

SAMPLING AND ANALYSIS PLAN
FOR OPEN BURN AND OPEN
DETONATION UNITS

FORT MCCLELLAN,
PELHAM RANGE, ALABAMA

Environmental Group

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NOTE: Subsequent to preparation of the draft version of this document, it was determined that Unit 1 was included in the permit documentation erroneously. Rather than making substantial revisions to this document, the reader is instructed to disregard all references to "Unit 1".

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ACRONYMS

ADEM	Alabama Department of Environmental Management
ASTM	American Society for Testing and Materials
BLS	Below Land Surface
CAR	Corrective Action Report
CCQC	Contractor Chemical Quality Control
COC	Chain-of-Custody
CQC	Chemical Quality Control
DCQCR	Daily Chemical Quality Control Report
DOT	Department of Transportation
DQO	Data Quality Objective
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
GPS	Global Positioning System
HNu	Photoionization Detector
IDW	Investigation-Derived Waste
NTU	Nephelometric Turbidity Units
OB	Open Burn
OD	Open Detonation
OVA	Organic Vapor Analyzer
POC	Point of Contact
PPE	Personal Protective Equipment
ppm	parts per million
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control

ACRONYMS (CONTINUED)

RCRA	Resource Conservation and Recovery Act
RDX	Cyclotrimethylene-Trinitramine
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SSHSP	Site-Specific Health and Safety Plan
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TNT	Trinitrotoluene
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence

1.0 PROJECT DESCRIPTION

The U.S. Army Corps of Engineers (USACE) Mobile District contracted URS Group, Inc. to conduct a site characterization study of the open burn (OB) and open detonation (OD) units at Fort McClellan, Pelham Range, Alabama. This work is being conducted to demonstrate compliance with the closure performance and closure standards for achieving administrative clean closure of the Resource Conservation and Recovery Act (RCRA) interim status treatment units at Pelham Range. Two areas containing RCRA interim status treatment units have been identified at Fort McClellan, Pelham Range. One is located outside the Large Impact Area (Unit 1) and the second is located within the Large Impact Area (Unit 2) (see Figure 1-1).

The Sampling and Analysis Plan (SAP) defines the procedures and methods that will be used to collect field measurements and media samples during field activities. This SAP discusses the following:

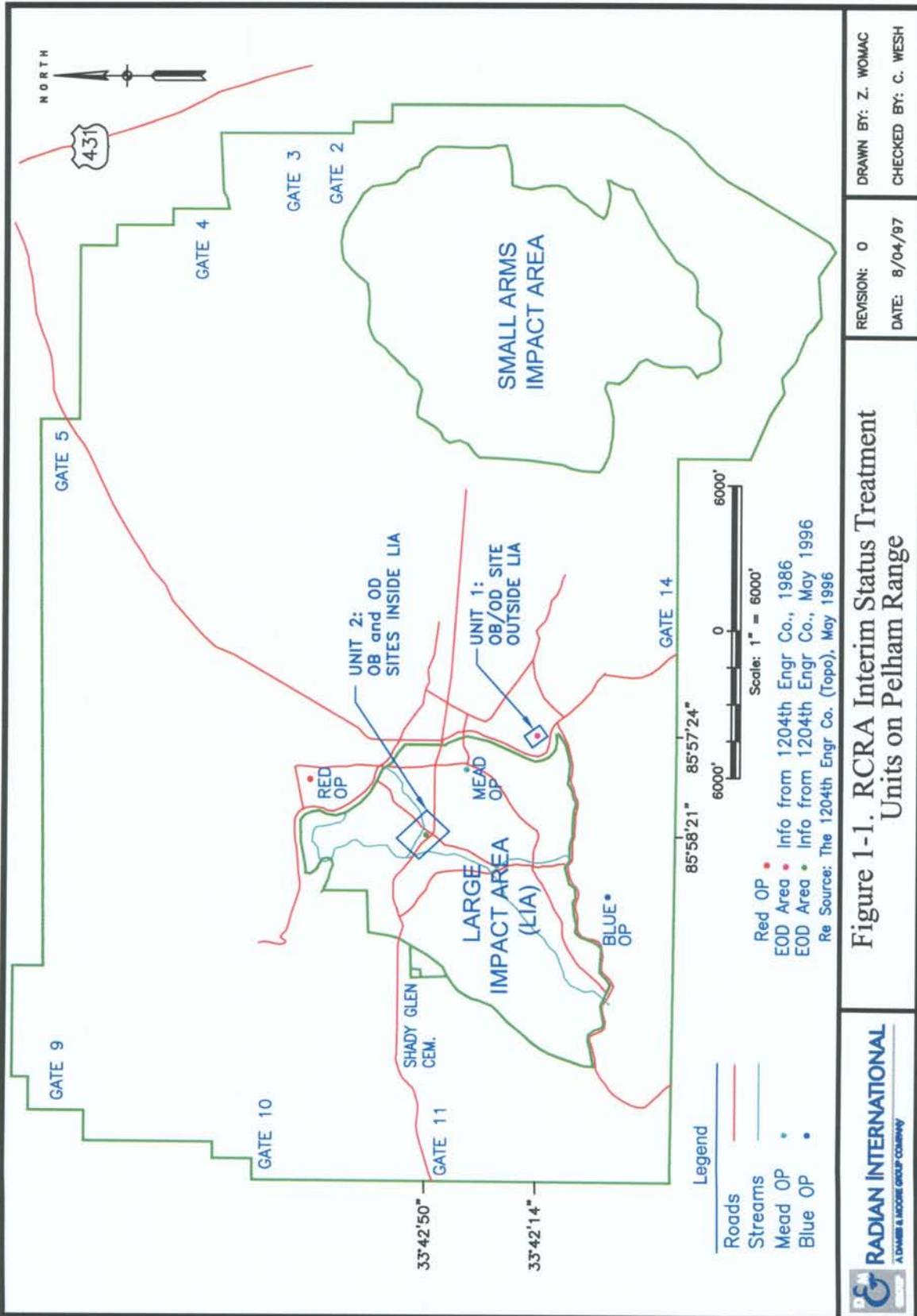
- Installation of groundwater monitoring wells;
- Procedures for the collection of surface and subsurface soil samples, sediment samples, and groundwater samples, including field measurements and quality assurance (QA)/quality control (QC) samples;
- Requirements for sample chain-of-custody (COC), documentation, and shipping;
- Management of investigation-derived waste (IDW); and
- The schedule of field activities.

1.1 Site History and Contaminants

Fort McClellan is a U.S. Army training installation, which is centrally located in Calhoun County, Alabama, adjacent to the City of Anniston, and along Alabama Highway 21 (Figure 1-2). The 41,174-acre installation covers 64.3 square miles and includes two main parcels of government-owned land.

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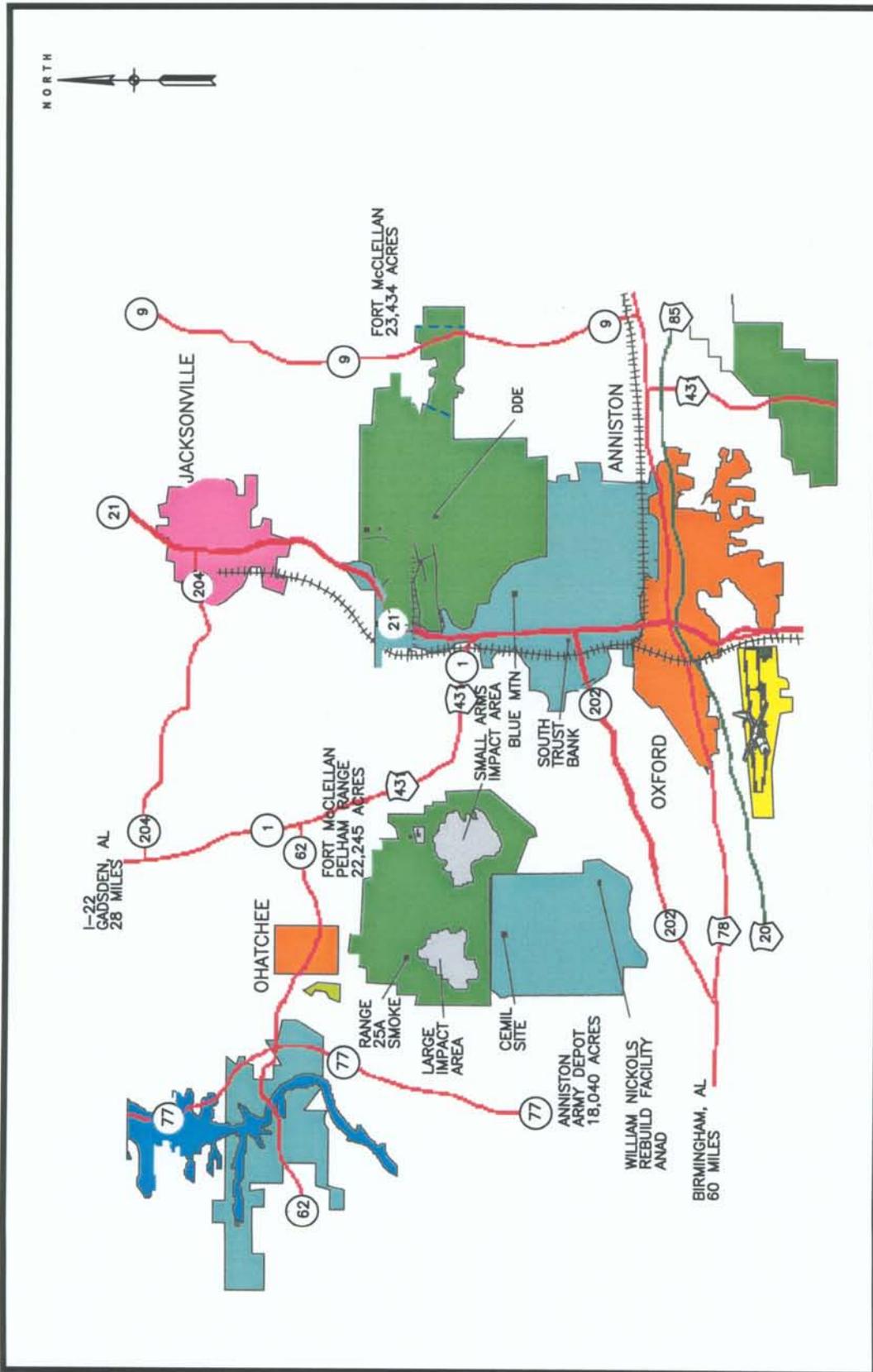
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Figure 1-1. RCRA Interim Status Treatment Units on Pelham Range





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Figure 1-2. General Vicinity Map for Fort McClellan Main Post and Pelham Range





Main Post—The first parcel, the Main Post, adjoins the City of Anniston, and extends 6 miles to the northeast toward Jacksonville, Alabama, along the Choccolocco Mountain Range. The Main Post encompasses approximately 19,000 acres. The cantonment area encompasses approximately 2,500 acres of the total 19,000 acres. The remaining acreage is made up of training areas, bivouac sites, and lightly to heavily forested unimproved property.

Pelham Range—The second parcel, Pelham Range, is located in a rural setting approximately 5 miles due west of the Main Post and 0.5 mile west of U.S. 431. Pelham Range consists of approximately 22,245 acres adjoining Anniston Army Depot to the south. Pelham Range is utilized as a series of multi-purpose firing and training ranges. Firing ranges, training and maneuver areas, bivouac sites, and maintenance facilities are located on Pelham Range. OB and OD activities, which are the subject of this SAP, have been conducted at two locations within the Pelham Range Large Impact Area and one location outside and east of the Large Impact Area.

The 722nd Explosive Ordnance Disposal (EOD) company operated the RCRA interim status treatment units at Fort McClellan to conduct small arms ammunition destruction, demilitarization of waste ordnance and munitions, and response to emergency operations involving explosive materials.

1.2 RCRA Interim Status Treatment Units

The RCRA interim status treatment units have been operating as interim status permitted treatment units since November 1988. The Part B permit application submitted in November 1988 for the RCRA interim status treatment units details the treatment activities and includes:

- Render nonhazardous Class C munitions and Class A and B explosives non-reactive by inducing materials to detonate or burn under controlled circumstances. Treatment (either OB or OD) occurs five to six times annually.
- To achieve burning, ordnance is placed within a demolition pit, primed, and remotely initiated. Wastes are packed with refuse (ammunition storage boxes,

crates, etc.) and saturated with diesel fuel prior to initiation of four 1-gal containers of gasoline. Approximately 360 lb total weight of munitions are destroyed per burn (1,800–2,160 lb annually).

- Items marked for OD are positioned within a demolition pit to expose the largest surface area to the initiating charge. Detonating blocks are distributed through the items and primed. Electrical initiation of detonation is performed remotely. A maximum of 40 lb NEW (including initiating materials) can be destroyed per detonation. Typically, C4 plastic explosives coupled with a time fuse or blasting cap are employed in the process.

Fort McClellan's 722nd EOD unit and its predecessors conducted treatment activities at different locations on Pelham Range from approximately 1983 to 1996. Two RCRA interim status treatment units have been identified on Pelham Range (Figure 1-2). One site is located east and outside of the Large Impact Area (Unit 1) and the other is centrally located within the Large Impact Area (Unit 2). There is only minimal physical evidence that OB and/or OD treatment activities occurred at the site located outside of the Large Impact Area. However, this location is referenced in base documentation. The site located inside the Large Impact Area includes an OD area (Site 2A), an OB and OD area near an unnamed crossroads (Site 2B), and a third OB and/or OD area near an old target area (Site 2C).

1.3 Unit 1: OB and OD Unit Outside the Large Impact Area of Pelham Range

Two data sources indicate that EOD activities occurred at Unit 1. A map of Pelham Range entitled *For Training Only Pelham Range* (dated 1986) identifies an EOD area at this location. The latitude/longitude coordinates provided in the RCRA Part B Suppart X permit application dated November 1988 also refer to the area labeled "EOD" on the 1986 map. Personnel interviews indicated that training and/or very minimal OD activities may have been conducted in this area. In March 2000, the Fort McClellan Environmental Office found documentation indicating the area where Unit 1 is located was used for demolition training. This documentation, a FONSI written sometime between 1980 and 1981, was submitted as part of a package for construction of Demolition Training Area at the location of Unit 1. Subsequent to preparation of the draft version of this document, it was determined that Unit 1 was included in

the permit documentation erroneously. Rather than making substantial revisions to this document, **the reader is instructed to disregard all references to Unit 1.**

Physical inspection of the area on 12 December 1996 revealed no evidence of OD craters. However, several depressions and soil piles were noted at the site, as well as crossties and railroad spikes (possible training bunkers). The perimeter of the unit is defined by the change in vegetation from new growth to more mature pines. Figure 1-3 shows that Unit 1 is 0.1 acre based upon a Global Positioning System (GPS) survey conducted during the 12 December 1996 site visit. The surface and subsurface magnetometer sweeps conducted in April 1997 over Unit 1 indicated no evidence of ordnance or ordnance explosive waste in the area.

1.4 Unit 2: OB and OD Units Inside the Large Impact Area of Pelham Range

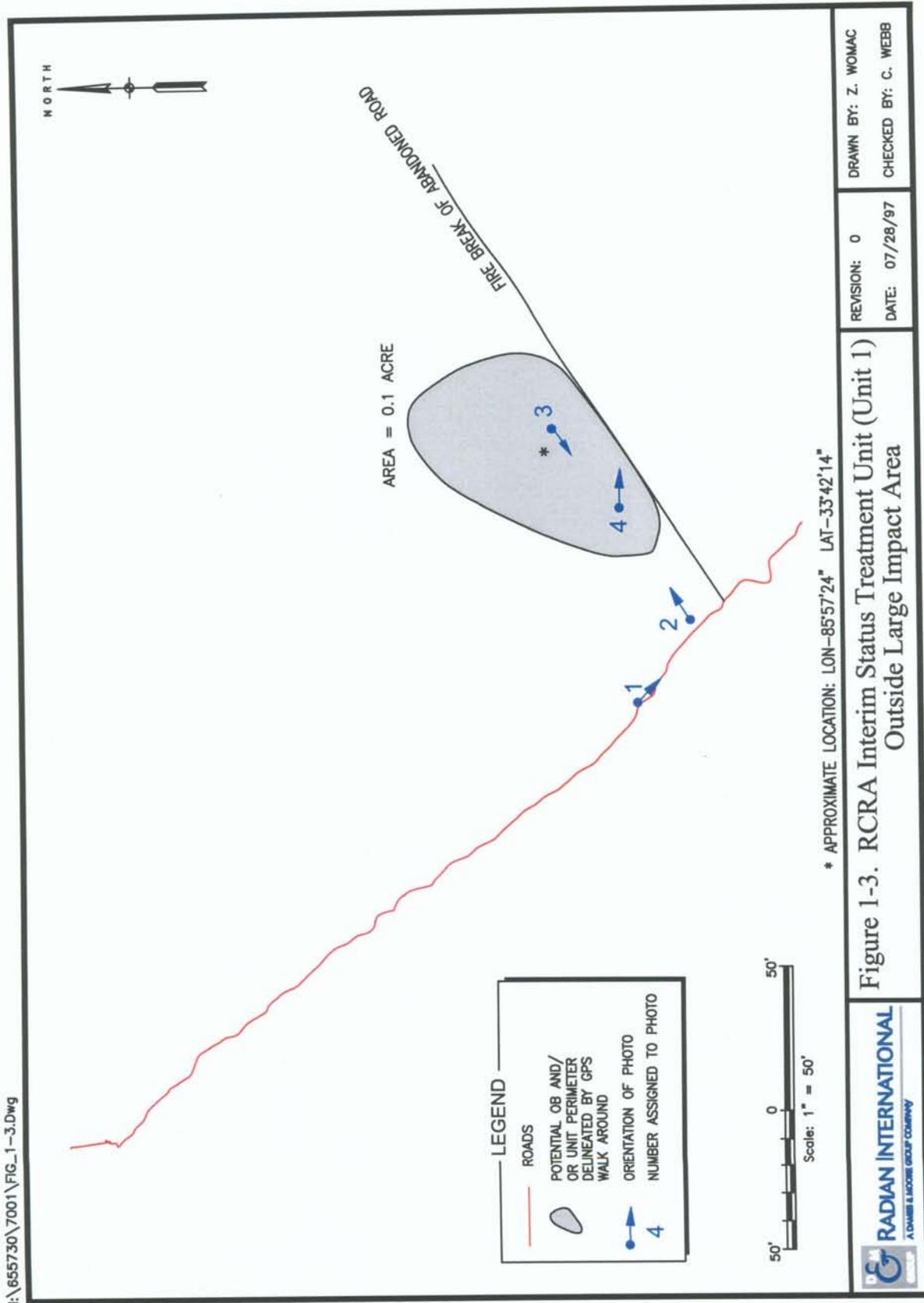
Three areas within the Large Impact Area were identified as OB and OD sites during site delineation. The areas from west to east include an OD area (Site 2A), OB and OD area near an unnamed crossroads (Site 2B), and an old target area in the Large Impact Area (Site 2C). Each site is discussed in detail below. Figure 1-1 shows the locations of the OB and/or OD sites within the Large Impact Area.

