

**SEPTEMBER 2011
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**

July 1, 2011

Prepared by:

Akos Fekete, L.G.
Senior Geologist

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

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1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this September 2011 Groundwater Monitoring Plan on behalf of Capital Industries, Inc. (Capital) for groundwater monitoring activities to be conducted in September 2011. The groundwater monitoring activities for the Capital Area of Investigation are defined in the following documents that were prepared by Farallon and approved by the Washington State Department of Ecology (Ecology):

- *Remedial Investigation Work Plan, Capital Industries, Inc., 5801 Third Avenue South, Seattle, Washington* dated September 16, 2008 (Farallon 2008a) (RI Work Plan);
- *Groundwater Monitoring Plan, Capital Industries, Inc., 5801 3rd Avenue South, Seattle, Washington* dated May 19, 2010 (Farallon 2010); and
- *Addendum to Groundwater Monitoring Plan, Capital Industries, Inc., 5801 3rd Avenue South, Seattle, Washington* dated March 4, 2011 (Farallon 2011c).

The documents listed above summarize the groundwater monitoring program conducted to date for the Remedial Investigation (RI) of the Capital Area of Investigation (Figures 1 and 2). The RI is being conducted in accordance with Agreed Order No. DE 5348 entered into by Capital and 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 latest groundwater monitoring event for the RI was conducted in March 2011. The results of the RI field program conducted to date will be summarized in the RI Report that will be submitted to Ecology in draft format in July 2011. The RI was conducted to collect sufficient information to enable development and evaluation of technically feasible cleanup alternatives in accordance with WAC 173-340-360.

As required by Ecology, the scope of work for the groundwater monitoring summarized herein has been developed to satisfy the data objectives presented in the letters from Ecology regarding: 1) the Groundwater Monitoring Plan Addendum dated January 14, 2011; 2) the Revised Groundwater Monitoring Plan Addendum dated March 22, 2011; 3) the Draft Post-Remedial Investigation Groundwater Monitoring Work Plan dated May 2, 2011; and 4) Groundwater

Monitoring in 2011 dated June 14, 2011 (collectively referred to herein as the Ecology Comment Letters).

Background information pertaining to the Capital Area of Investigation, adjacent property land use, environmental setting, hydrogeology, and previous investigations is presented in the RI Work Plan. Historical and background data for the Capital Property, Philip Services Corporation (PSC) facility, Art Brass Plating (ABP) facility, and Blaser Die Casting (BDC) facility are discussed in detail in the *Data Summary Report, West Groundwater Investigation Area, Seattle, Washington* (Farallon et al. 2008) and the RI Work Plan.

1.1 OBJECTIVES

The objectives of the September 2011 groundwater monitoring are based on the data objectives defined in the Ecology Comment Letters. The results of the groundwater monitoring completed for the RI to date show, in Farallon's opinion, that the concentrations of constituents of potential concern (COPCs) detected in groundwater are well delineated and do not require quarterly monitoring.

The specific data objectives for the September 2011 groundwater monitoring as defined by Ecology are to:

- Confirm the current understanding of the nature and extent of concentrations of COPCs in groundwater and hydraulic conditions within the Capital Area of Investigation.
- Collect additional tidal information to refine groundwater flow directions and gradients in tidally influenced areas of the Capital Area of Investigation.
- 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, Capital Industries, Inc., 5801 Third Avenue South, Seattle, Washington* (Farallon 2008b) (VI Assessment Work Plan) and the *Addendum to the Vapor Intrusion Assessment Work Plan, Capital Industries, Inc., 5801 Third Avenue South, Seattle, Washington* (Farallon 2011a) (Addendum to VI Assessment Work Plan).

Five consecutive quarters of groundwater monitoring have been completed for the RI at the Capital Area of Investigation since March 2010; however, not all of the monitoring wells in the network were installed at the time of the March 2010 event. Groundwater monitoring was conducted only at the installed portion of the overall Capital groundwater monitoring well network. The results of the five consecutive quarters of groundwater monitoring have met the data objectives defined in the RI Work Plan. As required by the Ecology Comment Letters, Capital will conduct the September 2011 groundwater monitoring to address the data objectives identified in the Ecology Comment Letters.

