Superfund Records Center
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US ARMY CORPS
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FINAL
FIELD SAMPLING PLAN

Interim Data Collection Remedial Investigation And Feasibility Study Centredale Manor Restoration Project Site North Providence, Rhode Island

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Interim Data Collection
Remedial Investigation And Feasibility Study
Centredale Manor Restoration Project Site
North Providence, Rhode Island

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) Region I and U.S. Army Corps of Engineers (USACE) New England District are conducting a Remedial Investigation and Feasibility Study (RI/FS) for the Centredale Manor Restoration Project Site located in North Providence, Rhode Island. This Interim Data Collection Field Sampling Plan (FSP) describes data collection activities required to complete the RI/FS for the terrestrial part of the site. The general approach that will be used to address data needs for completing the RI/FS is presented in the Interim Data Collection Work Plan (Battelle, 2002e).

This FSP is divided into four sections. Section 1.0 presents background information and states the objectives of the field activities. Section 2.0 describes the components of general site management and Section 3.0 presents the specifics of the field data collection activities. References are provided in Section 4.0, and other supporting information is provided in the appendices.

A Quality Assurance Project Plan (QAPP) addendum has also been prepared for these activities and is provided as a separate document (Battelle, 2002c). The FSP and QAPP addendum comprise the Sampling and Analysis Plan (SAP) for the investigation. An updated Site Health and Safety Plan (HASP), Data Management Plan (DMP), and Site Management Plan (SMP) have also been prepared to support the field investigation and subsequent data analyses.

1.1 Objectives

The purpose of the Centredale Manor Restoration Project Site RI is to determine the sources, nature, and extent of contamination at the site; characterize the fate and transport of contaminants; and evaluate potential human health and ecological risks resulting from exposure to site-related contaminants. The RI will evaluate areas of the Centredale Manor Restoration Project Site that have not already been addressed by time-critical removal actions (TCRA) completed in 2000 and non-time critical removal action (NTCRA) that is currently in progress (see Section 2.3 of the Work Plan).

The *Summary of Data Needs for the Centredale Manor Restoration Project Site RI/FS* (Battelle, 2002f) evaluated the sufficiency of previously-collected data for completing the RI/FS. Data gaps were identified in several areas, and additional data collection is required to fill these gaps. This FSP addresses the following field activities:

- Collection of surface and subsurface soil samples from the tailrace on the east side of the Centredale Manor Restoration Project Site source area to better define the horizontal and vertical distribution of dioxin contamination and screen for the presence of other contaminants;
- Collection and analysis of soil samples from the John E. Fogarty Center property on the southeast shore of Lyman Mill Pond to evaluate potential human health risks to site users. Samples will be analyzed for semivolatile organic compounds (SVOCs), polychlorinated biphenyl (PCB) Aroclors, pesticides, metals (including methylmercury), dioxins/furans (including HCX), TOC, grain size, and percent moisture; and
- Collection and analysis of groundwater samples from all groundwater monitoring wells. All groundwater samples will be analyzed for volatile organic compounds (VOCs); the groundwater sample from Well MW-05S will also be analyzed for dioxins/furans.

Additional sediment sample collection and analysis will be required in the future to fully define the extent of contamination in the Woonasquatucket River and its ponds. The scope of this effort will be determined after the results of the Baseline Ecological Risk Assessment (BERA) are available and

geomorphic and geophysical analyses of the Woonasquatucket River system have been completed. The BERA and the geomorphic analysis are being conducted by USACE and the geophysical analysis is being conducted by USEPA Environmental Response Team Center (ERTC).

1.1.1 Site Description

The main part of the Centredale Manor Restoration Project Site is located at 2072 and 2074 Smith Street in North Providence, Rhode Island, immediately south of Route 44 and on the east bank of the Woonasquatucket River. Features of the main part of the site (i.e., the source area) are shown in Figure 1. The main part of the site is occupied by the Brook Village and Centredale Manor apartment complexes and is bounded on the north by Route 44; on the east by a former mill tailrace (drainage swale); on the south by Allendale Pond, an impoundment of the Woonasquatucket River behind the Allendale Dam; and on the west by the Woonasquatucket River. The site also includes the reach of the Woonasquatucket River affected by contamination from the site, including Allendale Pond, Lyman Mill Pond, and possibly areas downstream of the Lyman Mill Dam. The site history, conceptual site model (CSM) and a summary of previous investigations at the site are provided in the Interim Data Collection Work Plan.

1.2 Overview of Field Activities

The field activities described in this FSP include the following:

- Mobilization/demobilization;
- Collection of surface and subsurface soil samples from the tailrace east of the source areas;
- Collection of commercial use soil samples from one property at the southeast end of Lyman Mill Pond;
- Collection of water level measurements and groundwater samples from existing monitoring wells; and
- Characterization and disposal of Investigation Derived Waste (IDW).

Details of the sampling program are described in Section 3.0.

2.0 PROJECT ORGANIZATION AND SITE MANAGEMENT

This section presents the project organization and site management considerations for the Centredale Manor Restoration Project Site RI/FS field activities.

2.1 Project Organization

This section describes the project organization and schedule, including responsibilities of the personnel involved in performing the field activities. Key project personnel and their responsibilities are outlined below.

2.1.1 Personnel Responsibilities

The project organization structure is presented in Figure 2. The Harding ESE field personnel conducting the work outlined in this FSP will consist of a Field Operations Leader (FOL), Site Safety Officer (SSO), and field scientists. The team under the direction of the FOL will perform the field work. The FOL will report directly to the Battelle RI/FS Task Manager.

Responsibilities of the FOL include supervising field operations; ensuring that the procedures specified in the Work Plan and FSP are properly implemented; maintaining daily sampling and shipping schedules; and reporting to the RI/FS Task Manager on a regular basis regarding sampling status and progress of the field activities.

The SSO will be appointed from the Harding ESE field team personnel. The SSO will assist in implementing the Health and Safety Plan (Battelle, 2002b). The SSO will report directly to the Battelle Health and Safety Officer on any health and safety issues. The SSO will also report any hazards, injuries, or decisions to stop work to the FOL who, in turn, will contact the Battelle RI/FS Task Manager.

2.1.2 Schedule

All fieldwork is separated by activity. The estimated schedule for the investigation is shown in Table 1.

2.2 Site Control

The following subsections contain information regarding the control of activities at the site. Site information is also contained in the SMP Update (Battelle, 2002d).

2.2.1 Site Access

USEPA will obtain an access agreement for the John E. Fogarty Center Building at 220 Woonasquatucket Avenue in North Providence. No other site access issues are anticipated.

2.2.1.1 Utility Clearance and Other Permits

Clearance of underground utilities in the tailrace area must be coordinated through DIGSAFE (1-888-344-7233) after sample locations have been marked and before sample collection begins.

2.2.1.2 Field Office/Command Post

No single field support location will be established for this investigation as field crews will operate primarily out of support vehicles. The support vehicles will be located in a non-obtrusive area near to the locations being sampled on a given day.

2.2.1.3 Site Security/Control

Harding ESE will not control access to the study area, and will only control access to active sampling locations. As directed by the FOL, all removable equipment will be locked in support vehicles and secured at the end of each working day.

3.0 FIELD SAMPLING ACTIVITIES

The field sampling activities consist of the following subtasks:

- Mobilization/demobilization;
- Sample collection;
- Field investigation documentation;
- Field quality control (QC) sample collection;
- Chain-of-custody procedures;
- Decontamination procedures, and
- Control, characterization and disposal of Investigation Derived Waste (IDW).

Each of these tasks and the specific activities are described below.

3.1 Mobilization/Demobilization

Prior to beginning any field work, all field team members will review the Statement of Work (SOW), Interim Data Collection Work Plan, this FSP, the QAPP Addendum, the HASP, and all applicable Standard Operating Procedures (SOPs) identified in Section 3.2 and provided in Appendix A of this FSP. In addition, the RI/FS Task Manager, the SSO, the FOL, and field scientists will hold a field team orientation meeting prior to beginning the fieldwork to familiarize personnel with the scope of the field activities. All field team members will receive a copy of all of the documents listed above prior to the orientation meeting. A record of the fieldwork orientation meeting will be maintained in the project file.

Equipment mobilization may include, but not necessarily be limited to, transporting and preparing the following equipment:

- Sampling and shipping equipment;
- Health and safety equipment;
- Decontamination equipment;
- Subcontractor equipment (to be conducted by the subcontractor).

The FOL will coordinate the mobilization. The FOL will be responsible for mobilizing and demobilizing the equipment and personnel necessary to perform the work outlined in the specification, including obtaining utility clearance and any other permits required by federal, state, and local authorities. The FOL will also coordinate any equipment purchases necessary to conduct the field investigation and transportation of equipment to the site as needed.

At the completion of field work, the FOL will coordinate the demobilization, which includes the removal of all sampling equipment, IDW, and any other investigation-related materials from the site. A subcontractor will be procured for IDW characterization and disposal. Once the procurement process has been completed, a "Notice to Proceed" will be issued to the selected subcontractor to initiate IDW removal as required.

3.2 Sample Collection

Samples will be collected from the Centredale Manor Restoration Project Site as follows:

- Surface and subsurface soil samples will be collected from nine borings and two surface sample locations in the tailrace east of the source area;
- Three surface soil samples will be collected from the John E. Fogarty Center property at the southeast end of Lyman Mill Pond; and
- Groundwater samples will be collected from 33 existing monitoring wells.

Each of these sampling activities is described below.

3.2.1 Tailrace Soil Sampling

Soil samples will be collected from nine borings and two surface sample locations in the tailrace on the east side of the source area to characterize the distribution of dioxin contamination and screen for the presence of other site-related contaminants. Each boring will be advanced to a depth of 9 ft. Assuming that the soil type is uniform, surface and subsurface samples will be collected from each boring from the following intervals: 0-1 ft, 1-3 ft, 3-5 ft, 5-7 ft and 7-9 ft. Each sample will consist of a composite sample of the soil interval. If the soils are stratified, then sample intervals will be adjusted so that different soil types are not mixed in the same sample. However, no composite sample will exceed 2 ft in thickness. Boring locations are shown in Figures 3, 4, and 5 and a sample summary is provided in Table 2. A total of 47 soil samples will be collected.

SOPs that apply to soil sampling procedures are listed in Table 3. Copies of all SOPs are provided in Appendix A. Boring locations will be surveyed in advance using a Global Positioning System (GPS) following SOP S-12 and marked with a stake. All sample locations will be referenced to the Rhode Island State Plane Coordinate System (NAD 83).

Surface samples in the tailrace will be collected using a hand auger collection technique. Subsurface samples in the tailrace will be collected using Geoprobe™ drilling methods. In the event that the Geoprobe™ drilling method is ineffective (e.g., cobbles present), then an alternative drilling method (i.e., hollow stem auger) will be employed. The soil type in each boring will be described and logged following Work Instruction 4.C.5.28 (Appendix A). Borings will be logged at a scale of 1 in = 1 ft (or less). Concentrations of VOCs in soil headspace samples will be monitored using a photoionization detector (PID). Field equipment use and calibration are described in the applicable SOPs provided in Appendix A.

After homogenizing each soil sample, sub-samples will be collected as detailed in Table 2. Sample container requirements, holding times, and preservation requirements are summarized in Table 4.

3.2.2 Commercial Use Soils Sampling

A total of 3 surface soil samples (0-0.5 ft) will be collected from the John E. Fogarty Center at 220 Woonasquatucket Avenue to support the baseline human health risk assessment. Three samples will be collected from the fenced yard in the rear of the building. Sample locations will be determined using a Global Positioning System (GPS) following SOP S-12 (Appendix A). All sample locations will be referenced to the Rhode Island State Plane Coordinate System (NAD 83).

Commerical use soil sample locations are shown in Figure 6 and a sample summary is provided in Table 2. Soil samples will be obtained following the procedures specified in Table 3. Applicable SOPs are provided in Appendix A.

Commercial use soil samples will be analyzed for SVOCs, PCB Aroclors, pesticides, metals (including methylmercury), dioxins/furans (including HCX), TOC, grain size, and percent moisture (Table 2). Sample container requirements, holding times, preservation requirements and associated analytical laboratories are summarized in Table 4.

3.2.3 Groundwater Sampling

One groundwater sample will be collected from each of the 33 existing monitoring wells at the site. Monitoring well locations are shown in Figure 7 and a sample summary is provided in Table 5. Prior to sampling, a round of standing water level measurements will be collected at all wells and at the staff gages in the Woonasquatucket River and Allendale Pond.

Monitoring wells will be purged and groundwater samples will be collected following the procedures specified in the USEPA Region I document *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells* (July 30, 1996). Parameters that will be measured using a flow-through cell include pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation/reduction potential. In the event that the low flow procedure is not effective, alternative methods (e.g., bailer) may be used. A complete list of field related SOPs is summarized in Table 3 and provided in Appendix A. All groundwater samples will be analyzed for VOCs; the groundwater sample from Well MW-05S will also be analyzed for dioxins/furans (Table 5). Sample container requirements, holding times, preservation requirements and associated analytical laboratories are summarized in Table 4.

3.2.4 Packaging and Shipment of Samples

Samples will be shipped to participating laboratories following Battelle SOP No. 5-210-03, *Packaging and Shipping of Samples* (Appendix A). Briefly, the FOL or designee will pack the samples securely in a cooler with bubble wrap and blue ice or crushed ice to achieve the proper temperature. Each cooler will contain a cooler temp blank, which will be comprised of a bottle of sand and labeled in the same manner. The cooler should have at least one inch of bubble wrap placed on the bottom of the cooler and the samples should be wrapped in bubble wrap if breakable or crushable containers are used. The samples will be packed tightly and not be able to move freely in the cooler; they must be secure. An upper weight limit of 70 pounds per cooler is suggested. All paper work is signed, the original custody form is placed in a zip-lock bag with a cover letter, and taped to the top of the cooler to avoid moisture.

A cover letter accompanying samples should include

- the name of the Battelle technical contact (i.e., Deirdre Dahlen);
- a statement about the number of coolers being shipped;
- a reference to the appropriate document (i.e., QAPP); and
- a request that the receiving laboratory return the signed custody forms to Battelle (i.e., Deirdre Dahlen).

When one sample shipment is contained in multiple coolers, the custody forms should be copied, placed in zip-lock bags, and attached to the inside top of each cooler. Copies should be clearly labeled as such and they should indicate which samples are contained in each cooler. The individual coolers should be numbered 1 of 3, 2 of 3, etc. In addition, the Federal Express (or other transporter) label should be completed to indicate the cooler number and total number of coolers in the shipment (1 of 3, 2 of 3, etc.). Each cooler shipped by Federal Express receives a unique tracking number. Shipping over national holidays and weekend deliveries should be avoided whenever possible.

3.3 Field Investigation Documentation

Field documentation requirements are described below.

3.3.1 Logbooks

Logbooks will be maintained throughout the field investigation. The site master log, field logbooks, and field equipment logbooks are briefly described below.

3.3.1.1 Site Master Log

The site master log is the primary field investigation document to be maintained by the FOL. Its primary purpose is to contain within one document the actual field data or references to other field documents that contain a specific description of every activity that has occurred in the field on any given day. Any administrative occurrences, conditions, or activities that have affected the fieldwork will also be recorded. A copy of these reports will be sent to the site managers at the conclusion of the field program. Daily Calibration Data Sheets will be filed as part of the Master Log as well (see Section 3.3.1.3 for details regarding calibration of the field equipment).

3.3.1.2 Field Books

Each field team will maintain separate field books, as necessary. Field books will be sequentially numbered by the user and bound with a hard cover. All entries will be in permanent ink with changes initialed and dated. In general, these books will contain specific details supporting the tasks performed by the person maintaining the field logbook. Information to be recorded in the field books or on supporting field data forms shall include, but not be limited to the following:

- name and title of author, date and time of entry, and physical/environmental conditions during the field activity;
- name and titles of field crew, including subcontractors;
- name and titles of site visitors, and time on and off site;
- documentation of health and safety activities;
- sampled media designation (i.e., soil, groundwater);
- sample collection method (i.e., grab or composite);
- number and volume of samples taken;
- description of sampling points;
- date and time of collection;
- sample identification numbers;
- references for maps and photographs of the sampling sites;
- field observations;
- field measurements made (i.e., pH, temperature);
- decontamination procedures;
- instrument calibration; and
- weather conditions.

3.3.1.3 Field Equipment Notebook

The purpose of the field equipment notebook is to document the proper use, maintenance, and calibration of the field testing equipment. Equipment will be inspected and approved by the FOL before being used. A Calibration Data Sheet will be maintained daily for all monitoring instruments used on site; the bound

data sheets will comprise the Field Equipment Notebook, which will be incorporated into the Master Log. Information recorded on the data sheets or on separate pages in the notebook will include, but will not be limited to, the following items:

- name and identifying number of the instrument;
- date calibrated;
- calibration points;
- name and title of the calibrator;
- instrument manufacturer;
- lot number;
- expiration date of calibration standards;
- results of the calibration;
- field maintenance; and
- problems encountered/resolution of problems.

3.3.2 Sample Documentation

Soil or groundwater sample log sheets will be completed for each sample collected. Example field forms used to document sample collection activities (e.g., soil boring logs, groundwater and surface soil sampling records) are provided in Appendix B. Information recorded will include sample identification, analytes, depth sampled, date and time collected, and other pertinent information. Chain-of-custody (COC) forms will be maintained in a file and copies will be sent to the site managers on a weekly basis when analytical samples are being shipped.

3.3.3 Sample Location Identification System

Each analytical sample collected from the study area will be assigned a unique sample location tracking number. Consistent with previous investigations, the sample location tracking number will consist of a four- to five-segment, alpha-numeric code that identifies the area, sample medium, specific sample location identifier, sample event, sample depth or the quality control (QC) sample designation, if appropriate. Any other pertinent information regarding sample identification will be recorded in the field logbooks or on sample log sheets.

The alphanumeric coding to be used in the sample location numbering system is explained in the following diagram and the subsequent definitions:

AAA - AA - NNNN - NNNN - NN

Where "A" represents an alpha character and "N" represents a numeric character.

1. The three alpha character group identifies the area investigated (e.g., "CMS" for Centredale Manor Site). The character groups are as follows:

   CMS – Centredale Manor Site
   LPX – Lyman Mill Pond

2. The two alpha character group identifies the matrix sampled as follows:

   SS – Soil
   GW – Groundwater

3. A four numeric character group describing a unique location number identified sequentially. Data collected will use a "4100" series.

4. A four-digit group stating the depth of the sample collected in feet. Note that the depth interval for groundwater samples will be recorded in the field log and the sample designation will not include this information.

