FINAL

SAMPLING AND ANALYSIS PLAN ADDENDUM NO. 1

FOR THE

PHASE I REMEDIAL INVESTIGATION OF RAMSDELL QUARRY LANDFILL AT THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

PREPARED FOR

US Army Corps of Engineers®

LOUISVILLE DISTRICT

CONTRACT No. F44650-99-D-0007
DELIVERY ORDER CY11

October 2003

SAIC

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U.S. Army Corps of Engineers
Louisville District
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Prepared by

Science Applications International Corporation
151 Lafayette Drive
Oak Ridge, Tennessee 37830

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Science Applications International Corporation (SAIC) has completed the Sampling and Analysis Plan Addendum No. 1 for the Phase I Remedial Investigation of 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 Corps policy.

W. Kevin Jago
Kevin Jago
Study/Design Team Leader

10-22-03
Date

Sally Absher
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Primary Author

10-22-03
Date

W. Kevin Jago
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Independent Technical Review Team Leader

10-22-03
Date

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

> Reference comment response table appended to the back of the document. Incorporation of responses have been verified by the Independent Technical Review Team Leader.

As noted above, all concerns resulting from independent technical review of the project have been considered.

William P [illegible]
Principal w/ A-E firm

10-22-03
Date

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PART II–QUALITY ASSURANCE PROJECT PLAN ADDENDUM

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Part I

Field Sampling Plan
Addendum No. 1
for the
Phase I Remedial Investigation of
Ramsdell Quarry Landfill at the
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FIGURES

TABLES

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ACRONYMS

AOC	area of concern
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
CSM	conceptual site model
DOT	Department of Transportation
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
FSA	Field Staging Area
HHRC	human health risk characterization
IDW	investigation-derived waste
JMC	Joint Munitions Command
NTU	nephelometric turbidity unit
OAC	Ohio Administrative Code
OE	ordnance and explosives
Ohio EPA	Ohio Environmental Protection Agency
OVA	organic vapor analyzer
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protective equipment
PRG	preliminary remediation goal
PZ	piezoelectric
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
RQL	Ramsdell Quarry Landfill
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SRC	site-related contaminant
SVOC	semivolatile organic compound
TAL	target analyte list
TNT	trinitrotoluene
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
UXO	unexploded ordnance
VOC	volatile organic compound
WBG	Winklepeck Burning Grounds

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1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

The Phase I Remedial Investigation (RI) of Ramsdell Quarry at the Ravenna Army Ammunition Plant (RVAAP), Ohio (Figure 1-1) will use data collected under previous investigations and the Phase I RI to evaluate the nature and extent, chemical fate and transport, and human and ecological risks for site-related contaminants (SRCs) in soil, sediment, surface water, and groundwater.

This Phase I RI Sampling and Analysis Plan (SAP) Addendum for the Ramsdell Quarry Landfill (RQL) at RVAAP has been prepared by Science Applications International Corporation (SAIC) under contract F44650-99-D0007, Delivery Order CY 11 (ECAS Control No.431), with the U.S. Army Corps of Engineers (USACE), Louisville District. This SAP Addendum has been developed to tier under and supplement the *Facility-Wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001a). The Facility-wide SAP provides the base documentation, technical procedures, and investigative protocols for conducting RIs under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at RVAAP, whereas this SAP Addendum includes the sampling and analysis objectives, rationales, planned activities, and criteria specific to the Phase I RI at RQL. Consequently, the Phase I RI cannot be implemented without the guidance provided in both documents. Where appropriate, the SAP Addendum contains references to the Facility-wide SAP for standard procedures and protocols.

Both the Facility-wide SAP and this SAP Addendum have been developed following the USACE guidance document *Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3, September 1994* (USACE 1994a), to collectively meet the requirements established by the Ohio Environmental Protection Agency (Ohio EPA), Northeast District, and the U.S. Environmental Protection Agency (EPA), Region 5, for conducting CERCLA investigations.

1.2 HISTORY AND CONTAMINANTS

RVAAP is located in northeastern Ohio in Portage and Trumbull counties and lies about 16 km (10 miles) east of Ravenna, Ohio (Figure 1-1). Operations at the facility began in September 1941 and included the storage, handling, and packing of military ammunition and explosives. The facility encompasses 8,668 ha (21,419 acres) and is jointly operated by the Joint Munitions Command (JMC) of the U.S. Army and the National Guard Bureau. The JMC controls environmental areas of concern (AOCs) and active mission areas. A detailed history of process operations and waste disposal processes for each AOC at RVAAP (Figure 1-2) is presented in the *Preliminary Assessment for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1996).

Ramsdell Quarry is located in the northeastern portion of RVAAP and encompasses about 14 acres (Figure 1-3). The quarry was excavated about 9 to 12 m (30 to 40 ft) below existing grade into the Sharon Member of the Pottsville Formation. The original unconsolidated glacial material overlying the sandstone was only a few meters (<10 ft) thick and appears to have been entirely removed. The excavated material, consisting of sandstone and quartz pebble conglomerate, was used for road and construction ballast. Quarry operations were discontinued about 1941.

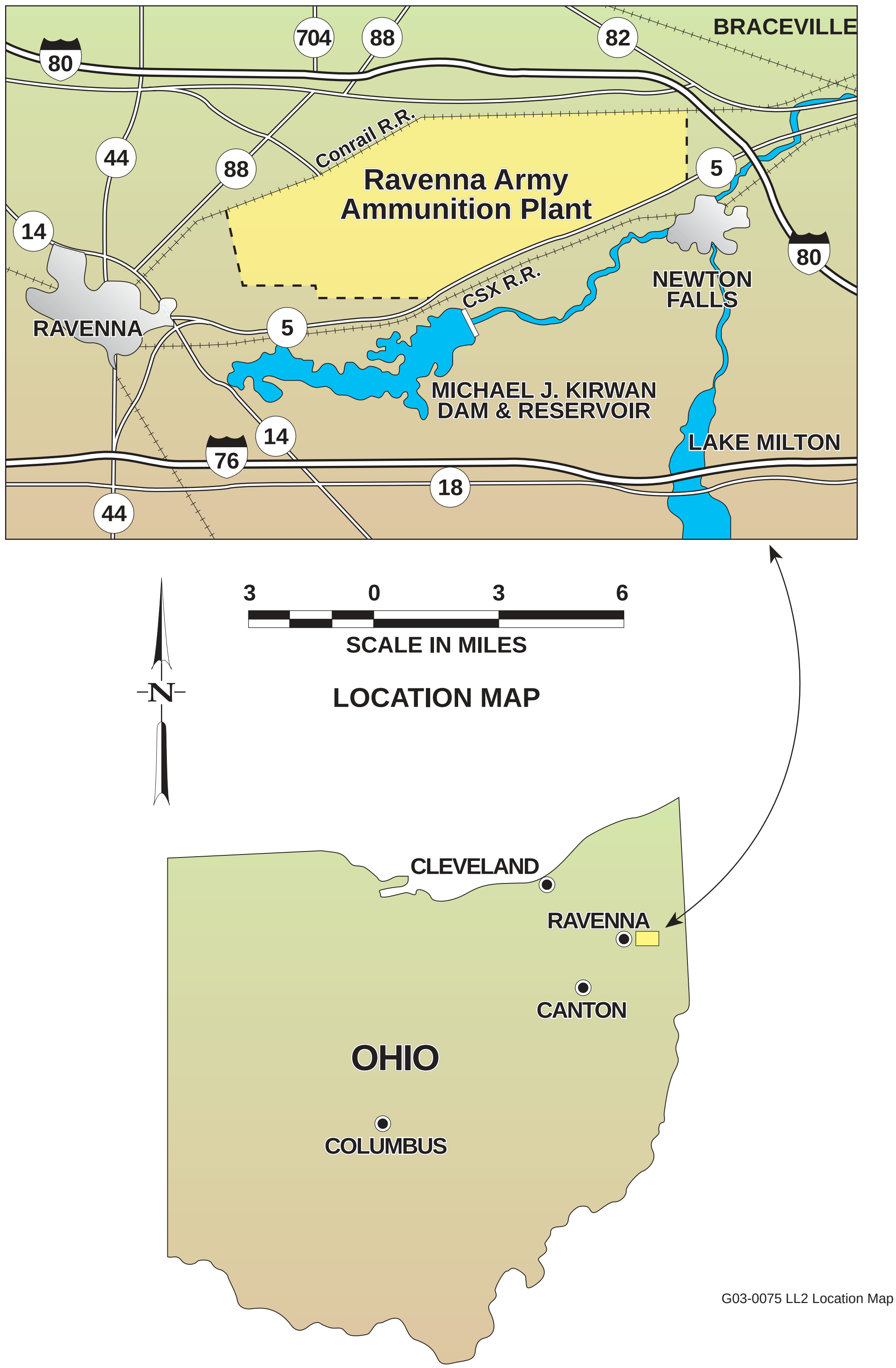
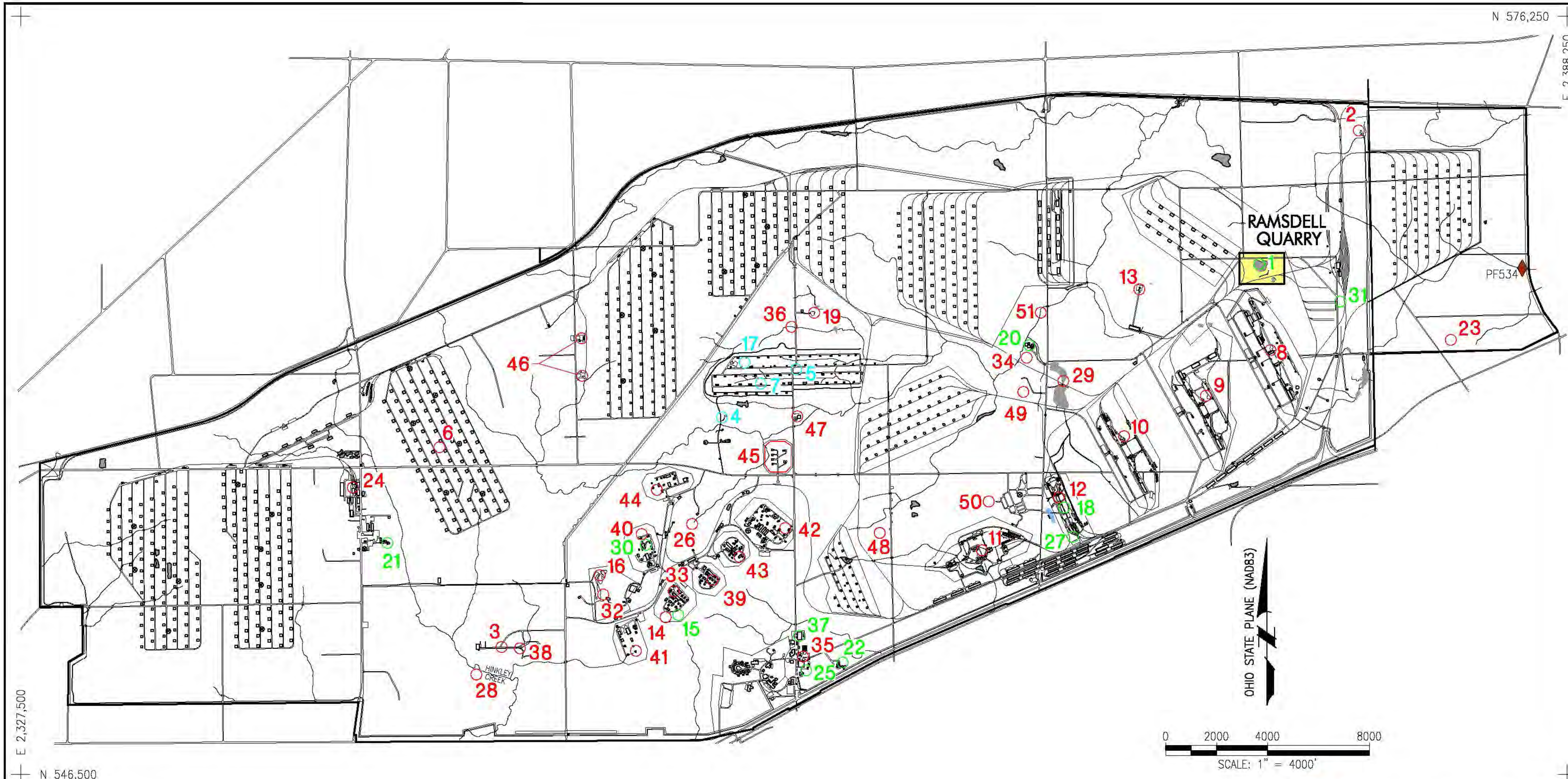


Figure 1-1. General Location and Orientation of RVAAP



LEGEND OF SITES:

1 .... RAMSDELL QUARRY LANDFILL
2 .... ERIE BURNING GROUNDS
3 .... DEMOLITION AREA 1
4 .... DEMOLITION AREA 2
5 .... WINKLEPECK BURNING GROUNDS
6 .... C BLOCK QUARRY
7 .... BLDG 1601 HAZARDOUS WASTE STORAGE
8 ...... LOAD LINE 1 AND DILUTION/SETTLING POND
9 ...... LOAD LINE 2 AND DILUTION/SETTLING POND
10 ..... LOAD LINE 3 AND DILUTION/SETTLING POND
11 ..... LOAD LINE 4 AND DILUTION/SETTLING POND
12 .... LOAD LINE 12 AND DILUTION/SETTLING POND
13 .... BLDG 1200 AND DILUTION/SETTLING POND
14 .... LOAD LINE 6, EVAPORATION UNIT
15 .... LOAD LINE 6, TREATMENT PLANT
16 . QUARRY LANDFILL/FORMER FUZE & BOOSTER BURNING PITS
17 .... DEACTIVATION FURNACE
18 ..... LOAD LINE 12 PINK WASTEWATER TREATMENT
19 .. LANDFILL NORTH OF WINKLEPECK BURNING GROUND
20 .... SAND CREEK SEWAGE TREATMENT PLANT
21 .... DEPOT SEWAGE TREATMENT PLANT
22 .... GEORGE ROAD SEWAGE TREATMENT PLANT
23 .... UNIT TRAINING SITE WASTE OIL TANK
24 .. RESERVE UNIT MAINTENANCE AREA WASTE OIL TANK
25 .... BLDG 1034 MOTOR POOL WASTE OIL TANK
26 .... FUZE BOOSTER AREA SETTLING TANKS
27 .... BLDG 854-PCB STORAGE
28 .... MUSTARD AGENT BURIAL SITE
29 .... UPPER AND LOWER COBBS POND COMPLEX
30 ... LOAD LINE 7 PINK WASTEWATER TREATMENT PLANT
31 .... ORE PILE RETENTION POND
32 .... 40- AND 60-MM FIRING RANGE
33 .... FIRESTONE TEST FACILITY
34 .... SAND CREEK DISPOSAL ROAD LANDFILL
35 ..... 1037 BUILDING-LAUNDRY WASTEWATER SUMP
36 .... PISTOL RANGE
37 .... PESTICIDE STORAGE BUILDING T-4452
38 .... NACA TEST AREA
39 .... LOAD LINE 5 / FUZE LINE 1
40 .... LOAD LINE 7 / BOOSTER LINE 1
41 .... LOAD LINE 8 / BOOSTER LINE 2
42 .... LOAD LINE 9 / DETONATOR LINE
43 .... LOAD LINE 10 / PERCUSSION ELEMENT
44 .... LOAD LINE 11 / ARTILLERY PRIMER
45 .... WET STORAGE AREA
46 .... BUILDINGS F-15 AND F-16
47 .... BUILDING T-5301 DECONTAMINATION
48 .... ANCHOR TEST AREA
49 .... CENTRAL BURN PITS
50 .... ATLAS SCRAP YARD
51 .... DUMP ALONG PARIS-WINDHAM ROAD

○ .... CERCLA
○ .... RCRA
○ .... OTHER REGULATORY
◆ SURFACE WATER QUALITY MONITORING STATION PF534

US Army Corps of Engineers Louisville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

RAVENNA ARMY AMMUNITION PLANT
RAMSDALE QUARRY LANDFILL
(RVAAP-01)

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	0 / 09-04-03	/03026/DWGS/S83RVAP1

Figure 1-2. Ravenna Army Ammunition Plant Facility Map

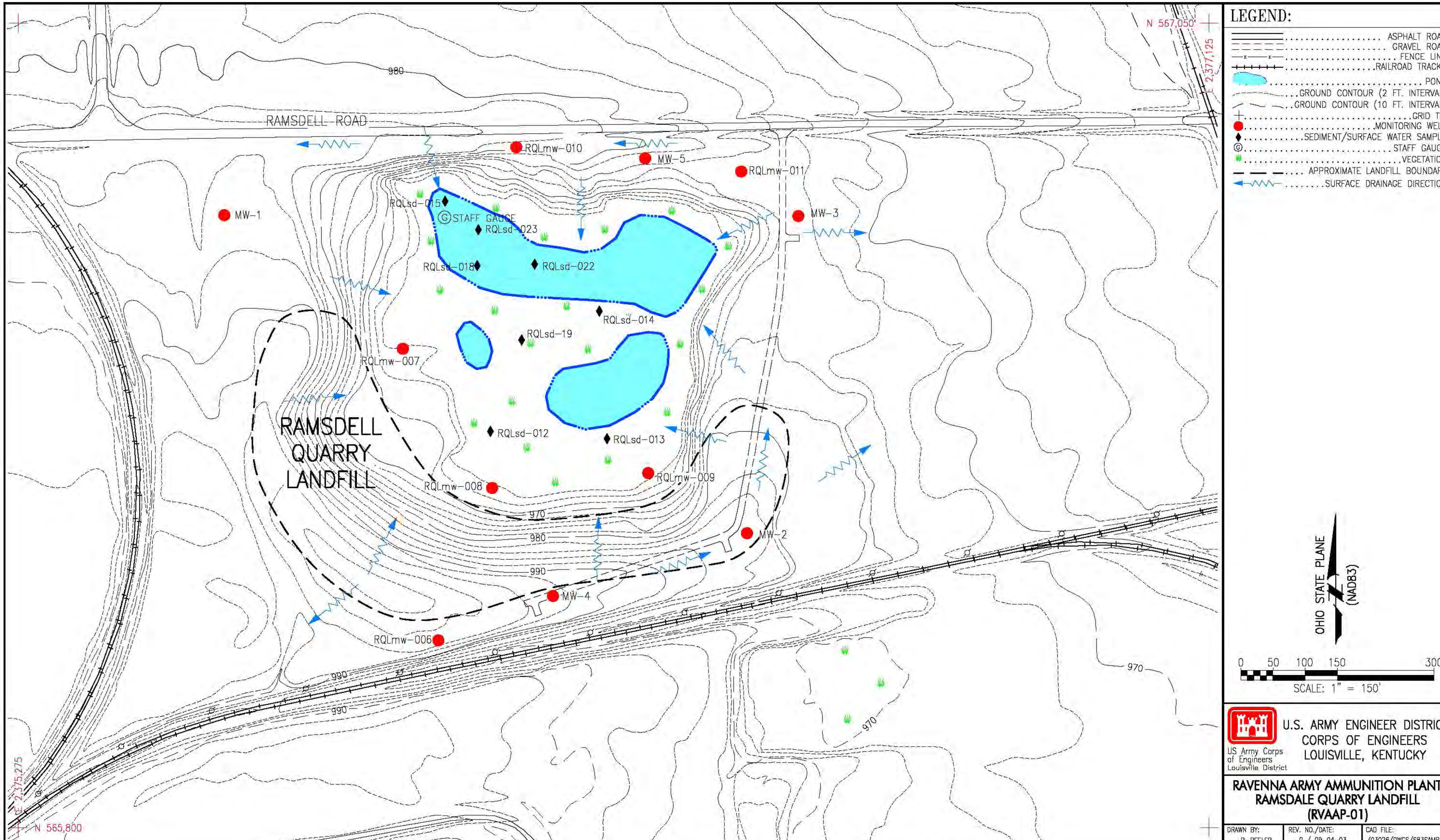


Figure 1-3. Ramsdell Quarry Site Map and Previous Sampling Locations

The western and southern portion of the abandoned quarry was subsequently used for landfill operations (RQL) between 1941 and 1989 (Figure 1-3). No information is available regarding landfill disposal activities between 1941 and 1976. From 1976 until the landfill was closed in 1989, only non-hazardous solid waste was deposited in RQL. In 1978, a portion of the abandoned quarry was permitted as a sanitary landfill by the State of Ohio. The permit required a 30-m (100-ft) buffer be maintained between the landfill and the pond; the extent of the pond prior to this time is not known. Closure of the permitted sanitary landfill was completed in May 1990 under State of Ohio solid waste regulations [Ohio Administrative Code (OAC) 3745-27-10]. A requirement of closure was installation and semiannual monitoring of five monitoring wells (Figure 1-3).

