CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Prudent Environmental Services, Incorporated (Prudent) has completed the Final Work Plan Addendum for 2010 Preliminary Assessment Compliance Restoration Site CC RVAAP-78 Quarry Pond Surface Dump for 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 United States Army Corps of Engineers policy.

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October 19, 2011

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Final Work Plan Addendum for 2010 Preliminary Assessment Compliance Restoration Site CC RVAAP-78 Quarry Pond Surface Dump sites including the Quality Assurance Project Plan, the Field Sampling and Analysis Plan, the Site Safety and Health Plan, and the Final UXO/MEC Anomaly Avoidance Plan.

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Final Work Plan Addendum for 2010 Preliminary Assessment Compliance Restoration Site CC RVAAP-78 Quarry Pond Surface Dump

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Final Work Plan Addendum for 2010 Preliminary Assessment
Compliance Restoration Site
CC RVAAP-78 Quarry Pond Surface Dump

Ravenna Army Ammunition Plant
Ravenna, Ohio

Contract No. W912QR-10-P-0052

Prepared for:

US Army Corps of Engineers®

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600 Martin Luther King, Jr. Place
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Program Manager / USAEC	0	1

COR – Contracting Officer's Representative
USACE – U.S. Army Corps of Engineers
RVAAP – Ravenna Army Ammunition Plant
OHARNG – Ohio Army National Guard
OHEPA – Ohio Environmental Protection Agency
REIMS – Ravenna Environmental Information System
USAEC – U.S. Army Environmental Command

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos Containing Material
ACSIM	Assistant Chief of Staff for Installation Management
ADR	Automatic Data Review
AEC	Army Environmental Command
AOC	Area of Concern
APA	Abbreviated Preliminary Assessment
bgs	Below ground surface
BRACD	Base Realignment and Closure Division
Camp Ravenna	Camp Ravenna Joint Military Training Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Chemicals of Potential Concern
COR	Contracting Officer Representative
CR	Compliance Restoration
CUG	Clean-up Goal
CUGIROD	Cleanup Goal from IROD
CPR	Cardio Pulmonary Resuscitation
DFFOs	Director's Final Findings and Orders
DNT	Dinitrotoluene, also 2,4-Dinitrotoluene
DOD	Department of Department
DOT	Department of Transportation
DMM	Discarded Military Munitions
EDD	Electronic Data Deliverable
EDMS	Environmental Data Management System
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ESS	Explosives Safety Submission
FBQ	Fuze and Booster Quarry
FS	Feasibility Study
FSP	Field Sampling Plan
FWSAP	Facility-Wide Sampling and Analysis Plan
GPS	Global Positioning System
HRRR	Historical Records Review Report
HASP	Health and Safety Plan (or Safety and Health Plan)
HAZWOPER	Hazardous Waste Operations and Emergency Response
HTRW	Hazardous, Toxic, and Radioactive Waste
IDW	Investigation-Derived Waste
IROD	Interim Record of Decision
IRP	Installation Restoration Program
ISM	Incremental Sampling Methodology
JSA	Job Safety Analysis
MEC	Munitions and Explosives of Concern
MC	Munitions Constituents
MI	Multi-increment
MMRP	Military Munitions Response Program
NGB	National Guard Bureau

OHARNG	Ohio Army National Guard
OHEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCP	Project Coordination Plan
PMP	Project Management Plan
Prudent	Prudent Technologies
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality System Manual
PLM	Polarized Light Microscopy
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive (1,3,5-Trinitroperhydro-1,3,5-triazine; Cyclotrimethylenetrinitramine)
REIMS	Ravenna Environmental Information Management System
RI	Remedial Investigation
RVAAP	Ravenna Army Ammunition Plant
SAP	Sampling and Analysis Plan
SRC	Site-Related Contaminant
SSHP	Site Safety and Health Plan
SWPPP	Storm Water Pollution Prevention Plan
TCLP	Toxicity Characteristic Leaching Procedure
TNT	Trinitrotoluene (2,4,6-Trinitrotoluene)
SOW	Scope of Work
USACE	United States Army Corps of Engineers
USATCES	United States Army Technical Center for Explosives Safety
USP&FO	United States Property and Fiscal Officer
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WBS	Work Breakdown Structure

CC RVAAP-78 EXECUTIVE SUMMARY

Prudent Technologies Inc., (Prudent) was contracted by the United States Army Corps of Engineers (USACE) Louisville District to complete a Preliminary Assessment (PA) for Compliance Restoration (CR) site CC RVAAP-78 Quarry Pond Surface Dump at the Ravenna Army Ammunition Plant, Ravenna, Ohio, under Contract No. W912QR-10-P-0052.

The objective of this project is to conduct a PA of the area of concern (AOC), which includes a comprehensive background historical review and an initial intrusive investigation to confirm the presence or absence of contamination. The comprehensive background historical review has been completed and is provided in the Historical Records Review Report for 2010 Preliminary Assessment Compliance Restoration Sites CC RVAAP-78 Quarry Pond Surface Dump & CC RVAAP-80 Group 2 Propellant Can Tops, (Prudent, 2011).

The initial intrusive investigation for CC RVAAP-78 includes environmental sampling and support tasks. These tasks include collecting grab samples of transite from Debris Piles A and B for Asbestos Containing Material (ACM) determinations, collecting surface soil samples immediately adjacent to Debris Piles A and B, collecting surface and subsurface samples from within Debris Pile C, from the apparent burn area, sampling the contents of two rusted 55-gallon drums, and properly disposing of the two rusted 55-gallon drums. The purpose of the limited sampling is to confirm the presence or absence of contaminants at CC RVAAP-78.

1.0 BACKGROUND

1.1 PROJECT BACKGROUND AND SUMMARY

Prudent Technologies Inc., (Prudent) was contracted by the United States Army Corps of Engineers (USACE) Louisville District to complete a PA for Compliance Restoration (CR) site CC RVAAP-78 Quarry Pond Surface Dump at the Ravenna Army Ammunition Plant, Ravenna, Ohio, under Contract No. W912QR-10-P-0052.

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The initial intrusive investigation for CC RVAAP-78 includes environmental sampling and support tasks. These tasks include collecting grab samples of transite from Debris Piles A and B for Asbestos Containing Material (ACM) determinations, collecting surface soil samples immediately adjacent to Debris Piles A and B, collecting surface and subsurface samples from within Debris Pile C, from the apparent burn area, sampling the contents of two rusted 55-gallon drums, and properly disposing of the two rusted 55-gallon drums.

Due to former activities at this site, munitions and explosives of concern (MEC) may potentially be present at the AOC. The probability of encountering MEC is low. MEC avoidance surveys will be conducted during the investigation activities.

1.2 GENERAL FACILITY DESCRIPTION

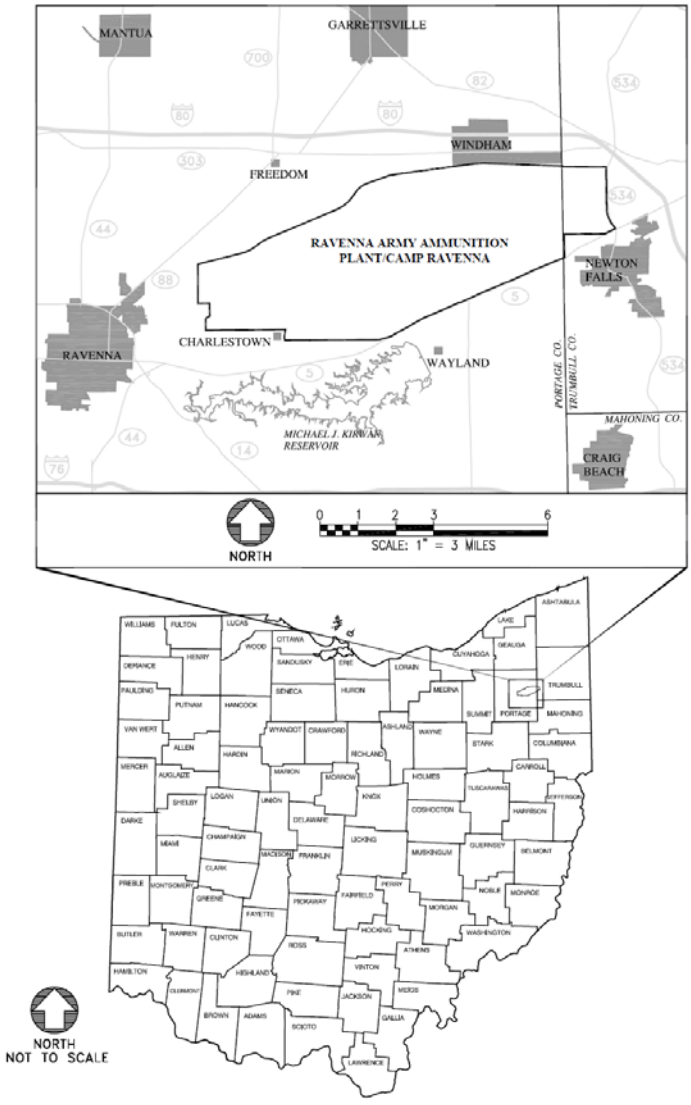
When the RVAAP Installation Restoration Program (IRP) began in 1989, RVAAP was identified as a 21,419-acre installation. The property boundary was resurveyed by OHARNG over a 2-year period (2002 and 2003) and the total acreage of the property was found to be 21,683.289 acres. As of February 2006, a total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

The current RVAAP consists of 1,260 acres scattered throughout the OHARNG Camp Ravenna Joint Military Training Center (Camp Ravenna). Camp Ravenna is in northeastern Ohio within Portage and Trumbull Counties, approximately 3 miles (4.8 km) east-northeast of the City of Ravenna and approximately 1 mile (1.6 km) northwest of the City of Newton Falls. The RVAAP portions of the property are solely located within Portage County. RVAAP/Camp Ravenna is a parcel of property approximately 11 miles (17.7 km) long and 3.5 miles (5.6 km) wide bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garret, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east. Camp Ravenna is surrounded by several communities: Windham on the north; Garrettsville 6 miles (9.6 km) to the northwest; Newton Falls 1 mile (1.6 km) to the southeast; Charlestown to the southwest; and Wayland 3 miles (4.8 km) to the south.

When RVAAP was operational, Camp Ravenna did not exist and the entire 21,683-acre parcel was a government-owned, contractor-operated industrial facility. The RVAAP Installation Restoration Program (IRP) encompasses investigation and cleanup of past activities over the entire 21,683- acres of the former RVAAP and therefore references to the RVAAP in this document are considered to be inclusive of the

historical extent of the RVAAP, which is inclusive of the combined acreages of the current Camp Ravenna and RVAAP, unless otherwise specifically stated. The property location is depicted in Figure 1-1.

Figure 1-1: RVAAP Location & General Vicinity Map



2.0 PROJECT DESCRIPTION

2.1 PROJECT BACKGROUND AND SUMMARY OF CC RVAAP-78

The Quarry Pond Surface Dump consists of former dumping areas at the bases of two steeply inclined rock slopes and another dump area northwest of the northern-most pond. The surface dumps are located north, northwest and northeast of the northern-most quarry pond within the Fuze and Booster Quarry Landfill/Pond (RVAAP-16) AOC. The Fuze and Booster Quarry (FBQ) was used as an explosive contaminated sawdust burning area for Load Lines 6 and 11 from 1945-1949. In 1976, settling ponds were constructed, separated by earthen dams, with flow control gates for treating the spent brine regenerant and sand filtration backwash water from the Water Works 3 treatment plant that treated groundwater from facility production wells (1976-1993). Historical operational information indicated fuze and booster assemblies, projectiles, residual ash, and sanitary wastes were burned or dumped in the quarry prior to pond construction. In 1976, debris was removed from the quarry bottom and transferred to the Ramsdell Quarry Landfill or one of the other burning grounds. In 1998, the RVAAP-16 AOC was expanded to include the quarry vicinity, the 11 former settling ponds/depressions and drainage conveyances, and a debris pile north of the quarry.

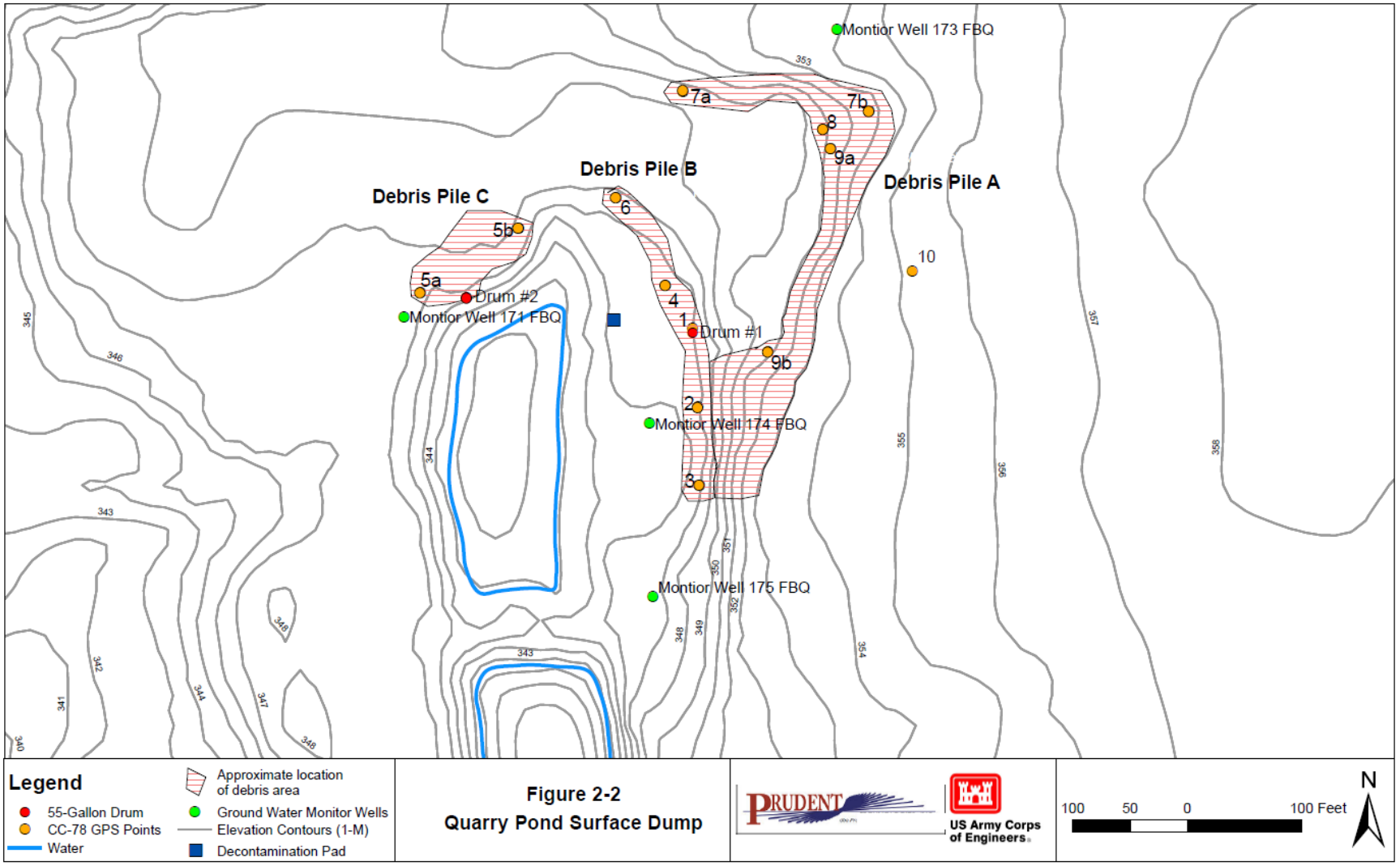
The Quarry Pond Surface Dump AOC is located in the southwestern portion of the facility, just north of the Fuze and Booster Quarry Landfill/Ponds AOC, north of Fuze and Booster Road. The site consists of areas of former dumping at the bases of steeply inclined rock slopes. The surface dumps, referenced as Debris Piles A, B, and C on Figures 2-1 and 2-2, are located north, northwest and northeast of the northern-most quarry pond within the Fuze and Booster Quarry Landfill/Ponds (RVAAP-16) AOC. Debris Pile A is approximately 425 feet in length and 18 to 68 feet wide and is suspected of containing ACM, construction debris, scrap metal, and unidentified materials. A second, smaller debris pile at the base of a steeply inclined rock slope, defined as Debris Pile B, is approximately 296 feet in length and 24 feet wide. An apparent burn area is located near a rusted, 55-gallon drum, both of which are within Debris Pile B. The apparent burn area is characterized by ground charring and lack of vegetation. The topographic map of this area, (see Figure 2-2), shows that the south end of Debris Pile A becomes one continuous slope from Reference Point 9b of Debris Pile A to Reference Point 3 of Debris Pile B (see Figure 2-1). Debris Pile C is located along the northwestern corner of the northern-most quarry pond area with the debris area being approximately 120 feet by 45 feet. A second rusted 55-gallon drum is present within this area. Table 2-1 list Global Positioning System (GPS) Ohio State Plane coordinates of locations where observations were made during the site reconnaissance, monitoring wells and 55-gallon drums.

Table 2-1: Latitude/Longitude from RVAAP CC-78 Site Reconnaissance

Reference #	Latitude	Longitude
CC-78 GPS Points		
1	41.1796	-81.1128
2	41.1794	-80.1128
3	41.1792	-81.1128
4	41.1797	-81.1129
6	41.1799	-81.1131
8	41.1801	-81.1124
10	41.1797	-81.1121
5a	41.1797	-81.1137
5b	41.1798	-81.1134
7a	41.1801	-81.1129
7b	41.1801	-81.1123
9a	41.1800	-81.1124
9b	41.1795	-81.1126
Ground Water Monitoring Wells FBQ		
171	41.1796	-81.1138
173	41.1803	-81.1124
174	41.1793	-81.1130
175	41.1789	-81.1130
55-Gallon Drum		
55-Gallon Drum 1	41.1796	-81.1136
55-Gallon Drum 2	41.1796	-81.1128

Figure 2-1: CC RVAAP-78 Quarry Pond Surface Dump Location Map

Figure 2-2: CC RVAAP-78 Quarry Pond Surface Dump Topographic Map



2.2 WORK TO BE PERFORMED

The PA for CC RVAAP-78 will include an initial intrusive investigation of possible impacts to the applicable media to confirm the presence or absence of contaminants.

Limited surface soil sampling will be conducted and the results compared with cleanup goals, as prescribed in the Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals (USACE 2009), to determine chemicals of potential concern (COPCs). As per the limited scope of a Phase I Remedial Investigation (Preliminary Assessment), no sampling of groundwater is provided within this project. However, brief summaries of existing related surface and groundwater data will be presented. MEC avoidance procedures will be needed during intrusive investigations.

2.3 PROJECT TASKS

The following tasks are prescribed in the contract to accomplish the overall project objectives.

Task 1	Project Management
1.1	Project Management Plan (PMP)
1.2	Site Safety and Health Plan (SSHP) Addendum
1.3	Project Execution/Client Correspondence
Task 2	Historical Review and Research of Available Data
2.1	Research
2.2	Historical Records Review Report
Task 3	PA Initial Intrusive Investigation
3.1 - 2	Preparation of Work Plan Support Documents
	Work Plan
	Sampling and Analysis (SAP) Addendum
	Quality Assurance Project Plan (QAPP) Addendum
3.3	Implementation of PA Work Plan
3.4	Disposal of Investigation Derived Wastes (IDW)
3.5	Data Management/Data Validation
3.6	PA Report
3.7	Surveying and Mapping
Task 4	Optional Tasks
4.1	Vegetation Removal
4.2	Snow Removal
4.3	Road Improvements/Temporary Road Installations

3.0 PROJECT ACTIVITIES

The project activities associated with the planned intrusive activities will be completed in two segments: RI and report writing. This Work Plan (WP) includes all project activities. It contains amendments to the Facility-Wide (FW) Sampling and Analysis Plan (SAP) (SAIC, 2011b). These amendments are included as Appendix A (the FSP Addendum) and Appendix B (the FW QAPP Addendum). In addition, a Site Safety and Health Plan (SSHP) Addendum is provided as Appendix C and an MEC/Anomaly Avoidance Plan is included as Appendix D.

3.1 PREMOBILIZATION

Prior to the field investigation, a series of pre-mobilization activities will be undertaken to ensure that all applicable requirements are met. These will include obtaining any necessary notifications to the RVAAP Facility Manager, Ohio EPA, the operating contractor, Vista Technologies, Inc. (Vista) and other stakeholders. In addition, all necessary approvals (e.g., Work Plan) as well as subcontracts and purchase orders for transport, analytical, and other necessary services will be in place.

3.1.1 Utility Clearance

Prior to intrusive sampling, subsurface utilities identified as part of the pre-mobilization will be reviewed during a site walk.

Work around all marked utilities will be conducted with utmost precaution to ensure that no utility lines will be damaged. In case an unmarked utility line is exposed during remediation activities, Prudent will stop work and notify the RVAAP Facility Manager. Work will resume only after Prudent gets a clearance from the RVAAP Facility Manager.

3.1.2 Pre-Field Work Meetings

Pre-field work meetings will be held prior to commencing investigational efforts. These meetings will communicate project expectations and requirements to ensure that all stakeholders understand their roles, responsibilities, and interactions with others. These meetings will be conducted by the Prudent Technical Project Manager.

3.2 MOBILIZATION AND SITE PREPARATION

Sampling personnel will be mobilized once during the implementation of this project. All applicable requirements will be met prior to commencing work activities.

Mobilization and site preparation will include, but not limited to, the following:

- Verify utility layout,
- Coordinate site security with Post 1,
- Set up controlled access to the job site,
- Review the job safety analysis (JSA) with field crews for those activities to be conducted,
- Establish any environmental monitoring operations in accordance with the SSHP Addendum to the Facility-Wide and Health Plan Sections 5.5, 7.0, and 8.0,
- Ensure that all necessary equipment is on site and ready for use,

- Set up an equipment staging area, and
- Set up equipment fueling area.

3.2.1 Temporary Facilities

Temporary facilities, including office space, sanitary facilities, and hand wash stations will be placed at locations designated by the RVAAP Facilities Manager. If any of these temporary facilities use land previously transferred to National Guard Bureau (NGB), approval from Camp Ravenna is required and will be obtained. Communications will include both cell phones and handheld radios. Signs and barricades will be used to identify sampling areas.

3.2.2 Site Security

Site security for the protection of the general public, site workers and site equipment, and materials will be established in accordance with the Prudent SSHP Addendum. Personnel and any subcontractors who will be working at RVAAP will be submitted to the RVAAP Security Staff at least one week in advance. The roster will be updated/maintained on a weekly basis. All personnel approved for entry to the RVAAP will be required to provide government issued identification (i.e., driver's license, passport, etc.) in order to enter. Any personnel working within any of the focus area will also be required to provide documentation of their 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Training and their current 8-hour OSHA HAZWOPER Refresher Training.

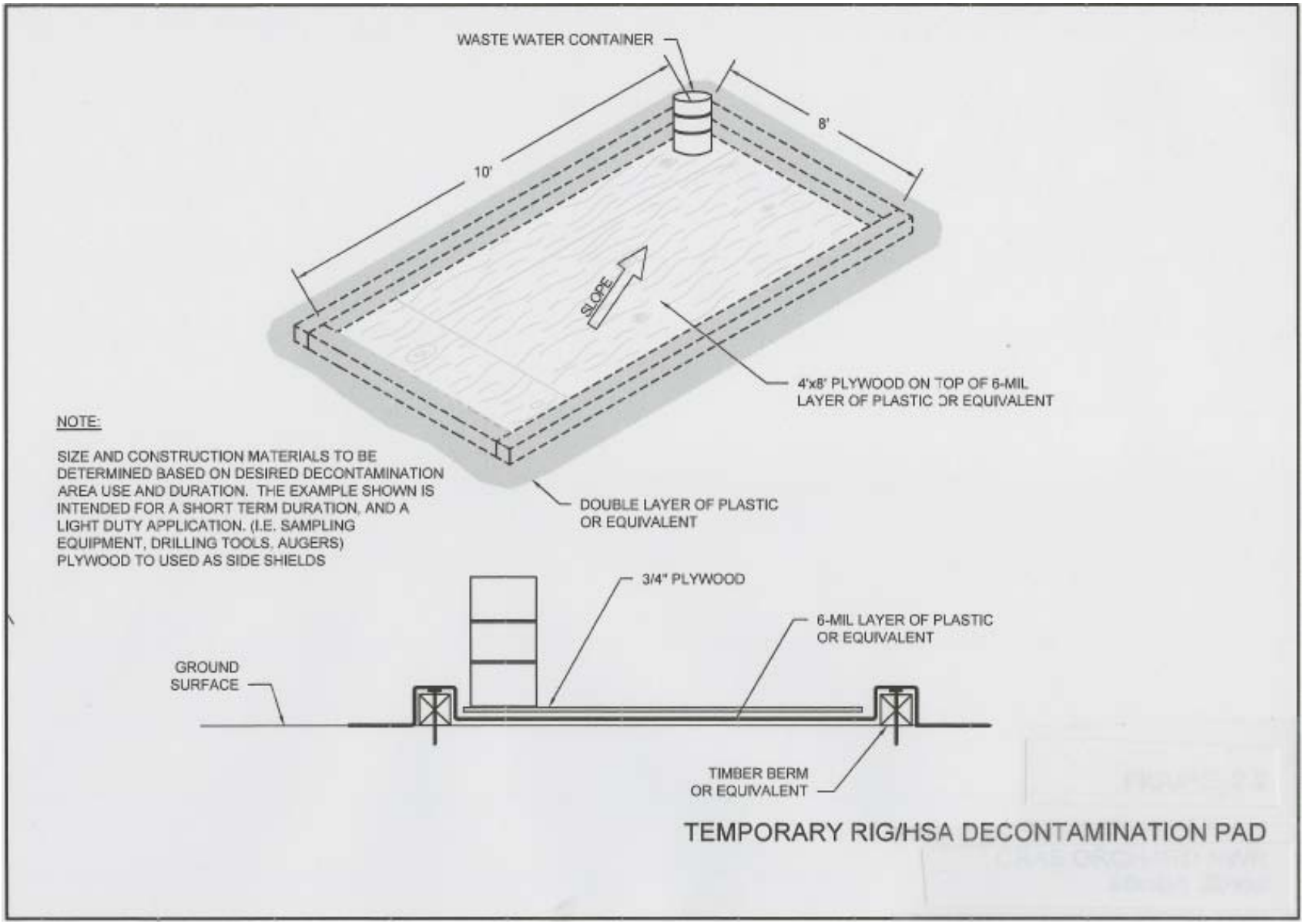
3.2.3 Decontamination

A temporary decontamination area will be constructed to facilitate decontamination of drum removal equipment and other associated equipment and personnel. The location and layout of the field decontamination area will be determined by the Prudent Project Manager and the Site Safety and Health Officer (SSHO). The tentative location of the temporary decontamination pad is shown on Figures 2-1 and 2-2. A schematic of the temporary decontamination pad is provided as Figure 3-1. An additional decontamination area will be located in Building 1036 (or another location determined by the RVAAP Facility Manager) and will be used to decontaminate soil sampling equipment. All sampling equipment will be decontaminated in accordance with the procedures outlined in Sections 5.5.2.8 of the FWSAP. Any exceptions to these procedures are detailed in the FSP Addendum within Appendix A. If the toxicity characteristic leaching procedure (TCLP) results of the drum contents indicate that drum removal and overpacking need to be done by heavy equipment, decontamination of equipment will be conducted per US EPA Region 4 Field Equipment Cleaning and Decontamination. If the TCLP results indicate that drum removal by hand is acceptable, then an area immediately adjacent to the drums will be covered with 1-inch plywood and 0.6-mil plastic and the rusted drums and their contents placed into a new or reconditioned 55-gallon drum. The new or reconditioned drum containing the rusted drum, its contents and soil immediately adjacent to the rusted drum will be rolled over to a pickup truck and rolled into the truck. The new or reconditioned 55-gallon drum(s) containing the rusted drum, its contents, and soil immediately adjacent to it will be disposed of per the results of the TCLP analysis.

3.3 FIELD WORK

Fieldwork will consist of incremental sampling methodology (ISM) surface soil sampling of areas immediately adjacent to the downgradient sides of Debris Piles A and B, within Debris Pile C, and

Figure 3-1: Temporary Decontamination Pad



within the apparent burn area. Subsurface soil ISM sampling will also be conducted within the area of Debris Pile C. Such sampling will extend to rock which is anticipated at a depth of approximately 5 ft. In each ISM surface soil sampling area, 30 aliquots or subsample locations will be laid out in a systematic random manner. In the subsurface ISM sample area, 6 subsample or boring locations will be laid out in a systematic random manner.

Additionally two discrete samples of transite will be collected to determine the ACM content, one from Debris Pile A and another from Debris Pile B for comparison purposes. Debris Pile A has the most exposed transite. Finally, samples of the material within the two rusted 55-gallon drums and subsequent transport/disposal of those drums will be conducted based on the results of the TCLP analyses of the materials within the rusted drums.

Three field days with the Project Manager, Senior and Mid-Level Geologists will be utilized for the field effort. Initially, one day is planned for vegetation removal (via Subcontractor) to allow access to the site, if needed. Vegetation removal will not be performed on the debris piles due the suspected presence of transite. Discrete asbestos sampling will be performed by a Certified Asbestos Inspector. Triplicate ISM sampling of surface soils immediately adjacent to the debris piles will be performed once the asbestos sampling is completed. Both of these operations will require unexploded ordnance (UXO) avoidance support. Because there is much metallic debris anticipated, much of the UXO Technician's work will be visual. Additionally, one volatile organic compounds (VOC) field blank sample will also be collected for quality control purposes.

Sampling of the contents of the two 55-gallon drums will be conducted first to allow determination of TCLP results prior to the field team leaving the facility. Drum sampling and overpacking, if required, will be performed per US EPA SOP #2009 and US EPA-600/2-86-013. Over-packed drums will be temporarily stored adjacent to Building 1036. Subsequently ISM surface soil sampling adjacent to Debris Piles A and B, within Debris Pile C, and the apparent burn area will be conducted. Finally, samples of the transite will be collected to determine ACM content.

All sampling will be performed as per the approved FSP. Within 90 days of the generation of IDW, Prudent will characterize and properly dispose of IDW at approved off-site waste disposal facilities in compliance with applicable Federal, state, and local rules, laws and regulations. Prudent will maintain applicable waste characterization and disposal records, and produce a waste disposal report for submittal to and approval by the Ohio EPA. IDW disposal will be coordinated with the RVAAP Facility Manager and OHARNG.

3.4 SCHEDULE

The current schedule for the subject project is provided as Table 3-1.

Table 3-1: Project Schedule

Task No - Name	Orig Scheduled Completion Date	Actual/Projected Completion Date	Status/ % Complete
0 - Project Management	On Going		
1.0 Contr Identify PM	11 Jun 2010	4 Jun 2010	100
1.1 – Project Management			
Pre Draft PMP	26 Jun 2010	25 Jun 2010	100
Draft PMP	5 Aug 2010	5 Aug 2010	100
Final PMP	9 Oct 2010	9 Oct 2010	100
1.2 – SSHP			
Pre Draft PMP	26 Jun 2010	25 Jun 2010	100
Draft PMP	5 Aug 2010	5 Aug 2010	100
Final PMP	9 Oct 2010	30 Sep 2010	100
1.3-Proj. Mtgs., Monthly Reports, etc	50		
2.1 Conduct Historical Records Review	23 Dec 2010	24 Apr 2011	100
2.2 Historical Records Review Report (HRRR)			
Pre Draft HRRR	21 Dec 2010	15 Dec 2010	100
Draft HRRR	30 Jan2011	11 Feb 2011	100
Final HRRR	5 Apr 2011	14 Apr 2011	100
3.1.a SAP			
Pre Draft SAP	15 May 2011	20 May 2011	100
Draft SAP	24 Jun 2011	10 Aug 2011	80

Final SAP	28 Aug 2011	8 Oct 2011	0
3.1.b QAPP			
Pre Draft QAPP	15 May 2011	20 May 2011	100
Draft QAPP	24 Jun 2011	10 Aug 2011	80
Final QAPP	28 Aug 2011	8 Oct 2011	0
3.2 Work Plan (WP)			
Pre Draft WP	15 May 2011	20 May 2011	100
Draft WP	24 Jun 2011	10 Aug 2011	100
Final WP	28 Aug 2011	21 Oct 2011	100
3.3 Implement Field Work	9 Oct 2011	8 Nov 2011	0
3.4 Dispose of IDW	6 Jan 2012	11 Jan 2012	0
3.5 Data Verification	7 Dec 2011	7 Jan 2012	0
3.6 PA			
Prelim PA	6 Jan 2012	24 Jan 2012	0
Draft PA	15 Feb 2012	2 Mar 2012	0
Final PA	20 Apr 2012	4 May 2012	0

PM = Project Manager
PMP = Project Management Plan
HRRR = Historical Records Review Report
SAP = Sampling and Analysis Plan
WP = Work Plan
QAPP = Quality Assurance Project Plan
PA = Preliminary Assessment

3.5 ANALYTICAL WORK

The sub-contract laboratory will analyze the surface soil ISM samples for one or more of the following parameters: VOCs, semi-volatile organic compounds (SVOCs), target analyte (TAL) metals (including mercury), polychlorinated biphenyls (PCBs), explosives, propellants, and pesticides per the FW QAPP (SAIC 2011b). The specific analytes to which each sample is to be subjected are delineated on Table 3-1 of the Field Sampling Plan. Since there is no analytical information about what is contained in the debris materials, the samples of these materials will be analyzed for chemicals commonly used at the RVAAP. Additionally per the requirements of the FWSAP, a few samples will be analyzed for the RVAAP full suite set of analytes. The transite samples will be analyzed to determine ACM content, and the drum samples will be analyzed to determine their appropriate disposal. Additionally, the work will be conducted with the following enumerations:

- Asbestos content determined as per EPA Method 600/R-93/116 to meet the requirements of 40 CFR Part 763, Subpart E, Appendix E, Section 1 Polarized Light Microscopy.
- Blind triplicate ISM surface soil samples will be used for QC/QA.
- Air-drying and sieving of the surface soil ISM samples will be done. No grinding of the ISM surface soil samples will be conducted.
- Small discrete plugs of soils will be collected near the approximate middle of any ISM sampling areas at a depth of approximately 0.5 feet for VOC analyses.
- Low-level Method 8270 will be utilized for analyses of the SVOCs to achieve lower reporting limits as per the low cleanup goals.
- VOC samples will be prepared from the 40 ml vials by Paragraph 9.3.1.4 of the FW QAPP (SAIC 2011b).

Representative samples of the materials within the 55-gallon drums will be analyzed for full toxicity characteristic leaching procedure (TCLP) parameters, ignitability (Flashpoint), reactivity, and corrosivity (pH) with the intent to assist proper disposal of the drums.

Prudent has secured a USACE approved laboratory that can provide analytical data in the USACE Automatic Data Review (ADR) electronic format. The laboratory selected has been Environmental Laboratory Accreditation Program (ELAP) certified by an accrediting body to perform Department of Defense (DoD) work under the DoD Quality Systems Manual for Environmental Laboratories. Sample data will be provided in electronic data deliverable (EDD) format. The project will utilize the RVAAP library file created by personnel from Prudent and TestAmerica, and will be maintained to accurately reflect the analytical quality and will be provided to both the USACE and the sub-contract laboratory for use in screening EDD submittals. Data review will comply with the procedures outlined in the Louisville Quality System Manual (QSM) Supplement and provide compatibility with data management software, at a minimum, the Environmental Data Management System (EDMS) software. Provisions for analytical data quality (QC/QA) management are provided in section 4.9 of Appendix A and Appendix B.

