

**Draft**  
**Completion Report for the Sand Creek**  
**Culvert Replacement and Rocket Ridge Slope Stabilization at**  
**RVAAP-004-R-01 Open Demolition Area #2**

**Former Ravenna Army Ammunition Plant/Camp Ravenna**  
**Portage and Trumbull Counties, Ohio**

**Contract No. W912QR-12-D-0004**  
**Delivery Order No. 0003**

**Prepared for:**



**United States Army Corps of Engineers**  
**Louisville District**  
**600 Dr. Martin Luther King, Jr. Place, Room 821**  
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**August 29, 2017**

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1 PLACEHOLDER FOR OHIO EPA REVIEW AND APPROVAL

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## CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Tetra Tech, Inc. has completed the preparation of this Completion Report for the Sand Creek Culvert Replacement and Rocket Ridge Slope Stabilization for RVAAP-004-R-01 Open Demolition Area #2 at the former Ravenna Army Ammunition Plant (RVAAP)/Camp Ravenna. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This independent technical review included review of methods, procedures, and materials used and disposed; conformity to Ohio Army National Guard specifications; and reasonableness of the results, including whether the product met the customer's needs consistent with law and existing USACE policy.




\_\_\_\_\_  
Scott Nesbit  
Project Manager



\_\_\_\_\_  
Date



\_\_\_\_\_  
Robert Davis  
Independent Technical Review Team Leader



\_\_\_\_\_  
Date

1 **DRAFT**  
2 **COMPLETION REPORT FOR THE SAND CREEK CULVERT REPLACEMENT**  
3 **AND ROCKET RIDGE SLOPE STABILIZATION AT**  
4 **RVAAP-004-R-01 OPEN DEMOLITION AREA #2**

5 Former Ravenna Army Ammunition Plant/Camp Ravenna  
6 Portage and Trumbull Counties, Ohio

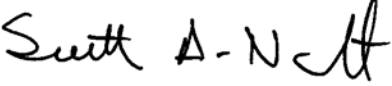
7 **Prepared for:**  
8 United States Army Corps of Engineers  
9 Louisville District


10 **Prepared by:**  
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12 661 Andersen Drive  
13 Pittsburgh, Pennsylvania 15220

14 Multiple Award Remediation Contract  
15 Contract No. W912QR-12-D-0004  
16 Delivery Order No. 0003

17 August 29, 2017

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19 **AND APPROVED FOR SUBMITTAL BY:**

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## DOCUMENT DISTRIBUTION LIST

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Nathaniel Peters II, USACE–Louisville	2	1
Gail Harris, AR Manager–Camp Ravenna	2	2
Pat Ryan, Leidos–REIMS	Transmittal	Letter

2	AR	Administrative Record
3	ARNG-ILE-CR	Army National Guard–Installation Logistics Environmental–Cleanup Restoration
4	ARNG	Camp Ravenna–Army National Guard–Camp Ravenna Joint Military Training Center
5	CO	Contacting Office
6	DERR	Division of Environmental Response and Revitalization
7	EPA	Environmental Protection Agency
8	OHARNG	Ohio Army National Guard Camp Ravenna Joint Military Training Center
9	REIMS	Ravenna Environmental Information Management System
10	USACE	United States Army Corps of Engineers

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## ACRONYMS AND ABBREVIATIONS

2	AASHTO	American Association of State Highway and Transportation Officials
3	ARNG	Army National Guard
4	BEM	Buried Explosion Module
5	Camp Ravenna	Camp Ravenna Joint Military Training Center
6	DAR	daily activity reports
7	DOT	Department of Transportation
8	E&SC	erosion and sediment control
9	GOH	Glenn O. Hawbaker, Inc.
10	km	kilometer
11	MEC	munitions and explosives of concern
12	mm	millimeter
13	MDAS	material documented as safe
14	MPPEH	material potentially presenting an explosive hazard
15	NAB	North Atlantic Division, Baltimore District
16	NWP	Nationwide Permit
17	ODA2	Open Demolition Area #2
18	OHARNG	Ohio Army National Guard
19	PCN	Pre-Construction Notification
20	PE	Professional Engineer
21	PWS	Performance Work Statement
22	RVAAP	Ravenna Army Ammunition Plant
23	Tetra Tech, Inc.	Tetra Tech NUS, Inc.
24	USACE	United States Army Corps of Engineers
25	USFWS	United States Fish and Wildlife Service
26	UXO	unexploded ordnance
27	WBG	Winklepeck Burning Grounds

**EXECUTIVE SUMMARY**

Tetra Tech recently completed work at RVAAP-004-R-01 Open Demolition Area #2 (ODA2) at Camp Ravenna Joint Military Training Center (Camp Ravenna) under Contract No. W912QR-12 D-0004, Delivery Order No. 0003. The Performance Work Statement (PWS) for this Delivery Order included:

- Slope stabilization at Rocket Ridge;
- Removal and replacement of the culvert located where Sand Creek crosses the ODA2 access road; and
- Removal of munitions items from the culvert area.