5. A two digit round number for that station number "01" for the first sample collected from that location, and "02" for the second sample collected from that location, etc. For example, the sample identifier, CMS-SS-4101-0005-01 represents a soil sample collected from the Centredale Manor Site at location 4101, collected between 0 and 0.5 feet, and it was the first soil sample collected at that location.

QC Samples (see Section 3.4)

1. A three alpha character group identifying the area investigated (see above).

2. A two alpha character group will be used to identify QC samples as identified below. This two character group will replace the character group used to identifying the matrix in the primary sample:

   DU = Field Duplicate
   RB = Rinsate Blank
   TB = Trip Blank

3. A six numeric character group describing the date of sample collection and a letter in sequence (A being the first collected that day, B being the second, etc.). For example, CMS-DU-091502A represents the first duplicate sample collected on 15 September 2002.

3.3.4 Field Electronic Data Deliverable

The field team will be responsible for generating an electronic data deliverable (EDD) that summarizes all sample collection data. The field EDD must be prepared in accordance with the requirements of the Data Management Plan (DMP) update (Battelle, 2002a). The field EDD will be loaded into the project database. Field EDD specifications and an example EDD are provided in Appendix C.

All data in the field EDD should be formatted as values (no formulas). There should not be any blank rows, hidden columns and hidden rows in the file. The first line of each file will be the column header. The column names are the same as the database field names and must exactly match the spelling provided in Appendix C. Field formats should be reviewed carefully prior to submitting the EDD to Battelle. A field reported as *Null* cannot have spaces or returns. A number field must be reported with a number or *Null*. For example, if a text value, such as "N/A" or a space, is reported in a number field, the data will not be acceptable to the database and the EDD will be rejected.

3.3.5 Field Summary Report

A field summary report that describes the field activities will be prepared within 3 weeks of completion of all field sampling. The field report will include a chronology of events, narrative description of field conditions, tabulated sample collection information (i.e., the field EDD), and a summary of any problems encountered, deviations, and corrective actions. The FOL is responsible for preparing the report.

3.4 Quality Control Samples

The field QC samples that will be collected or generated during the field sampling activities are described below. A detailed discussion of the objectives, procedures, and collection rates for each type of QC sample is provided in the QAPP addendum (Battelle, 2002c).

Field Duplicates: Field duplicates will be collected at a rate of one per twenty field samples.

Rinsate Blanks: Rinsate blanks will be collected at a rate of one per twenty field samples. Please note that rinsate blanks will not be collected for analysis of dioxins/furans, methyl mercury, or total organic carbon.

Trip Blanks: Trip blanks will be submitted for the analysis of VOCs in water. One trip blank will accompany each cooler of groundwater samples.

Performance Evaluation (PE) Samples: PE samples will be sent by EPA to the laboratory at a rate of one for every 20 samples per analysis (SVOCs as phenols and phthalates in soil only).

Additional sample volume for Laboratory QC: Additional groundwater sample volume will be collected at the rate of one per 20 field samples per analysis for laboratory QC analysis (e.g., analytical duplicates and matrix spikes/matrix spike duplicates).

3.5 Chain of Custody Procedures

Samples collected at the site will be held under Chain of Custody (COC). COC procedures will be used to ensure that:

- All necessary samples are collected for all scheduled analyses;
- The correct samples are analyzed for requested analyses and traceable to their records;
- Samples are protected from loss and identified if damaged;
- Alteration of samples (e.g., filtration and preservation) is documented;
- A forensic record of sample integrity is established; and
- Sample security is maintained.

COC protocol to be followed by sampling personnel involves the following steps:

- Documenting procedures used and reagents added to samples during sample preparation and preservation;
- Recording sample site identification, field sample number, and specific sample collection procedures on the appropriate forms;
- Using sample labels which contain all information necessary for effective sample tracking; and
- Completing standard field data record forms to establish sample custody in the field before sample shipment.

The COC record is used to document sample-handling information (i.e., sample location, sample identification, and number of containers corresponding to each sample number). The following information is recorded on the COC record:

- Project reference;
- Site identification code, sample identification code, date of collection, time of collection, number and type of sample containers for each analysis, preservation methods, site type, total number of containers for each sample, and sample depth;
- Names of the sampler(s) and the person shipping the samples; and
- Date and time that the samples were delivered for shipping.

3.6 Equipment Decontamination

This section provides guidelines for decontamination of equipment used during the field investigation. All decontamination activities will be conducted within an established area and will be performed under the supervision of the FOL. Personnel decontamination issues are discussed in the HASP.

3.6.1 Decontamination Procedures

All non-disposable sampling and testing equipment that comes in contact with the sample medium will be decontaminated to prevent cross-contamination between sampling points, as described below:

- Brush to remove gross contamination;
- Potable water and detergent (e.g., Alconox or Liquinox) wash and scrub with brush;
- Rinse with potable water;
- Rinse with DI water (analyte free);
- Rinse with reagent grade 2-propanol (collect separate from water rinses to minimize solvent IDW volume);
- Rinse with reagent grade hexane (collect separate from water rinses to minimize solvent IDW volume);
- Air dry (to the extent practical) on aluminum foil or in a strainer; and
- Wrap in aluminum foil for transport (or if not being used immediately).

Decontamination procedures will follow SOP S-8 (Table 3). This SOP is provided in Appendix A.

3.7 Control and Disposal of Investigation-Derived Waste (IDW)

IDW generated by the project will include the following:

- Purge water from the groundwater wells;
- Excess sample material from the soil borings in the tailrace;
- Unexpended sample material;
- Decontamination fluids (solvent and aqueous);
- Filters used for dewatering; and
- Personal protective equipment (PPE) waste.

All IDW will be managed in accordance with SOP S-9 (Table 3; Appendix A), and is summarized below:

Purged Groundwater—is defined as purge water from the ground water wells; purged groundwater will be replaced in the well from which it was removed.

Solid Waste—is defined as excess soil sample material (e.g., soil cuttings), solid residuals from dewatering process, PPE and unexpended sample material. Solid residuals from the dewatering process will be comprised of sediments and used bag filters. The PPE waste generated during work will be decontaminated, double-bagged in plastic bags, and disposed of as solid waste in 55-gallon drums. The unexpended sample material is sample remaining after completion of laboratory analyses; this unexpended sample material will be returned to the site and placed in the drums of solid waste. Solid waste is classified as F-listed waste and will be placed in separate labeled drums for ultimate thermal destruction at the Swan Hills facility in Alberta, Canada (see Section 3.7.3).

Solvent Waste—is defined as solvent (e.g., methanol, methylene chloride) used to decontaminate sampling equipment and/or drums. Solvent waste is classified as F-listed waste and will be placed in separate labeled containers for ultimate destruction at the Swan Hills facility in Alberta, Canada (see Section 3.7.3). The solvent waste will not be monitored or tested given that there is generator knowledge (i.e., solvents used).

Decontamination Fluids—is defined as liquids generated during equipment decontamination. Based on communications with USEPA and USACE, Battelle and Harding ESE will dewater approximately 1000 gallons of aqueous IDW (primarily wash water from equipment cleaning) in general accordance with procedures historically conducted onsite by TetraTech NUS and LEA, Inc. at the Centredale Manor Site under direction of USEPA. A summary of the bag filtration procedure that will be used is as follows:

The water will be filtered through 3 bag filter housings connected in series. Filters will include 50 micron, 25 micron, and 10 micron arranged from largest to smallest. Units will be connected with pressure hoses. Pressure gauges will be installed to monitor pressure as a surrogate for flow rate (location of gauges to be determined). The system will be run with a gasoline powered centrifugal pump rated at 50 gpm (60 psi). The above supplies and equipment will be provided by ServiceTech, N. Providence RI, the same company that supplied the equipment to LEA., Inc.

Water will be pumped out of drums through the system. The water resulting from the above filtration procedure will be discharged to the Woonasquatucket River. Drums will be rinsed three times with a pressure washer. Rinse water will also be pumped through the filters and discharged to the river. Rinsed drums will be sent to a scrap metal recycler. Upon completion, the filters will be disposed of offsite following procedures established for other F-listed waste. The aqueous discharge will not be monitored or tested. Rather, sufficient data that establish the efficacy of the dewatering process exist in EPA files. Battelle assumes that neither the dewatering procedure nor discharge into the river will require a permit.

All IDW will be stored (on a daily basis) in a locked area on Interim Cap #1 at the Centredale Manor Site until disposal. Details concerning analytical requirements for waste characterization are discussed in Section 3.7.3.

3.7.1 Drum Labeling

It is anticipated that IDW will be generated during the subsurface soil sampling and equipment decontamination activities. After the material is drummed and the lid secured, the drum will be marked using a waterproof indelible ink marker; an example follows:

- IDW-CM-01 – (IDW – Centredale Manor – Drum #01)
- Date first accumulated: e.g., 9/15/02

- Source(s) of material: Sample ID#
- Volume and type of total material

Drum labeling is necessary to identify materials stored in the drums and to evaluate how the drummed material will be sampled for waste characterization. After a sample is removed for waste characterization, the drums will be labeled as "Pending Analysis".

3.7.2 Analytical Requirements for Waste Characterization

As discussed in Section 3.7.1, samples of the solvent and dewatered aqueous waste will not be tested, rather only the solid IDW requires waste characterization. It is anticipated that 10 drums of solid IDW will be generated during the subsurface soil sampling and equipment decontamination activities. Upon completion of the field sampling effort, one sample will be randomly collected from one of the ten drums. The drum sample for waste characterization will be shipped to FIRSTECH, Inc. of Warrensville Heights, Ohio for complete TCLP and total PCB (by Aroclor) analysis. The total PCB concentration of the drum sample must be less than 50 ppm (dry weight), otherwise the solid waste cannot cross the US border into Canada and the solid waste (drums) will remain at the site.

3.7.3 Transportation and Disposal

It is anticipated that the drums of waste (solid, solvent) will remain on site until the unexpended sample material from the participating laboratories is no longer needed (approximately three or more months). A licensed hazardous waste transportation and disposal subcontractor (ONYX Environmental Services, LLC) has been contracted to transport and dispose of any non-hazardous and hazardous waste streams generated during the investigation. The dioxin bearing waste (F-listed) will be sent to ONYX in Menomenee Falls, WI, for ultimate thermal destruction at the Swan Hills incinerator in Alberta, Canada.

The drums containing the aqueous IDW, upon triple rinsing, will be disposed of as scrap metal to be recycled. Other equipment (pumps, hoses, etc.) will be triple-rinsed as per RCRA regulations and discarded as regular solid waste, or possibly reused.

3.7.4 Documentation

On a daily basis, the FOL or designee will document the generation of IDW during the investigative activities and ensure that the IDW is properly containerized and stored at the staging area. Information will be recorded in a bound notebook. Daily records of groundwater stored in drums will include the following information:

- Drum Identification Number;
- Date first accumulated;
- Source of material;
- Volume of material; and
- Sample Identification Numbers (consistent with sample identifiers described in Section 3.3.4).

3.7.5 Hazardous Waste Manifesting Compliance

The transportation and disposal subcontractor for each shipment of IDW leaving the site will prepare one hazardous waste manifest.

Manifests will be completed for all hazardous wastes disposed off site, and signed by Battelle's Hazardous Waste Coordinator "On Behalf of EPA". At no time does Battelle or its subcontractors assume ownership of the IDW.

Copies of all documentation of control and disposal of IDW generated by the project will be provided to the USEPA. Copies will also be maintained in the project file located at the Harding ESE Wakefield, Massachusetts office.

4.0 REFERENCES

Battelle. 2002a. *Data Management Plan Update, Interim Data Collection, Remedial Investigation and Feasibility Study, Centredale Manor Restoration Project Site.* Prepared for the U. S. Army Corps of Engineers New England District, September.

Battelle. 2002b. *Health and Safety Plan, Interim Data Collection, Remedial Investigation and Feasibility Study, Centredale Manor Restoration Project Site.* Prepared for the U. S. Army Corps of Engineers New England District, September.

Battelle. 2002c. *Quality Assurance Project Plan Addendum, Interim Data Collection, Remedial Investigation and Feasibility Study, Centredale Manor Restoration Project Site.* Prepared for the U. S. Army Corps of Engineers New England District, September.

Battelle. 2002d. *Site Management Plan Update, Interim Data Collection, Remedial Investigation and Feasibility Study, Centredale Manor Restoration Project Site.* Prepared for the U. S. Army Corps of Engineers New England District, September.

Battelle. 2002e. *Work Plan, Interim Data Collection, Remedial Investigation and Feasibility Study, Centredale Manor Restoration Project Site.* Prepared for the U. S. Army Corps of Engineers New England District, September.

Battelle. 2002f. *Summary of Data Needs for the Centredale Manor Restoration Project Site RI/FS.* Prepared for the U. S. Army Corps of Engineers New England District, January.

5.0 TABLES

Table 1. Interim Data Collection Estimated Field Schedule.

Activity	Working Days	Est. Start Date	Est. Finish Date
Notice to Proceed	1	09/18/02	09/18/02
Field preparation	17	09/19/02	10/11/02
Mark sample locations, GPS survey, open wells and measure water levels	2	10/14/02	10/15/02
Dig safe, clearing and fence removal	3	10/16/02	10/18/02
Kickoff meeting	1	10/21/02	10/21/02
Tailrace soil borings and sample collection	3	10/21/02	10/23/02
Groundwater sample collection	4	10/24/02	10/29/02
Commercial soil and IDW sample collection	1	10/30/02	10/30/02
Fence replacement and water processing	4	10/31/02	11/05/02

Table 2. Soil Sample Summary.

Sample Location	Description	Purpose	Depth Interval (ft)	Dioxins/ Furans	Pesticides, PCBs, SVOCs, metals, HCX, grain size, TOC	Archive
Source Area Residential Use Soils (Tailrace)						
CMS-4101	Center of tailrace, north end near CMS-442	Verify level of contamination near former drainage feature from drum recycling facility	0 – 1[1]			X
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X
CMS-4102	Center of tailrace south of CMS-079, elevation approx. 94.5 ft	Define the northern limit of elevated dioxin levels; this location is immediately north of the apparent pool that received runoff from the former impoundment and waste piles	0 - 1	X		
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X
CMS-4103	Composite surface samples along the residential property line at an elevation of approximately 94.5 ft	Measure dioxin concentrations at site boundary	0 – 1	X		
CMS-4104	Composite surface sample immediately north of 01-DEL-100 at an elevation of 95 ft	Define northern edge of elevated dioxin levels	0 – 1	X		
CMS-4105	Center of tailrace near 01-DEL-21 at elevation of approximately 93.5 ft	Define vertical extent of contamination; this location is in the lowest part of the tailrace	0 – 1[2]		X	
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X
CMS-4106	Center of tailrace between two apparent low-lying pools.	Better define horizontal limits of elevated dioxin levels	0 - 1	X		
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X

Table 2. Soil Sample Summary (continued).

Sample Location	Description	Purpose	Depth Interval (ft)	Dioxins/ Furans	Pesticides, PCBs, SVOCs, metals, HCX, grain size, TOC	Archive
CMS-4107	West side of tailrace at north end of Centredale Manor building; adjacent to CMS-098 where 28 ppb dioxin was found in 0-0.25 ft sample.	Characterize potentially filled or reworked area; define western limit of contamination	0 – 1[3]			
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X
CMS-4108	West side of tailrace at middle of Centredale Manor building	Characterize potentially filled or reworked area; define western limit of contamination	0 - 1	X		
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X
CMS-4109	Center of tailrace between two apparent low-lying pools.	Better define horizontal limits of elevated dioxin levels	0 - 1	X		
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X
CMS-4110	Center of tailrace in apparent low-lying pool	Determine whether elevated dioxin levels occur in this low-lying area	0 - 1	X	X	
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X
CMS-4111	West side of tailrace at south end of Centredale Manor building	Characterize potentially filled or reworked area; define western limit of contamination	0 - 1	X		
			1 – 3	X		
			3 – 5	X		
			5 – 7			X
			7 - 9			X

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Table 2. Soil Sample Summary (continued).

Sample Location	Description	Purpose	Depth Interval (ft)	Dioxins/ Furans	Pesticides, PCBs, SVOCs, metals, HCX, grain size, TOC	Archive
Commercial Use Soils (John E. Fogarty Center)						
LPX-4112	John E. Fogarty Center	Assess potential human health risk	0.0 - 0.5	X	X	
LMX-4113	John E. Fogarty Center	Assess potential human health risk	0.0 - 0.5	X	X	
LMX-4114	John E. Fogarty Center	Assess potential human health risk	0.0 - 0.5	X	X	

(1) Surface sample dioxin data from CMS-442 will be used to represent surface dioxin concentrations in this area.

(2) Surface sample will be analyzed for PCBs, pesticides, semivolatile organic compounds, metals, grain size and TOC. Near-surface sample dioxin data from 01-DEL-21 will be used to represent surface dioxin concentrations in this area.

(3) Surface sample dioxin data from CMS-098 will be used to represent surface conditions in this area.

Table 3. Standard Operating Procedures[1].

Reference Number	Title, Revision Date and/or Number	Originating Organization
S-1	How to Collect/Document Surface Soil Samples Rev 01, 7/23/99	Harding ESE (also referred to as MACTEC)
S-2	How to Collect/Document Subsurface Soil Samples Rev 01, 7/23/99	As above
S-3	How to Calculate Purge Volume Rev 01, 7/23/99	As above
S-4	How to Purge a Well with Peristaltic, Submersible or Centrifugal Pumps Rev 01, 7/23/99	As above
S-5	How to Purge a Well with a Bailer Rev 01, 7/23/99	As above
S-6	How to Collect/Document Water Samples with a Pump Rev 01, 7/23/99	As above
S-7	How to Collect/Document Samples with a Bailer Rev 01, 7/23/99	As above
S-8	How to Decontaminate Sampling Equipment Rev 01, 7/23/99	As above
S-9	How to Manage Investigation Derived Waste Rev 01, 7/23/99	As above
S-10	How to Monitor Operation of Drill Rigs Rev 01, 7/23/99	As above
S-11	How to Complete Soil Boring Log Rev 01, 7/23/99	As above
S-12	GPS Measurements	As above
S-13	How to Screen Sample Headspace for VOCs Rev 01, 7/23/99	As above
S-14	How to Measure VOCs in Air with a PID or FID Rev 01, 7/23/99	As above
S-15	Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells Rev 02, 7/30/96	USEPA Region I
S-16	Packaging and Shipping of Samples SOP No. 5-210-03 April 4, 2001	Battelle

[1] Sampling SOPs provided in Appendix A.

Table 4. Sample Container, Sample Size, Preservation Requirements, Holding Times and Analytical Laboratories.

