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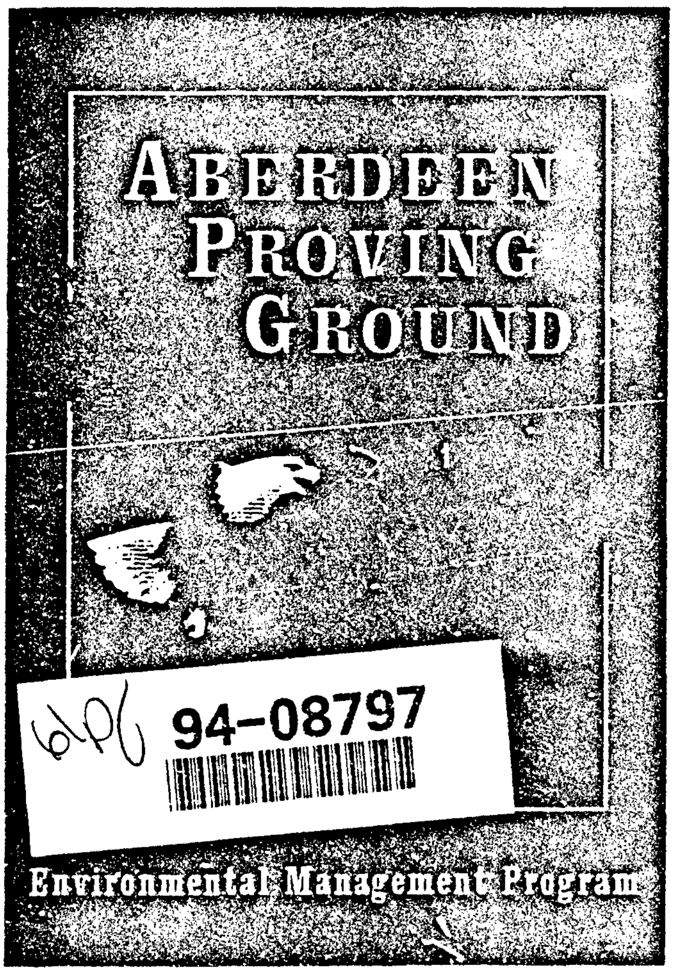
Beach Point Test Site
Aberdeen Proving Ground - Edgewood Area, Maryland

FOCUSED FEASIBILITY STUDY
FINAL FIELD SAMPLING PLAN



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1.0 INTRODUCTION

Jacobs Engineering Group Inc. (JEG) has been contracted by Environmental Management Operations (EMO)[1] to develop a Focused Feasibility Study (FFS) for Beach Point in the Edgewood Area of Aberdeen Proving Ground (APG-EA). The task will be performed under the provisions of Master Agreement 071914-A-D7, Task Order 142133, Supplement Number 8.

At the direction of APG-DSHE, the project has been separated into three work phases to allow for data evaluation and risk determination before a full focused feasibility study is conducted (Figure 1-1). Phase I of the project consists of an aerial photography investigation, surface/marine geophysical surveys, a flowmeter logging program, sampling surface and subsurface soils, an ecological risk assessment of the Beach Point Test Site, and analysis of chemical groundwater data generated through the separate Canal Creek Groundwater Monitoring Program.

Tasks described for Phase II of the FFS will be performed upon evaluation of data needs, identified subsequent to completion of the Phase I tasks. Phase II investigations include installation of additional groundwater monitoring wells, sampling of the new and previously existing monitoring wells, a flowmeter logging program, downhole geophysical logging of new monitoring wells (and one previously existing well), and possible soil gas surveys.

Phase III tasks may be performed after Phase I, and at any point thereafter, if it is determined that contamination found in the Beach Point Test Site warrants treatment. It is not anticipated that there will be extensive sampling associated with any pilot treatability studies for Phase III work, therefore, sampling for Phase III is not outlined in this Field Sampling Plan (FSP). Basic sampling protocols described in Section 3 of the FSP should remain largely the same for any additional sampling which may be required as a result of Phase III activity.

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[1]EMO is operated for the U.S. Department of Energy by Battelle Memorial Institute.

1.1 PURPOSE AND SCOPE

Previous investigators have determined that the groundwater underlying the Beach Point Test Site is contaminated with organic and inorganic compounds which include solvents, chemical agent degradation products, toxic metals, and possibly explosives. Previous studies suggest that water quality in nearby surface water bodies may have been impacted by discharge of contaminated groundwater and by surface drainage from source areas. Because data from these investigations are pre-1990, it is necessary to establish a new baseline of groundwater chemistry prior to commencing additional environmental investigations of the area.

Work for Phase I of the FFS is designed to analyze physical and chemical groundwater data and to collect water samples from on-site monitoring wells, surface and subsurface soil samples, and sediment samples for laboratory analyses. Reduction of the data will be performed to evaluate observable trends in groundwater flow and water chemistry as well as to identify potential source areas of contamination. The data will be used to develop the scope of any additional contamination investigations and remedial feasibility investigations at Beach Point. The groundwater data will also be used to aid in the design of any groundwater extraction and treatment system for possible future remedial actions.

The overall goals of the investigation will be to:

(1) determine the nature and distribution of contamination at the site in the surficial aquifer;

(2) differentiate between naturally occurring background levels and contributions from other sources;

(3) evaluate whether human health or environmental risks exist as a result of site related contamination; and

(4) determine whether remedial actions are necessary to mitigate these effects.

The major objectives of the work plan are:

- Provide a complete background characterization of the Beach Point Test Site, including physical characteristics and environmental setting; operations and disposal history; summary of previous investigations; and contamination assessment.
- Perform a preliminary contaminant assessment related to groundwater, surface water, or other types of contamination at Beach Point, focusing on identifying contaminants, exposure pathways, and human and environmental receptors of potential concern.
- Identify key data gaps for performing a complete risk assessment and focused feasibility study of remedial alternatives for the site.
- Develop an environmental sampling program, including biota sampling and specific biological tests as well as groundwater, soil, and sediment sampling, to address data gaps and provide the basis for conducting a detailed risk assessment and focused feasibility study. In addition, geophysical and soil gas surveys, soil borings, and additional monitoring wells will be considered for source and plume delineation.
- Develop a pilot treatment study plan as indicated in the flow diagram for the Beach Point FFS, (See Figure 1-1).

1.2 REGULATORY CONSIDERATIONS

Field work and data evaluation will be conducted in accordance with U.S. Environmental Protection Agency (EPA) guidance documents developed for activities performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA); the National Environmental Policy Act of 1969 (NEPA); and the President's Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508). In addition, the procedures used in the study are consistent with the Department of the Army's policy toward integrating the NEPA and CERCLA/SARA processes. The task is being performed under the purview of the U.S. Army, EPA Region III, and the Maryland Department of the Environment (MDE).

BEACH POINT (APG-EA) - FOCUSED FEASIBILITY STUDY

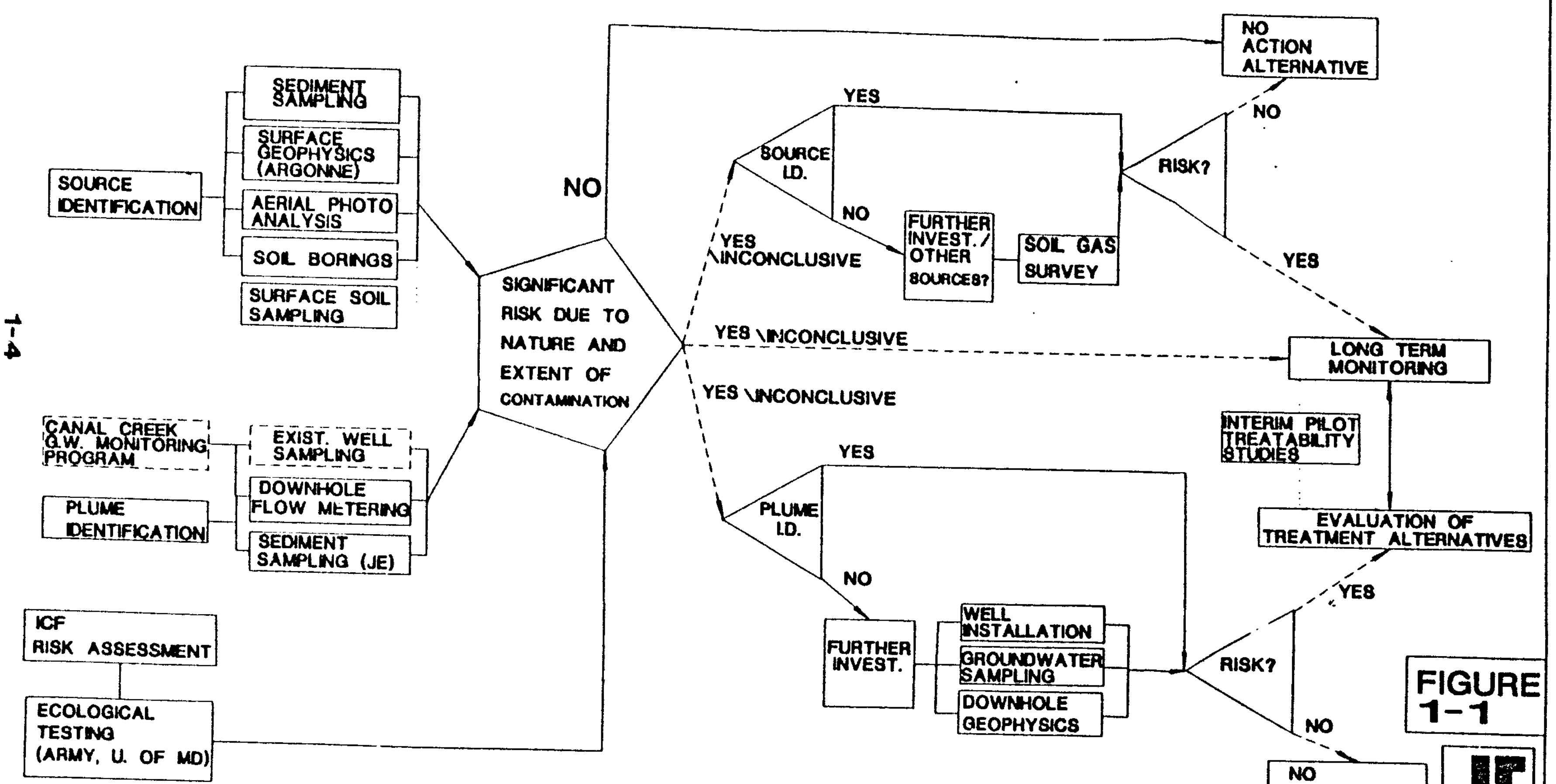

FIGURE 1-1

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1.3 DOCUMENTATION

This plan was developed from applicable information contained in plans prepared for similar work at APG and modified for site-specific purposes. Procedures detailed in this document will be used while performing the activities outlined for the FFS at Beach Point.

1.3.1 Field Sampling Plan

This Field Sampling Plan (FSP) was prepared using applicable EPA-approved protocols and procedures contained in an FSP developed for work at the O-Field area of APG. The Beach Point Test Site FSP is organized as follows:

Section 1.0 — Introduction.

Contract authority, purpose of the FFS, regulatory considerations, and data objectives to be attained during the program are detailed. Documents prepared in support of the sampling program are also discussed.

