FINAL

SITE SAFETY AND HEALTH PLAN

PAINESVILLE FUSRAP SITE
PAINESVILLE, OHIO

US Army Corps of Engineers®

Prepared for:

U. S. ARMY ENGINEER DISTRICT, BUFFALO
Buffalo, New York
Formerly Utilized Sites Remedial Action Program

Contract No. DACW49-03-D-0003; Delivery Order 0002

Prepared by:

CABRERA SERVICES, INC.
East Hartford, CT

August 2, 2005

SITE SAFETY AND HEALTH PLAN
for the
Painesville FUSRAP Site
Painesville, OH

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SITE SAFETY AND HEALTH PLAN APPROVALS

By their specific signature, the undersigned certify that this SSHP is approved for use during radiological investigation activities at the Painesville FUSRAP Site, Painesville, OH.

[redacted]

8/8/05
Date

8/8/05
Date

8.5.05
Date

By their specific signature, the undersigned certify that they reviewed and provided comments on this SSHP for use during radiological investigation activities at the Painesville FUSRAP Site, Painesville, OH.

[redacted]

8/8/05
Date

8/3/05
Date

TABLE OF CONTENTS

1.0 INTRODUCTION....1
1.1 PURPOSE/OBJECTIVES....1
1.2 SITE LOCATION....1
1.3 SITE DESCRIPTION AND HISTORY....2
1.4 PREVIOUS INVESTIGATIONS....2
1.5 CONTAMINANTS OF CONCERN....3
2.0 ORGANIZATIONAL STRUCTURE....6
2.1 KEY PERSONNEL....6
2.1.1 USACE Project Personnel....6
2.1.2 Vice President....6
2.1.3 Project Manager (PM)....6
2.1.4 Safety and Occupational Health Manager (SOHM)....6
2.1.5 Radiation Safety Officer (RSO)....7
2.1.6 Field Site Manager (FSM)....7
2.1.7 Site Safety and Health Officer (SSHO)....7
2.1.8 Site Radiation Safety Manager (SRSM)....8
2.1.9 Personnel Assigned to the Project....8
3.0 HAZARD ASSESSMENT....11
3.1 TASKS TO BE PERFORMED....11
3.2 CHEMICAL CONTAMINANTS OF CONCERN....12
3.3 HAZARD COMMUNICATION....12
3.4 RADIOLOGICAL HAZARDS....12
3.5 PHYSICAL HAZARD IDENTIFICATION....12
3.5.1 Slips, Trips, and Falls....12
3.5.2 Hand Tools....13
3.5.3 Traffic....13
3.5.4 Illumination....13
3.6 BIOLOGICAL HAZARD IDENTIFICATION....13
3.6.1 Tick Bites....13
3.6.2 Poisonous Plants....14
3.6.3 Animal or Insect Bites....14

4.0 TRAINING REQUIREMENTS 16
4.1 GENERAL 16
4.1.1 Basic OSHA Training 16
4.1.2 First Aid and CPR Training 16
4.1.3 Site-Specific Safety and Health Training/Pre-Entry Briefing 16
4.1.4 Bloodborne Pathogen (BBP) Training 16
4.1.5 Hearing Conservation Training 17
4.1.6 Respiratory Protection Training 17
4.1.7 Personal Protective Equipment Training 17
4.2 DAILY SAFETY MEETINGS 17
4.3 RECORD KEEPING 17
5.0 ACTIVITY HAZARD ANALYSIS 19
5.1 PHYSICAL HAZARDS 19
5.1.1 Drill/Geoprobe Rig Operations 19
5.1.2 Heat Stress 20
5.2 COLD EXPOSURE 23
5.2.1 Control Measures 23
6.0 SITE CONTROL 30
6.1 GENERAL SITE ACCESS 30
6.1.1 Access to Twin Rivers Technologies Property 30
6.1.2 Site Visitors 30
6.2 ACCOUNTABILITY 31
6.3 BUDDY SYSTEM 31
6.4 SAFE WORK PRACTICES 31
7.0 RADIATION SAFETY PROGRAM 32
8.0 HEALTH AND SAFETY ACTION LEVELS 33
9.0 CONTAMINATION MONITORING 34
9.1 DIRECT READING INSTRUMENTS 34
9.2 PERSONAL AND PERIMETER AIR MONITORING 34
10.0 LEVELS OF PROTECTION 35
11.0 DECONTAMINATION PROCEDURES 36
12.0 EMERGENCY RESPONSE 37

12.1 EMERGENCY CONTACTS 37
12.2 HOSPITAL ROUTE 37
13.0 MEDICAL SURVEILLANCE REQUIREMENTS **38**
14.0 REFERENCES **39**

LIST OF FIGURES

FIGURE 1-1. **LOCATION OF THE PAINESVILLE FUSRAP SITE, PAINESVILLE,OH** 4
FIGURE 1-2. **PAINESVILLE FUSRAP SITE PROJECT AREA** 5
FIGURE 2-1. **PROJECT ORGANIZATIONAL CHART** 10

LIST OF TABLES

TABLE 2-1. **KEY PROJECT PERSONNEL** 8
TABLE 5-1. **RECOMMENDATIONS FOR WORK/REST CYCLE DURATIONS TO REDUCE HEAT STRESS** 21
TABLE 5-2. **WORK DEMAND CATEGORIES** 22
TABLE 5-3. **WIND CHILL FACTORS** 24
TABLE 5-4. **ACTIVITY HAZARD ANALYSIS** 25
TABLE 5-5. **EQUIPMENT AND TRAINING REQUIREMENTS** 29
TABLE 8-1. **TASK SPECIFIC ACTION LEVELS FOR DIRECT-READING INSTRUMENTS** 33

LIST OF APPENDICES

APPENDIX A: **SSHP ACKNOWLEDGEMENT FORM**
APPENDIX B: **RADIATION PROTECTION PLAN**
APPENDIX C: **EMERGENCY CONTACT LIST AND HOSPITAL DIRECTIONS**

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	As Low as Reasonably Achievable
ANSI	American National Standards Institute
BBP	Bloodborne Pathogens
BEI	Biological Exposure Indices
CFR	Code of Federal Regulation
CGI	Combustible Gas Indicator
CHP	Certified Health Physicist
CIH	Certified Industrial Hygienist
cm^2	square centimeters
cpm	counts per minute
CPR	Cardiopulmonary Resuscitation
CSP	Certified Safety Professional
dBA	Decibels (A-weighted scale)
DMC	Diamond Magnesium Company
FSM	Field Site Manager
FSP	Field Sampling Plan
FUSRAP	Formerly Utilized Sites Remedial Action Program
GSA	General Services Administration
GWS	Gamma Walkover Survey
HAZWOPER	Hazardous Waste Operations
HCS	Hazard Communication Standard
HTRW	Hazardous Toxic or Radioactive Waste
m	meters
m^3	cubic meter(s)
MSDS	Material Safety Data Sheet
NIOSH	National Institute of Occupational Safety and Health
ODH	Ohio Department of Health
OEPA	Ohio Environmental Protection Agency
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration

pCi/g	Picocuries per gram
PID	photo ionization detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	parts per million
RCOC	Radiological Contaminant of Concern
RI/FS	Remedial Investigation/Feasibility Study
RPP	(Site) Radiation Protection Plan
RSO	Radiation Safety Officer
RSP	Radiation Safety Program
SOHM	Safety and Occupational Health Manager
SOP	Standard Operating Procedure
SRSM	Site Radiation Safety Manager
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TLV	Threshold Limit Value
USACE	US Army Corps of Engineers
USAEC	US Atomic Energy Commission
WBGT	Wet-Bulb Globe Temperature
WNV	West Nile Virus

1.0 INTRODUCTION

1.1 PURPOSE/OBJECTIVES

Cabrera Services Inc. (CABRERA) has been contracted by the U.S. Army Corps of Engineers – Buffalo District (USACE-Buffalo) under Contract No. DACW49-03-D-0003 (hereafter referred to as the "Contract") (USACE, 2003a) to provide environmental services for the Painesville FUSRAP Site (hereafter referred to as the "Site") in Painesville, Ohio. This site has been identified as containing various levels of residual radioactive material in soils from previous operations, including radium-226 (Ra-226), thorium-230 (Th-230), thorium-232 (Th-232), and total uranium (Total U). This Site Safety and Health Plan (SSHP) has been prepared to describe the project requirements for Site pre-remediation and final status radiological surveys.

The purpose of this document is to establish standard safety and health procedures for CABRERA personnel and any contractors involved in site work, which involves potential exposure to hazardous, toxic, radiological, or other physical hazards. Project activities shall be performed in accordance with this SSHP. This SSHP is a working document and is subject to change based on review and the implementation of additional tasks. This document meets the requirements of the Occupational Safety and Health Administration (OSHA) 1910.120 and 1926.65, Hazardous Waste Operations and Emergency Response (HAZWOPER) and USACE EM 385-1-1 (USACE, 1996).

This SSHP establishes the work practices necessary to help ensure protection of all personnel assigned tasks on the site, the local community, and the environment during site activities. The objective of this SSHP is to anticipate, identify, evaluate, and control safety and health hazards, in addition to providing emergency response procedures relative to operations conducted at the site. Specific hazard control methodologies have been evaluated and selected in an effort to minimize the potential for accident or injury.

Site activities will be performed in accordance with this SSHP, other applicable health and safety regulations, policies and procedures of CABRERA, OSHA, and other applicable local and federal statutes.

The levels of personal protection and the procedures specified in this plan are based on the best information available from reference documents and current site data. Therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project. Unforeseeable site conditions may warrant a reassessment of protection levels and controls stated. Revisions to the SSHP must have prior approval by the CABRERA Safety and Occupational Health Manager (SOHM) and the Site Safety and Health Officer (SSHO).

On-site personnel shall follow the designated safety and health procedures, be alert to the hazards associated with working on the site, and exercise reasonable caution at all times.

1.2 SITE LOCATION

The Painesville FUSRAP Site is located at 720 Fairport Nursery Road in Painesville, Ohio, approximately 22 miles northeast of Cleveland. Figure 1 shows the site's proximity to the surrounding area. The site is currently owned by the Crompton Manufacturing Company, Inc. (formally the Uniroyal Chemical Company). The Site is approximately 30 acres in size, and is bounded on the north by the Norfolk and Southern Railroad, on the west by property owned by

Crompton, on the south by Fairport Nursery Road, and on the east by Twin Rivers Technologies (formally Lonza, Inc.). The ground surface of the site is primarily covered with a mix of asphalt, concrete, and building rubble. Process buildings, warehouses, office buildings, a chemical transfer facility, several aboveground storage tanks, building rubble piles, and a railroad spur formerly covered the site but have since been demolished by the property owner. Figure 1-2 shows the layout of the Painesville Site.

1.3 SITE DESCRIPTION AND HISTORY

In the early 1940's, the Defense Plant Corporation financed construction of a magnesium production facility in Painesville, Ohio, on property acquired by the Federal Government. The Diamond Magnesium Company (DMC) operated this plant from 1942 to 1953 for the General Services Administration (GSA).

In 1952 and 1953, DMC received approximately 1,650 tons of radiologically contaminated ferrous scrap metal from the GSA. This scrap was generated from discarded metal drums and other items previously used to store uranium compounds involved with pitchblend operations, possibly including waste from the Mallinckrodt Chemical Company of Saint Louis, Missouri. The scrap metal was shipped to the DMC from the Atomic Energy Commission's Lake Ontario Storage Area. DMC used the ferrous scrap metal to scrub chlorine gas during the magnesium production process; the radiological contamination was incidental to this use. The scrap metal was delivered to the site via railroad cars on the eastern and western sides of the site, and stored on the ground on the northern side of the production building before use.

In 1963, GSA sold the property to the U.S. Rubber Company (which later became the Uniroyal Company, and is now the Crompton Manufacturing Company).

1.4 PREVIOUS INVESTIGATIONS

In 1990, the Department of Energy (DOE) completed preliminary site survey of the Painesville Site (Oak Ridge National Laboratory, ORNL, 1990). This survey included a surface gamma scan of selected portions of the outdoor property west of the buildings, and collection and analysis of surface and subsurface soil samples. This survey identified elevated gamma radiation levels in the vicinity of the railroad car spill containment area, and elevated concentration of radionuclides within soils from eight biased sampling locations. The primary contaminants detected were Radium-226, and Uranium-238. This survey recommended that a detailed radiological survey be conducted to more precisely define the extent of the contamination.

In 1991 the DOE completed a radiological characterization survey of the Painesville, Ohio Site (ORNL 1991). This survey included a gamma surface scan, measurements of direct radiation levels, collection and analysis of systematic and biased soil samples (both surface and subsurface), and measurement of direct radiation levels inside three buildings used during the operation of the former Diamond Magnesium Company. This survey identified widespread radiological soil contamination on the Crompton property, and elevated radionuclide soil concentrations in a small area on the Twin Rivers Technologies property. The primary contaminants detected were U-238, Ra-226 and Th-230. The soil contamination on the Uniroyal property is primarily located in two large regions where scrap metal had been stored, as well as in numerous smaller regions scattered throughout the site.

In May of 1998, the U.S. Army Corps of Engineers (USACE) published the Characterization Report for the Painesville Site (USACE 1998b). This site characterization included surface gamma scans, air monitoring, building surveys, geophysical surveys, surface and subsurface soil sampling, surface and subsurface water sampling, and ecological sampling. The report identified six areas containing radiological contamination of the soil, with the largest area being in the vicinity of a butadiene tank installed by the current site owner, Crompton. It is believed that this area was the primary former storage site for the contaminated scrap metal prior to its use in the magnesium production process.