This document will detail the processes by which each of these tasks were completed.

Rocket Ridge, located downstream of the Sand Creek culvert in the central portion of Camp Ravenna within ODA2, required stabilization along Sand Creek because creek flow was undercutting the toe of the hillside, and a storm event after a prior site restoration caused the slope to slump. The hillside was stabilized by planting native woody vegetation on the slope and placing Type A boulders in Sand Creek to promote flow along a previously diverted creek bed, which is now used as the main creek channel.

The ODA2 access road had previously been damaged from erosion of the northern banks of Sand Creek when storm water overtopped the roadway. It was also reported that existing backfill for the culvert was comingled with munitions items. As part of completion of the PWS, the concrete pipe culverts were removed, recycled, and replaced by an open-bottom concrete-arch culvert capable of passing the peak flow of the 100-year storm. A concrete pad was constructed on top of the culvert to facilitate travel across the culvert.

During construction of the new culvert, excavated munitions were characterized and removed from the culvert area.

## 1.0 PROJECT DESCRIPTION

This report describes the activities undertaken by Tetra Tech to complete the slope stabilization at Rocket Ridge, culvert replacement at the Sand Creek crossing, and munitions removal at the Former Ravenna Army Ammunition Plant (RVAAP)/Camp Ravenna Joint Military Training Center (Camp Ravenna) in Ravenna, Ohio. The work was performed in accordance with the design set forth in the Final Basis of Design and Work Plan (Tetra Tech, 2016).

This work was performed in accordance with United States Corps of Engineers (USACE), Louisville District Contract No. W912QR-12 D-0004, Delivery Order No. 0003. The performance objectives were specified in the Revised Performance Work Statement issued by the United States Army on June 26, 2015 (USACE, 2015).

### 1.1 BACKGROUND

Camp Ravenna 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 1-1). 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 CSX System Railroad on the south; Garret, McCormick, and Berry roads on the west; Norfolk Southern Railroad on the north; and State Route 534 on the east.

The installation was formerly known as the RVAAP and was used as a load, assemble, and pack facility for munitions. Administrative control of the facility (21,683 acres) has been transferred to the United States Property and Fiscal Officer for Ohio and was 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) Directorate and OHARNG, encompasses investigation and cleanup of past activities over the entire 21,683 acres of the former RVAAP.

The Open Demolition Area #2 (ODA2) is an approximately 317.4-acre area located in the central portion of the facility within Portage County (Figure 1-2). ODA2 was previously used as an open burning and open detonation site. Rocket Ridge area is located adjacent to Sand Creek within ODA2. A site map showing the location of the Rocket Ridge and Sand Creek work areas within ODA2 is presented as Figure 1-2.

Munitions items had been observed within the backfill used for construction of a roadway located along Sand Creek South of RVAAP-05 Winklepeck Burning Grounds (WBG) and upstream of the Rocket Ridge area within ODA2. Anecdotal evidence suggests that material presenting a potential explosive hazard (MPPEH) may have been inadvertently incorporated into the backfill during

repairs in this area following flood events. Prior actions at ODA2 involved removal of munitions items along Rocket Ridge adjacent to Sand Creek.

## **1.2 PROJECT OBJECTIVES**

Three project objectives were established in the Performance Work Statement (PWS):

- Slope stabilization at Rocket Ridge;
- Removal and replacement of the culvert located where Sand Creek crosses the ODA2 access road; and
- Removal of munitions items from the culvert area.