3.6 DATA MANAGEMENT / DATA VALIDATION

Electronic data submitted by the sub-contract laboratory will be error-free, and in complete agreement with the hardcopy data. Data files will be delivered by e-mail and/or high density CD accompanying the hardcopy data reports.

Working with the sub-contract lab, analytical data will be verified according to the DoD QSM Version 4.1 requirements via ADR. The completed data validation report (prepared by a separate USACE contractor) will be included as an appendix to the final report.

3.7 SURVEYING AND MAPPING

Significant points, not already located in the HRRR, related to the project will be located according to the requirements of the project specific scope of work (SOW), and the facility-wide (FW) SAP, as follows:

- Horizontal Control - accuracy will be within one meter
- Vertical Control - estimated from the facility 2-foot contour interval topographic.

3.8 PA REPORT

Prudent will prepare a PA report that includes findings and investigation results for CC-RVAAP-78 Quarry Pond Surface Dump. At a minimum, the report will include:

- Description of the history and nature of waste handling practices,
- Description of known Hazardous, Toxic, and Radioactive Waste (HTRW) and suspected Military Munitions Response Program (MMRP) issues,
- Description of potential pathways and receptors for HTRW,
- Description of human population and environmental targets,
- Analytical data and results,
- Comparison of analytical results to the most recent facility Clean Up Goals (CUGs),
- Determination of chemicals of potential concern will be ascertained,
- Data Verification Report, and
- Recommendations for further action.
- Comply with the Ravenna Army Ammunition Plan Deliverable Document Format Guidelines, Version 18.0, December 21, 2009

3.9 SITE LOGISTICS AND COORDINATION

During any week in which Prudent personnel (including Prudent subcontractors) are performing site work at RVAAP/Camp Ravenna, a representative will attend the weekly contractor meeting. These meetings are designed to facilitate coordination of various contractor activities occurring at RVAAP/Camp Ravenna and with those of Army or OHARNG activities. All on-site personnel of both Prudent and its subcontractors will have completed 40-hour HAZWOPER training and be current with associated 8-hour refresher training. Prudent and its subcontractors will coordinate its field activities with other subcontractors, the Army, and the OHARNG. All on-site Prudent personnel and associated subcontractors will submit their current copy of HAZWOPER certification to the RVAAP Base Realignment and Closure Division (BRACD) Facility Manager's Office.

Prudent will not perform any site work during weekends when deer or turkey hunts are occurring at Camp Ravenna.

In order to ensure the security and orderly operation of RVAAP/Camp Ravenna, Prudent will follow procedures established by RVAAP/Camp Ravenna, and the facility caretaker contractor regarding access to the facility of contractors, consultants, or visitors. Prudent will notify the facility caretaker contractor at least 24 hours ahead of any deliveries to RVAAP/Camp Ravenna.

Personnel associated with this project will adhere to posted speed limits or default to 35 mph during daylight hours and 25 mph during nighttime hours.

Smoking will be permitted in designated areas of RVAAP/Camp Ravenna and food will be consumed only in designated areas.

Communication among Prudent personnel will be primarily by cell phones, with radios as backup.

Prudent will remove non-hazardous trash brought to or generated at RVAAP/Camp Ravenna during its work. Any manifests for removal of non-RCRA (Resource Conservation and Recovery Act) hazardous waste will be signed by Jim McGee, manager for the facility-operating contractor; and any manifests for removal of RCRA hazardous waste will be signed by Mark Patterson, the BRACD Facility Manager.

3.10 PROJECT RESOURCES

Army Furnished Resources - The Army is providing specified resources to Prudent for investigation and remediation purposes, including:

- Access to Army-maintained records, reports, data, analyses, and information in their current format, i.e., paper copy, electronic, tape, disc, compact disks.
- Access to DoD and Army policy and guidance documents.
- Access and use of the facility sampling building, Bldg 1036, as available, in coordination with other contractors or Army personnel, and as per policies of the facility-operating contractor.

Contractor Furnished Resources - Prudent will provide required expertise, knowledge, equipment and tools needed to meet or exceed the government's objectives delineated in the SOW for this project in accordance with established industry standards.

4.0 ENVIRONMENTAL PROTECTION PLAN

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract will be protected during the entire period of this contract. Prudent will confine its activities to areas defined by this WP.

4.1 PROTECTION OF NATURAL RESOURCES

Prior to the beginning of field operations, Prudent will identify, in consultation with the RVAAP Stakeholders, all land resources to be preserved within the work area. Prudent will not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and landforms without permission from RVAAP Stakeholders.

4.2 PROTECTION OF LANDSCAPE

Trees, shrubs, vines, grasses, landforms, and other landscape features to be preserved will be clearly identified. Except in work areas, trees or shrubs will not be removed, cut, defaced, injured, or destroyed without the permission from RVAAP Stakeholders. A poly liner will protect any areas accessed for the purpose of transporting or transferring wastewater or solid waste materials.

4.3 DISPOSAL OF WASTE

Disposal of waste, trash, and other materials off the project site will be in accordance with all applicable federal, state, and local rules, regulations, and laws and Section 8.0 of the FWSAP.

4.4 DISPOSAL OF HAZARDOUS WASTE

RCRA hazardous wastes that may be generated during performance of the SOW include explosive soil and waste acetone/mixtures from the onsite laboratory. Section 6.1 describes the management procedures for IDW, including wastes generated at the on-site laboratory.

Explosive soil is considered to fall into the MEC category. MEC are defined as follows:

a. UXO, as defined in 10 United States Code (U.S.C.) 2710(e)(9);

b. Discarded military munitions (DMM), as defined in 10 U.S.C. 2710 (e)(2); or

c. Munitions constituents (e.g., TNT, RDX) present in high concentrations to pose an explosive hazard. (28 October 2003 Assistant Chief of Staff for Installation Management (ACSIM) Memorandum) (USACE, 2004). "Pink water" is a listed RCRA hazardous waste, which may be encountered during this project.

With respect to condition c above, soil containing a concentration of secondary explosives, e.g., TNT or RDX, of 10 percent or greater by weight is considered an explosive hazard (USACE, 2007a). Explosive soil is therefore MEC, and it carries the RCRA D003 hazardous waste code for reactivity.

The project is being performed within the CERCLA framework; therefore, compliance with the substantive, not administrative, e.g., permitting, requirements of applicable or relevant and appropriate requirements is necessary. The Director's Final Findings and Orders (DFFOs), Section VI, 9, (a), also states that a hazardous waste facility and installation operation permit is not required for the in-place treatment (destruction) of MEC discovered at the RVAAP that cannot be safely transported to the

RVAAP open detonation area, provided that the Army complies with other applicable hazardous waste requirements.

4.5 PROTECTION OF WATER RESOURCES

Prudent will keep field operations under surveillance, management, and control to avoid pollution of surface and ground waters. Prudent intends to protect streams and wetlands by not disturbing these areas.

4.6 SPILL CONTROL

Special measures will be taken to prevent any chemicals, fuels, oils, greases, waste washings, herbicides, insecticides, rubbish or sewage, and other pollutants from entering RVAAP surface waters. In addition, Prudent will have spill supplies on hand and will respond to any on-site spills in accordance with the facility spill plans.

5.0 PROJECT DOCUMENTATION AND SAMPLE QA/QC

5.1 MONTHLY ACTIVITY REPORTS

Monthly activity reports will be submitted by the fifth of each month in accordance with the SOW.

5.2 SAMPLE HANDLING AND TRACKING

Samples will be prepared, packaged, and shipped in accordance with the FWSAP, Section 7.0. Exceptions to the FWSAP procedures will include:

- All VOC sample containers will be placed in either foam bubble wrap or paper towels to reduce the potential for breakage during shipping.

Sample handling will be in accordance with the FWSAP Section 6.4. The laboratory's chain of custody will be used to document the integrity of all samples collected. A copy of each chain will be forwarded to Prudent's San Antonio office for sample tracking purposes.

5.3 FIELD ACTIVITIES COORDINATION

During the performance of the SOW, field activities will be coordinated on a daily basis with any other onsite contractors. Additionally, weekly updates will be discussed at the RVAAP weekly contractors' meeting with the Facility, OHARNG, and other on-site contractors.

5.4 FIELD AND LABORATORY QA/QC

Triplicate surface ISM samples will be taken to provide an overall evaluation of the total (field sampling + laboratory sample preparation + laboratory analysis) sampling and measurement process (see Hawaii Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan). One triplicate sample will be taken from each debris pile. The results of the triplicate sample analyses will be used to measure the investigation error. The main criterion for this purpose will be the Relative Standard Deviation (RSD) calculated from the triplicate data as follows:

RSD (%) = 100 x (Standard Deviation)/Average

Acceptable RSDs for triplicate surface soil ISM samples are generally within 35 percent.

Geotechnical logging of surface soil materials will be conducted as prescribed in the FWSAP.

6.0 DISPOSITION OF INVESTIGATION-DERIVED WASTE

All IDW, including personal protective equipment, disposable sampling equipment, and decontamination fluids, will be segregated, handled, labeled, characterized, managed, and disposed in accordance with federal, state, and local rules, regulations, and laws, and Section 8.0 of the FWSAP. The waste will be temporarily stored on the east side of Bldg. 1036 pending disposal.

The IDW will be segregated by type of medium and will be containerized as follows:

- Personal protective equipment and disposable sampling equipment will be containerized in Department of Transportation (DOT) approved, 55-gallon steel drums and staged at the temporary waste accumulation area (Building 1036) pending sample analysis.
- Water used to decontaminate large and small equipment will be containerized in poly tanks or DOT-approved drums and staged at the temporary waste accumulation area pending sample and waste characterization analysis.
- Decontamination and extraction fluids including acid, methanol, and acetone will be containerized in poly tanks or DOT-approved drums and staged at the temporary waste accumulation area pending sample and waste characterization analysis.

IDW will be characterized as it is generated. The waste will be sampled for characterization after generation has filled a container with a particular waste stream. The characterization results, classification, and disposition of the IDW will be documented. An IDW Characterization and Disposal Plan, per Paragraph 8.4 of the FWSAP, will present an inventory of all stored IDW, document the analytical results and IDW characterization, and make recommendations for the disposal of all IDW based on facility-wide applicable or relevant and appropriate requirements and contaminant risk-based action levels. The IDW Characterization and Disposal Plan will be submitted to the U.S. Army, the Ohio EPA Division of Emergency and Remedial Response, and the Ohio EPA Division of Solid and Infectious Waste Management and, upon approval, implemented. Characterization, transportation, and disposal of the IDW will comply with federal, state and local rules laws and regulations, as well as the permit requirements for the receiving facility as applicable. In the event environmental sample data indicate that an IDW stream is potentially hazardous, a TCLP sample will be collected for additional characterization purposes. All shipments of IDW off site will be coordinated through the RVAAP Environmental Coordinator. Disposition will be based on the results of the laboratory analyses for the bulk quantity in accordance with all federal, state and local rules, laws and regulations. Labeling of all IDW containers will be in accordance with Section 8.2 of the FWSAP.

7.0 CLEAN UP LEVELS: BACKGROUND CONCENTRATIONS

All results will be compared to facility background levels and the cleanup goals (CUGs) for all the human health risk scenarios contained in the Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plan Ravenna, Ohio (SAIC, 2010). A listing of the of cleanup goals (CUGs) for the National Guard Trainee, the Resident Adult Farmer, and the Resident Child Farmer or the Regional Screening Level (RSL), where no CUGs are in place, is provided in Table 7-1 below.

Table 7-1: Facility-Wide Surface Soil Clean-Up Goals

Chemical	Units	Criterion To Be a Chemical of Potential Concern	National Guard Trainee Surface Soil CUG		Background	Resident Farmer Adult Surface Soil CUG		Resident Farmer Child Surface Soil CUG		RSL for Chemicals w/No CUG
			Non-Cancer HI = 1	Cancer Risk = 10^{-5}		Non-Cancer HI = 1	Cancer Risk = 10^{-5}	Non-Cancer HI = 1	Cancer Risk = 10^{-5}	10^{-5} or HI =1
Inorganics										
Aluminum	mg/kg	34,960	34,960	*	19,500	529,229	*	73,798	*	
Antimony	mg/kg	136	1,753	*	0.96	136	*	28.2	*	
Arsenic	mg/kg	19.8	1,140	27.8	19.8	82.1	4.25	20.2	5.24	
Barium	mg/kg	3,506	3,506	*	124.0	89,656	*	14,129	*	
Beryllium	mg/kg	160			0.88					160
Cadmium	mg/kg	109	3,292	109	0	223	12,491	64.1	26,767	
Chromium (as Cr-3)	mg/kg	196,942	1,000,000	*	27.2	196,942	*	81,473	*	
Chromium, hexavalent	mg/kg	16.4	56.1	16.4	*	904	1,874	199	4,015	
Cobalt	mg/kg	70.3	140	70.3	23.2	8,198	8,030	1,313	17,207	
Copper	mg/kg	27,138	253,680	*	32.2	27,138	*	3,106	*	
Lead	mg/kg	4,000			19.1					4,000
Manganese	mg/kg	1,450	351	*	1,450	14,817	*	2,927	*	
Mercury	mg/kg	165	1,722	*	0.044	165	*	22.7	*	
Nickel	mg/kg	13,463	126,391	*	60.7	13,463	*	1,552	*	
Nitrate	mg/kg	1,000,000	1,000,000	*	*	1,000,000	*	124,868	*	
Selenium	mg/kg	390			1.5					390
Silver	mg/kg	3,240	31,049	*	0	3,240	*	386	*	
Thallium	mg/kg	47.6	477	*	0.91	47.6	*	6.12	*	
Vanadium	mg/kg	1,558	23,045	*	37.6	1,558	*	449	*	
Zinc	mg/kg	196,589	1,000,000	*	93.3	196,589	*	23,209	*	

Table 7-1 Continued

Chemical	Units	Criterion To Be a Chemical of Potential Concern	National Guard Trainee Surface Soil CUG Non-Cancer HI = 1	National Guard Trainee Surface Soil CUG Cancer Risk = 10^{-5}	Background	Resident Farmer Adult Surface Soil CUG Non-Cancer HI = 1	Resident Farmer Adult Surface Soil CUG Cancer Risk = 10^{-5}	Resident Farmer Child Surface Soil CUG Non-Cancer HI = 1	Resident Farmer Child Surface Soil CUG Cancer Risk = 10^{-5}	RSL for Chemicals w/No CUG 10^{-5} or HI =1
Explosives - Propellants										
1,3,5 Trintrobenzene	mg/kg	15,280	165,422	*	*	15,280	*	2252	*	
1,3 Dinitrobenzene	mg/kg	59.4	596.0	*	*	59.4	*	7.65	*	
2,4,6 Trinitrotoluene	mg/kg	211	2,488	4,643	*	211	328	36.5	284	
2,4 Dinitrotoluene	mg/kg	7.53	6,519	134	*	439	7.53	128	11	
2,6 Dinitrotoluene	mg/kg	7.69	3,309	136	*	224	7.69	64.2	11	
2-Amino-4,6 Dinitrotoluene	mg/kg	128	1,237	*	*	128	*	15.4	*	
4-Amino-2,6-dinitrotoluene	mg/kg	128	1,237	*	*	128	*	15.4	*	
Nitrobenzene	mg/kg	48					48			
2 Nitrotoluene	mg/kg	60.3	59,611	726	*	5,945	60.3	765	38.8	
3 Nitrotolueme	mg/kg	6.1								6.1
4 Nitrotoluene	mg/kg	816	59,611	9,818	*	5,945	816	765	525	
HMX	mg/kg	19,090	234,645	*	*	19,090	*	3594	*	
RDX	mg/kg	1,452	17,113	1,452	*	1,632	*	227	80.3	
Tetryl	mg/kg	240								240
Nitroguanadine	mg/kg	6,100								6,100
Nitroglycerin	mg/kg	816	*	9,818	*	*	816	*	525	
Asbestos Conatining Material										
Asbestos		The threshold for asbestos in soil to be considered ACM in previous RVAAP projects is >1% Polarized Light Microscopy.								

RSL = Regional Screening Levels
CUG = Cleanup Goal
HI = Hazard Index
PCBs = Polychlorinated Biphenyls
* = Does not exist

Table 7-1 Continued

Chemical	Units	Criterion To Be a Chemical of Potential Concern	National Guard Trainee Surface Soil CUG		Resident Farmer Adult Surface Soil CUG		Resident Farmer Child Surface Soil CUG		Region 9 2008 for COCs w/No CUG	RSL for COCs w/No CUG
			Non-Cancer HI = 1	Cancer Risk = 10^{-5}	Non-Cancer HI = 1	Cancer Risk = 10^{-5}	Non-Cancer HI = 1	Cancer Risk = 10^{-5}	10^{-5} or HI =1	10^{-5} or HI =1
Semi-Volatiles										
2 Methylnaphtalene	mg/kg	2,378	23,845	*	2,378	*	306	*		
4 Chloro-3-methylphenol	mg/kg	*	*	*	*	*	*	*		
4 Nitrophenol	mg/kg	4,756	47,689	*	4,756	*	612	*		
Benzo(a) anthracene	mg/kg	2.21	*	47.7	*	2.21	*	6.5		
Benzo(a) pyrene	mg/kg	0.221	*	4.77	*	0.221	*	0.650		
Benzo(b) fluoranthene	mg/kg	2.21	*	4.77	*	2.21	*	6.50		
Benzo(k) fluoranthene	mg/kg	22.1	*	477	*	22.1	*	65.0		
Bis(2-chloroethoxy)methane	mg/kg	1,783	17,883	*	1,783	*	230.0	*		
Carbazole	mg/kg	694	*	8,346	*	694	*	446		
Chrysene	mg/kg	221	*	4,774	*	221	*	650		
Dibenz(a,h) anthracene	mg/kg	0.221	*	4.77	*	0.221	*	0.650		
Dibenzofuran	mg/kg	1,189	11,922	*	1,189	*	153.0	*		
Fluoranthene	mg/kg	2,765	50,868	*	2,765	*	1,627.0	*		
Fluorene	mg/kg	7,366	114,583	*	7,366	*	2,433.0	*		
Indeno(1,2,3-cd) pyrene	mg/kg	2.21	*	47.7	*	2.21	*	6.50		
N-Nitroso-di-n-propylamine	mg/kg	1.27	*	19	*	1.27	*	1.20		
Naphthalene	mg/kg	3,678	15,407	*	3,678	*	1,215.0	*		
Pentachlorophenol	mg/kg	21.2	56,558	440	3,269	21.2	1,514.0	49.1		
Pyrene	mg/kg	2,074	38,151	*	2,074	*	1,220.0	*		
1,2,4 Trichlorobenzene	mg/kg	220								220
1,2 Dichlorobenzene	mg/kg	1,900								1,900
1,3 Dichlorobenzene	mg/kg	530							530	
1,4 Dichlorobenzene	mg/kg	24								24
2,4,5 Trichlorophenol	mg/kg	6,100								6,100
2,4,6 Trichlorophenol	mg/kg	440								440
2,4 Dichlorophenol	mg/kg	180								180
2,4 Dimethylphenol	mg/kg	1,200								1,200
2,4 Dinitrophenol	mg/kg	120								120
2,4 Dinitrotoluene	mg/kg	16								16
2,6 Dinitrotoluene	mg/kg	61								61
2 Chloronaphthalene	mg/kg	6,300								6,300
2 Chlorophenol	mg/kg	390								390
2 Methylphenol	mg/kg	3,100							3100	
2 Nitroaniline	mg/kg	6,100								6,100
3,3 Dichlorobenzidine	mg/kg	11								11
4 Nitroaniline	mg/kg	240								240
Acenaphthene	mg/kg	3,400								3,400
Anthracene	mg/kg	22,000								22,000
Benzo(g,h) perylene	mg/kg	62							62	
Benzoic acid	mg/kg	240,000								240,000
Benzyl alcohol	mg/kg	6,100								6,100
Bis(2-chloroisopropyl) ether	mg/kg	29							29	
Bis(2-chloroethyl) ether	mg/kg	2								2.1
Bis(2-ethylhexyl)phthalate	mg/kg	35								35
Butylbenzylphthalate	mg/kg	2,600								2,600
Di-n-butylphtalate	mg/kg	6,100								6,100
Di-n-octylphthlalate	mg/kg	2,400							2400	
Diethylphtalate	mg/kg	49,000								49,000
Dimethylphthalate	mg/kg	610,000							610000	
Hexachlorobenzene	mg/kg	3								3
Hexachlorobutadiene	mg/kg	62								62
Hexachlorocyclopentadiene	mg/kg	370							370	
Hexachoroethane	mg/kg	350								350
Isophorone	mg/kg	5,100								5,100
n-Nitroso-diphenylamine	mg/kg	990							990	
Nitrobenzene	mg/kg	48								48
Phenanthrene	mg/kg	2,300							2300	
Phenol	mg/kg	18,000								18,000

Table 7-1 Continued

Chemical	Units	Criterion To Be a Chemical of Potential Concern	National Guard Trainee Surface Soil CUG		Resident Farmer Adult Surface Soil CUG		Resident Farmer Child Surface Soil CUG		Region 9 2008 for COCs w/No CUG	RSL for COCs w/No CUG
			Non-Cancer HI = 1	Cancer Risk = 10^{-5}	Non-Cancer HI = 1	Cancer Risk = 10^{-5}	Non-Cancer HI = 1	Cancer Risk = 10^{-5}	10^{-5} or HI =1	10^{-5} or HI =1
PESTICIDES & PCBs										
4,4-DDE	mg/kg	40.8	*	491	*	40.8	*	26.3		
Aldrin	mg/kg	0.8	179	7.88	17.8	0.816	2.3	0.525		
Dieldrin	mg/kg	0.9	298	8.39	29.7	0.867	3.83	0.558		
Endrin	mg/kg	17.7	330	*	17.7	*	11.2	*		
Endrin aldehyde	mg/kg	0.0	*	*	*	*	*	*		
Heptachlor	mg/kg	3.1	2,981	29.8	297	3.08	38.3	0.558		
Heptachlor epoxide	mg/kg	1.5	77.5	14.8	7.73	1.52	0.995	0.981		
PCB-1016	mg/kg	2.0	192	34.6	12.2	2.03	4.19	3.49		
PCB-1248	mg/kg	2.0	*	34.6	*	2.03	*	3.49		
PCB-1254	mg/kg	2.0	54.9	34.6	3.48	2.03	1.20	3.49		
PCB-1260	mg/kg	2.0	*	34.6	*	2.03	*	3.49		
alpha-Chlordane	mg/kg	0.0	*	*	*	*	*	*		
beta-BHC	mg/kg	7.7	*	74.2	*	7.7	*	4.96		
gamma-Chlordane	mg/kg	0.0	*	*	*	*	*	*		
Alpha-BHC	mg/kg	0.9							0.9	
Endosulfan I	mg/kg	370							370	
Endosulfan II	mg/kg	370							370	
4,4-DDD	mg/kg	20								20
Endosulfan sulfate	mg/kg	370							370	
4,4-DDT	mg/kg	17								17
Methoxychlor	mg/kg	310								310
Endrin ketone	mg/kg	18							18	
Gamma-chlordane	mg/kg	16							16	
Toxaphene	mg/kg	4.4							4.4	
PCB-1221	mg/kg	1.4								1.4
PCB-1232	mg/kg	1.4								1.4
PCB-1242	mg/kg	2.2								2.2

RSL = Regional Screening Levels HI = Hazard Index * = Does not exist
CUG = Cleanup Goal PCBs = Polychlorinated Biphenyls

Table 7-1 Continued

Chemical	Units	Criterion To Be a Chemical of Potential Concern	Region 9 2008 for COCs w/No CUG 10^{-5} or HI =1	RSL for COCs w/No CUG 10^{-5} or HI =1
Volatiles				
1,1,1 Trichloroethane	mg/kg	8700		8700
1,1,2,2 Tetrachloroethane	mg/kg	5.6		5.6
1,1,2 Trichloroethane	mg/kg	11		11
1,1 Dichloroethane	mg/kg	33		33
1,1 Dichloroethene	mg/kg	120	120	
1,2 Dibromoethane	mg/kg	0.34		0.34
1,2 Dichloroethane	mg/kg	4.3		4.3
1,2 Dichloroethene (total)	mg/kg	700		700
1,2 Dichloropropane	mg/kg	8.8		8.8
2 Butanone	mg/kg	22000	22000	
2 Hexanone	mg/kg	210		210
4 Methyl-2-pentanone	mg/kg	5300	5300	
Acetone	mg/kg	61000		61000
Benzene	mg/kg	11		11
Bromochloromethane	mg/kg	8.2	8.2	
Bromodichloromethane	mg/kg	2.7		2.7
Bromoform	mg/kg	610		610
Bromomethane	mg/kg	7.3		7.3
Carbon disulfide	mg/kg	820		820
Carbon tetrachloride	mg/kg	6.1		6.1
Chlorobenzene	mg/kg	290		290
Chloroethane	mg/kg	30	30	
Chloroform	mg/kg	2.9		2.9
Chloromethane	mg/kg	120		120
Cis-1,3-dichloropropene	mg/kg	17		17
Dibromochloromethane	mg/kg	6.8		6.8
Ethyl benzene	mg/kg	54		54
Methylene chloride	mg/kg	110		110
Styrene	mg/kg	6300		6300
Tetrachloroethene	mg/kg	4.8	4.8	
Toluene	mg/kg	5000		5000
Trans-1,3-dichloropropene	mg/kg	17		17
Trichloroethene	mg/kg	0.53	0.53	
Vinyl chloride	mg/kg	0.6		0.6
Xylenes (total)	mg/kg	630		630

RSL = Regional Screening Levels HI = Hazard Index * = Does not exist
CUG = Cleanup Goal PCBs = Polychlorinated Biphenyls

8.0 DELIVERABLES

Discussion of the number of deliverables and their distribution and approval requirements is provided in Paragraph 5 of Prudent's Project Management Plan.

9.0 REFERENCES

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Appendix A – Field Sampling Plan Addendum to the Facility-Wide Sampling and Analysis Plan

Final Field Sampling Plan Addendum for 2010 Preliminary Assessment Compliance Restoration Site CC RVAAP-78 Quarry Pond Surface Dump

Ravenna Army Ammunition Plant
Ravenna, Ohio

Contract No. W912QR-10-P-0052

US Army Corps of Engineers®

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October 24, 2011

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos Containing Material
ADR	Automated Data Review
AOC	Area of Concern
APA	Abbreviated Preliminary Assessment
Camp Ravenna	Camp Ravenna Joint Military Training Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Contracting Officer
COR	Contracting Officer Representative
CQAP	Contractor Quality Assurance Plan
CR	Compliance Restoration
CSM	Conceptual Site Model
DQO	Data Quality Objective
DU	Decision Unit
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
FWSAP	Facility-Wide Sampling and Analysis Plan
GPS	Global Positioning System
IDW	Investigation-Derived Waste
IRP	Installation Restoration Program
ISM	Incremental Sampling Methodology
MC	Munitions of Concern
MEC	Munitions of Explosive Concern
NVLAP	National Voluntary Laboratory Accreditation Program
OHARNG	Ohio Army National Guard
OSHA	Occupational Safety & Health Administration
PCB	Polychlorinated Biphenyl
PMP	Project Management Plan
PPE	Personal Protective Equipment
Prudent	Prudent Technologies, Inc.
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SOW	Scope of Work
SVOC	Semi-volatile Organic Compound
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
USACE	United States Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion & Preventive Medicine
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound

1.0 –PROJECT DESCRIPTION

This Field Sampling Plan (FSP) addendum addresses supplemental project-specific information in relation to the revised Facility-Wide Sampling and Analysis Plan (FWSAP) for the Ravenna Army Ammunition Plant (RVAAP) (SAIC, 2011b). This FSP is an Appendix to the Work Plan (WP) that describes the project for the surface soil sampling immediately adjacent to debris piles, surface soil sampling of an apparent former burn area, drum sampling, and drum removal.

This investigation will be performed in the appropriate level of personal protective equipment (PPE), when handling potentially contaminated materials. If one of several action levels is exceeded or the potential for increased risk becomes apparent during the investigation, protective procedures, including protective clothing, will be upgraded as necessary by the Site Safety & Health Officer (SSHO).

1.1 Purpose And Scope

Environmental work at the RVAAP under the Installation Restoration Program (IRP) began in earnest in 1995, with 32 environmental Areas of Concern (AOCs) identified and prioritized according to U.S. Army Center for Health Promotion & Preventive Medicine (USACHPPM) relative risk protocols into high, medium, and low priority AOCs. Environmental restoration work has proceeded primarily by addressing the highest priority sites first, with sites of medium and low priority receiving attention later. In 2000, the number of environmental AOCs was increased from 32 to 51. Relative risk ranking was again performed to prioritize those additional environmental AOCs. The area identified for investigation for this project is Compliance Restoration (CR) Site CC RVAAP-78 Quarry Pond Surface Dump.

The above site is considered to potentially have munitions and explosives of concern (MEC). The following section provides a brief description of the site.

CC RVAAP-78, Quarry Pond Surface Dump

The Quarry Pond Surface Dump consists of former dumping areas at the bases of two steeply inclined rock slopes and another dump area northwest of the northern-most pond. The surface dumps are located northwest and northeast of the northern-most quarry pond within the Fuze and Booster Quarry Landfill/Pond (RVAAP-16) AOC. The Fuze and Booster Quarry (FBQ) was used as an explosive contaminated sawdust burning area for Load Lines 6 and 11 from 1945-1949. In 1976, settling ponds were constructed, separated by earthen dams, with flow control gates for treating the spent brine regenerant and sand filtration backwash water from the Water Works 3 treatment plant that treated groundwater from facility production wells (1976-1993). Historical operational information indicated fuze and booster assemblies, projectiles, residual ash, and sanitary wastes were burned or dumped in the quarry prior to pond construction. In 1976, debris was removed from the quarry bottom and transferred to the Ramsdell Quarry Landfill (RQL) or one of the other burning grounds. In 1998, the RVAAP-16 AOC was expanded to include the quarry vicinity, the 11 former settling ponds/depressions and drainage conveyances, and a debris pile north of the quarry.

The Quarry Pond Surface Dump is located in the western part of the Installation, east of the intersection between South Patrol Road and Greenleaf Road. The site consists of areas of former dumping at the bases of steeply inclined rock slopes. The surface dumps, referenced as Debris Piles A, B, and C on Figures 1-1 and 1-2, are located north, northwest and northeast of the northern-most quarry pond within the Fuze and Booster Quarry Landfill/Ponds (RVAAP-16) AOC. Debris Pile A is approximately 425 feet in length and 18 to 68 feet wide and is suspected of containing asbestos containing material (ACM), construction debris,

scrap metal, and unidentified materials. A second, smaller debris pile at the base of a steeply inclined rock slope, defined as Debris Pile B, is approximately 296 feet in length and 24 feet wide. An apparent burn area is located near a rusted, 55-gallon drum, both of which are within Debris Pile B. The apparent burn area is characterized by ground charring and lack of vegetation. The topographic map of this area, (see Figure 1-2), shows that the south end of Debris Pile A becomes one continuous slope from Reference Point 9b of Debris Pile A to Reference Point 3 of Debris Pile B (see Figure 1-1). Debris Pile C is located along the northwestern corner of the northern-most quarry pond area with the debris area being approximately 120 feet by 45 feet. A second rusted 55-gallon drum is present within this area. Table 1-1 lists Global Positioning System (GPS) Ohio State Plane coordinates of locations where observations were made during the site reconnaissance, monitoring wells, and the two 55-gallon drums.

Table 1-1: Latitude/Longitude from RVAAP CC-78 Site Reconnaissance

Reference #	Latitude	Longitude
CC-78 GPS Points		
1	41.1796	-81.1128
2	41.1794	-80.1128
3	41.1792	-81.1128
4	41.1797	-81.1129
6	41.1799	-81.1131
8	41.1801	-81.1124
10	41.1797	-81.1121
5a	41.1797	-81.1137
5b	41.1798	-81.1134
7a	41.1801	-81.1129
7b	41.1801	-81.1123
9a	41.1800	-81.1124
9b	41.1795	-81.1126
Ground Water Monitoring Wells FBQ		
171	41.1796	-81.1138
173	41.1803	-81.1124
174	41.1793	-81.1130
175	41.1789	-81.1130
55-Gallon Drum		
55-Gallon Drum 1	41.1796	-81.1136
55-Gallon Drum 2	41.1796	-81.1128

1.2 Work To Be Performed

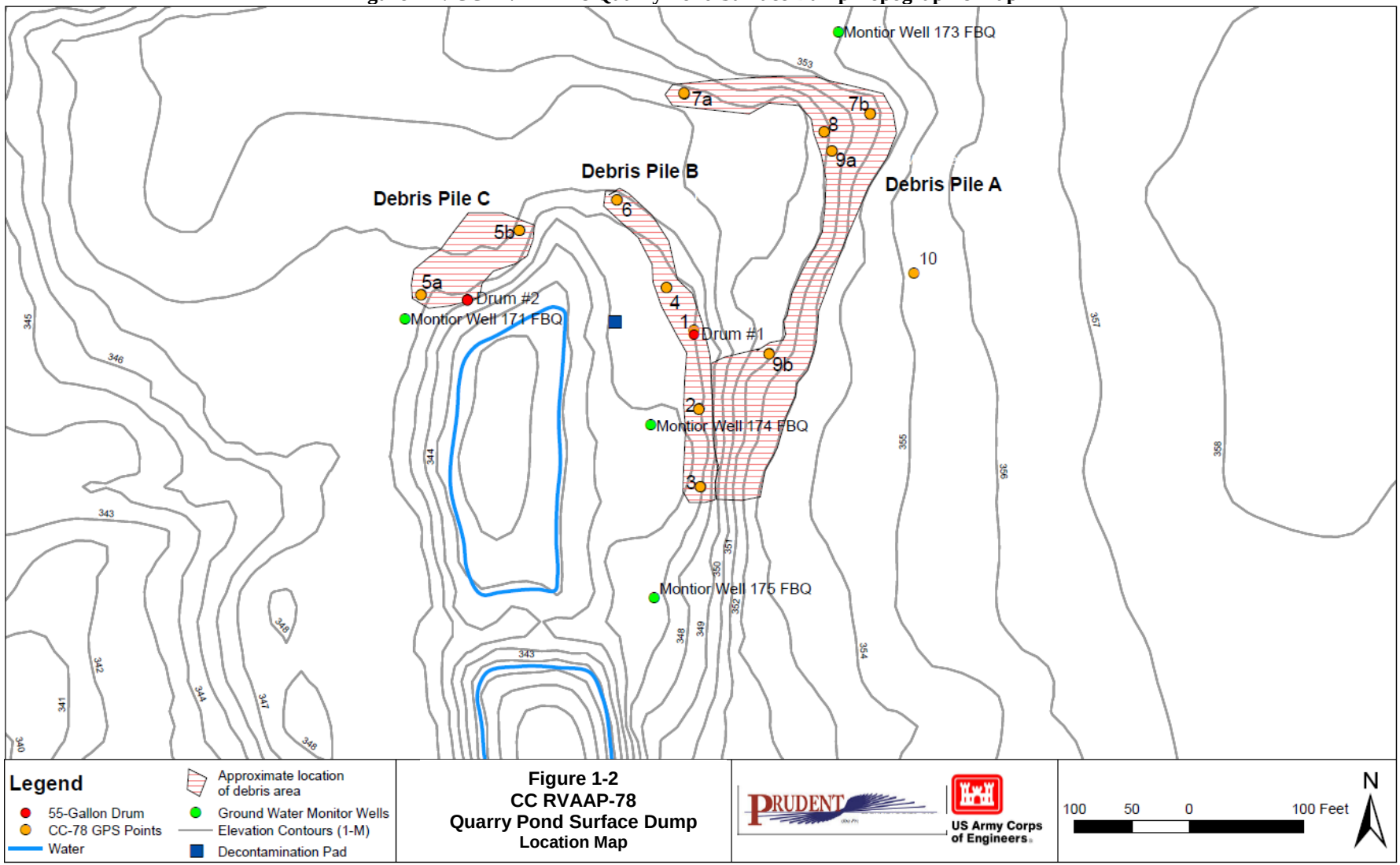
The Phase I RI for AOC CC RVAAP-78 will include an initial intrusive investigation of possible impacts to the applicable media to confirm the presence or absence of contaminants.