In addition, from 1946 to the 1950s, the bottom of the quarry was used to burn waste explosives from Load Line 1. Approximately 18,000 225-kg (500-lb) incendiary or napalm bombs were reported to have been burned in the abandoned quarry. Liquid residues from annealing operations were also dumped in the quarry. No additional historical information currently is available on how the quarry was used, other than for landfill operations, from the 1950s until 1976, when operational records show that non-hazardous solid wastes were placed in RQL.

Based upon available information and past uses of the abandoned quarry, wastes may include domestic, commercial, and industrial solid and liquid wastes, including explosives [e.g., trinitrotoluene (TNT), hexahydro-1,3,5-trinitro-1,3,5-triazine, Composition B], napalm, gasoline, acid dip liquor, annealing residue (e.g., sulfuric acid, shell casings, sodium orthosilicate, chromic acid, and alkali), aluminum chloride, and inert material. Interviews with former RVAAP personnel have indicated that much of the landfilled wastes and debris at the abandoned quarry were removed in the 1980s.

A much smaller quarry (also abandoned) was located directly southeast of RQL (Figure 1-3). Although no standing water was observed in the smaller quarry during earlier investigations, it was water filled in late August as a result of above average rainfall during the summer of 2003. No documentation of waste disposal or treatment exists for this quarry.

1.3 SUMMARY OF EXISTING DATA

Previous investigations at Ramsdell Quarry include monitoring related to post-closure of RQL and a Groundwater Investigation to evaluate the suitability of the post-closure groundwater monitoring network for RQL and to investigate general groundwater/surface water interactions in the quarry. The Groundwater Investigation was designed to: (1) evaluate whether the closed landfill is in compliance with Ohio solid waste post-closure requirements; (2) to close data gaps in the RQL post-closure monitoring program; and (3) to address potential impacts upon groundwater related to historical operations at Ramsdell Quarry prior to use of the site for landfill operations. To achieve the project data quality objectives (DQOs), two phases (initial and follow-on) of work were conducted. A summary of the post-closure monitoring program results through 1999 and results of the Groundwater Investigation are contained in the Initial Phase Groundwater Investigation Report (USACE 1999) and the Final Phase Groundwater Investigation Report (USACE 2000).

The initial phase, conducted in July 1998, involved: (1) the installation and sampling of six new monitoring wells; (2) sampling of the existing RQL post-closure monitoring well system; (3) sampling of sediment and surface water within the quarry; and (4) construction of a staff gauge within the main quarry pond. Results of the initial phase of the investigation were presented in the *Initial Phase Report, Groundwater Investigation Ramsdell Quarry Landfill, Ravenna Army Ammunition plant, Ravenna, Ohio* (USACE 1999).

The follow-on phase of the investigation, which extended until July 15, 1999, included: (1) quarterly, dry season, and wet season (storm event) sampling of the new monitoring well network and quarry pond surface water; (2) collection of long-term water levels from new monitoring well network and quarry pond; (3) monthly manual water level measurements from all wells and the pond staff gauge; and (4) collection of precipitation data.

Groundwater

Groundwater samples from the Groundwater Investigation contained low, but consistently detectable, concentrations of nine explosive compounds and associated degradation products and nitroglycerin. Multiple trace metals were present above facility-wide background criteria, as well as Ohio drinking water standards in both unfiltered and filtered samples. The most prevalent of these were aluminum, arsenic, cobalt, manganese, mercury, nickel, and zinc. Sporadic detections of bis(2-ethylhexyl)phthalate and volatile organic compounds (VOCs) were noted. Toluene and methylene chloride were the most persistent VOCs detected. No VOC results exceeded Ohio primary maximum contaminant levels (MCLs). The upgradient well (RQLmw-006) and two wells (RQLmw-007 and RQLmw-008) located at the toe of the landfill typically had the highest percentages of detected contaminants. The furthest downgradient well (RQLmw-011) also had a comparatively high frequency of metals above background criteria.

Potentiometric data collected during the period of the investigation showed that horizontal potentiometric gradients are consistently to the northeast across the site during dry periods of the year. During these periods, the quarry pond is a static representation of the water table and may even function as a sink through evapotranspiration processes. During the wet season of the year, a sufficient reservoir of water exists in the quarry pond to act as a recharge point to groundwater. As a result, potentiometric surface elevations in upgradient well RQLmw-006 and those at the toe of the landfill are essentially equal. Rainfall events during the wet period of the year provide additional volume to the quarry pond and produce sufficient hydraulic head to produce slight, localized flow gradient reversals between the pond and well RQLmw-006 for short periods of time. Wells RQLmw-010 and RQLmw-011 remain consistently downgradient of RQL throughout the year.

The distribution of contaminants in wells at RQL are consistent with the observed hydraulic characteristics. Considering that the horizontal potentiometric gradient during the wet season is flat and exhibits short-term reversals, RQL is the likely source of observed contaminants in well RQLmw-006. For a majority of the year, groundwater flow is consistently to the north-northeast providing the mechanism for contaminant migration to wells located at the toe of RQL and to RQLmw-011.

Sediment

Multiple metals and cyanide were detected in initial phase sediment samples in excess of facility-wide background criteria. Numerous semivolatile organic compounds (SVOCs), primarily polynuclear aromatic hydrocarbons (PAHs), were also detected. Volatile constituents were sporadic and limited to estimated concentrations of acetone, 2-butanone, and methylene chloride below reporting limits. Seven explosive compounds were detected at low concentrations in at least one sample. The most persistent of these were 2,4,6-TNT (three detects) and octahydro-1,3,5-7-tetranitro-1,3,5,7-tetrazocine (eight detects). Nitrocellulose was detected in three samples.

Surface Water

Arsenic, chromium, copper, lead, manganese, mercury, and zinc concentrations in surface water exceeded facility-wide surface water background criteria on at least two occasions. Iron and manganese exceed their respective Ohio state-wide surface water quality criteria; however, background values for these constituents exceed these criteria. Metals detected above background occurred primarily in the dry season when quarry pond water levels were extremely low, which likely produced evaporative concentration of dissolved constituents. Explosives were detected only on one occasion and propellants were not detected. Acetone, methylene chloride, and tetrachloroethene were each detected on one occasion. No SVOCs were detected.

1.4 SPECIFIC SAMPLING AND ANALYSIS PROBLEMS

Due to site history, ordnance and explosives (OE) are potentially present; therefore, OE (anomaly) avoidance will be performed prior to and during the sampling effort. Habitat exists at Ramsdell Quarry for wildlife that represent potential biological hazards (e.g., wasps, hornets, snakes) during the planned field activities. Also, the high deer population at RVAAP and vegetation overgrowth result in a high tick population. Per the Site Safety and Health Plan Addendum, all sampling personnel will be advised specifically on biological hazards and pertinent preventive measures. Also, access to some of the planned Phase I RI monitoring well locations, especially in the southwest portion of the AOC, is limited and will require the use of all-terrain drilling equipment and potentially access route clearing using a light-duty backhoe or dozer.

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2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The RQL Phase I RI project organization and responsibilities are presented in Figure 2-1. The functional responsibilities of all key personnel, except the Field Logistics and Investigation-Derived Waste (IDW) Coordinator, are described in Chapter 2.0 of the Facility-wide SAP and, therefore, are not repeated here. Table 2-1 presents the baseline project schedule.

The Field Logistics and IDW Coordinator will coordinate with the Field Operations Manager and Sample Manager to coordinate operational logistics such as supplies, rentals, deliveries, and sample packaging and shipping. This position will also have specific responsibilities for labeling, tracking, and coordinating the staging and disposal of all IDW generated under the project. This position will also conduct an IDW management quality assurance (QA) and compliance review at the conclusion of each field project to ensure all containers are accounted for and properly staged pending characterization and disposal. The Field Logistics and IDW Coordinator will work, in conjunction with the Project Manager and the SAIC Compliance Officer, to prepare IDW characterization reports and to ensure proper disposition of IDW upon receipt of characterization results.

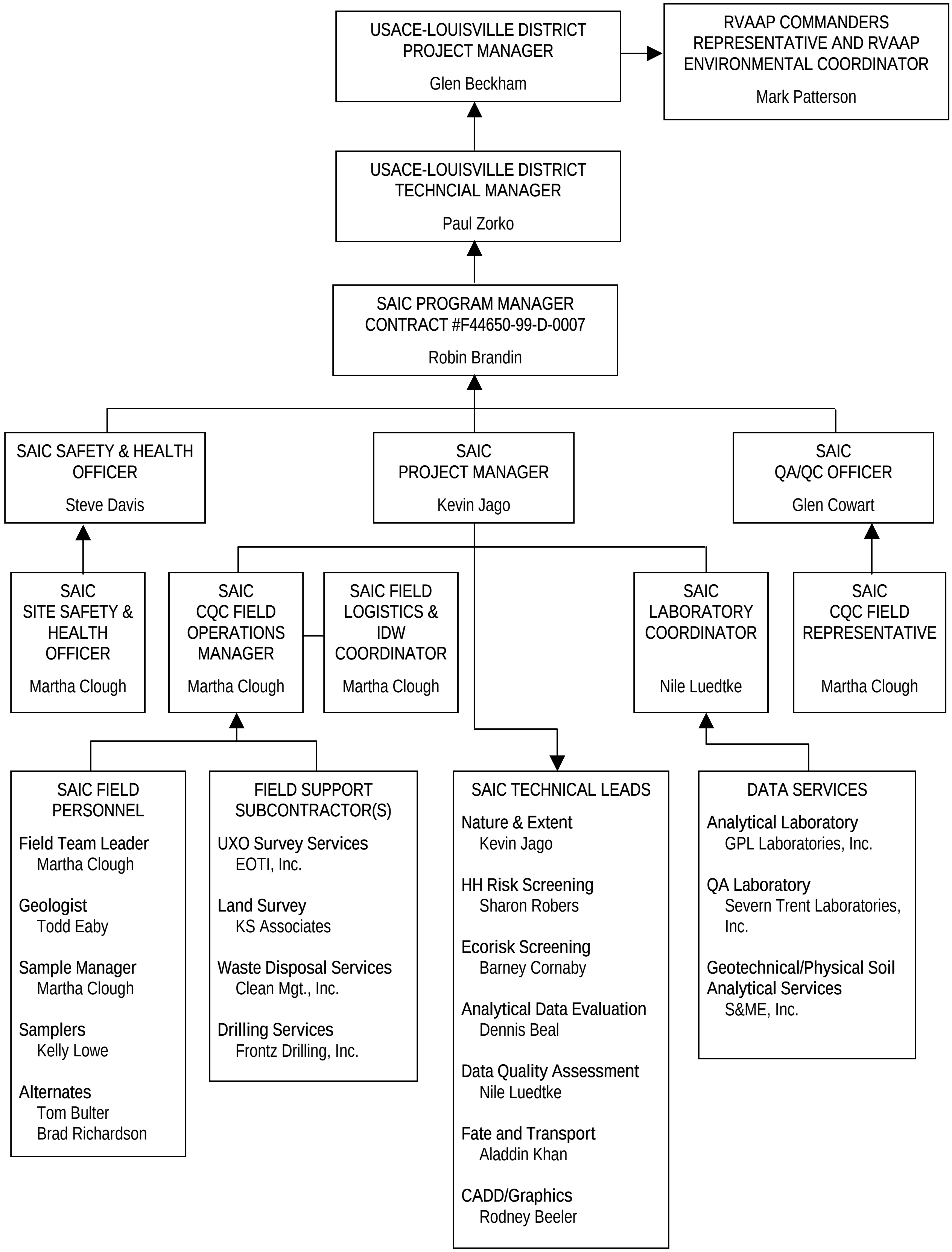

Figure 2-1. Project Organization Chart for the Ramsdell Quarry Phase I RI

Table 2-1. Project Schedule for the Ramsdell Quarry Landfill Phase I RI

Deliverable/Milestone	Scope of Work Section	Calendar Days Following Notice to Proceed
Submit Draft RI Work Plan Addenda	2.2 to 2.5	39
Submit Provisional Draft Work Plan Comment Response Tables	2.6	56
Work Plan Meeting	2.6	75
Submit Work Plan Meeting Minutes	2.6	83
Submit Final Work Plan Addenda	2.7	90
Receive Approval of Final Work Plan Addenda	2.7	97
Mobilization Phase	4.0	97 to 104
Field Investigation Phase	4.2 and 4.3	106 to 148 Two, 3-day follow-on work cycles for groundwater sampling TBD
Submit Survey Report	4.4	187
Submit OE Avoidance Report	5.0	176
Draft IDW Report	6.0	187
Final IDW Report	6.0	215
IDW Disposal	6.0	222
Analytical Investigation Phase	7.0	125 to 257
Baseline Risk Assessments	8.0	257 to 297
Submit Preliminary Draft Phase II RI Report	9.0	341
Submit Provisional Preliminary Draft Phase II RI Report Comment Response Tables	10.0	383
Draft RI Report Comment Resolution Meeting	10.0	388 to 390
Submit Draft RI Report Comment Resolution Meeting Minutes	10.0	404
Submit Draft Phase II RI Reports	11.0	439
Submit Provisional Draft Phase II RI Report Comment Response Tables	12.0	495
Final RI Report Comment Resolution Meeting	12.0	500
Submit Final RI Report Comment Resolution Meeting Minutes	12.0	514
Submit Final Phase II RI Reports	13.0	572
Submit Supplemental Groundwater Data	14.0	TBD
Submit pdf Documents	15.0	TBD

IDW = investigation-derived waste.
OE = ordnance and explosives.
RI = Remedial Investigation.
TBD = to be determined.

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3.0 SCOPE AND OBJECTIVES

3.1 PHASE I REMEDIAL INVESTIAGATION SCOPE AND OBJECTIVES

The scope of this investigation is to complete the assessment of the extent of contamination and to complete a human health risk characterization (HHRC) and ecological risk assessment (ERA) for the purpose of reaching a remedial action decision. The primary objectives of the Phase I RI are as follows.

- Abandonment of existing monitoring wells MW-1, -2, -3, -4, and -5.
- Install additional monitoring wells downgradient (north-northwest) of the AOC to bound the extent of contamination observed in groundwater adjacent to the quarry and to further evaluate potentiometric gradient reversal observed previously adjacent to the quarry.
- Install additional monitoring wells south-southeast (upgradient) of the AOC to identify if any potential migration of contaminants from Load Line 1 is occurring, which might account for contaminants observed at Ramsdell Quarry.
- Conduct multiple sampling rounds of newly installed wells under both baseflow/dry conditions and high flow/storm event conditions to determine if storm-induced flushing and transport of contaminants is occurring.
- Utilize existing data (surface water, sediment, and groundwater) and surface soil data acquired under the Phase I RI to complete an HHRC in accordance with Ravenna facility-wide risk assessment guidance and an Ohio Level II ERA.
- Conduct surface soil sampling using multi-increment sampling techniques for comparative evaluation to discrete soil samples and to evaluate the feasibility of method for characterizing AOCs.
- Update AOC site characteristics and refine the conceptual site model (CSM) using newly acquired Phase I RI data.
- Assess any remaining data gaps with respect to sources and extent of sediment, surface water, and groundwater contamination.
- Provide recommendations for any additional investigations and/or actions.

Investigation-specific objectives have been developed using the DQO approach presented in the Facility-wide SAP. Project-specific sampling objectives are presented for each environmental medium in Chapter 4.0 of this SAP Addendum.

3.2 PHASE I RI DATA QUALITY OBJECTIVES

The project DQO is to provide sufficient high-quality data to address the primary project objectives identified in Section 3.1.

3.2.1 Conceptual Site Model

The facility-wide hydrogeologic CSM for RVAAP, presented in the Facility-wide SAP, is applicable to Ramsdell Quarry for this Phase I RI, based on current knowledge. The CSM for Ramsdell Quarry, based on the compilation of previously collected data, is presented in detail in the Final Groundwater Investigation Report (USACE 2000).

Source Term and Release Mechanisms

Three potential source terms were evaluated as part of the CSM: RQL, quarry pond sediment, and Load Line 1. Available records for RQL indicate that only non-hazardous solid waste was disposed of between 1976 and 1989. No information regarding landfill disposal activities is available for the period 1941 to 1976; however, based on operation history, it may be assumed that aerosol cans, paint residues, pesticide containers, common degreasers, and waste petroleum products and containers were likely placed into the landfill. Disposal of materials containing explosives or propellants residues is not known. As such, a wide variety of potential source-related contaminants may be present. RQL overlies bedrock, is unlined, and a leachate collection system was not part of engineered controls. Closure involved placement of a compacted soil/clay cover over the landfill. Results of the Groundwater Investigation indicate that RQL is a source term for metals, explosives, nitroglycerin, and trace levels of VOCs in groundwater. RQL does not appear to represent a source of SVOCs. The primary current release mechanism to groundwater likely includes infiltration of precipitation either through the soil cover layer or from upslope areas beneath the edge of the cap. Subsequently, leaching and migration of contaminants from landfilled wastes occurs through fractures in the bedrock vadose zone until intercepting the water table. Prior to landfill closure, surface water leaching and erosional transport processes also may have mobilized contaminants from primary waste materials, either in dissolved phase or particulate bound, and resulted in accumulation within sediment in low-lying areas of the quarry.

Ramsdell quarry was used for open burning of waste explosives and munitions, as well as disposal of annealing residues. Results of this study show that the sediments contain residual metals, cyanide, SVOCs, and explosive and propellant compounds. Review of signature contaminants in the quarry sediments (cyanide, PAHs, and explosives) does not provide conclusive evidence that they act as a secondary source term. Explosives were detected on only one occasion in monitoring wells immediately downgradient of sediment sources (RQLmw-010 and RQLmw-011), as compared to multiple detections in those wells immediately upgradient at the toe of RQL (wells RQlmw-007, RQLmw-008, and RQLmw-009). In addition, PAHs were not detected in any of the site monitoring wells. Explosives, propellants, cyanide, and SVOCs were not detected in associated surface water samples, indicating that contaminant mass transfer from sediment to surface water with subsequent infiltration of contaminated surface water is not a significant release mechanism. A potential does exist that the quarry sediments may contribute some metals contaminants to groundwater.

Load Line 1, located approximately 244 m (800 ft) to the south of RQL, is a known source term for explosives, propellants, metals, and polychlorinated biphenyls (PCBs)/pesticides. Available potentiometric data indicate that the northern portion of the load line is hydraulically upgradient to RQL; thus, groundwater flow is possible via fracture pathways. However, data obtained during the course of Phase I and II RI activities at Load Line 1 have not confirmed that it is a source of contamination in groundwater observed at Ramsdell Quarry. Analytical data from the northernmost well at Load Line 1 have not shown the presence of signature contaminants (i.e., explosives). The probability of attenuation and dilution within the shallow, active groundwater flow pathways is high, which would likely preclude long-distance migration of explosives and propellants from contaminated areas in Load Line 1 to Ramsdell Quarry. While metals contaminants were observed in Load Line 1 groundwater samples, high adsorption coefficients for this class of constituents probably precludes long distance transport to RQL.