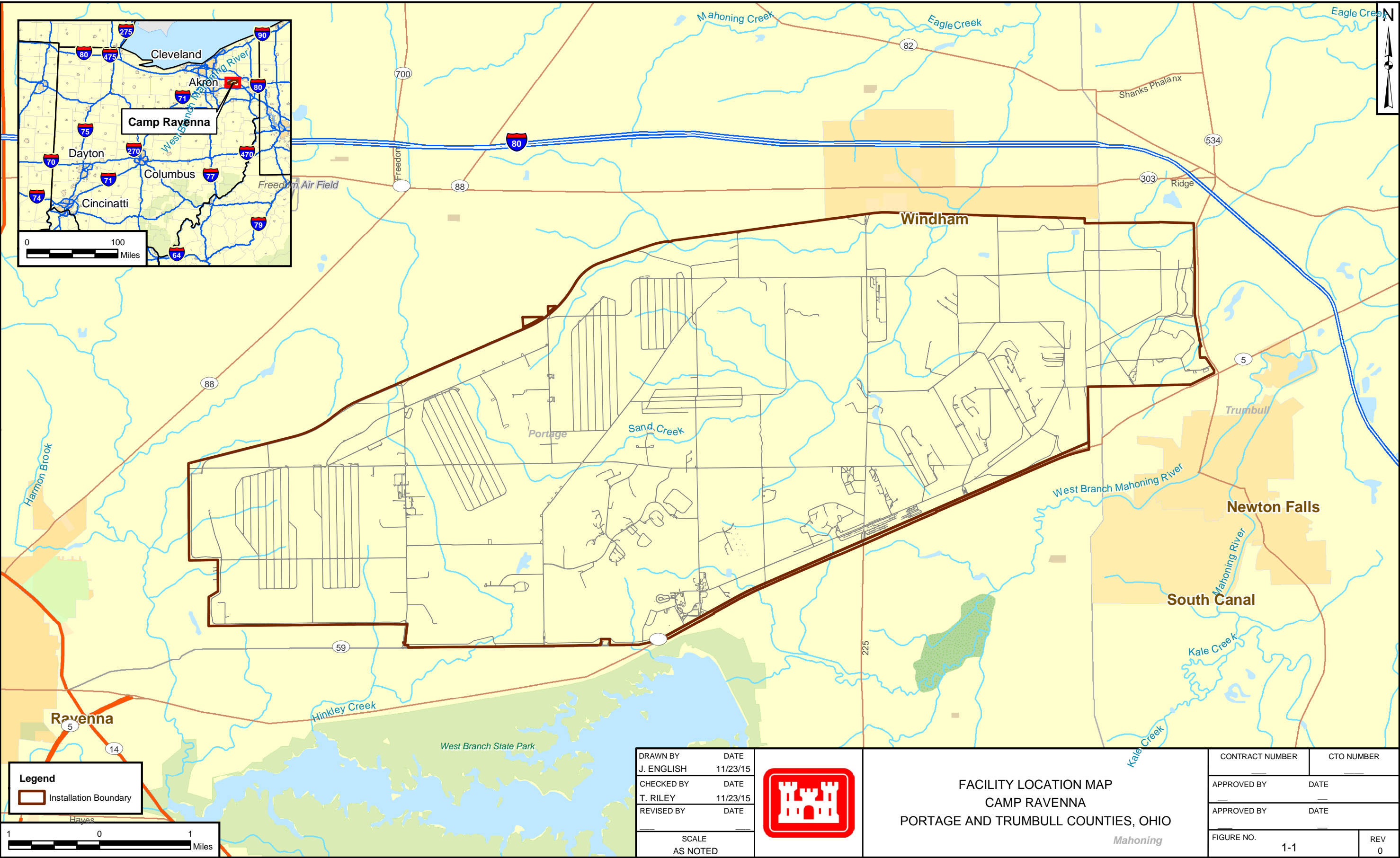
The slope in the Rocket Ridge area was stabilized by planting native woody vegetation on the slope and by placing boulders at the location where Sand Creek diverges northwest of the slope. The native woody vegetation used for stabilization consisted primarily of native selected hardwoods consistent with those allowed by the Camp Ravenna Integrated Natural Resources Management Plan.

The existing Sand Creek culvert was removed at the ODA2 access road crossing in response to erosion of the roadway from overtopping during storm events. Coincident with the culvert installation, the PWS included the removal of munitions items present within the roadway backfill.

## **1.3 DOCUMENT ORGANIZATION**


This document is organized as follows:

- Section 1.0, Project Description, provides an overview of site conditions and project objectives;
- Section 2.0, Open Demolition Area #2 Activities, provides descriptions of the activities required to stabilize the Rocket Ridge slope, replace the Sand Creek culvert, and remove munitions from excavated material at the Sand Creek culvert;
- Section 3.0, References, provides a list of documents referenced in this document.







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## 2.0 OPEN DEMOLITION AREA #2 ACTIVITIES

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The activities discussed in this section were documented through daily activity reports (DARs) distributed to OHARNG, ARNG, and USACE. These DARs have been included in Appendix A along with photographs of the activities.

