

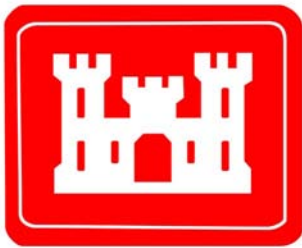
FINAL

**SITE SAFETY AND HEALTH PLAN
ADDENDUM NO. 1**

FOR THE

**PHASE II REMEDIAL INVESTIGATION OF
LOAD LINES 2, 3, AND 4 AT THE RAVENNA ARMY
AMMUNITION PLANT, RAVENNA, OHIO**

PREPARED FOR



**US Army Corps
of Engineers®**

LOUISVILLE DISTRICT

CONTRACT No. F44650-99-D-0007

DELIVERY ORDER CY01

JULY 2001



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Prepared by

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
800 Oak Ridge Turnpike, P.O. Box 2502
Oak Ridge, Tennessee 37831

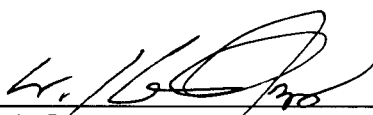
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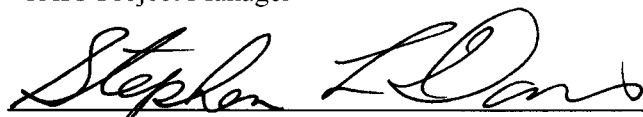
APPROVALS

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July 2001



Kevin Jago, Phone 865-481-4614 Date 7/12/2001
SAIC Project Manager



Stephen Davis, CIH (#4213), CSP (#10044), Phone 865-481-4756 Date 7/12/2001
SAIC Health and Safety Officer

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ACRONYMS

CIH	Certified Industrial Hygienist
COC	contaminant of concern
CSP	Certified Safety Professional
DNT	dinitrotoluene
EC&HS	Environmental Compliance and Health and Safety
EPA	U.S. Environmental Protection Agency
FP	flash point
FSHP	Facility-wide Safety and Health Plan
GFCI	ground-fault circuit interruptor
H&S	Health and Safety
HAZWOPER	Hazardous Waste Site Operations
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IDLH	immediately dangerous to life and health
IP	ionization potential
LEL	lower explosive limit
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
OE	ordnance and explosives
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
PVC	polyvinyl chloride
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RI	Remedial Investigation
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
STEL	short-term exposure limit
TLV	threshold limit value
TNB	trinitrobenzene
TNT	2,4,6-trinitrotoluene
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
VP	vapor pressure

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INTRODUCTION

Science Applications International Corporation's (SAIC's) formal policy, stated in the Environmental Compliance and Health and Safety Program manual, is to take every reasonable precaution to protect the health and safety of our employees, the public, and the environment. To this end, the Ravenna Army Ammunition Plant (RVAAP) *Facility-wide Safety and Health Plan* (FSHP)(USACE 2001) and this Site Safety and Health Plan (SSHP) Addendum collectively set forth the specific procedures required to protect SAIC and SAIC subcontractor personnel involved in the field activities. These plans are driven by requirements contained in U.S. Army Corps of Engineers (USACE) (1992) and USACE (1996). SAIC activities are also subject to the requirements of the SAIC corporate Environmental Compliance and Health and Safety program and procedures. 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 and nothing in these plans relieves such 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 FSHP addresses program issues and hazards and hazard controls common to the entire installation. This SSHP Addendum to the FSHP serves as the lower tier document addressing the hazards and controls specific to the Phase II Remedial Investigation (RI) at Load Lines 2, 3, and 4. Copies of the FSHP and this SSHP Addendum will be present at the work site during all fieldwork.

SAIC will perform field investigations at Load Lines 2, 3, and 4. Load lines 1 through 4 were used to melt and load 2,4,6-trinitrotoluene (TNT), Amatol, and Composition B into large-caliber shells and bombs. Composition B is a mixture of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) and TNT. Amatol is a mixture of TNT and ammonium nitrate. The operations on these load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls would be cleaned with water and steam. The liquid, containing TNT and Composition B, was known as "pink water" and was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport (surface flow) to earthen settling ponds. Potential contaminants associated with these operations include explosives and metals.

Phase I RIs were performed at the RVAAP High Priority Areas of Concern, including Load Lines 2, 3, and 4. During the course of these RIs, numerous soil, sediment, and surface water samples were obtained for the initial site characterizations. Additionally, two groundwater monitoring wells were installed at Load Line 2. Contaminants of concern identified during the Phase I RI included TNT, RDX, metals, and several organic compounds.

Planned site activities consist of environmental sampling and support tasks. These tasks include soil sampling, surface water and groundwater sampling, sediment sampling, monitoring well installation, a survey of existing sewer lines, operation of a field explosives laboratory, and trenching.

Potential hazards posed by the planned tasks include injury from ordnance and explosives; drowning associated with water and sediment sampling from boats; noise and cut hazards associated with clearing vegetation; striking, rotation, and noise hazards from excavating and drilling equipment; lifting, noise, and strain hazards 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 appears to be very low, given the nature of planned tasks. All of the potential contaminants have low vapor pressures, making overexposure through vapor inhalation very unlikely. All of the planned tasks pose minimal potential for creating airborne particulates. There is some potential for adverse effects due to dermal contact with contaminated soil. The crew will use protective gloves

to handle potentially contaminated materials, and, if necessary, the Site Safety and Health Officer (SSHO) will upgrade the required personal protective equipment (PPE) to prevent dermal contact with potentially contaminated materials. Physical hazards are associated with water-borne operations, excavation and drilling equipment, and hand-operated power tools (chainsaw, etc.). Task-specific hazard controls have been specified for these tasks. The SSHO will observe all site tasks during daily safety inspections and will use professional judgment and appropriate monitoring results to determine if upgrading PPE is required. A detailed analysis of these hazards and specific appropriate controls is presented in Chapter 2.0, Table 2-2.

