

**Final
No Further Action Record of Decision for
RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site
Version 1.0**

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

**Contract No. W912DR-09-D-0005
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Prepared for:



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14. ABSTRACT This Record of Decision (ROD) provides the final remedy of No Further Action (NFA) that was selected for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site (MRS) at the former Ravenna Army Ammunition Plant under the Military Munitions Response Program (MMRP). The selection of the final remedy included a public meeting that was presented by the U.S. Army followed by a 30-day public comment period in accordance with its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations 300). The recommendation of NFA at the MRS under the MMRP is protective of human health and the environment and meets the statutory requirements for cleanup standards established in Section 121 of CERCLA.					
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Ohio EPA—Ohio Environmental Protection Agency

RVAAP—former Ravenna Army Ammunition Plant

USACE—United States Army Corps of Engineers

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Acronyms and Abbreviations

AMEC	AMEC Earth and Environmental, Inc.
amsl	above mean sea level
ARNG	U.S. Army National Guard
bgs	below ground surface
Camp Ravenna	Camp Ravenna Joint Military Training Center
CB&I	CB&I Federal Services LLC
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i>
cm/s	centimeters per second
Community Relations Plan	<i>Final Community Relations Plan for the Ravenna Army Ammunition Plant Restoration Program in Portage and Trumbull Counties, Ohio</i>
COL	colonel
DERR	Division of Environmental Response and Revitalization
DDFO	<i>Director's Final Findings and Orders (DDFO) for RVAAP</i>
e ² M	engineering-environmental Management, Inc.
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
HHRA	human health risk assessment
MC	munitions constituents
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and/or explosives of concern
MEC HA	<i>Interim Munitions and Explosives of Concern Hazard Assessment Methodology</i>
MKM	MKM Engineers, Inc.
mm	millimeter
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
NFA	No Further Action
NFA Proposed Plan	<i>No Further Action Proposed Plan for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site</i>
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
RAB	Restoration Advisory Board
RI	Remedial Investigation
RI Report	<i>Final Remedial Investigation Report for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site</i>
ROD	Record of Decision
RVAAP	former Ravenna Army Ammunition Plant
Shaw	Shaw Environmental & Infrastructure, Inc.
SI	Site Inspection
SI Report	<i>Final Site Inspection Report</i>

Acronyms and Abbreviations (continued)

TNT	trinitrotoluene
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
UXO	unexploded ordnance
Work Plan	<i>Final Work Plan Addendum for Military Munitions Response Program Remedial Investigation Environmental Services</i>

PART I: DECLARATION

A. Site Name and Location

This No Further Action (NFA) Record of Decision (ROD) addresses investigations conducted at RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site (MRS) under the Military Munitions Response Program (MMRP) at the former Ravenna Army Ammunition Plant (RVAAP), now known as the Camp Ravenna Joint Military Training Center (Camp Ravenna). Camp Ravenna is located in east-central Portage County and southwestern Trumbull County, Ohio, approximately 3 miles east-northeast of Ravenna and approximately 1 mile northeast of the city of Newton Falls (**Figure 1**). The Water Works #4 Dump MRS is located at the south-central portion of Camp Ravenna (**Figure 2**). The United States (U.S.) Environmental Protection Agency (EPA) *Comprehensive Environmental Response, Compensation, and Liability Information System* Identifier for Camp Ravenna is OH5210020736.

B. Statement of Basis and Purpose

The U.S. Army National Guard (ARNG) is the lead agency and presents the decision that NFA is considered as the recommended alternative for the Water Works #4 Dump MRS. NFA is selected in accordance with the requirements of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) of 1980, as amended by the *Superfund Amendments and Reauthorization Act* of 1986 and the *National Oil and Hazardous Substances Pollution Contingency Plan*. The ARNG's decision is based on information contained in the Administrative Record file for the Water Works #4 Dump MRS.

The Ohio Environmental Protection Agency (Ohio EPA), the lead regulatory agency as per the *Director's Final Findings and Orders (DFFO) for RVAAP* (DFFO; Ohio EPA, 2004), reviewed and concurred with the *No Further Action Proposed Plan for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site* (NFA Proposed Plan; CB&I Federal Services [CB&I], 2015a). The NFA Proposed Plan presented the ARNG's preliminary recommendations concerning how best to address the Water Works #4 Dump MRS where no munitions and/or explosives of concern (MEC) were found that had the potential to originate from historical activities associated with manufacturing, storing, transporting, testing, training, and/or disposal that occurred at the facility. The NFA decision under the MMRP at this MRS satisfies the requirements of the DFFO (Ohio EPA, 2004).

C. Description of the Selected Remedy

NFA under CERCLA is necessary for the Water Works #4 Dump MRS under the MMRP. No evidence of MEC or a source of munitions constituents (MC) from MEC or munitions-


related activities were found at the MRS during the Remedial Investigation (RI) field work that was conducted under the MMRP.

D. Statutory Determination

No MEC were encountered at the Water Works #4 Dump MRS, and there are no explosive hazards or sources for MC. The recommendation of NFA at the MRS under the MMRP is protective of human health and the environment and meets the statutory requirements for cleanup standards established in Section 121 of CERCLA.

E. Authorizing Signatures and Support Agency Acceptance

Approved by:



HALLET BRAZELTON, JR.
Acting Chief,
I&E, Army National Guard

11/12/19
Date

PART II: DECISION SUMMARY

A. Site Name, Location, and Description

Camp Ravenna, formerly known as RVAAP, is located in northeastern Ohio within Portage and Trumbull Counties and is approximately 3 miles east-northeast of the City of Ravenna and 1 mile west-northwest of the City of Newton Falls. The facility is federally owned and is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Newton Falls, Charlestown, and Wayland (**Figure 1**).

Camp Ravenna was formerly utilized as a load, assemble, and pack facility. Administrative control of the 21,683-acre facility has been transferred to the U.S. Property and Fiscal Officer for Ohio in a series of transfers, with the last one taking place in September 2013. The property is licensed to the Ohio Army National Guard (OHARNG) for use as a military training site, Camp Ravenna. When the RVAAP was operational, Camp Ravenna did not exist and the entire 21,683-acre parcel was a federal government-owned, contractor-operated, industrial facility. The RVAAP restoration program involves cleanup of former production areas across the facility related to former operations under the RVAAP.