### 2.1 ROCKET RIDGE SLOPE STABILIZATION

#### 2.1.1 Tree Planting

On May 16 and 17, 2016, Tetra Tech conducted tree-planting activities at Rocket Ridge in accordance with the approved plan (Figure 2-1). The tree planting effort was conducted to enhance slope stability at Rocket Ridge.

Two types of trees, *Quercus rubra* (Red Oak) and *Acer rubrum* (Red Maple), were purchased from a nursery within 200 miles of Camp Ravenna (Musser Forests, Inc., Indiana, PA) and planted at the site. A 40-foot by 60-foot grid was established for tree planting while maintaining an approximate 8-foot spacing between trees. Tree species were alternated between rows. After each tree was planted, a bamboo rod was placed in the ground adjacent to each tree to indicate the tree's location. Biodegradable flagging was attached to each bamboo rod to assist in locating the trees in the future. A total of 53 trees were planted at Rocket Ridge.

On June 6, 2016, Tetra Tech returned to ODA2 to water and evaluate the growth of the trees. Water from Sand Creek was used to water the trees. Tetra Tech also returned to water and inspect tree growth on June 22, 2016. During this inspection, the grassy, hillside vegetation was cleared next to each tree by hand to promote growth. On June 14, 2017, Tetra Tech evaluated tree growth at ODA2 and determined that approximately 80% of the original 53 trees were alive.

#### 2.1.2 Boulder Placement

On February 8, 2017, boulder placement within Sand Creek was initiated. To facilitate placement, wooden beams were placed within the creek to allow a hydraulic excavator to place the boulders at the planned location without disrupting the creek flow.

Approximately 40 tons of Ohio Department of Transportation (DOT) Type A stone were transported to Rocket Ridge and placed along the southern edge of the creek channel to direct flow into the diverted creek channel. Due to the boulders obstruction of the southern, original channel, the diverted creek channel is now the stream's main channel. A diagram of boulder placement is included as Figure 2-2.

Following the completion of activities at Rocket Ridge the disturbed areas were regraded. Restoration activities are further discussed in Section 2.4.



## **2.2 SAND CREEK CULVERT REPLACEMENT**

Prior to mobilization of heavy equipment for work at Rocket Ridge and the Sand Creek culvert, Tetra Tech developed a Basis of Design and Work Plan for the new culvert installation (Tetra Tech, 2016b). The plan was reviewed and approved by RVAAP restoration program stakeholders (i.e., USACE, ARNG, OHARNG, Ohio EPA). In addition, a Pre-Construction Notification (PCN) was prepared and submitted to USACE Pittsburgh (Appendix B). Approval of the PCN and coverage under Nationwide Permit (NWP) #14 was granted by USACE Pittsburgh in a letter dated August 12, 2016 (Appendix B). The work activities were conducted in compliance with the PCN and NWP #14

A kickoff meeting was held on February 6, 2017, at the OHARNG Environmental Office at Camp Ravenna. The meeting consisted of representatives from USACE, OHARNG, ARNG, Tetra Tech, and Tetra Tech's subcontractor Glenn O. Hawbaker, Inc. (GOH). The meeting agenda included topics such as safety, logistics, schedule, and coordination with onsite USACE North Atlantic, Baltimore (NAB) District personnel.

Equipment was mobilized to the site on February 6, 2017. The equipment mobilized to the staging area included two excavators, one mini-excavator, one bulldozer, and one equipment trailer.

Operations at the Sand Creek culvert began on February 7, 2017. The culvert work area is shown on Figure 2-3, and the Sand Creek culvert site layout is shown on Figure 2-4.

### **2.2.1 Tree Removal**

The Northern Long-Eared Bat is a threatened species protected under the Endangered Species Act. As such the cutting of trees with a diameter of 3 inches or greater is prohibited during the roosting season, April 1 to September 30, according to the US Fish and Wildlife Service (USFWS). On March 29 and 30, 2016, Tetra Tech personnel mobilized to ODA2 at the Sand Creek culvert to remove trees within the project area with the potential to be habitat for the Northern Long-Eared Bat.

### **2.2.2 Surveying**

Pre-construction and as-built surveys were conducted on February 8, and April 26, 2017, respectively, by Campbell & Associates of Akron, Ohio. Figures detailing pre- and post-construction conditions are provided in Appendix C.

### **2.2.3 Erosion and Sediment Controls**

Erosion and sediment controls (E&SCs) were established according to the proposed site plan (Appendix C) where applicable to prevent runoff from entering nearby water bodies. Silt fence was installed along the northern and southern banks of Sand Creek downstream (east) of the

1 culvert. Following completion of culvert installation and backfilling, additional silt fencing was  
2 established near the culvert wing walls and further east along the creek bank. These E&SCs were  
3 inspected weekly beginning after demobilization and remained intact until the surrounding  
4 revegetation efforts reached 70-percent cover on May 18, 2017.