Site 2A—Extensive interviews with former EOD personnel indicate that Site 2A was used only for OD. The perimeter of the area (0.3 acre) and pit locations were delineated by GPS survey during the 22–23 April 1997 site visit (Figure 1-4). Nine of the pits shown in Figure 1-4 were located by obtaining a GPS point on the northern perimeter of each pit, and six of the pits were delineated by walking around the perimeter and obtaining GPS points at regular intervals. The pits range from 4 to 20 ft in diameter and are 2 to 8 ft deep.

Site 2B—The unit could have been used for OB and/or OD based on the permit application and interviews with EOD personnel. Surface debris, including an old truck bed, 55-gal drums, ammunition boxes, small arms cartridges, pieces of wood crates, spent rocket motors, and miscellaneous metal fragments, were observed in the area during the 22–23 April 1997 site visit. The size of Site 2B is approximately 0.6 acre as determined by a GPS survey conducted

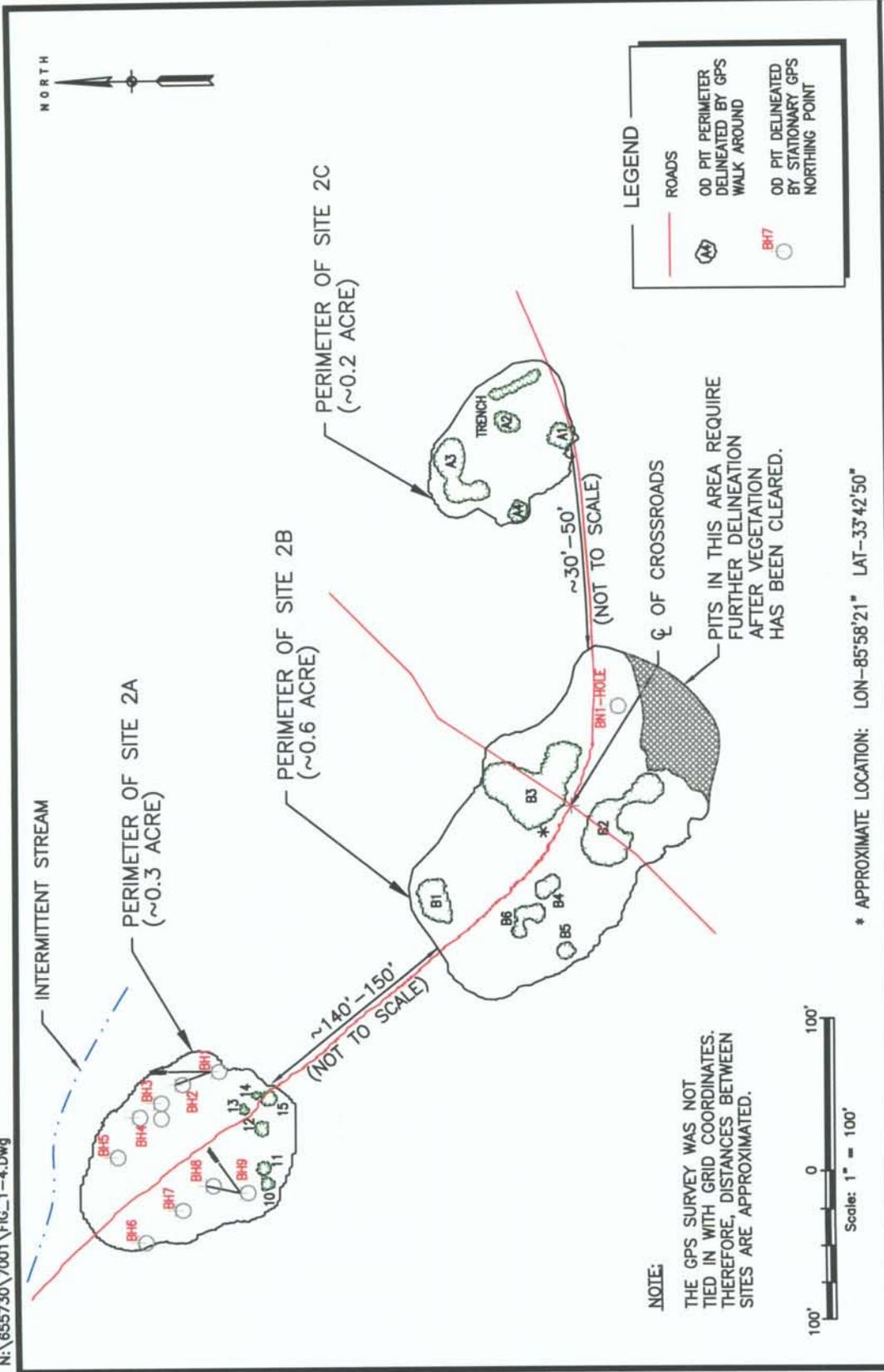
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Figure 1-4. RCRA Interim Status Treatment Unit 2 (Sites 2A, 2B, and 2C) Inside Large Impact Area





during the 22–23 April 1997 site visit (Figure 1-4). Seven pits were also delineated by GPS and range from 10 to 30 ft in diameter and are 3 to 10 ft deep. However, pits visually located in the southwest corner could not be accessed safely due to tall, dense vegetation in this area at the time of the site visit. This area will be cleared and delineated in more detail prior to sampling and closure activities.

Site 2C—Site 2C is a third area located within the Large Impact Area east of site 2B. The size of the area was determined to be approximately 0.2 acre by a GPS survey conducted during the 22–23 April 1997 site visit (Figure 1-4). The site includes four suspected demolition pits and a trench. The pits range from 10 to 15 ft in diameter and are 2 to 6 ft deep. Standing water was present in all the pits during the April 1997 site visit. The trench is approximately 40 ft long by 6 ft wide by 2 ft deep and did not contain any water. Ammunition cases, spent illumination cartridges, small arms cartridges, and spent mortar shells were also observed in the area. This site appears to be near an old target area. Several old targets and a large number of impact craters are visible around this location.

1.5 Site-Specific Sampling and Analysis Problems

The areas containing the OB and OD sites inside the Large Impact Area (Unit 2) are generally clear-cut with minimal physical structures or overhead obstructions and no subsurface service lines. Therefore, problems associated with groundwater monitoring well installation and soil sampling are expected to be minimal. The OB and/or OD area outside of the Large Impact Area (Unit 1) is densely vegetated with new growth pine trees that are physical obstructions requiring clearing prior to implementing field activities. Paths large enough for vehicle access will need to be created to each monitoring well location and soil sampling location. Site clearing will be scheduled and completed by Fort McClellan personnel.

Unexploded ordnance (UXO) may be present in the area due to training activities and possibly OB and OD treatment operations. Properly conducted OB and OD treatment will not contribute to UXO contamination, but the possibility exists. Prior to initiating any drilling or sampling activities, subcontracted EOD personnel will conduct a thorough surface sweep and

magnetometer sweep of the areas utilizing an MK-26 Ordnance Locator. Additionally, down hole readings will be taken at 1-ft intervals with a Schonstedt Magnetic Gradiometer model MG-220 or equivalent. Anomaly avoidance procedures will be employed throughout the field effort.

Water is available from a municipal potable source located outside the Large Impact Area. The water will be transported to the sites via a water truck. This water source is expected to be sufficient for use in decontaminating drilling and sampling equipment.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

URS's project team for the Fort McClellan site characterization project and their roles and responsibilities are discussed in this section. Figure 2-1 presents the overall project organization, including subcontractors.

2.1 Roles and Responsibilities

2.1.1 Contract Manager

Mr. Tony Babb will serve as the Contract Manager for this project. In this role, Mr. Babb will have overall responsibility, authority, and accountability for the project. He will function as the primary interface among the USACE, URS management, subcontractor management, and the project team. In executing these duties, he will:

- Have responsibility for meeting all contractual requirements for the task;
- Administer and supervise all contractual requirements for the task;
- Direct the formulation of SAPs in accordance with client directions;
- Have responsibility for ensuring that required staffing levels and technical expertise are provided;
- Keep the USACE Technical Manager informed on all aspects of the project, including expenditures, progress, problems, and recommended solutions;
- Be available to URS project personnel for action on any problem requiring additional management or technical support;
- Keep URS management informed on all matters relating to the project; and
- Review every technical project output prior to issue.

2.1.2 Project Manager

Mr. Chad Webb will serve as the Project Manager for this project. In this capacity, he will be responsible for organizing and directing the technical activities of the project and for reporting the results of these activities. He will have day-to-day interaction with the technical staff. In the execution of these duties, Mr. Webb will:

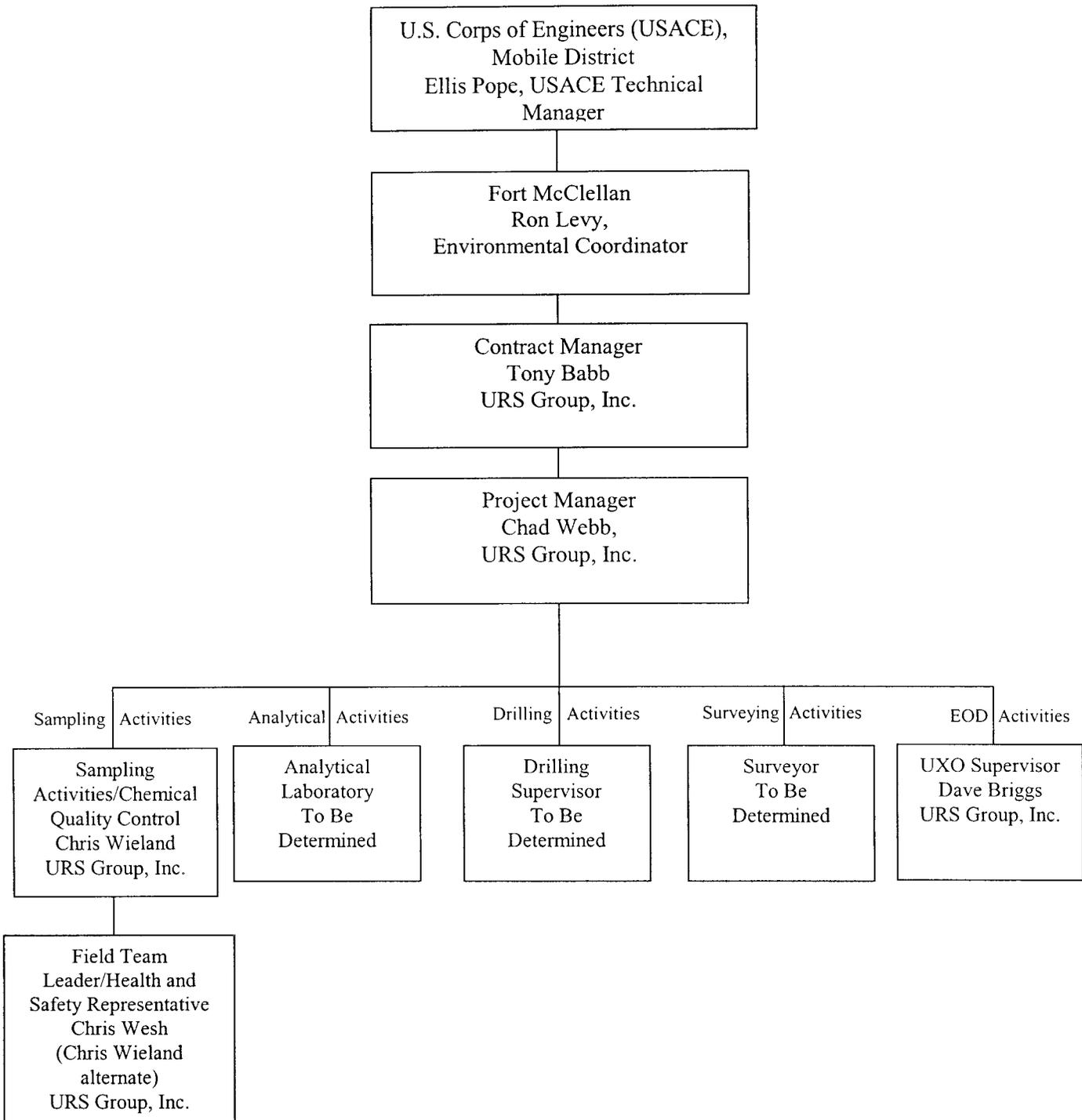


Figure 2-1. Organization of Project Team

- Establish technical objectives and assist the Contract Manager and field team leader in the preparation and review of SAPs;
- Be responsible for responding to SAP revisions;
- Advise the Contract Manager of technical progress, expenditures, program needs, potential problems, and recommended solutions;
- Ensure technical quality of reports, memoranda, and other communications through review of results;
- Maintain contact with the USACE Technical Manager in areas that require decisions on technical matters; and
- Confer with the Contract Manager in the selection of supporting technical staff and be responsible for reviewing their performance throughout the program.

2.1.3 Chemical Quality Control

Mr. Wieland will serve as the Chemical Quality Control (CQC) representative. In his role as the CQC, he will be responsible for ensuring all QC procedures are followed during the field activities and sample collection. CQC responsibilities will include:

- Implementation of the three-phase Contractor Chemical Quality Control (CCQC) process for all field work and
- Complete daily QC reports to be submitted to USACE on a daily basis.

2.1.4 Field Team Leader/Health and Safety Representative

Mr. Chris Wesh (Chris Wieland alternate) will serve as field team leader, resolving any technical and scope-related issues that arise during field activities, and as the health and safety representative. As the health and safety representative, Mr. Wesh will be responsible for ensuring compliance with the Site-Specific Health and Safety Plan (SSHSP) for field activities. The field team leader is responsible for managing the execution of all field activities as described in this SAP. Specifically, the responsibilities of the field team leader are to:

- Ensure that planned activities are executed in accordance with this plan and other applicable documents (e.g., SSHSP);
- Ensure that technical personnel are qualified by experience or training to perform assigned work and comply with the technical and QA requirements applicable to the work being performed;
- Serve as field custodian to coordinate and supervise all sample collection, packaging, and dispatching activities;
- Review, as appropriate, all project documentation; and
- Oversee activities performed by subcontractors.

The field team leader will be responsible for on-site coordination of field activities and initiation of field change notices to the project SAP. He will also be responsible for the coordination of activities for subcontractors involved in the investigation—the analytical laboratory, the drilling firm, and site surveyors. The field team leader will review all field data collected. He will observe field activities to ensure all tasks are conducted in accordance with the SAP.

2.1.5 Supervising Site/Rig Geologist

Mr. Christopher Wesh (Chris Wieland alternate), Professional Geologist, will serve as the supervising site/rig geologist. He will be required to ensure that boreholes are logged consistently and accurately and that sample integrity is maintained. He will be responsible for logging samples, collecting and shipping samples, recording groundwater data, preparing boring logs and well diagrams, and recording the well installation and decommissioning procedures conducted with that rig. General responsibilities of the site/rig geologist are to:

- Supervise drilling, sampling, and well installation activities;
- Act as on-site health and safety officer responsible for implementing all field surveillance activities necessary to ensure that worker health and safety concerns are fully addressed, including following the SSHSP requirements, training, and personal inspection;
- Inspect samples for physical evidence of contamination;

- Keep daily log of operations in field logbook, including complete daily field reports, time and materials log, and soil sample and organic vapor analyzer (OVA) and photoionization detector (HNU) reading data sheet;
- Record other pertinent information on drilling log form (e.g., OVA and HNU readings, discoloration, odor, and waste observed);
- Record intervals from which samples were taken for analysis;
- Prepare field notes and well logs for entry into geologic database;
- Assist in making field decisions regarding location of drilling, sampling, etc.;
- Coordinate day-to-day QC activities as part of the internal QC system; and
- Ensure compliance with all QC acceptance criteria as specified in the SAP.

2.2 Subcontractor Qualifications

Subcontractor staff managers assume ultimate responsibility for all operations under their subcontracts. Subcontractors and key personnel are presented below.

2.2.1 Drilling

Geotek Drilling Company, Inc. of Knoxville, Tennessee (preliminary selection) will provide all drilling services. Geotek will be responsible for meeting monitoring well installation requirements discussed in Section 4.3.2.

2.2.2 Survey Activities

The surveying of soil, sediment, and surface water sampling locations, piezometers, and monitoring wells will be completed by a licensed surveyor registered in the State of Alabama. The surveyor must meet the requirements contained in this SAP.

2.2.3 Laboratory Analytical Services

An analytical laboratory, yet to be determined, will provide analytical support for all the soil, surface water, sediment, and groundwater samples collected during the site

characterization activities at Fort McClellan. The subcontracted analytical laboratory will have all required state, federal, and USACE requirements.

2.3 Sample Collection Coordination

The field team leader (Mr. Chris Wesh) will be responsible for sample collection coordination as described in Section 2.1.4 and thus will serve in the capacity of field custodian. The field custodian is responsible for properly packaging and dispatching samples to the appropriate laboratory.

As discussed in Section 4.0, all soil, sediment, groundwater, and surface water samples will be collected in appropriate sample containers, sealed, and labeled. Each sample will be identified by affixing a pressure-sensitive gummed label or standardized tag on the container(s). This label will contain the sample identification number, date and time of collection, source, preservative used, analysis required, and the collector's initials. All samples will be recorded on a chain-of-custody (COC) record. Sample COC and documentation are discussed in detail in Section 5.0.

Samples will be placed in a shipping cooler, along with the COC record, pertinent field records, and analysis request form as needed. Samples will be packed with ice for preservation and padding, as necessary, to protect against breakage. The transportation case or cooler will be sealed or locked so that any tampering can be readily detected. Sample packaging and shipping requirements are outlined in Section 6.0.

