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GROUNDWATER MONITORING PLAN

CAPITAL INDUSTRIES, INC.
5801 3rd AVENUE SOUTH
SEATTLE, WASHINGTON

AGREED ORDER NO. DE 5348

Submitted by:
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Farallon PN: 457-004

For:
Mr. Ron Taylor
Capital Industries, Inc.
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1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Groundwater Monitoring Plan on behalf of Capital Industries, Inc. (Capital) for the groundwater monitoring program to be conducted for the Remedial Investigation (RI) at the Capital Area of Investigation (Figure 1). The Capital Area of Investigation was defined in the Remedial investigation Work Plan (Farallon 2008) 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 South Mead Street and west of 4th Avenue South in Seattle, Washington (Figures 2 and 3). Based on the results of reconnaissance groundwater and groundwater samples collected during the first phase of the RI, the Capital Area of Investigation has been redefined as the area south of South Mead Street, north of South Front Street, west of 4th Avenue South, and east of the Duwamish Waterway in Seattle, Washington (Figure 3). The Capital Area of Investigation does not define the 'Capital Site' per WAC 173-340-200 and does not imply that concentrations of volatile organic compounds (VOCs) in groundwater that may have been released from the Capital property, is discharging to the Duwamish Waterway at concentrations above the screening levels. In accordance with Exhibit A of Agreed Order No. DE 5348 entered into by Capital and the Washington State Department Ecology (Ecology) on January 24, 2008 (Agreed Order) and with Section 200 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-200), the Capital Site will be defined after completion of the RI as the area where concentrations of constituents of concern (COCs) released from the Capital Property at 5801 3rd Avenue South in Seattle, Washington exceed regulatory cleanup levels. This Groundwater Monitoring Plan has been prepared to meet the requirements of Ecology stated in the Agreed Order, Exhibit B, Section (6).

Background information pertaining to the Capital Area of Investigation (Figure 3), adjacent properties land use, environmental setting, hydrogeology, and previous investigations is presented in the *Remedial Investigation Work Plan, Capital Industries, Inc.* dated September 16, 2008, prepared by Farallon (Farallon 2008a) (RI Work Plan). Historical and background data for the Capital Property, Philip Service Corporation (PSC) facility, Art Brass Plating (ABP) facility, and Blaser Die Casting (BDC) facility are discussed in detail in both the Data Summary Report (Farallon et al. 2008) and the RI Work Plan. Farallon (2009) proposed monitoring well locations to Ecology in the First Phase Remedial Investigation Field Program Report. Farallon met with Ecology to confirm approval of the final monitoring well locations presented in this Groundwater Monitoring Report. If modification to the monitoring well locations is required due to access limitations, the modifications will be approved by Ecology and documented on the final as-built drawings.

1.1 OBJECTIVES

This section presents the objectives of the groundwater monitoring that include collection and analysis of sufficient groundwater samples to determine the nature and extent of concentrations of COCs in groundwater above the regulatory cleanup levels, to identify sources of the COCs to groundwater, and to collect sufficient information to evaluate and select technically feasible cleanup alternatives. . Groundwater monitoring will be conducted to address the following objectives:

- Determine the groundwater flow direction, horizontal and vertical gradients, seasonal impacts, and tidal influence from the Duwamish Waterway;
- Determine the nature and extent of the concentrations of the constituents of concern that exceed regulatory cleanup levels and define the COCs that are applicable to the Capital Area of Investigation;
- Determine the correlation between concentrations of COCs detected in reconnaissance groundwater samples collected from reconnaissance borings with the concentrations of COCs detected in groundwater samples collected from monitoring wells to evaluate the analytical results that will meet the Data Quality Objectives (DQOs) for evaluation and selection of technically feasible cleanup alternatives;
- Determine seasonal impacts on groundwater flow directions, horizontal and vertical gradients and on the nature and extent of concentrations of COCs in groundwater over four consecutive quarters;
- Identify trends, if any, in COC concentrations in groundwater over four consecutive quarters of groundwater monitoring;
- Define the boundaries of the "Capital Site" in accordance with the definition of WAC 173-240-200 based on the nature and extent of the COCs in groundwater that exceed the cleanup levels;
- Collect sufficient groundwater geochemistry data to support the evaluation of natural attenuation; and
- Analyze groundwater samples collected from monitoring wells in the Water Table Zone to meet the requirements of the Capital Vapor Intrusion (VI) Assessment program, as defined in the Vapor Intrusion Assessment Work Plan (Farallon 2008b) and in Section 3, Vapor Intrusion Assessment Requirements, below.

1.2 REPORT ORGANIZATION

The Groundwater Monitoring Plan has been organized into the following sections:

- **Section 1—Introduction.** This section presents a brief introduction and overview of the Groundwater Monitoring Plan.
- **Section 2—Groundwater Monitoring.** This section describes the procedures and protocols associated with the installation and monitoring of groundwater monitoring wells within the Capital Area of Investigation.
- **Section 3—Vapor Intrusion Assessment Requirements.** This section presents the requirements associated with vapor intrusion based on the results of groundwater monitoring.
- **Section 4—Reporting.** The section discusses the reporting requirements associated with groundwater monitoring.

- **Section 5—Bibliography.** This section lists the materials used in preparation of the Groundwater Monitoring Report.

2.0 GROUNDWATER MONITORING

This section describes the installation of the planned network of monitoring wells, the groundwater monitoring program schedule and documentation, and waste management. The monitoring well network has been designed to assess aquifer characteristics and the nature and extent of COCs as defined in the RI Work Plan, and to enable an evaluation of natural attenuation processes. The monitoring well network includes both existing and planned monitoring wells. The locations of the existing and planned monitoring wells are presented on Figure 4. The specific depths and well-screen intervals are presented in Table 1. Groundwater monitoring will be conducted in accordance with the Sampling and Analysis Plan (Appendix A) and the Quality Assurance Project Plan (Appendix B). If variations to the planned monitoring well network are necessary due to site conditions or access limitations, modifications will be documented and approved by Ecology.

2.1 GROUNDWATER MONITORING WELL NETWORK INSTALLATION

The monitoring well network consists of monitoring wells that have been installed by Capital and PSC, and monitoring wells that will be installed by Capital. A total of 25 monitoring wells will be installed in addition to the 15 monitoring wells that have already been installed, for a total of 40 monitoring wells in the network. The planned monitoring well locations were selected to complete the monitoring well network to assess groundwater in the three water-bearing zones defined for the Capital Area of Investigation (Farallon 2008a). The water-bearing zones are defined as:

- The Water Table Zone, the water-bearing zone from first-encountered groundwater to approximately 20 feet below ground surface (bgs);
- The Shallow Zone, the water-bearing zone from 20 to 40 feet bgs; and
- The Intermediate Zone, the upper portion of the intermediate water-bearing zone between 40 and 70 feet bgs.

The locations of the existing monitoring wells to be included in the monitoring well network are shown on Figure 4 and include: monitoring wells MW-2 through MW-8 installed by Capital into the Water Table Zone only; CI-MW-1-WT installed by Capital and CI-MW-1-40 and CI-MW-1-60 installed by BDC into the Water Table Zone, Shallow Zone, and the Intermediate Zone, respectively; CG-137-WT and CG-137-40 installed by PSC into the Water Table Zone and the Shallow Zone, respectively; and CG-141-WT, CG-141-40, and CG-141-50 installed by PSC into the Water Table Zone, the Shallow Zone, and the Intermediate Zone, respectively (Table 1). Well logs and/or well construction sheets for monitoring wells installed to date are included in Appendix C. Well logs and/or well construction sheets for monitoring wells to be installed will be provided to Ecology via email within 30 days of the monitoring well installation and development.

The monitoring wells to be installed by Capital will be completed as monitoring well clusters, defined as two or more monitoring wells at a similar location and screened in different zones.

The locations of the monitoring wells to be installed by Capital are showed on Figure 4. Monitoring well network details are summarized in Table 1.

Monitoring wells will be installed by Cascade Drilling, in accordance with the Minimum Standards for Construction and Maintenance of Wells as established in WAC 173-160, using a drill rig equipped with hollow-stem augers. Soil samples will not be collected during advancement of the borings for installation of the monitoring wells, as sufficient subsurface data were collected during the Tier 1 and Tier 2 investigations conducted earlier (Farallon 2009).

Each monitoring well will be constructed in the well-boring immediately after the target depth has been achieved. The monitoring wells will be constructed of 2-inch-diameter blank polyvinyl chloride (PVC) casing, flush-threaded to 10 feet of 0.010-inch slotted well screen, with the exception of monitoring well CI-10-65, which will be constructed with 15 feet of screen. The top and bottom of each monitoring well will be fitted with a locking compression-fit well cap and a threaded PVC bottom cap, respectively. A sand filter pack will be placed from the bottom of the screened interval to approximately 2 feet above the top of the screened interval. The sand pack (filter pack) will use 10/20 Colorado Silica sand, which will be installed slowly or through a tremie pipe from the bottom of the screened interval to approximately 2 feet above the top of the screened interval. The volume of sand used will be compared to the calculated sand pack volume prior to well installation in accordance with Standard Operating Procedure (SOP) No. FAR-101.

The annular seal between the boring and the 2-inch PVC casing will be installed using 3/8-inch bentonite pellets with a minimum thickness of 3 feet, followed by pumping cement/bentonite grout (at least 6 percent high-yield bentonite powder mixed with Portland cement) into the annulus with a tremie pipe. The grout will be pumped into the borehole at least 30 minutes after the bentonite pellet layer is installed. The monitoring wells will be completed at the surface with a flush-mounted, traffic-rated well monument set in concrete. Following installation of the monitoring wells, a surveyor licensed in the State of Washington will survey the top of each monitoring well casing to an accuracy of 0.01 foot relative to the vertical datum NAVD88. Monitoring well construction details are summarized in Table 1.

Each monitoring well will be developed using a combination of surging and bailing until approximately five submerged casing-volumes of water has been removed from the well and the quantity of fine-grained sediment in the extracted water has stabilized.

2.1.1 Access Considerations

Eighteen of the 40 monitoring wells included in the monitoring well network are either proposed or have been installed on private property located south-southwest of the Capital property. In order to define the terms upon which Capital may access these properties to install monitoring wells and conduct subsequent groundwater monitoring, Capital has executed (or will execute) access agreements with the respective property owners to determine the terms of access. Access agreements may vary slightly based on the negotiations conducted by Capital and each property owner. However, at a minimum, each access agreement stipulates that Capital should provide the property owner 24 hours' notice before entering the property for the purpose of conducting any

work. Access agreements also provide the appropriate contact information for personnel relative to the property being accessed. Ecology may inspect the monitoring wells or observe the sampling process on private property by either contacting the property owner directly or by notifying Capital of a pending inspection or observation with ample time to provide the property owner with the required minimum notification. The access agreements executed to date have been included in Appendix D.

2.2 GROUNDWATER MONITORING PROGRAM SCHEDULE

The groundwater monitoring program includes four consecutive quarters of groundwater monitoring scheduled to begin after installation of the monitoring wells by Capital to complete the monitoring well network, projected to be in March 2010. The Capital monitoring well network consists of monitoring wells MW-2 through MW-6 and monitoring well clusters CI-MW-1, CI-7 through CI-15, CI-137, and CG-141 (Figure 4; Table 1). Groundwater monitoring will be conducted by BDC at monitoring well cluster CI-MW-1 during Capital's first and fourth quarterly groundwater monitoring events. Capital will conduct groundwater monitoring at CI-MW-1 during the second and third quarterly groundwater monitoring events to ensure that the objectives of the RI are met.

Groundwater monitoring and sampling will be conducted in accordance with SOP No. FAR-103, included in Attachment 1 of Appendix A. The groundwater monitoring program consists of three components:

- Well condition inspection;
- Routine water-level monitoring; and
- Groundwater quality sampling.

Each of these components is described in greater detail below.

2.2.1 Well Condition Inspection

An inspection of the condition of each monitoring well will be conducted concurrently with collection of water level measurements (described below). Field personnel will take note of the condition of the flush-mounted monument, monument seal, and casing to identify required maintenance activities.

2.2.2 Water-Level Monitoring

Water levels will be measured at each monitoring event that will be coordinated with ABP, BDC, and PSC to ensure that all measurements are taken on approximately the same day. Water-level measurements are expected to be completed before each quarterly groundwater quality sampling event is initiated.

Prior to the monitoring and sampling, the locking well cap will be removed from each monitoring well and the groundwater level will be allowed to equilibrate to atmospheric pressure for a minimum of 15 minutes. The depth to groundwater will be measured from the surveyed

location at each monitoring well casing to the nearest 0.01 foot using an electronic water-level measuring device. Groundwater-level measurements for all of the monitoring wells will be taken within a 24-hour period. The depth to the monitoring well bottom will be measured to evaluate whether fine-grained material has accumulated in the monitoring well casing. All reusable equipment will be decontaminated between uses as described in SOP No. FAR-300, included in Attachment 1 of Appendix A.

2.2.3 Tidal Study

A tidal study will be performed to assess the potential for tidal influences on groundwater elevations and gradients near the Duwamish Waterway. The tidal study will evaluate the tidal effects of the inland propagation of the pressure wave caused by the rise in the surface water in the Duwamish Waterway that could cause groundwater levels and gradients (both horizontal and vertical) to fluctuate. A single set of water-level measurements cannot be used to accurately characterize tidal influence on groundwater flow. Additional steps will be taken to correct for the tidally influenced head changes so that mean hydraulic heads and gradient can be calculated.

Data obtained from the tidal study will be used to calculate the mean hydraulic gradient by comparing mean groundwater and surface water elevations. Filtering methods developed by Serfes (1991) will be used to determine mean water levels. The net effect of tidal changes (if any) on groundwater flow within the Capital Area of Investigation to the Duwamish Waterway will be determined from this investigation.

The tidal study will include monitoring water levels in 15 wells down-gradient of the Capital property:

- Water Table Interval: C-10-WT, CI-11-WT, CI-12-WT, CI-13-WT, CI-14-WT;
- Shallow Interval: C-10-35, CI-11-30, CI-12-30, CI-13-30, CI-14-35; and
- Intermediate Interval: C-10-65, CI-11-60, CI-12-60, CI-13-60, and CI-14-70.

These wells will provide horizontal and vertical head data in the vicinity of the Duwamish Waterway and extending inland to an area expected to be beyond tidal influence.

Down-hole pressure transducers/data loggers will be placed in each monitoring well and in the Duwamish Waterway to collect data at 5-minute intervals for 14 consecutive days. Vented pressure transducers will used to compensate for atmospheric pressure changes so barometric corrections to water level data will not be required. However, barometric pressure data will be collected using a barometric pressure transducer in the event that barometric efficiency calculations are needed. The data loggers will be synchronized to the same internal clock time to simplify subsequent data reduction. In addition, field personnel will be on Site to periodically monitor equipment and collect manual readings to confirm results and provide backup if information is lost. Water levels will be measured manually in each well before the data loggers are installed and before the loggers are removed to establish baseline groundwater elevations from the pressure transducer readings. Data loggers will be anchored securely in the wells to avoid slippage during the test, and well boxes will be secured after starting the test to prevent damage to the data loggers and cables.

The tidal data collected will be analyzed using the method of Serfes (1991) to calculate a mean hydraulic gradient over a 72-hour period (a subset of the 14-day data collection interval) and to assess changes in vertical hydraulic gradients during the tidal cycle. Hydraulic conductivity will also be estimated from the tidal data as proposed by Aspect using the methods of Ferris (1951).

The results of the tidal study will be provided in a technical memorandum submitted to Ecology for review. If the results of the tidal study indicate that there is tidal influence on water levels in monitoring wells inland of the Duwamish Waterway, pressure transducers may be placed in selected monitoring wells to calculate mean hydraulic gradient during subsequent quarterly monitoring events. The need for this data collection procedure will be based on the results of the tidal study and will be discussed with Ecology prior to implementation.

2.2.4 Groundwater Quality Sampling

Each monitoring well will be purged at a low-flow rate using a decontaminated bladder pump or Redi-flo 2 submersible pump, with the intake placed at the approximate mid-point of the well-screen interval or the mid-point between the water table and the bottom of the well screen if the water table is lower than the top of the well-screen interval. Temperature, pH, conductivity, dissolved oxygen, and oxidation-reduction potential will be monitored using a YSI multiparameter water-quality meter and flow cell during purging to ascertain when stabilization of these parameters occurs. Turbidity also will be measured using a turbidity meter. Calibration, operation of the YSI multiparameter water quality meter and turbidity meter, and criteria for parameter stabilization will be in accordance with SOP No. FAR-103, included in Attachment 1 of Appendix A.

If a monitoring well is completely dewatered during purging or if low-flow sampling methods are not practical due to a low yield of groundwater to the well, samples will be collected when sufficient recharge has occurred to allow filling of all of the sample containers. However, based on the known subsurface conditions, it is highly unlikely that any of the monitoring wells will be completely dewatered. Therefore, if a monitoring well produces a low yield or is dewatered, the boring logs and well construction details will be reviewed to identify the reasons why the monitoring well is not producing sufficient water.

Following stabilization of temperature, pH, conductivity, oxygen-reducing potential (ORP), dissolved oxygen, and turbidity, groundwater samples will be collected directly from the low-flow pump outlet where practical. Care will be taken to not handle the seal or lid of the container. The containers will be filled to eliminate headspace and the seals/lids will be secured. The sample container will be labeled in accordance with the Sampling and Analysis Plan (Appendix A). Applicable information will be logged on a Chain of Custody form and the sample will be placed into an iced cooler for transport to the laboratory under chain-of-custody protocols. Well caps and monuments will be secured following sampling. Any damaged or defective well caps or monuments will be noted and scheduled for replacement, if necessary.

2.2.5 Laboratory Analyses

The quarterly groundwater sampling and analysis program includes measuring the depth to groundwater and collecting groundwater samples for analysis for halogenated volatile organic

compounds (HVOCs) in four consecutive quarters. Table 2 provides a summary of the laboratory analyses by monitoring well specific to each sampling event. The analytical methods, sampling containers, and number of samples are delineated in the Sampling and Analysis Plan (Appendix A). Additional analyses will be conducted as summarized below and on Table 2:

- Quarter 1 (Winter 2010)—Analysis will include HVOCs by U.S. Environmental Protection Agency (EPA) Method 8260B at all monitoring wells installed.
- Quarter 2 (Spring 2010)—Analysis will include HVOCs by EPA Method 8260B; 1,4-dioxane by EPA Method 8270C; total and dissolved manganese and iron by EPA Method 6010; and natural attenuation parameters, as discussed in the Sampling and Analysis Plan (Appendix A). Analysis for HVOCs; 1,4-dioxane; and total and dissolved manganese and iron will be conducted at monitoring wells throughout the Capital monitoring well network. Analysis for natural attenuation parameters will be conducted at a subset of monitoring wells within the Capital monitoring well network (Table 2).
- Quarter 3 (Summer 2010)—Analysis will include HVOCs by EPA Method 8260B at all monitoring wells within the Capital monitoring well network.
- Quarter 4 (Fall 2010)—Analysis will include HVOCs by EPA Method 8260B at all monitoring wells within the Capital monitoring well network, and analysis for natural attenuation parameters at a subset of monitoring wells within the Capital monitoring well network (Table 2).

2.2.6 Aquifer Characterization

Slug testing will be conducted at selected monitoring wells screened in the Water Table, Shallow, and Intermediate Zones. The primary objective of the slug test is to estimate the hydraulic conductivity and transmissivity of the three aquifer zones. The locations of the monitoring wells to be used for slug testing, the slug testing procedures, and data analysis methodology will be discussed with Ecology prior to implementation. Standard slug testing procedures are described in Farallon SOP No. FAR-107 included in Attachment 1 of Appendix A.

2.3 FIELD DOCUMENTATION

Field forms will be prepared to document observations and data collected as part of the groundwater monitoring program. Field personnel will record daily activities on a Field Report form. Water-level measurements and well condition inspection notes will be recorded on the Water Level Measurement Form. Groundwater sampling details, including field parameters, purge measurements, sample inventory, and equipment used will be documented on a Groundwater Sampling Form. Additional forms may be used to aid in field work as determined by field personnel. Examples of the field forms to be used are provided in Attachment 2 of Appendix A. Other documentation will be prepared in accordance with the RI Work Plan.

2.4 INVESTIGATION-DERIVED WASTE MANAGEMENT

Purge water removed from monitoring wells will be collected and returned to the Capital Property where it will be stored in sealed and labeled 55-gallon drums and secured pending waste profiling results. The purge water will be consolidated for disposal. Disposable sampling and health and safety equipment will be discarded in appropriate waste dumpsters.

3.0 VAPOR INTRUSION ASSESSMENT REQUIREMENTS

Groundwater monitoring results will be evaluated to satisfy the requirements of the Capital VI Assessment Work Plan (Farallon 2008b). The VI Assessment Work Plan addresses methods to evaluate the VI exposure pathway for HVOCs to commercial and industrial buildings located within the Capital Area of Investigation (Figure 3). The VI Assessment Work Plan specifies evaluation of groundwater monitoring results for selected wells near those buildings to identify buildings for potential Tier 3 assessment. (The VI Assessment Work Plan provides a discussion of the tiered VI decision process.)

4.0 REPORTING

Groundwater monitoring results will be included in quarterly Progress Reports, as required under the Agreed Order. These reports will include a summary of groundwater monitoring data presented in tables and figures. Figures may include groundwater contour maps based on the groundwater data collected during the reporting period, an interpretation of plume conditions based on the chemical data collected during the reporting period, and cross sections demonstrating the nature and extent of COCs in the area of investigation. At a minimum, progress reports for the second and fourth groundwater monitoring events will include figures to the level of detail noted above.

The Remediation Investigation Report, to be prepared after completion of four consecutive quarterly groundwater monitoring events, will include a summary of the groundwater monitoring and soil sampling results and will present the nature and extent of COCs in the Capital Area of Investigation to the extent known, based on the data collected before and during groundwater monitoring.