Section 2.0 — Site Background

A brief history and pertinent technical data for the Beach Point Test Site are discussed. A summary of the historical data collected by previous researchers is also presented.

Section 3.0 — Technical Approach

Rationale, procedures, and equipment used for the aerial photograph analysis, sampling program and geophysical and ecological risk studies are detailed. Included in this section are the procedures for determining the decontamination water source, equipment decontamination procedures, sample chain-of-custody, sample documentation, and equipment calibration documentation.

Section 4.0 — Sample Chemical Analyses

Analytical parameters and associated laboratory methods proposed for this program are summarized. More detailed information is included in the Quality Assurance Project Plan (QAPP).

Section 5.0 — Investigation-Derived Waste Disposal

Procedures are described for temporary on-site storage and final dispcsal of uncontaminated and potentially contaminated wastes which will be generated during sampling activities.

Section 6.0 — Reporting Requirements

Reporting requirements are outlined for documents which will be prepared for detailing progress of the project and presenting results of the sampling effort.

1.3.2 Quality Assurance Project Plan

The QAPP presents the Data Quality Objectives (DQOs) for the project, methods for sample analysis, and the standard operating procedures (SOPs) for both the sampling teams and the laboratory (additional information is discussed in Section 2.6 of the Project Work Plan). Adherence to field sampling methodologies and analytical procedures specified in the QAPP will assure that the quality of the data remains consistent throughout the project. The QAPP for the Beach Point Test Site FFS project was developed from EPA-approved quality assurance measures and applicable sections of the QAPP for the Terrestrial and Ecological Risk Assessment (TERA) of APG-EA. SOPs provided in the QAPP are EPA-approved protocols developed by the U.S. Army Corps of Engineers Waterways Experiment Station (WES).

1.4 SAMPLING AND ANALYSIS OBJECTIVES

The scope of work outlined in the Project Work Plan details operations required for the tasks of identifying potential contaminant source areas, determining ... contaminant plume geometry and groundwater flow paths, and evaluating ecological toxicity of contaminants present in groundwater. The data generated through the activities outlined in the Project Work Plan are intended to supplement the existing data collected by previous researchers. The data will be used to assist in assessing risks to the environment posed ... presence of contamination in the Beach Point Test Site and planning treatability studies, aquifer testing, modeling, and other valuative efforts to determine the most appropriate remedial technology for the Beach Point Test Site, if necessary.

Specific sampling and analysis objectives have been separated into three project phases and are as follows:

Phase I Objectives*

- To evaluate potential on-site sources of groundwater contamination through review of historical aerial photographs, seismic and electromagnetic geophysical surveys, and surface soil and subsurface soil sampling.
- To collect groundwater samples from seven (7) existing groundwater monitoring wells. This well sampling is not actually part of the scope of work for the FFS, however, is planned to occur as part of the Groundwater Monitoring Program for Canal Creek. The data generated from this Groundwater Monitoring Program will be used to check contaminant levels against data that has been previously collected and confirm the suite of contaminants of concern (COCs) for future sampling, risk assessment, and pilot treatability studies.
- To determine the risk associated with the contamination found in the Beach Point Test Site. In addition, to determine if sediments in the area of Beach Point are contaminated and whether the source of any contamination is emanating from the Beach Point peninsula.
- To attempt to partially define the hydrogeology and geomorphology of the surficial aquifer in the Beach Point Test Site area through the use of geophysical surveys and downhole groundwater flow measurements.
- To prepare a summary report with recommendations for or further investigation, if necessary and determine if treatability studies remedial alternatives are needed.

*These objectives are based on the results of a USGS Canal Creek HGA data report dated April 1992.

The sampling methodology for this FFS will be in accordance with EPA guidance so that a standard method is used to obtain samples. The samples will be analyzed by approved laboratories. The analytical data will be the equivalent of EPA Level IV data. This level of data quality has been established for environmental work in the Beach Point Test Site by representatives of APG-DSHE. Table 1-1 summarizes the Phase I sampling regime for the Beach Point Test Site.

Phase II Objectives

The scope of objectives for Phase II work is entirely dependent upon the results of the Phase I activities. The objectives outlined below may be entirely or partially eliminated due to the results of Phase I activities. Potential objectives include:

- To further define the lateral extent of the dense nonaqueous phase liquid (DNAPL) contaminant plume in the surficial aquifer in the Beach Point Test Site area and to better determine groundwater movement by installing up to six (6) groundwater monitoring wells, sampling new and existing wells in the Beach Point Test Site area for Contaminants of Concern (COCs), and the performing flowmeter logging.
- To acquire more information concerning the geology of the surficial aquifer in order to more fully develop a conceptual model of the relationship(s) between groundwater flow and contaminant transport. This additional information will be acquired through geological logging of the soil borings during well installations, and downhole geophysical logging of the new wells.
- To determine if treatability studies are needed based upon the risk from, and the fate and transport of contamination in the Beach Point Test Site.

Phase III Objectives

Phase III investigations will determine appropriate treatability technologies and pilot studies for groundwater contamination in the Beach Point Test Site. The objectives of any possible Phase III investigations have not yet been determined, however, sampling objectives may include long term groundwater monitoring in order to determine the level of natural biodegradation of the contaminants in groundwater.

Table 1-1

Phase I Sampling Regime

MEDIA SAMPLED	NUMBER OF SAMPLES	LOCATION OF SAMPLES**
Sediment	10	Proximate to site
Sediment (local background)	4	Bush River, Kings Creek
Groundwater	7	Existing wells*
Subsurface Soil	10	Source locations
Surface soil	20	Suspected source locations

*University of Maryland will be conducting bioassays and biotoxicity studies on groundwater and on porewater from sediment samples.

**Figure 3-2 shows sampling locations.

2.0 SITE BACKGROUND

Beach Point is a small peninsula located at the mouth of Kings Creek where the creek flows into Bush River (Figure 2-1). The Beach Point Test Site includes the peninsula and areas south of Beach Point and southeast of the Aberdeen Proving Ground-Edgewood Arsenal (APG-EA) wastewater treatment plant. The test site has been used for several types of military testing work. These tests and approximate timeframes during which testing was performed include:

- firing tests of 4.2 inch mortar rounds (1940s);
- field tests of mobile clothing impregnating plants (1945-early 1950s);
- performance tests for pyrotechnic devices and smoke generators (1945-1970), and;
- fire suppression tests involving liquid rocket fuels (1963-1965).

Probable contaminant source areas due to these activities are depicted on Figure 2-2. Many of the wastes generated from these tests were discharged directly to Kings Creek and Bush River. Wastes from at least one of the mobile clothing impregnating plants were discharged into an unlined pit and were allowed to percolate into the subsurface. Some of the wastes generated from rocket fuel fire suppression tests were discharged directly on the ground surface and either ran off into the streams or percolated into the subsurface.

Buildings located at the test site were used for small-scale chemical agent storage (G agents), laboratories, storehouses, offices, and machine shops. Several of these structures were built with sewer systems which discharged directly to Kings Creek and Bush River. A few of the buildings were constructed with septic systems which allowed septic system effluent to percolate into the subsurface.

Many of the structures at Beach Point have been demolished or were moved to other locations. The buildings which remain are used primarily for storage. Materials stored in these structures include wastewater treatment plant supplies, pyrotechnic research materials (aluminum, graphite, etc.), and chemical agent decontamination water.

