Final

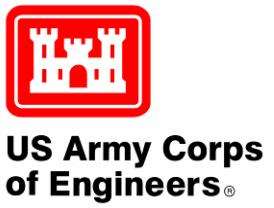
Engineering Evaluation for Soil and Dry Sediment at RVAAP-01 Ramsdell Quarry Landfill

Version 1.0

Ravenna Army Ammunition Plant
Ravenna, Ohio

GSA Contract No. GS-10F-0076J
Delivery Order No. W912QR-05-F-0033

Prepared for:



United States Army Corps of Engineers
Louisville District

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This Engineering Evaluation describes unforeseen conditions encountered while implementing the selected remedy stated in the Record of Decision for Soil and Dry Sediment at Ramsdell Quarry Landfill (RVAAP-01) and re-evaluates remedial alternatives to address these new conditions and achieve remedy-in-place (RIP) at Ramsdell Quarry Landfill (RQL).

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Ohio | Environmental Protection Agency
John R. Kasich, Governor
Mary Taylor, Lt. Governor
Scott J. Nally, Director

October 6, 2011

RE: RVAAP - RQL - 267000859083
RAVENNA ARMY AMMUNITION PLANT
PORTAGE/TRUMBULL COUNTIES
FINAL ENGINEERING EVALUATION
RE-EVALUATE REMEDIAL ALTERNATIVES
RAMSDELL QUARRY LANDFILL
APPROVAL

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Dear Mr. Patterson:

The Ohio Environmental Protection Agency (Ohio EPA) has received and reviewed the document entitled: Final Engineering Evaluation for Soil and Dry Sediment at RVAAP-01 Ramsdell Quarry Landfill, Ravenna Army Ammunition Plant, Ravenna, Ohio. This document, dated and received on September 2, 2011 at Ohio EPA, was prepared for the U.S. Army Corps of Engineers (USACE) - Louisville District, SAIC Engineering of Ohio, Inc., under GSA contract number GS-10F-0076J, Delivery Order No. W912QR-05-F-0033.

This document was reviewed by personnel from Ohio EPA's Division of Environmental Response and Revitalization (DERR). Ohio EPA has determined that all required text changes have been made to this document and considers it to be final and approved, providing there are no additional comments from the Army or Ohio Army National Guard.

If you have any questions regarding this correspondence, please do not hesitate to contact me at (330) 963-1148.

Sincerely,

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

Prepared by:
SAIC Engineering of Ohio, Inc.
8866 Commons Boulevard
Twinsburg, Ohio 44087

September 2, 2011

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Science Applications International Corporation (SAIC) has completed the Engineering Evaluation for Soil and Dry Sediment at RVAAP-01 Ramsdell Quarry Landfill at the Ravenna Army Ammunition Plant, Ravenna, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing USACE policy.

09/02/11

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Deputy Project Manager

Date

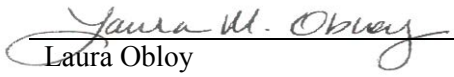
09/02/11

W. Kevin Jago, P.G.
Independent Technical Review Team Leader

Date

Significant concerns and the explanation of the resolution are as follows:

Internal SAIC Independent Technical Review comments are recorded on a Document Review Record per SAIC quality assurance procedure QAAP 3.1. This Document Review Record is maintained in the project file. Changes to the report addressing the comments have been verified by the Study/Design Team Leader. As noted above, all concerns resulting from independent technical review of the project have been considered.



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Principal w/ A-E firm

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-Containing Material
AOC	Area of Concern
ARAR	Applicable and Relevant or Appropriate Requirements
BGS	Below Ground Surface
Camp Ravenna	Camp Ravenna Joint Military Training Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Constituent of Concern
CUG	Cleanup Goal
DFFO	Director's Final Findings and Orders
ESD	Explanation of Significant Differences
FS	Feasibility Study
GSA	General Services Administration
HHRA	Human Health Risk Assessment
ILCR	Incremental Lifetime Cancer Risk
IRP	Installation Restoration Program
ISM	Incremental Sampling Method
LUC	Land Use Control
MEC	Munitions and Explosives of Concern
NCP	National Contingency Plan
NGB	National Guard Bureau
O&M	Operations and Maintenance
OAC	Ohio Administrative Code
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbon
PBA	Performance-Based Acquisition
PPE	Personal Protective Equipment
RI	Remedial Investigation
RIP	Remedy in Place
ROD	Record of Decision
RQL	Ramsdell Quarry Landfill
RVAAP	Ravenna Army Ammunition Plant
RVAAP-01	Ramsdell Quarry Landfill
SAIC	Science Applications International Corporation
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Science Applications International Corporation (SAIC) has been contracted by the U.S. Army Corps of Engineers (USACE), Louisville District, to provide environmental services in support of six high priority areas of concern (AOCs) at the Ravenna Army Ammunition Plant (RVAAP) in Ravenna, Ohio. This Engineering Evaluation describes unforeseen conditions encountered while implementing the selected remedy stated in the *Record of Decision for Soil and Dry Sediment at Ramsdell Quarry Landfill (RVAAP-01)* (USACE 2009) (herein referred to as the RQL ROD) and re-evaluates remedial alternatives to address these new conditions and achieve remedy-in-place (RIP) at Ramsdell Quarry Landfill (RQL). Information within this Engineering Evaluation is provided in accordance with National Contingency Plan (NCP) 300.825 to provide RVAAP Stakeholders with information to form the basis for the decision to modify the response action specified in the RQL ROD.

This work is being performed under a Performance-Based Acquisition (PBA) (formerly termed a Performance-Based Contract) in accordance with U.S. General Services Administration (GSA) Environmental Advisory Services Contract GS-10-F-0076J. In addition, planning and performance of all work elements is being conducted in accordance with the requirements of the Ohio Environmental Protection Agency (Ohio EPA) *Director's Final Findings and Orders* (DFFO) dated June 10, 2004 (Ohio EPA 2004).

1.1 PURPOSE

The remedial alternative developed and assessed in the *Feasibility Study for Ramsdell Quarry (RQL-01)* (USACE 2006) (herein referred to as the RQL FS) and specified in the RQL ROD was Alternative 3: Excavation of Soil and Dry Sediment with Off-site Disposal ~ Security Guard/Maintenance Worker. This alternative removes soil that contains chemicals of concern (COCs) which exceed cleanup goals (CUGs) for the representative future land use (Restricted Access ~ Security Guard/Maintenance Worker) at RQL. The COCs identified are presented in Table 1-1.

Table 1-1. Cleanup Goals for Ramsdell Quarry Landfill Soil (Security Guard/Maintenance Worker)

Constituent of Concern	Cleanup Goal (mg/kg)
Representative Land Use (Restricted Access – Security Guard/Maintenance Worker)	
Benz(a)anthracene	13
Benzo(a)pyrene	1.3
Benzo(b)fluoranthene	13
Dibenz(a,h)anthracene	1.3
Indeno(1,2,3-cd)pyrene	13

mg/kg = milligrams per kilogram

During the physical implementation of the remedy that began July 2010, large amounts of subsurface construction and miscellaneous debris were identified within the remedial action excavation footprint. Much of this debris was considered friable asbestos-containing material (ACM). The presence of

substantial debris and friable ACM was not indicated during the extensive sampling during historical investigations or the Remedial Investigation (RI) phase of work that preceded the selection of Alternative 3 through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

ACM was not previously identified during the Phase I RI (USACE 2005b) or other investigations performed in the RQL quarry bottom; therefore the quarry bottom was not identified as an "inactive asbestos waste disposal site." However, the recent discovery of ACM invokes relevant and appropriate requirements similar to those stated in Ohio Administrative Code (OAC) 3745-20-01. Those relevant and appropriate requirements are as follows:

1. Discharge no visible emissions to the outside air; or

2. Cover the asbestos-containing waste material with at least six inches of compacted non-ACM, and grow and maintain a cover of vegetation on the area adequate to prevent exposure of the asbestos-containing waste material; or

3. Cover the asbestos-containing waste material with at least 2 ft compacted non-ACM and maintain the cover to prevent exposure of the asbestos-containing waste material; or

4. If excavation has occurred that exposes ACM, remove ACM-containing material as encountered (regardless of whether it occurs outside of the areas requiring remediation to address COCs identified in the RQL ROD) to confirm removal through visual inspection and soil sampling.

The purpose of this Engineering Evaluation is to re-evaluate the selected remedial alternative and evaluate additional alternatives to determine if the remedy for soil at RQL requires change given the change of site conditions. Re-evaluation of remedial alternatives is allowed under the *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA 1999). The change in waste type encountered (asbestos-containing waste) falls under either a Significant or Fundamental Change. As defined in Section 7.2 of the guidance document, the change in conditions included an appreciable change in scope, performance, and cost. The discovery of ACM provides a basis for re-evaluation of alternatives with respect to potential ARARs. Additional alternatives will provide remedy for the identified COCs in the RQL quarry bottom and invoke the relevant and appropriate requirements established from the identification of ACM in the contaminated areas.

1.2 SCOPE

The scope of this Engineering Evaluation is to re-evaluate the selected alternative for soil and dry sediment at RQL due to: (1) requirements to identify, excavate, and dispose ACM until ACM is not present on excavation floors and sidewalls from disturbed areas; (2) the unknown extent of ACM beyond the areas containing COCs; (3) the increased risk of exposure to ACM by workers involved with implementing this alternative; and (4) the potential increase in disturbance of sensitive

environmental habitat (e.g., wetlands) and future liability to the Army (e.g., monitoring and inspections). This Engineering Evaluation presents new Alternatives 5, 6, 7, and 8 and evaluates these alternatives using the National Contingency Plan (NCP) evaluation criteria, and provides a new recommended alternative for addressing soil and dry sediment at RQL.

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2.0 FACILITY AND AREA OF CONCERN DESCRIPTION

2.1 FACILITY DESCRIPTION

When the RVAAP Installation Restoration program (IRP) began in 1989, RVAAP was identified as a 21,419-acre installation. The property boundary was resurveyed by Ohio Army National Guard (OHARNG) over a 2-year period (2002 and 2003) and the total acreage of the property was found to be 21,683.289 acres. As of February 2006, a total of 20,403 acres of the former 21,683-acre RVAAP has been transferred to the National Guard Bureau (NGB) and subsequently licensed to OHARNG for use as a military training site.

The current RVAAP consists of 1,280 acres scattered throughout the OHARNG Camp Ravenna Joint Military Training Center, herein referred to as Camp Ravenna. Camp Ravenna is in northeastern Ohio within Portage and Trumbull counties, approximately 3 miles (4.8 km) east-northeast of the city of Ravenna and approximately 1 mile (1.6 km) northwest of the city of Newton Falls. The RVAAP portions of the property are solely located within Portage County. RVAAP/Camp Ravenna is a parcel of property approximately 11 miles (17.7 km) long and 3.5 miles (5.6 km) wide bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garret, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east (Figures 2-1 and 2-2). Camp Ravenna is surrounded by several communities: Windham on the north; Garrettsville 6 miles (9.6 km) to the northwest; Newton Falls 1 mile (1.6 km) to the southeast; Charlestown to the southwest; and Wayland 3 miles (4.8 km) to the south.

When RVAAP was operational, Camp Ravenna did not exist and the entire 21,683-acre parcel was a government-owned, contractor-operated industrial facility. The RVAAP IRP encompasses investigation and cleanup of past activities over the entire 21,683 acres of the former RVAAP. References to RVAAP in this document are considered to be inclusive of the historical extent of RVAAP, which is inclusive of the combined acreages of the current Camp Ravenna and RVAAP, unless otherwise specifically stated.

2.2 RAMSDELL QUARRY LANDFILL DESCRIPTION AND HISTORY

RQL encompasses approximately 14 acres in the northeastern portion of RVAAP. The environmental setting at RQL includes old-field communities with patches of forests and grasslands. The land surface in a large portion of the AOC slopes into a former quarry, which occupies most of the AOC. The quarry bottom is about 40 ft below the surrounding area. Former quarry operations resulted in the removal of much of the original soil. Surface water runoff collects in an isolated wetland in the bottom of the former quarry. There is no surface water drainage outlet from the quarry. The extent of the wetland varies widely depending on the season and rainfall, and it is sometimes completely dry. When water is present in the wetland, the depth is usually less than 4 ft. The drainage ways and ditch lines outside of the quarry, located along access roads and the rail line in the southern part of the AOC, only contain water during rain events.

RQL was initially a stone quarry that operated until 1941. During operations, the quarry was excavated 30 to 40 ft below existing grade. The excavated sandstone and quartzite pebble conglomerate was used for road and construction ballast. From 1946 to the 1950s, the bottom of the quarry was used to burn waste explosives from Load Line 1. Reportedly, 18,000 500-lb (225-kg) incendiary or napalm bombs were burned and liquid residues from annealing operations were disposed in the quarry.

Between 1941 and 1989, the western and southern sections of the abandoned quarry were used for landfill operations. Following World War II, napalm bombs were burned in Ramsdell Quarry (USATHAMA 1978). Only nonhazardous solid waste was deposited in RQL from 1976 until it was closed in 1989. In 1978, a portion of the abandoned quarry was permitted as a sanitary landfill by the State of Ohio. The sanitary landfill was closed in 1990 under State of Ohio solid waste regulations. A clay cap was placed on the former permitted landfill area covering approximately 4 acres of the AOC. The installation and semi-annual monitoring of five groundwater monitoring wells were required as part of Ohio post-closure requirements for the landfill.

2.3 ANTICIPATED FUTURE LAND USE

RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities. Surveying, sampling, essential security, safety, periodic maintenance, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. The U.S. Army intends to transfer RQL to the NGB once remedial actions are complete. The NGB will subsequently license the land to OHARNG for military use. The OHARNG has established the future land use for RQL as restricted access, no digging.

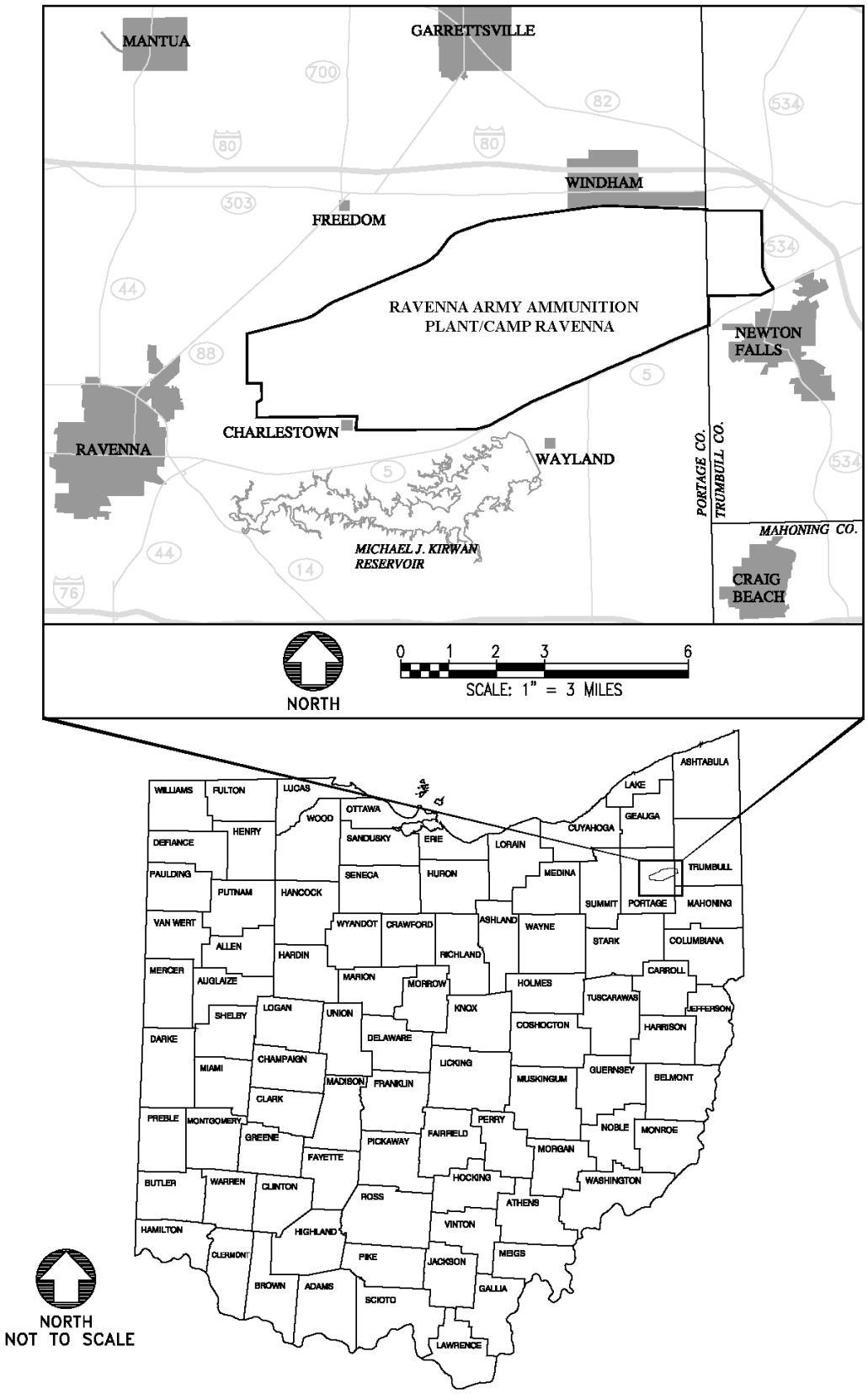

Figure 2-1. General Location and Orientation of RVAAP/Camp Ravenna

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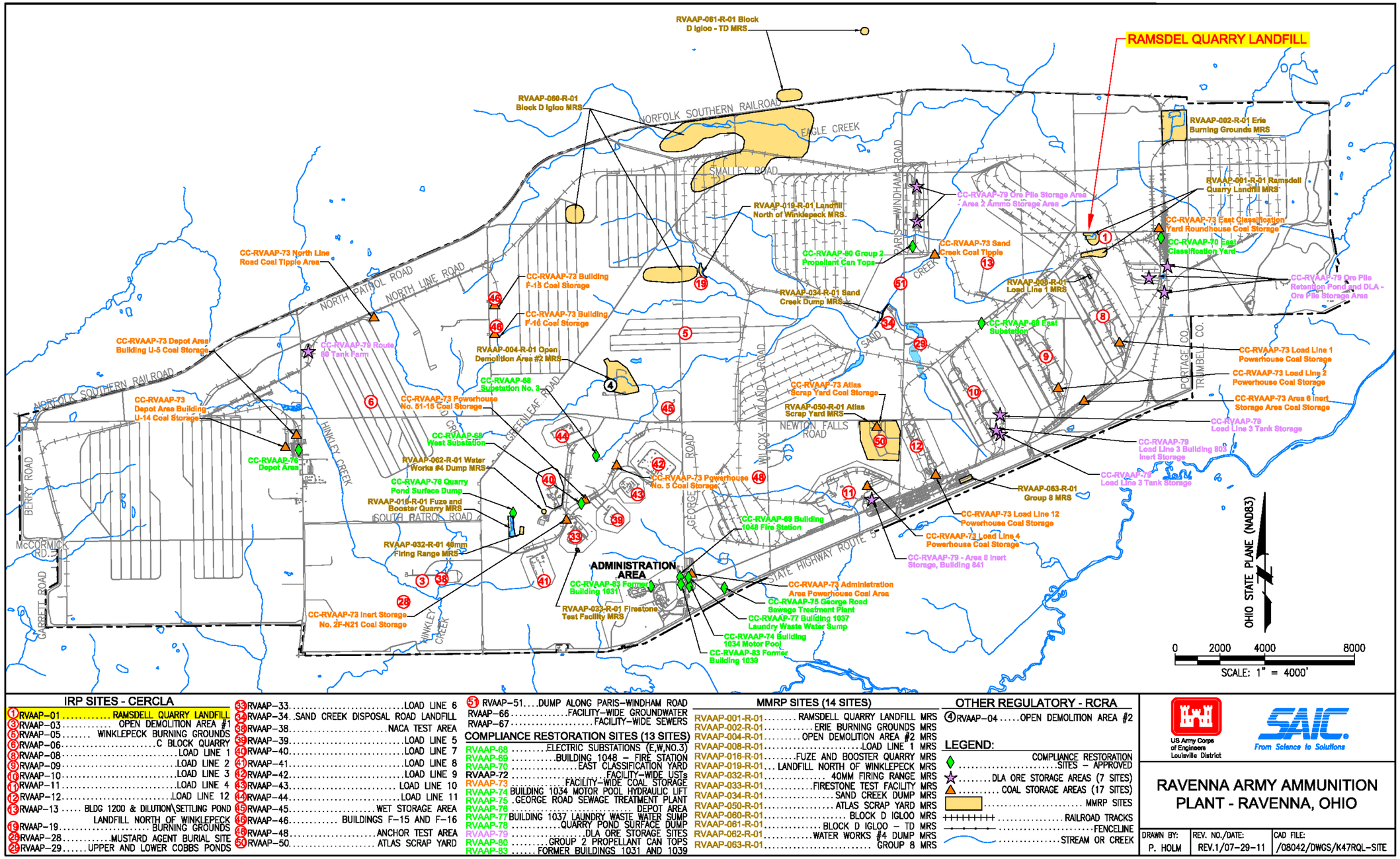

IRP SITES - CERCLA

1 RVAAP-01 ..... RAMSDELL QUARRY LANDFILL
3 RVAAP-03 ..... OPEN DEMOLITION AREA #1
5 RVAAP-05 ..... WINKLEPECK BURNING GROUNDS
6 RVAAP-06 ..... C BLOCK QUARRY
8 RVAAP-08 ..... LOAD LINE 1
9 RVAAP-09 ..... LOAD LINE 2
10 RVAAP-10 ..... LOAD LINE 3
11 RVAAP-11 ..... LOAD LINE 4
12 RVAAP-12 ..... LOAD LINE 12
13 RVAAP-13 ..... BLDG 1200 & DILUTION\SETTLING POND
LANDFILL NORTH OF WINKLEPECK
19 RVAAP-19 ..... BURNING GROUNDS
28 RVAAP-28 ..... MUSTARD AGENT BURIAL SITE
29 RVAAP-29 ..... UPPER AND LOWER COBBS PONDS
33 RVAAP-33 ..... LOAD LINE 6
34 RVAAP-34 ..SAND CREEK DISPOSAL ROAD LANDFILL
38 RVAAP-38 ..... NACA TEST AREA
39 RVAAP-39 ..... LOAD LINE 5
40 RVAAP-40 ..... LOAD LINE 7
41 RVAAP-41 ..... LOAD LINE 8
42 RVAAP-42 ..... LOAD LINE 9
43 RVAAP-43 ..... LOAD LINE 10
44 RVAAP-44 ..... LOAD LINE 11
45 RVAAP-45 ..... WET STORAGE AREA
46 RVAAP-46 ..... BUILDINGS F-15 AND F-16
48 RVAAP-48 ..... ANCHOR TEST AREA
50 RVAAP-50 ..... ATLAS SCRAP YARD
51 RVAAP-51 ...DUMP ALONG PARIS-WINDHAM ROAD
RVAAP-66 ..... FACILITY-WIDE GROUNDWATER
RVAAP-67 ..... FACILITY-WIDE SEWERS