On this basis, Load Line 1 is not currently believed to impact groundwater quality at RQL. Data from the Phase I RI at Ramsdell Quarry will help to refine this aspect of the conceptual model.

Groundwater Flow and Contaminant Migration Pathways

A majority of groundwater flow at Ramsdell Quarry occurs through permeable fracture pathways within bedrock. The overburden layer in the site vicinity is characteristically thin and has been largely removed within the quarry by past operations; therefore, infiltration occurs almost directly to bedrock. Hydrographs for the wells located at the toe of the landfill clearly indicate rapid, strong response to storm events.

Potentiometric data show that horizontal potentiometric gradients are consistently to the northeast during dry periods of the year. During these periods, the quarry pond is a static representation of the water table and may even function as a sink through evapotranspiration processes. During the wet season of the year, a sufficient reservoir of water exists in the quarry pond to act as a recharge point to groundwater. As a result, potentiometric surface elevations in upgradient well RQLmw-006 and those at the toe of the landfill are essentially equal. Rainfall events during the wet period of the year provide additional volume to the quarry pond and produce sufficient hydraulic head to produce slight, localized flow gradient reversals between the pond and well RQLmw-006 for short periods of time. Wells RQLmw-010 and RQLmw-011 remain consistently downgradient of RQL throughout the year.

The distribution of contaminants in wells at RQL is consistent with the observed hydraulic characteristics. Considering that the horizontal potentiometric gradient during the wet season is flat and exhibits short-term reversals, leaching from RQL is the likely source of observed contaminants in well RQLmw-006. For a majority of the year, groundwater flow is consistently to the north-northeast providing the mechanism for contaminant migration to wells located at the toe of RQL and to RQLmw-011.

Uncertainties

Uncertainties within the CSM for the Ramsdell Quarry include the following:

- The nature and types of contaminants to be expected from RQL are largely unknown due to incomplete operational records and source term characterization. Thus, RQL is assumed, but not confirmed, as the primary source for groundwater contaminants, such as explosives, propellants, and VOCs.

- Due to extremely dry conditions that persisted during the latter portions of the investigation, water levels in the quarry pond were abnormally low; thus, the degree of recharge provided by the quarry pond may not have been representative of typical site conditions. During periods of normal precipitation, the pond would be expected to remain at full pool for longer periods of time. Accordingly, the duration and severity of observed groundwater flow reversals may be greater than that demonstrated under conditions represented in this study.

- Because of the very dry conditions stated above, the degree to which quarry pond sediments may act as a secondary source under typical site conditions could not be fully evaluated by the Groundwater Investigation. Under average rainfall conditions, leachate development and mass transfer of contaminants may be greater than during conditions represented by this study. Conversely, higher precipitation levels in conjunction with relatively constant mass transfer rates may effectively dilute any contaminants that do partition from sediment to surface water.

3.2.2 Problem Definition

The historical waste disposal and treatment processes at Ramsdell Quarry have contaminated groundwater and, to some extent, sediment within the bottom of the quarry. The extent of potential northward migration of groundwater contaminants was not fully defined in previous investigations and the potential that contaminants from Load Line 1 may migrate to Ramsdell Quarry also could not be fully evaluated. Consequently, additional investigation of groundwater is to be included under this Phase I RI to specifically address these uncertainties. Surface soil data were not collected under the scope of the Groundwater Investigation and are required to complete risk evaluations for the AOC in order to proceed to a remedial decision. Leaching potential from soil to groundwater and contaminant migration potential in groundwater will be evaluated using numerical simulations based on the results of this Phase I RI. Adequate surface water and sediment characterization has been conducted to evaluate the extent of contamination and to conduct risk evaluations for these media.

3.2.3 Remedial Action Objectives

Section 3.2.3 of the Facility-wide SAP describes the process for identifying remedial action objectives for RVAAP under the CERCLA process.

3.2.4 Identify Decisions

The key decisions for all investigations at RVAAP have been identified in Section 3.2.4 and in Table 3-1 of the Facility-wide SAP. Phase I RI data inclusive of the risk assessment results are necessary for sound remedial decision making and to determine whether additional investigation is needed or what types of response actions are most appropriate.

3.2.5 Define the Study Boundaries

The investigation area boundary for Ramsdell Quarry is presented in Figure 1-3. This boundary was established by the RVAAP Team during the Phase I RI scoping process and encompasses all known or suspected historical operations areas and adjacent support areas.

3.2.6 Identify Decision Rules

Decision rules used to guide remediation decisions are provided in Section 3.2.6 of the Facility-wide SAP. Previous groundwater and soil data were not sufficient to fully define the nature and extent of contamination; therefore, risk of exposure to contaminants could not be fully ascertained. The purpose of the Phase I RI data is to fully determine the presence, type, concentration, and extent of contamination in selected media. These data will be used to quantitatively evaluate human health and ecological risks to identify areas requiring remediation and areas where additional characterization may be needed.

Data collected under the Groundwater Investigation are of sufficient quality for incorporation into the assessment of contaminant nature and extent and risk assessment. Because the conditions at Ramsdell Quarry have not changed appreciably since the Groundwater Investigation was conducted (e.g., major grading, demolition, or construction activities have not been conducted), the data generated from this previous investigation may be pooled with Phase I RI data and screened as discussed in Section 3.3.

3.2.7 Identify Inputs to the Decisions

Inputs to the decision process are the analytical results, risk-assessment results, and the refined site-specific conceptual model developed from field observations and environmental data.

3.2.8 Specify Limits on Decision Error

Limits on decision errors are addressed in Section 3.2.8 of the Facility-wide SAP.

3.2.9 Sample Design

The rationale for sampling of different environmental media and the sampling design for the Phase I RI of Ramsdell Quarry are described in detail in Chapter 4.0 of this SAP Addendum. Appendix A provides a summary of planned sampling for the AOC. Groundwater north and south of the AOC and surface soil within the bottom of the quarry represent specific focus areas for additional characterization. Surface soil/fill along the top and toe slope of RQL will not be characterized.

3.3 DATA EVALUATION METHODS

The methods for identifying chemicals related to AOC operations (SRCs) are described in the following sections. The data evaluation methods to be employed for the Ramsdell Quarry Phase I RI are consistent with those established under previous Phase I and Phase II investigations at RVAAP. The general process for identifying SRCs involves initial data reduction, defining data aggregates, data quality assessment, and screening of data against statistical, background, and weight-of-evidence criteria. Analytical results will be reported by the laboratory in electronic form and loaded into a database. Electronic data will then be verified against the laboratory hard copy and the sampling records to ensure that the data are complete and to qualify any data that do not meet project DQOs. Ten percent of the data will be submitted to a USACE subcontractor for full independent, third-party validation, as described in the Quality Assurance Project Plan (QAPP). In accordance with USACE, Louisville District requirements (USACE 2001b), if full-independent third-party validation of an initial 10% of the data identifies significant problems or issues with the data set, additional steps must be taken to review the data. These will include:

- Isolation of the problem to the specific analyses and target analyte.
- Review of project data verification checklists to identify the potential extent of the problem throughout the data set.
- Independent third-party validation of an additional 10% of the data set focused on the specific problem, analyses, and analyte.
- The steps outlined above continue as necessary (USACE 2001b).

Quality control (QC) data, such as sample splits and duplicates and laboratory re-analyses, will not be included in the determination of contaminant nature and extent or in the risk assessment. Diluted samples may be used if the detection limits are not evaluated due to the dilution; only one result per sample and analyte are used (either the diluted result or the original result). Samples rejected in the data verification and independent USACE validation process also will be excluded. If, during verification, it is found that a significant number of samples are rejected, the entire data set will be evaluated to determine if a representative data set exists without the rejected data. The percentage of rejected data will be presented in the Data Quality Control Summary of the Phase I RI report. If independent, third-party validation determines that a significant percentage of the data does not meet USACE data quality requirements, subsequent percentages of the data set will be subject to validation, as stated in the QAPP.

3.3.1 Determination of AOC Chemical Background

Analytical results will be screened against the final facility-wide background values for RVAAP developed as part of the Phase I RI for the Winklepeck Burning Grounds (WBG) (USACE 2001c). These facility-wide background criteria and the processes used to generate them have been reviewed and accepted by USACE and Ohio EPA. This screening step will be used to determine if detected metals are SRCs or if they are naturally occurring.

3.3.2 Definition of Aggregates

Data collected from Ramsdell Quarry will be aggregated by environmental medium (soil, sediment, surface water, and groundwater). Soil data will be aggregated by depth interval [surface soil from 0 to 0.3 m (0 to 1 ft) below ground surface (bgs)]. As part of the Phase I RI report, data within the various environmental media aggregates will be evaluated to determine if further subdivisions (spatial aggregates) may be made on the basis of site operational history and hydrogeologic characteristics, and potential future land use (i.e., former waste disposal areas versus non-disposal areas). Data for sediment and surface water media will be evaluated with respect to drainage patterns, contaminant sources, and ecological habitat to define logical spatial aggregates if merited. Groundwater will be evaluated as one spatial aggregate unless compelling hydrogeologic data are obtained during the Phase I RI to suggest that further subdivisions be made.

Summary statistics (i.e., minimum concentration, maximum concentration, frequency of detection, mean concentration, and 95 percent upper confidence limit) will be developed for each environmental medium on an AOC-wide basis and for each spatial aggregate. Source areas ("hot spots") will be identified spatially from the data. Focused discussion of any prevalent SRC that occurs consistently across the AOC and any hot spots will be presented in the Phase I RI report. Evaluation of the spatial distribution of contaminants will include factors such as proximity to sources and surface and groundwater flow patterns in the vicinity of the AOC.

3.3.3 Data Screening

Data screening prior to the risk evaluation will consist of four steps: (1) data quality assessment, (2) frequency of detection screen, (3) background screening, and (4) screening of essential human nutrients. These screens will be used to identify SRCs. Those constituents identified as SRCs will then be evaluated in the screening risk assessments. The application of these screens to the Phase I RI risk assessments is presented in Section 3.4.

- A detailed assessment of the quality of the Phase I RI analytical results will take place. Data that are rejected as a result of the data quality assessment will not be evaluated further in the screening process.

- Chemicals that are never detected will be eliminated as SRCs. For sample aggregations with greater than 20 samples and a frequency of detection of less than 5% (i.e., 1 detection in 20 samples), a weight-of-evidence approach will be used to determine if inorganic chemicals, VOCs, SVOCs, pesticides, and PCBs are related to the AOC. The magnitudes and locations (clustering) of the detected values will be evaluated. Additionally, the occurrence of the constituent in other environmental media will be considered as part of the weight of evidence. Consistent with EPA risk assessment guidance (EPA 1989), if the detected results for a chemical show no clustering, if concentrations are not substantially elevated relative to the detection limit, and the constituent is not an SRC in another aggregate, it will be considered spurious, and the chemical eliminated as an SRC.

Any detected explosive or propellant compound will be considered as an SRC regardless of its frequency of detection.

- For each inorganic constituent exceeding the frequency of detection screen, concentrations will be screened against pre-established, naturally occurring, facility-wide background levels. If the maximum concentration of a constituent exceeds the background value, the constituent will be considered as an SRC. Facility-wide background levels developed for surface soil, sediment, surface water, and groundwater within either the unconsolidated interval or bedrock will be employed as appropriate. In the facility-wide background data set, if a constituent was never detected, its background level is assigned as zero. This conservative process ensures that chemicals detected within a particular medium are not eliminated too early in the screening process. Organic compounds are considered to be anthropogenic; therefore, any compound that is not eliminated by the frequency of detection screening step will be considered to be above background, evaluated as to its nature and extent, and evaluated as part of the risk assessment.

- Chemicals that are considered essential nutrients (calcium, chloride, iodine, iron, magnesium, potassium, phosphorous, and sodium) will not be evaluated as SRCs in the human health risk assessment unless grossly elevated relative to background. These chemicals are an integral part of the country’s food supply and are often added to foods as supplements; thus, these constituents are not generally addressed as contaminants (EPA 1989, 1995). Data on essential elements, however, will be used to evaluate the subsurface geochemistry.

3.4 HUMAN HEALTH RISK CHARACTERIZATION

An HHRC will be conducted in accordance with the most current draft version of the RVAAP Facility-wide Human Health Risk Assessment Work Plan (USACE 2003a). The HHRC will further screen all constituents identified as SRCs using the processes described in Section 3.3 above. Contaminants of potential concern (COPCs) will first be identified by screening of SRCs against EPA Region 9 preliminary remediation goals (PRGs) for industrial receptors. Specifically, chemicals with carcinogenic endpoints will be screened against the Region 9 PRGs and chemicals with non-carcinogenic endpoints will be screened against 1/10th the Region 9 PRGs. Subsequently, risks and chemical hazards for identified COPCs will be evaluated for land use/exposure scenarios specific to Ramsdell Quarry. The assumed future land use for Ramsdell Quarry, for purposes of the risk assessment, will be restricted access. The area will be closed to all normal training and administrative activities. It may contain hazardous contamination, unexploded ordnance (UXO), other hazards to human health and safety, protected cultural or historical sites, and/or protected environmentally sensitive areas. Surveying; sampling and other essential security, safety, natural resources management; and other directed activities may be conducted here only after authorized personnel have been properly briefed on potential hazards/sensitive areas. Individuals unfamiliar with the hazards/restrictions will be escorted by authorized personnel at all times while in the restricted area. One receptor (Maintenance Worker) will be evaluated. One AOC-wide exposure unit for surface soil (0 to 1 ft) will be evaluated. Subsurface soil will not be evaluated because shallow bedrock precludes collection of subsurface soil samples and the Maintenance Worker scenario does not include exposure to this medium, per the draft Facility-wide Risk Assessment Work Plan. Surface water, sediment, and groundwater media will not be included in the quantitative HHRC because the Maintenance Worker scenario does not include exposure to these media.

3.5 OHIO LEVEL II ECOLOGICAL RISK ASSESSMENT

An Ohio ERA Guidance Level II risk assessment will be conducted in accordance with the protocols prescribed by the State of Ohio ERA Guidance and the guidance specified in the RVAAP Facility-Wide Ecological Risk Assessment Work Plan (USACE 2003b). Ohio Level I habitat description will not be conducted. It is acknowledged that habitat does exist for this area as evidenced by the previous visits that have taken place to date. Rather, a habitat description will be conducted in the Level II assessment, which will consist of information about terrestrial, aquatic, and sensitive habitats, including lists of species of ecological receptors and threatened and endangered organisms that were provided in the ecological resources description of the Load Lines 1 and 12 RI reports. One terrestrial exposure unit will be defined and evaluated. Additionally, one aquatic exposure unit will be evaluated for sediment and surface water. Groundwater will not be evaluated as part of the ERA. Because terrain slope (steep quarry sides), vegetation patterns (forest and grassy slope), and disturbance history (limited) at Ramsdell Quarry are very different than those observed at WBG, only the plant protection levels from WBG will be extrapolated as ecological screening values at Ramsdell Quarry. The Level II risk assessment will result in a number of hazard quotients for a number of ecological receptors, which may be used in making future risk management decisions for Ramsdell Quarry (e.g., no further action needed, further investigation needed to clarify an issue, or some form of remedial action).

4.0 FIELD ACTIVITIES

In order to organize and track sampling efforts for the Phase I RI at Ramsdell Quarry, a summary of the environmental matrices, number of sampling locations, and sampling rationales, was developed for reference during field operations. The selection of these locations for monitoring well installation, discrete surface soil sampling, and mutli-increment surface soil sampling is based on the project DQOs and the CSM described in Chapter 3.0. The sampling and monitoring well locations planned for the Phase I RI are shown on Figure 4-1. Appendix A contains a summary of planned sampling activities by media, inclusive of QA and QC samples, for the Phase I RI. In addition, five wells comprising the original RQL monitoring network (wells MW-1 through MW-5) will be plugged and abandoned because they no longer serve their intended purpose and have been replaced by wells installed during the Groundwater Investigation.

4.1 GROUNDWATER

4.1.1 Rationale

Monitoring wells will be installed to define the maximum downgradient (north-northwest) extent of contaminants associated with Ramsdell Quarry. Three groundwater monitoring wells will be installed in a configuration along the north side of Ramsdell Road (Figure 4-1) that will provide data on general hydrogeologic characteristics and groundwater flow patterns. One monitoring well is also planned to the west of RQL to fill a data gap in this portion of the AOC. One monitoring well will be installed southwest of the quarry to also fill a data gap in this portion of the AOC and to monitor for potential northward contaminant transport from Load Line 1. One monitoring well is also planned due south of the AOC, between Ramsdell Quarry and Load Line 1; this location was selected to determine whether contaminants observed in the upgradient well at Ramsdell Quarry (RQLmw-006) are sourced from Load Line 1.

4.1.1.1 Monitoring well locations and installation

All monitoring wells will be installed using conventional drilling techniques (hollow-stem auger and air rotary drilling, as required) as described in Section 4.1.2.1. The maximum depth of each shallow monitoring well and piezometer is expected to be ~ 13 m (40 ft) bgs. The screened intervals for the wells will be installed to so that the water table is within the screen where possible. If the water table is less than a depth of 6.1 m (20 ft), which is the minimum depth required to set a complete well with a 3.05-m (10-ft) screen per USACE specifications, the screened interval will be placed at the minimum feasible depth (from 3.05 to 6.1 m (10 to 20 ft).

Bedrock is expected to be encountered in all monitoring wells at depths of 3.3 m (10 ft) or less. Thus, all monitoring well borings are anticipated to be dry cored and reamed using air rotary drilling equipment. At locations where the water table lies within the bedrock interval, the screen and filter pack will be set entirely within the bedrock interval [e.g., minimum screen interval from about 4.0 to 7 m (13 to 23 ft)].