#### 5       **2.2.4 Creek Diversion**

6 Removal of the existing concrete pipe culverts began on February 9, 2017. To facilitate removal,  
7 Sand Creek flow was diverted into parallel, 24-inch, corrugated, high-density polyethylene pipes  
8 placed beneath the roadway on the northern side of the work area. Concrete slabs from the existing  
9 culvert wing walls and riprap placed within Sand Creek were placed by excavator to divert the  
10 creek flow into the bypass pipes on February 13, 2017. In addition to the diversion, a 6-inch diesel  
11 pump, 2-inch diesel pump, and 2-inch submersible pump were used to dewater the work area  
12 during culvert removal and replacement activities by translocating the water downstream.

#### 13       **2.2.5 Excavation**

14 At the initiation of culvert removal and replacement activities, a small dam within Sand Creek  
15 downstream of the original culvert was removed to allow unobstructed flow from the plunge pool  
16 adjacent to the work site. This lowered the creek water level and facilitated construction of the  
17 new culvert foundations without flooding. In addition to dam removal, a small wooden bridge was  
18 constructed across Sand Creek downstream of the work area. This allowed construction equipment  
19 to traverse between the northern and southern sides of the work site during culvert construction  
20 activities.

21 Excavation of the existing concrete pipe culverts began on February 13, 2017. Materials excavated  
22 along the northern side of the work area were stockpiled northeast of the culvert, and materials  
23 excavated from the southern side of the work area were stockpiled southeast of the culvert. The  
24 stockpiled materials were screened to identify and remove munitions items. Munitions items  
25 recovered from the excavated soil were transferred for later disposition to onsite representatives  
26 of the USACE NAB staff who were onsite completing a munitions removal action at ODA2.  
27 Munitions recovery is further discussed in Section 2.5.

28 Removal of the existing concrete pipe culvert segments was completed on February 14, 2017. The  
29 removed culvert segments were staged southeast of the construction site until disposition at project  
30 completion. Forty-five tons of concrete pipe were recycled at Earth 'n Wood Products, Inc.,  
31 Canton, Ohio. Bill of lading and recycling documentation for the three truckloads of recycled  
32 culvert material is included in Appendix D.

### **2.2.6 Foundation and Culvert Installation**

Prior to installation of the Sand Creek culvert foundations, a Tetra Tech Professional Engineer (PE) inspected the soil present at the base of each excavation to confirm conditions were suitable for supporting the foundations and culvert. Elevations were established throughout the construction with a rotary laser level starting with the base of each excavation. Approximately 4 inches of American Association of State Highway and Transportation Officials (AASHTO) No. 57 stone were then placed in the base of each excavation as a sub-foundation. The elevation was again established with a rotary laser prior to installing the foundations. Excavators began laying the culvert and wing wall foundations from west to east on the northern side and then the southern side of the culvert starting February 17, 2017. The final foundation was installed on February 23, 2017. After the each foundation was installed, top of foundation elevation measurements were taken, and the stone sub-foundation was reapportioned to achieve the design elevations.

Prior to installation of the arch culvert and wing walls, Ohio DOT Type D stone was placed on the creek bed.

On February 24, 2017, a 20-ton-capacity crane was delivered to the site to lay the wing walls, head walls, and culvert sections. The wing walls, head walls, and culvert sections were delivered on five flatbed trucks. The wing walls and head walls were placed along the access road approaching the culvert, and the three culvert segments were placed on the foundation with the crane. Subsequently, the crane placed the eight sections of head walls and wing walls. The installation of each section met the allowable tolerances indicated in the design. On March 2 and 3, 2017, concrete was poured into the culvert and wing wall foundations. Photographs of the activities are included with the DARs in Appendix A.

### **2.2.7 Backfilling and Concrete Pad**

Excavated soil from culvert removal was used as backfill behind the wing walls. Prior to reuse, the soil was surveyed by unexploded ordnance (UXO) technicians. Detector-aided surveys were completed on 100 percent of the soil removed during culvert construction.

Due to the clayey nature of the soil, it was determined not to be suitable for use beneath the roadway. Therefore, Type 304 aggregate was used as backfill over the culvert and beneath the concrete pad.

Construction of the 6-inch-thick concrete pad on top of the culvert was completed on March 22, 2017. The concrete pad included a 14-foot-wide road surface with a 2-foot shoulder on each side and a 20-foot length perpendicular to Sand Creek. Photographs of the concrete pad are included in Appendix A.