COMPLIANCE RESTORATION SITES (13 SITES)

RVAAP-68 ..... ELECTRIC SUBSTATIONS (E,W,NO.3)
RVAAP-69 ..... BUILDING 1048 – FIRE STATION
RVAAP-70 ..... EAST CLASSIFICATION YARD
RVAAP-72 ..... FACILITY-WIDE USTs
RVAAP-73 ..... FACILITY-WIDE COAL STORAGE
RVAAP-74 BUILDING 1034 MOTOR POOL HYDRAULIC LIFT
RVAAP-75 ..GEORGE ROAD SEWAGE TREATMENT PLANT
RVAAP-76 ..... DEPOT AREA
RVAAP-77 BUILDING 1037 LAUNDRY WASTE WATER SUMP
RVAAP-78 ..... QUARRY POND SURFACE DUMP
RVAAP-79 ..... DLA ORE STORAGE SITES
RVAAP-80 ..... GROUP 2 PROPELLANT CAN TOPS
RVAAP-83 ..... FORMER BUILDINGS 1031 AND 1039

MMRP SITES (14 SITES)

RVAAP-001-R-01 ..... RAMSDELL QUARRY LANDFILL MRS
RVAAP-002-R-01 ..... ERIE BURNING GROUNDS MRS
RVAAP-004-R-01 ..... OPEN DEMOLITION AREA #2 MRS
RVAAP-008-R-01 ..... LOAD LINE 1 MRS
RVAAP-016-R-01 ..... FUZE AND BOOSTER QUARRY MRS
RVAAP-019-R-01 ... LANDFILL NORTH OF WINKLEPECK MRS
RVAAP-032-R-01 ..... 40MM FIRING RANGE MRS
RVAAP-033-R-01 ..... FIRESTONE TEST FACILITY MRS
RVAAP-034-R-01 ..... SAND CREEK DUMP MRS
RVAAP-050-R-01 ..... ATLAS SCRAP YARD MRS
RVAAP-060-R-01 ..... BLOCK D IGLOO MRS
RVAAP-061-R-01 ..... BLOCK D IGLOO – TD MRS
RVAAP-062-R-01 ..... WATER WORKS #4 DUMP MRS
RVAAP-063-R-01 ..... GROUP 8 MRS

OTHER REGULATORY - RCRA

4 RVAAP-04 ..... OPEN DEMOLITION AREA #2

LEGEND:

COMPLIANCE RESTORATION SITES – APPROVED
DLA ORE STORAGE AREAS (7 SITES)
COAL STORAGE AREAS (17 SITES)
MMRP SITES
RAILROAD TRACKS
FENCELINE
STREAM OR CREEK

US Army Corps of Engineers Louisville District

SAIC. From Science to Solutions

RAVENNA ARMY AMMUNITION PLANT - RAVENNA, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE:
P. HOLM	REV.1/07-29-11	/08042/DWGS/K47RQL-SITE

Figure 2-2. RVAAP/Camp Ravenna Installation Map

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3.0 SUMMARY OF SELECTED REMEDY AND REMEDIAL ACTIVITIES

3.1 SELECTED REMEDY

The selected remedy in the RQL ROD was Alternative 3: Excavation and Off-site Disposal ~ Security Guard/Maintenance Worker Land Use. The Security Guard/Maintenance Worker receptor was determined to be representative under a restricted land use scenario for RQL because the closed landfill cap adjacent to the quarry bottom requires long-term inspection and maintenance. This alternative involves the removal of RQL soil with concentrations of COCs that exceed CUGs for the Security Guard/Maintenance Worker (previously presented in Table 1-1) to reduce the risk level to below acceptable risk levels for this receptor. This alternative would result in restricted use of RQL, which is consistent with the planned future use of this AOC due to the presence of munitions and explosives of concern (MEC) and the presence of the landfill.

Results of the risk assessment for RQL indicated that exposure to surface soil and dry sediment (0-1 ft bgs) may result in potential human health risks from soil above the target risk of the cumulative excess lifetime cancer risk of 1E-05 and the NCP risk range of 1E-06 to 1E-04 Incremental Lifetime Cancer Risk (ILCR) under the Security Guard/Maintenance Worker land use scenario. Estimated risks are associated with dermal exposure to soil by a Security Guard/Maintenance Worker visiting the site 250 days/year for 25 years wearing short sleeves and operating heavy equipment. The response action selected in the RQL ROD would reduce risks for this receptor to acceptable levels.

The RQL ROD identified two areas (shown as RQL-039M and RQL-040M on Figure 3-1) requiring removal for an estimated disposal volume (ex situ) of 423 yd^3. This alternative required sampling of the entire quarry bottom to re-assess Incremental Sampling Method (ISM) samples collected during the 2003 Phase I RI. The remedy assumed the excavated soil to be characteristically nonhazardous based on available data, resulting in an estimated cost for the alternative to be $301,978. The estimated cost included five-year reviews to be conducted by the U.S. Army, activities required for a 30-year Operations and Maintenance (O&M) period, and land use controls (LUCs).

3.2 REMEDIAL ACTIVITIES

The following sections describe the remedial activities conducted at RQL.

3.2.1 Confirmation Sampling

In May 2009 and January 2010, SAIC collected soil samples from the bottom of RQL in accordance with the RQL ROD. These sampling activities were performed as part of the remedial design activities to confirm 2003 Phase I RI samples using current analytical methods with improved reporting limits. These sampling results were presented to the U.S. Army and Ohio EPA in technical memorandums. The sample results identified seven ISM areas that exceeded CUGs presented in the

RQL ROD. These ISM areas are RQL-039M, RQL-040M, RQL-041M, RQL-042M, RQL-043M, RQL-044M, and RQL-045M, as presented in Figure 3-1.

To assist in volume estimations during the implementation of the remedial actions, SAIC conducted a walkover survey of the quarry bottom in May 2009. During this walkover survey, the soil depth to bedrock was measured using a push probe at multiple, random locations. The soil thickness varied throughout the quarry bottom from locations where bedrock was exposed to locations that had a soil depth exceeding two ft. The average depth of soil overlying bedrock at the quarry bottom was seven inches. This average depth was used to estimate soil removal quantities.

Based on the remedial design sampling and walkover survey, the area requiring soil removal increased from 282 ft^2 (0.006 acres) to 49,300 ft^2 (1.13 acres). Table 3-1 presents the revised estimated soil volume requiring disposal assuming an average depth of seven inches to bedrock. The estimated volume for soil removal increased from 423 yd^3 to 1,597 yd^3.

Table 3-1. Estimated Volumes of Contaminated Soil

Scenario	Surface Area (ft^2)	In situ		In situ with Constructability[a]		Ex situ[a,b]	
		Volume (ft^3)	Volume (yd^3)	Volume (ft^3)	Volume (yd^3)	Volume (ft^3)	Volume (yd^3)
Removal of ISM Areas RQL-039M, RQL-040M, RQL-041M, RQL-042M, RQL-043M, RQL-044M, and RQL-045M	49,300	28,758	1,065	35,948	1331	43,137	1,597

[a] Constructability accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in situ volume is increased by 25% for a constructability factor.
[b] Includes 20% swell factor.

3.2.2 Implementation of Soil Removal

In July 2010, SAIC began implementation of the selected remedy for soil excavation and disposal within the quarry bottom. The excavation activities began by removing soil at the eastern edge of area RQL-043M (Figure 3-1).

During the soil removal activities, a large amount of construction and miscellaneous debris was encountered between the surface layer and bedrock (approximately 1 to 2 ft bgs). Some of the debris (e.g., transite and roofing materials) was suspected to contain asbestos; therefore, the materials were sampled and sent for analysis for asbestos. Results revealed that the transite and roofing materials within the excavation were ACM as they contained greater than 1% asbestos. As a result, the following activities took place:

1. SAIC collected additional samples from the removal areas to verify the waste profile of the soil and debris that required excavation and disposal. The removal areas were confirmed to be nonhazardous material; however, the material containing ACM required handling and disposal as friable ACM in accordance with Ohio regulations.

2. SAIC developed a plan to address handling, transport, and disposal of soil with ACM. Highlights of this plan include the following:
   a. A Hazard Abatement Specialist must be on-site to perform all aspects of ACM handling, packaging, and disposal (e.g., ensuring area is adequately wet, making sure roll off boxes are properly lined and sealed, demarcating the work area).
   b. The construction areas are to be demarcated with asbestos hazard tape. Only workers with asbestos hazard awareness training (at minimum) can enter the construction area.
   c. Workers must wear respirators and air monitoring must be conducted until air samples indicate personal protective equipment (PPE) can be downgraded.
   d. Material considered friable ACM must be wrapped in minimum 12-mil poly sheeting and sealed prior to transport to the landfill.

3. Per Ohio EPA requirements, SAIC completed excavation and disposal of disturbed ACM-containing soil within area RQL-043M and continued the excavation beyond the remedial action design boundary until ACM was not visible on the excavation footprint or sidewalls. The Hazard Abatement Specialist verified the removal of visible ACM.

4. A sampling plan (approved by Ohio EPA) was implemented to analyze asbestos in soil. Soil within the excavation floor and sidewalls was verified to contain less than 1% asbestos.

Figure 3-1 presents the area removed in accordance with the requirements stated above. Approximately 1,100 tons of soil and construction debris (all considered friable ACM) was removed from RQL and transported and disposed at the American Landfill in Waynesburg, Ohio. The total removal area was approximately 10,000 ft^2, with approximately 5,800 ft^2 extending beyond RQL-043M to remove ACM identified on the excavation sidewalls.

3.2.3 Landfill Cap Extent

The specific extent of the RQL cap placed at the time of landfill closure in 1990 has been subject to some uncertainty in historical drawings of the AOC. To better establish the as-built landfill cap limits, SAIC conducted a site walk after vegetation clearing was completed. USACE participated in the site walk, including previous RVAAP employees that worked on closing the sanitary landfill at RQL. The site walk confirmed that previous depictions of the extent of the landfill cap were not accurate. This Engineering Evaluation re-establishes the landfill cap at the 964 ft amsl topographic line at the south and western portions of the quarry bottom. This new landfill boundary is depicted on Figure 3-1.

Based on the site walkover, sample areas RQL-044M and portions of RQL-045M (Figure 3-1), were determined to fall within the extent of the RQL cap. Benzo(a)pyrene concentrations in surface soil in these two sample areas exceeded the cleanup goal for the Security Guard/Maintenance Worker (1.3 mg/kg). The benzo(a)pyrene surface soil concentration in RQL-044M was 4.4 mg/kg and that in RQL-045M was 1.4 mg/kg. The presence of benzo(a)pyrene in these areas is not considered to be a result of historical activities conducted in the quarry, given the cap material was imported from a borrow source off of RVAAP. Additionally, excavation or penetration of the cap as part of remedial

actions in these areas may compromise the integrity of the landfill cap or expose wastes. Based on the additional information gained during the site walkover, sample areas that fall within the landfill cap extent are not included in the re-evaluation of the remedial alternatives.

3.3 PRELIMINARY RESULTS OF SELECTED REMEDY

At the onset of the soil removal activities at RQL, construction debris and friable ACM were identified in the proposed excavation footprint. As required by Ohio EPA, all soil containing friable ACM was to be handled and disposed as such. In addition, Ohio EPA required: (1) an excavation to continue until ACM was not identified on the excavation sidewall and floor; and (2) a sampling plan to be developed to confirm less than 1% asbestos is present in the soil of the remaining excavation footprint and sidewalls.

Approximately 1,100 tons of soil and construction debris (all considered friable ACM) were removed from the RQL quarry bottom. The soil removal area extended by 58% to remove ACM identified on the excavation sidewall, as required by Ohio EPA and accounted for 9% of the surface area recommended for removal in Table 3-1. The excavated area was backfilled and seeded in accordance with the Final RD.

The RVAAP Stakeholders agreed to demobilize from the AOC to re-evaluate the selected remedy at RQL in accordance with Section 7.2 of the *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA 1999), as the selected remedy had a change in scope, performance, and cost. This re-evaluation is warranted due to the identification of friable ACM within the excavation footprint; uncertainty with respect to the quantities of ACM within the area containing COCs for remediation; the unknown extent of ACM beyond the areas containing COCs; the increased risk of exposure to ACM by workers involved with implementing this alternative; the potential increase in disturbance of sensitive environmental habitat (e.g., wetlands); and the future responsibility for the U.S. Army (e.g., monitoring and inspections). The following sections of this Engineering Evaluation present new alternatives (Alternatives 5, 6, 7, and 8), in addition to those in the FS, to achieve remedial action objectives for the future OHARNG land use at RQL.

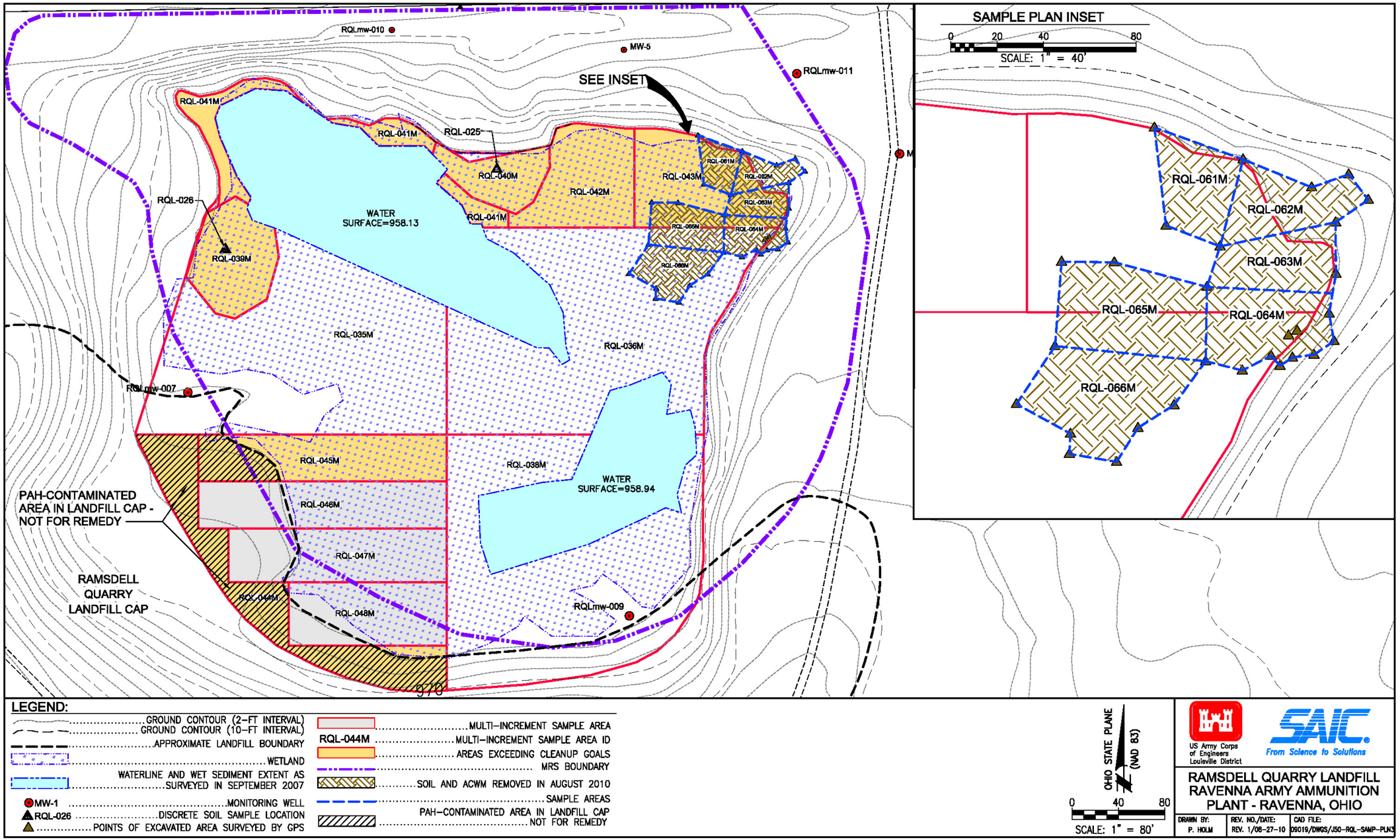

Figure 3-1. RQL Site Features and Removal Extent

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4.0 DEVELOPMENT OF ALTERNATIVES

This section presents Alternatives 5, 6, 7, and 8 for soil and dry sediment at RQL.

4.1 ALTERNATIVE 5: EXCAVATION OF SOIL AND DRY SEDIMENT WITH OFF-SITE DISPOSAL AS FRIABLE ACM ~ SECURITY GUARD/MAINTENANCE WORKER LAND USE

Alternative 5 consists of excavating soil with COCs exceeding CUGs for the Security Guard/Maintenance Worker. This includes excavation of ISM areas RQL-039M, RQL-040M, RQL-041M, RQL-042M, RQL-044M, RQL-045M, as well as what was not previously excavated in RQL-043M. This alternative is similar to Alternative 3 presented in the RQL ROD. Additionally, this remedy also requires excavation until ACM is not present on the excavation sidewalls and floor. Assumptions within this alternative accounts for a potential increase in soil volume, management and disposal of ACM, the potential increase in disturbance of sensitive habitat, and the potential increase in future long-term O&M costs to the U.S. Army.

This Engineering Evaluation assumes 1,614 yd^3 of contaminated soil will be excavated for off-site disposal. The basis for this volume is the inclusion of the removal of polycyclic aromatic hydrocarbon (PAH)-contaminated areas presented in Figure 3-1 to an average depth to bedrock of 7 inches (totaling 1,457 yd^3), minus any soil volume considered to be within the landfill cap (380 yd^3). Additionally, 537 yd^3 was added to the volume estimate to account for the requirements of the Ohio EPA to continue excavating if ACM is present on the sidewalls or floor. This additional volume to remove ACM-contaminated soil is approximately 50% over that required for excavation of PAHs. If ACM is present on excavation sidewalls or floor, Ohio EPA's preferred method to address the material is removal until ACM is not visible, and laboratory results confirm soil samples from the excavation footprint have less than 1% ACM. Friable ACM previously encountered within area RQL-043M resulted in a 58% increase of excavated soil volume over that required to remove only PAHs. Based on the conditions previously encountered, this alternative assumes an increase of soil volume by 50%, resulting in the total 1,614 yd^3 of soil contaminated with PAHs and ACM.

Upon completion of this alternative, potential for exposure to contaminated soil and ACM for National Guard receptors will be reduced. LUCs would be necessary, as planned excavation will not attain CUGs for residential land use and would not include excavation of contaminated soil below 1 ft unless ACM is also encountered.

Alternative 5 requires coordination of excavation activities and LUC activities with Ohio EPA, OHARNG, and the U.S. Army. Coordinating with stakeholders during the implementation of the excavation minimizes health and safety risks to on-site personnel and potential disruptions of RVAAP/Camp Ravenna activities. The amount of time to complete this removal action is estimated to take 2 months, and includes an LUC O&M period (30 years is the assumed duration for cost estimating purposes).

Components of this remedial alternative include:

- Explanation of Significant Differences;
- Notifications and approvals;
- Remedial Design addendum;
- Pre-mobilization activities;
- Soil excavation and disposal;
- Confirmatory sampling;
- Restoration;
- Wetland mitigation;
- LUCs; and
- Five-year reviews.

4.2 ALTERNATIVE 6: CAPPING ~ SECURITY GUARD/MAINTENANCE WORKER

Alternative 6 consists of putting a 12-inch compacted cover (cap) of native fill and topsoil on the remaining areas within the quarry bottom that exceed CUGs for the COCs, with the exception of the area identified on the existing sanitary landfill cap. An estimated 33,200 ft^2 requires capping. Capping will leave soil containing COCs and ACM-containing debris in place. The purpose this cap serves is to:

1. Prevent exposure of PAHs to the Security Guard/Maintenance Worker (exposure scenario includes shallow surface soil from 0 to 1 ft bgs);

2. Be in compliance with OAC 3745-20-07(A)(2) requirements to "cover the asbestos-containing waste material with at least six inches of compacted non-ACM, and grow and maintain a cover of vegetation on the area adequate to prevent exposure of the asbestos-containing waste material;" and

3. Provide adequate restoration for the Modified, Category 2 wetland within the quarry.

A leachate collection system and venting are not required for this cap.

Once capping is complete, this alternative mitigates risk by physically preventing exposure of National Guard receptors to contaminated soil and ACM. LUCs would be necessary to prevent digging, and because the area of the planned cap will not reduce exposures to meet residential CUGs.

Alternative 6 requires coordination of excavation activities and LUC activities with Ohio EPA, OHARNG, and the U.S. Army. Coordinating with stakeholders during the implementation of the excavation minimizes health and safety risks to on-site personnel and potential disruptions of RVAAP/Camp Ravenna activities. The amount of time to complete this removal action (estimated 2 months) is relatively short and includes a LUC O&M period (30 years is the assumed duration for cost estimating purposes).

Components of this remedial alternative include:

- Public notification and comment period;
- ROD Amendment;
- Notifications and approvals;
- Remedial Design addendum;
- Pre-mobilization activities;
- Soil placement and capping;
- Seeding and restoration;
- Wetland mitigation;
- LUCs;
- Cap inspections and maintenance; and
- Five-year reviews.

4.3 ALTERNATIVE 7: QUARRY BOTTOM FENCE ~ RESTRICTED LAND USE

Alternative 7 consists of installing a fence (e.g., chain link security fence or five-strand high tensile wire fence) around the quarry bottom at RQL as part of a LUCs alternative to restrict access to the AOC. The fence specifications would be finalized in a Remedial Design. However, for purposes of this Engineering Evaluation, the fence specifications include: (1) Schedule 40, 2" posts on 10-ft centers; (2) 9 gauge wire mesh; and (3) 6 ft high gates with a 1⅝" frame. Installation of chain link security fence and signage provides a physical control for the AOC. This physical control will be combined with administrative LUCs for access control into the quarry bottom and use restriction to ensure there is no digging. These controls will eliminate or reduce receptor exposure to COCs and comply with requirements of OAC 3745-20-07(A)(1) by eliminating the potential of discharging visible emissions to the outside air.

Figure 4-1 presents a preliminary layout of fencing to be installed at RQL. Installation of this fence encompasses the two areas specified in the RQL ROD (i.e., RQL-039M and RQL-040M) as well as RQL-041M, RQL-042M, RQL-043M, and most of RQL-045M. A fence does not surround portions of RQL-045M and all of RQL-044M, as: (1) those areas are considered to be part of the closed sanitary landfill cap and not a part of historical operations of the quarry bottom; and (2) to ensure the integrity of the existing RQL landfill cap is not compromised. Placement of the gates will be finalized in a Remedial Design. Additionally, signage notifying personnel of the presence of asbestos in the quarry will be placed on the fence.

RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities. However, surveying, sampling, and essential security, safety, periodic maintenance, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. All individuals unfamiliar with RQL are properly briefed on the hazards/restrictions prior to entry into the AOC (USACE 2005b).