The Water Works #4 Dump MRS is 0.77 acres in size and is located in the south-central portion of Camp Ravenna (**Figure 2**). The MRS consists of an open cleared area that is currently undeveloped vacant land with no improvements (CB&I, 2015b). **Figure 3** presents the current MRS boundaries and cultural features that remain near the Water Works #4 Dump MRS.

B. Site History

The RVAAP was constructed between 1940 and 1941 for depot storage and ammunition assembly/loading. During operations as an ammunition plant, the RVAAP was a government-owned and contractor-operated industrial facility. Industrial operations at the facility consisted of 12 munitions assembly facilities, referred to as “load lines.” Load Lines 1 through 4 were used to melt and load 2,4,6-trinitrotoluene (TNT) and Composition B (mixture of TNT and Research Department Explosive) into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls were cleaned with water and steam. Following cleaning, the “pink water” waste water, which contained TNT and Composition B, was collected in concrete holding tanks, filtered, and pumped into

unlined ditches for transport to earthen settling ponds. Load Lines 5 through 11 were used to manufacture fuzes, primers, and boosters. From 1946 to 1949, Load Line 12 was used to produce ammonium nitrate for explosives and fertilizers prior to use as a weapons demilitarization facility.

In 1950, the facility was placed in standby status and operations were limited to renovation, demilitarization, and normal maintenance of equipment, along with storage of munitions. Production activities were resumed from July 1954 to October 1957 and again from May 1968 to August 1972. In addition to production missions, various demilitarization activities were conducted at facilities constructed at Load Lines 1, 2, 3, and 12. Demilitarization activities included disassembly of munitions and explosives melt-out and recovery operations using hot water and steam processes. Periodic demilitarization of various munitions continued through 1992.

In addition to production and demilitarization activities at the load lines, other facilities at the RVAAP include MRSs that were used for the burning, demolition, and testing of munitions. These burning and demolition grounds consist of large parcels of open space or abandoned quarries. Other areas of concern present at the facility include landfills, an aircraft fuel tank testing area, and various general industrial support and maintenance facilities (Science Applications International Corporation, 2011).

The Water Works #4 Dump MRS originally encompassed 6.15 acres of mostly forested area that included a small clearing, located immediately north of the Water Works #4 treatment building and west of Load Line 7 in the south-central portion of the facility (**Figure 2**). The Water Works #4 Dump MRS was presumably used for the intentional dumping of nonexplosive metal parts of large-caliber ordnance rounds. These dumping activities reportedly occurred from 1941 to 1949. Large-caliber casings were previously found scattered lying on the ground surface and partially buried throughout the wooded area north of the clearing, as were metal parts identified as ogives from World War I-era 155 millimeter (mm) Mk I shrapnel projectiles (engineering-environmental Management, Inc. [e²M], 2007). Ogives are the curved or tapered nose of the 155mm projectile that improved streamlining (Naval Explosive Ordnance Disposal Technology Center, 1981).

B.1 e²M 2007 Site Investigation

In 2007, a Site Inspection (SI) was completed at the Water Works #4 Dump MRS under the MMRP. The MRS at the time of the SI was the original 6.15 acres and consisted of the small clearing area and the surrounding wooded area where the large-caliber casings and projectile ogives were historically found (**Figure 3**). The activities conducted for the SI included a line abreast magnetometer survey and metal detector unexploded ordnance (UXO) survey at the open field portion of the MRS and a metal detector UXO survey only at the wooded area of

the MRS. The SI field work identified 20 155mm Mk I shrapnel projectile ogives that were scattered throughout the northern wooded area of the MRS. UXO-qualified personnel inspected the ogives and determined that they contained no energetic material and were inert. The ogives were classified by the UXO-qualified personnel as material documented as safe (MDAS) and were considered to be munitions debris (MD). Several closely spaced subsurface anomalies were detected during the SI field activities in the open field portion of the MRS; however, these anomalies were not intrusively investigated at that time.

A sample for the evaluation of MC was collected in surface soil from the open field portion of the MRS during the SI field work and was analyzed for Target Analyte List metals, propellants, and explosives using EPA Methods 6010C and 8330B. The sample was compared to the EPA Region 9 Residential Soil Regional Screening Levels, the screening criteria used at the time of the SI. Thallium was the only metal detected above one-tenth the noncarcinogenic Regional Screening Level at an estimated (i.e., “B” flagged) concentration of 1.1 milligrams per kilogram; however, thallium was dismissed as non-munitions related and was not considered to be a MC. No explosives or propellants were detected in the soil sample.

No MEC were found during the SI field work, and it was recommended, and subsequently approved by the stakeholders, in the *Final Site Inspection Report* (SI Report; e²M, 2008) that the MRS footprint be reduced from 6.15 to 0.77 acres to include only the open field area of the MRS where subsurface anomalies were detected. The original MRS acreage in the SI and the recommended reduced area (i.e., the current MRS) are presented on **Figure 3**. Since no MC were identified above the screening criteria during the SI field work, further characterization of MC was not recommended for the MRS under the MMRP (e²M, 2008).

B.2 CB&I 2011 Remedial Investigation

Between September and December 2011, CB&I conducted the field work for the RI at the Water Works #4 Dump MRS. During development of the *Final Work Plan Addendum for Military Munitions Response Program Remedial Investigation Environmental Services* (Work Plan; Shaw Environmental & Infrastructure, Inc. [Shaw], 2011), the MRS boundaries that were recommended in the SI Report (e²M, 2008) were reevaluated. It was recommended in the Work Plan that the areas where the MD was identified in the wooded area outside of the current MRS be further investigated for potential MEC. Therefore, the 5.38 acres removed from the MRS during the SI were reintroduced for further evaluation as part of the RI, which is hereafter referred to as the “expanded investigation area.” The RI field work included a Schonstedt-assisted visual survey at the reduced 0.77-acre MRS and the expanded investigation area. The field work at the open field area that constitutes the current MRS also included a full-coverage digital geophysical mapping.