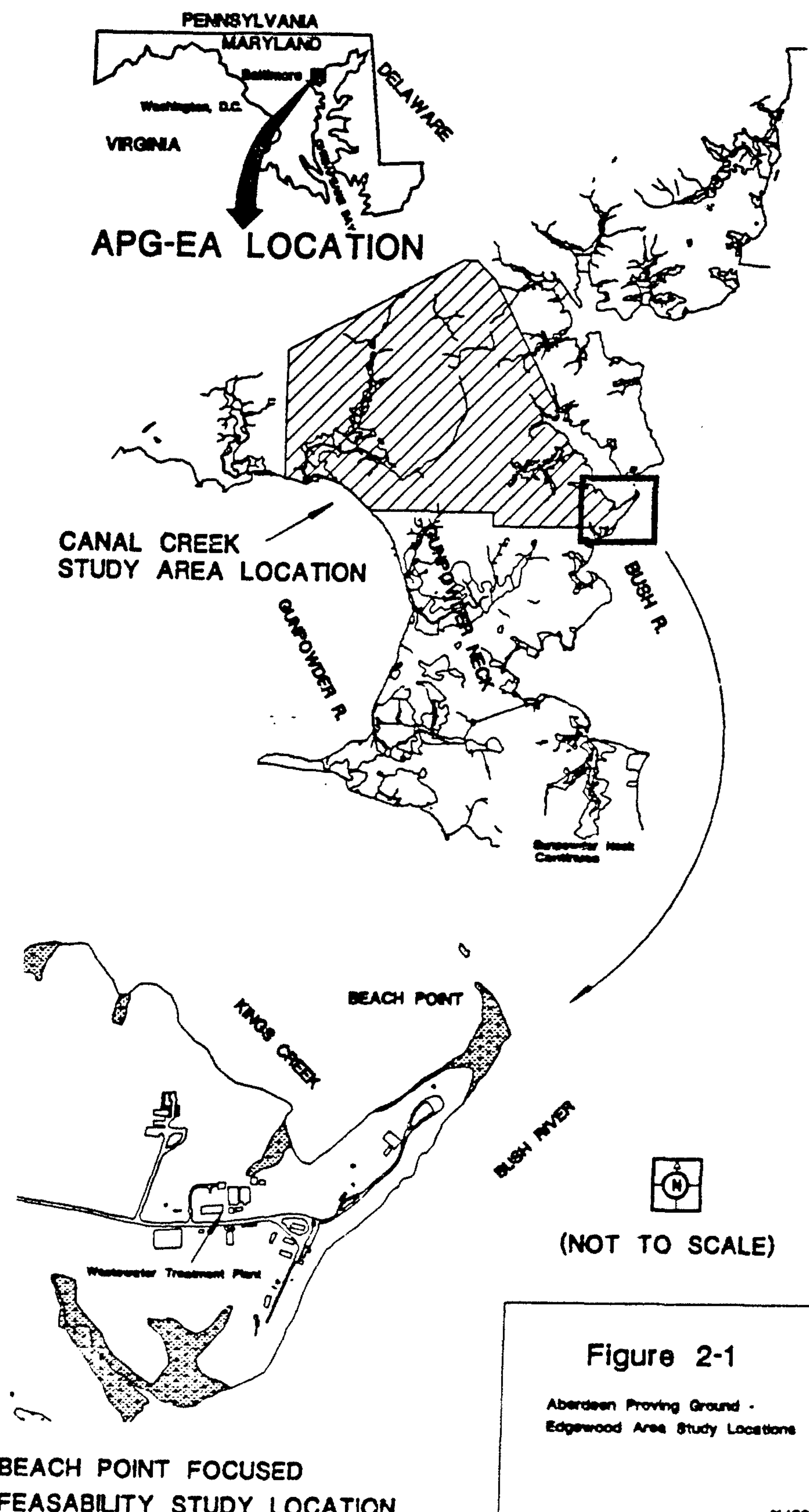

Figure 2-1

Aberdeen Proving Ground -
Edgewood Area Study Locations

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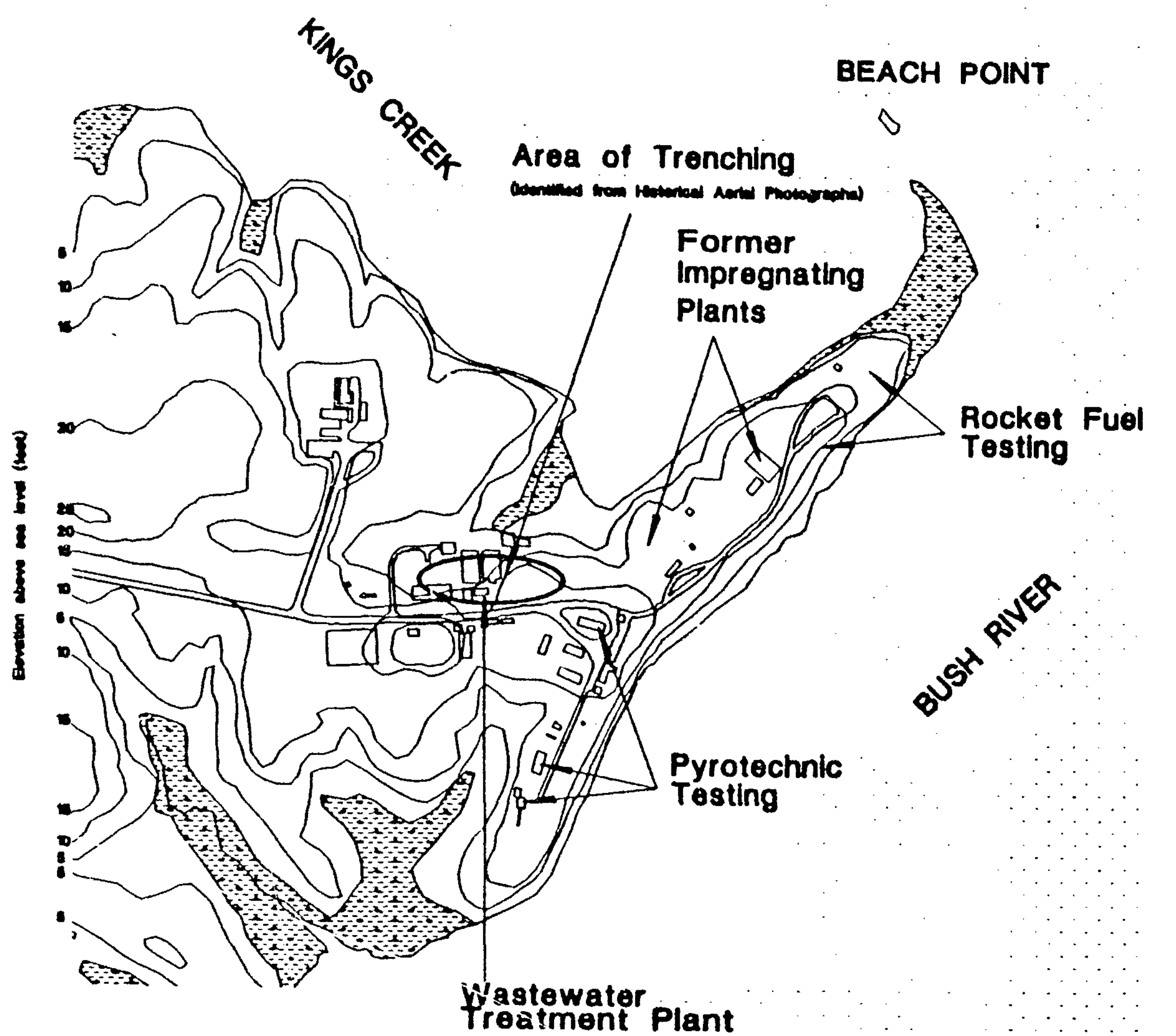

Figure 2-2
Beach Point Test Site

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Erosion of the Beach Point shoreline along Bush River has eliminated much of the beach area along the southern side of the peninsula. Erosion control efforts have been undertaken utilizing concrete construction debris to minimize further loss of land at Beach Point. Much of the construction debris deposited along APG-EA shorelines has come from demolition of chemical manufacturing plants, machine shops, and weapons filling plants which were demolished in the 1960s. The origin of construction debris deposited at Beach Point is not known.

2.1 LOCATION AND DESCRIPTION

The Beach Point project site (Figure 2-1) is located in the northwest quarter of Aberdeen Proving Ground-Edgewood Area in Harford County, Maryland. The project site is generally defined as the peninsula of land of APG-EA west of the confluence of Kings Creek and Bush River and east of the APG-EA sewage treatment plant (Figure 2-2).

2.1.1 Physiography

APG-EA lies in the Atlantic Coastal Plain physiographic province of North America. Overall topography of the area is relatively flat, with gently rolling topographic highs occurring between surface streams. Generally, the area slopes southward toward the Bush and Gunpowder rivers. Elevation of the Beach Point Test Site ranges from approximately 25 feet above mean sea level in the western section to near sea level along the major rivers. Average elevation of the site is approximately 15 feet above mean sea level.

2.1.2 Geology

Regional Geology. APG lies on coastal plain sediments that form a series of concentric bands sub-parallel to the Fall Line which lies just north of the installation. The Fall Line is the boundary between old resistant crystalline rock formations of the Piedmont Plateau and the younger, sedimentary rock formations of the Coastal Plain. The Coastal Plain sediments are Cretaceous and Quaternary in age and consist of unconsolidated beds of clay, silt, sand, and occasional gravel lenses. The sediments dip southeasterly, generally at an angle of less than one degree, and thicken to several hundred feet under the eastern shore of Chesapeake Bay. The crystalline rocks which underlie the Coastal Plain sediments are Precambrian to lower Paleozoic in age and consist chiefly of schist, gneiss, gabbro, granite, marble, and quartzite. The surface of this crystalline basement rock also dips to the southeast at an angle of less than one degree [Bennett and Meyer, 1952; Dingman et al., 1956; Southwick and Owens, 1969].

The geologic formations that outcrop within APG, from oldest to youngest, are the Potomac Group, Talbot Formation, and recent alluvium. The Potomac Group is Cretaceous in age and is subdivided into the Patuxent, Arundel, and Patapsco Formations. The Talbot Formation is Pleistocene in age and occupies the higher ground, while the alluvial deposits are recent in age and occur at the lower elevations.

The Potomac Group sediments are continental in origin and were deposited in the floodplain of rivers, lakes, and swamps. The lowest member, the Patuxent, consists generally of light gray to orange, moderately sorted, angular to sub-rounded sands with gray silt and clay beds. The silt and clay can constitute over 50 percent of the material in localized areas. The clays are usually white but may be brown, red, or purple. Gravel occurs mostly in abandoned channels and may be cemented by iron oxide. The Arundel Clay overlies the Patuxent and is primarily a red and brown clay with iron oxide stains. Where iron stains are absent, the colors are gray to dark gray. Sand lenses along with thin seams of cemented sandstone also occur. The uppermost sediments of the Potomac Group, the Patapsco Formation, are somewhat similar to the Patuxent Formation. The noticeable difference is that the Patuxent contains more sand and gravel and the Patapsco is marked by a higher percentage of clay. The Patapsco sediments are composed essentially of red, brown, white, or gray gravel, sand, sandy clay, and clay. Crossbedding is common. Most beds are lenticular and change rapidly in character over short distances. The sands are fine-to-medium grained and sub-rounded with a minor amount of gravel.

2.1.3 Regional Hydrogeology

The principal water bearing formation in the Coastal Plan is the Patuxent Formation. The Patapsco Formation also contains beds of sand and gravel which yield large quantities of water. The Arundel Clay is considered to be a confining layer, but it can yield small quantities of water for domestic supplies. Clear differentiation of these Potomac Group formations in Harford County is reportedly difficult. The Pleistocene age deposits can yield significant quantities of water where the sand and gravel beds are thick. The Potomac Group and the Pleistocene age formations all provide, or have provided, water for usage on APG.

2.1.4 Groundwater

Shallow groundwater occurrence at APG-EA has been defined for three separate aquifer systems. The three aquifer systems have been identified as:

- the surficial (or water table) aquifer which is generally comprised of Talbot Formation sediments, recent alluvial/estuarine deposits, and the unconfined portion of the upper Potomac Group sediments in the western portion of the study area;
- the Canal Creek aquifer which is comprised of sediments from the upper Potomac Group; and
- the lower (unnamed) confined aquifer which is comprised of sediments from the lower Potomac Group.

A detailed discussion of groundwater at the Beach Point Test Site can be found in Section 2.3.3 of the Project Work Plan.

2.2 PREVIOUS INVESTIGATIONS

Previous environmental studies conducted at APG-EA have identified areas of the installation contaminated with unexploded ordnance (UXO), and a variety of chemical manufacturing wastes. A Preliminary Assessment/Site Inspection (PA/SI) completed in

1984 has also identified a potential for off-site migration of contaminants into several nearby proposed critical habitat areas. In March 1990, the U.S. Army and U.S. Environmental Protection Agency (EPA) signed a Federal Facilities Agreement (FFA) which requires that studies of the site satisfy the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Several environmental studies have been conducted within the Beach Point Test Site. The studies have included biological, soil, sediment, surface water, and shallow groundwater investigations. The most comprehensive studies of Beach Point are the RCRA Facility Assessment (RFA) and the Hydrogeologic Assessment (HGA). These studies have indicated the presence of various contaminants in surface waters, groundwater, soils, and biota in the area. Results of these studies have indicated a need for collecting further information regarding potential sources of environmental contamination and possible contaminants associated with those sources. Further delineation of the lateral and vertical extent of detected plumes of contamination may also be required.

A limited amount of data from previous investigations is available in the Installation Restoration Data Management Information System (IRDMIS). However, comprehensive listings of the data derived from the investigations are contained in reports summarizing previous studies. Section 7.0 lists reports generated from these investigations.

2.2.1 RCRA Facilities Assessment

The RFA was prepared by the U.S. Army Environmental Hygiene Agency (USAEHA) in 1989. The RFA documents and catalogues historical activities related to activities at APG-EA which have resulted in confirmed or potential releases of hazardous materials into the environment and are related to solid waste management. Installation Restoration Program (IRP) sites and associated Solid Waste Management Units (SWMUs) are listed in the RFA along with recommendations for further work at the sites.

2.2.2 Hydrogeologic Investigation

The Hydrogeologic Assessment (HGA) for the Canal Creek area was completed by the U.S. Geological Survey (USGS) in 1991. Seven monitoring wells were installed during the investigation to characterize groundwater in the Beach Point Test Site of APG-EA. The HGA outlines hydraulic and geochemical characteristics of three aquifer systems located in the area. Findings are detailed from a series of chemical analyses performed on sediment gas, surface water, and groundwater samples.

Several areas of groundwater contamination were discovered during the investigation. Identified contaminants include, but are not limited to, volatile and semivolatile organic compounds, toxic metals, and nitrates. Plumes of contamination were detected in the surficial aquifer at Beach Point.