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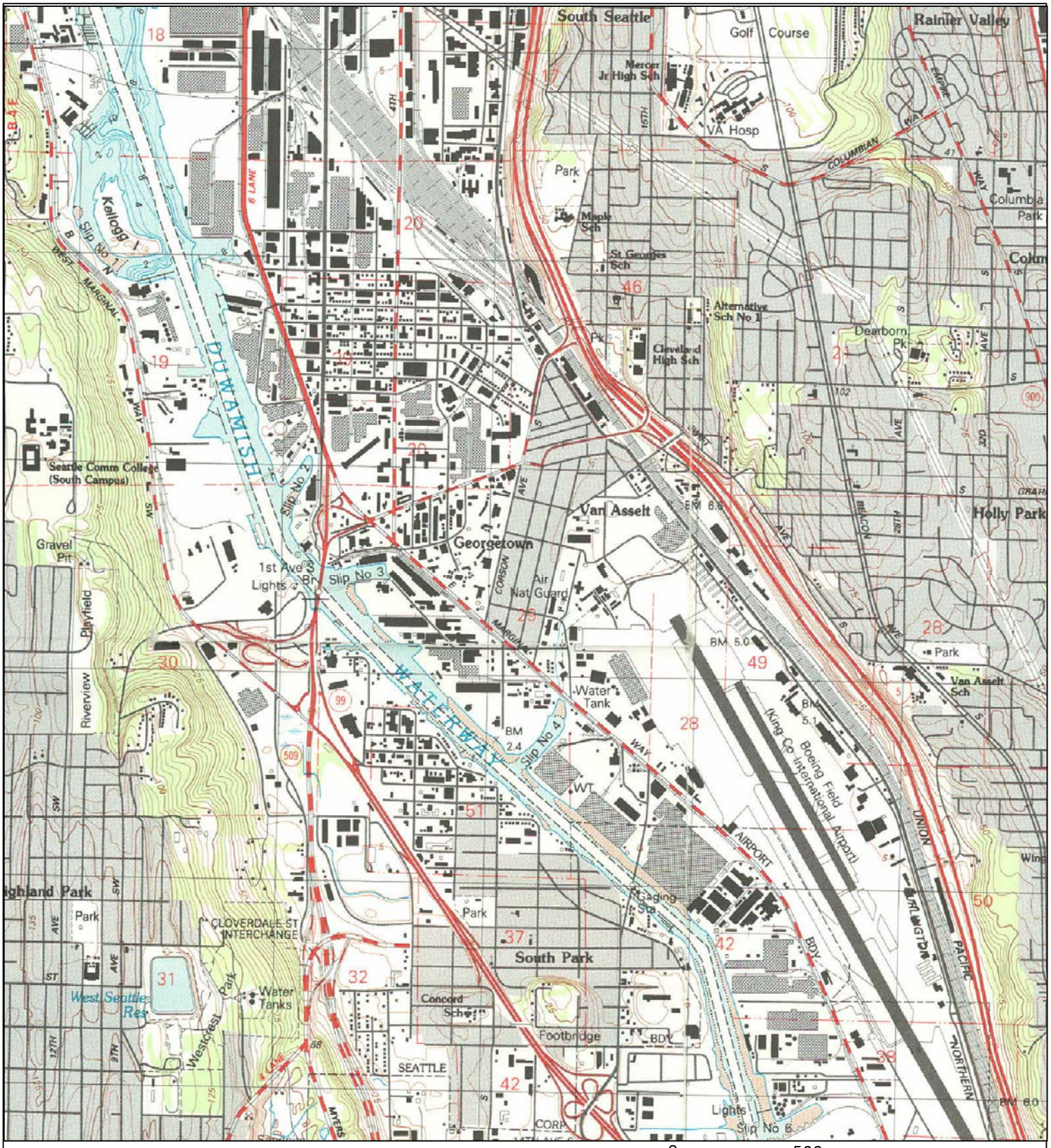
FIGURES

GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004



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APPROXIMATE SCALE IN METERS

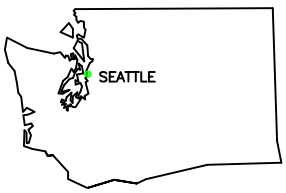


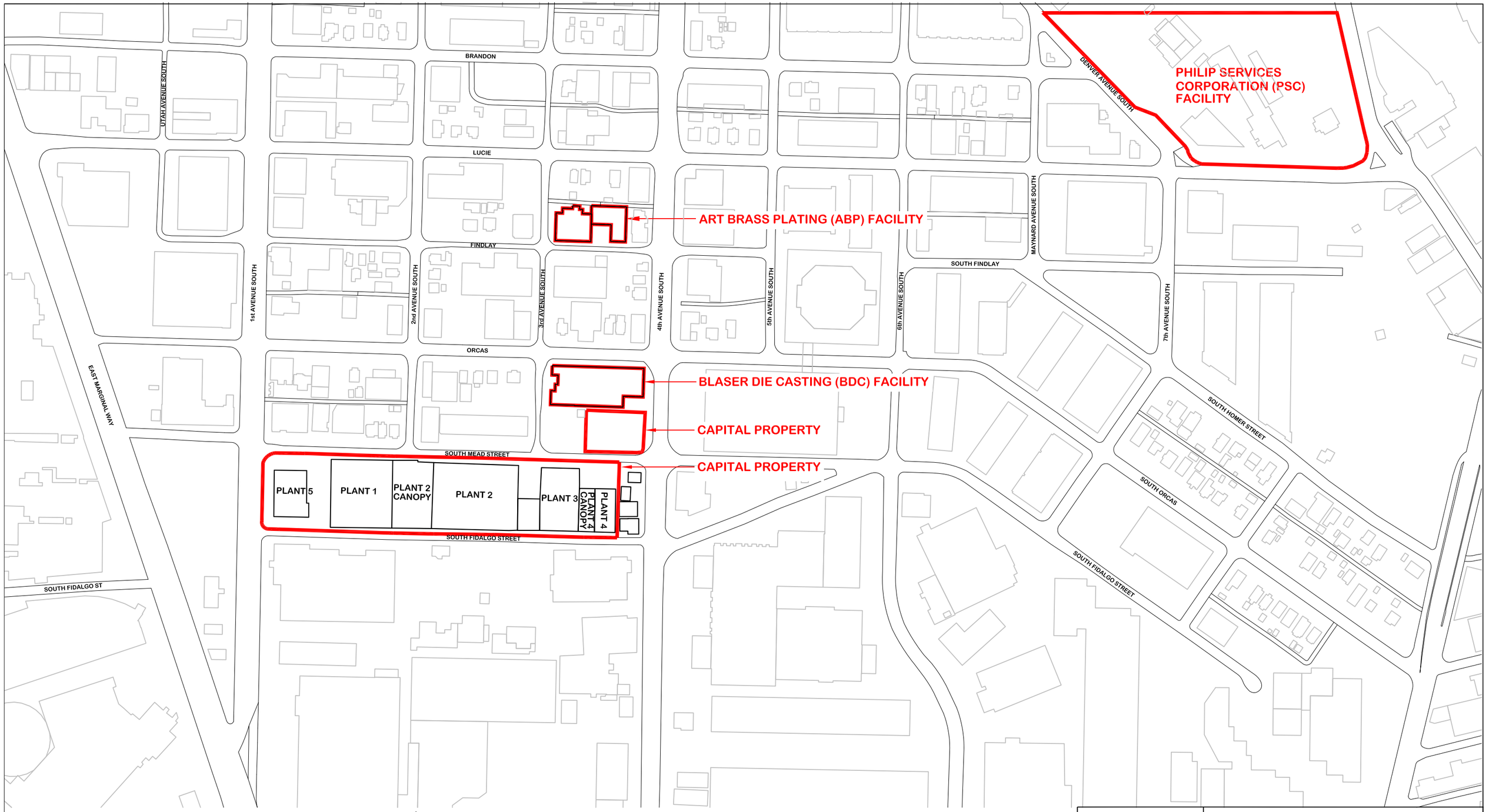
FIGURE 1

CAPITAL AREA OF INVESTIGATION LOCATION MAP
GROUNDWATER MONITORING PLAN
CAPITAL INDUSTRIES, INC.
SEATTLE, WASHINGTON

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC	Date: 2/09/10	Disk Reference: 457004h



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Issaquah, WA 98027

FIGURE 2

REGIONAL PLAN MAP
GROUNDWATER MONITORING PLAN
CAPITAL INDUSTRIES, INC.
SEATTLE, WASHINGTON

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC/PJ	Date: 2/09/10	Disk Reference: 457004h

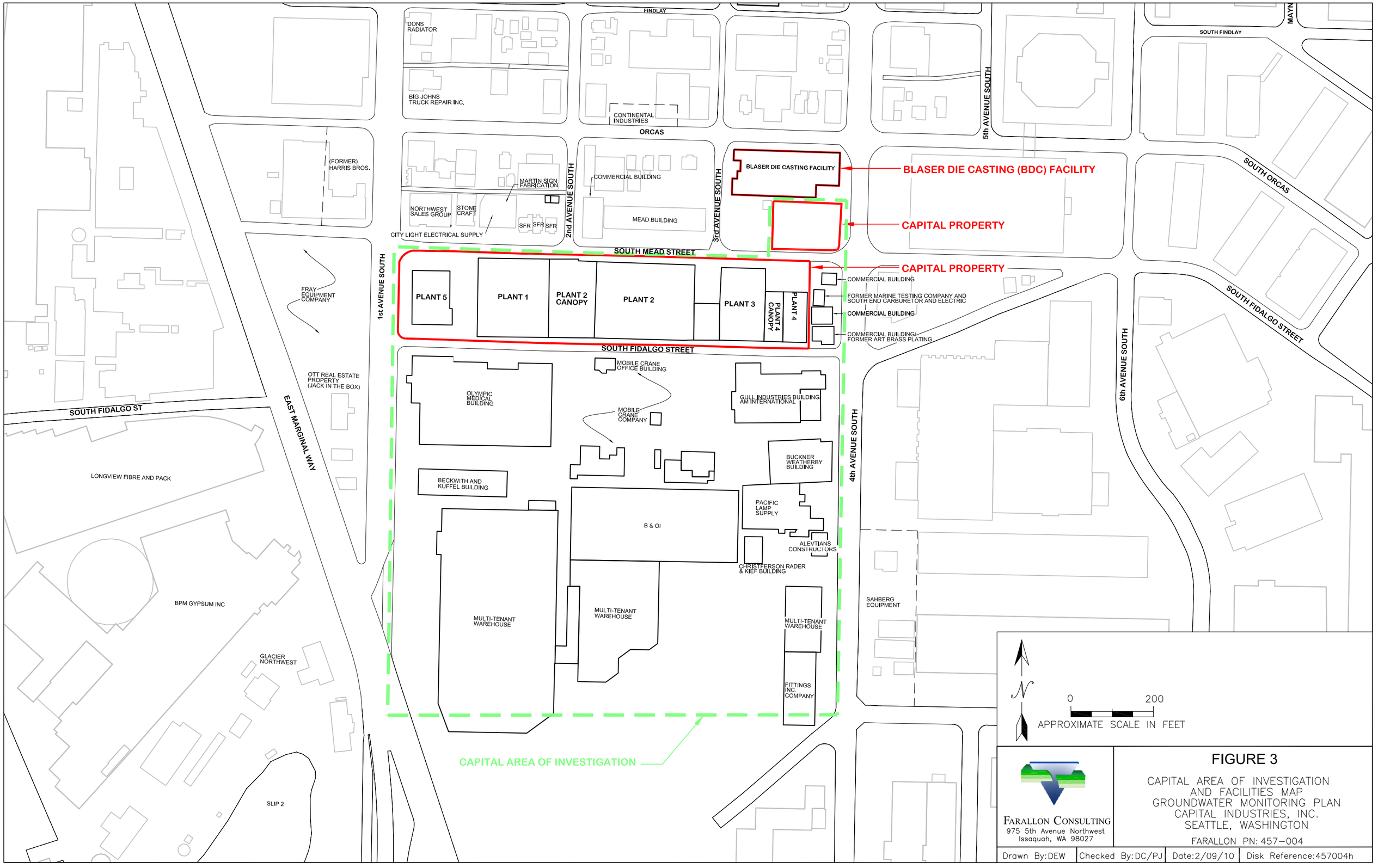

FIGURE 3

CAPITAL AREA OF INVESTIGATION
AND FACILITIES MAP
GROUNDWATER MONITORING PLAN
CAPITAL INDUSTRIES, INC.
SEATTLE, WASHINGTON

FARALLON PN: 457-004

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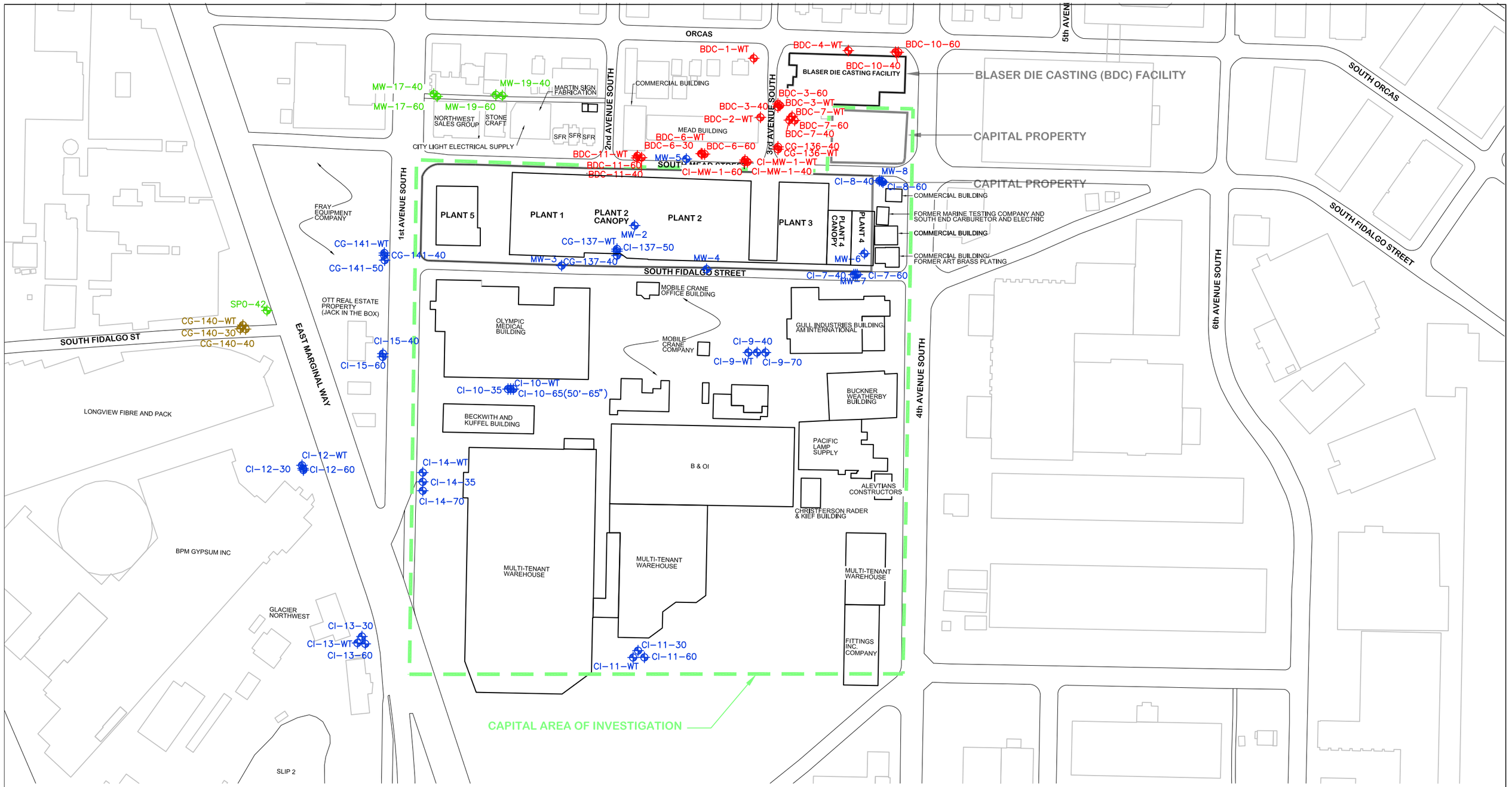
Issaquah, WA 98027

Drawn By: DEW	Checked By: DC/PJ	Date: 2/09/10	Disk Reference: 457004h



0 200
APPROXIMATE SCALE IN FEET

N

LEGEND

- CAPITAL INDUSTRIES MONITORING WELL
- BLASER DIE CASTING BORING MONITORING WELL
- PSC MONITORING WELL
- ART BRASS PLATING BORING MONITORING WELL

ALL LOCATIONS ARE APPROXIMATE

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Issaquah, WA 98027

FIGURE 4

SITE PLAN SHOWING
MONITORING WELL NETWORK LOCATIONS
GROUNDWATER MONITORING PLAN
CAPITAL INDUSTRIES, INC.,
SEATTLE, WASHINGTON

FARALLON PN: 457-004

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TABLES

GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

Table 1
Groundwater Monitoring Well Network Details
Groundwater Monitoring Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Monitoring Well or Well Cluster	Installed By	Location Name[1]	Total Depth (feet below ground surface)	Screen Interval (feet below ground surface)	Screen Length (feet)	Aquifer Zone[2]
CI-1	Capital	MW-1	20	10 to 20	10	Water Table
	BDC	CI-MW-1-40	40	30 to 40	10	Shallow
	BDC	CI-MW-1-60	60	50 to 60	10	Intermediate
MW-2	Capital	MW-2	20	10 to 20	10	Water Table
MW-3	Capital	MW-3	20	10 to 20	10	Water Table
MW-4	Capital	MW-4	20	10 to 20	10	Water Table
MW-5	Capital	MW-5	20	10 to 20	10	Water Table
MW-6	Capital	MW-6	20	10 to 20	10	Water Table
CI-7	Capital	MW-7	20	10 to 20	10	Water Table
	Capital	**CI-7-40**	40	30 to 40	10	Shallow
	Capital	**CI-7-60**	60	50 to 60	10	Intermediate
CI-8	Capital	MW-8	20	10 to 20	10	Water Table
	Capital	**CI-8-40**	40	30 to 40	10	Shallow
	Capital	**CI-8-60**	60	50 to 60	10	Intermediate
CI-9	Capital	**CI-9-WT**	20	10 to 20	10	Water Table
	Capital	**CI-9-40**	40	30 to 40	10	Shallow
	Capital	**CI-9-70**	70	60 to 70	10	Intermediate
CI-10	Capital	**CI-10-WT**	20	10 to 20	10	Water Table
	Capital	**CI-10-35**	35	25 to 35	10	Shallow
	Capital	**CI-10-65**	65	50 to 65	15	Intermediate
CI-11	Capital	**CI-11-WT**	20	10 to 20	10	Water Table
	Capital	**CI-11-30**	30	20 to 30	10	Shallow
	Capital	**CI-11-60**	60	50 to 60	10	Intermediate
CI-12	Capital	**CI-12-WT**	20	10 to 20	10	Water Table
	Capital	**CI-12-30**	30	20 to 30	10	Shallow
	Capital	**CI-12-60**	60	50 to 60	10	Intermediate
CI-13	Capital	**CI-13-WT**	20	10 to 20	10	Water Table
	Capital	**CI-13-30**	30	20 to 30	10	Shallow
	Capital	**CI-13-60**	60	50 to 60	10	Intermediate
CI-14	Capital	**CI-14-WT**	20	10 to 20	10	Water Table
	Capital	**CI-14-35**	35	25 to 35	10	Shallow
	Capital	**CI-14-70**	70	60 to 70	10	Intermediate
CI-15	Capital	**CI-15-40**	40	40 to 50	10	Shallow
	Capital	**CI-15-60**	60	50 to 60	10	Intermediate
CI-137	PSC	CG-137-WT	20	10 to 20	10	Water Table
	PSC	CG-137-40	40	30 to 40	10	Shallow
	Capital	**CI-137-50**	50	40 to 50	10	Intermediate
CG-141	PSC	CG-141-WT	20	10 to 20	10	Water Table
	PSC	CG-141-40	40	30 to 40	10	Shallow
	PSC	CG-141-50	50	40 to 50	10	Intermediate

NOTES:

[1]Monitoring wells denoted in **bold** were installed in Winter/Spring 2010.

[2]Aquifer zone are defined as Water Table = approximately 10 to 20 feet below ground surface (bgs), Shallow = 20 to 40 feet bgs, and Intermediate = 40 to 70 feet bgs.

PSC = Philip Service Corporation

Table 2
Groundwater Monitoring Analysis Schedule
Groundwater Monitoring Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Well Identification	Remedial Investigation Period[1,2]															
	Quarter 1 - Winter 2010				Quarter 2 - Spring 2010				Quarter 3 - Summer 2010				Quarter 4 - Fall 2010			
	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5]	NA Parameters[6]	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5]	NA Parameters[6]	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5]	NA Parameters[6]	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5,7]	NA Parameters[6]
Water Table Zone																
MW-2	x				x	x	x		x				x			
MW-3	x				x	x	x		x				x			
MW-4	x				x	x	x		x				x			
MW-5	x				x	x	x		x				x			
MW-6	x				x	x	x		x				x			
MW-7	x				x	x	x	x	x				x		x	x
MW-8	x				x	x	x		x				x			
CI-9-WT					x	x	x	x	x				x		x	x
CI-10-WT	x				x	x	x	x	x				x		x	x
CI-11-WT					x	x	x	x	x				x		x	x
CI-12-WT	x				x	x	x		x				x			
CI-13-WT					x	x	x	x	x				x		x	x
CI-14-WT					x	x	x		x				x			
CG-137-WT	x				x	x	x	x	x				x		x	x
CG-141-WT	x				x	x	x		x				x			
CI-MW-1-WT					x	x	x		x				x			
Shallow Zone																
CI-7-40	x				x	x	x	x	x				x		x	x
CI-8-40	x				x	x	x		x				x			
CI-9-40					x	x	x	x	x				x		x	x
CI-10-35	x				x	x	x	x	x				x		x	x
CI-11-30					x	x	x	x	x				x		x	x
CI-12-30	x				x	x	x		x				x			
CI-13-30					x	x	x	x	x				x		x	x
CI-14-35					x	x	x		x				x			
CI-15-40	x				x	x	x		x				x			
CI-16-35					x	x	x		x				x			
CG-137-40	x				x	x	x	x	x				x		x	x
CG-141-40	x				x	x	x		x				x			
CI-MW-1-40					x	x	x		x				x			
Intermediate Zone																
CI-7-60	x				x	x	x	x	x				x		x	x
CI-8-60	x				x	x	x		x				x			
CI-9-70					x	x	x	x	x				x		x	x
CI-10-70	x				x	x	x	x	x				x		x	x
CI-11-60					x	x	x	x	x				x		x	x
CI-12-60	x				x	x	x		x				x			
CI-13-60					x	x	x	x	x				x		x	x
CI-14-70					x	x	x		x				x			
CI-15-60	x				x	x	x		x				x			
CI-137-50	x				x	x	x	x	x				x		x	x
CG-141-50	x				x	x	x		x				x			
CI-MW-1-60					x	x	x		x				x			

NOTES:

[1]The Remedial Investigation period and sampling schedule is based on the anticipated well installation schedule.

[2]Field parameters will be collected from wells that are sampled for groundwater quality. Parameters will include turbidity, temperature, pH, conductivity, dissolved oxygen, and oxidation-reduction potential.

[3]HVOCs (halogenated volatile organic compounds) will be analyzed with standard detection limits by U.S. Environmental Protection Agency (EPA) Method 8260B.

[4]1,4-Dioxane will be analyzed by EPA Method 8270C Modified.

[5]Redox metals include ferrous iron, ferric iron, and manganese analyzed by EPA Method 8260B or 6020.

[6]NA Parameters (Natural attenuation parameters) include nitrate, nitrite, and sulfate for analysis by EPA Method 300.0; alkalinity for analysis by EPA Method SM2320B; ethane, ethene, and methane for analysis by EPA Method 8015B; total organic carbon for analysis by EPA Method 415.1; sulfide for analysis by EPA Method 376.1; and chloride for analysis by EPA Method 325.2/325.3/MSA 10-3.

[7]Proposed Monitoring well proposed for sampling and analysis of redox metals for the fourth quarterly monitoring event are preliminary only. Final sampling and analysis locations will be determined based on the second quarterly groundwater monitoring event. Proposed locations will be discussed with the Washington State Department of Ecology prior to finalizing forth quarter monitoring locations.

APPENDIX A
SAMPLING AND ANALYSIS PLAN

GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

FARALLON consulting

975 5th Avenue Northwest, Issaquah, Washington 98027
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SAMPLING AND ANALYSIS PLAN

Appendix A of the Groundwater Monitoring Plan

CAPITAL INDUSTRIES, INC.
5801 3rd 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:
Mr. Ron Taylor
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington 98108

May 19, 2010

Prepared by:

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Reviewed by:

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Principal

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ATTACHMENTS

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been prepared as Appendix A of the Groundwater Monitoring Plan prepared by Farallon Consulting, L.L.C. (Farallon) on behalf of Capital Industries, Inc. (Capital) to present the specific requirements for sample collection and analytical activities for monitoring well installation, groundwater monitoring, and collection and analysis of groundwater samples to be conducted for the Remedial Investigation (RI) of the Capital Area of Investigation (Figures 1 and 2). The Capital Area of Investigation was defined in the Agreed Order 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 South Mead Street and west of 4th Avenue South in Seattle, Washington (Figure 3)., Based on the results of reconnaissance groundwater and groundwater samples collected during the first phase of the RI, the Capital Area of Investigation has been redefined as the area south of South Mead Street, north of South Front Street, west of 4th Avenue South, and east of the Duwamish Waterway in Seattle, Washington (Figure 3). The Capital Area of Investigation does not define the 'Capital Site' per WAC 173-340-200 and does not imply that concentrations of volatile organic compounds (VOCs) in groundwater that may have been released from the Capital property is discharging to the Duwamish Waterway at concentrations above the screening levels. 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 after completion of the RI 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. The groundwater monitoring is being conducted as part of the RI at the Capital Area of Investigation. A Quality Assurance Project Plan (QAPP) has been prepared for the RI and is provided in Appendix B of the Groundwater Monitoring Plan.