The physical and administrative controls under this alternative further restricts access to that portion of the AOC exceeding cleanup goals. The chain-link security fence and signage further deters entry by any other receptors that are not granted access to RQL or have proper training. Administrative LUCs include such measures as access and digging restrictions and personnel training or briefings for access-authorized persons on potential hazards and safety precautions (e.g., appropriate PPE usage to prevent dermal exposure to soil, and appropriate steps to avoid disturbing ACM). Once the fence is complete and LUCs are in place, this alternative results in reduced potential for exposure to contaminated soil by National Guard receptors. The alternative ensures compliance with the requirement that all personnel are properly trained and briefed on potential hazards. Training may include 40-hour HAZWOPER and ACM awareness training. Workers accessing the fenced area will be required to use appropriate PPE to prevent dermal exposure to soil and take appropriate steps to avoid disturbing ACM. PPE for prevention of dermal exposure to soil would include such items as wearing long sleeve shirts, gloves.

As noted by the Ohio EPA Asbestos NESHAP Coordinator, installing a fence (with signage) around the area containing ACM is adequate protection for future land use of general foot traffic by U.S. Army and OHARNG personnel that have awareness that ACM was left in place. After the fence is put in place, there is no additional requirement for ACM removal. However, as part of this remedy, a best management practice (BMP) to remove surficial ACM through non-intrusive, no digging methods will be implemented. Given there is no requirement to remove ACM after the fence is put in place, there is no requirement to chase ACM (e.g., subsurface ACM) after implementing the BMP.

Components of this alternative include:

- Public Notification and Comment Period;
- ROD Amendment;
- Remedial Design addendum;
- Pre-mobilization activities (e.g., brush and tree clearing);
- Removal of surficial ACM;
- Fence installation;
- Wetland mitigation (areas disturbed during removal described in Section 3.2.2);
- LUCs; and
- Five-year reviews.

4.4 ALTERNATIVE 8: PERIMETER FENCE ~ RESTRICTED LAND USE

Alternative 8 consists of installing a fence around the perimeter of RQL. The fence will be a combination of a chain link security fence and high tensile wire fence. The fence specifications would be finalized in a Remedial Design. However, for purposes of this Engineering Evaluation, the specifications of the fence include:

1. At the northern perimeter of RQL, a chain-link security fence (Schedule 40, with 9 gauge wire mesh and 2" posts on 10-ft centers) and 6 ft high gates with a 1⅝" frame will be installed.

2. At the eastern, southern, and western perimeter of RQL, a five-strand high tensile wire fence will be installed.

3. Gates to allow for authorized personnel and equipment access will be installed.

Figure 4-1 presents a preliminary layout of fencing to be installed under Alternative 8.

Installation of this fence encompasses the two areas specified in the RQL ROD (i.e., RQL-039M and RQL-040M), the areas identified to exceed COC CUGs (RQL-041M, RQL-042M, RQL-043M, and RQL-045M), and the closed, sanitary landfill. The fence line will provide the U.S. Army and NBG access control to the closed, sanitary landfill. Gates will be in the fence line so activities such as maintenance of the quarry bottom, landfill cap inspections, and mowing may take place. Placement of the gates will be finalized in a Remedial Design. Additionally, signage notifying personnel of the presence of asbestos in the quarry will be placed on the fence.

This physical control will be combined with administrative LUCs to ensure there is no digging. RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed, sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities, and installation of this fence will help enforce these restrictions. Surveying, sampling, and essential security, safety, periodic maintenance, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. Appropriate personnel will be granted access to the AOC after being properly briefed on the hazards/restrictions prior to entry (USACE 2005b). The physical and administrative controls will eliminate or reduce receptor exposure to COCs and comply with requirements of OAC 3745-20-07(A)(1) by eliminating the potential of discharging visible asbestos emissions to the outside air.

The physical and administrative controls under this alternative further restricts access to that portion of the AOC exceeding cleanup goals. The fence and signage further deters entry of any other receptors that are not granted access to RQL or who do not have proper training. Administrative LUCs include such measures as access and digging restrictions and personnel training or briefings on potential hazards and safety precautions (e.g., appropriate PPE usage to prevent dermal exposure to soil, and appropriate steps to avoid disturbing ACM) for access-authorized persons. Once the fence is complete and LUCs are in place, this alternative results in reduced potential for exposure to contaminated soil by National Guard receptors. This alternative will also protect the landfill cap on the closed, sanitary landfill within RQL. The alternative ensures compliance with the requirement that all personnel are properly trained and briefed on potential hazards. Training may include 40-hour HAZWOPER and ACM awareness training. Workers accessing the fenced area will be required to use appropriate PPE to prevent dermal exposure to soil and take appropriate steps to avoid disturbing ACM. PPE for prevention of dermal exposure to soil includes long sleeve shirts and gloves.

As noted by the Ohio EPA Asbestos NESHAP Coordinator, installing a fence (with signage) around the area containing ACM is adequate protection for future land use of general foot traffic by U.S.

Army and OHARNG personnel that have awareness that ACM was left in place. After the fence is put in place, there is no additional requirement for ACM removal. However, as part of this remedy, a BMP to remove surficial ACM in the quarry bottom through non-intrusive, no digging methods will be implemented. Given there is no requirement to remove ACM after the fence is put in place, there is no requirement to chase ACM (e.g., subsurface ACM) after implementing the BMP.

Components of this alternative include:

- Public Notification and Comment Period;
- ROD Amendment;
- Remedial Design addendum;
- Pre-mobilization activities (e.g., brush and tree clearing);
- Removal of surficial asbestos-containing material;
- Fence installation;
- Wetland mitigation (areas disturbed during removal described in Section 3.2.2);
- LUCs; and
- Five-year reviews.

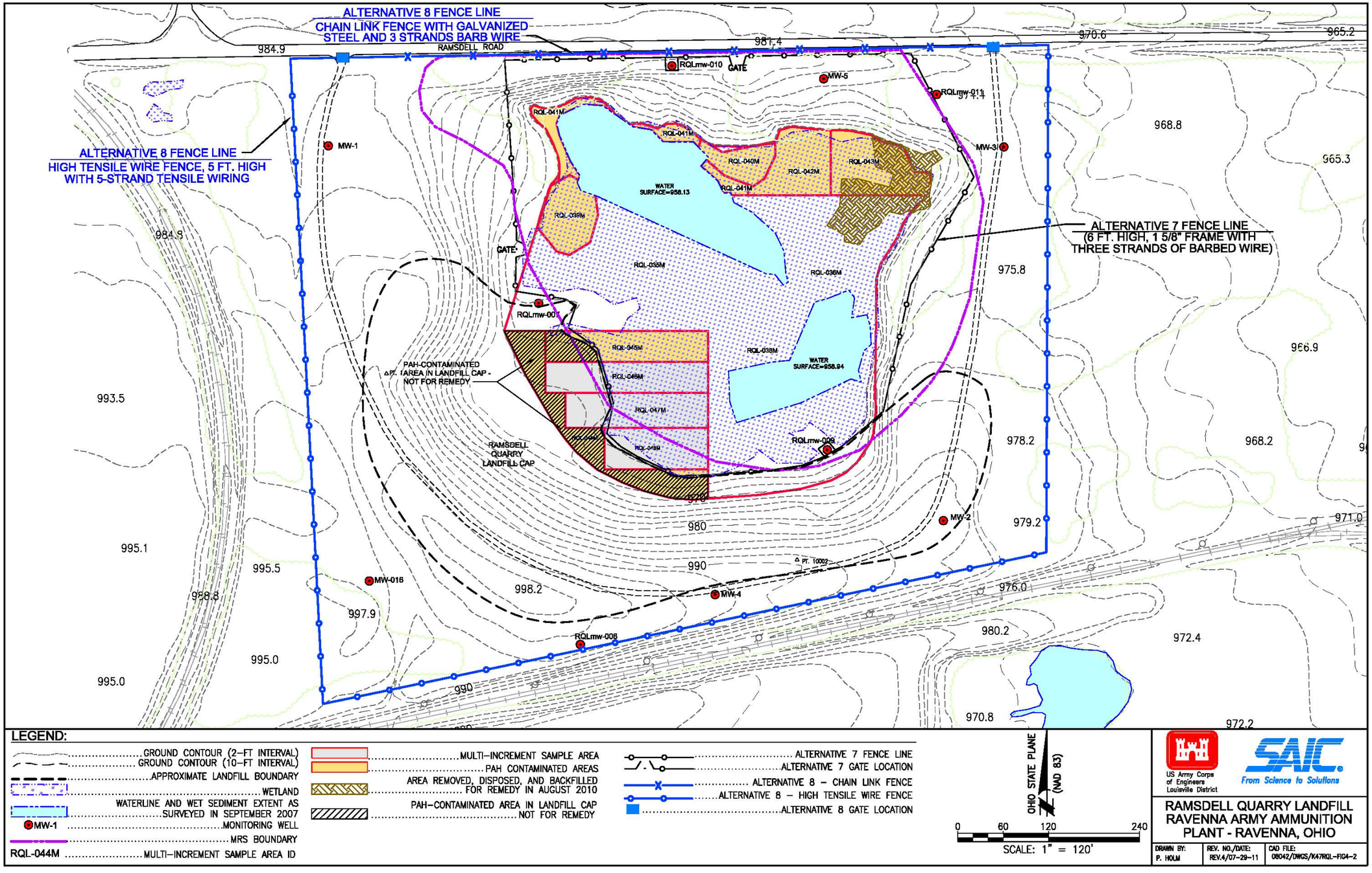

Figure 4-1. Proposed Fencing Layout for Alternatives 7 and 8

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5.0 ANALYSIS OF ALTERNATIVES

This section analyzes Alternatives 5, 6, 7, and 8 against the NCP evaluation criteria.

5.1 THRESHOLD CRITERIA

Two of the NCP evaluation criteria relate directly to statutory findings in the RQL ROD. These criteria are thus considered to be threshold criteria that must be met by any remedy to be selected. The criteria are:

1. Overall protection of human health and the environment; and
2. Compliance with ARARs.

Each alternative must be evaluated to determine how it achieves and maintains protection of human health and the environment. Similarly, each remedial alternative must be assessed to determine how it complies with ARARs, or, if a waiver is required, an explanation of why a waiver is justified. An alternative is considered to be protective of human health and the environment if it complies with media-specific preliminary CUGs.

5.2 BALANCING CRITERIA

The five balancing criteria represent the primary criteria upon which the detailed analysis of alternatives and the comparison of alternatives are based. They are:

1. Long-term effectiveness and permanence;
2. Reduction of toxicity, mobility, or volume through treatment;
3. Short-term effectiveness;
4. Implementability; and
5. Cost.

5.2.1 Long-term Effectiveness

Long-term effectiveness and permanence is an evaluation of the magnitude of residual risk (risk remaining after implementation of the alternative) and the adequacy and reliability of controls used to manage the remaining waste (untreated waste and treatment residuals) over the long term. Alternatives that provide the highest degree of long-term effectiveness and permanence leave minimal or no untreated waste at the AOC, make long-term maintenance and monitoring unnecessary, and minimize the need for LUCs.

5.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment is an evaluation of the ability of the alternative to reduce the toxicity, mobility, or volume of the waste. The irreversibility of the treatment process and the type and quantity of residuals remaining after treatment are also assessed.

5.2.3 Short-term Effectiveness

Short-term effectiveness addresses the protection of workers and the community during the remedial action, the environmental effects of implementing the action, and the time required to achieve media-specific CUGs.

5.2.4 Implementability

Implementability addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during implementation. Technical feasibility assesses the ability to construct and operate a technology, the reliability of the technology, the ease in undertaking additional remedial actions, and the ability to monitor the effectiveness of the alternative. Administrative feasibility is addressed in terms of the ability to obtain approval from federal, state, and local agencies.

5.2.5 Cost

Cost analyses provide an estimate of the dollar cost of each alternative. The cost estimates in this report are based on estimating reference manuals, historical costs, vendor quotes, and engineering estimates. Costs are reported in base year 2011 dollars, or present value (future costs are converted to base year 2011 dollars using a 4.125% discount factor). The present value analysis is a method to evaluate expenditures, either capital or O&M, which occur over different time periods. Present value calculations allow for cost comparisons of different remedial alternatives on the basis of a single cost figure. The capital costs have not been discounted due to their relatively short implementation duration. The cost estimates are for guidance in project evaluation and implementation, and are believed to be accurate within a range of -30% to +50% in accordance with U.S. Environmental Protection Agency (USEPA) guidance (USEPA 1988). Actual costs could be higher than estimated due to unexpected conditions or potential delays. Details and assumptions used in developing cost estimates for each of the alternatives are provided in Appendix A.

5.3 MODIFYING CRITERIA

The two modifying criteria are state acceptance and community acceptance.

5.3.1 State Acceptance

State acceptance considers comments received from agencies of the state of Ohio. The primary state agency supporting this investigation and remedy is the Ohio EPA. Comments will be obtained from state agencies on the recommended alternative. The final remedy for RQL will not be considered final until approved by Ohio EPA.

5.3.2 Community Acceptance

Community acceptance considers comments made by the community, including stakeholders, on the alternatives being considered. Input has been encouraged during the ongoing investigation process to ensure the remedy ultimately selected for RQL is acceptable to the public. The community has been and will continue to be notified of the progress at RQL during Restoration Advisory Board (RAB) meetings. Additionally, RAB members were given a tour of site conditions at RQL in September 2010. A public notification will take place for change of remedy at RQL. Depending upon the chosen remedy, an Explanation of Significant Differences will be developed or Public Notification will be implemented to explain the nature of the significant changes, summarize the information that led to making the changes, and affirm that the revised remedy complies with the NCP and statutory requirements of CERCLA.

5.4 DETAILED ANALYSIS OF ALTERNATIVES

Detailed analyses of the newly proposed remedial alternatives for the RQL are presented below. Each relevant set of alternatives are described and evaluated for each AOC against the criteria outlined in Section 5.1. For these evaluations, the term "high" indicates a highly favorable situation, "medium" indicates a moderately favorable situation, and "low" indicates a situation that is not favorable.

5.4.1 Alternative 5: Excavation of Soil and Off-site Disposal

5.4.1.1 Overall Protection of Human Health and the Environment

In general, the long-term protectiveness of this alternative is high for the intended restricted land use at RQL as represented by the Security Guard/Maintenance Worker.

The human health risk assessment (HHRA) for RQL indicates potential future human health risks from soil are above the target risk of the cumulative excess lifetime cancer risk of 1E-05 and the NCP risk range of 1E-06 to 1E-04 ILCR under the Security Guard/Maintenance Worker land use scenario. The potential future human health risk does not exceed an HI of 1.0 for non-carcinogenic compounds for soil.

The removal provides reasonable certainty that the total ILCR and total HI across all chemical contaminants will be at or below the thresholds of 1E-05 and 1.0, respectively for the Security Guard/Maintenance Worker following remediation. The removal will also reduce the potential risk

from exposure to friable ACM. Therefore, this alternative provides overall protection to the representative receptor for human health.

5.4.1.2 Compliance with ARARs

Requirements identified as ARARs were evaluated within the RQL FS and finalized within the RQL ROD. Those requirements identified within the referenced documents are not re-created here but are incorporated by reference for the excavation and off-site disposal of soil. This section provides relevant and appropriate requirements to address the presence of ACM within the removal area. The removal of soil containing ACM through excavation requires compliance with OAC 3745-20-05 (Standard for asbestos waste handling) as an action-specific ARAR. These regulations require that wastes containing asbestos must be handled in a manner to prevent fugitive emissions from waste handling and must be transported to disposal in a sealed or contained manner (either sealed containers or transported in bulk by leak-tight transport vehicles or containers as required by subparagraph (B)(2) of the referenced rule.

In addition, a relevant and appropriate requirement can be invoked for this activity under OAC 3745-20-07(A)(1-3) to ensure either: (1) no visible emissions are discharged to the outside air; (2) asbestos-containing waste material is covered with at least six inches of compacted non-ACM, and a cover of vegetation is grown and maintained on the area to adequately prevent exposure of the asbestos-containing waste material; or (3) the asbestos-containing waste material is covered with at least 2 ft compacted non-ACM, and the cover is maintained to prevent exposure of the asbestos-containing waste material. Any potential ACM located in an identified wetland areas beyond the PAH-contaminated remedial footprint does not require removal to eliminate the discharge of visible emissions due to the fact that the quarry bottom is heavily vegetated and much of the quarry bottom lies within identified wetlands and the material will be saturated or inundated.

It is anticipated that removal of the materials (with handling of the waste materials as specified by rule) would achieve compliance with the identified ARARs (within the FS, ROD, and Engineering Evaluation).

5.4.1.3 Long-Term Effectiveness and Permanence

Alternative 5 is protective in the long-term for restricted land-use as represented by the Security Guard/Maintenance Worker. Contaminants remain on-site above CUGs for residential land use. This alternative includes administrative LUCs to eliminate or reduce exposures to receptors. There are currently no physical controls at RQL to ensure the LUCs are enforced. However, with appropriate documentation and procedures, LUCs can be successfully implemented and would be effective in protecting human health and the environment.

Reviews will be conducted at least once every 5 years, pursuant to CERCLA requirements. CERCLA five-year reviews permit the evaluation of remedy components, including effectiveness of LUCs.

5.4.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 5 involves excavation of contaminated soil for disposal in a permitted solid waste landfill. This alternative reduces the mobility of the COCs by placing the contaminated soil in an engineered, lined, disposal cell at the landfill. This alternative does not reduce the toxicity or volume of the contaminated soil.

5.4.1.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 5 includes the potential for worker exposure during the excavation process as well as the exposure to the community during transportation of soil and ACM. Workers would follow a health and safety plan and wear appropriate PPE to minimize exposures. Mitigation measures are used to minimize short-term impacts, such as erosion and dust control during construction. Additional mitigation measures due to handling ACM would include having a Hazard Abatement Specialist on-site, ensuring excavated material is adequately wet, demarcating the construction area with asbestos hazard tape, having workers wear respirators until air monitoring allows for PPE downgrade, and wrapping friable ACM in minimum 12-mil poly sheeting prior to transport. Excavation would result in temporary loss of vegetated habitat for ecological receptors, including portions of the existing wetland.

Excavated soil is transported by truck to a disposal facility. Risks are mitigated during transport by inspecting vehicles before and after use, decontaminating when needed, observing safety protocols, following pre-designated routes, and limiting the distance the waste is transported in vehicles. Transportation risks (e.g., from continuous leaks or accidents) increase with distance and volume. Transportation of contaminated materials to an off-site disposal facility strictly complies with all applicable state and federal regulations. Pre-designated routes would be traveled, and an emergency response program developed to facilitate accident response. Alternative 5 requires transportation of approximately 75 truckloads of soil/ACM a total of approximately 5,250 miles (i.e., 35 miles each way/trip).

Remedial actions are estimated to require approximately 2 months to complete, followed by 30 years of O&M. Wetland monitoring and maintenance will be implemented to ensure compliance with wetland mitigation requirements. Upon the completion of the excavation activities, the entirety of RQL would be released for Security Guard/Maintenance Worker land use.

5.4.1.6 Implementability

Alternative 5 is technically implementable. Excavation of contaminated soil, construction of temporary roads, and waste handling are conventional activities in construction projects of this kind. However, due to the type of waste (friable ACM), only select disposal facilities are available that can accept generated waste, and enhanced site controls and personnel protection is required. Construction and operation of the components of Alternative 5 would be available to complete the remedial

activity. Special engineering techniques (e.g., use of respirators, air monitoring) may be required during construction activities to deal with friable ACM and potential MEC issues at RQL.

LUCs also are implementable with the proper oversight of the U.S. Army. RQL currently has administrative access restrictions implemented at the AOC, although this alternative does not propose physical restrictions or barriers. Technical difficulties for establishing additional monitoring programs or restricting access controls are not expected.

Careful planning would be needed between remedial action planners and OHARNG to minimize disruptions and/or impacts to OHARNG operations during implementation. Access routes for heavy equipment to the remediation area would be selected to minimize disruption. Additional steps would be taken to minimize hazards posed to on-site personnel. This type of planning will increase the implementation difficulty of Alternative 5 but also will reduce the risks to personnel.

The present value cost to complete Alternative 5 is approximately $757,155 (in base year 2011 dollars with a 4.125% discount factor). O&M costs including cap and wetland maintenance, monitoring, and imposition of LUCs are estimated for a 30-year period. In addition, five-year reviews are required throughout the costing period and are included in the estimate.

5.4.2 Alternative 6: Capping

5.4.2.1 Overall Protection of Human Health and the Environment

In general, the long-term protectiveness of this alternative is high for the intended restricted land use at RQL as represented by the Security Guard/Maintenance Worker.

The HHRA for RQL indicates potential future human health risks from soil are above the target risk of the cumulative excess lifetime cancer risk of 1E-05 and the NCP risk range of 1E-06 to 1E-04 ILCR under the Security Guard/Maintenance Worker land use scenario. The potential future human health risk does not exceed HI of 1.0 for non-carcinogenic compounds for soil.

The capping of contaminated soil provides reasonable certainty that the total ILCR and total HI across all chemical contaminants will be at or below the thresholds of 1E-05 and 1.0, respectively for the Security Guard/Maintenance Worker following remediation. The capping will also reduce the potential risk from exposure to friable ACM present within the remedial action footprint. Therefore, this alternative provides overall protection to the representative receptor for human health.

5.4.2.2 Compliance with ARARs

Requirements identified as ARARs were evaluated within the RQL FS and finalized within the RQL ROD, with the exception of relevant and appropriate requirements pertaining to ACM. Those requirements identified within the referenced documents are not re-created here but are incorporated by reference for capping. This section provides relevant and appropriate requirements to address the

presence of ACM within the PAH-contaminated area requiring remedial actions. The presence of ACM within the contaminated area triggers a relevant and appropriate requirement for this activity under OAC 3745-20-07(A)(2) to cover the asbestos-containing waste material with at least six inches of compacted non-ACM, and grow and maintain a cover of vegetation on the area adequate to prevent exposure of the asbestos-containing waste material. In addition, paragraph (B) of the referenced rules requires specific signage and access control to the site to ensure the material is not disturbed.

It is anticipated that capping and control of the facility would comply with the identified ARARs included within this Engineering Evaluation and those incorporated by reference from the FS and ROD.

5.4.2.3 Long-Term Effectiveness and Permanence

Alternative 6 is protective in the long-term for Security Guard/Maintenance Worker land use. The areas containing COCs above CUGs will be covered to a thickness that eliminates exposure of the anticipated future land user to these areas (maximum exposure depth of 1 ft bgs). Additionally, this cover meets the relevant and appropriate requirement to cover the asbestos-containing waste material with at least six inches of compacted non-ACM. Contaminants will remain on-site below 1 ft bgs as well as above CUGs for residential land use. This alternative includes administrative LUCs to eliminate or reduce exposures to receptors. Physical LUCs will not be present at RQL. However, with appropriate documentation and procedures, LUCs can be successfully implemented and would be effective in protecting human health and the environment.

Installation of a cap at RQL may prevent future investigations or cleanup required under the Military Munitions Response Program (MMRP). RQL is considered a Munitions Response Site (MRS) and there are future activities for munitions investigations that may lead to remedial work to achieve remedy. Placing a cap over the area requiring investigation and possible remediation for munitions may inhibit or prevent remedy under the MMRP.

Reviews will be conducted at least once every 5 years, pursuant to CERCLA requirements. CERCLA five-year reviews permit the evaluation of remedy components, including effectiveness of LUCs.

5.4.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 6 does not involve treatment. Therefore, no reduction in contaminant toxicity, mobility, or volume is achieved with this alternative.