Following development and prior to sampling of the six Phase I RI monitoring wells, one round of contemporaneous water level measurements will be performed (on the same day) for all new and existing wells at Ramsdell Quarry. Water level measurements will also be collected from the wells at the time they are sampled. Groundwater samples will be collected from each of the six Phase I RI monitoring wells following development and AOC-wide water level measurements. Two subsequent rounds of sampling will be conducted within 1 year of installation. One subsequent sampling event will correspond to baseflow conditions, which are defined as dry season conditions (July through October) with no

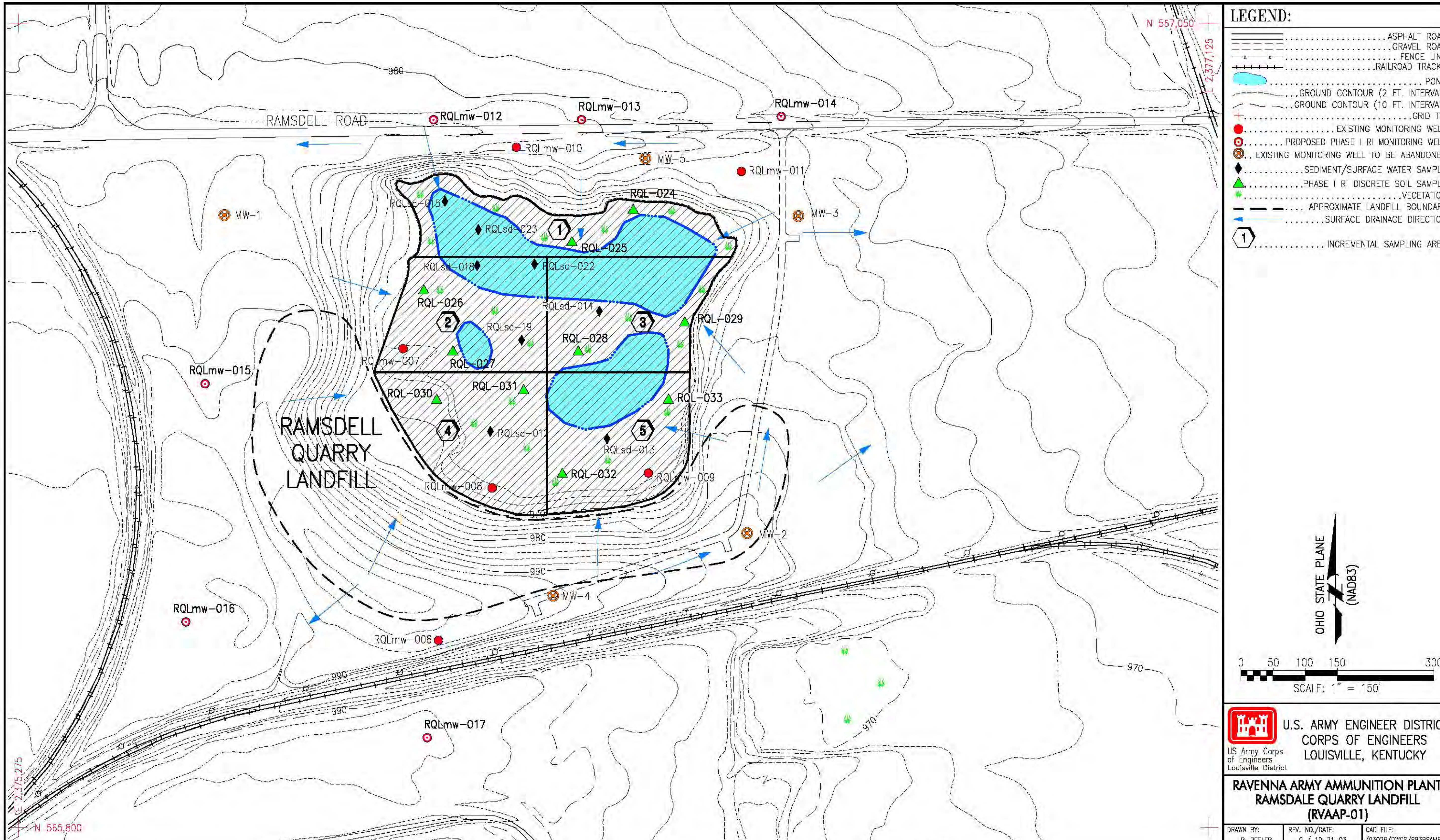

Figure 4-1. Proposed Ramsdell Quarry Phase I RI Surface Soil Sampling and Groundwater Monitoring Well Locations

measurable precipitation for at least 72-hrs preceding the sampling event. The other subsequent sampling event will correspond to high flow conditions, which are defined as wet season conditions (March through June) and within 24-hrs following a rain event of at least 2.43-cm (1-in.) of precipitation. The individual sample identification and the required chemical analyses are provided in Chapter 5.0.

4.1.1.2 Sample collection for field and laboratory analysis

All monitoring wells will be field screened for VOCs prior to sample collection using a hand-held photoionization detector (PID) or flame ionization detector organic vapor analyzer (OVA). Screening will be accomplished by monitoring the headspace vapors at the top of the riser pipe. Field measurements of pH, temperature, specific conductance, turbidity, and dissolved oxygen will be recorded for each groundwater sample. No samples will be collected for additional headspace analysis. Water level measurements will be collected immediately prior to sampling of each well.

An unfiltered groundwater sample will be collected from each monitoring well and submitted for laboratory analysis of explosives, propellants, cyanide, SVOCs, VOCs, pesticides, and PCBs. Filtered samples for Target Analyte List (TAL) metals analyses will be collected using in-line 0.45-um filters in accordance with Section 4.3.5 of the Facility-wide SAP. Unfiltered samples for TAL metals will not be analyzed. The specific number of samples and the types of chemical analyses to be performed are delineated in Chapter 5.0.

4.1.1.3 Quality assurance/quality control, and blank samples and frequency

QC duplicates, USACE QA split groundwater samples, equipment rinsate samples, and matrix spike/matrix spike duplicates will be collected during the Phase I RI. Duplicates and QA splits will be selected randomly (from the same locations, whenever possible) and analyzed for the same parameters as the environmental samples. Duplicate and QA split samples will be collected at a frequency of 10% of environmental samples. Equipment rinsate samples will also be collected at a frequency of 10% of groundwater samples. Matrix spike/matrix spike duplicates will be collected at a rate of 5% of total samples per media. Trip blanks, which originate in the laboratory, will accompany shipment of all VOC groundwater samples and will be analyzed for VOCs only.

One source blank will be collected from the potable water source, which will be used for all potable wash and rinse water for equipment decontamination during the Phase I RI. One source blank will also be collected from the deionized/distilled (American Society of Testing and Materials Type I) water source used. The source blanks will be analyzed for a full suite of analyses, including propellants.

4.1.2 Monitoring Well Installation

Monitoring wells to be installed during the Phase I RI will be 2.0-in., Schedule 40 polyvinyl chloride wells with 3.3-m (10-ft) screen lengths and standard above-grade completions. Specifications for drilling, installation, completion, and development of monitoring wells are contained in the following subsections.

4.1.2.1 Drilling methods and equipment

Equipment Condition and Cleaning

Requirements for the condition and cleaning of equipment used for well installation are described in Section 4.3.2.1.1 of the Facility-wide SAP. These requirements, as applicable, will be employed for equipment used to install monitoring wells in the Phase I RI.

Drilling Methods

Conventional drilling techniques (hollow-stem auger and air rotary) will be used to install monitoring wells, as described in Section 4.3.2.1.2 of the Facility-wide SAP. It is anticipated that the third drilling scenario described under Section 4.3.2.1.3 will be applicable for the installation of the monitoring wells to be drilled into bedrock (i.e., hollow stem auger and continuous sampling to bedrock with coring and subsequent reaming using air rotary with no surface casing). In the event that unconsolidated materials are found to be prone to collapse, then the second drilling scenario (e.g., use of temporary surface casings) will be employed.

Where depth to the water table is great enough, monitoring well boreholes will be drilled to sufficient depth to install the bottom of a 3-m (10-ft) well screen approximately 2.1 m (7 ft) below the current water table elevation. If the water table lies at too shallow a depth to place a screen across it and complete a well per specifications, then the borehole will be advanced to the minimum required depth of 6.1 m (20 ft) and the well completed. It is anticipated that the depth to bedrock will be 3.3 m (10-ft) or less. The maximum depth of each monitoring well is expected to be approximately 13.1 m (40 ft) bgs.

For all groundwater monitoring wells that penetrate bedrock, NQ-size coring shall be performed for the bedrock interval prior to reaming the borehole to a diameter of at least 15.2 cm (6 in.) using air-rotary equipment with an oil-free (filtered) air source. The purpose of coring is to evaluate bedrock stratigraphy and the degree and nature of weathering and fracturing in bedrock. All rock cores will be stored in wooden boxes in such a manner as to preserve their relative positions by depth. Intervals of lost core shall be noted in the core sequence with wooden or Styrofoam blocks. Boxes will be marked on the outside to provide the boring number, cored interval, and box number, if there are multiple boxes. All cores collected will be documented (including photographing the core after it has been properly placed and labeled in the core boxes) and stored at RVAAP in accordance with *Ohio EPA Technical Guidance for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA 1995) and EM-1110-1-4000, *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE 1994b).

4.1.2.2 Materials

Casing/Screen

The casing and screen materials for monitoring wells were presented in Section 4.3.2.2.1 of the Facility-wide SAP.

Filter Pack, Bentonite, and Grout

The filter pack, bentonite, and grout materials for monitoring wells were presented in Section 4.3.2.2.2 of the Facility-wide SAP.

Surface Completion

All wells will be constructed as above-ground installations, as described in Section 4.3.2.2.3 of the Facility-wide SAP.

Water Source

Potable water from a commercial source will be used during this investigation for monitoring well and decontamination purposes. The collection and evaluation of the source water sample will follow Section 4.3.2.2.4 of the Facility-wide SAP.

Delivery, Storage, and Handling of Materials

All monitoring well construction materials will be delivered, stored, and handled following Section 4.3.2.2.5 of the Facility-wide SAP.

4.1.2.3 Installation

All monitoring well installation will be in accordance with the procedures for above-ground installations, as presented in Section 4.3.2.3 of the Facility-wide SAP.

4.1.2.4 Documentation

Logs and Well Installation Diagrams

Boring Logs. Boring logs will be completed for all monitoring well boreholes following Section 4.3.2.4.1.1 of the Facility-wide SAP. Visually determined Unified Soil Classification System (USCS) of each soil sample taken will be recorded on each boring log.

Well Construction Diagrams. All monitoring well activities will be documented according to the procedures presented in Section 4.3.2.4.1.2 of the Facility-wide SAP.

4.1.2.5 Well abandonment

The five wells comprising the original RQL monitoring network will be abandoned during the Phase I RI according to the procedures presented in Section 4.3.2.5 of the Facility-wide SAP. In addition, if any boreholes or new monitoring wells installed during Phase I RI requirement abandonment, the Facility-wide procedures as specified above will also be followed.

4.1.2.6 Water level measurement

Water level measurements will follow the procedure presented in Section 4.3.2.6 of the Facility-wide SAP.

4.1.2.7 Well development

Development of monitoring wells will be accomplished with a pump following Section 4.3.2.3.11 of the Facility-wide SAP. Bottom-filling bailers may be used instead of pumps where well size or slow recharge rates restrict pump usage. Development will proceed until the criteria specified in the Facility-wide SAP are met.

- Turbidity readings of 5 nephelometric turbidity units (NTUs) or less are attained. If values of 5 NTUs or less cannot be attained, development will continue until the water is clear to the unaided eye or the maximum development time has expired (48 hrs).

- The sediment thickness remaining in the well is less than 1% of the screen length or <30 mm (0.1 ft) for a 3.05-m (10-ft) screen.

- A minimum of five times the standing water volume in the well has been purged (to include the well screen and casing plus saturated annulus, assuming 30% porosity).

- Indicator parameters (pH, temperature, and specific conductance) have stabilized to ±10% over three successive well volumes.

If potable water is added to the boring to aid drilling of the well or to control heaving sands, five times the volume of any water added will be removed during development. If development to the criteria specified above cannot be achieved due to site conditions, such as slow recharge or persistent turbidity, then the Architectural and Engineering contractor's Field Operations Manager, Ohio EPA, and the USACE Technical Manager or other field representative will determine the appropriate course of action. For each monitoring well developed during the Phase I RI, a record will be prepared to include the information specified in Section 4.3.2.4.2 of the Facility-wide SAP.

4.1.3 Field Measurement Procedures and Criteria

All field measurement procedures and criteria will follow Section 4.3.3 of the Facility-wide SAP. All monitoring wells will be field screened for VOCs using a PID or OVA during groundwater sample collection. Screening will be accomplished by monitoring the headspace vapors at the top of the riser pipe.

4.1.4 Sampling Methods for Groundwater

Groundwater sampling from monitoring wells will follow the procedures for low-flow (micro-purge) sampling presented in Section 4.3.4.2 of the Facility-wide SAP. All groundwater samples will be analyzed for explosives, filtered TAL metals, cyanide, propellants, VOCs, SVOCs, and pesticides/PCBs.

4.1.4.1 Well Purging Methods

In order to minimize the quantity of liquid IDW generated as a result of well purging, wells will be purged using micro-purge methods where conditions permit, in accordance with Ohio EPA technical guidance (Ohio EPA 1995), as follows.

- A dedicated bladder or submersible pump is used for purging.

- The purge rate should not exceed 100 ml/min unless it can be shown that higher rates will not disturb the stagnant water column above the well screen (i.e., will not result in water level drawdown).

- The volume purged is either two pump and tubing volumes or a volume established through in-line monitoring and stabilization of water quality indicators such as dissolved oxygen and specific conductance.

- Sample collection should occur immediately after purging.

Where micro-purging cannot be accomplished for any reason, purging and sampling of all monitoring wells installed during the Phase I RI will be conducted in accordance with conventional procedures discussed in Section 4.3.4.1 of the Facility-wide SAP.

4.1.4.2 Filtration

Only filtered groundwater samples for dissolved TAL metals will be collected per Section 4.3.5 of the Facility-wide SAP. Filtered samples will be collected using 0.45-µm, disposable, in-line pore filter attached to the return line of the bladder pump used for micropurging. If conventional purging and sampling is required, filtration will be performed by using a negative pressure, hand-operated vacuum pump and collection flask and a disposable 0.45-µm pore size filter assembly. In the case of either method, filters will be replaced as they become restricted by solids buildup, as well as between sample collection sites.

4.1.5 Sample Containers and Preservation Techniques

Requirements for sample containers and preservation techniques for groundwater samples are presented in Section 4.3.6 of the Facility-wide SAP and Table 4-1 of the Ramsdell Quarry Phase I RI QAPP Addendum.

4.1.6 Field Quality Control Sampling Procedures

QA/QC samples for monitoring well groundwater sampling activities will include QC duplicates and QA split groundwater samples, equipment rinsates, matrix spike/matrix spike duplicates, and trip blanks as described in Section 4.1.1.3 above. Split samples will be submitted to the following USACE contract laboratory for independent analyses: Severn Trent Laboratories, North Canton, Ohio.

4.1.7 Decontamination Procedures

Decontamination of equipment associated with groundwater sampling will be in accordance with the procedure presented in Section 4.3.8 of the Facility-wide SAP. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

4.1.8 In-Situ Permeability Testing

A slug test will be performed in each of the monitoring wells installed as part of the Phase I RI to determine the hydraulic conductivity of the geologic material surrounding each well. The slug test method involves lowering or raising the static water level in a well bore by the removal or insertion of a cylinder (slug) of known volume. The return of the water level to a pre-test static level is then measured over time. The change in water level over time is plotted on a logarithmic scale to determine hydraulic conductivity (K). K is a function of the formation permeability and the fluid in the formation and is influenced by well construction.

At a minimum, a slug insert (falling head) test will be used for this investigation. A rising head test will also be performed following the falling head test to obtain a corresponding K value for comparative purposes. If possible, the slug test will be performed in such a manner as to prevent the water level in the well from dropping below the top of the screened interval when the slug is removed. All tests will be performed after the groundwater has been sampled, as described in Section 4.1.4, and will be contingent upon a monitoring well containing sufficient water to allow testing.

Slug tests will only be initiated after the well has recovered from groundwater sampling, or after a minimum of 12 hrs has elapsed since sampling. A pressure transducer will be inserted into the well and the water level allowed to equilibrate to static conditions or until at least 6 hrs have elapsed. A slug that displaces 0.3 m (1 ft) of water will be inserted to provide an adequate response for the analysis. Prior to the start of the test, plastic sheeting will be placed around the well in a manner to minimize water contact with the ground surface. The static water level will be measured with an electronic water level indicator and recorded to the nearest 0.003 m (0.01 ft) below top of casing. The total depth of the well will be measured with an electronic water level indicator and recorded to the nearest 0.003 m (0.01 ft) below top of casing. These measurements will be used to calculate the water column height in the well. Use of the electronic water level meter will follow procedures outlined in Section 4.3.3.1 of the Facility-wide SAP.

For the rising head test, the slug will be withdrawn quickly from the well without surging. The time of the test will begin as soon as the slug leaves the water column. Water level measurements will be recorded continuously during the test with a pressure transducer and data logger programmed to make measurements to within 0.003 m (0.01 ft) and record them on a logarithmic scale. Water level change will be recorded for a period of 6 hrs or until the well re-equilibrates to 90% of the pre-test water level, whichever occurs first. The test data will be evaluated by the Bouwer and Rice method (1976, 1989) or the Cooper et al. method (1967). If the test geometry is not conducive to analysis to either of these two methods, an alternate method will be used subject to RVAAP team approval (USACE and Ohio EPA).

4.1.9 OE Avoidance

An OE Avoidance Plan in accordance with EP 75-1-2, prepared by the OE support subcontractor, is contained in Appendix B. Upon approval of the OE Avoidance Plan by the USACE Unexploded Ordnance Mandatory Center of Excellence, it will be presented as part of the initial project safety briefing. OE support staff will be present during all field operations. The OE Team Leader will train all field personnel to recognize and stay away from propellants and OE. Safety briefings for OE will also be provided to all site personnel and site visitors.

All sample locations and access routes into the locations will be cleared for potential OE prior to entry. The OE team will verify that the location is anomaly free using magnetometers. The OE Team Leader will clearly mark the boundaries of the cleared drilling/boring locations and access routes. If surface OE is encountered, the approach path will be diverted away from the OE, the area clearly marked, and the OE Team Leader notified immediately. In the event OE is encountered, notification will be made to the RVAAP Environmental Coordinator along with a map showing the exact location of the item. No item shall be moved without RVAAP approval. In any area where surface metallic OE is encountered, a magnetometer will be used to ensure that no subsurface OE exists within the approach path. If anomaly-free routes and sample locations cannot be identified, the OE Center of Excellence will be notified and the level of UXO support reassessed.

Where subsurface soil sampling or drilling is to be conducted [0.3 to 0.9 m (1 to 3 ft) bgs], the auger will be withdrawn at the top of the subsurface interval [0.3 m (1 ft) bgs] and the magnetometer lowered into the borehole to screen for subsurface magnetic anomalies. Should special circumstances dictate that the borehole be deepened beyond 0.9 m (3 ft) bgs, then a magnetometer reading will be taken at the top of each subsequent 0.6-m (2-ft) interval prior to augering. This process will be repeated to a depth of 3.05 m (10 ft) or to the top of the bedrock, whichever occurs first. Magnetometer equipment will be decontaminated between borings, or, in the case of hand-held magnetometers, a plastic sleeve may be used and replaced between borings.

4.2 SUBSURFACE SOIL

Subsurface soil samples will not be collected during the Ramsdell Quarry Phase I RI.

4.3 SURFACE SOIL AND SEDIMENT

4.3.1 Rationale

Soil sampling will employ a combination of discrete and multi-increment sampling to provide general characterization of the quarry bottom, as well as suspected contaminant accumulation points. Surface soil or dry sediment samples from 0.0 to 0.3 m (0 to 1 ft) will be collected from 10 discrete stations during the Phase I RI to: (1) assess contaminant occurrence and distribution, if any, in surface soil within the bottom of the quarry. Discrete soil sample stations are located to provide coverage in areas where dry sediment samples were not collected during the Groundwater Investigation (Figure 4-1). The locations illustrated on Figure 4-1 are estimated. Field conditions (lack of insufficient soil cover or observed accumulation points) may dictate that discrete sample stations be moved in order to adequately achieve the project objectives.

For the purposes of multi-increment sampling, the bottom of Ramsdell Quarry, exclusive of the pond and landfill toe slope, has been divided into approximately five equal areas (Figure 4-1). One multi-increment composite sample (comprised of at least 30 aliquots) will be collected from each of the five separate areas. Each of the areas also contains the discrete sample locations. Results of discrete samples collected within each area will be evaluated against the results of the multi-increment composite for each area.

4.3.1.1 Discrete/composite soil and sediment sampling requirements

Discrete Samples

Due to the limited scope of planned soil sampling, field analyses for explosives and propellants will not be performed under the Phase I RI. For discrete surface soil sampling stations, composite samples for fixed-base laboratory analyses of explosives and propellants will be collected. These composite samples will be derived from three subsamples collected from about 0.9 m (3 ft) from one another in a roughly equilateral triangle pattern following protocols in Section 4.5.2.5 of the Facility-wide SAP. Samples for all analyses other than explosives or propellants will be collected from a point in the approximate center of the three triangular points from which the composite samples noted above are collected.

Multi-increment Samples

Surface soil and sediment samples under this classification will be collected using multi-increment techniques. Multi-increment samples are composite samples collected from multiple random points within each of the five designated areas. The sample aliquots are collected at random using a small-diameter push tube; thus, the corresponding volume for each aliquot is small. A sufficient number of aliquots are collected to provide statistical confidence that the average concentration of a particular constituent within a designated area is represented by the composite sample. For an approximately 0.5-acre area (exposure unit), no less than 30 aliquots will be collected to provide the requisite statistical confidence (95%).