This investigation will be performed in Level D PPE, plus chemical-resistant gloves 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 SSHO.

1.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

1.1 SITE DESCRIPTION

The Ravenna Army Ammunition Plant (RVAAP) is located in northeastern Ohio within Portage and Trumbull counties, approximately 4.8 kilometers (3 miles) northeast of the town of Ravenna. The installation consists of 8,668 hectares (21,419 acres) in a 17.7-kilometer (11-mile) long, 5.6-kilometer (3.5-mile) wide tract bordered by a sparsely inhabited private residential area. The site is an inactive government-owned armament, munitions, and chemical command facility maintained by a contracted caretaker, TolTest, Inc.

The installation was active from 1941 to 1992. Activities included loading, assembling, storing, and packing military ammunition; demilitarization of munitions; production of ammonium nitrate fertilizer; and disposal of “off-spec” munitions. Various munitions were handled on the installation including artillery rounds of 90 mm or more and bombs up to 2,000 pounds.

1.1.1 Munitions Production

The explosive melt-pour process for large caliber shells was conducted in Load Lines 1, 2, 3, and 4. The melt-load system was a conventional World War II system housed in a three-story building that required large quantities of explosives in the melt-pour-cool cycle. The operations on these load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls would be cleaned with water and steam. The liquid, containing 2,4,6-trinitrotoluene (TNT) and Composition B, was known as “pink water” and was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport (surface flow) to earthen settling ponds.

During load line operations, the bulk TNT (flakes in shipping cartons) was transported from the storage igloos to the screening building, which was located in an area remote from melting operations. The screened TNT flake was collected in metal hoppers and moved to the third story of the melt building using an overhead drag conveyor. At the dump station on the third floor, the TNT was manually fed over permanent magnets to remove foreign metal parts such as boxing staples. From there, the TNT flowed to melt grid feed hoppers to partially melt the TNT flakes. The melted TNT then was fed into the steam-jacketed mixing kettles, which were located on the second floor, to complete the melting and mixing process. The melted TNT then flowed from the mixing kettles to a holding kettle on the first floor and was vacuum drawn into a pouring cart. From the pouring cart, the TNT was volumetrically poured into steel projectiles or cartridges.

When Composition B [TNT, hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), and beeswax] was loaded instead of TNT, it was transported directly from a storage igloo to the melt building and manually inspected on a spread-out table. Next it was fed through permanent magnets to the hoppers feeding the melt kettles.

During production, explosives residues that collected on the walls and floor were periodically washed out of the sides of the buildings and collected in ditches, sumps, washout basins, and concrete settling tanks. Additional information about the production processes is included in the Preliminary Assessment.

Load Lines 2–4 operated at full capacity during World War II and produced the following munitions:

- Load Line 2 produced 155-millimeter, 8-inch, 240-millimeter, 4.5-inch, and 6-inch high explosive (HE) artillery projectiles and 100-pound bombs.

- Load Line 3 produced 155-millimeter, 8-inch, and 240-millimeter HE artillery projectiles and 100-pound, 500-pound, 1,000-pound, and 2,000-pound bombs.
- Load Line 4 produced 8-inch HE artillery projectiles and 500-pound and 1,000-pound bombs.

Load Lines 2, 3, and 4 operated again from 1951 to 1957 and produced the following munitions:

- Load Lines 2 and 3 produced M107, 155-millimeter HE projectiles and M101, 155-millimeter HE projectiles.
- Load Line 2 produced M106, 8-inch HE projectiles; M73, 120-millimeter HE projectiles.
- Load Line 4 produced antitank mines (HE, T27).

Again, during 1969 to 1971, Load Lines 1, 2, and 3 operated and produced the following munitions:

- Load Line 2 loaded TNT into 175-millimeter projectiles.
- Load Line 3 loaded Composition B into 155-millimeter projectiles.

1.1.2 Demilitarization Activities

Demilitarization was performed on the following munitions at Load Lines 2 and 3:

- Late 1940s: Load Line 2 – Debanding and TNT washout; 1,800,000 kilograms of TNT were salvaged.
- From 1951 to 1957: Load Line 2 – reclaimed cartridge cases for reuse. Sulfuric acid, sodium ortho silicate, chromic acid, and alkali were used. At Load Line 3, 105-millimeter HE artillery projectiles and M80, 37-millimeter antipersonnel shot were demiled.

1.1.3 Defense Logistics Agency Activity at Load Line 3

The Defense Logistics Agency conducted a storage mission for strategic materials at Load Line 3. A 1970 plan of Load Line 3 showed aboveground storage tank numbers 1400–1500. A 1986 listing of then-current storage tanks showed Tanks 1484–1500 containing antimony and Tanks 1444–1446 containing asbestos. Tank 1443 is reported to have stored talc (magnesium silicate) at some point in its history. To date, no records have been located regarding the storage of materials at Tanks 1400–1442 and 1446–1483. Aerial photographs of the load line dated 1952 and 1966 show a large number (100) of storage tanks, but those taken in 1981 and 1997 show only 20 tanks (numbers 1444–1446 and 1484–1500).

1.2 CONTAMINANTS

Table 1-1 lists contaminants known to occur in soil at the former Load Lines 2, 3, and 4. Inclusion in this table indicates the potential to encounter a contaminant during Phase II Remedial Investigation (RI) field activities, but it does not necessarily indicate that the contaminant is present in sufficient quantity to pose a health risk to workers.