Limited surface soil sampling will be conducted and the results compared with cleanup goals, as prescribed in the Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals (USACE 2009), to determine chemicals of potential concern (COPCs). As per the limited scope of a Phase I Remedial Investigation (Preliminary Assessment), no sampling of groundwater is provided within this project. However, brief summaries of existing related surface and groundwater data will be presented. MEC avoidance procedures will be needed during intrusive investigations.

This FSP Addendum is a supplement to the 2011 FWSAP for RVAAP (SAIC, 2011b). The FWSAP provides the base documentation (i.e., technical and investigative protocols) for conducting a remedial

Figure 1-1: CC RVAAP-78 Quarry Pond Surface Dump Location Map

Figure 1-2: CC RVAAP-78 Quarry Pond Surface Dump Topographic Map



investigation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at RVAAP.

1.3 Site Description And Background

The site description and background information are contained in Section 1.1. Additional information regarding the climatic conditions, geologic setting, hydrologic setting, and ecological setting are contained in Section 1.0 of the FWSAP. An aerial view and a topographic map of the sampling area are shown below (Figures 1-1 and 1-2).

1.4 Specific Sampling And Analysis Problems

The area identified for investigation for this project is CR Site CC-RVAAP-78 Quarry Pond Surface Dump.

Sampling at the nearby Fuse and Booster Quarry AOC and the presence of transite (cement board with various amounts of asbestos fiber, 12 to 50 percent) in the debris piles indicate the possibility of encountering explosives, metals, and ACM at the Quarry Pond Surface Dumps.

1.5 Scope And Objectives

The scope of this investigation is to determine if there is surface soil contamination immediately adjacent to the three Quarry Pond Surface Dump sites (CC-RVAAP-78), determine if there is surface soil contamination within the apparent burn area, and characterize the contents within the two rusted 55-gallon drums and remove them according to appropriate provisions. Additionally, two samples of exposed transite, one from Debris Piles A and one from Debris Pile B will be assessed.

1.6 Sampling

1.6.1 Surface Sampling

Incremental Sampling Methodology (ISM) surface soil sampling for all analyzes except volatile organic compounds (VOCs); analyses and discrete surface soil sampling for VOCs will be collected at the areas described above. All such sampling will be conducted in accordance with the FWSAP (SAIC, 2011b).

1.6.2 Subsurface Sampling

Incremental Sampling Methodology (ISM) subsurface soil sampling (horizontal and vertical) for all analyzes will be collected within the area of Debris Pile C. All such sampling will be conducted in accordance with Section 4.4.

1.6.3 Drum Sampling

Discrete samples of the contents of the two drums will be collected, as described in Section 4.6, and analyzed to determine the RCRA characteristics for proper disposal. The two 55-gallon drums are extremely rusted with openings in their ends and sides. They are partially buried and their contents are solid. Leather gloves will be worn when accessing the rusted drums. Unused nitrile gloves will be used when sampling the drum contents

2.0 – PROJECT ORGANIZATION & RESPONSIBILITIES

Section 2.0 of the FWSAP describes the project organization and responsibilities. This information is also contained in Section 4.0 of Prudent Technologies, Inc. (Prudent) Project Management Plan (PMP).

2.1 Project Organization, Roles, and Responsibilities

Prudent is responsible for the execution of this project. The project team is shown in Figure 2-1. The project team organizational chart displays the management and technical roles for this project, as well as the personnel assigned to those roles. Prudent will utilize a two-tiered project management structure for execution of this project. The Program Manager will service all contractual elements and the Project Manager will be responsible for all technical work.

Program Manager - The Prudent Program Manager (Prakash Raja, CHMM) will be the principal point of contact for all matters relating to the USACE Contracting Officer (CO) or the CO Representative (COR). The Program Manager will ensure that the necessary resources will be made available to the Project Manager for execution of the work. The Program Manager reports directly to the President of the firm on the competent execution and the satisfaction of customer and project stakeholders with Prudent's performance. Any changes in the Statement of Work (SOW), schedule, and/or costs, which require action by Prudent with the CO or COR, will be handled exclusively by the Program Manager supported by the Project Manager and other key personnel as needed.

Project Manager - The Prudent Project Manager (John P. Jent, PE) will serve as the single point of contact and liaison for all technical work, executing the SOW in compliance with the required schedule. Day-to-day technical activities will be managed by the Project Manager with support from field and other key personnel. The Project Manager has full authorization to stop work if unsafe work conditions develop and to demand corrective action for non-compliance with the SSHP/Addendum.

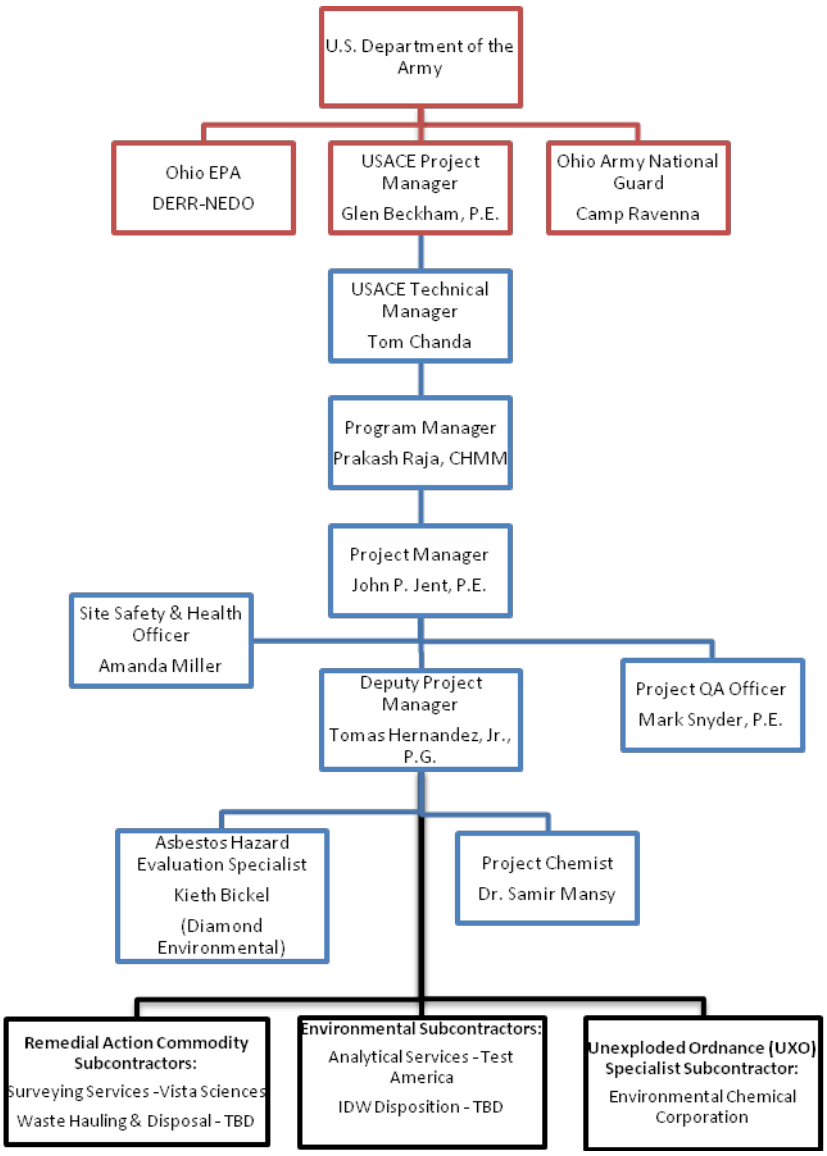
Deputy Project Manager - The Prudent Deputy Project Manager (Tomas Hernandez, Jr., PG) will assist the Project Manager in ensuring project execution in accordance with the contract and regulatory requirements. The Deputy Project Manager will serve as the project scheduler and site supervisor during investigative fieldwork. The Deputy Project Manager has full authorization to stop work if unsafe work conditions develop and to demand corrective action for non-compliance with the SSHP/Addendum.

Project Quality Assurance Officer - The Prudent Project Quality Assurance Officer (Mark Snyder, PE) will be the principal officer ensuring that the quality of all products adhere to the requirements of the Contractor Quality Assurance Plan (CQAP).

Project Chemist - The Prudent Project Chemist (Dr. Samir Mansy) will be responsible for preparing the project QAPP, coordination with the analytical lab, and data verification per the automated data review (ADR) software.

SSHO - The Prudent Project Site Safety and Health Officer (Amanda Miller.) will prepare the project SSHP/Addendum for the necessary site work. The SSHO, or his representative, is responsible for implementation of the Site Safety and Health Plan (SSHP) and conducts site inspections to ensure compliance with Federal, State, and Occupational Safety & Health Administration (OSHA) regulations and all aspect of the SSHP/Addendum including activity hazard analyses, air monitoring, use of PPE,

Figure 2-1 Project Organizational Chart



decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, and spill containment program. The SSHO ensures all personnel are properly trained for their assigned tasks. The SSHO has full authorization to stop work if unsafe work conditions develop and to demand corrective action for non-compliance with the SSHP/Addendum.

Unexploded Ordnance (UXO) Technician Level 3 will be on-site during all field activity. The UXO technician will be subcontracted for each field activity.

2.2 Subcontractor Management

Prudent will implement this project using contractors for asbestos sampling, surveying, chemical laboratory services, drum removal, and waste removal services. Subcontracts will be carefully developed

by the Project Manager to reflect detailed scope and realistic performance objectives and specifications. Performance of all subcontractors will be monitored by the Project Manager, the Investigation Site Supervisor, the Remediation Site Supervisor, and the SSHO who will record observations of progress. Deviations will be addressed in accordance with the protocols specified in the relevant Work Plan(s). Negative performance trends will instigate a negative performance evaluation and a correction action plan will be developed as required to bring schedule/cost performance back in line.

3.0 –SCOPE & OBJECTIVES

3.1 Scope And Objectives

The scope of this investigation is to determine if there is surface soil contamination immediately adjacent to the three Quarry Pond Surface Dump sites (CC-RVAAP-78), determine if there is surface soil contamination within the apparent burn area, and characterize the contents within the two rusted 55-gallon drums. Additionally, two samples of exposed transite at Debris Piles A and B will be assessed.

3.2 Data Quality Objectives

The overall project data quality objective (DQO) is to provide representative, repeatable, high quality data to estimate the average values of contamination within the surface soils adjacent to the debris piles, within the apparent burn area, and within the two 55-gallon drums.

3.2.1 Conceptual Site Model

The facility-wide conceptual site model (CSM) for RVAAP, presented in the FWSAP, is applicable to Site CC-78 based on current knowledge.

3.2.2 Define the Problem

Currently it is unknown if contamination within the debris piles (if any) has migrated to surface soils adjacent to the piles. Also it is not known if there is environmental contamination within the apparent burn area and two 55-gallon drums. Additionally, it is not known what percentage of ACM (if any) is contained within the transite materials.

3.2.3 Remedial Action Objectives

Remedial action objectives are provided in the Facility-Wide Human Health Cleanup Goals for the RVAAP, Ravenna, Ohio (SAIC 2010).

3.2.4 Identify Decisions

If chemicals of potential concern are indicated based on the results of the chemical analyses, then additional phases of the CERCLA process will be conducted.

3.2.5 Define the Study Boundaries

The study boundaries constitute the surface soils adjacent to the three debris piles, the surface soil within the apparent burn area, and the contents within the two rusted 55-gallon drums.

3.2.6 Identify Decision Rules

Results of the chemical analyses will be compared to the Facility-Wide Human Health Cleanup Goals for the RVAAP, Ravenna, Ohio (SAIC 2010).

3.2.7 Identify Inputs to the Decisions

Inputs to the decision process are the analytical results of the samples collected in this investigation.

3.2.8 Specify Limits on the Decision Error

Limits on decision errors are addressed in Section 4.2.8 of the FWSAP.

3.2.9 Sample Design

Surface soil samples will be collected as described in the FWSAP and Section 4.5 herein, and drum samples will be collected as described in Section 4.6.

The surface soil (ISM) samples will be collected adjacent to Debris Piles A and B, from within Debris Pile C, and from within the apparent burn area adjacent to Debris Pile B. Additionally two samples of exposed apparent transite will be collected. Composite samples of the contents from within the two 55-gallon drums will also be taken and subjected to the toxicity characteristic leaching procedure (TCLP).

A summary table of the planned surface ISM and drum sampling is provided as Table 3-1.

A sampling ID table for the planned surface soil, transite, and drum sampling is provided as Table 3-2. Eight surface soil ISM samples, six discrete surface soil samples, eight (two horizontal and six vertical) subsurface soil ISM samples, two small samples of transite, and two samples of the 55-gallon drum contents will be collected, per Table 3-2. Table 3-3 lists the subsurface ISM sampling sample IDs.

Table 3-1: Sampling Table for CC-RVAAP 78

Area of Sample	Media	Type of Sample	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM	TCLP	Corrosivity	Ignitability	Reactivity
Debris Pile A	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1	1	1				
Debris Pile A	Surface Soil	ISM - QC	0 - 1.0	1	1	1	1	1	1	1	1	1				
Debris Pile A	Surface Soil	ISM - QA	0 - 1.0	1	1	1	1	1	1	1	1	1				
Debris Pile A	Surface Soil	ISM - MS/MSD	0 - 1.0	1	1			1	1		1					
Debris Pile A	Transite	Discrete	Snip									1				
Debris Pile B	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1		1				
Debris Pile B	Transite	Discrete	Snip									1				
Debris Pile C	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1		1				
Debris Pile C	Subsurface Soil	Horizontal ISM	1.0 – 3.0	3	3	3	3	3	3	3	3	3				
Debris Pile C	Subsurface Soil	Horizontal ISM	3.0 – 5.0	3	3	3	3	3	3	3	3	3				
Debris Pile C	Subsurface Soil	Vertical ISM	1.0 – 5.0	18	18	18	18	18	18	18	18	18				
Burn Area	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1		1				
		Totals		**32**	**32**	**33**	**33**	**32**	**32**	**30**	**31**	**32**	**2**	**2**	**2**	**2**

TAL = Target Analyte List SVOCs = Semi-volatile Organic Compounds VOCs = Volatile Organic Compounds ACM = Asbestos Containing Material
ISM = Incremental Sampling Methodology QC = Quality Control QA = Quality Assurance MS/MSD = Matrix Spike/Matrix Spike Duplicate

Table 3-2: Sampling IDs at CC RVAAP-78 Quarry Pond Surface Dump

Area of Sample	Media	Type of Sample	Sample ID	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM	TCLP	Corrosivity	Ignitability	Reactivity
Debris Pile A	Surface Soil	ISM	C78SS-001M-0001-SO	0 - 1.0	1	1	1	1	1	1		1	1				
	Surface Soil	Discrete	C78SS-002-0001-SO	0.5							1						
	Surface Soil	ISM - QC	C78SS-003M-0001-SO	0 - 1.0	1	1	1	1	1	1		1	1				
	Surface Soil	Discrete	C78SS-004-0001-SO	0.5							1						
	Surface Soil	ISM - QA	C78SS-005M-0001-SO	0 - 1.0	1	1	1	1	1	1		1	1				
	Surface Soil	Discrete	C78SS-006-0001-SO	0.5							1						
	Surface Soil (P)	ISM - MS/MSD	C78SS-007M-0001-SO	0 - 1.0	1	1	1	1	1	1		1					
	Surface Soil (P)	Discrete	C78SS-007-0002-SO	0.5							1						
	Surface Soil(QA)	ISM - MS/MSD	C78SS-008M-0001-SO	0 – 1.0	1	1	1	1	1	1		1					
	Surface Soil(QA)	Discrete	C78SS-008-0002-SO	0.5							1						
	Transite	Discrete	C78SS-009-0001-BD	Small Piece									1				
Debris Pile B	Surface Soil	ISM	C78SS-010M-0001-SO	0 - 1.0	1	1	1	1	1	1			1				
	Surface Soil	Discrete	C78SS-011-0001-SO	0.5							1						
	Transite	Discrete	C78SS-012-0001-BD	Small Piece									1				
Debris Pile C	Surface Soil	ISM	C78SS-013M-0001-SO	0 - 1.0	1	1	1	1	1	1			1				
	Surface Soil	Discrete	C78SS-014-0001-SO	0.5							1						
Burn Area	Surface Soil	ISM	C78SS-015M-0001-SO	0 - 1.0	1	1	1	1	1	1			1				
	Surface Soil	Discrete	C78SS-016-0001SO	0.5							1						
55-Gallon A	Solid Contents	Composite	C78DM-017-0001-WS	Surface			1	1		1		1		1	1	1	1
		Discrete	C78DM-018-0001-WS	Surface							1						
55-Gallon B	Solid Contents	Composite	C78DM-019-0001-WS	Surface			1	1		1		1		1	1	1	1
		Discrete	C78DM-020-0001-WS	Surface							1						
		Equip Rinseate	C78-Rinseate-1		1	1	1	1	1	1		1					
				Totals	9	9	11	11	9	11	10	8	8	2	2	2	2

TAL = Target Analyte List
ISM = Incremental Sampling Methodology
SVOCs = Semi-Volatile Organic Compounds
QC = Quality Control
VOCs = Volatile Organic Compounds
QA = Quality Assurance
ACM = Asbestos Containing Material
MS/MSD = Matrix Spike/Matrix Spike Duplicate

Table 3-3: Subsurface Soil Sampling ID's at CC RVAAP-78 Quarry Pond Surface Dump

Area of Sample	Media	Type of ISM Sample	Type of Sample	Sample ID	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM
Debris Pile C	Subsurface Soil	Horizontal ISM	Primary	C78SB-021M-0101-SO	1.0 - 3.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	Primary	C78SB-021V-0101-SO	1.0 – 3.0							1		
	Subsurface Soil	Horizontal ISM	Primary	C78SB-021M-0102-SO	3.0 - 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	Primary	C78SB-021V-0102-SO	3.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0001-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0001-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0002-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0002-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0003-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0003-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0004-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0004-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0005-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0005-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0006-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0006-SO	1.0 – 5.0							1		
	Subsurface Soil	Horizontal ISM	QC	C78SB-022M-0101-SO	1.0 - 3.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QC	C78SB-022V-0101-SO	1.0 – 3.0							1		
	Subsurface Soil	Horizontal ISM	QC	C78SB-022M-0102-SO	3.0 - 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QC	C78SB-022V-0102-SO	3.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0001-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0001-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0002-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0002-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0003-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0003-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0004-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0004-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0005-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0005-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0006-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0006-SO	1.0 – 5.0							1		

Table 3-3 Continued

Area of Sample	Media	Type of ISM Sample	Type of Sample	Sample ID	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM
Debris Pile C	Subsurface Soil	Horizontal ISM	QA	C78SB-023M-0101-SO	1.0 - 3.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QA	C78SB-023V-0101-SO	1.0 – 3.0							1		
	Subsurface Soil	Horizontal ISM	QA	C78SB-023M-0102-SO	3.0 - 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QA	C78SB-023V-0102-SO	3.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0001-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0001-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0002-S0	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0002-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0003-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0003-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0004-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0004-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0005-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0005-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0006-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0006-SO	1.0 – 5.0							1		

TAL = Target Analyte List SVOCs = Semi-Volatile Organic Compounds VOCs = Volatile Organic Compounds ACM = Asbestos Containing Material
ISM = Incremental Sampling Methodology QC = Quality Control QA = Quality Assurance

4.0 – FIELD ACTIVITIES

All field activities will be conducted in accordance with the FWSAP except as noted in the following subsections.

4.1 Geophysics

Not applicable.

4.2 Soil Gas Survey

Not applicable.

4.3 Groundwater

Not applicable.

4.4 Subsurface Soil

4.4.1 Rationales

Multi-increment subsurface samples from 0' to 5', where not prevented by refusal, will be collected from locations specified within Debris Pile C during the investigation to assess contaminant occurrence and distribution in subsurface soil. All samples will be analyzed for explosives, propellants, SVOCs, VOCs, PCBs, target analyte list (TAL) metals, mercury, pesticides and ACM.

The goal of the subsurface MI sampling is to determine average levels of contamination within 2' horizontal layers within a given exposure/sample area. The subsurface layers will be, 1' – 3' and 3' – 5'. A vertical MI sample will also be taken from 1' – 5' at each push probe boring.

Additionally, the subsurface MI sampling will aim at providing good estimates of the types, locations, and extents of subsurface contamination areas.

4.4.2 Soil Sampling Requirements – Multi Increment Soil Sampling

Subsurface push probe samples will be taken with sampling equipment providing push probe samples with a diameter of 1.5 inches. Push probe equipment will be pushed from 0' to 5', but only the samples from depths of 1' to 5' will be selected for geotechnical logging and analytical testing. Detailed geotechnical logging will be conducted on all samples to help delineate the location and extent of subsurface contamination should it be encountered.

The completed MI samples will be forwarded to a fixed base laboratory where laboratory sample preparation, consisting of air-drying, sieving, and grinding will be done to provide a small representative sample suitable for chemical analysis. The standard operating procedure (SOP) for laboratory drying and particle size reduction of the sample is provided in Method 8330B.

4.4.3 Sample Collection for Field and Laboratory Analysis

The push probe contractor will then take borings at or as near as possible the locations staked out. If refusal is encountered at a planned push probe location and two nearby locations, that location will be temporarily abandoned. If the locations where refusal at depths less than planned appear to be based on

isolated or random obstructions, then up to two additional attempts will be made at planned locations where the borings failed to reach the planned depths.

Because of volatility issues related to VOC analyzes, one set of procedures, as described below, will be followed for those samples to have VOC analyzes performed, and another set of procedures followed for those samples on which VOC testing is not to be performed.

4.4.3.1 Processing of Non-VOC Samples (To Be Done at the Sampling Building)

The push probe sample tubes shall be capped, collected, and labeled as soon as they are withdrawn from the boring and placed on a table for subsequent tube cutting.

Horizontal Layer Samples - A small portion along an entire 2' thick layer (1 – 3' and 3' – 5') push probe sample shall be taken with an a sharpened length of ½"x ½" aluminum channel and combined with the corresponding same layer samples from all the other push probe borings within that sampling area. This sample will be processed at the lab and utilized for TAL metals, explosives, propellants, PCBs, pesticides, ACM, mercury and SVOCs as designated in the sampling tables.

Vertical Samples - A small portion along the entire 2' thick layer (1' – 3' and 3' – 5') push probe sample shall be taken with a sharpened length of ½"x ½" aluminum channel (wedge samplers) and combined with the other samples from that push probe boring. Thus, one vertical MI sample will be collected for each push probe boring

4.4.3.2 Processing of Samples That Will Have VOC Analyses Performed (To Be done in the Field)

For those sample areas where VOC testing will occur, the methanol method of sample collection and analysis will be performed as described by Bigl, Hewitt, and Ramsey. There will be one bottle for each of the three horizontal layers, and one bottle down the entire depth of each individual push probe boring. Terra Cores will be used to collect plugs of soil from the tubes and placed in the jars of methanol. At least 50 Terra Core plugs will be collected for horizontal samples, and as many as six 2' sampling intervals for vertical samples will be collected. After the removal of any samples for VOC analyses, as described, the push probe tube sample will be logged geotechnically to detect any obvious explosive or UXO type material, types and extents of natural and fill materials present, any obvious or visual contamination, estimated water condition, estimated strength, estimated determination of natural or fill material, and type and extent of any vertical cracking. Terra core samplers will be used to collect horizontal and vertical samples for VOC analyses and the remaining push probe tube sample will be sampled for additional analyses (explosives, metals, etc). This whole process will be done in the field to minimize losses of VOCs4.4.4 MI Quality Control Procedures

Triplicate subsurface MI samples (see QAPP section 4.5) will be taken to provide an overall evaluation of the total (field sampling + laboratory sample preparation + laboratory analysis) sampling and measurement process (see Hawaii Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan). The results of the triplicate sample analyses will be used to measure the investigation error. The main criterion for this purpose will be the Relative Standard Deviation (RSD) calculated from the triplicate data as follows:

RSD(%) = 100% x (Standard Deviation)/Average

Acceptable RSDs for triplicate surface soil MI samples are generally within 35%. RSDs in the Bigl, Hewitt, and Ramsey study ranged from 3.9 - 112%. The one extremely high-percent RSD value (112) was obtained from a set of triplicates collected in a zone of backfill (which may be similar to conditions

in the present project). Omitting the one high RSD value, the RSDs of the other triplicates ranged from 3.9 – 34 %.

Geotechnical logging of the push probe cores under stable, controlled conditions within the sampling building will promote more valid geotechnical logging. Prior to such logging of samples from any given AOC, geotechnical information (as unified soil classification system (USCS) classifications) from previous investigations will be reviewed to know what types of soils were encountered previously at that AOC. Logging data will be entered onto a boring log template (Figure 4-4) in the computer at the time the logging is done. Once that logging has been completed, the geologist or geotechnical engineer performing the logging print out the boring log and sign his/her name to the log. Additional field and laboratory QC procedures are required for MI sampling. These procedures are described in the Quality Assurance Project Plan Addendum (QAPP) located in Appendix B of the Work Plan.

4.4.4 Decontamination Procedures

The aluminum wedge samplers will be decontaminated per the FWSAP, Section 5.6.2.9. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

4.4.5 Sample Container/Preservation Technique

Sample container and preservation technique requirements will follow those prescribed in the Table 5-3 of the QAPP Addendum (Appendix B).

4.4.6 Site Survey

Upon completion of the subsurface soil ISM sampling, a surveyor will determine the locations of the individual borings used to collect the subsurface soil ISM sample.

4.5 Surface Soil

The surface soil (ISM) samples will be collected adjacent to Debris Piles A and B, from within Debris Pile C, and from within the apparent burn area adjacent to Debris Pile B. Additionally two samples of exposed apparent transite will be collected. All such sampling will be conducted in accordance with the FWSAP (SAIC, 2011b).

4.5.1 Rationales

ISM will be used because it provides representative, repeatable estimates of the average levels of contamination within a given sample area.

4.5.2 Soil Sampling Requirements

Multi-increment surface soil field samples from zero to one foot will be collected from a minimum of 30 discrete sample locations within each sampling area during the investigation to assess contaminant occurrence in surface soils adjacent to the debris piles and within the apparent burn area. All samples will be analyzed for explosives, target analyte list (TAL) metals, SVOCs, ACM, VOCs, and hexavalent chromium. Additionally, the ISM sample collected at the apparent burn area will be analyzed for SVOCs, polychlorinated biphenyl compounds (PCBs), pesticides, and propellants (i.e., full suite analyses). Discrete surface soil samples will be taken in the approximate middle of the apparent burn area at a depth of approximately ½ ft. and analyzed for VOCs.

Surface soil ISM samples will be aggregated samples collected from stratified random locations within each of the designated sample areas. The sample aliquots will be collected using a small-diameter (7/8 inch inside diameter) step probe. As per the surface soil criterion at RVAAP, the individual aliquots will be obtained by pushing the step probe sampler to 12 inches in depth. The entire volume of all aliquots will be aggregated into a single (plastic bag) field sample. The plastic bag will be closed, labeled, double bagged, and delivered to Building 1036 or 1038 for storage in a refrigerator. The entire sample will then be forwarded to a fixed base laboratory where laboratory sample preparation, consisting of air-drying and sieving will be done to provide a small representative sample suitable for chemical analysis. Discrete (Terra core) samples will be collected in sample areas where the subsequent analysis is for VOCs, as per the seventh paragraph of Section 5.6.2.1.3 of the FWSAP.

4.5.3 Sample Collection for Field and Laboratory Analysis

See Table 5-1 of the Quality Assurance Project Plan (QAPP) Addendum (Appendix B)

4.5.4 ISM Quality Control Procedures

Triplicate surface ISM samples will be taken to provide an overall evaluation of the total (field sampling + laboratory sample preparation + laboratory analysis) sampling and measurement process. Both field and laboratory quality control (QC) procedures are required for ISM sampling. These procedures are described in the QAPP located in Appendix B of the WP.

4.5.5 Decontamination Procedures

The decontamination procedures for soil sampling activities are presented in Section 5.6.2.9 of the FWSAP. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination. A temporary decontamination pad will be placed on-site at the sampling location for immediate use (see Figure 4-1).

4.5.6 Sample Container/Preservation Technique

Sample container and preservation technique requirements will follow those prescribed in Table 5-1 of the QAPP Addendum (Appendix B).

4.5.7 Site Survey

Not applicable.

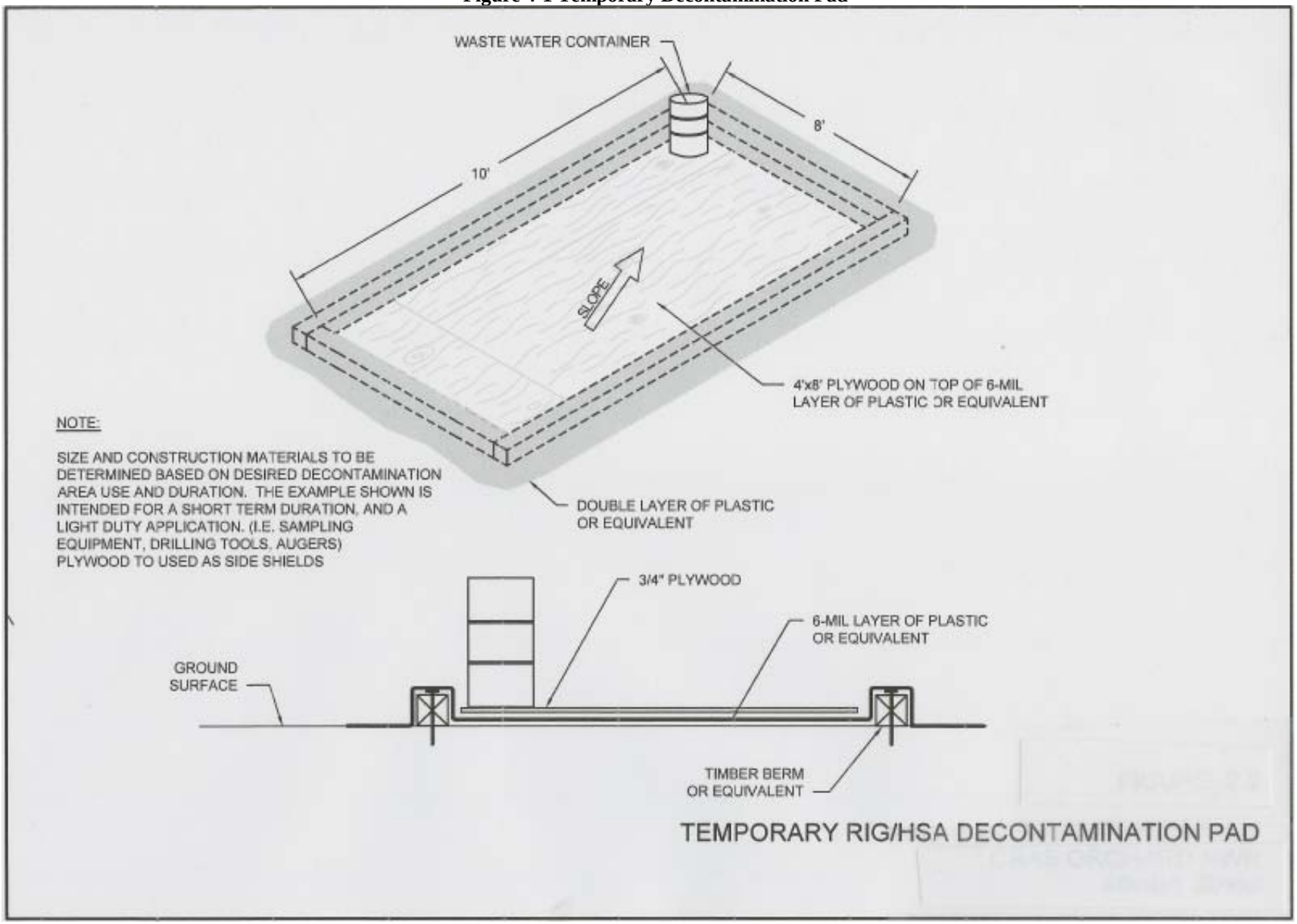
4.6 Drum Sampling

Drum sampling of unknown wastes will be accomplished as appropriate. Initial observations indicate that the contents of the two rusted 55-gallon drums are solidified. However, the state of material, liquid or solid, below the observed surface is not known. Therefore, provisions for sampling both solid and liquid states of material within the drum are provided hereafter.

4.6.1 Rationales

Preliminary screening using direct reading instrumentation will be accomplished to assess the degree of hazard. Assuming weathering and container venting have successfully mitigated the hazard a representative sample of the drum contents will be obtained using the most appropriate sampling device. All drum samples will be analyzed for toxicity characteristic leaching procedure (TCLP) metals, volatiles,

Figure 4-1 Temporary Decontamination Pad



semi-volatiles, pesticides, reactivity, ignitability, and corrosivity (assuming a liquid phase is present) in accordance with 40 CFR 261.21-24.

4.6.2 Drum Sampling Requirements

Drum samples will be collected from each drum using appropriate sampling equipment. Solid samples will be collected using the most appropriate sampling device and a minimum of three glass jars capable of containing a minimum of 100 grams of sample. All samples will be labeled as appropriate, cooled ≤ 4°C, and analyzed within the Environmental Protection Agency (EPA) SW-846 established holding times.
Sample Collection for Field and Laboratory Analysis

See Table 5-1 of the QAPP Addendum (Appendix B)

4.6.3 Drum Sample Quality Control Procedures

These procedures are described in the QAPP located in Appendix B of the WP.

4.6.4 Decontamination Procedures

The decontamination procedures for soil sampling activities are presented in Section 4.4.2.8 of the FWSAP. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

4.6.5 Sample Container/Preservation Technique

Sample container and preservation technique requirements will follow those prescribed in Table 5-2 of the QAPP Addendum (Appendix B).

4.6.6 Site Survey

Not applicable.

4.6.7 Sampling Method & Waste Characterization

Waste characterization is most commonly accomplished by performing analysis on a representative sample of the waste. The type of sampling/analysis performed is mostly dependent on the type of waste.

4.6.7.1 Sampling Equipment

Determination of the appropriate sampling equipment and sampling procedure depends upon the chemical constituents and physical state (solid, liquid, or gas) of the waste. Although there are multiple physical states and different waste sampling procedures for each physical state, only those procedures most appropriate for typical wastes generated are discussed. Selection of the sampling method and equipment is based on the following criteria:

- Disposability or ease of decontamination;
- Ease of operation;
- Compatibility with waste;
- Safety; and
- Prevention of dilution, escape, or cross-contamination.