Five ogives were found on the ground surface at the expanded investigation area during the Schonstedt-assisted visual survey. Two ogives were found during the intrusive investigation at the MRS at a maximum depth of 1 inch below ground surface (bgs). All of the ogives were classified as MDAS by the UXO-qualified personnel in the field and were considered as MD. The remainder of the anomalies identified during the intrusive investigation was considered to be non-munitions related or "Other Debris." No MEC were identified during the Schonstedt-assisted visual survey or the intrusive investigation at the MRS.

Sampling for MC at the MRS was not proposed during development of the RI field work unless MEC or concentrated areas of MD were found (Shaw, 2011). No MEC were identified at the Water Works #4 Dump MRS during RI field activities, and only individual MD consisting of ogives were found at isolated locations. Therefore; sampling for MC was not warranted.

To date, no MEC have been found at the Water Works #4 Dump MRS and the only MD historically found were ogives on the ground surface or in the shallow subsurface at a maximum depth of 1 inch bgs. The RI field work confirmed the results of previous investigations at and outside the MRS where no MEC have ever been found; therefore, an explosive safety hazard is not present at the Water Works #4 Dump MRS. Based on the results of the MC sampling during the SI field activities and the MEC investigation portion of the RI field activities, it was determined that no potential source of MC was present at the Water Works #4 Dump MRS (CB&I, 2015b).

C. Highlights of Community Participation

Using the RVAAP community relations program, the ARNG and the Ohio EPA have interacted with the public through news releases, public meetings, reading materials, direct mailing, an internet website, and receiving and responding to public comments. Specific items of the community relations program include the following:

- **Restoration Advisory Board (RAB):** The U.S. Army established the RAB in 1996 to promote community involvement in the U.S. Department of Defense environmental cleanup activities and to allow the public to review and discuss the progress with decision makers. RAB meetings are typically held every 4 months, except during the summer months, and are open to the public.
- **RVAAP Community Relations Plan:** The Final *Community Relations Plan for the Ravenna Army Ammunition Plant Restoration Program in Portage and Trumbull Counties, Ohio* (Community Relations Plan; U.S. Army Corps of Engineers [USACE], 2015) was prepared to establish processes to keep the public informed of activities being conducted as part of the RVAAP restoration program.

- **RVAAP Internet Website:** The U.S. Army established an internet website in 2004 for the RVAAP restoration program. This internet website is accessible to the public at www.rvaap.org.

In accordance with Section 117(a) of CERCLA and Section 300.430(f)(2) of the *National Oil and Hazardous Substances Pollution Contingency Plan*, the ARNG released the NFA Proposed Plan for the Water Works #4 Dump MRS (CB&I, 2015a) to the public in May 2015. The NFA Proposed Plan and other project-related documents were made available to the public in the Administrative Record maintained at Camp Ravenna and in the two Information Repositories at Reed Memorial Library in Ravenna, Ohio and Newton Falls Public Library in Newton Falls, Ohio. The notice of availability for the NFA Proposed Plan was sent to the following media outlets: radio stations, television stations, and newspapers (*Newton Falls Press*, *Youngstown Vindicator*, *Warren Tribune-Chronicle*, *Akron Beacon Journal*, and *Ravenna Record Courier*), as specified in the Community Relations Plan (USACE, 2015). The notice of availability initiated the 30-day public comment period beginning June 4, 2015, and ending July 3, 2015.

The ARNG held a public meeting on June 3, 2015, at the Newton Falls Community Center, 52 East Quarry Street, Newton Falls, Ohio 44444, to present the NFA Proposed Plan to the public. At this meeting, representatives of the ARNG provided information and answered questions about the results of the MMRP-related investigations at the Water Works #4 Dump MRS. A transcript of the public meeting is available to the public and has been included in the Administrative Record. Responses to the verbal and written comments received at this meeting and during the public comment period are included in the Responsiveness Summary, which is Part III of this ROD. The ARNG considered the public's input from the public meeting on the NFA Proposed Plan in selecting NFA under the MMRP at the Water Works #4 Dump MRS.

D. Scope and Role of Response Action

The Water Works #4 Dump MRS is federal property that is licensed to the OHARNG for future use as a military training site. The purpose of the RI field work was to evaluate for the presence of MEC associated with the historical findings of MD at the MRS and the expanded investigation area in support of its intended use. The selected remedy must be protective of the receptors associated with the future land use.

No explosive safety hazards have ever been found at the Water Works #4 Dump MRS or the expanded investigation area during the RI or previous investigations. Further, since no MEC or concentrated areas of MD have been identified, there is no potential source of MC. Therefore, there are no source materials or impacted environmental media at the MRS or the

expanded investigation area. Further, there is no nearby surface water features associated with the MRS.

No other investigations are currently ongoing at the MRS under the MMRP or the Installation Restoration Program. Although not anticipated, if any potential explosive safety hazards are identified at this MRS that were not found during the RI field work, then they would be addressed under the MMRP as a separate response action.

E. Summary of Site Characteristics

Characteristics, nature and extent of contamination, and the conceptual site model for the Water Works #4 Dump MRS are based on the various assessments, investigations, and/or removal actions that were conducted at the MRS.

E.1 Topography/Physiography

This section presents the discussion of the topography and physiography characteristics at Camp Ravenna and the Water Works #4 Dump MRS. Camp Ravenna, in general, is located within the Southern New York section of the Appalachian Plateaus physiographic province. Rolling topography containing incised streams and dendritic drainage patterns are prevalent in the province. Rounded ridges, filled major valleys, and areas covered with glacially derived unconsolidated deposits were the product of glaciation in the Southern New York section. In addition, bogs, kettle lakes, and kames are evidence of past glacial activity in the province; however, none are located at the MRS. Old stream drainage patterns were disturbed and wetlands were created within the province as a result of past glacial activity (e²M, 2008).

The topography at the Water Works #4 Dump MRS and surrounding area trends downgradient toward the southeast. The topography at the 0.77-acre MRS is relatively flat at approximately 1,150 feet above mean sea level (amsl). There is an elevation change of approximately 20 feet within the expanded investigation area that surrounds the MRS. The highest elevation is approximately 1,165 feet amsl at the northwest corner of the expanded investigation area, and the lowest elevation is approximately 1,145 amsl at the southeast corner of the investigation area (CB&I, 2015b).