When transferring samples, the transferee will sign and record the date and time on the COC record. Every person who takes custody will fill in the appropriate section of the record. The number of custodians in the chain of possession will be kept to a minimum.

The COC record and other pertinent forms will accompany all packages sent to the laboratory. URS will retain a copy of these forms. Mailed packages will be registered with

return receipt requested. For packages sent by common carrier, receipts will be retained as part of the permanent COC documentation.

2.4 IDW Disposal

IDW is expected to be generated in the form of soils and purge, decontamination, and development waters removed from the boreholes associated with the installation of groundwater monitoring wells and decontamination waters associated with the collection of soil samples. The results of soils and groundwater analyses performed on the analytical samples from the boreholes will be used to characterize the IDW. These samples will be analyzed for explosive constituents, Target Analyte List (TAL) metals, and organic compounds. IDW drums will be temporarily stored at the EOD Range pending the results of the analyses. If results indicate that no contamination is present, the soils will be placed at their origin within the unit. If results indicate the presence of hazardous constituents above allowable limits, the IDW drums will be removed to the Fort McClellan Container Storage Facility (RCRA permitted storage facility) pending removal by a licensed hazardous waste transporter. Storage and disposal of IDW are discussed in Section 7.0.

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3.0 SCOPE AND OBJECTIVES

The objective of the site characterization study is to gather data on current site conditions in support of closure of the RCRA interim status treatment units at Fort McClellan, Pelham Range. Chemical analysis data will be used to determine whether constituents of concern are present in soils, sediment, and surface and groundwater at and in the vicinity of the RCRA interim status treatment units. In order to meet this objective, surface and subsurface soil, sediment, surface water, and groundwater samples will be collected at and in the vicinity of the RCRA interim status treatment units. Samples will be analyzed for explosives, TAL metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). Refer to Table 3-1 for a complete list of analytes.

All sampling and analysis will be conducted in accordance with the U.S. Environmental Protection Agency (EPA) regulations and USACE and Alabama Department of Environmental Management (ADEM) requirements. The sampling locations and analytical parameters have been selected based on site conditions, historical data, and input from ADEM, EPA, installation personnel, and USACE.

Field replicates of both aqueous and solid matrices, trip blanks, equipment rinse blanks, and temperature blanks will be collected. The designated CQC representative will perform the QC responsibilities described in Sections 8.0 and 9.0. All analytical laboratories will be certified by the USACE Missouri River District (MRD) and will follow method-specific QA/QC procedures discussed in the Quality Assurance Project Plan (QAPP).

Table 3-1
Complete List of Analytes

Analyte	Solid MDL	Minimum Soil/Sediment Action Level ^a	Aqueous MDL	Minimum Groundwater/Surface Water Action Level ^a
TAL Metals (Method 6010/7471)				
Aluminum (6010-ICP)	5.8 mg/kg	8655 mg/kg	0.027 µg/L	1.6 mg/L
Antimony (6010-ICP)	0.5 mg/kg	1.38 mg/kg ^b	0.0015 µg/L	0.003 mg/L ^b
Arsenic (6010-ICP)	0.45 mg/kg	16.73 mg/kg	0.0032 mg/L	0.002 mg/L ^b
Barium (6010-ICP)	0.16 mg/kg	110.44 mg/kg	0.0012 mg/L	0.072 mg/L
Beryllium (6010-ICP)	0.057 mg/kg	0.69 mg/kg	0.00054 mg/L	0.007 mg/L
Cadmium (6010-ICP)	0.087 mg/kg	0.42 mg/kg ^b	0.00071 mg/L	0.001 mg/L ^b
Calcium (6010-ICP)	20 mg/kg	557.20 mg/kg	0.044 mg/L	16.8 mg/L
Chromium (6010-ICP)	0.17 mg/kg	39.56 mg/kg	0.0017 mg/L	0.019 mg/L
Cobalt (6010-ICP)	0.19 mg/kg	18 mg/kg	0.0014 mg/L	0.022 mg/L
Copper (6010-ICP)	0.72 mg/kg	12 mg/kg	0.0009mg/L	0.014 mg/L ^b
Iron (6010-ICP)	4.5 mg/kg	35530 mg/kg	0.018 mg/L	6.96 mg/L
Lead (6010-ICP)	0.42 mg/kg	36.81 mg/kg	0.0015 mg/L	0.009 mg/L
Magnesium (6010-ICP)	6.8 mg/kg	466 mg/kg	0.11 mg/L	6.94 mg/L
Manganese (6010-ICP)	0.21 mg/kg	1674 mg/kg	0.0014 mg/L	0.267 mg/L
Mercury (7471-CVAA)	0.0028 mg/kg	0.08 mg/kg	0.000072 mg/L	4.69 × 10 ⁻⁴ mg/L
Nickel (6010-ICP)	0.43 mg/kg	11 mg/kg	0.0047 mg/L	0.023 mg/L ^b
Potassium (6010-ICP)	16 mg/kg	335.98 mg/kg	0.190 mg/L	2.93 mg/L
Selenium (6010-ICP)	0.43 mg/kg	0.48 mg/kg ^b	0.0042 mg/L	0.007 × 82 mg/L
Silver (6010-ICP)	0.19 mg/kg	0.28 mg/kg ^b	0.0019 mg/L	0.004 mg/L ^b
Sodium (6010-ICP)	49 mg/kg	681 mg/kg	0.310 mg/L	3.09 mg/L
Thallium (6010-ICP)	0.57 mg/kg	0.60 mg/kg ^b	0.0049 mg/L	0.005 mg/L ^b
Vanadium (6010-ICP)	0.11 mg/kg	49.12 mg/kg	0.0022 mg/L	0.017 mg/L
Zinc (6010-ICP)	0.98 mg/kg	34 mg/kg	0.0059 mg/L	0.375 mg/L
Explosives (Method: 8330)				
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	130 µg/kg	MDL ^c	1.0 µg/L	MDL ^c
Hexahydro-1,3,5-trinitro-1,3,5-triazine	99 µg/kg	MDL ^c	0.14 µg/L	MDL ^c
1,3,5-Trinitrobenzene	50 µg/kg	MDL ^c	0.059 µg/L	MDL ^c
1,3-Dinitrobenzene	39 µg/kg	MDL ^c	0.04 µg/L	MDL ^c
Methyl-2,4,6-trinitrophenylnitramine	220 µg/kg	MDL ^c	0.14 µg/L	MDL ^c
2-Amino-4,6-dinitrotoluene	130 µg/kg	MDL ^c	0.11 µg/L	MDL ^c
4-Amino-2,6-dinitrotoluene	150 µg/kg	MDL ^c	0.13 µg/L	MDL ^c
Nitrobenzene	130 µg/kg	MDL ^c	0.13 µg/L	MDL ^c
2,4,6-Trinitrotoluene	74 µg/kg	MDL ^c	0.068 µg/L	MDL ^c
2,4-Dinitrotoluene	39 µg/kg	MDL ^c	0.053 µg/L	MDL ^c
2,6-Dinitrotoluene	87 µg/kg	MDL ^c	0.088 µg/L	MDL ^c
2-Nitrotoluene	77 µg/kg	MDL ^c	0.087 µg/L	MDL ^c
3-Nitrotoluene	140 µg/kg	MDL ^c	0.23 µg/L	MDL ^c
4-Nitrotoluene	130 µg/kg	MDL ^c	0.27 µg/L	MDL ^c
Explosives (Method: Modified 8330 or 8332)				
PETN	34 µg/kg	MDL ^c	5.9 µg/L	MDL ^c
Nitroglycerin	38 µg/kg	MDL ^c	5 µg/L	MDL ^c

Table 3-1
(Continued)

Analyte	Solid MDL	Minimum Soil/Sediment Action Level ^a	Aqueous MDL	Minimum Groundwater/Surface Water Action Level ^a
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	22 µg/kg	MDL ^c	0.36 µg/L	MDL ^c
1,2-Dichlorobenzene	24 µg/kg	MDL ^c	0.31 µg/L	MDL ^c
1,3-Dichlorobenzene	31 µg/kg	MDL ^c	0.32 µg/L	MDL ^c
1,4-Dichlorobenzene	27 µg/kg	MDL ^c	0.29 µg/L	MDL ^c
2,4,5-Trichlorophenol	29 µg/kg	MDL ^c	0.74 µg/L	MDL ^c
2,4,6-Trichlorophenol	20 µg/kg	MDL ^c	0.35 µg/L	MDL ^c
2,4-Dimethylphenol	28 µg/kg	MDL ^c	0.39 µg/L	MDL ^c
2,4-Dichlorophenol	31 µg/kg	MDL ^c	0.66 µg/L	MDL ^c
2,4-Dinitrophenol	150 µg/kg	MDL ^c	0.8 µg/L	MDL ^c
2,4-Dinitrotoluene	40 µg/kg	MDL ^c	0.41 µg/L	MDL ^c
2,6-Dinitrotoluene	29 µg/kg	MDL ^c	0.34 µg/L	MDL ^c
2-Chloronaphthalene	24 µg/kg	MDL ^c	0.39 µg/L	MDL ^c
2-Chlorophenol	32 µg/kg	MDL ^c	0.24 µg/L	MDL ^c
2-Methyl-4,6-dinitrophenol	200 µg/kg	MDL ^c	5 µg/L	MDL ^c
2-Methylnaphthalene	32 µg/kg	MDL ^c	0.33 µg/L	MDL ^c
2-Methylphenol (o-cresol)	32 µg/kg	MDL ^c	0.29 µg/L	MDL ^c
2-Nitroaniline	42 µg/kg	MDL ^c	5.3 µg/L	MDL ^c
2-Nitrophenol	19 µg/kg	MDL ^c	0.36 µg/L	MDL ^c
3,3'-Dichlorobenzidine	150 µg/kg	MDL ^c	4.4 µg/L	MDL ^c
3-Methylphenol/4-Methylphenol (m&p-cresol)	42 µg/kg	MDL ^c	0.71 µg/L	MDL ^c
3-Nitroaniline	32 µg/kg	MDL ^c	5 µg/L	MDL ^c
4-Bromophenyl phenyl ether	24 µg/kg	MDL ^c	0.35 µg/L	MDL ^c
4-Chloro-3-methylphenol	49 µg/kg	MDL ^c	0.33 µg/L	MDL ^c
4-Chloroaniline	37 µg/kg	MDL ^c	0.98 µg/L	MDL ^c
4-Chlorophenylphenylether	28 µg/kg	MDL ^c	0.66 µg/L	MDL ^c
4-Nitroaniline	42 µg/kg	MDL ^c	7.7 µg/L	MDL ^c
4-Nitrophenol	160 µg/kg	MDL ^c	4.9 µg/L	MDL ^c
Acenaphthene	29 µg/kg	MDL ^c	0.25 µg/L	MDL ^c
Acenaphthylene	21 µg/kg	MDL ^c	0.33 µg/L	MDL ^c
Anthracene	21 µg/kg	MDL ^c	0.33 µg/L	MDL ^c
Benzo(a)anthracene	20 µg/kg	MDL ^c	0.3 µg/L	MDL ^c
Benzo(a)pyrene	29 µg/kg	85.1	0.41 µg/L	1.83 × 10 ⁻³
Benzo(b)fluoranthene	23 µg/kg	MDL ^c	0.28 µg/L	MDL ^c
Benzo(g,h,i)perylene	26 µg/kg	MDL ^c	0.68 µg/L	MDL ^c
Benzo(k)fluoranthene	26 µg/kg	MDL ^c	0.72 µg/L	MDL ^c
Benzoic acid	61 µg/kg	MDL ^c	9.9 µg/L	MDL ^c
Benzyl alcohol	30 µg/kg	MDL ^c	0.49 µg/L	MDL ^c
bis(2-Chloroethoxy)methane	29 µg/kg	MDL ^c	0.26 µg/L	MDL ^c
bis(2-Chloroethyl)ether	26 µg/kg	MDL ^c	0.44 µg/L	MDL ^c
bis(2-Chloroisopropyl)ether	33 µg/kg	MDL ^c	0.23 µg/L	MDL ^c

Table 3-1
(Continued)

Analyte	Solid MDL	Minimum Soil/Sediment Action Level ^a	Aqueous MDL	Minimum Groundwater/Surface Water Action Level ^a
Semivolatile Organic Compounds (Continued)				
bis(2-Ethylhexyl)phthalate	45 µg/kg	4.52×10^{-4}	0.48 µg/L	4.31
Butylbenzylphthalate	42 µg/kg	MDL ^c	0.41 µg/L	MDL ^c
Chrysene	21 µg/kg	MDL ^c	0.44	MDL ^c
Dibenzo(a,h)anthracene	52 µg/kg	MDL ^c	0.8 µg/L	MDL ^c
Dibenzofuran	30 µg/kg	MDL ^c	0.29 µg/L	MDL ^c
Diethylphthalate	32 µg/kg	MDL ^c	0.47 µg/L	MDL ^c
Dimethylphthalate	25 µg/kg	MDL ^c	0.39 µg/L	MDL ^c
Di-n-butylphthalate	28 µg/kg	MDL ^c	0.26 µg/L	MDL ^c
Di-n-octylphthalate	54 µg/kg	MDL ^c	0.35 µg/L	MDL ^c
Fluoranthene	31 µg/kg	MDL ^c	0.33 µg/L	MDL ^c
Fluorene	31 µg/kg	MDL ^c	0.38 µg/L	MDL ^c
Hexachlorobenzene	45 µg/kg	MDL ^c	0.19 µg/L	MDL ^c
Hexachlorobutadiene	23 µg/kg	MDL ^c	0.35 µg/L	MDL ^c
Hexachlorocyclopentadiene	51 µg/kg	MDL ^c	2.4 µg/L	MDL ^c
Hexachloroethane	24 µg/kg	MDL ^c	0.32 µg/L	MDL ^c
Indeno(1,2,3-cd)pyrene	67 µg/kg	MDL ^c	0.56 µg/L	MDL ^c
Isophorone	26 µg/kg	MDL ^c	0.37 µg/L	MDL ^c
Naphthalene	25 µg/kg	MDL ^c	0.36 µg/L	MDL ^c
Nitrobenzene	27 µg/kg	MDL ^c	0.31 µg/L	MDL ^c
N-Nitrosodimethylamine	49 µg/kg	MDL ^c	0.49 µg/L	MDL ^c
n-Nitrosodi-n-propylamine	32 µg/kg	MDL ^c	0.29 µg/L	MDL ^c
N-Nitrosodiphenylamine/Diphenylamine	25 µg/kg	MDL ^c	0.34 µg/L	MDL ^c
Pentachlorophenol	180 µg/kg	MDL ^c	4 µg/L	MDL ^c
Phenanthrene	17 µg/kg	MDL ^c	0.33 µg/L	MDL ^c
Phenol	42 µg/kg	MDL ^c	0.28 µg/L	MDL ^c
Pyrene	63 µg/kg	MDL ^c	0.53 µg/L	MDL ^c
Volatile Organic Compounds				
Benzene	1.7 µg/kg	2.17×10^{-4}	0.1 µg/L	1.41
Bromobenzene	1.2 µg/kg	MDL ^c	0.11 µg/L	MDL ^c
Bromochloromethane	1.2 µg/kg	MDL ^c	0.21 µg/L	MDL ^c
Bromodichloromethane	0.88 µg/kg	1.02×10^{-4}	0.14 µg/L	1.08
Bromoform	0.82 µg/kg	MDL ^c	0.24 µg/L	MDL ^c
Bromomethane	3.6 µg/kg	MDL ^c	0.44 µg/L	MDL ^c
n-Butylbenzene	2.1 µg/kg	MDL ^c	0.14 µg/L	MDL ^c
sec-Butylbenzene	2.4 µg/kg	MDL ^c	0.11 µg/L	MDL ^c
tert-Butylbenzene	2 µg/kg	MDL ^c	0.07 µg/L	MDL ^c
Carbon tetrachloride	1.9 µg/kg	MDL ^c	0.09 µg/L	MDL ^c
Chlorobenzene	1.3 µg/kg	1.53×10^{-5}	0.09 µg/L	14.6
Chloroethane	2.2 µg/kg	MDL ^c	0.22 µg/L	MDL ^c
Chloroform	1.7 µg/kg	7.77×10^{-4}	0.14 µg/L	1.15

Table 3-1
(Continued)

