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HAZWOPER Work Plan and Site Safety and Health Plan for the Alpha Characterization Project at the Solid Waste Storage Area 4 Bathtubbing Trench at Oak Ridge National Laboratory

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Energy Systems Environmental Restoration Program
ORNL Environmental Restoration Program

HAZWOPER Work Plan and Site Safety and Health Plan for the Alpha Characterization Project at the Solid Waste Storage Area 4 Bathtubbing Trench at Oak Ridge National Laboratory

Date Issued—July 1994

Prepared by
Environmental Sciences Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

Prepared for
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ORNL/ER-241

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ACRONYMS

ACGIH	American Council of Governmental Industrial Hygienists
DOE	Department of Energy
ESD	Environmental Sciences Division
HAZWOPER	Hazardous Waste Operations and Emergency Response
HP	health physics
LSS	Laboratory Shift Superintendent
N/A	not applicable
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
RWP	Radiation Work Permit
SARA	Superfund Amendments and Reauthorization Act
SSHO	Site Safety and Health Officer
SSHP	site safety and health plan
STL	Sampling Team Leader
SWSA	Solid Waste Storage Area
WAG	Waste Area Grouping

EXECUTIVE SUMMARY

This work plan/site safety and health plan is for the alpha sampling project at the Solid Waste Storage Area 4 bathtubbing trench. The work will be conducted by the Oak Ridge National Laboratory (ORNL) Environmental Sciences Division and associated ORNL environmental, safety, and health support groups. This activity will fall under the scope of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). The purpose of this document is to establish health and safety guidelines to be followed by all personnel involved in conducting work for this project. Work will be conducted in accordance with requirements as stipulated in the ORNL HAZWOPER Program Manual and applicable ORNL; Martin Marietta Energy Systems, Inc.; and U.S. Department of Energy policies and procedures.

The levels of protection and the procedures specified in this plan are based on the best information available from historical data and preliminary evaluations of the area. Therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project. Unforeseeable site conditions or changes in scope of work may warrant a reassessment of the stated protection levels and controls. All adjustments to the plan must have prior approval by the safety and health disciplines signing the original plan.

1. INTRODUCTION

This work plan/site safety and health plan (SSHP) is for the alpha sampling project at the Solid Waste Storage Area (SWSA) 4 bathtubbing trench. The work will be conducted by the Oak Ridge National Laboratory (ORNL) Environmental Sciences Division (ESD) and associated ORNL environmental, safety, and health support groups. This activity will fall under the scope of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). The purpose of this document is to establish health and safety guidelines to be followed by all personnel involved in conducting work for this project. Work will be conducted in accordance with requirements as stipulated in the ORNL HAZWOPER Program Manual and applicable ORNL; Martin Marietta Energy Systems, Inc. (Energy Systems); and U.S. Department of Energy (DOE) policies and procedures.

The levels of protection and the procedures specified in this plan are based on the best information available from historical data and preliminary evaluations of the area. Therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project. Unforeseeable site conditions or changes in scope of work may warrant a reassessment of the stated protection levels and controls. All adjustments to the plan must have prior approval by the safety and health disciplines signing the original plan.

This project is located at the SWSA 4 bathtubbing trench. Bathtubbing occurs when infiltrating water fills a waste trench and overflows at the topographical low end of the trench, causing surface seepage of contaminated water. Since records for SWSAs 3 and 4 and part of SWSA 5 were destroyed accidentally by fire, basic information about the types of contaminants buried there is needed. A previous study (Clapp et al. 1993) identified ^{90}Sr, ^{3}H, and ^{137}Cs as the major beta- and gamma-emitting isotopes. Tritium (^{3}H) was in the form of tritiated water, with activities ranging from 2434 to 1,030,440 pCi/L. The activities of ^{90}Sr and ^{137}Cs ranged from 42 pCi/L to 72,200 pCi/L and from 0 to 20,700 pCi/L respectively. Additional summary data are provided in Appendix A. Alpha activity was also found at six of the wells. These alpha activities ranged from 119 to 865 pCi/L, but funding was not available for alpha spectroscopy to identify which alpha emitters were present. There have been no hazardous volatile chemicals or radioactive gases detected when the wells were opened for routine monitoring. External and internal exposure to radioactive material will be controlled primarily by administrative controls and personal protective equipment (PPE) as described in a later section.

The objective of the current study is to resample those six alpha wells to identify the alpha emitters. Once they have been identified, a full characterization will be done of those wells to identify the type of geochemical environment that exists in the burial trenches. In addition, colloidal filtration will determine if the alpha emitters are adsorbed onto nanometer-size particles suspended in the groundwater. This has important implications for the migration of the alpha emitters beyond the waste site, remediation techniques, and geochemical modeling of contaminant transport.

SWSA 4 is a 9.3-ha (23-acre) site located within the Oak Ridge Reservation in Waste Area Grouping (WAG) 4. The burial ground was developed to dispose of various solid

radioactive contaminated wastes generated by both defense- and research-related nuclear establishments. The ORNL Operations Division estimated the total waste volume emplaced in SWSA 4 to be ~5.7×10^4 m^3. This volume contained ~4.1×10^{15} Bq (1.1×10^5 Ci) of radioactivity (Lomenick and Cowser 1961). After being filled, waste trenches were covered with the previously excavated soil. The waste trenches that were known to contain alpha-contaminated wastes reportedly were covered with a concrete cap (overlaid by shaley fill soil) to serve as a marker and intruder barrier (Browder et al. 1959). The site was closed to routine burial operations in July 1959 but remained open as a disposal area for uncontaminated fill until July 1973.

The bathtubbing trench study area includes all of the area of SWSA 4 west of the asphalt-lined surface-water diversion ditch. Maps of the area are included in Appendix B. Most of this area may contribute subsurface flow to the seeps because the trenches tend to converge at the seep location. The bathtubbing trench is located on the southern edge of SWSA 4. In FY 1988, it was isolated by a berm made of sandbags. The polygonal berm serves as a minicatchment area, diverting surface water generated outside the seep area and collecting the seep water and rainfall excess within the berm. The bathtubbing area is 408 m^2. Seep water is drained via a 6.1-m long pipe into White Oak Creek. The wells to be sampled are located in and immediately around this bermed area and range in depths from 10 to 16 ft.

This task will be limited to sampling of groundwater and possibly surface water exiting seeps. The work will be limited to collection and filtration of water samples. There will be no excavation, nor will there be any collection of sediments or soil. Prior to initial sampling, Health Physics (HP) will survey the work area to identify any radiological or contamination hazards and set requirements for zoning and PPE. Existing wells will be evaluated based on previous sampling data. A thin-window beta-gamma "pancake" meter will be used to detect low energy beta activity. Groundwater samples will be monitored by HP or, with HP's permission, by the Site Safety and Health Officer (SSHO) at the site to determine that the samples do not exceed the action guidelines of >100 cpm above background, based on survey meters; if that guideline is exceeded, HP will be notified immediately for guidance and additional instructions. All personnel will perform a whole-body frisk with a hand-held monitor (alpha and beta-gamma) before leaving the sampling site.