## **2.3 SITE RESTORATION**

### **2.3.1 Diversion Pipe Removal**

At the conclusion of culvert installation activities, the corrugated creek diversion pipes were removed, and the diversion channels cut on the eastern and western sides of the road north of the culvert were backfilled with the screened soil from culvert construction.

### **2.3.2 Grading**

Following installation of the concrete pad, debris from brush clearing was relocated to the southern staging area. During demobilization, the staging areas, embankments, and ODA2 access road were graded by an excavator.

### **2.3.3 Revegetation**

On March 29, 2017, disturbed areas surrounding the culvert were hydroseeded in accordance with Camp Ravenna's revegetation guidance. Tetra Tech monitored the progress of the vegetation growth on a weekly basis and left E&SCs in place until vegetation reached approximately 70 percent cover on May 18, 2017.

## **2.4 MUNITION ITEMS SCREENING**

On February 27, 2017, screening of stockpiled soil from culvert removal to remove munitions items was initiated. UXO technicians surveyed the soil with magnetometers and visually inspected the excavated soil, which was spread into 2-foot lifts to facilitate screening. Surveying of excavated soil was completed on March 3, 2017.

Approximately 1,303 pounds of material documented as safe (MDAS) and 355 items classified as MPPEH were recovered during culvert excavation activities and subsequent UXO screening. The recovered items were relinquished to USACE NAB personnel for identification, management, and disposition. USACE NAB personnel transferred the items temporarily to a storage magazine at ODA2 where they were stored for future destruction at the Buried Explosion Module (BEM). Items recovered included 2.36-inch rocket motors, 155-millimeter (mm) projectiles and fragments, 90-mm projectiles, 75-mm armor-piercing projectiles, 75-mm high explosive projectiles, anti-personnel mines, smoke canisters, miscellaneous fuses, and other fragments.

No munitions and explosives of concern (MEC) items were recovered as part of these activities.

## **2.5 REPORTING**

At the completion of the activities at the Sand Creek culvert, Tetra Tech submitted the Compliance Certification Form included in Appendix E to USACE Pittsburgh confirming that the activities permitted under NWP #14 had been completed.



**BARE ROOT TREES TO BE PLANTED**

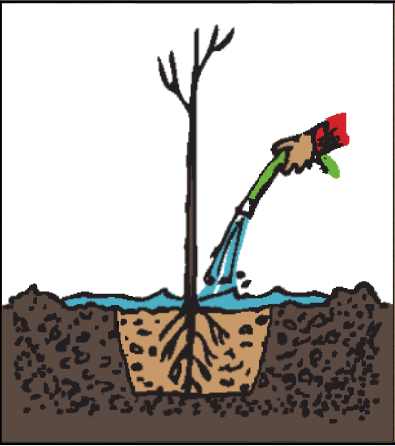
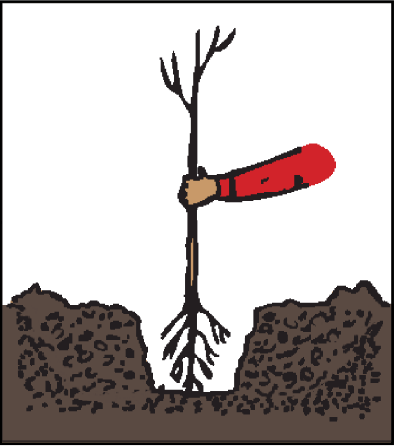
- 1. Mix of Northern Red Oak (*Quercus rubra*) and Red Maple (*Acer rubrum*).
- 2. Obtain trees from a nursery within 200 miles of Camp Ravenna. One possible source of trees is Musser Forests (Indiana, PA).