Both sampling equipment and sample bottles must be clean in order to prevent contamination of the sample. Personnel collecting hazardous waste samples must wear PPE appropriate for the type of sampling being done. According to 29 CFR §1910.120, "Hazardous Waste Operations and Emergency Response" appropriate PPE includes impervious gloves, chemical safety goggles, disposable splash-proof

Tyvek® coveralls, and suitable boots when sampling known hazardous waste. A minimum of Level B protection (e.g., chemical splash suit, impervious gloves, impervious outer boots, and a positive pressure self-contained breathing apparatus) must be worn when sampling unknown wastes streams.

4.6.8 Sample Collection

4.6.8.1 Sampling Protocols

All samples will be collected using standard collection methods as specified in Table 4-1. Table 4-2 suggests appropriate sampling equipment for different waste stream types. Disposable equipment should be used whenever practical to minimize requirements for decontamination. Sample types include grab and composite. Grab samples are samples obtained from a particular location at a distinct point in time. These samples are useful in determining waste stream variability when multiple or frequent samples are taken, but a large number of samples may be required. Composite samples are a set of individually collected samples combined into a single sample for analysis. This is the most common type of sample for obtaining average concentration estimates of a waste stream and will be utilized for this project.

Table 4-1 Sampling Protocols

Physical State of Waste	Protocols
Extremely viscous liquids and solids	ASTM Standard D140-70
Crushed or powdered material	ASTM Standard D346-75
Soil or rock-like material	ASTM D1452-65
Fly ash-like material	ASTM Standard D2234-76
Containerized Liquid Waste	USEPA SW-846-COLIWASA Procedure
Liquid wastes in pits, ponds, lagoons, and similar reservoirs	USEPA SW-846-Pond Sampler

Notes:

- Contact the American Society for Testing and Materials (ASTM), (215) 299-5400, to obtain publications containing the standardized method Protocol.
- Contact the National Technical Information Service (NTIS), (800) 553-6847 or (703) 487- 4650, to obtain a copy of USEPA SW-846. It may also be accessed online at: http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm

Initial Screening Prior to any sampling event, the sampling location should be surveyed prior to deployment of the sampling team. The site should be evaluated to ensure all required equipment and access is available. Additionally, the site should be inspected for adequate ventilation, protection from extreme weather and temperatures, access to stable power (if required), and provisions for water and gases of required purity. When dealing with unknown wastes the use of direct reading instruments should be maximized to assess the degree of hazard before any sampling activity commences.

Record conditions, markings and observations of containers and include background information obtained from record searches or personnel interviews. The following information describing the physical characteristics of the waste should be recorded:

- Color - Describe the color of the waste (e.g., blue, clear, varies).
- Physical State (e.g., solid, liquid, powder, gas, semi-solid, or sludge).
- Layers - note whether the waste is multi-layered (e.g., oil/water/sludge), bi-layered (e.g., oil/water), or homogeneous.
- Percent Liquid - estimate the percent of liquid volume.

Table 4-2 Applicability of Sampling Equipment to Waste Streams

Waste Location or Container									
Waste Type	**Drum**	**Sacks and Bags**	**Open-Bed Truck**	**Closed-Bed Truck**	**Storage tanks or bins**	**Waste Piles**	**Ponds, Lagoons, & Pits**	**Conveyor Belt**	**Pipe**
Free flowing liquids and slurries	Coliwasa	N/A	N/A	Coliwasa	Weighted Bottle[a]	N/A	Dipper	N/A	Dipper
Sludges	Trier	N/A	Trier	Trier	Trier	b	b	b	b
Moist powders or granules	Trier	Trier	Trier	Trier	Trier	Trier	Trier	Shovel	Dipper
Dry powder or granules	Thief	Thief	Thief	Thief	b	Trier	Thief	Shovel	Dipper
Sand or packed powders and granules	Auger	Auger	Auger	Auger	Thief	Thief	b	Dipper	Dipper
Large grained solids	Large Trier	Large Trier	Large Trier	Large Trier	Large Trier	Large Trier	Large Trier	Trier	Dipper

[a]When the tank is adequately agitated or a recirculation line is accessible, samples can be collected through a side tap.

[b]This type of sampling situation can present significant logistical sampling problems, and sampling equipment must be specifically selected or designed based on site and waste conditions. No general statement about appropriate sampling equipment can be made.

Composite Liquid Waste Sampler (Coliwasa): The Coliwasa consists of a glass, plastic, or metal tube equipped with an end closure that can be opened and closed while the tube is submerged in the material to be sampled.

Weighted Bottle: This sampler consists of a glass or plastic bottle, sinker, stopper, and a line that is used to lower, raise, and open the bottle.

Dipper: The dipper consists of a glass or plastic beaker clamped to the end of a two- or three-piece telescoping aluminum or fiberglass pole that serves as the handle.

Thief: A thief consists of two slotted concentric tubes, usually made of stainless steel or brass. The outer tube has a conical pointed tip that permits the sampler to penetrate the material being sampled. The inner tube is rotated to open and close the sampler.

Trier: A trier consists of a tube cut in half lengthwise with a sharpened tip that allows the sampler to cut into sticky solids and to loosen soil.

Auger: An auger consists of sharpened spiral blades attached to a hard metal central shaft.

Scoops and Shovels: Scoops and shovels are used to sample granular or powdered material in bins, shallow containers, and conveyor belts.

Obtaining Samples of Unknown Wastes

Safety Precautions. The first phase of obtaining samples of unknown waste is to eliminate any immediate hazard. This includes isolating the area, restricting personnel access, and containing any leaks or spills. Required protective clothing should be identified as well as any equipment specifications such as the use of non-sparking tools. A bulging drum indicates that it is under pressure and should not be sampled until pressure is relieved. (NOTE: These situations should be coordinated with appropriate emergency response organizations).

4.7 Asbestos Sampling

Suspect transite will be procured utilizing grab method sampling with a clean plastic or metal scoop. Each sample will be placed in an airtight, preferably large Ziploc® bag. Samples will be double bagged prior to shipment to a National Voluntary Laboratory Accreditation Program (NVLAP0 accredited laboratory). Asbestos content will be determined by EPA Method 600/R-93/116 to meet the requirements of 40 CFR Part 763, Subpart E, Appendix E, Section 1 Polarized Light microscopy. All asbestos sampling will be performed by an Ohio certified Asbestos Hazard Evaluation Specialist. Sampling area will be wet down before samples are collected or any transite is cut. Sampler will wear Tyvek® suit and face respirator when collecting any asbestos samples, including surface soil ISM samples.

4.8 Ordnance Explosive Anomaly Avoidance

A UXO technician will verify that there are no metallic anomalies where step probes are to be pushed.

A detailed UXO Anomaly Avoidance Plan is attached as Appendix D.

4.9 Triplicate Sampling

4.9.1 Collection of Triplicate ISM Samples

To statistically evaluate sampling accuracy for each sample/decision unit (DU), additional, completely separate replicate ISM samples (collected from a set of systematic random or stratified random locations within the DU that are different from those used for the initial ISM samples) are collected from selected DUs (see Section 5.6.2.1.3 of the FWSAP and the Hawaii Dept of Health, Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan). For surface soil samples, the replicates are made up of a minimum of 30 different systematic or stratified random increments from within the same DU. The replicate samples are prepared and analyzed in the same manner as carried out for the initial sample. Triplicate samples (i.e., primary ISM sample, a duplicate, and a triplicate) are preferred and more useful than just duplicates for statistical evaluation of the accuracy and comparability.

A different random starting location is determined for each replicate collected in the selected DUs. Replicate sample increments are generally collected along the same approximate directional lines established through the DU for the initial ISM samples, though at different systematic random locations than initially used. This is accomplished by pacing off the replicate increments from a different random starting location on the first line/row of the DU, and continuing to sample at this random interval throughout the DU. The replicate increments should not be collected from the same points or co-located with those used for the initial ISM samples. Replicate samples are sent to the laboratory as “blind” samples, meaning the laboratory does not know they represent replicate samples of the initial ISM samples.

4.9.2 Statistical Evaluation of Replicate ISM Samples

MI samples are considered “representative” and repeat measurements within the same DU would be expected to provide the average contaminant concentration. Data from replicate sampling are used to determine:

1. The amount of variation from the mean that will be considered when comparing average contaminant concentrations in the DU to applicable CUGs and
2. Whether the average contaminant concentration(s) is adequately representative for the DU(s) under investigation.

There are a number of options available for determining what measure of data variation from the mean will be used when evaluating the ISM sample replicate measurements and comparing ISM sample data to the CUGs. The measure of data variation from the mean that is chosen is a function of the data quality objective (DQO) for the site investigation. Two common approaches are: 1) use of the standard deviation of the replicate values, or 2) use of the 95% Upper Confidence Level (UCL) of the replicate (triplicate) values.

4.9.3 Evaluation of Replicates and Data Representativeness

The field replicate data collected for DUs are also used to demonstrate that the investigation error for each contaminant is within a reasonable range that supports a conclusion that average contaminant concentrations (e.g., mean plus standard deviation or 95% UCL of the mean) are below or above the relevant CUG. In other words, this evaluation addresses the question of whether the data are good enough to make a decision that the average contaminant concentration is below or above the CUG.

Typically, the Relative Standard Deviation (RSD) of the field replicates (triplicates) is used for this evaluation. The RSD is expressed as a percentage and is calculated using the following formula:

$$RSD\% = \frac{100 \times \text{Standard Deviation}}{\text{Average}}$$

The lower the RSD% of the replicate data the better. Generally, an RSD% of approximately 35% or less indicates the amount of estimated total error is within a reasonable range for decision making. However, this evaluation will also depend on the DQO established for the site investigation, as well as how close the contaminant concentrations are to the relevant CUGs. For example, if the RSD% of replicates for a contaminant concentration in a DU was determined to be 40% to 50%, but the contaminant concentration was a factor of 3 or 4 below the relevant CUG, then a decision that the contaminant is below levels of concern would still be valid. In general, the closer the contaminant level is to the CUG, the more impact this statistical measure will have on site decisions.

The ISM approach provides averages that approximate a statistically "normal distribution" if the RSD% of replicates is reasonably low (this is assumed, for example, when determining the 95% UCL of replicate data). The higher the RSD%, the less confidence there is that the averages approximate a normal distribution, and that the average contaminant concentrations are adequately representative of the DU(s). As the RSD exceeds 50%, and if the average DU concentrations are near the relevant CUGs, there is increasing uncertainty that the data are adequately representative. In this case additional ISM may be necessary, utilizing a larger number of sample increments and/or larger sample increment masses to obtain a more representative measure of the (very heterogeneous) contaminant concentrations in the DU. Careful evaluation of the sample processing and analysis procedures would also be indicated. In some cases, grinding samples may serve to reduce the RSD% and provide more representative sampling data.

As the RSD% approaches 100% there is no confidence that the sampling data are useful for decision making.

5.0 – SAMPLE CHAIN-OF-CUSTODY/DOCUMENTATION

5.1 Field Book

All field data will be entered into a dedicated field logbook. A typed, formatted blank boring log will be prepared before sampling begins.

5.2 Photographs

Information regarding the documentation of photographs for the investigation is presented in Section 6.2 of the FWSAP. Representative photographs will be taken of the investigative activities and any significant observations made during the field effort.

5.3 Sample Numbering System

The sampling numbering, provided in Table 3-2, was prepared in accordance with section 6.3 of the FWSAP.

5.4 Sample Documentation

All sample labels, logbook, field records, and field form information will follow structures identified in Section 6.4 of the FWSAP.

5.5 Documentation Procedure

Documentation and tracking of samples and field information will follow the series of steps identified in Section 6.5 of the FWSAP.

5.6 Corrections To Documentation

Any corrections to documentation will follow guidance established in Section 6.6 of the FWSAP.

6.0 – SAMPLE PACKAGING & SHIPPING REQUIREMENTS

Packaging and shipping of primary samples will follow procedures specified in Section 6.0 of the FWSAP. Coolers containing quality assurance (QA) samples that are shipped to the contract laboratory for independent analysis will also be prepared and shipped in accordance with the FWSAP. Information for the primary and QA laboratories is provided below.

TestAmerica North Canton

4101 Shuffle Street NW

North Canton, Ohio 44720

Phone: 330-497-9396

Fax: 330-497-0772

www.testamericainc.com

Contact: Mark Loeb

EMLab P & K will be performing the asbestos analyses

1936 Olney Ave.

Cherry Hill, NJ 08003

Phone: 866-871-1984

POC: to be determined

USACE has selected the following QA laboratory.

CT Laboratories

1230 Lange Court

Baraboo, WI 53913

Phone: 608-356-2760

POC: Pat Letterer

7.0 – INVESTIGATION-DERIVED WASTE

This section describes the Investigation-Derived Waste (IDW) handling for this project. All IDW, including auger cuttings, PPE, disposable sampling equipment, and decontamination fluids, will be properly handled, labeled, characterized, and managed in accordance with Section 8.0 of the FWSAP, federal and state of Ohio large-quantity generator requirements, and RVAAP's Installation Hazardous Waste Management Plan.

Four types of IDW are anticipated; each type will be contained separately. The types and estimated quantities for each include:

- Soil from various including residual surface soil, resulting from sample collection using hand sampling equipment. One, 55-gallon drum of soil IDW is anticipated.
- Decontamination fluids, including those derived from decontamination of sampling equipment. One, 55-gallon drum of decontamination fluid is anticipated from sampling equipment decontamination.
- Expendables/solid wastes, including PPE and disposable sampling equipment. One, 55-gallon drum of expendable IDW is anticipated.

7.1 IDW Collection & Containerization

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 not soiled) and usage of the waste material (e.g., outer sampling gloves versus glove liners). 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-gallon 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 acetone extraction fluids) and the waste stream contained in labeled DOT-approved, 55-gallon closed-top drums. All known or potentially hazardous liquid, non-indigenous IDW streams, such as methanol, hydrochloric acid rinses, and acetone will be contained separately in labeled DOT-approved, closed-top, 55-gallon drums.

7.2 Container Waste 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 8.2 of the FWSAP.

7.3 IDW Field Staging

A field staging area will be designated at each location at the beginning of field activities and approved by the RVAAP Acting Facility Manager. The IDW drums or other specified containers will be located at the designated field staging area for each load line. Centralized field staging areas will be managed according to the requirements of Section 8.3 of the FWSAP.

A final inventory will be conducted prior to demobilization from the site and all IDW staged at Building 1036. All liquid waste that has not been transported off the facility within 90 days following project completion will require secondary containment.

7.4 IDW Characterization and Classification for Disposal

All indigenous IDW (soil) will be characterized for disposal based on analytical results from environmental samples collected from each sampling station. 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 8.4.1 and 8.4.2 of the FWSAP. The PPE and expendable sampling equipment will be managed in accordance with Section 8.4 of the FWSAP.

7.5 IDW 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 8.5 of the FWSAP and all applicable State and Federal rules, laws, and regulations. All shipments of IDW off site will be coordinated through the RVAAP Environmental Coordinator and Caretaker Site Manager.

8.0 – REFERENCES

Bigl, Hewitt, Ramsey. MULTI-INCREMENT© TCE Vadose-Zone Investigation, Wiley InterScience, Winger 2008.

Hawaii Dept of Health, Technical Guidance Manual for the Implementation of the Hawai'i State Contingency Plan. November 2008.

SAIC, 2011a. Facility-Wide Safety and Health Plan for Environmental Investigations at the Ravenna Army Ammunition Plant. Ravenna, Ohio. Prepared for the US Army Corps of Engineers, Louisville District. February 24, 2011.

SAIC, 2011b. Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant. Ravenna, Ohio. Prepared for the US Army Corps of Engineers, Louisville District. February 24, 2011.

USACE, Interim Guidance 09-02, Implementation of Incremental Sampling (IS) of Soil for the Military Munitions Response Program. July 2009.

USACE, 2010. Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant (RVAAP) Ravenna, Ohio. March 23, 2010.

USACE, 2011. Guidance Document for the Evaluation of Land Use Controls at Ravenna Army Ammunition Plant, Ravenna, Ohio. February 3, 2011.

Appendix B – Quality Assurance Project Plan Addendum to the Facility-Wide Quality Assurance Project Plan

Final Quality Assurance Project Plan Addendum for 2010 Preliminary Assessment Compliance Restoration Site CC RVAAP-78 Quarry Pond Surface Dump

Ravenna Army Ammunition Plant
Ravenna, Ohio

Contract No. W912QR-10-P-0052

Prepared for:

US Army Corps of Engineers®

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

Prepared by:

PRUDENT TECHNOLOGIES, INC. dba Prudent Environmental Services, Inc.

Prudent Technologies, Inc.
4242 Medical Drive, Suite 5250
San Antonio, Texas 78229

October 24, 2011

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos Containing Material
Camp Ravenna	Camp Ravenna Joint Military Training Center
COR	Contracting Officer's Representative
CR	Compliance Restoration
CUGs	Clean up goals
DOD	Department of Defense
DU	Decision Unit
ELAP	Environmental Laboratory Accreditation Program
FBQ	Fuze and Booster Quarry
FSP	Field Sampling Plan
ISM	Incremental Sampling Methodology
LCG	Louisville Chemistry Guideline Version 5 2002
LCS	Laboratory Control Sample
MDL	Method Detection Limit
ISM	Incremental Sampling Methodology
MS/MSD	Matrix Spike/Matrix Spike Duplicate
Ohio EPA	Ohio Environmental Protection Agency
Prudent	Prudent Technologies, Inc.
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QC/MRL	QC/Method Reporting Level Standard
QSM	Quality System Manual
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RL	Reporting Limit
RVAAP	Ravenna Army Ammunition Plant
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
TCLP	Toxicity Characteristic Leaching Procedure
TNT	Trinitrotoluene
USACE	United States Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

1.0 – INTRODUCTION

This Quality Assurance Project Plan (QAPP) Addendum addresses supplemental project-specific information in relation to the Facility-Wide (FW) QAPP for Environmental Investigations for the Ravenna Army Ammunition Plant (RVAAP) (SAIC, 2011). This QAPP Addendum and the Field Sampling Plan (FSP) Addendum, Appendix A, constitute the Sampling and Analysis Plan (SAP). The FSP describes the project for the sampling of soils at the Quarry Pond Surface Dump site. Table 2-1 of this QAPP Addendum lists the Increment Sampling Methodology (ISM) surface samples, discrete asbestos samples, and 55-gallon drum samples and the analytical methods required for this investigation. A summary of the sampling scheme and details of the surface ISM for each area are listed in Tables 3-2 of the FSP Addendum.

Each QAPP section is presented documenting adherence to the FW QAPP or stipulating project-specific addendum requirements.

Primary analytical and quality directions for this project will be obtained from the identified U.S. Environmental Protection Agency (USEPA) SW-846 Methods, the DoD Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.1 and the USACE Louisville District QSM supplement.

2.0 – PROJECT DESCRIPTION

The site history, project objectives and scope, sampling design, parameters to be tested and the project schedule are described in the Work Plan and FSP Addendum.

A full analytical suite is defined as samples that will be analyzed for TAL metals, mercury, explosives, VOCs, SVOCs, propellants, pesticides, and PCBs. For this project, ISM samples are expected to be collected and analyzed from areas surrounding Debris Piles A and B and from within Debris Pile C and the apparent burn area to determine the presence of absence of contamination. The samples collected from the apparent burn area will be analyzed for the Ravenna full suite. Additionally discrete samples of apparent transite will be collected within Debris Piles A and B to determine if Asbestos Containing Materials (ACM) are present. Two 55-gallon drums, with contents unknown, will also be sampled and subjected to a toxicity characteristic leaching procedure (TCLP) analyses. Triplicate field quality control (QC)/quality assurance (QA) samples will be collected. The primary and blind duplicate QC samples will be sent to the primary laboratory and the QA samples will be sent to the QA laboratory chosen by USACE. Table 2-1 of the QAPP Addendum lists the total and QA samples along with all the analytical procedures required for this effort.

Table 2-1 Sampling Table for CC-RVAAP 78

Sample Area	Media	Type of Sample	Sample ID	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM	TCLP	Corrosivity	Ignitability	Reactivity
Debris Pile A	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1	1	1	1				
Debris Pile A	Surface Soil	ISM - QC	0 - 1.0	1	1	1	1	1	1	1	1	1	1				
Debris Pile A	Surface Soil	ISM - QA	0 - 1.0	1	1	1	1	1	1	1	1	1	1				
Debris Pile A	Surface Soil	ISM - MS/MSD	0 - 1.0	1	1			1	1		1						
Debris Pile A	Transit e	Discrete	Snip									1	1				
Debris Pile B	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1		1	1				
Debris Pile B	Transit e	Discrete	Snip									1	1				
Debris Pile C	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1		1	1				
Debris Pile C	Subsurface Soil	Horizontal ISM	1.0 – 3.0	3	3	3	3	3	3	3	3	3	3				
Debris Pile C	Subsurface Soil	Horizontal ISM	3.0 – 5.0	3	3	3	3	3	3	3	3	3	3				
Debris Pile C	Subsurface Soil	Vertical ISM	1.0 – 5.0	18	18	18	18	18	18	18	18	18	18				
Burn Area	Surface Soil	ISM	0 - 1.0	1	1	1	1	1	1	1		1	1				
			Total	**32**	**32**	**33**	**33**	**32**	**32**	**30**	**31**	**32**	**2**	**2**	**2**	**2**

TAL = Target Analyte List SVOCs = Semi-volatile Organic Compounds VOCs = Volatile Organic Compounds

ISM = Incremental Sampling Methodology QC = Quality Control QA = Quality Assurance

Table 2-2: Sampling IDs at CC RVAAP-78 Quarry Pond Surface Dump

Area of Sample	Media	Type of Sample	Sample ID	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM	TCLP	Corrosivity	Ignitability	Reactivity
Debris Pile A	Surface Soil	ISM	C78SS-001M-0001-SO	0 - 1.0	1	1	1	1	1	1		1	1				
	Surface Soil	Discrete	C78SS-002-0001-SO	0.5							1						
	Surface Soil	ISM - QC	C78SS-003M-0001-SO	0 - 1.0	1	1	1	1	1	1		1	1				
	Surface Soil	Discrete	C78SS-004-0001-SO	0.5							1						
	Surface Soil	ISM - QA	C78SS-005M-0001-SO	0 - 1.0	1	1	1	1	1	1		1	1				
	Surface Soil	Discrete	C78SS-006-0001-SO	0.5							1						
	Surface Soil (P)	ISM - MS/MSD	C78SS-007M-0001-SO	0 - 1.0	1	1			1	1		1					
	Surface Soil (P)	Discrete	C78SS-007-0002-SO	0.5							1						
	Surface Soil(QA)	ISM - MS/MSD	C78SS-008M-0001-SO	0 – 1.0	1	1			1	1		1					
	Surface Soil(QA)	Discrete	C78SS-008-0002-SO	0.5							1						
	Transite	Discrete	C78SS-009-0001-BD	Small Piece									1				
Debris Pile B	Surface Soil	ISM	C78SS-010M-0001-SO	0 - 1.0	1	1	1	1	1	1			1				
	Surface Soil	Discrete	C78SS-011-0001-SO	0.5							1						
	Transite	Discrete	C78SS-012-0001-BD	Small Piece									1				
Debris Pile C	Surface Soil	ISM	C78SS-013M-0001-SO	0 - 1.0	1	1	1	1	1	1			1				
	Surface Soil	Discrete	C78SS-014-0001-SO	0.5							1						
Burn Area	Surface Soil	ISM	C78SS-015M-0001-SO	0 - 1.0	1	1	1	1	1	1			1				
	Surface Soil	Discrete	C78SS-016-0001SO	0.5							1						
55-Gallon A	Solid Contents	Composite	C78DM-017-0001-WS	Surface			1	1		1		1		1	1	1	1
		Discrete	C78DM-018-0001-WS	Surface							1						
55-Gallon B	Solid Contents	Composite	C78DM-019-0001-WS	Surface			1	1		1		1		1	1	1	1
		Discrete	C78DM-020-0001-WS	Surface							1						
		Equip Rinseate	C78-Rinseate-1		1	1	1	1	1	1		1					
				Totals	9	9	9	9	9	11	10	10	8	2	2	2	2

TAL = Target Analyte List SVOCs = Semi-Volatile Organic Compounds VOCs = Volatile Organic Compounds ACM = Asbestos Containing Material
ISM = Incremental Sampling Methodology QC = Quality Control QA = Quality Assurance MS/MSD = Matrix Spike/Matrix Spike Duplicate

Table 2-3: Subsurface Soil Sampling ID's at CC RVAAP-78 Quarry Pond Surface Dump

Area of Sample	Media	Type of ISM Sample	Type of Sample	Sample ID	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM
Debris Pile C	Subsurface Soil	Horizontal ISM	Primary	C78SB-021M-0101-SO	1.0 - 3.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	Primary	C78SB-021V-0101-SO	1.0 – 3.0							1		
	Subsurface Soil	Horizontal ISM	Primary	C78SB-021M-0102-SO	3.0 - 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	Primary	C78SB-021V-0102-SO	3.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0001-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0001-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0002-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0002-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0003-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0003-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0004-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0004-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0005-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0005-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	Primary	C78SB-021M-0006-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	Primary	C78SB-021V-0006-SO	1.0 – 5.0							1		
	Subsurface Soil	Horizontal ISM	QC	C78SB-022M-0101-SO	1.0 - 3.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QC	C78SB-022V-0101-SO	1.0 – 3.0							1		
	Subsurface Soil	Horizontal ISM	QC	C78SB-022M-0102-SO	3.0 - 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QC	C78SB-022V-0102-SO	3.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0001-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0001-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0002-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0002-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0003-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0003-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0004-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0004-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0005-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0005-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QC	C78SB-022M-0006-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QC	C78SB-022V-0006-SO	1.0 – 5.0							1		

Table 2-3 Continued

Area of Sample	Media	Type of ISM Sample	Type of Sample	Sample ID	Sample Depth (ft)	Explosives	Propellants	TAL Metals	Mercury	PCBs	SVOCs	VOCs	Pesticides	ACM
Debris Pile C	Subsurface Soil	Horizontal ISM	QA	C78SB-023M-0101-SO	1.0 - 3.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QA	C78SB-023V-0101-SO	1.0 – 3.0							1		
	Subsurface Soil	Horizontal ISM	QA	C78SB-023M-0102-SO	3.0 - 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Horizontal ISM	QA	C78SB-023V-0102-SO	3.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0001-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0001-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0002-S0	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0002-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0003-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0003-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0004-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0004-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0005-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0005-SO	1.0 – 5.0							1		
	Subsurface Soil	Vertical ISM	QA	C78SB-023M-0006-SO	1.0 – 5.0	1	1	1	1	1	1		1	1
	Subsurface Soil	Vertical ISM	QA	C78SB-023V-0006-SO	1.0 – 5.0							1		

TAL = Target Analyte List SVOCs = Semi-Volatile Organic Compounds VOCs = Volatile Organic Compounds ACM = Asbestos Containing Material
ISM = Incremental Sampling Methodology QC = Quality Control QA = Quality Assurance

3.0 – PROJECT ORGANIZATION & RESPONSIBILITIES

The functional project organization and responsibilities are described in Section 3 of the FW Sampling and Analysis Plan (SAIC, 2011b) and in the Project Work Plan.

Analytical support for this work has been assigned to TestAmerica, North Canton, Ohio. TestAmerica will perform all required analyses at that location except for the explosives and propellant analyses, which will be performed in the TestAmerica West Sacramento facility. TestAmerica's organizational structure, roles, and responsibilities are identified in Section 4.0 of their Quality Assurance Manual (QA Manual), which is available for review upon request. The address and telephone number for TestAmerica laboratories are as follows:

TestAmerica North Canton

4101 Shuffle Street NW
North Canton, Ohio 44720
Phone: 330-497-9396
Fax: 330-497-0772
www.testamericainc.com
Contact: Mark Loeb

TestAmerica West Sacramento (samples to be analyzed for explosives/propellants will be forwarded to West Sacramento)

880 Riverside Parkway
West Sacramento, CA 95605
Phone: 916-373-5600
Fax: 916-372-1059
Contact: Karen Dahl

EMLab P & K will be performing the asbestos analyses

1150 Bayhill Drive
Suite 100
San Bruno, CA 94066
Phone: 866 888-6653
POC: to be determined

USACE has selected the following QA laboratory

CT Laboratories

1230 Lange Court
Baraboo, WI 53913
Phone: 608-356-2760
POC: Pat Letterer

Data Validation will be performed by a 3rd Independent Party via USACE Louisville District:

MECx, LP

12269 East Vessar Drive
Aurora, Colorado 80014
Phone: 720 535-5502
Fax: 720 535-7555
POC : Elizabeth Wessing
Mobile: 303-881-6816
Email: Elizabeth.wessing@mecx.net

4.0 – QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

4.1 Data Quality Objectives

Analytical data quality objectives for soils/sediments and aqueous samples (rinsate and TCLP extracts) for this investigation are summarized in Table 4-1 and Table 4-2, respectively, in the FW QAPP. However, the laboratory will use accuracy and precision limits prescribed in the DoD Quality Systems Manual for Environmental Laboratories, version 4.1 (QSM). The laboratory is required to comply with all methods as written; recommendations are considered requirements.

4.2 Level of Quality Control Effort

The QC efforts will follow Section 4.2 of the FW QAPP. Field QC analyses will include field triplicates and equipment rinsate blanks. Trip blanks will be included when aqueous samples for volatile organic analyses are shipped to the laboratory. Laboratory QC will include method blanks; laboratory control samples (LCSs), laboratory duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples, MS/MSD must not be conducted on the rinsate blanks. One MS/MSD sample will be designated in the field and collected for at least every 20 investigative samples per matrix. Tables 2-1 and 2-2 of this QAPP Addendum list the needed number of rinsate blanks, and MS/MSDs. Additional laboratory QC will be explained in subsequent sections of this QAPP Addendum.

4.3 Accuracy, Precision, and Sensitivity of Analysis

Project accuracy and precision goals are identified in Section 4.3 and Table 4-1 for soil and sediment of the FW QAPP. However, the laboratory will adhere to Section 9.3 of this QAPP Addendum. Accuracy is determined through percent recoveries of spiked or surrogate samples. Laboratory precision is assessed through relative percent differences from duplicate analyses and/or MS/MSDs.

4.4 Completeness, Representativeness, and Comparability

The completeness goals are identified in Table 3-1 and 3-2 of the FW QAPP and will be utilized for this investigation. The surface soil ISM design allows Prudent Technologies, Inc. (Prudent) to evaluate the representativeness of the samples in relation to the field conditions. Comparability will be determined by evaluating sample and its duplicate results from the primary laboratory to its triplicate results from the USACE QA laboratory analysis.

5.0 – SAMPLING PROCEDURES

Sampling procedures are discussed in Field Activities, Section 4.0 of the FSP Addendum. The ISM protocol to be used as part of this investigation is also included in the FSP Addendum. Table 5-1 lists soil and sediment container, preservation and holding time requirements for this investigation. Table 5-2 lists container, preservative and holding time requirements for drum sampling.

Table 5-1 Container Requirements for Soil Sampling

Analyte Group	Container	Minimum Sample size	Preservative	Holding Time
Asbestos	1 Gallon Ziploc Bag	1/2 inch^2	None	180 d
VOCs	40 mL VOA vial	5g Terra Core Plug	Methanol, Cool, 4°C	28 d
SVOCs	ISM Sample: Plastic Garbage Disposal Liner Bag (1 Kg of soil material)	60g	Cool, 4°C	14 d (extraction) 40 d (analysis)
Pesticides		60g	Cool 4°C	14 d (extraction) 40 d (analysis)
PCBs		60g	Cool 4°C	14 d (extraction) 40 d (analysis)
Explosives		60g	Cool 4°C	14 d (extraction) 40 d (analysis)
Propellants		60g	Cool 4°C	14 d (extraction) 40 d (analysis)
Metals and Mercury		50g	Cool 4°C	180 d, Mercury 28 d
g = grams, d = days, Kg = kilogram, VOA = Volatile organic analyses, ml = milliliter, VOCs = Volatile organic compounds, SVOCs = Semi-volatile organic compounds, PCBs = Polychlorinated biphenyls				

Table 5-2 Container Requirements for Drum Sampling

Analyte Group	Container	Minimum Sample size	Preservative	Holding Time
VOCs	2 X VOA vials	2 X 40 ml	HCl, pH<2 Cool 4^0 C	14 d
SVOCs	Amber glass with Teflon lined lid	2X1000 ml	Cool 4^0 C	7 d extraction 40 d analysis
Explosives	Amber glass with Teflon lined lid	2X1000 ml	Cool 4^0 C	7 d extraction 40 d analysis
Pesticides	Amber glass with Teflon lined lid	2X1000 ml	Cool 4^0 C	7 d extraction 40 d analysis
PCBs	Amber glass with Teflon lined lid	2X1000 ml	Cool 4^0 C	7 d extraction 40 d analysis
Propellants	Amber glass with Teflon lined lid	2X1000 ml	Cool 4^0 C	7.d extraction 40 d analysis
Metals and Mercury	Plastic	1000 ml	HNO_3 ,pH<2 Cool 4	180 d for metals 28 days for mercury
g = grams, d = days, Kg = kilogram, VOA = Volatile organic analyses, ml = milliliter, VOCs = Volatile organic compounds, SVOCs = Semi-volatile organic compounds, PCBs = Polychlorinated biphenyls				

6.0 – SAMPLE CUSTODY

6.1 Field Chain-Of-Custody Procedures

Sample handling, packaging, and shipment procedures will follow those identified in Section 6.1 of the FW QAPP and Section 5.0 of the FSP. Prudent's Chain of Custody Form will follow the format of Figure 6-5 of the FW SAP.

6.2 Laboratory COC Procedures

Laboratory chain of custody will follow handling and custody procedures identified in Section 7.0 of the TestAmerica QA Plan.

6.3 Final Evidence Files Custody Procedures

Custody of evidence files will follow those criteria defined in Section 6.3 of the FW QAPP.

7.0 – CALIBRATION PROCEDURES AND FREQUENCY

7.1 Field Instruments/Equipment

Field instruments and equipment calibrations will follow those identified in Section 7.1 of the FW QAPP.

7.2 Laboratory Instruments

Calibration of laboratory instruments will be conducted according to USEPA analytical procedures. Additional method specific calibration information is provided in various Tables in Appendix F of the QSM, 4.1, and Louisville Chemistry Guideline Version 5, 2002.

8.0 – ANALYTICAL PROCEDURES

8.1 Laboratory Analysis

Analytical methods, parameters and quantitation limits are listed in Tables 4-3 through 4-8 of the FW QAPP. Reporting limits for VOCs in Methanol and for low level SVOCs will aim for the levels prescribed in Tables 4-3 and 4-4 in the FW QAPP; however, actual reporting limits will vary depending on sample weight, moisture content, and matrix interferences.

All preparation and analytical methods required for this investigation are listed in Table 8-1 and 8-2 of this QAPP Addendum.