An Action Memorandum was signed in September 1998 to authorize the interim remedial action detailed in the USACE Engineering Evaluation/Cost Analysis published in June 1998. Between September and November 1998, USACE conducted a removal action at the Painesville Site. Approximately 1,326 cubic yards (yd^3) of contaminated soil with Ra-226 concentrations greater than 27 picocuries per gram (pCi/g) were excavated in the vicinity of the butadiene tank. However, excavation was halted before remediation of the site was completed due to impending poor winter weather, and the fact that the volume of contaminated soil was greater than anticipated 790 yd^3, and was beyond the scope of the Action Memorandum.

In May 2003, the USACE completed a Remedial Investigation/Feasibility Study (RI/FS) of the Painesville Site (SAIC, 2003). As a result, several alternative remedial actions were developed including revised soil cleanup goals.

1.5 CONTAMINANTS OF CONCERN

The USACE has identified four FUSRAP-related radiological contaminants of concern (RCOCs) in impacted soils: Ra-226, Th-230, Th-232, and Total U.

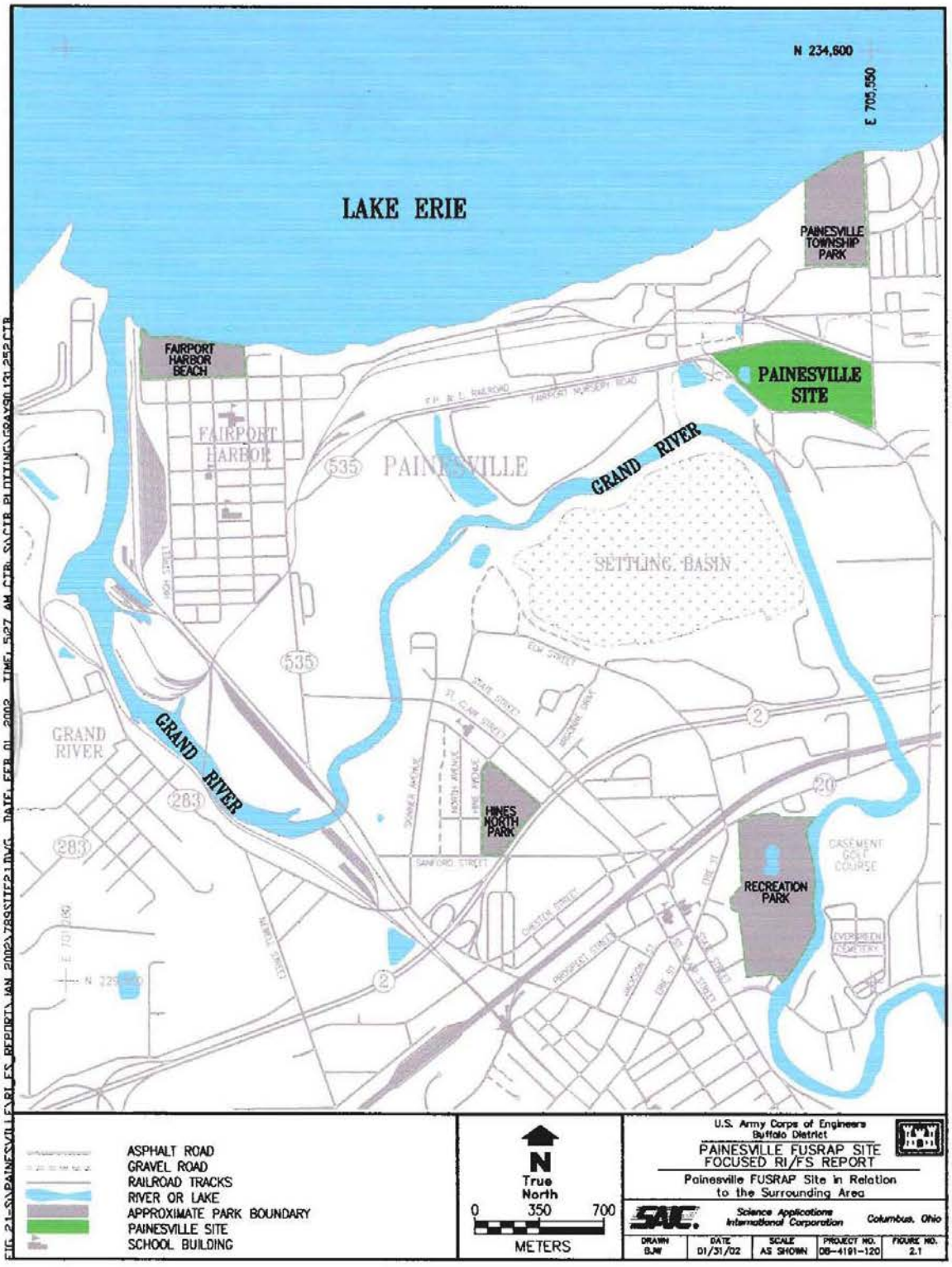
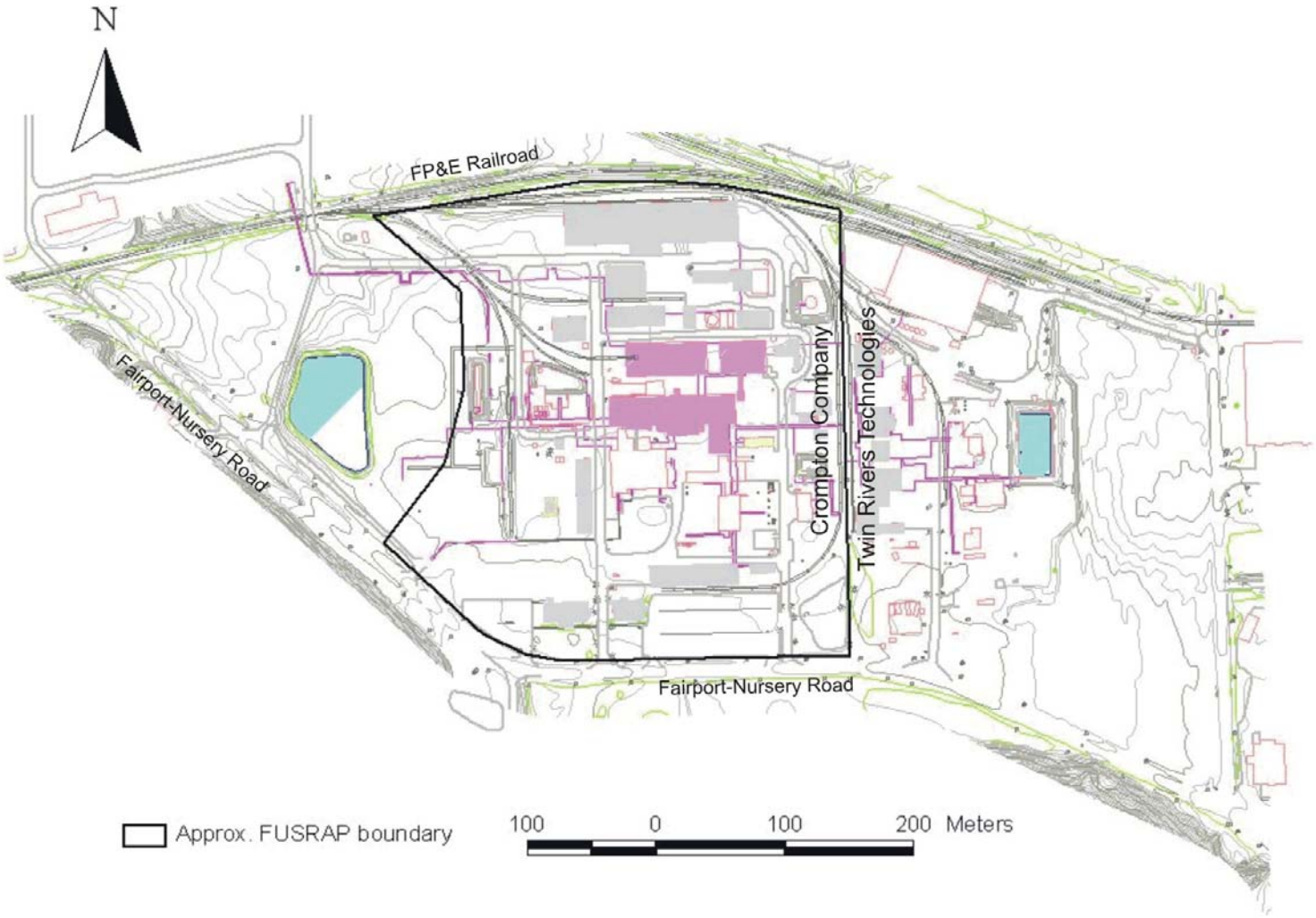


Figure 1-1. Location of the Painesville FUSRAP Site, Painesville,OH

(*Figure courtesy of SAIC, Focused RI/FS Report – 2003*)



(Figure Courtesy of Argonne National Laboratory)

Figure 1-2. Painesville FUSRAP Site Project Area

2.0 ORGANIZATIONAL STRUCTURE

2.1 KEY PERSONNEL

As the project progresses, it may be necessary to modify some CABRERA organizational aspects, such as personnel responsibilities and authorities, so that individual tasks can be performed as efficiently and safely as possible. Any changes to the overall CABRERA organizational structure will be recorded in the appropriate sections of this SSHP that are developed for individual phases or tasks. These specific changes will be communicated to all parties involved. Figure 2-1 shows the organizational structure of the project team. Phone numbers of key project personnel are shown in Table 2-1.

2.1.1 USACE Project Personnel

USACE personnel within the organizational structure hold overall management responsibility for the entire program. The U.S. Army Engineer District, Buffalo Project Manager ( ) will be the prime interface with the site property owners, the U.S. Environmental Protection Agency (US EPA), the Ohio Environmental Protection Agency (OEPA), and the Ohio Department of Health (ODH). The USACE Project Engineer (Mr. Bob Simmington) will be the primary Point of Contact for CABRERA for this project and will direct the USACE project team. The USACE Industrial Hygienist for the project team will be and the Field Health Physicist will be .

2.1.2 Vice President

PhD, CHP is CABRERA's Vice President of Operations and Managing Principal for the Painesville FUSRAP site project. He is responsible for assuring the project team implements the policies and procedures required under the USACE contract, and assures that all corrective action is taken if performance is not acceptable to USACE. He will work closely with the Project Manager and project quality assurance personnel to ensure established protocols and procedures are implemented.

2.1.3 Project Manager (PM)

The PM, , CHP is responsible for establishing and executing program administrative matters, program controls, program-related policy matters, and program levels of authority, responsibility, and communication. The PM is responsible for ensuring necessary project health and safety personnel have been assigned to the project team and that necessary Health and Safety documents have been reviewed and approved before the commencement of site related activities.

2.1.4 Safety and Occupational Health Manager (SOHM)

The SOHM, , CIH, CSP is responsible for the acceptance of the SSHP and for approving revisions. No hazardous, toxic or radioactive waste (HTRW) project shall commence without written acceptance of the SSHP, from the SOHM. Additionally the SOHM shall:

- Ensure that the SSHP complies with all federal, state, and local health and safety requirements. If necessary, modify specific aspects of the SSHP to adjust for on site changes that affect safety.

- Evaluate and authorize any changes to the SSHP.
- Implement and oversee the CABRERA Services Health and Safety Program.
- Ensure that necessary numbers of trained supervisory personnel and SSHOs are available
- Provide sufficient training resources to meet the project staffing requirements.
- Provide industrial hygiene support to the project staff.

2.1.5 Radiation Safety Officer (RSO)

The RSO, Hank Siegrist, CHP, PE assists the Site Safety and Health Officer (SSHO) in implementation of the SSHP. The RSO provides direct supervision of field staff ensuring that all personnel adhere to the requirements of this SSHP. The RSO has the following additional responsibilities:

- Coordinate with the PM and SOHM in developing the SSHP for site-specific projects.
- Coordinate with the SOHM and the SSHO for field implementation of the SSHP.
- Provide consultation to the SSHO on matters pertaining to radiation.
- Ensure compliance with all applicable regulations concerning the handling and transportation of radioactive material.
- Provide radiation training to on-site personnel.

2.1.6 Field Site Manager (FSM)

The FSM, TBD, is responsible for supervising field activities. The FSM provides direct supervision of field staff and, together with the SSHO, is responsible for ensuring that all personnel adhere to the requirements of the SSHP.

2.1.7 Site Safety and Health Officer (SSHO)

The SSHO, TBD, is responsible for the day-to-day implementation of the SSHP. The SSHO has the authority to shut down any operation that he/she feels jeopardizes the health and safety of site personnel, the environment or local personnel. In addition the SSHO has the following responsibilities:

- Assist in the development of the SSHP.
- Implement and enforce the SSHP.
- Assist the FSM in the daily tailgate safety briefings.
- Train employees in site-specific hazards, collect and retain necessary training documents, review and collect activity hazard analysis.
- Specify proper levels of PPE according to the specifications of this SSHP.
- Develop additional health and safety procedures, as required.
- Assist the SOHM in the investigation of accidents/incidents and "near misses".
- Conduct weekly safety audits and complete required documentation.
- Coordinate with SOHM any issues that may arise.

2.1.8 Site Radiation Safety Manager (SRSM)

The SRSM, TBD, for this project meets the qualification requirements for a radiation safety officer as outlined in USACE Engineering Manual EM385-1-1, which includes but is not limited to formal and "hands-on" training in radiation protection and knowledge of radiation physics, use of monitoring instruments, and knowledge of applicable regulations. The SRSM reports directly to the Project Manager and will have the following project responsibilities:

- Support the SSHO in the on-site implementation of the SSHP and ensure that all project personnel follow the radiological requirements of the SSHP.
- Assist the FSM in the daily tailgate safety meetings and report any incidents that occur on-site to the FSM and Corporate RSO.
- Develop and maintain the Radiation Work Permit procedures for the work site.
- Note changes in site conditions or procedures and suggest revisions to the SSHP and site procedures as necessary to ensure adequate safety precautions are in place.
- Acquire and implement input from the Corporate RSO, as necessary, to maintain the site radiological safety program.
- Provide on-site administration of the personnel exposure monitoring procedures for on-site personnel.
- Ensure compliance with all applicable regulations concerning the handling and transportation of radioactive material.
- Provide radiation training to all onsite personnel who may be exposed to ionizing radiation.