The goal of the work is to determine if radionuclides in the groundwater or exiting the seeps are adsorbed to colloidal (submicron-sized) particles or complexed with natural organic matter in the groundwater. Groundwater containing actinides will be sampled and filtered at the well head. Filters will range from 0.45 μm (450 nm) to 1 nm (3000 dalton molecular weight) in nominal size cut-off. Groundwater will be filtered on line (before exiting the sample tube) to avoid introduction of artifacts that could produce colloids during sampling. Slow pumping rates (<100 mL/min) will be used to minimize shear forces around the well that could entrain colloids that are normally immobile. Prior to sampling, the chemical conditions (pH, electrode potential, specific conductance, dissolved oxygen, alkalinity, and temperature) of the groundwater will be measured. The primary emphasis of this work will be on wells that have elevated levels of actinides, since these radioisotopes are expected to have the greatest affinity for adsorbing to groundwater colloids. Purged water will be collected and contained in carboys or barrels for appropriate disposal.

2. SITE ORGANIZATION AND COORDINATION

The work will be performed by ORNL ESD. ORNL Industrial Hygiene, Industrial Safety, and Radiation Protection will provide appropriate monitoring and oversight. Before the initial sampling of groundwater, HP will evaluate the site for radiological hazards and will make recommendations for any protective requirements or any additional monitoring that will be required for present or future sampling at the site. Radiation Protection will decide if monitoring and oversight of sampling activities at the sampling site can be conducted by the SSHO or if the presence of a Radiation Protection technician is necessary during sampling.

The following section details the organizational structure for this project. Key personnel and their project responsibilities are listed. Team members from ESD will include J. D. Marsh, J. F. McCarthy, J. McDonald, T. Thomas, T. Knowles, B. Gu, and W. L. Webster. J. McDonald will serve as the Sampling Team Leader (STL) and the SSHO, and J. D. Marsh will serve as back-up STL and SSHO. General responsibilities of all project staff include

- safeguarding record materials, including, but not limited to, field notebooks, raw data sheets, and chain-of-custody forms;
- maintaining complete, factual, detailed, and objective program notes;
- retaining records of all analyses and procedures used for the WAG 2 Remedial Investigation (RI)/Feasibility Study and Site Investigation (SI) projects;
- ensuring that proper waste management procedures are followed; and
- ensuring that the requirements of the sampling and analysis plan, quality assurance plan, data management plan, and health and safety plan are satisfied.

2.1 PROJECT MANAGER

The Project Manager oversees all efforts of the project and provides guidance to project personnel. Responsibilities of the Project Manager include:

- managing the project and overseeing the technical and programmatic activities of the health and safety program;
- assigning sufficient resources to maintain and implement the health and safety program; and
- ensuring that adequate health and safety systems (policies, plans, procedures, materials, etc.) are in place and operational.

2.2 SAMPLING TEAM LEADER

The STL is responsible for oversight of the sampling activities for the project. He/she will be responsible for site accessibility, safety, quality assurance, and waste management and may delegate further responsibilities to other team members. Specific responsibilities of the STL are

- coordinating site operations, including logistics;
- interfacing with plant and project personnel;
- notifying appropriate personnel of work schedules;
- maintaining and controlling all site records;
- determining in-field procedural variances in response to site conditions;
- documenting and reporting unforeseen site changes and corrective actions; and
- coordinating waste disposal.

2.3 SITE HEALTH AND SAFETY OFFICER

The project will designate a qualified site-specific SSHO, who must be approved by the HAZWOPER Program Coordinator (who must also approve alternates) and who will implement, monitor, and enforce the SSHP. The SSHO is the primary on-site contact for safety and health during field activities. The SSHO oversees the on-site execution of all field activities regarding safety and health procedures and has the authority to stop all work if conditions are judged to be hazardous to on-site personnel or to the public. The SSHO will remain on site at all times while workers are performing site activities. Other specific responsibilities are to

1. ensure that a pre-entry briefing is conducted prior to initiation of site activities to ensure that personnel receive a copy of the site-specific health and safety plan and are aware of its provisions; are instructed on how the work will be accomplished and how to ensure workers safety; are familiar with potential hazards, routes of entry, and health effects that could be hazardous during this project; and are familiar with planned emergency procedures;

2. ensure that employees meet the required training and medical requirements, including respirator fit testing (as needed), attendance at a pre-entry briefing on project and potential site hazards, and review of the work plan and SSHP; maintain copies of documentation of the above at the project site; and ensure documentation is available for on-site review (note: the ORNL Special Access Training Badge will be used as verification of training; see Sect. 8 for site entry requirements);

3. require personnel to obtain immediate medical attention in case of a work-related injury or illness;

4. deny access to all or any portion of the work area as warranted;

5. order work to cease, evacuate the work area of all personnel, and reestablish safe working conditions as needed;

6. control access to the site by visitors and unauthorized personnel, advise visitors and personnel of their responsibilities, and ensure they meet access requirements before entry is allowed;

7. ensure the correct field execution of the work plan and SSHP;

8. ensure this work plan and SSHP are revised and approved if there are changes;

9. advise emergency response personnel in an emergency;

10. coordinate with Industrial Hygiene, Industrial Safety, and Radiation Protection to establish site work zones and to recommend additional requirements for personnel protection, monitoring, and other controls when needed;

11. coordinate and minimize the number of personnel and amount of equipment in the work zones;

12. coordinate accident prevention by oversight of field activities and awareness of all site operations;

13. ensure that needed work permits [e.g., Radiation Work Permit (RWPs)] are obtained and made available on site;

14. ensure that Industrial Hygiene, Industrial Safety, and Radiation Protection are contacted, when needed, prior to commencement of site work, to notify of intent to begin work and to request monitoring support, as recommended by Industrial Hygiene, Industrial Safety, or Radiation Protection, during their initial survey of each sampling site;

15. conduct daily inspection of the work site (see site surveillance checklist, Appendix C);

16. provide the HAZWOPER Program Coordinator a list of personnel participating in site activities to determine the need for inclusion in the Hazardous Waste Worker Medical Surveillance Program; and

17. maintain a daily logbook to document health and safety issues.

2.4 FIELD PERSONNEL

Responsibilities of field personnel include the following:

1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees; being alert to potentially harmful situations.

2. Performing only those tasks that they believe they can do safely and immediately reporting any accidents and/or unsafe conditions to the SSHO.

3. Notifying the SSHO of any special medical conditions (i.e., allergies, contact lenses, diabetes,and medication use). Although highly recommended, it is not mandatory to report pregnancies, per Energy Systems policy under the Reproductive Hazards Program.

4. Preventing spillage to the extent possible, and in the event spillage occurs, containing the spillage;notifying the SSHO [all spills must be reported to the ORNL Environmental Interface (4-8770)]; cleaning up immediately, using safe clean up measures as directed by the SSHO (note: field personnel should not engage in spill containment or cleanup if conditions are not safe and if the cleanup cannot be accomplished with supplies available at the site); and evacuating the area.

5. Avoiding splashing materials to the extent possible.

6. Practicing good housekeeping by keeping the work area neat, clean, and orderly to the extent possible.

7. Reporting all injuries, no matter how minor.

2.5 RADIATION PROTECTION

ORNL Radiation Protection will be responsible for oversight and approval of personnel protection requirements related to radiation protection. Mitch Conner, Office of Radiation Protection, will review and approve the Work Plan and SSHP prior to commencement of field activities. The Office of Radiation Protection representative will authorize a return to work after any on-site hazard related to radiation protection has been resolved. ORNL Radiation Protection will be consulted prior to entry into any posted Radiological Area and will instruct field participants on requirements for that area, including the need for an RWP, appropriate monitoring, dosimetry, and PPE.