5.4.2.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 6 includes the potential for worker exposure during the capping process. Workers would follow a health and safety plan and wear appropriate PPE to minimize exposures. Mitigation measures would be used to minimize short-term impacts, such as erosion and dust control during construction. Approximately 75 truckloads of clay and top soil for the cap would be transported from a local source. Capping would result in temporary loss of vegetated habitat for ecological receptors including portions of the existing wetland.

Remedial actions are estimated to require approximately 2 months to complete, followed by 30 years of O&M. Upon the completion of the cap, the entirety of RQL would be released for Security Guard/Maintenance Worker land use.

5.4.2.6 Implementability

Alternative 6 is technically implementable. Putting a cap on contaminated soil is performed via conventional activities in construction projects of this kind. Construction and operation of the components of Alternative 6 would be available to complete the remedial activity. However, special engineering techniques may be required during construction activities to deal with encountering potential ACM and MEC at RQL.

LUCs also are implementable with the proper oversight of the U.S. Army. RQL currently has administrative access restrictions implemented at the AOC, although this alternative does not propose physical restrictions or barriers. Technical difficulties for establishing additional monitoring programs or restricting access controls are not expected.

Careful planning would be needed between remedial action planners and OHARNG to minimize disruptions and/or impacts to OHARNG operations during implementation. Access routes for heavy equipment to remediation areas would be selected to minimize disruption. Additional steps would be taken to minimize hazards posed to on-site personnel. This type of planning will increase the implementation difficulty of Alternative 6 but also will reduce the risks to personnel.

5.4.2.7 Cost

The present value cost to complete Alternative 6 is approximately $340,590 (in base year 2011 dollars with a 4.125% discount factor). O&M costs including cap and wetland maintenance, monitoring, and imposition of LUCs are estimated for a 30-year period. In addition, five-year reviews are required throughout the costing period and are included in the estimate.

5.4.3 Alternative 7: Quarry Bottom Fence

5.4.3.1 Overall Protection of Human Health and the Environment

In general, the long-term protectiveness of this alternative is high for the intended restricted land use at RQL.

The HHRA for RQL indicates potential future human health risks from soil are above the target risk of the cumulative excess lifetime cancer risk of 1E-05 and the NCP risk range of 1E-06 to 1E-04 ILCR under the Security Guard/Maintenance Worker land use scenario. Estimated risks are associated with dermal exposure to soil by a Security Guard/Maintenance Worker visiting the site 250 days/year for 25 years wearing short sleeves and operating heavy equipment.

RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities. However, surveying, sampling, and essential security, safety, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. All individuals unfamiliar with RQL are properly briefed on the hazards/restrictions prior to entry into the AOC (USACE 2005b).

The physical and administrative controls under this alternative will further restrict access to the portion of the AOC exceeding cleanup goals. The chain-link security fence and signage will further deter entry by any other receptors that are not granted access to RQL. All personnel will be properly briefed on access controls and potential hazards. In the event non-routine or emergency entry into the fenced area is necessary, additional training, including the use of appropriate PPE to prevent dermal exposure to soil and appropriate procedures to follow to avoid disturbing ACM, will be provided.

5.4.3.2 Compliance with ARARs

Requirements identified as ARARs were evaluated within the RQL FS and finalized within the RQL ROD. Those requirements identified within the referenced documents are not re-created here, but are incorporated by reference for this alternative. This section provides an addendum to the previously identified requirements and includes the additional requirements identified as ARAR due to the presence of ACM within the landfill.

The presence of ACM would trigger the requirements of OAC 3745-20-07 (Standards for inactive asbestos waste disposal sites) as an action-specific ARAR. In addition, a relevant and appropriate requirement can be invoked for this activity under OAC 3745-20-07(A)(1-3) to ensure either: (1) no visible emissions are discharged to the outside air; (2) the asbestos-containing waste material is covered with at least six inches of compacted non-ACM, and a cover of vegetation is grown and maintained on the area to adequately prevent exposure of the asbestos-containing waste material; or (3) the asbestos-containing waste material is covered with at least 2 ft compacted non-ACM, and the cover is maintained to prevent exposure of the asbestos-containing waste material. Any potential

ACM located in areas beyond the PAH-contaminated remedial action footprint does not require removal to eliminate the discharge of visible emissions due to the fact that the quarry bottom is heavily vegetated and much of the quarry bottom lies within identified wetlands and the material will be saturated or inundated.

It is anticipated that fencing and controlled access of the facility will comply with the identified ARARs included within this Engineering Evaluation and those incorporated by reference from the FS and ROD.

5.4.3.3 Long-Term Effectiveness and Permanence

Alternative 7 is protective in the long-term for restricted land use. Contaminants will remain on-site above CUGs; however the quarry bottom at RQL will have administrative and physical controls in place to eliminate or reduce exposure to various receptors. With appropriate documentation and access procedures, LUCs can be successfully implemented and would be effective in protecting human health and the environment.

Reviews will be conducted at least once every 5 years, pursuant to CERCLA requirements. CERCLA five-year reviews permit the evaluation of remedy components, including effectiveness of LUCs.

5.4.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 7 does not involve treatment. Therefore, no reduction in contaminant toxicity, mobility, or volume is achieved with this alternative.

5.4.3.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 7 is high. This alternative does not include excavation or construction activities within the contaminated area of the AOC thus minimizing the potential for worker exposure during implementation of the alternative. There are no significant short-term human health risks associated with Alternative 7 beyond baseline conditions. No short-term health risks to the community would occur since no excavation or construction activities would be conducted within the contaminated area of the AOC. There would be no transportation risks nor would workers be exposed to any additional health risks. Alternative 7 would not directly cause adverse impacts on soils or air quality. Installation of the fence would result in temporary loss of vegetated habitat for ecological receptors at the perimeter of the AOC, but would not impact the existing wetland.

Remedial actions are estimated to require approximately 1 month to complete, followed by 30 years of O&M. Upon the completion of the fence, RQL would be released for restricted land use.

5.4.3.6 Implementability

Alternative 7 is technically implementable. Fence installation is performed via conventional activities in construction projects of this kind. Some vegetation and tree clearing is required. Construction and operation of the components of Alternative 7 would be available to complete the remedial activity.

Land use controls also are implementable with the proper oversight of the U.S. Army. RQL currently has administrative access restrictions implemented at the AOC, although this alternative proposes the addition of physical restrictions or barriers. Technical difficulties for establishing additional monitoring programs or restricting access controls are not expected.

5.4.3.7 Cost

The present value cost to complete Alternative 7 is approximately $249,153 (in base year 2011 dollars with a 4.125% discount factor). O&M costs, including fence maintenance, monitoring, and imposition of LUCs, are estimated for a 30-year period. In addition, five-year reviews are required throughout the costing period and are included in the estimate.

5.4.4 Alternative 8: Perimeter Fence

5.4.4.1 Overall Protection of Human Health and the Environment

In general, the long-term protectiveness of this alternative is high for the intended restricted land use at RQL.

The HHRA for RQL indicates potential future human health risks from soil are above the target risk of the cumulative excess lifetime cancer risk of 1E-05 and the NCP risk range of 1E-06 to 1E-04 ILCR under the Security Guard/Maintenance Worker land use scenario. Estimated risks are associated with dermal exposure to soil by a Security Guard/Maintenance Worker visiting the site 250 days/year for 25 years, wearing short sleeves, and operating heavy equipment.

RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed, sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities. However, surveying; sampling; essential security, safety, natural resources management; and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. All individuals unfamiliar with RQL are properly briefed on the hazards/restrictions prior to entry into the AOC (USACE 2005b).

The physical and administrative controls under this alternative will further restrict access to the entire AOC, specifically the portion of the AOC exceeding cleanup goals and the sanitary landfill. The chain-link security fence, five-strand high tensile wire fence, and signage will further deter entry of receptors that are not granted access to the AOC; this will provide added benefit to protect the adjacent landfill cap from surface damage or intrusive activities. All personnel will be properly

briefed on access controls and potential hazards. In the event non-routine or emergency entry into the fenced area is necessary, additional training, including the use of appropriate PPE to prevent dermal exposure from soil contact and appropriate procedures to follow to avoid disturbing ACM, will be provided by the U.S. Army.

5.4.4.2 Compliance with ARARs

Requirements identified as ARARs were evaluated within the RQL FS and finalized within the RQL ROD. Those requirements identified within the referenced documents are not re-created here but are incorporated by reference for this alternative. This section provides an addendum to the previously identified requirements and includes the additional requirements identified as ARARs due to the presence of ACM within the landfill.

The presence of ACM in the quarry would trigger the requirements of OAC 3745-20-07 (Standards for inactive asbestos waste disposal sites) as an action-specific ARAR. In addition, a relevant and appropriate requirement can be invoked for this activity under OAC 3745-20-07(A)(1-3) to ensure either: (1) no visible emissions are discharged to the outside air; (2) the asbestos-containing waste material is covered with at least 6 inches of compacted non-ACM, and a cover of vegetation is grown and maintained on the area to adequately prevent exposure of the asbestos-containing waste material; or (3) the asbestos-containing waste material is covered with at least 2 ft compacted non-ACM, and the cover is maintained to prevent exposure of the asbestos-containing waste material. The "no visible emissions" requirement of OAC 3745-20-07(A)(1) can be attained for co-located PAH and ACM-containing areas to be excavated or disturbed by removal and proper disposal of the material. Any potential ACM located in areas beyond the PAH-contaminated remedial action footprint does not require removal to eliminate the discharge of visible emissions per OAC 3745-20-07(A)(1) due to the fact that the quarry bottom is heavily vegetated, much of the quarry bottom lies within identified wetlands, and the material will be saturated or inundated. However, the U.S. Army requested implementation of a BMP to remove surficial ACM from the quarry bottom.

It is anticipated that fencing and controlled access of the facility will comply with the identified ARARs included within this Engineering Evaluation and those incorporated by reference from the FS and ROD.

5.4.4.3 Long-Term Effectiveness and Permanence

Alternative 8 is protective in the long-term for restricted land use. CERCLA contaminants will remain on-site above CUGs; however, the quarry bottom at RQL will have administrative and physical controls in place to eliminate or reduce exposure to various receptors. With appropriate documentation and access procedures, LUCs can be successfully implemented and would be effective in protecting human health and the environment. In addition, the fence under this alternative provides added long-term effectiveness by preventing exposure to the closed, sanitary landfill.

Reviews will be conducted at least once every five years, pursuant to CERCLA requirements. CERCLA five-year reviews permit the evaluation of remedy components, including effectiveness of LUCs.

5.4.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 8 does not involve treatment. Therefore, no reduction in contaminant toxicity, mobility, or volume is achieved with this alternative.

5.4.4.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 8 is high. This alternative does not include excavation or construction activities within the contaminated area of the AOC thus minimizing the potential for worker exposure during implementation. There are no significant short-term human health risks associated with Alternative 8 beyond baseline conditions. No short-term health risks to the community would occur since no excavation or construction activities would be conducted within the contaminated area of the AOC. There would be no transportation risks, and workers would not be exposed to any additional health risks. Alternative 8 would not directly cause adverse impacts on soils or air quality. Installation of the fence would result in temporary loss of vegetated habitat for ecological receptors at the perimeter of the AOC, but it would not impact the existing wetland.

Remedial actions are estimated to require approximately 1 month to complete, followed by 30 years of O&M. Upon the completion of the fence, RQL would be released for restricted land use.

5.4.4.6 Implementability

Alternative 8 is technically implementable. Fence installation is performed via conventional activities in construction projects of this kind. Some vegetation and tree clearing is required. Construction and operation of the components of Alternative 8 would be available to complete the remedial activity.

LUCs also are implementable with the proper oversight of the U.S. Army. RQL currently has administrative access restrictions implemented at the AOC, although this alternative proposes the addition of physical restrictions or barriers. Technical difficulties for establishing additional monitoring programs or restricting access controls are not expected.

5.4.4.7 Cost

The present value cost to complete Alternative 8 is approximately $249,962 (in base year 2011 dollars with a 4.125% discount factor). O&M costs, including fence maintenance, monitoring, and imposition of LUCs, are estimated for a 30-year period. In addition, five-year reviews are required throughout the costing period and are included in the estimate.

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6.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, a comparative analysis of the four alternatives is conducted to identify relative advantages and disadvantages based on the detailed analysis above. The comparative analysis provides a means by which remedial alternatives are directly compared to one another with respect to common criteria. Overall protection and compliance with ARARs are threshold criteria that must be met by any alternative to be eligible for selection. The other criteria, consisting of short- and long-term effectiveness; reduction of contaminant toxicity, mobility, or volume through treatment; ease of implementation; and cost are the primary balancing criteria used to select a preferred remedy among alternatives satisfying the threshold criteria.

The relative advantages and disadvantages and comparative analysis of these alternatives are described below and presented in Tables 6-1 and 6-2.

6.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives 5, 6, 7, and 8 are all protective for human health in a restricted-access land use scenario at RQL. Alternatives 5 and 6 remove or cap soil in the quarry to meet the Security Guard/Maintenance Worker preliminary CUGs. Removal or capping of the soil provides reasonable certainty that the total ILCR and total HI across all contaminants will be at or below thresholds of 1E-05 and 1.0 respectively for the Security Guard/Maintenance Worker. Alternatives 7 and 8 prevent exposure by constructing a fence and emplacing administrative controls to prevent entry into those portions of the AOC having CERCLA COCs greater than CUGs. Alternative 8 provides the additional protectiveness of preventing access to the closed, sanitary landfill. Additional administrative controls will ensure personnel who must enter the fenced area on a non-routine emergency basis have been properly briefed on potential hazards, wear appropriate PPE to prevent dermal exposure to soil, and take appropriate steps to avoid disturbing ACM.

Ecological risks are not high, based on AOC reconnaissance and low COPEC concentrations. Under Alternatives 5, 7, and 8, wetland mitigation and monitoring are required as part of substantive requirements. Under Alternative 6, challenges exist with re-establishing a wetland on the cap and maintaining wetlands per substantive requirements. There are implementation concerns that increasing the soil elevation by 1 ft will impact the wetland restoration, as the intermittent surface water may not remain in the quarry bottom long enough to re-establish the isolated wetland.

6.2 COMPLIANCE WITH ARARS

Alternatives 5, 6, 7, and 8 comply with the identified ARARs for the site including those incorporated by reference from the FS and ROD and requirements of OAC 3745-20-07.

6.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative 5 is rated high in terms of long-term effectiveness in preventing exposures or the spread of contamination due to the removal of COCs in soil to a Security Guard/Maintenance Worker land use scenario and implementation of administrative LUCs. Alternative 6 is rated medium due to the fact that COCs (although capped) are left in place at the AOC and only administrative controls will be put in place to ensure digging is not conducted at the AOC. Alternatives 7 and 8 are rated medium due to the permanence and effectiveness a fence will have at eliminating exposure to CERCLA COCs and co-located friable ACM. Although no contaminants will be removed from the AOC, physical and administrative controls will minimize or eliminate exposure to contaminants from the quarry bottom.

6.4 REDUCTION IN CONTAMINANT VOLUME, TOXICITY, AND MOBILITY THROUGH TREATMENT

The ability of Alternative 5 to reduce contaminant volume, toxicity, and mobility is medium. Alternative 5 does not reduce contaminant volume and toxicity of COCs (presented in Table 1-1) or ACM. However, Alternative 5 reduces the mobility of the COCs and ACM by placing the contaminated soil in an engineered, lined, disposal cell at the landfill. The fate and transport modeling concluded COCs are not predicted to impact underlying groundwater beneath the AOC, and they have never been detected during groundwater monitoring at the AOC. Most asbestos minerals are chemically inert, insoluble in water, and the potential for solid particulate migration through soil and bedrock to underlying groundwater is negligible. Therefore, asbestos is not included as a standard analyte under the RVAAP facility-wide groundwater monitoring program. The ability of Alternatives 6, 7, and 8 to reduce contaminant volume, toxicity and mobility is low since these alternatives do not involve treatment.

6.5 SHORT-TERM EFFECTIVENESS

Short-term risks are associated with implementation of Alternatives 5 and 6 because these activities will be conducted in the presence of friable ACM and in the possible presence of munitions. Additionally, both alternatives impact the wetlands that currently exist in the quarry bottom during implementation activities. Alternative 5 is rated low because intrusive work will be performed and friable ACM will be handled and disposed. Additionally, Alternative 5 will require the transport of approximately 75 truckloads of soil/ACM over local roads to an off-site disposal facility. The disposal of an estimated 1,614 yd^3 in a landfill will also shorten the longevity of that landfill. Alternative 6 is rated medium due to risks of encountering munitions while installing the cap on the surface soil in the quarry bottom; however, this alternative does not include potential impacts from excavation and transportation of contaminated soil and ACM.

The short-term effectiveness for Alternatives 7 and 8 include activities during the fence installation. Entry to the quarry bottom will be limited during fence installation of either alternative; thus, impacts to ecological habitat will be minimized. Alternative 7 requires fence installation at the slope of the sanitary landfill and has risk of encountering MEC and ACM. Alternative 8 is outside of the quarry

bottom; therefore, the fence installation is not within the MRS nor is it expected ACM will be encountered. Consequently, Alternative 7 is rated medium for short-term effectiveness, and Alternative 8 is rated high for short-term effectiveness.

6.6 IMPLEMENTABILITY

All alternatives are considered implementable on a technical and availability-of-services basis. Alternative 5 is rated low since the extent of ACM is not defined, and a potential for encountering MEC exists. Alternative 6 is implementable through common construction practices (truck hauling, installation of clay cap). However, there will be challenges associated with disturbing ACM in the capped area, encountering munitions, and meeting wetland restoration requirements after placing 1 ft of soil on the existing wetland. Alternative 6 is rated low for implementability. Alternatives 7 and 8 are implementable through common construction practices (vegetation clearing and fence installation). In a relative comparison, implementation of Alternative 7 will be more difficult than implementation of Alternative 8. Alternative 7 involves more vegetation clearing, whereas the installation of the five strand wire fence in the east, south, and west sides of the RQL perimeter will be implemented relatively easily and will not require clearing. Consequently, Alternative 7 is rated medium for implementability and Alternative 8 is rated high for implementability.

6.7 COST

Costs were estimated for comparison purposes only and are believed accurate within a range of -30% to +50%. The estimated present value cost (in base year 2011 dollars with a 4.125% discount factor) to complete each of the alternatives is as follows:

Alternative 5:	$ 757,155
Alternative 6:	$ 340,590
Alternative 7:	$ 249,153
Alternative 8:	$ 249,962

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Table 6-1. Summary of Detailed Analysis of Remedial Alternatives

NCP Evaluation Criteria	Alternative 5: Excavation of Soil and Off-site Disposal as Friable ACM ~ Security Guard/Maintenance Worker	Alternative 6: Capping ~ Security Guard/Maintenance Worker	Alternative 7: Quarry Bottom Fence ~ Restricted Land Use	Alternative 8: Perimeter Fence ~ Restricted Land Use
1. Overall Protectiveness				
Human Health Protection	Protective due to removal of impacted soil, ACM, and institution of LUCs.	Protective due to capping of impacted soil and institution of LUCs.	Protective due to prevention of exposure to impacted soil by physical (fence) and institutional LUCs.	Protective due to prevention of exposure to impacted soil by physical (fence) and institutional LUCs.
Environmental Protection	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Wetland mitigation and monitoring required as part of substantive requirements.	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Concerns and challenges exist with re-establishing a wetland on the cap and maintaining wetlands per substantive requirements.	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Wetland mitigation and monitoring required for areas already excavated as part of substantive requirements.	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Wetland mitigation and monitoring required for areas already excavated as part of substantive requirements.
2. Compliance with ARARs				
ARARs	Alternative will comply with the identified ARARs. ACM containing soils will be managed in a manner to ensure no visible emissions occur and will be transported and disposed in accordance with the identified requirements.	Alternative will comply with the indentified ARARs. ACM materials would be covered per the requirements and potential exposure subsequently controlled.	Alternative will comply with the identified ARARs. LUCs will ensure there is no discharge of visible emissions to the outside air.	Alternative will comply with the identified ARARs. LUCs will ensure there is no discharge of visible emissions to the outside air.
3. Long-Term Effectiveness and Permanence				
Magnitude of Residual Risk	Residual risk/hazard exceeds target risk/hazard for residential land use.	Residual risk/hazard exceeds target risk/hazard for residential land use.	Residual risk/hazard exceeds target risk/hazard for residential land use.	Residual risk/hazard exceeds target risk/hazard for residential land use.
Adequacy and Reliability of Controls	Controls will be implemented through administrative means via a Property Management Plan. OHARNG will need to monitor access and land use at the AOC after the remedy is complete.	Controls will be implemented through administrative means via a Property Management Plan. OHARNG will need to monitor access and land use at the AOC after the remedy is complete.	Controls will be implemented through administrative means via a Property Management Plan. Management of site access will be bolstered significantly by the physical controls provided by the fence.	Controls will be implemented through administrative means via a Property Management Plan. Management of site access will be bolstered significantly by the physical controls provided by the fence.
Long-Term Management	Required since soils would remain on-site in exceedance of residential land-use CUGs. The wetlands will require periodic surveillance and maintenance.	Required since soils would remain on-site in exceedance of residential land-use CUGs. The wetlands and cap will require periodic surveillance and maintenance.	Required since soils would remain on-site in exceedance of residential land-use CUGs. The fence will require periodic maintenance.	Required since soils would remain on-site in exceedance of residential land-use CUGs. The fence will require periodic maintenance.
4. Reduction of Toxicity, Mobility, or Volume through Treatment				
Reduction through Treatment	None (no treatment).	None (no treatment).	None (no treatment).	None (no treatment).
5. Short-Term Effectiveness				
Community	Risk due to excavation, handling, and transportation of friable ACM and performing work with a munitions response site.	Risk due to heavy equipment on areas containing friable ACM and within a munitions response site.	No immediate increased risk to community.	No immediate increased risk to community.
Workers	Risk due to excavation and handling contaminated soil and friable ACM. Additionally, risk from work performed in a munitions response site. Transportation risks from trucking soil/ACM to off-site disposal facility.	Risk due to construction of cap on contaminated soil and friable ACM. Additionally, risk from work performed in a munitions response site.	No significant increase of risks or hazards to workers.	No significant increase of risks or hazards to workers.
Ecological Resources	Excavation would result in a temporary loss of vegetated habitat including portions of wetland	Capping would result in a temporary loss of vegetated habitat including portions of wetland. Challenges exist in re-developing isolated wetland after cap placement.	Temporary habitat impacts limited to area at perimeter of AOC with no impacts to wetlands.	Temporary habitat impacts limited to area at perimeter of AOC, with no impacts to wetlands.
LUCs	Potential releases controlled with management and engineering practices.	Potential releases controlled with management and engineering practices.	Minimal LUCs are needed in short-term due to low impact alternative	Minimal LUCs are needed in short-term due to low impact alternative.
Time to Complete[1]	2 months	2 months	1 month	1 month
O&M Period	30 years (estimated)	30 years (estimated)	30 years (estimated)	30 years (estimated)

Table 6-1. Summary of Detailed Analysis of Remedial Alternatives (continued)

NCP Evaluation Criteria	Alternative 5: Excavation of Soil and Off-site Disposal as Friable ACM ~ Security Guard/Maintenance Worker	Alternative 6: Capping ~ Security Guard/Maintenance Worker	Alternative 7: Quarry Bottom Fence ~ Restricted Land Use	Alternative 8: Perimeter Fence ~ Restricted Land Use
6. Implementability				
Technical Feasibility	Feasible	Feasible	Feasible	Feasible
Administrative Feasibility	LUCs are currently being implemented at AOC. Additional administrative challenges include wetland disturbances, executing a large construction project, and coordination with facility operations.	LUCs are currently being implemented at AOC. Additional administrative challenges include wetland disturbances, executing a large construction project, and coordination with facility operations.	Relatively easy. LUCs are currently being implemented at AOC.	Relatively easy. LUCs are currently being implemented at AOC.
7. Cost				
Estimated Cost[2]	$757,155	$340,590	$249,153	$249,962

[1]Time to complete remedial action after completion of remedial design, assuming timely project funding. Does not include O&M period.
[2]Estimated costs calculated as net present value in base year 2011 dollars using a 4.125% discount factor. A 30-year O&M period is assumed for cost estimating purposes.
ACM = Asbestos-containing Material
AOC = Area of concern
ARAR = Applicable and relevant or appropriate requirements
COPEC = Constituent of potential ecological concern
CUG = Cleanup Goals
LUC = Land Use Control
NCP = National Contingency Plan
OHARNG = Ohio Army National Guard
O&M = Operation and maintenance
USEPA = U. S. Environmental Protection Agency

Table 6-2. Summary of Comparative Analysis of Remedial Alternatives

NCP Evaluation Criteria	Alternative 5: Excavation of Soil and Off-site Disposal as Friable ACM ~ Security Guard/Maintenance Worker		Alternative 6: Capping ~ Security Guard/Maintenance Worker		Alternative 7: Quarry Bottom Fence ~ Restricted Land Use		Alternative 8: Perimeter Fence ~ Restricted Land Use	
Threshold Criteria	***Result***		***Result***		***Result***		***Result***	
1. Overall Protectiveness of Human Health and the Environment	Protective		Protective		Protective		Protective	
2. Compliance with ARARs	Compliant		Compliant		Compliant		Compliant	
Balancing Criteria	***Ranking***	***Score***	***Ranking***	***Score***	***Ranking***	***Score***	***Ranking***	***Score***
3. Long-Term Effectiveness and Permanence	High	3	Medium	2	Medium	2	Medium	2
4. Reduction of Toxicity, Mobility, or Volume through Treatment	Medium	2	Low	1	Low	1	Low	1
5. Short-Term Effectiveness	Low	1	Medium	2	Medium	2	High	3
6. Implementability	Low	1	Low	1	Medium	2	High	3
7. Cost	Low	1	Medium	2	High	3	High	3
Balancing Criteria Score		*8*		*8*		*10*		*12*

"High" = highly favorable situation
"Medium" = moderately favorable situation
"Low" = situation that is not favorable

7.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

Implementation of Alternative 5 will required an Explanation of Significant Differences (ESD) to be developed for the public to describe the nature of the significant changes, summarize the information that led to making the changes, and affirm that the revised remedy complies with the NCP and statutory requirements of CERCLA. A side-by-side comparison of the original and proposed remedy components will be used to clearly display the significant differences. The ESD will provide additional information on changes that have resulted in the preferred remedy and will include a statement that the ROD remains protective and continues to meet ARARs [NCP §§300.430(f)(1)(ii)(B)(1) and (2)].