2.1.9 Personnel Assigned to the Project

Each person assigned work on the site is ultimately responsible for his or her own health and safety while working on this project.

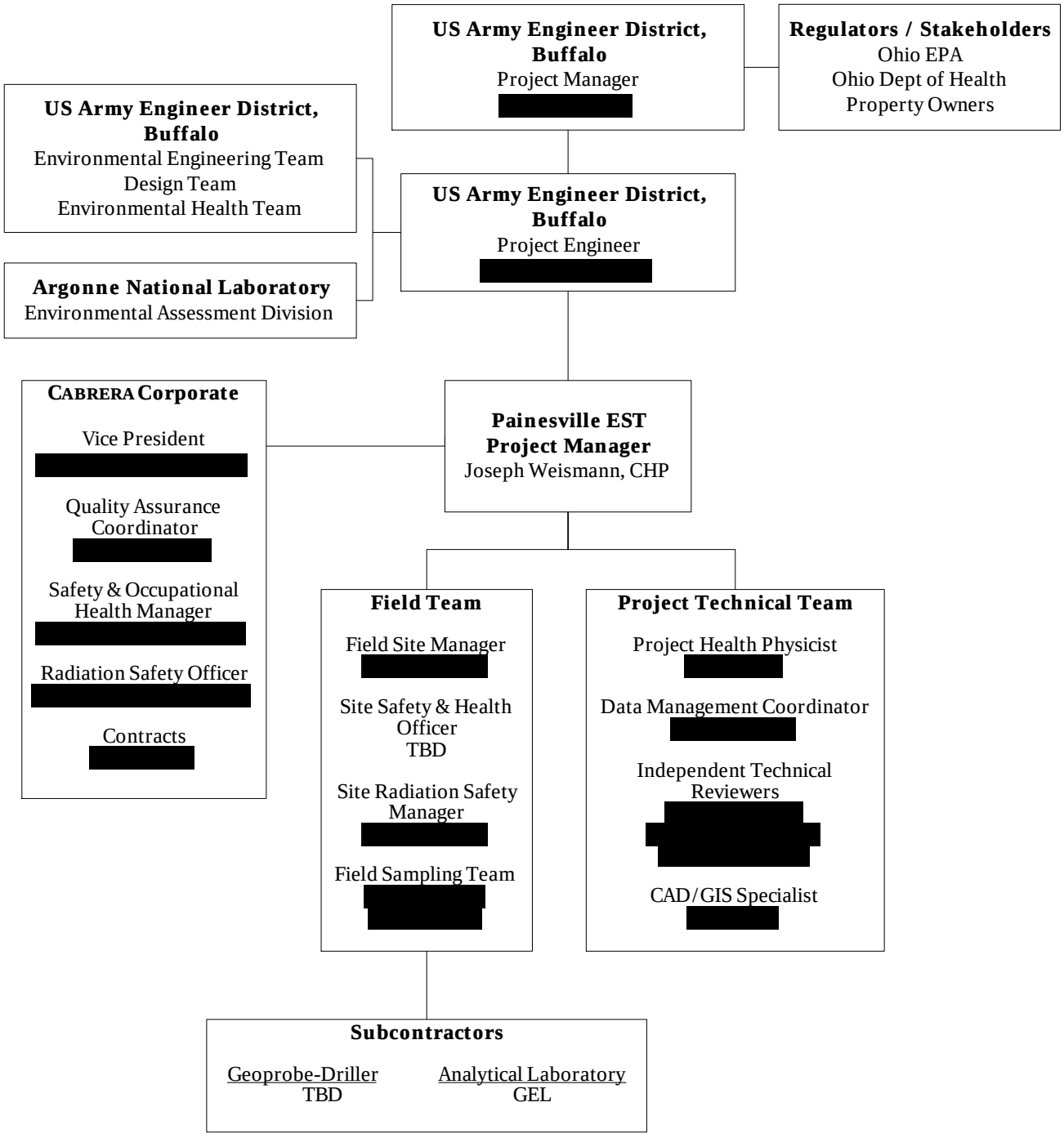
Taking all reasonable precautions to prevent injury to themselves and to their fellow employees and being alert to potentially harmful situations are primary responsibilities. Site personnel shall be responsible for:

- Performing only tasks that they can do safely and in which they have been trained.
- Notifying the SSHO of special medical conditions (i.e., allergies, contact lenses, etc.).
- Notifying the SSHO of prescription and/or non-prescription medication the worker may be taking that might cause drowsiness, anxiety or other unfavorable affects.
- Preventing spillage and splashing of materials to the greatest extent possible.
- Practicing good housekeeping by keeping the work area neat, clean, and orderly.
- Immediately reporting all injuries to the SSHO.
- Complying with the SSHP and all health and safety recommendations and precautions, properly using the PPE as determined by this SSHP and/or the SSHO.

Table 2-1. Key Project Personnel

TITLE	NAME	TELEPHONE
US Army Corps of Engineers - Buffalo		
USACE Project Manager	[redacted]	[redacted]
USACE Project Engineer	[redacted]	[redacted]
USACE Industrial Hygienist	[redacted]	[redacted]
USACE Field Health Physicist	[redacted]	[redacted]
CABRERA		
Vice President	[redacted]	[redacted]
Project Manager	[redacted]	[redacted]
Safety and Occupational Health Manager	[redacted]	[redacted]
Radiation Safety Officer	[redacted]	[redacted]
Field Site Manager	TBD	[redacted]
Site Safety and Occupational Health Officer/ Site Radiation Safety Manager	TBD	[redacted]
Site Employees with First Aid/CPR	TBD	[redacted]

Figure 2-1. Project Organizational Chart



3.0 HAZARD ASSESSMENT

Potential exposure to site contaminants is expected to be minimal. The SSHO will make the final determination of PPE levels for hazardous contaminants prior to the start of site preparation and survey activities.

3.1 TASKS TO BE PERFORMED

- Task 1. Mobilization - This task will include setting up the on-site trailers for use during the project; mobilizing sampling equipment; moving in project personnel; performing utility locations and geophysical surveys; and familiarizing project personnel with the site, the work, and the requirements for the work.
- Task 2. Site Preparation - This task will include setup and delineation of work areas and the staging and setup of equipment. Brush clearing will be performed as necessary to provide access to drill/Geoprobe rig sampling locations.
- Task 3. Establish Sample Locations - This task includes establishing the proposed survey and sampling locations and ensuring underground services have been identified before any intrusive activity begins.
- Task 4. Gamma Walkover Survey (GWS) - This task involves a GWS of accessible portions of the site with a gamma scintillation detector.
- Task 5. Drill Soil Samples - This task includes the set-up of a drill rig or Geoprobe rig and drilling to a specified depth.
- Task 6. Collect Soil Samples - This task includes the collection of soil samples, the packaging and labeling of the samples, and performance of a screening radiation survey on each sample.
- Task 7. Decontamination of Equipment - This task consists of the decontamination and survey of any equipment that may have been contaminated as a result of the radiological investigation activities.
- Task 8. Downhole gamma logging - This task includes the collection of in-situ downhole gamma measurements in each open soil core location prior to backfilling. These measurements will be performed to assess whether any additional subsurface hot particles are present in the immediate area of the core that require sampling.
- Task 9. Demobilization - This task will include removing all equipment from the site, removing the trailers and their contents, removing holding tanks and other equipment and materials from the site, and returning the site its original condition.

If, during the course of this project, conditions change that require an upgrade to more protective PPE, the decision will be made by the SSHO and the SOHM. Upgrades for radiological contaminants will be in accordance with the Site Radiation Protection Plan (RPP), Appendix B of this SSHP. Conditions that may warrant changes in PPE may include, but are not limited to, discovery of buried chemicals, radiological materials, etc.

3.2 CHEMICAL CONTAMINANTS OF CONCERN

None are anticipated during the course of the project. However, intrusive activities will be monitored for potential chemical contaminants should there be evidence of possible chemical contamination.

3.3 HAZARD COMMUNICATION

In order to comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200 (HCS), the following shall apply to all commercial products containing hazardous substances brought on site (refer to Volume 4, HSM – 002, Hazard Communication):

- Any hazardous materials brought on site shall comply with the requirements of CABRERA's Hazard Communication Program, from the *Cabrera Services Health and Safety Manual* (CABRERA, 1999). This program shall be made available to all site personnel.
- A Material Safety Data Sheet (MSDS) will be maintained for each hazardous product used on site;
- Containers not supplied with adequate hazard labeling shall have a hazard communication label affixed to the container displaying the health and physical hazards of the material;
- Employees working with hazardous substances shall be trained in accordance with the requirements of 29 CFR 1910.1200;
- An inventory of hazardous substances used on-site will be maintained;
- Personnel, including contractors, using hazardous substances shall be informed of the hazards and of the location of appropriate MSDS.

Contractors are required to provide MSDSs to other contractors on-site if such materials could pose a risk to other site personnel. MSDS's for all products on-site shall be submitted to the SSHO for review.

3.4 RADIOLOGICAL HAZARDS

The Site RCOCs are Ra-226, Th-230, Th-232, and Total U in soils. Site radiological hazards are discussed in detail in the Site Radiation Protection Plan (RPP) in Appendix B of this SSHP.

3.5 PHYSICAL HAZARD IDENTIFICATION

3.5.1 Slips, Trips, and Falls

The most common hazard will be due to wet or uneven ground with substantial debris and underbrush. As the work will be outdoors, wet ground could contribute to falls and injuries from slipping. The debris (concrete rubble, cracked roadways and building pads) and vegetation growth could contribute to falls from tripping. These types of slips, trips, and falls could lead to various injuries, such as foot, back, abrasions, or lacerations. These hazards will be alleviated by safe practices, such as making personnel aware of and marking unsafe areas, and clearing vegetation or debris that would contribute to unsafe working conditions.

3.5.2 Hand Tools

Only tools that are in good condition shall be used. Improper and defective tools contribute to accidents. In addition to the *Use, Inspection, and Maintenance* requirements of Section 13.A.02 of USACE EM 385-1-1, the following safe practices shall be observed when using hand tools:

- Use equipment/tools in the manner for which they were designed.
- Be sure of footing before using any tool.
- Do not use tools that have split handles, mushroom heads, worn jaws, defective electrical components or other defects.
- Do not use makeshift tools or other improper tools.
- Use spark proof tools or equipment near explosive vapors, gases, or residue.

3.5.3 Traffic

Vehicular traffic in the survey areas is expected to consist of work support vehicles, a drilling or Geoprobe rig, and possibly mowing or brush clearing equipment. Drilling/Geoprobe operations are discussed in detail in Section 5.1.1. Personnel will be made aware of traffic where activities are conducted in non-survey areas such as trailer locations, parking areas, near roadways, or traversing to survey locations. Additional precautionary measures will be instituted as traffic conditions in these areas are evaluated or change.

3.5.4 Illumination

Outdoor work will be conducted during daylight hours; therefore the need for supplemental illumination is not anticipated.

3.6 BIOLOGICAL HAZARD IDENTIFICATION

Biological hazards that may be encountered in the field include poisonous plants, wild and/or rabid animals, snakes, and insects.

3.6.1 Tick Bites

The Center for Disease Control has noted the increase of Lyme Disease and Rocky Mountain Spotted Fever that are caused by bites from infected ticks that live in and near wooded areas, tall grass, and brush. Ticks are small, ranging from the size of a comma up to about one quarter inch. They are sometimes difficult to see. The tick season extends from spring through summer.

Lyme Disease has occurred in almost all states, with the heaviest concentrations in the Northeast (Connecticut, Massachusetts, New Jersey, New York, Pennsylvania), the upper Midwest (Minnesota and Wisconsin), and along the northern California coast. It is caused by ticks, which have become infected with spirochetes. Deer ticks are about one quarter inch in size, and black or brick red in color. Male deer ticks are smaller, and all black. The deer tick larva are extremely small [approximately the size of a period (.)].

Standard field gear (work boots, socks and light-colored coveralls) provides good protection against tick bites, particularly if the joints are taped. However, even then wearing field gear, the following precautions should be taken when working in areas that might be infested with ticks:

- When in the field, check yourself often for ticks, particularly on your lower legs and areas covered with hair.
- Spray outer clothing, particularly your pant legs, boots, and socks, BUT NOT YOUR SKIN, with an insect repellent that contains permethrin or permanone.
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- If you suspect that a tick is present, remove it with tweezers only, and not with matches or a lit cigarette. Grasp the tick near the head with the tweezers and pull gently. Do not use nail polish or any other type of chemical. Be sure and remove all parts of the tick's body. Once removed, disinfect the area with alcohol or a similar antiseptic. Keep the tick in a plastic bag and report the incident to the SSHO or FSM.
- Look for signs of the onset of Lyme Disease, such as a rash that looks like a bull's eye or an expanding red circle surrounding a light area, frequently with a small welt in the center. This rash can appear from several days to several weeks after the tick bite. The first symptoms of either disease are flu like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals recover fully in a short period of time. If not treated, more serious symptoms can occur.

If any of the above noted signs and symptoms appear, contact the SSHO or FSM. Consult with a physician for an examination and possible treatment.