**HANDLING TREES UPON ARRIVAL**

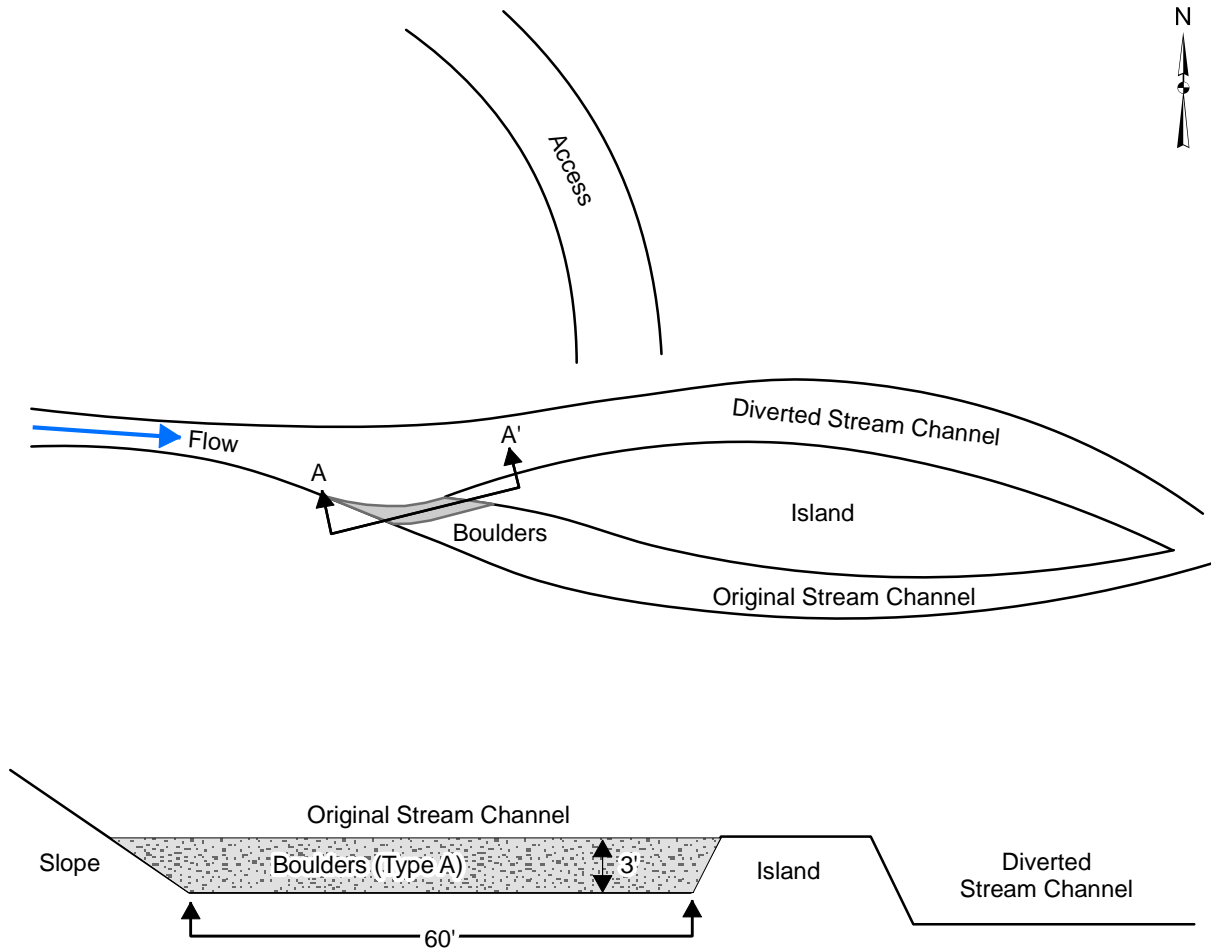
- 1. Unpack trees as soon as they arrive.
- 2. Untie bundles and spread trees out.
- 3. Sprinkle tops and roots with water.
- 4. Cover roots with damp packing material and cover packing material with straw, white plastic or burlap to prevent drying.
- 5. Do not soak roots in water.
- 6. Keep roots moist and well covered until actual planting.
- 7. Plant within 2 days of arrival.

**PLANTING BARE ROOT TREES**

- 1. Trees will be carried to planting site in a planting bag or white plastic bag to keep them cool and moist. A piece of moist burlap can also be used to keep roots covered while planting.
- 2. Plant in 40 foot by 60 foot area on an 8-foot by 8-foot spacing.



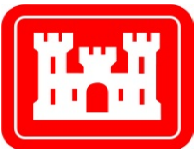
- 3. Dig hole large enough so roots can spread in a natural position without curling. Any excessively long roots should be trimmed back. A slow-release fertilizer tablet may be placed in bottom of hole and allow some soil to fall over it before inserting roots. Roots should not touch fertilizer tablet.
- 4. Pack soil firmly around roots and add water. Use heel to firmly pack soil. Make sure to leave no air pockets that would allow roots to dry out. Leave slight depression to collect water or rainfall.
- 5. Do not incorporate or top dress with granular or liquid fertilizer when planting. However, slow release fertilizer tablets may be used at planting time provided there is an inch or so of soil between tablet and roots.
- 6. *Correct depth:* Soil line should be about one inch above top root. Roots are then spread out. Soil is tamped in a slight depression to catch rain water.  
*Wrong depth (tree is planted too deep):* Roots are twisted and curled.  
*Wrong depth (tree is planted too shallow):* Roots are exposed to air, which may kill the tree.
- 7. Water each tree immediately after planting and weekly for one month.
- 8. Once planted, insert a bamboo stake into the ground next to each tree and attach a bright color biodegradable flag to each stake.