This 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 (WAC 173-340-350 and 173-340-820) and in accordance with the Agreed Order. The SAP presents specific methodologies for the sample collection and analysis that will be conducted in accordance with technically acceptable protocols and will meet the data quality objectives defined in the QAPP (Appendix B of the Groundwater Monitoring Plan). The SAP provides standard operating procedures (SOPs) pertaining to sampling equipment, sample collection and handling, and the laboratory analysis that will be used for monitoring well installation and groundwater monitoring and sampling. The SAP provides a basis for planning field activities and a mechanism for implementing quality assurance requirements.

1.1 PURPOSE

The purpose of the SAP is to:

- Provide the basis for conducting field activities to meet the scope of work described in the *Remedial Investigation Work Plan, Capital Industries, Inc.* dated September 16, 2008, prepared by Farallon (RI Work Plan) and in the Groundwater Monitoring Plan;

- Identify monitoring well locations and monitoring well installation, design, and procedures;
- Delineate the sample quantities, analytical methods, and documentation for the sampling program; and
- Describe the equipment, procedures, and methodology to be used for groundwater sample collection.

1.2 ORGANIZATION

The SAP is organized into the following sections:

- **Section 2—Sampling Objectives and Scope**: This section summarizes the objectives and scope of the sampling program, including the investigation area and work elements.
- **Section 3—Sampling Locations and Equipment**. This section describes the monitoring well installation and groundwater monitoring activities to be conducted.
- **Section 4—Sampling Procedures and Designation**. This section details the procedures that will be followed for groundwater monitoring and sampling.
- **Section 5—Laboratory Analysis**. This section describes the laboratory analysis to be conducted for the Groundwater Monitoring Plan.
- **Section 6—Sample Handling**. This section provides details on groundwater sample handling, packaging, shipment, documentation, and quality assurance/quality control (QA/QC) samples.
- **Section 7—Management of Investigation-Derived Waste**. This section describes the waste handling, profiling, and disposal procedures that will be followed for the groundwater monitoring program.
- **Section 8—Field Documentation**. This section summarizes the field documentation procedures and forms that will be used during implementation of the Groundwater Monitoring Plan.
- **Section 9—Schedule**. This section presents the tentative schedule for the quarterly groundwater monitoring events.

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 identify the COCs and define the extent of the "Capital Site"; evaluate the impact of human health and the environment; and collect sufficient information to develop a conceptual site model to enable evaluation and selection of a cleanup action for the Capital Site. This SAP presents the specific requirements for monitoring well installation and groundwater sample collection and analysis for the RI field program.

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

The SAP provides specific procedures for the following:

- Installation and development of 25 monitoring wells located up-, down-, and cross-gradient of the Capital Property (Figure 4); and
- Collection and analysis of groundwater samples collected from monitoring wells located within the Capital Area of Investigation.

3.0 SAMPLING LOCATIONS AND EQUIPMENT

This section describes the monitoring well installation and groundwater monitoring activities to be conducted to meet the requirements of the RI Work Plan and the Groundwater Monitoring Plan. The groundwater monitoring will be conducted in accordance with WAC 173-340-820 and the attached SOPs (Attachment 1).

The groundwater monitoring field program includes collection of groundwater samples from monitoring wells. Prior to initiating monitoring well installation, Farallon will review surface structures and as-built utility maps, if available, and will contact a private utility location service to confirm the location of subsurface utilities. Monitoring well locations will be coordinated with property personnel, specific requirements of property operational procedures, and public rights-of-way.

3.1 MONITORING WELL INSTALLATION AND DEVELOPMENT

A total of 25 new monitoring wells will be installed, adding to the 12 existing monitoring wells previously installed (Figure 4). The monitoring wells will be advanced using hollow-stem auger drilling methods and constructed in accordance with the SOPs provided in Attachment 1. Each of the proposed monitoring well locations is proximate to a Tier 1 or Tier 2 sampling location, where soil samples were collected and logged continuously and select soil samples were submitted for laboratory analysis of halogenated volatile organic compounds (HVOCs) and total organic carbon. Collection of additional soil samples is not necessary.

Installation and development of the monitoring wells will follow SOP No. FAR-101 for well construction and SOP No. FAR-102 for development. The monitoring wells will be constructed in accordance with WAC 173-160. All field equipment will be decontaminated between boring locations using the procedures described in SOP No. FAR-300 (Attachment 1).

Each monitoring well will be constructed using 2-inch-diameter Schedule 40 polyvinyl chloride (PVC) well casing. The monitoring wells will be constructed with 10 feet of screen (with the exception of well CI-10-65, which will be constructed with 15 feet of screen) from the bottom of the well using 0.010-inch slotted Schedule 40 PVC pipe, and a sand filter pack will be emplaced from the bottom of the screened interval to approximately 2 feet above the top of the screened interval. The sand pack (filter pack) will use 10/20 Colorado Silica sand, which will be installed slowly or through a tremie pipe from the bottom of the screened interval to approximately 2 feet above the top of the screened interval. The volume of sand used will be compared to the calculated sand pack volume prior to well installation in accordance with SOP No. FAR-101. The annular seal between the boring and the 2-inch PVC casing will be installed using 3/8-inch bentonite pellets with a minimum thickness of 3 feet, followed by pumping cement/bentonite grout (at least 6 percent high yield bentonite powder mixed with Portland cement) into the annulus with a tremie pipe. The grout will be pumped into the borehole at least 30 minutes after the bentonite pellet layer is installed. Each monitoring well will have a locking cap and will be completed with flush-mounted, traffic-rated 8-inch steel covers with security bolts.

The screened intervals and total depth in each monitoring well will be designed to screen a discrete range within the Water Table Zone, the Shallow Zone, or the Intermediate Zone, described in Section 3.1.1, Monitoring Well Locations. The specific screened interval of each planned monitoring well was selected based on the results of the first-phase reconnaissance groundwater sampling results. The depths and screen intervals of the existing and planned monitoring wells are summarized in Table 1.

The locations and screened intervals of the planned monitoring wells combined with the existing monitoring wells will allow a comprehensive evaluation of both vertical and horizontal groundwater gradients, as well as allow for collection of groundwater samples for analysis of COPCs and natural attenuation parameters within each of the three zones across the Capital Area of Investigation.

Monitoring well development will occur shortly after well construction has been completed to ensure removal of fine-grained sediment from the vicinity of the well screen. This procedure allows groundwater to flow freely into the monitoring well and reduces the turbidity of groundwater during sampling. Well development will be conducted in accordance with the SOPs provided in Attachment 1. Each well will be surged using a stainless steel or PVC surge rod to flush water into the soil surrounding the well screen to loosen fine-grained sediment and pull it into the well. The surge rod will be removed from the monitoring well and a submersible pump will be used to evacuate the water from the monitoring well. This process will be repeated until three to five well-volumes of water has been removed from the monitoring well, the monitoring well is purged dry, or visual observation indicates that sediment is no longer present in the groundwater.

Decontamination water and purged groundwater generated during installation and development of the monitoring wells will be temporarily stored on the Capital Property pending receipt of laboratory analytical data and waste profiling. Decontamination water and purged groundwater generated during installation and development of the monitoring wells will be handled as described in Section 7.2, Wastewater.

Following installation of the monitoring wells, the top of the casing in each monitoring well will be surveyed relative to mean sea level. A professional surveyor licensed in the State of Washington will survey the horizontal and vertical location of the top of each well casing and the top of each monument relative to the vertical datum NAVD88.

3.1.1 Monitoring Well Locations

The monitoring well network consists of existing monitoring wells previously installed by Capital and the Philip Service Corporation (PSC), and monitoring wells to be installed by Capital. The locations for the monitoring wells to be installed have been approved by Ecology and are designed to complete the monitoring well network to assess groundwater in the three water-bearing zones defined for the Capital Area of Investigation (Farallon 2008). The water-bearing zones are defined as:

- The Water Table Zone, the water-bearing zone from first-encountered groundwater to approximately 20 feet bgs;

- The Shallow Zone, the water-bearing zone from 20 to 40 feet bgs; and
- The Intermediate Zone, the upper portion of the intermediate water-bearing zone deeper than 40 feet bgs to 70 feet bgs. Existing monitoring wells are shown on Figure 4 and include monitoring wells MW-2 through MW-8 installed by Capital into the Water Table Zone only; CG-137-WT and CG-137-40 installed by PSC into the Water Table Zone and the Shallow Zone, respectively; and CG-141-WT, CG-141-40, and CG-141-50 installed by PSC into the Water Table Zone, the Shallow Zone, and the Intermediate Zone, respectively (Table 1; Figure 4).

The locations of the existing monitoring wells and the monitoring wells to be installed are shown on Figure 4. The monitoring wells to be installed will be completed as monitoring well clusters, where monitoring wells at a similar location are screened in each of the zones, to complete the Capital monitoring well network (Figure 4).

3.2 GROUNDWATER MONITORING AND SAMPLING

Groundwater monitoring will be conducted at the following individual and clustered monitoring well locations (Figure 4):

- Monitoring well cluster MW-1, consisting of monitoring wells MW-1, MW-1-40, and CI-MW-1-60, located up-gradient of Capital Plant 2;
- Monitoring well MW-2, located within Capital Plant 2;
- Monitoring well MW-3, located south of Capital Plant 1;
- Monitoring well MW-4, located south of Capital Plant 2;
- Monitoring well MW-5, located north of Capital Plant 2;
- Monitoring well MW-6, located within Capital Plant 4;
- Monitoring well cluster CI-7, consisting of monitoring wells MW-7, CI-7-40, and CI-7-60, located south of Capital Plant 4;
- Monitoring well cluster CI-8, consisting of monitoring wells MW-8, CI-8-40, and CI-8-60, located north of Capital Plant 4;
- Monitoring well cluster CI-9, consisting of monitoring wells CI-9-WT, CI-9-40, and CI-9-70, located west-southwest of the Gull Industries Building;
- Monitoring well cluster CI-10, consisting of monitoring wells CI-10-WT, CI-10-35, and CI-10-65, located south of the Olympic Medical Building and north of the Beckwith and Ruffel, Inc. Building;
- Monitoring well cluster CI-11, consisting of monitoring wells CI-11-WT, CI-11-30, and CI-11-60, located south of the easternmost multi-tenant warehouse;
- Monitoring well cluster CI-12, consisting of monitoring wells CI-12-WT, CI-12-30, and CI-12-60, located east of the BPM Gypsum, Inc. facility;

- Monitoring well cluster CI-13, consisting of monitoring wells CI-13-WT, CI-13-30, and CI-13-60, located north-northeast of Slip 2 on the Glacier Northwest property;
- Monitoring well cluster CI-14, consisting of monitoring wells CI-14-WT, CI-14-35, and CI-14-70, located west of the westernmost multi-tenant warehouse;
- Monitoring well cluster CI-15, consisting of monitoring wells CI-15-40 and CI-15-60, located east of the Ott Real Estate (Jack in the Box) Property in the City of Seattle right-of-way (sidewalk);
- Monitoring well cluster CI-137, consisting of PSC monitoring wells CG-137-WT and CG-137-40, located within the Capital Plant 2 Canopy, and Capital monitoring well CI-137-50, located south of the Capital Plant 2 Canopy; and
- Monitoring well cluster CG-141, consisting of PSC monitoring wells CG-141-WT, CG-141-40, and CG-141-50, located northeast of the Ott Real Estate (Jack in the Box) Property.

Groundwater monitoring and sampling will be conducted in accordance with the procedures described in the SOPs provided in Attachment 1. Groundwater samples collected from each monitoring well will be analyzed as described in Section 4, Sampling Procedures and Designation, and summarized in Table 2.

4.0 SAMPLING PROCEDURES AND DESIGNATION

This section summarizes the procedures and designation protocols to be implemented for groundwater monitoring and sampling at the Capital Area of Investigation. Specific SOPs for each of the sampling procedures are included in Attachment 1. Copies of the Field Report forms are included in Attachment 2.

4.1 SAMPLING PROCEDURES

The field sampling procedures for collecting and handling samples are described below and discussed in detail in the SOPs (Attachment 1).

4.1.1 Groundwater Monitoring and Sampling

Groundwater monitoring and sampling will be conducted at the monitoring wells as defined in Table 2. The SOPs for groundwater monitoring and sampling activities are provided in Attachment 1. Each groundwater monitoring and sampling event will consist of the following elements:

- Measurement of the depth to groundwater in accordance with SOP No. FAR-100;
- Low-flow purging of each monitoring well in accordance with SOP No. FAR-103;
- Field-monitoring of water quality parameters to determine parameter stability for sampling using a YSI multiparameter water quality meter in accordance with SOP No. FAR-201;
- Collection of groundwater samples in accordance with SOP No. FAR-103; and
- Decontamination of field equipment between sampling locations in accordance with SOP No. FAR-300.

Groundwater samples will be decanted from the 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 the sample is placed into the containers. The containers will be filled to eliminate headspace, and the seals/lids will be secured.

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° Celsius for transport to the laboratory. Standard chain-of-custody protocols will be maintained during sample transport and submittal to the laboratory.

4.2 SAMPLE DESIGNATION

No soil samples will be submitted for laboratory analysis during this portion of the RI. Each groundwater sample collected during groundwater monitoring will be assigned a unique sample identifier and number. The sample identifier and number will be recorded in indelible ink on a label that will be affixed to the corresponding container 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 initials; analytical method; and analyte preservative(s), if any. The sample designation procedures for groundwater samples collected during groundwater monitoring are detailed below.

4.2.1 Designation Procedures for Groundwater Monitoring and Sampling

The groundwater samples collected from the monitoring wells will be assigned a unique sample identifier that will include the components listed below:

- The well identification (e.g., MW-3); and
- The sample date (e.g., 041210).

For example, a groundwater sample collected from monitoring well MW-3 on April 12, 2010 would be numbered MW3-041210. The sample identification will be placed on the sample label, Field Report form, and Chain of Custody form.

5.0 LABORATORY ANALYSIS

This section describes the details of the laboratory analysis associated with groundwater monitoring activities that will be conducted to meet the requirements of the RI Work Plan and the Groundwater Monitoring Plan. Groundwater samples collected from the Water Table Zone, Shallow Zone, and Intermediate Zone will be analyzed for HVOCs by U.S. Environmental Protection Agency (EPA) Method 8260/8260 BSIMS. Groundwater samples collected during the second quarter of groundwater monitoring after all of the monitoring wells have been installed will also be analyzed for:

- 1,4-dioxane by EPA Method 8270C; and
- Total and dissolved manganese and iron by EPA Method 6010.

Groundwater samples collected during the second and fourth quarterly groundwater monitoring event will also be analyzed for the following natural attenuation parameters: alkalinity by EPA Method 310.2; sulfate by EPA Method 375.4; sulfide by EPA Method 376.1; nitrate and nitrite by EPA Method 353.2; chloride by EPA Method 325.2/325.3; ferrous iron and ferric iron by Method SM 3500-FeB/6010B; manganese by EPA Method 6010B; and methane, ethane, and ethane by EPA Method 8015B.

TestAmerica, Inc. of Bothell, Washington will conduct the analysis for 1,4-dioxane in the groundwater samples collected during the second quarter of groundwater monitoring. TestAmerica, Inc. is certified by Ecology and meets the QA/QC requirements of both Ecology and EPA. All other laboratory analyses of samples collected during each groundwater monitoring and sampling event will be conducted by OnSite Environmental Inc. of Redmond, Washington (OnSite). OnSite is certified by Ecology and meets the QA/QC requirements of Ecology and EPA. Copies of the laboratory quality assurance manuals for Test America, Inc. and OnSite are on file at the Farallon office for review and reference, are included in Attachment A of the QAPP, and will be followed throughout the RI. Ecology will have access to laboratory personnel, equipment, and records pertaining to sample collection, transportation, and analysis.

Table 3 summarizes the analytical methods, containers, preservation requirements, and hold time requirements for groundwater samples. Table 4 summarizes the estimated number of field and QA/QC samples to be submitted for analysis laboratory analysis and the analysis to be performed for groundwater. Table 5 provides a summary of the laboratory practical quantitation limits and preliminary screening levels for the contaminants to be analyzed.

Quality assurance/quality control (QA/QC) 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 groundwater monitoring and sampling. The protocols discussed include sample containers, preservation procedures, and hold times; sample packaging and shipment; sample documentation; and QA/QC samples. Additional details are provided in the SOPs provided in Attachment 1.

Upon transfer of the samples to laboratory personnel or arrival of the samples at the laboratory, the laboratory will assume responsibility for custody of the samples. Laboratory personnel will document the status of the shipping and handling containers, and the laboratory will use its 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 groundwater monitoring and sampling are based on the medium to be sampled and the type(s) of analysis to be performed. The containers, preservation procedures, and hold times for groundwater are shown in Table 3 and follow standard laboratory protocols.

6.2 SAMPLE PACKAGING AND SHIPMENT

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

The following procedures will be used for sample packaging, and represent the minimum shipping and handling requirements:

- Sample labels will be affixed to corresponding sample containers at the time of sample collection.
- Bubble-wrap bags or an 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 correct cooler.
- One copy of the Chain of Custody form will be detached and retained.
- Remaining paperwork will be sealed in a resealable plastic bag. The bag 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. Ice will be double-bagged in heavy-duty bags and/or garbage bags.

- The cooler will be sealed with a Chain of Custody seal.
- The cooler will be taped shut using strapping tape.
- The laboratory address will be affixed to the cooler(s).
- Extraneous stickers will be removed from the cooler(s).
- Farallon's return address on the cooler(s) will be confirmed.

6.3 SAMPLE DOCUMENTATION

Sample containers will be adequately identified with a durable label, and the sample identification will be recorded on the Chain of Custody form and the Field Report form (Attachment 2). Additional sample documentation to be maintained by field personnel includes Well Purging and Sampling Data forms, Chain of Custody seals, and sample labels. Examples of these forms are included in Attachment 2.

Sample containers 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.

At the time of sampling, the appropriate sample containers will be selected and the sample number for each sample will be recorded on the Field Report form. A Chain of Custody seal will be used to seal the cooler shut before shipping to ensure that no tampering occurs between the time the cooler is relinquished by field personnel and the time it arrives at the laboratory. The Chain of Custody seal will be attached so that it must be broken to open the shipping container. Information on the Chain of Custody seal will be checked against sample summary log entries, and samples will be recounted before they are removed from the site to verify that no samples have been misplaced. Prior to transfer of the samples off the site, chain-of-custody entries for all samples will be made on the Chain of Custody form.

Each Chain of Custody form will contain the following information: media, 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.

6.4.1 Trip and Transport Blanks

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.

6.4.2 Field Duplicate Samples

One or more field duplicate samples will be collected during each of the groundwater monitoring and sampling events. The field duplicate sample will be collected with the original sample as a split from one homogenized sample. The duplicate will be analyzed for the COPCs. Field duplicates will be collected at a frequency of 10 percent of the total samples collected (Table 4).

7.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste soil, wastewater, and other products generated during the RI may be contaminated and will be containerized and properly disposed of pending receipt of analytical results. Specific criteria that will be used to manage investigation-derived waste, including the 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 monitoring wells will be placed into Washington State Department of Transportation (WSDOT)-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 generated, origin, and level of personal protective equipment (e.g., Level D, Level C) used during waste production. Waste soil temporarily stored at the Capital Property will be tracked using a Waste Inventory form (Attachment 2).

No contaminated waste soil will remain at the Capital Property longer than 90 days after generation. Farallon will recommend an appropriate disposal facility based on the laboratory analytical data. The waste soil profiles will be provided to the selected landfill facility or permitted transport, storage, and disposal facility. Waste profiles and manifests will be forwarded to the generator for approval and signature prior to transport of the materials off the Capital Property. Waste soil will be removed in labeled WSDOT-approved containers by a licensed transporter. Documentation for waste soil disposal will be maintained in the project file.

7.2 WASTEWATER

Wastewater generated by equipment decontamination and well development and purging will be segregated and placed into 55-gallon drums for storage at the Capital Property during the monitoring well installation and groundwater monitoring and sampling phases. Purge water from each monitoring well will be placed into a different 55-gallon drum. Wastewater will not remain on the Capital Property longer than 90 days after generation. Wastewater generated by the investigation will be tracked using a Waste Inventory form.

Groundwater analytical data from the groundwater monitoring and sampling will be used to develop wastewater profiles. Based on the analytical results, Farallon will recommend an appropriate disposal facility. The waste profiles will be provided to the transport, storage, and disposal facility. The waste profiles and manifests will be forwarded to the generator for approval and signature prior to transport of the wastewater off the Capital Property in labeled WSDOT-approved containers. Documentation for wastewater disposal 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 Well forms, Monitoring Well Construction Data forms, Well Purging and Sampling Data forms, Waste Inventory forms, sample and Waste Material 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.

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 responsibilities, field equipment used, and any activities performed in a manner other than as specified in the SAP. In addition, if other forms or documents are completed or used (e.g., Chain of Custody form, well head survey, map) they will be referred to in and attached to the Field Report form. Field personnel will sign the Field Report form. An example of the Field Report form is included in Attachment 2.

8.2 LOG OF WELL FORM

A Log of Well form will be prepared by the Farallon Scientist for each hollow-stem auger boring during monitoring well installation. The log includes a depiction and description of hydrologic conditions (if possible), lithologic descriptions using the Unified Soil Classification System (if possible), and information on the potential presence of contamination. A copy of the Log of Well form is included in Attachment 2.

8.3 MONITORING WELL CONSTRUCTION DATA FORM

A Monitoring Well Construction Data form will be prepared for each monitoring well installed by the Farallon Scientist. The form includes well construction details and development information for the monitoring well. A copy of the Monitoring Well Construction Data form is included in Attachment 2.

8.4 WELL PURGING AND SAMPLING DATA FORM

A Well Purging and Sampling Data form will be used to record the depth to groundwater, well purging information, and other pertinent hydrologic measurements and supplementary information collected during groundwater sampling at each monitoring well during each groundwater sampling event. The form will be completed by the Farallon Scientist at the time of sample collection. A copy of a Well Purging and Sampling Data form is included in Attachment 2.

8.5 WASTE INVENTORY FORM

A Waste Inventory form will be used to document and track wastes generated during the RI. The form will include information on the waste container, origin and type of waste, date generated, date removed from the site, transporter, and disposal location. An example of the Waste Inventory form is included in Attachment 2.

8.6 SAMPLE LABELS

Sample labels are filled out and affixed to sample containers immediately prior to sample collection. The labels are filled out in indelible ink and include the following information: media, date and time sampled, sample identification and number, project name, project number, sampler's initials, and analyte preservative(s) if any. An example of a sample label is included in Attachment 2.

8.7 WASTE MATERIAL LABEL

A Waste Material label is filled out in indelible ink and affixed to a waste container immediately upon filling. The label includes the following information: job number and name, address where waste was generated, contents of the container, operation, date, consultant's name and telephone number, and sampler's initials. An example of a nonhazardous Waste Material label is included in Attachment 2.

8.8 CHAIN OF CUSTODY

A Chain of Custody form is filled out by the field sampling team any time samples are collected, transferred, stored, analyzed, or destroyed. The form is designed to be an accurate written record 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.

All samples submitted to a laboratory are accompanied by the Chain of Custody form. This form 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 appropriate storage conditions (e.g., ambient, refrigeration, frozen). The laboratory Project Manager assigned to a particular client is responsible for tracking the status of the samples throughout the laboratory. Samples are signed out of the Sample Control Room in a sample control logbook by the analyst who will prepare the samples for analysis.

The Chain of Custody form includes the following information: client, project name and number, date and time sampled, sample identification, sampler's initials, analysis, and analyte preservative(s), if any. An example of a Chain of Custody form is included in Attachment 2.

