APPENDIX A
RECONNAISSANCE SAMPLING AND ANALYSIS PLAN

REMEDIAL INVESTIGATION WORK PLAN
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RECONNAISSANCE SAMPLING AND ANALYSIS PLAN

APPENDIX A OF THE REMEDIAL INVESTIGATION WORK PLAN

CAPITAL INDUSTRIES, INC.
5801 THIRD AVENUE SOUTH
SEATTLE, WASHINGTON

AGREED ORDER NO. DE 5348

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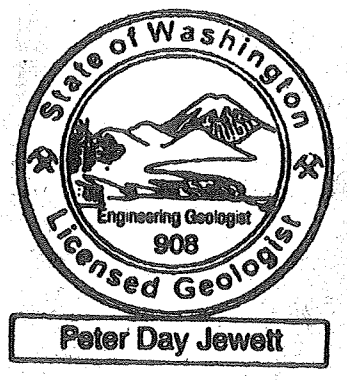

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1.0 INTRODUCTION

This Reconnaissance Sampling and Analysis Plan (SAP) has been prepared by Farallon Consulting, L.L.C. (Farallon) on behalf of Capital Industries, Inc. (Capital) to define the specific requirements for sample collection and analytical activities for the first phase of the Remedial Investigation (RI) field sampling to be conducted at the Capital Area of Investigation (Figures 1 and 2). The Capital Area of Investigation is defined as the area south of South Mead Street, north of South Front Street, east of 1st Avenue South, and west of 4th Avenue South, and the property north of Mead Street and west of 4th Avenue South (Figure 2). In accordance with Exhibit A of Agreed Order No. DE 5348 entered into by Capital and the Washington State Department of Ecology (Ecology) on January 24, 2008 (Agreed Order), the Capital Site will be defined as the area where concentrations of constituents of concern (COCs) released from the Capital Property at 5801 3rd Avenue South in Seattle, Washington (Capital Property) exceed regulatory cleanup levels.

This Reconnaissance SAP has been prepared in accordance with the Washington State Model Toxics Control Act Cleanup Regulation as established in Sections 350 and 820 of Chapter 173-340 of the Washington Administrative Code and in accordance with the Agreed Order. The purpose of the Reconnaissance SAP is to define the specific requirements for sample collection and analysis in accordance with technically acceptable protocols and to ensure that results meet the data quality objectives defined in the Quality Assurance Project Plan (QAPP). The Reconnaissance SAP delineates the sampling objectives, sample locations, measurement frequencies, and protocols for sampling equipment, procedures, handling, and analysis that will be used for the first phase of the RI field program as defined in the RI Work Plan. The Reconnaissance SAP provides the basis for planning field activities and a mechanism for validating that quality assurance requirements are met. The QAPP and the Health and Safety Plan for Capital are included as Appendices B and C, respectively, to the RI Work Plan.

1.1 PURPOSES

The purposes of the Reconnaissance SAP are to:

- Provide the basis for conducting reconnaissance field activities to meet the scope of work described in the RI Work Plan;
- Identify the reconnaissance sample locations, sample quantities, analytical methods, and documentation requirements for the sampling program; and
- Describe the equipment, procedures, and methodology to be used for reconnaissance soil and groundwater sample collection.

1.2 ORGANIZATION

The Reconnaissance SAP is organized into the following sections:

- **Section 2—Sampling Objectives and Scope**: Section 2 summarizes the sampling objectives and scope, including the investigation area and work elements.

- **Section 3—Sample Locations and Frequency**. Section 3 provides a description of sampling locations, frequency, rationale, and decision rules for collecting depth to groundwater measurements and soil and groundwater samples.
- **Section 4—Sampling Methods**. Section 4 describes the sampling equipment and procedures to be followed for collecting soil and groundwater samples. Sample designation and the numbering system to be used for the soil and groundwater samples also are discussed.
- **Section 5—Laboratory Analysis**. Section 5 presents the laboratory analytical methods that will be used in conducting the RI.
- **Section 6—Sample Handling**. Section 6 provides the details pertaining to soil and groundwater sampling containers, preservation procedures and hold times, and sample packaging and shipment.
- **Section 7—Investigation-Derived Waste Management**. Section 7 provides details on waste sampling, profiling, and handling.
- **Section 8—Field Documentation**. Section 8 summarizes the field documentation procedures to be implemented and the forms that will be used for the RI field work.
- **Section 9—Schedule.** Section 9 provides a schedule for implementing and completing the project work elements.

2.0 SAMPLING OBJECTIVES AND SCOPE

The sampling objectives of the RI are to collect sufficient data in the media of concern to characterize the nature and extent of constituents of potential concern (COPCs) defined in the RI Work Plan, to evaluate the impact of human health and environment, and to collect sufficient information to develop a Conceptual Site Model to enable evaluation and selection of a cleanup action for the Capital Site. This Reconnaissance SAP presents the specific requirements for soil and groundwater sampling and analysis for the first phase of the RI field program.

The RI field sampling will be conducted in phases, with data collected at each phase used to develop the scope of work for the next phase. The first phase of the RI field sampling will include two-tiered collection and laboratory analysis of soil and reconnaissance groundwater samples and historical research, as described in the RI Work Plan. The second phase of the RI field program will include installation of monitoring wells, groundwater monitoring, and aquifer testing. The sampling and analytical procedures to be used throughout the reconnaissance RI field sampling are provided in this Reconnaissance SAP. Monitoring well installation, development, and sampling procedures will be described in the Groundwater Monitoring Plan. Aquifer testing procedures also will be included in the Groundwater Monitoring Plan or a separate addendum. Other addenda may be prepared to provide specific detail for subsequent phases, as defined herein.

The Reconnaissance SAP provides specific procedures for the following work elements:

- Collecting and analyzing reconnaissance groundwater samples from direct-push borings to be located up- and down-gradient of the Capital Property within the Capital Area of Investigation (Figure 3). Alternative and/or additional boring locations may be proposed based on the results of the historical research; and
- Collecting and analyzing soil samples from direct-push borings for laboratory analysis and lithologic description.

3.0 SAMPLE LOCATIONS AND FREQUENCY

This section describes the sample locations, frequency, and decision rules for collecting soil and reconnaissance groundwater samples for the RI reconnaissance field program. The objectives of the reconnaissance sampling are presented in the RI Work Plan. As noted earlier, monitoring well installation, groundwater monitoring well sampling, and aquifer testing will be conducted during the second phase of the RI field program, and the scope of work for these tasks will be provided in the Groundwater Monitoring Plan. A summary of the sample locations, the sampling frequency, and the rationale for each RI reconnaissance work element is provided below.

3.1 RECONNAISSANCE GROUNDWATER AND SOIL SAMPLING

Reconnaissance groundwater sampling will be conducted in two tiers. Tier 1 reconnaissance groundwater sampling will include collection and analysis of reconnaissance groundwater samples from direct-push borings located immediately up- and down-gradient of Capital Plant 2 and Plant 4. Tier 2 reconnaissance groundwater sampling will be based on the analytical results for Tier 1 reconnaissance groundwater samples and will focus on characterizing the lateral and vertical extent of HVOCs not fully defined by Tier 1 reconnaissance sampling. Proposed Tier 1 and Tier 2 direct-push boring locations are depicted on Figure 4.

Tier 1 reconnaissance groundwater sampling includes collection of reconnaissance groundwater samples from direct-push borings for analysis for halogenated volatile organic compounds (HVOCs) immediately down-gradient of Capital Plant 2 and Plant 4 and up-gradient of Plant 4 (Figure 4). The analytical results of groundwater samples collected by Pacific Groundwater Group for Blaser Die Casting (BDC) from the existing and proposed BDC monitoring wells north of Plant 2 will be used to characterize the lateral and vertical extent of HVOCs above screening levels in groundwater up-gradient of Plant 2, if the proposed monitoring wells are installed and sampled prior to Tier 1 reconnaissance groundwater sampling. Reconnaissance soil samples will be collected for HVOC analysis at select reconnaissance borings proximate to Plant 4 to characterize the lateral and vertical extent of HVOCs in soil above screening levels that may have been released from Plant 4.

Tier 2 reconnaissance groundwater sampling will include collection of reconnaissance groundwater samples from direct-push boring locations selected based on the analytical results of Tier 1 reconnaissance groundwater sampling. Tier 2 reconnaissance groundwater sampling will be performed if additional reconnaissance groundwater sampling is necessary to characterize the down-gradient lateral and vertical extent of concentrations of HVOCs in groundwater above screening levels. The analytical results of the Tier 1 reconnaissance groundwater sampling may indicate that some or all of the proposed Tier 2 sampling locations are not required to characterize the vertical and lateral extent of HVOCs released from the Capital Property.

A Technical Memorandum will be prepared after completion of Tier 1 activities and prior to Tier 2 field work to describe the results of Tier 1 sampling and to provide the specific locations and rationale for Tier 2 sampling. An RI Reconnaissance Sampling Report will be prepared after completion of Tier 1 and 2 sampling and prior to installation of the groundwater monitoring

wells. This report will present the results of the reconnaissance sampling and provide the rationale for proposed monitoring well locations.

3.1.1 Tier 1 Sampling Locations and Protocol

Tier 1 borings B6 through B17 will be advanced to a maximum depth of 70 feet below ground surface (bgs) into the Intermediate Zone using direct-push drilling methods. Boring B18 will be advanced to the top of the Water Table Zone only for collection of soil samples. Reconnaissance groundwater samples will be collected from borings B6 through B17 at multiple discrete depths within the Water Table Zone, the Shallow Zone, and the Intermediate Zone.

Borings B6 through B12 will be situated down-gradient of Capital Plant 2 at locations in the area south of South Fidalgo Street, east of 1st Avenue South, and north of South Front Street (Figure 4). These borings will be located to evaluate the extent of HVOCs in groundwater in the Water Table Zone, the Shallow Zone, and the Intermediate Zone that may have migrated down-gradient from Capital Plant 2 and commingled with releases of HVOCs from other up-gradient sources, and to assess the potential for HVOCs in groundwater in the Water Table Zone to volatilize and migrate to indoor ambient air at buildings down-gradient of Capital Plant 2.

Borings B13 through B16 will be situated down- and/or cross-gradient of Capital Plant 4 at locations in the area south of South Mead Street and west of 4th Avenue South (Figure 4). These borings will be located to evaluate the extent of HVOCs in groundwater in the Water Table Zone, the Shallow Zone, and the Intermediate Zone that may have migrated down-gradient from Capital Plant 4, and to assess the potential for HVOCs in groundwater in the Water Table Zone to volatilize and migrate to indoor ambient air at buildings down-gradient of Capital Plant 4. Boring B17 will be located to confirm that a release of COPCs has not occurred at Parcel No. 17228018530, located immediately north (up-gradient) of Capital Plant 4 across South Mead Street. Boring B18 will be advanced to the top of the Water Table Zone to collect soil samples east of Plant 4.

Soil Sampling Protocol

Soil samples will be collected continuously from the ground surface to the proposed depth of each boring and described in the field to identify the subsurface stratigraphy. Soil samples will be collected at depths of 2, 4, and 6 feet bgs from borings B14, B15, and B18 for HVOC analysis. Soil samples will be collected from within the Water Table Zone, the Shallow Zone, and the Intermediate Zone from borings B6, B9, B13, and B17 for total organic carbon (TOC) analysis.

Groundwater Sampling Protocol

Reconnaissance groundwater samples will be collected from temporary well points installed in each of the borings. An estimated total of 15 reconnaissance groundwater samples will be collected from each boring at 4-foot intervals to a maximum depth of 70 feet bgs. The depth to first-encountered groundwater is estimated at 8 feet bgs; therefore, the first reconnaissance groundwater sample will be collected from each boring at a depth interval of 8 to 12 feet bgs, with subsequent samples collected at depth intervals of 12 to 16 feet bgs, 16 to 20 feet bgs, etc.

to a total depth of 70 feet bgs. The actual depth of the reconnaissance groundwater samples will depend on the subsurface stratigraphy at each boring and the depth of first-encountered groundwater. Reconnaissance groundwater samples will be submitted for laboratory analysis for HVOCs.

3.1.2 Tier 2 Sampling Locations and Protocol

The analytical results of Tier 1 groundwater sampling will be evaluated and used to determine the number and location of Tier 2 samples. As noted earlier, a Technical Memorandum will be prepared after completion of Tier 1 activities and prior to Tier 2 field work that will present the results of Tier 1 sampling and the specific rationale for Tier 2 sampling locations and depths.

Proposed Tier 2 boring locations B19 through B24 are depicted on Figure 4. The need for these borings and their final depths and locations, if necessary, will be based on the data obtained from Tier 1 sampling.

The decision protocol that will determine the need for Tier 2 groundwater samples includes:

- Vertical Delineation of Contaminants: If concentrations of HVOCs detected in two consecutive groundwater reconnaissance samples in a given boring are below the screening levels, the vertical extent of groundwater contamination in that boring caused by releases from the Capital Property will be considered to have been defined by the uppermost sample having concentrations of HVOCs above screening levels. For example, if concentrations of HVOCs are detected above screening levels to a depth of 30 feet bgs, but concentrations of HVOCs in reconnaissance groundwater samples collected from 30 to 34 and 34 to 38 feet bgs are below screening levels, the vertical extent of COPCs released from the Capital Property will be considered 30 feet bgs, even if concentrations of HVOCs above screening levels are detected below 38 feet bgs in subsequent samples.

- Horizontal Delineation of Contaminants: The lateral extent of HVOCs in groundwater will be determined by the presence or absence of concentrations of HVOCs within each zone. For example, if concentrations of HVOCs above the screening levels are detected in reconnaissance groundwater samples collected in the Shallow Zone in a given boring but are not detected above screening levels in that zone in the next down-gradient reconnaissance boring, the lateral extent of HVOCs in groundwater in that zone will be considered defined by the boring yielding concentrations of HVOCs below the screening levels, and additional down-gradient borings and sampling will not be required in that zone.

The decision protocol described above provides a general plan of action for the Tier 2 reconnaissance sampling based on the Tier 1 results. However, this protocol may be modified after thorough review of analytical results and discussions with Ecology.

Soil samples will be collected from borings B21 and B24 (or the closest equivalent boring selected for Tier 2 sampling) for TOC analysis to provide additional TOC data down-gradient of the Capital Property. The soil and groundwater sampling protocol for Tier 2 reconnaissance sampling will be similar to that for Tier 1 sampling.