The entire volume of all aliquots is composited into a single sample, then dried, sieved, splits obtained, and the splits are used for specified non-volatile constituent analyses. Sample collection, drying, sieving, and splitting are completed in the field. Sample grinding, splitting, and analyses are conducted at the fixed-base laboratory. Volatile organic analyses are not conducted on samples collected using this technique.

4.3.1.2 Sample collection for field and laboratory analysis

For discrete sample stations, field screening of surface soil and sediment samples for organic vapors will be performed using a PID per Section 4.3.2.3; samples for headspace analyses will not be collected.

Organic vapor screening will not be conducted at multi-increment sampling points. For discrete samples stations, geotechnical logging, including estimates of USCS classification, will be performed at the time of sampling. Sample aliquots for laboratory and geotechnical analyses will be collected as discussed in Section 4.3.2. Disturbed samples for geotechnical analyses will be collected at specified discrete surface soil locations from homogenized soil mixtures.

4.3.1.3 Field quality control sampling procedures

Surface soil/sediment QA/QC samples will be collected during the Phase I RI for Ramsdell Quarry. QC duplicate and QA split soil samples will be collected at a frequency of 10% (1 per 10 environmental samples) for each matrix (soil and sediment). Matrix spike/matrix spike duplicate samples will be collected at a rate of 5% of total samples per media. QA split samples will be submitted to the following USACE contract laboratory for independent analyses: Severn Trent Laboratories, 4101 Shuffel Drive, N.W., North Canton, Ohio, 44720. Duplicate and split samples will be derived from the same sampling station, selected on a random basis, and submitted for the same analyses as the environmental samples. Two rinsate blanks will be collected for surface soil/sediment equipment per field cycle. Trip blanks will accompany all shipments containing VOCs. Chapter 5.0 and the QAPP addendum (Chapter 8.0) summarize QA/QC sampling requirements.

4.3.2 Sampling Procedures

4.3.2.1 Sampling methods for soil/dry sediment

Bucket Hand-Auger Method

Surface soil and dry sediment samples will be collected with a bucket hand auger in accordance with Section 4.5.2.1.1 of the Facility-wide SAP.

Trowel/Scoop Method

A stainless steel trowel or scoop may be used, as presented in Section 4.5.2.1.2 of the Facility-wide SAP, to collect surface soil or dry sediment samples in soft, loose soil, if feasible. The protocol for compositing, homogenization, and discrete VOC sample collection will follow that described in Section 4.3.2.1.1 of the Facility-wide SAP for bucket hand augers.

Multi-Increment Sampling

Each of the five designated multi-increment sampling areas will be roughly marked in the field using flagging and/or wooden stakes. Sample aliquots will be randomly collected across the entire length and breadth of each area at a minimum of 30 points. Sampling points will be located using a "random walk" technique employed in the field; sample points will not be pre-located using a random grid. Each sample aliquot will be collected using a 53-cm (21-in.) long, 2.2-cm (0.875-in.) outside diameter, 1.7-cm (0.68-in) inside diameter, stainless steel, soil probe. The soil probe collects a 25.4-cm (10-in) soil core and may be either pushed or driven into the ground using a hammer attachment. In areas where a soil probe cannot be used (e.g., very rocky soil or hard pan), a hand auger, stainless steel scoop, or trowel may be used to sample from 0 to 1.3 m (0 to 12 in.). If a scoop or trowel is used, aliquots should be about the same volume.

Sample aliquots will be composited in a large stainless steel container. Upon collection of the sample aliquots, the entire composited contents of each sample will be air-dried and sieved using No. 4 and No. 10 brass sieves. The sieved sample will be spread evenly on an aluminum or stainless steel tray and a minimum of 30 random aliquots collected until the requisite volume is attained for shipment to the contract laboratory. Upon receipt of the samples, the contract laboratory will grind samples for 10 to 30 sec and mix the samples to attain a high degree of homogeneity. Sample grinding will be accomplished using a conventional coffee grinder or food processor unit with removable blades for decontamination (stainless steel blades are preferred). The ground sample will be split for analysis by the primary and QA laboratories.

4.3.2.2 Field measurement procedures and criteria

Field determinations of explosives will not be conducted during the Ramsdell Quarry Phase I RI. Organic vapor screening will follow Section 4.4.2.3 of the Facility-wide SAP, with the following exception. Headspace gases will not be collected and screened in the field for organic vapors. Because there were minimal detections of VOCs in environmental media during the Groundwater Investigation, organic vapor monitoring of headspace gases is not necessary in Phase I. All OVA readings will be noted in the field boring logs.

4.3.2.3 Sampling for geotechnical analysis

Discrete surface soil samples will be analyzed for total organic carbon. For any monitoring well boring that is completed in the overburden interval, two undisturbed geotechnical samples (Shelby tube) will be obtained from the from the approximate midpoint of the screened interval and analyzed for USCS classification, Atterberg limits, bulk density, porosity, and total organic carbon. Sampling procedures for geotechnical analysis using the above sampling methods are presented in Section 4.5.2.4 of the Facility-wide SAP.

4.3.2.4 Sampling for chemical analysis

Soil

Procedures for sampling surface soil for chemical analyses (discrete and composite samples) are presented in Section 4.5.2.1 of the Facility-wide SAP. The following chemical analyses will be conducted for discrete surface soil samples:

- All discrete samples will be analyzed for explosives, TAL metals, cyanide, and SVOCs;
- Two discrete samples (15% of the total) will be analyzed for propellants; and
- One discrete sample (10% of the total) will be analyzed for VOCs and pesticides/PCBs.

Multi-increment samples will not be analyzed for VOCs. The following chemical analyses will be conducted for multi-increment surface soil samples:

- All multi-increment samples will be analyzed for explosives, TAL metals, cyanide, and SVOCs; and
- One multi-increment sample will also be analyzed for propellants and pesticides/PCBs.

The selection of specific samples to receive those analyses other than explosives, TAL metals, cyanide, and SVOCs will be determined based on field conditions and observations. Table 5-1 in Chapter 5.0 and Appendix A contain additional detailed information regarding analytical requirements. Requirements for sample containers and preservation techniques for surface soil samples are presented in Section 4.4.2.6 of the Facility-wide SAP and in the QAPP Addendum.

4.3.2.5 Decontamination procedures

The decontamination procedure for surface soil and sediment sampling activities is presented in Section 4.4.2.8 of the Facility-wide SAP. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

4.3.2.6 Sample Container/Preservation Techniques

Sample container and preservation technique requirements will follow those prescribed in Table 4-1 in the Ramsdell Quarry Phase I RI QAPP Addendum.

4.3.3 OE avoidance

The protocol for OE avoidance for sampling activities is discussed in Section 4.1.9 and detailed in the OE Avoidance Plan (Appendix B). In addition to the protocol in Section 4.1.9, OE technicians will collect soil samples in any identified areas suspected (i.e., red soil or raw product) to have explosives concentrations greater than 10% (100,000 mg/kg). For multi-increment sampling areas, OE technicians will accompany the sample team and screen points where surface soil aliquots are to be collected.

4.4 SITE SURVEY

Following sampling and well installation activities, the horizontal coordinates of all discrete soil sampling stations and monitoring wells will be determined to within 0.3 m (1 ft). For discrete soil sampling stations, the ground elevations will be determined at the point of collection to within 0.06 m (0.2 ft). The boundaries of multi-increment sampling areas will be approximated based on tape measurements and landmarks. Locations of individual multi-increment sample points will also be approximated.

For groundwater monitoring wells and piezometers, the horizontal and vertical coordinates will be determined in accordance with the current Facility-wide SAP, which requires 1.0 ft horizontal and 0.01 ft vertical accuracy. All locations will be conveyed in Ohio State Plane Coordinates (NAD83). The vertical datum for all elevations will be 1929 National Geodetic Vertical Datum. All coordinates and elevations will be recorded on the boring logs upon receipt of quality assured survey results. In addition, electronic results will be provided to USACE and RVAAP in ASCII format.

5.0 SAMPLE CHAIN OF CUSTODY/DOCUMENTATION

5.1 FIELD LOGBOOK

All field logbook information will follow structures identified in Section 5.1 of the Facility-wide SAP.

5.2 PHOTOGRAPHS

Information regarding the documentation of photographs for the Ramsdell Quarry Phase I RI is presented in Section 4.3.2.4.3 of the Facility-wide SAP. Representative photographs will be taken of the investigative measures during the Phase I RI and any significant observations that are made during the field effort. Photographs will be suitable for presentation in a public forum, as well as for documenting scientific information.

5.3 SAMPLE NUMBERING SYSTEM

The sample numbering system that will be used to identify samples collected during the Ramsdell Quarry Phase I RI is explained in Section 5.3 of the Facility-wide SAP. The specific identifying information that will be used to implement this system during the Phase I RI is presented in Figure 5-1. Samples have previously been collected at Ramsdell Quarry under the post-closure monitoring program and Groundwater Investigation; therefore, sample numbering will continue the sequence established in the previous investigation. Table 5-1 presents the baseline sample identification listing for the Phase I RI. Samples collected in addition to the baseline set will be identified sequentially by following the numbering system. If a sample in the baseline set is not collected or is reassigned to another location, a specific reason and notation will be given in the project field books.

5.4 SAMPLE DOCUMENTATION

All sample label, logbook, field record, and field form information will follow structures identified in Section 5.4 of the Facility-wide SAP.

5.5 DOCUMENTATION PROCEDURES

Documentation and tracking of samples and field information will follow the series of steps identified in Section 5.5 of the Facility-wide SAP.

5.6 CORRECTIONS TO DOCUMENTATION

Any corrections to documentation will follow guidance established in Section 5.6 of the Facility-wide SAP.

5.7 MONTHLY REPORTS

Monthly reports during implementation of the Phase I RI field investigation and laboratory analyses will be provided. The content of the reports will have content similar to that specified in Section 5.7 of the Facility-wide SAP.

XXX = Area Designator
RQL = Ramsdell Quarry Landfill

mm = Sample Location Type
For station/location identification, this field is optional, with the exception of monitoring wells. This field is mandatory for environmental sample identification.
mw = Groundwater Monitoring Well
so = Soil Boring/Subsurface Soil Sample Location
sw = Surface Water Sample Location
sd = Sediment Sample Location
ss = Surface Soil Sample Location
tr = Trench Sample Location
sp = Seep or Spring Sample Location
wp = Groundwater Well Point
fs = Floor Sweep Sample

NNN = Sequential Sample Location Number
Unique, sequential number for each sample location beginning with Phase I RI stations and extending into any subsequent investigative phases (i.e., 001 – 999).

(n) = Special Identifier
Optional use as needed to identify special sample matrices or sample location characteristics.
c = Stream or Drainage Channel Sample
p = Pond Sample
b = Railroad Ballast Sample
d = Debris Sample
s = Slag Sample

= Sequential Sample Identification Number
Unique, sequential number for each sample beginning with Phase I RI locations and extending into any subsequent investigative phases (i.e., 0001 – 9999).

tt = Sample Type
GW = Groundwater
GF = Groundwater, Filtered
SO = Soil Sample
SD = Sediment Sample
SW = Surface Water Sample
MI = Multi-increment
TB = Trip Blank
FB = Field Blank
ER = Equipment Rinsate
FS = Floor Sweep

Station/Location Identification: XXX(mm)-NNN
Sample Identification: XXXmm-NNN(n)-####-tt

Figure 5-1. Ramsdell Quarry Phase II RI Sample Identification System

Table 5-1. Baseline Sample Identification for the Ramsdell Quarry Phase I RI

Facility/Area	Depth (ft)	Station	Sample ID	Exp	Prop[a]	TAL Metals	CN	Pest/PCBs	SVOCs	VOCs[c]	Other[d]
Discrete Surface Soil Locations (10)	0 to 1	RQL-024	RQLss-024-0124-SO	1	1	1	1	1	1	1	TOC
	0 to 1	RQL-025	RQLss-025-0125-SO	1	1	1	1		1		TOC
	0 to 1	RQL-026	RQLss-026-0126-SO	1		1	1		1		TOC
	0 to 1	RQL-027	RQLss-027-0127-SO	1		1	1		1		TOC
	0 to 1	RQL-028	RQLss-028-0128-SO	1		1	1		1		TOC
	0 to 1	RQL-029	RQLss-029-0129-SO	1		1	1		1		TOC
	0 to 1	RQL-030	RQLss-030-0130-SO	1		1	1		1		TOC
	0 to 1	RQL-031	RQLss-031-0131-SO	1		1	1		1		TOC
	0 to 1	RQL-032	RQLss-032-0132-SO	1		1	1		1		TOC
	0 to 1	RQL-033	RQLss-033-0133-SO	1		1	1		1		TOC
Multi-increment Surface Soil Locations (5)	0 to 1	RQL-034	RQLss-034-0134-MI	1	1	1	1	1	1		
	0 to 1	RQL-035	RQLss-035-0135-MI	1		1	1		1		
	0 to 1	RQL-036	RQLss-036-0136-MI	1		1	1		1		
	0 to 1	RQL-037	RQLss-037-0137-MI	1		1	1		1		
	0 to 1	RQL-038	RQLss-038-0138-MI	1		1	1		1		
Groundwater (Base Round – six wells)		RQLmw-012	RQLmw-012-0139-GW	1	1	1[b]	1	1	1	1	Two Shelby tubes: USCS, AL, BD, P, TOC
		RQLmw-013	RQLmw-013-0140-GW	1	1	1[b]	1	1	1	1	Two Shelby tubes: USCS, AL, BD, P, TOC
		RQLmw-014	RQLmw-014-0141-GW	1	1	1[b]	1	1	1	1	Two Shelby tubes: USCS, AL, BD, P, TOC
		RQLmw-015	RQLmw-015-0142-GW	1	1	1[b]	1	1	1	1	Two Shelby tubes: USCS, AL, BD, P, TOC
		RQLmw-016	RQLmw-016-0143-GW	1	1	1[b]	1	1	1	1	Two Shelby tubes: USCS, AL, BD, P, TOC

Table 5-1. Baseline Sample Identification for the Ramsdell Quarry Phase I RI (continued)

Facility/Area	Depth (ft)	Station	Sample ID	Exp	Prop[a]	TAL Metals	CN	Pest/PCBs	SVOCs	VOCs[c]	Other[d]
		RQLmw-017	RQLmw-017-0144-GW	1	1	1[b]	1	1	1	1	Two Shelby tubes: USCS, AL, BD, P, TOC
Groundwater (high-flow conditions – six wells)		RQLmw-012	RQLmw-012-0145-GW	1	1	1[b]	1	1	1	1	
		RQLmw-013	RQLmw-013-0146-GW	1	1	1[b]	1	1	1	1	
		RQLmw-014	RQLmw-014-0147-GW	1	1	1[b]	1	1	1	1	
		RQLmw-015	RQLmw-015-0148-GW	1	1	1[b]	1	1	1	1	
		RQLmw-016	RQLmw-016-0149-GW	1	1	1[b]	1	1	1	1	
		RQLmw-017	RQLmw-017-0150-GW	1	1	1[b]	1	1	1	1	
Groundwater (low-flow conditions – six wells)		RQLmw-012	RQLmw-012-0151-GW	1	1	1[b]	1	1	1	1	
		RQLmw-013	RQLmw-013-0152-GW	1	1	1[b]	1	1	1	1	
		RQLmw-014	RQLmw-014-0153-GW	1	1	1[b]	1	1	1	1	
		RQLmw-015	RQLmw-015-0154-GW	1	1	1[b]	1	1	1	1	
		RQLmw-016	RQLmw-016-0155-GW	1	1	1[b]	1	1	1	1	
		RQLmw-017	RQLmw-017-0156-GW	1	1	1[b]	1	1	1	1	

[a] Soil samples for propellant analyses will be selected based on field conditions/observations.
[b] Only filtered groundwater samples will be collected for TAL metals analyses. Sample identification numbers will end in –GF for these samples.
[c] Soil samples for VOC analyses will be selected based on field conditions/observations.
[d] Other analytes include specified TOC for discrete surface soil samples. Undisturbed geotechnical samples will be collected only in those wells (if any) that are completed in the unconsolidated interval.

AL = Atterberg limits.
BD = bulk density.
CN = cyanide.
Exp = explosives.
ID = identification.
P = porosity.
PCB = polychlorinated biphenyl.
Prop = propellants (nitrocellulose, nitroglycerine, nitroguanidine).
RI = Remedial Investigation.
SVOC = semivolatile organic compound.
TAL = Target Analyte List.
TOC = total organic carbon.
USCS = Unified Soil Classification System.
VOC = volatile organic compound.

6.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

Packaging and shipping of primary samples shall follow procedures specified in Chapter 6.0 of the Facility-wide SAP. Coolers containing QA samples that are shipped to the USACE contract laboratory for independent analysis will also be prepared and shipped in accordance with the Facility-wide SAP. On all shipments to all laboratories, a chain-of-custody form will be prepared for each cooler and the cooler number will be recorded on the chain-of-custody form.

Although none are anticipated, any geotechnical samples collected during the Phase I RI do not require refrigeration or other preservation, and will be shipped to the contract laboratory at the conclusion of the sampling effort by conventional methods.

The addresses and points-of-contact for laboratories used for chemical and geotechnical analyses for this field effort are listed in Chapter 2.0 of the QAPP.

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7.0 INVESTIGATION-DERIVED WASTE

All IDW, including auger cuttings, personal protective equipment (PPE), disposable sampling equipment, and decontamination fluids, will be properly handled, labeled, characterized, and managed in accordance with Chapter 7.0 of the Facility-wide SAP, federal and state of Ohio large-quantity generator requirements, and RVAAP's Installation Hazardous Waste Management Plan.

Seven types of IDW are anticipated, which will be contained separately. The types and estimated quantities for each include

- Soil and dry sediment from depths typically <1.8 m (6 ft), including residual surface and subsurface soil, resulting from sample collection using hand sampling equipment. One 55-gal drum of soil and sediment IDW is anticipated.

- Soil and rock cuttings from borehole/monitoring well drilling activities >1.8 m (6 ft) to be contained in a roll-off box. The capacity of the roll-off box at Ramsdell Quarry will be 10 yds^3.

- Groundwater (drilling fluids) resulting from drilling and coring of boreholes for monitoring wells. An estimated 2,000 gal (polytank or 36, 55-gal drums) of groundwater IDW are anticipated.

- Groundwater resulting from well development and well purging activities. An estimated 750 gal (14, 55-gal drums) of development and purge water are anticipated over the course of the project.

- Decontamination fluids, including those derived from decontamination of sampling equipment and drilling equipment. One 55-gal drum of decontamination fluid is anticipated from sampling equipment decontamination. An estimated 750 gal (14, 55-gal drums or polytank) of drill rig decontamination water and one, 55-gal drum of residual sludge from the drilling rig decontamination pad is anticipated.

- Expendables/solid wastes, including PPE and disposable sampling equipment. One, 55-gal drum of expendable IDW is anticipated.

7.1 INVESTIGATION-DERIVED WASTE COLLECTION AND CONTAINERIZATION

Indigenous solid IDW (soil and rock cuttings) generated from borehole installations >1.8 m (6 ft) in depth will be collected and contained in a lined roll-off box. The roll-off box will be staged at a central point within Ramsdell Quarry in an approved field staging area (FSA). Soil and rock cuttings will be added to the roll-off box using a small skid loader or light-duty backhoe.

Indigenous solid IDW (soil and sediment) from borehole installations <1.8 m (6 ft) will be collected and contained in labeled Department of Transportation (DOT)-approved, open-top, 55-gal drums equipped with plastic drum liners and sealed with bung-top lids.