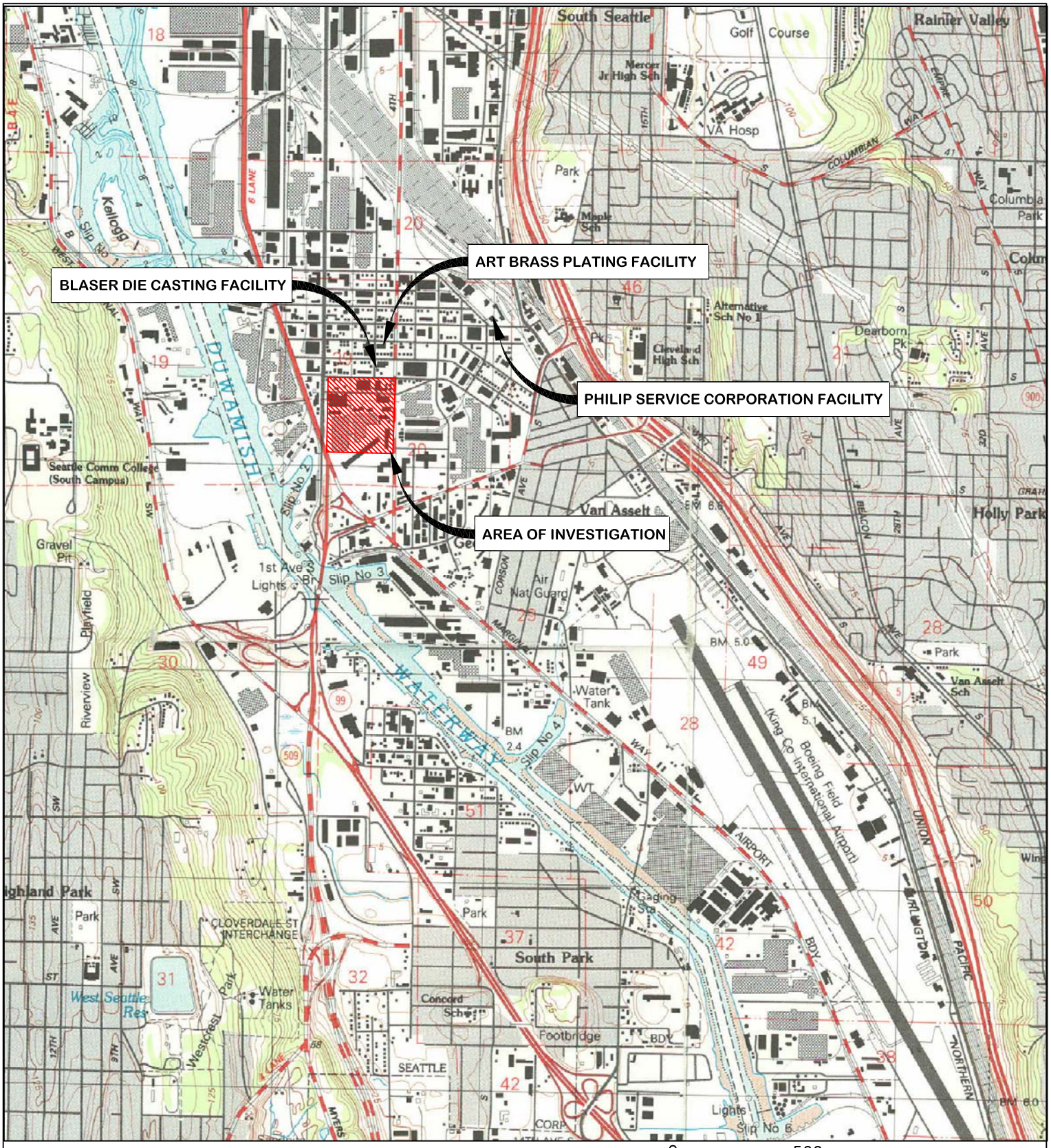
9.0 SCHEDULE

Variations to the groundwater monitoring well installation and sampling schedule may occur due to access complications. Capital has requested access to all of the private properties where monitoring wells are to be located. Capital's efforts have been documented with Ecology, who has assumed access negotiations with the owners of the properties where access has not been granted. Capital is proceeding with installation of monitoring wells where access has been granted. The Groundwater Monitoring Plan has been prepared under the assumption that the entire monitoring well network will be installed prior to the first quarterly groundwater monitoring event, scheduled for March/April 2010. However, access limitations may preclude installation of all of the monitoring wells prior to the first quarter of groundwater monitoring. As approved by Ecology, Farallon will conduct the first quarter of monitoring in March/April 2010 at the monitoring wells that have been installed. Farallon anticipates that all of the monitoring wells will be installed by the second quarter in June/July 2010.

FIGURES

SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

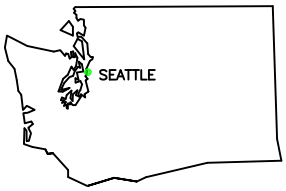
Farallon PN: 457-004



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

0 500

APPROXIMATE SCALE IN METERS



WASHINGTON

N

FIGURE 1

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

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC	Date: 2/09/10	Disk Reference: 457004h

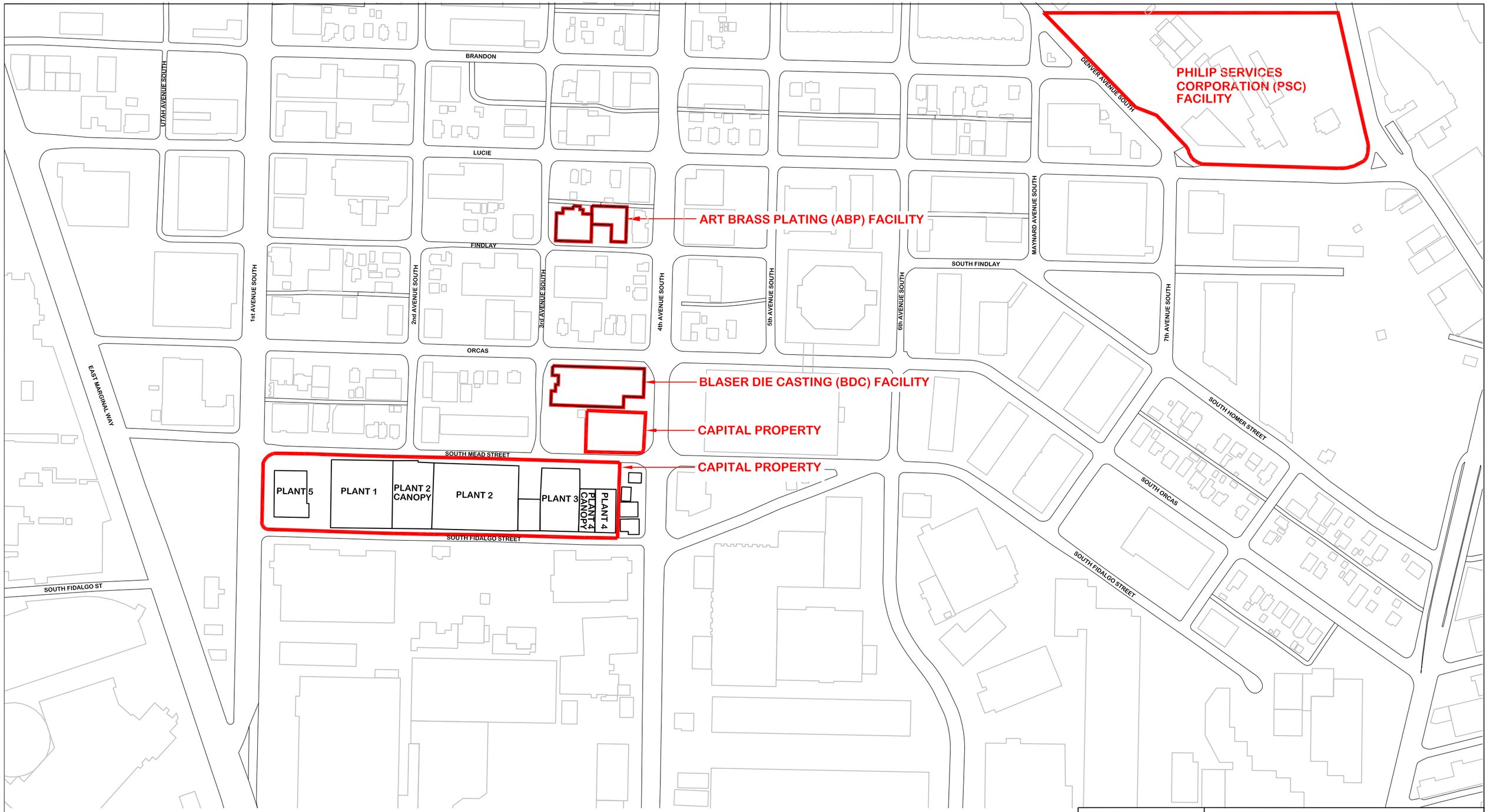


FIGURE 2

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

FARALLON PN: 457-004

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Drawn By: DEW	Checked By: DC/PJ	Date: 2/09/10	Disk Reference: 457004h

DONS RADIATOR
BIG JOHNS TRUCK REPAIR INC.
FINDLAY
CONTINENTAL INDUSTRIES
ORCAS
5th AVENUE SOUTH
SOUTH FINDLAY
(FORMER) HARRIS BROS.
MARTIN SIGN FABRICATION
NORTHWEST SALES GROUP
STONE CRAFT
SFR SFR SFR
CITY LIGHT ELECTRICAL SUPPLY
2nd AVENUE SOUTH
COMMERCIAL BUILDING
MEAD BUILDING
3rd AVENUE SOUTH
BLASER DIE CASTING FACILITY
BLASER DIE CASTING (BDC) FACILITY
CAPITAL PROPERTY
SOUTH ORCAS
SOUTH MEAD STREET
1st AVENUE SOUTH
CAPITAL PROPERTY
PLANT 5
PLANT 1
PLANT 2 CANOPY
PLANT 2
PLANT 3
PLANT 4 CANOPY
PLANT 4
COMMERCIAL BUILDING
FORMER MARINE TESTING COMPANY AND SOUTH END CARBURETOR AND ELECTRIC
COMMERCIAL BUILDING
COMMERCIAL BUILDING/ FORMER ART BRASS PLATING
SOUTH FIDALGO STREET
FRAY EQUIPMENT COMPANY
OTT REAL ESTATE PROPERTY (JACK IN THE BOX)
MOBILE CRANE OFFICE BUILDING
OLYMPIC MEDICAL BUILDING
MOBILE CRANE COMPANY
GULL INDUSTRIES BUILDING AM INTERNATIONAL
BUCKNER WEATHERBY BUILDING
SOUTH FIDALGO ST
EAST MARGINAL WAY
BECKWITH AND KUFFEL BUILDING
PACIFIC LAMP SUPPLY
B & OI
ALEVTIANS CONSTRUCTIONS
CHRISTFERSON RADER & KIEF BUILDING
4th AVENUE SOUTH
6th AVENUE SOUTH
SOUTH FIDALGO STREET
LONGVIEW FIBRE AND PACK
BPM GYPSUM INC
GLACIER NORTHWEST
MULTI-TENANT WAREHOUSE
MULTI-TENANT WAREHOUSE
MULTI-TENANT WAREHOUSE
FITTINGS INC. COMPANY
SAHBERG EQUIPMENT
SLIP 2
CAPITAL AREA OF INVESTIGATION

N

0 200

APPROXIMATE SCALE IN FEET

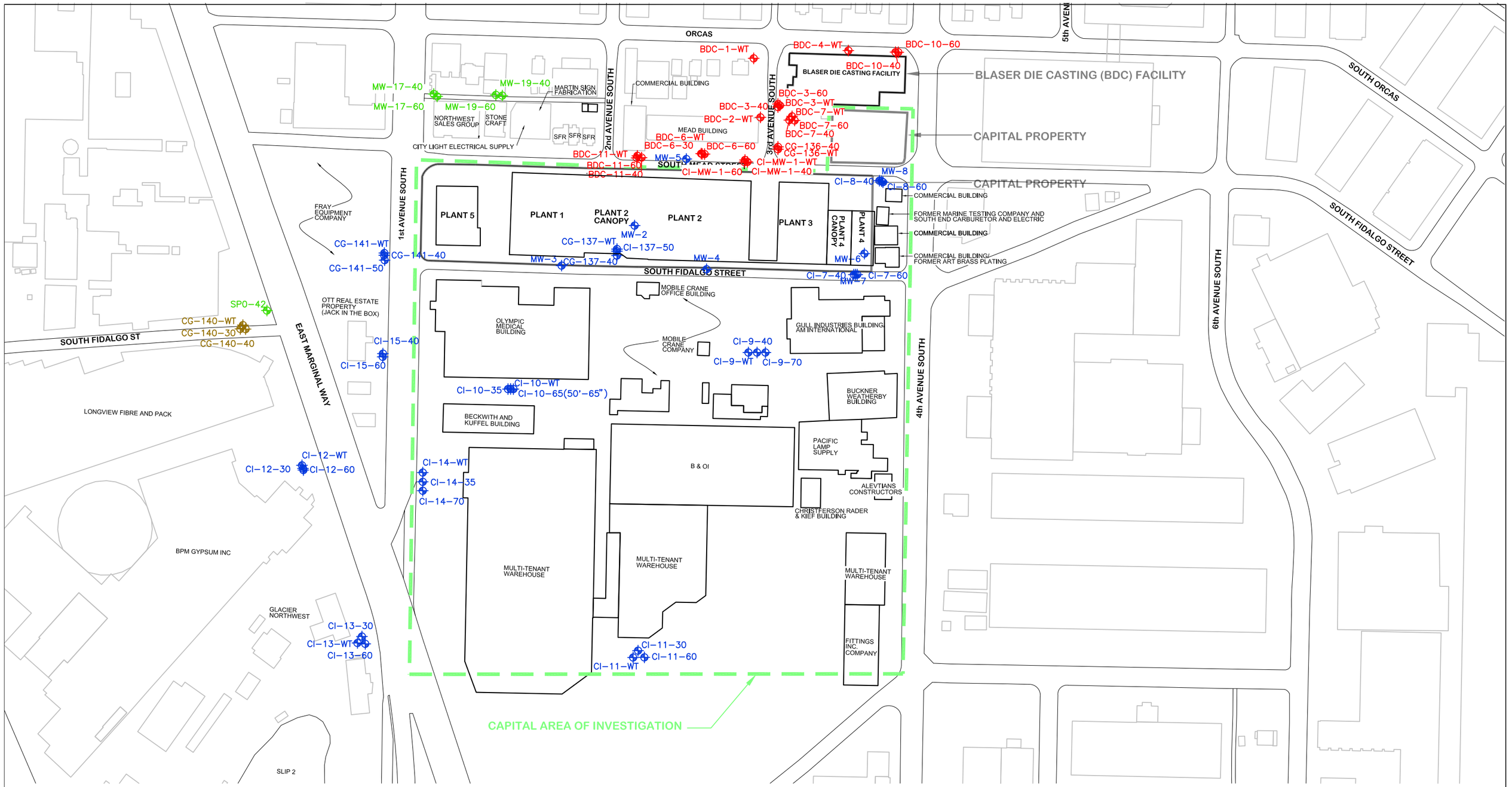
FIGURE 3

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

FARALLON PN: 457-004

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Drawn By: DEW	Checked By: DC/PJ	Date: 2/09/10	Disk Reference: 457004h



0 200

APPROXIMATE SCALE IN FEET

LEGEND

- CAPITAL INDUSTRIES MONITORING WELL
- BLASER DIE CASTING BORING MONITORING WELL
- PSC MONITORING WELL
- ART BRASS PLATING BORING MONITORING WELL

ALL LOCATIONS ARE APPROXIMATE

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 4

SITE PLAN SHOWING
MONITORING WELL NETWORK LOCATIONS
SAMPLING AND ANALYSIS PLAN
CAPITAL INDUSTRIES, INC.,
SEATTLE, WASHINGTON

FARALLON PN: 457-004

Drawn By: DEW	Checked By: DC/PJ	Date: 5/12/10	Disk Reference: 457004h

TABLES

SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

Table 1
Groundwater Monitoring Well Network Details
Sampling and Analysis Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Monitoring Well or Well Cluster	Installed By	Location Name[1]	Total Depth (feet below ground surface)	Screen Interval (feet below ground surface)	Screen Length (feet)	Aquifer Zone[2]
MW-2	Capital	MW-2	20	10 to 20	10	Water Table
MW-3	Capital	MW-3	20	10 to 20	10	Water Table
MW-4	Capital	MW-4	20	10 to 20	10	Water Table
MW-5	Capital	MW-5	20	10 to 20	10	Water Table
MW-6	Capital	MW-6	20	10 to 20	10	Water Table
CI-7	Capital	MW-7	20	10 to 20	10	Water Table
	Capital	**CI-7-40**	40	30 to 40	10	Shallow
	Capital	**CI-7-60**	60	50 to 60	10	Intermediate
CI-8	Capital	MW-8	20	10 to 20	10	Water Table
	Capital	**CI-8-40**	40	30 to 40	10	Shallow
	Capital	**CI-8-60**	60	50 to 60	10	Intermediate
CI-9	Capital	**CI-9-WT**	20	10 to 20	10	Water Table
	Capital	**CI-9-40**	40	30 to 40	10	Shallow
	Capital	**CI-9-70**	70	60 to 70	10	Intermediate
CI-10	Capital	**CI-10-WT**	20	10 to 20	10	Water Table
	Capital	**CI-10-35**	35	25 to 35	10	Shallow
	Capital	**CI-10-65**	65	50 to 65	15	Intermediate
CI-11	Capital	**CI-11-WT**	20	10 to 20	10	Water Table
	Capital	**CI-11-30**	30	20 to 30	10	Shallow
	Capital	**CI-11-60**	60	50 to 60	10	Intermediate
CI-12	Capital	**CI-12-WT**	20	10 to 20	10	Water Table
	Capital	**CI-12-30**	30	20 to 30	10	Shallow
	Capital	**CI-12-60**	60	50 to 60	10	Intermediate
CI-13	Capital	**CI-13-WT**	20	10 to 20	10	Water Table
	Capital	**CI-13-30**	30	20 to 30	10	Shallow
	Capital	**CI-13-60**	60	50 to 60	10	Intermediate
CI-14	Capital	**CI-14-WT**	20	10 to 20	10	Water Table
	Capital	**CI-14-35**	35	25 to 35	10	Shallow
	Capital	**CI-14-70**	70	60 to 70	10	Intermediate
CI-15	Capital	**CI-15-40**	40	40 to 50	10	Shallow
	Capital	**CI-15-60**	60	50 to 60	10	Intermediate
CI-137	PSC	CG-137-WT	20	10 to 20	10	Water Table
	PSC	CG-137-40	40	30 to 40	10	Shallow
	Capital	**CI-137-50**	50	40 to 50	10	Intermediate
CG-141	PSC	CG-141-WT	20	10 to 20	10	Water Table
	PSC	CG-141-40	40	30 to 40	10	Shallow
	PSC	CG-141-50	50	40 to 50	10	Intermediate

NOTES:

[1]Monitoring wells denoted in bold were installed in Winter/Spring 2010.

[2]Aquifer zones are defined as Water Table = approximately 10 to 20 feet below ground surface (bgs), Shallow = 20 to 40 feet bgs, and Intermediate = 40 to 70 feet bgs.

PSC = Philip Service Corporation

Table 2
Groundwater Monitoring Analysis Schedule
Sampling and Analysis Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Well Identification	Remedial Investigation Period[1,2]															
	Quarter 1 - Winter 2010				Quarter 2 - Spring 2010				Quarter 3 - Summer 2010				Quarter 4 - Fall 2010			
	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5]	NA Parameters[6]	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5]	NA Parameters[6]	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5]	NA Parameters[6]	HVOCs[3]	1,4-Dioxane[4]	Redox Metals[5]	NA Parameters[6]
Water Table Zone																
MW-2	x				x	x	x		x				x			
MW-3	x				x	x	x		x				x			
MW-4	x				x	x	x		x				x			
MW-5	x				x	x	x		x				x			
MW-6	x				x	x	x		x				x			
MW-7	x				x	x	x	x	x				x		x	x
MW-8	x				x	x	x		x				x			
CI-9-WT					x	x	x	x	x				x		x	x
CI-10-WT	x				x	x	x	x	x				x		x	x
CI-11-WT					x	x	x	x	x				x		x	x
CI-12-WT	x				x	x	x		x				x			
CI-13-WT					x	x	x	x	x				x		x	x
CI-14-WT					x	x	x		x				x			
CG-137-WT	x				x	x	x	x	x				x		x	x
CG-141-WT	x				x	x	x		x				x			
CI-MW-1-WT					x	x	x		x				x			
Shallow Zone																
CI-7-40	x				x	x	x	x	x				x		x	x
CI-8-40	x				x	x	x		x				x			
CI-9-40					x	x	x	x	x				x		x	x
CI-10-35	x				x	x	x	x	x				x		x	x
CI-11-30					x	x	x	x	x				x		x	x
CI-12-30	x				x	x	x		x				x			
CI-13-30					x	x	x	x	x				x		x	x
CI-14-35					x	x	x		x				x			
CI-15-40	x				x	x	x		x				x			
CI-16-35					x	x	x		x				x			
CG-137-40	x				x	x	x	x	x				x		x	x
CG-141-40	x				x	x	x		x				x			
CI-MW-1-40					x	x	x		x				x			
Intermediate Zone																
CI-7-60	x				x	x	x	x	x				x		x	x
CI-8-60	x				x	x	x		x				x			
CI-9-70					x	x	x	x	x				x		x	x
CI-10-70	x				x	x	x	x	x				x		x	x
CI-11-60					x	x	x	x	x				x		x	x
CI-12-60	x				x	x	x		x				x			
CI-13-60					x	x	x	x	x				x		x	x
CI-14-70					x	x	x		x				x			
CI-15-60	x				x	x	x		x				x			
CI-137-50	x				x	x	x	x	x				x		x	x
CG-141-50	x				x	x	x		x				x			
CI-MW-1-60					x	x	x		x				x			

NOTES:

[1]The Remedial Investigation period and sampling schedule is based on the anticipated well installation schedule.

[2]Field parameters will be collected from wells that are sampled for groundwater quality. Parameters will include turbidity, temperature, pH, conductivity, dissolved oxygen, and oxidation-reduction potential.

[3]HVOCs (halogenated volatile organic compounds) will be analyzed with standard detection limits by U.S. Environmental Protection Agency (EPA) Method 8260B.

[4]1,4-Dioxane will be analyzed by EPA Method 8270C Modified.

[5]Redox metals include ferrous iron, ferric iron, and manganese analyzed by EPA Method 8260B or 6020.

[6]NA Parameters (Natural attenuation parameters) include nitrate, nitrite, and sulfate for analysis by EPA Method 300.0; alkalinity for analysis by EPA Method SM2320B; ethane, ethene, and methane for analysis by EPA Method 8015B; and total organic carbon for analysis by EPA Method 415.1.

Table 3
Analytical Method, Container, Preservation, and Hold Time Requirements
Sampling and Analysis Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Monitoring Well Groundwater					
Analyte	**Method**	**Container[1]**	**Number of Containers**	**Preservation Requirements**	**Hold Time**
Tetrachloroethene	EPA Method 8260B	40-ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
Trichloroethene					
cis-1,2-Dichloroethene					
trans-1,2-Dichloroethene					
Vinyl Chloride					
1,4-Dioxane	EPA Method 8270C Modified	1 liter amber	2	4°C	7days/40 days
Manganese	EPA Method 6010B	500-ml HDPE	1	4°C, nitric acid to pH<2	180 days
Iron					
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
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	Gas Chromatograph/Flame Ionization Detection	40-ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
Ethane					
Ethene					

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
TOC = total organic carbon
VOA = volatile organic analysis

Table 4
Groundwater Sampling Summary
Sampling and Analysis Plan
Capital Industries, Inc.
Seattle, Washington
Farallon PN: 457-004

Analysis	Field Samples	Trip/Field Duplicate/Blanks Percentage	Trip/Field Duplicate/Blanks Estimated Total
HVOCs by EPA Method 8260B	139	10%	14
1,4-Dioxane by EPA Method 8270C Modified	38	10%	4
Manganese by EPA 6010B	38	10%	4
Iron by EPA 6010B	38	10%	4
Alkalinity by EPA Method 310.2	30	10%	3
Sulfate by EPA Method 375.4	30	10%	3
Sulfide by EPA Method 376.1	30	10%	3
Nitrate by EPA Method 353.2	30	10%	3
Nitrite by EPA Method 353.2	30	10%	3
Ferrous and Ferric Iron by Method SM3500-FeB/6010B	30	10%	3
Methane, Ethane, Ethene GC/FID	30	10%	3

NOTES:

EPA = U.S. Environmental Protection Agency

GC/FID = gas chromatograph equipped with a flame-ionization detector

HVOCs = halogenated volatile organic compounds

Table 5
Constituents 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 Water PQL (µg/l)	Screening Levels for Water (µg/l)		
			Water Table Zone	Shallow Zone	Intermediate Zone
Tetrachloroethene	EPA 8260B	0.20	0.17	0.17	0.17
Trichloroethene	EPA 8260B	0.20	0.404	0.654	0.654
cis-1,2-Dichloroethene	EPA 8260B	0.20	72.7	137	137
trans-1,2-Dichloroethene	EPA 8260B	0.20	65.3	1,403	1,403
Vinyl Chloride	EPA 8260B	0.20	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

µg/l = micrograms per liter

PQL = practical quantitation limit

ATTACHMENT 1
STANDARD OPERATING PROCEDURES

SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
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Seattle, Washington

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STANDARD OPERATING PROCEDURES

Attachment 1 of the Sampling and Analysis Plan

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

AGREED ORDER NO. DE 5348

Submitted by:

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May 19, 2010

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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 U.S. Environmental Protection Agency (EPA) 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., blatter pump or Redi-flo2 submersible 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
Temperature	$\Delta \leq 3$ % °C
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.