Sampling Location	Medium/ Matrix	Analytical Parameter	Minimum Sample Volume	Containers	Preservation Requirements (a)	Maximum Holding Time (preparation/ analysis)	Laboratory for Shipping
Centredale Manor Site	Residential Soil	Dioxin/Furan	½ full	125 mL pre-cleaned jar	Cold (4±2°C)	1-year	Karen Tracy Battelle Columbus 505 King Avenue Columbus, OH 43201 (614) 424-4028
		Archive (2 samples per boring * 9 boring locations)	½ full	125 m pre-cleaned jar	Cold (4±2°C)	1-year	Deirdre Dahlen Battelle Duxbury 397 Washington Street Duxbury, MA 02332 (781-934-0571)
Lyman Mill Pond	Commercial Soil	Moisture, PCB Aroclor/Pest, SVOC (PAH)	½ full	250 m pre-cleaned jar	Cold (4±2°C)	14-d [1-year if frozen (b)]	Deirdre Dahlen Battelle Duxbury 397 Washington Street Duxbury, MA 02332 (781-934-0571)
		Dioxin/Furan/HCX	½ full	125 mL pre-cleaned jar	Cold (4±2°C)	1-year	Karen Tracy Battelle Columbus 505 King Avenue Columbus, OH 43201 (614) 424-4028
		Metals	¾ full	125 mL spex jar	Cold (4±2°C)	Metals: 6-mo Hg: 28-d	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604
		MeHg	½ full	125 mL spex jar	Cold (4±2°C)	28-d	Linda Bingler Battelle MSL 1529 Sequim Bay Rd. Sequim, WA 98382 (360) 681-3604
		Grain Size; TOC	½ full	500 mL pre-cleaned jar	Cold (4±2°C)	28-d	Ken Davis Applied Marine Sciences 502 North Highway 3 League City, TX 77573 (281) 554-7272

Table 4. Sample Container, Sample Size, Preservation Requirements, Holding Times and Analytical Laboratories (continued).

Sampling Location	Medium/ Matrix	Analytical Parameter	Minimum Sample Volume	Containers	Preservation Requirements (a)	Maximum Holding Time (preparation/ analysis)	Laboratory for Shipping
		SVOCs (phenols/phthalates)	¾ full	8 oz. pre-cleaned jar	Cold (4±2°C)	14-d	Sharon Bacha STL Pittsburgh 450 William Pitt Way Building 6 Pittsburgh, PA 15238 (412) 820-8380
Centredale Manor	Groundwater	Dioxin/Furan	Full w/ ½ inch headspace	2.5-L amber glass bottle	Cold (4±2°C)	1-year (c)	Karen Tracy Battelle Columbus 505 King Avenue Columbus, OH 43201 (614) 424-4028
		VOC	Full (no headspace)	40-mL glass VOA vial 4 vials collected for each sample	cold (4±2°C), pH <2 with HCl	14-d	Keith Dudeck STL Pittsburgh 450 William Pitt Way Building 6 Pittsburgh, PA 15238 (412) 820-8380

(a) Samples will be kept chilled in the field and during transport. Storage conditions for samples held at the fixed laboratory are identified in the QAPP.
(b) EPA, 1992. EMAP Estuaries 1992 Virginian Province Quality Assurance Project Plan.
(c) EPA Method 1613, Rev B – for dioxin/furan, aqueous samples may be stored for up to one year if stored as described in the method.

Table 5. Groundwater Sample Summary.

Monitoring Well ID	Total Depth (ft bgs)	Diameter (in)	Volatile Organic Compound	Dioxins/ Furans
GEC1	14.5	2	X	
GEC2	15.0	2	X	
GEC3	15.0	2	X	
GEC4	15.0	2	X	
GEC5	15.0	2	X	
GEC6	11.0	2	X	
GEC7	12.0	2	X	
MW01S	8.1	2	X	
MW02S	8.0	2	X	
MW02M	30.0	2	X	
MW02D	69.8	2	X	
MW03S	8.9	2	X	
MW04S	14.0	2	X	
MW04D	45.5	2	X	
MW04B	77.0	2	X	
MW05S	8.0	2	X	X
MW06S	9.0	2	X	
MW07S	7.8	2	X	
MW07D	58.0	2	X	
MW08S	8.5	2	X	
MW09S	10.0	2	X	
MW10D	45.0	2	X	
MW10B	85.0	2	X	
MW11S	25.0	2	X	
MW11M	42.0	2	X	
MW11B	89.5	2	X	
MW12D	44.0	2	X	
MW12B	102.5	2	X	
MW13S	14.0	2	X	
MW13D	45.5	2	X	
MW13B	80.0	2	X	
MW14M	34.0	2	X	
MW15D	53.1	2	X	

6.0 FIGURES

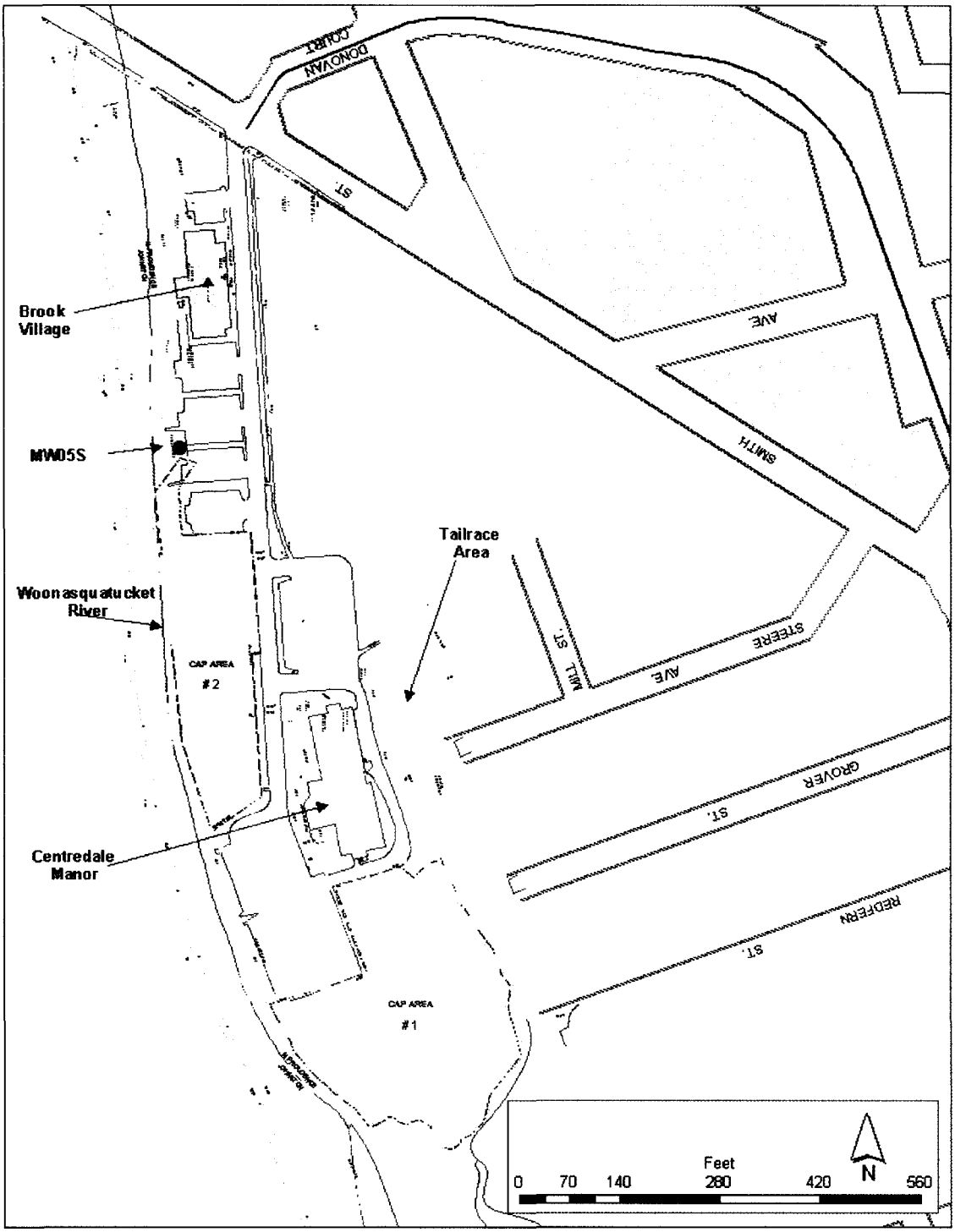

Figure 1. Centedale Manor Site Features.

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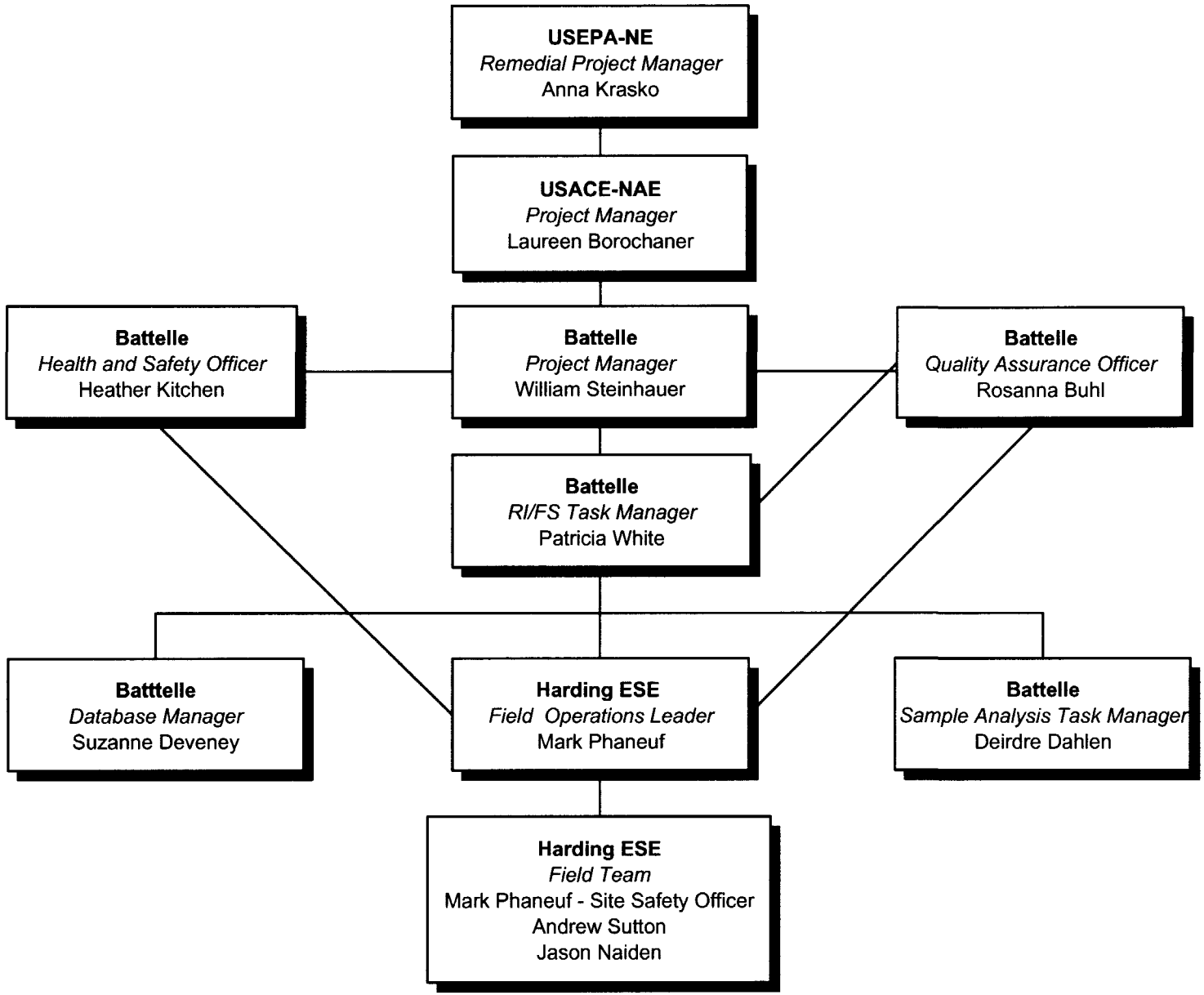

Figure 2. Centredale Manor Restoration Project Site RI/FS Field Sampling Organization Chart.

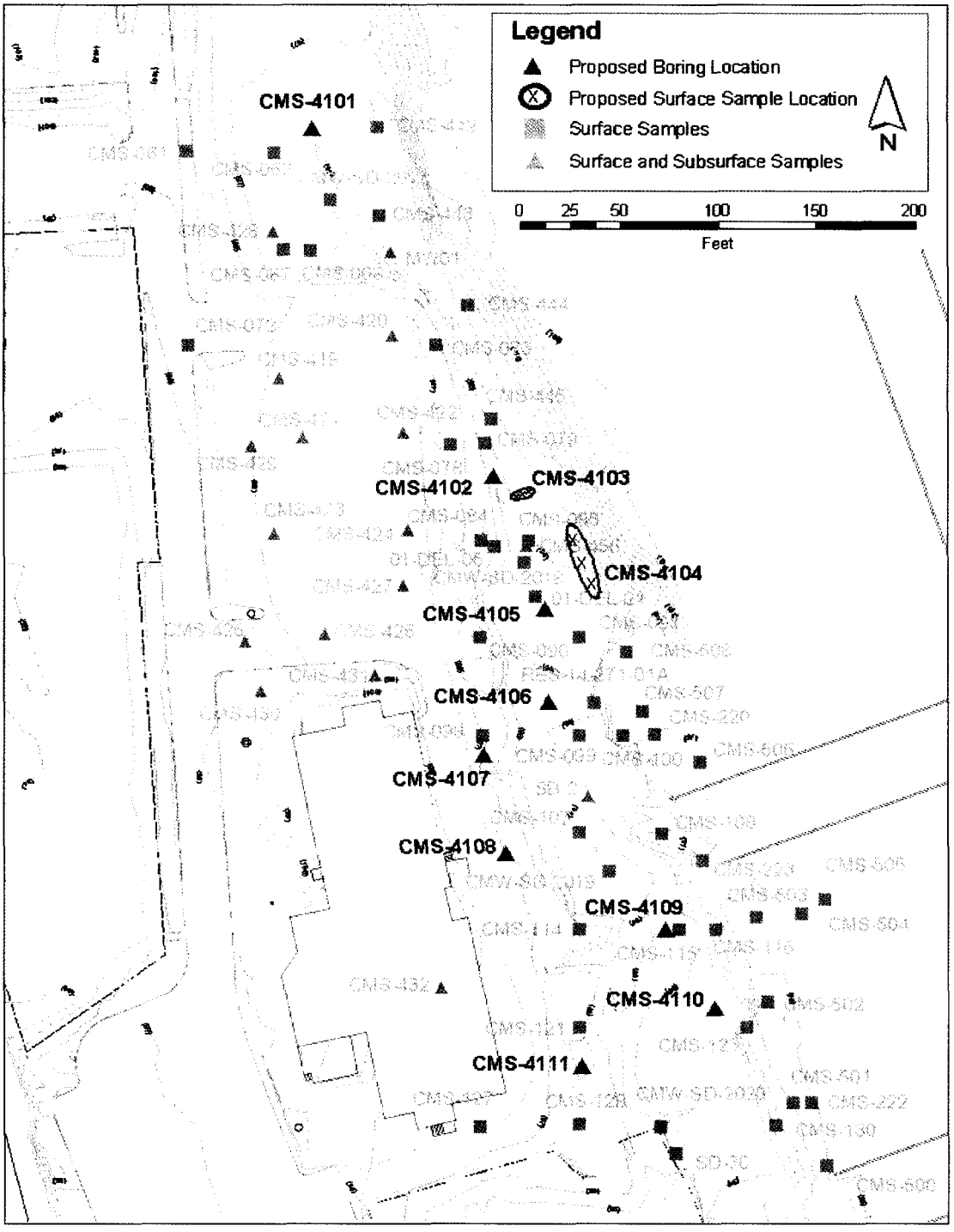

Figure 3. Tailrace Boring Locations.

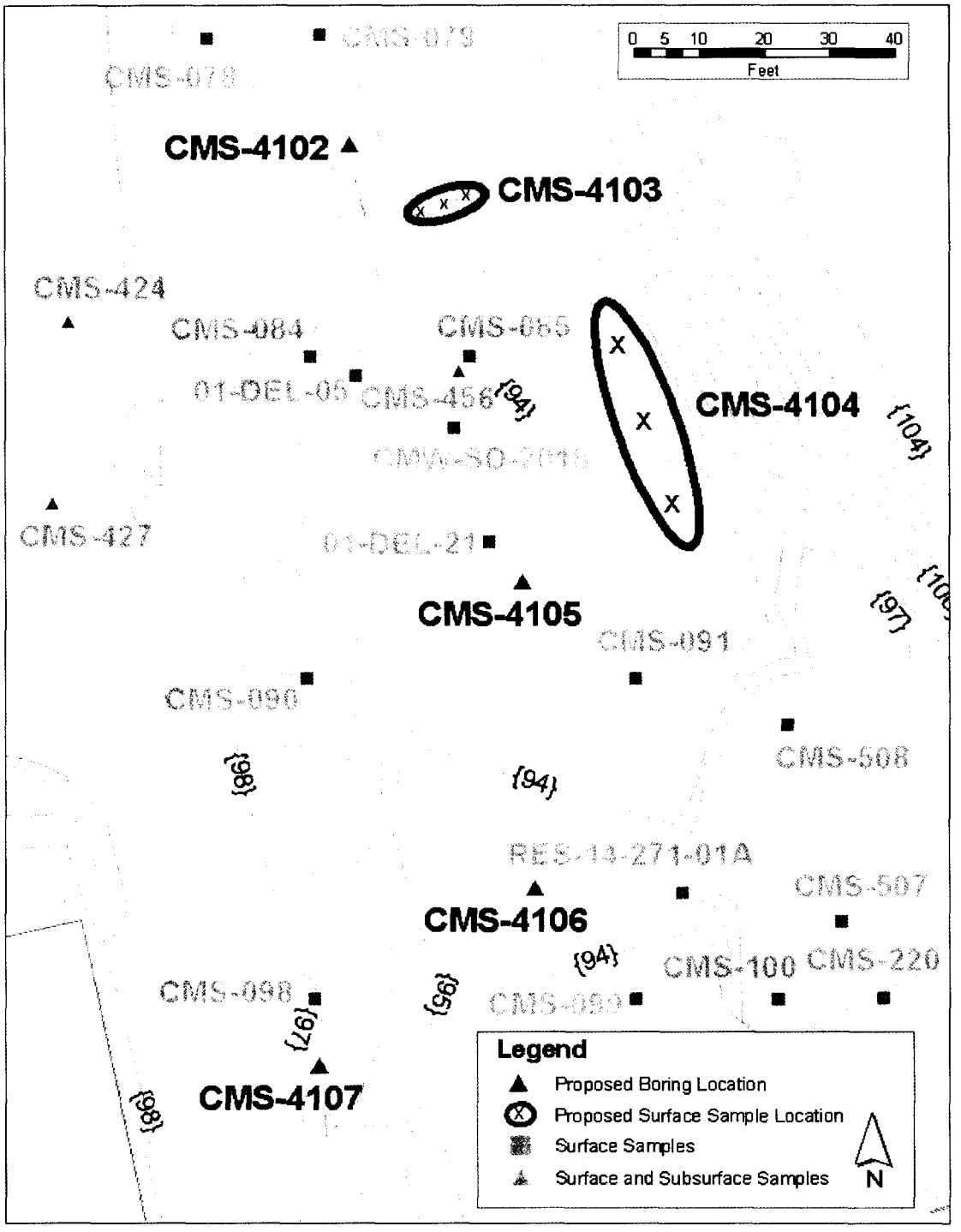

Figure 4. Detailed Map of Boring Locations CMS-4102 through CMS-4107.

