-002-SO	-		-		0.0022		0.0022		0.0022	U	0.0022	U	0.0022	U	0.0022	U	-		0.279	U	0.279	U
1/20/2021	1/27/2021	EA6A,CB4A,EB4,WP, FF19AC,G8B	PAHs: B(a)a, BaP, BbF, DA and PCB-1254 and TNT	EA6A,CB4A,EB4,WP, FF19AC,G8B Treatment Cell 2B-7	1/27/2021	Chemtech	M1297	LLEXSITUtv-025-001-SO	-		-		0.0494		-		0.13	UJ	0.13	UJ	0.0732	J	0.013	UJ	-		-		-	
						CT	159484		-		-		-		-		-		-		-		-		-		0.2	U	-	
1/20/2021	1/27/2021	EA6A,CB4A,EB4,WP, FF19AC,G8B	PAHs: B(a)a, BaP, BbF, DA and PCB-1254 and TNT	EA6A,CB4A,EB4,WP, FF19AC,G8B Treatment Cell 2B-7	1/27/2021	Chemtech	M1297	LLEXSITUtv-026-001-SO	-		-		0.13	J	-		0.0756	J	0.13	UJ	0.19	J	0.13	UJ	-		-		-	
						CT	159484		-		-		-		-		-		-		-		-		-		0.2	U	-	
1/27/2021	1/29/2021	CB4A	TNT	CB4A SWS East Portion 50-foot long, 5-foot wide extension Treatment Cell 2A-8	1/29/2021	CT	159502	LLEXSITUtv-027-001-SO	-		-		-		-		-		-		-		-		-		1.6	J	-	

Notes:

1 GEL Laboratory performed analysis of QA Split samples (shown in blue font)

BaP = Benzo(a)pyrene
BbF = Benzo(b)fluoranthene
COC = contaminant of concern
DA = Dibenz(a,h)anthracene
2,6-DNT = 2,6-dinitrotoluene
mg/kg = milligram(s) per kilogram
QC = quality control
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO = remedial goal option
TNT = 2,4,6-trinitrotoluene

QC qualifiers:

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed but was not detected above the reported sample quantitation limit or was qualified as not detected due to blank contamination.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 3-5. Disposal Characterization Results for Soil Excavated from Metals-Contaminated Excavations

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Analyte	Units	TCLP Criteria	LL1DC-001-001-SO 12/11/2020		LL4DC-002-001-SO 12/9/2020	
Solids, Percent	%	--	82.8		72.2	
Flashpoint	°F	--	>140		>140	
Aroclor-1016	µg/kg	--	47	U	53	U
Aroclor-1221	µg/kg	--	47	U	53	U
Aroclor-1232	µg/kg	--	24	U	27	U
Aroclor-1242	µg/kg	--	24	U	27	U
Aroclor-1248	µg/kg	--	47	U	53	U
Aroclor-1254	µg/kg	--	331		53	U
Aroclor-1260	µg/kg	--	131		27	U
Aroclor-1262	µg/kg	--	24	U	27	U
Aroclor-1268	µg/kg	--	47	U	53	U
pH	S.U.	--	7.23		5.94	
Arsenic	mg/L	5	0.0084	J	0.02	U
Barium	mg/L	100	0.65		0.22	
Cadmium	mg/L	1	0.0023		0.0014	J
Chromium	mg/L	5	0.0039	J	0.0032	J
Lead	mg/L	5	0.057		1.6	
Selenium	mg/L	1	0.02	U	0.02	U
Silver	mg/L	5	0.002	U	0.002	U
Mercury	mg/L	0.2	0.00008	U	0.00008	U
alpha-Chlordane	mg/L	0.03	0.0002	U	0.0002	U
Chlordane (Technical)	mg/L	0.03	0.004	U	0.004	U
Endrin	mg/L	0.02	0.0002	U	0.0002	U
gamma-Chlordane	mg/L	0.03	0.0001	U	0.0001	U
Heptachlor	mg/L	0.008	0.0004	U	0.0004	U
Heptachlor epoxide	mg/L	0.008	0.0001	U	0.0001	U
Lindane	mg/L	0.4	0.0002	U	0.0002	U
Methoxychlor	mg/L	10	0.0004	U	0.0004	U
Toxaphene	mg/L	0.5	0.004	U	0.004	U
2,4,5-TP (Silvex, acid eq)	mg/L	1	0.005	U	0.005	U
2,4-D (acid eq)	mg/L	10	0.025	U	0.025	U
1,1-Dichloroethene	mg/L	0.7	0.1	U	0.1	U
1,2-Dichloroethane	mg/L	0.5	0.2	U	0.2	U
2-Butanone	mg/L	200	1	U	1	U
Benzene	mg/L	0.5	0.1	U	0.1	U
Carbon tetrachloride	mg/L	0.5	0.1	U	0.1	U
Chlorobenzene	mg/L	100	0.1	U	0.1	U
Chloroform	mg/L	6	0.1	U	0.1	U
Tetrachloroethene	mg/L	0.7	0.1	U	0.1	U
Trichloroethene	mg/L	0.5	0.1	U	0.1	U
Vinyl chloride	mg/L	0.2	0.03	U	0.03	U
1,4-Dichlorobenzene	mg/L	7.5	0.01	U	0.01	U
2,4,5-Trichlorophenol	mg/L	400	0.05	U	0.05	U
2,4,6-Trichlorophenol	mg/L	2	0.05	U	0.05	U
2,4-Dinitrotoluene	mg/L	0.13	0.01	U	0.01	U
2-Methylphenol	mg/L	200	0.05	U	0.05	U
3 and 4-Methylphenol	mg/L	200	0.09	U	0.09	U
Hexachlorobenzene	mg/L	0.13	0.01	U	0.01	U
Hexachlorobutadiene	mg/L	0.5	0.01	U	0.01	U
Hexachloroethane	mg/L	3	0.01	U	0.01	U
Nitrobenzene	mg/L	2	0.01	U	0.01	U
Pentachlorophenol	mg/L	100	0.05	U	0.05	U
Pyridine	mg/L	25	0.02	U	0.02	UY

Notes:

% = percent
> = more than
°F = degrees Fahrenheit
mg/L= milligram(s) per liter
µg/kg = microgram(s) per kilogram
QC = quality control
TCLP = Toxicity Characteristic Leaching Procedure

QC qualifiers:
J = estimated value
U = analyte concentration below detection limit

Table 3-6. Disposal Characterization Results for Demolished Concrete

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Analyte	Units	EPA Residential RSL	CJAG Background (surface soil, 0 to 1 foot bgs)	CJAG Background (subsurface soil)	CONCRETEDC 001-001-CO 11/12/2020		CONCRETEDC-002-002-CO 11/12/2020	
Arsenic	mg/kg	0.68	15.4	19.8	4.4		5.3	
Barium	mg/kg	15,000	88.4	124	98.6		109	
Cadmium	mg/kg	71	NA	NA	0.18		0.17	
Chromium	mg/kg	120,000 [a]	17.4	27.2	7.5		7.5	
Lead	mg/kg	400	26.1	19.1	4.6		4	
Selenium	mg/kg	390	1.4	1.5	0.35	J	0.6	
Silver	mg/kg	390	NA	NA	0.057	U	0.058	J
Mercury	mg/kg	11	0.036	0.044	0.01		0.0042	J
Aroclor 1016	µg/kg	170 [b]	NA	NA	44	U	43	U
Aroclor 1221	µg/kg	170 [b]	NA	NA	44	U	43	U
Aroclor 1232	µg/kg	170 [b]	NA	NA	22	U	22	U
Aroclor 1242	µg/kg	170 [b]	NA	NA	22	U	22	U
Aroclor 1248	µg/kg	170 [b]	NA	NA	44	U	43	U
Aroclor 1254	µg/kg	170 [b]	NA	NA	44	U	43	U
Aroclor 1260	µg/kg	170 [b]	NA	NA	22	U	22	U
Aroclor 1262	µg/kg	170 [b]	NA	NA	22	U	22	U
Aroclor 1268	µg/kg	170 [b]	NA	NA	44	U	43	U

Notes:

[a]120,000 for chromium III (insoluble salts. for chromium VI the residential RSL is 0.3 mg/kg. Total chromium does not have a residential soil RSL; the total chromium MCL-based soil screening level for protection of groundwater is 180,000 mg/kg.

[b]The lowest EPA residential RSL for an individual PCB Aroclor is 170 µg/kg (Arocolor 1232).

µg/kg = microgram(s) per kilogram
bgs = below ground surface
CJAG = Camp James A. Garfield
EPA = U.S. Environmental Protection Agency
MCL = maximum contaminant level
mg/kg = milligram(s) per kilogram
NA = not applicable
PCB = polychlorinated biphenyl
QC = quality control
RSL = regional screening level

QC qualifiers:
J = estimated value
U = analyte concentration below detection limit

Table 3-7. Off-Site Backfill Source Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Sample Date	**11/11/2020**
Lab SDG	**157970**
Sample Identification	**OFFSS-001-001-CO**

Analyte	Units	RVAAP Background Criteria	Result	QC Qualifier
pH	S.U.	NA	7.89	
Cyanide	mg/kg	0	0.596	U
Nitrocellulose	mg/kg	NA	100	UJ
Nitroguanidine	mg/kg	NA	0.099	U
Pesticides				
4,4'-DDD	µg/kg	NA	2.3	U
4,4'-DDE	µg/kg	NA	2.3	U
4,4'-DDT	µg/kg	NA	4.6	U
Aldrin	µg/kg	NA	4.6	U
alpha-BHC	µg/kg	NA	4.6	U
alpha-Chlordane	µg/kg	NA	2.3	U
beta-BHC	µg/kg	NA	2.3	U
Chlordane (Technical)	µg/kg	NA	46	U
delta-BHC	µg/kg	NA	2.3	U
Dieldrin	µg/kg	NA	2.3	U
Endosulfan I	µg/kg	NA	4.6	U
Endosulfan II	µg/kg	NA	4.6	U
Endosulfan sulfate	µg/kg	NA	4.6	U
Endrin	µg/kg	NA	4.6	U
Endrin aldehyde	µg/kg	NA	4.6	U
Endrin ketone	µg/kg	NA	2.3	U
gamma-Chlordane	µg/kg	NA	2.3	U
Heptachlor	µg/kg	NA	4.6	U
Heptachlor epoxide	µg/kg	NA	2.3	U
Lindane	µg/kg	NA	4.6	U
Methoxychlor	µg/kg	NA	4.6	U
Toxaphene	µg/kg	NA	46	U
PCBs				
Aroclor-1016	µg/kg	NA	46	U
Aroclor-1221	µg/kg	NA	46	U
Aroclor-1232	µg/kg	NA	23	U
Aroclor-1242	µg/kg	NA	23	U
Aroclor-1248	µg/kg	NA	46	U
Aroclor-1254	µg/kg	NA	46	U
Aroclor-1260	µg/kg	NA	23	U
Aroclor-1262	µg/kg	NA	23	U
Aroclor-1268	µg/kg	NA	46	U