Implementation of Alternatives 6, 7, and 8 will require changes to the RQL ROD in accordance with NCP §§300.435(c)(2)(ii)(A through H). In addition, these alternatives will include a 30-day public notice and comment period.

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8.0 RECOMMENDED ALTERNATIVE

The recommended remedial alternative for soil and dry sediment at RQL is Alternative 8: Perimeter Fence ~ Restricted Land Use. This alternative includes installation of a fence at the perimeter of RQL and implementing a BMP to remove surficial ACM through non-intrusive, no digging methods. The fence will be a combination of a chain-link security fence and high tensile wire fence. The fence specifications would be finalized in a Remedial Design. However, for purposes of this Engineering Evaluation, the specifications of the fence include:

1. At the northern perimeter of RQL, a chain-link security fence (Schedule 40, with 9 gauge wire mesh and 2" posts on 10-ft centers) and 6 ft high gates with a 1⅝" frame will be installed.

2. At the eastern, southern, and western perimeter of RQL, a five-strand high tensile wire fence will be installed.

3. Gates to allow for authorized personnel and equipment access will be installed.

Installation of the fence and signage provides a physical control for the AOC. This deterrent will minimize or eliminate the potential for exposure to receptors that are not granted access to RQL. RQL is closed to all normal training and administrative activities. Surveying, sampling, essential security, safety, periodic maintenance, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas.

The physical and administrative controls under this alternative will further restrict access to that portion of the AOC exceeding cleanup goals. The fence and signage will further deter entry by any other receptors that are not granted access to RQL. Administrative LUCs will include access and digging restrictions and personnel briefings for access-authorized persons on potential hazards and safety precautions (e.g., appropriate PPE usage to prevent dermal exposure to soil and appropriate steps to avoid disturbing ACM). Once the fence is complete and LUCs are in place, this alternative will result in reduced potential for exposure to contaminated soil and ACM by National Guard receptors. Fencing will ensure compliance with the requirement that all personnel be properly briefed on potential hazards, including the use of appropriate PPE to prevent dermal exposure to soil, and appropriate steps to take to avoid disturbing ACM. PPE for prevention of dermal exposure to soil would include wearing long sleeves and gloves when in contact with soil.

Implementation of Alternative 8 will provide a remedy for soil and dry sediment at RQL. In addition, fencing around the perimeter of RQL may also provide a remedy for surface water and wet sediment media that currently exists at this AOC. Although the CERCLA process for these two media has not been fully implemented, a fencing option for soil and dry sediment may provide a No Further Action remedy for surface water and wet sediment. This alternative will also provide access restrictions and protection to the landfill cap on the closed, sanitary landfill within RQL.

Alternative 8 has an estimated cost of $249,962 that includes a $95,613 O&M cost. This is a reduction of the $68,806 O&M cost associated with Alternative 3 (selected in the RQL ROD). In addition, this remedy may serve as a remedy for surface water and wet sediment if deemed feasible during the CERCLA process. Implementation of this alternative includes fencing maintenance, wetland mitigation, and supervision of areas disturbed during the removal activities described in Section 3.2.2.

9.0 REFERENCES

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

USACE (United States Army Corps of Engineers) 2005a. *Facility-Wide Biological and Water Quality Study 2003 Ravenna Army Ammunition Plant, Ravenna, Ohio, Part I-Streams, Part II-Ponds*. November 2005.

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

USACE 2006. *Final Feasibility Study (FS) for Ramsdell Quarry Landfill (RVAAP-01) at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. March 2006.

USACE 2009. *Final Record of Decision for Ramsdell Quarry Landfill (RVAAP-01) at the Ravenna Army Ammunition Plant, Ravenna, Ohio.* March 2009.

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USEPA (United States Environmental Protection Agency) 1988. *Guidance for Conducting Remedial Investigation/Feasibility Studies under CERCLA*. October 1988.

USEPA 1999. *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*. July 1999.

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APPENDIX A

Cost Estimate

Engineering Evaluation/Cost Analysis for Soil
Ramsdell Quarry Landfill - Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of Alternatives

Ramsdell Quarry Landfill Alternatives		Duration	Non Discounted Cost		
			Soil and Sediment		
			Capital Cost	O&M Cost	Total
5	Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use	30 years	$644,309	$194,108	$838,417
6	Capping – Security Guard/Maintenance Worker Land Use	30 years	$239,533	$173,345	$412,878
7	Quarry Bottom Fence – Restricted Land Use	30 years	$157,217	$161,704	$318,922
8	Perimeter Fence – Restricted Land Use	30 years	$154,349	$168,190	$322,539

Ramsdell Quarry Landfill Alternatives		Duration	Discounted Cost (4.125%)		
			Soil and Sediment		
			Capital Cost	O&M Cost	Total
5	Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use	30 years	$644,309	$112,846	$757,155
6	Capping – Security Guard/Maintenance Worker Land Use	30 years	$239,533	$101,057	$340,590
7	Quarry Bottom Fence – Restricted Land Use	30 years	$157,217	$91,936	$249,153
8	Perimeter Fence – Restricted Land Use	30 years	$154,349	$95,613	$249,962

Notes:

1. The base year of comparison and cost data will be CY2010. The discounted rates used to calculate present values will be based on Economic Guidance Memorandum, 11-01, Federal Interest Rates for Corps of Engineers Projects for Fiscal Year 2011.

2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

Engineering Evaluation/Cost Analysis for Soil
Ramsdell Quarry Landfill - Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of AOC Areas and Volumes

	Alternatives	Surface Area (sq ft)	*In situ* Soil (cy)	*In situ with Constructability* [a] Soil (cy)	*Ex situ* [a,b] Soil (cy)	Total Volume (cy)
5	Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use	49,800	1,076	1,345	1,614	1,614
6	Capping – Security Guard/Maintenance Worker Land Use	33,200	Not Applicable			
7	Quarry Bottom Fence – Restricted Land Use	262,800	Not Applicable			
8	Perimeter Fence – Restricted Land Use	750,400	Not Applicable			

[a] Includes 25% constructability factor
[b] Includes 20% swell factor

Ramsdell Quarry Landfill Soil

Alternative 5 - Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Additional Site Characterization			
Confirmation Samples	ea	15	Includes 15 sample collected for asbestos delineation.
Sampling Labor	hrs	16	Includes sampling labor. Assumes 1 sampling technician at 8 hours/day for 2 days.
Sampling Labor	$/hr	70	
Truck Rental / Gas	$/event	230	1 truck x $90/day. Add $50 for gas.
Dig Test Trenches	day	2	Includes 1/2 cy excavator, 1 Operator, 1 Laborer for 2 days. RSMeans 312316130062.
Dig Test Trenches	$/day	1988	
Sample Materials	ea	15	Reference ECHOS 33 02 0401/0402 for disposable sampling and decontamination materials.
Sample Materials	$/ea	22	
Analytical Cost	$/event	1,500	Analyze samples for asbestos in soil (15 @ $100).
Site Work			
Site Area	sf	49,800	
Civil Survey	day	3.0	Survey AOC for land use controls, limits of excavation, record drawings. RSMeans 017123131100.
Civil Survey	$/day	950	
As Built Drawings	hours	16	Develop record drawings.
As Built Drawings	$/hr	60	
Clearing	acre	1.00	Assume trees/brush cleared, chipped, and left onsite.
Clearing	$/acre	4,025	RSMeans 022302000200. Clear and chip medium trees to 12" dia.
Install Signs on Posts	ea	12	Assume warning signs located around AOC perimeter at 100 ft centers. RSMeans 028907000100 & 1500. Add 25% for custom letters. Furnish, place, and install.
Install Signs on Posts	$/ea	209.00	
Soil Excavation			Includes excavation of the AOC areas based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (In situ)	cy	1,345	
Soil Excavation Volume (Ex situ)	cy	1,614	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Volume to Weight Conversion	tons/cy	1.60	In situ soil conversion.
Soil Excavation Mass	tons	2,152	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	49,800	
Mobilization/Demobilization	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
Excavate Soils	$/cy	43.29	Includes 1/2 cy excavator, 2-22 cy off highway trucks, 1 O.E., 2 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for asbestos packaging, shallow excavations, and security/ S&H requirements. Average 150 cy/day. RSMeans Crew B12-E.
Standby Time	day	3	Assume 3 days equipment standby while analysis is being performed.
	$/day	1120	Assume no additional hot spot excavation.
UXO Support	days	15	Based on historical cost.
UXO Technician	$/days	1,150.00	
Blow in Place Munitions Clearing	lot	1.00	Assume two munitions require blow in place during one event.
Blow in Place Munitions Clearing	$/lot	15,000	
Loading Soils	cy	1614	2.5 cy FE Loader, 1 O.E., 2 L.S. Avg. 400 cy/day. RSMeans.
	$/cy	4.84	

Ramsdell Quarry Landfill Soil

Alternative 5 - Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Transport and Offsite Disposal	tons	2,152	Based on shipping waste to American Landfill, Waynesburg, Ohio
	$/ton	71.00	approximately 80 mi RT. Assume 4 hrs/cycle for transportation.
Dewatering Pad			
Dewatering Pad Area	sf	10,000	100 ft x 100 ft
Poly Liner	$/sf	0.75	
Drain/Sump/Pump/Berm	$/lot	1,500	Engineering estimate
Gravel Backfill	$/sf	0.57	Assume 6-in gravel layer. ECHOS 17030513.
Tarp and Ballast	$/sf	0.50	Engineering estimate
Dump Ramp	$/ea	3,000	Engineering estimate
Baker Tank Rental	$/ea	3,000	Assume 2 each. Engineering estimate
Confirmational Sampling & Analysis			
Confirmation Samples	ea	15	Includes 10 samples using incremental sampling methodology (ISM).
Sampling Labor	hrs	40	Includes confirmation sampling labor. Assumes 1 sampling technician
Sampling Labor	$/hr	70	at 8 hours/day for 5 days.
Truck Rental / Gas	$/event	550	1 truck x $90/day. Add $100 for gas.
Confirmation Sample Materials	ea	35	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable
Confirmation Sample Materials	$/ea	80	sampling and decontamination materials.
Analytical Cost	$/event	3,750	Analyze samples for metals (15 @ $100), asbestos soil (15 @ $100), and asbestos air (5@ $150).
Asbestos Certification and Report	$/event	2,500	Included certified asbestos inspector certification and report.
Sample Shipment	$/event	100	5 coolers @ $20 ea.
Data Management	hrs	35	Data validation
Data Management	$/hr	80	
Restoration			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	1,614	RSMEANS 312323160035 and 312323160040, Unclassified Fill, 6"
Native Soil Backfill	$/cy	26.20	Lifts, Offsite Source @ 10 miles, Includes delivery, spreading, and compaction.
Seeding, Vegetative Cover	MSF	66	RSMeans 329219142200. Seeding with mulch and fertilizer. Assume
Seeding, Vegetative Cover	$/MSF	88.00	1.5 acres are revegetated for excavation areas and equipment damage.
SWPPP Inspections	hrs	40	Assume 4 hrs per week for 10 weeks.
SWPPP Inspections	$/hr	60	
Plans and Reports			
Corrective Action Completion Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	$/hr	80	

Ramsdell Quarry Landfill Soil

Alternative 5 - Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
O&M Cost (Years 0 to 30)			
Site Inspection and Maintenance	years	30	
Site Inspection	events	60	
Site Inspections	hrs	4	Inspect site semi-annually for disturbance/erosion, warning signs, and complete checklist for annual report.
Field Labor	$/hr	60	
Site Maintenance	years	30	Assume signs are replaced every 10 years. Assume AOC area is overseeded and fertilized every 5 years. Costs have been annualized.
Site Maintenance	$/yr	1,130	
Wetland Maintenance	years	5	Assume crew of 1 landscape architect and 1 laborer with equipment and materials for 1 day and 2 events per year.
Wetland Maintenance	$/yr	2,300	
Annual Report			
Annual O&M Report	years	30	
Annual O&M Report	$/year	640	Assume 8 hours @ $80/hr for letter report.
CERCLA Reviews			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	$/event	7,400	Assume 80 hours/review @ $80/hr. Add $1,000 misc expenses.

Ramsdell Quarry Landfill Soil

Alternative 5 - Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use

Cost Estimate

CAPITAL COST			$644,309
Activity (unit)	Quantity	Unit Cost	Total
Additional Site Characterization			
Sampling Labor (hrs)	16	$70.00	$1,120
Truck Rental / Gas (event)	1	$230.00	$230
Dig Test Trenches (day)	2	$1,988.00	$3,976
Confirmation Sample Materials (ea)	15	$22.00	$330
Sample Analysis (event)	1	$1,500.00	$1,500
Site Work			
Civil Survey (day)	3.0	$950.00	$2,850
As Built Drawings (hrs)	16	$60.00	$960
Clearing (acre)	1.0	$4,025.00	$4,025
Install Signs on Posts (ea)	12	$209.00	$2,508
Soil Excavation			
Mobilization/Demobilization (ls)	1	$5,000.00	$5,000
Excavate Soil (cy)	1,345	$43.29	$58,226
Standby Time (day)	3	$1,120.00	$3,360
UXO Support (days)	15	$1,150.00	$17,250
Blow in Place Munitions Clearing (lot)	1	$15,000.00	$15,000
Loading Soils (cy)	1,614	$4.84	$7,816
Transport and Offsite Disposal (ton)	2,152	$71.00	$152,792
Dewatering Pad			
Poly Liner (sf)	10,000	$0.75	$7,500
Drain/Sump/Pump/Berm (lot)	1	$1,500.00	$1,500
Gravel Backfill (sf)	10,000	$0.57	$5,741
Tarp and Ballast (sf)	10,000	$0.50	$5,000
Dump Ramp (ea)	1	$3,000.00	$3,000
Baker Tank Rental (ea)	1	$3,000.00	$3,000
Confirmational Sampling & Analysis			
Sampling Labor (hrs)	40	$70.00	$2,800
Truck Rental / Gas (event)	1	$550.00	$550
Confirmation Sample Materials (ea)	35	$80.00	$2,800
Sample Analysis (lot)	1	$3,750.00	$3,750
Asbestos Certification and Report (lot)	1	$2,500.00	$2,500
Sample Shipment (lot)	1	$100.00	$100
Data Management (hrs)	35	$80.00	$2,800
Restoration			
Native Soil Backfill (cy)	1,614	$26.20	$42,287
Seeding, Vegetative Cover (MSF)	66	$88.00	$5,808
SWPPP Inspections (hrs)	40	$60.00	$2,400

Ramsdell Quarry Landfill Soil

Alternative 5 - Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use

Cost Estimate

Activity (unit)	Quantity	Unit Cost	Total
Plans and Reports			
Corrective Action Completion Report (ea)	200	$80.00	$16,000
Subtotal			$384,479
Design		13%	$49,982
Office Overhead		5%	$19,224
Field Overhead		15%	$57,672
Subtotal			$511,357
Profit		6%	$30,681
Contingency		20%	$102,271
Total			$644,309

Ramsdell Quarry Landfill Soil

Alternative 5 - Excavation of Soil with Offsite Disposal as Friable ACM - Security Guard/Maintenance Worker Land Use

Cost Estimate

OPERATION AND MAINTENANCE **$194,108**

Activity (unit)	Quantity	Unit Cost	Total Cost	Present Value (4.125%)
Site Inspection and Maintenance				
Site Inspection (ea)	60	$240	$14,400	$8,176
Site Maintenance (year)	30	$1,130	$33,900	$19,247
Wetland Maintenance (year)	5	$2,300	$11,500	$10,203
Annual Report				
Annual O&M Report (year)	30	$640	$19,200	$10,901
CERCLA Reviews				
CERCLA 5-Year Reviews (ea)	6	$7,400	$44,400	$23,213
Subtotal O&M			$123,400	$71,739
Design		10%	$12,340	$7,174
Office Overhead		5%	$6,170	$3,587
Field Overhead		15%	$18,510	$10,761
Subtotal			$160,420	$93,261
Profit		6%	$9,625	$5,596
Contingency		15%	$24,063	$13,989
Total			$194,108	$112,846

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost) **$838,417**

Ramsdell Quarry Landfill Soil
Alternative 6 - Capping – Security Guard/Maintenance Worker Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Additional Site Characterization			
Delineation Sampling	ea	0	Assume no additional soil samples will be required to further define the limits of contamination.
Site Work			
Site Area	sf	33,200	
Civil Survey	day	3.0	Survey AOC for land use controls, limits of cap, record drawings.
Civil Survey	$/day	950	RSMeans 017123131100.
As Built Drawings	hours	16	Develop record drawings.
As Built Drawings	$/hr	60	
Clearing	acre	1.00	Assume trees/brush cleared, chipped, and left onsite.
Clearing	$/acre	4,025	RSMeans 022302000200. Clear and chip medium trees to 12" dia.
Install Signs on Posts	ea	12	Assume warning signs located around AOC perimeter at 100 ft centers.
Install Signs on Posts	$/ea	209.00	RSMeans 028907000100 & 1500. Add 25% for custom letters. Furnish, place, and install.
Dewatering			
Excavate sump and install pump	$/lot	2,000	Engineering estimate
Gravel Backfill	$/lot	880	Assume 22 tons.
Baker Tank Rental and Cleaning	$/lot	4,500	Assume 3 each and water is discharge back onsite.
Water samples and analysis	$/lot	2,500	
Capping			Includes 6-in native fill and 6-in topsoil. Assume productivity has been reduced by 25% to account for security and safety requirements.
Mobilization/Demobilization	ls	5,000	Includes mob/demob of equipment and preparing submittals.
Native Backfill (6-in layer)	cy	740	Includes 6-in lift of native fill assuming 20% swell. ECHOS 17030423
Native Backfill (6-in layer)	$/cy	30.96	and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Topsoil (6-in layer)	cy	1,430	Includes 6-in lift of topsoil assuming 20% swell. ECHOS 18050301 and
Topsoil (6-in layer)	$/cy	42.95	RSMeans 312323160040, Topsoil, 6" Lifts, Offsite Source @ 20 miles, Includes delivery and spreading.
Seeding, Vegetative Cover	MSF	44	RSMeans 329219142200. Seeding with mulch and fertilizer. Assume 1
Seeding, Vegetative Cover	$/MSF	66.00	acre is revegetated for excavation areas and equipment damage.
SWPPP Inspections	hrs	40	Assume 4 hrs per week for 10 weeks.
SWPPP Inspections	$/hr	60	
UXO Support	days	6	Based on historical cost.
UXO Technician	$/days	1,150.00	
Plans and Reports			
Corrective Action Completion Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	$/hr	80	

Ramsdell Quarry Landfill Soil
Alternative 6 - Capping – Security Guard/Maintenance Worker Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
O&M Cost (Years 0 to 30)			
Site Inspection and Maintenance	years	30	
Site Inspection	events	60	
Site Inspections	hrs	4	Inspect site semi-annually for disturbance/erosion, warning signs, and complete checklist for annual report.
Field Labor	$/hr	60	
Site Maintenance	events	30	Assume signs are replaced every 10 years. Assume AOC area is overseeded and fertilized every 5 years. Costs have been annualized.
Site Maintenance	$/yr	690	
Wetland Maintenance	years	5	Assume crew of 1 landscape architect and 1 laborer with equipment and materials for 1 day and 2 events per year.
Wetland Maintenance	$/yr	2,300	
Annual Report			
Annual O&M Report	event	30	
Annual O&M Report	$/year	640	Assume 8 hours @ $80/hr for letter report.
CERCLA Reviews			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	$/event	7,400	Assume 80 hours/review @ $80/hr. Add $1,000 misc expenses.