Table 1-1. Concentrations of Constituents of Potential Concern in Soil at Load Lines 2, 3, and 4^a

Contaminant	Load Line 2 Maximum Concentration	Load Line 3 Maximum Concentration	Load Line 4 Maximum Concentration
1,3,5-TNB	160	110	<RBC
2,4,6-TNT	12,000	390,000	2.2
HMX	1,500	<RBC	<RBC
RDX	9,800	10	<RBC
Antimony	<RBC	30	<RBC
Arsenic	<RBC	23.2	<RBC
Beryllium	2.9	1.2	3.6
Cadmium	22.7	4.1	5.2
Chromium	116	150	<RBC
Lead	881	2,620	384
Manganese	4,250	4,800	2,830
Thallium	7.6	3.5	13.3
4,4'-DDT	0.17	<RBC	0.23
Aldrin	0.024	<RBC	0.043
Heptachlor Epoxide	<RBC	0.094	<RBC
Alpha Chlordane	0.57	0.59	<RBC
Gamma Chlordane	<RBC	0.11	<RBC
Aroclor-1254	2.5	2.1	3.2
Aroclor-1260	6.0	<RBC	4.5
Dieldrin	0.027	<RBC	0.0048
Endrin	<RBC	3.2	<RBC
Anthracene	1.9	<RBC	1.2
Benzo(a)anthracene	2.9	1.2	2.1
Benzo(b)pyrene	2.3	1.0	2.7
Benzo(b)fluoranthene	0.17	1.1	7.2
Benzo(k)fluoranthene	3.2	1.0	5.0
Chrysene	2.7	1.5	6.4
Dibenzo(a,h)anthracene	0.72	0.25	1.2
Indeno(1,2,3-cd)pyrene	1.3	0.59	3.7

^aSource: USACE 1998, all values are in mg/kg.

<RBC = Constituent not detected or maximum detect is less than U.S. Environmental Protection Agency (EPA) Region 9 Preliminary Remediation Goals at a target risk of 10⁻⁷ and hazard quotient of 0.1.

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.

RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

TNB = Trinitrobenzene.

TNT = Trinitrotoluene.

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2.0 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 2-1, a general checklist of hazards that may be posed by this project, indicates whether a particular major type of hazard is present. If additional tasks or significant hazards are identified during the work, this document will be modified by addendum or field change order to include the additional information.

Table 2-1. Hazards Inventory

Yes	No	Hazard
X		Confined space entry
	X	Excavation entry (excavations will not be entered)
X		Heavy equipment (drill rigs, backhoe)
X		Fire and explosion (fuels)
X		Electrical shock (utilities and tools)
X		Exposure to chemicals (contaminants and chemical tools)
X		Temperature extremes
X		Biological hazards (poison ivy, Lyme disease)
	X	Radiation or radioactive contamination
X		Noise (excavation equipment, powered auger, drill rig)
X		Drowning
X		OE (potential to encounter unexploded ordnance)

OE = Ordnance and explosives.

Specific tasks are as follows:

- soil sampling with powered auger, hand augers, or scoops;
- soil sampling beneath building floor slab by concrete corer and hand auger;
- surface material sampling from floors using manual methods;
- vegetation clearing with machetes and chainsaws;
- surface water and sediment sampling on ponds and streams from shoreline and boats;
- camera survey of inactive storm and sanitary sewer lines;
- sediment and water sampling from manholes in sanitary sewer lines;
- field screening for explosives in an on-site laboratory;
- excavation of test trenches;
- civil surveying;
- investigation-derived waste handling and disposition;
- subsurface soil sampling and monitoring well installation using air rigs and hollow stem auger drill rigs;
- well development and groundwater sampling; and
- sampling equipment decontamination.

2.1 TASK-SPECIFIC HAZARD ANALYSIS

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

2.2 POTENTIAL EXPOSURES

Prior sampling results indicate that the primary contaminants of concern at Load Lines 2, 3, and 4 are explosives residues and metals. Information on the potential contaminants, as well as the reagents and chemicals that will be used for the project, is contained in Table 2-3. It is important to note that the contaminants listed in Table 2-3 have been detected in a number of locations at RVAAP and might be expected to occur at any former operations area. Exposure to chemical tools, such as corrosive sample preservatives, field laboratory reagents, or flammable fuels, is a possibility and will be controlled through standard safe handling practices.