E.2 Soils and Geology

This section presents the discussion of the soils and geology characteristics at Camp Ravenna and at the Water Works #4 Dump MRS. Based on regional geology, the facility consists of Mississippian- and Pennsylvanian-age bedrock strata, which dip to the south at approximately 5 to 10 feet per mile. The bedrock is overlain by unconsolidated glacial deposits of varying thickness.

Bedrock is overlain by deposits of Wisconsin-age Lavery Till and Hiram Till in the western and eastern portions of the facility, respectively. The thickness of the glacial deposits varies throughout the facility, ranging from ground surface in parts of the eastern portion of the facility to an estimated 150 feet in the south-central portion of the facility.

Bedrock is present near the ground surface in many locations at Camp Ravenna, particularly at the east end of the facility. Where glacial deposits are still present, their distribution and character are indicative of ground moraine origin. Laterally discontinuous groupings of yellow-brown, brown, and gray silty clays to clayey silts, with sand and rock fragments are present. Glacial-age standing-water-body deposits may be present at the facility, in the form of uniform light gray silt deposits over 50 feet thick. At approximately 200 feet bgs, the Mississippian Cuyahoga Group is present throughout most of the facility. In the northeastern corner of the facility, the Meadville Shale Member of the Cuyahoga Group is present close to the surface. The Meadville Shale Member of the Cuyahoga Group is blue-gray silty shale characterized by alternating thin beds of sandstone and siltstone.

The Sharon Member of the Pennsylvanian Pottsville Formation unconformably overlies the Meadville Shale Member of the Mississippian Cuyahoga Group. A relief of as much as 200 feet exists in Portage County, which can be seen in the Sharon Member thickness variations. The Sharon Member is made up of shale and a conglomerate.

The Sharon Member conglomerate unit is identified as highly porous, permeable, cross-bedded, frequently fractured, and weathered quartzite sandstone, which is locally conglomeratic and has an average thickness of 100 feet. A thickness of as much as 250 feet exists in the Sharon Conglomerate where it was deposited in a broad channel cut into Mississippian rocks. In marginal areas of the channel, the conglomerate unit may thin out to approximately 20 feet, or in places, it may be missing owing to nondeposition on the uplands of the early Pennsylvanian erosional surface. Thin shale lenses occur intermittently within the upper part of the conglomerate unit.

The Sharon Member shale unit is identified as a light to dark gray fissile shale, which overlies the conglomerate in some locations; however, it has been eroded throughout the majority of the facility. The Sharon Member outcrops in many locations in the eastern half of the facility.

The remaining members of the Pottsville Formation overlie the Sharon Member in the western portion of the facility. Due to erosion and because the land surface is above the level of deposition, the Pottsville Formation is not found in the eastern half of the facility.

The Connoquenessing Sandstone Member, which is sporadic, relatively thin-channel sandstone comprised of gray to white, coarse-grained quartz with a higher percentage of

feldspar and clay than the Sharon Conglomerate, unconformably overlies the Sharon Member. The Mercer Member, which is found above the Connoquenessing Sandstone Member, consists of silty to carbonaceous shale with many thin and discontinuous lenses of sandstone in its upper part. The Homewood Sandstone Member unconformably overlies the Mercer Member and consists of the uppermost unit of the Pottsville Formation. The Homewood Sandstone Member ranges from well-sorted, coarse-grained, white quartz sandstone to a tan, poorly sorted, clay-bonded, micaceous, medium- to fine-grained sandstone. The Homewood Sandstone Member occurs as a caprock on bedrock highs in the subsurface (MKM Engineers, Inc. [MKM], 2007).

The soils identified at the facility are generally derived from the Wisconsin-age silty clay glacial till. The majority of native soil at the facility has been reworked or removed during construction activities (MKM, 2007). The major soil types found at the facility are silt or clay loams, ranging in permeability from 6.0×10^{-7} to 1.4×10^{-3} centimeters per second (cm/s) (U.S. Department of Agriculture [USDA] et al., 1978).

The Water Works #4 Dump MRS is located over the Mercer Member geologic formation, and the bedrock elevation ranges from 1,100 to 1,150 feet amsl (AMEC Earth and Environmental, Inc. [AMEC], 2008). No bedrock formations were observed or encountered at the MRS during the RI; however, bedrock at the MRS appears to be relatively shallow, at depths less than 10 feet bgs across the MRS (USDA et al., 1978).

Two native soil types, the Mahoning Silt Loam and the Mitiwanga Silt Loam, are present at the Water Works #4 Dump MRS and expanded investigation area. Both soil types have 2 to 6 percent slopes (AMEC, 2008).

The Mahoning Silt Loam is the predominant soil type at the MRS and at the eastern portion of the expanded investigation area. This soil type is characterized with medium to rapid runoff, severe seasonal wetness, and slow permeability. The average permeability of the Mahoning Silt Loam with a 2 to 6 percent slope is 9.1×10^{-5} cm/s (USDA et al., 1978).

The Mitiwanga Silt Loam is the predominant soil type in the expanded investigation area and a small area at the west side of the MRS. This is a nearly level soil type in wide, flat areas such as the MRS and the expanded investigation area. Permeability is very slow in the subsoil and underlying glacial till with an average rate of 1.04×10^{-7} cm/s. Runoff is slow, and ponding is common after heavy rains or seasonally wet weather (USDA et al., 1978).

E.3 Hydrology and Hydrogeology

This section presents the discussion of the hydrology and hydrogeology characteristics at Camp Ravenna and the Water Works #4 Dump MRS. The facility is located within the Ohio River Basin. The major surface stream at the facility is the west branch of the Mahoning

River, which flows adjacent to the western end of the facility, generally from north to south, before flowing into the Michael J. Kirwan Reservoir. After leaving the reservoir, the west branch joins the Mahoning River east of the facility.

Surface water features within Camp Ravenna include a variety of streams, lakes, ponds, floodplains, and wetlands. Numerous streams drain the facility, including approximately 19 miles of perennial streams. The combined stream length at the facility is 212 linear miles (AMEC, 2008).

Three primary watercourses drain Camp Ravenna: (1) the south fork of Eagle Creek, (2) Sand Creek, and (3) Hinkley Creek. Eagle Creek and its tributaries, including Sand Creek, are designated as State Resource Waters. With this designation, the stream and its tributaries fall under the state's antidegradation policy. These waters are protected from any action that would degrade the existing water quality.