4.0 SAMPLING METHODS

This section summarizes the protocols and procedures that will be used for the RI reconnaissance field sampling. Specific Standard Operating Procedures (SOPs) are included in Attachment A.

4.1 BORING INSTALLATION

The field sampling procedures for each drilling method and the handling procedures for soil and groundwater sample collection are summarized below and detailed in the SOPs provided in Attachment A. Before any drilling activities are performed, the one-call utility location service and a private utility location service will confirm the location of subsurface utilities. All field sampling data will be recorded and documented on field forms as described in Section 8, Field Documentation. Examples of the field sampling forms are provided in Attachment B.

4.1.1 Direct-Push Borings

Direct-push borings will be used to collect soil and reconnaissance groundwater samples. A direct-push soil probe equipped with macro-core tube samplers will be used to advance the borings to the maximum proposed depth or the point of refusal. The boring locations will be marked and measured in the field, with locations adjusted as necessary, based on accessibility and the presence of utilities. The borings will be advanced using a direct-push drill rig by driving a hydraulic probe from surface grade to a maximum depth of 70 feet bgs or the point of refusal. Soil samples will be collected continuously to the total depth of the boring by driving a 4-foot-long sampling tube using a hydraulic probe at the desired sample interval (SOP No. FAR-105).

The sampler will be lined with a disposable acetate sleeve, which will be removed and opened to expose the soil sample after each 4-foot sample interval is collected. The soil will be described in accordance with the Unified Soil Classification System (USCS), and notations of unusual odor, discoloration, sheen, or other evidence of potential contamination will be entered on the boring log. Soil samples collected for laboratory analysis will be obtained from the 4-foot sample interval.

4.1.2 Surveying

The locations of the direct-push borings will be surveyed to define spatial locations accurately. The ground surface elevation also will be surveyed relative to mean sea level to ensure accurate depiction of stratigraphic data on cross sections and maps. Professional surveyors licensed in the State of Washington will survey the horizontal and vertical location of each boring.

4.2 SAMPLE COLLECTION

4.2.1 Soil Sample Collection

Soil samples from the direct-push borings will be collected and handled in accordance with the procedures described below (SOP No. FAR-105):

- Soil conditions will be observed directly from the acetate sleeve using stainless steel or plastic sampling tools. All nondedicated sampling equipment will be decontaminated between uses in accordance with SOP No. FAR-300;
- Soil conditions will be logged during borehole drilling, including at a minimum: sample depth, USCS description, soil moisture and occurrence of groundwater, physical indication of contamination (e.g., odor, staining), and field-screening results obtained using a photoionization detector;
- Soil samples collected in the split-spoon sampler or acetate sleeve will be discarded after the description is complete or collected for analysis;
- Soil samples collected for analysis will be placed into laboratory-prepared glass sample containers fitted with Teflon lids. Care will be taken to not handle the seals or lids of the containers when placing the sample in the containers. The containers will be filled to eliminate headspace and the seals/lids will be secured;
- The sample container will be labeled with the following information: client, project name and number, date and time sampled, sample identification, sampler's initials, analysis, and analyte preservative(s), if any;
- Applicable information as defined in SOP No. FAR-201 will be logged on a Chain of Custody form, and the sample will be placed into a cooler at approximately 4 degrees Celsius (°C) for transport to the laboratory; and
- Standard chain-of-custody protocols will be maintained during sample transport and submittal to the laboratory.

4.2.2 Reconnaissance Groundwater Sample Collection

Reconnaissance groundwater samples will be collected from temporary well points and handled in accordance with the procedures described below and in SOP No. FAR-103:

- A 2-inch outside-diameter drill pipe will be driven using direct-push drilling methods to the desired depth where the reconnaissance groundwater sample is to be collected;
- The casing will be withdrawn to expose the well screen to water-bearing material;
- Dedicated polyethylene tubing will be inserted into the temporary well screen;
- Each temporary well point will be purged using a peristaltic pump until observed turbidity in the purge water stabilizes, or until the temporary well is purged of water (SOP No. FAR-103). If very low flows are encountered during reconnaissance sampling (i.e., less than 100 milliliters per minute), groundwater sampling may be modified to allow collection with a disposable bailer. If the temporary well is completely dewatered

during purging, samples will be collected when sufficient recharge has occurred to allow filling of all of the sample containers;

- After purging, the top of the tubing will be sealed and the tubing slowly removed from the temporary well screen. The reconnaissance groundwater sample will be decanted from the bottom of the polyethylene tubing directly into laboratory-prepared sample containers;
- The containers will be filled completely, with care taken to minimize turbulence. Care will be taken to not handle the seals or lids of the containers when placing the sample in the containers. The containers will be filled to eliminate headspace and the seals/lids will be secured;
- The sample container will be labeled with the following information: client, project name and number, date and time sampled, sample identification, sampler's initials, analysis, and analyte preservative(s), if any;
- Applicable information as defined in SOP No. FAR-201 will be logged on a Chain of Custody form, and the sample will be placed into a cooler at approximately 4°C for transport to the laboratory; and
- Standard chain-of-custody protocols will be maintained during sample transport and submittal to the laboratory.

4.3 SAMPLE DESIGNATION

Each sample collected during the reconnaissance RI will be assigned a unique sample identifier and number. The sample identifier and number labels will be written in indelible ink and affixed to the containers immediately prior to sample collection. In addition to the sample identifier and number, the sample labels will include the following information: client name, project name and number, date and time of sample collection, sampler's initials, analytical method, and analyte preservative(s), if any. As each sample is collected, a Sample Summary form that contains the sample location and depth, sample number and identifier, and other observations regarding the sample will be maintained. The sample designation procedures for soil and groundwater samples collected during the RI are detailed below.

4.3.1 Soil Sampling

Soil samples collected from the reconnaissance borings will be assigned a unique sample identifier that will include the following information:

- Sample identification (e.g., S1);
- Sample date (e.g., 040208);
- Depth at which the sample was collected, recorded in feet bgs (e.g., 0.5)

For example, the soil sample collected on April 2, 2008 at 0.5 feet bgs would be numbered S1-040208-0.5. This sample identification will be placed on the sample label, the Field Report form, the Sample Summary form, and the Chain of Custody form.

4.3.2 Reconnaissance Groundwater Sampling

Reconnaissance groundwater samples collected from temporary well points during advancement of the borings will be assigned a unique sample identifier that will include the following information:

- Boring identification (e.g., B9);
- Sample date (e.g., 040208); and
- Depth at which the sample was collected, recorded in feet bgs (e.g., 10).

For example, the reconnaissance groundwater sample collected from boring B9 at 10 feet bgs on April 2, 2008 would be numbered B9-040208-10. This sample identification will be placed on the sample label, the Field Report form, the Sample Summary form, and the Chain of Custody form.

5.0 LABORATORY ANALYSIS

OnSite Environmental Inc. of Redmond, Washington (OnSite) will conduct the analysis of the samples collected for the RI. OnSite is certified by Ecology, and meets the quality assurance/quality control (QA/QC) requirements of Ecology and the U.S. Environmental Protection Agency (EPA). A copy of the laboratory Quality Assurance Manual for OnSite to be followed throughout the RI is on file at the Farallon office for reference and is included in Attachment A of the QAPP. Ecology will have access to laboratory personnel, equipment, and records pertaining to sample collection, transportation, and analysis.

Selected reconnaissance groundwater samples collected for the RI will be submitted for laboratory analysis for HVOCs by EPA Method 8260BSIMS. Select soil samples collected from borings will be analyzed for TOC using Plumb 1981.

Table 1 summarizes the analytical methods, containers, preservation requirements, and holding time requirements for each medium. Table 2 summarizes field data collection, laboratory analysis, and the QA/QC samples to be submitted for analysis for soil and groundwater. Table 3 provides a summary of the laboratory practical quantitation limits and the preliminary screening levels for the contaminants to be analyzed.

Quality assurance/quality control soil samples will be collected to provide for data validation as detailed in the QAPP. Details on the types and frequency of QA/QC samples are provided in Section 6.4, Field Quality Assurance/Quality Control Samples.

6.0 SAMPLE HANDLING

This section discusses the sample handling methods to be used for the RI. The protocols discussed include sample handling, sample packaging and shipment, sample documentation, and collection of QA/QC samples. Additional details are provided in the SOPs provided in Attachment A.

The laboratory will assume responsibility for custody of the samples upon transfer of the samples to laboratory personnel or arrival of the samples at the laboratory. Laboratory personnel will document the status of the shipping and handling of containers. The laboratory will follow standard chain-of-custody procedures for tracking each sample through all stages of laboratory processing.

6.1 SAMPLE CONTAINERS, PRESERVATION PROCEDURES, AND HOLD TIMES

Sample container requirements for the RI are based on the medium to be sampled and the type of analysis to be performed. The containers, preservation procedures, and holding times for each matrix to be sampled are shown in Table 1 and adhere to standard laboratory protocols.

6.2 SAMPLE PACKAGING AND SHIPMENT

All samples shipped for laboratory analysis will be packaged according to applicable regulations. Samples will be transported expeditiously to the analytical laboratory after being sealed in coolers. The sampling team may drive the samples from the Capital Area of Investigation to the Farallon office in Issaquah, Washington for subsequent transport to the analytical laboratory.

The following procedures for sample packaging represent minimum shipping and handling requirements:

- Sample labels will be affixed to the corresponding sample containers at the time of sample collection;
- Bubble-wrap bags or equivalent will be used to protect glass sample bottles;
- Sample containers will be placed into a cooler and checked against the Chain of Custody form to ensure that all samples are listed and are in the appropriate cooler;
- One copy of the Chain of Custody form will be detached and retained;
- Additional paperwork will be sealed in a resealable plastic bag that will be taped to the inside of the cooler lid;
- One to three resealable bags will be filled with ice and/or chemical equivalent and included in the cooler shipment. All ice will be double-bagged in heavy-duty bags and/or garbage bags;
- The cooler will be sealed with a custody seal;

- The cooler will be taped shut using strapping tape;
- The address of the laboratory will be affixed to the exterior of all coolers;
- Extraneous stickers will be removed from the cooler; and
- The coolers will be examined to ensure that Farallon's return address is provided on each cooler.

6.3 SAMPLE DOCUMENTATION

All sample containers will be adequately identified with a durable label, and the sample identification will be recorded on the Sample Summary Form and the Field Report forms (Attachment B). Additional sample documentation to be maintained by field personnel includes Purging and Sampling forms, Chain of Custody forms and custody seals, sample labels, and shipment bills. Examples of these forms are provided in Attachment B.

Sample containers will be labeled with the client name, project name and number, date and time sampled, sample identification, sampler's initials, analysis, and analyte preservative(s), if any.

At the time of sampling, the appropriate sample containers will be selected and the sample number for each sample recorded on the Sample Summary Form and in the field log book. A custody seal will be used to seal the cooler shut before transport to the laboratory. A custody seal is used to show that no tampering occurred between the time the cooler was relinquished by field personnel and the time it arrived at the laboratory. The custody seal is attached to the shipping container in a manner that requires the seal to be broken in order for the shipping container to be opened. The information on the seals will be checked against Sample Summary log entries, and samples will be recounted before transport from the Capital Area of Investigation to verify that no samples have been misplaced. Entries on the Chain of Custody form will be made for all samples prior to transfer of the samples from the Capital Area of Investigation.

Recorded on each Chain of Custody forms will be the medium, date, time sampled, sample identification and number, project name, project number, sampler's initials, and analyte preservative(s) if any.

6.4 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Groundwater QA/QC samples will be collected to provide data validation as detailed in the QAPP. The QA/QC samples will include a trip or transport blank and a field duplicate sample.

Trip or transport blanks are sample containers filled with organic-free water. A trip blank will be prepared by the laboratory and sent to Farallon with the empty containers for the reconnaissance groundwater sampling and the groundwater monitoring and sampling events. These trip/transport blank containers will not be opened in the field and will be returned to the laboratory with the shipment that contains the samples to be analyzed for HVOCs. The blank will determine whether cross-contamination occurred during sample packaging or shipping.

Field duplicate samples will be collected during the reconnaissance groundwater sampling program.

7.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

Investigation-derived waste soil, wastewater, and other products generated during the RI may be contaminated and will be containerized and disposed of properly pending receipt of analytical results. Specific criteria that will be used to manage investigation-derived waste, including profiling and selection of an appropriate disposal option for each of the expected waste streams, are discussed below.

7.1 WASTE SOIL

Waste soil generated by the installation of the borings will be placed into U.S. Department of Transportation- (DOT-)approved 55-gallon drums provided by the drilling contractor, pending sampling and profiling of the waste soil. The drums will be labeled with the content, date, origin, and level of personal protective equipment used during waste production (e.g., Level D, Level C). Waste soil temporarily stored at the Capital Property will be tracked using a Waste Inventory form.

Soil analytical data from the soil borings will be used to develop a waste profile. No contaminated waste soil will remain at the Capital Property longer than 90 days following generation. The waste soil profiles will be provided to an appropriate landfill facility or permitted transport, storage, and disposal facility. Waste profiles and manifests will be forwarded to the generator for approval prior to transport and disposal. Waste soil will be removed by a licensed transporter in labeled DOT-approved containers. Documentation for waste soil disposal will be maintained in the project file.

7.2 WASTEWATER

Wastewater generated by equipment decontamination and purging activities for the RI will be segregated into 55-gallon drums of suspected clean and contaminated wastewater for storage at the Capital Property during the reconnaissance sampling program. Wastewater generated by the investigation will be tracked using a Waste Inventory form. Wastewater will not remain on the Capital Property longer than 90 days following generation.

Groundwater analytical data from the reconnaissance sampling phase of the RI will be used to develop wastewater profiles. Based on the analytical results, an appropriate disposal option will be selected. The waste profiles will be provided to the transport, storage, and disposal facility. Waste profiles and manifests will be forwarded to the generator for approval prior to transport and disposal. The wastewater will be transported off the Capital Property in labeled DOT-approved containers. Wastewater documentation will be maintained in the project file.

7.3 DISPOSABLES

Disposable personal protective clothing (e.g., Tyvek suits, rubber gloves, boot covers) and disposable sampling devices (e.g., plastic scoops, bailers) will be cleaned, placed into plastic garbage bags, and disposed of as nonhazardous waste.

8.0 FIELD DOCUMENTATION

Documentation of field activities will be included on Field Report forms, Log of Boring forms, Waste Inventory forms, sample and waste labels, and Chain of Custody forms. Documentation generated during the field program will be retained in the project file and included in the reports generated, as appropriate. Examples of the forms described below are provided in Attachment B.