3.6.2 Poisonous Plants

Site personnel need to be alert to the presence of poisonous plants. The most common types of poisonous plant are poison ivy, poison oak and poison sumac. Skin contact with these plants can cause skin sensitization resulting in reddening, swelling and itching of the affected areas. Skin exposure can result from either direct contact with the plant or contact with clothing/equipment previously exposed to the plant. Site personnel will receive training in the recognition of poisonous plants and methods for preventing exposure during the site-specific safety briefing.

3.6.3 Animal or Insect Bites

Animal bites or stings are usually nuisances (localized swelling, itching, and pain) that can be handled by first-aid treatment. The bites of certain snakes, lizards, spiders, and scorpions contain sufficient poison to warrant medical attention. There are diseases that can be transmitted by insect and animal bites (e.g., Rocky Mountain Spotted Fever, Lyme Disease [tick], rabies [mainly dogs, skunks, raccoons, and foxes], malaria, and equine encephalitis [mosquitoes]). The greatest hazard and most-common cause of fatalities from animal bites, particularly bees, wasps, and spiders, is from a sensitivity reaction. Shock due to stings can lead to severe reactions in the circulatory, respiratory, and central nervous systems, which also can result in death.

If an assigned employee has a history of allergic reactions to bites, they will be required to have their prescribed treatment with them, and first aid personnel will know where it is located.

Stings or bites will be taken seriously. Anyone stung or bitten, with the exception of mosquito bites, will be required to stop work while that person is observed for signs of severe swelling, shortness of breath, nausea, or shock. If there is any doubt, medical attention will be obtained.

Wild animals should be avoided, particularly wild animals that are unusually passive or aggressive. Any such animals will be reported to appropriate site personnel. Skunks, raccoons, foxes, and bats are wild animals most frequently infected with rabies; however, any warm-blooded animal could be infected. If an animal suspected of being infected with rabies bites an individual, the animal should be captured. On-site personnel will not attempt a capture unless it can be done safely and there is no risk of injury from, or bites by, the suspect animal. If on-site personnel cannot capture the animal easily, it should be kept under surveillance and appropriate assistance (such as a municipal animal control officer) will be called to capture the animal. The animal should then be tested. A dead animal suspected of infection should also be preserved and tested. Health departments are often sources of testing or obtaining information about where testing can be done.

The bite area should be washed with soap and water and disinfected with 70% alcohol as quickly as possible, followed by treatment by a doctor or emergency room. Rabies is preventable but treatment must begin immediately. Hence, prompt medical attention and determining whether the animal is infected are very important.

West Nile virus (WNV) is a mosquito-borne disease that can infect humans, birds, horses and other mammals. In most humans, WNV infection can cause a mild flu-like illness, or may cause no symptoms at all. However in some cases, particularly among the elderly, it can cause severe neurological diseases such as encephalitis or meningitis. West Nile virus first appeared in North America in New York City in 1999. Since then, the virus has spread across the continental United States.

West Nile virus is predominantly spread to humans by the bite of an infected mosquito. In 2002 other methods of human transmission were discovered. It has now been shown that West Nile virus can be transmitted to humans who receive infected organs through transplantation, or who receive transfusions of infected blood or blood products. Also, in 2002 there was one case of transmission from a pregnant woman to her fetus and one mother-to-child transmission through breast milk. West Nile virus is NOT spread by casual contact such as touching, kissing, or caring for someone who is infected.

From June through October, when mosquitoes are most active, the following precautions should be taken:

- Wear protective clothing such as long pants and long-sleeved shirts, particularly between dusk and dawn when mosquitoes are searching for a blood meal.
- Avoid shaded, bushy areas where mosquitoes like to rest.
- Limit outdoor evening activity, especially at dusk and dawn when mosquitoes are most active.
- Use an insect repellent containing DEET to help reduce exposure to mosquitoes.

4.0 TRAINING REQUIREMENTS

4.1 GENERAL

All personnel assigned to or regularly entering the project site will have received the required minimum HTRW training required in 29 CFR 19l0.120 (e). In addition, other specific training requirements as required by applicable sections of 29 CFR 1910 and 1926 shall have been completed prior to commencement of the particular site task. Specifics of radiation worker training are discussed in the RPP (see Appendix B).

4.1.1 Basic OSHA Training

Site workers participating in field investigations and sampling must have the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and three days of documented field experience under the direct supervision of a trained experienced supervisor. On-site management personnel (the FSM or SSHO) must have an additional eight hours of specialized supervisory training. Workers must have an annual refresher (eight hours) if initial training is over one year old. Copies of training certificates should be readily available for review.

Personnel without current OSHA training may gain access to the administrative portions of the Site (e.g. Field Trailer, Support Zones) but may not enter active work zones or radiologically controlled areas, as defined in the RPP.

4.1.2 First Aid and CPR Training

At least two on-site workers will be certified in First Aid and CPR. The training shall be equivalent to that provided by the American Red Cross. These individuals will be on-site at all times during which project field survey and sampling activities are in progress.

4.1.3 Site-Specific Safety and Health Training/Pre-Entry Briefing

Site-specific health and safety training will be conducted prior to field activities. The designated SSHO will review the SSHP, project plans, and other associated responsibilities with the field team members and afford them the opportunity to ask any questions. A record of this training will be maintained by the SSHO.

4.1.4 Bloodborne Pathogen (BBP) Training

Individuals who have received first aid and/or CPR certification and who may need to provide emergency service to an injured/unconscious co-worker shall have received awareness level training in controlling exposures to Bloodborne Pathogens (BBP). This training will consist of the following:

- Review of the Bloodborne Pathogen standards.
- Requirements of the Exposure Control Plan (CABRERA, 1999).

- Description of the risks of exposure and how BBP are transmitted.
- Methods of protection against exposure and procedures for decontamination.
- Post-exposure procedures.

4.1.5 Hearing Conservation Training

Powered equipment generally will produce sound levels greater than 85 dBA. Hearing protection will be required in the immediate drilling area during subsurface sample collection or where exposure at these levels could occur for several hours during the day. For individuals with documented threshold shifts, use of hearing protection is mandatory whenever powered equipment or other devices are used which produce sound levels over 85 dBA.

4.1.6 Respiratory Protection Training

In accordance with OSHA 29 CFR 1910.134, site personnel required to use respiratory protection devices shall have received equipment-specific training and satisfactorily completed a qualitative fit test for the model to be worn. This training covers the use, limitations, inspection, maintenance and cleaning of respiratory protection devices required for use under the conditions of this SSHP. Unless air monitoring indicates the need for respiratory protection, it will not be required for this project. Optional use of respiratory protection will be at the discretion of the SSHO in consultation with the SOHM. Furthermore, all personnel shall have an up to date OSHA Ability to Wear medical clearance in order to qualify for work requiring respiratory protection.

4.1.7 Personal Protective Equipment Training

In accordance with OSHA 29 CFR l910, Subpart I (Personal Protective Equipment) personal protective equipment will be provided, used and maintained in a sanitary and reliable condition. All personal protective equipment (PPE) will be of construction, design, and material to provide employees protection against known or anticipated hazards. PPE will be selected which properly and appropriately fits the employee. Personnel shall be provided with training on the selection, use, and limitations of PPE in accordance with the standard. Any concerns regarding the use of appropriate PPE will be brought to the attention of the SOHM. SSHO is responsible for ensuring that necessary PPE is available on site.

4.2 DAILY SAFETY MEETINGS

The FSM and/or the SSHO will conduct daily safety meetings to review the day's work plan, associated activities, and any anticipated hazards. Names and topics will be documented and maintained on file.

4.3 RECORD KEEPING

Each Site worker is responsible for providing the following information to the FSM for record-keeping. These records will become a part of the project file.

1. Statement of SSHP Acknowledgment (See Appendix A).

2. 40-hr HAZWOPER Training certificates and current 8-hr refresher.

3. Medical Approval for site work and respirator clearance.

In addition to the above, the following records or logs will be incorporated into the project file:

1. Accident Investigation Reports: in case of an accident or employee injury on-site, a written accident report form must be completed within 24 hours of the accident and forwarded to the SOHM.

2. Revisions to the SSHP: The SSHO, in consultation with the SOHM and the USACE Project Team, will document recommended changes to the SSHP. Revisions approved by the SSHO will be made part of the SSHP and will be distributed to all essential personnel.

5.0 ACTIVITY HAZARD ANALYSIS

The activity hazard analysis is an ongoing process from the initiation of the SSHP preparation through the implementation and completion of the project. Therefore, the activity hazard analyses shall be completed for each task associated with the project. Site-specific activity hazard analyses are presented in this section. The hazards associated with each activity and the proposed control measures are provided in Table 5-4.

Equipment, inspection, and training requirements for each activity are identified in Table 5-5. Inspection and training requirements are hereby included by reference from CABRERA's Health and Safety Manual. Health and safety equipment, such as monitoring instruments and PPE, is specified in specific subsections of this SSHP. Additional field equipment is specified in the Field Sampling Plan (FSP) for this project. The analysis for radiological hazards and radiological equipment and training requirements are presented in the RPP, Appendix B to this SSHP.

5.1 PHYSICAL HAZARDS

In addition to the physical hazards outlined in the Activity Hazard Analysis Summary (Table 5-4), special physical hazards that have the potential to affect worker and public safety are addressed in the following subsections.

5.1.1 Drill/Geoprobe Rig Operations

Drill rig operations will be conducted in accordance with USACE EM 385-1-1 16 M and in consideration of the following:

- The work area around the drill rig should be barricaded or marked (barricade tape or equivalent) during active drilling activities.
- There is emergency/first aid equipment (20-lb ABC fire extinguisher/first aid kit/emergency communication equipment [radios, telephones, etc.]) readily available to the crew.
- The drill rig and equipment are maintained according to the manufacturer's directions, operated by qualified operators, and inspected daily with inspections documented and kept on file.
- Air and radiation monitoring are performed during drilling operations as described in Table 5-4and the RPP.
- Physical hazards (overhead and underground) have been identified and marked where applicable.
- Appropriate MSDS for drilling fluids have been obtained.
- The crew is trained in routine and emergency operations, and the training is documented.
- Operators of the rig are familiar with the emergency shutdown device.
- Persons involved in handling potentially contaminated soil should handle it carefully to avoid spreading the contamination. Personnel contamination monitoring will be conducted prior to allowing employees to leave the contaminated area. Gross

contamination will be removed from equipment prior to leaving contaminated areas. Solids and rinsate from decontamination activities will be collected and stored.

- Underground utilities must be identified prior to any intrusive activities.

5.1.2 Heat Stress

Heat stress monitoring shall be conducted for work performed when air temperature exceeds 70 degrees Fahrenheit. Personnel performing field activities will be familiar with the signs and symptoms of heat stress. These symptoms include:

- Heat Cramps: Painful muscle spasms, usually occurring in the abdomen and legs. Heat cramps are often the first signals that the body is succumbing to heat exposure.
- Heat Exhaustion: Dizziness, light-headedness, slurred speech, rapid pulse, confusion, fainting, fatigue, copious perspiration, cool skin that is sometimes pale and clammy, and nausea.
- Heat Stroke: Hot, dry, flushed skin; delirium, and coma (in some cases). Heat stroke is a life-threatening event and requires immediate medical attention.

Heat stress can be prevented by resting frequently in a shaded area and consuming large quantities of fresh, potable water. Dilute electrolytic beverages, such as Gatorade®, may be used as a secondary source of fluid replacement. If heat exhaustion symptoms are observed, the person will be required to rest in a shaded area and consume liquids. If symptoms are widespread or observed frequently, an appropriate work/rest period will be instituted. This will involve limiting the work/rest regimen so that after one minute of rest, a person's heart rate does not exceed 110 beats per minute. A suggested work-rest regimen is provided in Table 5-1.

Table 5-1. Recommendations for Work/Rest Cycle Durations to Reduce Heat Stress

WGBT values expressed in °F and °C, Source: ACGIH 2002 TLVs and BEIs

	ACCLIMATIZED EMPLOYEES				NON-ACCLIMATIZED EMPLOYEES			
Work Demand	**Light**	**Moderate**	**Heavy**	**Very Heavy**	**Light**	**Moderate**	**Heavy**	**Very Heavy**
100% Work	85.1° F 29.5° C	82.1° F 27.8° F	78.8° F 26.0° C	NO WORK	81.5° F 27.5° C	77.0° F 25.0° C	72.5° F 22.5° C	NO WORK
75% Work 25% rest	86.9° F 30.5° C	83.3° F 28.5° C	81.5° F 27.5° C	NO WORK	84.2° F 29.0° C	79.7° F 26.5° C	76.1° F 24.5° C	NO WORK
50% Work 50% Rest	88.7° F 31.5° C	85.1° F 29.5° C	83.3° F 28.5° C	81.5° F 27.5° C	86.0° F 30.0° C	82.4° F 28.0° C	79.7° F 26.5° C	77.0° F 25.0° C
25% Work 75% Rest	90.5° F 32.5° C	87.8° F 31.0° C	86.0° F 30.0° C	85.1° F 29.5° C	87.8° F 31.0° C	84.2° F 29.0° C	82.4° F 28.0° C	79.7° F 26.5° C

Table 5-2. Work Demand Categories

(Source: ACGIH 2002 TLVs and BEIs)

CATEGORIES	EXAMPLE ACTIVITIES
Resting	Sitting quietly
	Sitting with moderate arm movement
Light	Sitting with moderate arm movement
	Standing with light work at machine or bench while using arms
	Using table saw
	Standing with light or moderate work at machine or bench and some walking
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 6 Km/hr (3.7 m/hr) carrying 3 Kg (6.6 lbs.) weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a non-continuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick and shovel work)
Very Heavy	Shoveling wet sand

If the heart rate is higher than 110 beats per minute after 1 minute of rest, the next work period will be shortened by 33 percent, while the length of the rest period stays the same. Resting heart rate will be established prior to start of onsite activities when ambient temperatures exceed 70^{o} F and workers are wearing impervious clothing or when temperatures exceed 85^{o} F.