2.3 BASELINE RISK ASSESSMENT

A Baseline Risk Assessment of the Canal Creek area (which includes the Beach Point Test Site) was performed by ICF Kaiser Engineers in January, 1991. An evaluation of human health and ecological impacts in the Canal Creek area was presented for known and tentatively identified chemical contaminants. Conclusions drawn from the study suggest that insufficient data were available for a full evaluation of human health risks. Also outlined in the assessment are probable adverse impacts to aquatic and terrestrial wildlife either inhabiting Canal Creek or feeding in the Canal Creek area. Along with uncertainties inherent to risk estimates, the report states that additional sampling data is needed to more definitively assess environmental impacts to the Beach Point study area and to assess human health risks with a greater degree of certainty.

Standardized procedures will be employed by field sampling teams to assure consistency of data quality. The following section describes methods which will be used while conducting the proposed field work. The methods include: personal health protection, site safety procedures, environmental media sampling protocols, and procedures for decontamination of equipment.

3.1 SITE LOGISTICS

Several protocols will be followed to ensure the safety of individuals on-site as well as adequate communication with Army operations prior to and during field investigations. Specific safety and security measures may involve the U.S. Army Technical Escort Unit (TEU); the use of personal protective equipment (PPE); and communications with the APG Emergency Operations Center, Chemical Research Development and Engineering Center Security Office (Security), and the Edgewood Fire Department. These measures are addressed in this section. Coordination, notification, and emergency response contacts and telephone numbers are given in Table 3-1.

3.1.1 General Requirements

Prior to the beginning of sampling activities, JEG will mobilize an office trailer at the site and position the office in a location to be determined by APG-DSHE. Normal APG-EA working hours are 0800 to 1630 hours. JEG sampling crews will work from 0800 to 1700 hours. If working hours for groundwater sampling in unrestricted areas must be extended into the evening or on weekends, the JEG site manager will coordinate hours for extended work with APG Security and APG-DSHE.

Table 3-1

Contacts and Telephone Numbers

NAME	ORGANIZATION	TELEPHONE
John Wrobel	APG-Directorate of Safety, Health, and Environment	(410) 671-3320
Bob Crouse	APG-DSHE Installation Safety Division	(410) 671-3660
Mark Montgomery	EMO (Battelle)	(916) 852-7172
Gary Grimm	EMO (Battelle)	(410) 676-0200
Christopher Barrett	CBDA Security	(410) 671-3222/3220
Duty Officer/Duty Non-Commissioned Officer	APG-EA Military Police Operations	(410) 671-2222/2628
Francine Gordon	JEG Project Manager	(202) 789-7290
Wayne Mandell	JEG Task Manager	(202) 789-7290
Terry Briggs	JEG Corporate Health and Safety Officer	(303) 595-8855
Ken Rapuano	JEG Washington Operations Health and Safety Coordinator	(202) 789-7290
APG-EA Emergency Phone Number		17 (Installation Phones Only) (410) 676-0960
Maryland State Police		911 (Emergency Only)

3.1.2 Restricted Areas

Most of the areas of investigation at the Beach Point test Site are in areas of open unrestricted access. Escorts and security badges will not be necessary while working in these areas.

Security is strictly enforced at fenced building sites and areas which are fenced around the perimeter. These sites are conspicuously posted as restricted areas and are well guarded and patrolled. Stringent precautions are taken to ensure security in these areas due to the nature of everyday activities. Security check points, badges, and possible escort requirements are components of the security procedures at fenced sites.

Work in restricted areas will be limited to time between 0800 and 1600 hours. Escorts will be provided by APG-DSHE on an as-needed basis for work in restricted areas. Coordination of escort requirements, lead time needed for escort requests, and escort availability will be between the JEG Site Manager and the APG-DSHE Representative.

3.1.3 Security Badges

Team members are not required to possess security badges while working in unrestricted areas of APG-EA. JEG will provide JEG personnel with baseball caps, hardhats, or shirts that have the "JE" logo, "Jacobs," or "Jacobs Engineering Group" clearly printed on the article. This will provide a means of preliminary identification of the person as a team member who is authorized to work on the site.

Temporary visitor badges will be issued to team members working in restricted areas. Temporary visitor badges are issued at the gate to the restricted area. APG Security issues contractor security badges. A notice from JEG will be submitted to APG-DSHE at least two weeks in advance for proper personnel clearance to obtain a temporary visitor badge.

An escort from APG-DSHE will be required to accompany JEG personnel wearing Temporary visitor badges in restricted areas. Security requirements specify that no more than three people with visitor badges may be escorted by an individual possessing a permanent security badge. A field team member with a temporary badge must be accompanied by the designated escort at all times in restricted areas.

JEG field team members will obtain contractor badges to minimize the need for an APG-DSHE escort. Forty-five to sixty days are required for issuance of a contractor badge after security papers are completed by the party requesting a badge. Primary JEG field personnel have already submitted the forms necessary to obtain contractor badges.

3.1.4 Vehicle Access

Vehicle passes will be obtained as needed for all vehicles used in the sampling project. Generally, APG-EA is open to privately-owned civilian and contractor vehicles. Passes for such vehicles are not required. Privately-owned vehicles (POVs) are not permitted in restricted areas. Only contractor vehicles will be permitted into restricted areas for project activities. Passes for contractor vehicles will be obtained at the restricted area gate, if required.

3.1.5 Camera Passes and Site Photographs

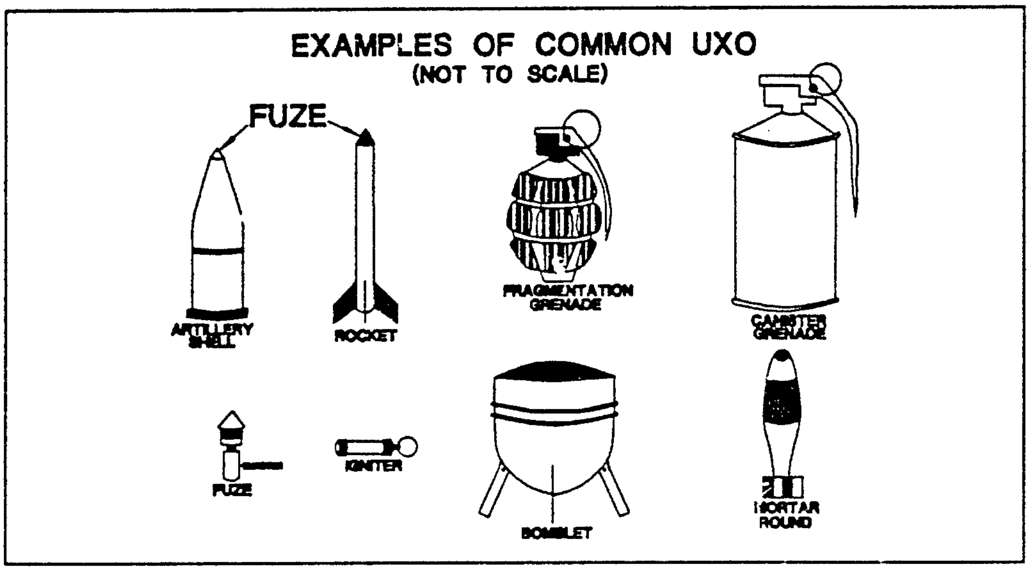
EPA strongly suggests complete photo-documentation of all CERCLA site activities. JEG will comply with the suggestion to the extent allowed by APG-DSHE. All JEG personnel who will be in possession of still or video cameras while on site will be required to carry a camera pass. Camera passes will be obtained by each individual at the office of the APG-EA Provost Marshal, building E5141. Photographs taken during the project will be limited to documentation of project-related activities.

If it is necessary to document field activities or monitoring well conditions in restricted areas, the APG-DSHE escort will perform the photography. Only one camera per sampling team will be permitted in restricted areas. The APG-DSHE escort will maintain custody of cameras while sampling in restricted areas. Buildings and structures in sensitive and restricted areas of APG-EA will not be photographed.

3.1.6 Unexploded Ordnance

Unexploded ordnance (UXO) could be encountered at sampling sites in the Beach Point Test Site. Common ordnance items include grenados, mortar rounds, artillery shells, fuzes with bursters, land mines, and rockets. These items were painted to military specifications and labelled to identify the contents. Weather and the environment may have obliterated markings and paint. Figure 3-1 shows some of the more common types of ordnance which could be found at APG-EA.

Figure 3-1



All sampling sites where intrusive sampling is performed will be screened for UXO prior to collecting samples. In the event suspected UXO is encountered, all sampling work will immediately cease at that location and the JEG Site Manager will be notified immediately. The sampling team will clearly mark the suspected UXO location with brightly colored survey ribbon and offset the sampling location a minimum of ten feet. The JEG site manager will call the APG Security emergency phone number and report the discovery of suspected UXO.

3.1.7 On-site Communication

Commercial telephone lines and a two-way radio base station will be available at the JEG office location. Frequency to be used will be assigned by APG-DSHE. Each sampling team will carry hand-held, two-way radios for communication from sampling sites to the JEG field office. If necessary, a portable cellular telephone will be made available for landline communication from any sampling site in the area.

3.2 DECONTAMINATION WATER

JEG will assemble a commercially-available water treatment system at the field office for on-site manufacturing of organic-free, deionized water (organic-free water). This water will be used for specialty cleaning (decontamination) of sampling equipment. The treatment system will consist of the following components:

- a coarse filter canister for removal of any suspended solid matter in the APG-EA water supply;
- a pressure regulator to prevent over-pressurizing sensitive system components;
- a water meter for tracking total production of organic-free water;
- a granular activated carbon (GAC) canister for removal of any dissolved organic chemicals;
- a primary ion exchange canister for initial removal of any anionic and cationic constituents;

- a resistivity meter with indicator lights to continuously monitor performance of the primary ion exchange canister;
- a polishing ion exchange canister for final removal of ionic contaminants;
- a chlorine removal filter canister; and
- a 2 micron filter canister for removal of any fine particles which may escape from the GAC and ion exchange canisters.

Bulk water will be obtained from an approved APG-EA tapwater source located near the JEG field office. Tapwater will be supplied to the treatment system through ordinary garden hoses. Each component of the organic-free water treatment system will be plumbed in series with Teflon tubing and fittings made from stainless steel or Teflon. The resistivity meter will be set at 14 mega-ohms/cm to trip the breakthrough indicator light which shows when the primary ion exchange canister should be replaced. The GAC canister will be replaced according to manufacturer's specifications for the useful life of the canister with respect to the quantity of water treated.

Tapwater will only be used for the initial cleaning of equipment. Organic-free deionized water, nitric acid solution, and pesticide-grade isopropanol will be used for thorough equipment decontamination. Decontamination of sampling equipment will be performed using the procedures specified for each type of equipment as detailed in Section 3.7 of the FSP.

3.2.1 Decontamination Water Samples

Samples of the tapwater and organic-free water will be obtained prior to the start of field activities and will be submitted to the laboratory for chemical analysis. Organic-free water samples will also be collected weekly during the sampling program. Collection of water samples will be accomplished by following applicable procedures in the groundwater sampling protocol. At a minimum, the laboratory will analyze each sample for the following chemical parameters:

- Target Compound List (TCL) volatile organic compounds;
- TCL semi-volatile compounds (base/neutral/acid extractable organic compounds, or BNAs);
- Target Analyte List (TAL) inorganic constituents, and;
- water chemistry parameters (phosphates, sulfates, chloride, nitrite, and nitrate).