Approximately 153 acres of ponds are found on the facility. Most of the ponds were created by beaver activity or small man-made dams and embankments. Some were constructed within natural drainage ways to function as settling ponds for effluent or runoff. No bogs, kettle lakes, or kames have been identified as being present within the MRS (AMEC, 2008).

A planning-level survey (i.e., desktop review of wetlands data and resources [National Wetlands Inventory maps, aerials, etc.]) for wetlands was conducted for the entire facility, including the MRS, and no wetlands have been identified at Water Works #4 Dump MRS. Wetlands located within the facility include seasonally saturated wetlands, wet fields, and forested wetlands. Sand and gravel aquifers are present within the buried-valley and outwash deposits in Portage County. In general, the aquifer is too thin and localized to provide large quantities of water; however, yields are sufficient for residential water supplies. Wells located on the facility were primarily located within the sandstone facies of the Sharon Member (MKM, 2007).

No groundwater monitoring wells have been specifically installed for the Water Works #4 Dump MRS. Based on the facility groundwater data collected for the Facility-Wide Groundwater Monitoring Program, the groundwater elevation at the MRS and the immediate vicinity appears to be at a potentiometric high at approximately 1,100 feet amsl. The groundwater appears to flow in all directions from this higher formation. The approximate depth to groundwater in the unconsolidated aquifer at the Water Works #4 Dump MRS and the immediate surrounding area is 50 feet bgs (Environmental Quality Management, Inc., 2012).

E.4 Ecology

This section presents the discussion of the ecological habitats and receptors at Camp Ravenna and at the Water Works #4 Dump MRS. Camp Ravenna has a diverse range of vegetation and habitat resources. Habitats present within the facility include large tracts of closed-canopy hardwood forest, scrub/shrub open areas, grasslands, wetlands, and open-water ponds and lakes. Vegetation at the facility can be grouped into three categories: (1) herb dominated, (2) shrub dominated, and (3) tree dominated. Tree-dominated areas are most abundant, covering approximately 13,000 acres of the facility. Shrub vegetation covers approximately 4,200 acres. A plant species survey identified 18 vegetation communities on the facility. The facility has seven forest formations, four shrub formations, eight herbaceous formations, and one nonvegetated formation (AMEC, 2008).

The plant communities present at and in the vicinity of the Water Works #4 Dump MRS and the expanded investigation area are a combination of red maple woods and oak-maple-tulip tree forest classifications (AMEC, 2008), while the open field consists mainly of grasses. Vegetation at the current MRS (open field area) may have been influenced/disturbed by the former use of the land as a dumping area.

Biological inventories have not occurred specifically within the MRS boundary, although no confirmed sightings of federal- or state-listed species have been reported. Although there is the potential for federal, state-listed, or rare species to be within the MRS boundary, the potential is unlikely due to the minimal size of the MRS (Camp Ravenna, 2010).

E.5 Nature and Extent of Contamination

The determination of the nature and extent of contamination at the Water Works #4 Dump MRS is based on the data collected during the RI field work under the MMRP and presented in the *Final Remedial Investigation Report for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site* (RI Report; CB&I, 2015b). Under the MMRP, the evaluation for nature and extent of contamination is inclusive of MEC and MC that may be present at an MRS. MEC and MC are known to be present at other MRSs at Camp Ravenna; however, those media and MRSs are being addressed separately from the Water Works #4 Dump MRS included in this NFA ROD.

As outlined in the RI Report (CB&I, 2015b), no evidence of MEC was found at the MRS and there are no explosive hazards or sources for MC. Therefore, there is no evidence of contamination associated with MEC or MC under the MMRP at the Water Works #4 Dump MRS.

E.6 Contaminant Fate and Transport

The fate and transport analysis for the Water Works #4 Dump MRS in the RI Report concluded that there were no MEC that justified concerns for explosive hazards. Since no MEC were found during the RI field activities at the MRS, there are no sources of potential release of MC and a fate and transport analysis for MC at the MRS was not required (CB&I, 2015b).

F. Current and Potential Future Land Uses

Current activities at the Water Works #4 Dump MRS include maintenance, environmental sampling, and natural resource management activities. Possible users associated with the current activities at the MRS include facility personnel, contractors, and potential trespassers (CB&I, 2015b).

The OHARNG future use at the MRS is military training. The potential users for the future land use are the National Guard Trainee and the Engineering School Instructor (USACE, 2005).

G. Summary of Site Risks

The overall recommendation of NFA under the MMRP must be protective of the human and environmental receptors identified for the MRS. The planned method for risk evaluation for explosive safety hazards at an MRS is the *Interim Munitions and Explosives of Concern Hazard Assessment Methodology* (MEC HA; EPA, 2008). In addition to the risk assessment for MEC, screening-level risk assessments for both human health and ecological risks were proposed when environmental media that represented the potential for MC were identified and collected (Shaw, 2011). The evaluation of risk is required to estimate risk reduction for any response action, including NFA, and the evaluation and determinations for risk at the Water Works #4 Dump MRS, as presented in the RI Report (CB&I, 2015b), are discussed in this section.

G.1 MEC Hazard Assessment

The MEC HA (EPA, 2008) addresses human health and safety concerns associated with potential exposure to MEC at a MRS under a variety of site conditions, including various cleanup scenarios and land use assumptions. If an explosive hazard is identified, the MEC HA evaluation will include the information available for the MRS up to and including the RI field activities and provide a scoring summary for the current and future land use activities. If no explosive hazard is found at the MRS, then there is no need to calculate a MEC HA score since there are no human health safety concerns.

No MEC representing an explosive safety hazard at the Water Works #4 Dump MRS were identified during the RI field activities. Therefore, calculation of a MEC HA score was not warranted for the MRS and the MEC exposure pathways for all receptors at the MRS are incomplete (CB&I, 2015b).

G.2 Human Health and Ecological Risk Assessment

The purpose of a human health risk assessment (HHRA) is to document whether MRS conditions may pose a risk to current or future receptors and to identify which, if any, MRS conditions need to be addressed further in the CERCLA process. An ecological risk assessment (ERA) evaluates the potential for adverse effects posed to ecological receptors from potential releases at a MRS.