If symptoms of heat stroke are observed, the victim will be cooled immediately and emergency medical services will be called. Workers will not hesitate to seek medical attention if heat stroke is suspected.

One or more of these additional mitigating measures may also be implemented:

- Provide a cool environment in the work vicinity (an air-conditioned box van, for example).
- Use ice vests while in PPE to provide cooling to the worker.
- Reschedule work for cooler times of the day (night or early morning).

5.2 COLD EXPOSURE

Exposure to cold temperatures increases the likelihood and potential for worker disorders or conditions that could result in injury or illness. Extreme low temperatures may not be the only element necessary to create the potential for cold exposure disorders or conditions; strong wind accompanied by cold temperatures can lead to these types of disorders or conditions.

The wind chill factor is the cooling effect of any combination of temperature and wind velocity or air movement. The wind chill index (Table 5-3) should be consulted when planning for exposure to low temperatures and wind. The wind chill index does not take into account the specific part of the body exposed to cold, the level of activity that affects body heat production, or the amount of clothing being worn.

The human body senses "cold" as a result of both the air temperature and the wind velocity. Cooling of exposed flesh increases rapidly as the wind velocity goes up. Frostbite can occur at relatively mild temperatures if wind penetrates the body insulation. For example, when the actual air temperature of the wind is 40 F (4.4 C) and the velocity is 30 mph (48 km/h), the exposed skin would perceive this situation as an equivalent still air temperature of 13 F (-11 C).

The generally recognized cold disorders or conditions are:

- Frostbite—The freezing of tissue that most commonly affects the toes, fingers, and face.
- Hypothermia—Systemic hypothermia occurs when body heat loss exceeds body heat gain and the body core temperature falls below the normal 99° F.

Contributing factors to these disorders or conditions are:

- Exposure to humidity.
- High winds.
- Contact with wetness.
- Inadequate clothing.
- Poor worker health.

The physical conditions that effect cold exposure disorders or conditions are the same as those associated with heat disorders or conditions, such as physical fitness, alcohol or drug use, and disease.

5.2.1 Control Measures

The presence of dead air space between the warm body and clothing and the outside air is essential. Many layers of relatively light clothing with an outer shell of windproof material maintains body temperature much better than a single heavy outer garment worn over ordinary indoor clothing. The more air cells each clothing layer has, the more efficient it insulates against body heat loss. Clothing also needs to allow some venting of perspiration. In addition to adequate clothing, whenever possible, full use should be made of windbreaks and heat tents. Table 5-3 gives the recommended time limits for working in various low temperature ranges.

Table 5-3. Wind Chill Factors

Temperature (F)

Wind Speed (MPH)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	Wind Speed (MPH)
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63	**5**
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72	**10**
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77	**15**
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81	**20**
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84	**25**
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87	**30**
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89	**35**
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91	**40**
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93	**45**
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95	**50**
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97	**55**
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	**60**

"New" Wind Chill Formula: $T_{(wc)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$

Frost Bite Times	30 Minutes	10 Minutes	5 Minutes

Table 5-4. Activity Hazard Analysis

(4 pages)

Task	Hazards	Hazard Control
All Tasks	Housekeeping.	Materials will be stored to prevent intrusion into the work areas. Work areas will be kept organized.
	Fire.	Flammable liquids will be stored in safety containers and flammable storage cabinets. Properly rated fire extinguishers will be placed within 50 feet of fuel storage areas, within site vehicles, and within site trailer(s).
	Electric Hazards.	Generators will be grounded unless self-grounded. Extension cords will be properly rated for intended use and will be GFI protected. Prior to any intrusive activity, authorities will be contacted for clearance or permits. Elevated parts of machinery, ladders, and antennas will be kept at least 10 ft from overhead electric lines. Qualified electricians will make all electrical installations. A lockout/tagout program shall be implemented (CABRERA 1999).
	Hand tools, manual and power.	Tools shall be inspected prior to use. Damaged tools will be tagged out-of-service until repair can be performed by a qualified person. Tools will be used properly and for their intended purpose.
	Traffic.	Work areas will be clearly barricaded and appropriate signs displayed. Traffic will be rerouted as necessary. Persons working near roadways or directing traffic will wear high visibility vests.
	Strains and sprains from manually lifting and moving.	Proper lifting techniques will be used such as keeping straight back, lifting with legs; personnel will avoid twisting back, will use mechanical equipment, or get help from others.
	Slip, trips, falls, terrain, or vegetation; uneven walking surfaces, wet ground, ice or snow	Work and support areas shall be visually inspected. Slip, trip, and fall hazards shall be either removed or marked and barricaded. Sufficient illumination shall be maintained. Site personnel shall conduct initial walkovers in groups of two at a minimum. If present ice, snow, and mud will be cleared from steps to reduce slip hazards.

Task	Hazards	Hazard Control
All Tasks	Abrasions and lacerations, hands or fingers caught between objects.	Personnel shall be made aware of the hazard and asked to coordinate carefully the handling and placement of heavy objects. Materials and objects being handled will be inspected for rough or sharp edges, and appropriate precautions shall be taken to avoid contact. Personnel shall wear work gloves and avoid placing hands between objects.
	Inclement Weather, including rain, lightning, heat and cold stress, sunburn, poor visibility.	Personnel shall have appropriate PPE for working in rain or cold. Personnel will be informed of the heat/cold stress symptoms. Appropriate PPE and fluids will be supplied to workers. Work rest periods will be established according to ACGIH and NIOSH guidelines. If heat stress is a problem, engineering controls (e.g., the vortex cooling unit, ice vests), or process controls (e.g., early morning work schedules, rotating work crews) will be implemented. Work will cease during lightning. Sun block will be used as appropriate. Direct exposure to sun for long periods of time will be avoided, as practical.
Tasks 1 through 3, Task 9: Mobilization, site preparations, establish sample locations, demobilization.	Chemical Hazards—Non-intrusive activities; therefore, the risk level of exposure to site chemicals during this activity is low.	No intrusive activities will be allowed during this activity. Level D PPE will be worn to prevent dermal contact. Liquid pools and stained areas will be avoided if possible. If liquid from aqueous investigation-derived material is to be handled, PPE for splash protection shall be worn (modified Level D PPE). A background survey with a Photoionization Detector (PID), or equivalent, will be conducted to ensure the levels of protection are correct. Action levels established in Table 8-1 will be used.
	Moving mechanical parts from heavy equipment operations.	Personnel shall be made aware of the hazard and will coordinate carefully during equipment operations. Guards will be kept in place during operation. A safe distance will be maintained from moving mechanical parts.
	Striking and being struck by operating equipment, loads, falling objects, and pinch points.	Workers shall stay out of the swing area of all equipment and from under loads. No personnel shall ride on the equipment unless seats are provided. Workers exposed to traffic hazards will wear traffic/reflector vests.
Task 4: Gamma Walkover Surveys	Radiation Hazards – potential handling of and walking over contaminated materials & soils; Sources of ionizing radiation	See RPP, Appendix B.

Task	Hazards	Hazard Control
Tasks 5 and 6: Coring with Geoprobe	Radiation Hazards – potential handling of contaminated materials & soils	See RPP, Appendix B.
	Chemical Hazards—These tasks involve intrusive activities; therefore, the risk level of exposure to site chemicals during these activities is high.	Since these tasks involve intrusive activities resulting in handling of potentially contaminated materials, the appropriate PPE shall be implemented for these tasks. Initial boring activities at the core location and the removed cores shall be surveyed with a PID to establish that hazardous conditions do not exist and to ensure the levels of protection are correct. Action levels established in Table 8-1 will be used.
	Moving mechanical parts from heavy equipment operations.	Personnel shall be made aware of the hazard and will coordinate carefully during handling equipment operations.. Guards will be kept in place during operation. A safe distance will be maintained from moving mechanical parts. Appropriate PPE will be used.
	Striking and being struck by operating equipment, loads, falling objects, and pinch points.	Workers shall stay out of the swing area of all equipment and from under loads. No personnel shall ride on the equipment unless seats are provided. Workers exposed to traffic hazards will wear traffic/reflector vests. Vehicles will be checked during maintenance and cribbed if wheels need to be changed.
	Noise from equipment operation.	Hearing conservation program (CABRERA 1999) will be established, high noise areas identified, and hearing protection provided as appropriate. Latest ACGIH guidelines will be used.
	Drilling operations.	All utilities, overhead and underground, shall be identified and personnel briefed on their location and status. Drill rig is inspected daily and the results documented. Emergency devices, like shutdown switches, should be tested each shift. All personnel shall wear the proper PPE for drilling operations (modified Level D), including Tyvek coveralls, hard hat, safety glasses and shoes; no loose fitting clothes; and hearing protection.
	Underground utilities.	Utility companies will be contacted and all known utilities will be marked prior to any subsurface coring or drilling. The FSM and SSHO will be notified upon the discovery of any buried utilities.

Task	Hazards	Hazard Control
Task 8: Decontamination of materials and equipment.	Chemical Hazards—This task involves handling soil and water	Appropriate personnel protective measures will be implemented if initial analyses indicate that chemical contamination may be a concern.
	Striking and being struck by operating equipment, loads, falling objects, and pinch points.	Workers shall stay out of the swing range of all equipment and from under loads. No personnel shall ride on the equipment unless seats are provided. Personnel shall remain within view of operator. All heavy equipment should be equipped with back-up alarms. Workers exposed to traffic hazards will wear traffic/reflectorized vests. A traffic control system for positioning and moving haul vehicles will be established. Heavy vehicle operators may remain in their vehicles only if they have cab over protection. If operators must check loads, loading will cease until the operator is back in the cabin or away from the vehicles in a safe location.
	Noise from equipment operation.	A hearing conservation program (CABRERA 1999) will be established. High noise areas will be identified. Hearing protection will be provided as appropriate.
	Pressure washing equipment.	Personnel will be informed of the hazards associated with the operation of pressure washers including water under pressure and steam. Personnel will wear appropriate PPE including splash protection.
	Radiation Hazards – potential handling of contaminated soils, and resulting decon fluids.	See RPP, Appendix B.

Table 5-5. Equipment and Training Requirements

Activity	Equipment	Inspection	Training
All on-site work.	Not applicable.	Daily inspections shall be performed on all safety equipment.	Employees shall be trained on the SSHP and the associated hazards including physical hazards. An initial site-specific training will be conducted, and workers will be trained in proper monitoring and decontamination procedures. Safe work practices and good housekeeping will be followed. Personnel will be informed of the contaminants and chemicals at the site and availability of MSDS. A minimum of one person shall be trained in the OSHA hazardous operations workers training for supervisors. A minimum of two people will be trained in first aid and CPR. Daily safety meetings will be conducted before beginning the work.
Soil sampling.	Drill rig and/or Geoprobe.	The subcontractor shall be required to conduct daily inspections and necessary maintenance of the equipment.	Equipment will be operated by qualified operators with appropriate OSHA required 40-hr training (and 8-hr refresher if applicable). An initial site-specific training will be conducted, and workers will be trained in proper monitoring and decontamination procedures.
	Gas powered generator.	Daily inspections and routine maintenance shall be performed. Inspections for electrical safety, housekeeping, and lockout/tag out procedures shall be performed (as necessary).	Same as above.
	Radiation detection equipment.	Daily source and background checks shall be performed and documented. Radiation sources used for calibration shall have appropriate licensing and documentation and will undergo routine leak testing.	Equipment will be operated by qualified operators knowledgeable and trained in the operation of the equipment and interpretation of results and for radiological hazards.

6.0 SITE CONTROL

Survey and sample collection activities performed in radiological posted areas will be performed using radiation work permits as per CABRERA SOP, AP-012 *Radiation Work Permits*. As the primary site concern is radiological, site control, access, and work zones are discussed in the RPP, Appendix B to this SSHP. Figure 1-2 (page 5) presents a map of the Painesville FUSRAP Site project area.

6.1 GENERAL SITE ACCESS

Site access during project activities will be through the main gate on Fairport Nursery Road. CABRERA will have primary control and responsibility for Site access during pre-remediation investigation activities. This control will be coordinated with the USACE and property owners prior to mobilization onsite. Site access control will include:

- Allowing only authorized personnel to enter Site areas while the investigation is being performed.
- Ensuring that the site physical barriers (such as the fences, gates, and locks) are maintained.
- Proper posting of the site and individual work areas.
- Implementing sign-in and sign-out protocols for personnel moving on and off site.
- Ensuring that personnel are properly trained and qualified to be onsite or in specific work areas.

Site access may be modified based on the results of pre-remediation investigations for remediation designs and activities, if necessary. Evaluations of general site access and controls will be ongoing between CABRERA, the USACE, property owners, and remediation contractors. Access control for the remediation and Final Status Survey (FSS) stages of the project will need to reexamined as the Site will likely be administered by the Remediation Contractor.

6.1.1 Access to Twin Rivers Technologies Property

A portion of the FUSRAP investigation area at the Site lies on the property of Twin Rivers Technologies (TRT), the adjacent landowner to Crompton Corporation. TRT is an active chemical production facility that produces glycerin and fatty acids for consumer product uses. All workers must attend TRT site orientation and hazard awareness training prior to gaining access to TRT areas for Site investigation purposes.

6.1.2 Site Visitors

All Site visitors shall notify the FSM upon their arrival at the Site. Once onsite, all visitors are required to first report to the field trailer and sign the site entry and exit log. All visitors will receive a brief site safety briefing by the SSHO or his designee on their first visit. Access to Site zones is contingent upon the training requirements stated in Section 4.0. However, site visitors may be granted access support zones and contamination reduction zones without the requisite training if escorted by CABRERA personnel at all times.