U.S. 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.

SLUG TESTING PROCEDURE

SOP No. FAR-107

1.0 Purpose

The purpose of this SOP is to provide field personnel with the methodology for performing slug tests in monitoring wells.

2.0 Application

The SOP document provides a step-by-step guideline to be followed by field personnel to ensure use of consistent methodology and representative data collection during slug testing. This procedure is applicable to determine the horizontal hydraulic conductivity of distinct geologic horizons under in-situ conditions. These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

The slug test measures the rate of water level recovery in a well over time in response to the injection or withdrawal of a mass (slug) beneath the groundwater surface. The slug can be a quantity of water or a solid of known volume. Hydraulic conductivity in the immediate vicinity of the well can be determined by measuring water level versus time data after the slug is added or removed. Refer to the site-specific work plan for more information on the scope of work, a description of slug testing activities, and the locations of the wells that are to be tested.

Typically, a solid slug is inserted to a level beneath the groundwater surface and the water level is allowed to reach equilibrium. Then the slug is removed and the rise in water level is measured with time (rising head test). Alternatively, a solid slug is inserted or a slug of water is injected and water level drop is monitored over time (falling head test).

Slug tests will be performed in general accordance with ASTM Method D4043-96e1, "Standard Guide for Selection of Aquifer Test Method in Determining of Hydraulic Properties by Well Techniques," and ASTM Method D4044-96(2002), "Standard Test Method (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers." Standard test procedures are available in a number of publications and are patterned in this SOP after EPA (1994).

3.0 References

Bower, H., 1978, Groundwater Hydrology, McGraw-Hill Book Company, New York, New York.

Bower, H., and R.C. Rice, 1980, A Slug Test for Determining the Hydraulic Properties of Tight Formations, Water Resources Research, Vol. 16, No. 1 pp. 233-238.

Cooper, Jr. H.H., J.D., Bredehoeft, and S.S. Papadopulos, 1967, Response of a Finite-Diameter Well to an Instantaneous Charge of Water, Water Resources Research, Vol. 13, No. 1.

Fetter, C.W., 1980. Applied Hydrogeology, Charles E. Merrill Publishing Co., Columbus, Ohio.

Freeze, R. Allen and John A. Cherry, 1979. Groundwater, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Hvorslev, 1951, Time Lag and Soil Permeability in Ground Water Observations, Bulletin No. 36, U.S. Army Corps of Engineers p. 50.

U.S. Environmental Protection Agency, Slug Tests, Standard Operating Procedure (SOP) #2046, October 10, 1994.

4.0 Equipment

The following equipment is typically necessary to perform slug testing in monitoring wells:

- Water pressure transducer(s);
- Electronic data logger;
- Electronic water-level indicator;
- Manufacturer's operating manuals for equipment selected above;
- Solid cylinder (slug) of known volume and diameter made of inert material;
- Stopwatch or watch with a second hand;
- Tape measure (graduated in tenths of a foot);
- Semi-log graph paper;
- Straight edge;
- Calculator;
- Appropriate reference material;
- Slug test data forms;
- Indelible dark-ink pens;
- Five-gallon bucket;
- Groundwater elevation forms;
- Daily activity logs;
- Any PPE listed or required in the site-specific health and safety plan (HASP); and
- Any additional supplies listed in associated procedures, as needed.

5.0 Step-By-Step Process Description

The typical test processes for conducting slug tests are described below. These steps may vary somewhat depending on site-specific conditions.

1. When the slug test is performed using an electronic data logger and pressure transducer, all data will be stored internally or on a laptop computer or other field data storage device. This information will normally be transferred to a primary computer or server for subsequent analysis. A computer printout of the slug test data should be maintained in the files as documentation.

   Key slug test data is collected and recorded manually on a slug test data form. The slug test data form shall be completed as follows:

   - Site ID: Identification number assigned to the site.
   - Location ID: Identification of location being tested.
   - Date: Date when the test data was collected.
   - Slug volume (feet): Manufacturers' specification for the known volume or displacement of the slug device, in feet.
   - Logger: The company or person responsible for performing the field measurements.
   - Test method: The slug device is either injected or lowered into the well or withdrawn or pulled out from the monitoring well. Check the method that is applicable to the test situation being run.
   - Comments: Appropriate observations or information regarding the slug test for which no other blanks are provided.
   - Elapsed time (minutes): Cumulative time readings from beginning of test to end of test, in minutes.
   - Depth to water (feet): Depth to water recorded to 0.01 foot.

2. Decontaminate the transducer and cable.

3. Make initial water level measurements on monitor wells in an up- to down-gradient sequence, if possible.

4. Before beginning the slug test, information will be recorded and entered into the electronic data logger. The type of information may vary depending on the model used. When using different models, consult the operator's manual for the proper data entry sequence to be used.

5. Test wells from least contaminated to most contaminated, if possible.

6. Determine the static water level in the well by measuring the depth to water periodically for several minutes and recording the readings.

7. Cover sharp edges of the well casing with duct tape or similar material to protect the transducer cables.

8. Install the transducer and cable in the well to a depth below the target draw-down estimated

for the test but at least 2 feet from the bottom of the well. Ensure that the depth of submergence is within the design range stamped on the transducer. Temporarily tape the transducer cable to the well to keep the transducer at a constant depth.

9. Connect the transducer cable to the electronic data logger.

10. Enter the initial water level and transducer design range into the recording device according to manufacturer's instructions (the transducer design range will be stamped on the side of the transducer). Record the initial water level on the recording device.

11. Falling head test: Quickly introduce a solid cylinder (slug) of known volume to the well to displace and raise the water level.

    Rising head test: Quickly remove a solid cylinder (slug) of known volume from the well.

    It is important to remove or add the slugs as quickly as possible because the analysis assumes that an "instantaneous" change in volume is created in the well. Another method is to introduce or remove a known volume of water from the well, but this method is used less frequently because of water quality and/or water disposal issues at contaminated sites.

12. At the moment of volume addition or removal assigned time zero, measure and record the depth to water and the time at each reading. Depths should be measured to the nearest 0.01 foot. The number of depth and time measurements necessary to complete the test are variable. It is critical to make as many measurements as possible in the early part of the test. The number and intervals between measurements may be determined from previous aquifer tests or evaluations, if such data are available. A recommended time scale is presented as follows:

    - 15-second intervals for first 10 minutes;
    - 30-second intervals for next 10 minutes;
    - 1-minute intervals for next 10 minutes;
    - 2-minute intervals for next 15 minutes; and
    - 5-minute intervals to end of test.

    If a data logger is used, the frequency of measurements is set in advance of the slug test. If a log measurement frequency is selected, care must be taken to ensure that recordings are started as soon as the slug is introduced or removed from the well. However, it is important to collect manual measurements in any case to provide a backup to the data logger and to compare against data logger readings, if anomalies are observed.

13. Continue measuring and recording depth and time measurements until the water level returns to equilibrium conditions or a sufficient number of readings have been made to clearly show a trend on a semi-log plot of time versus depth. Allow the water level to recover to at least 90 percent of pre-test conditions, if feasible.

14. Retrieve slug (if applicable).

The time required for a slug test to be completed is a function of the volume of the slug, hydraulic conductivity of the formation, and type of well completion. The slug volume should be large enough that a sufficient number of water-level measurements can be made before the water level returns to equilibrium conditions. The length of the test may range from less than a minute to several hours.

If the well is to be used as a monitoring well, precautions should be taken that the wells are not contaminated by material introduced into the well. If water is added to the monitoring well, it should be from an uncontaminated source and transported in a clean container. Bailers or measuring devices should be cleaned prior to the test. If tests are performed on more than one monitoring well, care must be taken to avoid cross contamination of the wells.

Slug tests should be conducted on relatively undisturbed wells. If a test is conducted on a well that has recently been pumped for water sampling purposes, the measured water level must be within 0.1 foot of the water level prior to sampling. At least one week should elapse between the drilling of a well and the performance of a slug test.

6.0 Data Analysis

A number of methods are available for analysis and interpretation of slug test data. The simplest interpretation of piezometer recovery is that of Hvorslev (1951). The analysis assumes a homogenous, isotropic medium in which soil and water are incompressible. Hvorslev's expression for hydraulic conductivity (K) is:

$$K = \frac{r^2 \ln (L/R)}{2 L T_0} \quad (\text{for } L/R > 8)$$

where:

- K = hydraulic conductivity [feet/sec]
- r = casing radius [ft]
- L = length of open screen (or borehole) [feet]
- R = filter pack (borehole) radius [feet]
- T_0 = Basic Time Lag [sec]; value of t on semi-logarithmic plot of $H-h/H-H_0$ vs. t, where $H-h/H-H = 0.37$
- H = initial water level prior to removal of slug
- H_0 = water level at $t = 0$
- h = recorded water level at $t > 0$

The Bower and Rice method (1980) is also commonly used for K calculations. Refer to Freeze and Cherry (1979) or Applied Hydrogeology (Fetter 1980) for a discussion of these methods. In all cases, however, the hydrogeologist must choose a solution applicable to the particular geologic environment being analyzed.

Computer analysis software is also available to efficiently manage and analyze slug test data. The computer program AQTESOLV for Windows (HydroSolve, Inc. 2007) is widely used and can help to quickly and efficiently process field data and analyze a number of slug test solutions.

7.0 Decontamination

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 will be followed.

8.0 Documentation

All slug test data will be documented on appropriate field forms and in a detailed field report in accordance with the work plan.

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 2
FIELD SAMPLING FORMS

SAMPLING AND ANALYSIS PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

FIELD SAMPLING FORMS

1. Field Report Form
2. Log of Well Form
3. Monitoring Well Construction Data Form
4. Well Purging and Sampling Data Form
5. Waste Inventory Form
6. Sample Label
7. Waste Material Label
8. Chain of Custody Form

FARALLON
consulting

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:

975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring:

Client:
Project:
Location:
Farallon PN:
Logged By:

Date/Time Started:
Date/Time Completed:
Equipment:
Drilling Company:
Drilling Foreman:
Drilling Method:

Sampler Type:
Drive Hammer (lbs.):
Depth of Water ATD (ft bgs):
Total Boring Depth (ft bgs):
Total Well Depth (ft bgs):

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0										
5										
10										
15										
20										

Well Construction Information

Monument Type:
Casing Diameter (inches):
Screen Slot Size (inches):
Screened Interval (ft bgs):

Filter Pack:
Surface Seal:
Annular Seal:

Ground Surface Elevation (ft):
Top of Casing Elevation (ft):
Boring Abandonment:
Surveyed Location: X: Y:

MONITORING WELL CONSTRUCTION DATA

WELL/BORING NO:

PERMIT NO:

DATE: | PROJECT NAME: | PROJECT NO:

WELL SITE LOCATION PLAN:

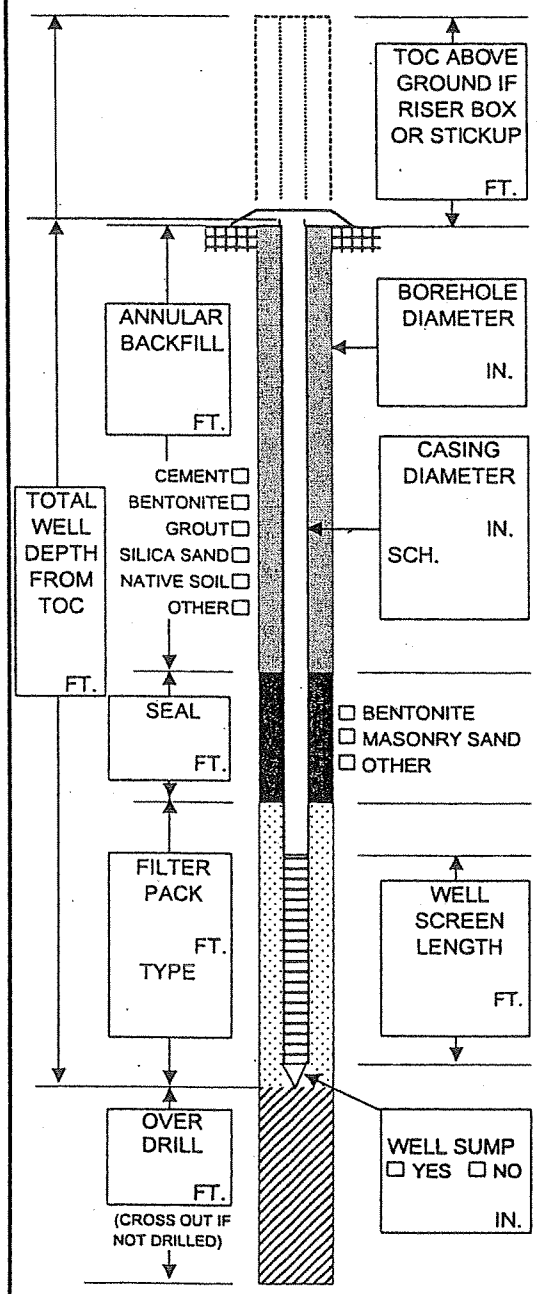
SEC: TWN: RGE: LAT: LONG:

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:

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 (mg/l)	TURBIDITY (NTU)	ORP (mV)	REMARKS
			(+/- 0.1°)	(+/- 3%)	(+/- 0.1)	(+/- 10%)	(NA)	(+/- 10 mV)	(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

DRUM INVENTORY

Date: _____

Site Name/Location: _____ Farallon PN: _____ Field Staff: _____

# of Soil Drums	How Full	**# of Decon Water Drums**	How Full	**# of Groundwater Drums**	How Full
Total:		**Total:**		**Total:**	

Location of Drums (sketch or describe):

For PM	Date Removed:
Disposal Location:	
Transporter:	

I-CHEM

CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY

I-CHEM

CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY

I-CHEM

CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY

I-CHEM

CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY

I-CHEM

CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY

I-CHEM

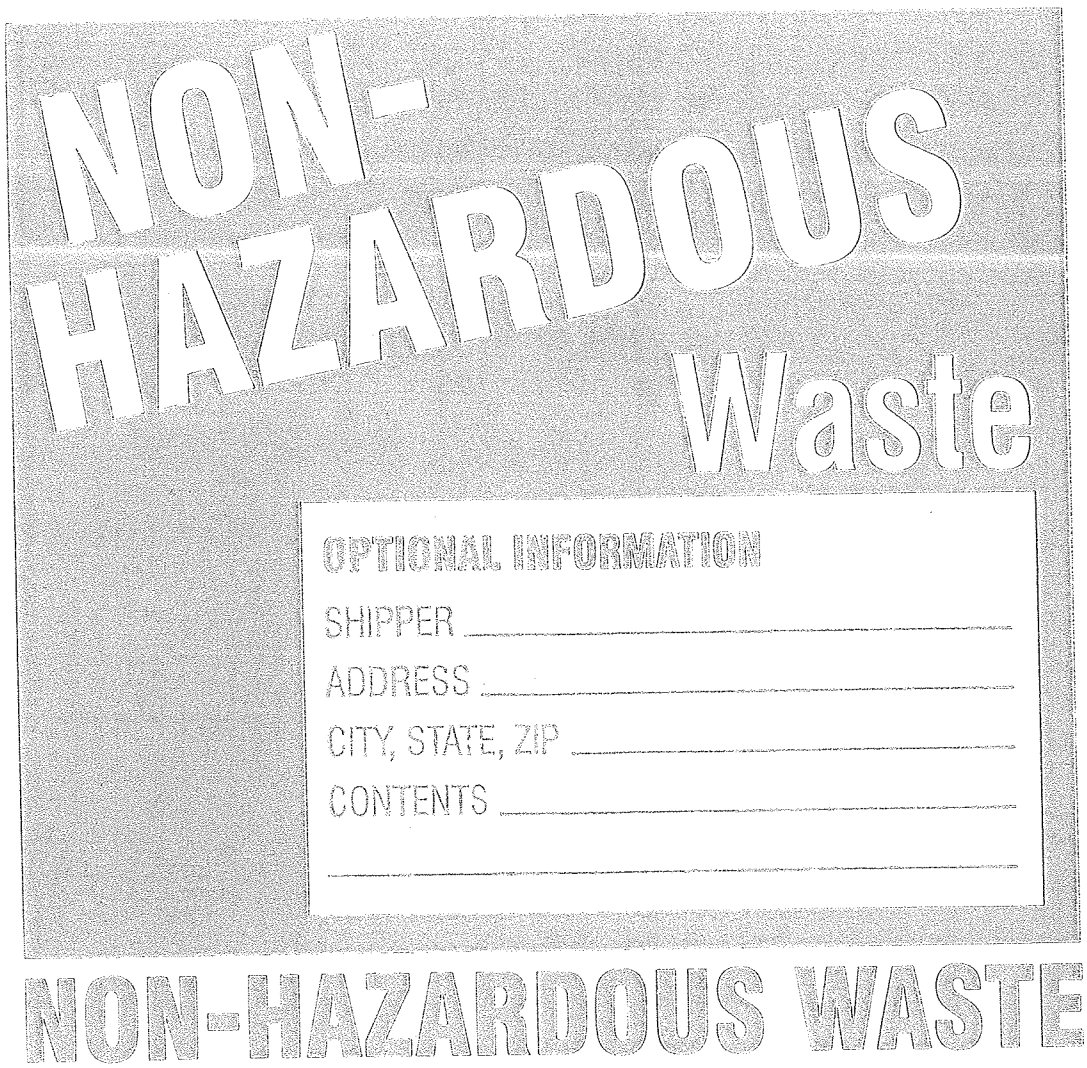
CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY

I-CHEM

CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY

I-CHEM

CLIENT/SOURCE	☐GRAB ☐COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL. BY



NON-HAZARDOUS WASTE

BRADY SIGNMARK® DIV.

Chain of Custody

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)
  (TPH analysis 5 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

	Signature	Company	Date	Time
Relinquished by				
Received by				
Relinquished by				
Received by				
Relinquished by				
Received by				

Comments/Special Instructions:

Reviewed by/Date

Reviewed by/Date

Chromatograms with final report ☐

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

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

FARALLON consulting

975 5th Avenue Northwest, Issaquah, Washington 98027
Tel: (425) 295-0800 Fax: (425) 295-0850
www.farallonconsulting.com

QUALITY ASSURANCE PROJECT PLAN

Appendix B of the Groundwater Monitoring 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:
Mr. Ron Taylor
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington 98108

May 19, 2010

Prepared by:

Daniel Caputo
Project Chemist

Reviewed by:

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

CONTENTS

TABLES

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared by Farallon Consulting, L.L.C. (Farallon) on behalf of Capital Industries, Inc. (Capital) to provide specific requirements for quality assurance and quality control (QA/QC) procedures for the Remedial Investigation (RI) to be conducted at the Capital Area of Investigation. Prior to the preparation of this document, the Capital Area of Investigation was defined in the Agreed Order as the area south of South Mead Street, north of South Front Street, east of 1st Avenue South, and west of 4th Avenue South. Based on the results of reconnaissance groundwater and groundwater samples collected during the first phase of the RI, the Capital Area of Investigation has been redefined as the area south of South Mead Street, north of South Front Street, west of 4th Avenue South, and east of the Duwamish Waterway in Seattle, Washington (Figure 3). The Capital Area of Investigation does not define the 'Capital Site' per WAC 173-340-200 and does not imply that concentrations of volatile organic compounds (VOCs) in groundwater that may have been released from the Capital property are discharging to the Duwamish Waterway at concentrations above the screening levels. 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) and with Section 200 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-200), 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.

The QAPP has been prepared in accordance with the Washington State Model Toxics Control Act Cleanup Regulation (MTCA), as established in WAC 173-340-350. As stated in the Ecology document *Guidelines for Preparation of Quality Assurance Project Plans for Environmental Studies* dated February 2001 (Ecology Publication No. 01-03-003), the purpose of the QAPP is to:

- Assist the Project Manager and project team to focus on factors affecting data quality during the planning stage of the project;
- Facilitate communication among field, laboratory, and management staff as the project progresses;
- Document the planning, implementation, and assessment procedures for QA/QC activities for the RI;
- Ensure that the data quality objectives (DQOs) are achieved; and
- Provide a record of the project to facilitate final report preparation.

Both qualitative and quantitative DQOs have been established for the RI at the Capital Area of Investigation to define the appropriate types of data and to specify the tolerable levels of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support the RI. The QAPP details both the qualitative and quantitative aspects of sample collection and analysis, including analytical methods, QA/QC procedures, and data quality reviews, to ensure that the DQOs are achieved.

1.1 PROJECT OBJECTIVES

The objectives of the RI are to identify the nature and extent of the constituents of potential concern (COPCs) above screening levels in the media of concern, as defined in the RI Work Plan, evaluate the impact to human health and the environment, and collect and evaluate sufficient information to enable selection of a cleanup action for the Capital Site.

2.0 PROJECT ORGANIZATION

The project organization for conducting the RI, including identification of key personnel and their responsibilities, is presented below.

2.1 KEY PERSONNEL

Farallon has been contracted by Capital to plan and implement the RI. The Project Contact for Capital is:

Mr. Ron Taylor
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington 98108
Telephone: (206) 292-2608
Fax: (206) 292-2601

The Principal for Farallon is:

Mr. Peter Jewett, L.G., L.E.G.
Farallon Consulting, L.L.C.
975 5th Avenue Northwest
Issaquah, Washington 98027
Telephone: (425) 295-0800
Fax: (425) 427-0850
pjewett@farallonconsulting.com

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Telephone: (425) 295-0800
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dcaputo@farallonconsulting.com

The Project QA/QC Officer for Farallon is:

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broberts@farallonconsulting.com

The Project Manager for Ecology is:

Mr. Ed Jones
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue Southeast
Bellevue, Washington 98008-5452
Telephone: (425) 649-7000
Fax: (425) 649-7098

2.2 KEY PERSONNEL RESPONSIBILITIES

The responsibilities of the key personnel involved in the RI are described below.

2.2.1 Project Manager

The Project Manager has overall responsibility for developing the QAPP, monitoring the quality of the technical and managerial aspects of the project, and implementing the QAPP and corresponding corrective measures where necessary.

2.2.2 Project QA/QC Officer

The Project QA/QC Officer is responsible for ensuring that personnel assigned to the project meet the training requirements of the QA/QC program, monitoring the project work, and verifying that project work is performed in accordance with the Sampling and Analysis Plan (SAP) prepared for the Groundwater Monitoring Plan and with other established procedures. Additional responsibilities include reviewing and verifying the disposition of nonconformance and corrective action reports. The QA/QC Officer also has the responsibility to assess the effectiveness of the QA/QC program and to recommend modifications to the program as appropriate.

2.2.3 Project Staff

Members of the project staff are responsible for understanding and implementing the QA/QC program as it relates to the RI project objectives.

2.2.4 Regulatory Agency

The RI is being conducted in accordance with the Agreed Order, MTCA as established in WAC 173-340-350, and the RI Work Plan prepared by Farallon and dated September 11, 2008,

with Ecology serving as the lead regulatory agency. Prior work conducted at the Capital Property was performed as an independent remedial action.

3.0 DATA QUALITY OBJECTIVES

The DQOs for this project will be used to develop and implement procedures to ensure that the data collected are of sufficient quality to adequately address the objectives of the RI at the Capital Site as defined in the Groundwater Monitoring Plan Sampling and Analysis Plan. All observations and measurements will be made and recorded in a manner so as to yield results representative of the media and conditions observed and/or measured. Goals for representativeness will be met by ensuring that sampling locations are selected properly, a sufficient number of samples are collected, and field screening and laboratory analyses are conducted properly. The media, constituents of concern, monitored natural attenuation parameters, and laboratory test methods as discussed in the Reconnaissance Sampling and Analysis Plan are summarized in Table 1.