Table 8-1 Preparation and Analytical Methods for RVAAP Soil and Sediment Samples

Analysis Name	Preparation Method	Analysis Method
Volatile Organic	EPA5035	EPA 8260B
Semi-Volatile Organic	EPA 3540C or 3541	EPA 8270C/D
PCB	EPA3540C or 3541	EPA 8082
Pesticides	EPA3540C or 3541	EPA8081A
Explosive Residues/Propellants	EPA 8330B	EPA 8330B
Nitroquanidine Nitroglycerin	EPA 8330B	EPA 8330M
Nitrocellulose	EPA 8330B	EPA Modified 353.2
TAL-Metals	3050B	EPA 6010B 6020
Mercury	EPA 7471B	EPA 7471B
TCLP	1311	
Ignitability	EPA 9045	EPA 9045
Reactivity	EPA9030B	EPA9034
pH	EPA9045C	EPA9045C

Table 8-2: Preparation and Analytical Methods for RVAAP Aqueous Samples

Analysis Name	Preparation Method	Analysis Method

Volatile Organic	EPA5030B	EPA 8260B
Semi-Volatile Organic	EPA 3510C	EPA 8270C/D
PCB	EPA3510C	EPA 8082
Pesticides	EPA3510C	EPA8081A
Explosive Residues	EPA8330B	EPA 8330B
Nitroquanidine Nitroglycerin	EPA 8330B	EPA 8330M
Nitrocellulose	EPA 8330B	EPA Modified 353.2
TAL-Metals	EPA3010A	EPA 6010B 6020
Mercury	EPA7470A	EPA 7470A
Corrosivity	EPA 9040B	EPA 9040B
Reactivity	EPA9030B	EPA9034
pH	EPA9040B	EPA9040B
PCBs = Polychlorinated biphenyls		

Reporting limits for PAH analysis, EPA 8310, can be set at 3 x MDl, levels in order to meet the required risk assessment levels; and conduct a QCMRL sample analysis at the 3x MDL concentrations. Laboratory-specific Standard Operating Procedures (SOPs) will be followed during the analysis of project samples and are available upon request.

The laboratory will maintain a safe and contaminant-free environment for the analysis of samples. The laboratory will demonstrate, through instrument tuning, calibration, LCS, blanks and analytical method blanks, that the laboratory environment and procedures do not and will not impact analytical results.

The laboratory will implement all reasonable procedures to achieve project quantitation levels for all sample analyses. Where contaminant levels or sample matrix analytical interferences impact the laboratory's ability to obtain RLs consistent with these requirements, the laboratory will institute sample clean-up processes, adjust instrument operational parameters, or propose alternative analytical methods or procedures.

All surface soil ISM samples will be air dried upon receipt and extracted within the holding times.

8.2 Sample Drying and Disaggregation

Drying and disaggregation of surface soil ISM samples will be performed per Section 9.3.1.1 of the FW QAPP, except that grinding of samples will not be performed.

9.0 – INTERNAL QUALITY CONTROL CHECKS

9.1 Field Sample Collection

Field QC and triplicate sample types, numbers, and frequencies are identified in Section 2 of this QAPP addendum and are summarized in Tables 2-1 and 2-2. One of the triplicate samples will be sent to the primary laboratory, the second to the QA laboratory chosen by USACE and the third sent as a blind sample to the primary laboratory. Table 2-1 of the QAPP Addendum lists the total and QA samples along with all the analytical procedures required for this effort.

Field equipment rinsates for soil samples will be collected at a frequency of one per day of soil sampling. Volatile organic trip blanks will accompany all shipments containing aqueous volatile organic samples.

9.2 Field Measurement

Not Applicable.

9.3 Laboratory Analysis

The QC checks and frequencies are prescribed in Section 9.3 of the FW QAPP, and in the DoD QSM and the Louisville DoD Quality Systems Manual Supplement, March 2007. In addition, the Tables F-2, F-3, F-4, and F-7 in Appendix F of the QSM 4.1 detail DoD-specific QC requirements for the various methods needed for this investigation. The control limits for various methods are listed in Appendix G of the QSM 4.1. In the absence of prescribed QC information in the FW QAPP or the QSM 4.1, the laboratory-specific limits will be used.

10.0 – DATA REDUCTION, VALIDATION, AND REPORTING

10.1 Data Reduction

Sample collection and field measurements will follow the established protocols defined in the FW FSP, FW QAPP, and the FSP Addendum. Laboratory data reduction will follow the laboratory's QA Plan guidance and conform to general direction provided by the FW QAPP, the QSM 4.1, and the Louisville Chemistry Guideline (LCG).

10.2 Data Verification/Validation

Project data verification and validation will follow direction provided in the FW QAPP, Section 10 and diagrammed in Figure 10-1.

All data will be reviewed and verified in the ADR format by Prudent according to the FW QAPP and a data verification report will be issued

Validation of a minimum of 10 percent of the data will be performed in accordance with the FW QAPP. An independent data validation subcontractor qualified by the USACE Louisville District, will perform this data validation.

10.3 Data Reporting

Analytical data reports will follow the direction provided in Section 10 of the FW QAPP. The laboratory data package will be organized and reported on a per batch basis. TestAmerica laboratory will also provide an ADR electronic data deliverable using the control limits in QSM 4.1 and a hard copy report. Case narratives and calibration information for the electronic files will be provided in hard copies.

11.0 – PERFORMANCE AND SYSTEM AUDITS

11.1 Field Audits

Internal audits of field activities will be conducted by the Prudent QA Officer (or designee) and/or Field Team Leader, according to the FW QAPP.

USACE or Ohio EPA audits may be conducted at the discretion of each respective agency.

11.2 Laboratory Audits

Laboratory audit may be conducted by Prudent QA officer/Chemist. Internal performance and system audits of laboratories will be conducted by the laboratory QA Officer as directed in the laboratory QA plan. On-site laboratory audits may be conducted in conjunction with or at the direction of USACE or Ohio EPA at the discretion of each respective agency.

TestAmerica North Canton Laboratory has been successfully audited by ANSI-ASQ National Accreditation Board/ACLASS and the laboratory certification is valid until March 3, 2012. The West Sacramento laboratory has been successfully audited by A2LA and the certification is valid until January 31, 2012. Both TestAmerica laboratories have been accredited under the ELAP (Environmental Laboratory Accreditation Program) by an authorized body to perform work for DoD under the DoD QSM.

12.0 – PREVENTIVE MAINTENANCE PROCEDURES

12.1 Field Instruments and Equipment

Maintenance of field sampling equipment will follow direction provided in Section 10 of the FW QAPP.

12.2 Laboratory Instruments

Routine and preventive maintenance for all laboratory instruments and equipment will follow the direction of the TestAmerica laboratory QA Manual.

13.0 –SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

13.1 Field Measurements Data

Field data will be assessed as outlined in Section 13.1 of the FW QAPP.

13.2 Laboratory Data

Laboratory data will be assessed as outlined in Section 13.2 of the FW QAPP.

13.3 Project Completeness

Project completeness will be calculated by evaluating the planned versus the actual data. All data that are not flagged with "R" (rejected) will be considered valid. The project completeness will be assessed relative to media, analyte and area of investigation. Project completeness will be determined according to Section 13.3 of the FW QAPP. The scope of this investigation is to determine if there is surface soil contamination immediately adjacent to the three debris piles within the Quarry Pond Surface Dump site (CC-RVAAP-78), determine if there is surface soil contamination within the apparent burn area, and characterize the contents within the two rusted 55-gallon drums. Additionally, two samples of exposed transite at Debris Piles A and B will be assessed.

14.0 – CORRECTIVE ACTIONS

14.1 Sample Collection/Field Measurements

Field activity corrective action protocol will follow directions provided in Section 14.1 of the FW QAPP.

14.2 Laboratory Analyses

Laboratory corrective action protocols will follow directions provided in Section 14.2 of the FW QAPP and the laboratory QA Plan, and the Louisville DoD Quality Systems Manual Supplement (March 2007).

15.0 – QA REPORTS TO MANAGEMENT

Procedures and reports will follow the protocol identified in the FW QAPP and the laboratory QA Plan.

16.0 – REFERENCES

EDQW 2009 DoD Quality Systems Manual for Environmental Laboratories, Version 4.1 April 2009.

Hawaii Dept of Health, Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan. November 2008.

SAIC. 2011. Science Applications International Corporation. Final Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio, Part I: Field Sampling Plan and Part II: Quality Assurance Project Plan. W912QR-08-D-0008, Delivery Order No. 0016, February 24, 2011.

TestAmerica 2008 Quality Systems Manual, TestAmerica North Canton Laboratories, January 2008.

TestAmerica, SOP No. NC-IP-001, Rev. 7, 2009, subsampling.

Louisville QSM Supplement. 2007. U.S. Army Corps of Engineers- Louisville District, March 2007.

Appendix C – Site Safety and Health Plan Addendum to the Facility-Wide Safety and Health Plan

Final Site Safety and Health Plan Addendum for 2010 Preliminary Assessment Compliance Restoration Site CC RVAAP-78 Quarry Pond Surface Dump

Ravenna Army Ammunition Plant
Ravenna, Ohio

Contract No. W912QR-10-P-0052

Prepared for:

US Army Corps of Engineers

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

Prepared by:

PRUDENT TECHNOLOGIES, INC.
dba Prudent Environmental Services, Inc.

Prudent Technologies, Inc.
4242 Medical Drive, Suite 5250
San Antonio, Texas 78229

October 24, 2011

Health and Safety Plan Addendum

2010 Phase I Remedial Investigation (RI) Services Compliance Restoration Site CC-RVAAP-78

Ravenna Army Ammunition Plant, Ravenna, Ohio

Position	Name	Phone Number
Program Manager	Prakash Raja, CHMM	210-860-8623
Project Manager	John P. Jent, P.E.	502-439-8005
Deputy Project Manager	Tomas Hernandez, Jr., P.G.	210-385-2011
Site Health and Safety Manager	Amanda L. Miller	865-414-1823
Certified Industrial Hygienist	Tony Ogunsanya, CIH	210-485-6029

Plan Approval Signatures

_____ _____

Certified Industrial Hygienist Date

_____ _____

Health and Safety Manager Date

_____ _____

Project Manager Date

_____ _____

Program Manager Date

This Health and Safety Plan is valid for the duration of this specific project. A copy of this plan is to be maintained along with the Facility-Wide Health and Safety Plan at all times.

Health and Safety Plan Addendum

2010 Phase I Remedial Investigation (RI) Services Compliance Restoration Site CC-RVAAP-78

Ravenna Army Ammunition Plant, Ravenna, Ohio

Plan Acknowledgement Signatures

I, by my signature, acknowledge that I have read and understand the contents of this Health and Safety Plan Addendum.

Printed Name	Signature	Date

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Hygienist
ACM	Asbestos-containing material
APA	Abbreviated Preliminary Assessment
AOC	Area of Concern
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CIH	Certified Industrial Hygienist
COPC	Chemicals of Potential Concern
CPR	Cardiopulmonary resuscitation
CR	Compliance Restoration
EPA	Environmental Protection Agency
ESS	Explosive Safety Submission
FID	Flame ionization detector
FP	Flash point
FWSAP	Facility-Wide Sampling and Analysis Plan
FWSHP	Facility-Wide Safety & Health Plan
GFCI	Ground-fault circuit interrupter
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDLH	Immediately dangerous to life and health
IDW	Investigation-derived waste
IRP	Installation Restoration Program
MC	Munitions constituents
MEC	Munitions and explosives of concern
MRS	Munitions Response Sites
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise reducing rating
O&M	Operations and maintenance
OE	Ordnance and explosives
OHARNG	Ohio Army National Guard
OSHA	Occupational Safety & Health Administration
PID	photoionization detector
PEL	Permissible explosive limit
PPE	Personal protective equipment
Prudent	Prudent Environmental Services, Inc.
PVC	Polyvinyl chloride
RI	Remedial investigation
RVAAP	Ravenna Army Ammunition Plant
SCBA	Self contained breathing apparatus
SPF	Sun Protection Factor
STEL	Short-term exposure limit
SSHO	Site Safety & Health Officer
SSHP	Site Safety & Health Plan
TLV	Threshold limit value

TWA	Time weighted average
VP	Vapor pressure
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
UXO	Unexploded ordnance
WNV	West Nile Virus

1.0 INTRODUCTION

The Ravenna Army Ammunition Plant (RVAAP) Facility-Wide Safety and Health Plan (FWSHP) (USACE 2011a) and this Site Safety and Health Plan (SSHP) Addendum collectively set forth the specific procedures required to protect Prudent Technologies, Inc. (Prudent) and Prudent subcontractor personnel involved in the field activities at CC-RVAAP-78 at the Ravenna Army Ammunition Plant (RVAAP). These plans are driven by requirements contained in U.S. Army Corps of Engineers (USACE) (2007) and USACE (2008 a,b). All field personnel are required to comply with the requirements of these programs and plans. In addition, subcontractors are responsible for providing their employees with a safe work place. These plans do not relieve subcontractors of this responsibility. If the requirements of these plans are not sufficient to protect the employees of a subcontractor, that subcontractor is required to supplement this information with work practices and procedures that will ensure the safety of its personnel.

The FWSHP addresses program issues, hazards, and hazard controls common to the entire installation. This SSHP Addendum to the FWSHP serves as the lower tier document addressing the hazards and controls specific to performing additional sampling and remedial activities at CC-RVAAP-78 at the Ravenna Army Ammunition Plant (RVAAP). Copies of the FWSHP and this SSHP Addendum will be present at the work site during all fieldwork. As per Paragraph 28.B.01.f of USACE 2008a, the combination of the FWSAP and Site Safety and Health Plan Addendum collectively satisfy the requirements of an Accident Prevention Plan required in Paragraph 01.A.07.

Planned site activities consist of environmental sampling and support tasks. These tasks include soil sampling via trenching across the debris field, surface soil sampling immediately adjacent to the debris field, drum sampling, and drum removal.

Potential hazards posed by the planned tasks include: injury from ordnance and explosives; striking, rotation, and noise hazards from excavating; lifting, noise, and physical strain associated with operating soil sampling equipment; fuel or decontamination solvent fires; chemical exposure; temperature extremes; stinging/biting insects; poisonous plants; and snakes.

The potential for chemical overexposure during the performance of the planned tasks is high based upon the toxicity of the potential contaminants and the potential for creating airborne particulates, as well as the uncertainty associated with unknown contaminants in the 55-gallon drums. There is also the potential for adverse health effects resulting from dermal contact with contaminated soil or debris. This potential hazard will be mitigated through the use of appropriate PPE during the handling of potentially contaminated materials.

This investigation will be performed in the appropriate level of personal protective equipment (PPE) as discussed in further in this report. If one of action levels (B, C, or D) is exceeded or the potential for increased risk becomes apparent during the investigation, protective procedures, including protective clothing, will be upgraded as necessary by the Site Safety & Health Officer (SSHO).

2.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

2.1 Site Description

Environmental work at the RVAAP under the Installation Restoration Program (IRP) began in earnest in 1995, with 32 environmental Areas of Concern (AOCs) identified and prioritized according to U.S. Army Center for Health Promotion & Preventive Medicine (USACHPPM) relative risk protocols into high, medium, and low priority AOCs. Environmental restoration work has proceeded primarily by addressing the highest priority sites first, with sites of medium and low priority receiving attention later. In 2000, the number of environmental AOCs was increased from 32 to 51. Relative risk ranking was again performed to prioritize those additional environmental AOCs. The area identified for investigation for this project is Compliance Restoration (CR) Site CC-RVAAP-78 Quarry Pond Surface Dump

The above site is considered to potentially have munitions and explosives of concern (MEC). The following section provides a brief description of the site.

CC-RVAAP-78, Quarry Pond Surface Dump – The Quarry Pond Surface Dump is located in the western part of the Installation, east of the intersection between South Patrol Road and Greenleaf Road. The site consists of areas of former dumping at the bases of steeply inclined rock slopes. The surface dumps, referenced as Debris Piles A, B, and C on Figures 2-1 and 2-2, are located north, northwest and northeast of the northern-most quarry pond within the Fuze and Booster Quarry Landfill/Ponds (RVAAP-16) AOC. Debris Pile A is approximately 425 feet in length and 18 to 68 feet wide and is suspected of containing asbestos containing material (ACM), construction debris, scrap metal, and unidentified materials. A second, smaller debris pile at the base of a steeply inclined rock slope, defined as Debris Pile B, is approximately 296 feet in length and 24 feet wide. The apparent burn area is located near the 55-gallon drum, both of which are within Debris Pile B. The apparent burn area is characterized by ground charring and lack of vegetation. The topographic map of this area, (see Figure 2-2), shows that the south end of Debris Pile A becomes one continuous slope from Reference Point 9b of Debris Pile A to Reference Point 3 of Debris Pile B (see Figure 1-1). Debris Pile C is located along the northwestern corner of the northern-most quarry pond area with the debris area being approximately 120 feet by 45 feet. A second rusted 55-gallon drum is present within this area. Table 2-1 list Global Positioning System (GPS) Ohio State Plane coordinates of locations where observations were made during the site reconnaissance, monitoring wells and the two 55-gallon drums.

Figure 2-1: CC RVAAP-78 Quarry Pond Surface Dump Location Map

Figure 2-2: CC RVAAP-78 Quarry Pond Surface Dump Topographic Map

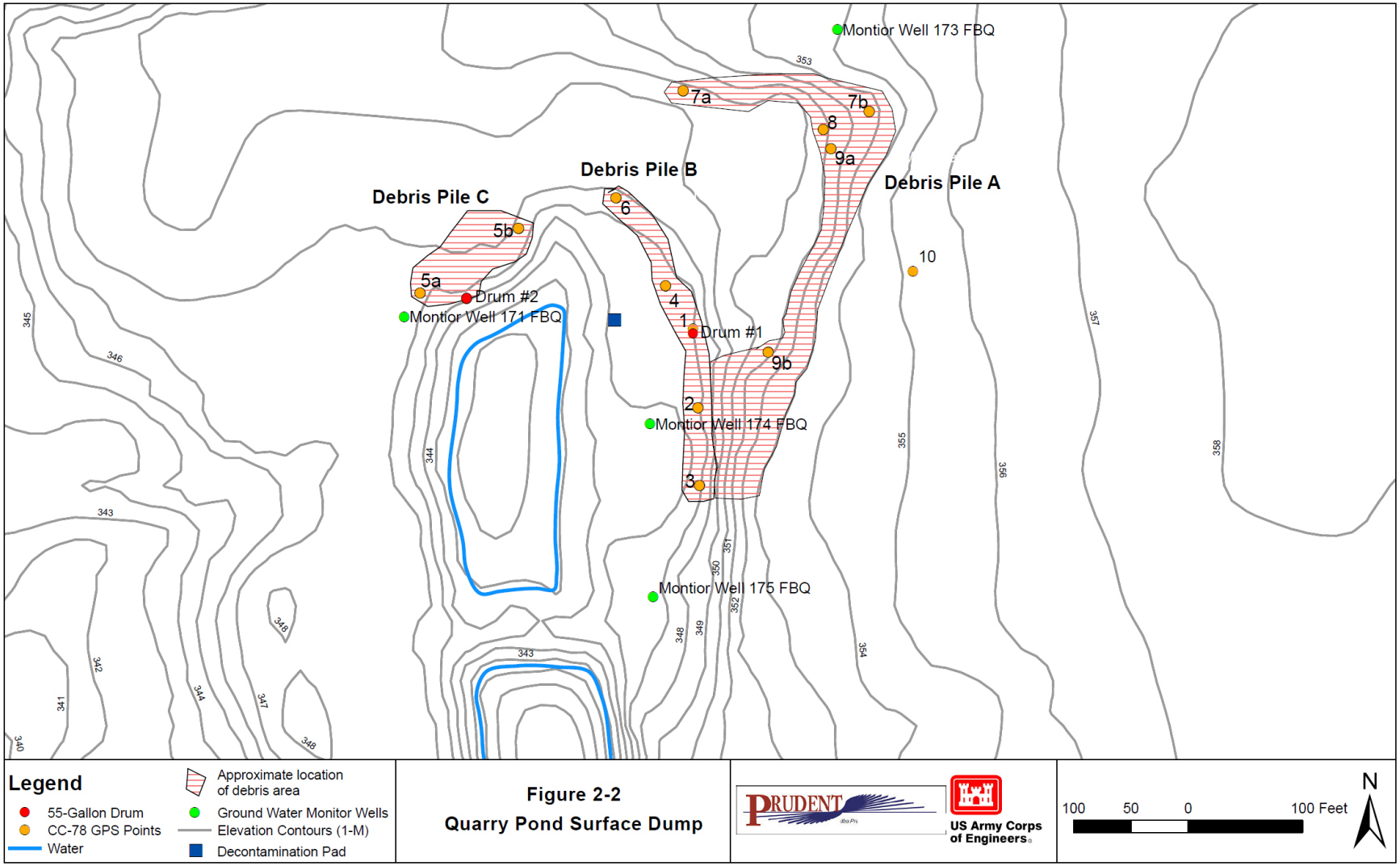


Table 2-1: Latitude/Longitude from RVAAP CC-78 Site Reconnaissance

Reference #	Latitude	Longitude
CC-78 GPS Points		
1	41.1796	-81.1128
2	41.1794	-80.1128
3	41.1792	-81.1128
4	41.1797	-81.1129
6	41.1799	-81.1131
8	41.1801	-81.1124
10	41.1797	-81.1121
5a	41.1797	-81.1137
5b	41.1798	-81.1134
7a	41.1801	-81.1129
7b	41.1801	-81.1123
9a	41.1800	-81.1124
9b	41.1795	-81.1126
Ground Water Monitoring Wells FBQ		
171	41.1796	-81.1138
173	41.1803	-81.1124
174	41.1793	-81.1130
175	41.1789	-81.1130
55-Gallon Drum		
55-Gallon Drum 1	41.1796	-81.1136
55-Gallon Drum 2	41.1796	-81.1128

FBQ = Fuze and Booster Quarry

2.2 Work to be Performed

An initial intrusive investigation of possible environmental impacts to the applicable media at CC RVAAP-78, the Quarry Pond Surface Dump will be performed to confirm the presence or absence of contaminants.

Limited surface soil sampling will be conducted, if possible, and the results compared with cleanup goals, as prescribed in the Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals (USACE 2009), to determine chemicals of potential concern (COPCs). As per the limited scope of a Phase I Remedial Investigation (Preliminary Assessment), no sampling of groundwater is provided within this project. However, brief summaries of existing related surface and groundwater data will be presented. Due to former activities at this site, munitions and explosives of concern (MEC) may potentially be present at this AOC. Therefore, MEC avoidance surveys will be conducted during the investigation activities.

2.3 Contaminant Characterization

Two categories of chemical hazards are associated with site activities:

- Site constituents; and
- Chemicals used to conduct the site work.

Sampling at the nearby Fuse and Booster Quarry AOC and the presence of Transite (cement board with various amounts of asbestos fiber, 12 to 50 percent) in the debris piles indicate the possibility of encountering explosives, metals, and ACM at the Quarry Pond Surface Dump. Information on the potential contaminants and the reagents/chemicals that will be used for the project is contained in Table 2-

2. It is important to note that the contaminants listed in Table 2-2 have been detected in a number of locations at RVAAP and may be present at former operations areas. Exposure to these potential contaminants and reagents/chemicals such as decontaminating solutions, solvents, sample preservatives, field laboratory reagents, or fuels, is likely and will be controlled through compliance with this addendum.

2.3.1 Site Constituents

Table 2-2 lists contaminants that have been encountered at other AOCs. Inclusion in this table indicates the potential to encounter a contaminant during field activities, but it does not necessarily indicate that the contaminant is present in sufficient quantity to pose a health risk to workers.

Hazard/Risk Analysis is provided in Appendix A. The purpose of the task hazard/risk analysis is to identify and assess potential hazards that may be encountered by personnel and to prescribe required controls.

Table 2-2 Potential Contaminants in Soil at CC-RVAAP-78

Contaminants	
1,3,5-TNB	Alpha Chlordane
2,4,6-TNT	Gamma Chlordane
HMX	Aroclor-1254
RDX	Aroclor-1260
Antimony	Dieldrin
Arsenic	Endrin
Beryllium	Anthracene
Cadmium	Benzo(a)anthracene
Chromium	Benzo(b)pyrene
Lead	Benzo(b)fluoranthene
Manganese	Benzo(k)fluoranthene
Thallium	Chrysene
4,4'-DDT	Dibenzo(a,h)anthracene
Aldrin	Indeno(1,2,3-cd)pyrene
Heptachlor Epoxide	Asbestos
TNB = trinitrobenzene, TNT = trinitrotoluene, HMX = Hydrogen-Deuterium Exchange, RDX = Hexahydro-Trinitro-Triazine, DDT = dichlorodiphenyltrichloroethane	

2.3.2 Materials Inventory

Table 2-3 lists chemicals to be used at the site. Inclusion in this table does not necessarily indicate the chemical is present in sufficient quantity to pose a health risk to workers. See Section 5.0 for information regarding PPE.

Table 2-3 Chemicals Used to Conduct Site Work

Materials Inventory
Acetone
Liquinox (decontamination)
Methanol (potentially used for equipment decontamination and sample preparation)
Isopropyl alcohol (potentially used for equipment decontamination)
Gasoline (equipment fuel)

2.3.3 Hazard Communication Materials

Materials that are considered hazardous materials under the Occupation Safety & Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200) may be used during this project. Material Safety Data Sheets (MSDSs) for the hazardous materials listed in table 2-2 are included in Attachment B. Copies of these MSDSs will be made available to all personnel on this project.

3.0 STAFF ORGANIZATION, QUALIFICATIONS AND RESPONSIBILITIES

Table 3-1 presents Prudent staff and their key positions, names and telephone numbers responsible for site safety and health and emergency response.

Table 3-1 Staff Organization

Position	Name	Phone Number
Program Manager	Prakash Raja, CHMM	210-860-8623
Project Manager	John P. Jent, P.E.	502-439-8005
Deputy Project Manager	Tomas Hernandez, Jr., P.G.	210-385-2011
Health and Safety Manager	Aditya Moralwar	402-617-4654
Certified Industrial Hygienist	Tony Ogunsanya, CIH	210-485-6029
UXO Technician Level 3	ECC to provide via subcontract	774-244-7103

The SSHO for this project is Aditya Moralwar, PE. He has over 5 years experience in hazardous, toxic, radiologic waste (HTRW) work, a Master's of Science in Chemical Engineering and a Professional Engineering license. Mr. Moralwar is familiar with the company's standards of procedures. He is OSHA 40 Hour Hazwoper certified and OSHA 30 Hour General Industry Safety & Health certified. Mr. Moralwar was the Project Manager for an Environmental Protection Agency (EPA) lead remediation project in Omaha, Nebraska. An unexploded Ordnance (UXO) Technician Level 3 will provide anomaly avoidance for all field activities related to this project.

4.0 TRAINING

Training requirements are summarized in Table 4-1. At least two persons trained in the Cardiopulmonary Resuscitation (CPR)/first aid will be present during sampling activities. A UXO Technician Level 3 will provide anomaly avoidance for all field activities related to this project.

Table 4-1 Staff Training

Training	Worker	Supervisor	Site Visitor (exclusion zone)
HAZWOPER 29 CFR 1910.120 (40-hr classroom and 3-day supervised field experience)	√	√	√
HAZWOPER Annual Refresher (8 hr)	√	√	√
Additional HAZWOPER Supervisors Training (8 hr)		√	
CPR/Standard First Aid Training (5.5 hr)	√	√	
HAZCOM 29 CFR 1910.1200	√	√	√
Respiratory Protection Training 29 CFR 1910.134 (if respirators are required)	√	√	√
Hearing Conservation Training 29 CFR 1910.95 (for workers exposed to hazardous noise)	√	√	√
Pre-entry Briefing with Site-Specific HAZCOM	√	√	√
Safety Briefing (daily and whenever conditions or tasks change)	√	√	√
UXO Safety Briefing (daily and whenever conditions or tasks change)	√	√	√

√ = required.
CPR = cardiopulmonary resuscitation.
HAZWOPER = Hazardous Waste Operations and Emergency Response.
HAZCOM = Hazardous Communication

5.0 PERSONAL PROTECTIVE EQUIPMENT

General guidelines for selection and use of PPE are presented in the FWSHP. Specific PPE requirements for this work are presented in the hazard/risk analysis section (Appendix A).

These guidelines describe the various types of clothing that are appropriate for use in various chemical operations, and provide recommendations in their selection and use. It is important that protective clothing users realize that no single combination of protective equipment and clothing is capable of protecting you against all hazards. Thus, protective clothing should be used in conjunction with other protective methods. For example, engineering or administrative controls to limit chemical contact with personnel should always be considered as an alternative measure for preventing chemical exposure. The use of protective clothing can itself create significant wearer hazards, such as heat stress, physical and psychological stress, in addition to impaired vision, mobility, and communication. In general, the greater the level of chemical protective clothing, the greater the associated risks. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. Over protection as well as under protection can be hazardous and should be avoided.

5.1 Levels of Protection

Table 5-1 lists ensemble components based on the widely used *EPA Levels of Protection: Levels A, B, C, and D.* These lists can be used as the starting point for ensemble creation; however, each ensemble must be tailored to the specific situation in order to provide the most appropriate level of protection. For example, if an emergency response activity involves a highly contaminated area or if the potential of contamination is high, it may be advisable to wear a disposable covering such as Tyvek® coveralls or PVC splash suits, over the protective ensemble.

Table 5-1 EPA Levels of Protection

Characteristics of Levels	Level A	Level B	Level C	Level D
Not Optional	1. Vapor protective suit (meets NFPA 1991). 2. Pressure-demand, full-face SCBA. 3. Inner chemical-resistant gloves. 4. Chemical-resistant safety boots 5. Two-way radio communication	1. Liquid splash-protective suit (meets NFPA 1992) 2. Pressure-demand, full-facepiece SCBA 3. Inner chemical-resistant gloves 4. Chemical-resistant safety boots 5. Two-way radio communications 6. Hard hat	1. Support Function Protective Garment (meets NFPA 1993) 2. Full-facepiece, air-purifying, canister-equipped respirator 3. Chemical resistant gloves and safety boots 4. Two-way communications system, hard hat	1. Coveralls 2. Safety boots/shoes 3. Safety glasses or chemical splash goggles

Table 5-1 Continued

Characteristics of Levels	1. **Level A**	1. **Level B**	1. **Level C**	1. **Level D**
Optional	2. Cooling system 3. Outer gloves 4. Hard hat	2. Cooling system, 3. Outer gloves	2. Faceshield 3. Escape self-contained breathing apparatus (SCBA)	2. Gloves 3. Escape SCBA 4. Face-shield
Protection Provided	Highest available level of respiratory, skin, and eye protection from solid, liquid and gaseous chemicals	Highest available level of respiratory, skin, and eye protection from solid, liquid and gaseous chemicals.	The same level of skin protection as Level B, but a lower level of respiratory protection. Liquid splash protection but no protection to chemical vapors or gases.	No respiratory protection, minimal skin protection.
Used When	The chemical(s) have been identified and have high level of hazards to respiratory system, skin and eyes. Substances are present with known or suspected skin toxicity or carcinogenity. Operations must be conducted in confined or poorly ventilated areas.	The chemical(s) have been identified but do not require a high level of skin protection. Initial site surveys are required until higher levels of hazards are identified. The primary hazards associated with site entry are from liquid and not vapor contact.	Contact with site chemical(s) will not affect the skin. Air contaminants have been identified and concentrations measured. A canister is available which can remove the contaminant. The site and its hazards have been completely characterized.	The atmosphere contains no known hazard. Work functions preclude splashes, immersion, potential for inhalation, or direct contact with hazard chemicals.
Limitations	Protective clothing must resist permeation by the chemical or mixtures present. Ensemble items must allow integration without loss of performance.	Protective clothing items must resist penetration by the chemicals or mixtures present. Ensemble items must allow integration without loss of performance.	Protective clothing items must resist penetration by the chemical or mixtures present. Chemical airborne concentration must be less than IDLH levels. The atmosphere must contain at least 19.5% oxygen.	This level should not be worn in the Hot Zone. The atmosphere must contain at least 19.5% oxygen.
When Not Applicable			Not Acceptable for Chemical Emergency Response	Not Acceptable for Chemical Emergency Response

The type of equipment used and the overall level of protection should be reevaluated periodically as the amount of information about the chemical situation or process increases, and when workers are required to perform different tasks. Personnel should upgrade or downgrade their level of protection only with concurrence with the site supervisor, safety officer, or plant industrial hygienist.

5.2 Classification of Protective Clothing

- Personal protective clothing includes the following:
    - — Fully encapsulating suits;
    - — Non-encapsulating suits;
    - — Gloves, boots, and hoods;
    - — Firefighter's protective clothing;
    - — Proximity, or approach clothing;
    - — Blast or fragmentation suits; and
    - — Radiation-protective suits.

Firefighter turnout clothing, proximity gear, blast suits, and radiation suits by themselves are not acceptable for providing adequate protection from hazardous chemicals.

5.3 Protective Clothing Selection Factors

- Material Chemical Resistance- Ideally, the chosen material(s) must resist permeation, degradation, and penetration by the respective chemicals.
- Permeation basis- there will be no visible evidence of chemicals permeating a material.
- Degradation involves physical changes in a material as the result of a chemical exposure, use, or ambient conditions (e.g. sunlight). The most common observations of material degradation are discoloration, swelling, loss of physical strength, or deterioration.
- Penetration is the movement of chemicals through zippers, seams, or imperfections in a protective clothing material.

It is important to note that no material protects against all chemicals and combinations of chemicals, and that no currently available material is an effective barrier to any prolonged chemical exposure.

5.4 Clothing Donning, Doffing, and Use

The procedures below are given for vapor protective or liquid-splash protective suit ensembles and should be included in the training program.

- **Donning the Ensemble**- A routine should be established and practiced periodically for donning the various ensemble configurations that a facility or team may use. Assistance should be provided for donning and doffing since these operations are difficult to perform alone, and solo efforts may increase the possibility of ensemble damage.
- Table 5-2 below lists sample procedures for donning a totally encapsulating suit/SCBA ensemble. These procedures should be modified depending on the suit and accessory equipment used. The procedures assume the wearer has previous training in respirator use and decontamination procedures.
- Once the equipment has been donned, its fit should be evaluated. If the clothing is too small, it will restrict movement, increase the likelihood of tearing the suit material, and accelerate wearer

fatigue. If the clothing is too large, the possibility of snagging the material is increased, and the dexterity and coordination of the wearer may be compromised. In either case, the wearer should be recalled and better-fitting clothing provided.

Table 5-2 Sample Donning Procedure

Step	Procedure
1	Inspect clothing and respiratory equipment before donning (see Section 5.7 Inspection).
2	Adjust hardhat or headpiece if worn, to fit user's head.
3	Open back closure used to change air tank (if suit has one) before donning suit.
4	Standing or sitting, step into the legs of the suit; ensure proper placement of the feet within the suit; then gather the suit around the waist.
5	• Put on chemical-resistant safety boots over the feet of the suit. Tape the leg cuff over the tops of the boots. • If additional chemical-resistant safety boots are required, put these on now. • Some one-piece suits have heavy-soled protective feet. With these suits, wear short, chemical resistant safety boots inside the suit.
6	Put on air tank and harness assembly of the self-contained breathing apparatus (SCBA). Don the facepiece and adjust it to be secure, but comfortable. Do not connect the breathing hose. Open valve on air tank.
7	Perform negative and positive respirator facepiece seal test procedures. • To conduct a negative-pressure test, close the inlet part with the palm of the hand or squeeze the breathing tube so it does not pass air, and gently inhale for about 10 seconds. Any inward rushing of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit. • To conduct a positive-pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.
8	Depending on type of suit: • Put on long-sleeved inner gloves (similar to surgical gloves). Secure gloves to sleeves, for suits with detachable gloves (if not done prior to entering the suit). • Additional overgloves, worn over attached suit gloves, may be donned later.
9	Put sleeves of suit over arms as assistant pulls suit up and over the SCBA. Have assistant adjust suit around SCBA and shoulders to ensure unrestricted motion.
10	Put on hardhat, if needed.
11	Raise hood over head carefully so as not to disrupt face seal of SCBA mask. Adjust hood to give satisfactory comfort.
12	Begin to secure the suit by closing all fasteners on opening until there is only adequate room to connect the breathing hose. Secure all belts and/or adjustable leg, head, and waistbands.
13	Connect the breathing hose while opening the main valve.
14	Have assistant first ensure that wearer is breathing properly and then make final closure of the suit.
15	Have assistant check all closures.
16	Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly.