Additional project-related chemical analyses may be requested from the laboratory for a small percentage of the samples.

Analytical results for samples collected prior to the start of sampling activities will be used to evaluate the performance of the organic-free water treatment system as a suitable source for decontamination water. Additional analyses of the organic-free water samples will be used for quality assurance checks during the sampling program.

3.3 GROUNDWATER SAMPLING

Groundwater sampling is to be performed at seven (7) existing monitoring wells (Figure 3-2) in the Beach Point Test Site as part of the Canal Creek Groundwater Monitoring Program. Additional groundwater samples will be collected from newly installed wells during Phase II activities. Before purging begins, a discrete bottom sample shall be taken from well CC-33B for DNAPL analysis. All groundwater samples will be collected in accordance with procedures in the QAPP.

3.3.1 Groundwater Sampling Procedures (Phase I)

One sample of groundwater will be collected for DNAPL analyses from the bottom of monitoring well CC-33B. Sampling procedures will follow protocols for DNAPL sample collection outlined in the QAPP (SOP 013). The sample will be submitted to the laboratory for analysis of TCL compounds (VOCs, SVOCs, and Pesticides/PCBs).

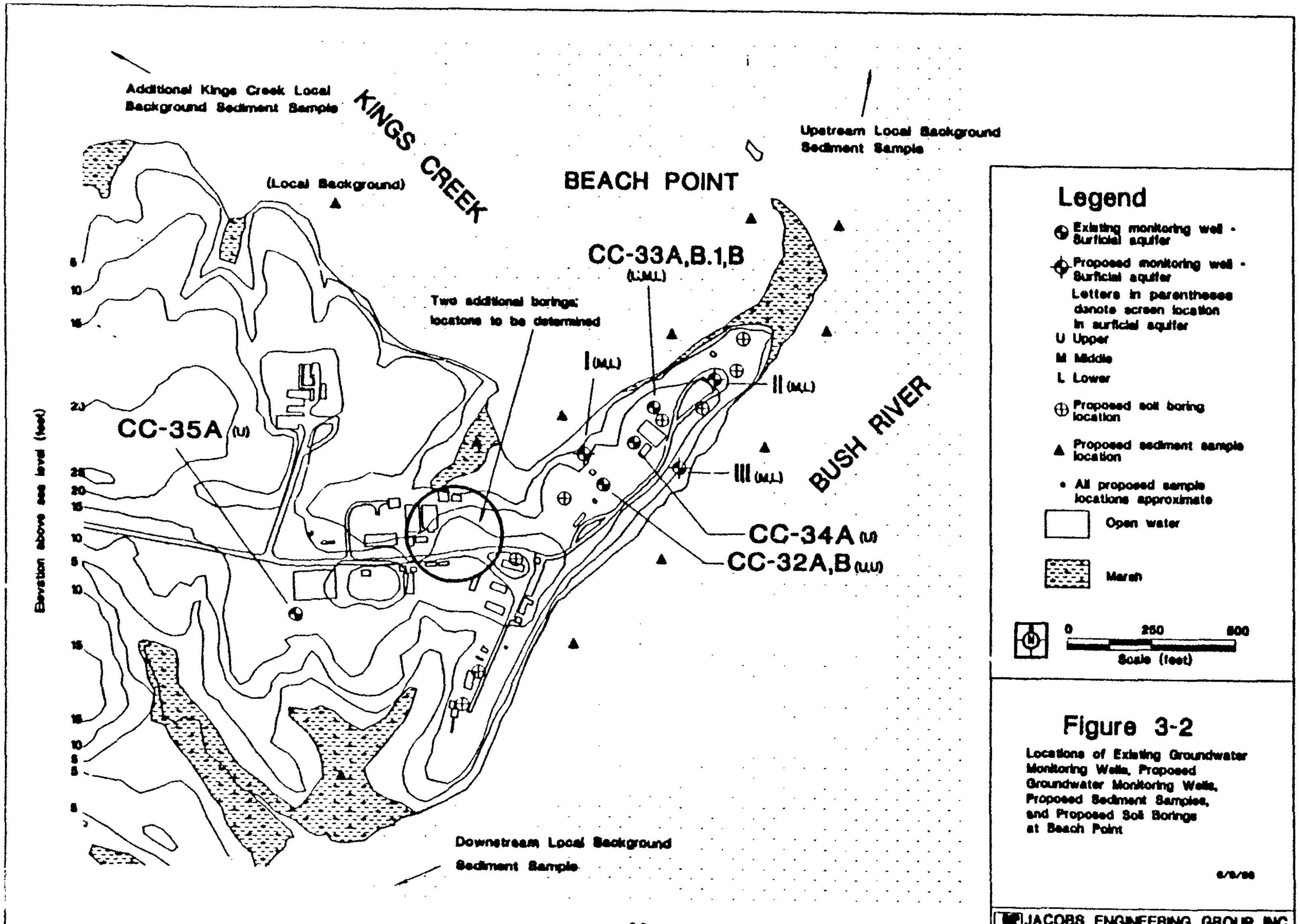


Figure 3-2

Locations of Existing Groundwater Monitoring Wells, Proposed Groundwater Monitoring Wells, Proposed Sediment Samples, and Proposed Soil Borings at Beach Point

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3.3.2 Groundwater Sampling Procedures (Phase II)

Specific procedures for site preparation, water level measurement, well purging, field parameter measurement, and laboratory sample collection are detailed in the QAPP (SOP13). An outline of the prescribed groundwater sampling protocol is described below.

3.3.2.1 <u>Site Preparation</u>. The sampling team will cut tall grass and brush at the sampling site and spread a clean piece of polyethylene sheeting on the ground around the well. This will prevent decontaminated sampling equipment from becoming contaminated by contact with soils. The sheeting will also minimize contact of potentially contaminated water with surface soils if spills occur.

Sampling equipment and wastewater containers will be staged in convenient locations at the well site. Drums for purge water will be placed on pallets at a location accessible to a vehicle. The portable generator will be placed at least 25 feet down wind of the well.

While standing upwind from the well, the sampling team will remove the well cap and obtain readings for organic vapors at the wellhead and in the breathing zone with a photoionization detector (PID) and/or a flame-ionization detector (FID). Personal protective equipment (PPE) will be modified in accordance with requirements in the Health and Safety Plan (HASP) based upon PID/FID readings obtained at the wellhead. PID/FID readings and any modifications to PPE will be recorded in field logbooks and on the monitoring well sampling data sheet.

3.3.2.2 <u>Static Water Level Measurement</u>. Measurement of the water level within the well will be taken prior to any well purging or groundwater sampling activity. Static water level will be measured to the nearest 1/100th of one foot (.01 ft.) from the water surface to an established measuring point (MP) marked on the riser casing. The MP should be marked on the highest point of the riser casing above ground level. If the MP is not permanently marked on the riser casing, the sampling team will determine the highest point of the riser casing and inscribe a permanent mark with a sharp knife to establish a new MP. Static water level and the location of the MP for each well will be recorded in the field logbooks and on the monitoring well sampling data sheet.

3.3.2.3 **Well Purging**. Each monitoring well will be purged with a low-flow Grunfos II Redi-Flow submersible pump, or equivalent, equipped with a Teflon-lined (if possible) polypropylene sampling hose to remove stagnant water prior to groundwater sampling. This will assure that water samples are fresh and representative of groundwater conditions. The following EPA-recommended protocol will be used for well purging:

- The pump will be lowered slowly into the well and set at a point near the middle of the screened interval.
- A water level indicator will be lowered into the well and set at a point immediately below the static water level.
- Purging will begin with the pump set on the lowest flow rate. The flow rate will be gradually increased to a rate not to exceed 1 liter per minute. A constant flow rate setting of approximately 500 ml/min. will be used if possible.
- The water level will be monitored continuously as the well is being purged. Flow rates will be adjusted to prevent drawdown in the well.
- Physical chemistry parameters will be monitored every five minutes as the well is purged. The next subsection discusses measurement of these parameters.

Water levels in the well will always be maintained above the topmost portion of the screen to prevent air-stripping of volatile chemical compounds. If monitoring well drawdown to the top of the screen occurs at a purging flow rate of <100 ml/min., the well will be considered purged adequately and available for water sampling after it has recharged. If turbidity of the water is high, the well will be purged a second time at the lowest flow rate before samples are collected. The physical chemistry parameter readings will be recorded for water samples collected during each pumping episode and recorded in field logbooks and on monitoring well data sheets.

Well completion measurement data is missing for most of the monitoring wells. Sand packs are estimated to extend at least two feet above the top of the screened interval in each monitoring well. A 30% sand pack porosity factor is assumed for the purpose of calculating saturated annulus volume. Actual volumes of water purged from each monitoring well will be recorded in field logbooks and on the monitoring well data sheet. Table 3-2 is presented to facilitate volumetric calculations in the field.

Table 3-2
Well Purge Volumes/Foot of Well
(in gallons)

BOREHOLE DIAMETER	10 inch	CASING DIAMETER	4 inch	CASING VOLUME	0.65	SANDPACK VOLUME	1.03
BOREHOLE DIAMETER	7.5 inch	CASING DIAMETER	2 inch	CASING VOLUME	0.16	SANDPACK VOLUME	0.64
BOREHOLE DIAMETER	10 inch	CASING DIAMETER	2 inch	CASING VOLUME	0.16	SANDPACK VOLUME	1.17
BOREHOLE DIAMETER	7.5 inch	CASING DIAMETER	4 inch	CASING VOLUME	0.65	SANDPACK VOLUME	0.49
BOREHOLE DIAMETER	24 inch	CASING DIAMETER	18 inch	CASING VOLUME	13.22	SANDPACK VOLUME	3.08

3.3.1.4 Physical Chemistry Samples

Physical water chemistry parameters pH, temperature, oxidation/reduction potential (Eh), specific conductivity (SC), turbidity, and dissolved oxygen (DO) will be monitored with in-line instruments. Readings of the physical parameters will be recorded every three to five minutes as the monitoring well is purged. Monitoring wells will be purged until stabilization of DO measurement within ± 10% of the two previous readings has been achieved. Results of the filed measurements will be recorded on a data sheet for the monitoring well and in field logbooks.

If continuous readings of physical parameters are not possible, readings of the physical chemistry parameters will be taken on grab samples of water collected every three to five minutes. Well purging will be considered adequate if the DO measurement stabilizes within ± 10% of the two previous readings.

If the DO readings are not stabilized to within ± 10% of the previous two readings before five well volumes have been removed from the well, the well will be considered adequately purged and available for water sampling upon removal of five well volumes. Physical parameter readings will be recorded in field logbooks and on the monitoring well data sheet.

Physical chemistry parameter measurements will be made on instruments which have been calibrated against known standards. Calibration procedures for each type of instrument which will be used for physical chemistry data collection are included in the QAPP.

3.3.1.5 Laboratory Samples

Groundwater samples for laboratory analysis will be collected immediately after stabilization of DO has been achieved. Collection of laboratory samples will follow the procedures detailed in SOPs provided in the QAPP.

Sampling teams will use the low-flow Grunfos II Redi-Flow submersible pump, or equivalent, equipped with a Teflon-lined (if possible) polypropylene sampling hose for collecting all groundwater samples. Sample bottles will be filled in the order of decreasing volatility in accordance with procedures in the QAPP. Sample bottle requirements, head space allowances, and preservatives for groundwater samples are presented in the QAPP.