All liquid indigenous (groundwater) IDW generated from monitoring well installation activities will be combined in a single polytank for characterization purposes and subsequent disposition. Monitoring well development and purge water will be collected in labeled DOT-approved, 55-gal, closed-top drums and segregated by sample station/monitoring well. Well development and purge water will be characterized through direct sample analyses.

All solid non-indigenous (expendable sampling equipment and trash) IDW will be segregated as non-contaminated and potentially contaminated material. Potentially contaminated and non-contaminated, solid, non-indigenous IDW will be identified in the field on the basis of visual inspection (e.g., soiled versus non-soiled), usage of the waste material (e.g., outer sampling gloves versus glove liners), and field screening of the material using available field instrumentation (e.g., OVA). All non-contaminated, non-indigenous IDW will be contained in trash bags. Potentially contaminated, non-indigenous IDW will be contained in labeled DOT-approved, open-top, 55-gal drums equipped with plastic drum liners and sealed with bung-top lids.

All liquid non-indigenous IDW (e.g., decontamination rinse water) will be segregated by waste stream (e.g., soap and water/water rinses will be separated from methanol and hydrochloric acid rinses) and contained in labeled DOT-approved, 55-gal closed-top drums. All known or potentially hazardous liquid, non-indigenous IDW streams, such as methanol or hydrochloric acid rinses, will be contained separately in labeled DOT-approved, closed-top, 55-gal drums. Liquid, non-indigenous IDW and residual sludge from the drill rig decontamination pad will be segregated from other liquid IDW streams and contained in a labeled polytank or DOT-approved, 55-gal drums as appropriate.

7.2 WASTE CONTAINER LABELING

All IDW containers will be labeled prior to placing IDW in them. All IDW containers (drums and roll-off boxes) will be labeled in accordance with Section 7.2 of the Facility-wide SAP.

7.3 INVESTIGATION-DERIVED WASTE FIELD STAGING

An FSA will be designated at each load line at the beginning of field activities and approved by the RVAAP Environmental Coordinator. Roll-off boxes will be located at the designated FSA for each load line. A centralized FSA at Building 1036 will be established for the staging of all drums of IDW. The FSA will be managed according to the requirements of Section 7.3 of the Facility-wide SAP.

Although none are anticipated, any waste stream that is identified (either through process knowledge or waste analysis and characterization), to be a Resource Conservation and Recovery Act hazardous waste will be managed in accordance with the Ohio Administrative Code (OAC), Chapter 3745-55, Management of Hazardous Wastes [40 *Code of Federal Regulations* 264, Subparts I (containers)]. A satellite accumulation area will be established in Building 1036 in accordance with OAC 3745-52-34 (C)(1). An inventory and a location map of the waste will be given to RVAAP staff on a daily basis, as waste is generated and updated on a daily basis, if changes occur. When 55 gal of hazardous waste are accumulated, the material will be transferred to a 90-day storage area within 3 days.

Daily inventories of IDW will be taken and provided to the RVAAP Environmental Coordinator by the designated IDW coordinator. A final inventory will be conducted prior to demobilization from the site and all IDW staged at the FSA at Building 1036, with the exception of the roll-off box and polytank containing drilling fluids. All liquid waste not transported off of the facility within 30 days following project completion will require secondary containment.

7.4 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND CLASSIFICATION FOR DISPOSAL

All indigenous IDW (soil, sediment, and groundwater) will be characterized for disposal on the basis of analytical results from environmental samples collected from each sampling station. Indigenous IDW contained in the roll-off box and non-indigenous IDW (decontamination fluids), except for PPE and expendable sampling equipment, will be characterized for disposal on the basis of composite samples collected from segregated waste stream storage containers. Composite waste samples will be submitted for laboratory analysis of full Toxicity Characteristic Leaching Procedure (TCLP) to characterize each waste stream for disposal. Procedures for composite waste sampling are presented in Sections 7.4.1 and 7.4.2 of the Facility-wide SAP. PPE and expendable sampling equipment will be managed in accordance with Section 7.4 of the Facility-wide SAP.

At the conclusion of field activities for the Ramsdell Quarry Phase I RI, letter reports will be submitted to the USACE and RVAAP Environmental Coordinator documenting the characterization and classification of the wastes. The RVAAP Environmental Coordinator will obtain approval from Ohio EPA for the planned disposition of IDW, as identified in the characterization reports.

7.5 INVESTIGATION-DERIVED WASTE DISPOSAL

Upon approval of IDW classification reports, all solid and liquid IDW will be removed from the site and disposed of by a licensed waste disposal contractor in accordance with Section 7.5 of the Facility-wide SAP and all applicable state and federal rules, laws, and regulations. All shipments of IDW off-site will be coordinated through the RVAAP Environmental Coordinator.

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8.0 REFERENCES

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APPENDIX A

SAMPLING SUMMARY FOR THE RAMSDELL QUARRY LANDFILL PHASE I REMEDIAL INVESTIGATION

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TABLE 1 Sample Analytical Requirements - Ramsdell Quarry Landfill, Phase I Remedial Investigation

MEDIA	NUMBER SAMPLES	SAMPLE DEPTH	Explosives Method 8330	TAL Metals+CN Method 6010	Propellants Method 8330	VOC Method 8260	SVOC Method 8270	Pesticides/PCBs Method 8081/8082	TOC Wakley/Black	Physical Characteristics	TCLP Full Suite
Surface Soil											
(discreet/multi-increment)	10/5	0 to 1'	10/5	10/5	2/1	1/0	10/5	1/1	10	-	-
Duplicates (10%)	1		1	1	1	1	1	1	-	-	-
USACE QA Splits (10%)	1		1	1	1	1	1	1	-	-	-
Trip Blanks	0		-	-	-	-	-	-	-	-	-
Equipment Blanks	1		1	1	1	-	1	1	-	-	-
MS(5%)	1		1	1	1	1	1	1	-	-	-
MSD (5%)	1		1	1	1	1	1	1	-	-	-
Subsurface Soil	No additional subsurface soil samples are planned for this investigation.										-
Sediment	No additional sediment samples are planned for this investigation.										
Surface Water	No additional surface water samples are planned for this investigation.										-
Groundwater	18 (3 sampling rounds)	N/A	18	18	18	18	18	18	-	-	-
Duplicates (10%)	3		3	3	3	3	3	3	-	-	-
USACE QA Splits (10%)	3		3	3	3	3	3	3	-	-	-
Equipment Blanks	3		3	3	3	3	3	3	-	-	-
Trip Blanks	18		-	-	-	18	-	-	-	-	-
MS(5%)	3		3	3	3	3	3	3	-	-	-
MSD (5%)	3		3	3	3	3	3	3	-	-	-
Source Water											
ASTM Decon Water	1		1	1	1	1	1	1	-	-	-
Drilling Water	1		1	1	1	1	1	1	-	-	-
IDW											
soils	1		-	-	-	-	-	-	-	-	1
Well Purge/Sample water	N/A										
Decon water	2		-	-	-	-	-	-	-	-	2
INVESTIGATION SAMPLES (D/M.I.)			**30/5**	**30/5**	**22/1**	**21/0**	**30/5**	**21/1**	**10/0**	**0/0**	**3**
QC SAMPLES (AE)			8	8	8	25	8	8	0	-	-
QA SAMPLES (CORPS)			4	4	4	4	4	4	0	-	-
TOTAL AE SAMPLES			**43**	**43**	**31**	**46**	**43**	**30**	**10**	**0**	3

1. Physical characterization samples are not anticipated due to bedrock being present at or near the ground surface.
2. Surface soils to be analyzed at the following frequencies: Explosives and metals=100%, Propellants 15%, VOCs=10%, SVOCs=100%, Pesticides/PCBs=10%.
3. Split and duplicate samples will be obtained on discreet samples only.
3. MS/MSD samples are not included in the "AE total sample" value.
4. AE QC samples include AE duplicates, equipment blanks and trip blanks. While the Corps QC samples are collected and shipped by the AE, analytical fees for these samples are billed directly to the Corps of Engineers.
5. Three sampling rounds for new wells corresponding to 1.) initial sampling 2.)storm event and 3.) low flow event.

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APPENDIX B

ORDNANCE AND EXPLOSIVES AVOIDANCE PLAN

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Appendix B
Site-Specific Operating Procedure For
Ordnance and Explosives Avoidance for the
Ramsdell Quarry Landfill (RVAAP-01)
Ravenna, OH

B-1.0 INTRODUCTION

The purpose of this Site-Specific Operating Procedure (SSOP) is to establish general guidelines and procedures that assure protection of Science Applications International Corporation (SAIC) personnel, Explosive Ordnance Technologies Inc. (EOTI) personnel, and the public. This plan includes considerations unique to ordnance and explosives (OE) operations. EOTI is the Unexploded Ordnance (UXO) contractor and has consulted with SAIC on the development of this plan.

The objective of a SSOP is to provide supervisors and workers with the necessary information and guidance to maintain a safe and healthy work place environment. SAIC and EOTI view safety and accident prevention as the first priority and place the burden of responsibility on all employees, consultants, and contractor/subcontractor team members. A copy of this SSOP is available to all employees, subcontractors, and visitors. All supervisors and workers are required to read the SSOP and sign a log acknowledging that they understand the plan prior to entering the work site. Personnel that violate policies contained in the SSOP may be directed to leave the work site and, if appropriate, their employment may be terminated.

B-2.0 GENERAL

EOTI will augment SAIC with UXO personnel to provide on-site UXO support during all well drilling and sampling activities at the referenced project site. During previous site investigation activities, components of explosives were encountered in these areas. The EOTI UXO team will not move, touch, or destroy any UXO encountered during this phase of the project. The UXO team will report all UXO to the SAIC Supervisor and the U.S. Army Corps of Engineers (USACE) on-site safety representative. EOTI will safely locate and identify any potential ordnance and ordnance-related scrap hazards found in the work area.

B-3.0 REFERENCES

EP 75-1-2 (20 November 2000) (Chapter 5) Unexploded Ordnance (UXO) Support During Hazardous, Toxic and Radioactive Waste (HTRW) and Construction Activities.

EP 385-1-95-a (29 June 2001) Basic Safety Concepts and Considerations for Ordnance and Explosive Operations.

EM 385-1-1 Safety Requirements and Health Manual (3 September 1996).

B-4.0 DEFINITIONS

a. Ordnance and Explosive (OE). Bombs and warheads, guided and ballistic missiles, artillery, rocket and mortar ammunition, small arms ammunition, anti-personnel and anti-tank mines, demolition charges, pyrotechnics, grenades, containerized and non-containerized explosives and propellants, military chemical agents, and all similar and related items or components explosive in nature or otherwise designed to cause damage to personnel or material. Soils with explosive constituents are considered to be OE if the concentration is sufficient to be reactive and present an imminent safety hazard.

b. Unexploded Ordnance (UXO). An item of explosive ordnance that has failed to function as designed or that has been abandoned, discarded, or improperly disposed of and is still capable of functioning and causing damage to personnel or material.

c. Inert Ordnance. An item that has functioned as designed, leaving an inert carrier. An item manufactured to serve a specific training purpose. Fragments from UXO.

d. Explosive Ordnance Disposal (EOD) Personnel. Active duty military EOD personnel.

e. UXO Personnel. Former EOD personnel employed by a contractor.

f. Recovered Chemical Warfare Material (RCWM). RCWM is defined as chemical agent material and/or associated equipment and surrounding contaminated media discovered either by chance or during deliberate real estate recovery/restoration operations that were previously disposed of as waste. RCWM is classified as hazardous waste by the Army and not within the scope of the Army Chemical Surety Program.

g. Chemical Event. Discovery of an actual or suspected chemical agent or container that may require emergency transportation or disposal.

B-5.0 UNEXPLODED ORDNANCE TEAM COMPOSITION AND QUALIFICATIONS

The following UXO procedures are proposed for use at the Ramsdell Quarry Landfill [Ravenna Army Ammunition Plant (RVAAP) -01] site. Procedures used at the site will be followed until such time as the UXO Supervisor and the SAIC Supervisor deem the procedures unnecessary.

a. UXO Team Leader. The UXO Team Leader for this project is Mr. Wayne Lewallen. Mr. Lewallen is qualified for this position by virtue of training and experience. He has more than 20 years of military and civilian UXO experience. Mr. Lewallen is qualified for, and has served, as Senior UXO Supervisor, Site Safety Officer, and Quality Control Specialist. Mr. Lewallen has attained Master EOD Technician level. Duties and assignments include range clearance as a supervisor of multiple team operations and civilian UXO experience including performance as UXO Supervisor for OE removal operations.

b. UXO Team Member. The UXO Team Member for this project is Mr. Daryl Satko. Mr. Satko is a graduate of the U.S. Naval Explosive Ordnance School. Mr. Satko is an Explosive Ordnance Disposal Technician with over 4 years of combined military and civilian experience.

B-6.0 RESPONSIBILITIES AND AUTHORITY

The Team Leader is the technical lead for all OE operations and is assigned the following safety- and health-related responsibilities:

- Reports administratively to the SAIC Site Supervisor, coordinating schedule and support requirements through that individual;
- Overall coordination between operations and safety and health personnel;
- Reviewing and becoming familiar with the site-specific Sampling and Analysis and Safety and Health Plan Addenda for this project;
- Early detection and identification of potential problem areas, including safety and health matters; and
- Conduct and document UXO safety briefings for all site personnel and visitors.

B-7.0 WORK AND SAFETY PLANS

UXO Specialists are required to comply with the provisions of the SAIC Site-Specific Safety and Health Plan Addenda for this project, applicable RVAAP policies and procedures, and all applicable federal, state, and local regulations. They report to their assigned UXO Supervisor for performing duties as members of functional teams. The UXO Team Leader will conduct UXO safety briefings for all site personnel and visitors.

B-8.0 ACCESS ROUTES TO SAMPLING LOCATIONS

a. Prior to soil sampling and well drilling crews entering the site, EOTI will conduct a reconnaissance of the area for each of the proposed work locations. The reconnaissance will include locating a path for the sampling crews, vehicles, and equipment to the approach site. The approach path, at a minimum, will be twice the width of the widest vehicle (normally a minimum of 20 ft). No personnel will be allowed outside the paths. The following color scheme will be used during the investigation to demarcate access routes and distinguish surface UXO and subsurface anomalies. EOTI will clearly mark all boundaries of the surveyed approach path with pin flags or other suitable markers (green in color) to signify all clear and prevent personnel from straying into areas that have not been identified as part of the established path. Red pin flags and other red markers (as appropriate) will be used to designate surface UXO. Yellow pin flags or flagging will be used to identify subsurface anomalies or any other item of concern. No subsurface utilities are known to exist within the Ramsdell Quarry Landfill; however, in the event that a subsurface utility is discovered, the trace of the utility will be marked with blue flagging or paint to distinguish it from surveyed access routes, UXO, or magnetic anomalies.

b. If UXO is encountered on the surface, EOTI personnel will divert the approach path around the UXO, clearly mark the area with red pin flags or ribbon, and report the UXO to the SAIC on-site Field Operations Manager (FOM) and USACE technical representative. The SAIC FOM and/or the USACE technical representative will, in turn, notify the RVAAP Facility

Representative, who will make the determination as to the appropriate response, including any necessary contacts with local law enforcement agencies or military EOD.

c. A magnetometer will be used to ensure there is no subsurface UXO within the approach path. If a magnetic anomaly is encountered, EOTI will divert the path around the anomaly. Only EOTI personnel will handle UXO and operate magnetometers.

d. It must be understood that during avoidance procedures, sample locations and access routes are not cleared. Locations and routes free of anomalies are identified and marked.

e. If anomaly-free routes and sample locations cannot be identified, the OE Center of Excellence must be notified and the level of UXO support reassessed.

B-9.0 SOIL SAMPLE AND MONITORING WELL SITES

a. The EOTI UXO team will conduct a survey of proposed sampling and drilling locations prior to sampling or drilling activities. All identified surface UXO and subsurface anomalies will be marked and avoided. If surface UXO is encountered or subsurface anomalies identified, they will be marked in accordance with the flagging/color scheme noted in Paragraph B-8.0a, and the investigation area will be relocated to avoid contact. Any discovered surface UXO may be assessed to determine its condition and whether reporting is required, as specified in Paragraph B-8.0b.

b. EOTI will clearly mark the boundaries of the site. Personnel will not go outside the cleared area. As a minimum, the cleared area will be a square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment to be brought on-site.

c. EOTI will use a hand-held magnetometer to clear an area prior to subsurface soil sampling or well drilling operations commencing. At not more than a 2-ft depth, the magnetometer will be lowered into the hole. This procedure will be used to ensure that smaller items of UXO, undetectable from the surface, can be detected. If no magnetic anomalies are located, the procedure will be repeated at 2-ft intervals to the maximum depth required (10 ft or until bedrock is encountered, whichever is less).

d. The following personal protective clothing will be used by all EOTI personnel while on the site.

- Safety glasses or goggles, gloves, and safety boots.

NOTE: EOTI personnel will not wear steel-toed shoes or other ferrous items on their person because of their interference with the operation of magnetometer/ordnance locators.

e. The following ordnance locators will be used to support this operation:

- The Schonstedt Models GA-52 and GA-72 magnetic locators will be used for sweeping and subsurface range clearance operations. These locators are designed to detect the magnetic field between two sensors spaced inside the locators 20 and 14 in. apart, respectively.

NOTE: The primary disadvantage of these locators is their inability to respond to nonmagnetic materials such as gold, silver, copper, brass, or aluminum, all of which can be found in certain types of military ordnance. Standard UXO safety precautions and techniques will be followed in support of this operation.

B-10.0 RECOVERED CHEMICAL WARFARE MATERIALS (RCWM)

a. If suspected Recovered Chemical Warfare Material (RCWM) is located at any time, all work will cease immediately. Site workers will withdraw along cleared paths from the area containing the RCWM. The EOTI Team Leader will clearly mark the area containing the RCWM, and report the chemical event, as specified in Figure B-1. EOTI UXO personnel will stand by in an upwind location until relieved by a government representative. The report of discovery of suspected RCWM will be made within 1 hr of the discovery. The point of contact (POC) will make the final determination as to the actual presence of RCWM.

b. If the POC confirms the presence of RCWM, the government person in charge will report the chemical event to the appropriate agencies.

c. When contacting the POC about suspect RCWM, EOTI will provide the information listed in Figure B-1. Contact with the POC will not be delayed due to lack of information. The suspect RCWM report will follow the format in Figure B-1.

1. Date and local time of event
2. Location
3. Quantity and type of munition(s) or container(s) and chemical agents involved
4. Description of what has happened
5. Description of property damage
6. Personnel casualties and/or injuries
7. Whether medical services or facilities were required
8. Assistance required
9. Any other pertinent information

Figure B-1. Suspected RCWM Data Report

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FINAL

Part II

Quality Assurance Project Plan
Addendum No. 1
for the
Phase I Remedial Investigation of
Ramsdell Quarry Landfill at the
Ravenna Army Ammunition Plant,
Ravenna, Ohio

October 2003

Prepared for

U.S. Army Corps of Engineers
Louisville District
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CONTENTS

PART II – QUALITY ASSURANCE PROJECT PLAN ADDENDUM

TABLES

ACRONYMS

COC	chain of custody
CX	Center of Expertise
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
GPL	GPL Laboratories
HTRW	Hazardous, Toxic, and Radioactive Waste
ICP	inductively coupled plasma
LCS	laboratory control sample
MDL	method detection limit
MRL	method reporting level
MS	matrix spike
MSD	matrix spike duplicate
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
RQL	Ramsdell Quarry Landfill
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
USACE	U.S. Army Corps of Engineers

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INTRODUCTION

This Quality Assurance Project Plan (QAPP) addendum addresses supplemental project-specific information in relation to the final Facility-wide QAPP for the Ravenna Army Ammunition Plant (USACE 2001b). Each QAPP section is presented documenting adherence to the Facility-wide QAPP or stipulating project-specific addendum requirements.