- **Doffing the Ensemble**- Exact procedures for removing a totally encapsulating suit/SCBA ensemble must be established and followed in order to prevent contaminant migration from the response scene and transfer of contaminants to the wearer's body, the doffing assistant, and others.
- Sample doffing procedures are provided in Table 5-3 below. These procedures should be performed only after decontamination of the suited end user. They require a suitably attired assistance. Throughout the procedures, both wearer and assistant should avoid any direct contact with the outside surface of the suit.

Table 5-3 Doffing Procedure

Stage	Procedure
1	If sufficient air supply is available to allow appropriate decontamination before removal.
2	Remove any extraneous or disposable clothing, boot covers, outer gloves, and tape.
3	Have assistant loosen and remove the wearer's safety shoes or boots.
4	Have assistant open the suit completely and lift the hood over the head of the wearer and rest it on top of the self-contained breathing apparatus (SCBA) tank.
5	Remove arms, one at a time, from suit. Once arms are free, have assistant lift the suit up and away from the SCBA backpack – avoiding any contact between the outside surface of the suit and the wearer's body – and lay the suit out flat behind the wearer. Leave internal gloves on, if any.
6	Sitting, if possible, remove both legs from the suit.
7	Follow procedure for doffing SCBA.
8	After suit is removed, remove internal gloves by rolling them off the hand, inside out.
9	Remove internal clothing and thoroughly cleanse the body.
10	If the low-pressure warning alarm has sounded, signifying that approximately 5 minutes of air remain.
11	Remove disposable clothing.
12	Quickly scrub and hose off, especially around the entrance/exit zipper.
13	Open the zipper enough to allow access to the regulator and breathing hose.
14	Immediately attach an appropriate canister to the breathing hose (the type and fittings should be predetermined). Although this provides some protection against any contamination still present, it voids the certification of the unit.
15	Follow Steps 1 through 8 of the regular doffing procedure above. Take extra care to avoid contaminating the assistant and the wearer.

5.5 User Monitoring and Training

- The wearer must understand all aspects of clothing/equipment operation and their limitations; this is especially important for fully encapsulating ensembles where misuse could potentially result in suffocation.
- During protective clothing use, end users should be encouraged to report any perceived problems or difficulties to their supervisor. These malfunctions include, but are not limited to:

- — Degradation of the protection ensemble;
- — Perception of odors;
- — Skin irritation;
- — Unusual residues on clothing material;
- — Discomfort;
- — Resistance to breathing;
- — Fatigue due to respirator use;
- — Interference with vision or communication;
- — Restriction of movement; and
- — Physiological responses such as rapid pulse, nausea, or chest pain.

- Before end users undertake any activity in their chemical protective ensembles, the anticipated duration of use should be established. Several factors limit the length of a mission, including:
  - — Air supply consumption as affected by wearer work rate, fitness, body size, and breathing patterns;
  - — Suit ensemble permeation, degradation, and penetration by chemical contaminants, including expected leakage through suit or respirator exhaust valves (ensemble protection factor);
  - — Ambient temperature as it influences material chemical resistance and flexibility, suit and respirator exhaust valve performance, and wearer heat stress; and
  - — Coolant supply (if necessary).

5.6 Inspection, Storage, And Maintenance

Following a standard program for inspection, proper storage, and maintenance along with realizing protective clothing/equipment limitations is the best way to avoid chemical exposure during emergency response.

5.7 Inspection

- An effective chemical protective clothing inspection program should feature five different inspections:
  - — Inspection and operational testing of equipment received as new from the factory or distributor.
  - — Inspection of equipment as it is selected for a particular chemical operation.
  - — Inspection of equipment after use or training and prior to maintenance.
  - — Periodic inspection of stored equipment.
  - — Periodic inspection when a question arises concerning the appropriateness of selected equipment, or when problems with similar equipment are discovered.

- Each inspection will cover different areas with varying degrees of depth. Those personnel responsible for clothing inspection should follow manufacturer directions; many vendors provide detailed inspection procedures. The generic inspection checklist provided in Table 5-4 may serve as an initial guide for developing more extensive procedures.

- Records must be kept of all inspection procedures. Individual identification numbers will be assigned to all reusable pieces of equipment and records will be maintained by that number. At a minimum, each inspection should record:
  - — Clothing/equipment item ID number;
  - — Date of the inspection;
  - — Person making the inspection;
  - — Results of the inspection; and
  - — Any unusual conditions noted.

Table 5-4 Sample PPE Inspection Checklist

PPE Item			Check
Clothing	*Before Use:*	Determine that the clothing material is correct for the specified task at hand.	
	Visually inspect for:	Imperfect seams	
		Non-uniform coatings	
		Tears	
		Malfunctioning closures	
		Pinholes (hold to light for inspection)	
	Flex Product	Observe for cracks	
		Observe for other signs of shelf deterioration	
	If the product has been used previously, inspect inside and out for signs of chemical deterioration.	Discoloration	
		Swelling	
		Stiffness	
	During the work task, periodically inspect for:	Evidence of chemical attack, such as discoloration, swelling, stiffening, and softening. (Note: Chemical permeation can occur without any visible effects.)	
		Closure failure	
		Tears	
		Punctures	
		Seam discontinuities	

5.8 Storage

- Clothing must be stored properly to prevent damage or malfunction from exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures and impact.
- Some guidelines for general storage of chemical protective clothing include:
  - — Potentially contaminated clothing should be stored in an area separate from street clothing or unused protective clothing.
  - — Potentially contaminated clothing should be stored in a well-ventilated area, with good airflow around each item, if possible.
  - — Different types and materials of clothing and gloves should be stored separately to prevent issuing the wrong material by mistake (e.g. many glove materials are black and cannot be identified by appearance alone).
  - — Protective clothing should be folded or hung in accordance with manufacturer instructions.

5.9 Maintenance

- The following procedures are adopted to ensure that the appropriate level of maintenance is performed only by those individuals who have this specialized training and equipment.
- In no case should you attempt to repair equipment without checking with the person in your facility that is responsible for chemical protective clothing maintenance.
- The following classification scheme is recommended to divide the types of permissible or non-permissible repairs:
  - — Level 1: User or wearer maintenance, requiring a few common tools or no tools at all.
  - — Level 2: Maintenance that can be performed by the response team's maintenance shop, if adequately equipped and trained.
  - — Level 3: Specialized maintenance that can be performed only by the factory or an authorized repair person.
- All repairs made must be recorded on the records for the specific clothing along with appropriate inspection results.

This investigation will be primarily performed in Level D PPE, plus chemical-resistant gloves when handling potentially contaminated materials. Specific tasks may require higher level of PPE as illustrated in Table 5-5 below. If an action levels is exceeded, or increased risk becomes apparent during the investigation, protective procedures will be upgraded as necessary by the SSHO.

Table 5-5 Baseline Personnel Protective Equipment

Activity	PPE Required
Drum sampling and handling	If the drum is intact and has unknown contents, Level A personal protective equipment (PPE): Totally encapsulating chemical protective suit, positive pressure full faced self-contained breathing apparatus or positive pressure supplied air respirator with escape self-contained breathing apparatus (SCBA). If the drum is vented and has unknown contents, Level B PPE: Hood chemical resistant clothing, positive pressure full faced self-contained breathing apparatus or positive pressure supplied air respirator with escape SCBA. Direct reading instruments photoionization detectors and flame ionization detectors (PID/FID), oxygen deficiency, combustible gas, radiological) will be used for screening purposes. If drum is corroded or pressurized it will not be sampled or moved. Call in specialized team.
Civil Surveys and Visual Surveys	LEVEL D PPE: long pants, shirts with sleeves, safety glasses, heavy duty work gloves, safety boots, and hardhats if overhead hazards are present, plus nitrile or similar gloves for contact with potentially contaminated material. Insect repellant (Deet for dermal application/Permethrin for clothing application) as necessary. Tuck pant legs into boots to minimize tick entry.
Surface soil sampling	Level C PPE: ½ mask particulate respirator to be worn by sampler, wear nitrile gloves, where safety glasses with side shields. Insect repellant (Deet for dermal application/Permethrin for clothing application) as necessary. Tuck pant legs into boots to minimize tick entry..
Investigative Derived Waste (IDW) handling	Level D PPE plus nitrile or equivalent gloves for handling of potentially contaminated material
Equipment Decontamination	Level D PPE plus nitrile or chemical resistant rubber gloves (see Section 5.0 of FWSHP). Face shield, splash hood and impermeable clothing when operating pressure washer.
Asbestos Sampling	Level C PPE: ½ mask particulate respirator and Tyvek® suit to be worn by sampler, wear nitrile gloves, where safety glasses with side shields. Insect repellant (Deet for dermal application/Permethrin for clothing application) as necessary. Tuck pant legs into boots to minimize tick entry. Sample area to be wet down before any samples are collected.

6.0 MEDICAL SURVEILLANCE

Medical surveillance requirements, as presented in Section 7.0 of the FWSHP, are summarized in Table 6-1.

Table 6-1 Medical Surveillance Requirements

Baseline	Routine	Suspected/Actual Overexposure	Final
Prior to work assessment	Every 12 months, unless greater frequency is deemed appropriate by attending physician.	As deemed appropriate by attending physicians.	Upon termination or re-assignment

All medical exams shall include (see Section 7.2 of the FWSHP):

- Collection of information on the employee's medical and work history;
- Hands-on examination;
- Audiometry;
- Blood screen such as Sequential Multiple Analyzer with Computer 24;
- Chest P/A X-ray at intervals specified by the attending physician;
- Complete blood count;
- Electrocardiogram for persons older than 45 or where medically indicated;
- Physical examination;
- Spirometry (forced expiratory volume/forced vital capacity); and 1
- Urinalysis (dipstick and microscopic).

7.0 EXPOSURE MONITORING / AIR SAMPLING PROGRAM

Airborne contaminants can present a significant threat to worker health and safety. Thus, identification and quantification of these contaminants through air monitoring is an essential component of a health and safety program at a hazardous waste site. Reliable measurements of airborne contaminants are useful for:

- Selecting personal protective equipment.
- Delineating areas where protection is needed.
- Assessing the potential health effects of exposure.
- Determining the need for specific medical monitoring.

Priorities for air monitoring will be based on the information gathered during initial site characterization. This information served as the basis for selecting the appropriate monitoring equipment and personal protective equipment (PPE) for use when conducting site monitoring. Depending on site conditions, four categories of site monitoring may be necessary: monitoring for immediate danger to life and health (IDLH) and other dangerous conditions, general onsite monitoring, perimeter monitoring, and periodic monitoring.

Monitoring for IDLH is the first step and should be conducted to identify any IDLH conditions, such as flammable or explosive atmospheres, oxygen-deficient environments, and highly toxic levels of airborne contaminants. Direct-reading monitoring instruments will normally include combustible gas indicators, oxygen meters, colorimetric indicator tubes, and organic vapor monitors.

Extreme caution will be exercised in continuing a site survey when atmospheric hazards are indicated. Monitoring personnel are aware that conditions can suddenly change from nonhazardous to hazardous. Acutely hazardous concentrations of chemicals may persist in confined and low-lying spaces for long periods of time.

Site conditions and thus atmospheric chemical conditions may change following the initial characterization. For this reason, monitoring should be repeated periodically, especially when:

- Work begins on a different portion of the site.
- Different contaminants are being handled.
- A markedly different type of operation is initiated (e.g., barrel opening as opposed to subsurface sampling).
- Workers are handling leaking drums or working in areas with obvious liquid contamination (e.g., a waste/debris pile or quarry ponds)

Selective monitoring of high-risk workers, i.e., those who are closest to the source of contaminant generation, will be implemented as necessary since the probability of significant exposure varies directly with distance from the source.

Personal monitoring samples will be collected in the breathing zone and, if workers are wearing respiratory protective equipment, outside the facepiece. These samples represent the actual inhalation exposure of workers who are not wearing respiratory protection and the potential exposure of workers who are wearing respirators.

Site exposure can be affected by several independent and uncontrollable variables, most notably temperature and weather conditions, can affect airborne concentrations. Some demonstrated variables include:

- Temperature. An increase in temperature increases the vapor pressure of most chemicals.
- Windspeed. An increase in wind speed can affect vapor concentrations near a free-standing liquid surface. Dusts and particulate-bound contaminants are also affected.
- Rainfall. Water from rainfall can essentially cap or plug vapor emission routes from open or closed containers, saturated soil, or lagoons, thereby reducing airborne emissions of certain substances.
- Moisture. Dusts, including finely divided hazardous solids, are highly sensitive to moisture content. This moisture content can vary significantly with respect to location and time and can also affect the accuracy of many sampling results.
- Vapor emissions. The physical displacement of saturated vapors can produce short-term, relatively high vapor concentrations. Continuing evaporation and/or diffusion may produce long term low vapor concentrations and may involve large areas.
- Work activities. Work activities often require the mechanical disturbance of contaminated materials, which may change the concentration and composition of airborne contaminants.

In addition to the above monitoring considerations, the SSHO may perform or require additional monitoring. As previously stated, the deployment of monitoring equipment will depend on the activities being conducted and the potential exposures. All personal exposure monitoring records will be maintained in accordance with the FWSSH and NIOSH 85-115. The minimum monitoring requirements and action levels are presented in Table 7-1 below.

Table 7-1 Monitoring Requirements and Action Limits

Instrument	Hazard Monitored	Limitations	Permissible Exposure Levels	Corrective Action	Task
Combustible Gas Indicator (CIG)	Combustible gasses and vapors	Accuracy depends, in part, on the difference between the calibration and sampling temperatures. Sensitivity is a function of the differences in the chemical and physical properties between the calibration gas and the gas being sampled. The filament can be damaged by certain compounds such as silicones, halides, tetraethyl lead, and oxygen enriched atmospheres. Does not provide a valid reading under oxygen deficient conditions.			
Flame Ionization Detector (FID) with Gas Chromatography Option	Many organic gasses and vapors	Does not detect inorganic gasses and vapors, or synthetics. Sensitivity depends on the compound. Should not be used at temperature less than 40°F. Difficult to absolutely define compounds. High concentration of contaminants or oxygen deficient atmosphere requires system modification. In survey mode, readings can be only reported relative to the calibration standard used			

Table 7-1 – Monitoring Requirements and Action Limits (Continued)

Instrument	Hazard Monitored	Limitations	Permissible Exposure Levels	Corrective Action	Task
Photoinization Detector (PID)	Many organic and some inorganic gasses and vapors.	Does not detect methane. Does not detect a compound if the probe used has a lower energy level than the compound's ionization potential. Response may change when gases are mixed. Other voltage sources may interfere with measurements: Readings can only be reported relative to the calibration standard used. Response is affected by high humidity			
Oxygen Meter	Oxygen (O2).	Must be calibrated prior to use. To compensate for altitude and barometric pressure. Certain gases, especially oxidants such as ozone, can affect readings.			
Alpha Radiation Survey Instrument	Alpha Radiation	May not measure beta or gamma radiation.			
Beta Radiation Survey Instrument	Beta Radiation	May not measure alpha or gamma radiation.			
Gamma Radiation Survey Instrument	Gamma Radiation	May not measure alpha or beta radiation.			

8.0 HEAT/COLD STRESS MONITORING

8.1 Inclement Weather

As stated in the FWSHP (Section 9.0), when warnings or indications of impending severe weather exist (e.g., heavy rains, thunderstorms, damaging winds, tornados, hurricanes, floods, lightning), the Contractor SSHO will monitor the weather conditions using a weather notification system. Appropriate precautions will be taken to protect personnel and property from the effects of the severe weather. In accordance with Section 6 of the *USACE Safety and Health Requirements Manual* (USACE 2008), project-specific SSHP addenda should include, at a minimum:

- Severe weather triggers to alert the Contractor SSHO to monitor weather conditions
- Training on severe weather precautions and actions
- Identified area of retreat, preferably a substantial building

8.2 Heat/Cold Stress Monitoring and Controls

Acclimatization, consumption of copious quantities of water (with alternating 1-3 ratio of Gatorade™ to water), and appropriate work/rest cycles are important factors in preventing heat stress-induced illnesses (see Table 8-1). General controls will consist of making fluids readily available, using the buddy system, and taking scheduled and unscheduled breaks in a temperature-controlled environment as necessary. The following specific steps will be taken to reduce the potential for heat stress-induced illness:

- When possible, schedule work for cooler periods during the day.
- Provide site training to include controlling heat stress, recognizing heat stress-induced illness, and administering first aid for heat stress.
- Provide cool water and Gatorade™ to site workers and encourage their consumption (1-3 ratio of Gatorade™ to water).
- Where employees are exposed to solar radiation for short periods and there is the potential for sunburn or exposure for prolonged periods where long-term exposure could lead to health effects such as skin cancer, they shall be provided sun screen with a sun protection factor (SPF) appropriate for their skin type and exposure. Sunscreens shall be used only in accordance with the manufacturer's recommendations.
- Instruct workers to monitor their own and their buddy’s condition relative to heat stress.
- Develop an initial work/rest cycle based on the site-specific conditions and the capabilities of the work crew. The American Conference of Governmental Industrial Hygienists (ACGIH) heat stress Threshold Limit Value (TLV) will be instituted per Table 8-1.
- Provide a cool environment for breaks, such as a vehicle with air conditioning.
- Encourage and allow workers to take unscheduled breaks, as needed.

Table 8-1 Recommended Work/Rest Cycle

Work-Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous work	86	80	77
45 min work/15 min rest	87	82	78
30 min work/30 min rest	89	85	82
15 min work/45 min rest	90	88	86

- Monitor workers wearing Tyvek® or other impermeable clothing for heat stress by taking their pulses at the beginning of each rest period. If any worker's heart rate exceeds 110 beats per minute, the next work period will be shortened by one third (NIOSH et al 1985).

Adequate clothing and staying dry are critical factors in preventing cold stress disorders. The SSHO and Field Operations Manager will ensure the capability to quickly move individuals who become wet to a sheltered, warm area. The following specific steps will be taken (adapted from ACGIH 2010).

- If ambient temperatures are less than 40°F, provide site training on preventing cold injury, recognizing cold injury symptoms, and administering cold injury first aid.
- Provide a heated break area if ambient temperatures are less than 32°F.
- Implement breaks in a warm area every 120 min, at a minimum, if ambient temperatures are less than 32°F.
- Allow workers to take unscheduled breaks, if needed, in a warm area.
- Outdoor work will not be performed if the equivalent chill temperature (temperature combined with the effect of wind) is less than -29°F.

8.3 Heat/Cold Stress-Induced Illness Signs And Symptoms

Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms are muscle spasms and pain in the hands, feet, and abdomen. Personnel exhibiting these symptoms should rest in a cool place and consume fluids and salt.

Heat exhaustion occurs from increased stress on various body organs. Signs and symptoms are:

- Pale, cool, moist skin;
- Heavy sweating;
- Dizziness and nausea; and
- Fainting.

Heat stroke is the most serious form of heat-related illness and should always be treated as a medical emergency. The body's temperature regulation system fails, and the body temperature rapidly rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs.

Signs and symptoms of heat stroke are:

- Red, hot, usually dry skin;
- Lack of or reduced perspiration;
- Nausea;
- Dizziness and confusion;
- Strong, rapid pulse and confusion; and
- Coma.

Hypothermia is the uncontrolled loss of body heat. As the body's core temperature decreases, bodily functions are slowed. The victim becomes weak and disoriented and may become comatose if steps are not taken to return the core temperature to the normal range. Hypothermia can occur whenever temperatures are below 45°F and is most common during wet, windy conditions, with temperatures between 40 and 30°F. The principal cause of hypothermia in these conditions is loss of insulating properties of clothing due to moisture, coupled with heat loss due to wind and evaporation of moisture on the skin.

Frostbite is the freezing of body tissue, which ranges from superficial freezing of surface skin layers to deep freezing of underlying tissue. Frostbite will only occur when ambient temperatures are below 32°F. The risk of frostbite increases as the temperature drops and wind speed increases.

9.0 STANDARD OPERATION SAFETY PROCEDURES

As stated in the FWSHP (section 10.0), general safety rules applicable to the anticipated tasks. The provisions of the plan are mandatory for all on-site employees and visitors, including employees engaged in initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization. These standard operating procedures are offered for guidance. Prudent is responsible for ensuring that the appropriate and sufficient procedures presented in project-specific SSHP addenda are used to protect its employees.

9.1 Site Rules

The following rules will apply to all site activities:

- Personnel must maintain contact with Post 1 at all times through two-way radios or phones.
- All work will be conducted in compliance with the *USACE Safety and Health Requirements Manual* (USACE 2008).
- Daily safety briefings ("tailgate") will be held during field activities to inform personnel of new hazards or procedures.
- The SSHO or Field Operations Manager will conduct and document daily safety inspections.
- Personnel will notify the SSHO of any medical conditions (e.g., allergic to bee stings, diabetes, pregnancy) that require special consideration.
- Personnel will maintain proper workplace housekeeping to minimize the potential for tripping and other accidents.
- Contact with potentially contaminated substances will be avoided. Site personnel in the exclusion zone will avoid walking through puddles, pools, and mud; kneeling on the ground; and placing equipment on the ground.
- Spills will be prevented to the extent possible. If a spill occurs, the material will be contained.
- All injuries and accidents requiring first aid will be reported to the SSHO, Field Operations Manager, Contractor CIH, and the Army Project Manager.
- All workers will abide by a buddy system. Members of a buddy team will maintain verbal or visual contact.

9.2 Driving

All posted speed limits and state vehicle operation laws must be obeyed at all times. Contractors driving motor vehicles/equipment may not use hand-held cellular phones but may use hands-free telephones while the vehicle is in motion. Prior to using a hand-held cellular phone, drivers shall find a safe place to bring their vehicle to a stop. This requirement does not preclude passengers from using cellular phones while the vehicle is in motion. Using headphones and earphones is prohibited while operating a motor vehicle/equipment.

9.3 Permit Requirements

Contractors will coordinate with RVAAP to obtain, as necessary, all permits necessary for the safe execution of a project.

9.4 Investigation-Derived Waste Drum/Container Handling

Any drums used for the project will meet the requirements of the Facility-Wide Sampling and Analysis Plan (FWSAP) USACE 2011b, and project-specific agenda. RVAAP Operations and Maintenance Contractor personnel will provide any required fork truck services in the investigation-derived waste (IDW) staging area (Building 1036). IDW movement from field sites to Building 1036 will be conducted by the drilling subcontractor using a backhoe equipped with forks and drum dollies. No personnel will be allowed under lifted loads. Lifts of greater than 50 pounds will be made with two or more personnel or with lifting equipment in compliance hazardous waste safety training and Sections 14 and 16 of the *USACE Safety and Health Requirements Manual*.

9.5 Hot Work, Sources of Ignition, and Fire Protection

This work will be conducted according to Sections 9 and 10 the *USACE Safety and Health Requirement Manual*.

Notify Post 1 before hot work activities begin. Such notification includes the location where the hot work will be conducted and the start and stop time of the hot work.

- Use a welder's helmet or shaded goggles, leather gloves, and long-sleeved shirt to conduct hot work (oxyfuel cutting).
- Provide a fire extinguisher, rated not less than 10-ABC, in the immediate vicinity of hot work.
- Keep sources of ignition at least 15.2 m (50 ft) from flammables storage areas.
- Post flammables storage areas with signs indicating "No Smoking or Open Flame."
- Keep at least one fire extinguisher, rated not less than 20-B, 7.6 to 22.9 m (25 to 75 ft) from all flammables storage areas.
- Use an approved flammables cabinet to store 94.6 L or more (25 gal or more) of flammable liquid.
- Keep flammable liquids (other than decontamination solvents) in safety containers with flame arresters.

9.6 Electrical Safety

This work will be conducted according to 29 *CFR* 1910 Subpart S and Section 11 of the *USACE Safety and Health Requirement Manual*.

- Connect all portable 110-V electrical equipment through ground fault circuit interrupters (GFCIs).
- Keep conductive materials (drill rigs) clear of energized power lines. Observe the following minimum distances: 0 to 50 kV (10 ft); 51 to 100 kV (12 ft); 101 to 200 kV (15 ft); 201 to 300 kV (20 ft); 301 to 500 kV (25 ft); 501 to 750 kV (35 ft); and 750 to 1000 kV (45 ft).

9.7 Excavation and Trench Safety

Not applicable.

9.8 Machine Guarding

All equipment will be operated with all guards provided by the manufacturer and in compliance with 29 *CFR* 1910, Subpart O and Section 16.A.11 of the *USACE Safety and Health Requirement Manual*. If any guarding must be removed for servicing, the equipment will be disabled to preclude movement or release of energy.

9.9 Lockout/Tagout

All potentially hazardous servicing or equipment repair will be governed by 29 *CFR* 1910.147 and Section 12 of the *USACE Safety and Health Requirement Manual*.

9.10 Fall Protection

Work areas with the potential for a fall of 1.2 meters (4 feet) or more will be provided with fall protection in compliance with Section 21.C of the *USACE Safety and Health Requirement Manual*. This fall protection will consist of guardrails or personal fall protection. Personal fall protection will be used if drilling personnel must climb the upright mast or derrick.

9.11 Hazard Communication

Hazard communication will be governed by 29 *CFR* 1910.1200 and Section 06.B of the *USACE Safety and Health Requirement Manual*. At a minimum, the following steps will be taken:

- Hazardous materials on-site will be labeled to comply with the hazard communication standard, and will include the following.
    - — Clear labeling as to the contents; and
    - — The appropriate hazard warning.
- MSDSs will be available on-site for all hazardous materials that are present.
- Site-specific training will be provided for the hazards posed by site chemicals, protective measures, and emergency procedures.
- Copies of MSDSs for all hazardous chemicals (chemicals brought on-site) will be maintained in the work area. MSDSs will be available to all employees for review during each work shift.
- For all activities where lead control and asbestos disturbance is performed, a separate compliance plan must be written to adequately communicate planned activities and implemented controls.

Compliance plans will appear as attachments or appendices to project-specific SSHP addenda and will be consistent with standards in Section 06.B.05 of the *USACE Safety and Health Requirement Manual.*

9.12 Sanitation

- Sanitation will comply with 29 *CFR* 1910.120(n) and Section 2 of the *USACE Safety and Health Requirement Manual*.
- Provide means at the work site for washing hands and faces prior to eating.

- Provide potable drinking water in closed, labeled ("Drinking Water"), sanitary dispensers and protect them from contamination.
- Post any containers or dispensers of non-potable water with "Caution – Water Unsafe for Drinking, Washing, or Cooking."
- Provide toilets, except for mobile crews with transportation to adequate facilities, according to the following: 1 to 15 personnel = 1 toilet, 16 to 35 personnel = 2 toilets, 36 to 55 personnel = 3 toilets, and 56 to 80 personnel = 4 toilets. Toilet facilities must be lit, ventilated, and have areas for hand washing per Section 02.E of the *USACE Safety and Health Requirement Manual*.

9.13 Munitions and Explosives of Concern

Work that involves, or may involve, exposure to MEC will comply Engineer Manual 385-1-97. The Contractor, at a minimum, will follow the procedures listed below for work in all areas at RVAAP. For activities within the work area, MEC avoidance protocols will be included in the SSHP addendum, as discussed below, and a qualified UXO Technician Level 3 will support the field investigation. UXO personnel will survey the area (visually and instrument-assisted) prior to work, establish appropriate controls, and accompany field teams during project execution.

- All on-site workers will be trained to recognize and avoid the types of MEC that may be present.
- Contractors and their subcontractors will not handle, move, or otherwise disturb MEC or any items that cannot be identified as non-MEC without specific authorization from Army.
- If MEC or potential MEC is discovered, the area will be marked and avoided and work will continue.
- The UXO Technician will use a hand-held magnetometer to clear an area prior to surface soil sampling.

9.14 Insect-Borne Diseases

Various insects are known to carry transmittable diseases at the site vicinity. Workers are to be aware of the threat of mosquitoes and ticks. Mosquitoes carry the West Nile Virus (WNV) and ticks carry Rocky Mountain Spotted Fever and Lyme Disease. Precautionary methods to avoid becoming infected by insect bites are as follows:

- Wear light colored clothing to spot ticks more efficiently.
- Wear insect repellant, Deet for dermal application/Permethrin for clothing application
- Tuck pants into boots to avoid transfer of ticks from grass and brush.
- Conduct personal daily checks focusing on armpit, groin and scalp.

Embedded ticks should be removed using fine-tipped tweezers. DO NOT use petroleum jelly, a hot match, nail polish, or other products. Grasp the tick firmly and as closely to the skin as possible. With a steady motion, pull the tick's body away from the skin. The tick's mouthparts may remain in the skin, but do not be alarmed. The bacteria that cause Lyme disease are contained in the tick's body. Cleanse the area with an antiseptic.

Note the date of removal of any imbedded tick and seek medical attention if any signs and symptoms of including malaise (a general ill feeling), fever, chest pain, dry or non-productive cough, headache, loss of

appetite, shortness of breath, joint and muscle pains, chills, and hoarseness develop over the ensuing days or weeks.

9.15 Ionizing Radiation

All work involving regulated radiation sources must be conducted in accordance with the requirements of the *USACE Safety and Health Requirements Manual*, Section 06.E, Ionizing Radiation (USACE 2008). Requirements include, but are not limited to:

- United States Department of Defense Form 3337, Application for Army Radiation Authorization, must be completed and approved by RVAAP prior to bringing a source onto RVAAP.
- All regulatory requirements, including source security, must be met during the period the source is on RVAAP.
- RVAAP must be notified when the source is removed.

9.16 Fuels

RVAAP procedures and applicable portions of Section 9 of the *USACE Safety and Health Requirements Manual* for use and storage of fuels, such as gasoline and diesel fuel, must be followed. These include, but are not limited to:

- Secondary containment for containers with a capacity of 100 gallons or more;
- All spills must be immediately reported to RVAAP;
- Spill response must comply with the current Installation Spill Contingency Plan for RVAAP;
- Fuel storage areas will be posted with signs stating "No Smoking, Matches, or Open Flame," and no ignition sources will be allowed within 50 feet.
- Only labeled/listed (by a nationally recognized testing laboratory) containers and portable tanks will be used for the storage of flammable and combustible liquids.

10.0 SITE CONTROL MEASURES

As stated in the FWSHP (section 11.0), the field Operations Manager will be responsible for establishing the site control zones, as necessary, around Contractor-controlled areas that present physical or chemical hazards. Implementation of these site control zones will help to minimize the number of employees potentially exposed and to minimize the potential for the spread of contamination. The SSHO will monitor the implementation of the required site control work rules and will report any deviations from prescribed practice to the Field Operations Manager or stop work, as appropriate. Any on-site individuals have stop work authority if unsafe work conditions develop.

No public site control is expected to be necessary for this work, as the work areas are remote and bystanders are not anticipated. The RVAAP installation is not open to the public, and only authorized personnel are allowed in the project site area. If the SSHO determines that a potential exists for unauthorized personnel to approach within 25 feet of a work zone or otherwise be at risk due to proximity, then exclusion zones will be established, as described in the FWSHP.

10.1 Exclusion Zone

The exclusion (contamination) zone is the area where the greatest potential exists for exposure to contamination or physical hazards. The periphery of the exclusion zone will be identified by barricade tape or rope suspended above the ground. An entry and exit checkpoint will be visually defined to regulate the flow of personnel and equipment. The entry and exit checkpoint will be delineated with barricade tape/rope and signs. Signs may state "Construction Area," or "High Noise Area," as deemed appropriate by the SSHO. The number of people and equipment in the exclusion zone will be minimized to control physical hazards and the spread of contamination. The following standard rules will apply to all entry into the exclusion zone:

- The SSHO or Field Operations Manager must approve (and log) entry into the exclusion zone.
- All personnel entering the exclusion zone will wear the prescribed level of protective clothing.
- All items and related paraphernalia intended to be placed on the face or in the mouth (e.g., cigarettes, lighters, matches, chewing tobacco, food, cosmetics) are prohibited in the exclusion zone.
- All personnel in the exclusion zone will follow the buddy system.

Exclusion zones will be established around all activities where contamination is a potential hazard. As a minimum, the exclusion zone will extend 25 feet from the hazard. Exclusion zones for other activities will be appropriate to the hazard and surroundings.

10.2 Contamination Reduction Zone

A contamination reduction (buffer) zone will be established, as necessary, outside the exclusion zone to provide a transition from and a buffer between the exclusion zone and the support zone. This contamination reduction zone is established because significant surface contamination is present or suspected. An entry and exit checkpoint will be visually defined at the periphery of the zone to regulate the flow of personnel and equipment. The entry and exit checkpoint and the perimeter of the zone will be

delineated with the use of ropes/barricade tape and signs. A contamination reduction zone will be established around the central equipment decontamination pad.

All personnel entering the contamination reduction zone will wear the prescribed level of protective clothing required for that zone. All items intended to be placed on the face or in the mouth (e.g., cigarettes, chewing tobacco, food, cosmetics) are prohibited in the contamination reduction zone. Doffing of protective clothing and personnel decontamination will occur in the contamination reduction zones.

10.3 Support Zone

The support zone is the clean and relatively safe area surrounding the exclusion and contamination reduction zones. Entry requirements for the support zone consist of those required for entry into the general area of the facility. Primary functions of the support zone are

- Staging area for clean equipment and supplies; and
- Location for support services (e.g., office trailers, laboratory trailers, eating area[s], toilet facilities, parking, visitor area[s]).

10.4 Site Visitors

The Field Operations Manager will add all visitors to the on-site access roster that is maintained by the RVAAP Operations and Maintenance (O&M) Contractor. The O&M Contractor will approve and coordinate site access with Guard Post 1. All visitors are required to sign-in with Guard Post 1 to gain site access. Visitors will not be allowed inside areas controlled by the Contractor without specific approval of the SSHO and Field Operations Manager. Visitors must meet all regulatory (specifically 29 *CFR* 1910.120) and site health and safety requirements (e.g., proof of training, medical surveillance) to be considered for RVAAP entry. All visitors will receive a health and safety briefing appropriate to the nature of the visit and the potential hazards associated with the visit. All visitors must sign the daily tailgate and health and safety briefing form.

10.5 Site Communication

Field personnel will be capable of contacting other field personnel and outside agencies. Communication on-site will be assured by hand-held radio, cellular phone, portable air horns, or vehicle horns. Short blasts (less than 1/2 second) of an air horn or car horn will be used to request assistance. Prolonged blasts (more than 2 seconds) will be used to signal an evacuation. If phone service is not immediately available on the site, the crew will be equipped with a hand-held radio.

11.0 PERSONNEL HYGIENE AND DECONTAMINATION

The FWSHP and Section 2.0 of this addendum states that a system of procedures will be used to control the spread of contamination from the exclusion (contamination) zone and to ensure that workers are sufficiently free of contamination to preclude adverse health effects. PPE doffing and personnel decontamination are part of this system. The SSHO will ensure the construction of a decontamination station, as necessary; instruct personnel on its proper use; and verify that personnel follow the appropriate steps. This section presents examples of basic requirements for personnel decontamination keyed to the level of protective clothing in use. It is the SSHO's responsibility to verify that decontamination processes are adequate to protect personnel and meet the requirements of Sections 06.M and 28 of the *USACE Safety and Health Requirements Manual* (USACE 2008).

11.1 Decontamination Procedures

11.1.1 Site Selection

Proper placement of the decontamination corridor depends on several factors including: the type of decontamination required, extent of decontamination required, and physical location of incident (inside or outside). Whenever possible place the corridor no more than 100 yards from the incident.