The quality of the laboratory data will be assessed according to the parameters of precision, accuracy, representativeness, completeness, and comparability. The definitions of these parameters and the applicable quality control (QC) procedures are presented in Sections 3.2 through 3.6. Quantitative DQOs for the parameters precision, accuracy, and completeness are provided following each definition. Laboratory DQOs have been established by the analytical laboratory.

3.1 QUANTITATION LIMITS AND QUALITY CONTROL CRITERIA

The laboratory practical quantitation limits (PQLs) for the analytes required for the RI are compared to the screening levels for soil and groundwater in Table 2. The actual detection or reporting limits for samples may be higher, depending on the sample matrix, matrix interferences, and laboratory dilution factors. Project-specific quality control criteria for laboratory analyses are summarized in Tables 3 through 5.

3.2 PRECISION

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures and is expressed in terms of analytical variability. For this project, analytical variability will be measured as the relative percent difference (RPD) or coefficient of variation between analytical laboratory duplicates and between the matrix spike (MS) and matrix spike duplicate (MSD) analyses. Monitoring and sampling variability will be measured by analysis of blind field replicate samples.

Precision will be calculated as the RPD as follows:

$$RPD = \frac{|S-D|}{(S+D)/2} \times 100$$

where:

RPD = Relative percent difference for compound

S = Analyte concentration in original sample

D = Analyte concentration in duplicate sample

The tolerance limit for percent differences between laboratory duplicates will be ±20 percent, and deviations from these criteria will be reported. If the QAPP criteria are not met, the laboratory will provide an explanation of why the limits were exceeded, and will implement appropriate corrective actions for laboratory control samples (LCSs)/LCS duplicates only. RPDs will be evaluated during data review and validation. The independent data reviewer will note deviations from the specified limits and will comment on the effect of the deviations on reported data. If precision limit exceedances are linked to field sampling, those field sampling procedures will be reviewed and any problems identified. Resampling and analysis may be required.

There are no specific RPD criteria for organic chemical analyses. Quantitative RPD criteria for organic analyses will be based on laboratory-derived control limits.

3.2.1 Duplicate Samples

Field duplicate samples will be collected during sampling to analyze for COCs to assess the precision of laboratory analytical and field sampling methods. Field duplicate groundwater samples for all parameters will be collected at a frequency of 10 percent of the primary samples. Field duplicate soil samples for non-volatile constituents will be collected at a frequency of 10 percent of primary samples. The quality goal for field duplicates samples (comparision of primary and duplicate samples) will be 25 percent. Deviations of this value will be reported similar to laboratory duplicates. Field duplicate soil samples for volatile constituents will not be collected.

3.3 ACCURACY

Accuracy (bias) is a statistical measurement of correctness and includes components of random error (i.e., variability due to imprecision) and systematic error. It therefore reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ excessively from the known concentration of the spike or standard.

Accuracy measures the bias in a measurement system and is difficult to measure for the entire data collection activity. Sources of error include the sampling process, field contamination, preservative handling, sample matrix effects, and sample preparation and analysis techniques. To confirm that the samples collected are not contaminated, laboratory method blank samples will be analyzed.

Accuracy will be calculated as percent recovery of analytes as follows:

$R_i = (Y_i / X_i) \times 100$

where:

R_i = percent recovery for compound i

Y_i = measured analyte concentration of compound i in sample i (measured minus original sample concentration)

X_i = known analyte concentration of compound i in sample i

Laboratory matrix spikes and surrogates will be carried out at the analytical laboratory in accordance with U.S. Environmental Protection Agency (EPA) SW-846 requirements for organic chemical analyses. The frequency for both matrix spikes and matrix spike duplicates will be one per batch of 20 samples, or less. Quantitative percent recovery criteria for organic analyses will be based on laboratory-derived control limits for surrogate recovery and matrix spike results.

The resultant percent recovery will be compared to the acceptance criteria defined in Table 4, and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will provide an explanation of why acceptability limits were exceeded and will implement appropriate corrective actions. Percent recoveries will be reviewed during data validation, and deviations from the specified limits will be noted. The data reviewer will comment on the effect of the deviations on reported data.

3.3.1 Laboratory Method Blanks

The laboratory will run method blanks at a minimum frequency of 5 percent (or one per batch) to assess potential contamination of the sample in the laboratory.

3.3.2 Trip Blanks

Laboratory-supplied trip blanks will accompany groundwater and soil samples collected during sampling events. The trip blank will be analyzed for volatile COCs by EPA Method 8260B (for tetrachloroethene, trichloroethene, and vinyl chloride) to assess the integrity of the sample containers during transport.

3.4 REPRESENTATIVENESS

Representativeness is a qualitative assessment of how closely the measured results reflect the actual concentration or distribution of the constituent concentrations in the matrix sampled. The sampling plan design, sample collection techniques, sample handling protocols, sample analysis methods, and data review procedures have been developed to ensure that the results obtained are representative of Capital Site conditions. These issues are addressed in detail in Section 4, Data Collection Approach, and in the Reconnaissance Sampling and Analysis Plan. Representativeness also will be determined by evaluating holding time, sample preservation, and blank contamination. Samples with expired holding times, improper preservation, or blank contamination may not be representative.

3.5 COMPLETENESS

Completeness is defined as the percentage of measurements judged to be valid. Valid and invalid data (i.e., data qualified with an R-Flag as rejected) will be identified during independent data review. Validation as described in Section 6.5, Data Reduction and Analysis. Completeness is calculated as follows:

$$C = \frac{(Number\ of\ Valid\ Measurements)}{(Total\ Number\ of\ Measurements)} x\ 100$$

The objectives for completeness of samples are expressed as a percentage and refer to the minimum acceptable percentage of samples received at the laboratory in good condition and acceptable for analysis. Objectives for completeness are based in part on the subsequent uses of the data: the more critical the use, the greater the completeness objective. The objective of completeness is 95 percent of the samples. This objective will be met though the use of proper sample containers, proper sample packaging procedures to prevent breakage during shipment, proper sample preservation, and proper labeling and chain-of-custody procedures. A loss of 5 to 10 percent of intended samples due to refusal or poor sample recovery is common. When feasible, the amount of sample collected will be sufficient to reanalyze the sample should the initial results not meet QC requirements. The goals set for the RI project are considered to be sufficient for intended data uses.

The objectives for completeness of chemical analyses refer to the percentages of analytical requests for which usable analytical data are produced, and also are expressed as a percentage. The initial objective for completeness of chemical analyses in the laboratory is 95 percent.

Although a general goal of 95 percent completeness is reasonable goal and unforeseen losses are possible, Capital will focus efforts to prevent the loss of groundwater monitoring data to the greatest extent possible. Of specific importance is the data critical to achieving the objectives for completeness; therefore, the RI includes:

- Groundwater data that define the vertical and lateral extent of COCs in groundwater above screening levels ;
- Groundwater data that define the horizontal and vertical groundwater flow direction and gradient; and
- Natural attenuation parameters data collected from the groundwater monitoring well network.

If overall completeness is less than the stated goal of 95 percent or if a loss of critical data noted above does occur, Capital will assess the reason for lack of completeness, which may include DQOs based on poor assumptions or a work plan that may have been poorly implemented or difficult to carry out. If DQOs are achieved despite lack of completeness, no further work will be performed. If DQOs are not achieved or the loss of data is determined to prevent completion

of RI objectives, further sample collection may be necessary and will be carried out under advisement from Ecology.

3.6 COMPARABILITY

Comparability is the degree to which data from one study can be compared with data from historical studies at the same location, other similar studies, reference values (such as background), reference materials, and screening values.

The following criteria will be evaluated to assess historical data and data generated by other potentially liable parties to ensure sufficient quality for use during the RI:

- Standard sampling techniques are consistent with EPA and Ecology methods;
- The analytical laboratory methods are consistent and conducted by a laboratory that is certified by Ecology and the National Environmental Laboratory Accreditation Program;
- QC samples and standard operating procedures are used by the laboratory to ensure that reporting standards were maintained in accordance with the Laboratory Quality Assurance Plan;
- The laboratory provides data reports similar to those developed as part of the EPA Contract Laboratory Program for all analyses requiring definitive data. The complete data report and corresponding documentation was sufficient to perform an appropriate level of data validation; and
- Data quality review and validation were performed on the analytical data according to the procedures specified in this QAPP.

If significant discrepancies are identified between data generated by Capital and data generated by other parties at similar locations (e.g. at well CI-MW-1), the criteria listed above will be used to help assess the cause of the discrepancy and to determine if data collected by other parties meet the DQOs for the RI. If the discrepancies invalidate the data, a determination will be made to resample monitoring wells or proceed with the evaluation without the data.

4.0 DATA COLLECTION APPROACH

Procedures that will be used to collect, preserve, transport, and store samples during the RI are described in the RI Work Plan Reconnaissance Sampling and Analysis Plan and Groundwater Monitoring Plan. All sampling protocols will be performed in accordance with generally accepted environmental practices, and will meet or exceed current regulatory standards and guidelines. Sampling procedures may be modified, if necessary, to satisfy amendments to current regulations, methods, or guidelines. The data collection approach for key elements of the RI field program to ensure that project DQOs are met or exceeded includes the following practices:

- Reconnaissance groundwater samples will be collected using EPA Method 5035B preservative protocols for groundwater samples anticipated to contain halogenated volatile organic compounds (HVOCs) at low concentrations. Reconnaissance and monitoring well groundwater samples will be collected in accordance with standard EPA low-flow groundwater sampling procedures to minimize volatilization;
- Reconnaissance groundwater samples will be collected at multiple depths from the borings advanced in the Water Table Zone, Shallow Zone, and Intermediate Zone;
- Reconnaissance groundwater samples will be submitted for laboratory analysis of HVOCs in accordance with the RI Work Plan;
- COCs will be analyzed using low-level sampling procedures to minimize volatilization during the collection of groundwater samples;
- Groundwater samples will be submitted for laboratory analysis of COCs and natural attenuation parameters in accordance with the RI Work Plan and Groundwater Monitoring Plan; and
- Select soil samples will be collected from reconnaissance borings and analyses of the samples for TOC.

Sample containers, preservation methods, and holding times are presented in Table 6. A sample summary by media, including duplicates and laboratory quality control samples, is presented in Table 7.

5.0 ANALYTICAL PROCEDURES

OnSite Environmental Inc. (OnSite) has been selected as the laboratory to conduct the VOC, manganese, iron, and monitored natural attenuation (MNA) parameter analyses of the samples collected for the RI. OnSite is certified by Ecology and meets the QA/QC requirements of both Ecology and EPA. The contact for OnSite is:

Mr. David Baumeister
OnSite Environmental Inc.
14648 Northeast 95th Street
Redmond, Washington 98052
Telephone: (425) 883-3881

TestAmerica, Inc. has been selected as the laboratory to conduct the analysis of the 1,4-dioxane samples collected for the RI. TestAmerica, Inc. is certified by Ecology and meets the QA/QC requirements of both Ecology and EPA. The contact for TestAmerica, Inc. is:

Ms. Sandra Yakimavich
TestAmerica, Inc.
11720 North Creek Parkway North, Suite 400
Bothell, Washington 98011
Telephone: (425) 420-9200

Analytical laboratory QA/QC procedures are described in the Laboratory Quality Assurance Manual for both On-Site and TestAmerica, Inc. These manuals are on file at the Farallon office. Ecology will have access to laboratory personnel, equipment, and records pertaining to samples, collection, transportation, and analysis.

Select soil samples collected from reconnaissance borings will be analyzed for TOC. The process for selecting samples for analysis is described in the RI Work Plan Reconnaissance Sampling and Analysis Plan.

6.0 DATA MANAGEMENT AND REPORTING

This section outlines the procedures to be followed for the inventory, control, storage, and retrieval of data collected during the RI. The procedures contained in the QAPP are designed to ensure that the integrity of the collected data is maintained for subsequent use. In addition, project tracking data such as schedules and progress reports will be maintained to monitor, manage, and document the progress of the RI.

6.1 DATA TYPES

A variety of data will be generated during the RI, including sampling and analytical data. Examples of data types include electronically reported laboratory data and manually recorded field data such as soil descriptions. Laboratory analytical data will be transmitted to Farallon both as an electronic file and as a hard copy laboratory data report. This format will facilitate validation and analysis of these data while avoiding transcription errors that may occur with computer data entry.

6.2 DATA TRANSFER

Procedures controlling the receipt and distribution of incoming data packages to Farallon and the transmittal of outgoing data reports from Farallon are outlined below.

6.2.1 Receipt of Data and Reports

Incoming documents will be date-stamped and filed. Correspondence and transmittal letters for reports, maps, and data will be filed chronologically. Data packages such as those from field personnel and laboratories (e.g., groundwater analytical data, hydrogeologic observations) and surveyors (e.g., well head location and elevation data) will be filed by project task, subject heading, and date. If distribution of a document is required, the number of needed copies will be made, distributed to the appropriate persons or agencies, and recorded on a document tracking form.

6.2.2 Outgoing Data and Reports

A transmittal sheet will be attached to all project data and reports sent out by Farallon. A copy of each transmittal sheet will be kept in the administrative file and in the project file. The Project Manager or the Project QA/QC Officer will review outgoing reports and maps.

6.3 DATA INVENTORY

Procedures for filing, storage, and retrieval of project data and reports are discussed below.

6.3.1 Document Filing and Storage

Project files and raw data files will be maintained at the Farallon office. Files will be organized by project task or subject heading and maintained by the Document Control Clerk. Electronic files will be maintained in a project directory and backed up daily, weekly, and monthly. The

electronic files will be stored on password-protected Microsoft servers with secure firewall protection. In accordance with WAC 173-340-850, the hard copy and electronic project files will be archived for a minimum of 10 years after completion of compliance monitoring or as long as any institutional controls remain in effect.

6.3.2 Access to Project Files

Access to project files will be controlled, and limited to Capital and their authorized representatives, Ecology, and Farallon personnel. When a hard-copy file is removed for use, a sign-out procedure will be used to track document custody. If a document is to be used for an extended period, a copy will be made and the original will be returned to the project file. The final version of reports, tables, and figures in electronic format will be write-protected in the project directory.

6.4 INDEPENDENT DATA QUALITY REVIEW

Data quality review will be performed using *Uniform Federal Policy for Quality Assurance Project Plans; Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs; Part 1: UFP-QAPP Manual* dated March 2005 (EPA Publication No. EPA-505-B-04-900A), the EPA Contract Laboratory Program *National Functional Guidelines for Organic Data Quality Review* dated October 1999 (EPA Document Number PB 99-963506), and the EPA Contract Laboratory Program *National Functional Guidelines for Inorganic Data Review* dated October 2004 (EPA Document Number EPA 540-R-04-004). All laboratory data will be independently verified by an independent third party, Sayler Data Solutions, Inc. of Bothell, Washington. The following types of QC information will be reviewed, as appropriate:

- Method deviations;
- Sample extraction and holding times;
- Method reporting limits;
- Blank samples (equipment rinsate and laboratory method);
- Duplicate samples;
- Matrix spike/matrix spike duplicate samples (accuracy);
- Surrogate recoveries;
- Percent completeness and RPDs (precision); and
- Final analytical data packages for samples collected during the subsurface investigation.

Laboratory quality control limits are presented in Tables 3, 4, and 5. Quality control limits may vary as a result of matrix interference and changes in laboratory control limits at the time of sample analysis.

6.5 DATA REDUCTION AND ANALYSIS

The Project Manager and Project QA/QC Officer are responsible for data review and validation in adherence to the parameters outlined in Section 3, Data Quality Objectives. The type of analyses and presentation methods selected for any given data set will depend on the type,

quantity, quality, and prospective use of those data. Analysis of project data will require data reduction for the preparation of tables, charts, and maps. To ensure that data are accurately transferred during the reduction process, two data reviews will be performed prior to issuing documents: one by the Project QA/QC Officer or Project Manager and the second by the Project Principal. Any incorrect transfers of data will be highlighted and corrected.

6.5.1 Data Reporting Formats

Physical and chemical characterization information developed in connection with the RI will be presented in the final report in the format described below.

6.5.1.1 Summary Tables and Plots

To facilitate assimilation and presentation, laboratory reports will be sorted according to various parameters to summarize the information contained. Groundwater sampling and analytical data will be sorted several ways, including by sample point number, constituent, and date of sample collection. The parameters chosen for sorting will depend on the requirements for the most appropriate format and the utility of that format in demonstrating the physical and chemical characteristics of interest. Summary tables, including well construction data, groundwater levels, and aquifer test data, also will be generated. Aquifer test data generated using modeling software will be presented as plots.

6.5.1.2 Maps

Plan maps needed to illustrate results of the RI will be assembled or prepared. These maps may include but are not limited to plan maps of the Site showing confirmed and suspected sources, sampling locations, chemical concentrations for individual chemicals and groups of chemicals, potentiometric surface maps, Capital Site features and potential preferential pathways (e.g., sewer lines), and cross-section locations.

6.5.1.3 Cross-Sections

Vertical profiles, or cross-sections, may be generated from field data to display Capital Site stratigraphy or other aspects of the RI.

6.6 QUALITY CONTROL SUMMARY REPORT

A Quality Control Summary Report will be prepared by Farallon based on the QC summary data provided by the laboratory and the validation report provided by the independent data validator.

7.0 QUALITY CONTROL PROCEDURES

This section provides a description of the QC procedures pertaining to both field activities and laboratory analysis. The QC procedures for field activities include standard operating procedures for sample collection and handling, equipment calibration, and field QC samples.

7.1 FIELD QUALITY CONTROL

Field QC samples (e.g., field duplicate samples) will be collected during the RI project as described in the Reconnaissance Sampling and Analysis Plan. The purpose of these samples is discussed in Section 3, Data Quality Objectives. In addition, standard operating procedures will be implemented during field-screening activities. The procedural basis for these field data collection activities will be documented on Field Report forms as described in the RI Work Plan, Reconnaissance Sampling and Analysis Plan, and Groundwater Monitoring Plan. Any deviation from established protocols will be documented on the Field Report forms.

7.2 LABORATORY QUALITY CONTROL

Analytical laboratory QA/QC procedures are described in the Laboratory Quality Assurance Manual for both OnSite and TestAmerica, Inc. These manuals are on file at Farallon.

7.3 DATA QUALITY CONTROL

The laboratory will perform in-house analytical data reduction under the direction of the Analytical Laboratory QA Manager. The laboratory data reduction procedures will be those specified in EPA- and Ecology-approved methods and those described in the laboratory procedures delineated in the Laboratory Quality Assurance Plan, provided on compact disc in Attachment A as an accompaniment to this QAPP. The data reduction steps will be documented, signed, and dated by the laboratory. Data reduction will be conducted as follows:

- Raw data produced will be processed and reviewed for compliance with the QC criteria established in this QAPP. The raw data will also be reviewed for overall reasonableness and for transcription or calculation errors.
- After the data have been entered into the Laboratory Information Management System, a computerized report will be generated and sent to the Analytical Laboratory QA Manager.
- The need for any sample reanalysis will be assessed. Upon discovery that an analysis fails to meet the required data quality criteria, the Project QA/QC Officer will be contacted to discuss noncompliant data sets. If corrective actions have been taken and data still do not meet project QA requirements, the Project Manager will be notified.
- Upon acceptance of the preliminary data reports by the analytical laboratory, final analytical reports will be generated. Final data reports will be available within approximately 30 calendar days of sample submittal.

7.3.1 Step II: Validation

The activities to be undertaken to validate the laboratory analytical data generated during the RI are described below.

7.3.1.1 Compliance

The laboratory will assign QC qualifiers (as described and defined in the Laboratory Quality Assurance Plan) if any of the following occur:

- The concentration of the chemical is below the required reporting limit or above calibration limits;
- The concentration of the chemical is below the required reporting limit but above the method detection limit;
- The chemical is found also in the laboratory blank;
- Spiking analyte recoveries (bias) are outside project-specified control limits (inorganic analyses only);
- Laboratory duplicate precision is outside project-specified control limits (inorganic analyses only); or
- Surrogate recoveries and laboratory duplicate precision are out of control limits for organic analyses.

Other sample-specific qualifiers will be added to describe QC conditions as necessary. The laboratory will maintain detailed procedures for laboratory record-keeping that support the validity of the analytical work completed. Each data report package submitted will contain the laboratory's written certification that the requested analytical method was run and that all QA/QC checks were performed.

The analytical laboratory has the initial responsibility for verifying the correctness and completeness of the data, based on an established set of guidelines and project QC criteria. The following QC elements will be verified:

- Documentation of sampling receipt and handling is complete;
- Sample preparation information is correct and complete;
- Analysis information is correct and complete;
- Raw data, including manual integrations, have been interpreted correctly;
- Appropriate preparation and analysis procedures have been followed;
- Special sample preparation and analytical requirements specific to the Site or project have been met;
- Analytical results have been calculated correctly and are complete;
- QC sample results are within project QC limits;

- Laboratory blanks are within project QC limits; and
- Documentation is complete. All anomalies in preparation and analysis have been documented, holding times have been documented, and all data (including data generated before and after corrective actions or cleanup has been conducted) are included in the laboratory data report.

Qualified laboratory personnel other than the original laboratory analyst will provide an independent peer review of the analytical data package to ensure the following QC elements:

- Appropriate laboratory standard operating procedures have been referenced;
- Calibration data are scientifically sound and appropriate to the method;
- QC sample data are within project-specific limits;
- Qualitative and quantitative results are correct;
- Raw data, including manual interpretations, have been correctly interpreted; and
- Documentation is correct and complete.

7.3.1.2 Comparison

One hundred percent of all laboratory data will receive summary level validation by an independent third part reviewer, Sayler Data Solutions of Bothell, Washington. Data review for this process involves the following steps:

- Assessment of data reliability based on QC sample results;
- Verification that requirements set forth in the project planning documents have been met; and
- Assessment of data usability.

Data review will include evaluation of laboratory summary data for precision, accuracy, representativeness, comparability, and completeness, and a summary of qualified data. Data review will not include review of raw data or recalculation of reported results. The data review summary will provide a list of all samples reviewed, a narrative summarizing each review topic (e.g., calibration, holding times), qualified results, worksheets, and any data resubmitted by the laboratory at the request of the reviewer, including chromatographs.

The data validation process for this project will follow the procedures specified in the EPA (1999; 2004) National Functional Guidelines, modified for the methods used and for project-specific criteria. The review will include verification of the following:

- Compliance with the QAPP;
- Proper sample preservation and handling procedures;

- Holding times;
- Method detection limit and method reporting limit;
- QC results (e.g., surrogate, MS/MSD, and LCS recoveries; MS/MSD, field duplicate, and laboratory duplicate RPDs; serial dilutions);
- Laboratory blank and trip blank analyses;
- Data completeness and format; and
- Data qualifiers assigned by the laboratory.

Qualifiers will be added to data during review as necessary. Qualifiers applied to data as a result of the review will be limited to the following designations:

U = The analyte was analyzed for, but was not detected above the sample-specific reporting limit.

J = The analyte was positively identified, and the associated numerical value is an estimate of the concentration of the analyte in the sample.

UJ = The analyte was not detected above the sample reporting limit. However, the reporting limit is approximate and may or may not represent the actual limit of quantitation.

R = The analyte results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified.

Results of the data review will be included in a data quality review report that will provide a basis for meaningful interpretation of the data quality and will evaluate the need for corrective action and/or comprehensive data validation.

7.3.2 Field Data Verification

Farallon will review field records and results of field observations and measurements to ensure that procedures were properly performed and documented. The review of field procedures will include the following factors:

- Completeness and legibility of field logs;
- Preparation and frequency of field QC samples;
- Equipment calibration and maintenance; and
- Chain of Custody forms.

Corrective actions for procedure violations are described in Section 10, Corrective Action.

7.4 DATA ASSESSMENT PROCEDURES

The Project Manager and Project QA/QC Officer are responsible for data review and validation. Upon receipt of each data package from the laboratory, calculations for precision, accuracy, and completeness will be performed using the equations presented in Section 3, Data Quality Objectives. Results will be compared to quantitative DQOs where established, or to qualitative DQOs. The data validation parameters are outlined in Section 3, Data Quality Objectives.