Since no MEC or concentrated areas of MD were identified between the SI and RI field activities at the Water Works #4 Dump MRS, media sampling for MC was not warranted. Therefore, an HHRA or an ERA was not required to be performed for the MRS and no risk associated with MC was identified for human or ecological receptors at the MRS (CB&I, 2015b).

H. Documentation of No Significant Change

The NFA Proposed Plan for the Water Works #4 Dump MRS (CB&I, 2015a) was released for public comment in May 2015. The Proposed Plan recommended NFA under the MMRP for the MRS. After the public comment period, no significant changes regarding the recommended alternative, as originally identified in the NFA Proposed Plan, were necessary or appropriate.

PART III: RESPONSIVENESS SUMMARY FOR PUBLIC COMMENTS ON THE PROPOSED PLAN

A. Overview

In May 2015, the ARNG released the NFA Proposed Plan for the Water Works #4 Dump MRS (CB&I, 2015a) for public comment. A 30-day public comment period was held between June 4, 2015, and July 3, 2015. The ARNG hosted a public meeting on June 3, 2015, to present the preferred alternative and take questions and comments from the public for the record.

Based on comments received, the community voiced few objections to the NFA recommendation. All public input was considered during the selection of the final decision.

B. Summary of Public Comments and Agency Responses

No site-specific verbal comments were received during the public meeting, and no written or verbal comments were received during the 30-day public comment period. Two written general comments and one site-specific comment were received during the public meeting. The transcript from the meeting was incorporated into the Administrative Record.

B.1 Oral Comments from Public Meeting

No oral questions or comments that were specific to the Water Works #4 Dump MRS were received during the public meeting.

B.2 Written Comments from Public Meeting

Written comments received during the public meeting are grouped together in the following general topic categories: groundwater monitoring, projected future land use, and the potential for future exposures and safety risks. Each comment was reformatted, where appropriate, for presentation in this section. Each comment is followed by a response.

B.2.1 Groundwater Monitoring

Comment: Where is the nearest monitoring well to the site?

Response: The nearest monitoring well to the site is well LL7mw-001, which is located approximately 200 feet to the east of the MRS. This well is situated at the southwestern portion of Load Line #7 and is sampled semiannually as part of the Facility-Wide Groundwater Monitoring Program that is conducted at Camp Ravenna. Other monitoring wells are located several hundred feet to the west at the Fuze and Booster Quarry Area of Concern as well as several hundred feet to the south at the Load Line #6 Area of Concern. Since the Water Works #4 Dump MRS is considered to be located at a potentiometric high at

Camp Ravenna, the aforementioned wells are considered to be hydraulically downgradient of the MRS.

B.2.2 Projected Future Land Use

Comment: What is the projected future land use of the RVAAP if not classified?

Response: The facility will be used for military training. Due to residual contamination that may be left in place at some cleanup sites (landfills, asbestos in soil), some sites will be restricted and properly managed with land-use controls. These sites will not be used for military training.

B.2.3 Potential for Future Exposures and Safety Risks

Comment: Do the ongoing investigations protect all future exposures and safety risks for all future involvement on the RVAAP facility?

Response: Investigations of potential contamination are utilized to define nature and extent of contamination from past operations. If contamination is found, then risk assessments are completed to assess potential for future exposure to contamination and develop any remedial action alternatives that may be necessary to address the risk to future receptors. Ongoing cleanup activities, including investigations, are protective for all projected future exposures/uses at the facility. If the land use changes, additional investigative activities would be required to evaluate the new use to ensure protectiveness.

C. Technical and Legal Issues

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

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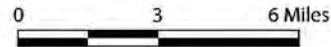
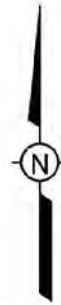
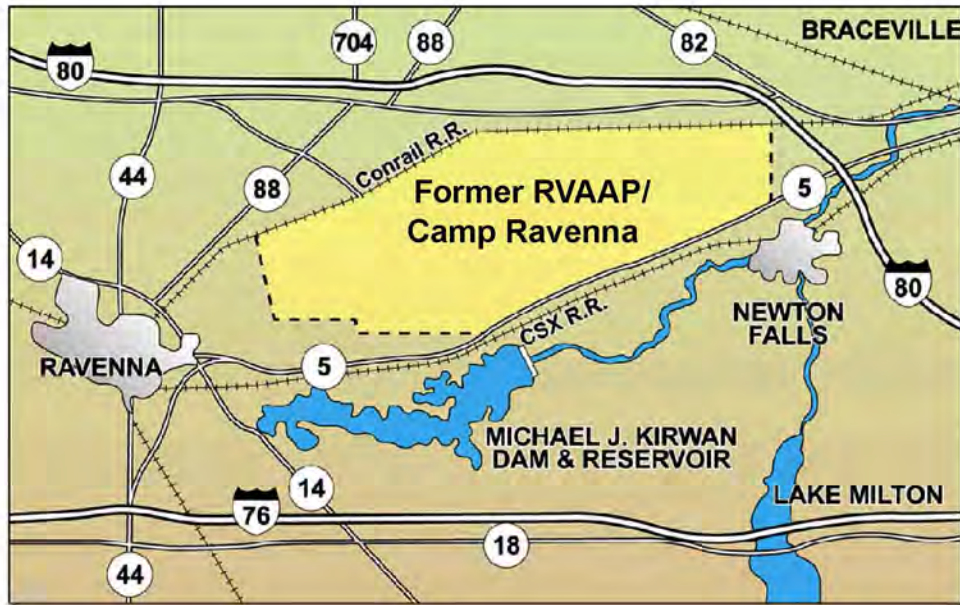
U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Ohio Department of Natural Resources, Division of Land and Soils, and Ohio Agriculture Research and Development Center (USDA, et al.), 1978. *Soil Survey of Portage County*.