Table 3-7. Off-Site Backfill Source Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Sample Date			**11/11/2020**	
Lab SDG			**157970**	
Sample Identification			**OFFSS-001-001-CO**	
Analyte	**Units**	**RVAAP Background Criteria**	**Result**	**QC Qualifier**
VOCs, TCL				
1,1,1-Trichloroethane	µg/kg	NA	0.87	U
1,1,2,2-Tetrachloroethane	µg/kg	NA	0.87	U
1,1,2-Trichloroethane	µg/kg	NA	0.87	U
1,1-Dichloroethane	µg/kg	NA	0.87	U
1,1-Dichloroethene	µg/kg	NA	0.87	U
1,2,3-Trichlorobenzene	µg/kg	NA	0.87	U
1,2,4-Trichlorobenzene	µg/kg	NA	0.87	U
1,2-Dibromo-3-chloropropane	µg/kg	NA	0.87	U
1,2-Dibromoethane	µg/kg	NA	0.87	U
1,2-Dichlorobenzene	µg/kg	NA	0.87	U
1,2-Dichloroethane	µg/kg	NA	0.87	U
1,2-Dichloropropane	µg/kg	NA	0.87	U
1,3-Dichlorobenzene	µg/kg	NA	0.87	U
1,4-Dichlorobenzene	µg/kg	NA	0.87	U
112Trichloro122trifluoroethane	µg/kg	NA	1.7	U
2-Butanone	µg/kg	NA	8.7	U
2-Hexanone	µg/kg	NA	8.7	U
4-Methyl-2-pentanone	µg/kg	NA	8.7	U
Acetone	µg/kg	NA	17	U
Benzene	µg/kg	NA	0.87	U
Bromochloromethane	µg/kg	NA	0.87	U
Bromodichloromethane	µg/kg	NA	0.87	U
Bromoform	µg/kg	NA	0.87	U
Bromomethane	µg/kg	NA	3.5	U
Carbon disulfide	µg/kg	NA	1.7	U
Carbon tetrachloride	µg/kg	NA	0.87	U
Chlorobenzene	µg/kg	NA	0.87	U
Chloroethane	µg/kg	NA	1.7	U
Chloroform	µg/kg	NA	0.87	U
Chloromethane	µg/kg	NA	1.7	U
cis-1,2-Dichloroethene	µg/kg	NA	0.87	U
cis-1,3-Dichloropropene	µg/kg	NA	0.87	U
Cyclohexanone	µg/kg	NA	17	U
Dibromochloromethane	µg/kg	NA	0.87	U
Dichlorodifluoromethane	µg/kg	NA	0.87	U
Ethylbenzene	µg/kg	NA	0.87	U
Isopropylbenzene	µg/kg	NA	0.87	U
m & p-Xylene	µg/kg	NA	1.7	U
Methyl acetate	µg/kg	NA	0.87	U
Methyl tert-butyl ether	µg/kg	NA	0.87	U
Methylcyclohexane	µg/kg	NA	1.7	U
Methylene chloride	µg/kg	NA	1.7	U
o-Xylene	µg/kg	NA	0.87	U
Styrene	µg/kg	NA	0.87	U
Tetrachloroethene	µg/kg	NA	0.87	U
Toluene	µg/kg	NA	0.87	U

Table 3-7. Off-Site Backfill Source Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Sample Date			**11/11/2020**	
Lab SDG			**157970**	
Sample Identification			**OFFSS-001-001-CO**	
Analyte	**Units**	**RVAAP Background Criteria**	**Result**	**QC Qualifier**
trans-1,2-Dichloroethene	µg/kg	NA	0.87	U
trans-1,3-Dichloropropene	µg/kg	NA	0.87	U
Trichloroethene	µg/kg	NA	0.87	U
Trichlorofluoromethane	µg/kg	NA	1.7	U
Vinyl chloride	µg/kg	NA	0.87	U
SVOCs, TCL				
1,1'-Biphenyl	µg/kg	NA	120	U
1,2,4,5-Tetrachlorobenzene	µg/kg	NA	230	U
2,3,4,6-Tetrachlorophenol	µg/kg	NA	580	U
2,4,5-Trichlorophenol	µg/kg	NA	580	U
2,4,6-Trichlorophenol	µg/kg	NA	580	U
2,4-Dichlorophenol	µg/kg	NA	580	U
2,4-Dimethylphenol	µg/kg	NA	580	UJ
2,4-Dinitrophenol	µg/kg	NA	580	U
2,4-Dinitrotoluene	µg/kg	NA	120	U
2,6-Dinitrotoluene	µg/kg	NA	120	U
2-Chloronaphthalene	µg/kg	NA	120	U
2-Chlorophenol	µg/kg	NA	580	U
2-Methylnaphthalene	µg/kg	NA	120	U
2-Methylphenol	µg/kg	NA	580	U
2-Nitroaniline	µg/kg	NA	230	U
2-Nitrophenol	µg/kg	NA	580	U
3 & 4-Methylphenol	µg/kg	NA	580	U
3,3'-Dichlorobenzidine	µg/kg	NA	230	U
3-Nitroaniline	µg/kg	NA	120	U
4,6-Dinitro-2-methylphenol	µg/kg	NA	580	U
4-Bromophenyl-phenyl ether	µg/kg	NA	120	U
4-Chloro-3-methylphenol	µg/kg	NA	580	U
4-Chloroaniline	µg/kg	NA	230	UJ
4-Chlorophenyl-phenyl ether	µg/kg	NA	120	U
4-Nitroaniline	µg/kg	NA	120	U
4-Nitrophenol	µg/kg	NA	580	U
Acenaphthene	µg/kg	NA	230	U
Acenaphthylene	µg/kg	NA	120	U
Acetophenone	µg/kg	NA	120	U
Anthracene	µg/kg	NA	120	U
Atrazine	µg/kg	NA	120	U
Benzaldehyde	µg/kg	NA	120	U
Benzo(a)anthracene	µg/kg	NA	120	U
Benzo(a)pyrene	µg/kg	NA	120	U
Benzo(b)fluoranthene	µg/kg	NA	120	U
Benzo(g,h,i)perylene	µg/kg	NA	120	U
Benzo(k)fluoranthene	µg/kg	NA	120	U
Bis(2-chloroethoxy)methane	µg/kg	NA	120	U
Bis(2-chloroethyl)ether	µg/kg	NA	120	U
Bis(2-chloroisopropyl)ether	µg/kg	NA	120	U
Bis(2-ethylhexyl)phthalate	µg/kg	NA	120	U

Table 3-7. Off-Site Backfill Source Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Sample Date			**11/11/2020**	
Lab SDG			**157970**	
Sample Identification			**OFFSS-001-001-CO**	
Analyte	**Units**	**RVAAP Background Criteria**	**Result**	**QC Qualifier**
Butylbenzylphthalate	µg/kg	NA	230	U
Caprolactam	µg/kg	NA	230	U
Carbazole	µg/kg	NA	230	U
Chrysene	µg/kg	NA	120	U
Dibenzo(a,h)anthracene	µg/kg	NA	120	U
Dibenzofuran	µg/kg	NA	120	U
Diethylphthalate	µg/kg	NA	48.5	J
Dimethylphthalate	µg/kg	NA	120	U
Di-n-butylphthalate	µg/kg	NA	230	U
Di-n-octylphthalate	µg/kg	NA	120	U
Fluoranthene	µg/kg	NA	120	U
Fluorene	µg/kg	NA	120	U
Hexachlorobenzene	µg/kg	NA	120	U
Hexachlorobutadiene	µg/kg	NA	120	U
Hexachlorocyclopentadiene	µg/kg	NA	120	UJ
Hexachloroethane	µg/kg	NA	120	U
Indeno(1,2,3-cd)pyrene	µg/kg	NA	120	U
Isophorone	µg/kg	NA	120	U
Naphthalene	µg/kg	NA	120	U
Nitrobenzene	µg/kg	NA	120	U
N-Nitroso-di-n-propylamine	µg/kg	NA	120	U
N-Nitrosodiphenylamine & Diphn	µg/kg	NA	230	U
Pentachlorophenol	µg/kg	NA	580	U
Phenanthrene	µg/kg	NA	120	U
Phenol	µg/kg	NA	580	U
Pyrene	µg/kg	NA	120	U
Explosives				
1,3,5-Trinitrobenzene	mg/kg	NA	0.2	U
1,3-Dinitrobenzene	mg/kg	NA	0.2	U
2,4,6-Trinitrotoluene	mg/kg	NA	0.2	U
2,4-Dinitrotoluene	mg/kg	NA	0.1	U
2,6-Dinitrotoluene	mg/kg	NA	0.2	U
2-Amino-4,6-dinitrotoluene	mg/kg	NA	0.2	U
2-Nitrotoluene	mg/kg	NA	0.2	U
3,5-Dinitroaniline	mg/kg	NA	0.2	U
3-Nitrotoluene	mg/kg	NA	0.2	U
4-Amino-2,6-dinitrotoluene	mg/kg	NA	0.2	U
4-Nitrotoluene	mg/kg	NA	0.2	U
HMX	mg/kg	NA	0.2	U
Nitrobenzene	mg/kg	NA	0.2	U
Nitroglycerin	mg/kg	NA	0.4	U
PETN	mg/kg	NA	0.8	U
RDX	mg/kg	NA	0.2	U
Tetryl	mg/kg	NA	0.2	U

Table 3-7. Off-Site Backfill Source Sample Results

Remedial Action Completion Report for RVAAP Load Lines 1, 2, 3, 4, and 12

Sample Date			**11/11/2020**	
Lab SDG			**157970**	
Sample Identification			**OFFSS-001-001-CO**	
Analyte	**Units**	**RVAAP Background Criteria**	**Result**	**QC Qualifier**
Metals				
Aluminum	mg/kg	17,700	7,660	J
Antimony	mg/kg	0.96	0.49	UJ
Arsenic	mg/kg	15.4	13.1	
Barium	mg/kg	88.4	37.6	
Beryllium	mg/kg	0.88	0.11	
Cadmium	mg/kg	0	0.09	J
Calcium	mg/kg	15,800	1,570	J
Chromium	mg/kg	17.4	10.9	
Cobalt	mg/kg	10.4	8.4	
Copper	mg/kg	17.7	16.4	
Iron	mg/kg	23,100	19,900	J
Lead	mg/kg	26.1	12.6	J
Magnesium	mg/kg	3,030	2,270	J
Manganese	mg/kg	1,450	348	J
Mercury	mg/kg	0.036	0.02	
Nickel	mg/kg	21.1	16.6	
Potassium	mg/kg	927	372	J
Selenium	mg/kg	104	0.25	UJ
Silver	mg/kg	0	0.062	U
Sodium	mg/kg	123	27.2	J
Thallium	mg/kg	0	6	J
Vanadium	mg/kg	31.1	14.1	
Zinc	mg/kg	61.8	53.3	J
Notes:				

µg/kg = microgram(s) per kilogram
mg/kg = milligram(s) per kilogram
NA = not applicable
ND = not detected
PCB = polychlorinated biphenyl
QC = quality control
RVAAP = Ravenna Army Ammunition Plant
SDG = sample delivery group
SVOC = semivolatile organic compound
TCL = target compound list
VOC = volatile organic compound

QC qualifiers:
J = estimated value
U = analyte concentration below detection limit

SECTION 4

Quality Assurance and Quality Control

4.1 Construction Quality Control

The Construction Manager/Quality Control Manager implemented the construction quality control (QC) plan described in the remedial action work plan. This included implementation of a three-phase control process (preparatory phase, initial phase and follow-up phase inspections) for each definable feature of work to ensure that project activities complied with the approved plans and procedures. The Daily Reports provided in **Appendix R** document the daily activities including implementation of the construction QC plan and corrective actions. Weekly Reports were provided to the Army during the field effort to summarize the activities conducted and included the daily reports.

4.2 Field Change Requests

Three Field Change Requests were approved by the Army and provided to Ohio EPA during the field effort (**Appendix P**).

4.3 Analytical Data Verification and Validation

Analytical data review, verification and validation were performed in accordance with the method requirements, professional judgment and general U.S. Department of Defense Quality System Manual requirements as presented in the QAPP.

One hundred percent of the excavation confirmation sample data and treatment verification sample data were validated using a combination of the Automated Data Review (ADR) software and a Stage 2B manual review and included the following items:

- A review of the data set narrative to identify issues that the laboratory reported in the data deliverable.
- A check of sample integrity (sample collection, preservation, and holding times).
- An ADR evaluation of basic QC measurements used to assess the accuracy, precision and representativeness of data including QC blanks, sample holding time, laboratory control samples (LCS)/laboratory control spike duplicates (LCSD), matrix spikes (MS)/matrix spike duplicates (MSD), surrogate recovery when applicable, and field or laboratory duplicate results.
- A review of sample results, target compound lists, and detection limits to verify that project analytical requirements are met.
- A review to verify that corrective actions were initiated, as necessary, based on the data review findings.
- Evaluation of calibration and QC summary results against the project requirements.
- Qualification of the data using appropriate qualifier flags, as necessary, to reflect data usability limitations.
- Other method specific QC requirements.
- The QA split sample data were not validated but were used to evaluate the analytical precision between the results of the primary laboratory and the QA split laboratory.