8.1 FIELD REPORT FORM

Field personnel will be required to keep a daily field log on a Field Report form. Field notes will be as descriptive and inclusive as possible so as to allow an independent party to reconstruct the sampling situation from the recorded information. Language will be objective, factual, and free of inappropriate terminology. A summary of each day's events will be completed on a Field Report form. At a minimum, field documentation will include the date, job number, project identification and location, weather conditions, sample collection data, personnel present and their responsibilities, field equipment used, and any activity performed in a manner other than as specified in the SAP. In addition, if another form is completed or used (e.g., well head survey), it will be referred to in and attached to the Field Report form. Field personnel will sign the Field Report form.

8.2 LOG OF BORING/MONITORING WELL CONSTRUCTION DATA FORMS

A Log of Boring form will be prepared by the Farallon Scientist for each boring drilled during the RI. The log includes hydrologic conditions, lithologic descriptions using the USCS, and information on the potential presence of contamination. Information regarding monitoring well construction will be recorded.

8.3 WELL PURGING AND SAMPLING DATA FORMS

A Well Purging and Sampling Data form will be used to record the depth to groundwater, temporary well purging information, and other pertinent hydrologic measurements and supplementary information collected during reconnaissance groundwater sampling. These forms will be completed by the Field Scientist at the time of sample collection and maintained in the project files.

8.4 WASTE INVENTORY FORM

A Waste Inventory form will be used to document and track wastes generated during the RI. The form will include information pertaining to sample container, origin of the waste, type of waste, date generated, date removed from the Capital Property, transporter, and disposal location.

8.5 SAMPLE LABELS

Sample labels are filled out and affixed to the appropriate containers immediately prior to sample collection. The labels are filled out using indelible ink and include the type of medium, date,

time sampled, sample identification and number, project name, project number, sampler's initials, and analyte preservative(s) if any.

8.6 WASTE MATERIAL LABEL

Waste material labels are filled out and affixed to the appropriate waste containers immediately upon filling. The label is filled out using indelible ink and includes the job number and name, address where the waste was generated, contents of the container, type of operation, date, consultant's name and telephone number, and sampler's initials.

8.7 CHAIN OF CUSTODY FORM

The record of the procedures followed when samples were collected, transferred, stored, analyzed, and/or destroyed provides an accurate written account that can be used to trace the possession and handling of a sample from the moment of its collection through analysis and reporting of analytical values. This written record, the Chain of Custody form, will be completed by the field sampling team at the time samples are obtained.

All samples submitted to the laboratory are accompanied by the Chain of Custody form, which is checked for accuracy and completeness, and then signed and dated by the laboratory sample custodian accepting the sample. At the laboratory, each sample is assigned a unique sequential laboratory identification number that is stamped or written on the Chain of Custody form.

All samples are held under internal chain-of-custody in the Sample Control room under the appropriate storage conditions (e.g., ambient, refrigeration, frozen). The assigned laboratory Project Manager is responsible for tracking the status of the samples throughout the laboratory. Samples are signed out of the Sample Control room by the analyst who will prepare the samples for analysis, using a sample control logbook.

The Chain of Custody form includes the client name, project name and number, date and time of sampling, sample identification, sampler's initials, analysis, and analyte preservative(s), if any.

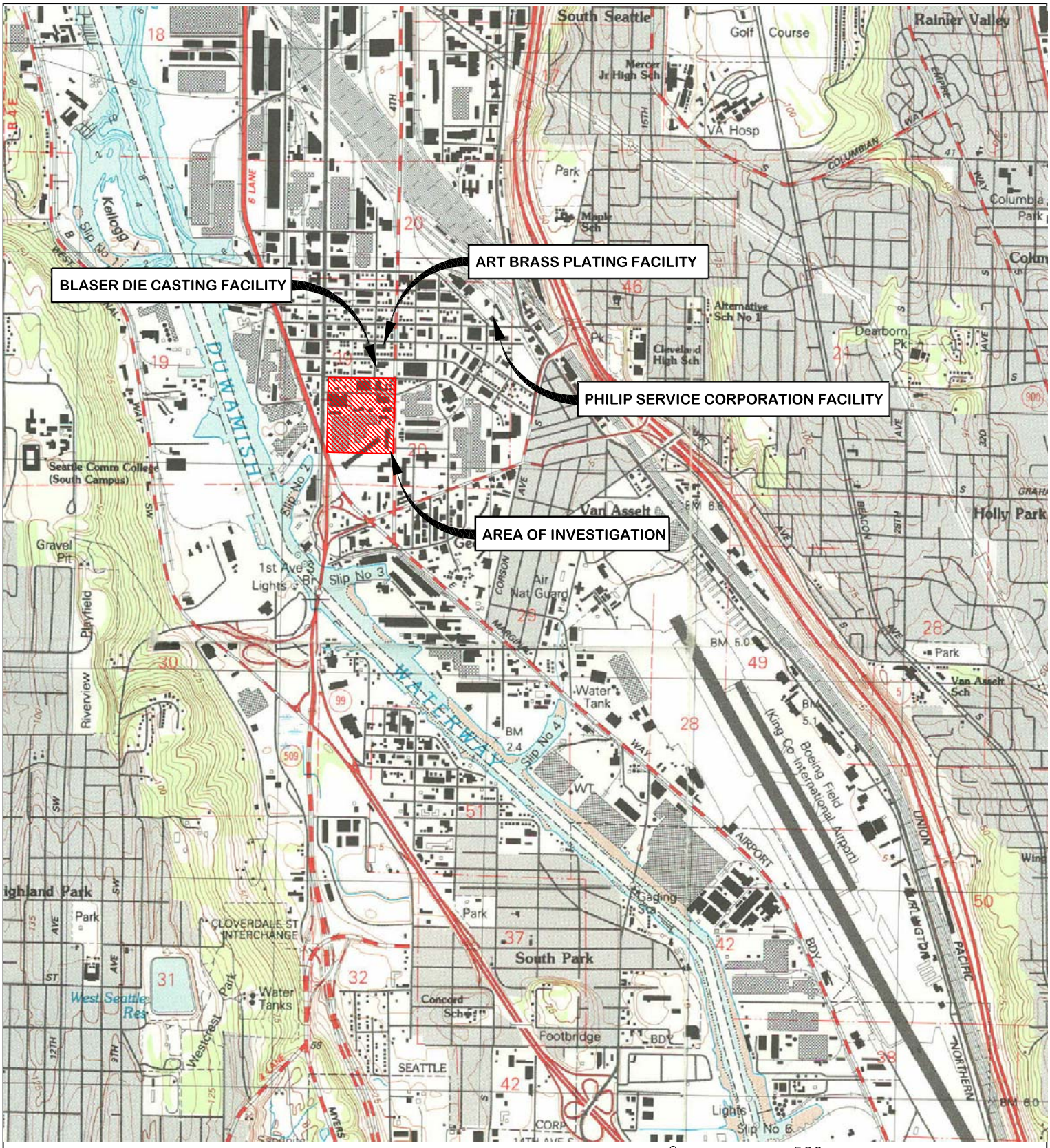
9.0 SCHEDULE

The proposed Phase I field sampling schedule is shown in Table 4. The start date is dependent on obtaining access agreements for borings located on private property and/or street use permits for borings located in city rights-of-way. The schedule will be adjusted throughout the field program to accommodate unknown conditions or delays.

FIGURES

RECONNAISSANCE SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington

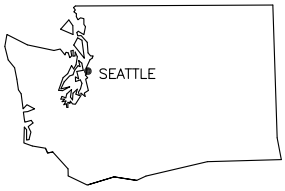
Farallon PN: 457-004



REFERENCE: 7.5 MINUTE USGS QUADRANGLE SOUTH SEATTLE, WASHINGTON. DATED 1983

0 500

APPROXIMATE SCALE IN METERS



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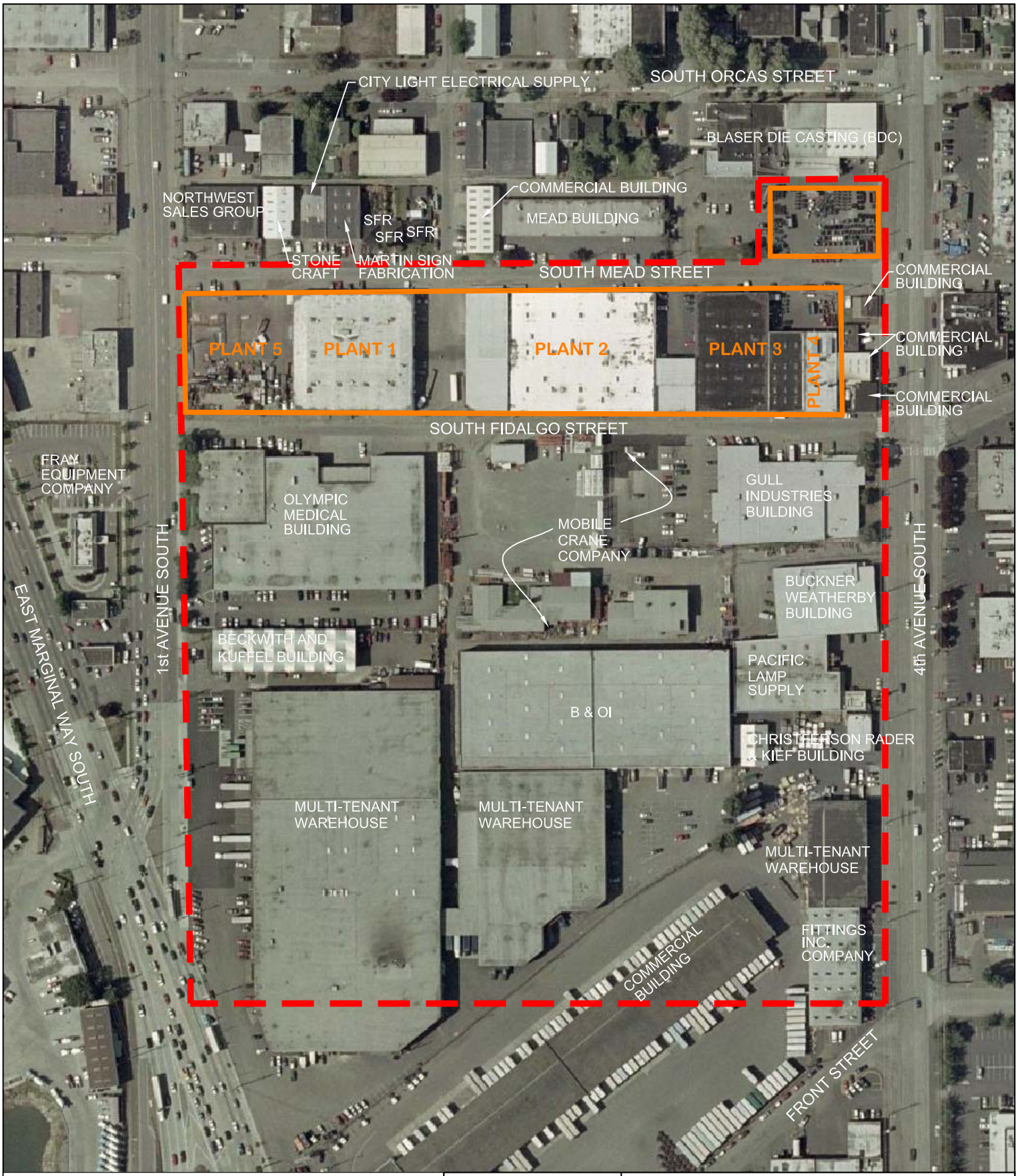
Issaquah, WA 98027

FIGURE 1

CAPITAL AREA OF INVESTIGATION
LOCATION MAP
SAMPLING AND ANALYSIS PLAN
CAPITAL INDUSTRIES, INC.
SEATTLE, WASHINGTON

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC	Date: 9/8/08	Disk Reference: 457004a



LEGEND

CAPITAL AREA OF INVESTIGATION

CAPITAL PROPERTY

SFR SINGLE FAMILY RESIDENCE

0 200

APPROXIMATE SCALE IN FEET

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Issaquah, WA 98027

FIGURE 2

CAPITAL AREAS OF INVESTIGATION
SAMPLING AND ANALYSIS PLAN
CAPITAL INDUSTRIES, INC.
SEATTLE, WASHINGTON

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC	Date: 9/8/08	Disk Reference: 457004a

ORCAS

1st AVENUE SOUTH

2nd AVENUE SOUTH

3rd AVENUE SOUTH

4th AVENUE SOUTH

NORTHWEST SALES GROUP

STONE CRAFT

CITY LIGHT ELECTRICAL SUPPLY

MARTIN SIGN FABRICATION

SINGLE FAMILY RESIDENCE

COMMERCIAL BUILDING

MEAD BUILDING

BLASER DIE CASTING FACILITY

CAPITAL CONTAINER YARD

SOUTH MEAD STREET

PLANT 5

PLANT 1

PLANT 2 CANOPY

PLANT 2

FORMER "WATERFALL" PAINT STATION

PLANT 3

PLANT 4

PLANT 4 CANOPY

FORMER SOLVENT DEGREASING UNIT

COMMERCIAL BUILDING

COMMERCIAL BUILDING

COMMERCIAL BUILDING

COMMERCIAL BUILDING

SOUTH FIDALGO STREET

1st AVENUE SOUTH

OFFICE

OLYMPIC MEDICAL

WAREHOUSE

MOBILE CRANE COMPANY

GULL INDUSTRIES BUILDING

0 80

APPROXIMATE SCALE IN FEET

LEGEND

CAPITAL PROPERTY

N

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975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 3

CAPITAL PROPERTY MAP
SAMPLING AND ANALYSIS PLAN
CAPITAL INDUSTRIES, INC.
SEATTLE, WASHINGTON

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC	Date: 9/10/08	Disk Reference: 457004cm