Ramsdell Quarry Landfill Soil
Alternative 6 - Capping – Security Guard/Maintenance Worker Land Use
Cost Estimate

CAPITAL COST **$239,533**

Activity (unit)	Quantity	Unit Cost	Total
Site Work			
Civil Survey (day)	3.0	$950.00	$2,850
As Built Drawings (hrs)	16	$60.00	$960
Clearing (acre)	1.0	$4,025.00	$4,025
Install Signs on Posts (ea)	12	$209.00	$2,508
Dewatering Pad			
Excavate sump and install pump (lot)	1	$2,000.00	$2,000
Gravel Backfill (lot)	1	$880.00	$880
Baker Tank Rental and Cleaning (lot)	1	$4,500.00	$4,500
Water samples and analysis (lot)	1	$2,500.00	$2,500
Capping			
Mobilization/Demobilization (ls)	1	$5,000.00	$5,000
Low Permeability Backfill (cy)	740	$30.96	$22,912
Topsoil (cy)	1,430	$42.95	$61,419
Seeding, Vegetative Cover (MSF)	44	$66.00	$2,904
SWPPP Inspections (hrs)	40	$60.00	$2,400
UXO Support (days)	6	$1,150.00	$6,900
Plans and Reports			
Corrective Action Completion Report (ea)	200	$80.00	$16,000
Subtotal			$137,758
Design		18%	$24,796
Office Overhead		5%	$6,888
Field Overhead		15%	$20,664
Subtotal			$190,106
Profit		6%	$11,406
Contingency		20%	$38,021
Total			$239,533

Ramsdell Quarry Landfill Soil
Alternative 6 - Capping – Security Guard/Maintenance Worker Land Use
Cost Estimate

OPERATION AND MAINTENANCE	$173,345

Activity (unit)	Quantity	Unit Cost	Total Cost	Present Value (4.125%)
Site Inspection and Maintenance				
Site Inspection (ea)	60	$240	$14,400	$8,176
Site Maintenance (ea)	30	$690	$20,700	$11,752
Wetland Maintenance (year)	5	$2,300	$11,500	$10,203
Annual Report				
Annual O&M Report (ea)	30	$640	$19,200	$10,901
CERCLA Reviews				
CERCLA 5-Year Reviews (ea)	6	$7,400	$44,400	$23,213
Subtotal O&M			$110,200	$64,245
Design		10%	$11,020	$6,424
Office Overhead		5%	$5,510	$3,212
Field Overhead		15%	$16,530	$9,637
Subtotal			$143,260	$83,518
Profit		6%	$8,596	$5,011
Contingency		15%	$21,489	$12,528
Total			$173,345	$101,057

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)	$412,878

Ramsdell Quarry Landfill Soil
Alternative 7 - Quarry Bottom Fence – Restricted Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Additional Site Characterization			
Delineation Sampling	ea	0	Assume no additional soil samples will be required to further define the limits of contamination.
Site Work			
Site Area	sf	262,800	
Civil Survey	day	1.0	Survey AOC for land use controls, fence, record drawings. RSMeans 017123131100.
Civil Survey	$/day	950	
As Built Drawings	hours	16	Develop as-built drawings.
As Built Drawings	$/hr	60	
Clearing	acre	0.25	Assume 0.25 acre of fenceline cleared, chipped, and left onsite.
Clearing	$/acre	4,025	RSMeans 022302000200. Clear and chip medium trees to 12" dia.
Install Signs on Posts	ea	21	Assume warning signs located around AOC perimeter at 100 ft centers.
Install Signs on Posts	$/ea	209.00	RSMeans 028907000100 & 1500. Add 25% for custom letters. Furnish, place, and install.
Fencing			
Mobilization/Demobilization	ls	2,500	Includes mob/demob of fencing equipment and preparing submittals.
Fencing	lf	2,040	RSMeans 323113200200. Fence, chain link industrial, galvanized
Fencing	$/lf	25.30	steel, 3 strands barb wire, 2" posts @ 10' OC, 9 ga. wire, 6' high, schedule 40, includes excavation, & concrete. Add 15% for site/security and terrain.
Gate	ea	2	RSMeans 323113201400. Fence, chain link industrial, gate, galvanized
Gate	$/ea	330.02	steel, 6' high fence, 1-5/8" frame, 3' wide, 6' high, includes excavation, in concrete.
Rock Drill Post Hole	ea	204	RSMeans 323113307975. Chain link fence gates and posts, auger
Rock Drill Post Hole	$/ea	38.50	fence post hole, rock, rock drill, 3' deep.
Seeding, Vegetative Cover	MSF	66	RSMeans 329219142200. Seeding with mulch and fertilizer. Assume
Seeding, Vegetative Cover	$/MSF	66.00	1.5 acres are revegetated for excavation areas and equipment damage.
SWPPP Inspections	hrs	40	Assume 4 hrs per week for 10 weeks.
SWPPP Inspections	$/hr	60	
UXO Support	days	10	Based on historical cost.
UXO Technician	$/days	1,150.00	
Removal of Surficial Asbestos-Containing Material			
Roll-off Mob, Liner, and Haul Fee	ea	1	
	$/ea	740.0	Includes roll-off box spot fee, liner, and hauling fee. Vendor quote.
ACM Disposal	cy	20	
	$/cy	36.50	Develop as-built drawings.
Asbestos Hazard Evaluation Specialist Labor	hrs	40.00	
	$/hr	90	
Plans and Reports			
Corrective Action Completion Report	hrs	80	Includes Construction QC data and preparing report.
Technical Labor	$/hr	80	

Ramsdell Quarry Landfill Soil
Alternative 7 - Quarry Bottom Fence – Restricted Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
O&M Cost (Years 0 to 30)			
Site Inspection and Maintenance	years	30	
Site Inspection	events	60	
Site Inspections	hrs	4	Inspect site semi-annually for disturbance/erosion, warning signs, and complete checklist for annual report.
Field Labor	$/hr	60	
Site Maintenance	events	30	Assume signs are replaced every 10 years. Assume replacement of 100 lf lf of fence. Costs have been annualized.
Site Maintenance	$/yr	610	
Wetland Maintenance	years	5	Assume crew of 1 landscape architect and 1 laborer with equipment and materials for 0.5 days and 2 events per year.
Wetland Maintenance	$/yr	1,300	
Annual Report			
Annual O&M Report	event	30	
Annual O&M Report	$/year	640	Assume 8 hours @ $80/hr for letter report.
CERCLA Reviews			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	$/event	7,400	Assume 80 hours/review @ $80/hr. Add $1,000 misc expenses.

Ramsdell Quarry Landfill Soil
Alternative 7 - Quarry Bottom Fence – Restricted Land Use
Cost Estimate

CAPITAL COST **$157,217**

Activity (unit)	Quantity	Unit Cost	Total
Site Work			
Civil Survey (day)	1.0	$950.00	$950
As Built Drawings (hrs)	16	$60.00	$960
Clearing (acre)	0.25	$4,025.00	$1,006
Install Signs on Posts (ea)	21	$209.00	$4,389
Fencing			
Mobilization/Demobilization (ls)	1	$2,500.00	$2,500
Fencing (lf)	2,040	$25.30	$51,611
Gate (ea)	2	$330.02	$660
Rock drill Post Hole (ea)	204	$38.50	$7,854
Seeding, Vegetative Cover (MSF)	66	$66.00	$4,356
SWPPP Inspections (hrs)	40	$60.00	$2,400
UXO Support (days)	10	$1,150.00	$11,500
Removal of Surficial Asbestos-Containing Material			
Roll-off Mob, Liner, and Haul Fee	1	$740.00	$740
ACM Disposal	20	$36.50	$730
Asbestos Hazard Evaluation Specialist Labor	40	$90.00	$3,600
Plans and Reports			
Corrective Action Completion Report (ea)	80	$80.00	$6,400
Subtotal			$99,656
Design		16%	$15,945
Office Overhead		5%	$4,983
Field Overhead		15%	$14,948
Subtotal			$135,532
Profit		6%	$8,132
Contingency		10%	$13,553
Total			$157,217

Ramsdell Quarry Landfill Soil
Alternative 7 - Quarry Bottom Fence – Restricted Land Use
Cost Estimate

OPERATION AND MAINTENANCE **$161,704**

Activity (unit)	Quantity	Unit Cost	Total Cost	Present Value (4.125%)
Site Inspection and Maintenance				
Site Inspection (ea)	60	$240	$14,400	$8,176
Site Maintenance (ea)	30	$610	$18,300	$10,390
Wetland Maintenance (year)	5	$1,300	$6,500	$5,767
Annual Report				
Annual O&M Report (ea)	30	$640	$19,200	$10,901
CERCLA Reviews				
CERCLA 5-Year Reviews (ea)	6	$7,400	$44,400	$23,213
Subtotal O&M			$102,800	$58,446
Design		10%	$10,280	$5,845
Office Overhead		5%	$5,140	$2,922
Field Overhead		15%	$15,420	$8,767
Subtotal			$133,640	$75,980
Profit		6%	$8,018	$4,559
Contingency		15%	$20,046	$11,397
Total			$161,704	$91,936

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost) **$318,922**

Ramsdell Quarry Landfill Soil
Alternative 8 - Perimeter Fence – Restricted Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Additional Site Characterization			
Delineation Sampling	ea	0	Assume no additional soil samples will be required to further define the limits of contamination.
Site Work			
Site Area	sf	750,400	
Civil Survey	day	1.0	Survey AOC for land use controls, fence, record drawings. RSMeans 017123131100.
Civil Survey	$/day	950	
As Built Drawings	hours	16	Develop as-built drawings.
As Built Drawings	$/hr	60	
Clearing	acre	0.50	Assume 0.5 acres of fenceline cleared, chipped, and left onsite.
Clearing	$/acre	4,025	RSMeans 022302000200. Clear and chip medium trees to 12" dia.
Install Signs on Posts	ea	35	Assume warning signs located around AOC perimeter at 100 ft centers.
Install Signs on Posts	$/ea	209.00	RSMeans 028907000100 & 1500. Add 25% for custom letters. Furnish, place, and install.
Fencing			
Mobilization/Demobilization	ls	2,500	Includes mob/demob of fencing equipment and preparing submittals.
Fencing	lf	1,000	
Fencing	$/lf	25.30	RSMeans 323113200200. Fence, chain link industrial, galvanized steel, 3 strands barb wire, 2" posts @ 10' OC, 9 ga. wire, 6' high, schedule 40, includes excavation, & concrete. Add 15% for site/security and terrain.
Fencing	lf	2,500	5 ft high, 10 ft on center, 5-strand high tensile wire fencing. Based on vendor quote.
Fencing	$/lf	6.00	
Gate	ea	2	RSMeans 323113201400. Fence, chain link industrial, gate, galvanized steel, 6' high fence, 1-5/8" frame, 3' wide, 6' high, includes excavation, in concrete.
Gate	$/ea	330.02	
Seeding, Vegetative Cover	MSF	88	
Seeding, Vegetative Cover	$/MSF	66.00	RSMeans 329219142200. Seeding with mulch and fertilizer. Assume 2 acres is revegetated for excavation areas and equipment damage.
SWPPP Inspections	hrs	40	Assume 4 hrs per week for 10 weeks.
SWPPP Inspections	$/hr	60	
UXO Support	days	20	Based on historical cost.
UXO Technician	$/days	1,150.00	
Removal of Surficial Asbestos-Containing Material			
Roll-off Mob, Liner, and Haul Fee	ea	1	
	$/ea	740.0	Includes roll-off box spot fee, liner, and hauling fee. Vendor quote.
ACM Disposal	cy	20	
	$/cy	36.50	Develop as-built drawings.
Asbestos Hazard Evaluation Specialist Labor	hrs	40.00	
	$/hr	90	
Plans and Reports			
Corrective Action Completion Report	hrs	80	Includes Construction QC data and preparing report.
Technical Labor	$/hr	80	

Ramsdell Quarry Landfill Soil
Alternative 8 - Perimeter Fence – Restricted Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
O&M Cost (Years 0 to 30)			
Site Inspection and Maintenance	years	30	
Site Inspection	events	60	
Site Inspections	hrs	4	Inspect site semi-annually for disturbance/erosion, warning signs, and complete checklist for annual report.
Field Labor	$/hr	60	
Site Maintenance	events	30	Assume signs are replaced every 10 years. Assume replacement of 5% of fence over O&M period. Costs have been annualized.
Site Maintenance	$/yr	890	
Wetland Maintenance	years	5	Assume crew of 1 landscape architect and 1 laborer with equipment and materials for 0.5 days and 2 events per year.
Wetland Maintenance	$/yr	1,300	
Annual Report			
Annual O&M Report	event	30	
Annual O&M Report	$/year	640	Assume 8 hours @ $80/hr for letter report.
CERCLA Reviews			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	$/event	7,400	Assume 80 hours/review @ $80/hr. Add $1,000 misc expenses.

Ramsdell Quarry Landfill Soil
Alternative 8 - Perimeter Fence – Restricted Land Use
Cost Estimate

CAPITAL COST **$154,349**

Activity (unit)	Quantity	Unit Cost	Total
Site Work			
Civil Survey (day)	1.0	$950.00	$950
As Built Drawings (hrs)	16	$60.00	$960
Clearing (acre)	0.50	$4,025.00	$2,013
Install Signs on Posts (ea)	35	$209.00	$7,315
Fencing			
Mobilization/Demobilization (ls)	1	$2,500.00	$2,500
Fencing (lf)	1,000	$25.30	$25,299
Fencing (lf)	2,500	$6.00	$15,000
Gate (ea)	2	$330.02	$660
Seeding, Vegetative Cover (MSF)	88	$66.00	$5,808
SWPPP Inspections (hrs)	40	$60.00	$2,400
UXO Support (days)	20	$1,150.00	$23,000
Removal of Surficial Asbestos-Containing Material			
Roll-off Mob, Liner, and Haul Fee	1	$740.00	$740
ACM Disposal	20	$36.50	$730
Asbestos Hazard Evaluation Specialist Labor	40	$90.00	$3,600
Plans and Reports			
Corrective Action Completion Report (ea)	80	$80.00	$6,400
Subtotal			$97,375
Design		11%	$10,711
Office Overhead		5%	$4,869
Field Overhead		15%	$14,606
Subtotal			$127,561
Profit		6%	$7,654
Contingency		15%	$19,134
Total			$154,349

Ramsdell Quarry Landfill Soil
Alternative 8 - Perimeter Fence – Restricted Land Use
Cost Estimate

OPERATION AND MAINTENANCE	$168,190

Activity (unit)	Quantity	Unit Cost	Total Cost	Present Value (4.125%)
Site Inspection and Maintenance				
Site Inspection (ea)	60	$240	$14,400	$8,176
Site Maintenance (ea)	30	$890	$26,700	$15,159
Wetland Maintenance (year)	5	$1,300	$6,500	$5,767
Annual Report				
Annual O&M Report (ea)	30	$640	$19,200	$10,901
CERCLA Reviews				
CERCLA 5-Year Reviews (ea)	6	$7,400	$44,400	$23,213
Subtotal O&M			$111,200	$63,215
Design		10%	$11,120	$6,322
Office Overhead		5%	$5,560	$3,161
Field Overhead		10%	$11,120	$6,322
Subtotal			$139,000	$79,019
Profit		6%	$8,340	$4,741
Contingency		15%	$20,850	$11,853
Total			$168,190	$95,613

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)	$322,539

DRAFT ENGINEERING EVALUATION FOR SOIL AND DRY SEDIMENT AT RVAAP-01 RAMSDELL QUARY LANDFILL
RAVENNA ARMY AMMUNITION PLANT, RAVENNA OHIO
COMMENT RESPONSE TABLE
REVISION 3

Comment Number	Page or Sheet	Comment	Recommendation	Response
Ohio EPA (Todd Fisher)				
O-1.	General Comment	Alternative 5 (Excavation of Soil and Dry Sediment with Off-site Disposal as Friable ACM – Security Guard/Maintenance Worker Land Use) is most consistent with the original remedy. Public notice and comment would not be required and would lessen impacts to project schedules.	Discussion requested.	Comment acknowledged.
O-2.	General Comment	Alternative 5 (Excavation of Soil and Dry Sediment with Off-site Disposal as Friable ACM – Security Guard/Maintenance Worker Land Use) has the best long term "effective and permanent" remedy. Neither capping nor fencing (alternatives 6 and 7 respectively) are permanent remedies.	Discussion requested.	Clarification. Alternative 5 was rated the highest of the alternatives in the comparative analysis for Long-term Effectiveness and Permanence. However, Alternatives 6 and 7 are also effective and permanent. Both alternatives eliminate exposure to the given receptors thru engineering controls and implementation of land use controls. To provide clarification of the alternative ratings, a revised Table 6-2 has been added to the report (see end of this comment response table).
O-3.	General Comment	Alternative 5 (Excavation of Soil and Dry Sediment with Off-site Disposal as Friable ACM – Security Guard/Maintenance Worker Land Use) is the only alternative that satisfies the second balancing criteria (reduction of toxicity, mobility, or volume through treatment). Neither alternatives 6 and 7 provide any treatment of the waste.	Discussion requested.	Agree. Sections 5.4.1.4, 6.4, and Table 6-2 are revised as presented at the end of this comment response table.

Comment Number	Page or Sheet	Comment	Recommendation	Response
O-4.	General Comment	Alternative 5 (Excavation of Soil and Dry Sediment with Off-site Disposal as Friable ACM – Security Guard/Maintenance Worker Land Use), impact to the wetland will be temporary and give a minor amount of restoration, should recover to its present level of service.	Discussion requested.	Agree. As noted in the Engineering Evaluation, Alternative 5 would result in temporary loss of vegetated habitat for ecological receptors, including portions of the existing wetland. The plants and animals will invade from nearby and undisturbed portions of the wetland. Full recovery should take a few years. No text changes required.
O-5.	General Comment	Alternative 5 (Excavation of Soil and Dry Sediment with Off-site Disposal as Friable ACM – Security Guard/Maintenance Worker Land Use) costs to implement appear to be excessive. The full extent of ACM at the bottom quarry has not been determined. How was the volume of material (to be removed) estimated? Is it the same area/volume as the original removal areas (footprint) impacted with PAHs? Does the estimate involve chasing visible asbestos until it's completely removed? No figures were provided showing how the removal area/volume was calculated.	Discussion requested.	Clarification and agree. The estimated volume for the soil removal was increased by 50% to account for additional soil removal from identified ACM. The basis for this volume estimate was from the original soil removal conducted in August 2010, where the PAH-contaminated area was increased by 58% to account for identified ACM. Alternative 5 includes volumes for "chasing" and excavation, and offsite disposal, of ACM as part of the remedy outside of those areas requiring removal of PAHs on the basis of the CERCLA RI/FS. This alternative provides for removal/disposal of ACM as one option for addressing the ARAR (OAC 3547-20-05) for uncontrolled ACM disposals to meet the mandated emission standard of "no visible emissions", which may be achieved through various measures as capping, excavation/disposal, and LUCs. Text on page 4-1, lines 16-25 is revised as follows: "This Engineering Evaluation assumes 1,614 yd^3 of contaminated soil will be excavated for off-site disposal. The basis for this volume is the inclusion of the removal of polycyclic aromatic hydrocarbon (PAH)-contaminated areas presented in Figure 3-1 to an average depth to bedrock of 7 inches (totaling 1,457 yd^3), minus any soil volume considered to be within the landfill cap (380 yd^3). Additionally, 537 yd^3 was added to the volume estimate to

Comment Number	Page or Sheet	Comment	Recommendation	Response
				account for the requirements of the Ohio EPA to continue excavating if ACM is present on the sidewalls or floor. This additional volume to remove ACM-contaminated soil is approximately 50% over that required for excavation of PAHs. If ACM is present on excavation sidewalls or floor, Ohio EPA's preferred method to address the material is removal until ACM is not visible, and laboratory results confirm soil samples from the excavation footprint have less than 1% ACM. Friable ACM previously encountered within area RQL-043M resulted in a 58% increase of excavated soil volume over that required to remove only PAHs. Based on the conditions previously encountered, this alternative assumes an increase of soil volume by 50%, resulting in the total 1,614 yd^3 of soil contaminated with PAHs and ACM." A figure was not provided because this is only a volume estimate. However, this estimate probably falls within the range to provide a cost estimate with an accuracy of +50%/-30%, as stated in the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA 1988).
O-6.	Page 4-2, lines 1-9, bullets	Alternative 5 (Excavation of Soil and Dry Sediment with Off-site Disposal as Friable ACM – Security Guard/Maintenance Worker Land Use) will require an ESD.	Please add "Explanation of Significant Differences (ESD)" to the bullet list.	Agree. The Explanation of Significant Differences is added to the bullet list. In addition, costs for the ESD (approximately $5K) will be added to the Remedial Design portion of the cost of Alternative 5.
O-7.	Page 4-3, lines 1-8, bullets	Alternative 6 (Capping -Security Guard/Maintenance Worker Land Use) will require an amendment to the Record of Decision and a 30 day public notice and comment period.	Please add "Amendment to the Record of Decision" and "30 day Public Notice and Comment Period" to the bullet list.	Agree. Amendment to the Record of Decision and 30 day Public Notice and Comment Period is added to the bullet list. In addition, costs for the ROD amendment and public comment period (approximately $10K) will be added to the Remedial Design portion of the cost of Alternative 6.

Comment Number	Page or Sheet	Comment	Recommendation	Response
O-8.	Page 4-4, lines 9-14, bullets	Alternative 7 (Fencing and Land Use Controls – Restricted Use) will require a 30 day public notice and comment period in addition to a ROD Amendment.	Please add "30 day Public Notice and Comment Period" to the bullet list.	Agree. Amendment to the Record of Decision and 30 day Public Notice and Comment Period is added to the bullet list. In addition, costs for the ROD amendment and public comment period (approximately $10K) will be added to the Remedial Design portion of the cost of Alternative 7.
O-9.	Page 4-5 Proposed Fencing Layout	Figure shows fence line encompassing the entire quarry bottom. It also shows the fence line following the toe of solid waste landfill at the southern end of quarry bottom. Since the limits of waste placement are estimated, what guarantees are there that the fence will not breech the landfill cap or waste will not be encountered (exhumed) during construction of the fence?	If alternative 7 is selected, fencing off the whole AOC should be considered and evaluated.	Clarification. The extent of the landfill cap was re-evaluated in the field with former RVAAP personnel that were on site during the placement of the landfill and cap (See Section 3.2.3). Bedrock is visible in many of the areas that the fence is recommended, thus reducing the concern of breeching the landfill cap. Also, please note that the extent of the landfill is also a concern associated with excavation in Alternative 5. However, the impacts to the ground surface from the Alternative 7 will be significantly less than Alternative 5. Regarding the extent of fence, a new Alternative 8 is incorporated into this Engineering Evaluation. This Alternative 8 will have a fence line that includes the PAH-contaminated area, in addition to the closed, solid waste landfill at RQL. This alternative is developed to be within the cost capabilities of the current contract. Funding for a chain link fence around the entire perimeter of RQL was not available from the Army. This alternative will have the protectiveness and access controls associated with the PAH-contaminated area in the quarry, in addition to enhancing the U.S. Army's access controls to the closed solid waste landfill. A new Section 4.4 for Alternative 8 is presented at the bottom of this response table.
O-10.	Page 8-1, Recommend ed	The remedial action alternative selected in the ROD was excavation and disposal of PAH contaminated	Discussion requested.	Agree. Explanations to the public regarding the change in alternative can include the following information.