6.2 ACCOUNTABILITY

A daily sign-in/sign-out log will be kept in the field trailer for Site accountability purposes. In the event of a Site emergency, the FSM will oversee accountability of all personnel listed as present prior to evacuation. The Site field trailer will serve as the rally point for accountability purposes.

6.3 BUDDY SYSTEM

Hazardous work will be scheduled so employees do not work alone. Each worker will maintain visual contact with another specified co-worker. The "buddy system" will ensure against an employee becoming injured without a co-worker being aware of his or her condition. The FSM will have a cellular telephone and will be responsible for coordination for emergencies that may arise. Individuals will have readily available means of contact (cellular phone or radios) with the FSM.

6.4 SAFE WORK PRACTICES

General safe work practices that will be followed by site workers include, but are not limited to:

- Eating, drinking, chewing gum or tobacco, applying cosmetics, and smoking are prohibited in work zones and in laboratory/counting areas where samples are handled and surveyed.
- Sitting or kneeling in areas of obvious contamination is prohibited.
- Hands and faces will be thoroughly washed upon leaving the work area.
- Immediately repair or replace defective PPE.
- When respirators are required, facial hair that interferes with the face-to-facepiece sealing surface of the respirator or with valve function will not be permitted.
- Personnel onsite will use the buddy system; visual contact will be maintained between team members.

7.0 RADIATION SAFETY PROGRAM

The CABRERA Radiation Safety Program (RSP) will be implemented to protect workers health and safety during this project. The Site RPP is provided as Appendix B to this SSHP to address the project radiological concerns. These include:

- Radiation Work Permits.
- Work Zones.
- Radiation Surveys and Monitoring.
- Acceptable Surface Contamination Levels.
- Contamination Surveys.
- Instrumentation.
- Personal Radiological Monitoring.
- ALARA.

8.0 HEALTH AND SAFETY ACTION LEVELS

No chemical contaminants are anticipated to be encountered based on available information on contaminants on the Painesville Site and due to the non-intrusive nature of most of the project survey activities. However, sampling for chemical contaminants will be initiated for the more intrusive activity of soil core removal by drilling or Geoprobe. This will establish that hazardous conditions do not exist or provide information to evaluate the need for additional personnel precautions in the form of PPE, respiratory protection, or engineering controls. In the event chemical contaminants are encountered, task specific action levels are presented in Table 8-1. Radiological contaminants are discussed in the RPP.

Table 8-1. Task Specific Action Levels for Direct-Reading Instruments

Task/Hazard	Instrument	Action Level*
Soil Coring / VOCs	PID	> 0.5 ppm: Notify Program Safety Manager to re-evaluate conditions. 0.5 to 1 ppm: Continue monitoring breathing zone in work areas.
Soil Coring / Particulates.	TSI Dust Trak.	> 0.5 mg/m^3: Dust control measures should be implemented. This is based on the OSHA Time Weighted Average for lead and uranium and an assumed 5% (50,000 mg/kg inorganic lead or U) soil contamination level.

*Readings in the Breathing Zone shall be used to determine respiratory PPE.

9.0 CONTAMINATION MONITORING

Direct reading and indirect monitoring equipment will be utilized during site activities to evaluate potential radioactive and chemical hazards to determine the effectiveness of control measures, and to evaluate the PPE requirements. Hazard monitoring is detailed in the Activity Hazard Analysis, Table 5-4. Monitoring for radioactive hazards is discussed in the RPP.

9.1 DIRECT READING INSTRUMENTS

Real-time monitoring using direct reading instruments, such as a PID (chemical) or hand held frisker (radiological), will be conducted to identify potential elevated exposure levels. Background readings will be taken in an area known to be free of contamination. Initial readings at the start of activities in areas of known or suspected contaminants will be performed to determine if levels of hazardous contaminants exist that will require a reevaluation of safety requirements.

9.2 PERSONAL AND PERIMETER AIR MONITORING

Personal and perimeter air monitoring is not anticipated during this investigation. Additional details of air sampling are presented in the RPP.

10.0 LEVELS OF PROTECTION

All personnel performing operations on-site shall be required to use the appropriate level of protection for the primary identified site hazard. This consists of Level D for Tasks 1-3 and Task 9 and Modified Level D for Tasks 4-8. Levels of protection and descriptions of PPE are provided in Section 8 of Appendix B - *Radiation Protection Plan*. If chemical contamination is detected or anticipated to be a concern anywhere onsite, appropriate PPE and/or engineering controls will be implemented. Upgrades in protection will be evaluated and approved by the SOHM and PM prior to implementation. Discussions of levels of protection in regards to radiological contamination as the primary hazard are contained in the RPP.

11.0 DECONTAMINATION PROCEDURES

Decontamination is the process of removing or neutralizing chemicals that have accumulated on personnel and equipment. This process is critical to health and safety at hazardous material response sites. Decontamination protects end users from hazardous substances that may contaminate and eventually permeate the protective clothing, respiratory equipment, tools, vehicles, and other equipment used in the vicinity of the chemical hazard; it protects all plant or site personnel by minimizing the transfer of harmful materials into clean areas; it helps prevent mixing of incompatible chemicals; and it protects the community by preventing uncontrolled transportation of chemicals from the site. For the Painesville FUSRAP Site Project, it is anticipated that the primary hazard from a decontamination perspective will be radiological. Radiological issues are addressed in the RPP.

12.0 EMERGENCY RESPONSE

12.1 EMERGENCY CONTACTS

An Emergency Contact List with telephone numbers is provided in Appendix C to this SSHP. This list shall be prominently posted in the CABRERA field office. This list should also be carried in a vehicle or by an individual while working in survey or sampling locations remote from the field office area.

In the event of an emergency requiring outside emergency services, CABRERA personnel will immediately dial 911 to request emergency services. Following the phone call, CABRERA personnel will contact USACE on-site personnel to inform them that emergency service personnel and equipment will be entering the facility. Subsequent to these notifications, appropriate off-site personnel of USACE and CABRERA will be contacted and informed about the situation.

12.2 HOSPITAL ROUTE

A map showing the route to the nearest hospital/medical facility and a written description of directions is provided in Appendix C to this SSHP. The map and directions will be posted near the site telephone in the CABRERA field office and in a vehicle, or by an individual, while working in survey or sampling locations remote from the field office area. The hospital route will be field-verified prior to work initiation.

13.0 MEDICAL SURVEILLANCE REQUIREMENTS

In accordance with OSHA requirements and CABRERA's Corporate Health and Safety Program, individuals assigned to on-site tasks must provide documentation of medical clearance, respirator fit testing (if required for performing intrusive tasks), and radiation dosimetry records for the current year. Documentation for all personnel will be maintained in the field office.

Medical monitoring requirements for personnel shall be conducted in accordance with federal regulations. All personnel who receive medical monitoring shall receive a written notification of the findings.

14.0 REFERENCES

(ACGIH, 2002) The American Conference of Governmental Industrial Hygienists' booklet; *Threshold Limit Values and Biological Exposure Indices for 1998*; 2002

(CABRERA, 1999) Cabrera Services, Inc.; *Cabrera Services Health and Safety Manual*; 1999 with updates through 2004.

(OSHA) Title 29 Code of Federal Regulations (CFR); Part 1910; Occupational Safety and Health Administration, Safety and Health Regulations for General Industry.

(SAIC, 2003) Final Remedial Investigation/Feasibility Study Report, Painesville FUSRAP Site, Painesville, OH, May 2003.

(USACE, 2003) U.S. Army Corps of Engineers (USACE); *Safety and Health Requirements Manual*; EM 385-1-1; 3 November 2003

APPENDIX A

SSHP ACKNOWLEDGEMENT FORM

SITE SAFETY AND HEALTH PLAN
for the Painesville FUSRAP Site
Painesville, Ohio

Contract No. DACW49-03-D-0003

I understand, agree to, and will conform with the information set forth in this Site Safety and Health Plan (and the Safety and Health Program) and discussed in the Personnel Safety and Health briefing(s).

Name	Signature	Date

APPENDIX B

RADIATION PROTECTION PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS 2

LIST OF TABLES 3

1.0 INTRODUCTION 5

1.1 Purpose and Objectives 5
1.2 Site Information 6

2.0 ORGANIZATIONAL STRUCTURE 6

3.0 HAZARD ASSESSMENT 7

3.1 Tasks To Be Performed 7
3.2 Hazard Communication 8
3.3 Radiological Hazards 8

4.0 PERSONNEL REQUIREMENTS 8

4.1 Training 8
4.2 Medical 9

5.0 ACTIVITY HAZARD ANALYSIS 9

6.0 SITE CONTROL 13

6.1 General Site Access 13
6.2 Radiologically Controlled Areas 13
6.2.1 Contamination Zone 13
6.2.2 Contamination Reduction Zone 13
6.2.3 RCA Entry And Exit 14
6.3 Support Zones 14

7.0 RADIATION SAFETY PROGRAM 14

7.1 Radiation Work Permits 14
7.2 Radiation Surveys and Monitoring 14
7.2.1 Survey Methods 14
7.2.2 Survey Documentation 15
7.3 Acceptable Surface Contamination Levels 15
7.4 Contamination Surveys 15
7.5 Personal Radiological Monitoring 16
7.5.1 External Radiation Dosimetry 16
7.5.2 Internal Dose Monitoring 17
7.6 Personal and Perimeter Air Sampling 17

8.0 LEVELS OF PROTECTION 17

8.1 Level D PPE 17
8.2 Modifed Level D PPE 17
8.3 Decontamination Procedures 18

9.0 EMERGENCY RESPONSE 18

10.0 MEDICAL SURVEILLANCE AND TRAINING REQUIREMENTS 18

11.0 REFERENCES 19

LIST OF TABLES

Table B-1. Key Project Personnel 6

Table B-2. RCOCs for Painesville Site Investigation 8

Table B-3. Radiological Activity Hazard Analysis 10

Table B-4. Equipment and Training Requirements 12

Table B-5. Acceptable Surface Contamination Levels 16

Table B-6. Minimum Level of Protection Requirements 18

LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
CABRERA	Cabrera Services, Inc.
cm^2	square centimeter
CRZ	Contamination Reduction Zone
CZ	Contaminated Zone
DMC	Diamond Magnesium Company
dpm	disintegration per minute
dpm/100 cm^2	disintegration per minute per 100 square centimeter
FSP	Field Sampling Plan
FSM	Field Site Manager
FUSRAP	Formerly Utilized Sites Remedial Action Plan
GM	Geiger-Mueller
GWS	Gamma Walkover Survey
HTRW	Hazardous, Toxic, and Radioactive Waste
IDW	Investigation Derived Waste
MDC	Minimum Detectable Concentration
MeV	million electron volt
OSHA	Occupation Safety and Health Administration
PPE	Personal Protective Equipment
RCA	Radiologically Controlled Area
RCOC	Radiological Contaminant of Concern
RPP	Radiation Protection Plan
RSO	Radiation Safety Officer
RSP	Radiation Safety Program
RWP	Radiation Work Permit
SOP	Standard Operating Procedure
SOHM	Safety and Occupational Health Manager
SRSM	Site Radiation Safety Manager
SSHP	Site Safety and Health Plan
SZ	Support Zone
USACE	U.S. Army Corps of Engineer

1.0 INTRODUCTION

1.1 Purpose and Objectives

This Radiation Protection Plan (RPP) was prepared by Cabrera Services Inc. (CABRERA) under contract to the U.S. Army Corps of Engineers (USACE), Buffalo District. The RPP addresses work to be performed on areas that received and used radiologically contaminated scrap metal at the former Diamond Magnesium Company (DMC). This facility has been identified as a Formerly Utilized Sites Remedial Action Program (FUSRAP) site because the contamination of the scrap metal originated as part of the Manhattan Engineer District operations. This RPP is an appendix to the Site Safety and Health Plan (SSHP), and as such certain descriptive information is not repeated within this RPP document.

The purpose of this document is to establish radiation protection procedures for CABRERA personnel, contractors, and government personnel involved in site work, which involves potential exposure to radiological hazards. As work tasks and potential contaminants are expected to be similar, this RPP will be applicable for the pre-remediation investigation as well as the Final Status Survey. Project activities shall be performed in accordance with this RPP. This document is a working document and is subject to change based on review and the implementation of additional tasks. This document meets the requirements of the USACE, including ER 385-1-80, *Radiological Safety* (USACE, 1997), ER 385-1-92*, Health and Safety for HTRW Activities* (USACE, 2003), EM 385-1-80*,Radiation Protection Manual* (USACE, 1997a), and EM 385-1-1, Section 6E*, Safety and Health Requirements Manual, Ionizing Radiation* (USACE, 2003).

This RPP establishes the work practices necessary to help ensure the radiological protection of personnel assigned tasks on the site, the local community, and the environment during site activities. The objective of this RPP is to anticipate, identify, evaluate, and control radiological hazards.

Site activities will be performed in accordance with this RPP, the SSHP, and other applicable health and safety regulations, CABRERA's *Radiation Safety Program* (CABRERA, 2000), U.S. Nuclear Regulatory Commission, Occupation Safety and Health Administration (OSHA), and other applicable local and federal statutes. CABRERA Standard Operating Procedures (SOPs) that are referenced within this RPP are radiological procedures from CABRERA's Radiation Safety Program.

The levels of personal protection and procedures specified in this plan are based on the best information available from reference documents and current site data. Therefore, these recommendations represent the minimum health and safety requirements to be observed by personnel engaged in this project. Unforeseeable site conditions may warrant a reassessment of the recommended protection levels and controls. Revision to the RPP must have prior approval by the CABRERA Safety and Occupational Health Manager (SOHM) and Radiation Safety Officer (RSO).