In addition, 10 percent of the excavation confirmation sample data and treatment verification sample data underwent a Stage 4 validation by an independent third party (Laboratory Data Consultants, Inc.) to verify identification of the analyte and to check sample calculations. Conclusions of the Stage 4 review were consistent with the Stage 2B manual review.

Data quality evaluation reports for the excavation confirmation and treatment verification samples are provided in **Appendix Q** and summarized below. The data generated from the excavation confirmation and treatment verification samples are of sufficient quality and can be used for project decisions taking into consideration the potential biases and validation flags applied to the data.

The quality of the field sampling efforts and laboratory results were evaluated for compliance with project data quality objectives through a review of overall precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). The following summarizes the PARCCS findings:

- Precision of the data was verified through the review of the field and laboratory data quality indicators such as field duplicates, laboratory duplicates, confirmation, laboratory subsampling duplicates or triplicates, MS/MSD and serial dilution RPDs and field/lab duplicate/triplicate RSDs. In addition, precision was also evaluated for the QA split sample data. Although there were a few instances where the confirmation, laboratory duplicate and/or serial dilution RPDs exceeded criteria for a few analytes and several instances where the RSD exceeded criteria for a few analytes, the overall precision was acceptable. QA split sample data also show overall acceptable precision.
- Accuracy of the data was verified through the review of the calibration data, LCS/LCSD, MS/MSD, internal standards, post digestion spike and surrogate standard recoveries, as well as the evaluation of method and calibration blank data. Although a few analytes were qualified as estimated in several samples due to LCS, MS/MSD and/or surrogate issues, overall accuracy was acceptable. Lead was detected in one method blank for excavation confirmation samples; however, the associated data were not impacted. The method/calibration blanks associated with the treatment verification samples were free of contamination.
- Representativeness of the data was verified through the sample's collection, storage and preservation procedures, the verification of holding-time compliance and potential heterogeneity issues. The laboratory did not note any issues with sample collection, preservation or storage. The data were reported from analyses within the U.S. Environmental Protection Agency (EPA)-recommended holding time.
- Comparability of the data was verified through the use of standard EPA analytical procedures and standard units for reporting. Results obtained are comparable to industry standards in that the collection and analytical techniques followed approved, documented procedures.
- Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements compared to planned measurements. Valid data are defined as all data that are not rejected for project use. All data were considered valid. The completeness goal of 95 percent was met for all analytes/methods.
- Sensitivity is the ability of an analytical method or instrument to discriminate between measurement responses representing different concentrations. Sensitivity was acceptable as the selected laboratory method LOQs met the project specific objectives.

SECTION 5

Land Use Controls

The remedial action is complete and the sites have met the RGOs and have achieved Commercial/Industrial Use. LUCs are no residential use, annual inspection to make sure that residential use has not occurred, and training of LUCs for the sites. **Appendix A** includes a site summary and inspection form that will be incorporated into the next update of the PMP.

SECTION 6

Conclusions

The approved soil remedial action specified in the ROD Amendment (Leidos, 2019a) for RVAAP Load Lines 1, 2, 3, 4 and 12, designated as AOCs RVAAP-08, -09, -10, -11, and -12, respectively, was completed per the approved Work Plan from October 2020 to April 2021. A total of 2,616 CY was excavated from the 24 locations identified in the ROD Amendment. A total of 2,528 CY of soil was excavated and thermally treated for PAHs, PCBs and explosives, sampled and analyzed to confirm the applicable RGOs were met, and then used as backfill in the excavations. Approximately 88 CY (160 tons) of soil was excavated from metals-contaminated locations, characterized as non-hazardous waste, and disposed off-site. Approximately 400 tons of concrete located within the excavation areas (walkway and foundation structures) were demolished, characterized as meeting requirements for recycling, and recycled off-site.

SECTION 7

References

CH2M HILL Constructors, Inc. (CH2M, now a wholly owned subsidiary of Jacobs Engineering Group Inc.). 2020a. *Remedial Design Work Plan for RVAAP Load Lines 1, 2, 3, 4, and 12, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio*. Prepared for U.S. Army Corps of Engineers – Louisville District. September.

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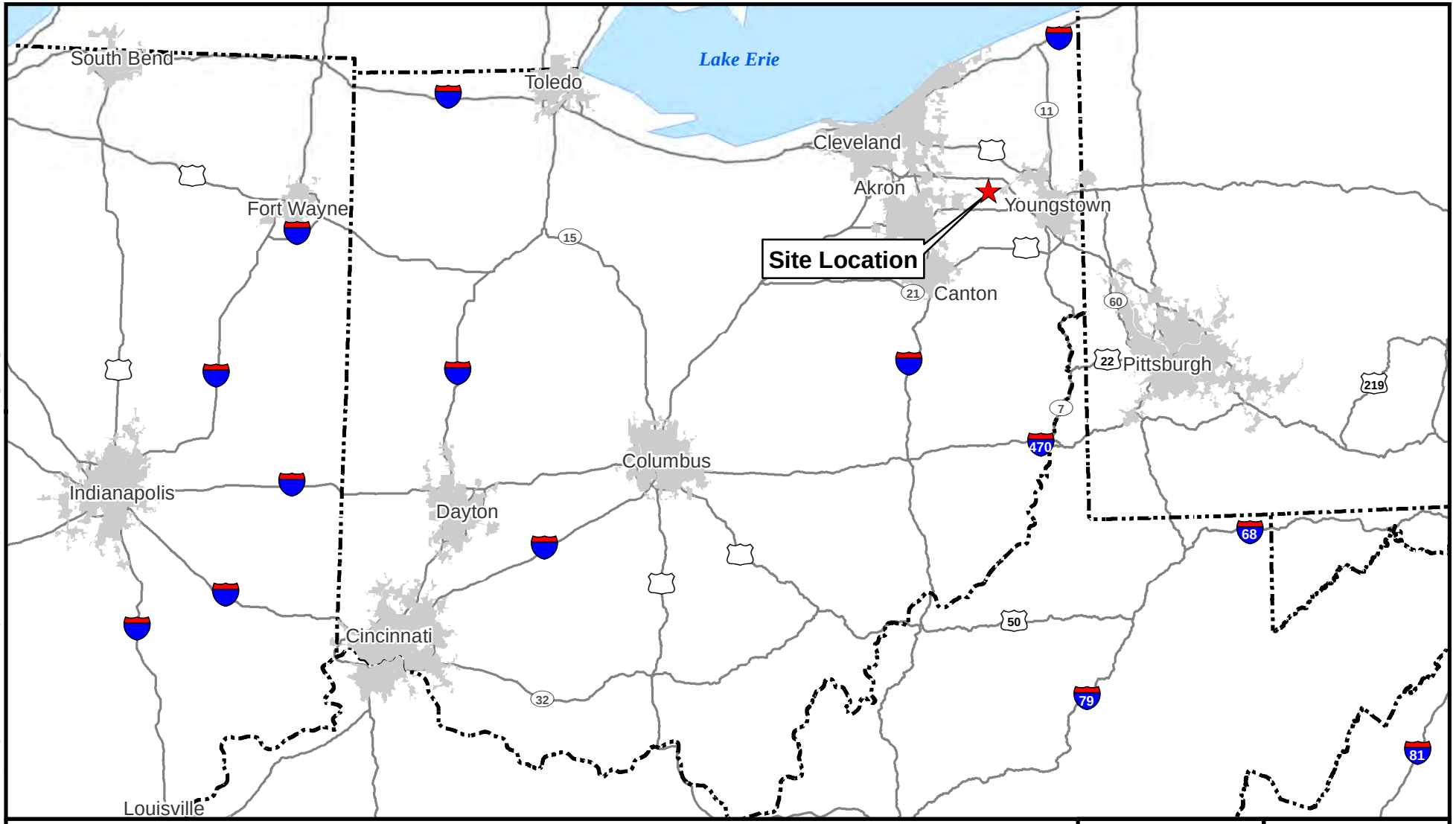
Figures



LEGEND:

- Interstate/Highway
- State Boundary
- Urban Areas (Regional)
- Major Lakes (State)

0 130,000 260,000

Scale In Feet

N

BASE MAP SOURCE: ESRI

Camp James A. Garfield

FIGURE 2-1

SITE LOCATION MAP

FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 3/26/2020

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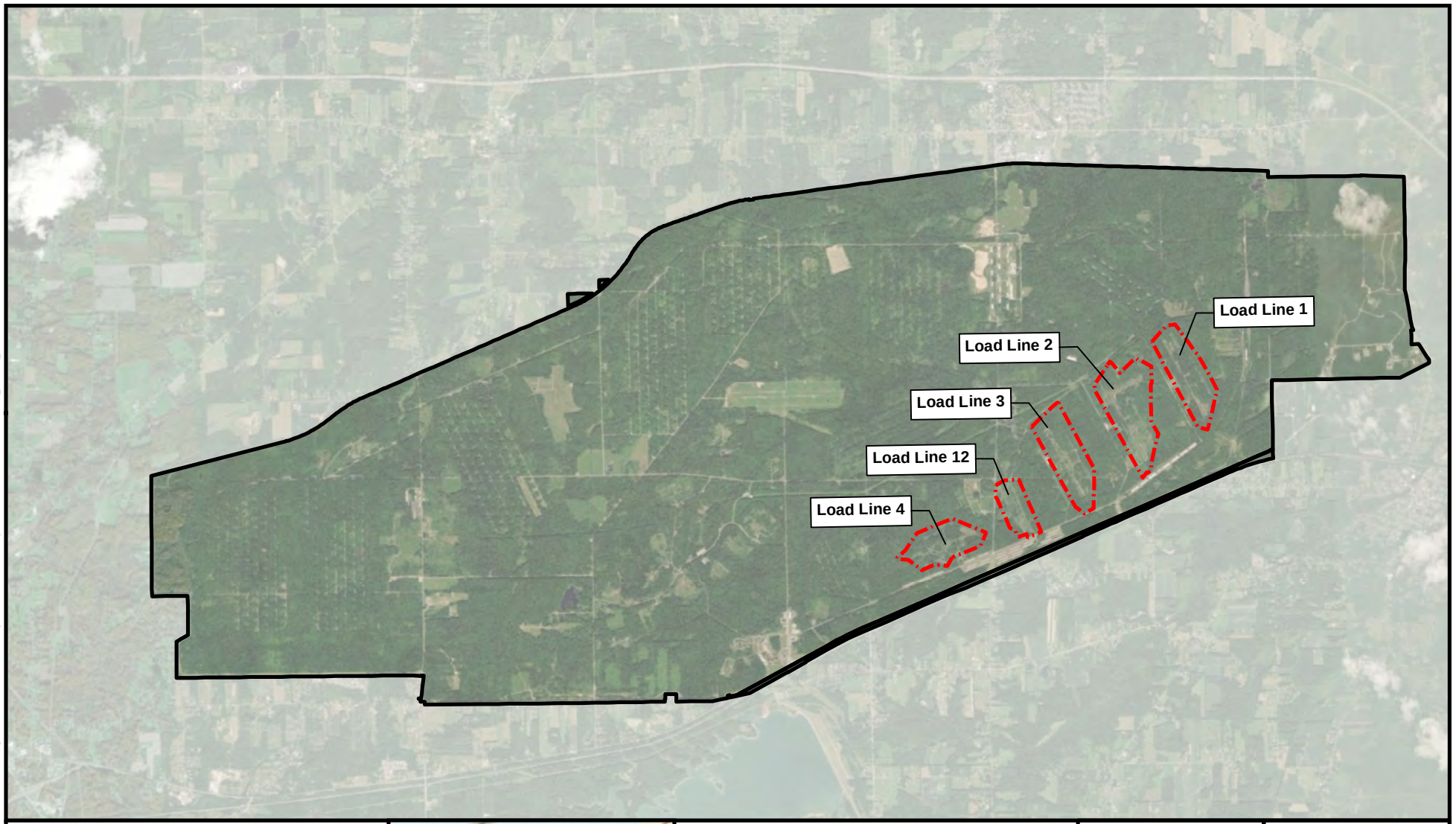

LEGEND:

- Camp James A. Garfield Property
- Load Line Area

0 3,900 7,800

Scale In Feet

N

BASE MAP SOURCE:
ESRI online map service, DigitalGlobe, 2017/2018.