Comment Number	Page or Sheet	Comment	Recommendation	Response
	Alternative (Fencing)	soil and dry sediment. The selection of this alternative was subjected to a public comment period. At the public meeting, all questions were addressed and the State gave its acceptance. By selecting this alternative, we will have to go through the public notice and comment process again. How will the public react to a fence and leaving the contaminated soil intact after we presented the case that removal of the soil was the best alternative? Questions may come up as to how we missed the ACM during our investigations.		Re-evaluation of remedial alternatives is allowed under "Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents". The change in waste type encountered (asbestos-containing waste) falls under a Fundamental Change with respect to implementability, short-term effectiveness, cost to implement, and long-term O&M cost for wetland monitoring. The discovery of ACM also provides a basis for re-evaluation of alternatives with respect to potential ARARs. Federal rules 40 *CFR* 61.150 and 61.151 would be considered relevant and appropriate for asbestos waste management, although not applicable. Corollary Ohio regulations, OAC 3547-20-05 and -07, would be considered applicable. These factors were considered in the Engineering Evaluation. The Engineering Evaluation provides a range of alternatives considering that removal/disposal of ACM is not required under OAC 3547-20-05. Also, the most current EPA guidance issued September 2008 provides a framework to focus on whether the asbestos within the environment poses an unacceptable risk to human health or the environment similar to the evaluation of any contaminant of concern, rather than relying on a 1% or greater concentration standard. In the event where asbestos and/or asbestos containing debris remains on a site, the response may include an active response action and/or administrative controls, or a finding of No Further Action based upon the nature and site-specific conditions associated with the site. Page 1-2, lines 24-28 are revised as follows: "The purpose of this Engineering Evaluation is to re-evaluate the selected remedial alternative and evaluate

Comment Number	Page or Sheet	Comment	Recommendation	Response
				additional alternatives to determine if the remedy for soil at RQL requires change given the change of site conditions. Re-evaluation of remedial alternatives is allowed under Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (USEPA 1999). The change in waste type encountered (asbestos-containing waste) falls under either a Significant or Fundamental Change. The discovery of ACM provides a basis for re-evaluation of alternatives with respect to potential ARARs. Additional alternatives will provide remedy for the identified COCs in the RQL quarry bottom and invoke the relevant and appropriate requirements established from the identification of ACM in the contaminated areas. " With respect to potential public reaction to the fence and leaving the contaminated soil in place, the fence will provide access and exposure restrictions to the contaminated PAHs. Given there is potentially ACM co-located with the PAH-contaminated soil, soil disturbance activities (excavation) would increase the short-term risk with respect to remedial workers and greatly affect implementability. Informal discussion with RAB members of a potential change in the remedy occurred during the September 2010 RAB tour. There were no reservations voiced by the public at that time, although it is noted that this does not constitute public concurrence. Public concurrence is official only after the public comment period.
Camp Ravenna (Katie Tait)				
CR-1.	General	The OHARNG still has many concerns with the preferred alternative, Alternative 7-Fencing, Restricted Access.		Clarification. All the alternatives presented in the Engineering Evaluation will require long-term LUCs, PPE, and specific

Comment Number	Page or Sheet	Comment	Recommendation	Response
		A remedy that includes PPE and specific training just to access the site to maintain it does not suit the OHARNG. We need to find a way to cover the site and restrict access and make it safe and easy to maintain without specific training and PPE. Additionally, we need to be able to maintain the fence by doing repair work, vegetation control. In a restricted access scenario, how does the maintenance worker perform these activities? Are there restrictions? Can he access the fenced area? Also what if an animal gets stuck in the fenced area? Can we perform natural resource management activities? We are also worried about future deterioration including asbestos exposed at the surface. Using a cover or removal would help to eliminate this concern. We prefer Alternatives 5 and 6. At a minimum we would like to select and achieve Alternative 6. Again, this will require a discussion of what is the best chosen alternative or end use.		training, as unrestricted land use is not achieved. Additionally, the presence of the landfill cover will require LUCs and restrict use of the AOC. RQL is also a MRS and may contain MEC. Regarding the ability to maintain the fence under Alternative 7, per January 2011 discussions with the Occupational Safety and Health Administration (OSHA) Compliance Guidance Group, there will be no additional training, monitoring, or PPE requirements for inspecting and maintaining the fence beyond what would be required future access to area following completion of either Alternatives 5 or 6. PPE that would be required is Level D protection. Training requirements would be general awareness training of the contaminants (PAHs) and additional elements (e.g., ACM, sanitary landfill) that will exist at the AOC. The proposed fence will have two gates for access. Additional gates and the locations of the gates can be finalized during the development of the remedial design, if this is the selected alternative. For HTRW contaminants, the security maintenance worker exposure assumes 1 hr per day for 250 days per year. Occasional, short-term entry into the area, for such activities as animal retrieval or natural resource management activities (e.g., such as species inventories, wetland assessment, etc.), would not result in unacceptable exposure and may be conducted so long as LUC requirements were followed. Given the above guidance from OSHA with respect to ACM requirements, occasional, short-term entry into the area will be possible through gates and may be done without additional PPE/monitoring/training, so long as no intrusive activities are conducted. Implementation of Alternatives 5 or 6 would not provide an appreciable risk reduction that that

Comment Number	Page or Sheet	Comment	Recommendation	Response
				provided from implementation of Alternative 7. Unless all asbestos is removed from the area, which is not included within the anticipated scope of any of the alternatives, the potential of such material at the surface is not precluded and the potential risk of exposure would remain. Based on consideration of the CERCLA alternative evaluation criteria, Alternative 7 provides protection of human health and the environment with high degree of implementability, least short-term impacts to the environment, and lowest overall cost to implement. Alternative 6 provides equal protectiveness to Alternative 7, but has a higher cost to implement and equivalent LUCs will apply. Alternative 5 provides a higher degree of protectiveness/long-term effectiveness than Alternatives 6 and 7, but it also has the highest short-term impacts, is the most difficult to implement, and the highest cost. Alternative 5 will also require LUCs and access controls, and LTM for a period of 5 years with respect to reconstructed wetlands. See also response to comment O-10.
CR-2.	Pg 5-10 Short Term Effectiveness	Since you do not know the extent of the asbestos in the Quarry bottom, how can you install a fence without short term impact to workers? I think you would need to have them wear PPE just in case friable asbestos is encountered. They may also have to be licensed asbestos workers to install the fence.		Clarification and agree. Per the January 2011 discussions with the Occupational Safety and Health Administration (OSHA) Compliance Guidance Group, additional PPE and training for fence installation would not be required. However, given there is a chance that friable ACM will be encountered during fence installation, lines 21-22 on page 5-10 are revised as follows. "…worker exposure during implementation of the alternative. ~~There are no significant short-term human health risks associated with Alternative 7 beyond baseline conditions.~~ No short-term health risks…"

Comment Number	Page or Sheet	Comment	Recommendation	Response
CR-3.	Pg 6-2, Implementability	The report indicates that Alternative 7 activities will circumvent chances of encountering ACM and MEC. Since a portion of the proposed fence will be constructed in the MRS, how can you avoid MEC? MEC should still be considered an issue although less likely.		Agree. MEC avoidance will be included as part of the fence installation (as well as the other alternatives). Specifications for MEC avoidance will be included in the remedial design for the selected alternative. The MEC avoidance was included in the cost of Alternative 7 as "UXO support".
CR-4.	Appendix 1	Alternative 7 - No PPE costs included for installation of fence or for maintenance of fence during 30 years O&M. No training costs included in 30 years O&M. These costs should be included if they are going to be a potential requirement.		Clarification. PPE and training costs are included in the hourly costs for site inspection and maintenance. These costs would be approximately the same for each of the alternatives. No additional training is required for Alternative 7 beyond what is for Alternatives 5 and 6, although there is an increase in O&M costs associated with Alternative 5 due to the extent of wetland maintenance and inspections that will be required. Since the purpose of the FS-type approach is to provide information for a comparative analysis among alternatives, the presentation of maintenance and training costs for the O&M period is appropriate. No text change proposed.
CR-5.	Pg 2-2, Line 25	"The OHARNG has established the future land use for RQL as restricted access, no digging." The OHARNG did not establish this end use. It was established based on the past use as a landfill and the monitoring requirements. Please revise.	Suggested revised text: The future land use for RQL is established as restricted access, no digging."	Agree. Text revised as recommended.

Additional Changes to Text

Per the request of Ohio EPA, the legend in Figure 4-1 changes the term "Construction Fence" to "Alternative 7 Fence Line". Additionally, the fence line for the new Alternative 8 is incorporated into Figure 4-1.

Section 5.4.1.4 Revision per comment O-3

5.4.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 5 involves excavation of contaminated soil for disposal in a permitted solid waste landfill. This alternative reduces the mobility of the COCs by placing the contaminated soil in an engineered, lined, disposal cell at the landfill. This alternative does not reduce the toxicity or volume of the contaminated soil. is achieved with this alternative.

Section 6.4 Revision per comment O-3

6.4 Reduction in Contaminant Volume, Toxicity, and Mobility through Treatment

The ability of Alternative 5 to reduce contaminant volume, toxicity, and mobility is medium. Alternative 5 does not reduce contaminant volume and toxicity of COCs (presented in Table 1-1) or ACM. However, Alternative 5 reduces the mobility of the COCs and ACM by placing the contaminated soil in an engineered, lined, disposal cell at the landfill. The fate and transport modeling concluded COCs are not predicted to impact underlying groundwater beneath the AOC, and they have never been detected during groundwater monitoring at the AOC. Most asbestos minerals are chemically inert, insoluble in water, and the potential for solid particulate migration through soil and bedrock to underlying groundwater is negligible. Therefore, asbestos is not included as a standard analyte under the RVAAP facility-wide groundwater monitoring program. The ability of Alternatives 6, 7, and 8 to reduce contaminant volume, toxicity and mobility is low since these alternatives do not involve treatment.

Additional text added to Sections 4.3 (Alternative 7) and Section 4.4 (Alternative 8) to address concerns of friable ACM on RQL ground surface: .

As noted by the Ohio EPA Asbestos NESHAP Coordinator, installing a fence (with signage) around the area containing ACM is adequate protection for future land use of general foot traffic by U.S. Army and OHARNG personnel that have awareness that ACM was left in place. After the fence is put in place, there is no additional requirement for ACM removal. However, as part of this remedy, a best management practice (BMP) to remove surficial ACM through non-intrusive, no digging methods will be implemented. Given there is no requirement to remove ACM after the fence is put in place, there is no requirement to chase ACM (e.g., subsurface ACM) after implementing the BMP.

Components of this remedial alternative include:

- Public notification and comment period;
- ROD Amendment;
- Notifications and approvals;
- Remedial Design addendum;
- Pre-mobilization activities;
- Soil placement and capping;
- Seeding and restoration;
- Wetland mitigation;
- LUCs;
- Cap inspections and maintenance; and
- Five-year reviews.

4.3 ALTERNATIVE 7: QUARRY BOTTOM FENCE~~FENCING AND LAND USE CONTROLS~~ ~ RESTRICTED LAND USE

Alternative 7 consists of installing a chain link security fence around the quarry bottom at RQL as part of a LUCs alternative to restrict access to the AOC. The fence specifications would be finalized in a Remedial Design. However, for purposes of this Engineering Evaluation, the fence specifications include: (1) Schedule~~include: (1) schedule~~ 40, 2" posts on 10-ft centers; (2) 9 gauge wire mesh; and (3) 6 ft high gates with a 1⅝" frame. Installation of chain link security fence and signage provides a physical control for the AOC. This physical control will be combined with administrative LUCs for access control into the quarry bottom and use restriction to ensure there is no digging. These controls will eliminate or reduce receptor exposure to COCs and comply with requirements of OAC 3745-20-07(A)(1) by eliminating the potential of discharging visible emissions to the outside air.

Figure 4-1 presents a preliminary layout of fencing to be installed at RQL. Installation of this fence encompasses the two areas specified in the RQL ROD (i.e., RQL-039M and RQL-040M) as well as RQL-041M, RQL-042M, RQL-043M, and most of RQL-045M. A fence does not surround portions of RQL-045M and all of RQL-044M, as: (1) those areas are considered to be part of the closed sanitary landfill cap and not a part of historical~~historic~~ operations of the quarry bottom; and (2) to ensure the integrity of the existing RQL landfill cap is not compromised. Placement of the gates will be finalized in a Remedial Design. Additionally, signage notifying personnel of the presence of asbestos in the quarry will be placed on the fence~~. The fence line as currently proposed provides adequate protection to future receptors~~.

RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities. However, surveying, sampling, and essential security, safety, periodic maintenance, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. All individuals unfamiliar with RQL are properly briefed on the hazards/restrictions prior to entry into the AOC (USACE 2005b).

The physical and administrative controls under this alternative further restricts access to that portion of the AOC exceeding cleanup goals. The chain-link security fence and signage further deters entry by any other receptors that are not granted access to RQL or have proper training. Administrative LUCs include such measures as access and digging restrictions and personnel training or briefings for access-authorized persons on potential hazards and safety precautions (e.g., appropriate PPE usage to prevent dermal exposure to soil, and appropriate steps to avoid disturbing ACM). Once the fence is complete and LUCs are in place, this alternative results in reduced potential for exposure to contaminated soil by National Guard receptors. The alternative ensures compliance with the requirement that all personnel are properly trained and briefed on potential hazards. Training may include 40-hour HAZWOPER and ACM awareness training. Workers accessing the fenced area will be required to use appropriate PPE to prevent dermal exposure to soil and take appropriate steps to avoid disturbing ACM. PPE for prevention of dermal exposure to soil would include such items as wearing long sleeve shirts, gloves.

As noted by the Ohio EPA Asbestos NESHAP Coordinator, installing a fence (with signage) around the area containing ACM is adequate protection for future land use of general foot traffic by U.S. Army and OHARNG personnel that have awareness that ACM was left in place. After the fence is put in place, there is no additional requirement for ACM removal. However, as part of this remedy, a best management practice (BMP) to remove surficial ACM through non-intrusive, no digging methods will be implemented. Given there is no requirement to remove ACM after the fence is put in place, there is no requirement to chase ACM (e.g., subsurface ACM) after implementing the BMP.

Components of this alternative include:

- Public Notification and Comment Period;
- ROD Amendment;
- Remedial Design addendum;
- Pre-mobilization activities (e.g., brush and tree clearing);
- Removal of surficial ACM;
- Fence installation;
- Wetland mitigation (areas disturbed during removal described in Section 3.2.2);
- LUCs; and
- Five-year reviews.

4.4 ALTERNATIVE 8: PERIMETER FENCE ~ RESTRICTED LAND USE

Alternative 8 consists of installing a fence around the perimeter of RQL. The fence will be a combination of a chain link security fence and high tensile wire fence. The fence specifications would be finalized in a Remedial Design. However, for purposes of this Engineering Evaluation, the specifications of the fence include:

1. At the northern perimeter of RQL, a chain-link security fence (Schedule 40, with 9 gauge wire mesh and 2" posts on 10-ft centers) and 6 ft high gates with a 1⅝" frame will be installed.

2. At the eastern, southern, and western perimeter of RQL, a five-strand high tensile wire fence will be installed.
3. Gates to allow for authorized personnel and equipment access will be installed.

Figure 4-1 presents a preliminary layout of fencing to be installed under Alternative 8.

Installation of this fence encompasses the two areas specified in the RQL ROD (i.e., RQL-039M and RQL-040M), the areas identified to exceed COC CUGs (RQL-041M, RQL-042M, RQL-043M, and RQL-045M), and the closed, sanitary landfill. The fence line will provide the U.S. Army and NBG access control to the closed, sanitary landfill. Gates will be in the fence line so activities such as maintenance of the quarry bottom, landfill cap inspections, and mowing may take place. Placement of the gates will be finalized in a Remedial Design. Additionally, signage notifying personnel of the presence of asbestos in the quarry will be placed on the fence.

This physical control will be combined with administrative LUCs to ensure there is no digging. RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed, sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities, and installation of this fence will help enforce these restrictions. Surveying, sampling, and essential security, safety, periodic maintenance, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. Appropriate personnel will be granted access to the AOC after being properly briefed on the hazards/restrictions prior to entry (USACE 2005b). The physical and administrative controls will eliminate or reduce receptor exposure to COCs and comply with requirements of OAC 3745-20-07(A)(1) by eliminating the potential of discharging visible asbestos emissions to the outside air.

The physical and administrative controls under this alternative further restricts access to that portion of the AOC exceeding cleanup goals. The fence and signage further deters entry of any other receptors that are not granted access to RQL or who do not have proper training. Administrative LUCs include such measures as access and digging restrictions and personnel training or briefings on potential hazards and safety precautions (e.g., appropriate PPE usage to prevent dermal exposure to soil, and appropriate steps to avoid disturbing ACM) for access-authorized persons. Once the fence is complete and LUCs are in place, this alternative results in reduced potential for exposure to contaminated soil by National Guard receptors. This alternative will also protect the landfill cap on the closed, sanitary landfill within RQL. The alternative ensures compliance with the requirement that all personnel are properly trained and briefed on potential hazards. Training may include 40-hour HAZWOPER and ACM awareness training. Workers accessing the fenced area will be required to use appropriate PPE to prevent dermal exposure to soil and take appropriate steps to avoid disturbing ACM. PPE for prevention of dermal exposure to soil includes long sleeve shirts and gloves.

As noted by the Ohio EPA Asbestos NESHAP Coordinator, installing a fence (with signage) around the area containing ACM is adequate protection for future land use of general foot traffic by U.S. Army and OHARNG personnel that have awareness that ACM was left in place. After the fence is

put in place, there is no additional requirement for ACM removal. However, as part of this remedy, a BMP to remove surficial ACM through non-intrusive, no digging methods will be implemented. Given there is no requirement to remove ACM after the fence is put in place, there is no requirement to chase ACM (e.g., subsurface ACM) after implementing the BMP.

Components of this alternative include:

- Public Notification and Comment Period;
- ROD Amendment;
- Remedial Design addendum;
- Pre-mobilization activities (e.g., brush and tree clearing);
- Removal of surficial asbestos-containing material;
- Fence installation;
- Wetland mitigation (areas disturbed during removal described in Section 3.2.2);
- LUCs; and
- Five-year reviews.

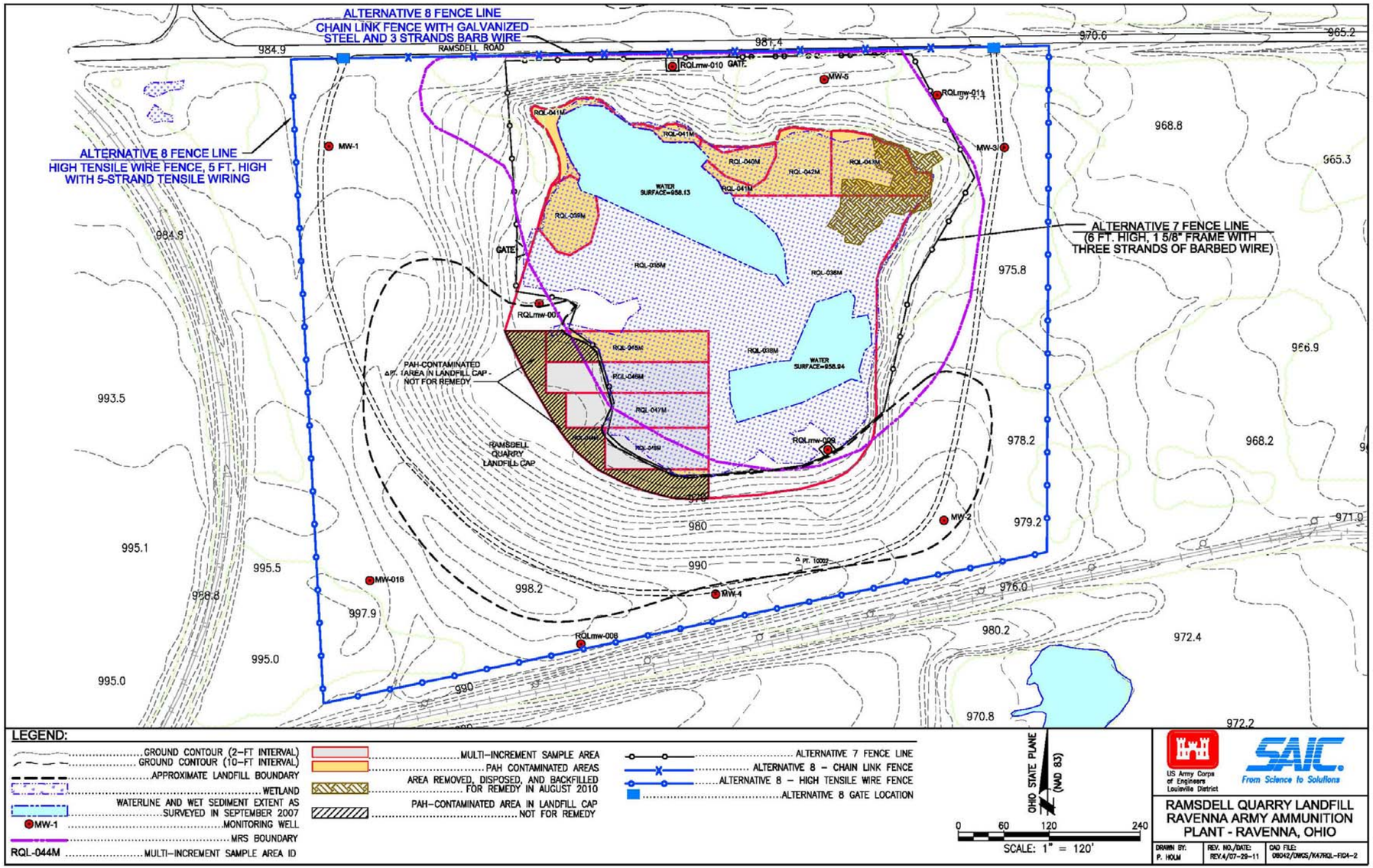

Figure 4-1. Proposed Fencing Layout for Alternatives 7 and 8

5.4.3.6 Implementability

Alternative 7 is technically implementable. Fence installation is performed via conventional activities in construction projects of this kind. Some vegetation and tree clearing is required. Construction and operation of the components of Alternative 7 would be available to complete the remedial activity.

Land use controls also are implementable with the proper oversight of the U.S. Army. RQL currently has administrative access restrictions implemented at the AOC, although this alternative proposes the addition of~~does not propose~~ physical restrictions or barriers. Technical difficulties for establishing additional monitoring programs or restricting access controls are not expected.

5.4.3.7 Cost

The present value cost to complete Alternative 7 is approximately $249,153~~200,146~~ (in base year 2011~~2010~~ dollars with a 4.125% discount factor). O&M costs, including fence maintenance, monitoring, and imposition of LUCs, are estimated for a 30-year period. In addition, five-year reviews are required throughout the costing period and are included in the estimate.

5.4.4 Alternative 8: Perimeter Fence

5.4.4.1 Overall Protection of Human Health and the Environment

In general, the long-term protectiveness of this alternative is high for the intended restricted land use at RQL.

The HHRA for RQL indicates potential future human health risks from soil are above the target risk of the cumulative excess lifetime cancer risk of 1E-05 and the NCP risk range of 1E-06 to 1E-04 ILCR under the Security Guard/Maintenance Worker land use scenario. Estimated risks are associated with dermal exposure to soil by a Security Guard/Maintenance Worker visiting the site 250 days/year for 25 years, wearing short sleeves, and operating heavy equipment.