ORCAS

1st AVENUE SOUTH

2nd AVENUE SOUTH

3rd AVENUE SOUTH

4th AVENUE SOUTH

EAST MARGINAL WAY

SOUTH MEAD STREET

SOUTH FIDALGO STREET

SOUTH FIDALGO STREET

FRONT STREET

BLASER DIE CASTING (BDC) FACILITY

CAPITAL PROPERTY

CAPITAL PROPERTY

CITY LIGHT ELECTRICAL SUPPLY

MARTIN SIGN FABRICATION

NORTHWEST SALES GROUP

STONE CRAFT

SFR

SFR

SFR

COMMERCIAL BUILDING

MEAD BUILDING

BDC-11-WT

BDC-11-40

BDC-11-60

BDC-5-WT

BDC-6-30

BDC-6-60

PGG-33

PGG-34

B17

B16

COMMERCIAL BUILDING

COMMERCIAL BUILDING

COMMERCIAL BUILDING

COMMERCIAL BUILDING

B18

PLANT 5

PLANT 1

PLANT 2

PLANT 3

PLANT 4

B10

FRAY EQUIPMENT COMPANY

B6

B7

OLYMPIC MEDICAL BUILDING

B11

B12

MOBILE CRANE COMPANY

B15

B14

GULL INDUSTRIES BUILDING

B13

B8

B9

BECKWITH AND KUFFEL BUILDING

B20

B19

BUCKNER WEATHERBY BUILDING

PACIFIC LAMP SUPPLY

B & OI

CHRISTFERSON RADER & KIEF BUILDING

B22

MULTI-TENANT WAREHOUSE

MULTI-TENANT WAREHOUSE

B21

MULTI-TENANT WAREHOUSE

B23

B24

COMMERCIAL BUILDING

FITTINGS INC. COMPANY

LEGEND

REGIONAL GROUNDWATER FLOW DIRECTION

CAPITOL SITE BOUNDARY

B16 TIER 1 PROPOSED RECONNAISSANCE BORING LOCATIONS

B12 TIER 2 CONDITIONAL PROPOSED RECONNAISSANCE BORING LOCATION

SFR SINGLE FAMILY FAMILY RESIDENCE

PGG-34 PROPOSED BLASER GEOPROBE LOCATION

BDC-6-60 PROPOSED BLASER MONITORING WELL LOCATION

BDC-5-WT EXISTING BLASER MONITORING WELL

0 160

APPROXIMATE SCALE IN FEET

N

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975 5th Avenue Northwest

Issaquah, WA 98027

FIGURE 4

SITE VICINITY MAP WITH PROPOSED RECONNAISSANCE BORING LOCATIONS SAMPLING AND ANALYSIS PLAN CAPITAL INDUSTRIES, INC. SEATTLE, WASHINGTON

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC	Date: 9/10/08	Disk Reference: 457004cm

TABLES

RECONNAISSANCE SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington

Farallon PN: 457-004

Table 1
Analytical Method, Container, Preservation and Holding Time Requirements
Sampling and Analysis Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Reconnaissance and Monitoring Well Groundwater					
Analyte	**Method**	**Container[1]**	**Number of Containers**	**Preservation Requirements**	**Holding Time**
Tetrachloroethene Trichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl Chloride	EPA Method 8260B	40-ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
1,4-Dioxane	EPA Method 8270C Modified	1 liter amber	2	4°C	7days/40 days
Manganese Iron	EPA Method 6010B	500-ml HDPE	1	4°C, nitric acid to pH<2	180 days
Alkalinity	EPA Method 310.2	500-ml HDPE	1	4°C	14 days
Sulfate	EPA Method 375.4				28 days
Nitrate	EPA Method 353.2				48 hours
Nitrite	EPA Method 353.2				48 hours
Sulfide	EPA Method 376.1	500-ml HDPE	1	2N zinc acetate; NaOH to pH>9	7 days
Total Organic Carbon	EPA Method 415.1	250-ml HDPE	1	4°C, sulfuric acid to pH<2	28 days
Ferrous and Ferric Iron	SM 3500-FEB/6010B	250-ml amber/500 ml HDPE	1/1	4°C, HCl/nitric acid to pH<2	0/180 days
Methane Ethane Ethene	Gas Chromatograph/Flame Ionization Detection	40-ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
Soil					
Tetrachloroethene Trichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl Chloride	EPA Methods 5035A, 8260B	4-oz clear wide mouth 5035A VOA vial 5035A VOA vial with stir bar	1 1 2	4°C	14 days; 5035A vials - 48 hours to preserve or freeze
TOC	Plumb 1981	4-oz clear wide mouth	1	4°C	28 days

NOTES:
[1]All glass sample containers will have Teflon-lined lids
°C = degrees Celsius
EPA = U.S. Environmental Protection Agency
HCl = hydrochloric acid
HDPE = high density polyethylene
ml = milliliter
oz = ounce
TOC = total organic carbon
VOA = volatile organic analysis

Table 2
Sampling Summary
Sampling and Analysis Plan
Capital Industries, Inc.
Seattle, Washington
Farallon PN: 457-004

Matrix	Analysis	Field Samples	Trip/Field Duplicate/Blanks	Estimated Total
Tier 1 Reconnaissance Sampling - Borings B6 through B18				
Groundwater	HVOCs by EPA Method 8260B	192	20	212
Soil	HVOCs by EPA Method 5030A/8260B	9	NA	9
	Total Organic Carbon by Plumb 1981	12	NA	12
Tier 2 Reconnaissance Sampling - Borings B19 through B24 (Conditional Sampling)				
Groundwater	HVOCs by EPA Method 8260B	96	10	106
Soil	Total Organic Carbon by Plumb 1981	6	NA	6
Monitoring Well Installation/Groundwater Monitoring Event (Locations to be Established)				
Groundwater	HVOCs by EPA Method 8260B	TBD	10%	TBD
	1,4-Dioxane by EPA Method 8270C Modified	TBD	10%	TBD
	Manganese by EPA 6010B	TBD	10%	TBD
	Iron by EPA 6010B	TBD	10%	TBD
	Alkalinity by EPA Method 310.2	TBD	10%	TBD
	Sulfate by EPA Method 375.4	TBD	10%	TBD
	Sulfide by EPA Method 376.1	TBD	10%	TBD
	Nitrate by EPA Method 353.2	TBD	10%	TBD
	Nitrite by EPA Method 353.2	TBD	10%	TBD
	Total Organic Carbon by EPA Method 415.1	TBD	10%	TBD
	Ferrous and Ferric Iron by Method SM3500-FeB/6010B	TBD	10%	TBD
	Methane, Ethane, Ethene GC/FID	TBD	10%	TBD

NOTES:

EPA = U.S. Environmental Protection Agency

GC/FID = gas chromatograph/flame-ionization detector

HVOCs = halogenated volatile organic compounds

TBD = to be determined

VOCs = volatile organic compounds

Table 3
Consituents of Potential Concern, Laboratory Practical Quantitation Limits, and Screening Levels
Sampling and Analysis Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Analyte	Analytical Method	Laboratory Soil PQL (mg/kg)	Laboratory Water PQL (µg/l)	Screening Levels for Soil [1] (mg/kg)	Screening Levels for Water [1] (µg/l)		
					Water Table Zone	Shallow Zone	Intermediate Zone
Tetrachloroethene	EPA 8260B	0.001	0.20	0.0031	0.17	0.17	0.17
Trichloroethene	EPA 8260B	0.001	0.20	0.0028	0.404	0.654	0.654
cis-1,2-Dichloroethene	EPA 8260B	0.001	0.20	0.00993	72.7	137	137
trans-1,2-Dichloroethene	EPA 8260B	0.001	0.20	0.00969	65.3	1,403	1,403
Vinyl Chloride	EPA 8260B	0.001	0.20	0.005	1.28	1.69	1.69
1,4-Dioxane	EPA 8270C Modified	--	1	--	78.7	78.7	78.7
Manganese	EPA 6010B	--	11	--	100	100	100
Iron	EPA 6010B	--	110	--	1,000	1,000	1,000

Notes:

EPA = U.S. Environmental Protection Agency

mg/kg = milligrams per kilogram

PQL = practical quantitation limit

µg/l = micrograms per liter

Table 4
Phase 1 Remedial Investigation Field Program Schedule
Sampling and Analysis Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Work Element	Estimated Start Date	Estimated Duration
Historical Research	Within 30 days of approval date of Final Remedial Investigation (RI) Work Plan	45 days
Site Access	Within 30 days of approval date of Final RI Work Plan	45 days
Tier 1 Reconnaissance Groundwater and Soil Sampling and Analysis	Within 30 days of Site Access and completion of Historical Research	30 days
Tier 2 Reconnaissance Groundwater Sampling and Analysis (if necessary)	Within 30 days of approval date of Final Tier 1 Reconnaissance Groundwater Sampling Technical Memorandum	20 days

ATTACHMENT A
STANDARD OPERATING PROCEDURES

RECONNAISSANCE SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington

Farallon PN: 457-004

FARALLON consulting

975 5th Avenue Northwest, Issaquah, Washington 98027
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STANDARD OPERATING PROCEDURES

Attachment A of Appendix A - Sampling and Analysis Plan of the Remedial Investigation Work Plan

CAPITAL INDUSTRIES, INC.
5801 THIRD AVENUE SOUTH
SEATTLE, WASHINGTON

AGREED ORDER NO. DE 5348

Submitted by:

Farallon Consulting, L.L.C.
975 5th Avenue Northwest
Issaquah, Washington 98027

Farallon PN: 457-004

For:

Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington 98101

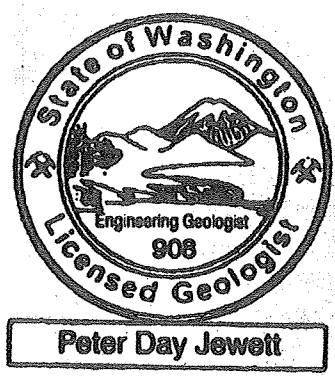
September 16, 2008

Prepared by:

Daniel Caputo
Project Chemist

Reviewed by:

Peter Jewett, L.G., L.E.G.
Principal



CONTENTS

MEASURING WATER LEVELS

SOP No. FAR-100

1.0 Purpose

The purpose of this Standard Operating Procedures (SOPs) document is to provide field personnel with an outline of the specific information needed to measure and document the depth to groundwater in monitoring wells.

2.0 Application

The SOP document provides a step-by-step guideline to be followed by field sampling personnel to ensure consistent and representative measurements of depth to groundwater in monitoring wells.

3.0 Reference

RCRA Ground-Water Monitoring: Draft Technical Guidance, dated November 1992, prepared by the U.S. Environmental Protection Agency (EPA), Office of Solid Waste.

4.0 Equipment

The following equipment is necessary for proper measurement of the depth to groundwater in monitoring wells:

- A well key, hand drill, socket set, Allen wrench, and padlock key, or other well-access equipment specific to the well monument cover plate.
- An electric water meter, calibrated to 0.01 foot, with sufficient line to reach the bottom of the monitoring well, and narrow enough to fit inside the monitoring well.
- All required materials for documenting the work, including field books and field forms.
- Personal protective equipment (PPE) as described in the Health and Safety Plan prepared for the Capital Site.
- Decontamination equipment, as specified in SOP No. FAR-300.

5.0 Procedures

5.1 Measuring Water Levels

The following procedures will be followed upon arrival at each monitoring well:

- Suit up in appropriate PPE, as described in the Health and Safety Plan.
- Remove any soil or vegetation from the well site.

- Open the wellhead enclosure and remove standing water inside the well monument prior to opening well cap.
- Open the well cap.
- Allow the water level to equilibrate for approximately 15 minutes prior to measurement. Measure the depth to water using a pre-decontaminated water level meter and record the measurement. See SOP No. FAR-300 for decontamination procedures. Set the water level meter at a medium level of sensitivity, and slowly lower the meter into the well casing until it reaches the water table. When the probe reaches the interface of the water table, it will beep. If the monitoring well does not have a dedicated pump, lower the water-level indicator probe to the bottom of the well to measure the total depth of the well. Gently bounce the probe on the well bottom and pull the slack on the cord to read the total depth.
- Read all measurements from a notch or marking in the polyvinyl chloride (PVC) well riser (if there is no notch, record the measurement from the north side of the well casing). Take all of the measurements three times to ensure that the readings are accurate and represent true depths. Take the measurements to the nearest 0.01 foot and record them in the field book and on the appropriate water level field form. The additional 2 to 3 inches from the zero point of the sonde to the tip of the sonde will be discounted for all total depth measurements.
- Decontaminate the water level meter in accordance with SOP No. FAR-300.
- Close the well appropriately and record any well integrity concerns in the field book and on the water-level measurement form.

6.0 Decontamination

All equipment that will come in contact with the well water will be decontaminated prior to arrival on site, relocation on site, and site exit. Decontamination procedures outlined in SOP No. FAR-300 shall be followed.

7.0 Documentation

All monitoring well water level measurements will be documented on water level measurement forms and in a detailed field report in accordance with the work plan.

WELL CONSTRUCTION

SOP No. FAR-101

1.0 Purpose

The purpose of this SOP is to provide field personnel with a set of guidelines to assure proper well construction and installation. All of the proposed monitoring wells to be installed during the Remedial Investigation will be constructed using 2-inch diameter, schedule 40 PVC well casing with 0.010-inch slotted screens.

2.0 Equipment

The following equipment is necessary for the construction and installation of monitoring wells:

- Well construction equipment (e.g., water level meter, photoionization detector [PID], tape measure, digital camera, plastic sheeting, steam cleaner), as needed.
- Well construction materials (e.g., well casing both screened and blank, filter pack sand, bentonite and/or Volclay Grout seal material, concrete, locking casing cap, wellhead stove-pipe monument complete with locking top, bollards for placement around wellhead monument), as needed.
- All required documentation including Log of Well Construction Data and Field Report forms.
- Personal protective equipment as described in the Health and Safety Plan.
- Decontamination equipment as specified in SOP No. FAR-300.

3.0 Decontamination

All equipment that will come in contact with potentially contaminated soil and groundwater will be decontaminated prior to arrival on site, relocation on site, and site exit. Procedures outlined in SOP No. FAR-300 shall be followed for decontamination of equipment as needed.

4.0 Well Construction and Installation Procedures

- Suit up in appropriate PPE as described in the Site Health and Safety Plan.
- Sound depth to bottom of well borehole in order to calculate appropriate placement and length of screened interval, filter pack, and seal. Calculate approximate volumes of filter pack and seal material required for specific well bore annulus and well casing diameter.
- Measure and check lengths of well screen and blank casing prior to installation, confirm slot size and sand filter pack size, confirm of type bentonite seal and/or Volclay Grout seal and wellhead monument. Record type and brand of all well construction materials used.

- Record start and completion times for various stages of well construction such as: installation of well casing into borehole, filter pack and seal emplacement, and wellhead monument.
- Record volumes of filter pack, bentonite seal, and concrete used to construct the well and check against calculated volumes to confirm proper placement and amount. Record irregularities during construction process that could indicate construction problems such as bridging of filter pack or seal material.
- Upon completion of well installation, measure total well depth and depth to groundwater, record on well construction summary.