Analyte	Solid MDL	Minimum Soil/Sediment Action Level ^a	Aqueous MDL	Minimum Groundwater/Surface Water Action Level ^a
Volatile Organic Compounds (Continued)				
Chloromethane	1.3 µg/kg	MDL ^c	0.3 µg/L	MDL ^c
2-Chlorotoluene	1 µg/kg	MDL ^c	0.11 µg/L	MDL ^c
4-Chlorotoluene	1.2 µg/kg	MDL ^c	0.14 µg/L	MDL ^c
Dibromochloromethane	0.84 µg/kg	MDL ^c	0.17 µg/L	MDL ^c
1,2-Dibromo-3-chloropropane	0.61 µg/kg	MDL ^c	0.37 µg/L	MDL ^c
1,2-Dibromoethane (EDB)	0.86 µg/kg	MDL ^c	0.13 µg/L	MDL ^c
Dibromomethane	0.93 µg/kg	MDL ^c	0.07 µg/L	MDL ^c
1,2-Dichlorobenzene	1.1 µg/kg	4.19×10^{-5}	0.08 µg/L	28.7
1,3-Dichlorobenzene	1.3 µg/kg	1.13×10^{-5}	0.11 µg/L	7.80
1,4-Dichlorobenzene	1.4 µg/kg	2.63×10^{-4}	0.14 µg/L	1.76
Dichlorodifluoromethane	2.4 µg/kg	MDL ^c	0.2 µg/L	MDL ^c
1,1-Dichloroethane	1.6 µg/kg	7.77×10^{-5}	0.38 µg/L	1.83
1,2-Dichloroethane	1.2 µg/kg	6.93×10^{-3}	0.46 µg/L	0.448
1,1-Dichloroethene	2.2 µg/kg	MDL ^c	0.19 µg/L	MDL ^c
Cis-1,2-Dichloroethene	1.7 µg/kg	7.77×10^{-4}	0.51 µg/L	15.4
Trans-1,2-Dichloroethylene	1.9 µg/kg	MDL ^c	0.19 µg/L	MDL ^c
1,2-Dichloropropane	1.4 µg/kg	MDL ^c	0.09 µg/L	MDL ^c
1,3-Dichloropropane	1.6 µg/kg	MDL ^c	0.14 µg/L	MDL ^c
2,2-Dichloropropane	2 µg/kg	MDL ^c	0.4 µg/L	MDL ^c
1,1-Dichloropropylene	2 µg/kg	MDL ^c	0.12 µg/L	MDL ^c
Cis-1,3-Dichloropropene	0.99 µg/kg	MDL ^c	0.17 µg/L	MDL ^c
Trans-1,3-Dichloropropene	2.1 µg/kg	MDL ^c	0.49 µg/L	MDL ^c
Ethylbenzene	2 µg/kg	MDL ^c	0.11 µg/L	MDL ^c
Hexachlorobutadiene	1.4 µg/kg	MDL ^c	0.14 µg/L	MDL ^c
Isopropylbenzene	3.8 µg/kg	MDL ^c	0.1 µg/L	MDL ^c
p-Isopropyltoluene	1.4 µg/kg	MDL ^c	0.13 µg/L	MDL ^c
Methylene chloride (Dichloromethane)	1.4 µg/kg	8.41×10^{-4}	0.25 µg/L	7.85
Naphthalene	0.57 µg/kg	MDL ^c	0.21 µg/L	MDL ^c
n-Propylbenzene	1.7 µg/kg	MDL ^c	0.19 µg/L	MDL ^c
Styrene	1.8 µg/kg	MDL ^c	0.16 µg/L	MDL ^c
1,1,1,2-Tetrachloroethane	1.3 µg/kg	MDL ^c	0.11 µg/L	MDL ^c
1,1,2,2-Tetrachloroethane	1 µg/kg	MDL ^c	0.13 µg/L	MDL ^c
Tetrachloroethene	3 µg/kg	1.21×10^{-4}	0.38 µg/L	1.26
Toluene	1.8 µg/kg	1.55×10^{-6}	0.28 µg/L	259
1,2,3-Trichlorobenzene	0.96 µg/kg	MDL ^c	0.17 µg/L	MDL ^c
1,2,4-Trichlorobenzene	1 µg/kg	7.76×10^{-4}	0.16 µg/L	13.2
1,1,1-Trichloroethane	2.1 µg/kg	MDL ^c	0.14 µg/L	MDL ^c
1,1,2-Trichloroethane	0.96 µg/kg	MDL ^c	0.15 µg/L	MDL ^c
Trichloroethylene	2.1 µg/kg	4.66×10^{-4}	0.17 µg/L	13.2
Trichlorofluoromethane	2.8 µg/kg	MDL ^c	0.49 µg/L	MDL ^c

Table 3-1
(Continued)

Analyte	Solid MDL	Minimum Soil/Sediment Action Level ^a	Aqueous MDL	Minimum Groundwater/Surface Water Action Level ^a
Volatile Organic Compounds (Continued)				
1,2,3-Trichloropropane	1 µg/kg	MDL ^c	0.49 µg/L	MDL ^c
1,2,4-Trimethylbenzene	1 µg/kg	MDL ^c	0.09 µg/L	MDL ^c
1,3,5-Trimethylbenzene	1.2 µg/kg	MDL ^c	0.15 µg/L	MDL ^c
Vinyl chloride	1.5 µg/kg	3.32×10^{-2}	0.28 µg/L	0.032
o-Xylene	1.6 µg/kg	MDL ^c	0.12 µg/L	MDL ^c
m&p-Xylene	3 µg/kg	MDL ^c	0.31 µg/L	MDL ^c
Acetone	3.6 µg/kg	MDL ^c	12 µg/L	MDL ^c
2-Butanone	3.3 µg/kg	MDL ^c	5.5 µg/L	MDL ^c
4-Methyl-2-pentanone (MIBK)	4.9 µg/kg	MDL ^c	0.59 µg/L	MDL ^c
Carbon disulfide	2.2 µg/kg	MDL ^c	0.35 µg/L	MDL ^c

^aThe minimum action levels are taken from the background values and SSSLs presented in Section 8 of the closure plan.

^bThis minimum action level consists of background values. If final detection limits are below the MDL, the results will be compared to the applicable SSSL.

^cSSSLs have not been calculated for this compound. If detected above the detection limit, SSSLs will be developed for this compound for comparison.

ICP = Inductively coupled (argon) plasma atomic emission spectrophotometer

CVAA = Cold vapor atomic adsorption spectrophotometer

4.0 FIELD ACTIVITIES

The site characterization of the three OB and OD sites within the Large Impact Area (Unit 2) and the OB and/or OD area outside the Large Impact Area (Unit 1) will include sampling and analysis of sediment, surface water, and groundwater and field screening and analysis of surface and subsurface soils to determine the presence or absence of constituents of concern at the site. If constituents of concern are present, sampling and analysis activities will be used to determine the nature and extent of the constituents. Soil samples within each OB and OD unit will be field screened [cyclotrimethylene-trinitramine (RDX), trinitrotoluene (TNT), and TAL metals] and laboratory analyzed for a full suite of analytes (explosives, TAL metals, VOCs, and SVOCs). Sampling and analysis for site characterization will be conducted in accordance with EPA Soil Screening Guidance Publication 9355.4-23, April 1996, Attachments 1 and 2, where applicable. This section discusses the requirements and procedures for the field activities to be performed. Additional standard operating procedures (SOPs) are provided in Attachment B.

Field activities involving sample/data collection will include the following:

1. **Soils**—Establish a 25-ft grid over each of the four OB and/or OD units. Collect surface soil samples at each grid node and field screen soils for RDX and TNT, TAL metals, and VOCs. Field screening results will also be used to determine subsurface sampling locations and quantities for laboratory analysis. Elevated field screening results are defined as (1) detectable levels greater than 1 part per million (ppm) of explosives, (2) metal concentrations above established background concentrations for Pelham Range, and (3) detectable levels greater than 1 ppm of total organic vapor. Collect samples based on field screening results for laboratory verification. A detailed discussion of these activities is included in Sections 4.4 and 4.5.
2. **OD Crater and OB Trench**—Collect five surface soil samples within each OD crater and OB trench greater than 5 ft in diameter and one soil sample within each OD crater less than 5 ft in diameter for field screening of RDX and TNT, TAL metals, and VOCs. Field screening results will be used to determine laboratory verification sampling locations. Areas with OD craters and OB trenches are located within the Large Impact Area. Areas with OD craters are identified as Unit 2, Sites 2A, 2B, and 2C. Site 2C contains an OB trench. A detailed discussion of these activities is included in Section 4.5.

3. **Piezometers**—Install three piezometers around the area containing the RCRA interim status treatment units within Large Impact Area (Unit 2) and three piezometers around the area containing the OB and/or OD units outside the Large Impact Area (Unit 1) to determine groundwater flow direction. Flow direction data will be used to determine the location of permanent monitoring wells. A detailed discussion of these activities is included in Section 4.3.
4. **Monitoring Wells**—Three groundwater monitoring wells (one upgradient and two downgradient) will be installed at each of the OD units within the unconfined aquifer. Split spoon samples will be collected continuously from ground surface to bottom of borehole. Groundwater samples will be collected from each well. A detailed discussion of these activities is included in Section 4.3.

Since this is an impact area, some ordnance could be present in the area due to training activities. All on-site activities will be coordinated with the USACE Technical Manager, the installation point of contact (POC), and the Range Control unit stationed at Fort McClellan. Entry requests will be coordinated with the Range Control unit at least 10 days prior to mobilizing to the site. UXO qualified personnel will accompany field teams to the RCRA interim status treatment units during all field activities. If known or suspected ordnance is discovered at any time during sample collection activities, UXO personnel will stop operations in the affected area and immediately notify the local EOD unit and POC, as well as the USACE Technical Manager. No activities will take place until the UXO personnel declare the area safe and clear to proceed with sampling activities.

4.1 Geophysics

Prior to initiating any drilling or sampling activities, UXO personnel will conduct a thorough surface sweep at each area of concern. The surface sweep will be completed visually and with a magnetometer utilizing a MK-26 Ordnance Locator (or equivalent equipment) during soil sampling and monitoring well installation. The visual surface sweep will be completed over each area of concern. Upon completion of the visual surface sweep, a MK-26 Ordnance Locator or equivalent will be used at each sampling location within the area of concern for the detection of buried ordnance. The MK-26 Ordnance Locator or equivalent will be used for the detection of

munitions to a depth of 1 ft. Qualified personnel will calibrate the instrument daily and operate as per the manufacturer requirements.

During subsurface soil sampling and piezometer and monitoring well installation, downhole magnetometer readings will be conducted using a Schonstedt Magnetic Gradiometer Model MG 220 or equivalent at 1 ft intervals to the groundwater interface. Subsurface soil sampling and piezometer and monitoring well installation will be completed utilizing hollow stem augers. For each method, the Gradiometer will be used at 1 ft intervals. After advancing each 1-ft interval, the hollow stem augers will be raised 1 ft, and the Gradiometer will be lowered to the bottom of the borehole before advancing the next 1 ft. Gradiometer data will be compared for each borehole to detect anomalous readings. If anomalous readings are observed, the borehole will be abandoned and re-located.

4.2 Soil Gas Survey

No soil gas survey will be performed for this project.

4.3 Groundwater

A qualified geologist or hydrogeologist will be on-site and will log and describe all drilling, well installation, well development, and well testing operations. The geologist will have on-site QA/QC responsibility for the drilling operations. Twelve groundwater monitoring wells will be installed into the unconfined aquifer in accordance with Section 4.3.2. Precautions will be taken to prevent contamination of the wells during and after installation. The water samples will be analyzed for explosives, TAL metals, VOCs, and SVOCs to determine the presence or absence of constituents of concern.

4.3.1 Rationales

4.3.1.1 Monitoring Well Location and Installation

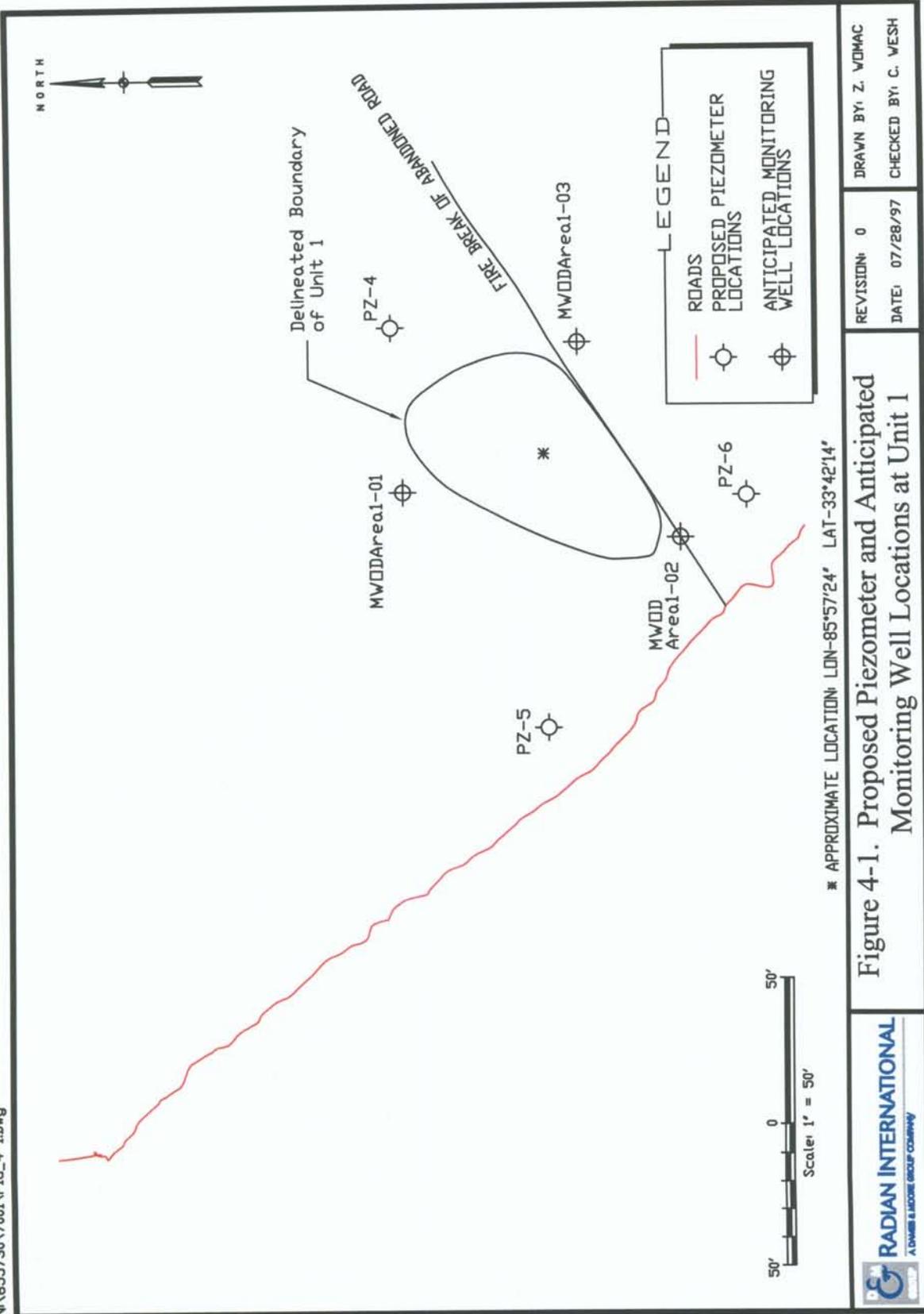
OB and/or OD Area Outside the Large Impact Area (Unit 1)—Prior to the selection of the well locations at Unit 1, three shallow piezometers screened a minimum of 5 ft into the water table aquifer will be installed surrounding the unit to determine the groundwater flow direction. The top of the casing of each piezometer will be surveyed to determine relative groundwater elevations. After groundwater has equilibrated for a minimum of 24 hours, groundwater elevations will be measured and compared to determine groundwater flow direction. Based on this information, three permanent groundwater monitoring wells will be installed around the unit, one upgradient and two downgradient. The anticipated depth of the wells is less than 25 ft. Figure 4-1 shows the approximate locations of the piezometers and wells at Unit 1.

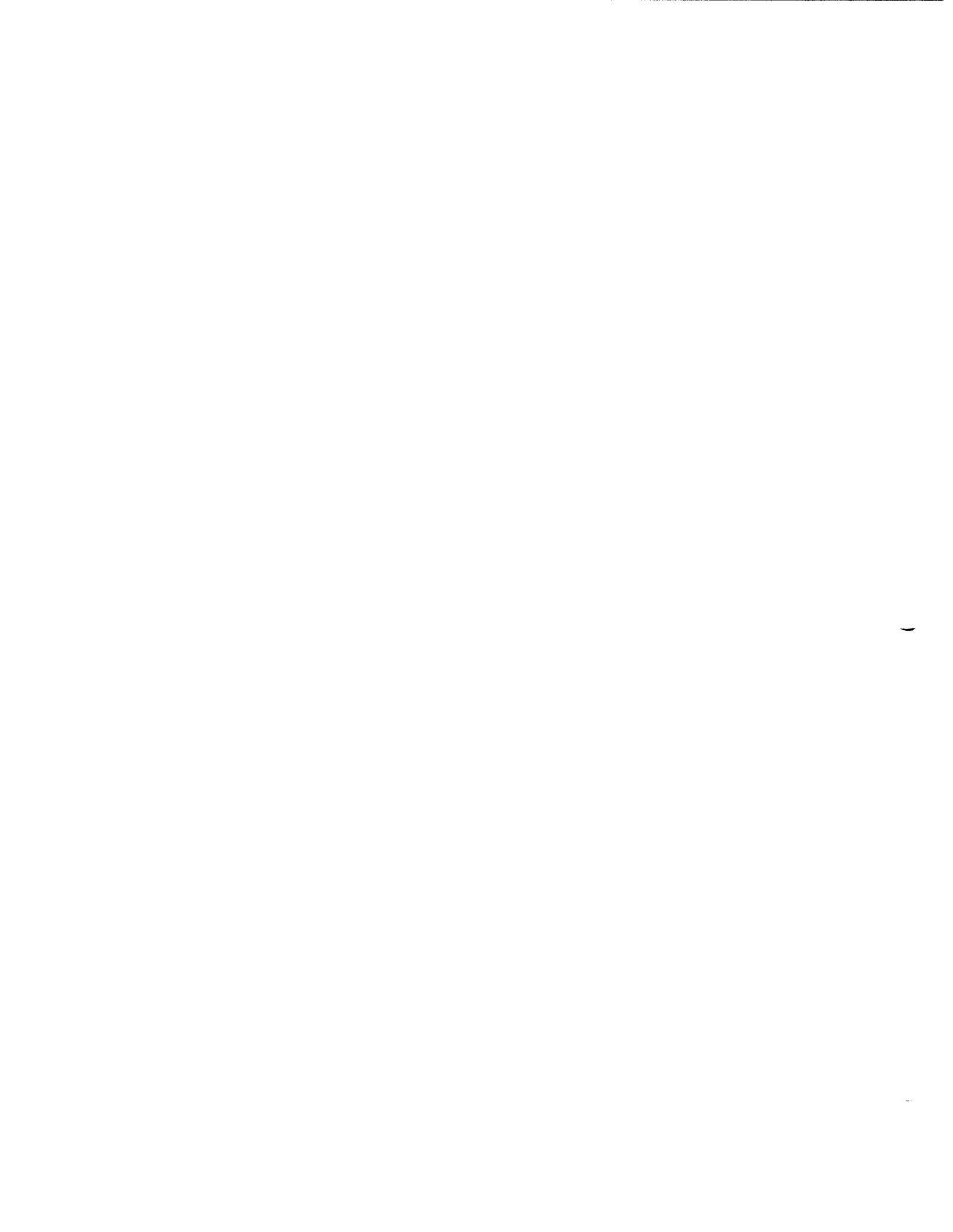
OB and OD Sites Within the Large Impact Area (Unit 2)—Prior to the selection of the well locations within the Large Impact Area, three shallow piezometers screened a minimum of 5 ft into the water table aquifer will be installed surrounding the three sites (Sites 2A, 2B, and 2C) to determine the groundwater flow direction. The top of the casing of each piezometer will be surveyed to determine relative groundwater elevations. After groundwater has equilibrated for a minimum of 24 hours, groundwater elevations will be measured and compared to determine groundwater flow direction. Based on this information, three permanent groundwater monitoring wells will be installed around the site, one upgradient and two downgradient. The anticipated depth of the wells is less than 25 ft. Figure 4-2 shows the approximate locations of the piezometers and wells at Unit 2.