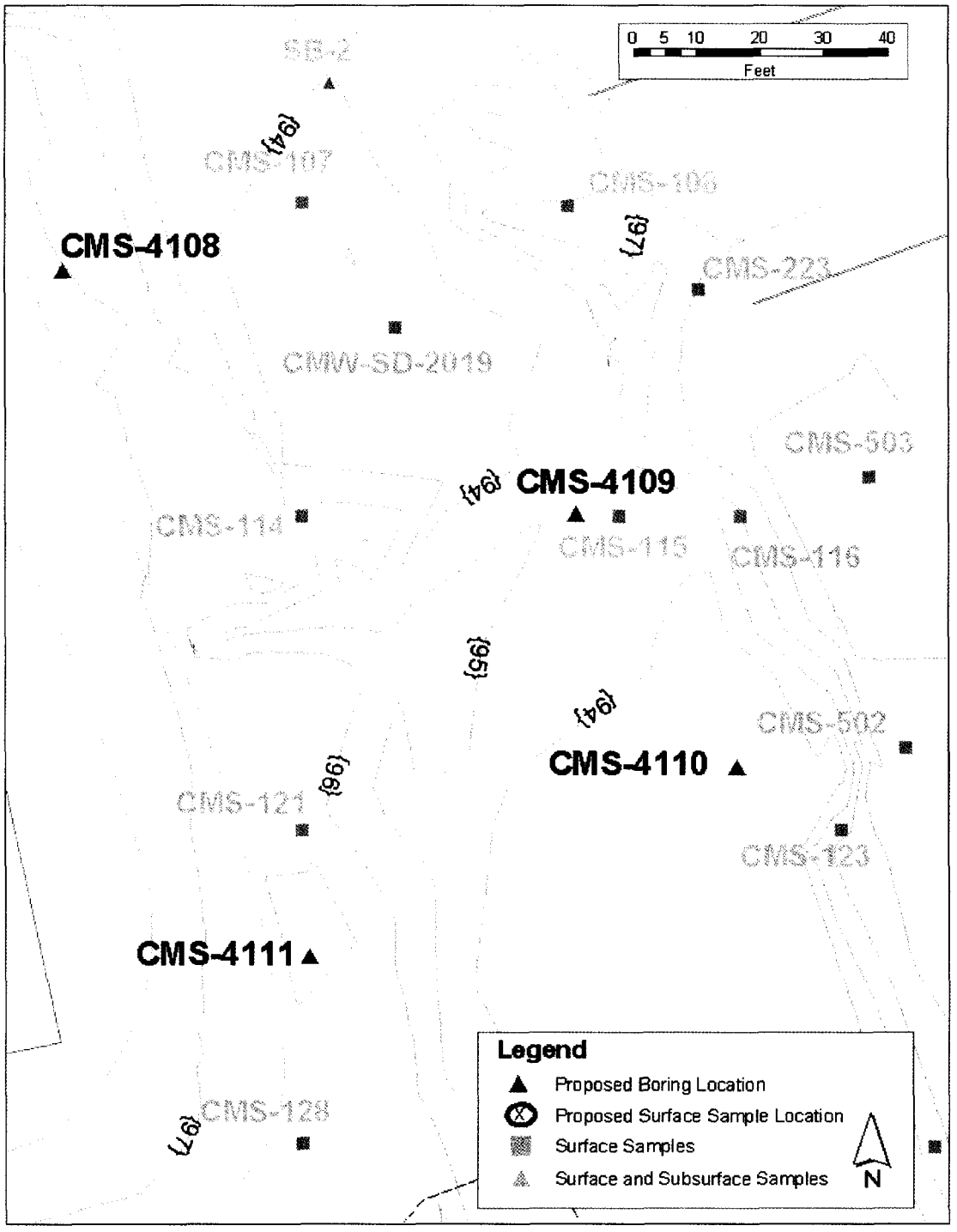

Figure 5. Detailed Map of Boring Locations CMS-4108 through CMS-4111.

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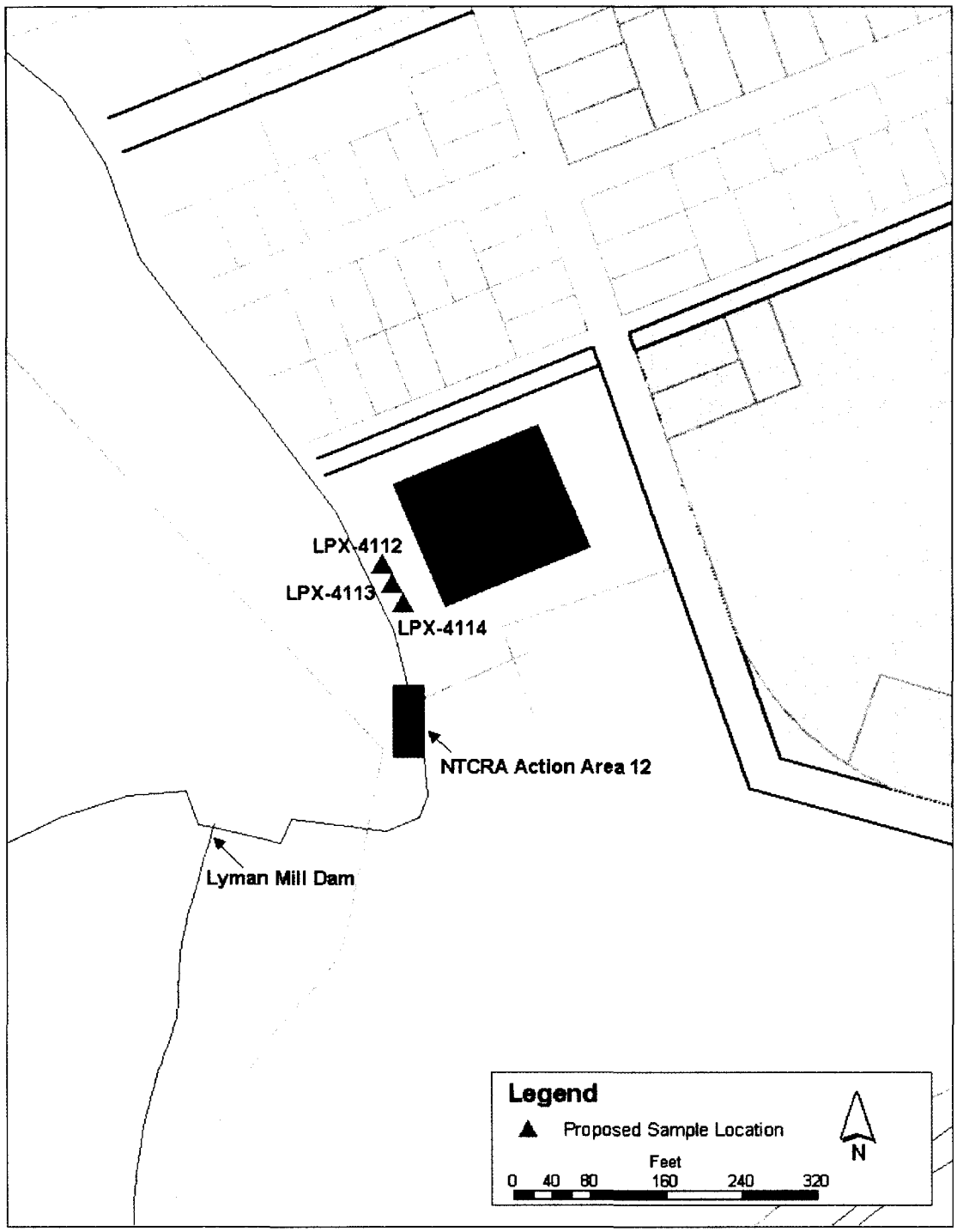

Figure 6. Soil Sample Locations at the John E. Fogarty Center.

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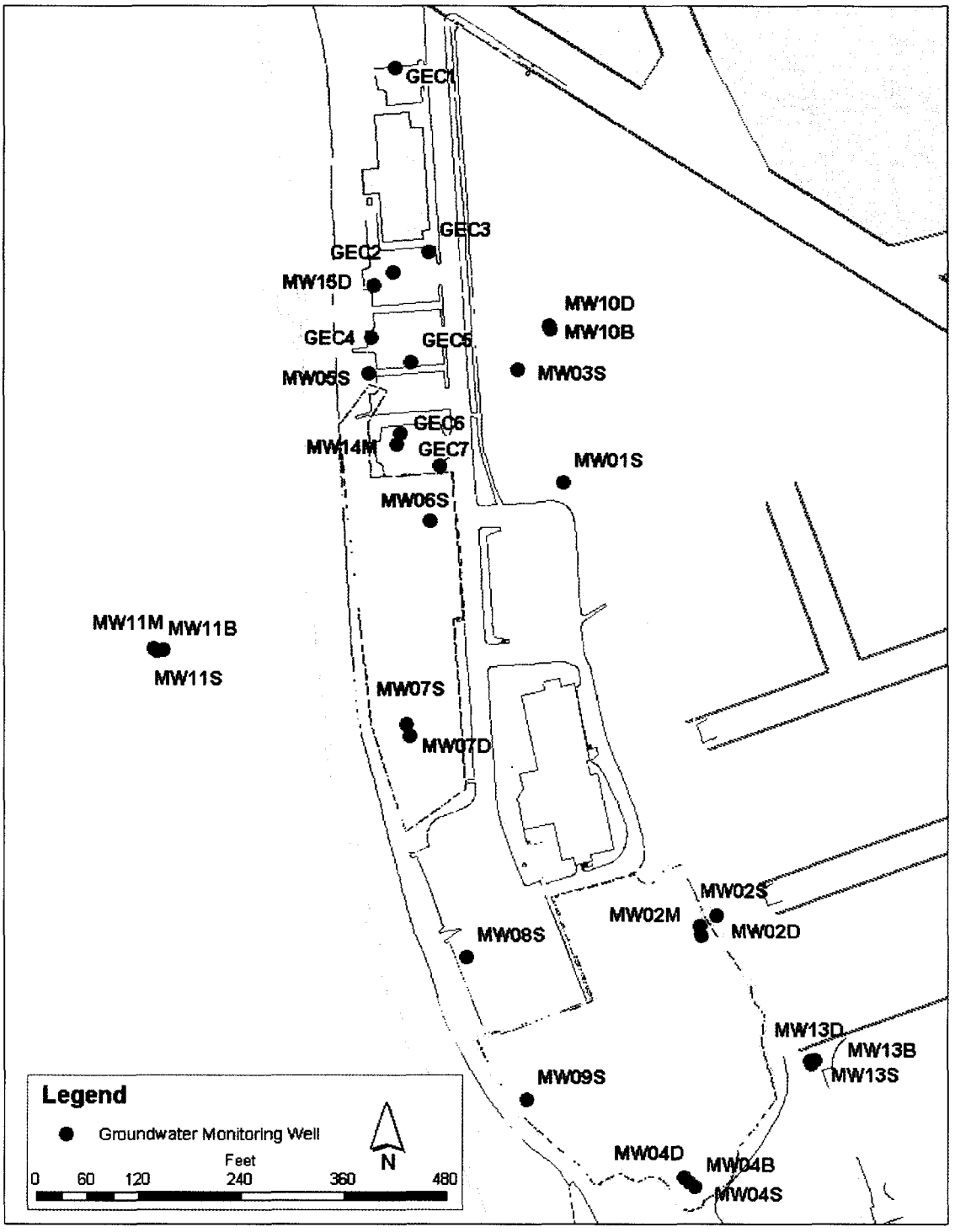

Figure 7. Monitoring Well Locations.

APPENDIX A

Standard Operating Procedures (SOPs)

Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SURFACE SOIL SAMPLES

Prerequisites: Understand Proper Decontamination Procedures, Health and Safety Training, Understand Project Health and Safety Plan

Equipment: Stainless Steel Spoon(s), Pyrex or Stainless Steel Bowl(s), Sample Jars, Sample Labels, Clear Tape, Permanent Ink Pen, Field Logbook.

Cautions: *Be sure to follow prescribed Health & Safety requirements and guidelines. Clean protective gloves must be worn for each sampling location.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Prepare for sampling.	☐	☐	☐	Don gloves, clear area of surface vegetation. Unwrap or decontaminate sampling equipment.
a. Label sample jar(s).	☐	☐	☐	
b. Sketch sample locations on data sheet and in field log book.	☐	☐	☐	
c. Don chemical-resistant gloves.	☐	☐	☐	
2. Clean soil surface of vegetation, debris, gravel, etc.	☐	☐	☐	Typical surface soil samples are taken from 0 to 2 feet deep.
3. Remove soil to be sampled with stainless steel (S/S) spoon or spatula.	☐	☐	☐	
4. Fill VOA sample jars, packing with back of spoon or spatula to minimize head space.	☐	☐	☐	Do not attempt to mix or homogenize soil sampled for VOAs, as this will release VOAs present and lead to erroneously low results.
5. Wipe threads of jars and recap jar. Place on ice in a cooler.	☐	☐	☐	
6. Fill decontaminated S/S bowl with enough soil to fill remaining sample jars.	☐	☐	☐	
7. Thoroughly homogenize soil with S/S spoon.	☐	☐	☐	Remove stones and large pieces of organic material (roots, twigs) with sampling spoon.
8. Fill sample jars.	☐	☐	☐	
9. Wipe threads of jars and recap jar. Place sample bottles on ice in a cooler.	☐	☐	☐	
10. Backfill and stake sampling location.	☐	☐	☐	Return sampling location to pre-sampling condition as much as possible.

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SURFACE SOIL SAMPLES

Operations:	***Yes No N/A***	***Notes:***
11. Document sampling activities.		Document information in Field Log Book and/or on the Surface Soil Sample Data Record Sheet.
a. Document general identifying information in data record, including:	☐ ☐ ☐	
i) Client	☐ ☐ ☐	
ii) Project/Site	☐ ☐ ☐	
iii) Project number	☐ ☐ ☐	
iv) Sample location/site ID	☐ ☐ ☐	
v) Sample number/sample ID	☐ ☐ ☐	
vi) Date	☐ ☐ ☐	
vii) Start time/end time	☐ ☐ ☐	
viii) Name/signature of sampler(s)	☐ ☐ ☐	
b. Document soil sample information including:	☐ ☐ ☐	
i) Depth of sample	☐ ☐ ☐	
i) Sampling method/equipment (e.g., trowel, split spoon)	☐ ☐ ☐	
i) Sample type (e.g., composite, grab)	☐ ☐ ☐	
i) Sample observations (e.g., odors, staining)	☐ ☐ ☐	
i) Soil description	☐ ☐ ☐	
i) Decontamination procedure and fluids used	☐ ☐ ☐	
a. Document sample collection requirements for each analytical fraction including:	☐ ☐ ☐	
i) Container type/volume	☐ ☐ ☐	
i) Time collected	☐ ☐ ☐	
i) Sample bottle IDs	☐ ☐ ☐	
i) Analyses to be performed	☐ ☐ ☐	

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SURFACE SOIL SAMPLES

Operations:	***Yes No N/A***	***Notes:***
a. Record field sketch of sampling location.	☐ ☐ ☐	Include distance from fixed, identifiable reference points (building corners, utility poles, other sampling locations, etc.). A sketch could alternatively be drawn in the *field logbook* or the surface soil sample data record sheet.
a. Record Investigation Derived Waste (IDW) information, including:	☐ ☐ ☐	
i) Disposition of soil cuttings	☐ ☐ ☐	
i) Disposition of spent decon fluids	☐ ☐ ☐	
i) Disposition of soiled personal protection equipment (PPE)	☐ ☐ ☐	
2. Decontaminate sampling equipment.	☐ ☐ ☐	Decontaminate equipment in accordance with the procedure identified in the Project Implementation Plan.

Comments:

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SUBSURFACE SOIL SAMPLES

Prerequisites: Proper Decontamination Procedures, Proper Health and Safety Training, Understanding Project Health and Safety Plan

Equipment: Stainless Steel (S/S) or Pyrex Bowl(s), Stainless Steel Spoon(s), Sample Jars, Clear Tape, Sample Labels, Permanent Ink Pen, Field Log Book.

Cautions: *Be sure to follow prescribed Health & Safety requirements/guidelines. Clean protective gloves must be worn.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Prepare for sampling.	☐	☐	☐	Don gloves, clear area of surface vegetation. Unwrap or decontaminate sampling equipment.
a. Label sample jar(s).	☐	☐	☐	
b. Sketch boring location on data record and in field logbook.	☐	☐	☐	
c. Don chemical-resistant gloves.	☐	☐	☐	
2. Advance borehole to target sampling depth using a shovel, a hand auger, and/or a drill rig.	☐	☐	☐	
3. Decontaminate sampling device or acquire another clean tool.	☐	☐	☐	
4. Remove an aliquot of soil with a stainless steel (S/S) spoon or spatula from the filled sampling device.	☐	☐	☐	
5. Place soil in jar for VOA, packing with back of S/S spoon or spatula to minimize head space.	☐	☐	☐	
6. Wipe threads of jars and recap. Place on ice in a cooler.	☐	☐	☐	
7. Fill a decontaminated S/S or Pyrex bowl with enough soil to fill remaining sample jars.	☐	☐	☐	
8. Thoroughly homogenize soil with S/S spoon.	☐	☐	☐	Remove stones and large pieces of organic debris (roots, twigs) with sampling spoon or spatula.
9. Fill sample jar(s).	☐	☐	☐	
10. Wipe threads of jars and recap. Place on ice in a cooler.	☐	☐	☐	
11. Backfill boring (i.e., bentonite, slurry, grout, soil cutting) to the ground surface.	☐	☐	☐	Use clean fill if necessary. Be sure to completely refill the boring to the surface and pack material down to minimize settling.