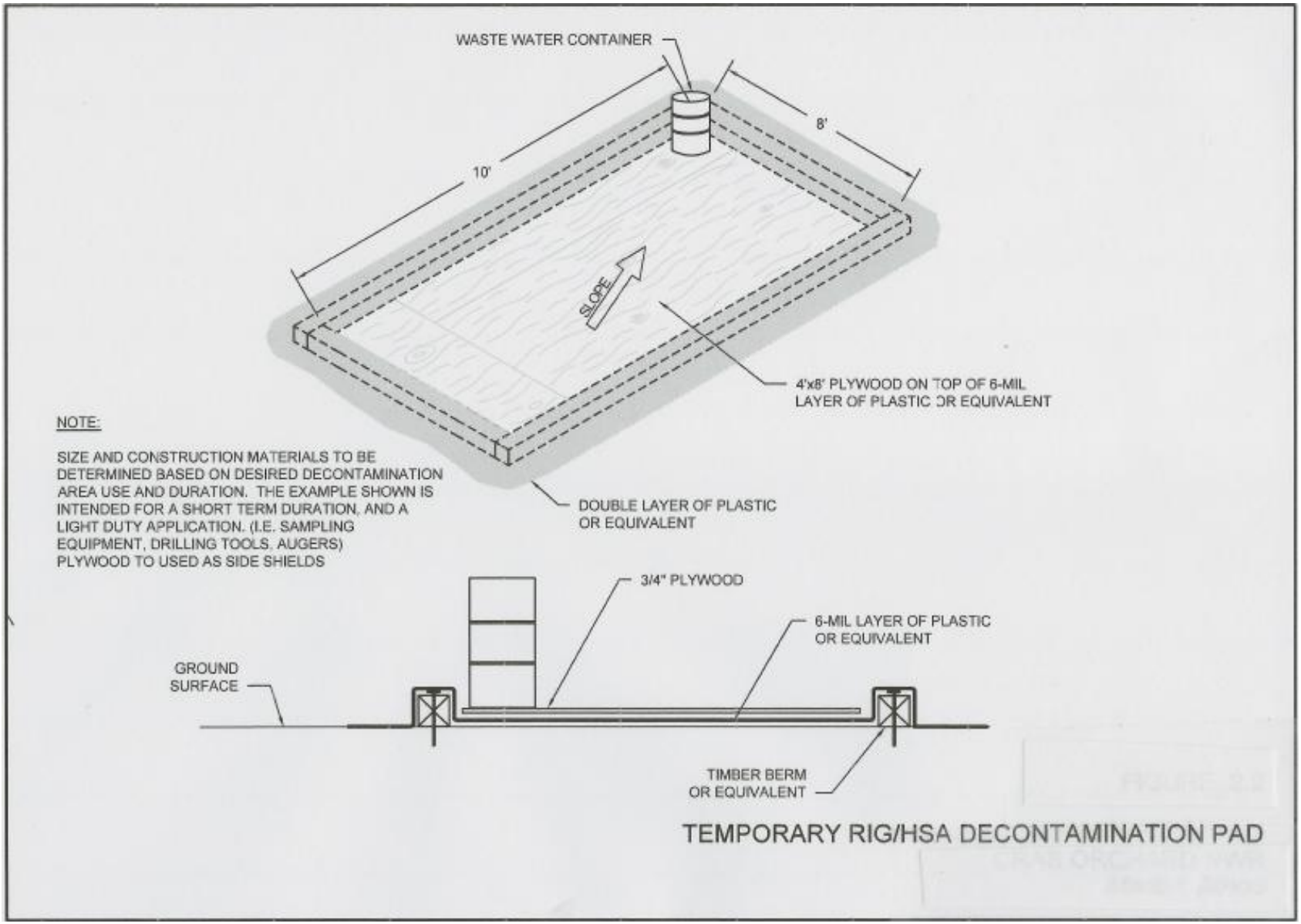
- Inside: Depending on the physical location of the incident there have been guidelines formulated and included in the Spill Control Procedure (002) on how to clean up the environment surrounding the spill. The decontamination area needs to be located where there are NO drains and provisions can be made for accumulation of fluids. If the personnel are severely contaminated the site should be where a safety shower is accessible (fixed facility), or where a water supply can be set up.
- Outside: The utilization of a decontamination area on the exterior of buildings is a possibility. These areas should be positioned up-wind, up-grade, and up-stream from the incident. The area should be paved and located where there are no drains to watercourses, sanitary or storm sewer systems. There should be a water supply available for washing the contaminated personnel.

For this project, a temporary decontamination pad will be placed on-site at the sampling location for immediate use (see Figure 11-1).

11.1.2 Decontamination Equipment and Supplies

In order to perform the task of decontamination there is an accumulation of equipment and supplies required. This list includes any specific decontamination solutions required for the contaminating material; appropriate PPE for the decontamination team; the necessary containers for containing items removed during the decontamination process; containers to hold the decontamination solutions; the appropriate numbers of brushes, sprayers, etc. to adequately clean individuals and equipment placed in the area; and any replacement items needed in the "Hot Zone" ie. spare SCBA cylinders, replacement duct tape, other tools as required.

Figure 11-1: Temporary Decontamination Pad



11.2 Decontamination Solutions

This standard establishes a procedure for decontamination solutions that are helpful in changing the chemical contaminant into a less harmful substance. Two areas will be addressed in this section: unknown compounds and known compounds. These solutions are for application to protective clothing, tools, and equipment only. Do not apply any neutralizing agents directly on the skin without the express orders from a physician.

11.2.1 Unknown materials

Characteristically, hazardous materials decontamination solutions are solutions of water and various chemical compounds selected to react with the contaminants and ultimately neutralize them. The temperature of the solution and the time it is allowed to contact the contaminant are considerations in determining whether the reaction is complete and the contaminant has been neutralized. The following solutions are effective for a variety of contaminants and therefore may be utilized in an unknown situation:

- Decon Solution A: 5% Sodium Carbonate, 5% Trisodium Phosphate & Water
- Decon Solution B: 10% Calcium Hypochlorite & Water
- Rinse Solution: 5% Trisodium Phosphate & Water

11.2.2 Known Materials

There are five general purpose decontamination solutions acceptable for use with known chemicals of the ten hazard classes. These are:

- Decon Solution A: 5% Sodium Carbonate, 5% Trisodium Phosphate & Water
- Decon Solution B: 10% Calcium Hypochlorite & Water
- Decon Solution C: 5% Trisodium Phosphate & Water
- Decon Solution D: Hydrochloric Acid & Water
- Decon Solution E: Concentrated Detergent & Water
- Rinse Solution: 5% Trisodium Phosphate & Water

11.2.3 Decontamination Solution Preparation

- Decontamination solution A
  - — Mix four pounds of commercial grade Sodium Carbonate and four (4) pounds of commercial grade Trisodium Phosphate with twenty (20) gallons of clean water.
- Decontamination solution B
  - — Mix eight pounds of Calcium Hypochlorite (HTH CHLORINE) with ten (10) gallons of clean water.
- Decontamination solution C
  - — Mix four pounds of commercial grade Trisodium Phosphate with ten (10) gallons of clean water

- Decontamination solution D.
    - Mix one pint of concentrated Hydrochloric Acid into ten (10) gallons of clean water. Stir with a wooden of plastic stirrer
- Decontamination solution E
    - Mix Tide or other powdered detergent into water until a paste is formed.
- Rinse Solution
    - Use formulation instructions for Decontamination Solution C.

11.3 Contaminated Protective Clothing

This standard establishes guidelines to be followed when uniforms, protective clothing or items of personal protective equipment are contaminated by a hazardous material.

- Personnel who enter the warm zone or the hot zone at a hazardous materials incident run the risk of becoming contaminated by the materials involved.
- Members must pass through the decontamination sector prior to being allowed to enter the cold zone.
    - At the entrance to the decon sector; the members should discard any hand tools and equipment at the edge of the corridor so that they can be decontaminated.
    - After the member has been rinsed off and decontaminated as much as possible, he shall proceed to the final area where a decontamination worker will assist him in removing his protective clothing.
    - All articles of contaminated protective clothing shall be placed in a bag, then sealed and tagged. The tag should list the contaminant, the contents of the bag, the member's name, and the time and date.
    - If a member's personal clothing or work uniform has been contaminated, the members should proceed to a showering station. After showering, he should dry off his body and change into clean clothes. Ensure that the member is afforded all due privacy.
    - Contaminated uniforms and articles of personal clothing should be bagged, then sealed and tagged. Towels and other items used to dry off should also be placed in a bag for decontamination or disposal.
- The decontamination officer shall make a determination if contaminated items are salvageable. Items that cannot be properly decontaminated shall be disposed of in accordance with state and federal regulations.
- Items that may be decontaminated shall be returned to the member after being properly decontaminated.

11.4 Personnel Decontamination- 9 Step Process

All contaminated personnel will be decontaminated prior to exiting the incident area using the following 9-Step process.

11.4.1 Hot Zone

Step 1 Tool Drop

Personnel enter the decontamination area through the ENTRY POINT. Once in the decontamination corridor they drop tools and equipment on the contaminated side and proceed to step 2.

Step 2 Gross Wash

Remove as much contamination as possible using dilution principle. At the same time, contain all fluids in diked areas as appropriate. Personnel may be in SCBA. Proceed to step 3.

11.4.2 Warm Zone

Step 3 SCBA Service

This step is where SCBA units are serviced. If the individual is in the decontamination area to undergo a cylinder change then the expired cylinder is removed and placed in a controlled area for subsequent decontamination and refilling. Place a full cylinder in the backpack and reconnect. Allow the worker to re-enter the work area.

If the worker is to be fully decontaminated then remove the SCBA with the exception of the facepiece. Place entire unit in a controlled area for subsequent decontamination. Move to step 4.

Step 4 PPE Removal

Remove PPE (SCBA face-piece last) and place in appropriate containers for decontamination and/or disposal. Move to step 5 or transport to a fixed decontamination site.

Step 5 Personal clothing removal

Remove personal clothing, as appropriate, and place in plastic bags for subsequent decontamination and return to the individual. Move to step 6.

Step 6 Personal Shower

Personnel are to shower using soap and sponges. Use cold water first and then slowly raise the temperature. Shower only in an enclosure without a curtain or closeable door. This avoids the possibility of inspiring airborne materials. Bag cleaning items for disposal. Move to step 7.

11.4.3 Cold Zone

Step 7 Redress

Personnel are to dry off. Bag towels for decontamination. Redress using clean clothes or disposable garments. Move to step 8.

Step 8 Medical Evaluation

Personnel are to be monitored by the Trauma Team and treated as required. Move to next step.

Step 9 Records and Transportation

Complete all field records and transport to a medical facility as required.

12.0 EQUIPMENT DECONTAMINATION

The extent of equipment contamination will be characterized by the toxicity of the sample areas and the level of PPE used during sampling. Equipment will be contained in the exclusion use when not being used. Before demobilization of any equipment it will undergo appropriate decontamination; including but not limited to a thorough wash with soap and water.

13.0 EMERGENCY PROCEDURES AND EQUIPMENT

Emergency contacts, telephone numbers, directions to the nearest medical facility, and general procedures can be found in the FWSHP Section 12.0. Emergency phone numbers and the hospital route map are also included in this Section. The Prudent Project Manager will remain in charge of all Prudent and subcontractor personnel during emergency activities. The Prudent staging building (Building 1036) will serve as the assembly point if it becomes necessary to evacuate one or more sampling locations.

13.1 Emergency Phone Numbers

Listed below are emergency groups and their telephone numbers. Cellular telephones and two-way radios will be present in the field and available for use. **RVAAP Post 1 (330 358-2017)** will be contacted first for any emergency service.

Table 13-1 Emergency Phone Numbers

Emergency Group	Phone Number
RVAAP Post 1	330-358-2017
Police (Mid-American Security)	330-338-7406
Emergency Medical Service	330-872-5050
Hospital	330-297-0811/2449
Fire Department (City of Ravenna)	330-297-5738
Hazardous Materials Response	330-358-7406/7409
USACE Project Manager (Glen Beckham)	502-315-6799
USACE Technical Manager (Tom Chanda)	502-315-6868
USACE Safety Officer (Matt Burg)	502-315-7061

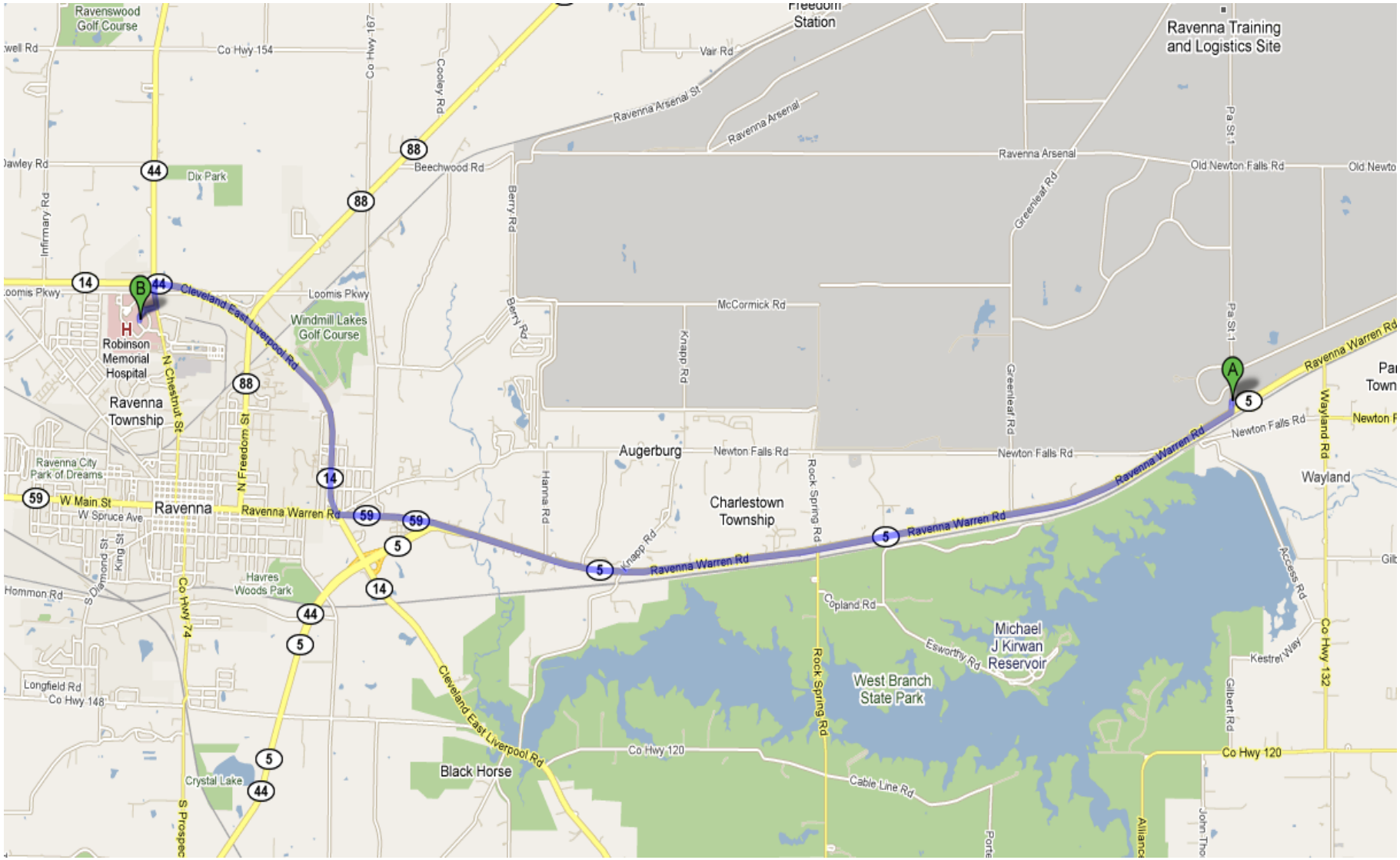
13.2 Procedures and Equipment

At least one person (i.e., project manager or site supervisor) must have a working two-way radio on the RVAAP frequency. The radio must be tested each morning before the start of work, by radioing Security with a communication check. Each team must have direct radio or telephone communication with the Project Manager or Site Supervisor. For the purposes of this requirement, a team is any individual not having a line of sight or within normal voice range of another individual having means of communication with the Project Manager or Site Supervisor.

In the event of medical emergency, Robinson Memorial Hospital is located approximately 10 miles from the site at 6847 North Chestnut Street in Ravenna, Ohio (Figure 13-1). It can be reached by taking PA Street 1 (Paris-Windham Road) towards Highway 5 West/Ravenna Warren Road approximately 7.2 miles west, turn right at Cleveland East Liverpool Road/Highway 14 North/Highway 44 North approximately 2.4 miles, turn left at North Chestnut Street/Ravenna Painesville Road.

In the event of an accident or incident, the SSHO will first notify RVAAP's security personnel, who will, in turn, contact the proper authorities. The field supervisor should then notify the U.S. Army Project Manager immediately according to the requirements of EM 385-1-1. The required Accident Report (ENG Form 3394) must be completed and submitted to the U.S. Army Project Manager within two days, in accordance with the FWSHP.

Figure 13-1: Route Map to Pre-Notified Medical Facility



14.0 LOGS, REPORTS, AND RECORD KEEPING

Prudent will adhere to the documenting activities related to daily logs, reporting, and record keeping requirements as described in the FWSHP. The UXO Technician Level 3 and the Site Health and Safety Manager will lead the daily tailgate meetings.

A copy of the DAILY TAILGATE MEETING FORM to be utilized for this project is attached as Figure 14-1.

Figure 14-1: Daily Tailgate Meeting Form

DAILY TAILGATE MEETING FORM

Site Name & Number: _____

Project Number: _____

Work Being Performed: _____

Date & Time of Meeting: _____

Name of Presenter: _____

NOTE: On the initial day of the project, the Project Manager or designee should conduct a visual inspection of the project site prior to the Tailgate Meeting. This inspection should include a review of project site equipment, hazards, and specific job tasks, activities or operations to be performed for that day. These specific items must be covered during the Tailgate Meeting. For subsequent days, any changes to the site or operations must be covered in Tailgate Meeting.

Itemize the Specific Topics Discussed (if more space is needed use the back of this page):

Participants (if needed, list additional participants on back of this page):

Print Name	Signature	Company	Date

A Tailgate Safety Meeting must be conducted and documented at the beginning of each workday when two or more Prudent employees and/or subcontractor representatives are present on site. Employees, client representatives and subcontractors who arrive at the site after the Tailgate Safety Meeting has been conducted must be briefed on the topics and acknowledge by signing this form.

15.0 REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists) 2003. *Threshold Limit Values*.

NIOSH (National Institute for Occupational Safety and Health). *NIOSH Pocket Guide to Chemical Hazards, the Condensed Chemical Dictionary,* online edition.

USACE. 2007. (U.S. Army Corps of Engineers). *Safety and Occupational Health Requirements for Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OEW) Activities,* ER-385-1-92, May 1, 2007.

USACE. 2008a. (U.S. Army Corps of Engineers). *Safety and Health Manual,* EM-385-1-1, Sep 15, 2008.

USACE. 2008b. (U.S. Army Corps of Engineers). *Explosives – Safety and Health Reuirements Manual.* , EM-385-1.97, September 15, 2008.

USACE (U.S. Army Corps of Engineers) 2011a. *Facility-Wide Safety and Health Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio,* W912QR-08-D-0008, Delivery Order No. 0016, February 24, 2011.

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US EPA 1984, *Drum Handling Practices at Hazardous Waste Sites,* EPA/600/2-86/013. January 1986.

US EPA 1994, *Drum Sampling, Environmental Response Team* SOP #2009. November 1994.

US EPA 2007, *Waste Sampling,* Region 4 Science and Ecosystem Support Division. November 2007.

Appendix A – Hazard/Risk Analysis

HAZARD/RISK ANALYSIS

The purpose of the task hazard/risk analysis is to identify and assess potential hazards that may be encountered by personnel and to prescribe required controls. Table 1-1 summarizes these general hazards and indicates their presence. If additional tasks or significant hazards are identified during the course of this work, this document will be modified by addendum or field change order to include the additional information.

Table 1-1 General Checklist for Hazards

Yes	No	Hazard
	X	Confined space entry
X		Heavy equipment (drum removal)
X		Fire and explosion (fuels)
X		Electrical shock (utilities and tools)
X		Exposure to chemicals (contaminants, fuels, sampling and decontamination)
X		Temperature extremes
X		Biological hazards (indigenous flora and fauna)
	X	Radioactive material/contamination
X		Noise (drum removal equipment)
X		Drowning
X		OE (potential to encounter unexploded ordnance)

OE = ordnance and explosives.

Specific tasks are as follows:

- clearing of brush and vegetation
- surface soil sampling using step probes or soil augers
- Asbestos sampling
- drum sampling
- drum removal
- civil surveying
- sampling equipment decontamination
- investigation-derived waste handling and disposition.

1.1 Task-Specific Hazard Analysis

Table 1-2 presents task-specific hazards, relevant hazard controls, and required monitoring, if appropriate, for all planned tasks.

1.2 Potential Exposures

Prior sampling results indicate the primary contaminants of concern at the project site are explosive residues and metals. Information on the potential contaminants, as well as the reagents/chemicals that will be used for the project is contained in Table 1-3. Material Safety Data Sheet records for reagents/chemicals to be used on the project are contained in Building 1036 at RVAAP. It is important to note that the contaminants listed in Table 1-3 have been detected in a number of locations at RVAAP and may occur at any former operation areas. Exposure to chemicals will be controlled through standard safe handling practices.

Table 1-2 - Hazards Analysis

Task	Potential Hazards	Controls	Monitoring Requirements
Civil Surveys and Visual Surveys in Potentially Contaminated Areas	General safety hazards (moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety boots, and hard hats if overhead hazards are present (see Section 5.0 of the FWSHP). Site-specific training, buddy system, proper housekeeping.	Daily site safety inspections
	Exposure to chemicals	Nitrile or similar gloves for contact with potentially contaminated material. Gloves will be disposed after single use. Wash face and hands and any other exposed areas prior to taking anything by mouth. Hazardous waste site operations training and medical clearance site training must include hazards and controls for exposure to site contaminants and chemicals used on-site. MSDSs on-site. All chemical containers labeled to indicate contents and hazard.	None
	Biological hazards (flora and/or fauna)	Level D PPE. Insect repellant (Deet for dermal application/Permethrin for clothing application) as necessary. Tuck pant legs into boots to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Section 9.0 of FWSHP). Avoidance of accumulations of bird or bat droppings (see Section 9.0 of FWSHP).	Visual survey
	Temperature extremes	Administrative controls (see Section 8.0 of FWSHP). Cooled (shaded) or warmed break area depending on the season. Routine and unscheduled breaks as necessary in established break area (see Section 8.0 of FWSHP). Chilled water if temperature exceeds 70°F. Advice on seasonal/ local weather hazards and controls.	Ambient temperature measurements at least twice daily. Monitor worker pulse rates at the start of each break if wearing impermeable clothing (>110 beats/min, reduce work period by 33% and maintain break cycle).
	MEC	On-site training and ordnance recognition for all field personnel. Avoid areas or withdraw all personnel from area as directed by UXO technician if ordnance or suspected ordnance is discovered.	Visual survey
Soil Sampling and Sample Preservation	General safety hazards (moving equipment, lifting, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety boots, hard hats if overhead hazards are present (see Section 5.0 of FWSHP). Buddy system. Site-specific training. Proper housekeeping. Lifts of >50 lbs will be performed by two or more personnel or with mechanical assistance; extensive heavy lifting will require additional lifting training. Exclusion zone if there is a potential for unauthorized entry.	Daily site safety inspections

Table 1-2 - Hazards Analysis (continued)

Task	Potential Hazards	Controls	Monitoring Requirements
	Noise	If SSHO determines noise level exceed 85 dBA hearing protection is required to attenuate noise level to less than 85 dBA.	Daily site safety inspection
	Fire (fuels)	Fuel stored in safety containers. Bonding and grounding during fuel transfers. Fuel storage areas marked with "no smoking" and/or "no open flame" sign." No ignition sources within 50ft. Fire extinguishers in all fuel use areas and inspected monthly. Gasoline-powered equipment must be shut down and allowed to cool prior to fueling.	Daily site safety inspections
	Exposure to chemicals	Level D PPE, including nitrile or PVC gloves, to handle potentially contaminated material. Minimal contact, wash face and hands prior to taking anything by mouth. Hazardous waste site operations training and medical clearance. Eyewash station in close proximity and placed in safe/easy access location when handling chemicals. Site training must include hazards and mitigation methodologies for all contaminants and chemicals used on-site. MSDSs for all hazardous materials must be kept on site. All containers must be labeled with its contents.	Daily site safety inspections. If soil boring indicated a potential for exposure conduct PID monitoring for those contaminants.
	Electrical shock	Electrical tools (110V) must be connected through heavy duty power cord to GFCI.	Daily site safety inspection
	Temperature extremes	Administrative controls (see Section 8.0 of FWSHP). Cooled (shaded) or warmed break area depending on the season. Routine and unscheduled breaks as necessary in established break area (see Section 8.0 of FWSHP). Chilled water if temperature exceeds 70°F. Advice on seasonal/ local weather hazards and controls.	Ambient temperature measurements at least twice daily. Monitor worker pulse rates at the start of each break if wearing impermeable clothing (>110 beats/min, reduce work period by 33% and maintain break cycle).
	Drowning	To address the potential for drowing, a 30" diameter life ring with a 50' of rope will be positioned at the water edge immediately down slope from Debris Pile C whenever sampling is occurring and sampling will always be conducted with a minimum of two people.	Daily site safety inspection and buddy system.
	Biological hazards (flora and/or fauna)	Level D PPE. Insect repellant (Deet for dermal application/Permethrin for clothing application) as necessary. Tuck pant legs into boots to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Section 9.0 of FWSHP). Avoidance of accumulations of bird or bat droppings (see Section 9.0 of FWSHP).	Visual survey

Table 1-2 - Hazards Analysis (continued)

Task	Potential Hazards	Controls	Monitoring Requirements
Surface Soil Sampling	General safety hazards (rotating machinery, suspended loads, moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety boots, work gloves for material handling plus hard hat (see Section 5.0 of FWSHP). Buddy system. Site-specific training. Proper housekeeping. No employees under lifted loads. At least two functional kill switches. Functional backup alarm, equipment manual on-site. Only experienced operators. Exclusion zone at least equal to mast height if there is any potential for unauthorized entry.	Daily site safety inspections.
	Noise	If SSHO determines noise level exceed 85 dBA hearing protection is required to attenuate noise level to less than 85 dBA.	Daily site safety inspection
	Fire (vehicle fuels or subsurface contaminants)	Fuel stored in safety containers. Bonding and grounding during fuel transfers. Fuel storage areas marked with "no smoking" and/or "no open flame" sign." No ignition sources within 50ft. Fire extinguishers in all fuel use areas and inspected monthly. Gasoline-powered equipment must be shut down and allowed to cool prior to fueling.	Combustible gas indicator/PID if buried organic material or other source of flammable gas is suspected
	Exposure to chemicals	Level D PPE, including nitrile or PVC gloves, to handle potentially contaminated material. Minimal contact, wash face and hands prior to taking anything by mouth. Hazardous waste site operations training and medical clearance. Eyewash station in close proximity and placed in safe/easy access location when handling chemicals. Site training must include hazards and mitigation methodologies for all contaminants and chemicals used on-site. MSDSs for all hazardous materials must be kept on site. All containers must be labeled with its contents.	PID or other sampling, as appropriate
	Temperature extremes	Administrative controls (see Section 8.0 of FWSHP). Cooled (shaded) or warmed break area depending on the season. Routine and unscheduled breaks as necessary in established break area (see Section 8.0 of FWSHP). Chilled water if temperature exceeds 70°F. Advice on seasonal/ local weather hazards and controls.	Ambient temperature measurements at least twice daily. Monitor worker pulse rates at the start of each break if wearing impermeable clothing (>110 beats/min, reduce work period by 33% and maintain break cycle).

Task	Potential Hazards	Controls	Monitoring Requirements
	Biological hazards (flora and/or fauna)	Level D PPE. Insect repellant (Deet for dermal application/Permethrin for clothing application) as necessary. Tuck pant legs into boots to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Section 9.0 of FWSHP). Avoidance of accumulations of bird or bat droppings (see Section 9.0 of FWSHP).	Visual survey
	Electric shock	Identification and clearance of overhead and underground utilities. Electrical tools (110V) must be connected through heavy duty power cord to GFCI.	Daily site safety inspection
	Drowning	To address the potential for drowing, a 30" diameter life ring with a 50' of rope will be positioned at the water edge immediately down slope from Debris Pile C whenever sampling is occurring and sampling will always be conducted with a minimum of two people.	Daily site safety inspection and buddy system.
Drum Sampling and Removal	General safety hazards (manual lifting, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety boots, hard hats if overhead hazards are present (see Section 5.0 of FWSHP). Buddy system. Site-specific training. Proper housekeeping. Lifts of >50 lbs will be performed by two or more personnel or with mechanical assistance; extensive heavy lifting will require additional lifting training. Exclusion zone if there is a potential for unauthorized entry.	Daily site safety inspection
	Contact with unexploded ordnance	Clearance of sites by OE personnel for intrusive work. Continuous escort by OE personnel when in areas with potential to encounter OE. Avoidance of area by OE personnel and non-OE personnel if ordnance is suspected or ordnance is discovered.	Visual and instrument surveys by OE technicians

Task	Potential Hazards	Controls	Monitoring Requirements
	Exposure to chemicals	If the drum is intact and has unknown contents, Level A PPE: Totally encapsulating chemical protective suit, positive pressure full faced self-contained breathing apparatus or positive pressure supplied air respirator with escape SCBA. If the drum is vented and has unknown contents, Level B PPE: Hood chemical resistant clothing, positive pressure full faced self-contained breathing apparatus or positive pressure supplied air respirator with escape SCBA. Direct reading instruments (PID/FID, oxygen deficiency, combustible gas, radiological) will be used for screening purposes. If drum is corroded or pressurized it will not be sampled or moved. Call in specialized team.	Drum inspection to determine over pressurizing or signs of bulging. Sampling as appropriate. Drum over packing as needed.
	Temperature extremes	Administrative controls (see Section 8.0 of FWSHP). Cooled (shaded) or warmed break area depending on the season. Routine and unscheduled breaks as necessary in established break area (see Section 8.0 of FWSHP). Chilled water if temperature exceeds 70°F. Advice on seasonal/ local weather hazards and controls. If personnel are wearing Level A or B PPE, minimize time wearing suit. Use cooling vest if necessary.	Ambient temperature measurements at least twice daily. Monitor worker pulse rates at the start of each break if wearing impermeable clothing (>110 beats/min, reduce work period by 33% and maintain break cycle). Personnel wearing Level A or B PPE, maintain communication. Be aware of hydration levels and body functions while wearing suit.
	Biological hazards (flora and/or fauna)	Level D PPE. Insect repellant (Deet for dermal application/Permethrin for clothing application) as necessary. Tuck pant legs into boots to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Section 9.0 of FWSHP). Avoidance of accumulations of bird or bat droppings (see Section 9.0 of FWSHP). Not Applicable for Level A or B PPE.	Visual survey

Task	Potential Hazards	Controls	Monitoring Requirements
	General hazards (lifting equipment)	Unnecessary personnel will stay well clear of operating equipment. Functional back-up alarm on fork trucks, Bobcats, trucks, etc. Ravenna O&M contractor personnel will provide any required fork truck services in the IDW staging area (Building 1036) in accordance with their procedures. IDW movement from field sites to Building 1036 will be conducted by the drilling subcontractor using a backhoe. equipped with forks and drum dollys. No personnel allowed under lifted loads. Lifts of greater than 50 lbs will be made with two or more personnel or with lifting equipment. Hazardous waste safety training. Compliance with EM 385-1-1 Sections 14 and 16.	Daily safety inspections of operations. Daily inspection of equipment to verify brakes and operating systems are in proper working condition
	Fire (vehicle fuels and flammable contaminants)	Fuel stored in safety containers. Bonding and grounding during fuel transfers. Fuel storage areas marked with "no smoking" and/or "no open flame" sign." No ignition sources within 50ft. Fire extinguishers in all fuel use areas and inspected monthly. Gasoline-powered equipment must be shut down and allowed to cool prior to fueling.	Daily site safety inspection
	Noise	Hearing protection within 7.6 m (25 ft) of any noisy drum moving equipment unless equipment-specific monitoring indicates exposures less than 85 dBA. If SSHO determines noise level exceed 85 dBA hearing protection is required to attenuate noise level to less than 85 dBA.	Daily site safety inspection
	Electric shock	Identification and clearance of overhead and underground utilities. Electrical tools (110V) must be connected through heavy duty power cord to GFCI.	Daily site safety inspection
Equipment Decontamination (Hot tap water and phosphate free detergent wash, deionized or organic free water rinse).	General equipment decontamination hazards (hot water, slips, falls, equipment handling)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety boots, hard hats if overhead hazards are present (see Section 5.0 of FWSHP). Buddy system. Site-specific training. Proper housekeeping. Lifts of >50 lbs will be performed by two or more personnel or with mechanical assistance; extensive heavy lifting will require additional lifting training. Exclusion zone if there is a potential for unauthorized entry.	Daily site safety inspection

Task	Potential Hazards	Controls	Monitoring Requirements
	Noise (spray washer)	Hearing protection within 7.6 m (25 ft) of any noisy washing equipment unless equipment-specific monitoring indicates exposures less than 85 dBA. If SSHO determines noise level exceed 85 dBA hearing protection is required to attenuate noise level to less than 85 dBA.	Daily site safety inspection
	Fire (decontamination solvents and gasoline)	Fuel stored in safety containers. Bonding and grounding during fuel transfers. Fuel storage areas marked with "no smoking" and/or "no open flame" sign." No ignition sources within 50ft. Fire extinguishers in all fuel use areas and inspected monthly. Gasoline-powered equipment must be shut down and allowed to cool prior to fueling.	Daily site safety inspection
	Exposure to chemicals	Level D PPE plus nitrile or chemical resistant rubber gloves (see Section 5.0 of FWSHP). Face shield, splash hood and impermeable clothing when operating pressure washer. Site-specific training. Proper housekeeping. Wash face and hands prior to taking anything by mouth. Minimal contact. Hazardous waste site operations training and medical clearance. Site training must include hazards and controls for exposure to site contaminants and chemicals used on-site. MSDSs on-site. All chemical containers labeled to indicate contents and hazard.	Daily site safety inspections. If exposed follow routine washing/neutralizing procedures and if necessary seek medical assistance.
	Temperature extremes	Administrative controls (see Section 8.0 of FWSHP). Cooled (shaded) or warmed break area depending on the season. Routine and unscheduled breaks as necessary in established break area (see Section 8.0 of FWSHP). Chilled water if temperature exceeds 70°F. Advice on seasonal/ local weather hazards and controls.	Ambient temperature measurements at least twice daily. Monitor worker pulse rates at the start of each break if wearing impermeable clothing (>110 beats/min, reduce work period by 33% and maintain break cycle).

dBA = Decibels A Weighted Scale
FID = Flame Ionization Detector
FWSHP = Facility-Wide Safety and Health Plan
GFCI = Ground-Fault Circuit Interrupter
HAZWOPER = Hazardous Waste Operations and Emergency Response
IDW = Investigation-Derived Waste
MEC = Munitions and Explosives of Concern
MSDS = Material Safety Data Sheet
NRR= Noise Reduction Rating
O&M = Operations and Maintenance
OE = Ordinance and Explosives
PID = Photoionization Detector
PPE = Personal Protective Equipment
PVC = Polyvinyl Chloride
RVAAP = Ravenna Army Ammunition Plant
SSHO = Site Safety and Health Officer
UXO = Unexploded Ordnance