Camp James A. Garfield

FIGURE 2-2
LOAD LINE LOCATIONS
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 3/26/2020

ch2m.

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CB-13B (LL1-252)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1.5
Actual Maximum Depth Excavated (feet bgs)	2.5
In-situ volume excavated (CY)	28.88
In-situ contaminated volume excavated (CY)	28.88
COCs	Lead

Building CB-4	
Planned Area (square feet)	1,403
Actual Area Excavated (square feet)	1,403
Treatment Interval (feet bgs)	2-3
Actual Maximum Depth Excavated (feet bgs)	2
Total In-situ volume excavated (CY)	56.21
In-situ contaminated volume excavated (CY)	0
COCs	PCB-1254

Building CB-4A	
Planned Area (square feet)	9,212
Actual Area Excavated (square feet)	10,049
Treatment Interval (feet bgs)	1-5
Actual Maximum Depth Excavated (feet bgs)	7.0
Total In-situ volume excavated (CY)	1,195.99
In-situ contaminated volume excavated (CY)	839.72
COCs	RDX, TNT

Outlet Channel D (LL1-049)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	350
Treatment Interval (feet bgs)	0-1.5
Actual Maximum Depth Excavated (feet bgs)	2.5
In-situ volume excavated (CY)	18.96
In-situ contaminated volume excavated (CY)	18.96
COCs	Antimony, Lead

Building CB-2	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-2
Actual Maximum Depth Excavated (feet bgs)	1.87
In-situ volume excavated (CY)	16.9
In-situ contaminated volume excavated (CY)	16.9
COCs	Antimony, Lead

LEGEND:

- Control Point
- Elevated Walkway
- Former Railroad
- Planned Excavation
- Actual Excavation
- Historical Remediation Area (2007/2010)
- Area of Concern Boundary
- Elevation Contour (10 ft interval)
- Elevation Contour (2 ft interval)

N

0 180 360

Scale In Feet

Camp James A. Garfield

FIGURE 2-3

LOAD LINE 1 EXCAVATION PLAN

FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 5/12/2021

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1010

1010

1010

1010

CP2-01

CP2-04

CP2-02

CP2-03

Building DB-4a

Building DB-4A	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-2
Actual Maximum Depth Excavated (feet bgs)	2.4
In-situ volume excavated (CY)	30.93
In-situ contaminated volume excavated (CY)	30.93
COCs	TNT

LEGEND:

- # Control Point
- Elevated Walkway
- Former Railroad
- Actual Excavation
- Planned Excavation
- Historical Remediation Area (2007/2010)
- Demolished Building
- Area of Concern Boundary
- Elevation Contour (10 ft interval)
- Elevation Contour (2 ft interval)

N

0 125 250

Scale In Feet

Camp James A. Garfield

FIGURE 2-4

LOAD LINE 2 EXCAVATION PLAN

FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 5/12/2021

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Building EB-10 (a)	
Planned Area (square feet)	9,962
Actual Area Excavated (square feet)	9,962
Treatment Interval (feet bgs)	3-5
Actual Maximum Depth Excavated (feet bgs)	5.4
In-situ volume excavated (CY)	1,221.65
In-situ contaminated volume excavated (CY)	239.58
COCs	PAHs B(a)a, BaP, BbF, DA
Bedrock encountered throughout bottom of excavation, no soil on sidewalls in treatment interval 3-5'bgs	

Building EB-10 (b)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-2
Actual Maximum Depth Excavated (feet bgs)	2
In-situ volume excavated (CY)	30
In-situ contaminated volume excavated (CY)	30
COCs	PCB-1254

Building EA-7	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.6
In-situ volume excavated (CY)	22
In-situ contaminated volume excavated (CY)	17
COCs	PCB-1254

Building EA-6 (b)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1
In-situ volume excavated (CY)	14.81
In-situ contaminated volume excavated (CY)	15
COCs	PAHs BaP, DA

Building EA-6 (a)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	800
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1
In-situ volume excavated (CY)	45
In-situ contaminated volume excavated (CY)	45
COCs	PAHs B(a)a, BaP, BbF, DA
Based on exceedance in Sidewall West sample, excavation extended 20 feet westward (extension excavated to bedrock at 2' bgs).	

Building EA-6 (c)	
Planned Area (square feet)	4,062
Actual Area Excavated (square feet)	4,062
Treatment Interval (feet bgs)	4.5-6
Actual Maximum Depth Excavated (feet bgs)	6.5
In-situ volume excavated (CY)	603.48
In-situ contaminated volume excavated (CY)	28.71
COCs	PAHs B(a)a, BaP, BbF, DA
Bedrock encountered 1 to 6.5' bgs, no soil on sidewalls in treatment interval, one pocket had soils in the treatment interval (approximately 10CY of impacted soils from an area just south of EA6b excavated to bedrock).	

Building EB-4	
Planned Area (square feet)	6,996
Actual Area Excavated (square feet)	7,517
Treatment Interval (feet bgs)	1-3
Actual Maximum Depth Excavated (feet bgs)	4.0
In-situ volume excavated (CY)	705.97
In-situ contaminated volume excavated (CY)	440.22
COCs	PCB-1254
Portions of excavation encountered bedrock at 0 to 2.5' bgs; Maximum depth excavated 4' bgs	

Building EB-9A	
Planned Area (square feet)	1,009
Actual Area Excavated (square feet)	1,009
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.6
In-situ volume excavated (CY)	41.44
In-situ contaminated volume excavated (CY)	41.44
COCs	TNT

West Perimeter	
Planned Area (square feet)	625
Actual Area Excavated (square feet)	1,054
Treatment Interval (feet bgs)	0-0.5
Actual Maximum Depth Excavated (feet bgs)	1.25
In-situ volume excavated (CY)	14.70
In-situ contaminated volume excavated (CY)	14.70
COCs	PAHs B(a)a, BaP, BbF, DA

Building EB-803	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.5
In-situ volume excavated (CY)	12.71
In-situ contaminated volume excavated (CY)	12.71
COCs	PCB-1254
Railroad ballast on west and south sidewalls.	

LEGEND:

- Control Point
- Elevated Walkway
- Planned Excavation
- Actual Excavation
- Historical Remediation Area (2007/2010)
- Former Railroad
- Demolished Building
- Area of Concern Boundary
- Elevation Contour (10 ft interval)
- Elevation Contour (2 ft interval)

N

0 160 320

Scale In Feet

Camp James A. Garfield

FIGURE 2-5

LOAD LINE 3 EXCAVATION PLAN

FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 7/6/2021

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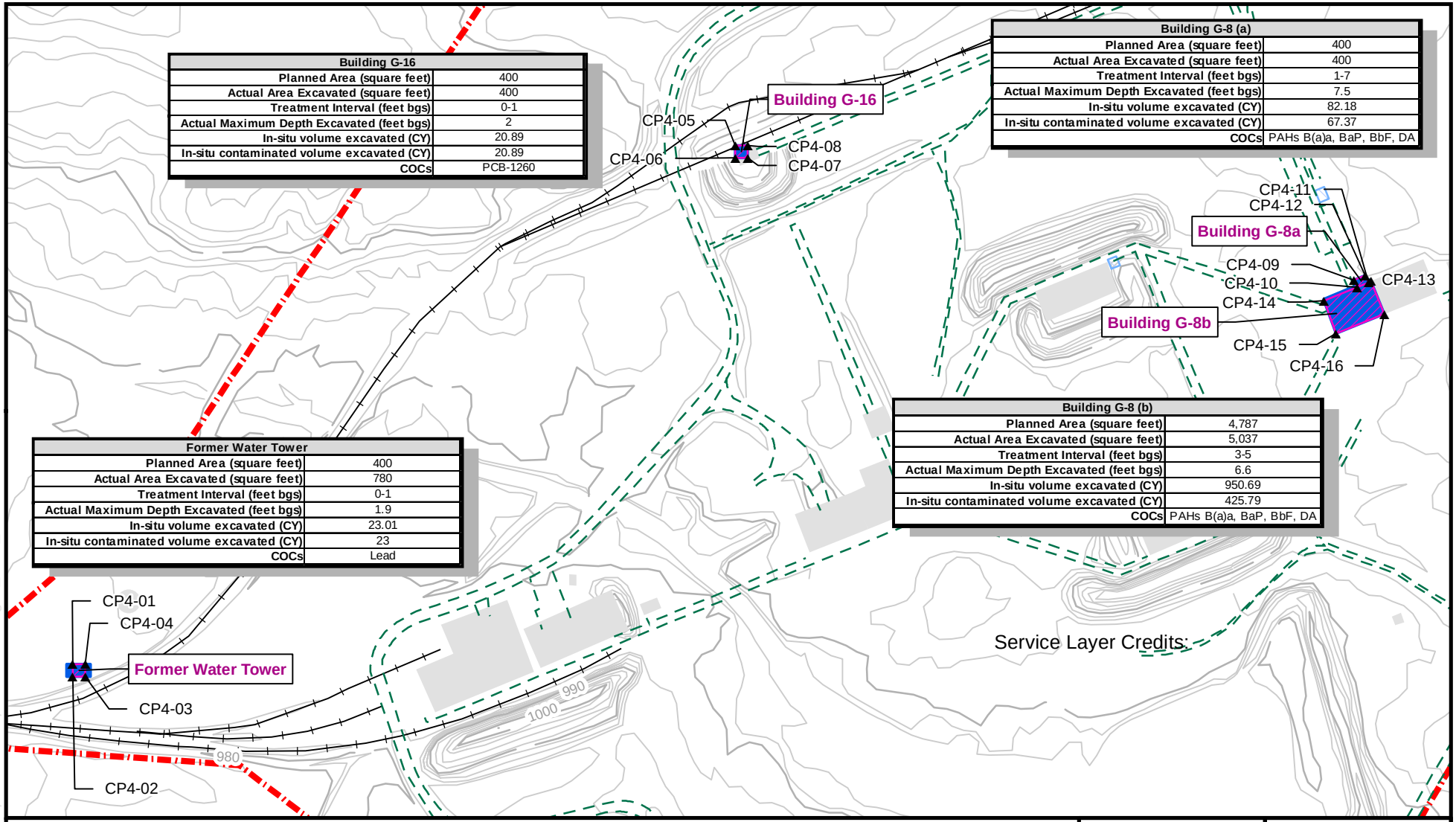

LEGEND:

- Control Point
- Elevated Walkway
- Planned Excavation
- Actual Excavation
- Elevation Contour (2 ft interval)
- Elevation Contour (10 ft interval)
- Former Railroad
- Historical Remediation Area (2007/2010)
- Area of Concern Boundary
- Demolished Building

N

0 140 280

Scale In Feet

Camp James A. Garfield

FIGURE 2-6

LOAD LINE 4 EXCAVATION PLAN

FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 5/12/2021

ch2m

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Active Area Channel	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-2
Actual Maximum Depth Excavated (feet bgs)	2.6
In-situ volume excavated (CY)	35.65
In-situ contaminated volume excavated (CY)	35.65
COCs	TNT, 2,6-DNT, BAP

CP12-04
CP12-01
CP12-02
CP12-03
Active Area Channel

Building FF-19 (a)	
Planned Area (square feet)	625
Actual Area Excavated (square feet)	868
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.7
In-situ volume excavated (CY)	24.66
In-situ contaminated volume excavated (CY)	24.66
COCs	PAHs B(a)a, BaP, BbF, DA