Table 2-2. Hazards Analysis

Safety and Health Hazards	Controls	Monitoring Requirements
<i>Civil Surveys and Visual Surveys in Potentially Contaminated Areas</i>		
General safety hazards (moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety shoes or boots, and hard hats if overhead hazards are present (see Chapter 5.0 of the FSHP). Hazardous waste safety (40-hour) and site-specific training, buddy system, proper and housekeeping.	Daily safety inspections.
Contact with OE	Pre-entry screening survey and continuous escort by OE specialist support. On-site training in ordnance recognition for all field personnel. Withdrawal of all SAIC and subcontractor personnel from immediate area and field marking of suspect area if ordnance or suspected ordnance is discovered.	Visual and instrument surveys for ordnance conducted by OE expert personnel.
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 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.
Gunfire (deer hunting with shotguns loaded with slugs is allowed in some areas on Friday and Saturday during season, October and November)	Fieldwork will not be conducted during hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
<i>Sewerline Video Survey and Sediment/Surface Water Sampling in Manholes</i>		
General safety hazards (moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety shoes or boots, and hard hats if overhead hazards are present (see Chapter 5.0 of FSHP). Hazardous waste safety (40-hour) and site-specific training, buddy system, proper and housekeeping.	Daily safety inspections.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Manhole entry (confined-space entry)	<p>Manholes will be monitored with at least a PID or equivalent prior to performing survey. If it becomes necessary to enter a manhole that is deeper than 4 feet to place or retrieve a camera, the manhole will be treated as a confined space and SAIC EC&HS Procedure 10 or equivalent will be followed. This will include at least</p> <ol style="list-style-type: none"> 1. Confined-space entry permit (as required by RVAAP or USACE). 2. Testing for oxygen content (must be between 19.5 and 22 percent), flammability (must be less than 10 percent), and toxicity using PID or equivalent (must be less than 5 ppm). 3. Two-person crew (entrant and attendant). 4. Continuous forced ventilation. <p>If entry must be made into any part of the system other than the manhole, the subcontractor must perform an entry assessment and enter in full compliance with the OSHA confined space entry standard. Requirements include but are not limited to</p> <ol style="list-style-type: none"> 1. The manhole entry requirements listed above. 2. Harness and retrieval system. 3. Formal training for entrants and attendant. 	PID or equivalent for all manholes. Oxygen, flammability, and PID or equivalent for entering manholes deeper than 4 feet.
Fire	Fuels stored in closed safety cans with flame arrestors, no ignition sources within 50 feet of open manholes, and fire extinguisher kept in immediate work area.	Daily safety inspections.
Contact with OE	Pre-entry screening survey and continuous escort by OE specialist support. On-site training in ordnance recognition for all field personnel. Withdrawal of all SAIC and subcontractor personnel from immediate area and field marking of suspect area if ordnance or suspected ordnance is discovered.	Visual and instrument surveys for ordnance conducted by OE expert personnel.
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 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.	PID or equivalent.
Gunfire (deer hunting with shotguns loaded with slugs is allowed in some areas on Friday and Saturday during season, October and November)	Video survey and sampling fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
<i>Field Screening for Explosives in Samples Using Colorimetric Analyses</i>		
General safety hazards (splash, cuts, slips, falls)	Level D PPE, including nitrile or PVC gloves, to handle samples (see Chapter 5.0 of FSHP). Standard procedures for operating field laboratory will be available on-site for review. Hazardous waste safety training. Exclude unauthorized personnel. Laboratory personnel trained to requirements of standard procedures and requirements of 29 CFR 1910.1450 and other relevant standards.	Daily site safety inspections conducted by laboratory supervisor.
Noise	None, unless SSHO determines that equipment potentially exceeds 85 dBA.	Daily safety inspection.
Fire (fuels/solvents)	Fuel stored in safety cans with flame arresters. Solvent containers kept closed or placed in open outside area to vent. Fire extinguisher rated ABC stored in laboratory. No ignition sources in screening area. Flammables cabinet for indoor storage of ≥25 gallons of flammable material.	Daily site safety inspections. CGI monitoring during the initial sample screening to verify that controls are adequate. If CGI readings exceed 10 percent, LEL for acetone screening must be stopped and ES&H Manager contacted and additional controls implemented.
Exposure to chemicals	Level D PPE, including nitrile or PVC gloves, to handle samples and chemicals. Forced exhaust ventilation (this can be a tight-fitting fan mounted in a window and positioned to blow out the window) must be provided, and screening must be performed immediately in front of the exhaust so that vapors are carried from the work area. Wash face and hands prior to taking anything by mouth. Medical clearance for HAZWOPER work. Fifteen-minute eyewash immediately available. Site training must include hazards and controls of exposure to contaminants and chemicals used on-site. MSDSs kept on-site. All chemical containers labeled with contents and hazard. Laboratory personnel will be briefed on the project SSHP, emergency phone numbers, and other health and safety information relevant to their tasks.	Daily site safety inspections. PID monitoring during initial sample screening to verify that controls are adequate. If PID readings exceed 5 ppm in the breathing zone, screening must be stopped, the ES&H Manager contacted, and additional controls implemented.
Electrical shock	GFCI for all electrical hand tools.	Daily safety inspection.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
<i>Soil Boring, Concrete Boring, and Soil Sampling Using a Hand-Operated Concrete Borer and Power Auger</i>		
General safety hazards (rotating machinery, moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety shoes or boots (see Chapter 5.0 of FSHP) plus hard hat if overhead hazards are present. Buddy system. Operate auger per manufacturer's directions. Only experienced operators will be allowed to operate auger. Positive action control (deadman switch). hazardous waste safety training. Lifts of >50 pounds 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 safety inspections.
Contact with OE	Pre-entry screening survey and continuous escort by OE specialist support. Down-hole monitoring at 2-foot intervals. On-site training in ordnance recognition for all field personnel. Withdrawal of all SAIC and subcontractor personnel from immediate area and field marking of suspect area if ordnance or suspected ordnance is discovered.	Visual and instrument surveys for ordnance conducted by OE expert personnel.
Exposure to chemicals	Nitrile or similar gloves for contact with potentially contaminated material. Gloves will be disposed after single use. Wash face and hands prior to taking anything by mouth. Hazardous waste 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. Water used to suppress dust during concrete boring.	PID or equivalent.
Gunfire (deer hunting with shotguns loaded with slugs is allowed in some areas on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Noise	Hearing protection within 7.6 meters (25 feet) of equipment when operating.	Daily safety inspections.
Fire (fuels)	Fuel in safety cans with flame arrestors. No ignition sources in fuel storage or refueling areas. Fire extinguisher in all fuel use areas. Bonding (metal to metal) contact while pouring. Gasoline-powered equipment must be shut down and allowed to cool for 5 minutes prior to fueling.	Daily safety inspections.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes. West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
Electric shock	Identification and clearance of underground utilities. Note – one live overhead electrical line is present at Load Line 2.	Visual survey of all work areas.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
<i>Groundwater Well Development, Groundwater Monitoring, Groundwater Sampling, and Sample Preservation</i>		
General safety hazards (moving equipment, lifting, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety shoes or boots, hard hats if overhead hazards are present (see Chapter 5.0 of FSHP). Buddy system. Lifts of >50 lbs will be performed by two or more personnel or with mechanical assistance, extensive heavy lifting will require additional lifting training. Hazardous waste safety training. Exclusion zone if there is a potential for unauthorized entry.	Daily site safety inspections.
Noise	None, unless SSHO determines that equipment potentially exceeds 85 dBA.	Daily safety inspection.
Fire (fuels)	Fuel stored in safety cans with flame arresters. Fire extinguisher in all fuel use areas. No ignition sources in fuel storage areas. Bonding (metal to metal contact) during pouring. Gasoline-powered equipment must be shut down and allowed to cool for 5 minutes 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. Medical clearance for HAZWOPER work. Fifteen-minute eyewash within 100 feet when pouring corrosive sample preservatives; eyewash bottle within 10 feet when adding water to pre-preserved sample containers. Site training must include hazards and controls of exposure to contaminants and chemicals used on-site. MSDSs for chemical tools kept on-site. All chemical containers labeled with contents and hazard.	Daily site safety inspections. PID monitoring if prior monitoring during soil boring indicated a potential for exposure.
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Electrical shock	GFCI for all electrical hand tools.	Daily safety inspection.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
<i>Soil Sampling (Trenching) Using Excavation Equipment</i>		
Safety hazards associated with excavation equipment	Level D PPE long pants, shirts with sleeves, safety shoes or boots, safety glasses, and hard hat (unless under protective shelter such as roll-over cage) (see Chapter 5.0 of FSHP). Buddy system. Unnecessary personnel will stay well clear of operating equipment and out of the arc of the backhoe arm. Functional backup alarm. Exclusion zone around excavation areas if there is any potential for unauthorized entry. Only experienced operators will be allowed to operate equipment.	Daily safety inspections of operations. Initial and at least weekly inspections of excavation equipment conducted by operator and verified by SSHO.
Potential excavation cave-in	No personnel will enter trenches deeper than 4 feet. Personnel will keep at least 0.9 meter (3 feet) distance from excavation edges if trench is deeper than 4 feet. Observation of trench will be made from trench ends, and digging will be discontinued during such observation. Trenches will not be left open overnight. Samples will be collected from outside of the excavation by sampling soil in the backhoe bucket or soil from the bottom of the excavation using an auger extension. Prior to sampling from excavations deeper than 1.5 meters (5 feet), excavation ends will be visually examined and approached only at points that are clearly cohesive and show no signs of collapse. If there is any doubt about the safety of the edge, plywood sheeting will be placed over the edge to spread the weight of the person collecting the sample.	Daily safety inspections of operations. Examine excavation edge for signs of spalling or collapse.
Contact with unexploded ordnance	On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Continuous escort by OE expert personnel when in areas with a potential to encounter OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Nitrile or similar gloves for contact with potentially contaminated material. Gloves will be disposed after single use. Staying upwind of any dust-generating activities. Wash face and hands prior to taking anything by mouth. Hazardous waste 40-hour certification training and medical clearance must be current. 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.	PID or equivalent.
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Fire (vehicle fuels and flammable contaminants)	Fuels stored in safety cans with flame arrestors. Bonding (metal to metal) and grounding during fuel transfers. Fuel storage areas marked with no smoking or open flames signs. Fire extinguishers in all fuel use areas.	Daily safety inspection.
Noise	None unless the SSHO determines necessary.	None, unless there is some doubt about backhoe noise being less than 85 dBA.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Snake chaps if working in overgrown areas. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