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SUBSURFACE SOIL SAMPLES

Operations:	***Yes No N/A***	***Notes:***
12. Document sampling activities.		Document information in field logbook and/or boring log.
a. Document general identifying information including:		
i) Client	☐ ☐ ☐	
ii) Project/site	☐ ☐ ☐	
iii) Project number	☐ ☐ ☐	
iv) Sample location/site ID	☐ ☐ ☐	
v) Sample number/sample ID	☐ ☐ ☐	
vi) Date	☐ ☐ ☐	
vii) Start time/end time	☐ ☐ ☐	
viii) Name/signature of sampler(s)	☐ ☐ ☐	
b. Document soil sample information including:		
i) Depth of sample	☐ ☐ ☐	
ii) Sampling method/ equipment (e.g., trowel, split spoon, etc.)	☐ ☐ ☐	
iii) Sample type (e.g., composite, grab)	☐ ☐ ☐	
iv) Sample observations (e.g., odors, staining)	☐ ☐ ☐	
v) Soil description	☐ ☐ ☐	
vi) Decontamination procedure and fluids used	☐ ☐ ☐	
c. Document sample collection requirements including:		
i) Container type/volume	☐ ☐ ☐	
ii) Time collected	☐ ☐ ☐	
iii) Sample bottle IDs	☐ ☐ ☐	
iv) Analyses to be performed	☐ ☐ ☐	
d. Record field sketch of sampling location.	☐ ☐ ☐	
e. Record Investigation Derived Waste (IDW) information including:	☐ ☐ ☐	
i) Disposition of soil cuttings	☐ ☐ ☐	

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SUBSURFACE SOIL SAMPLES

Operations:	***Yes No N/A***	***Notes:***
ii) Disposition of spent decon fluids	☐ ☐ ☐	
iii) Disposition of soiled personal protection equipment (PPE)	☐ ☐ ☐	
13. Decontaminate sampling equipment.	☐ ☐ ☐	Decontaminate equipment in accordance with the procedures identified in the Project Implementation Plan.

Comments:

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Collect Environmental Samples and Information

Method Title: HOW TO CALCULATE PURGE VOLUME

Prerequisites: Measure and Record Water Level, Proper Decontamination Procedures

Equipment: Well Keys, Water Level Meter, Logbook, Permanent Ink Pen

Cautions: *Water level indicator must be calibrated and functioning according to appropriate instrument manuals. Follow and record observations on Groundwater Sampling Data Sheet* ***and*** *in the Field Logbook.*

Operations:	***Yes No N/A***	***Notes:***
1. Open well.	☐ ☐ ☐	See Work Instruction No. 4.C.5.36.
2. Record water level reading to nearest 0.01 foot.	☐ ☐ ☐	Measure from reference point at top of well or on protective casing. Note location (TOW or TOC).
3. Determine bottom of well.	☐ ☐ ☐	Measure the depth to bottom of the well, or use historical data.
4. Measure well diameter and record.	☐ ☐ ☐	
5. Determine the height of the water column in the well by subtracting the depth to water (from top of well) from the depth to the bottom of the well (from top of well) and record to nearest 0.01 foot.	☐ ☐ ☐	
6. Determine the volume of groundwater in the well by multiplying the height of the water column by the appropriate conversion factor. (See Notes column.)	☐ ☐ ☐	Refer to Quality Assurance Plan for project specific requirements for purge volumes. Some programs/clients may require removal of filter/sandpack pore space volume also. If you need to show the derivation, it is: **gallons/ft** of well = $\pi r^2 h$ * 7.481 gal/ft^2, where *h* is 1 foot of water column in the well casing and *r* is the internal radius of the well in feet. 2"well = [water column (ft)] * 0.16 gallons/foot of water 4" well = [water column (ft)] * 0.65 gallons/fott of water. 6" well = [water column (ft) * 1.46 gallons/foot of water.
7. Record calculated well volume in *log book* and/or *groundwater sampling data sheet..*	☐ ☐ ☐	

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Collect Environmental Samples and Information

Method Title: HOW TO CALCULATE PURGE VOLUME

Operations:	***Yes No N/A***	***Notes:***
8. Multiply well volume by number of volumes required to purge to obtain total gallons required to purge.	☐ ☐ ☐	Consult project work plan to determine number of well volumes to purge. On rare occasions purge volumes may be calculated for well casing volume plus volume of pore spaces within filter pack and screen. Calculate this volume by adding casing volume to total borehole volume minus casing value times estimated porosity of filter pack.

Comments:

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Collect Environmental Samples and Information

Method Title: HOW TO PURGE A WELL WITH PERISTALIC, SUBMERSIBLE, OR CENTRIFUGAL PUMPS

Prerequisites:

Equipment: Appropriate Pump, Power Source, Tubing, Plastic Sheeting, Bucket, Water Level Indicator, Generator, Groundwater Sample Data Sheet

Cautions: *Monitor air at well head and discharge pipe for VOCs and other site-specific contaminants. Care is required around the generator to prevent injury.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Determine proper pump depth to static water.	☐	☐	☐	Refer to Project Implementation Plan (PIP).
2. Open well.	☐	☐	☐	See associated Work Instruction No. 4.C.5.36.
3. Measure depth to water.	☐	☐	☐	See associated Work Instruction No. 4.C.5.38.
4. Calculate Purge Volume.	☐	☐	☐	See associated Work Instruction No. 4.C.5.40.
5. Assemble pump and tubing.	☐	☐	☐	Assemble pump, intake and discharge tubing in accordance with the PIP. For centrifugal pumps, backflow values may be required.
6. Decontaminate pump and tubing.	☐	☐	☐	See associated Work Instruction No. 4.C.5.34.
7. Lower pump or tubing 3 to 5 feet into the water column. Place discharge tubing in drum or on ground.	☐	☐	☐	Check to make sure the pump is not resting on the bottom of the well. Refer to PIP to determine discharging requirements.
8. Begin pumping.	☐	☐	☐	
9. Monitor water level and volume of water purged.	☐	☐	☐	
10. If well is pumped dry, reduce flow rate if possible.	☐	☐	☐	
11. Lower pump or tubing intake if water level continues to drop after pumping rate has been reduced.	☐	☐	☐	
12. Measure and record water quality parameters on the Groundwater Sample Data Sheet. Record at each well volume or as specified in the PIP.	☐	☐	☐	See associated Work Instruction No. 4.C.5.39.

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Collect Environmental Samples and Information

Method Title: HOW TO PURGE A WELL WITH PERISTALIC, SUBMERSIBLE, OR CENTRIFUGAL PUMPS

Operations:	***Yes No N/A***	***Notes:***
13. When purging is complete, collect groundwater samples.	☐ ☐ ☐	Collect groundwater samples in accordance with the PIP.

Comments:

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Collect Environmental Samples and Information

Method Title: HOW TO PURGE WELL WITH A BAILER

Prerequisites: Proper Health and Safety Procedures, Understand Project Health and Safety Plan, Open Monitoring Well, Measure Water Level, Calculate Purge Volume

Equipment: Water Level Meter, Keys to Unlock Well, Plastic Sheeting, Bailer, Bailing Twine or Cable, Bucket

Cautions: *Tie bailer securely. Periodically check knot during process. Avoid dropping bailer abruptly into water column. Minimize release of VOAs and limit turbidity by minimizing agitation of water in the well with the bailer.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Access well and monitor at wellhead for presence or absence of VOCs.	☐	☐	☐	See associated Work Instruction No. 4.C.5.36.
2. Measure water level.	☐	☐	☐	See associated Work Instruction No. 4.C.5.38.
3. Calculate purge volume. As needed, cover ground area around well head with plastic sheeting. Volume bucket and other equipment should be placed on plastic sheeting.	☐	☐	☐	
4. Decontaminate bailer and other equipment prior to purging activity.	☐	☐	☐	See associated Work Instruction No. 4.C.5.34.
5. Attach bailer to string or cable.	☐	☐	☐	Secure line to reduce risk of losing equipment. Use bowline knot.
6. Gently lower bailer into water column. Avoid contact of purging equipment with the ground, other equipment, instruments, etc.	☐	☐	☐	
7. Submerge bailer, then withdraw smoothly and steadily.	☐	☐	☐	
8. Pour bailed water into measuring bucket or count number of bailers to determine volume purged. Dispose of water properly.	☐	☐	☐	
9. Measure water quality parameters.	☐	☐	☐	
10. Continue purging the well until parameters stabilize or the appropriate volume has been withdrawn.	☐	☐	☐	Refer to Project Implementation Plan (PIP) for specific guidance.
11. Dispose of purge water properly.	☐	☐	☐	Refer to PIP for proper IDW Management Procedures.
12. Properly dispose purging equipment and plastic sheeting after purging (and sampling) activities.	☐	☐	☐	
13. Secure well.	☐	☐	☐	

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Collect Environmental Samples and Information

Method Title: HOW TO PURGE WELL WITH A BAILER

Operations:	***Yes No N/A***	***Notes:***
14. Document all activities.	☐ ☐ ☐	

Comments:

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Collect Environmental Samples and Information

Method Title: **HOW TO COLLECT/DOCUMENT WATER SAMPLES WITH A PUMP**

Prerequisites: Health and Safety Training, Understanding Project Health and Safety Plan, Fill Water Sample Bottles, Set Up/Maintain Pump

Equipment: Pump, Tubing, Power Source, Plastic Sheeting, Sample Containers, and Associated Documents (forms).

Cautions: *Know potential contaminants and use levels of PPE identified in the Project Health and Safety Plan. Well casings may have rough edges that could damage tubing and electrical lines. Beware of possible electrical shock.*

Before groundwater samples are collected, these procedures should have been completed:

1. Proper opening and monitoring of well for VOCs.
2. Purging of monitor well.
   a. Plastic sheeting should already be in place.
   b. Pumping assembly and power supply may already be in place.
   c. Ensure the proper tubing is being used for sampling activities.

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Test pump and power supply prior to purging and sampling activities to insure the equipment is functioning properly.	☐	☐	☐	Sampler/Pump Operator should be familiar with pump specifications and functions.
2. Prepare sample containers.	☐	☐	☐	
3. Locate power supply downwind of well head if power supply produces exhaust.	☐	☐	☐	
4. Gently lower pump and/or tubing into the water column if it is not already in place. For submersible pumps, be certain that the pump is completely submerged.	☐	☐	☐	For submersible pumps – water level should be known. (See water level measurement.) Water intake point should be at the midpoint of the screened interval.
5. Plug pump into power source and start pump.	☐	☐	☐	
6. Adjust pump to lowest possible rate.	☐	☐	☐	Flow rate should be as low as possible to minimize agitation of sample water.
7. Collect sample parameter data.	☐	☐	☐	
8. Collect groundwater samples from discharge point into sample containers. Be certain that discharge tubing does not contact sample containers, the ground, or other sources of potential cross contamination.	☐	☐	☐	VOCs should be collected with a bailer. Program/client/regulatory may allow collection of VOCs via pump if low flow rates (≤ 200 ml/min) are used. Refer to Project Implementation Plan (PIP).

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT WATER SAMPLES WITH A PUMP

Operations:	***Yes***	***No***	***N/A***	***Notes:***
9. Turn pump off upon completion of sample collection.	☐	☐	☐	
10. Preserve and store samples, as required.	☐	☐	☐	In accordance with the PIP.
11. Document sampling activities.				Document information in Field Logbook and on the Groundwater Sample Data Record Sheet.
a. Document general identifying information in data record, including:	☐	☐	☐	
i) Client	☐	☐	☐	
ii) Project/Site	☐	☐	☐	
iii) Project number	☐	☐	☐	
iv) Sample location/site ID	☐	☐	☐	
v) Sample number/sample ID	☐	☐	☐	
vi) Date	☐	☐	☐	
vii) Start time/end time	☐	☐	☐	
viii) Name/signature of sampler(s)	☐	☐	☐	
b. Document soil sample information including:	☐	☐	☐	
i) Depth of sample	☐	☐	☐	
ii) Sampling method/ equipment	☐	☐	☐	
iii) Sample observations (odors, discoloration)	☐	☐	☐	
iv) Decontamination procedure and fluids used	☐	☐	☐	
c. Document sample collection requirements for each analytical fraction including:	☐	☐	☐	
i) Container type/volume	☐	☐	☐	
ii) Time collected	☐	☐	☐	
iii) Sample bottle IDs	☐	☐	☐	
iv) Analyses to be performed	☐	☐	☐	

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT WATER SAMPLES WITH A PUMP

Operations:	***Yes No N/A***	***Notes:***
d. Record field sketch of sampling location.	☐ ☐ ☐	Include distance from fixed, identifiable reference points (building corners, utility poles, other sampling locations, etc.). A sketch could alternatively be drawn in the *field logbook*, *test pit record*, etc.
e. Record Investigation Derived Waste (IDW) information, including:	☐ ☐ ☐	
i) Disposition of spent decon fluids	☐ ☐ ☐	
ii) Disposition of used personal protection equipment (PPE)	☐ ☐ ☐	
12. Decontaminate reusable equipment.	☐ ☐ ☐	Decontaminate equipment in accordance with the PIP.
13. Properly dispose of non-reusable materials and excess sample water.	☐ ☐ ☐	
14. Secure well.	☐ ☐ ☐	Ensure that well caps are secure and casing lid locked.

Comments:

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SAMPLES WITH A BAILER

Prerequisites: Health and Safety Training, Understanding of Project Health and Safety Plans, Label Sample Bottles, Tie Various Knots, Fill Water Sample Bottles, Decontamination Procedures

Equipment: Water Level Meter, Plastic Sheeting, Nylon or Bailing Line, Bailer, Sample Containers, Sample Documentation (forms)

Cautions: *Follow proper Health and Safety guidelines whenever working with potentially contaminated groundwater. Identify potential contaminants and use appropriate level of PPE. Avoid splashing during bailing. Some sample bottles may contain caustic or corrosive preservatives.*

Before groundwater samples are collected, these procedures must have been completed:

a. Proper opening and monitoring of well for VOCs.
b. Purging of Monitoring Well.
c. Confirm that all equipment has been properly decontaminated and that all documentation has been completed on the Groundwater Sample Data Record and referenced in the site logbook.
d. Plastic sheeting should already be on the ground.

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Clean sampling equipment should be used. Decontaminate bailer (if required).	☐	☐	☐	Understanding of decontamination procedures.
2. Tie bailer line to top of bailer.	☐	☐	☐	Acceptable bailer line materials vary by state or EPA region. Check state, regional, and/or client/program guidance. Refer to Project Implementation Plan (PIP). Knot of preference is the bow line.
3. Cut line to a length sufficient to reach the bottom of the well and have sufficient line to tie to a stationary object.	☐	☐	☐	
4. Attach the other end of the line to the well protective casing, or other stationary object.	☐	☐	☐	Secure rope to bailer with a bow line knot or other suitable knot and tie other end of knot to stationary object to avoid the loss of the bailer.
5. Arrange sample containers in order to be filled.	☐	☐	☐	Understanding of sample labels and sample documentation. Refer to PIP.
6. Gently lower the bailer into the water column below the top of the screened/open borehole interval, but above the bottom of the well. Avoid agitation of the water.	☐	☐	☐	Do not allow the bailer or line to touch the ground, well casing, or bottom of the well. Be careful not to cut the bailer line on sharp edges of well casing. Avoid contact of line and bailer to unprotected skin.
7. Gently retrieve the bailer and fill the first sample container. Avoid touching the bailer or line to the sample container.	☐	☐	☐	Pour from top of bailer or bottom with an emptying device.

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SAMPLES WITH A BAILER

Operations:	***Yes***	***No***	***N/A***	***Notes:***
8. Lower the bailer as many times as necessary to retrieve sufficient sample volume to fill sample containers.	☐	☐	☐	The first is usually poured out as a rinse of the bailer. Fill the containers in the order described by the SOPs or PIP.
9. Preserve samples as necessary.	☐	☐	☐	Refer to PIP for preservation requirements. Consult Work Plan, regional, and/or client program guidance for preservation techniques.
10. Place sample containers on ice in coolers.	☐	☐	☐	
11. Secure well.	☐	☐	☐	
12. Document sampling activities.				Document information in Field Logbook and on the Groundwater Sample Data Record Sheet.
a. Document general identifying information in data record, including:	☐	☐	☐	
i) Client	☐	☐	☐	
ii) Project/Site	☐	☐	☐	
iii) Project number	☐	☐	☐	
iv) Sample location/site ID	☐	☐	☐	
v) Sample number/sample ID	☐	☐	☐	
vi) Date	☐	☐	☐	
vii) Start time/end time	☐	☐	☐	
viii) Name/signature of sampler(s)	☐	☐	☐	
b. Document sample information including:	☐	☐	☐	
i) Depth of sample	☐	☐	☐	
ii) Sampling method/equipment	☐	☐	☐	
iii) Sample type	☐	☐	☐	
iv) Sample observations (odors, color, etc.)	☐	☐	☐	
v) Decontamination procedure and fluids used	☐	☐	☐	
c. Document sample collection requirements for each analytical fraction including:	☐	☐	☐	

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Collect Environmental Samples and Information

Method Title: HOW TO COLLECT/DOCUMENT SAMPLES WITH A BAILER

Operations:	***Yes No N/A***	***Notes:***
i) Container type/volume	☐ ☐ ☐	
ii) Time collected	☐ ☐ ☐	
iii) Sample bottle IDs	☐ ☐ ☐	
iv) Analyses to be performed	☐ ☐ ☐	
d. Record field sketch of sampling location.	☐ ☐ ☐	Include distance from fixed, identifiable reference points (building corners, utility poles, other sampling locations, etc.). A sketch could alternatively be drawn in the *field logbook, test pit record,* etc.
e. Record Investigation Derived Waste (IDW) information, including:	☐ ☐ ☐	
i) Disposition of spent decon fluids	☐ ☐ ☐	
ii) Disposition of used personal protection equipment (PPE)	☐ ☐ ☐	
13. Decontaminate reusable equipment as required.	☐ ☐ ☐	
14. Properly dispose of non-reuseable materials and excess sample water.	☐ ☐ ☐	Disposable materials include plastic sheeting, bailer line, etc. Understanding of IDW practices and plan required.

Comments:

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Collect Environmental Samples and Information

Method Title: HOW TO DECONTAMINATE SAMPLING EQUIPMENT

Prerequisites: Health and Safety Training, Understanding of Project Health and Safety Plan

Equipment: Potable Water Supply, Liquinox or other specified cleaning agent, DI water, other decontamination liquids/solvents specified by Project Implementation Plan (PIP), aluminum foil, field logbook.