Sampling teams will triple-rinse sample bottles with sample water before preservatives are added. Although sample bottles will be laboratory-cleaned according to EPA procedures, triple-rinsing is required to reduce the likelihood that any contaminants introduced into the bottles during shipment will be transferred to the sample.

Filtered water samples will be collected by passing the sample water through a disposable, in-line 0.45/μm filter attached to the sampling hose. Sample bottles for filtered groundwater samples will first be triple-rinsed with filtered sample water before preservatives are added.

Sample bottles will be labeled, custody-sealed, enclosed in a plastic bag, placed in an ice chest, and maintained at a constant temperature of 4°C immediately after each sample is collected. Sample numbers and corresponding analysis requirements will be recorded on each monitoring well data sheet and in field logbooks.

3.3.3 Safety Concerns

Sampling team members will take precautions to minimize their exposure to organic vapors which may be present in the headspace of the well. Full-facepiece, air-purifying respirators with GMC-H cartridges will be used when the well is opened. PID and FID readings will be taken immediately upon opening the well and at intervals during the groundwater purging and sampling process. Personal protective equipment (PPE) will be worn to prevent contact with the groundwater. Gloves will be changed or decontaminated between wells to reduce the risk of cross-contaminating water samples or monitoring wells.

3.4 SEDIMENT SAMPLING

Sediments will be sampled from the Bush River and Kings Creek sides of the Beach Point peninsula. Sediments analyses will be used to determine if surface run-off and/or contaminated groundwater is contaminating the near shore benthic environments in the area of Beach Point. In order to determine possible contaminant effects on the biota, the University of Maryland (UM) will be conducting toxicity evaluation of the sediments. JEG will collect samples using sediment protocols established by UM and the U.S. Army Corps of Engineers Waterways Experiment Station (WES).

3.4.1 Sample Site Selection

Sediment samples will be collected below the low-tide water elevation on the Bush River and Kings Creek sides of the Beach Point peninsula. Sediment samples will be acquired in water approximately 1-foot deep which will enable sampling teams and UXO clearance crews to wade to the sampling point.

Fourteen (14) sediment samples will be acquired in the area of Beach Point. The approximate locations of the samples appear on Figure 3-2. Rationale for the distribution of these samples is discussed in the Project Work Plan (Section 3.2.1.7).

3.4.2 Sampling Equipment and Techniques

Sediment samples will be collected in the following manner:

- The sampler team leader will select the sample site, locate it on a site map or aerial photograph and determine the location (to be performed prior to sampling).
- Samples will be obtained from the surface of the sediment to the total depth of the sampling tool (approximately 1.0 feet).
- The sample team members will initiate COC procedures.

The sediment sampling device will be capable of taking and retaining an undisturbed coring of bottom sediment, in a body of water, to a depth of at least one foot. Alternatively, samples may be taken using a dredge sampler, shovel, or other hand-operated sampler. In all cases, samples will be collected to a one-foot depth beneath the sediment-water interface, whenever possible. Care will be taken to retain fine sediments which often contain the highest concentration of chemical contaminants. Sediment samples will be placed into containers using only stainless steel utensils. Sediment that is in direct contact with the sampler will be discarded. A minimum of 500 grams of sediment will be collected at each site. Additional material may be required if duplicate analyses are scheduled to be performed on individual samples.

The sampling device will be decontaminated prior to each use in accordance with procedures in the QAPP (SOP 005).

3.4.2.1 **Safety Concerns**. Principal safety concerns for the sediment sampling are water safety and minimizing contact with the river bottom where UXO may be located. Prior to beginning of the sampling mission, there will be a tailgate safety meeting covering water safety. The team members should be able to swim. If a team member cannot swim, this must be identified so that appropriate precautions can be taken. There will be a shore-based spotter to monitor the sampling team when they are wading in the water. Level of dress, UXO clearance, and safety procedures are described in the QAPP and Health and Safety Plan and will be followed at all times.

3.5 SOIL SAMPLING

Soil samples will be acquired from areas suspected as potential contaminant sources. The soil sampling locations will be determined through information available from surface geophysical surveys, aerial photography analysis and a soil gas survey. The soil samples will be collected from both the surface and subsurface as indicated in the Project Work Plan.

3.5.1 Surface Soil Sampling

Surface soil samples will be collected with a stainless steel scoop or piston sampler. Locations for surface soil sampling will be based upon aerial photography and geophysical investigations (see Section 3.2.1.5 of the FFS Project Work Plan). Samples will be collected from the first six inches (0.5 ft.) of soil. Samples will then be placed in an appropriate sample container and sealed.

Prior to sampling, surface vegetation, rocks, pebbles, leaves, twigs, and debris will be cleared from the sample point to allow collection of representative material. Sampling equipment will be cleaned away from the sampling point. Equipment will be decontaminated prior to each use in accordance with procedures in the QAPP (SOP 005).

At least one additional sample will be taken from an area apart from the sites to establish tentative background values. One or more samples will be collected in swales or drainages intersecting the site.

3.5.2 Subsurface Soil Samples

Subsurface soil boring samples will be acquired in the Beach Point Test Site at locations that have been determined to be probable contaminant sources. A maximum of ten (10) soil borings will be drilled with a maximum of ten (10) chemical soil samples acquired from this portion of the sampling program (one from each boring). Four of these borings will also be used in conjunction for shallow geophysical ground truthing for ARGONNE.

The subsurface soil sampling program will be undertaken to define the location, nature, and concentration of contaminants in subsurface soils. The location/distribution of contaminants at the site are governed by (1) site operation or waste disposal practices, (2) site design, (3) waste characteristics, (4) site topography and surface drainage, (5) climate, and (6) site geology. Tentative soil boring locations are identified on Figure 3-2.

Techniques described in this section are those that have been selected to provide practical and efficient means of obtaining subsurface soils in a manner consistent with safety protocol and QAPP requirements.

Before drilling begins at any boring location, installation personnel responsible for utility clearances will be notified and requested to clear the proposed drilling location based on the presence of utilities in the immediate area of the boring. In addition, all locations will be cleared for the presence of UXO prior to drilling. Drilling operations in areas of possible buried UXO or have had detection of possible UXO before drilling will follow procedures outlined in Section 3.1.6 of the FSP Standard Operating Procedure (SOP) 044 of the QAPP.

If it is determined that geotechnical soil testing is necessary, samples will be collected and analyzed according to Section 6.6.4 in the QAPP.

3.5.2.1 **Sampling Procedures**. Soil samples will be collected from soil borings utilizing hollow-stem auger techniques with continuous core samplers, five (5) feet in length, or 24-inch split spoon samplers. The sampler is pushed into undisturbed soil below the lead auger. After the sampler has been advanced to the desired depth, it will be withdrawn from the borehole and opened.

Intact soil samples for physical descriptions, retention, and potential physical and chemical analyses will be collected at 5-foot intervals or at each major stratigraphic change. These samples will be representative of their host environment and will be obtained from the sampler.

The sampler will be opened and the sample extracted, peeled, and bottled in the shortest time possible. Peeling is the process that removes the portion of sample which is in direct contact with the sampler. The ends of the sample are removed and discarded if appropriate. Samples collected for volatile analysis will be peeled, bottled, and capped within 15 seconds from the time the sampler is opened.

All samples will be placed in containers that have been certified cleaned. Preservation for soil samples is to keep them cool at 4°C. Samples will be labeled in accordance with procedures in the QAPP. Sample bottles will be placed in an ice chest immediately after collection and delivered to the laboratory as soon as possible, Sec. SOP 025 of the QAPP.

Immediately after the samples are collected, all vials and jars are checked for completeness of the sampling objective and COC procedures are initiated. The boring log is also updated at this time by the drilling monitor. Boring logs may be completed by the driller, but for purposes of completeness and documentation, a separate boring log is also compiled by the drilling monitor. The boring logs will include interpretations of subsurface materials and conditions encountered, sample locations, and other notes pertinent to how the boring was conducted. The drilling monitor's boring log shall be completed on a boring log form (Figure 3-3).

Each boring log will fully describe the subsurface environment and the procedures used to gain that description. Information to be included in the Log is detailed in SOP 025 of the QAPP. Logs will be recorded directly in the field without transcribing from a field logbook or other documents.

Each original boring log will be submitted directly from the field to the Contracting Officer's designated office within three working days of boring completion. In those cases where a monitoring well or other instrument is to be inserted into the boring, both the log for that boring and the installation diagram must be submitted within three working days of instrument installation. Only the original boring log (and diagram) will be submitted from the field to fulfill this requirement. Carbon, typed, or reproduced copies will not be submitted.