Electric shock	Identification and clearance of overhead and underground utilities. Note – one live overhead electrical line is present at Load Line 2.	Visual of all work areas.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
<i>Soil Boring, Soil Sampling, and Monitoring Well Installation Using Air Rotary or Auger Drill Rig</i>		
General safety hazards (rotating machinery, suspended loads, moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, work gloves for material handling plus hard hat (see Chapter 5.0 of FSHP). Buddy system. No employees under lifted loads. At least two functional kill switches. Functional backup alarm. Drill rig 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. Weekly drill rig inspections.
Noise	Hearing protection \geq NRR 25 within 7.6 meters (25 feet) of rig unless rig-specific monitoring indicates noise exposure of less than 85 dBA.	Daily safety inspections.
Fire (vehicle fuels or subsurface contaminants)	Fuels stored in safety cans with flame arrestors. Bonding (metal to metal) and grounding during fuel transfers. Fuel storage areas marked with no smoking or open flames signs. Fire extinguishers in all fuel use areas.	Combustible gas indicator if buried organic material or other source of flammable gas is suspected.
Contact with unexploded ordnance	Downhole monitoring every 2 feet until cleared for continuous drilling by OE personnel. On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Continuous escort by OE personnel in areas with a potential to encounter OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Stay upwind of any dust-generating activities. Hazardous waste 40-hour certification training and medical clearance must be current. Site training must include hazards and controls for site contaminants and all chemicals used on-site. MSDSs for chemical tools on-site. Chemical containers labeled to indicate contents and hazard.	PID or other sampling as appropriate.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice per day. Pulse rates at the start of each break if wearing impermeable clothing.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize potential for tick entry. Snake chaps if working in overgrown areas. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
Electric shock	Identification and clearance of overhead and underground utilities. GFCI required for electric hand tools. Note – one live overhead electrical line is present at Load Line 2.	Visual of all work areas.
<i>Soil Sampling Using Hand Augers or Scoops</i>		
General safety hazards (manual lifting, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety shoes or boots, safety glasses, and work gloves for manual work (see Chapter 5.0 of FSHP). Buddy system. Hazardous waste safety training.	Daily site safety inspections.
Contact with unexploded ordnance	On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Continuous escort by OE personnel when in areas with potential to encounter OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered. Sampling of stations having known or suspected (i.e., red soil or raw product) explosives >10% (100,000 mg/kg) to be performed by OE technicians following applicable OE safety requirements.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Stay upwind of any dust-generating activities. Hazardous waste 40-hour certification training and medical clearance must be current. Site training must include hazards and controls for site contaminants and all chemicals used on-site. MSDSs for chemical tools on-site. Chemical containers labeled to indicate contents and hazard.	PID or other sampling as appropriate.
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Snake chaps if working in overgrown areas. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
<i>Surface Debris Sampling Using Hand Tools</i>		
General safety hazards (manual lifting, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety shoes or boots, safety glasses, and work gloves for manual work (see Chapter 5.0 of FSHP). Buddy system. Hazardous waste safety training. Verify buildings are safe to enter before sampling.	Daily site safety inspections.
Contact with unexploded ordnance	On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Continuous escort by OE personnel when in areas with potential to encounter OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Water mist dust suppression of any dust-generating activities. Hazardous waste 40-hour certification training and medical clearance must be current. Site training must include hazards and controls for site contaminants and all chemicals used on-site. MSDSs for chemical tools on-site. Chemical containers labeled to indicate contents and hazard.	PID or other sampling as appropriate.
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Snake chaps if working in overgrown areas. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
<i>Surface Water and Sediment Sampling on Foot</i>		
General safety hazards (moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, and safety shoes or boots (see Chapter 5.0 of FSHP). Hazardous waste safety training. Buddy system.	Daily site safety inspections.
Drowning	Coast Guard-approved personal flotation vests if working near (≤ 6 feet) or over water deeper than 4 feet.	None.
Noise	None.	None.
Fire	None.	None.
Contact with unexploded ordnance	On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Continuous escort by OE personnel when in areas with potential for OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered. Sampling of washout sumps or sedimentation basins by OE technicians if OE is confirmed or suspected to be present.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Hazardous waste 40-hour certification training and medical clearance must be current. Site training must include hazards and controls for site contaminants and all chemicals used on-site. MSDSs for chemical tools on-site. Chemical containers labeled to indicate contents and hazard.	None
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice a day. Pulse rates at the start of each break if wearing impermeable clothing.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Snake chaps if working in overgrown areas. Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
<i>Surface Water and Sediment Sampling Using Hand Tools from Boats</i>		
General safety hazards (moving equipment, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety glasses, and safety shoes or boots (see Chapter 5.0 of FSHP). Hazardous waste safety training. Buddy system.	Daily site safety inspections.
Drowning	Coast Guard-approved personal flotation vests if working near (≤ 6 feet) water deeper than 4 feet.	None.
Noise	None.	None.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Fire	No gasoline-powered motors in use.	Daily safety inspection.
Contact with unexploded ordnance	On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Continuous escort by OE personnel when in areas with potential for OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Hazardous waste 40-hour certification training and medical clearance must be current. Site training must include hazards and controls for site contaminants and all chemicals used on-site. MSDSs for chemical tools on-site. Chemical containers labeled to indicate contents and hazard.	None
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP Environmental Coordinator.	None.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice a day. Pulse rates at the start of each break if wearing impermeable clothing.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Snake chaps if working in overgrown areas. Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
<i>Vegetation Clearing with Chainsaws, Machetes, and Sling Blades</i>		
General safety hazards (contact with sharp edges, slips, falls)	Level D PPE: long pants, shirts with sleeves, safety shoes or boots, safety glasses, plus heavy-duty work gloves and hard hat (see Chapter 5.0 of FSHP). Buddy system. Only experienced operators. Personnel operating brush clearing tools must maintain separation of at least 15 feet. Machetes equipped with lanyard and lanyard looped around wrist. Tools must be inspected daily and taken out of service if damaged. Exclusion zone if there is a potential for entry of unauthorized personnel.	Daily site safety inspections.
Chainsaw kickback and related hazards	Chainsaw chaps. Saws must have automatic chain brake or kickback device. Idle speed adjusted so chain does not move when idling. Saws must not be used to cut above shoulder height. Saws must be held with both hands when operating. Additional requirements at 385-1-1 Section 31.	Daily inspection.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Noise (chainsaw)	Hearing protection \geq NRR 25 within 7.6 meters (25 feet) of operating chainsaw unless specific monitoring indicates noise exposure of less than 85 dBA.	Daily safety inspections.
Fire (fuels)	Fuels stored in safety cans with flame arrestors. Bonding (metal to metal) and grounding during fuel transfers. Fuel storage areas marked with no smoking or open flames signs. Fire extinguishers in all fuel use areas. Gasoline-powered equipment turned off and allowed to cool for at least five minutes prior to fueling.	Daily safety inspection.
Contact with unexploded ordnance	On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Escort by OE personnel when in areas with potential to encounter OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Hazardous waste 40-hour certification training and medical clearance must be current. Site training must include the hazards and appropriate controls for site contaminants and chemicals to be used or stored on-site. Chemical containers labeled to indicate contents and hazard. Medical clearance for hazardous waste work	Daily safety inspection.
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice per day. Pulse rates at the start of each break if wearing impermeable clothing.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on boots, pants, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize potential for tick entry. Snake chaps if working in overgrown areas. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
<i>Investigation-Derived Waste Handling</i>		
General hazards (lifting equipment, manual lifting, slips)	Level D PPE: long pants, shirts with sleeves, safety glasses, safety shoes or boots, heavy-duty gloves for materials handling, and hard hat if overhead hazards are present (see Chapter 5.0 of FSHP). Buddy system. Unnecessary personnel will stay well clear of operating equipment. Functional back-up alarm on fork trucks, Bobcats, trucks, etc. Documented forklift training for forklift operators. Only experienced operators will be allowed to operate equipment. No personnel allowed under lifted loads. Lifts of greater than 50 pounds 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.
Contact with unexploded ordnance	On-site training in ordnance recognition for all field personnel. Clearance of sites by OE personnel for intrusive work. Continuous escort by OE personnel if working in areas with potential for OE. Withdrawal of all non-OE personnel if ordnance or suspected ordnance is discovered.	Visual and instrument surveys by OE technicians.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Hazardous waste 40-hour certification training and medical clearance must be current. Site training must include hazards and controls for exposure to site contaminants and chemicals used on-site.	Daily safety inspections.
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season, October and November)	Fieldwork will not be conducted on hunt days. Office work, sample management, and analytical work may be conducted in the SAIC staging building (Building 1036) if approved by the RVAAP environmental coordinator.	None.
Fire (vehicle fuels and flammable contaminants)	Fuels stored in safety cans with flame arrestors. Bonding (metal to metal) and grounding during fuel transfers. Fuel storage areas marked with no smoking or open flames signs. Gasoline-powered equipment will be shut down and allowed to cool for 5 minutes before fueling. Fire extinguishers in all fuel use areas.	Daily safety inspection.
Noise	Hearing protection within 7.6 meters (25 feet) of any noisy drum moving equipment unless equipment-specific monitoring indicates exposures less than 85 dBA.	Daily safety inspections.
Biological hazards (bees, ticks, Lyme disease, histoplasmosis, wasps, snakes, West Nile Virus)	PPE (boots, work clothes). Insect repellent on pants, boots, and elsewhere, as necessary to repel ticks and mosquitoes. Pant legs tucked into boots or otherwise closed to minimize tick entry. Snake chaps if working in overgrown areas. Inspect for ticks during the day and at the end of each workday (see Chapter 9.0 of FSHP). Avoidance of accumulations of bird or bat droppings (see Chapter 9.0 of FSHP).	Visual survey.
Electric shock	Identification and clearance of overhead utilities. GFCI for all electrical hand tools.	Visual survey of all work areas.