7.5 QUALITY CONTROL SUMMARY REPORT

A Quality Control Summary Report will be prepared by Farallon based on the QC summary data provided by the laboratory.

8.0 PERFORMANCE AND SYSTEM AUDITS

Performance audits will be conducted for both sampling and analysis work. Field performance will be monitored through regular review of field notebooks, field measurements, and Chain of Custody forms. The Project Manager and/or the Project QA/QC Officer also will perform periodic on-site review of work in progress.

Ecology accreditation of the analytical laboratory for each type of analysis performed demonstrates the laboratory's ability to properly perform the requested methods. Therefore, a system audit of the analytical laboratories will not be conducted during the course of this project.

The Project Manager and/or Project QA/QC Officer will oversee communication with the analytical laboratories frequently while samples are being processed and analyzed at the laboratories. This oversight will allow Farallon to assess progress toward the DQOs and to take corrective measures, if necessary.

The analytical laboratories are responsible for identifying (and correcting, as appropriate) any deviation from performance standards, as discussed in the Laboratory Quality Assurance Manual. The laboratories will communicate to the Project Manager or the Project QA/QC Officer any deviation from the performance standards and the appropriate corrective measures taken during sample analysis. Corrective actions are discussed in Section 10, Corrective Action.

9.0 PREVENTIVE MAINTENANCE

Operation and maintenance manuals will accompany all field parameter analysis and measurement equipment. Included in these manuals will be procedures for calibration, operation, and troubleshooting. Maintenance activities will be documented in the project Field Report forms and/or equipment logbooks. A schedule of preventive maintenance activities will be maintained. In addition, spare parts and tools will be included in each equipment storage case to minimize equipment downtime.

10.0 CORRECTIVE ACTION

Corrective actions will be the joint responsibility of the Project Manager and the Project QA/QC Officer. Corrective procedures may include:

- Identifying the source of the violation;
- Reanalyzing samples if holding time criteria permit;
- Resampling and analyzing;
- Remeasuring the parameter;
- Evaluating and amending sampling and analytical procedures; and/or
- Qualifying data to indicate the level of uncertainty.

During field sampling operations, the Project Manager and field team members will be responsible for identifying and correcting protocols that may compromise the quality of the data. All corrective actions taken will be documented in the field notes.

11.0 QUALITY ASSURANCE REPORTS

Following completion of the summary level data validation, a usability assessment will be performed by the Project QA/QC Officer to ascertain the overall usability of the data. The usability assessment will include a discussion of the analytical program and the QC activities implemented during the field activities.

11.1 DATA LIMITATIONS AND USABILITY ASSESSMENT ACTIONS

The usability assessment will include a review of analytical and field procedures to ascertain the usability of the data, based on the five data quality indicators (i.e., precision, accuracy, representativeness, comparability, and completeness,). If deficiencies are identified during the usability assessment, project personnel will ascertain if data are usable, or if re-sampling or re-analysis is required to meet project goals.

11.2 ACTIVITIES

A variety of parameters will be used to ascertain whether project data are usable. Parameters include but are not limited to deviations in sampling locations, chain of custody, holding times, damaged samples, and QC samples. Deviations from the QAPP and their effect on DQOs will be documented in the RI Report.

Farallon will verify that the historical data has been validated in accordance with the protocols presented in this QAPP. If it is not certain that the historical data has been validated, the data will be reviewed by the independent third-party reviewer.

TABLES

QUALITY ASSURANCE PROJECT PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

Table 1
Summary of Laboratory Analyses by Media and Test Method
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-006

Groundwater - Monitoring Well Sampling		
Group	**Analyte**	**Method**
Halogenated Volatile Organic Carbons (HVOCs)	Tetrachloroethene	EPA 8260B
	Trichloroethylene	
	cis-1,2-Dichloroethene	
	trans-1,2-Dichloroethene	
	Vinyl Chloride	
1,4-Dioxane	1,4-Dioxane	EPA 8270C modified
Redox Metals	Manganese	EPA 6010B
	Iron	
Monitored Natural Attenuation Parameters	Alkalinity	EPA 310.2
	Chloride	EPA 325.2/325.3/MSA 10-3
	Sulfate	EPA 375.4
	Sulfide	EPA 376.1
	Nitrate	EPA 353.2
	Nitrite	
	Total Organic Carbon	EPA 415.1
	Ferrous and Ferric Iron	SM3500-FeB, 6010B
	Methane	Gas Chromatograph/Flame Ionization Detection
	Ethane	
	Ethene	

NOTES:

EPA = U.S. Environmental Protection Agency

Table 2
Laboratory Reporting Limits and Cleanup Levels
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Analyte	Analytical Method	Laboratory Water PQL (µg/l)	Screening Levels for Water [1] (µg/l)		
			Water Table Zone	Shallow Zone	Intermediate Zone
Tetrachloroethene	EPA 8260B	0.20	0.17	0.17	0.17
Trichloroethene	EPA 8260B	0.20	0.404	0.654	0.654
cis-1,2-Dichloroethene	EPA 8260B	0.20	72.7	137	137
trans-1,2-Dichloroethene	EPA 8260B	0.20	65.3	1,403	1,403
Vinyl Chloride	EPA 8260B	0.20	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
Alkalinity	EPA 310.2	20,000	--	--	--
Chloride	SM4500	2	--	--	--
Sulfate	EPA 375.4	5,000	--	--	--
Nitrate	EPA 353.2	50	--	--	--
Nitrite	EPA 353.2	50	--	--	--
Total Organic Carbon	Plumb 1981 - EPA 415.1	1500	--	--	--
Ferrous and Ferric Iron	SM3500-FeB, 6010B	0.04	--	--	--
Methane	GC/FID	0.50	--	--	--
Ethane	GC/FID	0.50	--	--	--
Ethene	GC/FID	0.50	--	--	--

NOTES:

[1] The basis for screening levels for soil and water are are presented in the Remedial Investigation Work Plan.
-- = not established
EPA = U.S. Environmental Protection Agency
GC/FID = gas chromatograph/flame ionization detection
mg/kg = milligrams per kilogram
µg/l = micrograms per liter
PQL = practical quantitation limit

Table 3
Laboratory Quality Assurance/Quality Control Limits for Surrogates for Groundwater
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Analyte	Lower Control Limit Percent	Upper Control Limit Percent
Volatile Organic Compounds		
Dibromofluoromethane	71	116
4-Bromofluorobenzene	70	123
Toluene-d_8	76	116
1,4-Dioxane		
1,4 Dioxane-d_8	20	125

NOTES:
Only surrogates applicable to the analyte list will be quantitated for a given sample.

Table 4
Laboratory Control Standard Limits for Groundwater Samples
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Analyte	Analytical Method	Lower Control Limit Percent	Upper Control Limit Percent	Relative Percent Difference
Tetrachloroethene	EPA 8260B	70	130	16
Trichloroethene		70	116	16
cis-1,2-Dichloroethene		70	130	13
trans-1,2-Dichloroethene		76	119	15
Vinyl Chloride		77	112	15
1,4-Dioxane	EPA 8270C Modified	75	125	20
Manganese	EPA 6010B	80	120	20
Iron		80	1120	20
Alkalinity	EPA 310.2	70	130	8
Sulfate	EPA 375.4	92	116	10
Nitrate	EPA 353.2	86	114	28
Nitrite		79	128	13
Total Organic Carbon	EPA 415.1 - Plumb 1981	75	125	20
Ferrous and Ferric Iron	SM3500-FeB, 6010B	75	125	20
Methane	GC/FID	70	130	25
Ethane		70	130	25
Ethene		70	130	25

NOTES:
EPA = U.S. Environmental Protection Agency
GC/FID = gas chromatograph/flame ionization detection

Table 5
Matrix Spike/Matrix Spike Duplicate Control Limits
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Analyte	Analytical Method	Lower Control Limit Percent	Upper Control Limit Percent	Relative Percent Difference
Tetrachloroethene	EPA 8260B	70	130	11
Trichloroethene	EPA 8260B	77	114	10
cis-1,2-Dichloroethene	EPA 8260B	70	130	13
trans-1,2-Dichloroethene	EPA 8260B	79	121	11
Vinyl Chloride	EPA 8260B	77	108	10
1,4-Dioxane	EPA 8270C Modified	75	127	25
Manganese	EPA 6010B	75	125	20
Iron	EPA 6010B	75	125	20
Alkalinity	EPA 310.2	70	130	8
Sulfate	EPA 375.4	88	111	10
Nitrate	EPA 353.2	81	119	28
Nitrite	EPA 353.2	78	131	13
Total Organic Carbon	EPA 415.1 - Plumb 1981	75	125	20
Ferrous and Ferric Iron	SM3500-FeB - 6010B	75	125	20
Methane	GC/FID	--	--	--
Ethane	GC/FID	--	--	--
Ethene	GC/FID	--	--	--

NOTES:
-- = Matrix spike/matrix spike duplicate not conducted by laboratory.

Table 6
Container, Preservation and Holding Time Requirements for Groundwater
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Analyte	Method	Container[1]	Number of Containers	Preservation Requirements	Holding Time
Tetrachloroethene	EPA Method 8260B	40 ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
Trichloroethene					
cis-1,2-Dichloroethene					
trans-1,2-Dichloroethene					
Vinyl Chloride					
1,4-Dioxane	EPA Method 8270C Modified	1 liter amber	2	4°C	7days/40 days
Manganese	EPA Method 6010B	500 ml HDPE	1	4°C, nitric acid to pH<2	6 months
Iron					
Alkalinity	EPA Method 310.2	500 ml HDPE	1	4°C	14 days
Nitrate	EPA Method 353.2				48 hours
Nitrite	EPA Method 353.2				48 hours
Chloride	SM4500	500 ml HDPE	1	4°C	28 days
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
Methane	Gas Chromatograph/Flame Ionization Detection	40 ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
Ethane					
Ethene					

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 7
Sample Summary by Media
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

	Number of Samples (identify field duplicates)			Laboratory Quality Control Samples		
Analytical Group	**Primary**	**Duplicate**	**Trip Blank**	**Matrix Spike**	**Matrix Duplicate**	**Rinsate Blank**
HVOCs	145	NA	1 trip blank per cooler . Analyze 10 %	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less
1,4-Dioxane	40	1	1 trip blank per cooler . Analyze 10 %	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less
Redox Metals	40	1	1 trip blank per cooler . Analyze 10 %	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less
Natural Attenuation Parameters	192	20	1 trip blank per cooler . Analyze 10 %	10 - 1 per batch of 20 samples or less	10 - 1 per batch of 20 samples or less	10 - 1 per batch of 20 samples or less
HVOCs, 1,4-Dioxane, Manganese, Iron, Monitored Natural Attenuation Parameters	Variable by Analysis (see Table 2 of SAP)	10% of samples of primary samples	1 trip blank per cooler . Analyze 10 %	1 per batch of 20 samples or less	1 per batch of 20 samples or less	1 per batch of 20 samples or less

NOTES:

NA = not applicable

TOC = total organic carbon

APPENDIX C
BORING/WELL LOGS AND WELL CONSTRUCTION SHEETS

GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

USCS Classification and Graphic Legend

Major Divisions			USCS Graphic Symbol	USCS Letter Symbol	Lithologic Description
Coarse-Grained Soil (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well graded GRAVEL, well graded GRAVEL with sand
				GP	Poorly graded GRAVEL, GRAVEL with sand
		GRAVEL WITH FINES (Appreciable amount of fines)		GP-GM	Poorly graded GRAVEL - GRAVEL with sand and silt
				GM	Silty GRAVEL
				GC	Clayey GRAVEL
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well graded SAND
				SP	Poorly graded SAND
		SAND WITH FINES (Appreciable amount of fines)		SP-SM	Poorly graded SAND - silty SAND
				SM	Silty SAND
				SC	Clayey SAND
				SM-ML	SILT - Silty SAND
Fine-Grained Soil (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	SILT
				CL	CLAY
				OL	Organic SILT
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic SILT
				CH	Inorganic CLAY
				OH	Organic CLAY
		Highly Organic Soil		PT	Peat
OTHER MATERIALS	PAVEMENT			AC	Asphalt concrete
				CO	Concrete
	OTHER			RK	Bedrock
				WD	Wood Debris
				DB	Debris (Miscellaneous)
				PC	Portland cement

Legend

- Sample Interval
- G — Grab Sample Interval
- Water level at time of drilling
- Water level at time of sampling
- Blank Casing
- Screened Casing
- Cement Grout
- Bentonite
- Sand Pack
- Well Cap

_____ Solid line indicates sharp contact between units well defined.

_ _ _ _ _ _ Dashed line indicates gradational contact between units.

feet bgs = feet below ground surface
NE = Not Encountered
NA = Not Applicable
PID = Photoionization Detector
PN = Project Number
*ppm = parts per million total organic vapors in isobutylene equivalents using a 10.6 electron volt lamp
USCS = Unified Soil Classification System

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-7-40

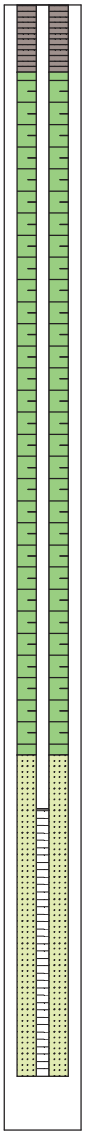
Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: J. Ruark

Date/Time Started:	2/8/2010	**Sampler Type:**	NA
Date/Time Completed:	2/8/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	40
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	40
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen
5										
10										
15										
20										
25										
30										
35										
40										



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 30-40

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-7-60

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: D. Clement

Date/Time Started:	2/9/2010	**Sampler Type:**	NA
Date/Time Completed:	2/9/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	60
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	60
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–60		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 50-60

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-8-40

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: J. Ruark

Date/Time Started:	2/8/2010	**Sampler Type:**	NA
Date/Time Completed:	2/8/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	40
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	40
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–40		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 30-40

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-8-60

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: J. Ruark

Date/Time Started:	2/8/2010	**Sampler Type:**	NA
Date/Time Completed:	2/8/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	60
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	60
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–60		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 50-60

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-10-20

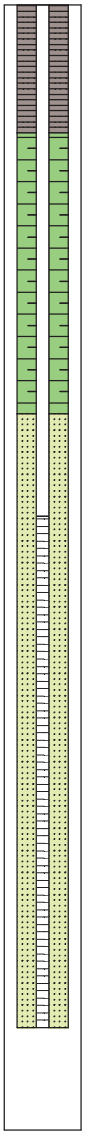
Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: J. Ruark

Date/Time Started:	2/11/2010	**Sampler Type:**	NA
Date/Time Completed:	2/11/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	20
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	20
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen
5										
10										
15										
20										



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 10-20

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-10-35

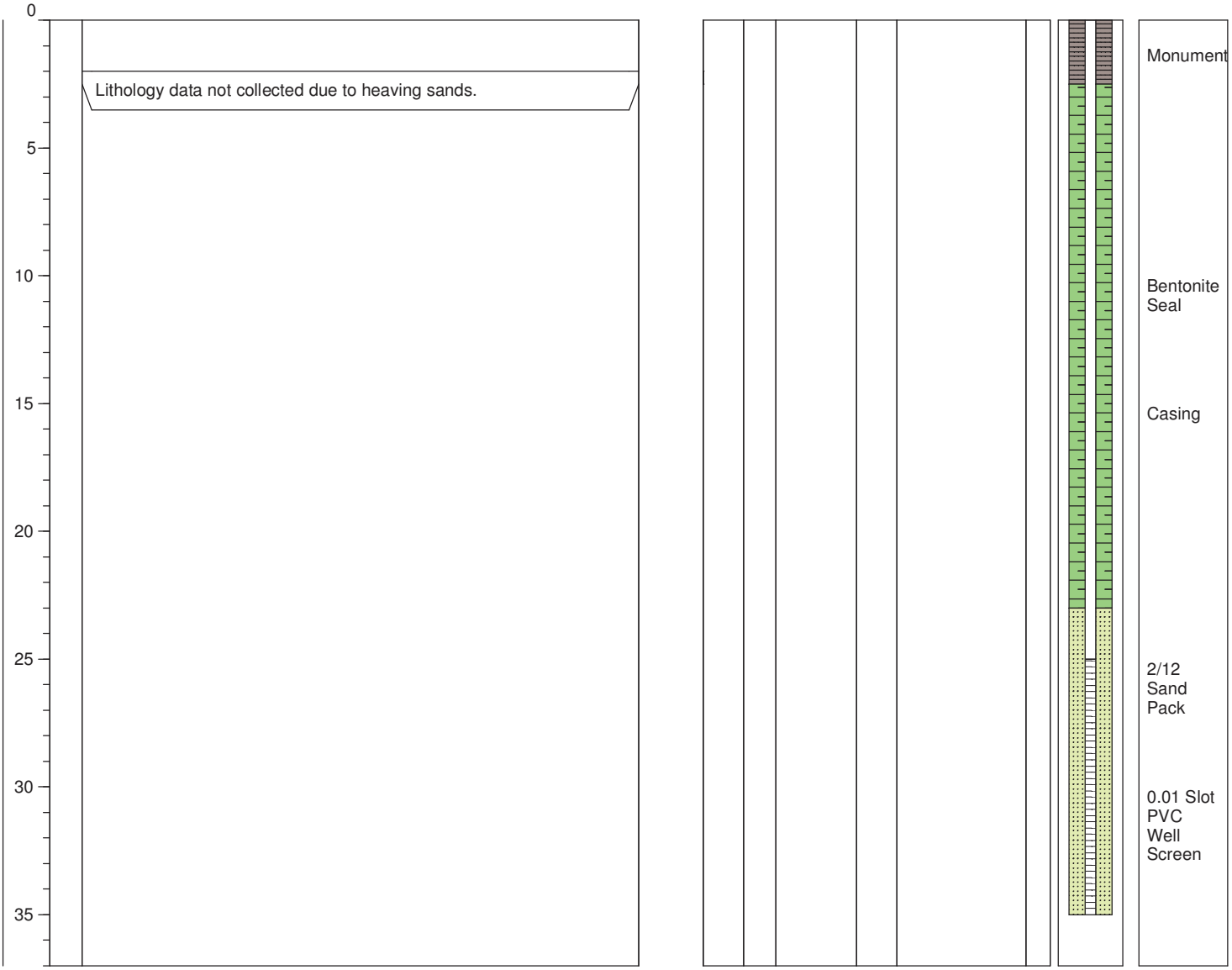
Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: J. Ruark

Date/Time Started:	2/11/2010	**Sampler Type:**	NA
Date/Time Completed:	2/11/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	35
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	35
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–35		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 25-35

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-10-65

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: J. Ruark

Date/Time Started:	2/11/2010	**Sampler Type:**	NA
Date/Time Completed:	2/11/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	65
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	65
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–65		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 50-65

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-12-30

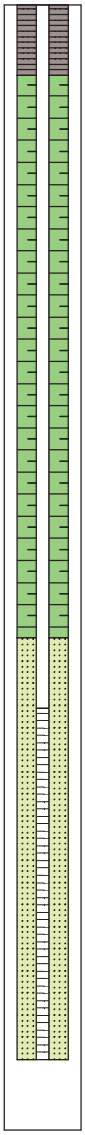
Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: K. Scott

Date/Time Started:	3/4/2010	**Sampler Type:**	NA
Date/Time Completed:	3/4/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	30
Drilling Foreman:	Steve Choate	**Total Well Depth (ft bgs):**	30
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Lithology data not collected due to heaving sands.								Monument
5										Bentonite Seal
10										
15										Casing
20										2/12 Sand Pack
25										0.01 Slot PVC Well Screen
30										



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 20-30

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-12-60

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: K. Scott

Date/Time Started:	3/4/2010	**Sampler Type:**	NA
Date/Time Completed:	3/4/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	60
Drilling Foreman:	Steve Choate	**Total Well Depth (ft bgs):**	60
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–60		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 50-60

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-12-WT

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: K. Scott

Date/Time Started:	3/4/2010	**Sampler Type:**	NA
Date/Time Completed:	3/4/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	20
Drilling Foreman:	Steve Choate	**Total Well Depth (ft bgs):**	20
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen
5										
10										
15										
20										

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 10-20

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-15-40

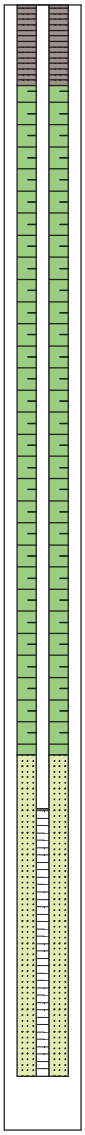
Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: K. Scott

Date/Time Started:	3/3/2010	**Sampler Type:**	NA
Date/Time Completed:	3/3/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	40
Drilling Foreman:	Steve Choate	**Total Well Depth (ft bgs):**	40
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Lithology data not collected due to heaving sands.								Monument
5										
10										Bentonite Seal
15										
20										Casing
25										
30										2/12 Sand Pack
35										0.01 Slot PVC Well Screen
40										



Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 30-40

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-15-60

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: K. Scott

Date/Time Started:	3/3/2010	**Sampler Type:**	NA
Date/Time Completed:	3/3/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	60
Drilling Foreman:	Steve Choate	**Total Well Depth (ft bgs):**	60
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–60		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 50-60

Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

FARALLON consulting
975 5th Avenue Northwest
Issaquah, Washington 98027

Log of Boring: CI-137-50

Client: Capital Industries
Project: Capital Industries
Location: Seattle, WA

Farallon PN: 457-004

Logged By: D. Clement

Date/Time Started:	2/9/2010	**Sampler Type:**	NA
Date/Time Completed:	2/9/2010	**Drive Hammer (lbs.):**	NA
Equipment:	CME 75	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	50
Drilling Foreman:	Andy	**Total Well Depth (ft bgs):**	50
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Lithology data not collected due to heaving sands.								Monument; Bentonite Seal; Casing; 2/12 Sand Pack; 0.01 Slot PVC Well Screen
5										
10										
15										
20										
25										
30										
35										
40										
45										
50										

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2.0
Screen Slot Size (inches): 0.01
Screened Interval (ft bgs): 40-50

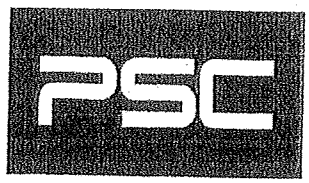
Filter Pack: 2/12 Sand
Surface Seal: Grout
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

APPENDIX D
ACCESS AGREEMENTS

GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004



March 18, 2009

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

Re: Access to PSC Monitoring Wells for Capital Industries – Georgetown Study Area

Dear Dan:

We are in receipt of your request to access select PSC Environmental Services, LLC (PSC) owned groundwater monitoring wells located in the vicinity of the Capital Industries (CI) property located at 5801 3rd Avenue South, Seattle, WA; in the Georgetown Study Area. The wells in question were identified in your Remedial Investigation Work Plan and subsequent correspondence with PSC. This access agreement will be for the time period required by Ecology under CI's Agreed Order No. DE5348. The specific PSC wells included in your work plan are as follows:

- CG-137-WT
- CG-137-40
- CG-141-WT
- CG-141-40
- CG-141-50

We understand that you would like to utilize these wells in conjunction with groundwater and other environmental investigations at the CI property. PSC is willing to allow you and CI access to the subject monitoring well(s) if you will agree to and acknowledge your consent to the following terms and conditions:

1. You will inform PSC in writing at least one calendar week prior to a water level measuring or groundwater sampling event involving any of the subject PSC monitoring wells.
2. You agree to have PSC personnel accompany you to the monitoring well location, provide access to the well, remain and observe the sampling activities, and secure the well following completion of sampling.
3. You will inform PSC of any observed potential damage to the wells upon discovery.
4. You will provide PSC with a copy of the field data.
5. You and/or CI will take full responsibility as the generator for any groundwater extracted from the monitoring well, including the proper disposal of all material constituting a hazardous waste.

Furthermore, you and CI agree to indemnify and hold harmless PSC from any third party claims arising from your or your client's sampling and related activities, including the use and/or access to PSC monitoring wells; and, you agree to pay for any damage to PSC monitoring well property resulting from or caused by your use of and/or sampling of PSC monitoring well property. You will promptly repair and/or replace any equipment and fully restore well installation integrity of the monitoring wells accessed and used by you and CI such that the damaged well may be placed back into proper and effective service. In the event any well may no longer be used for sampling purposes because of damage caused by you or CI, you and CI agree to replace the damaged well at your sole cost and expense in accordance with applicable regulatory requirements and as required by the Washington Department of Ecology. Such replacement and/or repair of a monitoring well in the PSC network shall occur no later than thirty (30) days following Ecology approval of well repair and/or replacement construction plans.