2.6 INDUSTRIAL HYGIENE

The ORNL Industrial Hygiene Section and the HAZWOPER Program Coordinator will be responsible for the oversight and approval of personnel protection related to industrial hygiene and the requirements of 29 CFR 1910.120. Ray Barham, the Industrial Hygiene Representative for ESD, and Ann Saulsbury, the HAZWOPER Program Coordinator, will approve the Work Plan and SSHP prior to commencement of field activities. A representative from the Industrial Hygiene Section will accompany the group during the initial activities to determine potential Industrial Hygiene hazards. In addition, the Industrial Hygiene representative will have stop-work authority and will provide guidance regarding PPE and industrial hygiene monitoring and sampling requirements.

2.7 INDUSTRIAL SAFETY

The ORNL Industrial Safety Section will be responsible for oversight and approval of personnel protection related to safety. Industrial Safety will review and approve the Work Plan and SSHP prior to commencement of field activities. Industrial Safety will have stop-work authority and will provide guidance regarding potential safety hazards, PPE, and safety requirements.

3. PROJECT HAZARD EVALUATION

3.1 SPECIAL HAZARDS

In addition to the expected hazards associated with sites, other potentially harmful hazards must be identified. Examples of some of these hazards are physical, chemical, radiological, underground, and overhead hazards as well as heat or cold stress, noise, illumination, ergonomics, and biological factors.

All site investigation and excavation personnel may be exposed to the hazards outlined in the following sections.

3.1.1 Heat Stress

Some site activities may be physically demanding, and physical demands may be compounded by the use of protective clothing and equipment, moderate-to-heavy work loads, ambient air temperatures, relative humidity, and exposure to nonionizing radiation.

Two important factors will help personnel function in hot environments: acclimatization and consumption of fluids. Acclimatization is a physical and psychological adjustment that workers experience during the first or second week of work in hot environmental conditions. Especially during this period, workers should concentrate on maintaining a balanced diet, consuming plenty of fluids throughout the day, and remaining aware of tell-tale signs of heat-related stress, such as headaches, dizziness, high body temperature, and increased heart rate. It is imperative that the SSHO be informed if a worker experiences these signs.

All activities that take place at the sites require the use of a buddy system. As field activities continue, all personnel should be aware of their buddy's condition and of signs of heat-related stress. The SSHO will institute a work and rest regimen when conditions become difficult to combat, according to his or her best professional judgement and guidelines published by the American Conference of Governmental Industrial Hygienists (ACGIH).

3.1.2 Cold Stress

Activities being conducted on site may be physically demanding during winter months, and the effects may be compounded by the use of protective clothing and equipment, moderate to heavy work loads, ambient air temperatures, relative humidity, wet or rainy conditions, wind speed, and exposure to nonionizing radiation.

Two important factors will help personnel function in cold environments: acclimatization and proper clothing. Acclimatization is a physical and psychological adjustment that workers experience during the first or second week of work in cold environmental conditions. Especially during this period, workers should concentrate on maintaining a balanced diet, consuming plenty of fluids throughout the day, and remaining aware of tell-tale signs of cold-related stress, such as headaches, numbness in digits or extremities, dizziness, low body temperature, and decreased heart rate. It is imperative that the SSHO be informed if a worker experiences these symptoms.

All activities that take place at the sites require the use of a buddy system. As field activities continue, all personnel should be aware of their buddy's condition and of signs of cold-related stress. The SSHO will institute a work and rest regimen to combat cold-related disorders according to his or her best professional judgement and guidelines published by the ACGIH when those conditions arise.

3.1.3 Biological Stress

Field conditions may present a variety of biological stresses, and it is the responsibility of personnel to inform the SSHO of health conditions they have that may be affected by site conditions. Examples of these stresses may be, but are not limited to, insect bites or stings, ticks, poison ivy, pollens and grasses, snakes, etc.

3.1.4 Illumination

Activities at any sites normally will be conducted during daylight hours. A conservative guideline may be that work will commence 15 min after sunrise and conclude 15 min prior to sunset.

3.1.5 Dust

The generation of respirable dust shall be kept to a minimal amount. A visible cloud of dust will constitute an action limit. An engineering control may be employed, such as wetting the area with deionized or potable water, sprayed as a fine mist from a garden sprayer. In the unlikely event that engineering controls are unsuccessful, Industrial Hygiene will be summoned to assess the situation and provide guidance.

3.1.6 Ergonomics

The interaction of personnel with the work environment may also present potential hazards at this site, such as incorrectly lifting heavy loads, equipment vibrations, improper body positioning, and negotiating physical obstacles when traversing ditches and brush. Personnel should always position themselves properly and lift from the legs when lifting equipment or heavy objects and should rely on the buddy system to assist in lifting loads greater than 50 lb. Back strain, the most common ergonomic hazard in the field, can be easily avoided if the site workers ask for assistance when they need it.

3.1.7 Tripping and Falling

Tripping and falling hazards will be present in all areas having an uneven surface and wet grass. Rubber boots will be worn to improve traction on wet surfaces. Personnel will be warned of those hazards and proper PPE requirements during daily briefings. Specific hazards and controls are described below. An "X" indicates an existing condition or a condition that may result from site operations.

Task: Sampling groundwater.

Physical Hazards

X Heat Stress	X Cold Stress	☐ Noise
☐ Confined Space	☐ Enclosed Space	☐ Heavy Lifting
X Tripping/Falling	☐ High Voltage	☐ High Pressure Water
☐ Oxygen Deficient	X Explosive/Flammable	☐ Vibration

Construction Hazards

☐ Trenching	☐ Excavating	☐ Heavy Equipment Op.
☐ Demolition	☐ High Work	☐ Welding/Cutting
☐ Ladders		

Chemical Hazards

☐ Organic Chemical	X Inorganic Chemical	☐ Carcinogen
X Corrosive	☐ Reactive	☐ OSHA Specific
☐ Mutagen	☐ Teratogen Substances	

Ionizing Radiological Hazards

☐ Internal Exposure X External Exposure

Nonionizing Radiological Hazards

☐ UV	☐ RF	☐ Microwave
☐ Laser		

Biological/Vector Hazards

X Wildlife	X Plants	☐ Medical Waste
☐ Bacterial	X Parasites	

3.2 DESCRIPTION OF HAZARDS AND CONTROLS

3.2.1 Chemical Hazards

Task: Sampling groundwater.

Small quantities of acid (typically < 1 mL of concentrated nitric or sulfuric acid) are used to preserve water samples in the field. Plastic bottles of acid (< 100 mL) are labeled, and personnel will wear protective gloves and safety eye glasses when dispensing the acid. A portable eyewash will be available at the site.

Workers will be briefed on the hazards of using strong acids, as listed in the Material Safety Data Sheets for those acids, prior to going to the field.

Previous sampling has documented that combustible gases are not present in the wells.

3.2.2 Fire/Explosion

Task: Sampling groundwater.

Are flammable liquids present? X Yes ☐ No

Description: Gasoline-powered electric generator.

Location: SWSA 4

Quantity: 2 gal

Containment/Storage method: Approved UL fireproof 2-gal metal can.

For welding, cutting, or brazing, is Welding Permit required? ☐ Yes X No

3.2.3 Confined/Enclosed Spaces

Task: Sampling groundwater.

Confined/enclosed space entry required (Low/High Risk)? ☐ Yes X No

Operations Safety Work Permit required? No.

Standard Operating Procedure required? No.

3.2.4 Ionizing Radiation

Task: Sampling groundwater.

Applicable detailed checklist? X Yes ☐ No ☐ N/A

Primary contaminating isotope(s): ^{241}Am, ^{244}Cm, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{90}Sr, ^{3}H, ^{137}Cs, ^{60}Co

Location: On site

Containment/Storage method: Radiological waste stored in carboy or barrel.