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring Requirements
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice daily. Pulse rates at the start of each break if wearing impermeable clothing.
<i>Equipment Decontamination (Hot Water Washing, Soap and Water Washing, HCl, and Methanol Rinse)</i>		
General equipment decontamination hazards (hot water, slips, falls, equipment handling)	Level D PPE plus nitrile or PVC gloves (see Chapter 5.0 of FSHP). Face shield and Saranex or rain suit when operating steam washer. Hazardous waste safety training	Daily safety inspections.
Noise (spray washer)	Hearing protection when washer is operating unless equipment-specific monitoring indicates that exposure is less than 85 dBA.	None.
Fire (decontamination solvents and gasoline)	Flammable material stored in original containers or in safety cans with flame arrestors. Fire extinguisher kept near decon area.	Daily safety inspection.
Exposure to chemicals	Level D PPE plus nitrile or equivalent gloves for contact with contaminated material. Wash face and hands prior to taking anything by mouth. Minimal contact. Hazardous waste 40-hour certification training and medical clearance must be current. 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.
Temperature extremes	Administrative controls (see Chapter 8.0 of FSHP). Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area (see Chapter 8.0 of FSHP). Chilled drinks if temperature exceeds 70°F.	Temperature measurements at least twice a day. Pulse rates at the start of each break if wearing impermeable clothing.