5.0 Documentation

All well construction activities should be documented on the Log of Well Construction Data form and in the Field Report forms.

MONITORING WELL DEVELOPMENT

SOP No. FAR-102

1.0 Purpose

The purpose of this SOP is to provide field personnel with a set of guidelines to assure proper monitoring well development. All monitoring wells should be developed to create an effective filter pack around the well screen, to rectify damage to the formation caused by drilling, to remove fine particulates from the formation near the borehole, and to assist in restoring the natural water quality of the aquifer in the vicinity of the well.

2.0 Application

This SOP provides a step-by-step guideline to be followed by the field sampling crew for performing or overseeing monitoring well development.

3.0 Reference

RCRA Groundwater Monitoring Draft Technical Guidance (Nov. 1992) EPA/530-R-93-001.

4.0 Equipment

The following equipment is necessary to properly develop a groundwater monitoring well:

- A well key, hand drill, socket set, padlock key, or other well access equipment.
- An electric water meter calibrated to 0.01 foot, and sufficiently long to reach the bottom of the well.
- Well purging equipment (e.g., silicone line, PVC pipe, plug, pump, tubing, power supply, and extension cord), as needed.
- A sufficient number of 55-gallon drums (including lids, gaskets, and fasteners) or a portable poly tank of sufficient capacity to contain all purge water, unless other water handling arrangements have been made.
- All required documentation including sample labels, field report forms, purging forms, and chain-of-custody forms.
- Personal protective equipment as described in the Site Health and Safety Plan.
- Decontamination equipment as specified in SOP No. FAR-300.

5.0 Decontamination

All equipment that will come in contact with the well water will be decontaminated prior to arrival on site, relocation on site, and site exit. Decontamination procedures outlined in SOP No. FAR 300 shall be followed.

6.0 Well Development Procedures

Upon arrival at each well, the following procedures shall be followed:

- Suit up in appropriate PPE as described in the Site Health and Safety Plan.
- Brush any soil or vegetation and pump any standing water away from the well opening.
- Open the well cap.
- Measure and record the depth to water and total depth of the well using a decontaminated water level indicator. Measurements are to be made to the nearest 0.01 foot and recorded in the Field Report form and on the purging and sampling form.
- Compute the unit purge volume using the following formula and the input values on the Well Volumes Table below:

  1 well volume (including annular space) =
  [x(total well depth – water level)] + [y(total well depth – bottom of seal)]

  where "x" is the Casing/Riser Volume per Unit Length, Internal (gal/ft)
  and "y" is the Annular Volume per Unit Length (gal/ft).

Well Volumes

Hole Diameter (inches)	Casing Diameter (inches)	V_{casing} (gallons/linear foot)	$V_{annulus}$ (gallons/linear foot)
7	2	0.17	0.68
8	2	0.17	0.98
10	4	0.65	1.34
12	4	0.65	2.07
12	6	1.47	1.70
14	8	2.61	1.98

6.1 New Well Development Procedure

- Attach one length of twine to the surge block or use a drill rig or tripod and lower it to the bottom of the well.
- Vigorously begin moving the surge block up and down in the well creating a surging action across the screened interval. This action will bring the finer-grained materials into suspension.
- Remove the surge block.

- If a submersible pump is to be used for well development, gently lower the pump to the well bottom. If a non-submersible pump is used, lower the tubing to the bottom of the well.
- Begin to purge the well at a rate sufficient to remove fines, slowly run the pump up and down the well over the length of the screen, and initiate physical water quality testing at least every 20 percent water removed for temperature, pH, conductivity, dissolved oxygen, and turbidity.
- A minimum of three and a maximum of five well volumes (including annular space) will be removed. If this is the first time the well has been developed and water was used in the drilling process, the volume of water introduced into the formation during well formation must also be removed during development. *Purging is completed once the following has occurred:*
  - *the minimum purge volume has been removed; OR*
  - *the well runs dry; OR*
  - *five purge volumes and drilling process water volumes have been removed.*
- Measure total depth of well after development.
- Containerize all purge water in 55-gallon drums, unless other handling arrangements have been made.
- Record additional information such as unique odors or water color, and a description of the suspended particle content in the field notes and on appropriate field forms.
- Upon completion of development, both the well and the purge drums are to be properly sealed and secured.
- All drums are to be permanently labeled as follows;
  - Boring/Well ID
  - Facility Name
  - Drum Contents
  - Percent Filled
  - Date
  - Drum Number
- Close the well appropriately and record any well integrity concerns in the field book and on the sampling form.

6.2 Existing Well Development Procedure

The following procedures are for existing wells in the monitoring network that may require re-development from time to time if excessive amounts of fines are present in well casing which could potentially interfere with stabilization of water quality parameters or collection of representative water quality samples.

- Remove pump and/or dedicated tubing from well.
- Attach one length of twine to the surge block or use a drill rig or tripod and lower it to the bottom of the well.
- Vigorously begin moving the surge block up and down in the well creating a surging action across the screened interval. This action will bring the finer-grained materials into suspension.
- Remove the surge block.
- Begin to purge the well at a sufficient rate to remove fines, and initiate physical water quality testing at a minimum of every 20 percent water removed for turbidity.
- Repeat surging and purging to reduce silt presence in water and keep checking total depth measurements.
- A minimum of three and maximum of five well volumes (including annular space) will be removed. *Purging is completed once the following has occurred:*
  - *the minimum purge volume has been removed; OR*
  - *the well runs dry; OR*
  - *five purge volumes and drilling process water volumes have been removed.*
- Measure total depth of well after development.
- Containerize all purge water in 55-gallon drums, unless other handling arrangements have been made.
- Record additional information such as unique odors or water color, and a description of the suspended particle content in the field notes and on appropriate field forms.
- Upon completion of development, both the well and the purge drums are to be properly sealed and secured.
- All drums are to be permanently labeled as follows;
  - Boring/Well ID
  - Facility Name
  - Drum Contents
  - Percent Filled

- Date
- Drum Number

- Close the well appropriately and record any well integrity concerns in the field book and on the sampling form.

7.0 Documentation

All monitoring well development activities should be documented on well purging and sampling forms and in the detailed field notebook.

GROUNDWATER SAMPLING PROCEDURES

SOP No. FAR-103

1.0 Purpose

The purpose of this SOP is to provide groundwater sampling personnel with an outline of the specific information needed to collect and document representative groundwater samples for chemical analyses from monitoring wells using EPA's low-flow groundwater sampling procedures.

2.0 Application

This SOP provides step-by-step guidelines to be followed by the field sampling crew to assure consistent and representative sampling.

3.0 References

Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, EPA/540/5-95/504, April 1996.

4.0 Equipment

The following equipment is necessary to properly purge and sample a groundwater monitoring well:

- A well key, hand drill, socket set, padlock key, or other well access equipment.
- An electric water meter calibrated to 0.01 foot, and sufficiently long to reach the bottom of the well.
- Well purging equipment (e.g., pump, tubing, power supply, and extension cord).
- A sufficient number of 55-gallon drums (including lids, gaskets, and fasteners) to contain all purge water, unless other water handling arrangements have been made.
- Flow-through water quality meter(s) that measure temperature, pH, specific conductivity, dissolved oxygen, redox potential, and turbidity.
- All required documentation including sample labels, field report forms, purging and sampling forms, and chain-of-custody forms.
- Chemical preservatives for samples as described in the Field Sampling Plan or as required by the laboratory.
- Personal protective equipment as described in the Site Health and Safety Plan.
- Sampling support equipment (e.g., sample coolers, ice/blue ice, bubble wrap, clear tape, duct tape, Ziploc bags, razor knives, garbage bags, paper towels, distilled water, nitril gloves).

5.0 Decontamination

All reusable equipment that will come in contact with the well and/or be used to acquire samples will be decontaminated prior to arrival on site, relocation on site, and site exit. SOP No. FAR-300 shall be followed.

6.0 Well Sampling Procedures

The well sampling procedures have been developed for monitoring wells without dedicated tubing (non-dedicated wells) and for monitoring wells that have dedicated tubing (dedicated wells).

6.1 Set Up

The setup procedures are slightly different for dedicated wells versus non-dedicated wells, as summarized here.

6.1.1 Dedicated Wells

Upon arrival at each monitoring well with dedicated tubing, the following procedures shall be followed:

- Suit up in appropriate PPE as described in the Site Health and Safety Plan.
- Brush any soil or vegetation and pump any standing water away from the well opening.
- Open the well cap.
- Measure and record the depth to water using a decontaminated water level meter (SOP No. FAR-100). All measurements will be taken from the north point on the dedicated pump or at the hatch mark on the well riser. Measurements are to be made to the nearest 0.01 foot and recorded in the field report form and on the appropriate field form.
- Set up peristaltic pump or bladder pump and flow-through cell in preparation for purging. Connect dedicated tubing from well to the pump. Turn pump to its lowest setting, set memory in flow-through cell to record readings every three minutes, and then turn the pump on. Begin purging slowly so that the water table is not drawn down.

6.1.2 Non-Dedicated Wells

Upon arrival at each monitoring well without dedicated tubing, the following procedures shall be followed:

- Suit up in appropriate PPE as described in the Site Health and Safety Plan.
- Brush any soil or vegetation and pump any standing water away from the well opening.

- Open the well cap.
- Measure and record the depth to water using a decontaminated water level meter (SOP No. FAR-100). All measurements will be taken from the north point on the dedicated pump or at the hatch mark on the well riser. Measurements are to be made to the nearest 0.01 foot and recorded in the field report form and on the appropriate field form.
- Insert appropriate length of pre-cleaned temporary polyethylene tubing into the well to approximately the midpoint of the screened interval. Attach appropriate length of pre-cleaned silicon tubing from wellhead to connect with the peristaltic pump. If using a bladder pump, insert the bladder pump, attached to the appropriate length of pre-cleaned temporary polyethylene tubing, into the well so that the pump intake is approximately at the midpoint of the screened interval.
- Set up the pump and flow-through cell in preparation for purging. Turn pump to its lowest setting, set memory in flow-through cell to record readings every three minutes, and then turn the pump on. Begin purging slowly so that the water table is not drawn down.

6.2 Purging Wells

6.2.1 Purging Procedure

Begin to purge and initiate water quality testing for temperature, pH, specific conductivity, dissolved oxygen, redox potential, and turbidity. All monitoring wells will be purged with a peristaltic or bladder pump and disposable/dedicated polyethylene and silicon tubing. Water quality parameters should be recorded every 3 to 5 minutes.

Water levels should also be recorded every 3 to 5 minutes, where possible. It is imperative that the water level does not drop by more than 0.33 foot during the low-flow purging process.

Flow rates should also be recorded every 3 to 5 minutes. It is also important to ensure the flow rate does not exceed 500 milliliters per minute (ml/min) during the low-flow purging process.

If the well does not have dedicated tubing, then polyethylene sample tubing can be lowered to the middle of the screened interval of the well. Pumping can begin at a flow rate of less than 500 ml/min. Be sure that the peristaltic pump or bladder pump controller is set on low when it is turned on so that the water column is not abruptly disturbed.

6.2.2 Purging Requirements

Samples cannot be collected from monitoring wells until one of the following requirements has been met:

- Drawdown is no greater than 0.33 foot for low-flow sampling and water-quality parameters have stabilized according to the corresponding stability criterion specified in the table below:

Water-Quality Parameter	Stability Criterion
Turbidity	{X} < 5 NTU **or** RPD < 10% for values {X} >5 NTU
Dissolved Oxygen	$\Delta \leq 0.3$ mg/l
Specific Conductivity	RPD ≤ 3%
ORP	Δ <10 mV
pH	$\Delta \leq 0.1$ unit

where: {X} = the last three water-quality readings

$$m = \text{mean} = \frac{\text{Max } \{X\} + \text{Min } \{X\}}{2}$$

$$\Delta = \text{Max } \{X\} - \text{Min } \{X\}$$

$$\text{RPD} = \frac{\Delta}{m} \times 100\%$$

There are some circumstances where the well may not be able to stabilize according to the above criterion, but the well can be sampled if one of the following conditions occurs:

- Wells are unable to meet stability criterion due to equipment accuracy issues. The accuracy of the instruments will often limit the ability to achieve stabilization on a percentage basis. For example, if the redox potential is consistently fluctuating between 1 and 15 millivolts (mV), there is greater than a 10-mV change in concentration, which is not within the requirements for stability. However, the accuracy of the instrument being used is ±20 mV. Therefore, in this case the stability criterion would be considered satisfied within the range of accuracy of the equipment. This is particularly important when the water quality parameter values are low. The field personnel must consult the instrument's manual to determine its accuracy.
- Wells for which all water-quality parameters have stabilized using low-flow sampling procedures may be sampled if it is clear that the drawdown will not stabilize before the water level drops below the minimum allowable value (i.e., pump intake, or top of screen if aquifer is confined).
- The water level drops below the minimum value using low-flow sampling procedures (i.e., the pump intake, or the top of the screen if the aquifer is confined) during purging, the pump should be turned off, and the well should

be allowed to recover. As long as a minimum of two tubing volumes (including the tubing and pump) has been removed from the well, then the well should be sampled as soon as the water level has recovered sufficiently to collect volume of groundwater necessary for all samples. Use the following equations to determine the minimum volume of groundwater to be removed prior to sampling when this problem occurs:

Minimum purge volume = 2[500 ml + M (length of tubing in feet)]
where "M" is the volume (in ml) contained in a 1-foot length of tubing

For tubing inner diameters of various diameters, M is equal to:

Inner Diameter	M
1/8 inch	2.4
1/4 inch	9.7
1/2 inch	39

This is acceptable even though the water-quality parameters have not stabilized and one well volume has not been removed.

Record in the field report form and purging and sampling form if any wells did not meet the stabilization and drawdown criteria and describe the rationale for sampling the well at the time it was sampled.

- If stabilization of the water quality parameters is unachievable but one well volume of groundwater has been removed from the well; or

- The well runs dry twice during the purging procedure.

6.3 Sample Collection Procedure

During low-flow sampling, do not stop pumping once the purging requirements have been met. Disconnect the sampling tube from the flow-through cell. Slow the pumping rate to less than 100 ml/min in order to reduce the chance of volatilization of the chemicals while collecting the samples. It is also imperative not to lower the water table or disturb the water column.

- Fill pre-cleaned sample containers using flexible silicon hose on discharge side of pump.

- For VOCs samples fill 40-ml VOA vials to top with a positive meniscus (no headspace) being careful not to overfill and seal VOA vials with a Teflon-lined septum lid.