Primary analytical direction for these projects will be obtained from the identified EPA SW-846 Methods; the USACE Shell for Analytical Chemistry Requirements Appendix I, EM200-1-3, (USACE 2001a); and the Louisville Chemistry Guideline, Rev. 5 (USACE 2002).

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1.0 PROJECT DESCRIPTION

1.1 SITE HISTORY/BACKGROUND INFORMATION

This information is contained in Section 1.1 of the Field Sampling Plan (FSP) of the Ramsdell Quarry Landfill (RQL) Phase I Remedial Investigation (RI) Sampling and Analysis Plan (SAP) Addendum.

1.2 PAST DATA COLLECTION ACTIVITY/CURRENT STATUS

This information is contained in Section 1.2 of the FSP of the RQL Phase I RI SAP Addendum.

1.3 PROJECT OBJECTIVES AND SCOPE

This information is contained in Chapter 3.0 of the FSP of the RQL Phase I RI SAP Addendum.

1.4 SAMPLE NETWORK DESIGN AND RATIONALE

This information is contained in Chapter 4.0 of the FSP of the RQL Phase I RI SAP Addendum.

1.5 PARAMETERS TO BE TESTED AND FREQUENCY

Sample matrix types, analytical parameters, and analytical methods are discussed in Chapter 4.0 of the FSP of the RQL Phase I RI SAP Addendum. These sampling and analysis requirements are summarized in Table 1-1 of this Quality Assurance Project Plan (QAPP) addendum, in conjunction with anticipated sample numbers, quality assurance (QA) sample frequencies, and field quality control (QC) sample frequencies.

1.6 PROJECT SCHEDULE

The RQL Phase I RI project schedule is discussed in Chapter 2.0 of the FSP of the SAP Addendum.

Table 1-1. Sampling and Analytical Requirements for the Ramsdell Quarry Phase I RIs

Parameter	Methods	Field Samples[a]	Field Duplicate Samples	Site Source Water[b]	Sampler Rinsates	Trip Blanks	Total A-E Samples	USACE QA Split Samples	USACE Trip Blanks
Surface Soils									
Volatile Organics, TCL	SW-846, 5030/8260B	2/0	1	-	1	-	4/0	1	-
Semivolatile Organics, TCL	SW-846, 3540/8270C	10/5	1	-	1	-	12/5	1	-
Pesticides, TCL	SW-846, 3540/8081A	2/1	1	-	1	-	4/1	1	-
PCBs, TCL	SW-846, 3540/8082	2/1	1	-	1	-	4/1	1	-
Explosives	SW-846, 8330	10/5	1	-	1	-	12/5	1	-
Propellants	SW-846, 8330/9056	3/1	1	-	1	-	5/1	1	-
Metals, TAL	SW-846, 6010B/7471	10/5	1	-	1	-	12/5	1	-
Cyanide	SW-846, 9011/9012A	10/5	1	-	1	-	12/5	1	-
TOC	Wakley/Black Method	8	-	-	-	-	8	-	-
Groundwaters (six wells –three sampling rounds)									
Volatile Organics, TCL	SW-846, 5030/8260B	18	3	2	3	9	35	3	3
Semivolatile Organics, TCL	SW-846, 3520/8270C	18	3	2	3	-	26	3	-
Pesticides, TCL	SW-846, 3520/8081A	18	3	2	3	-	26	3	-
PCBs, TCL	SW-846, 3520/8082	18	3	2	3	-	26	3	-
Explosives	SW-846, 8330	18	3	2	3	-	26	3	-
Propellants	SW-846, 8330/9056	18	3	2	3	-	26	3	-
Metals, TAL	SW-846, 6010B/7470	18	3	2	3	-	26	3	-
Cyanide	SW-846, 9012A	18	3	2	3	-	26	3	-

[a]Surface soil samples are identified as x/y, where x = discreet samples and y = multi-increment samples.
[b]Source waters = one potable water source and one American Society of Testing and Materials water supply lot for the project.

A-E = Architect-Engineer.
EM = Engineering Manual (USACE).
TAL = Target Analyte List.
TCL = Target Compound List.
TOC = total organic compound.
PCB = polychlorinated biphenyl.
QA = quality assurance.
USACE = U.S. Army Corps of Engineers.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The functional project organization and responsibilities are described in Chapter 2.0 of the Facility-wide SAP and the Ramsdell Quarry Phase I RI SAP Addendum.

Analytical support for this work has been assigned to GPL Laboratories, Inc (GPL). All analyses will be completed by GPL's Gaithersburg, Maryland facility. This laboratory is validated by the U.S. Army Corps of Engineers' (USACE's) Hazardous, Toxic, and Radioactive Waste (HTRW) Center of Expertise (CX), Omaha, Nebraska. GPL's QAPP, Version 7, May 2003, is available for review upon request. The laboratory's organizational structure, roles, and responsibilities are identified in Chapters 3.0 and 4.0 of the GPL-QAPP. Geotechnical determinations will be performed by S&ME, Inc. Louisville, Tennessee. Addresses and telephone numbers for each facility are as follows:

GPL Laboratories, Inc. – chemical analytical services:

202 Perry Parkway
Gaithersburg, MD 20877
Tel: (301) 926-6802
Fax: (301) 840-1209

S&ME, Inc. – soil and sediment geotechnical analyses:

1413 Topside Road
Louisville, TN 37777
Tel: (865) 970-0003
Fax: (865) 970-2312

Comprehensive data validation will be independently performed by the Louisville USACE-approved firm of Laboratory Data Consultants, Inc., 7750 El Camino Real, Suite 2L, Carlsbad, CA 92009. QA split samples will be submitted to the following USACE, Louisville District contract laboratory for independent analyses:

Severn Trent Laboratories
4101 Shuffel Drive, N.W.
North Canton, Ohio, 44720
Tel.: (330) 497-9396

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3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

3.1 DATA QUALITY OBJECTIVES

Data quality objective summaries for this investigation will follow Tables 3-1 and 3-2 in the Facility-wide QAPP. All QC parameters stated in the specific U.S. Environmental Protection Agency (EPA) SW-846 methods will be adhered to for each chemical listed. The SW-846 method references found in the Facility-wide QAPP have been revised to the Update III methods (i.e., 8260A is now 8260B, 8270B is now 8270C, etc.). Laboratories are required to comply with all methods as written; recommendations are considered requirements. Concurrence with the USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3 and Louisville Chemistry Guideline, is expected.

3.2 LEVEL OF QUALITY CONTROL EFFORT

QC efforts will follow Section 3.2 of the Facility-wide QAPP. Field QC measurements will include field source water blanks, trip blanks, field duplicates, and equipment rinsate blanks. Laboratory QC measurements will include method blanks, laboratory control samples (LCSs), laboratory duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples. LCS measurements will include the standard mid-level analyte concentration, plus a QC/method reporting level (MRL) low-level concentration, per the Louisville Chemistry Guideline. It is recognized that the laboratory will routinely perform and monitor the QC/MRL; however, guidance check limits will be utilized as advisory and corrective action will not be required for individual analyte variances.

3.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS

Program accuracy, precision, and sensitivity goals identified in Section 3.3 and Tables 3-1 through 3-9 of the Facility-wide QAPP will be imposed for this investigation. In addition, the Louisville Chemistry Guideline identifies analytical method quality objectives related to individual method QC protocol. Current GPL-generated analytical method control limits have been submitted to the USACE, Louisville District Chemistry group for review. Upon acceptance, these QC limits will be imposed during analytical runs. If these internal QC operational limits are not acceptable to USACE, Louisville District, the laboratory will impose the Louisville Chemistry Guideline control limits. Due to the instability of hexachlorocyclopentadiene analysis, this compound’s performance will be monitored but will not precipitate method corrective action procedures.

Program and project reporting levels are identified in Tables 3-1 through 3-9 of the Facility-wide QAPP. Laboratories will make all reasonable attempts to meet these levels for each individual sample analysis. When samples require dilution, both the minimum dilution and quantified dilution must be reported. GPL will screen all samples to determine optimum dilution ranges. Dilution runs will be performed to quantitate high target analyte concentrations within the upper half of the calibration range, thus reducing the degree of dilution as much as possible. In addition, a five times less diluted run will then be performed to report other target analyte reporting levels as low as possible without destroying analytical detectors and instrumentation. If there are matrix interferences, non-target analyte, or high target analyte concentrations that preclude analysis of an undiluted sample, the laboratory project manager will contact SAIC and USACE, Louisville District; forward analytical and chromatographic information from diluted runs; and obtain direction on how to proceed.

3.4 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Completeness, representativeness, and comparability goals identified in Section 3.4 and Tables 3-1 and 3-2 of the Facility-wide QAPP will be imposed for this investigation.

4.0 SAMPLING PROCEDURES

Sampling procedures are discussed in Chapter 4.0 of the Facility-wide SAP and SAP Addendum for the RQL Phase I RI.

Table 4-1 summarizes sample container, preservation, and holding time requirements for the soil, sediment, and water matrices for this investigation. The number of containers required is estimated in this table.

As noted in the Facility-wide QAPP, additional sample volumes will be provided, when necessary, for the express purpose of performing associated laboratory QC (MS/MSD). These laboratory QC samples will be designated by the field and identified for the laboratory on respective chain of custody (COC) documentation.

Table 4-1. Container Requirements for Water, Soil, and Sediment Samples for the Ramsdell Quarry Phase I RI at RVAAP[a]

Analyte Group	Approx. No. of Containers incl. Field QC	Container	Minimum Sample Size	Preservative	Holding Time
Groundwater					
VOCs	90	Three, 40-mL glass vials with Teflon®-lined septum (no headspace)	80 mL	HCl to pH <2 Cool, 4°C	14 d
SVOCs	60	Two, 1-L amber glass bottles with Teflon®-lined lid	1000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)
Pesticide Compounds	60	Two, 1-L amber glass bottles with Teflon®-lined lid	1000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)
PCB Compounds	60	Two, 1-L amber glass bottles with Teflon®-lined lid	1000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)
Explosive Compounds	60	Two, 1-L amber glass bottles with Teflon®-lined lid	1000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)
Propellant Compounds	30	One, 1-L amber glass bottles with Teflon®-lined lid	1000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)
Metals (total)	30	1-L polybottle	500 mL	HNO_3 to pH <2 Cool, 4°C	180 d
Cyanide	30	1-L polybottle	500 mL	NaOH to pH >12 Cool, 4°C	14 d
Soil					
VOCs	5	One 2-oz. glass jar with Teflon®-lined cap (no headspace)	20 grams	Cool, 4°C	14 d
SVOCs	20	One 8-oz. wide-mouth glass jar with Teflon®-lined cap	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Pesticide Compounds	-	One 8-oz. wide-mouth glass jar with Teflon®-lined cap or use same container as SVOC, where possible	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
PCB Compounds	-	One 8-oz. wide-mouth glass jar with Teflon®-lined cap or use same container as metals, where possible	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Explosive Compounds	20	One 4-oz. glass jar with Teflon®-lined cap	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Propellant Compounds	10	One 4-oz. glass jar with Teflon®-lined cap	100 grams	Cool, 4°C	14 days (extraction) 40 days (analysis)
Metals	20	One 8-oz. wide-mouth glass jar with Teflon®-lined cap	50 grams	Cool, 4°C	180 d
Cyanide	-	Use same container as metals	25 grams	Cool, 4°C	14 d
Total Organic Carbon	10	One 4-oz. glass jar with Teflon®-lined cap	10 grams	Cool, 4°C	28 d

[a]One sample will be tripled in volume for the laboratory to perform appropriate laboratory QC analysis.
PCB = polychlorinated biphenyl.
QC = quality control.
RI = Remedial Investigation.
RVAAP = Ravenna Army Ammunition Plant.
SVOC = semivolatile organic compound.
VOC = volatile organic compound.

5.0 SAMPLE CUSTODY

5.1 FIELD CHAIN-OF-CUSTODY PROCEDURES

Sample handling, packaging, and shipment procedures will follow those identified in Section 5.1 of the Facility-wide QAPP.

5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

Laboratory COC will follow handling and custody procedures identified in Section 6.3 of the GPL-QAPP.

5.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES

Custody of evidence files will follow those criteria defined in Section 5.3 of the Facility-wide QAPP.

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6.0 CALIBRATION PROCEDURES AND FREQUENCY

6.1 FIELD INSTRUMENTS/EQUIPMENT

Field instruments and equipment calibrations will follow those identified in Section 6.1 of the Facility-wide QAPP.

6.2 LABORATORY INSTRUMENTS

Calibration of laboratory equipment will follow procedures identified in Section 6.5 of the GPL-QAPP and GPL laboratory-specific standard operating procedures (SOPs), and corporate and facility-specific operating procedures.

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7.0 ANALYTICAL PROCEDURES

7.1 LABORATORY ANALYSIS

Analytical methods, parameters, and quantitation or detection limits are those listed in Tables 3-3 through 3-9 of the Facility-wide QAPP.

The GPL-QAPP will be followed during the analysis of these samples. The following laboratory SOPs will implement the defined EPA methods.

- SOP No. H.8, version 8, January 2003, Acid Digestion of Aqueous EP and TCLP Extracts and Waste, etc. 3010A.
- SOP No. H21, version 3, August 2002, Acid Digestion of Soil, Sludge, Sediment, and other Solid Waste Samples for ICP by SW846 Method 3050B.
- SOP No. H.11, version 11, February 2003, Trace ICP Quantitation for HSL Metals plus Boron, Molybdenum, Silicon, Strontium, Titanium, and Tin According to Method 6010B.
- SOP No. H.31, version 1, January 2003, Trace ICP Quantitation for HSL Metals plus Boron, Molybdenum, Silicon, Strontium, Titanium, and Tin According to Method 6020.
- SOP No. H.12, version 12, April 2003, Cold Vapor Analysis for Mercury in Accordance with SW846 Methods 7470A and 7471A.
- SOP No. M.5, version 12, February 2003, Volatile Organics – 8260B.
- SOP No. N.5, version 3, September 2002, Soil Extraction for Pesticide/PCB Compounds by Method 3540C (Soxhlet Extraction).
- SOP No. N.21, version 1, March 2001, Soil Extraction for Semivolatile Organics by Method 3540C (Soxhlet Extraction).
- SOP No. N.24, version 2, July 2002, Soil Extraction for Explosives by Method 3540C (Soxhlet Extraction).
- SOP No. N.6, version 7, September 2002, Method 3520C, Continuous Liquid-Liquid Extraction for Pesticide/PCB Compounds.
- SOP No. N.11, version 7, October 2002, Method 3520C, Continuous Liquid-Liquid Extraction for Semivolatile Organics.
- SOP No. N.34, version 1, February 2003, Method 3520C, Continuous Liquid-Liquid Extraction for Explosive Organics.
- SOP No. P.5, version 10, February 2003, SOP for SW846 Method 8270C, GC/MS Analysis of Semivolatile Organics.

- SOP No. Q.6, version 7, October 2002, SOP for Method 8081A, Organochlorine Pesticides.
- SOP No. Q.7, version 4, November 2001, SOP for Method 8082, Aroclor and PCB Congeners.
- SOP No. S.1, version 15, February 2003, HPLC Analysis of Nitroaromatic and Nitramine Explosive Residues in Water, Soil, and Sediment Samples (8330).
- SOP No. S.4, version 3, March 2003, HPLC Analysis of Nitroquanidine in Water and Soil Samples.
- SOP No. S.7, version 4, December 2002, HPLC Analysis of Nitroglycerine in Water and Soil Samples (8332).
- SOP No. J.28, version 7, December 2002, Nitrocellulose.
- SOP No. J.44, version 4, April 2003, Cyanide, (automatic colorimetric with off-line distillation) by Method 9012A.

GPL will at all times maintain a safe and contaminant free environment for the analysis of samples. The laboratories will demonstrate, through instrument blanks, holding blanks, and analytical method blanks, that the laboratory environment and procedures will not and do not impact analytical results.

GPL will also implement all reasonable procedures to maintain project reporting levels for all sample analyses. Where contaminant and sample matrix analytical interferences impact the laboratory's ability to obtain project reporting levels, the laboratory will institute sample clean-up processes, minimize dilutions, adjust instrument operational parameters, or propose alternative analytical methods or procedures. Elevated reporting levels will be kept to a minimum throughout the execution of this work. When samples require dilution, both the minimum dilution and quantified dilution must be reported. GPL will screen all samples to determine optimum dilution ranges. Dilution runs will be performed to quantitate high target analyte concentrations within the upper half of the calibration range, thus reducing the degree of dilution as much as possible. In addition, a five times less diluted run will then be performed to report other target analyte reporting levels as low as possible without destroying analytical detectors and instrumentation. If there are matrix interferences, non-target analyte, or high target analyte concentrations that preclude analysis of an undiluted sample, the laboratory project manager will contact SAIC and USACE, Louisville District; forward analytical and chromatographic information from diluted runs; and obtain direction on how to proceed.

7.2 FIELD SCREENING ANALYTICAL PROTOCOLS

Procedures for field analysis are identified in Chapter 6.0 of the Facility-wide SAP and in Chapter 4.0 of the FSP of this SAP Addendum. Only screening of samples for organic vapors using a photoionization detector will be conducted. Headspace analysis will not be conducted.

8.0 INTERNAL QUALITY CONTROL CHECKS

8.1 FIELD SAMPLE COLLECTION

Field QC sample types, numbers, and frequencies are identified in Chapters 4.0 and 5.0 of the FSP of this SAP Addendum. In general, field duplicates will be collected at a frequency of 10%. Field equipment rinsates will be collected at a frequency of 10% for water samples, while one soil/sediment equipment rinsate sample will be collected per field cycle. This will constitute a process check for the effectiveness of the decontamination procedure. Two site source water samples (one potable water source and one deionized water source) will be collected for the combined field effort. Volatile organic trip blanks will accompany all shipments containing volatile organic water samples.

8.2 FIELD MEASUREMENT

Refer to Chapter 4.0 of the FSP of this SAP Addendum for details regarding these measurements.

8.3 LABORATORY ANALYSIS

Analytical QC procedures will follow those identified in the referenced EPA methodologies. These will include method blanks, LCS, MS, MSD, laboratory duplicate analysis, calibration standards, internal standards, surrogate standards, and calibration check standards.

GPL will conform to the GPL-QAPP and implement their established SOPs to perform the various analytical methods required by the project. QC frequencies will follow those identified in Section 8.3 of the Facility-wide QAPP.

Analyses will also be consistent with direction provided by the USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3, 1 February 2001 and the Louisville Chemistry Guideline, Rev. 5 June 2002, Samir Mansy. The following are clarifications to this guidance relative to this project:

- The QC/method detection limit (MDL) check will be performed quarterly, until criteria can be established. After performance criteria are determined, the frequency of this QC check may be reduced to biannually or annually per instrument.

- Analytical method blanks will be considered clean as long as analyte concentrations are below reporting levels. Corrective actions will be performed for any analyte detected above the established MRL. Any analytes detected between the MDL and the MRL will be flagged appropriately.

- LCSs will contain all project target compounds; however, for organic methods, only the SW-846 subset of system monitoring compounds will be used to monitor method performance and initiate analytical method corrective actions.

- For methods that have multi-responders (i.e., arochlors and pesticides) within the same analytical process, the laboratory will not include all analytes within the matrix spiking mixture. A representative analyte will be employed for the MS evaluation.

- Inductively coupled plasma (ICP) initial calibration curves will be confirmed through the analysis of a blank and three standards, and this documentation will be reported as part of the analytical data package.

- ICP serial dilution will be performed on a per batch basis. If the serial dilution falls outside acceptance criteria, a post-digestion spike analysis will be performed.

- Sediment samples having moisture levels that preclude Soxlet extraction processes will be extracted by sonication methods.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 DATA REDUCTION

Sample collection and field measurements will follow the established protocols defined in the Facility-wide QAPP, Facility-wide SAP, and this SAP Addendum. Laboratory data reduction will follow GPL-QAPP, Chapter 7.0 guidance and conform to general direction provided by the Facility-wide QAPP, the USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3, (USACE 2001a), and the Louisville Chemistry Guideline, (USACE 2002).