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FIGURES

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Note:
The Scale is for the Upper Map Only
Showing the Former RVAAP/Camp Ravenna Location



**U.S. ARMY
CORPS OF ENGINEERS
BALTIMORE DISTRICT**

MILITARY MUNITIONS RESPONSE PROGRAM

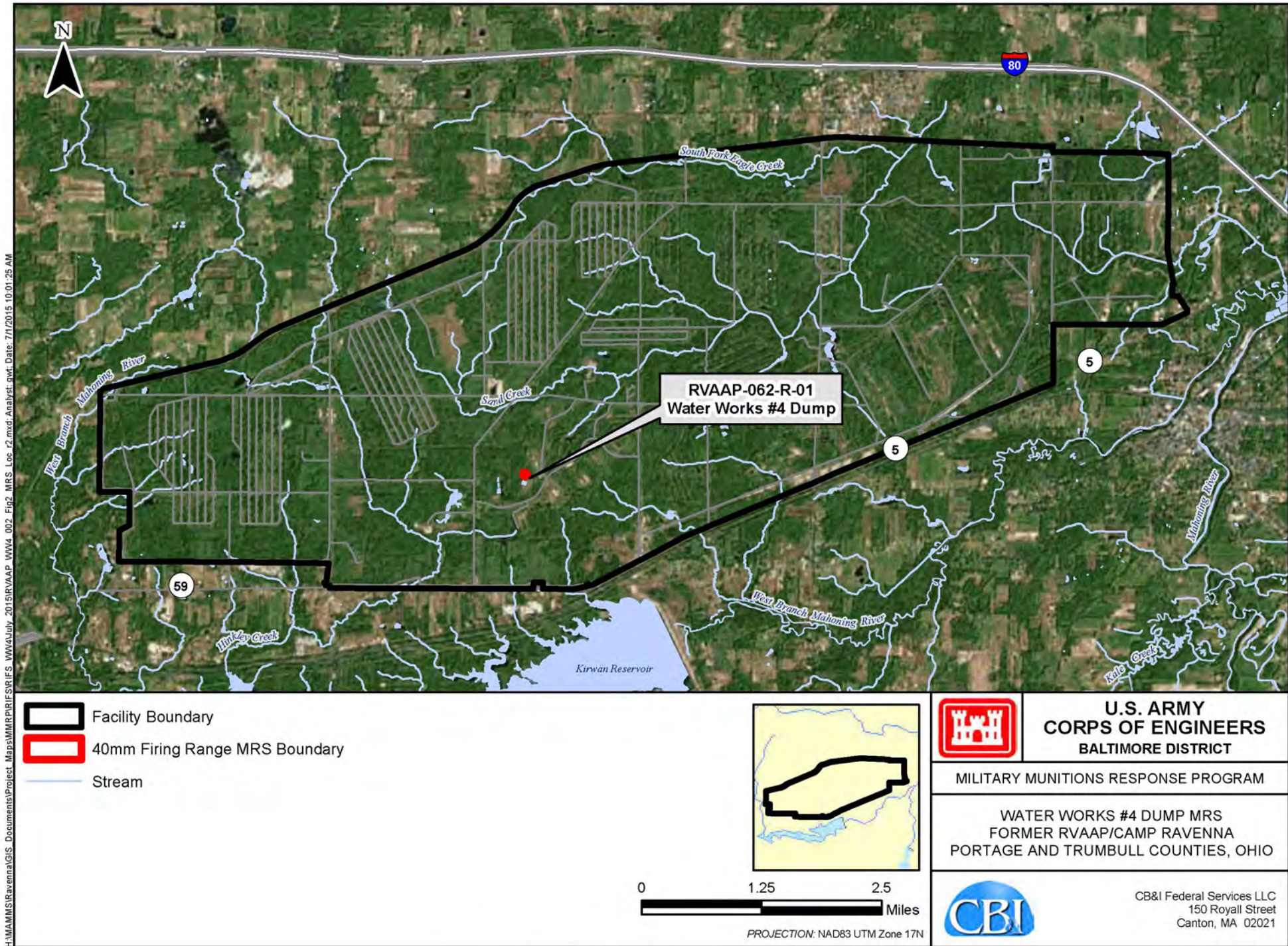
FORMER RVAAP/CAMP RAVENNA
PORTAGE AND TRUMBULL COUNTIES, OHIO



CB&I Federal Services LLC
150 Royall Street
Canton, MA 02021

FIGURE 1 INSTALLATION LOCATION MAP

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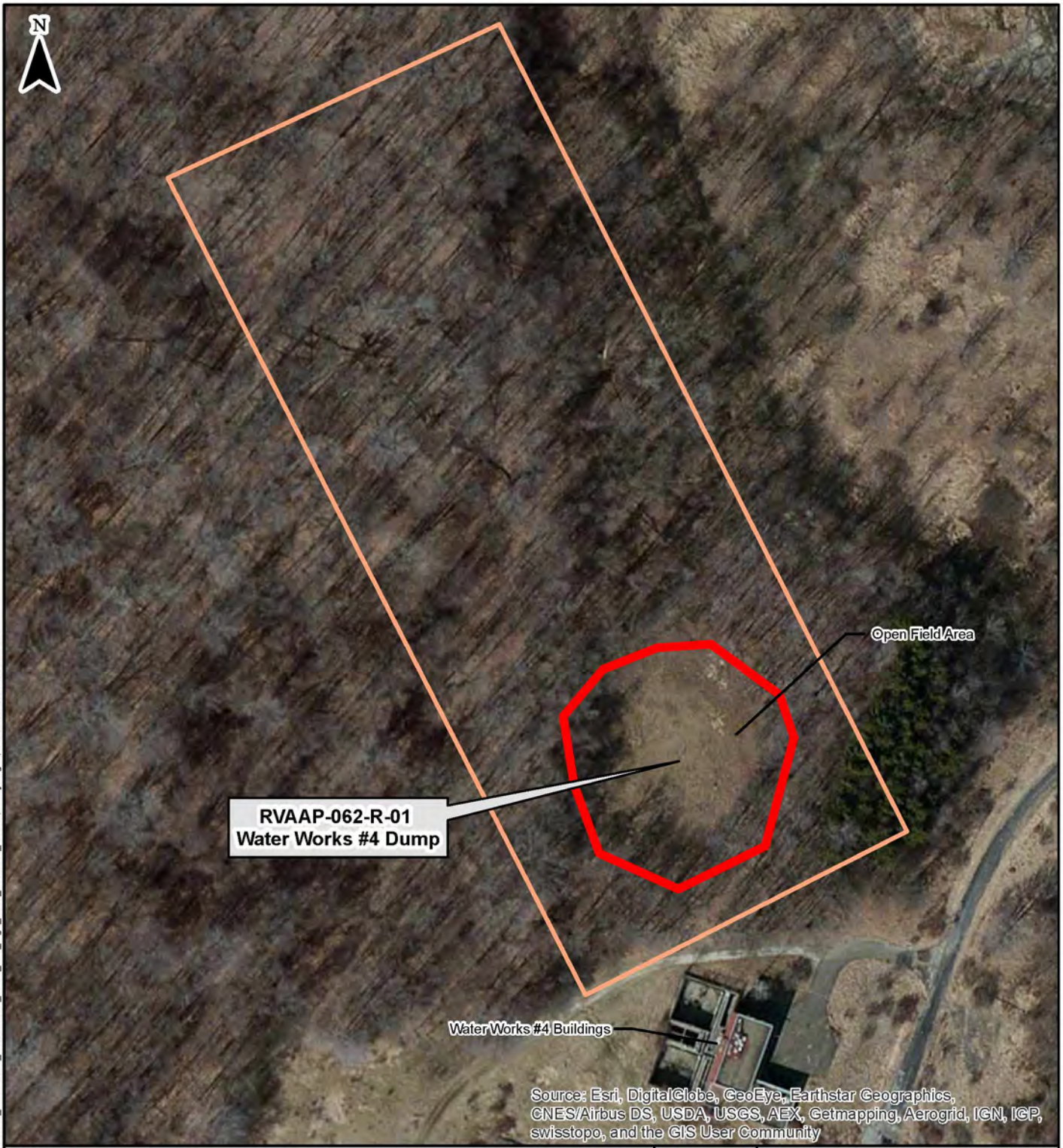