#### BOULDERS TO BE PLACED INTO SAND CREEK ORIGINAL STREAM CHANNEL

1. Place approximately 40 tons of boulders as shown in Sand Creek original stream channel. Boulders will be a specified material from Ohio DOT, Construction and Materials Specifications, Section 703.19.B, Dump Rock Fill and Channel Protection, Type A with exception. Boulders shall not contain any recycled Portland cement concrete (RPCC). (a.) Type A material has at least 85 percent of the total material by weight larger than an 18-inch (0.5 m) but less than a 30-inch (0.8 m) square opening and at least 50 percent of the total material by weight larger than a 24-inch (0.6 m) square opening. Furnish material smaller than an 18-inch (0.5 m) square opening that consists predominantly of rock spalls and rock fines, and that is free of soil.
2. Use a clean and leak-free excavator within the stream bed of Sand Creek diverted stream channel.
3. Move loose materials from original stream channel bed prior to boulder placement. Place loose materials against the boulders when complete.
4. Deliver boulders from the north side of Sand Creek using the existing access.
5. Pick-up boulders from the north side of Sand Creek and place boulders to dimensions as shown. Do not place/fill above island height.

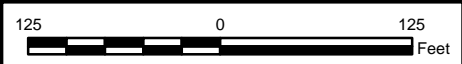
Plan view and cross-section are not shown to scale.

DRAWN BY J. ENGLISH	DATE 12/14/15		ROCKET RIDGE BOULDER PLACEMENT CAMP RAVENNA PORTAGE AND TRUMBULL COUNTIES, OHIO	CONTRACT NUMBER _____	CTO NUMBER _____
CHECKED BY T. RILEY	DATE 03/24/16			APPROVED BY _____	DATE _____
REVISED BY _____	DATE _____			APPROVED BY _____	DATE _____
SCALE AS NOTED				FIGURE NO. 2-2	REV 0





Aerial photograph provided by  
ESRI's ArcGIS Online World  
Imagery map service (© 2012  
ESRI and its data suppliers).  
Projection: NAD 1983 SPCS  
Ohio North (Feet).



DRAWN BY	DATE
J. ENGLISH	01/06/16
CHECKED BY	DATE
T. RILEY	01/07/16
REVISED BY	DATE
SCALE	AS NOTED



SAND CREEK CULVERT WORK AREA  
CAMP RAVENNA  
PORTAGE AND TRUMBULL COUNTIES, OHIO

CONTRACT NUMBER	CTO NUMBER
W912QR-12-D-0004	___
APPROVED BY	DATE
___	___
APPROVED BY	DATE
___	___
FIGURE NO.	REV
2-3	0





CONTRACT NUMBER		CTO NUMBER	
APPROVED BY		DATE	
APPROVED BY		DATE	
FIGURE NO.		2-4	REV 0
SAND CREEK CULVERT SITE LAYOUT CAMP RAVENNA PORTAGE AND TRUMBULL COUNTIES, OHIO			
DRAWN BY	DATE	SCALE	
J. ENGLISH	04/27/17	AS NOTED	
CHECKED BY	DATE		
G. HEALY	05/22/17		
REVISED BY	DATE		

**Legend**

— Road

REIMS Wetland - Palustrine Forest

Projection: NAD 1983  
SPCS Ohio North (Feet).



### 3.0 REFERENCES

- 1
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3 Former Ravenna Army Ammunition Plant/Camp Ravenna, Portage and Trumbull Counties, Ohio.  
4 June 9.
- 5 Tetra Tech, 2016b. Final Basis of Design and Work Plan for the Sand Creek Culvert Replacement  
6 at the Open Demolition Area #2 Crossing (RVAAP-004-R-01 Open Demolition Area #2 MRS)  
7 Military Munitions Response Program, Former Ravenna Army Ammunition Plant, Camp  
8 Ravenna, Portage and Trumbull Counties, Ohio. September 16.
- 9 USACE, 2015. Performance Work Statement for the Soil Removal Action at RVAAP-05 WBG,  
10 Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Camp Ravenna, Portage  
11 and Trumbull Counties, Ohio, Louisville District. June 25.
- 12 ARNG, 2014. Integrated Natural Resources Management Plan and Approved Grass Seed Mixes. July  
13 29.