CP12-08
CP12-05
Buillding FF-19a
CP12-06
CP12-07

Building FF-19 (b)	
Planned Area (square feet)	625
Actual Area Excavated (square feet)	625
Treatment Interval (feet bgs)	0-4.5
Actual Maximum Depth Excavated (feet bgs)	5.1
In-situ volume excavated (CY)	106.2
In-situ contaminated volume excavated (CY)	106.2
COCs	PAHs B(a)a, BaP, BbF, DA

CP12-20
CP12-13
CP12-12
CP12-09
Building FF-19b
CP12-10
CP12-11
CP12-14
Building FF-19c
CP12-19
CP12-18
CP12-17
CP12-16
CP12-15

Building FF-19 (c)	
Planned Area (square feet)	983
Actual Area Excavated (square feet)	1,112
Treatment Interval (feet bgs)	0-2.5
Actual Maximum Depth Excavated (feet bgs)	3.2
In-situ volume excavated (CY)	92.54
In-situ contaminated volume excavated (CY)	92.54
COCs	PAHs B(a)a, BaP, BbF, DA

LEGEND:

- Control Point
- Elevated Walkway
- Planned Excavation
- Actual Excavation
- Former Railroad
- Elevation Contour (2 ft interval)
- Elevation Contour (10 ft interval)
- Historical Remediation Area (2007/2010)
- Demolished Building
- Area of Concern Boundary

N

0 80 160
Scale In Feet

Camp James A. Garfield

FIGURE 2-7
LOAD LINE 12 EXCAVATION PLAN
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 5/12/2021

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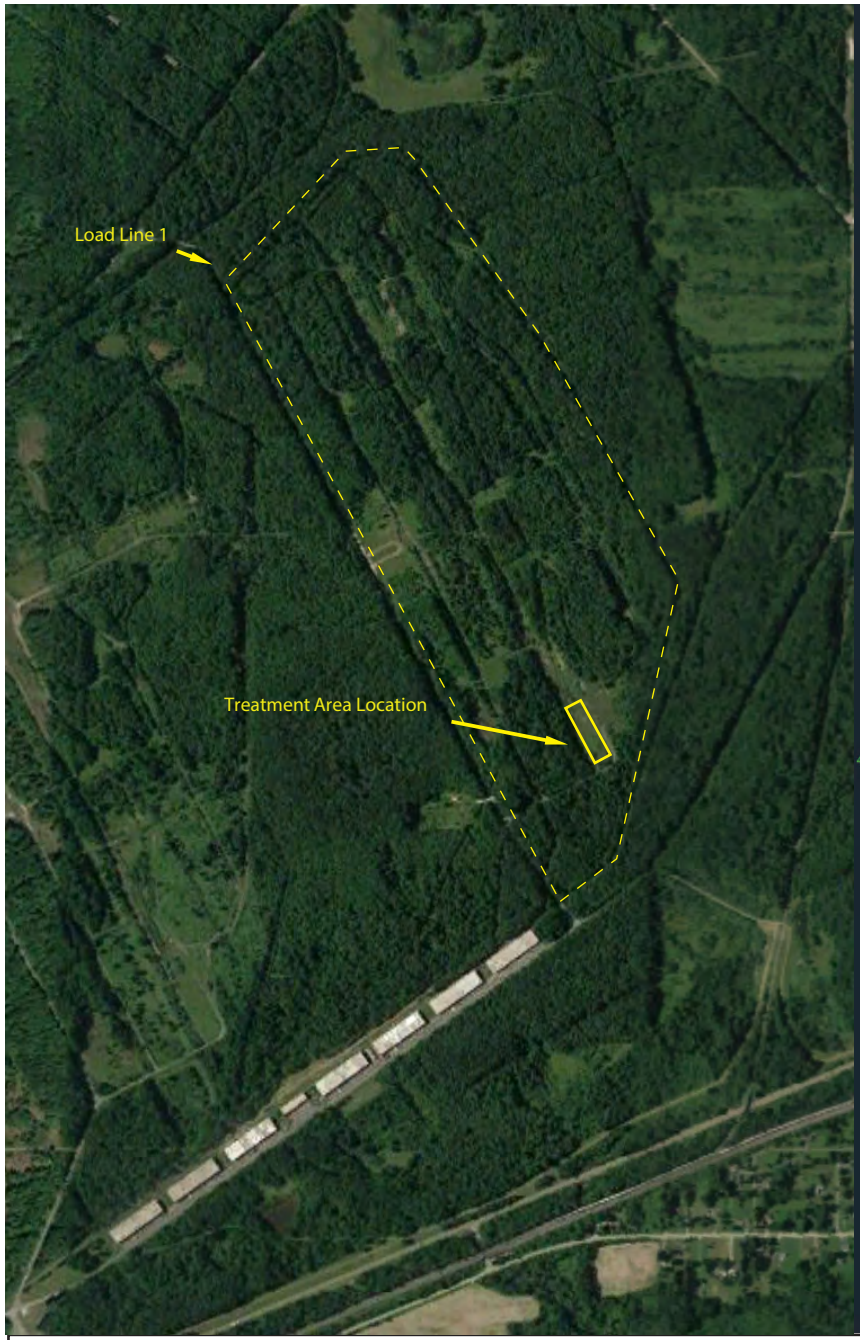


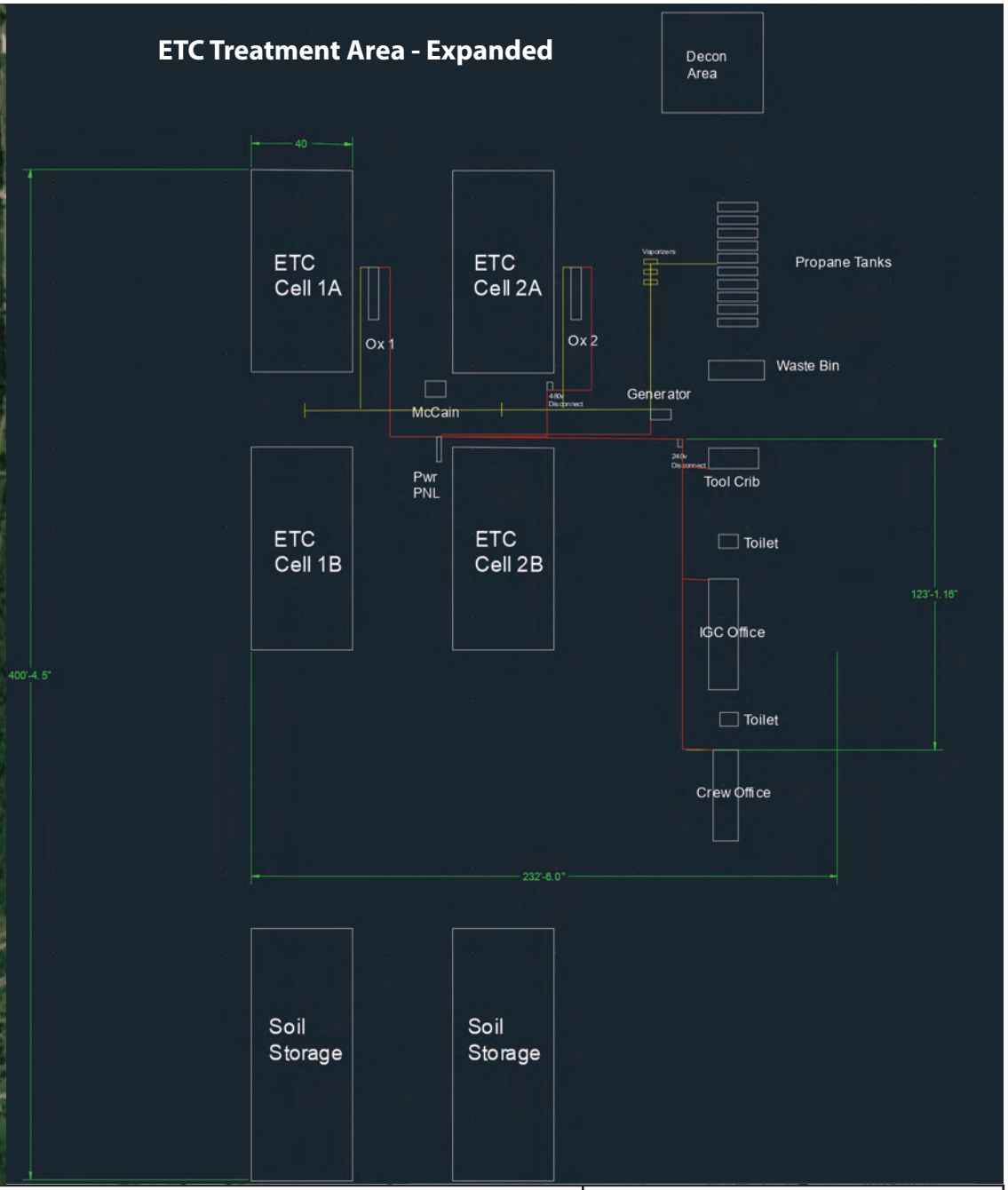
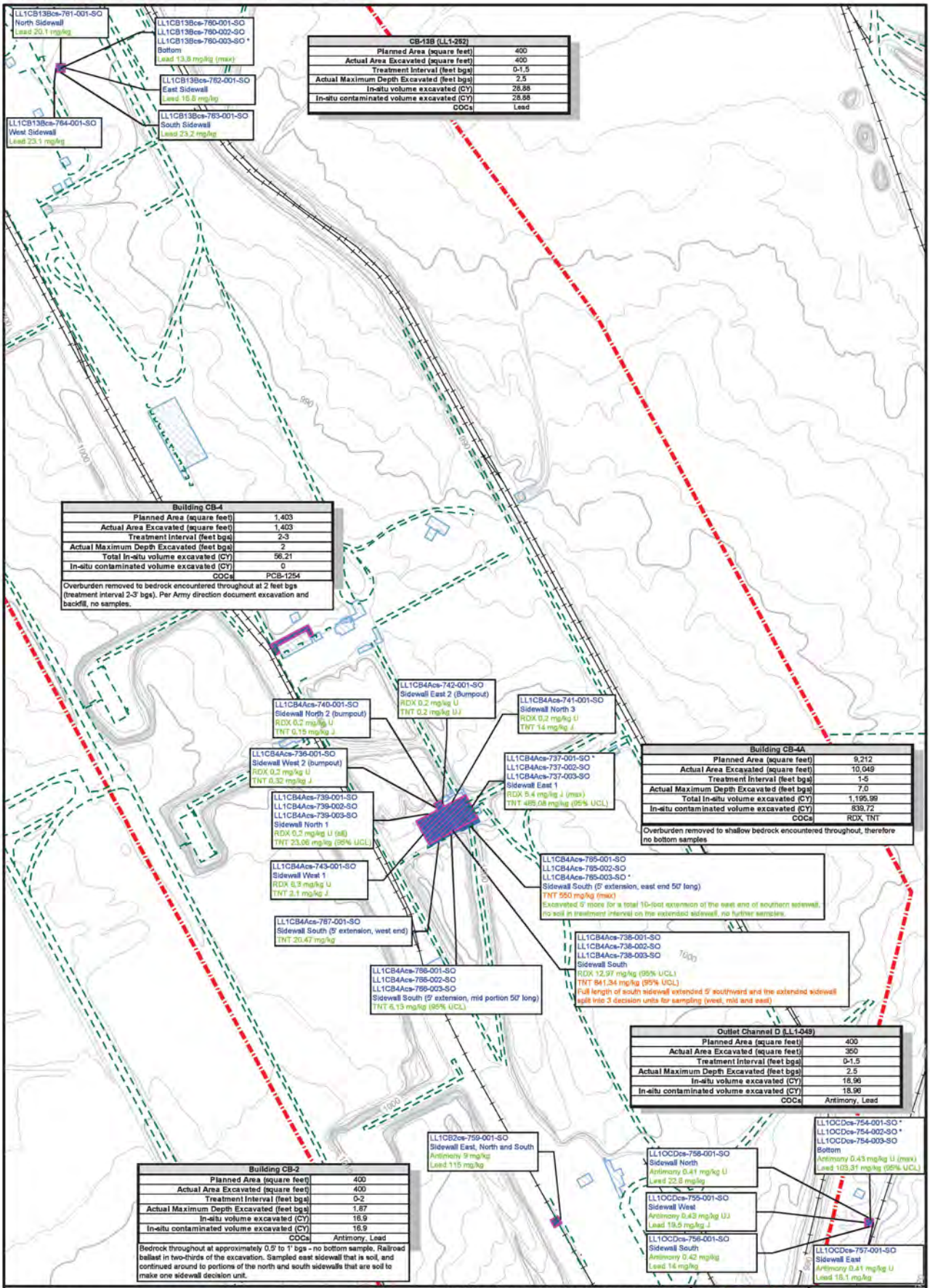