RQL is currently managed as "restricted access" due to post-closure care and monitoring requirements for the closed, sanitary landfill until the year 2040. RQL is closed to all normal training and administrative activities. However, surveying; sampling; essential security, safety, natural resources management; and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas. All individuals unfamiliar with RQL are properly briefed on the hazards/restrictions prior to entry into the AOC (USACE 2005b).

The physical and administrative controls under this alternative will further restrict access to the entire AOC, specifically the portion of the AOC exceeding cleanup goals and the sanitary landfill. The chain-link security fence and signage will further deter entry of receptors that are not granted access to the AOC; this will provide added benefit to protect the adjacent landfill cap from surface damage or intrusive activities. All personnel will be properly briefed on access controls and potential hazards.

In the event non-routine or emergency entry into the fenced area is necessary, additional training, including the use of appropriate PPE to prevent dermal exposure to soil and appropriate procedures to follow to avoid disturbing ACM, will be provided.

5.4.4.2 Compliance with ARARs

Requirements identified as ARARs were evaluated within the RQL FS and finalized within the RQL ROD. Those requirements identified within the referenced documents are not re-created here but are incorporated by reference for this alternative. This section provides an addendum to the previously identified requirements and includes the additional requirements identified as ARARs due to the presence of ACM within the landfill.

The presence of ACM in the quarry would trigger the requirements of OAC 3745-20-07 (Standards for inactive asbestos waste disposal sites) as an action-specific ARAR. In addition, a relevant and appropriate requirement can be invoked for this activity under OAC 3745-20-07(A)(1-3) to ensure either: (1) no visible emissions are discharged to the outside air; (2) the asbestos-containing waste material is covered with at least 6 inches of compacted nonasbestos-containing material, and a cover of vegetation is grown and maintained on the area to adequately prevent exposure of the asbestos-containing waste material; or (3) the asbestos-containing waste material is covered with at least 2 feet of compacted nonasbestos-containing material, and the cover is maintained to prevent exposure of the asbestos-containing waste material. The "no visible emissions" requirement of OAC 3745-20-07(A)(1) can be attained for co-located PAH and ACM-containing areas to be excavated or disturbed by removal and proper disposal of the material. Any potential ACM located in areas beyond the PAH-contaminated remedial action footprint does not require removal to eliminate the discharge of visible emissions per OAC 3745-20-07(A)(1) due to the fact that the quarry bottom is heavily vegetated, much of the quarry bottom lies within identified wetlands, and the material will be saturated or innundated.

It is anticipated that fencing and controlled access of the facility will comply with the identified ARARs included within this Engineering Evaluation and those incorporated by reference from the FS and ROD.

5.4.4.3 Long-Term Effectiveness and Permanence

Alternative 8 is protective in the long-term for restricted land use. CERCLA contaminants will remain on-site above CUGs; however, the quarry bottom at RQL will have administrative and physical controls in place to eliminate or reduce exposure to various receptors. With appropriate documentation and access procedures, LUCs can be successfully implemented and would be effective in protecting human health and the environment. In addition, the fence under this alternative provides added long-term effectiveness by preventing exposure to the closed, sanitary landfill.

Reviews will be conducted at least once every 5 years, pursuant to CERCLA requirements. CERCLA five-year reviews permit the evaluation of remedy components, including effectiveness of LUCs.

5.4.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 8 does not involve treatment. Therefore, no reduction in contaminant toxicity, mobility, or volume is achieved with this alternative.

5.4.4.5 Short-Term Effectiveness

The short-term effectiveness of Alternative 8 is high. This alternative does not include excavation or construction activities within the contaminated area of the AOC thus minimizing the potential for worker exposure during implementation. There are no significant short-term human health risks associated with Alternative 8 beyond baseline conditions. No short-term health risks to the community would occur since no excavation or construction activities would be conducted within the contaminated area of the AOC. There would be no transportation risks, and workers would not be exposed to any additional health risks. Alternative 8 would not directly cause adverse impacts on soils or air quality. Installation of the fence would result in temporary loss of vegetated habitat for ecological receptors at the perimeter of the AOC, but it would not impact the existing wetland.

Remedial actions are estimated to require approximately 1 month to complete, followed by 30 years of O&M. Upon the completion of the fence, RQL would be released for restricted land use.

5.4.4.6 Implementability

Alternative 8 is technically implementable. Fence installation is performed via conventional activities in construction projects of this kind. Some vegetation and tree clearing is required. Construction and operation of the components of Alternative 8 would be available to complete the remedial activity.

LUCs also are implementable with the proper oversight of the U.S. Army. RQL currently has administrative access restrictions implemented at the AOC, although this alternative proposes the addition of physical restrictions or barriers. Technical difficulties for establishing additional monitoring programs or restricting access controls are not expected.

5.4.4.7 Cost

The present value cost to complete Alternative 8 is approximately $249,962 (in base year 2011 dollars with a 4.125% discount factor). O&M costs, including fence maintenance, monitoring, and imposition of LUCs, are estimated for a 30-year period. In addition, five-year reviews are required throughout the costing period and are included in the estimate.

6.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, a comparative analysis of the fourthree alternatives is conducted to identify relative advantages and disadvantages based on the detailed analysis above. The comparative analysis provides a means by which remedial alternatives are directly compared to one another with respect to common criteria. Overall protection and compliance with ARARs are threshold criteria that must be met by any alternative to be eligible for selection. The other criteria, consisting of short- and long-term effectiveness; reduction of contaminant toxicity, mobility, or volume through treatment; ease of implementation; and cost are the primary balancing criteria used to select a preferred remedy among alternatives satisfying the threshold criteria.

The relative advantages and disadvantages and comparative analysis of these alternatives are described below and presented in Tables 6-1 and 6-2.

6.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives 5, 6, 7, and 87 are all protective for human health in a restricted--access land-use scenario at RQL. Alternatives 5 and 6 remove or cap soil in the quarry to meet the Security Guard/Maintenance Worker preliminary CUGs. Removal or capping of the soil provides reasonable certainty that the total ILCR and total HI across all contaminants will be at or below thresholds of 1E-05 and 1.0 respectively for the Security Guard/Maintenance Worker. Alternatives 7 and 8 preventAlternative 7 prevents exposure by constructing a fence and emplacing administrative controls to prevent entry into those portions of the AOC having CERCLA COCs greater than CUGs. Alternative 8 provides the additional protectiveness of preventing access to the closed, sanitary landfill. Additional administrative controls will ensure personnel who must enter the fenced area on a non-routine emergency basis have been properly briefed on potential hazards, wear appropriate PPE to prevent dermal exposure to soil, and take appropriate steps to avoid disturbing ACM.

Ecological risks are not high, based on AOC reconnaissance and low COPEC concentrations. Under Alternatives 5, 7, and 87, wetland mitigation and monitoring are required as part of substantive requirements. Under Alternative 6, challenges exist with re-establishing a wetland on the cap and maintaining wetlands per substantive requirements. There are implementation concerns that increasing the soil elevation by 1 ft will impact the wetland restoration, as the intermittent surface water may not remain in the quarry bottom long enough to re-establish the isolated wetland.

6.2 COMPLIANCE WITH ARARS

Alternatives 5, 6, 7, and 87 will comply with the identified ARARs for the site including those incorporated by reference from the FS and ROD and requirements of OAC 3745-20-07.

6.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative 5 is rated high in terms of long-term effectiveness in preventing exposures or the spread of contamination due to the removal of COCs in soil to a Security Guard/Maintenance Worker land use scenario and implementation of administrative LUCs. Alternative 6 is rated medium due to the fact that COCs (although capped) are left in place at the AOC and only administrative controls will be put in place to ensure digging is not conducted at the AOC. Alternatives~~Alternative~~ 7 and 8 are~~is~~ rated medium due to the permanence and effectiveness a fence will have at eliminating exposure to CERCLA COCs and co-located friable ACM. Although no contaminants will be removed from the AOC, physical and administrative controls will minimize or eliminate exposure to contaminants from the quarry bottom.

6.4 REDUCTION IN CONTAMINANT VOLUME, TOXICITY, AND MOBILITY THROUGH TREATMENT

The ability of Alternative 5 to reduce contaminant volume, toxicity, and mobility is medium. Alternative 5 does not reduce contaminant volume and toxicity of COCs (presented in Table 1-1) or ACM. However, Alternative 5 reduces the mobility of the COCs and ACM by placing the contaminated soil in an engineered, lined, disposal cell at the landfill. The fate and transport modeling concluded COCs are not predicted to impact underlying groundwater beneath the AOC, and they have never been detected during groundwater monitoring at the AOC. Most asbestos minerals are chemically inert, insoluble in water, and the potential for solid particulate migration through soil and bedrock to underlying groundwater is negligible. Therefore, asbestos is not included as a standard analyte under the RVAAP facility-wide groundwater monitoring program. The ability of Alternatives 6, 7, and 8 to reduce contaminant volume, toxicity and mobility is low since these alternatives do not~~Alternatives 5, 6, and 7 to reduce contaminant volume, toxicity and mobility is low since none of these alternatives~~ involve treatment.

6.5 SHORT-TERM EFFECTIVENESS

Short-term risks are associated with implementation of Alternatives 5 and 6 because these activities will be conducted in the presence of friable ACM and in the possible presence of munitions. Additionally, both alternatives impact the wetlands that currently exist in the quarry bottom during implementation activities. Alternative 5 is rated low because intrusive work will be performed and friable ACM will be handled and disposed. Additionally, Alternative 5 will require the transport of approximately 75 truckloads of soil/ACM over local roads to an off-site disposal facility. The disposal of an estimated 1,614 yd^3 in a landfill will also shorten the longevity of that landfill. Alternative 6 is rated medium due to risks of encountering munitions while installing the cap on the surface soil in the quarry bottom; however, this alternative does not include potential impacts from excavation and transportation of contaminated soil and ACM.

The ~~Alternative 7 is rated high for~~ short-term effectiveness for Alternatives 7 and 8 include activities during~~. In general,~~ the fence installation~~will be installed on the outside of areas containing COCs above CUGs, munitions, or friable ACM~~. Entry to the quarry bottom will be limited during fence installation of either alternative;~~,~~ thus, ~~temporary~~ impacts to ecological habitat will be minimized.

Alternative 7 requires fence installation at the slope of the sanitary landfill and has risk of encountering MEC and ACM. Alternative 8 is outside of the quarry bottom; therefore, the fence installation is not within the MRS nor is it expected ACM will be encountered. Consequently, Alternative 7 is rated medium for short-term effectiveness, and Alternative 8 is rated high for short-term effectiveness.

6.6 IMPLEMENTABILITY

All alternatives are considered implementable on a technical and availability-of-services basis. Alternative 5 is rated low since the extent of ACM is not defined, and a potential for encountering MEC exists. Alternative 6 is implementable through common construction practices (truck hauling, installation of clay cap). However, there will be challenges associated with disturbing ACM in the capped area, encountering munitions, and meeting wetland restoration requirements after placing 1 ft of soil on the existing wetland. Alternative 6 is rated low for implementability. Alternatives~~Alternative~~ 7 and 8 are~~is~~ implementable through common construction practices (vegetation clearing and fence installation). In a relative comparison, implementation of Alternative 7 ~~Given the activities~~ will be more difficult than implementation of Alternative 8. Alternative 7 involves more vegetation clearing, whereas the installation of the five strand wire fence in the east, south,~~circumvent chances of encountering ACM and MEC~~ and west sides of the RQL perimeter~~it~~ will be implemented relatively easily~~eliminate the potential of contaminant chasing~~ and will not require clearing. Consequently, Alternative 7 is rated medium for implementability and Alternative 8~~wetland restoration challenges. Alternative 7~~ is rated high for implementability.

6.7 COST

Costs were estimated for comparison purposes only and are believed accurate within a range of -30% to +50%. The estimated present value cost (in base year 2011~~2010~~ dollars with a 4.125% discount factor) to complete each of the alternatives is as follows:

Alternative 5:	$ 757,155 ~~752,331~~
Alternative 6:	$ 340,590 ~~330,176~~
Alternative 7:	$ 249,153 ~~200,146~~
Alternative 8:	$ 249,962

Table 6-1. Summary of Detailed Analysis of Remedial Alternatives

NCP Evaluation Criteria	Alternative 5: Excavation of Soil and Off-site Disposal as Friable ACM ~ Security Guard/Maintenance Worker	Alternative 6: Capping ~ Security Guard/Maintenance Worker	Alternative 7: Quarry Bottom Fence ~ ~~Fencing ~~ Restricted Land Use~~Access~~	Alternative 8: Perimeter Fence ~ Restricted Land Use
1. Overall Protectiveness				
Human Health Protection	Protective due to removal of impacted soil, ACM, and institution of LUCs.	Protective due to capping of impacted soil and institution of LUCs.	Protective due to prevention of exposure to impacted soil by physical (fence) and institutional LUCs.	Protective due to prevention of exposure to impacted soil by physical (fence) and institutional LUCs.
Environmental Protection	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Wetland mitigation and monitoring required as part of substantive requirements.	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Concerns and challenges exist~~Challenges~~ with re-establishing a wetland on the cap and maintaining wetlands per substantive requirements.	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Wetland mitigation and monitoring required for areas already excavated as part of substantive requirements.	No mitigation of calculated risks to ecological receptors; however, ecological risks are not likely to be high, based on AOC reconnaissance and low COPEC concentrations. Wetland mitigation and monitoring required for areas already excavated as part of substantive requirements.
2. Compliance with ARARs				
ARARs	Alternative will comply with the identified ARARs. ACM containing soils will be managed in a manner to ensure no visible emissions occur and will be transported and disposed in accordance with the identified requirements.	Alternative will comply with the indentified ARARs. ACM materials would be covered per the requirements and potential exposure subsequently controlled.	Alternative will comply with the identified ARARs. LUCs will ensure there is no discharge of visible emissions to the outside air.	Alternative will comply with the identified ARARs. LUCs will ensure there is no discharge of visible emissions to the outside air.
3. Long-Term Effectiveness and Permanence				
Magnitude of Residual Risk	Residual risk/hazard exceeds target risk/hazard for residential land use.	Residual risk/hazard exceeds target risk/hazard for residential land use.	Residual risk/hazard exceeds target risk/hazard for residential land use.	Residual risk/hazard exceeds target risk/hazard for residential land use.
Adequacy and Reliability of Controls	Controls will be implemented through administrative means via a Property Management Plan. OHARNG will need to monitor access and land use at the AOC after the remedy is	Controls will be implemented through administrative means via a Property Management Plan. OHARNG will need to monitor access and land use at the AOC after the remedy is	Controls will be implemented through administrative means via a Property Management Plan. Management of site access will be bolstered significantly by the physical controls provided by the	Controls will be implemented through administrative means via a Property Management Plan. Management of site access will be bolstered significantly by the physical controls provided by the

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	complete.	complete.	fence.	fence.
Long-Term Management	Required since soils would remain on-site in exceedance of residential land-use CUGs. The wetlands will require periodic surveillance and maintenance.	Required since soils would remain on-site in exceedance of residential land-use CUGs. The wetlands and cap will require periodic surveillance and maintenance.	Required since soils would remain on-site in exceedance of residential land-use CUGs. The fence will require periodic maintenance.	Required since soils would remain on-site in exceedance of residential land-use CUGs. The fence will require periodic maintenance.
4. Reduction of Toxicity, Mobility, or Volume through Treatment				
Reduction through Treatment	None (no treatment).	None (no treatment).	None (no treatment).	None (no treatment).
5. Short-Term Effectiveness				
Community	Risk due to excavation, handling, and transportation of friable ACM and performing work with a munitions response site.	Risk due to heavy equipment on areas containing friable ACM and within a munitions response site.	No immediate increased risk to community.	No immediate increased risk to community.
Workers	Risk due to excavation and handling contaminated soil and friable ACM. Additionally, risk from work performed in a munitions response site. Transportation risks from trucking soil/ACM to off-site disposal facility.	Risk due to construction of cap on contaminated soil and friable ACM. Additionally, risk from work performed in a munitions response site.	No significant increase of risks or hazards to workers.	No significant increase of risks or hazards to workers.
Ecological Resources	Excavation would result in a temporary loss of vegetated habitat including portions of wetland	Capping would result in a temporary loss of vegetated habitat including portions of wetland. Challenges exist in re-developing isolated wetland after cap placement.	Temporary habitat impacts limited to area at perimeter of AOC with no impacts to wetlands.	Temporary habitat impacts limited to area at perimeter of AOC, with no impacts to wetlands.
LUCs	Potential releases controlled with management and engineering practices.	Potential releases controlled with management and engineering practices.	Minimal LUCs are needed in short-term due to low impact alternative	Minimal LUCs are needed in short-term due to low impact alternative.
Time to Complete[1]	2 months	2 months	1 month	1 month
O&M Period	30 years (estimated)	30 years (estimated)	30 years (estimated)	30 years (estimated)

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Table 6-1. Summary of Detailed Analysis of Remedial Alternatives (continued)

NCP Evaluation Criteria	Alternative 5: Excavation of Soil and Off-site Disposal as Friable ACM ~ Security Guard/Maintenance Worker	Alternative 6: Capping ~ Security Guard/Maintenance Worker	Alternative 7: Quarry Bottom Fence ~ Restricted Land Use	Alternative 8: Perimeter Fence ~ Restricted Land Use
6. Implementability				
Technical Feasibility	Feasible	Feasible	Feasible	Feasible
Administrative Feasibility	LUCs are currently being implemented at AOC. Additional administrative challenges include wetland disturbances, executing a large construction project, and coordination with facility operations.	LUCs are currently being implemented at AOC. Additional administrative challenges include wetland disturbances, executing a large construction project, and coordination with facility operations.	Relatively easy. LUCs are currently being implemented at AOC.	Relatively easy. LUCs are currently being implemented at AOC.
7. Cost				
Estimated Cost[2]	$757,155~~752,331~~	$340,590~~330,176~~	$249,153~~200,146~~	$249,962

[1]Time to complete remedial action after completion of remedial design, assuming timely project funding. Does not include O&M period.
[2]Estimated costs calculated as net present value in base year 2011~~2010~~ dollars using a 4.125% discount factor. A 30-year O&M period is assumed for cost estimating purposes.

ACM = Asbestos-containing Material
AOC = Area of concern
ARAR = Applicable and relevant or appropriate requirements
COPEC = Constituent of potential ecological concern
CUG = Cleanup Goals
LUC = Land Use Control
NCP = National Contingency Plan
OHARNG = Ohio Army National Guard
O&M = Operation and maintenance
USEPA = U. S. Environmental Protection Agency

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Table 6-2. Summary of Comparative Analysis of Remedial Alternatives

NCP Evaluation Criteria	Alternative 5: Excavation of Soil and Off-site Disposal as Friable ACM ~ Security Guard/Maintenance Worker		Alternative 6: Capping ~ Security Guard/Maintenance Worker		Alternative 7: Quarry Bottom Fence ~ Restricted Land Use		Alternative 8: Perimeter Fence ~ Restricted Land Use	
Threshold Criteria	***Result***		***Result***		***Result***		***Result***	
1. Overall Protectiveness of Human Health and the Environment	Protective		Protective		Protective		Protective	
2. Compliance with ARARs	Compliant		Compliant		Compliant		Compliant	
Balancing Criteria	***Ranking***	***Score***	***Ranking***	***Score***	***Ranking***	***Score***	***Ranking***	***Score***
3. Long-Term Effectiveness and Permanence	High	3	Medium	2	Medium	2	Medium	2
4. Reduction of Toxicity, Mobility, or Volume through Treatment	~~Low~~Medium	2	Low	1	Low	1	Low	1
5. Short-Term Effectiveness	Low	1	Medium	2	~~High~~Medium	2	High	3
6. Implementability	Low	1	Low	1	~~High~~Medium	2	High	3
7. Cost	Low	1	Medium	2	High	3	High	3
Balancing Criteria Score		*8*		*8*		*10*		*12*

"High" = highly favorable situation
"Medium" = moderately favorable situation
"Low" = situation that is not favorable

8.0 RECOMMENDED ALTERNATIVE

The recommended remedial alternative for soil and dry sediment at ~~the~~ RQL is Alternative 8: Perimeter Fence ~ Restricted Land Use.~~7: Fencing.~~ This alternative includes installation~~consists~~ of a fence at the perimeter of RQL and implementing a BMP to remove surficial ACM through non-intrusive, no digging methods. The fence will be a combination of~~installing~~ a chain-~~-~~link security fence and high tensile wire fence~~around the quarry bottom at RQL as part of a LUCs alternative to restrict access to the AOC~~. The fence specifications would be finalized in a Remedial Design. However, for purposes of this Engineering Evaluation, the specifications of the fence include:

1. At the northern perimeter of RQL, a chain-link security fence (Schedule~~(1) schedule~~ 40, with 9 gauge wire mesh and 2"~~ in~~ posts on 10-ftfoot centers)~~; (2) 9 gauge wire mesh;~~ and~~ (3)~~ 6 ft high gates with a 1⅝" frame will be installed.

2. At the eastern, southern, and western perimeter of RQL, a five-strand high tensile wire fence will be installed.

3. Gates to allow for authorized personnel and equipment access will be installed.

~~.~~ Installation of the~~chain-link security~~ fence and signage provides a physical control for the AOC. This deterrent will minimize or eliminate the potential for exposure to receptors that are not granted access to RQL. RQL is closed to all normal training and administrative activities. Surveying, sampling, essential security, safety, periodic maintenance, natural resources management, and other directed activities may be conducted at RQL only after personnel have been properly briefed on potential hazards/sensitive areas.

The physical and administrative controls under this alternative will further restrict access to that portion of the AOC exceeding cleanup goals. The~~ chain-link security~~ fence and signage will further deter entry by any other receptors that are not granted access to RQL. Administrative LUCs will include access and digging restrictions and personnel briefings for access-authorized persons on potential hazards and safety precautions (e.g., appropriate PPE usage to prevent dermal exposure to soil and appropriate steps to avoid disturbing ACM). Once the fence is complete and LUCs are in place, this alternative will result in reduced potential for exposure to contaminated soil and ACM by National Guard receptors. Fencing will ensure compliance with the requirement that all personnel be properly briefed on potential hazards, including the use of appropriate PPE to prevent dermal exposure to soil, and appropriate steps to take to avoid disturbing ACM. PPE for prevention of dermal exposure to soil would include wearing long sleeves and gloves when in contact with soil.

Implementation of Alternative 8~~7~~ will provide a remedy for soil and dry sediment at RQL. In addition, fencing around the perimeter of~~quarry bottom at~~ RQL may also provide a remedy for surface water and wet sediment media that currently exists at this AOC. Although the CERCLA process for these two media has not been fully implemented, a fencing option for soil and dry

sediment may provide a No Further Action remedy for surface water and wet sediment. This alternative will also provide access restrictions and protection to the landfill cap on the closed, sanitary landfill within RQL.

Alternative 8~~7~~ has an estimated cost of $249,962~~200,146~~ that includes a $95,613~~104,528~~ O&M cost. This is a reduction of the $68,806~~59,621~~ O&M cost associated with Alternative 3 (selected in the RQL ROD). In addition, this remedy may serve as a remedy for surface water and wet sediment if deemed feasible during the CERCLA process. Implementation of this alternative includes fencing maintenance, wetland mitigation, and supervision of areas disturbed during the removal activities described in Section 3.2.2.