4.3.1.2 Sample Collection and Field and Laboratory Analysis

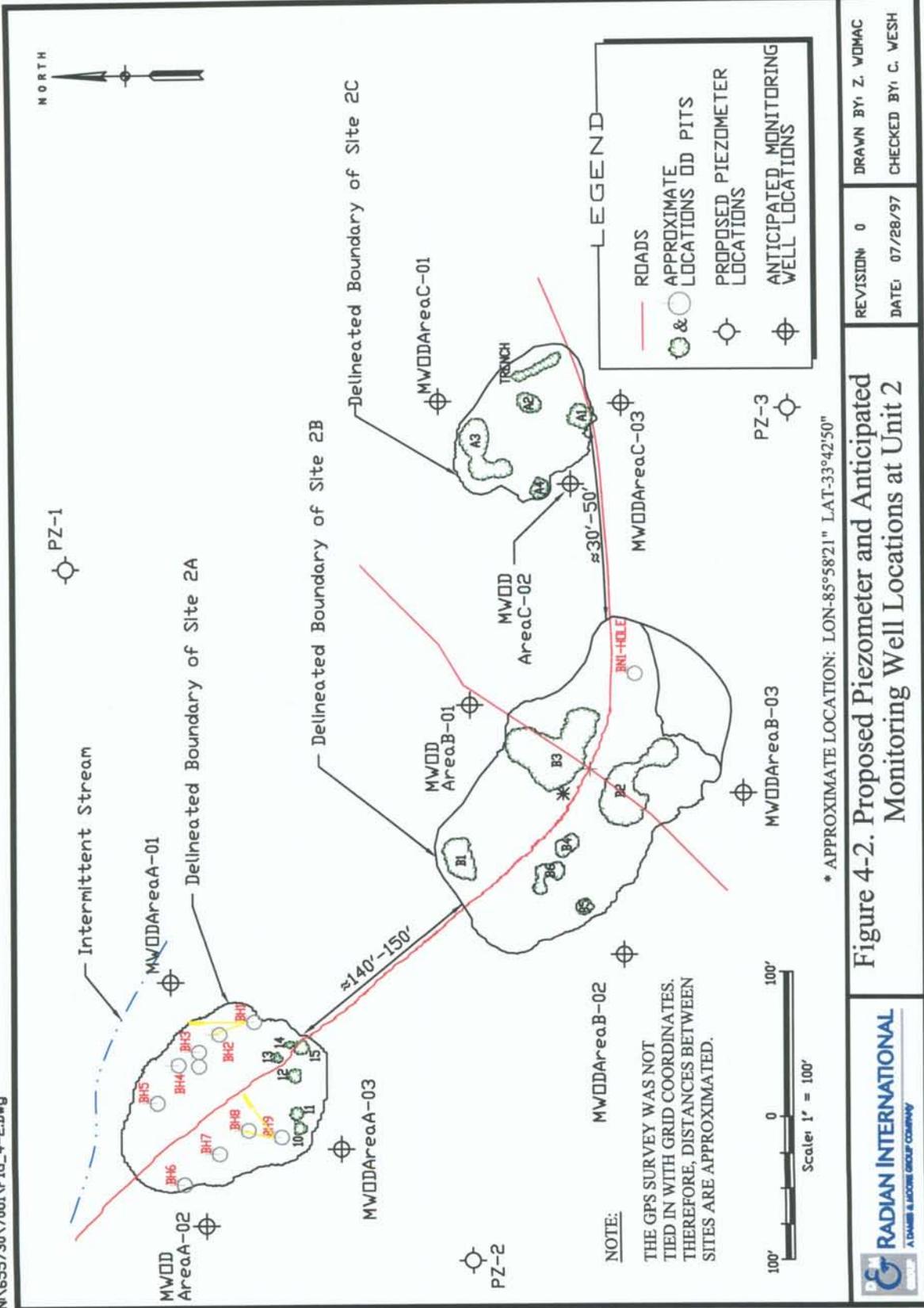
After the monitoring well network has been installed, the groundwater will be allowed to equilibrate for a minimum of 14 days prior to sampling. Groundwater samples will be collected from each monitoring well and submitted to an off-site laboratory for explosives, TAL

N:\655730\7001\FIG_4-1.DWG





N:\655730\7001\FIG_4-2.Dwg



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Figure 4-2. Proposed Piezometer and Anticipated Monitoring Well Locations at Unit 2





metals, SVOC, and VOC analyses. Table 4-1 presents a sample and analysis matrix for groundwater. Table 3-1 presents a complete list of analytes.

Table 4-1
Sampling and Analysis Matrix for Groundwater

Monitoring Well^a	Explosives (SW-8330)	Nitroglycerin and PETN (SW-8330 mod.)	TAL Metals Total and Dissolved (SW6010/7000+)	VOCs (SW-846/8260)	SVOCs (SW-846/8270)
MWOD Area A-01	X	X	X	X	X
MWOD Area A-02	X	X	X	X	X
MWOD Area A-03	X	X	X	X	X
MWOD Area B-01	X	X	X	X	X
MWOD Area B-02	X	X	X	X	X
MWOD Area B-03	X	X	X	X	X
MWOD Area C-01	X	X	X	X	X
MWOD Area C-02	X	X	X	X	X
MWOD Area C-03	X	X	X	X	X
MWOD/Area1-01	X	X	X	X	X
MWOD/Area1-02	X	X	X	X	X
MWOD/Area1-03	X	X	X	X	X

^a QA and QC samples are not included in this matrix.

Soil samples will be continuously collected from each monitoring well boring location. Soil samples will be collected in plastic or glass jars and visually classified by the Unified Soil Classification System [American Society for Testing and Materials (ASTM) D 2487-92 and ASTM D 2488-90] and appropriately described on the boring log (refer to Section 4.3.2.4).

4.3.1.3 Upgradient, QA/QC, and Blank Samples and Frequency

One upgradient monitoring well will be installed at both of the RCRA interim status treatment units to represent background groundwater quality for each area. Field QC duplicates and QA split groundwater samples will be collected at a frequency of 10% of the number of samples.

Therefore, one QA and one QC sample will be collected from the groundwater monitoring well network. An equipment rinsate blank will be performed on groundwater

sampling equipment after decontamination at a frequency of one per day (if decontamination is performed) per analysis. Trip blanks will be included in each cooler containing samples being submitted for VOC analysis. Temperature blanks will also be included in all sample coolers being submitted for laboratory analyses.

4.3.2 Monitoring Well Installation

4.3.2.1 Drilling Methods and Equipment

The monitoring wells will be installed by a licensed driller in the state of Alabama. Due to the nature of operations at the RCRA interim status treatment units and because this is an impact area that has received live fire training round for many years, there is a possibility of buried UXO at each. A UXO specialist will support all field activities. Based on the location of the monitoring well, this may require all drilling equipment to be removed from the borehole at 1-ft intervals for the survey to be conducted. Figure 4-3 shows a schematic design of a typical monitoring well. The hollow stem auger will have a minimum inside diameter of 6 in. and will be of a continuous flight design.

4.3.2.2 Materials

Wells will be designed and constructed using EPA Environmental Investigation Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) and EM 1110-1-4000, "Monitor Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites".



Casing/Screen—All well screen and riser pipe will be new, 2-in. inside diameter, Schedule 40, polyvinyl chloride (PVC) that conforms to ASTM D 1785. All connections will be flush joint threaded connections. No solvents or glue will be used in the fabrication of the well screen and riser pipe, including the end cap for the well screen. Well screens will be 10 ft long with continuous, factory cut or wired wrapped 0.010-in. slots.

Filter Pack, Bentonite, Grout—The filter material for the groundwater monitoring wells will be cleaned, rounded, uniformly graded, quartz filter sand, free of calcareous material, and free of organic material. The gradation will conform to a commercially available 20 - 40 filter sand; blasting sand is not permitted. The bentonite will be in the form of commercially prepared, 3/8-in.-diameter pellets. The grout will consist of Portland cement (ASTM C 150, Type I or II), powdered bentonite, and potable water. The grout will be comprised of cement, 3% to 4% bentonite, by weight of cement, and 7 gal of water/1 ft³ of cement (94 lb).

Surface Completion—All monitoring wells installed at the site will be above ground (stick-up). Stick-ups are appropriate in locations where wells are constructed in topographically low or poorly drained areas and entry of surface run-off into the wellhead is possible. Temporary, secure, watertight caps will be provided for incomplete wells or open boreholes anytime active construction or development operations are halted.

Water Source—The Fort McClellan water distribution system does not serve the areas containing the RCRA interim status treatment units. Water needed on-site will be obtained from a location specified by the installation POC (preferably a fire hydrant) and transported to the site by the drilling subcontractor.

Delivery, Storage, and Handling of Materials—Specific areas will be established at the RCRA interim status treatment units for staging materials used during the field effort. Site selection will be coordinated with the UXO personnel prior to initiation of site work. The drilling subcontractor will transport waste drums to a staging area designated by the installation POC.

Prior to the placement of any well screen or riser in the well, it will be steam-cleaned. After cleaning, the well screen and riser will be protected to prevent recontamination prior to installation.

4.3.2.3 Installation

Test Holes and Piezometers—As discussed in Section 4.3.1.1, prior to monitoring well installation, three piezometers will be installed around Unit 2 located within the Large Impact Area and three piezometers will be installed around Unit 1 located outside the Large Impact Area to determine the groundwater flow direction for monitoring well placement. Depending on site conditions, the borings may be advanced by hollow stem augers, wet rotary, or any other approved method required to complete the task. The piezometers will be constructed of 2-in.-diameter PVC pipe installed within the open borehole. The piezometer will be screened 5 ft into the water table with a filter pack installed around the screen. Upon completion of the monitoring well installation, the PVC pipe will be removed and the borehole tremie grouted.

Soil Sampling and Rock Coring During Drilling—Soil samples will be collected for soil classification for each monitoring well boring location. Split spoon samples (ASTM D 1586-84) will be collected continuously from the ground surface to the bottom of the borehole. Samples will be collected by driving a 1 3/8-in.-inner diameter 2 ft long split spoon sampler into the soil using a 140-lb hammer, falling 30 in. Blow counts will be recorded for each 6 in. of penetration of the sampler. Soil samples will be collected for each sample interval and stored in properly labeled jars.

Soil Classification—All soil samples will be visually classified in accordance with the Unified Soil Classification System (ASTM D 2487-92 and ASTM D 2488-90) and appropriately described on the boring log.

Borehole Diameter and Depth—If the site conditions allow, monitoring wells will be installed using 6-in.-inner diameter continuous flight augers at a minimum and to an anticipated depth of 25 ft in Unit 1 and 35 ft in Unit 2.

Screen and Well Casing Placement—Well screens will be 2-in. diameter, Schedule 40, threaded PVC and 10 ft in length and will be set within approximately the top 2–3 ft above the water table, encountered when the well is drilled. The monitoring wells will be completed with 2-in.-diameter, Schedule 40, threaded PVC casing from the top of the screen to approximately 3 ft above grade. After the hollow stem auger has advanced the borehole to the required depth and the annulus of the auger has been cleaned out, the well screen will be installed at the depth specified. The top of each PVC well casing will be equipped with a water-proof plug to prevent the possible entry of extraneous materials into the monitoring well.

Filter Pack Placement—The filter pack will be continuously tremied into place from the bottom of the boring to 2 ft above the top of the screen. A filter sand, meeting the requirements specified, will be introduced into the annular space of the auger as it is slowly withdrawn from the hole. Extreme care will be taken to ensure that the volume of the sand in the annular space of the auger is sufficient to ensure the placement of a continuous filter pack around the well screen as the auger is withdrawn from the hole. The filter pack will extend a minimum of 2 ft above the well screen. The monitoring wells will be surged with a surge block approximately 15 minutes after the filter pack has been installed.

Bentonite Seal—After the placement of the filter pack around the well screen, a minimum 3 ft thick bentonite plug will be installed in the well. The 3/8-in.-diameter bentonite pellets will be placed in 6-in. lifts, and each lift will be thoroughly wetted and tamped prior to placing each subsequent lift. After the bentonite seal has been installed, it will be allowed to hydrate for 1 hour prior to installing the grout seal.

Cement/Bentonite Grout Placement—The grout seal will be placed from the top of the bentonite seal to the ground surface by means of a tremie pipe. The grout will be emplaced by a bottom, side discharge tremie pipe.

Concrete/Gravel Pad Placement—A minimum of 24 hours after placing the internal grout seal in the well an external concrete protective pad will be placed. The protective pad

will be a minimum 5 1/2 in. thick and 3 ft-square. The base of the protective pad will be set 1.5 in. below the natural ground surface, and the pad will be finished so that the pad surface is sloped to drain away from the well casing. Wooden or steel forms will be used when the concrete well pad is placed.

Protective Cover Placement—The PVC well casing will be protected from damage by a lockable steel protective casing set into the concrete protective pad. The drilling contractor will provide appropriate, keyed-alike padlocks for the wells. Four 4-in.-diameter black steel protective pipes will be set, in concrete backfilled holes, around the perimeter of the concrete pad. The protective pipes will be set a minimum of 1.5 ft into the ground and will extend 4 ft above the ground. After the protective pipes are installed, they will be backfilled with concrete and the concrete will extend above the top of the pipe and be rounded off to prevent the ponding of water inside the pipes. The protective pipes will be cleaned of concrete, dirt, etc., primed with a rust preventing enamel primer, and painted with two coats of Occupational Safety and Health Administration Safety Yellow enamel.

Well Identification—A brass USACE survey disk will be placed in each pad (stamped with the well number and the surveyed ground reference) at each well. A metal plate with the corporate name, registration number, well number, depth, installation date, and elevation will be permanently attached to the well casing or the protective casing, whichever is more suitable. In addition, the wells will be permanently labeled “MONITORING WELL - NOT FOR WATER SUPPLY.” Monitoring wells will not be painted. Monitoring well number identification placards will be attached to the protective pipes in such a manner as to be readable from a road or trail.

Well Development—Well development will be performed as soon as possible after the well installation, but not sooner than 48 hours and not later than 7 days after placement of the internal grout seal. Well development will be accomplished using a surge block and bailer, surge block and pump, or other approved method. Blowing the well with compressed air or pumping with an airlift pump will not be permitted. The method selected for well development will ensure that the filter pack is thoroughly developed by causing the development water to surge back and forth through the filter pack. Development will continue until the groundwater is clear, is free of

sediment and drilling fluids, and water quality parameters (pH, temperature, conductivity, dissolved oxygen, and turbidity) have stabilized. If suitable development is not obtained after 6 hours of continuous development action, the geologist will stop development activities. He will either provide recommendations and procedures that will allow that well to meet standards for sample quality or will redrill the well at no additional cost to the government. After final development of the well, the geologist will collect approximately 1 L of water from the well in a clear glass jar, label and photograph it with a 35mm color slide, and submit the slide as part of the well log. The photograph will have a suitable backlight and be taken close up to show the clarity of the water. All development tools, including winch line, will be steam-cleaned prior to use in each well.

Well Survey—Following monitoring well installation, each well will be surveyed by a licensed surveyor in the state of Alabama. The horizontal location of each well will be determined to the nearest foot. The ground surface and top of casing elevation will be determined to the nearest 0.01 ft relative to mean seal level.

Alignment Testing—Alignment testing will not be performed for this project.

In Situ Permeability Testing—In situ permeability testing will not be performed for this project.

4.3.2.4 Documentation

Logs and Well Installation Diagrams—Detailed boring logs and well construction drawings will be completed for each well. A qualified geologist or hydrogeologist will observe the drilling of each well boring. Field observation will be recorded on ENG Form 1836, “Drilling Log.” Data recorded will include:

- Boring number and coordinates;
- Reference elevation for all depth measurements;
- Standard penetration test blow counts;
- Density, color, and classification of soil samples;

- Depth and thickness of each stratum;
- Identification and description of the material of which each stratum is composed;
- Types and sizes of samplers used;
- Depth interval from which each sample was taken;
- Sample number, sample recovery, and blow count;
- Depth at which groundwater was first encountered;
- Depth to static water level and changes in static water level with depth;
- Total depth of completed well;
- Quantity of grout used for grouting or sealing;
- Nominal borehole diameter;
- Description of well screen, manufacturer, length, location, slot size, diameter, and material;
- Static water level on completion of well and after development;
- Date boring started and date completed;
- Name of URS geologist;
- Name of driller and certificate number;
- Type of drill rig;
- Time allowed for hydration and bentonite;
- Well development methods and time spent on development; and
- Volume of water purged.

The boring log will be accompanied by a well installation diagram that completely details the well installation and references all depths to the top of casing elevation determined by survey.

Development Record—Details of well development (method, field measurements, water quality measurements, volume removed, etc.) will be documented and attached to the drilling logs.

Geophysical Logs—Not applicable.

Photographs—After final development of the well, the geologist will collect approximately 1 L of water from the well in a clear glass jar, label and photograph it with a 35mm color slide, and submit the slide as part of the well log. The photograph will have a suitable backlight and be taken close up to show the clarity of the water. Photographs will also be taken of each installed well.

4.3.2.5 Well Abandonment

It may be necessary to abandon wells during or after installation due to obstructions, improper installation, etc. The PVC pipe will be removed, if applicable, and the borehole will be tremie grouted.

4.3.2.6 Water Level Measurement

The top of each well casing will be notched to identify a constant measuring point for determining groundwater elevations. All water level measurements will be made with a decontaminated electronic water level indicator.

4.3.3 Determine Free Product Presence and Sampling

Free product determination and sampling will not be performed for this project.

4.3.4 Aquifer Testing

Aquifer testing will not be performed for this project.

4.3.5 Field Measurement Procedures and Criteria

The water quality screening instruments that may be used in the field during monitoring well installation are listed below:

- Specific conductance, dissolved oxygen, and temperature meter;
- pH meter;
- Thermometer;
- Turbidity meter; and
- Electronic water level indicator.

Instruments will be calibrated, at minimum, each day during field use. A calibration log will be maintained in the field.