PSC reserves its right to deny access to and/or withhold permission to sample its monitoring wells if any terms or conditions of this letter agreement are not accepted. If you agree to the terms and conditions stated above, please indicate your agreement and acknowledgment by signing in the designated signature block below. By your signature, you represent that you have the proper authority to bind yourself and CI to the terms and conditions set forth in this letter. Please return the original signed copy of this letter before you conduct any future planned sampling of the subject monitoring wells to establish your access to the wells.

Please call me if you have any questions regarding this matter at (425) 227 - 6149.

Cordially,

William Beck
Georgetown Facility
Corrective Action Project Manager
PSC Environmental Services, LLC

AGREED and ACKNOWLEDGED this
19 day of March, 2009.

By:

Firm: Capitol Industries, Inc.

Title: President

FIRST AMENDED SITE ACCESS AGREEMENT

This Site Access Agreement ("Agreement") entered into this 26nd day of January, 2010, by and between Natus Medical, Incorporated ("NATUS"), Michigan Properties, a Washington General Partnership ("MICHIGAN PROPERTIES"), and Capital Industries, Inc. ("CAPITAL").

RECITALS

1. MICHIGAN PROPERTIES is the owner of a building located at 5900 First Avenue South, Seattle, Washington, 98108 ("MICHIGAN PROPERTIES BUILDING").

2. NATUS is the lessee of the MICHIGAN PROPERTIES BUILDING. NATUS assumed the lease of Olympic Medical, Corp., a Washington corporation, in connection with its acquisition of and subsequent merger of Olympic Medical Corp. into NATUS.

3. CAPITAL is the owner/operator of property located at 5801 Third Avenue South, Seattle, Washington ("CAPITAL Property").

4. CAPITAL desires to continue to gain limited access to the MICHIGAN PROPERIES BUILDING for the sole purpose of installing and maintaining an air mitigation system, as described in attachment to this Agreement, in the MICHIGAN PROPERTIES BUILDING and to install and maintain three monitoring wells to be located on the south side of the MICHIGAN PROPERTIES BUILDING, as shown in attached Figure A. NATUS and MICHIGAN PROPERTIES are willing to grant such limited access under the following terms and conditions.

TERMS AND CONDITIONS

NATUS and MICHIGAN PROPERTIES hereby grant to CAPITAL and/or its authorized environmental consultants and its subcontractors permission to enter the MICHIGAN PROPERTIES BUILDING for the sole purpose of installing and maintaining an air mitigation system in the MICHIGAN PROPERTIES BUILDING and for installing and maintaining three monitoring wells on the south side of the property.

A. All activity will be conducted after reasonable prior notice, at reasonable times and in a reasonable manner (as determined by NATUS and with a NATUS representative present) so as to ensure that it does not interfere with the business or other operations at NATUS.

B. The scope and location of all activities in the MICHIGAN PROPERTIES BUILDING shall be pre-approved by NATUS, and all activities in the MICHIGAN PROPERTIES BUILDING and on the property owned by MICHIGAN PROPERTIES shall be conducted in an environmentally sound manner and in full compliance with all applicable law and regulations. All activities conducted in the MICHIGAN PROPERTIES BUILDING and on the property owned by MICHIGAN PROPERTIES will also be performed in a good and workmanlike manner, minimizing any injury or damage to the Property and leaving the Property in a safe and secure manner. If any injury or damage occurs, then CAPITAL shall replace and repair all items injured or damaged as a result of the permitted activities.

C. Anyone operating in the MICHIGAN PROPERTIES BUILDING or installing or maintaining monitoring wells on the property owned by MICHIGAN PROPERTIES shall keep and maintain insurance for commercial general liability, pollution liability, and vehicle liability; said policies to have limits of not less than $5,000,000 for all losses incurred on account of any injuries or damage arising from any activities conducted in the MICHIGAN PROPERTIES BUILDING. Upon request, CAPITAL agrees to provide NATUS and/or MICHIGAN PROPERTIES with periodic proof that such policies are in full force and effect.

D. CAPITAL, for itself and on behalf of anyone acting on its behalf, agrees to defend, indemnify and hold NATUS and MICHIGAN PROPERTIES harmless from any loss, cost, damage or injury, including but not limited to business interruption and lost profits, whether accidental or intentional, which results from any activities conducted in the MICHIGAN PROPERTIES BUILDING or on the property owned by MICHIGAN PROPERTIES.

E. The granting of permission by NATUS and MICHIGAN PROPERTIES to CAPITAL to install and maintain an air mitigation system and certain monitoring wells is not intended, nor should it be construed, as an admission of liability on NATUS' or MICHIGAN PROPERTIES' part for any environmental contamination in the area.

F. All indemnifications, representations and warranties contained herein shall survive the completion of any activity hereunder and/or the termination of this Agreement.

G. This Agreement shall be construed in accordance with the laws of the State of Washington, and venue for any action hereunder shall be in the courts of King County, Washington. In any action hereunder, the prevailing party shall be entitled to its reasonable costs and attorney fees.

This Agreement is entered into on the day and year above first written.

NATUS MEDICAL, INCORPORATED

Edward B. Weiler, Ph.D.

CAPITAL INDUSTRIES, INC.

Ronald S. Taylor, Pres.

MICHIGAN PROPERTIES

Larry A. Russak, General Partner

SITE ACCESS AGREEMENT ADDENDUM

This Addendum to the existing July 13, 2009, Site Access Agreement ("Addendum") is entered into this 13 day of ~~February~~ May, 2010, by and between Gull Industries, Inc., and 5901 Fourth Avenue, LLC (collectively "Gull") and Capital Industries, Inc. ("Capital"). This Addendum supplements the existing Site Access Agreement by and between Gull and Capital entered into on July 13, 2007. All terms of the July 13, 2007, Site Access Agreement remain in full effect.

RECITALS

1. Gull is the owner of a certain parcel of real property located at 5901 Fourth Avenue South, Seattle, Washington ("Gull Property").

2. Capital is the owner/operator of the adjoining property located at 5801 Third Avenue South, Seattle, Washington ("Capital Property").

3. Capital desires to gain limited access to the Gull Property for the sole purpose of installing three monitoring wells ("Wells") pursuant to Capital's agreement with the Washington Department of Ecology and conducting necessary monitoring of those wells. Capital desires to install the Wells to determine the nature and extent of any releases of hazardous substances as that term is defined under MTCA, RCW 70.105D.020(10) and the MTCA Cleanup Regulation, WAC 173-340-200 (including trichloroethene), if any, which may have migrated onto the Gull Property. The location of the proposed Wells is shown on the photograph of the subject property, which is attached to this Addendum as Exhibit A. Gull is willing to grant such limited access under the following terms and conditions.

TERMS AND CONDITIONS

Gull hereby grants to Capital and/or its authorized consultants, permission to enter the Gull Property for the sole purpose of installing the monitoring Wells as set forth in this Addendum, and the monitoring of these wells and for no other purposes including remediation.

A. All drilling activity will be conducted after reasonable prior notice of Capital's intent to enter the Gull Property, at reasonable times and in a reasonable manner as determined solely by Gull (and with a Gull representative present) so as to ensure that it does not interfere with the business or other operations at the Gull Property.

B. Copies of all data and test results obtained by Capital and its consultants from the installation of the Wells will be provided to Gull in a timely fashion.

C. This Addendum limits all drilling activity to the location of the Wells shown on **Exhibit A**. Capital agrees that the three Wells on the Gull Property will be

located less than approximately 8 feet apart and will be installed at depths of approximately 20 feet, 40 feet, and 70 feet, respectively. Any significant variation in the location or depth of the Wells must be pre-approved by Gull. Capital also agrees that the Wells shall be constructed, installed, maintained, and closed in an environmentally sound manner and in full compliance with all applicable laws and regulations.

D. All activity related to the installation of the Wells undertaken by Capital and its consultants will be conducted in accordance with all applicable laws and regulations and will be completed within 60 days from the date of this Addendum.

E. Capital agrees and warrants that anyone operating on the Gull Property, including all consultants hired by Capital, shall keep and maintain insurance for commercial general liability, pollution liability, and vehicle liability with Gull as an additional named insured, said policies to have limits of not less than $5,000,000 for all losses incurred on account of any injuries or damage arising from any activities conducted on the Gull Property. Capital agrees to provide Gull with periodic proof that such policies are in full force and effect.

F. Capital, for itself and on behalf of anyone acting on its behalf, agrees to indemnify and hold Gull harmless from any loss, cost, damage or injury, whether accidental or intentional, which results from any activities conducted by Capital and its consultants on the Gull Property. In addition, Capital agrees to reimburse Gull for Gull's actual costs and expenses incurred in providing Capital or its consultants access to the Gull Property, as a result of Capital's work, as well as Gull's costs of reviewing the data Capital provides to Gull referenced in paragraph B, above, in an amount not to exceed $2,000.00.

G. Capital, or its consultants, shall restore the monitoring well locations, to the maximum extent practicable, to the condition they were in prior to all activities authorized by this Addendum.

H. The granting of permission by Gull to Capital to install and monitor the Wells on the Gull Property is not intended, nor should it be construed, as an admission of liability on Gull's part for any potential contamination detected during the installation of the Wells or in the samples obtained from the Wells.

I. All indemnifications, representations and warranties contained herein shall survive the completion of any activity hereunder and/or the termination of this Addendum.

J. This Addendum shall be construed in accordance with the laws of the State of Washington and venue for any action hereunder shall be in the courts of King County, Washington. In any action hereunder, the prevailing party shall be entitled to its reasonable costs and attorney fees.

This Addendum entered into on the day and year above first written.

Gull Industries, Inc.

William Low, Senior Vice President

Capital Industries, Inc.

Ronald S. Taylor

SITE ACCESS AGREEMENT

This Agreement is made this 23rd day of February, 2010, between Capital Industries, Inc. ("Capital") and CertainTeed Gypsum Inc. ("CertainTeed Gypsum").

Recitals

A. CERTAINTEED GYPSUM owns real property located at 5931 E. Marginal Way South, Seattle, WA 98134 (the "Property").

B. Capital owns real property located at 5801 Third Avenue South, Seattle, WA 98108.

C. Capital is conducting a Remedial Investigation pursuant to an agreement with the Washington State Department of Ecology. The Remedial Investigation requires Capital to install groundwater monitoring wells on the Property.

D. Capital retained Farallon Consulting, LLC. ("Farallon") to install monitoring wells and collect groundwater samples from the Property pursuant to an agreement with the Washington State Department of Ecology dated _____.

Agreement

NOW, THEREFORE, in consideration of the mutual covenants and agreements contained herein, the parties do hereby covenant and agree to and with each other as follows:

1. Subject to the provisions of this Agreement, CERTAINTEED GYPSUM grants permission to Capital and Farallon, including anyone under the direct care and supervision of Capital and Farallon, (collectively "Guests") to enter the Property to perform or oversee the work described in Recital D above (the "Work"). Access granted under this Agreement to Guests shall be for the sole purpose of undertaking or overseeing the Work.

2. Guests shall, to the greatest extent reasonably possible, perform the Work in a manner that does not interfere with the use of the Property by CERTAINTEED GYPSUM.

Guests shall not cause or permit the Work to be performed in a manner that would cause or exacerbate any contamination at the Property.

3. Guests agree not to permit any liens to stand against the Property for work done or materials furnished to Guests.

4. Guests shall not cause or permit the Work to be performed in a manner that would cause damage to the Property which cannot be remedied and restored before, or promptly after, the completion of the Work.

5. As soon as reasonably possible, Guests shall restore and repair the affected portion of the Property to its condition before the Work commenced. Guests shall promptly and properly dispose of all waste generated during the Work.

6. CERTAINTEED GYPSUM has the right to be present during any Work at the Property. Guests will provide CERTAINTEED GYPSUM a minimum of 24 hours' notice before entering the Property for the purpose of beginning any Work. Guests will check in with the plant manager, Lorne Balaski (telephone: 206-768-3711 and email: lorne.balaski@saint-gobain.com) in order to be escorted around the Property.

7. Guests represent and warrant that all Work shall be performed in accordance with any and all applicable federal, state, and local law, and that all permits, licenses, or governmental approvals that may be required in connection with such Work have been obtained. Work shall be performed by a qualified environmental consultant in accordance with accepted practices. Guests shall bear all costs and expenses associated with the Work.

8. Guests shall be responsible for the safety of any person who enters the Property with respect to conditions created by the Guests while performing the Work. Guests also agree to abide by CERTAINTEED GYPSUM's safety procedures at the Property.

9. Guests, to the extent allowed under Washington law, shall indemnify defend, and hold CERTAINTEED GYPSUM harmless from and against any and all claims, demands, fines, damages, obligations, and liabilities (including reasonable attorney's fees) in connection with any claim to the extent such claim arises directly from the negligence of Guests in performing the Work, including the entry by Guests onto the Property, any restoration or repair required hereunder, and any breach of Guests' obligations under this Agreement. If Washington law allows one of the Guests to indemnify and defend CERTAINTEED GYPSUM, but not any other, then the Guest who under Washington law can indemnify and defend CERTAINTEED GYPSUM shall be obligated to do so regardless of the fault of any other Guest.

Any Guests who are not governmental entities represent that they will not attempt to take advantage of any immunity that one or more of their members may be entitled to as a result of their status as a governmental entity. Guests also represent that they will not have any of their members perform any portion of the Work alone in order to have that member take advantage of any opportunity they may have to avoid liability under Washington law.

10. Nothing in this Agreement shall give rise to any liability or obligation by any Guest with respect to any pre-existing contamination at the Property, whether known or unknown, unless Guests negligently perform the Work.

11. With respect to liability associated with the Work, no Guest is a representative of the Environmental Protection Agency, the Washington State Department of Ecology, the Washington State Department of Natural Resources, the Washington Department of Transportation's Environmental Services, or any Native American tribe or any Natural Resource Trustee.

12. The rights of the parties under this Agreement shall be governed by the law of the state of Washington.

13. This Agreement will terminate one year after the installation of the wells unless the Washington State Department of Ecology determines that Capital is required to monitor the groundwater from these wells beyond one year. In that case, this Agreement will terminate when the Department of Ecology determines that the wells can be closed. Capital shall be responsible for all costs associated with the installation, sampling, testing, and closure of the wells. Capital shall also act in a reasonable manner and take any and all steps necessary to request that the wells be closed as soon as possible after the required sampling is complete. Notwithstanding anything herein to the contrary, Guests' obligations hereunder (including, without limitation, its indemnification obligations) shall survive the expiration or earlier termination of this Agreement for a period of two years. This Agreement is not intended to, nor does it, convey any interest in real property to Guests.

14. All data and reports (whether preliminary or final) produced by or on behalf of Guests that relate to the Work shall be submitted to CERTAINTEED GYPSUM upon submission of the document to any outside organization or agency, or upon final completion of the Work.

15. Capital will only install wells in an area on CERTAINTEED GYPSUM'S property after discussing the location and the number of wells with CERTAINTEED GYPSUM. If CERTAINTEED GYPSUM requests that fewer wells be installed, or requests a well not be installed in a particular location, then Capital agrees not to install such wells until CERTAINTEED GYPSUM is able to discuss the number and location of the wells with the Washington State Department of Ecology.

16. As soon as feasible after entering into this Agreement, but no later than the date that Guests commence Work, Guests shall furnish CERTAINTEED GYPSUM with an insurance certificate of (a) any environmental consultant and (b) any other party, including any Guest who will participate in the Work, satisfactory in form and substance to CERTAINTEED GYPSUM at the sole subjective discretion of CERTAINTEED GYPSUM, showing at least the following coverages and providing for at least thirty (30) days' prior written notice by the insurance company of cancellation or modification and naming CERTAINTEED GYPSUM as an additional insured:

Kind of Insurance	Minimum Limits
Worker's Compensation	Statutory
Employer's Liability	$1,000,000 bodily injury by accident each accident $1,000,000 bodily injury by disease, policy limit $1,000,000 bodily injury by disease, each employee
Commercial General Liability	Combined Single Limits: $1,000,000 per occurrence $1,000,000 general aggregate
Business Auto Liability Owned autos	Combined Single Limit: $1,000,000 per accident Symbol 1 (Any Auto) including Hired and Non-

16. Any notice or communication required or permitted hereunder shall be in writing and shall be hand delivered or sent by registered or certified mail, postage prepaid, or by telecopier or recognized overnight carrier, to Lorne Balaski, Certainteed Gypsum Plant Manager, 5931 E. Marginal Way South, Seattle, WA 98134, as well as to Lauren P. Alterman, Vice

President, Health, Safety and Environment, Saint-Gobain Corporation, 750 E. Swedesford Road, Valley Forge, PA 19482.

Any such notice or communication shall be deemed delivered as follows: if hand delivered, on the day so delivered; if mailed, three business days after the date so mailed; if telecopied, upon telephone confirmation of receipt; and if sent by recognized overnight courier, the next business day.

17. Any provision of this Agreement that is unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such unenforceability without invalidating any other provision of this Agreement, and any such unenforceability in any jurisdiction shall not render unenforceable such provision in any other jurisdiction.

18. This Agreement shall inure to the benefit of, and be binding upon and enforceable by, the parties hereto and their respective successors and permitted assigns. Guests may not assign this Agreement, and any purported assignment shall be null and void.

19. The headings used in this Agreement are for convenience only and shall not be deemed to constitute a part of, or be used in the interpretation of, this Agreement.

20. All rights granted to Guests by CERTAINTEED GYPSUM hereunder are subject to all encumbrances affecting the Property and all rights and privileges of third parties to the Property existing prior to the execution of this Agreement.

21. This Agreement sets forth the entire agreement between the parties hereto with respect to the subject matter hereof and supersedes all prior agreements and understandings, whether written or oral. This Agreement may not be amended, supplemented, or rescinded except by a written instrument duly executed by each of the parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the date first above written.

CAPITAL INDUSTRIES, INC.	**CERTAINTEED GYPSUM, INC.**
_____	_____
BY: _____	BY: LORNE BALASKI
ITS: _____	ITS: PLANT MANAGER.

J. Davis
THOMAS DAVIS
HSE MANAGER

Capitol Indust. Parallel

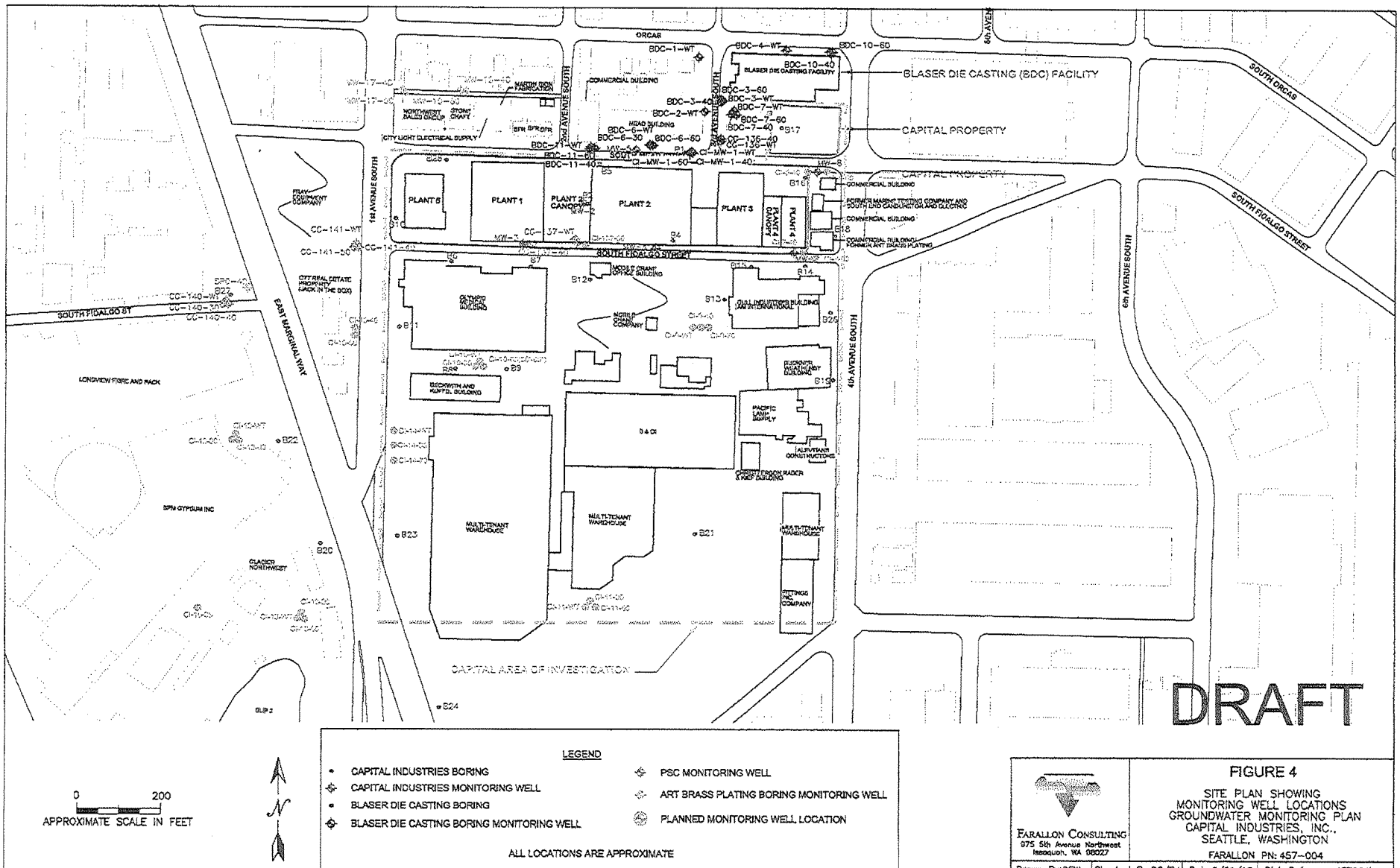


FIGURE 4

SITE PLAN SHOWING
MONITORING WELL LOCATIONS
GROUNDWATER MONITORING PLAN
CAPITAL INDUSTRIES, INC.,
SEATTLE, WASHINGTON

FARALLON PN: 457-004

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Drawn By: DEW | Checked By: DC/PJ | Date: 2/01/10 | Disk Reference: 457004h

From: Larry Russak
To: Dan Caputo;
Subject: Re: Capital Industries - Michigan Properties Access
Date: Thursday, May 13, 2010 1:22:18 PM

I thought I had sent an ok for the project. I have been out of town for a week. Anyway, you have my permission to go ahead with the boring for the monitoring wells. It is my understanding that there will be minimal disruption for the existing tenants. Please make sure to let the tenants know when you plan to do your work so they can be prepared and not complain to me.

Thanks,

Larry Russak

On Thu, May 13, 2010 at 12:04 PM, Dan Caputo <dcaputo@farallonconsulting.com> wrote:

> Mr. Russak,
>
>
>
> Farallon prepared an email (attached) on the behalf of Capital Industries,
> Inc. (Capital) on April 29, 2010 requesting access for, and providing the
> details of, the proposed monitoring well installation and groundwater
> monitoring at the Michigan Properties property located at 5960 1st Avenue
> South in Seattle, Washington (herein referred to as the property). Farallon
> has not received a response to this request to-date. Currently, drilling is
> scheduled to begin at the Property on Monday May 24, 2010. Please confirm
> that we may proceed with the work on that date (preferable by email so
> Capital may retain a record). I have cc Ed Jones from the Department of
> Ecology on this email. My understanding is that he has discussed this matter
> with you in the past, if you have any questions or comments please feel free
> to contact either Mr. Jones or myself.
>
>
>
> Thank you very much for your time.
>
>
>
> Daniel Caputo
> Farallon Consulting, L.L.C.
> Cell: (253) 228-1754
>
> Direct: (425) 295-0840
> Main: (425) 295-0800
> Fax: (425) 295-0850
> 975 5th Avenue Northwest
> Issaquah, Washington 98027

> www.farallonconsulting.com
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Larry Russak