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FIGURE 2 MRS LOCATION MAP

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, ICP, swisstopo, and the GIS User Community

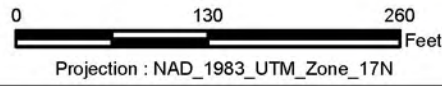
-  MRS Boundary
-  Site Investigation MRS Boundary and Remedial Investigation Expanded Investigation Area



**U.S. ARMY
CORPS OF ENGINEERS
BALTIMORE DISTRICT**

MILITARY MUNITIONS RESPONSE PROGRAM

WATER WORKS #4 DUMP MRS
FORMER RVAAP/CAMP RAVENNA
PORTAGE AND TRUMBULL COUNTIES, OHIO



CB&I Federal Services LLC
150 Royall Street
Canton, MA 02021

FIGURE 3 SITE FEATURES MAP

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OHIO EPA CORRESPONDENCE

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John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

December 3, 2015

**Re: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Approval
Remedial Response
Portage County
267000859227**

Mr. Mark Leeper, P.G., MBA
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 22204

Subject: Approval of the "Final No Further Action Record of Decision for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site, Version 1.0" Former Ravenna Army Ammunition Plant, Ravenna, Ohio: Dated September 29, 2015 (Work Activity No. 267-000859-227)

Dear Mr. Leeper:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR), has received and reviewed the "Final No Further Action Record of Decision for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site, Version 1.0" document, dated September 29, 2015. This document received by Ohio EPA's NEDO on September 30, 2015, was prepared by CB&I Federal Services LLC.

The Military Munitions Response Program (MMRP) Remedial Investigation (RI) for the Water Works #4 Dump Munitions Response Site (MRS) investigated the potential presence of munitions debris and munitions of explosives of concern within the defined portion of the MRS area. The MRS was investigated due to historical knowledge and reports of potential munitions items being dumped between 1941 through 1949. No installation restoration work has occurred at this site. No evidence of MEC or source of MC was found at the MRS during the RI field work. Based on these results, no risks associated with exposures to MEC or MC appear to be present. As there are no further comments or potential issues to address for the MRS, Ohio EPA concurs with the remedy of no further action and has signed and dated the final record of decision for the MRS and will submit a signed copy for your records.

RECEIVED
12-9-2015

MR. MARK LEEPER, P.G., MBA
ARMY NATIONAL GUARD DIRECTORATE
PAGE 2

If you have any questions or concerns, please do not hesitate to contact me at (614) 644-2896.

Sincerely,



Peter Whitehouse
Division Chief
Division of Environmental Response and Revitalization

PW:NCR/nvr

cc: Gregory F. Moore, USACE, Louisville District
Katie Tait/Kevin Sedlak, Camp Ravenna Environmental Office, Newton Falls
Haney/Harris, Camp Ravenna Environmental Office, Vista Sciences, Newton Falls

ec: Rod Beals, Ohio EPA, NEDO, DERR
Robert Princic, Ohio EPA, NEDO, DERR
Justin Burke, Ohio EPA, CO, DERR
Andrew Kocher, Ohio EPA, NEDO, DERR
Nicholas Roope, Ohio EPA, NEDO, DERR

September 21, 2015

Re: **US Army Ravenna Ammunition Pit RVAAP
Remediation Response
Plans
Remedial Response
Portage County
267000859227**

Mr. Mark Leeper, P.G., MBA
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 22204

Subject: Review of the "Draft No Further Action Record of Decision for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site, Version 1.0," Former Ravenna Army Ammunition Plant, Ravenna, Ohio: Dated August 31, 2015 (Work Activity No. 267-000859-227)

Dear Mr. Leeper:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the "Draft No Further Action Record of Decision for RVAAP-062-R-01 Water Works #4 Dump Munitions Response Site Version 1.0," dated August 31, 2015. This document received by Ohio EPA's NEDO on September 1, 2015, was prepared by CB&I Federal Services LLC. Ohio EPA has completed the review of the draft record of decision and has no further comments. Please submit the final copy of the document for approval.

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

Sincerely,



Nicholas Roope
Site Coordinator
Division of Environmental Response and Revitalization

NCR/nvr

cc: Gregory F. Moore, USACE, Louisville District
Katie Tait/Kevin Sedlak, Camp Ravenna Environmental Office, Newton Falls
Haney/Harris, Camp Ravenna Environmental Office, Vista Sciences, Newton Falls
ec: Rod Beals, Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
Justin Burke, Ohio EPA, CO, DERR
Andrew Kocher, Ohio EPA, NEDO, DERR

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