Radiation type: Alpha/beta/gamma

Dose rate (maximum): ≤ 3 mrem/h @ 30 cm
(average): 0.1 mrem/h

Worker dose limit 20 mrem/day

Contamination level (fixed): Will be surveyed by HP prior to work beginning.
(removable): Will be surveyed by HP prior to work beginning.

Airborne contamination concentration: 0 μCi/mi

Water contamination potential? X Yes ☐ No

Unrestricted airborne contamination release potential? ☐ Yes X No

Radiation work permit required? An RWP may be required for sampling at some locations, as advised by HP.

Health Physics coverage: Conditional. The area HP technician shall survey the work area prior to initiation of new work and set any additional requirements for zoning and PPE. Controls for tritium contamination will include the use of two pairs of latex (surgical) gloves and Tyvek suits to prevent skin contact. A splash shield will be present at the site, but because of the low splash potential of the sampling operation, the shield is not expected to be needed.

Special task operation requirements: Not applicable (N/A).

Welding/cutting/grazing	N/A
Grinding/chipping	N/A
Hydraulic/air hammer operation	N/A
Dusty conditions (sweeping, vacuuming, etc.)	N/A
Equipment decontamination/free release	N/A

3.2.5 Nonionizing Radiation

Task: Sampling groundwater.

High-voltage electrical transmission lines nearby? ☐ Yes X No

Location, distance and voltage: No overhead lines or underground utilities are close enough to present a hazard for this type of sampling at the sites.

Radio frequency radiation sources (AM and/or FM broadcast towers, r-f sealers) nearby?
☐ Yes X No

Location and distance: N/A

Microwave sources in use on-site? ☐ Yes X No

Location and distance: N/A

Lasers in use nearby? ☐ Yes X No

Location and laser class: N/A

Are workers potentially exposed to sunlight (ultraviolet radiation)? X Yes ☐ No

Are ultrasound sources in use on-site? ☐ Yes X No

Location: N/A

3.2.6 Electrical Hazards

Task: Sampling groundwater.

Electrical shock hazard? X Yes ☐ No
Voltage: 120V
Current: 8 amps

Location of hazard: Portable generator

Precautions: A ground-fault interrupter circuit will be used in conjunction with well-insulated electrical cord for all electrical connections.

3.2.7 Temperature Extremes

Task: Sampling groundwater.

Temperature extremes (Hot/Cold)? X Yes ☐ No
Average daily high temperature (during work shift): 95°F
Average daily low temperature (during work shift): 30°F
Temperature WBGT °C: Obtain from Industrial Hygiene prior to daily activities, as necessary.

Work load: X Light ☐ Moderate ☐ Heavy

Precautions: The SSHO will contact Industrial Hygiene for guidance/requirements. For hot conditions, the SSHO will establish appropriate work/rest regime. For cold weather, appropriate clothing and work schedules will be used.

Cooling/heating equipment needed: As required by weather conditions.

3.2.8 Noise

Task: Sampling groundwater.

Noise extremes? ☐ Yes X No

Sound level: ___ dB(A)

Noise source(s): Gasoline generator

Noise above 85 dB(A) (hearing protection required)? ☐ Yes X No

Precautions (specify): Monitoring by Industrial Hygiene demonstrated noise is not a problem at distances greater than 1 ft from the generator. Personnel will be ~5 ft from the generator during routine operation.

3.2.9 Vibration

Task: None.

Precautions (specify): N/A.

3.2.10 Sanitation

Task: Sampling groundwater.

Potable water required? Yes.

Nonpotable water used? No.

Decontamination: Buckets and water will be present at the sampling site for decontamination. Any materials in contact with groundwater (e.g., sampling tubing or pH electrodes) will be rinsed with water, wiped, and surveyed. Any contamination on personnel identified by frisking will be decontaminated using buckets and water. Because of the history of the site, the risk of chemical contamination is minute.

Eating, drinking, and smoking permitted? Drinking only.

Location: In areas designated by area HP. Personnel will take food and tobacco breaks in Bldg. 1505.

Toilet facilities required? Yes.

Location and number: Bldg. 1505

Washing facilities required? Yes.

Location: Bldg. 1505

Change rooms required? Yes.

Location: Bldg. 1505

3.2.11 Illumination

Task: Groundwater sampling.

All tasks will be conducted during daylight hours.

Additional illumination needed? ☐ Yes X No ☐ N/A

3.2.12 Safety Hazards

Site-posted information/notification required? X Yes ☐ No ☐ N/A

Site posting required? X Yes ☐ No

Site guard required? ☐ Yes X No ☐ N/A

Access control required? X Yes ☐ No

Entry/exit logs required? X Yes ☐ No

Note: logging in by badge reader at entrance to SWSA, as well as additional logging as required by any RWP.

Escape routing/posting required? Yes. (Site map is included in Appendix B as Fig. B.1.)

Compressed gas cylinders? ☐ Yes X No

Location: N/A

Storage: N/A

3.2.13 Biological Hazards

Insect and tick repellent will be used as appropriate. Cans of wasp spray will also be available in case needed.

4. TASK BREAKDOWN

4.1 SITE CONTROL

Site work zones are required to reduce the accidental spread of hazardous substances from contaminated areas to clean areas. The identification of the zones will provide for control of operations and flow of personnel. The HAZWOPER Program Coordinator will provide signs to be posted at the site for HAZWOPER requirements. The HP will determine radiological postings. Should additional barriers (rope, tape) or signs be required, HP, Industrial Hygiene, and Industrial Safety will be consulted. Personnel accessing the zones must meet access requirements as stated in this plan and at the entrances of the zones. The SSHO is responsible for ensuring all workers and visitors meet site access requirements. Section 8 is a record of site access requirements and personnel qualifications.

The buddy system is required for this project. All workers will have a partner to work with. To ensure worker safety, personnel will maintain (1) internal communication, (2) line of sight with other workers, and (3) work-party monitoring. The access control point into the radiological zones will be where the buddy system is implemented. A two-way radio will be maintained in the clean, support zone to ensure communication with the Laboratory Shift Superintendent (LSS) and emergency, safety, and health support personnel.

A breakdown of tasks involved in groundwater sampling, along with the hazards and controls is attached as Appendix D.

4.2 TASK DESCRIPTION

Type of Work: Intrusive X Nonintrusive ☐

Engineering Controls:

Administrative Controls (required permits, training, etc.): Training, applicable permits, postings, access controls, and altered work schedules as indicated.

Initial Level of Personal Protective Equipment:

Level of Protection: ( ) A ( ) C (X) Modified
( ) B (X) D

Respirator: ( ) SCBA ( ) Full Face ( ) 1/2-Face Resp.
(X) Respirator not required.

Cartridge: N/A

Protective Clothing:	( ) Encapsulating Suit	(X) Tyvek*	
	( ) Saranex	( ) Splash suit	
	( ) C-zone	(X) Company Clothing (khakis)	
	( ) Other		
Head/eye/ear:	( ) Hard Hat	(X) Safety Glasses	(X) Goggles†
	( ) Splash Shield	( ) Ear Plugs	( ) Other
Gloves:	( ) Nitrile	( ) Neoprene	( ) PVC
	(X) Latex‡	( ) Vinyl	( ) Leather
	( ) Other		
Footwear:	(X) Steel-toed Leather	( ) Chemical Overboots	
	( ) Steel-toed Rubber	(X) Other: Rubber Boots	

Additional comments: Each seep and each well shall be evaluated initially by HP/Industrial Hygiene before sampling activities occur. Groundwater sample containers will be monitored.