Table 1-3 – Potential Exposures

Chemical[a]	TLV/PEL/STEL/IDLH[b]	Health Effects/ Potential Hazards[c]	Chemical and Physical Properties[c]	Exposure Route(s)[c]
Hexavalent Chromium	TLV/TWA: 0.5 mg/m^3, A4 IDLH: 25 mg/m3	Eye irritation, sensitization	Solid; properties vary depending upon specific compound	Inhalation Ingestion Contact
DNT (dinitrotoluene)	TLV/TWA: 0.2 mg/m^3, A2 IDLH: Ca [50 mg/m3]	Suspected human carcinogen, anorexia, cyanosis, reproductive effects	Orange-yellow solid, VP: 1 mm; FP: 404°F	Inhalation Absorption Ingestion Contact
Gasoline (used for fuel)	TLV/TWA: 300 ppm IDLH: Ca	Potential carcinogen per NIOSH, dizziness, eye irritation, dermatitis	Liquid with aromatic odor; FP: -45°F; VP: 38-300 mm	Inhalation Ingestion Absorption Contact
Acetone (potentially used for equipment decontamination)	TLV/TWA: 250 ppm IDLH: 2500 ppm	Irritation of eyes, nose, throat; headache, dizziness, CNS depression; dermatitis	Colorless liquid with a fragrant, mint-like odor. VP: 180 mmHg	Inhalation Ingestion Contact
Hydrochloric acid (potentially used to preserve water samples or for equipment decontamination)	TLV: 5 ppm ceiling IDLH: 50 ppm	Irritation of eyes, skin, respiratory system	Liquid; VP: fuming; IP: 12.74 eV; FP: none	Inhalation Ingestion Contact
Isopropyl alcohol (potentially used for equipment decontamination)	TLV/TWA: 400 ppm STEL: 500 ppm IDLH: 2000 ppm	Irritation of eyes, skin, respiratory system; drowsiness, headache	Colorless liquid with alcohol odor; VP: 33 mm; IP: 10.10 eV; FP: 53°F	Inhalation Ingestion Contact
Lead	TLV/TWA: 0.05 mg/m^3, A3 PEL/TWA: 0.05 mg/m^3 IDLH: 100 mg/m3	Weakness, anorexia, abdominal pain, anemia	Solid metal; VP: 0 mm; FP: NA; IP: NA	Inhalation Ingestion Contact
Liquinox (used for decontamination)	TLV/TWA: None	Inhalation may cause local irritation to mucus membranes	Yellow odorless liquid (biodegradable cleaner); FP: NA	Inhalation Ingestion
Methanol (potentially used for equipment decontamination and sample preparation)	TLV/TWA: 200 ppm Skin notation IDLH: 6000 ppm	Irritation of eyes, skin, respiratory system; headache; optic nerve damage	Liquid; VP: 96 mm; IP: 10.84 eV; FP: 52°F	Inhalation Absorption Ingestion Contact
HMX (octogen)	TLV/TWA: None established; toxicity assumed to be similar to RDX, as compounds are very similar	Explosive, assumed irritation of eyes and skin, dizziness, weakness	Assumed similar to RDX- FP: explodes; VP: 0.0004 mm at 230°F	Assumed: Inhalation Absorption Ingestion Contact

Table 1-3 – Potential Exposures (continued)

Chemical[a]	TLV/PEL/STEL/IDLH[b]	Health Effects/ Potential Hazards[c]	Chemical and Physical Properties[c]	Exposure Route(s)[c]
RDX (cyclonite)	TLV/TWA: 0.5 mg/m^3, A4 Skin notation IDLH: none established	Explosive, irritation of eyes and skin, dizziness, weakness	White powder; FP: explodes; VP: 0.0004 mm at 230°F	Inhalation Absorption Ingestion Contact
TNT (2,4,6-trinitrotoluene)	TLV/TWA: 0.5 mg/m^3 Skin notation IDLH: 500 mg/m^3	Cluster headache, irritation of skin and mucus membranes, liver damage, kidney damage	Pale solid; FP: explodes; VP: 0.0002 mm	Inhalation Absorption Ingestion Contact
HMX (octogen)	TLV/TWA: None established; toxicity assumed to be similar to RDX, as compounds are very similar	Explosive, assumed irritation of eyes and skin, dizziness, weakness	Assumed similar to RDX- FP: explodes; VP: 0.0004 mm at 230°F	Assumed: Inhalation Absorption Ingestion Contact
RDX (cyclonite)	TLV/TWA: 0.5 mg/m^3, A4 Skin notation IDLH: none established	Explosive, irritation of eyes and skin, dizziness, weakness	White powder; FP: explodes; VP: 0.0004 mm at 230°F	Inhalation Absorption Ingestion Contact
TNT (2,4,6-trinitrotoluene)	TLV/TWA: 0.5 mg/m^3 Skin notation IDLH: 500 mg/m^3	Cluster headache, irritation of skin and mucus membranes, liver damage, kidney damage	Pale solid; FP: explodes; VP: 0.0002 mm	Inhalation Absorption Ingestion Contact

[a] The potential chemicals were obtained from the Ravenna Army Ammunition Plant Phase I Remedial Investigation Report (USACE 1998).
[b] From 1999 Threshold Limit Values, NIOSH Pocket Guide to Chemical Hazards (1997).
[c] From 1997 NIOSH Pocket Guide to Chemical Hazards, the Condensed Chemical Dictionary, 10th ed.

A2 = Suspected human carcinogen
A3 = Confirmed animal carcinogen with unknown relevance to humans.
A4 = Not classifiable as a human carcinogen
FP = Flash point
IDLH = Immediately dangerous to life and health
IP = Ionization potential
NA = Not available
NIOSH = National Institute for Occupational Safety and Health
OE = Ordnance and explosives
PEL = Permissible exposure limit
PPE = Personal protective equipment
STEL = Short-term exposure limit
TLV = Threshold limit value
TWA = Time-weighted average
VP = Vapor pressure

Appendix B – ENG Form 3394 Accident Investigation Form

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	**REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)**

1. **ACCIDENT CLASSIFICATION**

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC ☐ FATAL ☐ OTHER			☐	

2. **PERSONAL DATA**

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE

g. DUTY STATUS AT TIME OF ACCIDENT
☐ ON DUTY ☐ TDY ☐ OFF DUTY

h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER
☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL
☐ TEMPORARY ☐ STUDENT
☐ OTHER *(Specify)* _____

3. **GENERAL INFORMATION**

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER _____
☐ CIVIL WORKS ☐ MILITARY
☐ OTHER *(Specify)* _____

f. TYPE OF CONTRACT
☐ CONSTRUCTION ☐ SERVICE
☐ A/E ☐ DREDGE
☐ OTHER *(Specify)* _____

g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ SUPERFUND ☐ DERP
☐ IRP ☐ OTHER *(Specify)* _____

4. **CONSTRUCTION ACTIVITIES ONLY** *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY _____ (CODE) #

b. TYPE OF CONSTRUCTION EQUIPMENT _____ (CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY (CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED
PRIMARY _____ (CODE) #
SECONDARY _____ (CODE) #

f. NATURE OF ILLNESS/INJURY _____ (CODE) #

g. TYPE AND SOURCE OF INJURY/ILLNESS
TYPE _____ (CODE) #
SOURCE _____ (CODE) #

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT _____ (CODE) #

b. PERSONAL FLOATATION DEVICE USED?
☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE
☐☐ TRUCK ☐☐ OTHER *(Specify)* _____

b. TYPE OF COLLISION
☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END
☐ BROADSIDE ☐ ROLL OVER ☐ BACKING
☐ OTHER *(Specify)* _____

c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
(1) FRONT SEAT			
(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT _____ (CODE) #

b. TYPE OF COLLISION/MISHAP _____ (CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. **CAUSAL FACTOR(S)** *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. **TRAINING**

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. **FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES** *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. **ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).**

DESCRIBE FULLY:

15. **DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.**

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS _____ CONTRACTOR _____	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL

16. **MANAGEMENT REVIEW** *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. **MANAGEMENT REVIEW** *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. **SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW**

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. **COMMAND APPROVAL**

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10. ACCIDENT DESCRIPTION ***(Continuation)***

13a. DIRECT CAUSE ***(Continuation)***

13b. INDIRECT CAUSES *(Continuation)*

14. ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

Appendix D – UXO/MEC Anomaly Avoidance Plan

Final UXO/MEC Anomaly Avoidance Plan for 2010 Preliminary Assessment Compliance Restoration Sites CC RVAAP-78 Quarry Pond Surface Dump

Ravenna Army Ammunition Plant
Ravenna, Ohio

Contract No. W912QR-10-P-0052

Prepared for:

US Army Corps of Engineers

U.S. Army Corps of Engineers
600 Martin Luther King, Jr. Place
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Prepared by:

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October 24, 2011

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CO	Contracting Officer
COR	Contracting Officer Representative
CPR	Cardiopulmonary Resuscitation
DDESB	Department of Defense Explosives Safety Board
DoD	Department of Defense
DPT	direct push technology
HTRW	hazardous, toxic, radioactive waste
MC	munitions constituents
MEC	munitions and explosives of concern
Prudent	Prudent Technologies, Inc.
QC	quality control
RVAAP	Ravenna Army Ammunition Plant
SHSO	Site Health and Safety Officer
SSHP	Site Safety and Health Plan
SOW	scope of work
UXOSO	Unexploded Ordnance Safety Officer
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
WP	work plan

1.0 – INTRODUCTION

This project specific Munitions and Explosives of Concern (MEC) Avoidance discusses surface and MEC anomaly avoidance procedures to be used while conducting hazardous, toxic, radioactive waste (HTRW)-related activities during investigative actions to be completed at Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. The MEC anomaly avoidance procedures contained in this plan were developed in accordance with the United States Army Corps of Engineers (USACE) EP 75-1-2 "Munitions and Explosives of Concern (MEC) Support During HTRW and Construction Activities" (USACE, 2004a), "DoD Ammunition and Explosive Safety Standards" DoD 6055.9-STD, Chapter 15, Change 2, August 21 2009, "EXPLOSIVES SAFETY AND HEALTH REQUIREMENTS MANUAL" EM 385-1-97 (USACE 2008b) and USACE 2008 a. These procedures will be performed and adhered to by all Prudent Technologies, Inc. (Prudent) and subcontractor personnel during HTRW field activities conducted at RVAAP. Prudent and its subcontractors will work closely with the USACE staff assigned to RVAAP to ensure a safe working environment and to ensure the equipment, supplies, and other resources needed to provide MEC avoidance are present on-site.

Anomaly avoidance procedures will be provided during HTRW-related field investigation activities. These activities include, but are not limited to, surface soil sampling. The purpose of avoidance during field activities is to identify any potential surface or near-surface MEC and anomalies during field activities. For anomaly avoidance on site with potential MEC, Prudent will provide an unexploded ordnance (UXO) escort consisting of a qualified UXO Technician Level III during the entire fieldwork period.

If a magnetic anomaly is detected indicating the possible presence of MEC, the specific location will be marked and avoided. Intrusive anomaly investigation and/or MEC removal is not an authorized activity on this scope of work (SOW).

2.0 – UXO TEAM QUALIFICATIONS & RESPONSIBILITIES

2.0 UXO Team

2.1.1 UXO Team Qualification

MEC avoidance support activity will be completed by a minimum of a UXO Technician III and at least one other individual. The UXO Technician III will escort the field team and will be on-site during all field activities. The UXO Technician III working at this site has completed a training program, prior to beginning work on site, which complies with OSHA Regulations 29 CFR 1910.120e(9).

2.1.2 Responsibilities

The UXO Technician III has the following responsibilities for MEC avoidance support procedures during the field investigation:

- Provide the ordnance expertise to identify MEC-related hazards and will also act as the UXO Safety Officer (UXOSO) for the project during field activities.
- Conduct a surface access survey
- Establish and delineate surface MEC -free ingress/egress lanes and work areas.
- Conduct MEC safety briefings for all site personnel and visitors.
- Mark and report any potential surface MEC encountered to the appropriate authority for proper response and disposition.
- Work closely with the USACE personnel on all MEC-related matters.

2.1.3 Authority

The designated site UXOSO has final on-site authority on all munitions and MEC matters concerning safety. The UXOSO will report to and communicate directly with the Prudent Project Manager.

3.0 – ON-SITE TRAINING

As part of the MEC avoidance process, Prudent will perform project-specific training for all field personnel. The purpose of this training is to ensure that all field personnel fully understand the operational procedures and methods to be used, responsibilities, safety and environmental concerns during sampling, investigation and excavation activities. Any field personnel arriving at the site after this initial training session will have to complete the training before starting work. The UXOSO will conduct the training, which will include the following topics:

- General procedures to be followed for MEC avoidance.
- Emergency procedures and contact information for RVAAP.

4.0 – MEC SAFETY

If potential or actual MEC is encountered during any phase of work, the Prudent Project Manager, Prudent Site Health and Safety Officer (SHSO), Prudent UXO Safety Officer (UXOSO), and the USACE Site Safety Representative will immediately be notified (USACE, 2004b). In general, the following MEC safety protocols will be followed:

- The cardinal principle to be observed involving ordnance, explosives, ammunition, severe fire hazards, or toxic materials is to limit the exposure to a minimum number of personnel, for the minimum amount of time, to a minimum amount of hazardous material consistent with a safe and efficient operation.
- The age or condition of a MEC item does not decrease its effectiveness. MEC that has been exposed to the elements for an extended period becomes more sensitive to shock, movement, and friction because the stabilizing agent in the explosives may be degraded.
- Consider MEC that has been exposed to fire to be extremely hazardous. Chemical and physical changes to the contents may have occurred that render it more sensitive than it was in its original state.
- DO NOT touch or move any ordnance items regardless of the markings or apparent condition.
- DO NOT visit an MEC site if an electrical storm is occurring or approaching. If a storm approaches during a site visit or during site operations, leave the site immediately and seek shelter.
- DO NOT use radio or cellular phones near suspect MEC items.
- DO NOT drive vehicles into a suspected MEC area; use clearly marked lanes.
- DO NOT carry matches, cigarettes, lighters or other flame-producing devices onto the RVAAP.
- Always assume MEC items contain a live charge until determined otherwise.
- DO NOT touch, move, or jar any MEC item, regardless of its apparent condition.
- DO NOT be misled by markings on the MEC item stating, “practice bomb,” “dummy,” or “inert.” Even practice bombs have explosive charges that are used to mark and/or spot the point of impact; or the item could be marked incorrectly.

5.0 – PROJECT EQUIPMENT

5.1 Project Equipment

Project equipment for MEC avoidance will be inspected to ensure completeness and operational readiness. Any equipment found damaged or defective will be repaired or returned for replacement. All instruments and equipment that require routine maintenance and/or calibration will be inspected initially upon arrival and then periodically as required in the Facility-Wide Work Plan or manufacturer's equipment manual. Equipment required for daily usage shall be calibrated twice daily (start and finish). If an equipment check indicates that any piece of equipment is not operating correctly and field repair cannot immediately be accomplished, the equipment will be removed from service until it can be repaired. Alternately, the equipment may be replaced with an equivalent model. Key safety equipment will have an operational backup on site.

5.1.1 Geophysical Sweep Equipment

The use of geophysical sweep equipment will depend on the local area of the sweep and the intended work to be conducted in that area. If the area is to be investigated only on foot, it may suffice to conduct only a metal detector-aided visual search of the area. Along access routes for vehicular traffic a geophysical sweep for subsurface anomalies to a depth of 4 feet or more is required.

For the purpose of MEC anomaly avoidance, the following geophysical equipment will be utilized:

- For a geophysical sweep of an area to be sampled, a Schonstedt Model GA-72-Cd magnetometer (or equivalent) will be utilized. This equipment will be used prior the performance of soil sampling, beginning at ground surface and just before penetration.

5.1.2 Geophysical Survey Equipment

(The use of Geophysical Survey Equipment is not applicable to this project)

6.0 – MUNITIONS AND EXPLOSIVES OF CONCERN

Work that involves, or may involve, exposure to MEC will comply with Section 33 of the *USACE Safety and Health Requirement Manual*, USACE 2008a. The Contractor, at a minimum, will follow the procedures listed below for work in all areas at RVAAP. UXO personnel will survey the area (visually and instrument-assisted) prior to work, establish appropriate controls, and accompany field teams during project execution. In general, MEC avoidance is conducted as follows:

- Contractors and their subcontractors will not handle, move, or otherwise disturb MEC or any items that cannot be identified as non-MEC without specific authorization from Army.
- If the UXO Technician III identifies an area as possible MEC, all personnel will avoid that area.
- Contractors will be escorted by the UXO Technician at all times within the project site until the UXO Technician has completed a visual and magnetometer survey of access routes, work areas, and sampling locations and all cleared areas are marked. Schonstedt Model MG-220/230 Magnetic Gradiometers (or equivalent) normally will be used as the unit is designed to detect the presence of buried iron or steel objects.
- Escorted personnel will follow behind the UXO Technician. If anomalies or MEC are detected, the UXO Technician will halt escorted personnel in place, mark the item(s), select a course around the item, and instruct escorted personnel to follow. The anomaly will be reported to the on-site Field Operations Manager, who will initiate the appropriate response actions.
- Cleared access routes will be at least twice as wide as the widest vehicle entering the project site. At a minimum, the cleared work area will be a square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment for use on-site.
- The UXO Technician will use a hand-held magnetometer to clear an area prior to surface soil sampling.

7.0 – MEC AVOIDANCE ACTIVITIES

This section discusses MEC avoidance on this project.

7.1 Site Access

Prudent personnel will be escorted by a UXO technician at all times in areas potentially impacted with MEC until the team has completed the surface soil sampling and removal of two rusted, split 55-gallon drums. If anomalies are detected, the UXO tech escort will halt escorted personnel in place, flag the anomaly with a red survey flag, select a course around the item, and instruct escorted personnel to follow. No MEC items will be handled at any time during this project.

7.2 Clearing and Grubbing

Trees, shrubs, vines, grasses, landforms, and other landscape features to be preserved will be clearly identified. Except in work areas, trees or shrubs will not be removed, cut, defaced, injured, or destroyed without the permission from RVAAP Stakeholders.

7.3 Land Surveying

This section is not applicable to this project.

7.4 Geophysical Surveying

This section is not applicable to this project.

7.5 Surface Soil Sampling

Anomaly avoidance procedures for surface soil sampling (between 0 and 12 inches bgs) in areas with potential MEC will proceed as follows. The UXO tech will visually survey the surface of each proposed surface soil sampling location for any indication of MEC or MEC-related contamination. In addition, the UXO tech will conduct a survey of the proposed sampling locations using a hand-held magnetometer. If anomalies or evidence of explosive contamination are detected at a proposed sampling location or too many anomalies are detected in a general area of interest, the Prudent Field Manager will select an alternate location for collection of the surface soil sample. Any anomalies detected will be prominently marked with red survey flags or non-metallic pin flags for avoidance during HTRW sampling activities. Soil sampling with a hand auger or step probe typically involves manual penetration at the desired location, followed by withdrawal and collection of a soil sample.

7.6 Drum Removal

If the removal of the two rusted, split 55-gallon drums by small backhoe is required, the UXO tech escort will conduct an access survey for the small backhoe utilized to remove the drums. The access route shall be at least twice as wide as the small backhoe and the backhoe will use that route. At a minimum, the access area will have a dimension in all directions equal to twice the length of the small backhoe to be brought on-site and clearly delineated with green flagging or stakes.

Appendix E – Comment Resolution Tables

Comment Number	Page or Sheet	Comment	Recommendation	Response
Ohio EPA (K. Palombo, T. Fisher) **Draft Work Plan Addendum**				
O-1.	General	Work Plan contains many duplicate page numbers.	Please number pages consecutively.	All page numbers will be corrected and the Table of Contents adjusted to reflect the corrected page numbers. Replacement pages and corrected CDs will be provided to all stakeholders. The page numbers and TOC in the Final version will be correct.
O-2.	Report Documentation Page	Report Date says 10-8-2011. Is this an anticipated start date?	Change to actual start date or date of Final Work Plan	The report date is submitted per the format associated with Item 1 (DD-MM-YYYY) of the Standard Form 298.
O-3.	Draft Work Plan Table of Contents (TOC)	Executive Summary is not identified in TOC.	TOC needs to indicate Executive Summary is on page vii	The Executive Summary will be included in the TOC in the Final version.
O-4.	TOC, page ii, lines 11 and 12	Page numbers for Sections 2.2 and 2.3 need to be changed	Change page numbers for for Sections 2.2 and 2.3 to 2-6	See response to Comment #O-1.
O-5.	TOC, page ii, line 22	Page number for Section 3.4 needs to be changed	Change page number for Section 3.4 to 3-4	See response to Comment #O-1.
O-6.	TOC, page ii, lines 24 through 28	Page numbers for Sections 3.5 through 3.10 need to be	Change page numbers for Sections 3.5 through 3.10.	See response to Comment #O-1.

Comment Number	Page or Sheet	Comment	Recommendation	Response
		changed.		
O-7.	TOC, page iv	Page number for Table7-1 needs to be changed	Change page number for Table 7-1 from 7-1 to 7-2	See response to Comment #O-1.
O-8.	TOC Page iv, line 5	Page number for Figure 3-1 needs to be changed.	Change page number for Figure 3-1 from 3-1 to 3-3	See response to Comment #O-1.
O-9.	Page vii Executive Summary	What is the purpose of discussing CC RVAAP-80 Group 2 Propellant Can Tops? This is the Work Plan Addendum for CCRVAAP-78 Quarry Pond Surface Dump	Recommend removing discussion of CC RVAAP-80 Group 2 Propellant Can Tops in Executive Summary	References to CC RVAAP-80 Group 2 Propellant Can Tops in both the Executive Summary and the BACKGROUND were provided to add perspective to the project. Both references will be removed in the Final version.
O-10.	Page 1-1, Section 1.1	Same comment as above		Reference to CC RVAAP-80 Group 2 Propellant Can Tops will be removed in the Final version.
O-11.	Section 3.0, Page Numbers	Section 3.0 has three (3) Page 3-1's, and two (2) Page 3-2's.	Please correct page numbers in Section 3. The TOC should reflect any changes made to the page numbers.	See response to Comment #O-1.
O-12.	Page 3-2, Section 3.2.3	The location of the decontamination pad should be located	Please make sure that the decontamination pad	Suggest moving the decontamination pad southeasterly to approximately midway between the two 55-gallon drums, adjacent to the uphill side of

Comment Number	Page or Sheet	Comment	Recommendation	Response
		topographically downgradient from any proposed sampling or intrusive work. The location of the decontamination pad depicted in Figures 2-1 and 2-2 appear to be side gradient from Debris Pile C.	is placed at a location that will not directly impact an area being investigated.	the gravel road that provides access to Monitoring Wells 174 and 175. Removal of the 55-gallon drums will be performed after all surface soil sampling has been completed.
O-13.	Page 3-2,3-4 Section 3.3	Why are samples proposed adjacent to Piles A and B and not within the Piles?	Clarify the rationale or sample the Piles themselves.	Initially sampling of the piles themselves was considered. However, because of the possibility of asbestos containing material (ACM) being present within the piles and the requirement to remediate an area of ACM once it has been disturbed, it was decided to sample only adjacent to Piles A and B.
O-14.	Page 3-2,3-4 Section 3.3	If sampling adjacent to Piles A and B, why not on the downgradient side?	Clarify rationale or sample on downgradient sides of Piles	Suggest following text change, "*Field work –of areas adjacent to the downgradient sides of Debris Piles A and B,* ---
O-15.	Page 3-2,3-4 Section 3.3	What is rationale for sampling soil at only 0-1 feet bg? Soils at this depth may have been washed (stripped of contaminants) through precipitation events	Clarify rationale or sample to at least 4 feet	Debris Piles A and B are at the base of medium steep (about 45° to 60°) rock slopes, with fairly flat surfaces at the base of the rock slopes. Of the 14 borings taken in the RI in this area, 12 refused on rock at depths of 12-inches or less. Thus it is highly unlikely that borings utilizing hand equipment will penetrate much deeper than 12-inches. Debris Pile C would appear to have a greater depth to refusal than at the other two debris piles. ISM

Comment Number	Page or Sheet	Comment	Recommendation	Response
				surface soil sampling could be utilized over a depth range of 0 – 1'. Subsurface soil ISM horizontal and vertical samples could be collected via a geoprobe unit over depth ranges of 1' – 3' and possibly 3' – 5'. Six geoprobe borings over the area (approximately 45' x 120') would be drilled to collect the horizontal and vertical ISM samples. Triplicate surface soil and triplicate subsurface soil ISM samples would be required per the RVAAP FWSAP.
O-16.	Page 3-2,3-4 Section 3.3	This section does not clarify where the transite will be collected from.	State where the transite will be collected from, ie., which pile(s)	Suggest changing sentence on Page 3-1, line 1 to, *"Additionally two discrete samples of transite will be collected from Debris Pile At to determine the ACM content*."
O-17.	Page 3-2,3-4 Section 3.3	The plan does not provide a map of proposed sampling locations.	Provide a map showing proposed sampling locations	Suggest adding following text on Page 3-1, just prior to "Additionally", "*In each ISM sampling area, 30 aliquots or subsample locations will be laid out in a systematic random manner within each of the sample areas."* This is the standard procedure for ISM surface soil sampling.
O-18.	Page 3-4 Section 3.5	Section does not indicate sample specific analytes or rationale for each Pile or area	This section of the work plan should provide a specific analyte list for each area and rationale or basis for the list	Suggest adding the following text after the end on the first sentence on line 5 of Page 3-4, "The specific analyzes to which each sample is to be subjected are delineated on Table 3-1 of the Field Sampling Plan. Essentially, all soil samples will be subjected to the RVAAP full suite of analyses, the transite samples will be analyzed to determine ACM content, and the drum samples will be analyzed to determine their appropriate disposal."

Comment Number	Page or Sheet	Comment	Recommendation	Response
O-19.	Page 3-2, Section 3.3	Section 3.3 needs to refer reader to Section 3.2.9 of the Field Sampling Plan Addendum to clarify numbers and types of proposed samples	Make a reference in section 3.3 to the Sample Design in Section 3.2.9 in the Field Sampling Plan Addendum	See response to Comment #O-18.
O-20.	Page 3-2, line 27	Decon. procedures refer to FWSAP Section 5.6.2.9. It is actually presented in section 5.5.2.8	Change reference from Section 5.6.2.9 to 5.5.2.8	Will change the reference to 5.5.2.8.
O-21.	Page 3-5, Section 3.8 PA Report	This section does not mention that the report will follow the RVAAP Deliverable Document Format Guidelines, 17.0	Please add "Ravenna Army Ammunition Plant Deliverable Document Format Guidelines, Version 17.0. Sept. 18, 2009" to the bullet list and to the References on Page 9-1	Will add a bullet, "Comply with the Ravenna Army Ammunition Plant Deliverable Document Format Guidelines, Version 18.0, December 21, 2009" and will add the document to the References on Page 9-1.
O-22.	Page 6-1, Section 6.0 IDW	The text states that the characterization results, classification, and disposition of the IDW will be documented. However, there is no	Please provide Ohio EPA with an IDW summary report.	Suggest adding following text on Page 6-1, after the sentence ending on Line 18. "*An IDW Characterization and Disposal Plan, per Paragraph 8.4 of the FWSAP, will present an inventory of all stored IDW, document the analytical results and IDW characterization, and make recommendations for the disposal of all IDW based on facility-wide*

Comment Number	Page or Sheet	Comment	Recommendation	Response
		mention of an IDW report submittal.		*applicable or relevant and appropriate requirements and contaminant risk-based action levels. The IDW Characterization and Disposal Plan will be submitted to the U.S. Army, the Ohio EPA Division of Emergency and Remedial Response, and the Ohio EPA Division of Solid and Infectious Waste Management and, upon approval, implemented*."
O-23.	Page 7-1 Section 7.0	The text states that CUGs and RSLs will be used for comparative purposes.	Please add a comparison to site background levels.	On Page 7-1, suggest following text, "*All results will be compared to facility background levels and the minimum of the appropriate sets* ---. "
O-24.	Page 7-2, Table 7-1	Table 7-1 is made up of several pages. Headings are not displayed on every page.	To allow clear understanding of Table 7-1, provide headings on every page.	Headings will be included on all five pages of Table 7-1.
O-25.	Page 9-1, Section 7.0	Reference section contains no references to Ohio EPA DFFO or the Document Format Guidance.	Please add Ohio EPA DFFO and Document Formant Guidance reference to this section.	The two subject documents will be added to the references.
O-26.	Page 9-1, Section 7.0	The reference for the Facility Wide Sampling and Analysis Plan has the wrong year.	Change "SAIC.2001b." to "SAIC.2011b."	Will make the recommended change.

Appendix A Field Sampling Plan Addendum				
O-27.	Page 1-1, paragraph 3	Neither the Work Plan Addendum or the Field Sampling Plan Addendum provides a good description or general history of the piles.	If available, provide a general history of the disposal area, ie. when were the piles placed? Are they associated with the quarry? What are they composed of?	An historical records review for both Compliance Restoration Sites CC RVAAP-78 and CC RVAAP-80 was conducted and is documented in the Final Historical Records Review Report for 2010 Preliminary Assessment Compliance Restoration Sites CC RVAAP-78 Quarry Pond Surface Dump & CC RVAAP-80 Group 2 Propellant Can Tops, dated April 2011. The second paragraph on Page 3-1 of the historical records review report could be inserted at the beginning of Paragraph 2.1 PROJECT BACKGROUND AND SUMMARY OF CC RVAAP-78 in the work plan.
O-28.	Page 1-5, line 16,	A typographical error is present. The word, “as” needs to be changed.	Change the word ”as” to “at” or “from”.	Will make recommended change.
O-29.	Page 1-5, line 22	States, “leather gloves will be worn when assessing rusted drums”. Chemical protection should also be considered when handling drums with unknowns.	Consider chemical protection when handling unknown substances.	Suggest changing the text to, *“Leather gloves over nitrile gloves will be worn when accessing the rusted drums. Unused nitrile gloves will be used when sampling the drum contents.*”
O-30.	Figure 2-1, line 2 third box, line 9, box 1	Typographical errors. Line 2, “Guard” and, “Ravenna” and line 9 “Subcontractors”	Correct typographical errors	Will correct the typographical mistakes.

O-31.	Page 3-2, the FSPA	The FSPA should state the method that will used to collect the samples and provide the exact number of proposed samples that will be collected.	Include information on sampling method or refer to Section 4.5.2. of the FSPA. Include exact number of proposed samples.	Suggest text change as follows, "*Surface soil samples will be collected as described in the FWSAP and Section 4.5 herein, and drum samples will be collected as described in Section 4.6*." Suggest adding to the end of line 8,"*Eight (8) surface soil ISM samples, six (6) discrete surface soil samples, two small samples of transite, and two samples of the 55-gallon drum contents will be collected, per Table 3-2*."
O-32.	Page 4-7, line 18,19	Is the Hawaii Dept. of Health, TGM for Implementation of the Hawaii State Contingency Plan the proper and only only reference for collection of triplicate ISM sampling?	Consider an Ohio, EPA, Army, ITRC or other reference for activities at the RVAAP.	It is our understanding that the Final ITRC guidance is not currently available. Once that guidance is finalized, much of it will utilize the Hawaii guidance. The only known Army guidance is Interim Guidance 09-02, dated 20 July 2009. That guidance calls for splitting a field collected ISM sample and sending portions off to three laboratories, as opposed to collecting, processing, and analyzing three completely separate field samples. No Ohio EPA guidance regarding triplicate sampling is known to Prudent. The current FWSAP, however, does provide for triplicate sampling in Section 5.6.2.1.3. Thus suggest changing line 18 to *"--- DUs, Section 5.6.2.1.3 of the FWSAP and the Hawaii Dept of Health, Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan*." The Hawaii guidance provides much more discussion of triplicate sampling than the FWSAP.
O-33.	Page 4-7, line 15	Decision Unit (DU) is not present in the acronym list	Add Decision Unit (DU) to the acronym list	Will add decision unit to the acronym list.

Appendix B Quality Assurance Plan Addendum				
O-34.	Table of Contents	TOC does not include acronym list located on page iv	Add acronym list, page iv to TOC	The acronym list will be added to the TOC.
O-35.	Table of Contents	TOC does not include Section 13.3 located on page 13-1	Add Section 13.3, page 13-1 to TOC	Section 13.3, page 13-1 will be added to the TOC.
Appendix C Site Safety and Health Plan Addendum				
O-36.	Table of Contents	TOC, all of Section 2.0 page numbers need to be adjusted	Adjust page numbers in all of Section 2 and TOC	All page numbers will be corrected and the Table of Contents adjusted to reflect the corrected page numbers. Replacement pages and corrected CDs will be provided to all stakeholders. The page numbers and TOC in the Final version will be correct.
O-37.	Table of Contents	TOC Beginning with Section 11.2, page numbers need to be adjusted	Adjust page numbers beginning with Section 11.2 to end of Section and TOC	See response to Comment #O-36.
O-38.	Table of Contents	"Decontamination" in title of Section 12.0 is misspelled.	Correct misspelling	Will correct "Decontamination".
O-39.	Page 8-1 Section 8.0	Missing Cold Stress Monitoring and Controls.	Please add specific steps that will be taken to reduce the potential for cold stress-induced illness	Specific steps to reduce the potential for cold related distress will be added, especially since the work to be performed for this project will probably be conducted in the November of December time frame. The entirety of Section 8 of the FWSHP,

			(i.e. frostbite, Hypothermia)	which addresses both heat and cold related distress, will replace the current text.
O-40.	Page 13-1 Section 13.0 Lines 9 and 10	The text states that Mid-American Security will be contacted first for any emergency service.	Please indicate in the document that the first number to call in an event of an emergency is RVAAP Post 1 (330) 358-2017	Suggest changing text to, "**RVAAP Post 1 (330 358-2017)** will be contacted first in the event of any emergency."
O-41.	General Section 13.0	Where is Stop Work Authority mentioned in the document?	Please confirm that on-site individuals have Stop Work Authority if they were to observe unsafe conditions or practices.	As per Section 4.0 of the FWSHP, the Project Manager, Field Operations Manager, and Site Safety and Health Officer all have "*authority to exercise stop work authority if unsafe work conditions develop*." Stopwork authority text is presently included in Field Sampling Plan Addendum to the FWSAP for the SSHO. Such text will be added to the responsibilities for both the Project Manager and the Deputy Project Manager in Section 2 of Sampling Plan Addendum to the FWSAP. Additionally, the SSHO will be Amanda Miller instead of Aditya Moralwar.
O-42.	Appendix A Hazard Analysis (SSHP), Table 1	The table indicates that drowning is not considered a hazard for this project. The project site is located adjacent to the Fuze and Booster Quarry Ponds and therefore provides a drowning hazard for site workers.	Please update table to indicate that drowning is a hazard.	Originally in this project there was only one debris pile, essentially Debris Pile A, and it was thought that there was no drowning potential. Subsequently Debris Pile C has been added which is much closer to the upper-most Fuze and Booster Quarry Pond. To address the potential for drowning, it is suggested that a 30"-diameter life ring with 50' of rope be positioned at the water edge immediately downslope from Debris Pile C whenever sampling is occurring at Debris Pile C and that, as is required, sampling always be conducted with a minimum of two people.