Cautions: *Wear rubber gloves and face splash protection.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Establish decontamination station in accordance with the PIP.	☐	☐	☐	Number of stations.
2. Spray/rinse off excess dirt, mud, or other residue with potable water.	☐	☐	☐	
3. Scrub sampling equipment in potable water and Liquinox or other cleaning agent.	☐	☐	☐	
4. Rinse with potable water.	☐	☐	☐	Record DI water lot number.
5. Rinse with methanol, hexane, isopropanol, nitric acid, or other cleaning agents as required in the PIP.	☐	☐	☐	Containerize rinse wastes as required by Project Implementation Plan. Prepare rinse concentration in accordance with the PIP. Record lot number of chemicals used.
6. Rinse thoroughly with DI water or other approved source water. Repeat as required.	☐	☐	☐	
7. Air dry.	☐	☐	☐	
8. Wrap neatly in aluminum foil.	☐	☐	☐	Shiny side out.
9. Upon completion of decontamination procedure record that the decontamination activities have occured in field logbook and/or sample data record sheet.	☐	☐	☐	

Comments:

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Conduct Intrusive Explorations

Method Title: HOW TO MANAGE INVESTIGATION DERIVED WASTE

Prerequisites: Understand Project Health and Safety Procedures , Oversee/ Document Subcontractor Activities, Decontaminate Drilling and Sampling Equipment

Equipment:

Cautions:

Understand the range of site safety hazards. Know project-specific scope of investigation. Management of IDW from field programs is very specific to state regulatory requirements, program requirements, or client requirements. Be sure to consult the project work plan and senior staff before making decisions. This Work Instruction applies to onsite collection and documentation of investigation derived waste (IDW) at sites where hazardous materials could be encountered; it does not apply to specific disposal options or to the specific analytical requirements for waste characterization.

Operations:	***Yes No N/A***	***Notes:***
1. Manage soil cuttings IDW from drill program:		Management of investigation derived waste (IDW) can fall into five categories: (1) soil cuttings (solids); (2) liquids from drilling (drilling water/mud); (3) liquids from monitoring well development and purging; (4) decontamination fluids; and (5) solid waste consisting of personal protective equipment and trash.
a. If appropriate, spread plastic sheeting on ground for collection of soil cuttings.	☐ ☐ ☐	
a. Screen the soil cutting (auger cuttings or soil from drive and wash or mud tub) with field instrumentation (i.e., flannel/photoionization detector, radiation meter, field gas chromatograph) as stated in the project work plan.	☐ ☐ ☐	Soil cuttings, drilling water/mud, or development water treated as IDW should be segregated by "area of contamination" (AOC), which is typically the well or boring location, or location of a specific well cluster
a. If soil cuttings do not pass the screening procedures mentioned above, collect and containerize soil cuttings (auger cuttings or soil from a drive and wash or mud tub) in 55-gallon drums.	☐ ☐ ☐	
a. Label and transport drums or roll offs to a central temporary storage area. For large piles of soil cutting, collect appropriate composite samples and cover with plastic sheeting to avoid erosion.	☐ ☐ ☐	

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Conduct Intrusive Explorations

Method Title: HOW TO MANAGE INVESTIGATION DERIVED WASTE

Operations:	***Yes No N/A***	***Notes:***
a. Document the collection of soil cuttings in field notes.	☐ ☐ ☐	Record all pertinent data including location, physical characteristics of material (texture, water content, odor, field instrumentation readings associated with material, etc.). Record the number of drums or estimated volume of IDW in field notes.
b. Oversee physical transfer of the cuttings to drums by drilling subcontractor.	☐ ☐ ☐	Supervise workers to assure that proper health and safety and containerization procedures are being followed.
c. Label individual drums with site name, location identification, description of contents, field instrument readings, and any appropriate labeling required for transport include the following.	☐ ☐ ☐	If more than one drum is needed per AOC, label drums sequentially (i.e. 1 of 3, 2 of 3, etc.).
• Type of waste (i.e. soil, water, decontamination fluids	☐ ☐ ☐	
• Point of origin (i.e. boring or well number)	☐ ☐ ☐	
• Site name	☐ ☐ ☐	
• Job number	☐ ☐ ☐	
• Screening results	☐ ☐ ☐	
• Date	☐ ☐ ☐	
d. Assure and document that drums are sealed and that material is transported to a safe staging area (identified by regulatory agency and/or client) that is restricted by fencing from all unauthorized access upon completion of the IDW containment.	☐ ☐ ☐	Drums are to be segregated by AOC as much as is practical.
e. Screen ground surface under former soil cuttings to confirm that no residual contamination remains. If residual contamination is observed, remove and place in IDW soil drums generated from this AOC.	☐ ☐ ☐	
f. Document proposed final disposition of IDW.	☐ ☐ ☐	

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Conduct Intrusive Explorations

Method Title: HOW TO MANAGE INVESTIGATION DERIVED WASTE

Operations:	***Yes No N/A***	***Notes:***
g. Document client contact who has been informed of IDW disposal procedures.	☐ ☐ ☐	
2. Manage drilling water/mud and development water IDW.	☐ ☐ ☐	Drilling water/mud consisting of water/bentonite and suspended solids from drilling, at a specific AOC, can be containerized in drums or pumped into a tank for transfer to a larger tank or treatment system.
a. Containerize development water.	☐ ☐ ☐	Development water that is collected as wells are pumped or surged can be collected in the same manner mentioned above. Normally drilling fluids and development water from a specific AOC do not have to be segregated from one another.
b. Document in *field log book* all pertinent data related to volume, physical characteristics of material, odors, field instrumentation readings, etc.	☐ ☐ ☐	
c. Label drums according to procedure described in 1g above.	☐ ☐ ☐	Development water should be pumped directly into 55-gallon drum or tank and a screening sample should be collected once the container is full.
3. Manage decontamination fluids IDW.		
a. Collect and contain all fluids and solids from the decon operations at a central area	☐ ☐ ☐	All liquid from drilling equipment and decontamination should flow to a sump from where it can be pumped out and containerized in the appropriate manner. Solid should be shoveled from the equipment pad into 55-gallon drums for screening prior to disposal. Decontamination fluids from sampling activities should also be collected and containerized at a central location for sampling and/or disposal. Normally decontamination fluids are not segregated by AOC, except in cases where specific AOCs are known to be highly contaminated.
b. Document handling of decontamination fluids.	☐ ☐ ☐	Documentation and containerization of the decontamination fluids should proceed in the same manner as described in preceding discussions.
c. Label drums of decon fluids as in section 1g above.	☐ ☐ ☐	

References:

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Conduct Intrusive Explorations

Method Title: **HOW TO MANAGE INVESTIGATION DERIVED WASTE**

Appropriate document review to include:

ASTM D 5092-90; Standard Practice For Design and Installation of Groundwater Monitoring Wells in Aquifers
MACTEC SOP WEINS-006: Drilling and Well Installation
Navy CLEAN SOP for Drilling and Well Installation (if applicable)
USEPA Guidance on Monitoring Well Installation (appropriate region)
State Specific Guidance on Monitoring Well Installation and Permit Requirements
Site Specific Health and Safety Plan
USEPA, 1991. Management of Investigation-Derived Wastes During Site Inspections. EPA/540/G-91/009.

Comments:

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Conducting Intrusive Explorations

Method Title: HOW TO MONITOR OPERATION OF DRILL RIGS

Prerequisites: Understand Project Health and Safety Procedures, Oversee/Document Subcontractor Activities, Oversee/Document Installation of Monitoring Well, Decontaminate Drilling Equipment (EQ-05)

Equipment:

Cautions:

> *Understand the range of site safety hazards. Know project-specific scope of drilling. Understand the physical hazards of a drill rig. Review and understand the type of drilling that is being performed at this site. Only experience will teach you a feel for what the capabilities of the drilling equipment for the given conditions are. Rely on experienced people.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Clear utilities: check for buried electrical service, gas, sewer, telephone, and water lines, etc., that could be damaged by drilling activities before moving onto drill site, if not performed before arriving on site. Also, check for overhead electric lines.	☐	☐	☐	This method sheet pertains to all drilling methods. Noted exceptions for specific techniques are in parentheses.
2. Make sketch of location of well/boring in field book and measure location from fixed objects (if possible).	☐	☐	☐	Document in activity log book time that rig gets on hole, time that specific set up activities occur, and subcontractor and Harding ESE personnel at drill rig.
3. Direct set up of logistical arrangements (i.e., placement of materials, staging of cuttings, etc.) and document.	☐	☐	☐	
4. Establish and document exclusion zone by setting up traffic cones or hazard tape. The type of exclusion zone to be used will be based on the site-specific health and safety plan.	☐	☐	☐	Make sure that personnel working in the immediate area are aware of drilling going on. Set up traffic barriers, if necessary, or arrange with local or facility law enforcement personnel.
5. Advance first 4-5 feet of boring with post hole digger if utility clearance was not completed in advance.	☐	☐	☐	Direct location any hole offset that may be required. Review subcontractors' contractual offset procedures with Field Operations Leader/Project Manager.
6. Look over drill rig for obvious mechanical problems/leaks.	☐	☐	☐	
7. Monitor and document decontamination of drill rig and equipment.	☐	☐	☐	

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Conducting Intrusive Explorations

Method Title: HOW TO MONITOR OPERATION OF DRILL RIGS

Operations:	***Yes***	***No***	***N/A***	***Notes:***
8. Check drilling tools for residue that may have been missed in decontamination.	☐	☐	☐	Note oil staining on rods, rust particles coming out of the water tanks, etc.
9. Document source of potable water used in drill operation, and if any analytical data is available for the water source.	☐	☐	☐	This should have been arranged with driller prior to mobilization. Collect sample if data is lacking.
10. Document types of drilling equipment used (i.e., auger/casing diameter and length, drill rod size, bit size, drill rig power capacity, etc.)	☐	☐	☐	Many of these items are identified in the header of a boring log. Be sure to complete the header prior to leaving the drill site.
11. Document weather conditions and wind direction.	☐	☐	☐	
12. Document drilling mud composition.	☐	☐	☐	Note total volume and approximate amount of drilling mud additive (i.e., bentonite) that was added (for mud rotary, coring).
13. Monitor and document materials used by drilling subcontractor.				
14. Document rate of penetration, any delays, special problems that are encountered, water loss, tool changes, etc.	☐	☐	☐	Also, note evidence of any water gain, such as mud thinning.
15. Collect, describe, and document samples according to Project Implementation Plan (PIP).	☐	☐	☐	
16. Perform Health and Safety monitoring according to project Health and Safety Plan, or, more frequently, as site conditions warrant.	☐	☐	☐	Notify Harding ESE Field Operations Leader/ Project Manager and then local or facility personnel in the event of accident, exposure of personnel to site contaminants, or damage to property.
17. Document drilling completion times, final depth of exploration (measure with accurate tape), final disposition of exploration (i.e., grouted to surface or installed monitoring well/piezometer.)	☐	☐	☐	

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Conducting Intrusive Explorations

Method Title: HOW TO MONITOR OPERATION OF DRILL RIGS

Appropriate document review to include:

ASTM D 5092-90; Standard Practice for Design and Installation of Groundwater Monitoring Wells in Aquifers
MACTEC SOP WEINS-006: Drilling and Well Installation
Navy CLEAN SOP for Drilling and Well Installation (if applicable)
USEPA Guidance on Monitoring Well Installation (appropriate region)
State Specific Guidance on Monitoring Well Installation and Permit Requirements
Site Specific Work Plan and Health and Safety Plan
USEPA, 1991, Management of Investigation-Derived Wastes during Site Inspections. EPA/540/G-91/009.

Comments:

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Conduct Intrusive Exploration

Method Title: HOW TO COMPLETE SOIL BORING LOG

Prerequisites: Proper Health and Safety Procedures, Understanding of Unified Soil Classification System (USCS)

Equipment:

Cautions: *Follow prescribed Health & Safety Requirements when handling soil. Boring logs should be neat, legible, and complete. Ideally, they should be suitable for photocopying into a report.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Record Title Block Information, including:				Required for all boreholes advanced with conventional rotary or drive-and-wash equipment.
a. Client	☐	☐	☐	
a. Project/site	☐	☐	☐	
a. Project number	☐	☐	☐	Not required for come penetrometer or TerraProbe systems.
a. Boring number	☐	☐	☐	
a. Drilling contractor	☐	☐	☐	
a. Driller's name	☐	☐	☐	Use project-approved *soil boring log* forms.
a. Your name (logged by)	☐	☐	☐	
a. Drilling method (bit/sampler type and size)	☐	☐	☐	Complete *boring log* in field at time of drilling.
a. PI meter (manufacturer, model)	☐	☐	☐	
a. Personal protection level	☐	☐	☐	
a. Dates started/finished	☐	☐	☐	Use permanent blue or black ink.
a. Total depth	☐	☐	☐	
a. Observed water level	☐	☐	☐	
a. Geotechnical info	☐	☐	☐	
2. Record *soil boring log* information, including:				
a. Page number (1 of *n*)	☐	☐	☐	May be shown using a graphic scale.
a. Depth of sample (in feet below ground surface)	☐	☐	☐	
a. Sample number	☐	☐	☐	
a. Blows/6-inch interval on split spoon sampler	☐	☐	☐	
a. Penetration/recovery	☐	☐	☐	
a. Soil description	☐	☐	☐	Include necessary detail, consistent with the requirements of the Unified Soil Classification System.

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Conduct Intrusive Exploration

Method Title: HOW TO COMPLETE SOIL BORING LOG

Operations:	***Yes No N/A***	***Notes:***
2. Record organic vapor reading measured with an organic vapor meter (PID/FID), and method employed.	☐ ☐ ☐	
3. Record required information in a soil boring log (reference boring in site logbook), using project-required soil classification procedures:	☐ ☐ ☐	Use the Unified Soil Classification System (USCS), which is the Harding ESE standard.
a. Soil name based on gradation characteristics.	☐ ☐ ☐	Sand, silt, clay, etc.
b. Grain-size distribution.	☐ ☐ ☐	Gradation: conclude by grain size distribution (for coarse grained soils, not silt or clay). a. Well graded - wide range of particle size. b. Poorly graded - predominantly one grain size.
c. Moisture content.	☐ ☐ ☐	Note moisture content if possible (dry, damp, moist, wet, saturated, etc.).
d. Density (based on the standard penetration test if using split-spoon sampler).	☐ ☐ ☐	
e. Color (including mottling or staining).	☐ ☐ ☐	Use Soil Color Charts (e.g., Munsell), if possible.
f. Structure.	☐ ☐ ☐	Note structures if observed (stratified, lensed, homogenous, lenticular, etc.)
g. Geological origin or formal or local name (if known).	☐ ☐ ☐	
h. Organic matter content.	☐ ☐ ☐	Note presence of visible organic matter, if observed.
i. Other.	☐ ☐ ☐	Note any unusual odors associated with the soil, but avoid inhalation of related vapors if possible by remaining upwind of sample. Note staining or other unusual conditions observed.
4. Determine the appropriate Unified Soil Classification symbol (or Group symbol).	☐ ☐ ☐	Refer to Classification of Soil for Environmental Investigations SOP.

Comments:

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Collect Environmental Samples and Information

Method Title: GPS Data Collection Methods

Global Positioning System (GPS) data loggers will be used to establish the vertical and horizontal coordinates of all sample locations. All coordinates will be recorded in the Rhode Island Planar Grid system, with horizontal and vertical coordinates given in feet. Locations will be established with a margin of error of less than three feet.

At each sample location, the GPS logger will be used to establish the location. In order to assure accuracy within the required margin of error, the maximum PDOP permitted for logging should be less than 3.0. Data will be logged at each location for at least one minute, to ensure that enough discrete location measurements are collected to achieve the desired margin of error when averaged. Approximate location and elevation readings will be noted in the logbook for reference at each sample location, and the averaged data will be saved on the GPS instrument to be downloaded and added to the project database.

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Collect Environmental Samples and Information

Method Title: HOW TO SCREEN SAMPLE HEADSPACE FOR VOCS

Prerequisites: Health and Safety Training; Understanding of Project Health and Safety Plan; Calibrate/Maintain pH Meter; Collect Surface, Shallow, and Deep Sub-Surface Soil Sample; Decontaminate Soil Sample Equipment; Decontaminate General Equipment

Equipment: PID or OVA.

Cautions: *Reference proper health and safety procedures.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Wear the level of personal protection as identified in the Health and Safety Plan.	☐	☐	☐	In accordance with Project Implementation Plan (PIP) and Project Health and Safety Plan.
2. Collect soil sample for VOC screening.	☐	☐	☐	Use a clean jar, plastic baggie, or other sampling receptacle. Do not fill receptacle to capacity. (Allow room for headspace.)
3. Seal and store container.	☐	☐	☐	In accordance with PIP.
4. Open container.	☐	☐	☐	In accordance with PIP.
5. Insert calibrated VOC measuring device probe through aluminum foil, or into receptacle.	☐	☐	☐	Make sure probe does not touch soil. If so, clean prior to next use.
6. Record VOC measurement.	☐	☐	☐	
7. Discard sample.	☐	☐	☐	In accordance with PIP.
8. Decontaminate or dispose of container.	☐	☐	☐	

Comments:

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Non-Intrusive Testing and Observations

Method Title: **HOW TO MEASURE VOCS IN AIR WITH A PHOTOIONIZATION DETECTOR (PID) OR FLAME IONIZATION DETECTOR (FID)**

Prerequisites: Understand Project Health and Safety Plan, General Knowledge of Use of Electronic Equipment, Calibrate/Maintain PID, Calibration/Maintain FID

Equipment: PID/FID, Instrument Manual(s)

Cautions: *Use Health and Safety precautions. Volatile organic compounds are a health and safety danger in high concentrations. Most VOCs are combustible.*

Operations:	***Yes***	***No***	***N/A***	***Notes:***
1. Calibrate PID/FID with proper calibration gas every day before use.	☐	☐	☐	Follow calibration and operations procedures as stated in manual.
2. Document calibration in the project logbook and the project's calibration log notebook.	☐	☐	☐	
3. Perform a positive response check a minimum of twice a day to ensure the PID is functioning properly.	☐	☐	☐	For a positive response check use the cap of an indelible pen or other source of moisture free VOCs.
4. Verify PID/FID is turned on and functioning properly.	☐	☐	☐	PIDs and FIDs can be set to read compounds at various sensitivities. Use the same sensitivity setting in the field as you do for calibration.
5. Establish ambient air (background) VOC reading and record.	☐	☐	☐	
6. Place the intake port of the PID/FID near the source from which you want to take a reading (e.g., wellhead, open split spoon, etc.)	☐	☐	☐	Be certain not to draw water or other foreign matter into the instrument as that can cause internal drainage.
7. A VOC value will appear as a number in parts per million (PPM) on display of meter.	☐	☐	☐	Make sure you know what the action limit is for VOCs at the project site. Consult the H&S Plan.
8. Record PID/FID reading in *Field Log Book* and on other appropriate forms.	☐	☐	☐	

Comments:

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U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

LOW STRESS (low flow) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUND WATER SAMPLES FROM MONITORING WELLS

July 30, 1996
Revision 2

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

LOW STRESS (low flow) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUND WATER SAMPLES FROM MONITORING WELLS

I. SCOPE & APPLICATION

This standard operating procedure (SOP) provides a general framework for collecting ground water samples that are indicative of mobile organic and inorganic loads at ambient flow conditions (both the dissolved fraction and the fraction associated with mobile particulates). The SOP emphasizes the need to minimize stress by low water-level drawdowns, and low pumping rates (usually less than 1 liter/min) in order to collect samples with minimal alterations to water chemistry. This SOP is aimed primarily at sampling monitoring wells that can accept a submersible pump and have a screen, or open interval length of 10 feet or less (this is the most common situation). However, this procedure is flexible and can be used in a variety of well construction and ground-water yield situations. Samples thus obtained are suitable for analyses of ground water contaminants (volatile and semi-volatile organic analytes, pesticides, PCBs, metals and other inorganics), or other naturally occurring analytes.