FIGURE 3-1
ETC Treatment Location at Load Line 1
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

IRON CREEK GROUP


LL1CB13Bcs-761-001-SO
North Sidewall
Lead 20.1 mg/kg
LL1CB13Bcs-760-001-SO
LL1CB13Bcs-760-002-SO
LL1CB13Bcs-760-003-SO *
Bottom
Lead 13.8 mg/kg (max)
LL1CB13Bcs-762-001-SO
East Sidewall
Lead 16.8 mg/kg
LL1CB13Bcs-763-001-SO
South Sidewall
Lead 23.2 mg/kg
LL1CB13Bcs-764-001-SO
West Sidewall
Lead 23.1 mg/kg
CB-13B (LL1-282)
Planned Area (square feet) 400
Actual Area Excavated (square feet) 400
Treatment Interval (feet bgs) 0-1.5
Actual Maximum Depth Excavated (feet bgs) 2.5
In-situ volume excavated (CY) 28.88
In-situ contaminated volume excavated (CY) 28.88
COCs Lead
Building CB-4
Planned Area (square feet) 1,403
Actual Area Excavated (square feet) 1,403
Treatment Interval (feet bgs) 2-3
Actual Maximum Depth Excavated (feet bgs) 2
Total In-situ volume excavated (CY) 56.21
In-situ contaminated volume excavated (CY) 0
COCs PCB-1254
Overburden removed to bedrock encountered throughout at 2 feet bgs (treatment interval 2-3' bgs). Per Army direction document excavation and backfill, no samples.
LL1CB4Acs-742-001-SO
Sidewall East 2 (Bumpout)
RDX 0.2 mg/kg U
TNT 0.2 mg/kg UJ
LL1CB4Acs-741-001-SO
Sidewall North 3
RDX 0.2 mg/kg U
TNT 14 mg/kg J
LL1CB4Acs-740-001-SO
Sidewall North 2 (bumpout)
RDX 0.2 mg/kg U
TNT 0.15 mg/kg J
LL1CB4Acs-736-001-SO
Sidewall West 2 (bumpout)
RDX 0.2 mg/kg U
TNT 0.32 mg/kg J
LL1CB4Acs-737-001-SO *
LL1CB4Acs-737-002-SO
LL1CB4Acs-737-003-SO
Sidewall East 1
RDX 5.4 mg/kg J (max)
TNT 485.08 mg/kg (95% UCL)
LL1CB4Acs-739-001-SO
LL1CB4Acs-739-002-SO
LL1CB4Acs-739-003-SO
Sidewall North 1
RDX 0.2 mg/kg U (all)
TNT 23.06 mg/kg (95% UCL)
LL1CB4Acs-743-001-SO
Sidewall West 1
RDX 0.8 mg/kg U
TNT 2.1 mg/kg J
LL1CB4Acs-787-001-SO
Sidewall South (5' extension, west end)
TNT 20.47 mg/kg
Building CB-4A
Planned Area (square feet) 9,212
Actual Area Excavated (square feet) 10,049
Treatment Interval (feet bgs) 1-5
Actual Maximum Depth Excavated (feet bgs) 7.0
Total In-situ volume excavated (CY) 1,195.99
In-situ contaminated volume excavated (CY) 839.72
COCs RDX, TNT
Overburden removed to shallow bedrock encountered throughout, therefore no bottom samples
LL1CB4Acs-785-001-SO
LL1CB4Acs-785-002-SO
LL1CB4Acs-785-003-SO *
Sidewall South (5' extension, east end 50' long)
TNT 550 mg/kg (max)
Excavated 5' more for a total 10-foot extension of the east end of southern sidewall, no soil in treatment interval on the extended sidewall, no further samples.
LL1CB4Acs-738-001-SO
LL1CB4Acs-738-002-SO
LL1CB4Acs-738-003-SO
Sidewall South
RDX 12.97 mg/kg (95% UCL)
TNT 841.34 mg/kg (95% UCL)
Full length of south sidewall extended 5' southward and the extended sidewall split into 3 decision units for sampling (west, mid and east)
LL1CB4Acs-786-001-SO
LL1CB4Acs-786-002-SO
LL1CB4Acs-786-003-SO
Sidewall South (5' extension, mid portion 50' long)
TNT 6.13 mg/kg (95% UCL)
Outlet Channel D (LL1-049)
Planned Area (square feet) 400
Actual Area Excavated (square feet) 350
Treatment Interval (feet bgs) 0-1.5
Actual Maximum Depth Excavated (feet bgs) 2.5
In-situ volume excavated (CY) 18.96
In-situ contaminated volume excavated (CY) 18.96
COCs Antimony, Lead
LL1CB2cs-759-001-SO
Sidewall East, North and South
Antimony 9 mg/kg
Lead 115 mg/kg
LL1OCDcs-758-001-SO
Sidewall North
Antimony 0.41 mg/kg U
Lead 22.8 mg/kg
LL1OCDcs-755-001-SO
Sidewall West
Antimony 0.43 mg/kg UJ
Lead 19.5 mg/kg J
LL1OCDcs-756-001-SO
Sidewall South
Antimony 0.42 mg/kg
Lead 14 mg/kg
LL1OCDcs-754-001-SO *
LL1OCDcs-754-002-SO *
LL1OCDcs-754-003-SO
Bottom
Antimony 0.43 mg/kg U (max)
Lead 103.31 mg/kg (95% UCL)
LL1OCDcs-757-001-SO
Sidewall East
Antimony 0.41 mg/kg U
Lead 18.1 mg/kg
Building CB-2
Planned Area (square feet) 400
Actual Area Excavated (square feet) 400
Treatment Interval (feet bgs) 0-2
Actual Maximum Depth Excavated (feet bgs) 1.67
In-situ volume excavated (CY) 16.9
In-situ contaminated volume excavated (CY) 16.9
COCs Antimony, Lead
Bedrock throughout at approximately 0.5' to 1' bgs - no bottom sample. Railroad ballast in two-thirds of the excavation. Sampled east sidewall that is soil, and continued around to portions of the north and south sidewalls that are soil to make one sidewall decision unit.
LEGEND:
Elevated Walkway
Former Railroad
Planned Excavation
Actual Excavation
Historical Remediation Area (2007/2010)
Area of Concern Boundary
Elevation Contour (10 ft interval)
Elevation Contour (2 ft interval)
Sample ID
ISM Sample Location Description
Analytical Result (meets RGO)
Analytical Result (exceeds RGO)
Sample ID
Sample ID Duplicate
Sample ID Triplicate
ISM Sample Location Description
Analytical Result (meets RGO)
Analytical Result (exceeds RGO)
U = Data qualifier, analyzed but not detected above reported sample quantitation limit or was qualified as not detected due to blank contamination.
J = Data qualifier, analyte positively identified; approximate concentration
UJ = Data qualifier, analyte not detected above reported sample quantitation limit, which is an approximate concentration
* = ISM triplicate sample with maximum concentration used to compare to RGO
95% UCL = Used to compare to RGO if RSD for ISM triplicate samples >50%
N
0
180
360
Scale In Feet
Camp James A. Garfield
FIGURE 3-2
LOAD LINE 1
EXCAVATION CONFIRMATION SAMPLES
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO
PN: D3294900
DATE: 6/17/2021
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LL2DB4Acs-681-001-SO
Bottom
TNT 0.2 mg/kg U

LL2DB4Acs-683-001-SO
North Sidewall
TNT 0.2 mg/kg U

LL2DB4Acs-685-001-SO
West Sidewall
TNT 0.2 mg/kg U

LL2DB4Acs-682-001-SO
East Sidewall
TNT 0.2 mg/kg U

LL2DB4Acs-684-001-SO
South Sidewall
TNT 0.2 mg/kg U

Building DB-4A	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-2
Actual Maximum Depth Excavated (feet bgs)	2.4
In-situ volume excavated (CY)	30.93
In-situ contaminated volume excavated (CY)	30.93
COCs	TNT

1010

LEGEND:

- Elevated Walkway
- Former Railroad
- Actual Excavation
- Planned Excavation
- Historical Remediation Area (2007/2010)
- Demolished Building
- Area of Concern Boundary
- Elevation Contour (10 ft interval)
- Elevation Contour (2 ft interval)

Sample ID
ISM Sample Location Description
Analytical Result (meets RGO)

U = Data qualifier, analyzed but not detected above reported sample quantitation limit or was qualified as not detected due to blank contamination.

N

0 125 250
Scale In Feet

Camp James A. Garfield

FIGURE 3-3
LOAD LINE 2
EXCAVATION CONFIRMATION SAMPLES
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 6/23/2021

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Building EB-10 (a)	
Planned Area (square feet)	9,962
Actual Area Excavated (square feet)	9,962
Treatment Interval (feet bgs)	3-5
Actual Maximum Depth Excavated (feet bgs)	5.4
In-situ volume excavated (CY)	1,221.65
In-situ contaminated volume excavated (CY)	239.58
COCs	PAHs B(a)a, BaP, BbF, DA
Bedrock encountered throughout bottom of excavation, no soil on sidewalls in treatment interval 3-5'bgs	

LL3EA7cs-556-001-SO
LL3EA7cs-556-002-SO
LL3EA7cs-556-003-SO
North Sidewall
PCB-1254 0.395 mg/kg (max)

LL3EA7cs-557-001-SO
East Sidewall
PCB-1254 1.27 mg/kg

Building EA-7

Building EA-7	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.6
In-situ volume excavated (CY)	22
In-situ contaminated volume excavated (CY)	17
COCs	PCB-1254

LL3EA7cs-559-001-SO
West Sidewall
PCB-1254 0.716 mg/kg

LL3EA7cs-558-001-SO
South Sidewall
PCB-1254 0.622 mg/kg

LL3EA7cs-560-001-SO
Bottom
PCB-1254 0.429 mg/kg

Building EA-6 (b)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1
In-situ volume excavated (CY)	14.81
In-situ contaminated volume excavated (CY)	15
COCs	PAHs BaP, DA

Building EA-6 (a)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	800
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1
In-situ volume excavated (CY)	45
In-situ contaminated volume excavated (CY)	45
COCs	PAHs B(a)a, BaP, BbF, DA
Based on exceedance in Sidewall West sample, excavation extended 20 feet westward (extension excavated to bedrock at 2' bgs).	

1010

Building EB-10a

LL3EB10A
No samples - shallow bedrock

Buidling EB-10b

LL3EB10B
No samples - east sidewall is concrete, remaining sidewalls removed during excavation of EB019a

Building EA-6a

Building EA-6b

See Figure 3-4b for Building EA-6a, 6b and 6c excavation confirmation sample results

Building EA-6c

Building EB-10 (b)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-2
Actual Maximum Depth Excavated (feet bgs)	2
In-situ volume excavated (CY)	30
In-situ contaminated volume excavated (CY)	30
COCs	PCB-1254

Building EA-6 (c)	
Planned Area (square feet)	4,062
Actual Area Excavated (square feet)	4,062
Treatment Interval (feet bgs)	4.5-6
Actual Maximum Depth Excavated (feet bgs)	6.5
In-situ volume excavated (CY)	603.48
In-situ contaminated volume excavated (CY)	28.71
COCs	PAHs B(a)a, BaP, BbF, DA
Bedrock encountered 1 to 6.5' bgs, no soil on sidewalls in treatment interval, one pocket had soils in the treatment interval (approximately 10CY of impacted soils from an area just south of EA6b excavated to bedrock).	