6.4 Post-Sampling Procedures

The depth to water should be recorded to determine whether the water level changed from the original reading, where possible.

Close the well or tap appropriately and record any well integrity concerns in the field report form and on the purging and sampling form.

7.0 Reconnaissance Groundwater Sampling

Reconnaissance groundwater samples will be collected from reconnaissance borings using direct-push drilling methods.

7.1 Reconnaissance Sampling

Groundwater reconnaissance samples will be collected using a 2-inch outside-diameter casing and 0.010-inch slotted screen. The following procedure will be used for collecting a groundwater sample:

- When the desired sampling depth is reached, withdraw the drill pipe so that the temporary well screen is exposed to water-bearing material.
- Insert disposable polyethylene tubing to approximately the midpoint of the temporary well screen. Attach appropriate length of pre-cleaned disposable silicon tubing from polyethylene tubing to connect with the peristaltic pump or bladder pump.
- Set up peristaltic pump or bladder pump in preparation for purging. Turn pump to its lowest setting, then turn the pump on. Begin purging slowly so that the water table is not drawn down.
- Purge each temporary well point utilizing a peristaltic pump or bladder pump until the visual turbidity is as low as possible, or until the temporary well is purged dry of water.
- Purge a minimum of 1 to 2 liters prior to sample collection, if possible. If the temporary well is completely dewatered during purging, collect samples when sufficient recharge has occurred that will allow filling of all sample containers.
- Slow the pumping rate to less than 500 ml/min in order to reduce the chance of volatilization of the chemicals while collecting the samples.
- Collect the sample as described in Section 6.3.
- If insufficient groundwater is available to collect sample using peristaltic pump or bladder pump (e.g. boring pumps dry or cannot maintain sufficient flow <100 ml/min), or if the depth to groundwater exceeds maximum practicable limit for sampling using a peristaltic pump or bladder pump, use a disposable polyethylene

bailer lowered through the augers to collect a water sample from the screened interval, if possible.

8.0 Documentation

Documentation of all well purging and sampling activities should be documented on the well purging and sampling forms and in the detailed field notebook.

SOIL SAMPLING PROCEDURES

SOP No. FAR-105

1.0 Purpose

The purpose of this SOP is to provide soil sampling personnel with an outline of the specific information needed to collect and document representative soil samples for chemical analyses from reconnaissance and monitoring well borings.

2.0 Application

This SOP provides step-by-step guidelines to be followed by the field sampling crew to assure consistent and representative sampling.

3.0 References

HAZWRAP, July 1990, Quality Control Requirements for Field Methods, DOE/HWP-69/RI.

United States Environmental Protection Agency, 1987, A Compendium of Superfund Field Operation Methods.

American Society for Testing Materials, 1989, Standard Method for Penetration Test and Split-Barrel Sampling of Soils, Method D-1586-84.

4.0 Equipment

The following equipment is necessary to properly collect soil samples:

- A PID to monitor and record the soil headspace readings.
- Soil sampling equipment (e.g., stainless steel spoons and hand trowels, brass or stainless steel sleeves complete with plastic end cap covers, pre-cleaned sample containers, Teflon tape, stainless steel mixing bowl, stainless steel hand auger, stainless steel hand-held drive sampler, post hole auger, wood or steel stakes), as needed.
- A sufficient number of 55-gallon drums (including lids, gaskets, and fasteners) to contain all soil cuttings, unless other soil handling arrangements have been made.
- All required documentation including sample labels, field report forms, log of boring forms, and chain-of-custody forms.
- Personal protective equipment as described in the Site Health and Safety Plan.
- Decontamination equipment as specified in the SOP No. FAR 300.

- Sampling support equipment (e.g., sample coolers, ice/blue ice, bubble wrap, clear tape, duct tape, heavy resealable plastic bags, razor knives, garbage bags, paper towels, distilled water, nitril gloves), as needed.

5.0 Decontamination

All reusable equipment that will come in contact with soil cuttings or that is used to acquire soil samples will be decontaminated prior to arrival on site, between soil samples, relocation on site, and site exit. SOP No. FAR-300 shall be followed for equipment decontamination.

6.0 Soil Sampling Procedures

The soil sampling procedures have been developed for use during hollow-stem auger drilling methods. Specific drilling and soil sampling equipment used will be recorded on the boring log form and in the field report form.

Soil samples collected by direct-push drilling techniques will be collected using either split spoon samplers or tube samplers with the following specifications:

- Split Spoon - 36-inch length SPT split spoon sampler with a 1.5-inch I.D. that can be used with or without 6-inch brass or stainless steel sleeves.
- Tube Sampler – 22-inch length large bore tube sampler with a 1-inch I.D., which can be used with or without 6-inch brass/stainless steel sleeves or with a one piece polyethylene liner.

Soil samples collected by hollow-stem auger drilling methods will be collected using a standard 18-inch length (6-inch waste barrel) Dames & Moore split spoon sampler with a 2.5-inch I.D. that can be used with or without brass or stainless steel liners.

6.1 Set Up

Upon arrival at each boring site, the following procedures shall be followed:

- Suit up in appropriate PPE as described in the Site Health and Safety Plan.
- Set-up a temporary table adjacent to the drill rig to log and collect soil samples from soil cores as they are recovered during drilling. Lay plastic sheeting on the table to keep logging/sampling surface clean and prevent potential cross contamination between borings and soil samples. Designate clean areas for decontaminated sampling equipment and pre-cleaned soil sample containers.
- Set-up decontamination buckets (5-gallon) for decontaminating soil sampling equipment between soil samples. Drillers will provide buckets for their split spoons and core barrels. Use separate set of buckets for decontamination of soil sampling equipment. Refer to SOP No. FAR-300 for equipment decontamination.

- Calibrate PID to monitor headspace from selected soil samples (SOP No. FAR-200 for PID operation). Headspace readings will be collected for individual soil samples by placing the instrument probe in a sample jar or heavy resealable plastic bag containing a portion of soil sample and recording the reading on the Log of Boring form.

- Upon completion of a boring, measure the location of the boring from an on-site permanent datum.

6.2 Sample Collection

Sample collection procedures for lined and unlined split-spoon samplers, and tube samplers are described below.

6.2.1 Split Spoon Samplers

- Don clean nitrile sampling gloves prior to collecting each individual soil sample to avoid potential cross contamination from the prior sample and/or the decontamination of the sampling equipment.

- Insert pre-cleaned liners into a decontaminated split-spoon sampler, attach the sampler to the drill rod, insert into boring, and drive the samples the required length.

- Upon retrieval of the sampler, wipe off excess soil and/or drilling slough material from outside of sampler with clean paper towels then open the sampler and place the split spoons and drill shoe on the sampling table.

- Briefly examine the soil sample visually and by taking PID readings for obvious signs of contamination.

- Select the soil sample interval for laboratory analysis and transfer soil immediately to pre-cleaned sample containers using decontaminated stainless steel spoon. Completely fill container(s) to the top of container to minimize headspace and seal with a Teflon lid. Label the sample container and place it in a sampling cooler. Record sample information on a Chain-of-Custody form, boring log form and on the field report form.

- Remove the remaining soil sample from the split spoon, retain a portion of sample in a heavy resealable plastic bag or glass sample jar to measure headspace with the PID. Wait approximately 10 minutes prior to taking the measurement for headspace analysis using the PID. Insert the PID probe tip into a small opening in the top of the bag, and record the PID units on the boring log form.

- Examine the remaining soil sample for lithology using the Unified Soil Classification System (USCS) and record the lithology on the boring log form.

- Discard excess soil cuttings into a drum or soil bin.

- Decontaminate the soil sampling equipment and split spoons, and don a clean pair of sampling gloves prior to collection of the next soil sample.

6.2.2 Tube Sampler

- The same soil sampling procedures for split spoons will be used for the tube sampler with the exception that the lined tube sampler can also utilize a one-piece polyethylene liner instead of the 6-inch brass or stainless steel liners.

- When using one-piece polyethylene liners, select the soil sample interval and cut the liner with a razor knife.

7.0 Documentation

All soil sampling activities should be documented on the Log of Boring, Chain-of-Custody form, and in the detailed Field Report form.

PHOTOIONIZATION DETECTOR (PID) CALIBRATION AND OPERATION

SOP No. FAR-200

1.0 Purpose

The purpose of this SOP is to provide field personnel with step-by-step instructions on the proper use, operation, and handling of the Perkin-Elmer Photovac Air Monitor/Portable Photoionization Detector (PID), Model 2020. The operation and maintenance manual specific to this piece of equipment should be referenced, as necessary.

2.0 Application

The PID is used as a field screening instrument for measurement of total volatile organic (TVO) concentrations in air. Typical uses include air monitoring of the breathing zone for health and safety purposes, groundwater and soil screening for TVO emissions, and well headspace.

The PID is a highly sensitive instrument with an operating range of 0.1 to 2,000 parts per million (ppm) hexane equivalent. Its detection limit is 0.1 ppm hexane or isobutylene and its response time is less than 3 seconds.

3.0 References

PE Photovac Air Monitor/Portable Photoionization Detector (PID), Model 2020 Manual (2000).

4.0 Equipment

The following equipment is necessary to calibrate and use the PID:

- PE Photovac Air Monitor/Portable Photoionization Detector (PID), Model 2020 (PID).
- A calibration gas regulator.
- Calibration gas containing approximately 14 ppm hexane or isobutylene, and zero gas which contains no ionizable gases or vapors.
- A 110-volt battery charger.

5.0 PID Calibration

The PID should be calibrated at least daily and more if wet conditions are encountered, or as necessary. The following calibration procedures should be followed:

- Connect the regulators to the gas cylinders. Connect the adapter tubing to the regulators.
- Connect the PID sample probe to the PID.
- Turn the PID on by pressing ON/OFF. Wait for the PID to proceed to the default display. Allow it to warm up according to manufacturer's instruction (10 minutes).

- Press the ENTER key.
- Expose the PID to a supply of zero air by connecting the adapter tubing to the probe and opening the valve.
- Select "Set," "Cal" and then "Zero." Allow the PID to set its zero point.
- Select "Set," "Cal" and "Span." Enter the known span gas concentration, without pressing ENTER to confirm it.
- Expose the PID to a supply of span gas by connecting the adapter tubing to the probe and opening the valve. Press the ENTER key.
- When the display reverts to the default display, the PID is calibrated and ready for use.
- Values read by the PID when calibrating with zero gas and hexane should be recorded in a calibration book or the log field book in use at that time.

6.0 PID Drift

The drift from the initial daily calibration shall be measured and recorded at least daily or more if conditions warrant. This is done by exposing the PID to the calibration gases, and recording the reading for each of these gases in the calibration or log field book.

7.0 PID Operation

The following procedures should be followed when monitoring the breathing zone for Health and Safety purposes, groundwater and soil screening for TVO emissions and well headspace:

- Connect the PID sample probe to the PID hand-held Air Monitor.
- Turn the PID on by pressing ON/OFF. Wait for the PID to proceed to the default display. Allow it to warm up according to manufacturer's instructions (10 minutes).
- When monitoring the breathing zone for Health and Safety purposes, allow the PID to monitor the air quality at the breathing zone, chest or face level, and read the meter display that shows the detected concentrations.
- When monitoring groundwater and soil for TVO emissions, place the probe inlet near the surface of the groundwater or soil and read the meter display that shows the detected concentrations. Be cautious not to allow water or soil to be sucked into the instrument.
- When monitoring for the headspace of a monitoring well, monitor the headspace directly after opening the well. Place the probe inlet directly above the PVC or dedicated pump top within the well. Read the meter display that shows the detected concentrations.
- If an increasing meter reading is indicated, monitor until the maximum meter reading is obtained and leave the probe inlet in that position for approximately six seconds.

- Humidity or moisture from rain can cause large fluctuations in PID readings. It is essential that the PID remains dry at all times while in use. Moisture can cause inaccurate readings and damage the PID.
- If the PID is showing erratic readings, then it is possible that there is either moisture or dirt in the probe, or dirt has collected in the filter. If this occurs, clean and dry the sample probe by running zero gas backwards through it, and replace the filter if necessary (with attention to placing the filter shiny-side down towards the monitor).

8.0 Documentation

All PID measurements for all monitoring events should be documented on field forms and in a detailed field notebook. Observations of varying weather conditions such as temperature and humidity fluctuations should also be recorded.

YSI MULTI-PARAMETER WATER QUALITY MONITOR CALIBRATION AND OPERATION

SOP No. FAR-201

1.0 Purpose

The purpose of this SOP is to provide field personnel with step-by-step instructions on the proper use, operation, and handling of the YSI 600 XL in tandem with the YSI 650 Datalogger for multi-parameter water quality monitoring.

2.0 Application

The YSI 600 XL is used as a field-screening instrument for monitoring temperature, dissolved oxygen, redox, pH, and conductivity in water. The YSI 650 Datalogger is used to view and store this information to help determine parameter stability for groundwater sampling.

3.0 References

YSI 6-Series Environmental Monitoring Systems Operations Manual (YSI Manual).

4.0 Equipment

The following equipment is necessary to calibrate and use the YSI 600 XL in correlation with the YSI 650 Datalogger:

- YSI 650 Datalogger, YSI 600 XL sonde, a YSI flow-through cell and a battery charger.
- pH buffer standard calibration solutions for pH of 4, 7, and 10, conductivity calibration standard 718 uS solution, and ORP calibration solution.
- Sample cups and a labeled bottle for waste calibration solution.
- Deionized water with spray bottle and paper towels.
- Two 5-gallon buckets, a stand to hold YSI 600 XL and flow-through cell stationary, and rubber tubing to attach to the YSI flow-through cell.
- Equipment calibration form to record calibration information.

5.0 YSI Calibration

The YSI calibration procedures outlined here are summarized from the YSI manual. The YSI manual should be referenced, as necessary. The YSI should be calibrated daily for dissolved oxygen, pH, conductivity, and ORP (redox potential). Temperature is factory-calibrated and does not require field calibration.

To operate the YSI start by doing the following:

- Connect the YSI 650 Datalogger to the YSI 600 XL (sonde) using the field cable.

- Remove probe from storage cup.
- Turn the YSI 650 Datalogger on by pressing **Power**.