Modifications allowed: In accordance with HP/Radiation Protection, if required.

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*Must be worn by personnel working in known or suspected areas of contamination.

†Personnel must wear goggles or use a splash shield when handling acids and when there is the potential for contaminated water being splashed.

‡Latex surgical gloves will be worn in layers by personnel working in areas of known or suspected radiological contamination.

5. MONITORING REQUIREMENTS

5.1 DIRECT READING INSTRUMENTS

Direct reading instruments, pertinent tasks, monitoring frequencies, and action guidelines are identified in Table 1. Alpha and beta/gamma meters will be the primary monitoring instruments. Personnel and equipment will be frisked prior to exiting the sampling site and controlled access area. Radiological hazards are the only hazards anticipated, based on the history of the site and the results of previous sampling as noted in Sect. 1. Those hazards will be assessed using alpha and beta/gamma meters. Frisking will be conducted during sampling if there is reason to suspect contamination (e.g., a splash). If an activity of >100 cpm above background for beta/gamma and >300 dpm/100 cm^2 for alpha is detected, HP will be contacted for further instructions.

Table 1. Direct reading instruments and specifications

Direct reading instruments	Tasks	Monitoring frequency	Action guidelines
Lower explosive limit meter	N/A		
O_2 meter	N/A		
Colorimetric indicator tubes	N/A		
Alpha	all	Prior to exiting sampling site and controlled access area	>300 dpm/cm^2
Beta/gamma	all	Prior to exiting sampling site and controlled access area	>100 cpm
Photoionization or flame ionization detector	*a*	Before sampling	5 ppm
Area radiation monitors			
Noise meter			85 dBA
Other (PCM-113)	all	Upon exiting	Alarm

[a]Based on site history and the results of previous groundwater monitoring at the site, the risk of chemical contamination is minute. Combustible gases have not been found when any of the wells were opened during previous samplings. If contaminants above action guidelines stated in this plan are detected by Industrial Hygiene, sampling of that well will not occur until Industrial Hygiene has evaluated the hazard by collecting a sample and identifying the chemical hazard.

5.2 PERSONAL MONITORING

Personal monitoring requirements are listed in Table 2. Instruments used by the Industrial Hygiene representative will be calibrated and maintained in accordance with Industrial Hygiene Standard Operating Procedure SOP-IH-25.1, "Administration of the

Instrument Calibration Program." Instruments used by the Office of Radiation Protection are calibrated and source checked in accordance with the ORNL Health Physics Manual, RP-1.6, "Health Physics Instruments."

Table 2. Personal monitoring requirements

Type of monitoring	Tasks	Monitoring frequency	Action guidelines
Whole-body dosimetry	Sampling	Continuous	
Extremity dosimetry			
Whole-body count	Sampling	Before starting	IAW HP Manual
Urinalysis/bioassay	Sampling	Before starting	IAW HP Manual
Chemical air sampling		Not required	
Radiation air sampling		Not required	

6. DECONTAMINATION

The purpose of decontamination is to prevent contaminants that may be present on protective clothing and equipment from coming into contact with personnel as they unsuit. Also, decontamination protects workers from hazardous substances that may contaminate and eventually permeate the PPE used on-site; it protects personnel by minimizing the transfer of harmful materials into clean areas. Combining decontamination with the correct sequential method of removing PPE will prevent exposure to personnel leaving the work areas as well as off-site migration of contaminants. Generally, decontamination is accomplished by starting with the most heavily contaminated item and progressing to the least contaminated item.

Personnel will remove any disposable PPE and dispose of it in containers provided before leaving the radiological area. The Radiation Protection representative will assist the SSHO in establishing stations and sequence for doffing of PPE. Monitoring (frisking) of personnel and equipment prior to exiting contaminated areas will be conducted by the SSHO.

Upon job completion, all equipment will be surveyed by ORNL Radiation Protection and tagged accordingly. If contamination is detected on equipment, the equipment will be cleaned with a paper towel. Equipment that cannot be decontaminated will be bagged and disposed of in accordance with instructions from the Office of Radiation Protection representative.

Decontamination will also include contamination avoidance, which will include measures such as the use of disposable plastic to protect instrument surfaces and avoiding contact with contaminated equipment to the degree practical. Also, the tubing in the well will be dedicated to that well and will not need decontamination. The hollow fiber filters used for the particle size separation will be placed in a plastic bag and brought back to the laboratory for cleaning and decontamination. All electrochemical probes, such as pH meter probes and water-level probes will be rinsed with deionized water. The resulting waste water will be collected in an appropriate container and disposed of as low-level radioactive waste.

7. EMERGENCY PREPAREDNESS

Potential hazards are described in Sect. 3, and the controls for and response to those hazards are attached as Appendix D.

The responsibility for day-to-day implementation of this information primarily lies with the SSHO. During an actual emergency response situation, the SSHO will serve as the Emergency Coordinator until the LSS or emergency response team arrives.

Medical assistance will be provided by the Health Division, which is located at Bldg. 4500-North. Directions from the SWSA 4 site to the Health Division are as follows: Exit Portal 24, turn right on Lagoon Road, enter the second West End portal on the right, and continue east on Main Street to the 4500-North building, which is the last building on the right before the road takes a ninety degree turn.

Emergency services may be reached at the telephone numbers shown in Table 3. The LSS will provide emergency response personnel and coordinate emergency assistance. The radio number for the LSS is Station 103. The telephone number for the LSS is 574-6606.

Table 3. ORNL emergency personnel/organizations

Emergency personnel/organization	Telephone no.	Radio station no.
ORNL Emergency Response	911	
Laboratory Shift Superintendent	574-6606	103
Fire Department	574-5678	
Medical Center	574-7531	
Security		
Industrial Hygiene	576-5064/576-1367	
Industrial Safety		
Radiation Protection	574-6700	
Environmental Compliance	574-8770	
Waste Management/Remedial Action	574-1779	

The SSHO will perform the following pre-emergency tasks before starting field activities and will coordinate emergency response with the LSS:

1. Locate nearest telephone and alarm station.
2. Confirm and post emergency telephone numbers.
3. Post site map of work areas marked with evacuation routes.
4. Inventory and check out on-site emergency equipment and supplies, as warranted.

In the event of an emergency that requires evacuation of the site, a verbal instruction will be given by the SSHO to evacuate the area. Personnel will exit to a predesignated support area. At this point, the SSHO will account for all personnel, ascertain information about the emergency, and advise on-site personnel with other instructions. In all situations that require evacuation, personnel shall not reenter the work area until the conditions causing the emergency have been corrected; the hazard reassessed; the Work Plan and SSHP revised, approved, and reviewed with on-site personnel; and instructions given for re-entry.

The project personnel at the site will have a radio or cellular telephone available at the site to contact emergency personnel.

8. MEDICAL SURVEILLANCE AND PHYSICAL EXAMINATION

Some WAG 2 RI&SI personnel do not meet the criteria listed in 29 CFR 1910.120 for inclusion in the Hazardous Waste Worker Medical Surveillance Program. If field conditions should change, personnel who meet these criteria will be included in the ORNL Hazardous Waste Worker Medical Surveillance Program. All Energy Systems subcontractors involved in activities that require work in the exclusion zone or the contamination reduction zone shall ensure that their personnel receive medical evaluation as required by the Occupational Safety and Health Administration (OSHA).