Building EB-4

See Figure 3-4b for Building EB-4 excavation confirmation sample results

Building EB-4	
Planned Area (square feet)	6,996
Actual Area Excavated (square feet)	7,517
Treatment Interval (feet bgs)	1-3
Actual Maximum Depth Excavated (feet bgs)	4.0
In-situ volume excavated (CY)	705.97
In-situ contaminated volume excavated (CY)	440.22
COCs	PCB-1254
Portions of excavation encountered bedrock at 0 to 2.5' bgs; Maximum depth excavated 4' bgs	

LL3EB9Acs-573-001-SO
North Sidewall
TNT 0.1 mg/kg J

LL3EB9Acs-576-001-SO
West Sidewall
TNT 0.2 mg/kg UJ

Building EB-9A	
Planned Area (square feet)	1,009
Actual Area Excavated (square feet)	1,009
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.6
In-situ volume excavated (CY)	41.44
In-situ contaminated volume excavated (CY)	41.44
COCs	TNT

LL3EB9Acs-576-001-SO
East Sidewall
TNT 0.15 mg/kg J

LL3EB9Acs-576-001-SO
Bottom
TNT 11 mg/kg J

LL3WPcs-588-001-SO
LL3WPcs-588-002-SO *
LL3WPcs-588-003-SO
North Sidewall - 3' extension
B(a)a 1.91 mg/kg (max)
BaP 1.59 mg/kg (max)
BbF 2.24 mg/kg (max)
DA 0.202 mg/kg (max)

LL3WPcs-582-001-SO *
LL3WPcs-582-002-SO
LL3WPcs-582-003-SO
North Sidewall
B(a)a 69.3 mg/kg (max)
BaP 73.7 mg/kg (max)
BbF 101 mg/kg (max)
DA 10.7 mg/kg (max)

LL3EB9Acs-576-001-SO
South Sidewall
TNT 0.34 mg/kg J

LL3WPcs-583-001-SO
LL3WPcs-583-002-SO *
LL3WPcs-583-003-SO
West Sidewall
B(a)a 26.6 mg/kg (max)
BaP 25.7 mg/kg (max)
BbF 32.6 mg/kg (max)
DA 2.63 mg/kg (max)

LL3WPcs-581-001-SO
East Sidewall
B(a)a 37.1 mg/kg
BaP 32.1 mg/kg
BbF 41.4 mg/kg
DA 4.65 mg/kg

LL3WPcs-592-001-SO
West Sidewall - 6' extension
BaP 4.48 mg/kg
Asphalt present in extended sidewall, no further excavation

LL3WPcs-581-001-SO
East Sidewall - 3' extension
B(a)a 0.489 mg/kg
BaP 0.413 mg/kg
BbF 0.601 mg/kg
DA 0.0485 mg/kg

West Perimeter	
Planned Area (square feet)	625
Actual Area Excavated (square feet)	1,054
Treatment Interval (feet bgs)	0-0.5
Actual Maximum Depth Excavated (feet bgs)	1.25
In-situ volume excavated (CY)	14.70
In-situ contaminated volume excavated (CY)	14.70
COCs	PAHs B(a)a, BaP, BbF, DA

LL3WPcs-589-001-SO *
LL3WPcs-589-002-SO
LL3WPcs-589-003-SO
West Sidewall - 3' extension
B(a)a 3.12 mg/kg (max)
BaP 2.93 mg/kg (max)
BbF 3.96 mg/kg (max)
DA 0.323 mg/kg (max)

LL3WPcs-581-001-SO
Bottom
B(a)a 15.5 mg/kg
BaP 12 mg/kg
BbF 15.9 mg/kg
DA 1.3 mg/kg

LL3WPcs-584-001-SO
South Sidewall
B(a)a 3.22 mg/kg
BaP 3.14 mg/kg
BbF 14.15 mg/kg
DA 0.369 mg/kg

LL3WPcs-587-001-SO
Bottom - 3' extension
BaP 1.18 mg/kg

LL3WPcs-584-001-SO
South Sidewall - 3' extension
BaP 0.364 mg/kg

LL3EB803cs-579-001-SO
North Sidewall
PCB-1254 0.0355 mg/kg J

Building EB-803	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.5
In-situ volume excavated (CY)	12.71
In-situ contaminated volume excavated (CY)	12.71
COCs	PCB-1254
Railroad ballast on west and south sidewalls.	

LL3EB803
West Sidewall
No sample - railroad ballast

LL3EB803cs-580-001-SO
East Sidewall
PCB-1254 0.04 mg/kg U

LL3EB803
South Sidewall
No sample - railroad ballast

LL3EB803cs-578-001-SO
Bottom
PCB-1254 0.0729 mg/kg

LEGEND:

- Elevated Walkway
- Planned Excavation
- Actual Excavation
- Historical Remediation Area (2007/2010)
- Former Railroad
- Demolished Building
- Area of Concern Boundary
- Elevation Contour (10 ft interval)
- Elevation Contour (2 ft interval)

N

0 160 320
Scale In Feet

Camp James A. Garfield

FIGURE 3-4a
LOAD LINE 3
EXCAVATION CONFIRMATION SAMPLES
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 6/23/2021

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LL3EA6Acs-750-001-SO
Sidewall North
B(a)a 0.445 mg/kg
BaP 0.308 mg/kg
BbF 0.391 mg/kg
DA 0.0331mg/kg

LL3EA6Acs-749-001-SO
Sidewall West
B(a)a 6.37 mg/kg
BaP 4.42 mg/kg
BbF 5.86 mg/kg
DA 0.374 mg/kg

EA-6a Sidewall East
No sample (due to topography there is not an eastern sidewall)

Building EA-6a

LL3EA6Acs-751-001-SO
Sidewall South
B(a)a 1.72 mg/kg
BaP 01.24 mg/kg
BbF 1.56 mg/kg
DA 0.128 mg/kg

EA-6a Sidewall West - 20' extension westward, bedrock in bottom at 2' bgs, soil beyond 20' had already been excavated for EA-6c (no soil to sample)

Building EA-6b

LL3EA6Bcs-747-001-SO
Sidewall East
B(a)a 0.235 mg/kg
BaP 0.156 mg/kg
BbF 0.18 mg/kg
DA 0.02 mg/kg

LL3EA6Bcs-745-001-SO
Sidewall North
B(a)a 1.51 mg/kg
BaP 1.01 mg/kg
BbF 1.45 mg/kg
DA 0.0839 mg/kg

Building EA-6c

LL3EA6Bcs-748-001-SO
Bottom
B(a)a 1.39 mg/kg
BaP 0.925 mg/kg
BbF 1.32 mg/kg
DA 0.0822 mg/kg

LL3EA6Bcs-744-001-SO
Sidewall West
B(a)a 0.162 mg/kg J
BaP 0.114 mg/kg
BbF 0.174 mg/kg
DA 0.015 mg/kg J

LL3EA6Bcs-746-001-SO
Sidewall South
B(a)a 0.29 mg/kg
BaP 0.168 mg/kg
BbF 0.267 mg/kg
DA 0.0227 mg/kg

EB-4 Sidewall North 4
Bedrock, no sample

LL3EB4cs-753-001-SO
Sidewall West 4
PCB-1254 0.348 mg/kg

LL3EB4cs-571-001-SO
Bottom 3
PCB-1254 0.752 mg/kg

LL3EB4cs-572-001-SO
Sidewall North 3
PCB-1254 1.37 mg/kg

LL3EB4cs-563-001-SO
Sidewall East 3
PCB-1254 1.33 mg/kg

LL3EB4cs-567-001-SO
Sidewall West 3
PCB-1254 2.16 mg/kg

LL3EB4cs-566-001-SO
Sidewall North 2
PCB-1254 0.0573 mg/kg

LL3EB4cs-570-001-SO
Sidewall South 3
PCB-1254 0.571 mg/kg

LL3EBcs-586-001-SO
Sidewall North 1 - 3' extension
PCB-1254 2.92 mg/kg

EB-4 Sidewall East 2
Concrete, no sample

Building EB-4

EB-4 Bottom 2
Bedrock, no sample

LL3EBcs-555-001-SO
Sidewall North 1
PCB-1254 11.3 mg/kg

LL3EB4cs-565-001-SO
Sidewall South 2
PCB-1254 0.041 mg/kg U

LL3EB4cs-562-001-SO
Sidewall West 1
PCB-1254 1.13 mg/kg

LL3EB4cs-569-001-SO
Sidewall East 1
PCB-1254 0.487 mg/kg

LL3EB4cs-564-001-SO
Sidewall West 2
PCB-1254 0.0943 mg/kg

LL3EB4cs-568-001-SO
Bottom 1
PCB-1254 9 mg/kg

LL3EB4cs-561-001-SO
Sidewall South 1
PCB-1254 1.68 mg/kg

Building EB-4	
Planned Area (square feet)	6,996
Actual Area Excavated (square feet)	7,517
Treatment Interval (feet bgs)	1-3
Actual Maximum Depth Excavated (feet bgs)	4.0
In-situ volume excavated (CY)	705.97
In-situ contaminated volume excavated (CY)	440.22
COCs	PCB-1254

Portions of excavation encountered bedrock at 0 to 2.5' bgs; Maximum depth excavated 4' bgs

Building EA-6 (a)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	800
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1
In-situ volume excavated (CY)	45
In-situ contaminated volume excavated (CY)	45
COCs	PAHs B(a)a, BaP, BbF, DA

Based on exceedance in Sidewall West sample, excavation extended 20 feet westward (extension excavated to bedrock at 2' bgs).

Building EA-6 (b)	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1
In-situ volume excavated (CY)	14.81
In-situ contaminated volume excavated (CY)	15
COCs	PAHs BaP, DA

Building EA-6 (c)	
Planned Area (square feet)	4,062
Actual Area Excavated (square feet)	4,062
Treatment Interval (feet bgs)	4.5-6
Actual Maximum Depth Excavated (feet bgs)	6.5
In-situ volume excavated (CY)	603.48
In-situ contaminated volume excavated (CY)	28.71
COCs	PAHs B(a)a, BaP, BbF, DA

Bedrock encountered 1 to 6.5' bgs, no soil on sidewalls in treatment interval, one pocket had soils in the treatment interval (approximately 10CY of impacted soils from an area just south of EA6b excavated to bedrock).