This procedure does not address the collection of samples from wells containing light or dense non-aqueous phase liquids (LNAPLs and DNAPLs). For this the reader may wish to check: Cohen, R.M. and J.W. Mercer, 1993, DNAPL Site Evaluation; C.K. Smoley (CRC Press), Boca Raton, Florida and U.S. Environmental Protection Agency, 1992, RCRA Ground-Water Monitoring: Draft Technical Guidance; Washington, DC (EPA/530-R-93-001).

The screen, or open interval of the monitoring well should be optimally located (both laterally and vertically) to intercept existing contaminant plume(s) or along flowpaths of potential contaminant releases. It is presumed that the analytes of interest move (or potentially move) primarily through the more permeable zones within the screen, or open interval.

Use of trademark names does not imply endorsement by U.S.EPA but is intended only to assist in identification of a specific type of device.

Proper well construction and development cannot be overemphasized, since the use of installation techniques that are appropriate to the hydrogeologic setting often prevents "problem well" situations from occurring. It is also recommended that as part of development or redevelopment the well should be tested to determine the appropriate pumping rate to obtain stabilization of field indicator parameters with minimal drawdown in shortest amount of time. With this information field crews can then conduct purging and sampling in a more expeditious manner.

The mid-point of the saturated screen length (which should not exceed 10 feet) is used by convention as the location of the pump intake. However, significant chemical or permeability contrast(s) within the screen may require additional field work to determine the optimum vertical location(s) for the intake, and appropriate pumping rate(s) for purging and sampling more localized target zone(s). Primary flow zones (high(er) permealability and/or high(er) chemical concentrations) should be identified in wells with screen lengths longer than 10 feet, or in wells with open boreholes in bedrock. Targeting these zones for water sampling will help insure that the low stress procedure will not underestimate contaminant concentrations. The Sampling and Analysis Plan must provide clear instructions on how the pump intake depth(s) will be selected, and reason(s) for the depth(s) selected.

Stabilization of indicator field parameters is used to indicate that conditions are suitable for sampling to begin. Achievement of turbidity levels of less than 5 NTU and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. Sample collection may still take place provided the remaining criteria in this procedure are met. If after 4 hours of purging indicator field parameters have not stabilized, one of 3 optional courses of action may be taken: a) continue purging until stabilization is achieved, b) discontinue purging, do not collect any samples, and record in log book that stabilization could not be achieved (documentation must describe attempts to achieve stabilization) c) discontinue purging, collect samples and provide full explanation of attempts to achieve stabilization (note: there is a risk that the analytical data obtained, especially metals and strongly hydrophobic organic analytes, may not meet the sampling objectives).

Changes to this SOP should be proposed and discussed when the site Sampling and Analysis Plan is submitted for approval. Subsequent requests for modifications of an approved plan must include adequate technical justification for proposed changes. All changes and modifications must be approved before implementation in field.

II. EQUIPMENT

A. Extraction device

Adjustable rate, submersible pumps are preferred (for example, centrifugal or bladder pump constructed of stainless steel or

Teflon).

Adjustable rate, peristaltic pumps (suction) may be used with caution. Note that EPA guidance states: "Suction pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds" (EPA/540/P-87/001, 1987, page 8.5-11).

The use of inertial pumps is discouraged. These devices frequently cause greater disturbance during purging and sampling and are less easily controlled than the pumps listed above. This can lead to sampling results that are adversely affected by purging and sampling operations, and a higher degree of data variability.

B. Tubing

Teflon or Teflon lined polyethylene tubing are preferred when sampling is to include VOCs, SVOCs, pesticides, PCBs and inorganics.

PVC, polypropylene or polyethylene tubing may be used when collecting samples for inorganics analyses. However, these materials should be used with caution when sampling for organics. If these materials are used, the equipment blank (which includes the tubing) data must show that these materials do not add contaminants to the sample.

Stainless steel tubing may be used when sampling for VOCs, SVOCs, pesticides, and PCBs. However, it should be used with caution when sampling for metals.

The use of 1/4 inch or 3/8 inch (inner diameter) tubing is preferred. This will help ensure the tubing remains liquid filled when operating at very low pumping rates.

Pharmaceutical grade (Pharmed) tubing should be used for the section around the rotor head of a peristaltic pump, to minimize gaseous diffusion.

C. Water level measuring device(s), capable of measuring to 0.01 foot accuracy (electronic "tape", pressure transducer). Recording pressure transducers, mounted above the pump, are especially helpful in tracking water levels during pumping operations, but their use must include check measurements with a water level "tape" at the start and end of each record.

D. Flow measurement supplies (e.g., graduated cylinder and stop watch).

E. Interface probe, if needed.

F. Power source (generator, nitrogen tank, etc.). If a gasoline generator is used, it must be located downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate the samples.

G. Indicator field parameter monitoring instruments - pH, Eh, dissolved oxygen (DO), turbidity, specific conductance, and temperature. Use of a flow-through-cell is required when measuring all listed parameters, except turbidity. Standards to perform field calibration of instruments. Analytical methods are listed in 40 CFR 136, 40 CFR 141, and SW-846. For Eh measurements, follow manufacturer's instructions.

H. Decontamination supplies (for example, non-phosphate detergent, distilled/deionized water, isopropyl alcohol, etc.).

I. Logbook(s), and other forms (for example, well purging forms).

J. Sample Bottles.

K. Sample preservation supplies (as required by the analytical methods).

L. Sample tags or labels.

M. Well construction data, location map, field data from last sampling event.

N. Well keys.

O. Site specific Sample and Analysis Plan/Quality Assurance Project Plan.

P. PID or FID instrument (if appropriate) to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

III. PRELIMINARY SITE ACTIVITIES

Check well for security damage or evidence of tampering, record pertinent observations.

Lay out sheet of clean polyethylene for monitoring and sampling equipment.

Remove well cap and immediately measure VOCs at the rim of the well with a PID or FID instrument and record the reading in the field logbook.

If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the logbook.

A synoptic water level measurement round should be performed (in the shortest possible time) before any purging and sampling activities begin. It is recommended that water level depth (to 0.01 ft.) and

total well depth (to 0.1 ft.) be measured the day before, in order to allow for re-settlement of any particulates in the water column. If measurement of total well depth is not made the day before, it should not be measured until after sampling of the well is complete. All measurements must be taken from the established referenced point. Care should be taken to minimize water column disturbance.

Check newly constructed wells for the presence of LNAPLs or DNAPLs before the initial sampling round. If none are encountered, subsequent check measurements with an interface probe are usually not needed unless analytical data or field head space information signal a worsening situation. Note: procedures for collection of LNAPL and DNAPL samples are not addressed in this SOP.

IV. PURGING AND SAMPLING PROCEDURE

Sampling wells in order of increasing chemical concentrations (known or anticipated) is preferred.

1. Install Pump

Lower pump, safety cable, tubing and electrical lines slowly (to minimize disturbance) into the well to the midpoint of the zone to be sampled. The Sampling and Analysis Plan should specify the sampling depth, or provide criteria for selection of intake depth for each well (see Section I). If possible keep the pump intake at least two feet above the bottom of the well, to minimize mobilization of particulates present in the bottom of the well. Collection of turbid free water samples may be especially difficult if there is two feet or less of standing water in the well.

2. Measure Water Level

Before starting pump, measure water level. If recording pressure transducer is used-initialize starting condition.

3. Purge Well

3a. Initial Low Stress Sampling Event

Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no water level drawdown (less than 0.3 feet). If the minimal drawdown that can be achieved exceeds 0.3 feet but remains stable, continue purging until indicator field parameters stabilize.

Monitor and record water level and pumping rate every three to five minutes (or as appropriate) during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should, as needed, be reduced to the minimum capabilities of the pump (for example, 0.1 - 0.4 l/min) to ensure stabilization of indicator

parameters. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. During pump start-up, drawdown may exceed the 0.3 feet target and then "recover" as pump flow adjustments are made. Purge volume calculations should utilize stabilized drawdown value, not the initial drawdown. Do not allow the water level to fall to the intake level (if the static water level is above the well screen, avoid lowering the water level into the screen). The final purge volume must be greater than the stabilized drawdown volume plus the extraction tubing volume.

Wells with low recharge rates may require the use of special pumps capable of attaining very low pumping rates (bladder, peristaltic), and/or the use of dedicated equipment. If the recharge rate of the well is lower than extraction rate capabilities of currently manufactured pumps and the well is essentially dewatered during purging, then the well should be sampled as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples (ideally the intake should not be moved during this recovery period). Samples may then be collected even though the indicator field parameters have not stabilized.

3b. Subsequent Low Stress Sampling Events

After synoptic water level measurement round, check intake depth and drawdown information from previous sampling event(s) for each well. Duplicate, to the extent practicable, the intake depth and extraction rate (use final pump dial setting information) from previous event(s). Perform purging operations as above.

4. Monitor Indicator Field Parameters

During well purging, monitor indicator field parameters (turbidity, temperature, specific conductance, pH, Eh, DO) every three to five minutes (or less frequently, if appropriate). Note: during the early phase of purging emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken at three (3) to five (5) minute intervals, are within the following limits:

turbidity (10% for values greater than 1 NTU),
DO (10%),
specific conductance (3%),
temperature (3%),
pH (± 0.1 unit),
ORP/Eh (± 10 millivolts).

All measurements, except turbidity, must be obtained using a flow-through-cell. Transparent flow-through-cells are preferred, because they allow field personnel to watch for particulate build-up within the cell. This build-up may affect indicator field parameter values

measured within the cell and may also cause an underestimation of turbidity values measured after the cell. If the cell needs to be cleaned during purging operations, continue pumping and disconnect cell for cleaning, then reconnect after cleaning and continue monitoring activities.

The flow-through-cell must be designed in a way that prevents air bubble entrapment in the cell. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must be submerged in water at all times. If two flow-through-cells are used in series, the one containing the dissolved oxygen probe should come first (this parameter is most susceptible to error if air leaks into the system).

5. Collect Water Samples

Water samples for laboratory analyses must be collected before water has passed through the flow-through-cell (use a by-pass assembly or disconnect cell to obtain sample).

VOC samples should be collected first and directly into pre-preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

During purging and sampling, the tubing should remain filled with water so as to minimize possible changes in water chemistry upon contact with the atmosphere. It is recommended that 1/4 inch or 3/8 inch (inside diameter) tubing be used to help insure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, use one of the following procedures to collect samples: (1) add clamp, connector (Teflon or stainless steel) or valve to constrict sampling end of tubing; (2) insert small diameter Teflon tubing into water filled portion of pump tubing allowing the end to protrude beyond the end of the pump tubing, collect sample from small diameter tubing; (3) collect non-VOC samples first, then increase flow rate slightly until the water completely fills the tubing, collect sample and record new drawdown, flow rate and new indicator field parameter values.

Add preservative, as required by analytical methods, to samples immediately after they are collected if the sample containers are not pre-preserved. Check analytical methods (e.g. EPA SW-846, water supply, etc.) for additional information on preservation. Check pH for all samples requiring pH adjustment to assure proper pH value. For VOC samples, this will require that a test sample be collected during purging to determine the amount of preservative that needs to be added to the sample containers prior to sampling.

If determination of filtered metal concentrations is a sampling objective, collect filtered water samples using the same low flow procedures. The use of an in-line filter is required, and the filter

size (0.45 um is commonly used) should be based on the sampling objective. Pre-rinse the filter with approximately 25 - 50 ml of ground water prior to sample collection. Preserve filtered water sample immediately. Note: filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain chemical concentrations of total mobile contaminants in ground water for human health risk calculations.

Label each sample as collected. Samples requiring cooling (volatile organics, cyanide, etc.) will be placed into a cooler with ice or refrigerant for delivery to the laboratory. Metal samples after acidification to a pH less than 2 do not need to be cooled.

6. Post Sampling Activities

If recording pressure transducer is used, remeasure water level with tape.

After collection of the samples, the pump tubing may either be dedicated to the well for resampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

Before securing the well, measure and record the well depth (to 0.1 ft.), if not measured the day before purging began. Note: measurement of total well depth is optional after the initial low stress sampling event. However, it is recommended if the well has a "silting" problem or if confirmation of well identity is needed.

Secure the well.

V. DECONTAMINATION

Decontaminate sampling equipment prior to use in the first well and following sampling of each subsequent well. Pumps will not be removed between purging and sampling operations. The pump and tubing (including support cable and electrical wires which are in contact with the well) will be decontaminated by one of the procedures listed below.

Procedure 1

The decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump or the pump can be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and isopropyl alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

Flush the equipment/pump with potable water.

Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

Flush with isopropyl alcohol (pesticide grade). If equipment blank data from the previous sampling event show that the level of contaminants is insignificant, then this step may be skipped.

Flush with distilled/deionized water. The final water rinse must not be recycled.

Procedure 2

Steam clean the outside of the submersible pump.

Pump hot potable water from the steam cleaner through the inside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with end cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.

Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

VI. FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the ground water samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. The following quality control samples shall be collected for each batch of samples (a batch may not exceed 20 samples). Trip blanks are required for the VOC samples at a frequency of one set per VOC sample cooler.

Field duplicate.

Matrix spike.

Matrix spike duplicate.

Equipment blank.

Trip blank (VOCs).

Temperature blank (one per sample cooler).

Equipment blank shall include the pump and the pump's tubing. If tubing is dedicated to the well, the equipment blank will only include the pump in subsequent sampling rounds.

Collect samples in order from wells with lowest contaminant concentration to highest concentration. Collect equipment blanks after sampling from contaminated wells and not after background wells.

Field duplicates are collected to determine precision of sampling procedure. For this procedure, collect duplicate for each analyte group in consecutive order (VOC original, VOC duplicate, SVOC original, SVOC duplicate, etc.).

If split samples are to be collected, collect split for each analyte group in consecutive order (VOC original, VOC split, etc.). Split sample should be as identical as possible to original sample.

All monitoring instrumentation shall be operated in accordance with EPA analytical methods and manufacturer's operating instructions. EPA analytical methods are listed in 40 CFR 136, 40 CFR 141, and SW-846 with exception of Eh, for which the manufacturer's instructions are to be followed. Instruments shall be calibrated at the beginning of each day. If a measurement falls outside the calibration range, the instrument should be re-calibrated so that all measurements fall within the calibration range. At the end of each day, check calibration to verify that instruments remained in calibration. Temperature measuring equipment, thermometers and thermistors, need not be calibrated to the above frequency. They should be checked for accuracy prior to field use according to EPA Methods and the manufacturer's instructions.

VII. FIELD LOGBOOK

A field log shall be kept to document all ground water field monitoring activities (see attached example matrix), and record all of the following:

Well identification.

Well depth, and measurement technique.

Static water level depth, date, time and measurement technique.

Presence and thickness of immiscible liquid (NAPL) layers and

detection method.

Pumping rate, drawdown, indicator parameters values, and clock time, at the appropriate time intervals; calculated or measured total volume pumped.

Well sampling sequence and time of each sample collection.

Types of sample bottles used and sample identification numbers.

Preservatives used.

Parameters requested for analysis.

Field observations during sampling event.

Name of sample collector(s).

Weather conditions.

QA/QC data for field instruments.

Any problems encountered should be highlighted.

Description of all sampling equipment used, including trade names, model number, diameters, material composition, etc.

VIII. DATA REPORT

Data reports are to include laboratory analytical results, QA/QC information, and whatever field logbook information is needed to allow for a full evaluation of data useability.

EXAMPLE (Minimum Requirements) Page____of____

Well PURGING-FIELD WATER QUALITY MEASUREMENTS FORM

Location (Site/Facility Name)_____ Depth to _____/_____ of screen
Well Number_____Date_____ (below MP) top bottom
Field Personnel_____ Pump Intake at (ft. below MP)_____
Sampling Organization_____ Purging Device; (pump type)_____
Identify MP_____

Clock Time 24 HR	Water Depth below MP ft	Pump Dial[1]	Purge Rate ml/min	Cum. Volume Purged liters	Temp. °C	Spec. Cond.[2] µS/cm	pH	ORP/ Eh[3] mv	DO mg/L	Turb-idity NTU	Comments

1. Pump dial setting (for example: hertz, cycles/min, etc).
2. µSiemens per cm(same as µmhos/cm)at 25°C.
3. Oxidation reduction potential (stand in for Eh).

Battelle Duxbury Operations
Standard Operating Procedure

For

PACKAGING AND SHIPPING OF SAMPLES

Summary of changes in this version: An attachment that provides instructions for field personnel, additonal information for sample packaging and shipping, and a training section are added.

1.0 OBJECTIVE

The purpose of this SOP is to define the procedures, responsibilities, and documentation associated with the packaging and shipping of samples.

2.0 RESPONSIBILITIES

The sample custodian or designee is responsible for the proper packaging and shipping of samples from the laboratory. The Project Managers are responsible for informing the sample custodian or designee as to when and where the samples or sample containers are going to be shipped. The project manager or designee is responsible for contacting the recipient of the material to be shipped to notify them of a pending delivery.