Specific Conductance Meter—An Orion Model 222 Specific Conductance Meter, or equivalent, will be used to measure specific conductance of the groundwater within an inline flow chamber during development and purging. The Model 222 Specific Conductance Meter is a portable, battery-operated, transistorized instrument. This instrument will be calibrated daily in accordance with the manufacturer's specifications.

pH and Temperature Meter—An Orion Model 240 pH and temperature meter, or equivalent, will be used for determining pH (to ± 0.1 pH) and temperature of the groundwater with an inline flow chamber during development and purging. This instrument will be calibrated daily in accordance with the manufacturer's specifications.

Turbidity—A Hach Model 2100F Turbidity meter or equivalent will be used to measure turbidity from the groundwater within an inline flow chamber during development and purging. A standard suspension of Formazin with turbidity within the expected range of sample turbidities will be used to calibrate the instrument daily to check the instruments' precalibrated scale. The working range for the instrument is 0–40 nephelometric turbidity units (NTUs).

Electronic Water Level Indicator—Water level measurements obtained with a well sounder will be measured to the nearest 0.01 ft and will be recorded in a bound field logbook.

4.3.6 Sampling Methods for Groundwater—General

After completion of the monitoring well installation and development, the wells will be allowed to stabilize for a minimum of 14 days before initiating groundwater sampling. A low flow purging/sampling method will be used for the groundwater sampling effort.

A Grundfos Redi-Flo2, 2 in.-diameter submersible pump will be used in purging/sampling the monitoring well network with ½- to ¾-in. dedicated Teflon tubing. The following procedures will be used in implementing purging/sampling:

1. Prior to placement of the decontaminated Redi-Flo2 pump into the well, the static water level of the well will be measured using an electronic water level indicator. This measurement will be recorded in the logbook for later use (see Step 3 below).
2. The pump will then be slowly lowered to a depth corresponding to the center of the saturated screened interval, but sufficiently above the bottom of the well to prevent possible interference from fines. Placement will be determined based on the static water level and review of the well construction diagram. For wells with 10-ft screened intervals, the following placement is recommended:
 - The pump intake will be placed approximately 1 ft above the bottom of the screened interval for wells in which the water column is less than 5 ft.
 - The pump intake will be placed approximately 2 ft from the bottom of the screened interval for wells in which the water column is between 5 and 8 ft.
 - The pump intake will be placed approximately 5 ft above the bottom of the screened interval for wells in which the water column is more than 8 ft.
 - The height of the water column will be determined by subtracting the static water level from the total depth of the well. Both measurements will be in feet from the top of the casing.
 - It will be left up to the discretion of the geologist to determine the proper location of the pump within the screened section based on the yield of the well.
3. Water levels will be measured during monitoring well purging and sampling. A variation in water level of 0.3 to 1.0 ft from the static water level will be maintained during purging/sampling.
4. The flow will be measured at the outflow of the tubing from the submersible pump using calibrated containers. The flow rate will be either increased or decreased depending on the response of the water level. If the water level drops, the flow rate will be decreased until equilibrium is reached. If the water level

does not drop, the flow rate will be increased incrementally to a maximum of 4 L/minute. The stabilized flow rate will be recorded in the logbook.

5. Water quality parameters will be monitored throughout purging. A minimum of three times the volume of standing water in the well will be removed during purging. The well will be considered stable when pH, specific conductance, and temperature are within 10% for four or more successive readings taken at 2- to 4-minute intervals, and turbidity has either stabilized or is below 10 NTUs. If the chemical parameters have not stabilized in accordance with the above criteria after removing three well volumes, additional water may be removed. If the parameters have not stabilized within purging a maximum of three borehole volumes, it is at the discretion of the field team leader whether to collect a sample or continue purging. If the well purges dry, samples will be collected after upon sufficient recharge.
6. As soon as stabilization is achieved, the well will be considered ready for sampling.

4.3.7 Sampling Methods for Groundwater

Groundwater samples will be collected as soon as water quality parameters have stabilized during well purging. Samples will be collected from the Redi-Flo2 system at a constant flow rate not greater than 1 L/minute by discharging the water through the line into appropriately preserved sample bottles provided by the contract analytical laboratory. The samples will be immediately placed into laboratory-supplied coolers with ice and stored at 4°C or less. A COC record will be prepared in the field at the time each sample is collected. Prior to shipment, the coolers will be repackaged with ice, sealed with strapping tape and custody seals, and sent via overnight delivery to the analytical laboratory.

4.3.8 Sample Containers and Preservation Techniques

Sample containers and preservation techniques for groundwater samples are summarized in Table 4-2.

Table 4-2

Sample Container and Preservation Requirements for Groundwater

Analysis	Container^a	Preservation
Explosives	Two 1-L amber glass ^b	Cool 4°C
Nitrolycerin and PETN	Two 1-L amber glass ^b	Cool 4°C
TAL metals-total	500-mL plastic	Cool 4°C, HNO ₃ pH<2
SVOCs	Two 1-L amber glass ^b	Cool 4°C
VOCs	Three 40 mL glass ^b	Cool 4°C, HCL ₃ pH<2

^aThe subcontract laboratory will be consulted for the specific containers for this project. However, container materials and preservation requirements will not be altered.

^bTeflon-lined cap required.

4.3.9 Field Quality Control Sampling Procedures

One QC duplicate and one QA split groundwater sample will be collected at each of the four sites during sample collection. Equipment rinsate blanks will be performed by collecting laboratory grade, deionized water that has been rinsed over decontaminated groundwater sampling equipment. An equipment rinsate blank will be collected at a frequency of 10%. Therefore, one equipment rinsate blank will be collected during groundwater sampling. Temperature blanks will be prepared by the laboratory and accompany each cooler, containing VOC samples.

4.3.10 Decontamination Procedures

4.3.10.1 Drilling Equipment

A decontamination station will be required on-site to decontaminate the drill rig and all drilling tools and equipment. The drill rig and all equipment will be decontaminated prior to the start of drilling operations and after each boring or well. The decontamination station will be constructed of sufficient size to accommodate the drill rig, rods, auger sections, etc. It will be constructed so that all decontamination fluids, soil, etc., will be retained inside the decontamination area.

4.3.10.2 Sampling Equipment

The following decontamination procedure will be followed to ensure equipment used during groundwater sampling does not contaminate the samples or any of the materials or equipment:

Water Level Probe	Wash with Liquinox, potable water rinse, and distilled water rinse between soundings of monitoring wells.
Grundfos Redi-Flo2 Pump	Wash with a Liquinox solution, potable water rinse, laboratory grade, organic-free, distilled water rinse, and wrap in aluminum foil or plastic.

4.4 Subsurface Soil

Subsurface soil samples will be collected utilizing hollow stem auger and split spoon sampling system within the RCRA interim status treatment units. Subsurface soils will be evaluated at each OB and OD unit to assess the migration of constituents attributable to OB and OD treatment activities in the subsurface environment. Field screening results from the surface soils will be used to determine subsurface sampling locations (Section 4.5.1.5). Samples will be field screened and submitted for laboratory analysis. Upon receiving the analytical results, they will be reviewed to generate a list of site-related chemicals that will be subjected to a human health and ecological risk evaluation. This evaluation will be consistent with the Fort McClellan Installation-Wide Work Plan, *Streamlined Human Health and Ecological Risk Assessment*, which establishes SSSLs and assumptions for calculating risk to applicable receptors for all environmental media.

4.4.1 Rationales

4.4.1.1 Subsurface Sampling

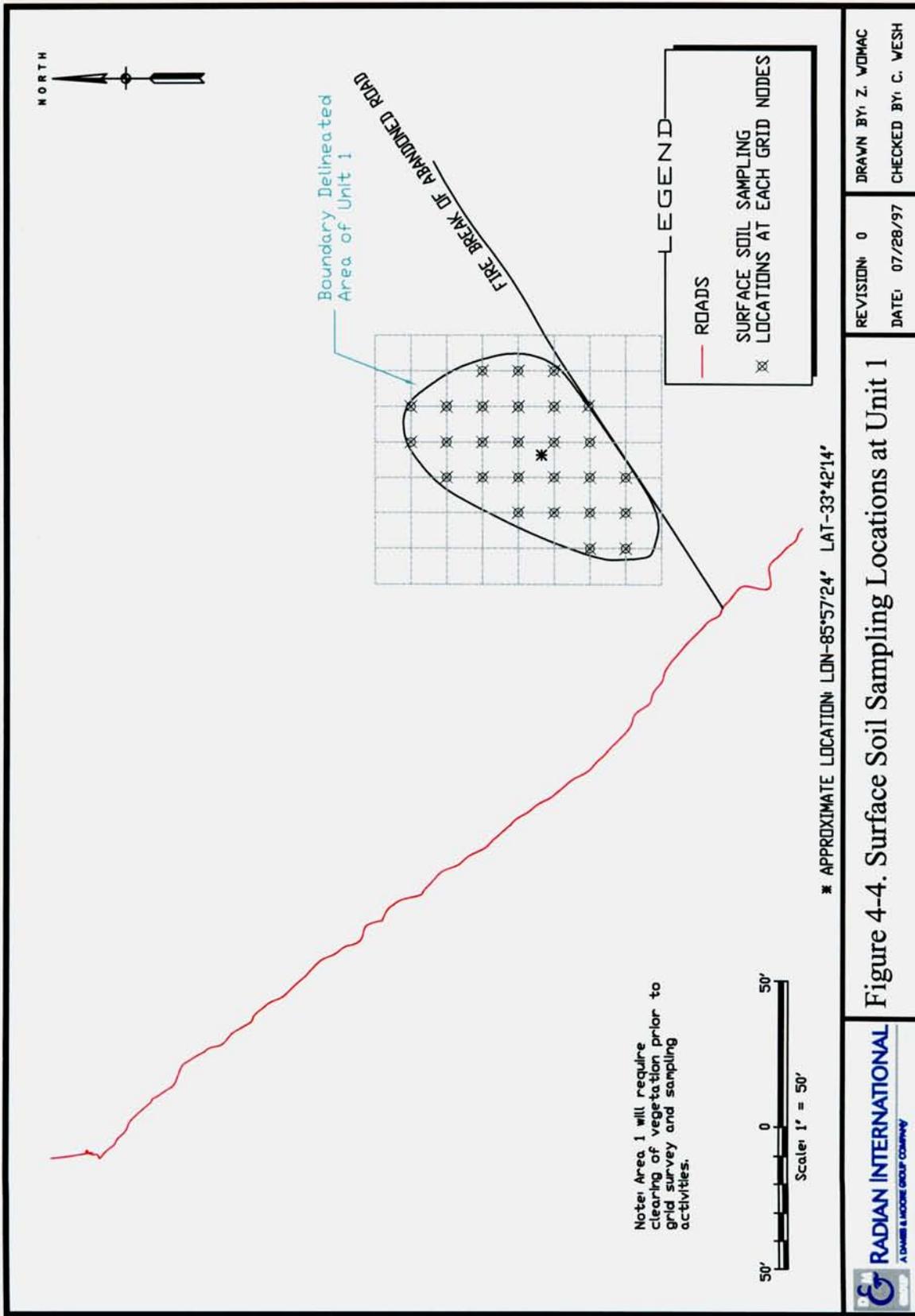
Subsurface soil samples will be collected utilizing hollow stem auger and split spoon mounted on an all-terrain vehicle. Subsurface soil sampling locations will correspond to

the surface soil sampling locations chosen for laboratory analysis due to elevated field screening levels. The surface soil sampling locations, as described in Section 4.5.1.1, will be at each node of a 25-ft grid surveyed over each of the four sites. Surface soil samples will be screened for RDX, TNT, and TAL metals. If the surface soil field screening results indicate no elevated constituents attributable to OB and OD treatment activities, five random grid node locations will be chosen for subsurface sampling. If the surface soil field screening results indicate elevated levels, the grid node locations with the 10 highest concentrations will be chosen for subsurface sampling. Elevated surface soil values are defined in Section 4.5.1.5. Figure 4-4 shows the grid over Unit 1, located outside the Large Impact Area, where surface soil samples will be collected, thus determining the subsurface soil sampling locations. Figure 4-5 shows the grid over Sites 2A, 2B, and 2C within the Large Impact Area where surface soil samples will be collected, thus determining the subsurface soil sampling locations.

4.4.1.2 Discrete/Composite Soil Sampling Requirements

Subsurface soils will be collected continuously from 1 to 10 ft below land surface (BLS) or to the groundwater interface. Samples will be collected with a decontaminated, 2 ft or 4 ft long, 2-in.-diameter stainless steel core sampler or split spoon samplers. One subsurface soil sample will be composited from each location from a depth of 1–10 ft BLS or to the groundwater interface, whichever comes first. Each composited sample will be submitted to the laboratory for explosives, TAL metals, SVOC, and VOC analysis. Each 2-ft sampling interval will be field screened for VOCs by headspace analysis using an OVA. A grab sample will be collected with an EnCore™ sampler from the interval with highest field screening results and submitted to the laboratory for VOC analysis. The EnCore™ sampler is a disposable, volumetric sampling device designed to collect soil samples with minimal handling. The following sampling method will be used. A reusable T-handle will be attached to a single-use 5-g or equivalent EnCore™ sampler, locked into place, and pushed into the soil at the desired sampling interval until the coring body is completely full. The sampler will then be removed from the borehole, wiped clean of excess soil, and capped while it is still on the T-handle. The full EnCore™ sampler will be returned to a zipper bag, sealed, and placed on ice for transportation to a laboratory for analysis. If there are no

N:\655730\7001\FIG_4-4.DWG



N:\655730\7001\FIG_4-5.DWG

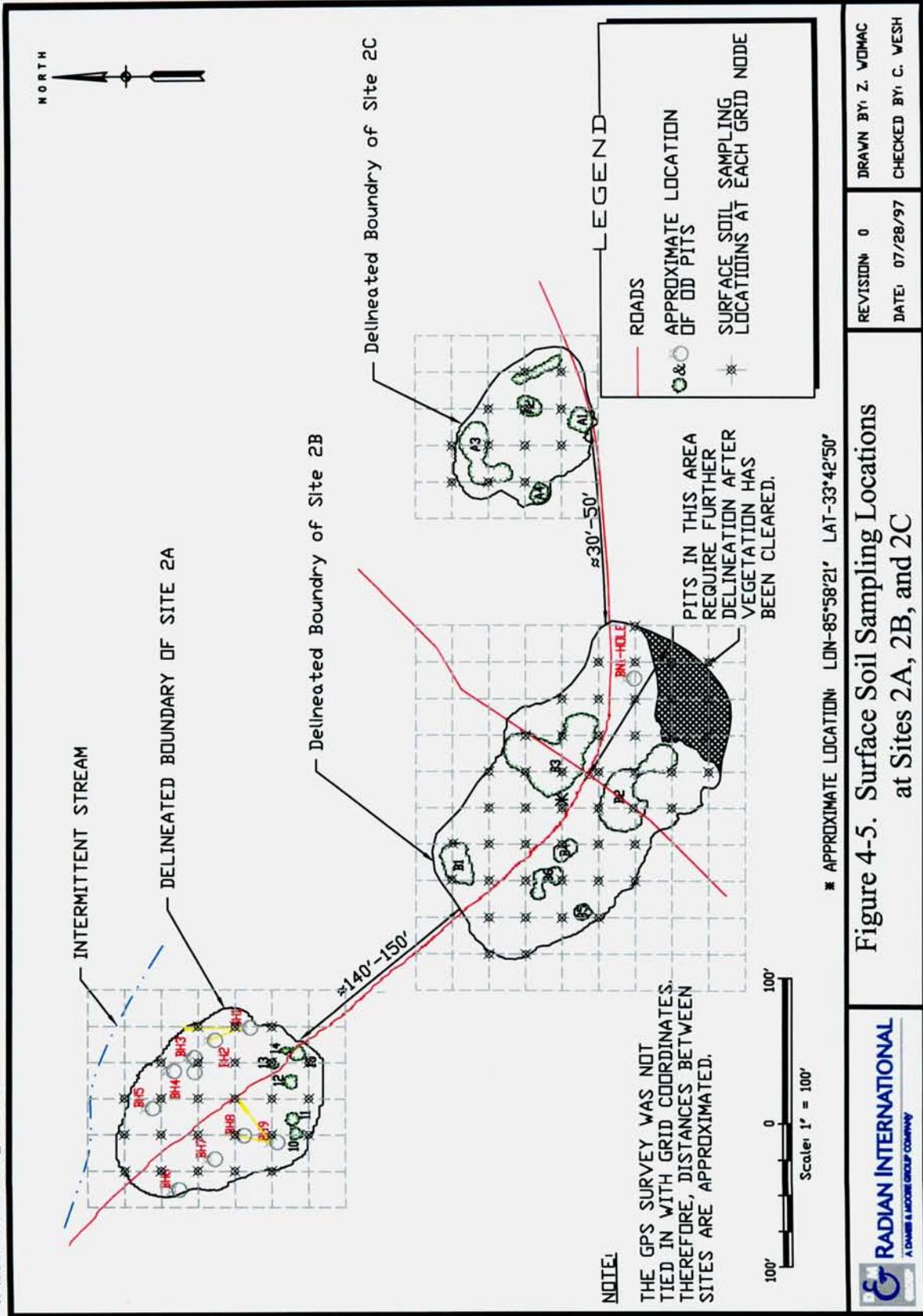


Figure 4-5. Surface Soil Sampling Locations at Sites 2A, 2B, and 2C



elevated field screening results from the 1 to 10 ft sampling interval, a discrete sample for VOCs will be collected from the 9 to 10 ft interval using the EnCore™ sampler for laboratory analysis for VOCs.

4.4.1.3 Sample Collection and Field and Laboratory Analysis

Subsurface soil samples will be submitted for explosives, TAL metals, SVOC, and VOC analysis as described in Section 4.4.1.2. Table 4-3 presents a sample and analysis matrix for subsurface soils. Sample handling is described in detail in Section 4.4.2.4.

**Table 4-3
Sampling and Analysis Matrix for Composite Subsurface Soils**

OB and/or OD Unit ^a	Number of Sampling Locations ^{b,c}	Explosives (SW-8330)	Nitroglycerin and PETN (SW-8330 mod.)	TAL Metals (SW6010/7000+)	SVOCs (SW-846/8270)	VOCs EPA 8260 ^d	VOCs EPA 8260 ^d (Biased Sample) ^e
Unit 1	10	10	10	10	10	10	10
Site 2A	10	10	10	10	10	10	10
Site 2B	10	10	10	10	10	10	10
Site 2C	10	10	10	10	10	10	10

^a QA and QC samples are not included in this matrix.