LEGEND:

- Elevated Walkway
- Planned Excavation
- Actual Excavation
- Historical Remediation Area (2007/2010)
- Former Railroad
- Demolished Building
- Area of Concern Boundary
- Elevation Contour (10 ft interval)
- Elevation Contour (2 ft interval)

U = Data qualifier, analyzed but not detected above reported sample quantitation limit or was qualified as not detected due to blank contamination.
J = Data qualifier, analyte positively identified; approximate concentration

Sample ID
ISM Sample Location Description
Analytical Result (meets RGO)
Analytical Result (exceeds RGO)

N

0 80 160
Scale In Feet

Camp James A. Garfield

FIGURE 3-4b
LOAD LINE 3 EA-6 and EB-4
EXCAVATION CONFIRMATION SAMPLES
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 7/21/2021

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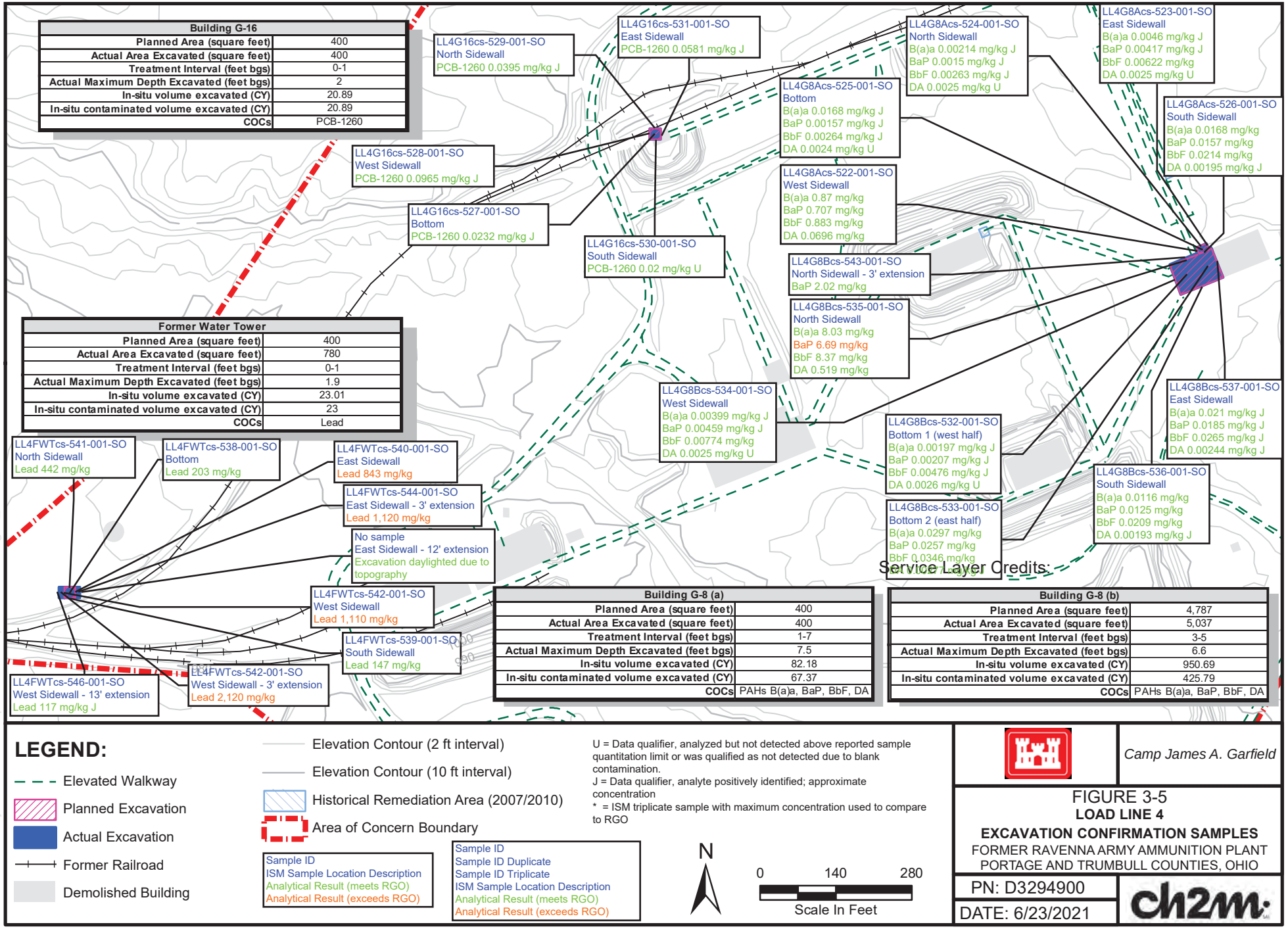

Camp James A. Garfield

FIGURE 3-5
LOAD LINE 4
EXCAVATION CONFIRMATION SAMPLES
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900
DATE: 6/23/2021

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Active Area Channel	
Planned Area (square feet)	400
Actual Area Excavated (square feet)	400
Treatment Interval (feet bgs)	0-2
Actual Maximum Depth Excavated (feet bgs)	2.6
In-situ volume excavated (CY)	35.65
In-situ contaminated volume excavated (CY)	35.65
COCs	TNT, 2,6-DNT, BAP

LL12AACcs-344-001-SO
North Sidewall
BAP 0.015 mg/kg
TNT 0.35 mg/kg
2,6-DNT 0.2 mg/kg U

LL12AACcs-343-001-SO
East Sidewall
BAP 0.00654 mg/kg
TNT 0.88 mg/kg
2,6-DNT 0.2 mg/kg U

LL12AACcs-341-001-SO
West Sidewall
BAP 0.00398 mg/kg J
TNT 2 mg/kg
2,6-DNT 0.1 mg/kg J

LL12AACcs-340-001-SO
Bottom
BAP 0.0172 mg/kg
TNT 0.65 mg/kg
2,6-DNT 0.2 mg/kg U

LL12AACcs-342-001-SO
South Sidewall
BAP 0.0015 mg/kg J
TNT 0.71mg/kg
2,6-DNT 0.091 mg/kg J

Building FF-19 (a)	
Planned Area (square feet)	625
Actual Area Excavated (square feet)	868
Treatment Interval (feet bgs)	0-1
Actual Maximum Depth Excavated (feet bgs)	1.7
In-situ volume excavated (CY)	24.66
In-situ contaminated volume excavated (CY)	24.66
COCs	PAHs B(a)a, BaP, BbF, DA

LL12FF19Acs-336-001-SO
Bottom
B(a)a 0.605 mg/kg
BaP 0.496 mg/kg
BbF 0.65 mg/kg
DA 0.0898 mg/kg

LL12FF19Acs-336-001-SO
North Sidewall
B(a)a 1.69 mg/kg
BaP 1.28 mg/kg
BbF 1.63 mg/kg
DA 0.237 mg/kg J

LL12FF19Acs-339-001-SO
West Sidewall
B(a)a 3.73 mg/kg
BaP 3.09 mg/kg
BbF 4.26 mg/kg
DA 0.54 mg/kg

LL12FF19A
East Sidewall
Railroad Ballast - no sample

LL12FF19Acs-346-001-SO
West Sidewall - 3' extension
BaP 3.56 mg/kg

LL12FF19Acs-337-001-SO *
LL12FF19Acs-337-002-SO
LL12FF19Acs-337-003-SO
South Sidewall
B(a)a 6.68 mg/kg (max)
BaP 5.35 mg/kg (max)
BbF 6.07 mg/kg (max)
DA 0.864 mg/kg (max)

LL12FF19Acs-350-001-SO
West Sidewall - 6' extension
BaP 0.543 mg/kg J

LL12FF19Acs-345-001-SO *
LL12FF19Acs-345-002-SO
LL12FF19Acs-345-003-SO
South Sidewall - 3' extension
BaP 1.72 mg/kg (max)

LL12FF19Ccs-325-001-SO
West Sidewall 1
B(a)a 4.96 mg/kg
BaP 3.96 mg/kg
BbF 4.85 mg/kg
DA 0.368 mg/kg

LL12FF19Ccs-324-001-SO
West Sidewall 2
B(a)a 0.371 mg/kg J
BaP 0.335 mg/kg J
BbF 1.07 mg/kg J
DA 0.821 mg/kg J

LL12FF19Ccs-326-001-SO
North Sidewall 1
B(a)a 2.11 mg/kg
BaP 1.45 mg/kg
BbF 1.93 mg/kg
DA 0.198 mg/kg

LL12FF19Bcs-332-001-SO
North Sidewall
B(a)a 1.36 mg/kg
BaP 1.13 mg/kg
BbF 1.49 mg/kg
DA 0.156 mg/kg

LL12FF19Ccs-347-001-SO
West Sidewall 1 - 3' extension
BaP 1.73 mg/kg

LL12FF19Ccs-330-001-SO
North Sidewall 2
B(a)a 0.243 mg/kg
BaP 0.158 mg/kg
BbF 0.248 mg/kg
DA 0.0229 mg/kg

LL12FF19Bcs-335-001-SO
LL12FF19Bcs-335-002-SO
LL12FF19Bcs-335-003-SO *
East Sidewall
B(a)a 3.33 mg/kg
BaP 2.6 mg/kg
BbF 3.23 mg/kg J
DA 0.494 mg/kg

LL12FF19Ccs-329-001-SO
LL12FF19Ccs-329-002-SO *
LL12FF19Ccs-329-003-SO
East Sidewall 2
B(a)a 0.276 mg/kg J
BaP 0.164 mg/kg J
BbF 0.199 mg/kg J
DA 0.0213 mg/kg J

LL12FF19Bcs-334-001-SO
West Sidewall
B(a)a 1.45 mg/kg
BaP 1.19 mg/kg
BbF 1.48 mg/kg
DA 0.148 mg/kg

LL12FF19Bcs-331-001-SO
Bottom
B(a)a 0.734 mg/kg
BaP 0.691 mg/kg
BbF 0.976 mg/kg
DA 0.0746 mg/kg

LL12FF19Ccs-323-001-SO
Bottom 2 (eastern lobe)
B(a)a 1.81 mg/kg
BaP 1.34 mg/kg
BbF 1.65 mg/kg
DA 0.185 mg/kg

Building FF-19 (b)	
Planned Area (square feet)	625
Actual Area Excavated (square feet)	625
Treatment Interval (feet bgs)	0-4.5
Actual Maximum Depth Excavated (feet bgs)	5.1
In-situ volume excavated (CY)	106.2
In-situ contaminated volume excavated (CY)	106.2
COCs	PAHs B(a)a, BaP, BbF, DA

LL12FF19Bcs-333-001-SO *
LL12FF19Bcs-333-002-SO
LL12FF19Bcs-333-003-SO
South Sidewall
B(a)a 2.38 mg/kg
BaP 1.94 mg/kg
BbF 2.59 mg/kg
DA 0.259 mg/kg J

LL12FF19Ccs-321-001-SO
Bottom 1
B(a)a 5.41 mg/kg
BaP 4.04 mg/kg
BbF 4.94 mg/kg
DA 0.391 mg/kg

LL12FF19Ccs-327-001-SO
South Sidewall 2
B(a)a 0.388 mg/kg
BaP 0.265 mg/kg
BbF 0.363 mg/kg
DA 0.0361 mg/kg

LL12FF19Ccs-348-001-SO
Bottom 1 - 3' extension
BaP 0.364 mg/kg

LL12FF19Ccs-349-001-SO
East Sidewall 1 - 3' extension
BaP 0.182 mg/kg

Building FF-19 (c)	
Planned Area (square feet)	983
Actual Area Excavated (square feet)	1,112
Treatment Interval (feet bgs)	0-2.5
Actual Maximum Depth Excavated (feet bgs)	3.2
In-situ volume excavated (CY)	92.54
In-situ contaminated volume excavated (CY)	92.54
COCs	PAHs B(a)a, BaP, BbF, DA

LL12FF19Ccs-324-001-SO
South Sidewall 1
B(a)a 1.16 mg/kg
BaP 0.863 mg/kg
BbF 1.07 mg/kg
DA 0.108 mg/kg

LL12FF19Ccs-322-001-SO
East Sidewall 1
B(a)a 4.16 mg/kg
BaP 3.58 mg/kg
BbF 6.14 mg/kg
DA 0.438 mg/kg

LEGEND:

- Elevated Walkway
- Planned Excavation
- Actual Excavation
- Former Railroad
- Demolished Building
- Elevation Contour (2 ft interval)
- Elevation Contour (10 ft interval)
- Historical Remediation Area (2007/2010)
- Area of Concern Boundary

Sample ID
ISM Sample Location Description
Analytical Result (meets RGO)
Analytical Result (exceeds RGO)

Sample ID
Sample ID Duplicate
Sample ID Triplicate
ISM Sample Location Description
Analytical Result (meets RGO)
Analytical Result (exceeds RGO)

N

U = Data qualifier, analyzed but not detected above reported sample quantitation limit or was qualified as not detected due to blank contamination.
J = Data qualifier, analyte positively identified; approximate concentration
* = ISM triplicate sample with maximum concentration used to compare to RGO

0 80 160
Scale In Feet

Camp James A. Garfield

FIGURE 3-6
LOAD LINE 12
EXCAVATION CONFIRMATION SAMPLES
FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

PN: D3294900

DATE: 6/23/2021

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