1.2 Site Information

Section 1 of the SSHP provides information for the Painesville FUSRAP site. This information includes location, physical description, history, previous investigations, and the radiological contaminants of concern (RCOC). The source of contamination is derived from the receipt and use of scrap metal, primarily discarded drums and other items used to store uranium compounds. The FUSRAP-related RCOCs identified for the Painesville site are radium-226 (Ra-226), thorium-230 (Th-230), thorium-232 (Th-232) and total uranium (Total U).

2.0 ORGANIZATIONAL STRUCTURE

Key project personnel are described in Section 2 of the SSHP, including the RSO and the Site Radiation Safety Manager (SRSM). This description includes the organizational structure of the project team, personnel responsibilities and authority, lines of reporting, phone numbers of key project personnel, and an organizational chart. The detailed description from the SSHP is summarized in Table B-1.

Table B-1. Key Project Personnel

TITLE	NAME	TELEPHONE
U.S. Army Corps of Engineers		
USACE Project Manager	[redacted]	[redacted]
USACE Project Engineer	[redacted]	[redacted]
USACE Industrial Hygienist	[redacted]	[redacted]
USACE Field Health Physicist	[redacted]	[redacted]
CABRERA		
Vice President	[redacted]	[redacted]
Project Manager	[redacted]	[redacted]
Safety and Occupational Health Manager	[redacted]	[redacted]
Radiation Safety Officer	[redacted]	[redacted]
Field Site Manager	TBD	TBD
Site Safety and Health Officer/Site Radiation Safety Manager	TBD	TBD
Field Health Physics Technicians	TBD	TBD
Site Employees with First Air/CPR	TBD	TBD

3.0 HAZARD ASSESSMENT

Potential exposure to radiological contaminants is expected to be minimal. The protection required for hazardous material will often protect against radiological contaminants. All hazards will need to be evaluated prior to making a final determination of required levels of personal protective equipment (PPE). The hazards review should consider the level of contamination (hazardous and radiological), the environment in the work area, and the type of work being performed. The SRSM, with concurrence of the SSHO and RSO, will make final determination of radiological controls and levels of PPE prior to start of site preparation and survey activities. Since higher levels of PPE can create or increase the heat stress of site workers, the extent of protective clothing required should be limited to the minimum required to protect against potential hazards.

3.1 Tasks To Be Performed

- Task 1. Mobilization - This task will include setting up the on-site trailers for use during the project; mobilizing sampling equipment; moving in project personnel; performing utility locations and geophysical surveys; and familiarizing project personnel with the site, the work, and the requirements for the work.
- Task 2. Site Preparation - This task will include setup and delineation of work areas and the staging and setup of equipment. Brush clearing will be performed as necessary to provide access to drill/Geoprobe rig sampling locations.
- Task 3. Establish Sample Locations - This task includes establishing the proposed survey and sampling locations and ensuring underground services have been identified before any intrusive activity begins.
- Task 4. Gamma Walkover Survey (GWS) - This task involves a GWS of accessible portions of the site with a gamma scintillation detector.
- Task 5. Drill Soil Samples - This task includes the set-up of a drill rig or Geoprobe rig and drilling to a specified depth.
- Task 6. Collect Soil Samples - This task includes the collection of soil samples, the packaging and labeling of the samples, and performance of a screening radiation survey on each sample.
- Task 7 Decontamination of Equipment - This task consists of the decontamination and survey of any equipment that may have been contaminated as a result of the radiological investigation activities.
- Task 8. Downhole gamma logging - This task includes the collection of in situ downhole gamma measurements in each open soil core location prior to backfilling. These measurements will be performed to assess whether any additional subsurface hot particles are present in the immediate area of the core that require sampling.
- Task 9. Demobilization - This task will include removing all equipment from the site, removing the trailers and their contents, removing holding tanks and other equipment and materials from the site, and returning the site its original condition.

3.2 Hazard Communication

The SSHP discusses the methods used to comply with the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard 29 CFR 1910.1200.

3.3 Radiological Hazards

Table B-2 presents information on the RCOCs for the site. While monitoring will be performed to verify radiation levels and radionuclide concentrations present, it is not anticipated that these constituents pose a significant hazard to field teams.

Table B-2. RCOCs for Painesville Site Investigation

Radionuclide	Symbol	Half Life	Principal Mode of Decay and Approximate Energies
Radium-226	Ra-226	1.6E3 yr	α (4.78, 4.60 MeV) γ (0.186 MeV)
Thorium-230	Th-230	7.7E4 yr	α (4.69, 4.62 MeV) γ (0.068, 0.142 MeV)
Thorium-232	Th-232	1.4E10 yr	α (4.01, 3.95 MeV) γ (0.059 MeV)
Uranium-234[1]	U-234	2.4E5 yr	α (4.72, 4.78 MeV)
Uranium-235[1]	U-235	7.04E5 yr	α (4.36, 4.39 MeV) γ (0.144, 0.183 MeV)
Uranium-238[1]	U-238	4.47E9 yr	α (4.20, 4.15 MeV)

1. The results of the three isotopes of uranium shown (U-234, U-235, and U-238) will be summed for comparison to the Total Uranium derived concentration guideline level (DCGL) for the Painesville site.

4.0 PERSONNEL REQUIREMENTS

4.1 Training

The training requirements section of the SSHP addresses the required General Access, Respiratory Protection, and PPE training requirements for this project. This section also addresses the use of daily tailgate safety meetings and required information for recordkeeping. Radiological safety will be included as part of the daily safety meetings. In addition to the required information in the SSHP, each employee involved in field activities is required to provide evidence of radiation safety training attendance within the past 12 months. This training shall be in conformance with CABRERA radiological procedure AP-009, *Training,* and will include topics required by the U.S. Nuclear Regulatory Commission (NRCs) Title 10 Code of Federal Regulation, Part 20 and appropriate sections of Appendix C of the USACE ER 385-1-92. These topics include:

- Site-specific procedures for handling and storing radioactive materials;

- Health and safety hazards associated with exposure to site-specific radioactive material;
- Familiarity with this SSHP and other project-specific procedures regarding protection from radiation exposure;
- Worker responsibility to report unsafe acts or procedures which might result in worker exposure to radiation;
- Worker response to on-site events and occurrences with radioactive material; and
- Worker's rights and responsibilities with respect to working with radioactive material.

4.2 Medical

Each employee involved in field activities will also be required to provide the following radiological and medical surveillance information for recordkeeping:

- Medical Approval for site work;
- Respirator clearance and evidence of qualitative respirator fit determination for the respirator type being used (if potential for respirator use exist); and
- Radiation dosimetry records for the current year.

5.0 ACTIVITY HAZARD ANALYSIS

The radiological activity hazard analysis is an ongoing process from the initiation of the RPP preparation through the implementation and completion of the project. The minimum site-specific radiological hazards associated with the activities associated with each task and the proposed control measures are provided in Table B-3. If surveys indicate actual radiological conditions are different than expected, then additional controls will be implemented.

Equipment, inspection, and training requirements for each radiological activity are identified in Table B-4. Inspection and training requirements are hereby included by reference from the CABRERA *Health and Safety Manual* (CABRERA 1999). Health and safety equipment, such as monitoring instruments and PPE, is specified in sections of the SSHP. Additional field equipment will be specified in the Field Sampling Plan (FSP) for this project. The CABRERA Radiological Operations Procedures referenced in this RPP will be maintained in a notebook in the field office.

Table B-3. Radiological Activity Hazard Analysis

(2 pages)

Task	Hazards	Radiological Hazard Control
All Tasks	Housekeeping.	Materials will be stored to prevent intrusion into the work areas.
All Tasks	Hand tools, manual and power.	Tools shall be surveyed for radioactivity after use on any potentially radioactive soils or materials. Release limits will be as specified in Table B-5. Prior to initial use, power tools will be evaluated based on the specific use to ensure that there is a low probability of contamination spread.
Tasks 1 through 4, Task 9: Mobilization, site preparation, establish sample locations, gamma walkover survey, and demobilization.	***Radiological Hazards***—Non-intrusive activities; therefore, the risk level of exposure to radiological hazards during this activity is low Removable contamination on the soil surface is not expected above the levels of Table B-5.	Personnel will be briefed on actual and potential radiological conditions. No intrusive activities will be allowed during this activity. Routine contamination control activities will take place to ensure that no spread of contamination takes place (personnel and equipment).
Tasks 5 and 6: Drill soil samples and collect soil samples.	***Radiological Hazards***—These tasks involve intrusive activities; therefore, there is expected to be exposure to radiological contaminants during these activities.	Since these tasks involve intrusive activities resulting in handling of potentially contaminated materials, the initial PPE required will be tyvek suits, shoe covers, and gloves. Radiation dosimetry and respiratory protection for radiological purposes will not be required. Samples shall be surveyed for removable beta and alpha radioactivity. Initial radiological air monitoring will be conducted at the borehole during the first phase of intrusive work to verify the determination that no respiratory protection or additional engineering controls are required. The drilling activities and the local work area should be continually surveyed for contamination to ensure the levels of protection are correct. Controls will include a "step-off-area" and frisker station at the work area entry/egress points.

Task	Hazards	Radiological Hazard Control
Task 7 – Decontamination of equipment.	***Radiological Hazards*** **-** This task involves handling soil and water, therefore, the risk level of skin exposure to radioactive particulates during these activities is high. Potential contact with, ingestion of, or inhalation of radioactive particulates during decontamination activities.	Since these tasks involve activities involving the handling of potentially contaminated materials, the minimum PPE required will be tyvek suits, shoe covers, and gloves. Radiation dosimetry and respiratory protection for radiological purposes will not be required. Equipment and personnel shall be surveyed for removable beta and alpha radioactivity. Controls will include a "step-off-area" and frisker station at the work area entry/egress points. Decontamination by scrubbing, power washing, or spraying of equipment may result in transfer of radioactive material onto workers' gloves, hands, and may generate airborne contamination. If practical, workers will use methods that are least likely to disperse contamination. If steam cleaning or pressure washing are utilized, radiological air monitoring will be performed. An evaluation will be performed to determine if these initial air monitoring results warrant additional controls, and to determine if continued sampling is necessary.
Task 8 – Downhole gamma logging.	***Radiological Hazards*** **-** This task direct contact with potentially contaminated soils, therefore, the risk level of skin exposure to radioactive particulates during these activities is high. Potential contact with, ingestion of, or inhalation of radioactive particulates during gamma logging activities.	Since these tasks involve activities involving the handling of potentially contaminated materials, the minimum PPE required will be tyvek suits, shoe covers, and gloves. Radiation dosimetry and respiratory protection for radiological purposes will not be required. Equipment and personnel shall be surveyed for removable beta and alpha radioactivity. Controls will include a "step-off-area" and frisker station at the work area entry/egress points.

Table B-4. Equipment and Training Requirements

Activity	Equipment	Inspection	Training
Radiological surveys.	Radiation survey instruments	Daily source and background checks shall be performed and documented. Radiation sources used for calibration shall have appropriate licensing, documentation, and surveillance.	Qualified operators knowledgeable and trained in the operation of the radiation survey equipment and interpretation of results will operate equipment.
Soil sampling.	Drill rig, Geoprobe™, and/or hand sampling	In addition to any routine equipment inspections, the sampling equipment shall be surveyed for fixed and loose surface radioactive contamination.	Qualified operators will operate equipment with appropriate training on the equipment, OSHA (Hazwoper), and Radiation Safety. Technicians will be knowledgeable in Cabrera and site-specific procedures for collection of samples, decontamination of equipment and materials, prevention of cross-contamination, and monitoring.
Decontamination of equipment.	Radiation detection equipment.	Daily source and background checks shall be performed and documented. Radiation sources used for calibration shall have appropriate licensing, documentation, and surveillance.	Qualified operators knowledgeable and trained in the operation of the radiation survey equipment and interpretation of results will operate equipment. Also required: 40-hr Hazwoper training, including training in radiological hazards.

6.0 SITE CONTROL

Survey and sample collection activities performed in radiological posted areas will be performed using radiation work permits as per CABRERA SOP, AP-012 *Radiation Work Permits*. Posted radiologically controlled area will be controlled through the use of Contamination Zones, Contamination Reduction Zones, and Support Zones, as described below.

6.1 General Site Access

General site access is discussed in the SSHP.

6.2 Radiologically Controlled Areas

A Radiologically Controlled Area (RCA) is designed to prevent employees, contractors, visitors, and the surrounding environment from exposure to radiation and radiological contamination during site activities. RCAs consist of Contamination Zones and Contamination Reduction Zones (also referred to as Buffer Zones). RCAs will be established by the SRSM and will encompass any area where intrusive tasks are being performed. If tasks are being performed concurrently at separate areas of the site, several RCAs may be established to support the work. Movement of personnel and equipment between work areas and on and off the site will be controlled by means of designated access points.

Minimum PPE for work in each RCA will be based upon radiological monitoring results.

Established work areas may be left over night with the concurrence of all project participants. Contaminated sampling equipment will be stored in a radiologically controlled area.

6.2.1 Contamination Zone

A Contamination Zone (CZ) will be designated and delineated for areas that have the possibility of exposing contaminated material to personnel or the surrounding environment. As such, they may be considered potentially contaminated areas. Potential CZs for this project are:

- The Painesville Area of Concern (AOC): This zone encompasses the area of concern as defined in the Data Quality Objectives of the Field Sampling Plan (FSP) for this project. This includes areas that have not been previously characterized, identified on the site map by an alpha character, within the boundaries of the former Diamond Magnesium Company property.
- Exposure to open investigation-derived material, consisting of investigation-derived wastes (IDW) and unsealed soil samples, when outside of the Painesville AOC. The IDW and unsealed soil samples may exist in the sample processing/shipping area and at the waste storage area. These areas will require visible delineation and posting as a CZ.
- Gross equipment decontamination area(s). This area(s) will require visible delineation and posting as a CZ.