^b One composite sample will be obtained from each location from 1 to 10 ft.

^c Maximum number of samples per RCRA interim status treatment units. Minimum number of samples per area may be 5.

^d Extraction method for 8260 analysis will be by EPA Method 5035.

^e Biased samples will be collected with an EnCore™ sampler for extraction by EPA Method 5035.

4.4.1.4 Background, QA/QC, and Blank Samples and Frequency

Subsurface soil samples that are collected and analyzed as defined in this section will be compared to the site-specific background subsurface soil data for Pelham Range as compiled in Section 3 of the Installation-Wide Work Plan. The background subsurface soil concentrations representative of the Range are presented in Table 4-4. Background data are only available for metals.

Table 4-4

Summary of Background Metal Concentrations—Subsurface Soil (>1–10 ft BLS)

Analyte	Total Number of Samples	Frequency of Detection	Detection Range		Mean Value ^a (µg/g)	95% Upper Confidence Limit ^a (µg/g)	2x Mean ^a Concentration (µg/g)
			Min. (µg/g)	Max. (µg/g)			
Aluminum	30	100%	1,770	11,400	6380.50	7,076	12761.00
Antimony	30	80%	0.12	0.99	1.08	2.2	2.15
Arsenic	31	94%	0.77	35	10.55	51	21.09
Barium	30	100%	6.6	4,500	181.32	190	362.63
Beryllium	24	95%	0.062	1.1	.34	0.74	0.69
Cadmium	31	74%	0.022	1.3	.21	0.57	0.42
Calcium	30	67%	71	2,270	278.60	571	557.20
Chromium	31	97%	6.8	55	21.58	25	43.15
Cobalt	30	90%	0.26	96	10.51	40	21.02
Copper	30	100%	3.5	61	11.82	18	23.64
Iron	30	100%	5,640	48,000	22725.07	25,512	45451.33
Lead	30	100%	3.0	500	29.08	37	58.16
Magnesium	30	87%	64	3,420	327.31	558	655.06
Manganese	30	100%	7.3	19,000	933.60	4,848	1307.198
Mercury	30	53%	0.026	0.097	0.04	0.059	0.08
Nickel	30	87%	1.8	33	6.61	13	13.21
Potassium	30	80%	107	433	190.47	226	340.93
Selenium	30	3%	0.35	0.55	0.24	0.29	0.48
Silver	30	67%	0.039	0.66	0.18	0.55	0.36
Sodium	30	100%	258	643	408.58	444	817.17
Thallium	30	83%	0.016	24	1.42	12	2.84
Vanadium	30	100%	12	99	39.41	55	78.81
Zinc	30	80%	7.8	72	18.96	39	37.93

^aResults of duplicate analyses were averaged and nondetects were treated as one-half the detection limit in the calculation of the arithmetic mean, standard deviation, and 95% UCL.

Source: SAIC 1998.

Field QC duplicates and QA split subsurface soil samples will be collected at a frequency of 10% of the number of subsurface soil samples collected for chemical analyses. QA/QC samples will be collected at a frequency of 10% of the total samples; therefore, four QA and four QC subsurface samples will be collected. An equipment rinsate blank will be performed on subsurface soil sampling after decontamination at a frequency of one per day (if decontamination is performed) per analysis. Trip blanks will be included in each cooler containing samples being submitted for VOC analysis. Temperature blanks will also be included in all sample coolers being submitted for laboratory analyses.

4.4.2 Procedures

4.4.2.1 Drilling Methods

Subsurface soil samples will be collected using a hollow-stem auger and split spoon sampling system mounted on an all-terrain vehicle. Samples will be collected continuously from 1 to 10 ft BLS or to the groundwater interface utilizing decontaminated, 2 ft or 4 ft long, 2-in.-diameter, stainless steel core sampler, equipped with disposable butyrate plastic liners. Soil samples will be collected for visual classification from each subsurface boring.

4.4.2.2 Boring Logs

Completion of boring logs is required for the monitoring wells. Documentation requirements are discussed in Section 4.3.2.4.

4.4.2.3 Field Measurement Procedures and Criteria

Field screening will be performed on soil samples for RDX, TNT, TAL metals, and VOCs. It is anticipated that the following methods will be used for field screening:

- Explosives – EPA Methods 8510 and 8515 immunoassay techniques for TNT and RDX, respectively.
- TAL metals – Method 6010/7000+ with 3-day turnaround for results and Level II reporting.
- VOCs – Headspace analysis using an OVA.

Note that the level of nitrates and nitrites in soil at each area will be evaluated prior to performing the immunoassay technique for RDX since these parameters cause false-positive results with the RDX test. EPA Method 8515 includes a modified extraction procedure to negate nitrate/nitrite interferents when present. Field screening methods and procedures are described in Attachment B, Section B1.3.2.1.

4.4.2.4 Sampling for Chemical Analyses

Subsurface soils will be collected using decontaminated 2 ft or 4 ft long, 2-in.-diameter stainless steel core samplers equipped with disposable butyrate plastic liners or split spoon samplers. After reaching the desired depth, the core sampler or split spoon sampler will be removed from the borehole and transported to a sampling table. The sampler will be placed on the sampling table lined with plastic to prevent cross-contamination. The sampler will be carefully opened and the sample visually identified and logged. A representative sample will be collected at 2-ft intervals and placed in glass jars for VOC headspace analysis and laboratory supplied holding jars for analysis. The sample will be held in holding jars until headspace analysis determines which sample interval will be sent for laboratory analysis. When the sampling interval has been determined, an EnCore™ sampler will extract approximately 5 grams of soil from the appropriate holding jar. The EnCore™ sampler is a disposable, volumetric sampling device designed to collect soil samples with minimal handling. The following sampling method will be used. A reusable T-handle will be attached to a single-use 5-g or equivalent EnCore™ sampler, locked into place, and pushed into the soil at the desired sampling interval until the coring body is completely full. The sampler will then be removed from the borehole, wiped clean of excess soil, and capped while it is still on the T-handle. The full EnCore™ sampler will be returned to a zipper bag, sealed, and placed on ice for transportation to a laboratory for analysis. The sample will be extruded into laboratory supplied, preserved, and weighed jars for analysis. An additional sample will be placed into a laboratory supplied jar from the sample interval for dry weight determination needed for the VOC analysis.

A representative sample of the entire sampling interval will be transferred to a stainless steel bowl for homogenizing (compositing). Once the sample is properly homogenized, the sample will be transferred into laboratory supplied jars. The jars will be labeled, entered into a sample log and COC, and placed into an iced cooler at 4°C.

Homogenizing (Compositing) Techniques—Applying proper homogenization techniques will help ensure that conditions are being accurately represented. Samples being analyzed for VOCs will always be taken from discrete locations prior to mixing. Homogenization will be accomplished by filling a properly decontaminated stainless steel tray or bowl with the

sample and mixing it with a decontaminated stainless steel instrument. Round bowls will be used for sample mixing. Adequate mixing is achieved by stirring the material in a circular manner and occasionally turning the material over. The extent of the mixing required will depend on the nature of the sample and will be done to achieve a consistent physical appearance prior to filling sample containers. Once mixing is completed, the sample will be divided in half and containers will be filled by scooping sample material alternately from each half.

4.4.2.5 Sample Containers and Preservation Techniques

Sample containers and preservation techniques for subsurface soil samples are summarized in Table 4-5.

Table 4-5
Sample Container and Preservation Requirements for Subsurface Soil

Analysis	Container	Preservation
Explosives	8-oz. glass jar ^a	Cool 4° C
Nitrolycerin and PETN	8-oz. glass jar ^a	Cool 4° C
TAL metals	8-oz. glass jar ^a	Cool 4° C
SVOCs	8-oz. glass jar ^a	Cool 4° C
VOC (composite)	4-oz. glass jar ^a	Cool 4° C
VOCs (biased grab) ^b	40 mL glass vial	Sodium bisulfate sol., Cool 4° C
VOC dry weight	125 mL glass jar	Cool 4° C

^aTeflon-lined cap required.

^bCollected with EnCore™ sampler.

4.4.2.6 Field Quality Control Sampling Procedures

Field QC duplicates and QA split subsurface soil samples are grab field replicates and will be collected simultaneously with the scheduled subsurface soil sample collected for chemical analysis. Equipment rinsate blanks will be performed by collecting deionized water that has been rinsed over decontaminated subsurface soil sampling equipment. Trip blanks provided by the laboratory will be placed in each shipping cooler containing VOC samples. Temperature blanks will be prepared by placing water in empty vials. Temperature blanks will be placed in all shipping containers. Field control samples are described in detail in Section 8.2.1.

4.4.2.7 Decontamination Procedures

Samples will be collected using decontaminated stainless steel samplers equipped with disposable butyrate plastic liners. The liners are decontaminated, packaged, and certified clean by the manufacturer. With the use of disposable liners, soil will not come in contact with the sampling equipment. The sampling equipment will be decontaminated as follows:

1. Remove any solid particles from the equipment or material by brushing and then rinsing with available tap water. The purpose of the initial step is to remove gross contamination.
2. Wash equipment with a brush and a phosphate-free detergent solution.
3. Rinse with tap water.
4. Rinse thoroughly with distilled water.
5. Allow equipment to air dry thoroughly.
6. Unless the equipment is going to be used immediately, it will be wrapped in new aluminum foil, shiny side out, to keep it clean until needed. For large bulky equipment, new plastic sheeting can be substituted for the aluminum foil.

If disposable liners are not used with the sampling equipment, the equipment will be decontaminated as follows:

1. Remove any solid particles from the equipment or material by brushing and then rinsing with available tap water. The purpose of the initial step is to remove gross contamination.
2. Wash equipment with a brush and a phosphate-free detergent solution.
3. Rinse with tap water.
4. Rinse with at least a 10% nitric acid solution.
5. Rinse thoroughly with distilled water.
6. Rinse with laboratory grade isopropanol.
7. Allow equipment to air dry thoroughly
8. Rinse with laboratory grade organic-free water.
9. If the equipment will be reused before the alcohol evaporates, it should be rinsed thoroughly with organic-free water.

Unless the equipment is going to be used immediately, it will be wrapped in new aluminum foil, shiny side out, to keep it clean until needed. For large bulky equipment, new plastic sheeting can be substituted for the aluminum foil.

4.5 Surface Soil and Sediment

4.5.1 Rationales

Surface soil will be evaluated to determine whether contaminants associated with OB and/or OD treatment activities are present in the soil surface (0–1 ft BLS). A stainless steel hand auger will be used to collect surface soil samples in accordance with applicable EPA, USACE, or ADEM procedures.

The sampling strategy for assessing surface soil in the four delineated areas will be comprised of field screening for TNT, RDX, and TAL metals followed by submittal of samples for laboratory analysis (Table 3-1). The field screening effort is intended to provide an overall assessment of surface soils across the sites. Field screening will also be used to identify localized, elevated areas where biased sampling and laboratory analysis will be conducted. The biased samples will be compared to the site-specific screening levels, consistent with the Fort McClellan Installation-Wide Work Plan, *Streamlined Human Health and Ecological Risk Assessment*, which establishes SSSLs and assumptions for calculating risk to applicable receptors and for all environmental media.

4.5.1.1 Surface Soil Sample Locations

Locations for surface soil sampling will be determined by establishing a 25-ft grid over each site. Surface soil samples will be collected from 0 to 1 ft BLS at each grid node that lies within each site boundary. Each soil sample collected will be field screened for TNT, RDX, TAL metals, and VOCs. Figure 4-4 shows the 25-ft grid over Unit 1, located outside the Large Impact Area, and Figure 4-5 shows the 25-ft grid over Sites 2A, 2B, and 2C, located within the Large Impact Area. It is anticipated that 27 surface soil samples will be collected from within Unit 1, 25 samples within Site 2A, 47 samples within Site 2B, and 12 samples within Site 2C.

4.5.1.2 Trench and Pits

Surface soil samples will also be collected and field screened for TNT, RDX, TAL metals, and VOCs to evaluate trenches and demolition pits that can be visually identified at the sites. There are no distinct trenches or demolition pits at Unit 1 to be sampled. However, there are several demolition pits in Sites 2A, 2B, and 2C, as well as one trench in Site 2C (see Figure 4-5). Five bias locations will be selected for soil sampling and field screening at each pit over 5 ft in diameter (Site 2A has 13 pits, Site 2B has 4 pits, and Site 2C has 5 pits over 5 ft in diameter), as well as the trench in Site 2C. These five samples will be collected from the lowest elevation and on the north, east, south, and west slopes of each pit/trench from a depth of 0–1 ft BLS. One grab sample will be submitted for laboratory analysis from the elevated field screening location (as defined above) exhibiting the highest level per pit/trench (i.e., no more than one sample per pit/trench for laboratory analysis).

One surface soil sample will also be collected for field screening at the lowest elevation within pits less than or equal to 5 ft in diameter (Site 2A has three pits and Site 2C has two pits). If field screening results at these locations results in elevated levels, laboratory analysis will also be performed on a sample collected from these locations. Figure 4-6 shows the typical sampling locations within the pits and trenches.

4.5.1.3 Sediment Sample Locations From On-Site and/or Off-Site Drainage Channels

Sediment samples will be collected to determine whether constituents attributable to OB and/or OD operations have migrated into adjacent drainageways and, if present will they adversely affect human health and the environment. There are no definable drainage pathways at the RCRA interim status treatment units, except at Site 2A. There is an intermittent stream bordering Site 2A to the northwest and a drainageway southwest of the area.

Sediment samples will be collected with decontaminated stainless steel trowel, in accordance with EPA, USACE, or ADEM procedures. Three sediment samples will be collected from within both the intermittent stream and drainageway associated with Site 2A. Samples will

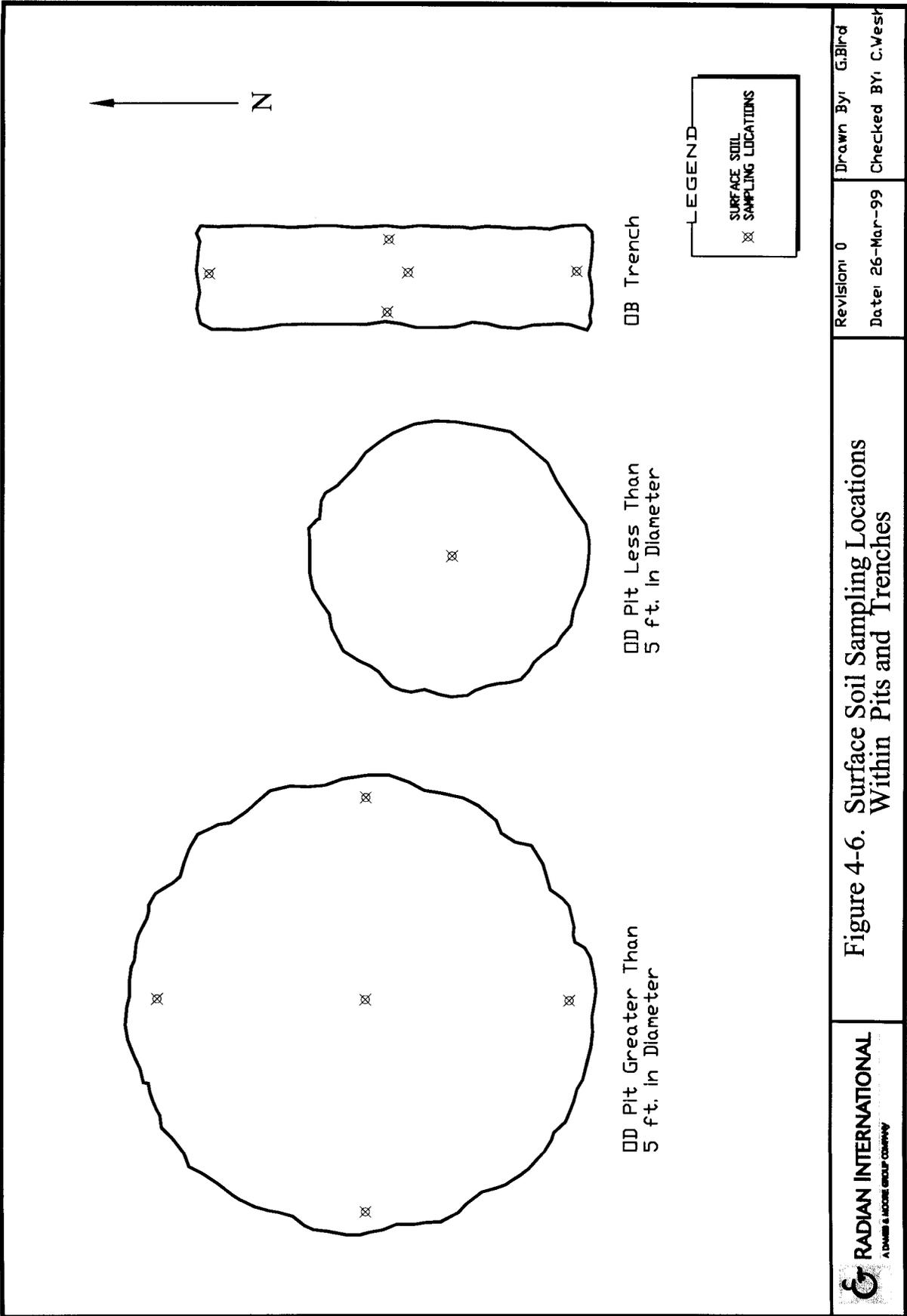


Figure 4-6. Surface Soil Sampling Locations Within Pits and Trenches

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be collected from locations upgradient, adjacent to, and downgradient of Site 2A within the intermittent stream and drainageway (for a total of six sediment samples). Figure 4-7 shows the sediment sampling locations. Samples will be submitted for explosives, TAL metals, SVOCs, and VOC analysis. Table 4-6 lists the sampling and analytical requirements for sediment samples.

4.5.1.4 Sediment Sample Locations From Ponds, Lakes, and Lagoons

Sediment sampling from ponds, lakes, and lagoons will not be performed for this project.