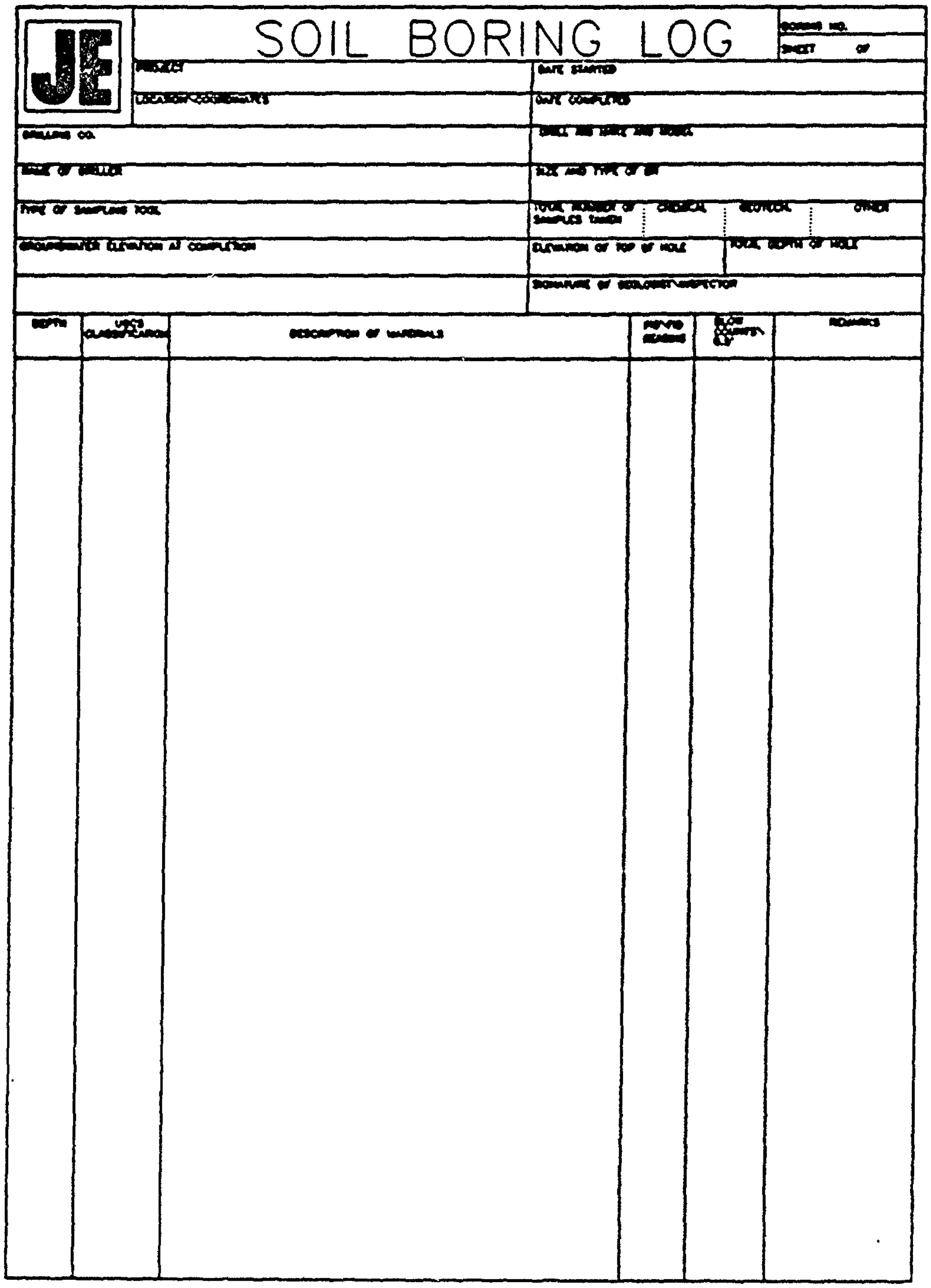

Figure 3-3. Soil Boring Log Form

3.5.3 Soil Borings For Monitoring Wells

A total of six (6) monitoring wells may be installed as part of Phase II of the FFS work. The description of well completion specifications appears in the SOPs in the QAPP. Soil borings drilled as part of the well installation will have no soil samples collected for chemical soil analyses. Monitoring wells will be installed as per SOP 019 of the QAPP. The soil borings for source ID, ground truthing (Section 3.5.2), and well installation will be coordinated so as not to duplicate the effort.

3.5.4 Soil Gas Sampling

Soil gas sampling may be performed during Phase II of the FFS in areas which have been identified as contaminant sources. Results of soil gas analyses will be used to delineate the possible extent of vadose zone contamination. Soil gas samples will be acquired and analyzed for the presence of volatile organic compounds and/or any other parameter which have been determined to be appropriate for this study. Areas in which soil gas sampling is performed will be determined from Phase I soil sampling results.

Objectives of the soil gas sampling program are to:

- Identify vadose zone areas of source contamination.
- Determine if gross contamination exists which extends over a large area.
- Supply data to aid in the effective performance of further remedial work if necessary.

3.5.4.1 **Active Soil Gas Sampling**. The soil gas sampling probe will consist of a stainless steel hollow barrel rod which is slotted at the end. The probe will be connected to an above-ground vacuum chamber by Teflon tubing which will be strung through a push rod. The vacuum chamber will be connected to an evacuated clean Tedlar bag. A stainless steel slide hammer, pneumatic hammer, or a hydraulic piston will be used to drive the probe into the vadose zone. Soil gas samples will be acquired at a specific depth interval (less than four feet). The depth at which the soil gas samples are to be taken will be at least 24 inches below ground surface before sample collection and the hole into which the probe is inserted sealed at the surface with an inert material to protect against atmospheric interference. Specific procedures for active soil gas sampling are in the QAPP (SOP 020).

Immediately before conducting soil gas sampling, a qualified UXO contractor will screen the sampling site for UXO. An MK-26 Ordnance Locator and/or similar metallic material detector will be set on maximum sensitivity in order to clear each sampling point to a depth of four feet. If suspicious contact is discovered, the sampling point will be abandoned and moved at least ten feet. The location of all identified or suspected UXO will be marked and reported to EOD. The UXO contractor will assist in developing a "render safe" plan for all UXO. Additional steps to ensure the safety of site personnel will be followed as described in the Unexploded Ordnance Clearance Scope of Work.

Prior to the day's sampling, internal surfaces will be flushed by using analytical grade nitrogen. Ambient air purified through an organic vapor (OV) cartridge will be used to flush the soil gas sampling system between sampling locations. A minimum of fifty (50) sampling system volumes of filtered ambient air will be flushed through the soil gas sampling system between sampling locations (this volume has been determined to be more than adequate for system purging purposes). Prior to analysis of soil gas, a sample of unfiltered ambient air will be drawn through the sampling equipment and injected into a Tedlar bag for QA/QC analyses. The analyses of the ambient air drawn through the sampling equipment will indicate whether any contaminants of concern exist in the ambient air or soil gas sampling equipment.

In addition, several background soil gas samples will be collected, outside the immediate study areas in order to determine levels of contamination in the background, not associated with source-derived contamination. Background areas will be determined by Army personnel.

All analytical equipment used in the field for soil gas analyses will be calibrated for the parameters being analyzed prior to sampling. The equipment will be fully charged and used in weather conditions within the limits of manufacturer specified equipment operation requirements. Soil gas sampling equipment will be decontaminated prior to each use following procedures in the QAPP (SOPs 005 and 020).

3.5.4.2 Passive Soil Gas Sampling. Due to the presence of UXO or other hazards below ground surface, it may not be possible to perform active soil gas sampling. In this case a determination as to the applicability of passive soil gas sampling techniques will be made.

Passive soil gas sampling measures the flux rate of ions/contaminates through the soil to a surface detector and therefore, yields much more qualitative data concerning actual levels of contaminants in the subsurface soil gas. Passive techniques will only be employed when no other alternatives exist.

Passive soil gas survey will employ the Petrex or Emflux® technologies. These surveys require:

- Initial location of sampling points using surveyed locations or field located non-surveyed locations using known bench marks.
- Making a small hole at the sampling location for detector placement.
- Placement of the detectors and exposure for a pre-determined time interval in a fashion in which they will not be disturbed.
- Collection of the detectors, sealing them from further exposure, and shipping them to the laboratory.

The detectors will each be uniquely numbered and chain of custody procedures followed from deployment to delivery to the laboratory.

Decontamination procedures for all equipment used for placement of the detectors will be the same as those specified for surface soil sampling (SOP 05 of the QAPP).

Since passive soil gas sampling procedures vary widely, details are not presented in this FSP, however, a generalized SOP is presented as SOP 027 of the QAPP.

Results of the soil gas sampling effort will be interpreted by chemist and other qualified personnel. Data collected in the field will include sampling location, depth, time, weather, ambient air and soil gas measurements using a FID, as well as other relevant data.

Evaluations will consist of reviewing the field notes, any groundwater quality data from wells in the vicinity of the soil gas sampling point and the test analysis values themselves. If contaminants are detected in any of the soil gas analyses, the potential relation of the detected soil gas contamination to soil or groundwater contamination will be evaluated. The detection of contaminated soil gas will be considered as an indication that shallow groundwater or soil contamination may exist.

3.6 GEOPHYSICAL SURVEYS

All surface geophysical surveys will be run by Argonne National Laboratories (ANL) and are referenced in the FFS Project Work Plan Appendix B. Subsurface geophysical logging will be done by a JEG subcontractor.

3.7 ECOLOGICAL TESTING

The University of Maryland will perform a six-month Biotox Study of Beach Point groundwater and will submit results to ICF for the overall risk assessment. Details are found in the FFS Project Work Plan Appendix C.

3.8 QUALITY ASSURANCE SAMPLES

Quality assurance (QA) water samples will be collected on a regular basis and will be submitted for laboratory analyses along with groundwater samples. These samples are used to evaluate the precision of analytical laboratory methods and to determine whether any inadvertent contamination of samples has taken place. QA sample containers, preservatives, shipping, and Chain-of-Custody procedures will follow the same protocols used for groundwater samples.

3.8.1 Duplicate Samples

The number of duplicate samples collected will be approximately 10% of the total samples. A number of duplicate samples will be "blind" duplicates, or duplicate samples for which the site location is not disclosed to the laboratory. The results from duplicate samples will be used to spot-check laboratory precision.

3.8.2 Split Samples

Government agencies may require split samples at any time during the project. These samples will be collected by representatives of the agency at the same time as project samples are collected.

3.8.3 Trip Blanks

One trip blank will be included in each sample cooler which contains water samples for VOC analysis. Trip blanks are used to determine if VOC contamination has occurred during sample shipment.

3.8.4 Rinse Blanks

The number of rinse blanks collected will equal approximately 5% of the total media samples. Rinse blanks are collected by pouring organic-free water into the decontaminated sampling equipment allowing the water to pass into the rinse blank bottles. The rinse blank will be collected in a manner identical to sample collection procedures, including use of a bottom-emptying device for VOC, IMPA, and MPA samples. Exceptions include samples taken using hand augers where the organic-free water will simply come into contact with the sampling device then into the sample containers. The rinse water is preserved and analyzed for the same parameters as the corresponding media sample. The purpose of a rinse blank is to determine if decontamination procedures have been adequate and cross-contamination between samples has not occurred.

3.8.5 Matrix Spikes

The laboratory will analyze samples spiked with known concentrations of selected contaminants to perform instrument calibration and to calculate analytical error. EPA Region III may provide a spiked performance evaluation sample during the sampling program.

3.9 SAMPLE SHIPMENT/CHAIN OF CUSTODY

Sample bottles will be labeled, preserved, and custody-sealed in the field, as described in the Quality Assurance Project Plan (QAPP). Each sample bottle will be sealed in a plastic bag. VOA samples will also be packed in clean air-tight steel cans with vermiculite for padding. Samples will be packed in plastic ice chests with sufficient ice to maintain a temperature of < 4°C during transport to the laboratory. The ice will be doublebagged to prevent contact of the melt water with the samples. All coolers will be affixed with custody seals before being shipped. All samples will be checked for integrity and lid closure to prevent leakage. Samples of the various media are not anticipated to meet the definition of a hazardous substance as defined by 49 CFR 171.8 and are therefore unregulated. Sample coolers will be labeled for shipment to the laboratory for next day delivery. The laboratory will be notified of the sample shipment and the estimated time of arrival of the samples being delivered. Any broken sample bottles or loosened sample jar lids at the time of laboratory receipt will be reported to the Sampling Team Leader so that any additional sampling may be conducted expeditiously.

Chain of Custody forms identifying all the sample containers, chemical analysis requirements, and other field data required by the laboratory will be completed for each sample cooler and shipped to the laboratory in each cooler. A sample of the Chain-of-Custody form is shown in Figure 3-4. The procedure for filling out these forms is provided in the SOPs which are part of the QAPP. These forms will be completed and signed by the sample team members and shipped to the laboratory inside each cooler. Upon arrival at the laboratory, the designated laboratory personnel will open the cooler, inspect and record the condition of each sampling container, and sign the chain-of-custody form.

3.10 DECONTAMINATION PROCEDURES

Comprehensive decontamination procedures are provided in SOP 005. The following procedures are specific to field activities. Tapwater used for initial cleaning of sampling equipment and decontamination rinse water will be obtained from the designated water supply source. The procedures which follow will be used for decontaminating all reusable downhole sampling equipment. These procedures are designed to meet the Level IV data quality objectives required for the sampling program.

3.10.1 Well Sounders and Measuring Tapes

Well depth sounders and measuring tapes will be decontaminated by following the procedure below:

- clean with hot tapwater from the approved source and non-phosphate laboratory detergent while scrubbing with a stiff-bristled brush;
- rinse with tapwater;
- rinse with organic-free deionized water;
- allow to air dry; then
- wrap in aluminum foil, seal in plastic, and date.