5.1 Calibration for Dissolved Oxygen

To calibrate the YSI to monitor for dissolved oxygen the following procedures must be performed:

- Inspect the plastic membrane at the tip of the dissolved oxygen probe. Make sure there are no air bubbles present beneath the membrane. Replace the membrane if there are any air bubbles.
- Press **Esc** to get to the Main Menu.
- Scroll down, using the arrow keys, to "Calibration Mode" and press **Enter**.
- Scroll down to "Dissolved Oxy" and press **Enter**.
- Select "DO %" and press **Enter**.
- Enter "760" for the Barometric Pressure (for sampling at sea level) and press **Enter**.
- Observe the readings under "DO" and when they show no significant change for approximately 30 seconds press **Enter**. Record the observed reading in the calibration log.
- Press **Esc** 4 times to return to the Main Menu. At this point the YSI is calibrated for dissolved oxygen.

Periodically, or when an air bubble is visible under the membrane, the DO membrane needs to be changed. The following procedure must be performed:

- Hold the probe in a vertical position and apply a few drops of KCl solution to the tip. The fluid should completely fill the small moat around the electrodes and form meniscus on the tip of the sensor. Be sure no air bubbles are stuck to the face of the sensor. If necessary, shake off the electrolyte and start over.
- Secure a membrane between your left thumb and the probe body. Always handle the membrane with care, touching it only at the ends.
- With the thumb and forefinger of your right hand, grasp the free end of the membrane. With one continuous motion, gently stretch it up, over, and down the other side of the sensor. The membrane should conform to the face of the sensor.
- Secure the end of the membrane under the forefinger of your left hand.
- Roll the O-ring over the end of the probe, being careful not to touch the membrane surface with your fingers. There should be no wrinkles or trapped air bubbles. Small wrinkles may be removed by lightly tugging on the edges of the membrane. If bubbles are present, remove the membrane and repeat process until successful.

- Trim off any excess membrane with a sharp knife or scissors. Rinse off any excess KCl solution, but be careful not to get any water in the connector.

5.2 Calibration for pH

To calibrate the YSI to monitor for pH, the following procedures must be performed:

- From the Main Menu on the YSI 650 Datalogger select "Calibration Mode" and press **Enter**.
- Select "ISE1 pH" and press **Enter**.
- Select "2 point" and press **Enter**.
- Fill 2 calibration cups with pH 4 and 7 buffer standard solution.
- Carefully immerse the probe in the pH 4 solution.
- Enter "4.0" on the YSI 650 Datalogger and press **Enter**.
- Observe the readings under "pH" and when they show no significant change for approximately 30 seconds press **Enter**. Record the observed reading in the calibration log.
- Remove the probe from the cup and rinse it with deionized water.
- Carefully immerse the probe in the pH 7 solution.
- Enter "7.0" on the YSI 650 Datalogger and press **Enter**.
- Observe the readings under "pH" and when they show no significant change for approximately 30 seconds press **Enter**. Record the observed reading in the calibration log.
- Remove the probe from the cup and rinse it with deionized water.
- Carefully immerse the probe in the pH 10 solution.
- Enter "10.0" on the YSI 650 Datalogger and press **Enter**.
- Observe the readings under "pH" and when they show no significant change for approximately 30 seconds press **Enter**. Record the observed reading in the calibration log.
- Remove the probe from the cup and rinse it with deionized water.
- Press **Esc** 3 times to return to the Main Menu. At this point the YSI is calibrated for pH and is now ready for use.
- If the calibration is not stabilizing for approximately 30 seconds after waiting an extended period of time (more than 5 minutes), thoroughly clean and rinse the pH sonde with DI water and try again. If the calibration continues to take a long time, wait a minimum of 5 minutes and then press **Enter**. Record difficulties in the Calibration Log or Log Field Book.

5.3 Calibration for Conductivity

To calibrate the YSI to monitor for Conductivity, the following procedures must be performed:

- From the Main Menu on the YSI 650 Datalogger select "Calibration Mode" and press **Enter**.
- Select "Conductivity" and press **Enter**.
- Select "Cond" and press **Enter**.
- Fill one calibration cup with Conductivity Standard 718 uS solution.
- Carefully immerse the probe in the solution.
- Enter the calibration solution concentration in mS/cm (.718) and press **Enter**.
- Observe the readings under conductivity and when they show no significant change for 30 seconds press **Enter**. Record the observed reading in the Calibration Log.
- Remove the probe from the cup and rinse it with deionized water.
- Press **Esc** 3 times to return to the Main Menu. At this point the YSI is calibrated for Conductivity and is now ready for use.
- If the calibration is not stabilizing for approximately 30 seconds after waiting an extended period of time (more than 5 minutes), thoroughly clean and rinse the conductivity sonde with DI water and try again. If the calibration continues to take a long time, wait a minimum of 5 minutes and then press **Enter**. Record difficulties in the Calibration Log or Log Field Book.

5.4 Calibration for ORP (Redox Potential)

To calibrate the YSI to monitor for ORP, the following procedures must be performed:

- Hydrate the ORP calibration solution by carefully following the directions provided with the calibration solution.
- From the Main Menu on the YSI 650 Datalogger select "Calibration Mode" and press **Enter**.
- Select "ISE2 ORP" and press **Enter**.
- Fill one calibration cup with Zobel 231 mV calibration solution.
- Carefully immerse the probe in the solution.
- Enter the concentration of calibration solution in mV correlated with the closest ambient air temperature and press **Enter**.
- Observe the readings under ORP and when they show no significant change for 30 seconds press **Enter**. Record the observed reading in the calibration log.

- Remove the probe from the cup and rinse it with deionized water.
- Press **Esc** 3 times to return to the Main Menu. At this point the YSI is calibrated for ORP and is now ready for use.
- If the calibration is not stabilizing for approximately 30 seconds after waiting an extended period of time, thoroughly clean and rinse the ORP sonde with DI water and try again. If the calibration continues to take a long time (more than 5 minutes), wait a minimum of 5 minutes, and then press **Enter**. Record difficulties in the Calibration Log or Log Field Book.

6.0 YSI Drift

At least once a day, the drift from the initial calibration of pH, Conductivity, and ORP should be measured and recorded. This is done by inserting the YSI 600 XL probe into the respective solutions, waiting until the reading stabilizes for approximately 30 seconds and recording the reading for each of these parameters.

7.0 YSI Operation

7.1 YSI Operation for Logging Data

The following procedures should be used, after calibrating the YSI for dissolved oxygen, Conductivity, ORP, and pH, when using the YSI to monitor and log groundwater parameters to be downloaded later.

- Connect the YSI 650 Datalogger to the YSI 600 XL (sonde) using the field cable.
- Remove probe from storage cup and screw on protective shield.
- Place the YSI 600 XL in the flow-through cell and secure it using the stand.
- Place the stand on top of an overturned 5-gallon bucket, placing the other 5-gallon bucket in front of it between the YSI and the monitoring well.
- Attach a 3 to 3-inch piece of disposable tubing to the top nozzle of the flow-through cell and another piece of disposable tubing to the bottom nozzle of the flow-through cell. Point the upper tube into the bucket to collect wastewater.
- Attach the sample tubing to the disposable tubing on the bottom nozzle.
- Turn the YSI 650 Datalogger on by pressing **Power**.
- From the Main Menu on the YSI 650 Datalogger scroll down to "610 Logging Mode," and press **Enter**.
- Select "Setup Header" and press **Enter**.
- Next to "File:" type in the name of the well currently being sampled and press **Enter**.
- Press **Esc** once and then select "Start 610 Logging," and press **Enter**.

- Press **Y** for a new file.
- Start pumping the well.
- When the flow-through cell is full of water, press **N** for weather data, and data will begin recording.
- Values will be displayed and recorded every 3 minutes. Press **Power** to turn off the YSI and end logging when sampling commences.

7.2 YSI Operation for Viewing Data That Does Not Need to be Logged

The following procedures apply when using the YSI to monitor groundwater parameters that do not need to be logged for later downloading:

- Connect the YSI 650 Datalogger to the YSI 600 XL (sonde) using the field cable.
- Remove probe from storage cup and screw on protective shield.
- Place the YSI 600 XL in the flow-through cell and secure it using the stand.
- Place the stand on top of an overturned 5-gallon bucket, placing the other 5-gallon bucket in front of it between the YSI and the monitoring well.
- Attach a 2- to 3-inch piece of disposable tubing to the top nozzle of the flow-through cell and another piece of disposable tubing to the bottom nozzle of the flow-through cell. Point the upper tube into the bucket to collect wastewater.
- Attach the sample tubing to the disposable tubing on the bottom nozzle.
- Turn the YSI 650 Datalogger on by pressing **Power**.
- Data will be displayed continually.
- Press **Power** to end readings and turn off YSI.

8.0 Decontamination

The YSI will be decontaminated between each well and at the end of each day, disassemble the YSI unit, and return the YSI-DM to the case. Rinse the YSI 600 XL Sonde and flow-through cell thoroughly with DI water. When the equipment has been sufficiently cleaned, set-up for the next well and/or return the flow-through cell to the case. Before storing the YSI 600 XL Sonde, spray a few ml of water into the storage cup. Secure the storage cup on the YSI 600 XL Sonde, and return it to the case.

Periodically, the probes need to be rinsed in a light acid wash to remove buildup from groundwater sampling. The following procedure must be followed:

- Prepare a light acid solution with HCl and deionized water in a small glass or plastic cup.
- Immerse the probes in the acid solution.

- If necessary, a small laboratory glassware brush can be gently used to remove the buildup.
- Thoroughly rinse the probes with deionized water.

9.0 Documentation

All YSI logging can be downloaded using the Ecowatch software after fieldwork is completed (see manual listed in References for an explanation of how to download data). Monitoring events will be documented on field forms as well and in a detailed field notebook.

FIELD MONITORING EQUIPMENT DECONTAMINATION PROCEDURE

SOP No. FAR-300

1.0 Purpose

The purpose of this SOP is to provide field personnel with an outline of the procedure and frequency of decontaminating field monitoring equipment that has come into contact with groundwater.

2.0 Application

This SOP provides a step-by-step guideline to be followed by the field sampling crew to prevent cross-contamination between wells and preserve well integrity.

3.0 References

RCRA Groundwater Draft Technical Guidance (EPA 1992).

4.0 Equipment

The following equipment is necessary to properly decontaminate equipment used for soil sampling, and installing, purging, and sampling wells.

- Alconox and paper towels.
- A clean hose and tap water source.
- A labeled 55-gallon drum for wastewater and a bucket to use for smaller volume prior to containing in drum.
- Personal protective equipment as described in the Site Health and Safety Plan.

5.0 General Decontamination Procedures

All reusable equipment that will come in contact with the well and/or be used to acquire samples will be decontaminated prior to arrival on site, relocation on site, and site exit.

5.1 Decontamination

- Wash the equipment with a solution of nonphosphate detergent (Alconox or equivalent) and water.
- Rinse the equipment with tap water (if using Alconox).
- Rinse the equipment with De-Ionization (DI) water.

6.0 Specific Decontamination Procedures

Specific decontamination procedures for each type of equipment that is anticipated for use in the Remedial Investigation are described below.

6.1 Soil Sampling Equipment Decontamination Procedure

After collecting a sample using the hand auger, split-spoon or tube sampler, or stainless-steel hand sampling equipment, follow the decontamination procedure that follows:

- Brush off any soil clinging to the equipment;
- Rinse the equipment with Alconox dissolved in tap water.
- Rinse the equipment with DI water.

6.2 Groundwater Sampling Equipment Decontamination Procedures

After sampling or developing a well using a surge block, water level meter, or non-dedicated submersible pump, decontaminate the equipment as follows:

- Rinse exposed equipment parts with Alconox dissolved in tap water.
- Rinse exposed equipment parts with DI water.
- Discard non-reusable tubing, as necessary.

7.0 Documentation

All decontamination procedures associated with monitoring well activities should be documented in the field notebook.

ATTACHMENT B
FIELD SAMPLING FORMS

RECONNAISSANCE SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington

Farallon PN: 457-004

FIELD SAMPLING FORMS

1. Field Report
2. Log Of Boring
4. Well Purging And Sampling Data Form
5. Low Flow Well Purging And Sampling Data Form
6. Sample Summary Form
7. Waste Inventory Tracking Sheet
8. Custody Seal
9. Sample Label
10. Non-Hazardous Waste Label
11. Chain-of-Custody Form

FARALLON CONSULTING, L.L.C.

FIELD REPORT

Page ___ of ___

Date: _____ **Project #:** _____ **Task #:** _____

Project: _____ **Site Address:** _____

Client: _____ **Contractor:** _____

Weather: _____ **Temp:** _____

Equipment Used: _____

Hours: _____ _____ **Mileage:** _____ **Project Manager:** _____

Contractor *Staff*

Prepared By: _____ **Reviewed By:** _____

Comments:

FARALLON CONSULTING, L.L.C.