EC&HS = Environmental Compliance and Health and Safety.

FSHP = Facility-wide Safety and Health Plan.

GFCI = Ground-fault circuit interrupter.

HAZWOPER = Hazardous Waste Site Operations.

MSDS = Material Safety Data Sheet.

NRR= Noise Reduction Rating.

OE = Ordinance and explosives.

OSHA = Occupational Safety and Health Administration.

PID = Photoionization detector.

PPE = Personal protective equipment.

PVC = Polyvinyl chloride.

RVAAP = Ravenna Army Ammunition Plant.

SAIC = Science Applications International Corporation.

SSHO= Site Safety and Health Officer.

SSHP = Site Safety and Health Plan.

USACE = U.S. Army Corps of Engineers.

Table 2-3. Potential Exposures

Chemical ^a	TLV/PEL/STEL/IDLH ^b	Health Effects/ Potential Hazards ^c	Chemical and Physical Properties ^c	Exposure Route(s) ^c
Chromium	TLV/TWA: 0.5 mg/m ³ , A4 IDLH: 25 mg/m ³	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/m ³]	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
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/m ³	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)	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

Table 2-3. Potential Exposures (continued)

Chemical ^a	TLV/PEL/STEL/IDLH ^b	Health Effects/ Potential Hazards ^c	Chemical and Physical Properties ^c	Exposure Route(s) ^c
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

^aThe potential chemicals were obtained from the *Ravenna Army Ammunition Plant Phase I Remedial Investigation Report* (USACE 1998).

^bFrom 1999 Threshold Limit Values, *NIOSH Pocket Guide to Chemical Hazards* (1997).

^cFrom 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.

3.0 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

This section presents the personnel (and their associated telephone numbers) responsible for site safety and health and emergency response. Table 3-1 identifies the SAIC and subcontractor staff who will fill key roles. See the FSHP for information on the roles and responsibilities of key positions.

Table 3-1. Staff Organization

Position	Name	Phone
Program Manager	Bob Smith	702-792-0203
Health and Safety Manager	Steve Davis CIH, CSP	865-481-4755
Project Manager	Kevin Jago	865-481-4614
Field Operations Manager	Joe Schultheis	937-431-2242
Site Safety and Health Officer (SSHO)	Martha Clough	330-405-5804
Emergency Responder	Martha Clough	330-405-5804
Emergency Responder	Molly McCann	865-481-8740
Emergency Responder	Beau Williams	330-405-5817

CIH= Certified Industrial Hygienist.
CSP = Certified Safety Professional.

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4.0 TRAINING

Training requirements are outlined in the FSHP and in Table 2-2 of this SSHP Addendum. In addition, at least one American Red Cross 43-hr Emergency Response certified person will be present during sampling activities at each load line. All on-site personnel shall be first aid/CPR trained.