3.0 EQUIPMENT

Field Pack Equipment
Coolers
Bubble Wrap
Teflon Tape
Black Ball Point Pens **NO "SHARPIES"**
Blank custody forms
Proper Jars for sampling
Packaging Tape
Chain-of-custody (COC) Seals

Sample Transmittal Equipment
Coolers
Bubble Wrap
Sample Transmittal Forms
Samples
Cover Letter
Zip Lock Bag

4.0 PREPARTION

4.1 Cooler Preparation

Coolers should be washed inside and outside with soap and warm water to avoid any possible contamination of the samples. The coolers should have two sturdy handles, a working top, and be in good shape. Do not use any coolers that are damaged or are contaminated.

4.2 Cooler Labeling

It is critical that cooler labels are secured to the cooler to ensure that samples are not lost.

- The shipping label (typically Fed Ex) should be permanently attached to the cooler lid, NOT the cooler handle. In order to ensure that the label doesn't fall off, scrub the cooler lid and rinse with a solvent (e.g., methanol). Stick the label on the lid and tape over it with packing tape.
- In addition to the shipping label, a full label with the recipient's name and address as well as the sender's name and address should be attached to the outside of the cooler.
- The sample custody form should include the full addresses of the recipient and the shipping organizations, as well as a contact name at each organization.

5.0 PROCEDURE

There are two types of shipping performed by the sample custodian or designee. The most common is Sample Transmittal or sample transfer, this occurs when the laboratory custodian ships samples to an outside contractor. The second type of shipping is the preparation and shipment of "Field Packs."

5.1 Shipping Samples

The sample custodian or designee packs the samples securely in a cooler with bubble wrap and adds blue ice or crushed ice to achieve the proper temperature and to ensure that the samples stay at a constant temperature for their entire trip. The cooler should have at least one inch of bubble wrap placed on the bottom of the cooler and the samples should be wrapped in bubble wrap if breakable or crushable containers are used. Cubitainers are soft plastic and are easily punctured. Cubitainers should not be packaged with anything that has sharp edges. The samples must be packed tightly and not be able to move freely in the cooler; they must be secure. An upper weight limit of 70 pounds per cooler is suggested. All paper work is signed, the original custody form is placed in a zip lock bag with a cover letter, and taped to the top of the cooler to avoid moisture.

Cover letter accompanying samples should include
- the name of the Battelle technical contact;
- a statement about the number of coolers being shipped;
- a description of the work to be performed or a reference to the appropriate document (e.g., contract, QAPP); and
- a request that the receiving laboratory return the signed custody forms.

When one sample shipment is contained in multiple coolers, the custody forms should be copied, placed in Zip-lock bags, and attached to the inside top of each cooler[1]. Copies should be clearly labeled as such and they should indicate which samples are contained in each cooler. The individual coolers should be numbered 1 of 3, 2 of 3, etc. In addition, the Federal Express (or other transporter) label should be completed to indicate the cooler number and total number of coolers in the shipment (1 of 3, 2 of 3, etc.). Each cooler shipped by Federal Express receives a unique tracking number. Copies of all paper work associated with a sample shipment are stored in the custody form logbook for tracking purposes. (Note that it is Battelle policy that all cover letters receive one-over-one approval).

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[1] Some projects may require that a separate, cooler-specific custody form be prepared to inventory the contents of each cooler. This requirement should be communicated to the sample custodian by the project manager.

5.2 Shipping Field Packs

The second form of shipping is a "field pack." In this type of shipping the empty jars and coolers are sent to clients for sampling in the field. They might consist of just an empty cooler or include a complete kit of PC (certified) grade jars, pens, packing tape, bubble wrap, Teflon tape, custody forms and warm blue ice to be frozen in the field. This type of packaging needs to be secured in the same manner as actual samples (described above). Field packs must be accompanied by Attachment 1, which describes sampling and documentation requirements for field personnel to ensure the integrity of the samples.

If the sample jars are shipped from Battelle, the certificate which comes with the jars certifying that they are precleaned must be maintained in the Sample Jar Logbook. The custodian notes the jar lot on the sample custody forms that are shipped to the client. If the sample jars are drop-shipped directly to the field then Battelle is not responsible for retaining the jar certificates unless they are shipped to Battelle with the samples. The handling of the cleaning certificate should be specified in the cover letter. The project manager should specify whether the cleaning certificate should be returned to Battelle or maintained with the field records.

6.0 TRAINING

The sample custodian is normally responsible for the shipment of samples off-site. Therefore, the sample custodian and alternates must receive training in this SOPs. Another individual may perform the activities described in this SOP under the supervision of the sample custodian or another trained staff member. A person who is being trained to ship samples from Battelle must first read this SOP. The person may then perform specific tasks under the supervision of a qualified instructor. A certificate of training (Attachment 2) is issued upon completion of training and provided to the Quality Assurance Unit.

ATTACHMENTS

Attachment 1 Instructions for field sampling teams
Attachment 2 Certificate of training

APPROVALS

Author	Joanna M Buhl	4-02-01
Laboratory Supervisor	[illegible]	4.3.01
Quality Systems Manager	Joanna M Buhl	4-4-01
Analytical Services and Field Operations Resource Manager	Carlene J McCarty (Name)	4/3/2001 (Date)

Attachment 1
Instructions For Field Sampling Teams (Page 1 of 3)

RESPONSIBILITIES
The person collecting the samples (sample collector) is responsible for

- Collect and preserve samples in accordance with approved procedures, as specified in the project specifications or the attached guidance
- Collect sufficient sample for the intended analyses
- Adjust the pH to < 2 if the sample is intended for volatile organics analysis (and also adding sodium thiosulfate if total residual chlorine is present)
- Assign a sample number or code at the time of collection that uniquely identifies that sample
- Label each sample container with the sample number, project identification, date of collection, collector's initials, and storage requirements (room temperature, frozen, chilled). Labeling system must be water resistant and use indelible ink. Sharpies cannot be used for VOA samples.
- Document sample collection (location, date and time of collection, collector's name), sample type (matrix), preservation, and any special remarks on the custody form
- Collect samples into proper sample containers (see table below)
- Package samples for shipment in a manner that minimizes the risk of breaks and leaks and to ensure that the samples are maintained at the appropriate temperature
- Complete and sign the custody form completely, accurately, and legibly
- Enclose the custody form in a sealed plastic bag, and attach the bag to the inner top of the cooler
- Ensure integrity of the samples by sealing or locking the shipping container(s) and applying custody tape (if required)
- Arrange timely transportation of samples to the laboratory; identify on the shipping label the name of the person to whom the samples should be delivered
- Ship samples with ample time to meet holding time requirements and ample volume for the intended analyses
- Call the laboratory to notify the laboratory that the samples have been shipped and when they will arrive

If the samples show signs of damage or contamination, contact the sampling team project manager immediately to determine if samples should be re-collected. Compromised samples must be segregated and shipped separately to avoid potential cross-contamination.

DECONTAMINATION
All sampling equipment should be thoroughly decontaminated prior to the field sampling efforts. The employer of the sample collector is responsible for this training and for documenting the decontamination procedures. Decontamination must be appropriate for the types of samples and intended analysis.

SHIPPING REQUIREMENTS
It is Battelle policy that samples are not received outside of regular business hours unless the project manager has made specific arrangements with the laboratory manager and the sample custodian in advance.

Attachment 1
Instructions For Field Sampling Teams (Page 2 of 3)

REJECTION OF SAMPLES

It may be necessary for Battelle to reject samples if any of the following conditions are noted upon receipt:

- The integrity of the samples is compromised (leaks, cracks, grossly contaminated container exteriors or shipping cooler interiors, obvious odors, etc.)
- The identity of the container cannot be verified
- The proper preservation of the container cannot be established
- VOC vials contain bubbles of sizes greater than 1% of the vial volume
- Incomplete sample custody forms: the sample collector or the intended analysis is not documented, or the custody forms are not signed and dated by the person who relinquished the samples
- Samples are designated for VOA analysis but no VOA trip blank is provided.

Attachment 1
Instructions For Field Sampling Teams (Page 3 of 3)

HOLDING TIMES AND CONDITIONS

The employer of the field sampling team is responsible for determining, documenting, and communicating to the field sampling team the holding times required for the intended analysis. In the absence of other instructions, the attached criteria should be applied.

Compound Class	Containers (Volume)	Preservation		Holding Time
		Temperature	Other	
WATER (1 L except TBT 2 L)				
Pesticides and PCBs	Glass with Teflon lined caps	Cool 4°C ±2°C	pH 5-9 if held longer than 72 hours	7 days
SVOA, TPH or Fingerprinting	Glass with Teflon lined caps	Cool 4°C ±2°C	Store in dark	7 days
VOA	Glass with Teflon lined caps	Cool 4°C ±2°C	pH<2 Headspace ≤1% of sample No bubbles	14 days
TBT	Polycarbonate Teflon lined caps	Freeze ≤20°C		90 days
Metals	Teflon	Cool 4°C ±2°C	Acidify with 0.2% nitric acid < 2pH	28 days (Hg) 6 months (Other metals)
SEDIMENT OR SOIL (50 g)				
Pesticides and PCBs	Glass with Teflon lined caps	Cool 4°C ±2°C or Frozen <20°C		14 days 1 year
SVOA or TBT	Glass with Teflon lined caps	Cool 4°C ±2°C or Frozen <20°C		14 days 1 year
VOA, TPH, or Fingerprinting	Glass with Teflon lined caps	Cool 4°C ±2°C		14 days
Metals	Polystyrene or Glass with Teflon lined caps	Cool 4°C ±2°C		28 days (Hg) 6 months (Other metals)
TISSUE (50 g)				
All classes	Glass with Teflon lined cap or for organic analysis solvent-rinsed foil	Freeze ≤20°C		1 year

Attachment 2

RECORD OF TRAINING
For
SOP No. 5-210-03
Packaging of Samples for Shipment

The above mentioned SOP is relevant to your work. Your signature below signifies that you have read and understand the requirements associated with this procedure.

Trainee _____

Instructor_____

Date SOP read and understood _____

Comments:

Approval_____ Date_____

APPENDIX B

Field Forms

Harding ESE
A MACTEC Company

Soil Boring Log

Harding ESE
107 Audubon Road
Wakefield, MA

Boring Location:	
Project Name:	**Geologist:**
Date Started:	**Drilling Company:**
Date Completed:	**Drilling Method:**
Total Depth:	**Depth to Water:**
Comments:	

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID

HARDING ESE, INC.

PAGE ____ OF ____

FIELD DATA RECORD - GROUNDWATER SAMPLING

PROJECT _____ JOB NUMBER _____ DATE _____

WELL ID _____ ACTIVITY _____ BOTTLE _____

TIME START _____ END _____ TIME _____

SAMPLE ISIS ID _____

☐ QC SAMPLES COLLECTED — DUPLICATE ID _____ MS ID _____ MSD ID _____

WATER LEVEL / WELL DATA

MEASURED WELL DEPTH _____ FT (TOR) HISTORICAL WELL DEPTH _____ FT (TOR) PROTECTIVE CASING STICKUP (FROM GROUND) _____ FT PROTECTIVE CASING / WELL DIFFERENCE _____ FT

DEPTH TO WATER _____ FT (TOR) SCREEN LENGTH _____ FT WELL DIAMETER _____ IN WELL MATERIAL _____

HEIGHT OF WATER COLUMN _____ FT x ☐ 0.16 GAL/FT (2 IN) ☐ 0.65 GAL/FT (4 IN) ☐ 1.5 GAL/FT (6 IN) = _____ GAL/VOL TOTAL VOLUME PURGED _____ GAL

AMBIENT AIR _____ PPM WELL MOUTH _____ PPM

PURGE DATA

TIME					
DEPTH TO WATER (ft)					
PURGE VOLUME (gallons)					
TEMPERATURE (degreesC)					
pH (units)					
TURBIDITY (ntu)					
SPEC. COND. (uhmos/cm)					
DISSOLVED OXYGEN (mg/L)					
REDOX POTENTIAL					

SAMPLE OBSERVATIONS:

- ☐ CLEAR
- ☐ CLEAR
- ☐ COLORED _____
- ☐ COLORED _____
- ☐ CLOUDY _____
- ☐ TURBID _____
- ☐ ODOR _____
- ☐ OTHER (see notes)

EQUIPMENT DOCUMENTATION

PURGING

SAMPLING
- ☐ PERISTALTIC PUMP
- ☐ SUBMERSIBLE PUMP
- ☐ BLADDER PUMP
- ☐ PVC/SILICON TUBING
- ☐ TEFLON/SILICON TUBING
- ☐ WATTERA
- ☐ IN LINE FILTER
- ☐ PRESS/VAC FILTER
- ☐ _____

DECON FLUIDS USED
- ☐ METHANOL
- ☐ LIQUINOX
- ☐ POTABLE WATER
- ☐ DEIONIZED WATER
- ☐ HEXANE
- ☐ NITRIC ACID
- ☐ _____

WATER LEVEL EQUIPMENT USED
- ☐ ELECTRIC COND. PROBE
- ☐ FLOAT ACTIVATED
- ☐ KECK INTERFACE PROBE
- ☐ _____

NUMBER OF FILTERS USED _____

ANALYTICAL PARAMETERS

	METHOD NUMBER	FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	SAMPLE BOTTLE ID NUMBERS
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____
☐					☐	____/____/____/____

NOTES

SIGNATURE: _____

RECEIVED BY: _____

SURFACE SOIL SAMPLE FIELD DATA RECORD

Project: _____ _____

Project Number: _____ Date: _____

Sample Location ID: _____

Time: Start: _____ End: _____ Signature of Sampler: _____

SOIL SAMPLE

DEPTH OF SAMPLE _____

EQUIPMENT USED FOR COLLECTION:
- [ ] HAND AUGER
- [ ] S.S. SPLIT SPOON
- [ ] SHOVEL
- [ ] HAND SPOON
- [ ] ALUMINUM PANS
- [ ] SS BUCKET
- [ ] _____

TYPE OF SAMPLE COLLECTED:
- [ ] DISCRETE
- [ ] COMPOSITE

SAMPLE OBSERVATIONS:
- [ ] ODOR _____
- [ ] COLOR _____
- [ ] _____

DECONTAMINATION FLUIDS USED:
- ✓ ALL USED
- [ ] ETHYL ALCOHOL
- [ ] 25% METHANOL/ 75% ASTM TYPE II WATER
- [ ] DEIONIZED WATER
- [ ] LIQUINOX SOLUTION
- [ ] HEXANE
- [ ] HNO_3 SOLUTION
- [ ] POTABLE WATER
- [ ] NONE

SOIL TYPE:
- [ ] CLAY
- [ ] SAND
- [ ] ORGANIC
- [ ] GRAVEL

FIELD GC DATA: [ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID _____

SAMPLE LOCATION SKETCH:
- [ ] YES
- [ ] NO

SAMPLES COLLECTED

✓ IF REQUIRED AT THIS LOCATION	MATRIX: SURFACE WATER	MATRIX: SEDIMENT	MATRIX: SOIL	✓ IF PRESERVED WITH ACID-BASE	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE IDS
[ ]	[ ]	[ ]	✓	[ ]	_____	[ ]	____/____/____/____
[ ]	[ ]	[ ]	✓	[ ]	_____	[ ]	____/____/____/____
[ ]	[ ]	[ ]	✓	[ ]	_____	[ ]	____/____/____/____
[ ]	[ ]	[ ]	✓	[ ]	_____	[ ]	____/____/____/____
[ ]	[ ]	[ ]	✓	[ ]	_____	[ ]	____/____/____/____
[ ]	[ ]	[ ]	✓	[ ]	_____	[ ]	____/____/____/____
[ ]	[ ]	[ ]	✓	[ ]	_____	[ ]	____/____/____/____

NOTES/SKETCH

SURFACE SOIL SAMPLE FIELD DATA RECORD

APPENDIX C

Field Electronic Data Deliverable Requirements

Table C-1. Electronic Data Deliverable Requirements for Field Data.

Field Name	Definition
NSAMPLE	Sample ID from sample custody records
FIELD_QC_TYPE	Normal = not a QC sample; DU = field duplicate, RB = rinsate blank, PE = performance evaluation sample; TB = trip blank.
SACODE	"Normal" = not duplicated, "Dup1" = duplicated, "Dup2" = duplicate
SAMP_DATE	Collection date from custody records; Format DD-MON-YY.
MATRIX	Soil or groundwater
SPECIES	Not applicable for RI/FS; leave as NULL in EDD
TISSUETYPE	Not applicable for RI/FS; leave as NULL in EDD
BORING	Sample location (several nsamples will have the same boring ID; e.g. soil samples collected from the same location at different depths).
NORTHING	State plane coordinate (NAD 1983) of boring.
EASTING	State plane coordinate (NAD 1983) of boring.
ELEVATION	In feet (NGVD 1929).
TOP	Top of sample interval in feet. Applicable to soil samples.
BOTTOM	Bottom of sample interval in feet. Applicable to soil samples.
DEPCODE	"a" = surface, "b" = subsurface.
OU	Not applicable for RI/FS; leave as NULL in EDD
AOC	Not applicable for RI/FS; leave as NULL in EDD
DATEAPPENDED	Leave as NULL in EDD.
DATASOURCE	Battelle
SUBMATRIX	Leave as NULL in EDD.
FILTERED	"Unfiltered" for RI/FS groundwater samples.
MATRIX_GENERAL	Leave as NULL in EDD
WRECEPTOR	Leave as NULL in EDD

Table C-2. Example Field EDD.

SACODE	SAMP_DATE	BORING	NORTHING	EASTING	ELEVATION	TOP	BOTTOM	DEPCODE	DATASOURCE
DUP1	2/17/1999	CMS-001	282652.562	331496.151	0	0	0.25	A	IT
DUP2	2/17/1999	CMS-001	282652.562	331496.151	0	0	0.25	A	IT
NORMAL	2/17/1999	CMS-002	282561.114	331509.087	0	0	0.25	A	IT
NORMAL	2/17/1999	CMS-003	282453.252	331510.447	0	0	0.25	A	IT
DUP1	2/17/1999	CMS-004	282361.637	331526.270	0	0	0.25	A	IT
DUP2	2/17/1999	CMS-004	282361.637	331526.270	0	0	0.25	A	IT
DUP1	2/17/1999	CMS-005	282258.112	331530.864	0	0	0.25	A	IT
DUP2	2/17/1999	CMS-005	282258.112	331530.864	0	0	0.25	A	IT
NORMAL	2/17/1999	CMS-006	282159.182	331531.801	0	0	0.25	A	IT
NORMAL	2/17/1999	CMS-007	282058.635	331534.945	0	0	0.25	A	IT
NORMAL	2/17/1999	CMS-008	281958.088	331540.900	0	0	0.25	A	IT
NORMAL	2/17/1999	CMS-009	281854.820	331544.134	0	0	0.25	A	IT
NORMAL	2/17/1999	CMS-010	281757.250	331555.363	0	0	0.25	A	IT