9. TRAINING REQUIREMENTS AND SITE PERSONNEL QUALIFICATIONS

All site personnel and visitors requiring access to the work zones will be required to have current General Employee Training, 24-h HAZWOPER [Superfund Amendments and Reauthorization Act (SARA)/OSHA] training and annual refresher, and Radiation Worker II Training. If site conditions change, or other hazards are detected, the training and access requirements will be revised accordingly. If respiratory protection is required for sampling a site, workers will require 40-h SARA/OSHA training, and respirator fitting and training will be required.

Name: J. Daniel Marsh Badge number: 27615

Assigned tasks: Sampling groundwater/alternate STL and SSHO

Requirement	Yes	No
40-h SARA/OSHA (HAZWOPER) training	✓	
24-h SARA/OSHA (HAZWOPER)	✓	
SARA/OSHA (HAZWOPER) annual refresher training	✓	
SARA/OSHA (HAZWOPER) supervisor training	✓	
Confined-space entry training		✓
Radiation worker training	✓	
Respirator fit testing and training		✓
Medical Surveillance Program	✓	
Other training		

Name: J. F. McCarthy Badge number: 23942

Assigned tasks: Sampling groundwater.

Requirement	Yes	No
40-h SARA/OSHA (HAZWOPER) training		✓
24-h SARA/OSHA (HAZWOPER)	✓	
SARA/OSHA (HAZWOPER) annual refresher training	✓	
SARA/OSHA (HAZWOPER) supervisor training		✓
Confined-space entry training		✓
Radiation worker training	✓	
Respirator fit testing and training		✓
Medical Surveillance Program	✓	
Other training		

Name: Jennifer McDonald Badge number: 623975

Assigned tasks: Sampling groundwater, STL, and SSHO.

Requirement	Yes	No
40-h SARA/OSHA (HAZWOPER) training	✓	
24-h SARA/OSHA (HAZWOPER)	✓	
SARA/OSHA (HAZWOPER) annual refresher training		✓
SARA/OSHA (HAZWOPER) supervisor training	✓	
Confined-space entry training		✓
Radiation worker training	✓	
Respirator fit testing and training	✓	
Medical Surveillance Program	✓	
Other training		

Name: Lynn Webster Badge number: 625335

Assigned tasks: Sampling groundwater.

Requirement	Yes	No
40-h SARA/OSHA (HAZWOPER) training		✓
24-h SARA/OSHA (HAZWOPER)	✓	
SARA/OSHA (HAZWOPER) annual refresher training	✓	
SARA/OSHA (HAZWOPER) supervisor training		✓
Confined-space entry training		✓
Radiation worker training	✓	
Respirator fit testing and training		✓
Medical Surveillance Program	✓	
Other training		

Name: Traci Knowles Badge number: 624135

Assigned tasks: Sampling groundwater.

Requirement	Yes	No
40-h SARA/OSHA (HAZWOPER) training	✓	
24-h SARA/OSHA (HAZWOPER)	✓	
SARA/OSHA (HAZWOPER) annual refresher training		✓
SARA/OSHA (HAZWOPER) supervisor training	✓	
Confined-space entry training		✓
Radiation worker training	✓	
Respirator fit testing and training	✓	
Medical Surveillance Program	✓	
Other training		

Name: Tony Thomas Badge number: 17401

Assigned tasks: Sampling groundwater.

Requirement	Yes	No
40-h SARA/OSHA (HAZWOPER) training	✓	
24-h SARA/OSHA (HAZWOPER)	✓	
SARA/OSHA (HAZWOPER) annual refresher training	✓	
SARA/OSHA (HAZWOPER) supervisor training		✓
Confined-space entry training		✓
Radiation worker training	✓	
Respirator fit testing and training		✓
Medical Surveillance Program	✓	
Other training		

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Clapp, R. B., J. D. Marsh, Jr., R. J. Selfridge, and N. D. Farrow 1993. *Annual Report on SWSA 4 Bathtubbing Trench Monitoring*, ORNL/RAP/LTR-89/36, Oak Ridge National Laboratory, Oak Ridge, Tenn.

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Appendix A

SWSA 4 SAMPLE DATA

SWSA 4 Bathtubbing Trenches Project August 1989

Groundwater Well Samples

Sample Number	Well Point	Date	Time (EDT)	Total Depth of Well (cm)	Depth to Water (cm)	Water Depth (cm)	Temp (C)	pH (field)	pH (lab)	Conductivity (mmho/cm)	D.O. (mg/l)	ORP (volts)	Suspended Solids (g/l)	Dissolved Solids (mg/l)
BTTWP01080989	Well 1	8/09/89	1440	366.00	189.50	176.50	18.80	6.18	6.85	0.740	0.16	0.144	0.6041	1190
BTTWP05081089	Well 5	8/10/89	0900	462.50	112.50	350.00	16.43	6.26	6.92	0.712	0.31	-0.160	0.8938	251
BTTWP08080889	Well 8	8/08/89	1400	384.81	-----		23.50	6.68	6.89	0.297	0.25	0.039	1.1349	1379
BTTWP10080889	Well 10	8/08/89	1530	406.50	185.50	221.00	17.44	6.57	6.82	0.362	0.14	-0.125	0.7825	1439
BTTWP11081089	Well 11	8/10/89	1115	307.00	59.00	248.00	17.10	6.36	6.96	1.051	0.30	0.172	0.9406	1466
BTTWP14081089	Well 14	8/10/89	1400	499.00	134.00	365.00	17.11	6.31	7.01	0.928	0.64	0.095	0.8380	1191
BTTWP14081089-FD	Well 14	8/10/89	1605	499.00	134.00	365.00	16.61	6.29	7.02	0.914	0.18	0.125	0.9318	1238
BTTWP15080989	Well 15	8/09/89	1315	444.00	271.20	172.80	17.21	6.33	6.92	0.806	0.18	-0.164	0.6574	979
SWS4690080989-B	Well 690	8/09/89	1030	890.00	372.50	517.50	19.55	6.29	7.10	0.719	0.32	-0.096	0.7803	394

SWSA 4 Bathtubbing Trenches Project August 1989

Groundwater Well Samples

Well Point	Gross Alpha (pCi/l)	2 Sigma % Error	Gross Beta (pCi/l)	2 Sigma % Error	Dissolved Cs-137 (pCi/l)	1 Sigma % Error	Particulate Cs-137 (pCi/g/l)	1 Sigma % Error	Strontium-90 (pCi/l)	1 Sigma % Error	Tritium (pCi/l)	1 Sigma % Error	Carbon 14 (pCi/l)	2 Sigma % Error
Well 1	568	9.5	78378	3.5	5447	4.0	150.0	8.3	46000	2.61	9310	1.54	3784	14.3
Well 5	622	8.7	137838	2.0	1991	6.7	42.3	12.4	72200	0.14	7063	1.83	2973	18.2
Well 8	487	11.1	21622	1.3	4933	4.5	39.5	11.3	9580	0.94	34093	0.73	11692	6.8
Well 10	865	9.4	62162	4.4	20700	1.9	691.1	2.9	24600	0.81	44778	0.65	17027	4.8
Well 11	487	16.7	22432	1.2	5280	5.0	44.4	10.8	10700	0.93	49243	0.60	19730	4.1
Well 14	119	25.0	17838	1.5	<79	----	52.5	1.9	9660	0.21	1025344	0.13	324324	8.3
Well 14	230	18.8	18378	1.5	147	25.7	4.9	0.8	10900	0.92	1030440	0.13	324324	8.3
Well 15	<11	----	243	11.1	<94	----	2.4	208.0	42	57.14	2434	3.85	<1	-
Well 690	<5	----	405	6.7	<52	----	156.6	8.0	190	63.16	42144	0.66	15405	5.3