JE

CHAIN OF CUSTODY RECORD (COC)

INSTALLATION

PRIME CONTRACTOR

SAMPLE PROGRAM

SAMPLED BY (PRINT NAME)

SAMPLER'S SIGNATURE

REPORT TO:

BILL TO:

P.O. # / BILLING REFERENCE

LAB CLIENT NO.

LAB PROJECT MANAGER

LAB PROJECT NO.

FILE NAME	SITE TYPE	SITE ID	FIELD SAMPLE NO	[illegible]	SAMPLE DEPTH	[illegible]	LAB NO	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	HCl	NaOH	VOA GC/MS (H_2O)	VOA GC/HALL (H_2O)	VOA GC/PID (H_2O)	BNA GC/MS (H_2O)	OCP GC/ECD (H_2O)	HERB GC/ECD (H_2O)	METALS ICP (H_2O)	CYANIDE (H_2O)	TPH 418.1 (H_2O)	ANIONS-IC (H_2O)	TOTAL PO_4 (H_2O)	ORTHO PO_4 (H_2O)	VOA GC/MS (SOLID)	VOA GC/HALL (SOLID)	VOA GC/PID (SOLID)	BNA GC/MS (SOLID)	OCP GC/ECD (SOLID)	HERB GC/ECD (SOLID)	METALS ICP (SOLID)	MERCURY CVAA (SOLID)	METALS FAA (SOLID)	CYANIDE (SOLID)	TCLP METALS (SOLID)	EXPLOSIVES (H_2O)	EXPLOSIVES SOIL				LABORATORY REMARKS

SHIPPING AIRBILL NO.	NO. OF COOLERS	NO. OF COC IN SHIPMENT	[illegible]

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME

FIELD SAMPLING REMARKS.

Figure 3-4. Sample Chain of Custody Form

3.10.2 Submersible Well Purging Pumps

Submersible pumps used for well purging will be decontaminated by following the procedures below:

- clean with hot tapwater from the approved source and non-phosphate laboratory detergent while scrubbing the exterior of the pump and hose with a stiff-bristled brush;
- pump a sufficient amount of soapy water through the hose to flush out residual purge water;
- pump a sufficient amount of tapwater through the hose to flush out soapy water;
- rinse the exterior of the pump and hose with tapwater;
- pump a sufficient amount of organic-free water through the hose to flush out tapwater;
- rinse the exterior of the hose and pump with organic-free deionized water; then
- place the equipment in a polyethylene bag or wrap in polyethylene sheeting to prevent contamination during transport or storage.

3.10.3 Teflon™ or Glass Sampling Equipment

Reusable Teflon™ or glass sampling equipment will be decontaminated by following the procedures below:

- rinse equipment in the field with tapwater immediately after use;
- clean with hot tapwater from the approved source and non-phosphate laboratory detergent while scrubbing the exterior and accessible interior portions of the equipment with a stiff-bristled brush;
- rinse thoroughly with hot tapwater;
- rinse with 10% nitric acid solution;
- rinse with tapwater;
- rinse thoroughly with organic-free deionized water;
- rinse twice with pesticide-grade isopropanol;
- allow to air dry for at least 24 hours; then
- wrap equipment in one layer of aluminum foil, seal in polyethylene sheeting, and date.

If equipment must be used within 24 hours the following step will be substituted for air drying:

- rinse thoroughly with organic-free water;
- shake off excess moisture and allow to air dry as long as possible; then
- wrap equipment in one layer of aluminum foil and seal in polyethylene sheeting to prevent contamination of equipment during storage and transport.

3.10.4 Stainless Steel or Metal Sampling Equipment

Reusable stainless steel or metal sampling equipment will be decontaminated by following the procedures below:

- rinse equipment in the field with tapwater immediately after use;
- clean with hot tapwater from the approved source and non-phosphate laboratory detergent while scrubbing the exterior and accessible interior portions of the equipment with a stiff-bristled brush;
- rinse thoroughly with hot tapwater;
- rinse thoroughly with organic-free deionized water;
- rinse twice with pesticide-grade isopropanol;
- allow to air dry for at least 24 hours; then
- wrap equipment in one layer of aluminum foil, seal in polyethylene sheeting, and date.

If equipment must be used within 24 hours the following step will be substituted for air drying:

- rinse thoroughly with organic-free water;
- shake off excess moisture and allow to air dry as long as possible; then
- wrap equipment in one layer of aluminum foil and seal in polyethylene sheeting to prevent contamination of equipment during storage and transport.

3.10.5 Field Analytical Equipment

Field analytical equipment such as pH probes, conductivity probes, and DO probes will be decontaminated by following the procedures below:

- wipe probe and cable with a clean, damp cloth;
- rinse probe and cable with organic-free water; then
- place in storage case to prevent contamination of equipment during storage and transport.

3.10.6 Organic-free Water Storage Containers

Dedicated glass storage containers will be used solely for dispensing organic-free water. New organic-free water containers will be decontaminated by following the procedures below:

- clean with hot tapwater from the approved source and non-phosphate laboratory detergent while scrubbing the exterior and interior of the container with a stiff-bristled brush;
- rinse thoroughly with hot tapwater;
- rinse with 10% nitric acid solution;
- rinse with tapwater;
- rinse thoroughly with organic-free deionized water; then
- fill with organic-free water, cap with one layer of Teflon™ paper and one layer of aluminum foil, secure cap with a rubber band, and date the container.

Used organic-free water containers will be decontaminated by following the procedures below:

- clean the exterior with hot tapwater from the approved source, non-phosphate laboratory detergent, and a stiff-bristled brush;
- rinse the exterior thoroughly with organic-free deionized water;

- rinse the interior twice with pesticide-grade isopropanol;
- rinse the interior thoroughly with organic-free water; then
- fill with organic-free water, cap with one layer of Teflon™ paper and one layer of aluminum foil, secure cap with a rubber band, and date the container.

ORGANIC-FREE WATER WILL NOT BE STORED IN THE CONTAINERS FOR LONGER THAN THREE DAYS PRIOR TO USE.

3.10.7 Sample Bottles

At the completion of each sample activity, the outside of the sample bottles must be decontaminated as follows:

- Check that the bottle lids are on tight.
- Wipe the outside of the bottle with a paper towel and dispose of the towel properly.

Chemical analysis of aqueous and solid samples will be performed to determine the nature of contamination. Chemicals of concern include VOCs, explosives, chemical agent degradation products, and metals. Analytical method descriptions, quantitation limits, and reporting limits are provided in Section 6 of the QAPP.

4.1 VOLATILE ORGANIC COMPOUNDS

VOCs will be analyzed in accordance with the contract Laboratory Program (CLP) SOW identified in the QAPP. VOCs will be analyzed by gas chromatography/mass spectroscopy (GC/MS).

4.2 SEMIVOLATILE ORGANIC COMPOUNDS

Base/neutral/acid (BNA) extractable organics, pesticides, herbicides, and PCBs will be analyzed in accordance with the appropriate CLP SOW identified in the QAPP. BNAs will be analyzed by GC/MS. Pesticides, herbicides, and PCBs will be analyzed by GC electron capture detection (ECD).

4.3 EXPLOSIVES

The EPA does not currently have an available procedure for analysis of trace explosives in water. Samples for which explosives analysis is requested will be analyzed by USAAEC approved methods. High Performance Liquid Chromatography (HPLC) will be employed.

4.4 CHEMICAL AGENT DEGRADATION PRODUCTS

Samples for which this analysis is requested will require techniques developed by USAEC. HPLC techniques will be employed to analyze for thiodiglycol. Ion chromatography will be used to analyze for IMPA and MPA. Organosulfur and all other organophosphorus compounds will be analyzed by GC flame photometric techniques.

4.5 INORGANIC ANALYTES

Inorganic analytes will be analyzed in accordance with the appropriate CLP SOW or EPA method identified in the QAPP. Mercury will be analyzed using cold vapor atomic adsorption spectroscopy. Arsenic, selenium, and lead will be analyzed using graphite furnace atomic absorption spectroscopy. Chlorides and sulfates will be analyzed using ion chromatography. Nitrate, nitrite, and phosphates will be analyzed using colorimetric techniques. The remaining inorganics will be analyzed using inductively coupled argon plasma emission spectroscopy (ICAP).

4.6 DIOXINS AND FURANS

Samples submitted for dioxin and furan analysis will be analyzed by the appropriate CLP SOW identified in the QAPP.

5.0 INVESTIGATION-DERIVED WASTE DISPOSAL

Investigation-derived waste generated during the execution of the project will include: equipment decontamination water, monitoring well purge water, soil cuttings, PPE and disposable sampling equipment, and uncontaminated solid waste such as cardboard boxes, paper, etc. Care will be taken in the field to segregate these wastes so that disposal costs may be minimized. The proposed procedures for disposing of these categories of waste is discussed in this section.

5.1 DECONTAMINATION WATER

Decontamination water will initially be containerized in a tank near the decontamination area. At the end of field activities, the contents of the tank will be sampled for priority pollutant constituents and pretreatment parameters listed for the APG-EA sewage treatment plant. If it is determined that the decontamination water meets the pretreatment standard, the water will be disposed of by dumping the water into the APG-EA sanitary sewer at a location approved by the sewage treatment plant operator. If the pretreatment standard is not met, the water will be disposed of as hazardous waste under RCRA Subtitle C by APG-EA.

5.2 PURGE WATER

Purge water will temporarily be contained in 55-gallon drums at the well location. Purge water in these containers will be emptied into a mobile tank using a centrifugal pump. When a tank is filled with purge water, the contents of the tank will be sampled for priority pollutant constituents and pretreatment parameters listed for the APG-EA sewage treatment plant. If it is determined that the purge water meets the pretreatment standard, the water will be disposed of by dumping the water into the APG-EA sanitary sewer at a location approved by the sewage treatment plant operator. If the pretreatment standard is not met, the water will be disposed of as hazardous waste under RCRA Subtitle C by APG-EA.

5.3 PPE AND DISPOSABLE SAMPLING EQUIPMENT

It is unlikely that PPE and disposable sampling equipment will constitute a hazardous waste. Good environmental practice dictates that it be responsibly handled and disposed of properly. Every effort will be made to keep the volume of this material to a minimum. All disposable sampling equipment (used groundwater filters, tubing, hoses, etc.) and PPE will be sealed in plastic bags and temporarily stored in labeled steel drums. Sealed bags of spent equipment and PPE will be transported to a dumpster approved by APG-DSHE for disposal.

5.4 SUBSURFACE SOIL SAMPLING GENERATED WASTES

Drill cuttings will be screened for gross VOCs utilizing a PID. Cuttings which are found to have VOCs in excess of 5 ppm will be collected into 55-gallon drums. In areas of known metal contamination the cuttings will be drummed regardless of the VOC content. The drums will be labeled as soil from drilling operations and will not be labeled as hazardous waste or non-hazardous waste until the results of the soil sampling program and/or composite samples from the drums themselves have had laboratory testing performed. Wastes will be staged at a temporary storage area at Beach Point. The ultimate disposition of the wastes will be determined based on a review of laboratory analytical results for soil and water samples of explorations contributing wastes to the drum(s) or container(s) as well as waste characterization samples obtained from waste container(s). It will be necessary to coordinate with APG-DHSE on a final plan for disposal of wastes.

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