9.2 DATA VERIFICATION/VALIDATION

Project data verification and validation will follow direction provided in the Facility-wide QAPP Section 9.2 and diagramed in Figure 9-1. Protocol for analytical data verification and validation has been updated to the following references:

- USACE Louisville Chemistry Guideline, Rev. 5, June 2002.
- USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3, February 2001.
- Environmental Data Assurance Guideline, USACE Louisville, May 2000.
- EPA National Functional Guidelines for Organic Data Review, EPA-540/R-99/008, October 1999.
- EPA National Functional Guidelines for Inorganic Data Review, EPA-540/R-94/013, February 1994.

All data will be reviewed and verified by Science Applications International Corporation (SAIC) according to the Facility-wide QAPP.

Validation of 10% of the data will follow the direction provided in the Facility-wide QAPP and the Louisville Chemistry Guideline, Rev.5, June 2002, Samir Mansy. An independent data validation subcontractor qualified by USACE, Louisville District will perform this data validation.

9.3 DATA REPORTING

Analytical data reports will follow the direction provided in the Facility-wide QAPP.

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10.0 PERFORMANCE AND SYSTEM AUDITS

10.1 FIELD AUDITS

A minimum of one field surveillance for the investigation will be performed by the SAIC QA Officer and/or the SAIC Field Team Leader. This audit will encompass the sampling of groundwater, surface water, soil, and sediment from the wells, ditches, ponds, and land areas. Surveillances will follow SAIC QAAP No. 18.3.

USACE, EPA Region 5, or Ohio EPA audits may be conducted at the discretion of the respective agency.

10.2 LABORATORY AUDITS

Routine USACE HTRW CX on-site laboratory audits may be conducted by USACE, while audits by EPA Region 5 or Ohio EPA may be conducted at the discretion of the respective agency.

Internal performance and systems audits will be conducted by GPL's QA staff, as defined in the GPL-QAPP, Sections 9.2 and 9.3.

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11.0 PREVENTIVE MAINTENANCE PROCEDURES

11.1 FIELD INSTRUMENTS AND EQUIPMENT

Maintenance of all field analytical and sampling equipment will follow direction provided in Section 11.1 of the Facility-wide QAPP.

11.2 LABORATORY INSTRUMENTS

Routine and preventive maintenance for all laboratory instruments and equipment will follow the direction of Section 5.3 of the GPL-QAPP.

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12.0 SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

12.1 FIELD MEASUREMENTS DATA

Field data will be assessed as outlined in Section 12.1 of the Facility-wide QAPP.

12.2 LABORATORY DATA

Laboratory data will be assessed as outlined in Section 12.2 of the Facility-wide QAPP.

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13.0 CORRECTIVE ACTIONS

13.1 SAMPLE COLLECTION/FIELD MEASUREMENTS

Field activity corrective action protocol will follow directions provided in Section 13.1 of the Facility-wide QAPP.

13.2 LABORATORY ANALYSES

Laboratory activity corrective action protocol will follow directions provided in Section 13.2 of the Facility-wide QAPP and Section 9.5 of the GPL-QAPP.

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14.0 QA REPORTS TO MANAGEMENT

Procedures and reports will follow the protocol identified in Section 14.0 of the Facility-wide QAPP and those directed by Chapter 9.0 of the GPL-QAPP.

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15.0 REFERENCES

USACE (U.S. Army Corps of Engineers) 2001a. Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3, Appendix I, *Shell for Analytical Chemistry Requirements*, February.

USACE (U.S. Army Corps of Engineers) 2001b. *Facility-wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*, DACA62-00-D-0001, Delivery Order CY02, Final, March.

USACE (U.S. Army Corps of Engineers) 2002. *Louisville Chemistry Guideline (LCG),* Environmental Chemistry Branch, Rev. 5, June.

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Comment Response Table
Draft Phase I Remedial Investigation Sampling and Analysis Plan Addenda for Ramsdell Quarry
at the Ravenna Army Ammunition Plant, Ravenna, Ohio

Comment Number	Page or Sheet	Comment	Response
U.S. ARMY CORPS OF ENGINEERS ***John Sikes, OE-MCX***			
1.	General	The following documents were received electronically from Mr. Paul Zorko and reviewed for inclusion of appropriate OE Avoidance procedures: 1. Draft Facility-Wide Sampling and Analysis Plan for the Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, OH, dated July 2000. 2. Draft SAP, Addendum No. 1 for Phase I Remedial Investigation of the Ramsdell Quarry Landfill at the Ravenna AAP, Ravenna, OH, dated September 2003. 3. Draft SSHP, Addendum No. 1 for Phase I Remedial Investigation of the Ramsdell Quarry Landfill at the Ravenna AAP, Ravenna, OH, dated September 2003. 4. Draft SAP, Addendum No. 1 for the Phase II Remedial Investigation of the Erie Burning Grounds at the Ravenna AAP, Ravenna, OH, dated September 2003. 5. Draft SSHP, Addendum No. 1 for the Phase II Remedial Investigation of the Erie Burning Grounds at the Ravenna AAP, Ravenna, OH, dated September 2003.	Comment noted.
2.	General	As currently written, the OE CX does not concur. Please see comments below.	Comment noted. See specific responses below.
3.	Facility-wide SAP, dated July 2000 - General	Suggest adding a general statement concerning the possible need to utilize UXO support procedures. You may want to consider adding UXO Technicians to paragraph 2.8.	Comment noted. Agree with requested changes; however, changes to the Facility-wide SAP are deferred to a future revision of the report, as they are beyond scope of the Ramsdell Quarry Phase I RI.

Comment Number	Page or Sheet	Comment	Response
4.	Draft SSHP, Addendum No. 1, Ramsdell Quarry, Dated September 2003, Para 4.1.9 and Appendix B	Both of these sections need to reflect current guidance provided in Engineering Pamphlet (EP) 75-1-2, Chapter 5. The procedures provided are based on rescinded Engineering Technical Letters. Both ETLs listed in Para B-3.0 are no longer valid and have been replaced with EP 75-1-2 and EP 385-1-95a. See the links provided: http://www.usace.army.mil/inet/usace-docs/eng-pamphlets/ep75-1-2/toc.htm http://www.usace.army.mil/inet/usace-docs/eng-pamphlets/ep385-1-95a/toc.htm It must be understood that during avoidance procedures, sample locations and access routes are not cleared. Locations and routes free of anomalies are identified and marked.	Agree. Text has been revised as requested.
5.	Para 4.1.9 and Appendix B, General	Both procedures should also contain a statement that if anomaly free routes and sample locations cannot be identified, the OE CX must be notified and the level of UXO support reassessed.	Agree. Text has been changed as requested.
6.	Para 4.1.9 and Appendix B, General	Assure procedures are in place to have local law enforcement or military EOD respond to any UXO requiring disposal.	Clarification. Procedural requirements for UXO removal or disposal are beyond the scope of the Phase I RI, which addresses OE avoidance only. Text has been added that the OE avoidance personnel will notify the SAIC Field Operations Manager and USACE Technical Representative on-site. In turn, these personnel will notify the RVAAP Facility Manager who has responsibility for appropriate actions, including notifications to military EOD personnel and local law enforcement agencies, as appropriate.
7.	General	Mr. Lewallen is qualified to perform the functions listed in the SAP. However, I could not find Mr. Wallace listed in the personnel database. Mr. Wallace will have to provide a resume listing all EOD and contractor UXO experience.	Clarification. Please note a personnel change is proposed in the revised OE Avoidance Plan due to revised project start schedules. Mr. Daryl Satko is proposed as the support technician; his qualifications have been previously submitted to the OE-CX.

Comment Response Table
Draft Phase I Remedial Investigation Sampling and Analysis Plan Addenda for Ramsdell Quarry
at the Ravenna Army Ammunition Plant, Ravenna, Ohio

Comment Number	Page or Sheet	Comment	Response
8.	Para. B-9.0a	This paragraph states the EOTI personnel will identify anomalies. This is not in accordance with EP 75-1-2, paragraph 5-5e, which states "If anomalies or surface UXO are encountered, they will be marked with flagging and the investigation area will be relocated to avoid contact." If surface UXO is encountered, you may assess its condition to determine if disposal action is required, however, ALL subsurface anomalies are to be marked and avoided.	Agree. Text has been revised as requested.
9.	Para. B-8.0 and B-9.0	Paragraph 5-5e of EP 75-1-2 also states "The team will establish a system of flagging colors that will distinguish anomalies, surface UXO, and route boundaries from each other as well as from any utility markings that have been used at the site." Currently, Appendix B contains only markings for surface UXO (red pin flags or ribbon) and the boundaries for the approach path (yellow pin flags or other suitable markers). I did not see any discussion on marking of subsurface anomalies and/or utility markings.	Agree. Text has been revised to include a color scheme for demarcating approach paths, surface UXO, subsurface anomolies, and any utilities that may be discovered.
U.S. ARMY CORPS OF ENGINEERS ***Paul Zorko, CELRL-ED-E-E***			
1.	General	The USACE data validation contractor for this action will be: Laboratory Data Consultants, Inc., 7750 El Camino Real, Suite 2L, Carlsbad, Ca 92009, POC Mr. Richard Amano	Agree. Text has been revised as requested.
2.	Page 1-5, Section 1.2, last para.	The smaller quarry was water filled in late august as a result of above average rainfall during the summer of 2003.	Agree. Information regarding the small quarry has been added.
3.	Section 3.1	Add " The abandonment of existing Monitoring Wells MW-1, -2, -3, -4 and -5" to the list of objectives	Agree. Objective has been added as requested.
4.	Section 3.2.1	In the first paragraph under the heading " Source Term and Release Mechanisms" it is stated that RQL **did not** have an engineered cap installed during closure operations. This statement is false and needs to be corrected.	Clarification. Information regarding closure was obtained during the Groundwater Investigation for RQL. An engineered cap (e.g., multi-layer, low-permeability cap) was not documented to have been installed during closure of the landfill. Text has been changed to state RQL was closed with a compacted soil/clay cover.
5.	Section 3.2.1, 3rd para., first line	Change sentence to read "….waste explosives and munitions as well as disposal of annealing residues."	Agree. Text has been changed as requested.

Comment Number	Page or Sheet	Comment	Response
6.	Section 3.2.1, page 3-3, Uncertainties	Last bulleted item : I believe the statement should read "…under typical site conditions could ***not*** be fully evaluated…"	Agree. Text has been changed as requested.
7.	Figure 4-1	Printing error, Add separate symbol for and designate the wells to be abandoned.	Agree. Figure has been corrected.
8.	Page 4-4, Section 4.1.2.1	Reference should be made regarding the requirement for an "oil free" air source. Please be sure that the drilling contractor is aware of the requirement if it has not already been done.	Agree. Requirement has been added as requested. Drilling subcontractor has been made aware of the requirement for a filtered air source.
9.	Page 4-6, Section 4.1.6	The designated QA laboratory for this action will be STL North Canton.	Agree. Text has been changed as requested.
10.	Table 5-1, Figure 5-1	Regarding the MI samples, We should probably create a new "sample type" to differentiate. MI works for me.	Agree. Revisions have been made as requested.
11.	Appendix B	Ensure that the contractor is aware of the EP-75-1-2, UXO Support during HTRW and Construction Activities, USACE, 20 Nov 2000 and modifies his plan accordingly.	Agree. The OE Avoidance Plan has been modified in accordance with the new requirements.
12.	QAPP, Chapter 2.0	See comment No. 1.	Agree. Text has been revised as requested.
U.S. ARMY CORPS OF ENGINEERS ***Dr. David Brancato, CELRL-ED-E-E***			
1.	Section 3.4	I would like it to read with the re-use intent by the guard: "Ramsdell Quarry will be under Restricted Access having Authorized Persons only." "The area will be closed to all normal training and administrative activities. May contain hazardous contamination, UXO, other hazards to human health and safety, protected cultural or historical sites, and/or protected environmentally sensitive areas. Surveying, sampling and other essential security, safety, natural resources management, and other directed activities may be conducted here only after authorized personnel have been properly briefed on potential hazards/sensitive areas. Individuals unfamiliar with the hazards/restrictions will be escorted by authorized personnel at all times while in the restricted area."	Agree. Text will added regarding re-use intent; however, for the purposes of the SAP Addendum, it will be stated that the <u>assumed</u> land use, for purposes of the risk evaluation, will be Restricted Access. This is due to the fact that final RQL land use determinations will be negotiated with the regulators and codified in a future decision document. Also, prior comments from the RVAAP Team have indicated that it is not appropriate for the RI to define risk management decisions.

Comment Response Table
Draft Phase I Remedial Investigation Sampling and Analysis Plan Addenda for Ramsdell Quarry
at the Ravenna Army Ammunition Plant, Ravenna, Ohio

Comment Number	Page or Sheet	Comment	Response
1. (continued)		SAIC should acknowledge the Level I Eco-Scoping Assessment from Ohio EPA. While the Level I sheets are not needed to be completed, (SOW clarification between SAIC and USACE) there needs to be conveyed to Ohio EPA that habitat does exist for this area as will be evidenced from the eco-surveys that have taken place to date. SAIC will only extrapolate PPLs from WBG to the RQ area because disturbance history is between WBG and RQ is very different. But, site history at RQ was used to deactivate 500# napalm shells and WBG was used to deactivate all different types of shells. Therefore, I believe the COPECs 95% UCL as well as the PPLs may be used in the screening of constituents at RQ, thus taking one through step 5 on Figure III pf the facility-Wide Eco work plan. Please read step descriptions on pp 53 and 54 of the RVAAP facility Wide Ecological Risk Assessment Work Plan and amend section 3.5 accordingly.	Agree. A statement has been added that habitat does exist within RQL, which will be defined as part of the RI. Clarification. Only PPLs will be extrapolated per technical clarifications in Reference A-1 regarding Technical Assumptions and, specifically, S0W Section 8.0 (Task 7.2) and bullet 4. Thus, there is present scope to extrapolate only a few PPLs for this AOC whose conditions are so different from the flat and heavily used WBG. If comparability between Ramsdell and WBG can be shown in the biological walkover, as specified in step 5 of the Facility-wide Ecological Assessment Work Plan, and additional extrapolations are needed, these may be included in future discussions.
U.S. ARMY CORPS OF ENGINEERS ***Gerald Simms, CELRL-ED-E-E***			
1.	General	Have your contractor supplement the draft addendum or facility wide plan as noted below. He should review and reference ER 385-1-92 prior to resubmittal of the draft. Please also remind him to include appropriate signatures.	Agree. ER-385-1-92 was included in the references as requested and signatures were included.
2.	General	The addendum lists OE as a potential, yet there is no compliance with EP 75-15. An anomaly avoidance plan in accordance with Chapter 3 of the reference will need to be generated, submitted and approved by Huntsville CX of USACE. This plan needs to appear as an appendix to the SSHP addendum.	Clarification. The OE Avoidance Plan is included as Appendix B to the SAP Addendum due to multiple references throughout to OE avoidance procedures. This plan was submitted to the OE-CX for review (Mr. John Sikes). The revised SSHP now includes a reference to Appendix B to the FSP Addendum for OE avoidance procedures.
3.	General	Recommendation - in future please utilize CELRL form 1259 for Activity Hazards Analyses.	Comment noted. Future SSHP Addenda will include this format for AHAs.

Comment Number	Page or Sheet	Comment	Response
4.	General	Provide the PPE required for all of the tasks being performed on this project. Please don't just reference the hazards risk analyses in section 2 or the FWSP.	Agree. Details on PPE for all tasks are included as requested under each separate task listed in the Hazard Analysis table.
5.	General	Provide site-specific emergency response information for activities being performed at Ramsdell Quarry. Please designate an emergency evacuation point specific for this project and report it in the SSHP addendum. Please also include a site-specific map to the hospital facility from Ramsdell Quarry. Please verify the emergency POC list in the FSHP is still current and report in the addendum. In the event respirators are to be worn please append the SAIC written respiratory protection plan to the FSHP or the addendum.	Agree. The emergency evacuation assemble point has been designated as requested (Building 1036). The emergency POC list contained on page 12-2 of the FSHP and Figure B-1 (hospital route map) is still current and has been re-iterated in Chapter 12.0 of the SSHP Addendum.
6.	General	Please include a copy of SAIC's written PPE program as an appendix to the FSHP or the addendum.	Agree. A copy of SAIC’s written PPE program has been included as an appendix to the SSHP addendum.
7.	General	Please include a statement in the addendum notifying employees of the location of MSDSs.	Agree. A statement has been added to Section 2.2 of the SSHP Addendum that MSDS records for reagents and chemicals to be used on the project are contained in Building 1036 at RVAAP.
8.	General	General note - if there is any question on whether to include something in the addendum that may already be in the FSHP go ahead and include it in the addendum.	Comment noted.
OHIO EPA ***Todd Fisher, DERR-NEDO***			
1.	Table 2-1	There still exists a potential drowning hazard at this AOC. Please check “yes” under “drowning hazard.”	Clarification. No surface water sampling is planned for the Phase I RI; thus, drowning hazards were not identified in the Activity Hazards Analysis. No text changes required.
2.	SSHP – General	There are many references back to the Facility Wide Safety and Health Plan (FSHP). Since this is an addendum to the FSHP, please make sure that all sampling parties have a copy of the FSHP in the field (i.e. Addendum has no map to local hospital).	Agree. Note that egress routes and a map to the local hospital have been added (Figures 12-1 and 12-2).

Comment Response Table
Draft Phase I Remedial Investigation Sampling and Analysis Plan Addenda for Ramsdell Quarry at the Ravenna Army Ammunition Plant, Ravenna, Ohio

Comment Number	Page or Sheet	Comment	Response
3.	Section 4.0, page 4-1	It has been brought to the Ohio EPA's attention that the American Red Cross may have suspended their 43-HR First Responder Training Course. Since this was a RVAAP requirement for at least one person to be First Responder certified, the FSHP may need to be updated in the future to reflect this change.	Agree. SSHP has been updated to reference the 8-hr CPR course for First Responders.
4.	Section 3.0, Scope and Objectives, page 3-1	Please include monitoring well abandonment (of the original 5 RQLs wells) in this section.	Agree. Information has been added.
5.	Section 3.5, Ohio Level II Ecological Risk Assessment, page 3-7	The text states that "terrain slope, vegetation patterns, and disturbance history at Ramsdell Quarry are very different from those observed at WBG, only the plant protection levels from WBG will be extrapolated as ecological screening values at Ramsdell Quarry." The WBG Ecotruthing report has yet to be finalized, and any extrapolation of PPLs as ecological screening values between AOCs must first be discussed and then mutually agreed upon by USACE, RVAAP, and the Ohio EPA.	Agree. Future discussions of the WBG Ecotruthing Application to Ramsdell Quarry will be conducted as part of the RI report preparation process. No text changes required.
6.	Section 4.1.6, Field Quality Control Sampling Procedures, page 4-7	The text states that ground water split samples will be collected and submitted to the USACE contract laboratory (GPL - Gaithersburg) for independent analysis. SAIC is also set up to send their samples to GPL in Gaithersburg, MD. This is the same and only laboratory that Ohio EPA is contracted with to analyze split samples. Will USACE be collecting the split samples and sending them to another USACE approved contract laboratory? Should the splits and the regular samples go to the same laboratory?	Clarification. Text has been modified to state Severn Trent Laboratories is the designated USACE QA laboratory.
7.	Section 4.3.1.3, Field Quality Control Sampling Procedures, page 4-9	The text states The text states that split samples will be collected at a frequency of 10% for each matrix and that these samples will be submitted to the USACE contract laboratory (STL North Canton) for independent analysis. This contradicts with the text in Section 4.1.6 which indicates that splits will go to (GPL-Gaithersburg). Please resolve this discrepancy and make the appropriate changes to the text.	See response to Ohio EPA comment No. 8.