FIELD REPORT (continued)

Page ___ of ___

Project: _____ **Date:** _____ **Project #:** _____ **Task #:**_____

FARALLON CONSULTING
320 3rd Ave. NE, Suite 200
Issaquah, WA 98027

Sketch Boring Location:
Page #
N

PROJECT
CLIENT
CITY, STATE

Farallon PN:

Logged By:

Depth in Feet	Sample Interval	Blow Counts 6/6/6	% Rec-overy	Sample ID	Sample Analyzed	PID (units)	USCS	DESCRIPTION

Date/Time Started :
Date/Time Completed :
Drilling Company :
Drilling Forman :
Drilling Method :

Sampler Type :
Depth Of Water ATD :
Total Depth :

LOG OF BORING B-

03-13-2002 W:\Drafting\GEO 2002\FEILD FORMS\FEILD BORING LOG TEM 1 of 1.BOR

MONITORING WELL CONSTRUCTION DATA

WELL/BORING NO:

PERMIT NO:

DATE: | PROJECT NAME: | PROJECT NO:

WELL SITE LOCATION PLAN:

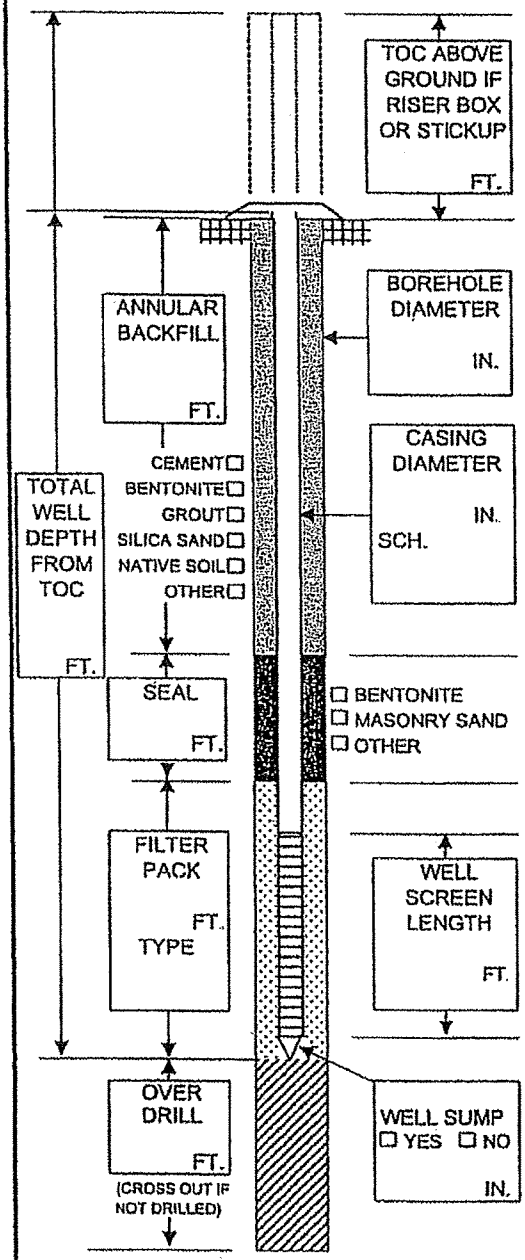
SEC: TWN: RGE: LAT: LONG:

DRILLING CO:

DRILL CREW:

WELL TYPE: ☐ SHALLOW ☐ SINGLE CASED ☐ MONITORING
☐ PERMANENT ☐ INTERMEDIATE ☐ DOUBLE CASED ☐ RECOVERY
☐ TEMPORARY ☐ DEEP ☐ OTHER ☐ OTHER

WELL SCHEMATIC



INSTALLATION DATA

DECON. ☐ STEAM CLEAN ☐ HIGH PRESSURE WASH ☐ SOAP WASH ☐ OTHER

CASING TYPE: ☐ PVC ☐ STAINLESS ☐ TEFLON ☐ OTHER
JOINTS: ☐ THREADED ☐ WELDED ☐ COUPLED ☐ SCREWED ☐ OTHER
PIT CASING: ☐ YES ☐ NO ☐ DESCRIBE

WELL SCREEN: ☐ PVC ☐ STAINLESS ☐ TEFLON ☐ OTHER
DIAMETER: ☐ 2" ☐ 4" ☐ 6" ☐ OTHER _____ IN
SLOT: ☐ 0.010 ☐ 0.020 ☐ OTHER _____ IN

DRILLING METHOD: ☐ SOLID STEM ☐ HOLLOW STEM ☐ MUD ROTARY ☐ AIR ROTARY ☐ DIRECT PUSH ☐ HAND AUGER ☐ OTHER
BIT SIZE: ☐ 2" ☐ 4" ☐ 6" ☐ 8" ☐ 12" ☐ OTHER ____ IN
DRILLING MUD: ☐ NONE ☐ WATER ☐ BENTONITE ☐ OTHER

COMPLETION: ☐ FLUSH MOUNT ☐ STICKUP ☐ RISER BOX
LOCK TYPE: ☐ DOLPHIN ☐ MASTER KEY NO. ☐ OTHER
PAD: ☐ 2'X2' ☐ 4'X4' ☐ OTHER

CUTTINGS: ☐ DRUMMED NUMBER OF DRUMS ☐ SPREAD ☐ OTHER

DEVELOPMENT METHOD: ☐ NONE ☐ BAILING ☐ PUMPING ☐ AIR LIFT ☐ SURGE & BLOCK ☐ OTHER
TIME: ☐ 10 MIN ☐ 20 MIN ☐ OTHER _____ MIN
AMOUNT ☐ 5 GAL ☐ 10 GAL ☐ OTHER _____ GAL
WATER BEFORE: ☐ SILTY ☐ TURBID ☐ OPAQUE ☐ CLEAR
WATER AFTER: ☐ SILTY ☐ TURBID ☐ OPAQUE ☐ CLEAR
EVIDENT ODOR: ☐ YES ☐ NO TYPE

DEVELOPMENT WATER: ☐ DRUMMED NUMBER OF DRUMS ☐ SPREAD ☐ TREATED ☐ POTW ☐ OTHER

WATER LEVEL: INITIAL _____ FT ☐ BTOC ☐ BLS

DATE: _____ _____ FT BELOW TOC

DATE: _____ _____ FT BELOW TOC

NOTES: (DESCRIBE ALL NON-STANDARD METHODS & MATERIALS)

PREPARED BY:

WELL PURGING AND SAMPLING DATA

		WELL NO:
DATE:	PROJECT NAME:	PROJECT NO:

WEATHER CONDITIONS:

WELL DIAMETER (IN.) ☐ 1 ☐ 2 ☐ 4 ☐ 6 ☐ OTHER _____

SAMPLE TYPE: ☐ GROUNDWATER ☐ WASTEWATER ☐ SURFACE WATER ☐ OTHER

WELL DEPTH (TOC) FT.	DEPTH TO WATER BEFORE PURGING (TOC) FT.
LENGTH OF WATER FT.	CALCULATED ONE WELL VOLUME[1]: GAL.

PURGING DEVICE: ☐ DEDICATED ☐ DISPOSABLE ☐ DECONTAMINATED

SAMPLING DEVICE: ☐ DEDICATED ☐ DISPOSABLE ☐ DECONTAMINATED

EQUIP. DECON. ☐ TAP WATER WASH ☐ ISOPROPANOL ☐ ANALYTE FREE FINAL RINSE
☐ ALCONOX WASH ☐ DIST/DEION 1 RINSE ☐ OTHER SOLVENT ☐ DIST/DEION FINAL RINSE
☐ LIQUINOX WASH ☐ DIST/DEION 2 RINSE ☐ TAP WATER FINAL RINSE ☐ AIR DRY

CONTAINER PRESERVATION: ☐ LAB PRESERVED ☐ FIELD PRESERVED

WATER ANALYZER MODEL & SERIAL NO:

ACTUAL TIME (MIN)	CUMUL. VOLUME PURGED (GAL)	TEMP ☐ °F ☐ °C	SPECIFIC CONDUCT.	pH	DISS. OXYGEN	TURBIDITY (NTUs)	WATER APPEAR CL=CLEAR CO=CLOUDY TU=TURBID	REMARKS (EVIDENT ODOR, COLOR, PID)
	INITIAL							

DEPTH TO WATER AFTER PURGING (TOC) FT. SAMPLE FILTERED ☐ YES ☐ NO SIZE _____

NOTES:

SAMPLE TIME: ID#

DUPLICATE ☐ TIME: ID#:

EQUIP. BLANK: ☐ TIME: ID#:

PREPARED BY:

[1] A 1 FOOT LENGTH OF WATER = 0.05 GAL IN 1" DIA. PIPE 0.17 GAL IN 2" DIA PIPE 0.65 GAL IN 4" DIA PIPE 1.5 GAL IN 6" DIA PIPE

LOW FLOW WELL PURGING AND SAMPLING DATA

		WELL NO:
DATE:	PROJECT NAME:	PROJECT NO:
WEATHER CONDITIONS:		
WELL DIAMETER (IN.) ☐ 1 ☐ 2 ☐ 4 ☐ 6 ☐ OTHER		
SAMPLE TYPE: ☐ GROUNDWATER ☐ WASTEWATER ☐ SURFACE WATER ☐ OTHER		
WELL DEPTH (TOC) FT.	DEPTH TO WATER BEFORE PURGING (TOC) FT.	
LENGTH OF WATER FT	CALCULATED ONE WELL VOLUME[1]: GAL.	
DEPTH OF SAMPLE POINT FT.	ESTIMATED VOLUME PURGED GAL.	
EQUIP. DECON. ☐ ALCONOX WASH ☐ LIQUINOX WASH ☐ DIST/DEION 1 RINSE ☐ DIST/DEION 2 RINSE ☐ OTHER		
CONTAINER PRESERVATION: ☐ LAB PRESERVED ☐ FIELD PRESERVED		
WATER ANALYZER:	PUMP TYPE:	TUBING:

ACTUAL TIME (MIN)	FLOW RATE (ml/min)	DEPTH TO WATER (feet)	TEMP ☐ °F ☐ °C	SPECIFIC CONDUCT.	pH	DISS. OXYGEN	TURBIDITY (NTUs)	ORP (mV)	REMARKS (EVIDENT ODOR, COLOR, PID)
	INITIAL		--	--	--	--	--	--	

DEPTH TO WATER AFTER PURGING (TOC) FT.	SAMPLE FILTERED ☐ YES ☐ NO SIZE _____
NOTES:	SAMPLE TIME: ID#
	DUPLICATE ☐ TIME: ID#:
	EQUIP. BLANK: ☐ TIME: ID#:
	PREPARED BY:

[1] A 1 FOOT LENGTH OF WATER = 0.05 GAL IN 1" DIA. PIPE 0.17 GAL IN 2" DIA PIPE 0.65 GAL IN 4" DIA PIPE 1.5 GAL IN 6" DIA PIPE

Sample ID	QA/ QC	Location/ Depth	Date/ Time	Matrix (SW, GW, soil)	No. of Containers	Container Type, Preservatives	Analysed (y/n)				Analytical Results			
							PCE	TCE	TOC	Other	PCE	TCE	TOC	Other

WASTE INVENTORY TRACKING SHEET

Site Name:_____
Site Address:_____
_____
Reason for Site Visit:_____
_____
Reason for Site Visit:_____
_____

Page ___ of ___
Date of Inventory:_____
Field Personell:_____
_____
_____

Container ID	Fullness	Contents	Date(s) Accumulated	Labled (Y/N)	Sampled (Y/N)	Comments

NOTES: Contents should be specified and include identification of well/boring, media, souce, depth of soil (if applicable), and any other applicable information.

CUSTODY SEAL

Date _____

Signature _____

OnSite Environmental Inc.
14648 NE 95th Street
Redmond, WA 98052
(425) 883-3881

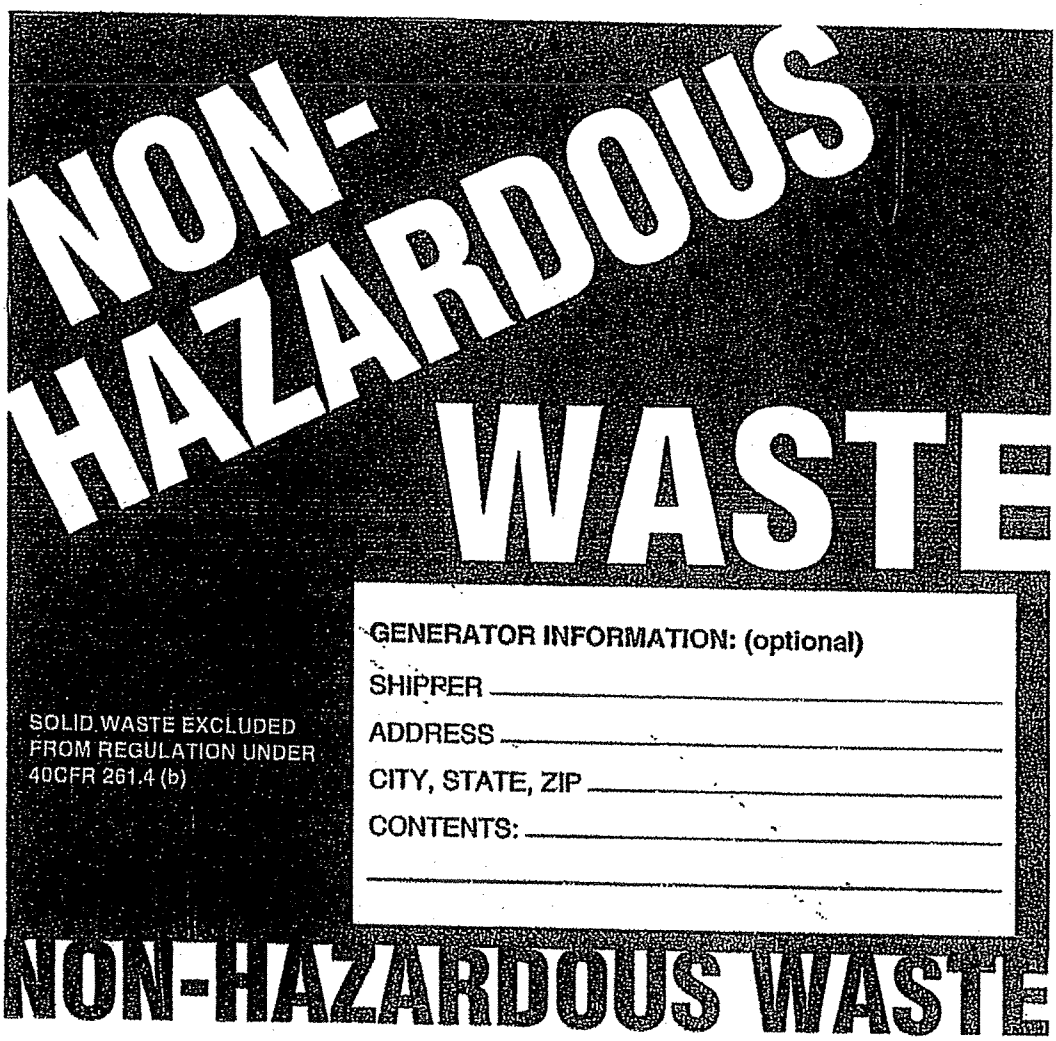
Client _____

Project _____

Sample ID _____

Date _____ Time _____

Analysis _____ Preservative _____



GWMV REV.11-1-92 LABELMASTER® (800) 621-5808 www.labelmaster.com

Chain of Custody

Page _____ of _____

OnSite Environmental Inc.
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • Fax: (425) 885-4603

Company:

Project Number:

Project Name:

Project Manager:

Sampled by:

Turnaround Request (in working days)

(Check One)

☐ Same Day ☐ 1 Day

☐ 2 Day ☐ 3 Day

☐ Standard (7 working days)

☐ _____ (other)

Laboratory Number:

Requested Analysis

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C / SIM	PCBs by 8082	Pesticides by 8081A	Herbicides by 8151A	Total RCRA Metals (8)	TCLP Metals	HEM by 1664	VPH	EPH					% Moisture

Relinquished by	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished by					
Received by					
Relinquished by					
Received by					
Relinquished by					
Received by					

Reviewed by/Date

Reviewed by/Date

Chromatograms with final report ☐

DISTRIBUTION LEGEND: White - OnSite Copy Yellow - Report Copy Pink - Client Copy