6.2.2 Contamination Reduction Zone

Contamination Reduction Zones (CRZs) will be established between CZs and any non-contaminated areas. Personnel and equipment that exit a CZ will do so through the CRZ.

Equipment and initial vehicle decontamination may be performed in a CZ. However, personnel and final equipment decontamination shall be located in the CRZ. The CRZ will contain the equipment necessary for personnel decontamination and decontamination verification, and may be equipped with designated "step-off areas" for personnel following doffing of potentially contaminated PPE.

6.2.3 RCA Entry And Exit

When exiting a CZ, personnel and equipment must pass through the CRZ. Potentially contaminated PPE will be removed in the CRZ. Decontamination shall be performed prior to exiting the CRZ if contamination is detected above the limits in Table B-5**.**

6.3 Support Zones

Support Zones (SZ) are uncontrolled 'clean' areas throughout the site. SZs encompass both the overall support infrastructure (i.e., site trailers, vehicles, personal hygiene and sanitary facilities) as well as smaller, task-specific SZs that may be established adjacent to CRZs. These SZs may consist of break areas, equipment and PPE staging areas, and engineering control support centers such as misting trailers and air–conditioned break vans. PPE will not normally be required in exterior areas of a SZ.

If personnel are performing work in PPE in a CZ, a minimum of one person will be in the SZ at all times. This person will have access to communications with the FSM and SSHO (e.g., cellular phone or two-way radio).

7.0 RADIATION SAFETY PROGRAM

The CABRERA Radiation Safety Program (RSP) will be implemented to protect workers health and safety during remedial support activities. The RSO ensures that contamination control activities are effective, samples and areas are not cross-contaminated, occupational doses are maintained as low as reasonably achievable (ALARA) (CABRERA SOP AAP-005, ALARA), workers and the environment are protected, and that activities comply with radiological procedures in the RSP. This will require a method to identify and prevent the release of potentially contaminated items from radiologically controlled areas. Methods and programs used to protect the workers, site visitors and the environment are discussed in the following sections.

7.1 Radiation Work Permits

The Radiation Work Permit (RWP) serves as a tool in protecting workers from the radiation hazards (CABRERA SOP AP-012 *Radiation Work Permits*). In this permit the levels of PPE will be detailed (CABRERA SOP AP-010 *Personal Protective Equipment*), as well as the levels of radioactive materials expected and other pertinent information.

7.2 Radiation Surveys and Monitoring

7.2.1 Survey Methods

Contamination surveys, which include removable contamination (i.e., smears, or "swipes") and total radioactivity (i.e., direct measurement) surveys on equipment and other potentially contaminated items originating from radiological control areas, will be preformed (CABRERA SOP OP-001, *Radiological Surveys*).

7.2.2 Survey Documentation

Original copies of field data, field records, analytical data, training records, and other project-specific documentation will be retained in the CABRERA New York Office in accordance with CABRERA procedure AP-001, Rev. 0, *Record Retention*.

7.3 Acceptable Surface Contamination Levels

USACE *Radiation Protection Manual*, EM-385-1-80, Table 6-4 provides limits for acceptable levels of surface contamination. These levels are presented in Table B-5. The most conservative values (Ra-226 and Th-230) of the site RCOCs from Table B-5 will be applied as the release criteria for this project. For Ra-226 and Th-230, the alpha removable contamination limit is 20 disintegrations per minute per 100 square centimeters (dpm/100cm^2), while the maximum and average contamination limits are 300 and 100 dpm/100cm^2, respectively. The beta-gamma removable contamination limit is 1000 dpm/100cm^2.

7.4 Contamination Surveys

Contamination surveys will be conducted upon arrival/receipt on-site of equipment that will enter any CZ, and on equipment and personnel prior to leaving a CZ. Contamination surveys will be accomplished using direct measurements for total radioactivity and swipe surveys for removable contamination. The direct measurement "frisking" method is performed using a calibrated and daily source checked radiation detection instrument capable of detecting alpha, beta and gamma radiations.

Swipe samples will be collected over a finite surface area, ideally 100 cm^2, and analyzed using on-site laboratory counting equipment for alpha and beta radioactive contamination as per CABRERA SOP, OP-004 *Unconditional Release of Materials from Radiological Control Areas*.

Contamination surveys will be used to ascertain that materials, working surfaces, and equipment are not contaminated with radioactive material above the action level. The SRSM will identify areas subject to routine swipe surveys to be analyzed for gross alpha and gross beta contamination. These areas could include, but are not limited to, the following areas:

- On-site laboratory trailer floors and countertops.
- Officer trailer floor and desktops
- Break area floor and tabletops.

The following examples of instruments (or their equivalent) will be used to perform personnel and equipment frisking and swipe counting:

- Ludlum Model 3 Ratemeter coupled to a Ludlum Model 44-9 pancake Geiger-

Mueller (GM) detector.

- The Ludlum Model 2929 Alpha/Beta Scaler coupled to the Ludlum 43-10-1 scintillation detector will act as the primary on-site swipe sample counter.

The minimum detectable concentration (MDC) of these instruments will be field verified, prior to use, to be 50% of the applicable limits listed in Table B-5 (i.e., MDC for removable alpha contamination would be 20 x 0.5 or 10 dpm/100cm^2). Survey and counting instruments are source checked on a daily basis and the performance of instruments used to count swipe samples is tracked on a control chart. The daily source count will be handled as per CABRERA SOP OP-009, *Use and Control of Radioactive Check Sources*. Calibration and use of the instruments is found in CABRERA SOP OP-020, *Operation of Contamination Survey Meters* and SOP OP-021 *Alpha-Beta Counting Instrumentation*.

Table B-5. Acceptable Surface Contamination Levels

RCOC[a]	Average[b,c] (dpm/100 cm^2)	Maximum[b,d] (dpm/100 cm^2)	Removable[b,e] (dpm/100 cm^2)
U-nat, U-235, U-238 and associated decay products	5,000 α	15,000 α	1,000 α
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000	3,000	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted.	5,000 β-γ	15,000 β-γ	1,000 β-γ

[a] Where surface contamination by both alpha and beta-gamma emitting nuclides exists, the limits established for alpha and beta-gamma emitting nuclides should apply independently.

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should mot be averaged over mote than 1 square meter. For objects of less surface area, the average should be derived for each object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper (swipe), applying moderate pressure, and assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionately and the entire surface should be swiped.

7.5 Personal Radiological Monitoring

7.5.1 External Radiation Dosimetry

Work in the RCA and with site soil samples presents very low radiation dose rates and doses to personnel are expected to be well below Tier 2 Dose Limits as described in

USACE Regulation ER 385-1-80, *Radiological Safety* [USACE, 1997]. Therefore, no radiation dosimetry is required for the planned pre-remediation activities.

7.5.2 Internal Dose Monitoring

The contamination levels in the soil for planned activities are not expected to approach Tier 2 Dose Limits as described in ER 385-1-80. Therefore, initial internal dose monitoring (i.e., bioassay) is not required. However, personnel air sampling will be performed throughout Site intrusive activities (See Section 7.6) to ensure that any unforeseen airborne hazards are detected and evaluated promptly.

7.6 Personal and Perimeter Air Sampling

Radiological airborne hazards are not anticipated during the project activities, therefore personal and perimeter air monitoring will not be required. However, to confirm this, initial localized lapel air samples will be collected on personnel performing intrusive soil boring activities. The results of the analyses of these initial air samples will be evaluated by the SOHM and RSO to determine if additional air monitoring is warranted.

8.0 LEVELS OF PROTECTION

All personnel performing operations on-site shall be required to use the appropriate level of protection. The minimum levels of protection to begin each activity of this project are shown in Table B-3 and Table B-6 and are described in the following subsections. If conditions are identified requiring a change in the level of protection, then PPE will be upgraded or downgraded according to guidelines in this RPP prior to continuing work activities.

8.1 Level D PPE

Level D PPE will be worn during non-intrusive activities where no known contamination is present. Level D PPE consists of the following:

- Work clothes, e.g., coveralls (cotton), or full-length pants and long-sleeve shirt.
- Work gloves, leather or cotton as necessary for physical hazards.
- Boots, certified according to the American National Standards Institute.
- Safety glasses with side shields, as necessary for physical hazards.
- Hard Hats, as necessary for physical hazards.
- Hearing protection (during noise-generating activities).

8.2 Modifed Level D PPE

Modified Level D PPE will be employed when conducting activities with known or potential contact with radioactively contaminated materials. In addition to the Level D components listed above, the following items will be added:

- Shoe covers or booties.
- Water resistant gloves (may replace leather gloves).
- Latex gloves for handling/packaging of soils samples or used air filters.

- Tyvek™ suits or lab coats.

If, during the course of this project conditions change that require an upgrade to more protective PPE, the decision will be made by the SRSM with the concurrence of the SSHO and RSO. Conditions that may warrant changes in PPE may include, but are not limited to discovery of buried chemicals, radiological materials, or encountering potentially hazardous conditions that have not been previously evaluated.

Table B-6. Minimum Level of Protection Requirements

Activity	Level of Protection
Mobilization, site preparation,	Level D
Establish sample locations and Gamma Walkover Surveys	Modified Level D
Drill and collect soil samples	Modified Level D
Downhole gamma logging	Modified Level D
Handling, packaging IDW and soil samples, IDW	Modified Level D
Decontamination of equipment	Modified Level D
Demobilization	Level D

8.3 Decontamination Procedures

The types of radiological decontamination to be addressed for this project are:

- *Equipment and Materials*. To remove contamination from equipment to ensure compliance with release criteria.
- *Vehicles.* To remove contamination from vehicles to prevent spread of contamination and ensure compliance with release criteria.

Radiological decontamination shall be performed using the guidance presented in CABRERA SOP, OP-018, *Decontamination of Equipment and Tools*.

9.0 EMERGENCY RESPONSE

Emergency telephone numbers are listed in the SSHP. A map showing the route to the hospital will be posted near the site telephone. A copy of the hospital route map is provided in Appendix C of the SSHP.

10.0 MEDICAL SURVEILLANCE AND TRAINING REQUIREMENTS

CABRERA's requirements for medical surveillance and worker training are presented in the SSHP. This includes the requirements for radiation worker training.

11.0 REFERENCES

(NRC, 2004) U.S. Nuclear Regulatory Commission (NRC); *Energy*, Title 10 Code of Federal Regulations; January 2004

(OSHA, 2004) U.S. Occupational Safety and Health Administration (OSHA); *Labor*, Title 29 Code of Federal Regulations; July 2004

(USACE, 2003) U.S. Army Corps of Engineers (USACE); *Safety*, ER 385-1-1; November 2003

(USACE, 2003) U.S. Army Corps of Engineers (USACE); *Safety and Health Requirements*, EM 385-1-1; November 2003

(USACE, 1997) U.S. Army Corps of Engineers (USACE); *Radiological Safety*, ER 385-1-80; May 1997

(USACE, 2003) U.S. Army Corps of Engineers (USACE); *Health and Safety for HTRW Activities*; ER 385-1-92; July 2003

(CABRERA, 1999) Cabrera Services, Inc.; *CABRERA Services Health and Safety Manual*; 1999

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Radiation Safety Program*; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Record Retention*; AP-001; January 2000

(CABRERA, 2001) Cabrera Services, Inc.; *CABRERA Training*; AP-009; April 2001

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Personal Protective Equipment*; AP-010; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Radiation Work Permits*; AP-012; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Radiological Surveys*; OP-001; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Unconditional Release of Material from Radiological Control Areas*; OP-004; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Check Sources*; OP-009; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Decontamination of Equipment and Tools*; OP-018; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Operation of Contamination Survey Meters*; OP-020; January 2000

(CABRERA, 2000) Cabrera Services, Inc.; *CABRERA Alpha-Beta Counting Instrumentation Record Retention*; AP-021; January 2000

APPENDIX C

EMERGENCY CONTACT LIST AND

HOSPITAL DIRECTIONS

EMERGENCY CONTACT LIST

Service	Telephone Number
Lake Hospital System **10 E. Washington Street** **Painesville, OH**	**440-354-1685**
Painesville Police (Emergency)	**440 392-5815 (911)**
Painesville Fire Department (Emergency)	**440 392-5852 (911)**
USACE-Buffalo Industrial Hygienist: [redacted]	[redacted]
CABRERA CIH: [redacted]	[redacted]
[redacted]	[redacted]
CHEMTREC	**800-424-9300**
Poison Control	**800-888-7655**

- **This list shall be prominently posted in the CABRERA field office. This list should also be carried in a vehicle or by an individual while working in survey or sampling locations remote from the field office area.**

- **In the event of an emergency requiring outside emergency services, CABRERA personnel will immediately dial 911 to request emergency services. Following the phone call, CABRERA personnel will contact USACE on-site personnel to inform them that emergency service personnel and equipment will be entering the facility. Subsequent to these notifications, appropriate off-site personnel of USACE and CABRERA will be contacted and informed about the situation.**

DIRECTIONS AND MAP TO LAKE HOSPITAL

10 EAST WASHINGTON STREET

PAINESVILLE, OH 44077

440-354-1685

Depart 720 Fairport Nursery Rd, Painesville, OH on SR-535 [Fairport Nursery Rd] (East)	0.6 mi
1: Bear RIGHT (South) onto Mantle Rd	0.7 mi
2: Keep STRAIGHT onto US-20 [Casement Ave]	0.1mi
3: Bear RIGHT (West) onto US-20 [E Erie St]	1.4 mi
4: Turn LEFT (East) onto SR-283 [Richmond St]	0.1 mi
5: Road name changes to Liberty St	0.1 mi
Arrive 10 E Washington St, Painesville, OH 44077	

Route to Lake Hospital System