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5.0 PERSONAL PROTECTIVE EQUIPMENT

General guidelines for selection and use of PPE are presented in the FSHP. Specific PPE requirements for this work are presented in the hazard/risk analysis section (Chapter 2.0).

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6.0 MEDICAL SURVEILLANCE

Medical surveillance requirements are presented in the FSHP and in Table 2-2 of this SSHP Addendum.

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7.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Assessment of airborne chemical concentrations will be performed, as appropriate, to ensure that exposures do not exceed acceptable levels. Action levels, with appropriate responses, have been established for this monitoring. In addition to the specified monitoring, the SSHO may perform or require additional monitoring, such as organic vapor monitoring, in the field laboratory or equipment decontamination area or personnel exposure monitoring for specific chemicals. 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 29 *CFR* 1910.20. The minimum monitoring requirements and action levels are presented in Table 7-1.

Most of the Phase II RI fieldwork is not expected to pose airborne exposure hazards for the following reasons:

- With the exception of field laboratory analyses, which will be performed in well-ventilated buildings, work will be performed in open areas or abandoned buildings with natural ventilation.
- The site has not been used for more than 40 years, and any volatile contaminants should have dissipated.
- Prior site sampling indicated that contaminants are unlikely to pose an airborne hazard.
- The most probable contaminants (metals, explosives, propellants, and semivolatile organic compounds) are materials with relatively low vapor pressures.

Air monitoring of the breathing zone using a photoionization detector or equivalent is planned during soil sampling, groundwater monitoring well drilling, and trenching. The SSHO will examine site conditions and will contact the Health and Safety Manager and initiate additional monitoring if there is any indication of potential airborne exposure.

Table 7-1. Monitoring Requirements and Action Limits

Hazard or Measured Parameter	Area	Interval	Limit	Action	Tasks
Airborne organics with PID or equivalent	Breathing zone [0.9 meters (3 feet) from source or 0.36 meters (14 inches)] in front of employee's shoulder	From 1 to 3 feet below ground surface and if site conditions, such as discolored soil or chemical smells, indicate that monitoring is necessary	<5 ppm >5 ppm	Level D Withdraw and evaluate <ul style="list-style-type: none"> • evaluate need for PPE upgrade • identify contaminants • notify project manager and H&S manager 	Explosive screening using test kits, drilling, hand auguring, power auguring, and other intrusive work.
Flammability and oxygen content with combustible gas indicator	In manholes, if manholes deeper than 4 feet will be entered	Prior to entry	<10% LEL and between 19.5 and 23.5% O ₂ >10% LEL or <19.5% or >23.5% O ₂	Continue and evaluate source Withdraw and allow area to ventilate; notify project manager and H&S manager	Entry into manholes deeper than 4 feet
Noise	All	During operation of power augers and any area where there is some doubt about noise levels	85 dBA and any area perceived as noisy	Require the use of hearing protection	Hearing protection will be worn within the exclusion zone, around power augers, or other motorized equipment
Visible contamination	All	Continuously	Visible contamination of skin or personal clothing	Upgrade PPE to preclude contact; may include disposable coveralls, boot covers, etc.	All
Visible airborne dust	All	Continuously	Visible dust generation	Stop work; use dust suppression techniques such as wetting surface	All

H&S = Health and Safety.
LEL = Lower explosive limit.
PID = Photoionization detector.
PPE = Personal protective equipment.

8.0 HEAT/COLD STRESS MONITORING

General requirements for heat/cold stress monitoring are contained in the FSHP.

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9.0 STANDARD OPERATING SAFETY PROCEDURES

Standard operating safety procedures are described in the FSHP. Requirements for maintaining standard operating procedures specific to the field laboratory are defined in Table 2-2.

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10.0 SITE CONTROL MEASURES

Site control measures are described in the FSHP. No formal site control is expected to be necessary for this work, as the work areas are somewhat remote and fenced, and bystanders are not anticipated. The RVAAP installation is not open to the public, and only authorized personnel are allowed in the load line areas. 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 FSHP.

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11.0 PERSONNEL HYGIENE AND DECONTAMINATION

Personal hygiene and decontamination requirements are described in the FSHP and in Chapter 2.0 of this addendum.

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12.0 EMERGENCY PROCEDURES AND EQUIPMENT

Emergency contacts, telephone numbers, directions to the nearest medical facility, and general procedures can be found in the FSHP. The SAIC field operations manager will remain in charge of all SAIC and subcontractor personnel during emergency activities. The SAIC field office will serve as the assembly point if it becomes necessary to evacuate one or more sampling locations. During mobilization, the SSHO will verify that the emergency information in the FSHP is correct.

Each field team shall have a hand-held, two-way radio for communications purposes.

During field operations at each load line, at least one American Red Cross 43-hour Emergency Response certified person shall be present, and all on-site personnel shall have CPR/first aid training.

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13.0 LOGS, REPORTS, AND RECORD KEEPING

Logs, reports, and record keeping requirements are described in the FSHP.

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14.0 REFERENCES

NIOSH (National Institute for Occupational Safety and Health) 1997. *NIOSH Pocket Guide to Chemical Hazards, the Condensed Chemical Dictionary*, 10th Edition.

USACE (U.S. Army Corps of Engineers) 1992. *Safety and Occupational Health Requirements for Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OEW) Activities*. ER-385-1-92.

USACE 1996. *Safety and Health Manual*. EM-385-1-1-13, September.

USACE 1998. *Phase I Remedial Investigation of High-Priority Areas of Concern at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. DACA69-94-D-0029, D.O.0010 and 0022, February.

USACE 2001. *Facility-Wide Safety and Health Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. DACA62-00-D-0001, D.O. CY02, March.

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