SWSA 4 Bathtubbing Trenches Project August 1989

Groundwater Well Samples

Well Point	Ag (mg/l)	Al (mg/l)	As (mg/l)	Ba (mg/l)	Be (mg/l)	Ca (mg/l)	Cr (mg/l)	Fe (mg/l)	K (mg/l)	Mg (mg/l)	Mn (mg/l)	Na (mg/l)	Ni (mg/l)	Si (mg/l)	SiO2 (mg/l)	Sn (mg/l)	Sr (mg/l)	Zn (mg/l)
Well 1	0.0069	0.53	0.085	1.20	0.0014	110	0.022	16.00	1.9	15	1.60	15.0	0.021	4.0	8.56	<0.050	0.26	0.65
Well 5	0.0067	0.55	0.080	0.25	<0.0004	110	0.019	7.80	1.4	14	1.90	6.5	0.011	4.0	8.56	<0.050	0.21	0.35
Well 8	0.0070	0.67	0.100	0.26	0.0015	140	0.029	13.00	4.5	20	0.75	24.0	0.068	4.6	9.84	<0.050	0.28	0.18
Well 10	0.0058	0.68	0.110	0.35	0.0022	130	0.027	18.00	4.8	19	0.68	31.0	0.065	4.3	9.20	0.077	0.28	0.16
Well 11	0.0069	0.69	0.110	0.41	0.0050	130	0.029	19.00	4.8	20	0.75	30.0	0.071	4.7	10.05	0.062	0.28	0.13
Well 14	0.0083	0.57	0.100	0.53	<0.0004	110	0.028	0.45	2.6	20	3.00	48.0	0.021	4.2	8.99	<0.050	0.27	1.00
Well 14	0.0084	0.55	0.120	0.48	<0.0004	110	0.026	0.91	3.4	19	3.10	43.0	0.021	4.1	8.77	0.051	0.27	0.93
Well 15	0.0050	0.61	0.097	3.10	<0.0004	120	0.019	21.00	1.4	16	0.40	12.0	0.013	2.9	6.20	0.064	0.28	0.19
Well 690	0.0056	0.54	0.078	0.18	<0.0004	100	0.021	0.52	1.4	14	0.95	16.0	0.008	4.3	9.20	<0.050	0.23	<0.008

SWSA 4 Bathtubbing Trenches Project August 1989

Groundwater Well Samples

Well Point	F (mg/l)	Cl (mg/l)	Br (mg/l)	NO3 (mg/l)	SO4 (mg/l)	SAR (calc)	Hardness (cal) (mg/l CaCO3)	Alkalinity (mg/l CaCO3)	HCO3 (mg/l)	TOC (mg/l)	&18O (meas)	&2H (meas)	&2H (calc)
Well 1	0.16	8.05	0.10	<0.05	0.38	0.356	337	390	475.5	7.2	-6.22	-31.30	-39.76
Well 5	0.16	4.43	<0.50	<0.05	0.32	0.155	332	380	463.3	5.8	-6.10	-31.20	-38.8
Well 8	0.43	10.20	0.28	0.07	9.02	0.502	432	522	636.4	8.0	-----	-----	-----
Well 10	0.39	11.80	0.37	0.10	5.29	0.672	403	532	648.6	8.3	-----	-----	-----
Well 11	0.39	12.60	0.38	0.10	3.98	0.647	407	550	670.6	10.6	-6.15	-34.90	-39.2
Well 14	0.20	24.00	0.16	<0.05	3.73	1.105	357	470	573.0	7.8	-6.40	-31.30	-41.2
Well 14D	0.20	25.90	0.17	<0.05	3.07	0.996	353	460	560.8	9.5	-6.45	-31.40	-41.6
Well 15	0.13	5.03	<0.05	<0.05	1.85	0.273	366	445	542.6	3.7	-6.11	-28.80	-38.88
Well 690	0.06	6.74	0.22	<0.05	14.60	0.397	307	367	447.5	3.4	-6.67	-33.00	-43.36

Appendix B

SITE MAPS

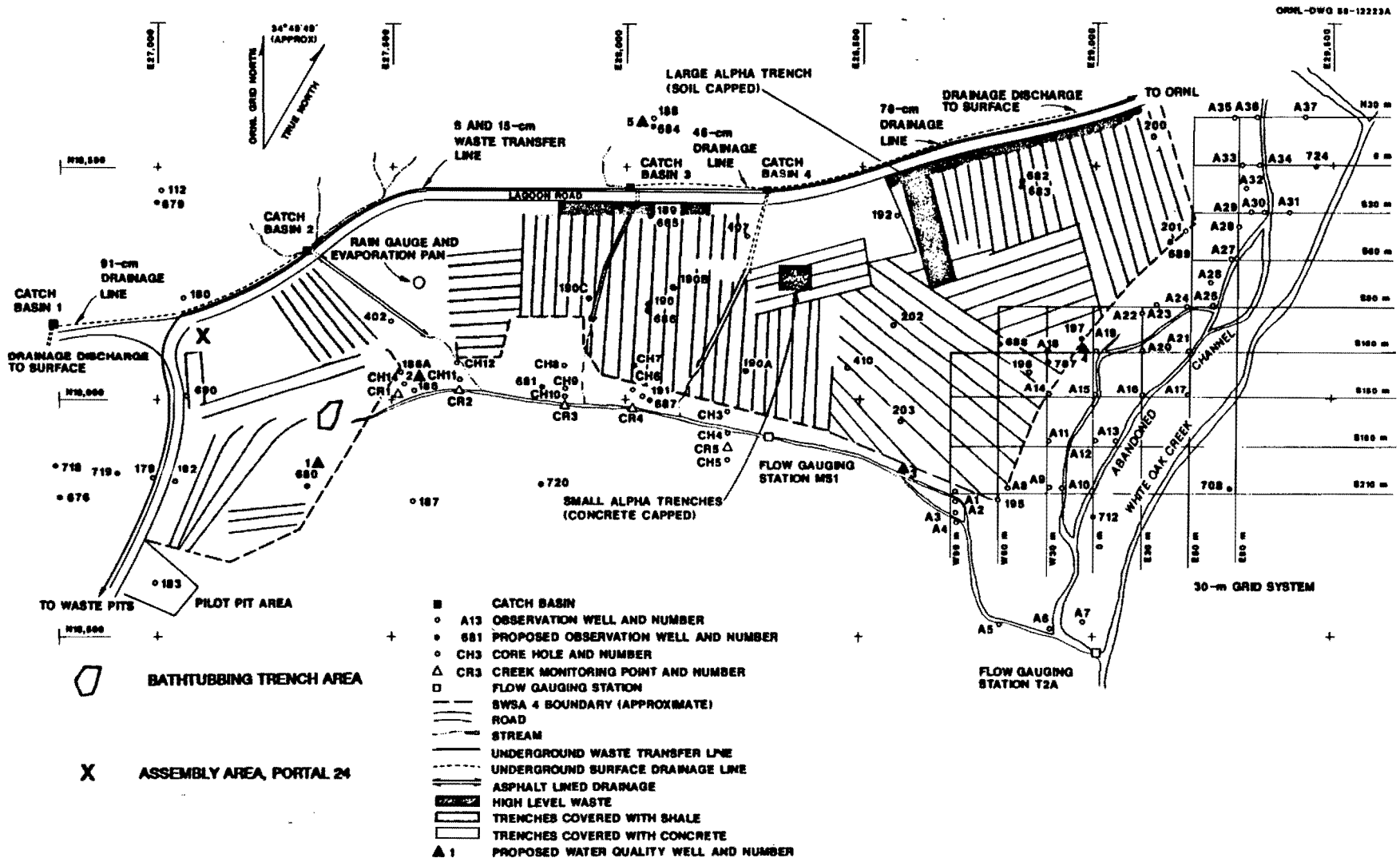

Fig. B.1. Site map of SWSA 4. Base map (ORNL-DWG 86-1223A) modified to illustrate location of bathtubbing trench area and assembly area (Portal 24).