4.5.1.5 Sample Collection and Field and Laboratory Analysis

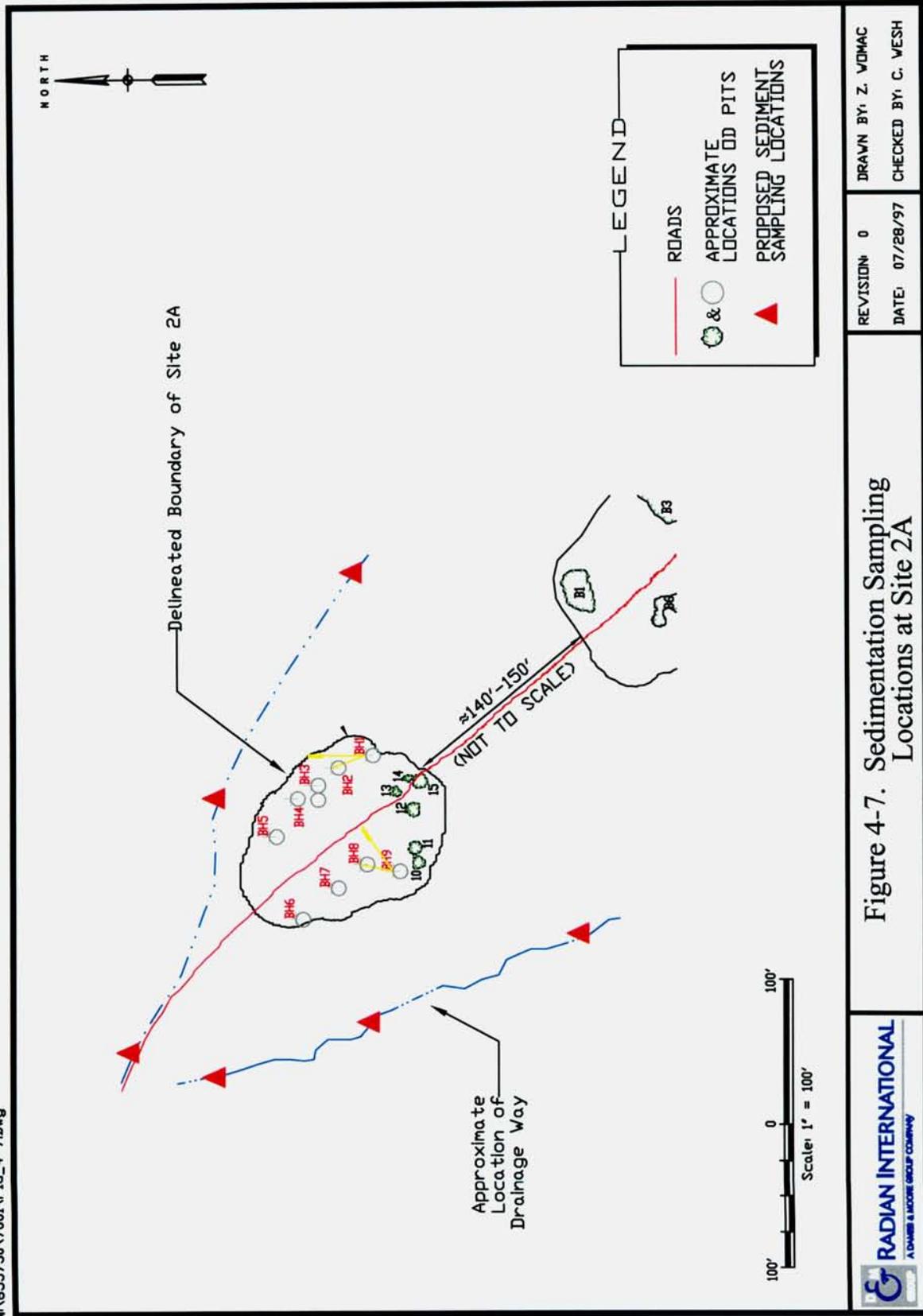
All surface soil samples (grid nodes, pits, and trenches) will be collected using decontaminated stainless steel hand augers and bowls. All surface soil samples will be collected from a depth of 0–1 ft BLS. Field screening will be performed on all surface soil samples collected for TNT, RDX, TAL metals, and VOCs. The following methods will be utilized to accomplish field screening:

- Explosives – EPA Methods 8510 and 8515 immunoassay techniques for TNT and RDX, respectively.
- TAL Metals – Mobile field laboratory equipped with x-ray fluorescence (XRF) instrumentation.
- VOCs – Headspace analysis using an OVA.

4.5.1.5 Sample Collection and Field and Laboratory Analysis

All surface soil samples (grid nodes, pits, and trenches) will be collected using decontaminated stainless steel hand augers and bowls. All surface soil samples will be collected from a depth of 0–1 ft BLS. Field screening will be performed on all surface soil samples collected for TNT, RDX, TAL metals, and VOCs. The following methods will be utilized to accomplish field screening:

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Figure 4-7. Sedimentation Sampling Locations at Site 2A



**Table 4-6
Sampling and Analysis Matrix for Surface Soils and Sediments**

OB and/or OD Unit ^a	Media	Location	Estimated Number of Samples to be Field Screened ^b	Laboratory Analysis ^c			
				Explosives (SW-8330)	Nitroglycerin and PETN (SW-8330 mod.)	TAL Metals (SW-6010/7000+)	SVOCs (SW-8270)
Unit 1	Surface soil	Grid nodes	27	10	10	10	10
Site 2A	Surface soil	Grid nodes	25	10	10	10	10
		13 OD pits ≥ 5 ft diameter	65	13	13	13	13
		30 OB pits ≤ 5 ft diameter	3	3	3	3	3
	Sediment	Intermittent stream		3	3	3	3
		Drainageway		3	3	3	3
		Grid nodes	47	10	10	10	10
Site 2B	Surface soil	400 pits ≥ 5 ft diameter	20	4	4	4	4
		Grid nodes	12	10	10	10	10
Site 2C	Surface soil	500 pits ≥ 5 ft diameter	25	5	5	5	5
		200 OD pits ≤ 5 ft diameter	2	2	2	2	2
		1 open trench	5	1	1	1	1

^a QA and QC sampling are not included in this matrix.

^b Field screen analysis includes explosives, TAL metals, and VOCs.

^c Number of samples listed for laboratory analysis represent the maximum number to be analyzed.

- Explosives – EPA Methods 8510 and 8515 immunoassay techniques for TNT and RDX, respectively.
- TAL Metals – Method 6010/7000+ with 3-day turnaround for results and Level II reporting.
- VOCs – Headspace analysis using an OVA.

Note that the level of nitrates and nitrites in soil at each area will be evaluated prior to performing the immunoassay technique for RDX since these parameters cause false-positive results with the RDX test. EPA Method 8515 includes a modified extraction procedure to negate nitrate/nitrite interferences when present.

Field screening results will be used to determine biased sample locations on the grid layout for laboratory analysis. Biased surface soil samples will be taken from field screening locations that exhibit elevated explosives (TNT and RDX), TAL metals, or VOCs and submitted for laboratory analysis. Elevated field screening results are defined as (1) detectable levels (greater than 1 ppm) of explosives, (2) metal concentrations above background for Pelham Range, as shown on Table 4-7, and (3) detectable levels (greater than 1 ppm) of total organic vapors. Ten samples (maximum) will be collected from grid nodes that exhibit the highest levels of contamination from each area for laboratory confirmation analysis. If field screening indicates that there are no elevated locations (as defined above), a minimum of five samples from that site will be submitted for laboratory confirmation. All samples collected for laboratory analysis will be submitted for explosives, TAL metals, and SVOC and VOC analysis.

EPA methods will be used to analyze soil samples in the laboratory. Table 3-1 lists the methods of analysis for each of the parameters to be analyzed. Field screen samples submitted for TAL metals analysis will be held in the laboratory until the screening results are evaluated. TAL metal samples selected for full analytical analysis will have a complete data package (Level III) prepared.

4.5.1.6 Background, QA/QC, and Blank Samples and Frequency

Surface soil samples that are collected and analyzed as defined in this section will be compared to the site-specific background surface soil data for Pelham Range. The background surface soil concentrations representative of the Range are presented in Table 4-7. QA/QC samples will be collected at a frequency of 10% of the total samples; therefore, 23 QC duplicate samples for field screening will be collected. Seven QA and seven QC surface soil and sediment samples will be collected for laboratory analysis. An equipment rinsate blank will be performed on surface soil sampling equipment after decontamination at a frequency of one per day (if decontamination is performed) per analysis. Trip blanks will be included in each cooler containing samples being submitted for VOC analysis. Temperature blanks will also be included in all sample coolers being submitted for laboratory analyses.

4.5.2 Procedures

4.5.2.1 Sampling Methods for Surface Soil/Dry Sediment

Surface Soil Sampling—Surface soil and sediment samples will be collected using decontaminated stainless steel hand augers and bowls. Surface soil samples will be collected from a depth of 0–1 ft BLS. The procedure for collecting surface soil and sediment samples by spade and scoop is provided below:

1. Using a decontaminated stainless steel hand auger, collect sample from 0–1 ft BLS and transfer sample to a stainless steel bowl.
2. Transfer sample into the appropriate sample bottle with a decontaminated stainless steel lab spoon or equivalent.
3. Secure the cap tightly.
4. Label the sample bottle with the appropriate sample label. Be sure to complete the label carefully and clearly, addressing all the categories or parameters.
5. Place filled sample containers on ice immediately.

Table 4-7
Summary of Background Metal Concentrations of Pelham Range Surface Soil
(0–1 ft BLS)^a

Analyte	Total Number of Samples	Frequency of Detection	Detection Range		Mean Value ^a (µg/g)	95% UCL (µg/g)	2x Mean ^a Concentration (µg/g)
			Min. (µg/g)	Max. (µg/g)			
Aluminum	37	100%	2,460	15,700	7,877	10,236	15,753
Antimony	37	62%	0.13	2.8	1.5	6.3	3
Arsenic	38	97%	2.0	49	9.0	169	18
Barium	37	100%	11	288	58	92	116
Beryllium	25	100%	0.062	0.77	0.38	0.44	1
Cadmium	38	86%	0.025	0.21	0.21	0.52	
Calcium	37	92%	77	1,080	386	774	773
Chromium	38	97%	5	134	22	34	43
Cobalt	37	95%	0.91	71	8.8	20	18
Copper	37	100%	1.3	17	8.2	9.2	12
Iron	37	100%	4,460	56,600	19,208	28,182	28,416
Lead	37	100%	3.4	83	20	32	41
Magnesium	37	100%	79	652	233	312	486
Manganese	37	100%	21	6,850	1,004	5,016	2,008
Mercury	37	27%	0.030	0.18	0.036	0.019	
Nickel	37	78%	2.9	17	5.5	11	11
Potassium	37	81%	104	437	182	209	384
Selenium	37	9%	1.3	1.3	0.24	0.30	
Silver	37	54%	0.019	1.9	0.23	1.3	
Sodium	37	100%	223	507	341	365	681
Thallium	37	68%	0.015	0.45	1.1	26	2
Vanadium	37	100%	9.6	158	37	56	75
Zinc	37	89%	4.6	47	17	29	34

^aResults of duplicate analyses were averaged and nondetects were treated as one-half the detection limits in the calculation of the mean and 95% UCL.

Source: SAIC 1998

6. Complete all COC documents and record in the field logbook. Prepare samples for shipment.
7. Decontaminate sampling equipment after use and between sample locations.

Special Handling of VOC Samples—All VOC samples for laboratory analysis will be collected with an EnCore™ sampler directly from the hand auger or bowl. The EnCore™ sampler will extract approximately 5 grams of soil. The soil will be extruded into pre-preserved and pre-weighed laboratory supplied vials. The vials will be preserved with a sodium bisulfate solution. Additionally, a second sample will be collected in a 125-mL pre-weighed jar for each VOC sample for determination of the sample's dry weight.

Homogenizing (Compositing) Techniques—Applying proper homogenization (compositing) techniques will help ensure that conditions are being accurately represented. Samples being analyzed for VOCs will always be taken from discrete locations prior to mixing. Homogenization will be accomplished by filling a properly decontaminated stainless steel bowl with the sample and mixing it with a decontaminated stainless steel spoon. Round bowls will be used for sample mixing. Adequate mixing is achieved by stirring the material in a circular manner and occasionally turning the material over. The extent of the mixing required will depend on the nature of the sample and will be done to achieve a consistent physical appearance prior to filling sample containers. Once mixing is completed, the sample will be divided in half and containers will be filled by scooping sample material alternately from each half.

4.5.2.2 Sampling Methods for Underwater Sediments From Ponds, Lakes, and Lagoons

Underwater sediment sampling from ponds, lakes, and lagoons will not be performed for this project.

4.5.2.3 Field Measurement Procedures and Criteria

Field measurement procedures and criteria are not applicable to this project.

4.5.2.4 Sampling for Physical/Geotechnical Analyses

Sampling for physical/geotechnical analyses will not be performed for this project.

4.5.2.5 Sampling for Chemical Analyses

Sampling surface soil for chemical analyses is discussed in Section 4.5.1.5. Table 4-6 also provides a matrix for surface soil and sediment sampling and analysis.

4.5.2.6 Sample Containers and Preservation Techniques

Sample containers and preservation techniques for surface soil samples are summarized in Table 4-8.

Table 4-8
Sample Container and Preservation Requirements for Surface Soil and Sediment

Analysis	Container ^a	Preservation
Explosives	8-oz. glass jar ^b	Cool 4° C
Nitroglycerin and PETN	8-oz. glass jar ^b	Cool 4° C
TAL metals	8-oz. glass jar ^b	Cool 4° C
SVOCs	8-oz. glass jar ^b	Cool 4° C
VOCs (composite)	4-oz. glass jar ^b	Cool 4° C
VOCs (biased grab) ^c	40 mL glass vial	Sodium bisulfate sol., Cool 4° C
VOC dry weight	125 mL glass jar	Cool 4° C

^aThe subcontract laboratory will be consulted for the specific containers for this project. However, container materials and preservation requirements will not be altered.

^bTeflon-lined cap required.

^cCollected with EnCore™ sampler.

4.5.2.7 Field QC Sampling Procedures

Field QC duplicates and QA split surface soil samples are grab field replicates and will be collected simultaneously with the scheduled surface soil samples. Equipment rinsate blanks will be performed by collecting deionized water that has been rinsed over decontaminated

surface soil sampling equipment. Trip blanks will be provided by the laboratory and will be placed in each shipping cooler containing VOC samples. Temperature blanks will be prepared by placing water in empty vials. Temperature blanks will be placed in all shipping containers. Field control samples are described in detail in Section 8.2.1.

4.5.2.8 Decontamination Procedures

Decontamination of surface soil sampling equipment will be the same as described in Section 4.4.2.7 for subsurface soils.

4.6 Surface Water

Surface water samples will be collected from the intermittent stream located in OD unit of Site 2A. To determine the presence and concentration of contamination impacting the surface water system pathway from OD activities.

4.6.1 Rationale

Surface water from the OD unit in Site 2A discharges into the intermittent stream. Sampling this surface water system will determine the impact to the surface water pathways from the OD unit. The surface water sampling rationale, inclusive of sampling locations, technique, and QA/QC, is described below.

4.6.1.1 Surface Water Sample Locations

Two surface water samples will be collected if surface water is present in the intermittent stream during this sampling effort. One surface water grab sample will be collected upstream of Site 2A and one will be collected downstream of Site 2A.

4.6.1.2 Sample Collection and Field and Laboratory Analysis

The surface water samples will be submitted for explosives, TAL metals, SVOC, and VOC analyses. The sample and analysis matrix for surface water sampling is presented in Table 4-9. Refer to Table 3-1 for a complete list of analytes.

**Table 4-9
Sampling and Analysis Matrix for Surface Water Samples**

OB and OD Unit^a	Number of Sampling Locations	Explosives (SW-8330)	Nitroglycerin and PETN (SW-8330 mod.)	TAL Metals (SW6010/7000+)	SVOCs (SW-846/8270)	VOCs EPA 8260
Site 2A Intermittent Stream	2	2	2	2	2	2

^a QA and QC samples are not included in this matrix.

4.6.1.3 Upgradient, QA/QC, and Blank Samples and Frequency

One upgradient sample will be collected as described in the Section 4.6.1.1. One field QC duplicate and QA split surface water sample will be collected from the downgradient location and analyzed for the parameters listed in Table 4-9. Temperature blanks will also be included in all sample coolers being submitted for laboratory analyses.

4.6.2 Procedures

4.6.2.1 Sampling Methods for Surface Water—General

Surface water samples will be collected using a decontaminated Teflon or stainless steel ladle. The samples will be collected in a manner as to not disturb the sediments, creating a turbid sample. The water will be placed directly into the appropriate laboratory supplied bottles and placed into the shipping container (cooler) for shipment to the laboratory.

4.6.2.2 Sampling Methods for Surface Water—Filtration

Surface water sample filtration will not be performed for this project.

4.6.2.3 Sample Containers and Preservation Techniques

Table 4-10 presents sample containers and preservation techniques for surface water samples.

Table 4-10
Sample Container and Preservation Requirements for Surface Water

Analysis	Container ^a	Preservation
Explosives	Two 1-L amber glass ^b	Cool 4°C
Nitrolycerin and PETN	Two 1-L amber glass ^b	Cool 4°C
TAL metals	500-mL glass ^b	Cool 4°C, HNO ₃ pH≤2
SVOCs	Two 1-L amber glass ^b	Cool 4°C
VOCs	Three 40 mL glass ^b	Cool 4°C, HNO ₃ pH≤2

^aThe subcontract laboratory will be consulted for the specific containers for this project. However, container materials and preservation requirements will not be altered.

^bTeflon-lined cap required.

4.6.2.4 Field Quality Control Sampling Procedures

The upgradient sample in the intermittent stream will be collected first, followed by the downgradient sample. The location for QA/QC samples will be at the downgradient location of Site 2A. Temperature blanks will be placed in all shipping containers.

4.6.2.5 Decontamination Procedures

Decontamination of the sampling equipment helps to ensure sample integrity and accurate analytical results. Sampling equipment will be decontaminated after each surface water sample has been collected. The general procedure for field decontamination of surface water sampling equipment is as follows:

1. Wash equipment with a brush and a phosphate-free detergent solution.
2. Rinse with tap water.
3. Rinse with a 10% nitric acid solution.
4. Rinse with distilled water.
5. Rinse with laboratory grade isopropanol.
6. Allow equipment to air dry.
7. Rinse thoroughly with distilled water and organic-free water.
8. Unless the equipment is going to be used immediately, it will be wrapped in new aluminum foil, shiny side out, to keep it clean until needed.

4.7 **Other Matrices**

This section is not applicable to the project.