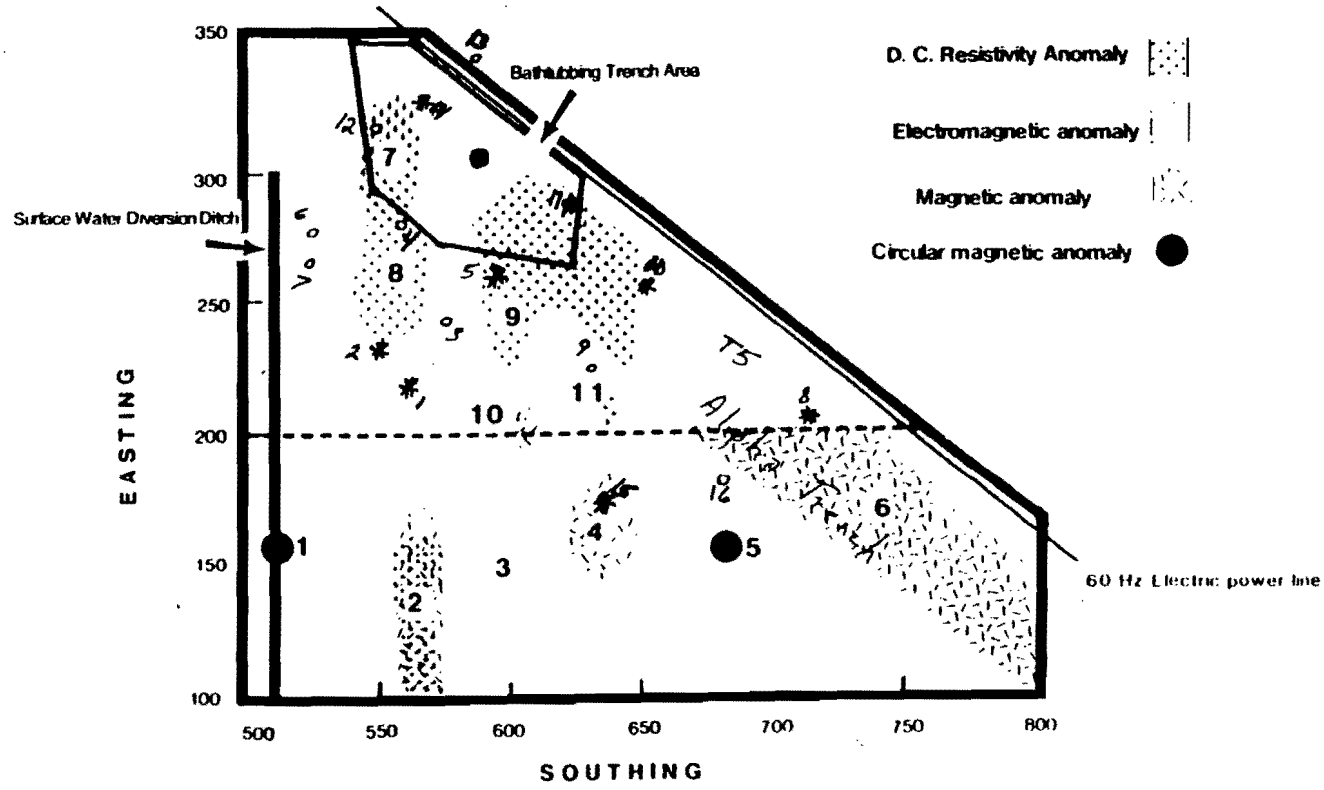

Fig. B.2. Map of the bathtubbing trench study area.

Appendix C

ES&H AND WASTE MANAGEMENT SURVEILLANCE PLAN WORKSHEET FOR WAG 2 RI&SI ALPHA CHARACTERIZATION OF SWSA 4 BATHTUBBING TRENCH

ES&H and Waste Management Surveillance Plan Worksheet
for
WAG 2/SI Alpha Characterization of SWSA 4 Bathtubbing Trench

Activity/Item	Inspected/Verified by (signature)	Date/Time	Comments
Pre-entry health and safety meeting held			
	SSHO		
Proper PPE use			
	SSHO		
Personnel know how to respond to an emergency			
	SSHO		
Radiation monitoring using Alpha Meter			
	SSHO		
Radiation monitoring using Beta/Gamma Meter			
	SSHO		
Waste properly bagged and labeled			
	SSHO		
Drums are labeled (including date)			
	SSHO		
Structural integrity of Drums			
	SSHO		

Additional Comments _____

_____

Appendix D

SITE HAZARDS AND CONTROLS

Table D-1. List of tasks, hazards, and controls

Task	Hazard	Control(s)
	Entry by unauthorized personnel	• Work-control zones
	Ticks/chiggers	• Apply tick repellant in hot weather • Visual inspection after site work
	Snake bites	• Make noise • Do not reach under objects • Snake-bite kit
	Sunburn	• Apply sunblock to exposed skin areas • Use long sleeved clothing to cover other areas • Limit exposure time
	Slip, trip, and fall	• Buddy system • Visual observation • Avoid uneven or slippery surfaces to the degree possible
	Heat stress	• Fluid intake • WBGT monitoring/work-rest cycles • Rotate personnel • Cool vests • Core temperature monitoring • Work during cooler times of day • Visual observations
	Cold stress	• Work-rest cycles • Layering clothing • Do not leave skin exposed to wind • Observe buddy for signs of frostbite
	Lighting	• Work during daylight hours
GW sampling	Splash	• Turn off pump when changing filters • Use plastic dispenser for acids
	Direct contact with acids or contaminated water	• Wear gloves and clothing resistant to the materials being handled
	Inhalation of vapors	• Vent well for 5 min before sampling (if volatiles are present) • Monitor for contaminants and use respiratory protection as necessary
	Lightning	• Visual observation • Audible thunder • Terminate field activities
	Traffic	• Not a problem since the work is on controlled government property

Table D-1 (continued)

Task	Hazard	Control(s)
Filtering sample	Shock hazard from generator	• Use GFI pigtail or GFI circuit
		• Avoid work in wet areas
	Dripping hazardous liquids	• Place absorbent pads in area where drips are anticipated
	Fire (gasoline)	• Fill generator before initial use. Let generator cool before refilling tank • Use funnel to avoid direct contact between engine and fuel • Bond gas can to engine • Use safety can for gasoline
	Manual lifting	• Seek help over 50 lb • Use mechanical aids such as hand trucks or forklifts
Exiting site	Contamination spread from exclusion area	• Contamination avoidance measures • Frisk before exiting • Decontaminate if frisk indicates contamination is present • Seal contaminated items in plastic bag if decontamination is not acceptable
Emergencies	Splash to eyes	• Flush for 15 min (eye wash unit) • Seek medical assistance
	Incipient stage fire	• Extinguish using fire extinguisher
		• Extinguish using water or sand
	Larger fire	• Withdraw and call fire department
	Cuts	• Apply first aid to stabilize. Report to clinic • Dispose of blood-soaked items at clinic
	Broken bones	• Stabilize with first aid and seek medical assistance
	Spill of acid or gasoline	• Call emergency response team

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