1.2 REPORT ORGANIZATION

This document has been organized into the following sections:

- **Section 1—Introduction.** This section provides a brief introduction and presents the objectives of Capital groundwater monitoring.
- **Section 2—September 2011 Groundwater Monitoring.** This section describes the procedures and protocols associated with groundwater monitoring 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 the groundwater monitoring.
- **Section 4—Reporting.** This section discusses the reporting requirements associated with the groundwater monitoring.
- **Section 5—References.** This section lists the documents cited in this September 2011 Investigation Groundwater Monitoring Plan.

2.0 SEPTEMBER 2011 GROUNDWATER MONITORING

The September 2011 groundwater monitoring will include measuring the depth to groundwater and collecting groundwater samples from a subset of monitoring wells in the Capital groundwater monitoring well network as summarized in the sections below. Locations of the monitoring wells included in the September 2011 groundwater monitoring well network are presented on Figure 3. Specific depths and well-screen intervals are presented in Table 1. Groundwater monitoring requirements are defined for each monitoring well in Table 2.

Groundwater monitoring will be conducted in accordance with the processes and procedures presented in the *Groundwater Monitoring Plan, Capital Industries, Inc., 5801 3rd Avenue South, Seattle, Washington* (Farallon 2010), which included a Sampling and Analysis Plan, a Quality Assurance Project Plan, and Standard Operating Procedures for groundwater monitoring; and the *Addendum to Groundwater Monitoring Plan, Capital Industries, Inc., 5801 3rd Avenue South, Seattle, Washington* (Farallon 2011c).

2.1 COLLECTION OF GROUNDWATER ELEVATIONS

Measuring the depth to groundwater will be conducted at all of the monitoring wells in the groundwater monitoring well network in September 2011. Water-level measurement events will be coordinated with ABP, BDC, and PSC to confirm that measurements are taken on approximately the same day so that regional groundwater conditions are assessed.

Capital conducted tidal influence and aquifer characterization activities in 2010. Ecology (2011d) is requiring that additional dry- and wet-season tidal studies be completed. The tidal study to be conducted in 2011 will consist of placing transducers that continuously measure the water level in the monitoring wells defined below over a 72-hour period. Transducer water-level data will be collected over a period of 2 days before and 2 days after the area-wide monitoring event to be conducted in September 2011. Transducers will be placed in the following wells:

- Water Table Zone: C-10-WT, C-11-WT, C-12-WT, C-13-WT, and C-14-WT;
- Shallow Zone: C-10-35, C-11-30, C-12-30, C-13-30, C-14-35, and C-15-40; and

- Intermediate Zone: C-10-65, C-11-60, C-12-60, C-13-60, C-14-70, and CI-15-60.

The results of the tidal study will be provided as an addendum to the RI Report.

2.2 SEPTEMBER 2011 GROUNDWATER MONITORING WELL NETWORK

The Capital groundwater monitoring well network consists of 40 monitoring wells that were installed by Capital, PSC, and BDC for the RI. The monitoring well locations for the RI were selected to assess groundwater quality in the three water-bearing zones defined for the Capital Area of Investigation. 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 approximately 70 feet bgs.

The results of groundwater monitoring conducted for the RI to date have detected COPCs above screening levels in groundwater in some of the monitoring wells included in the Capital groundwater monitoring well network. The COPCs for the Capital Area of Investigation that have been detected above the applicable screening levels are halogenated volatile organic compounds (HVOCs), 1,4-dioxane, ferric iron, and manganese. An evaluation of the nature and extent of COPCs based on the results of the groundwater monitoring conducted for the RI in 2010 and March 2011 will be presented in the RI Report. A subset of monitoring wells have been selected for the September 2011 groundwater monitoring based on the chemical and hydraulic information that was collected during the RI field program. The results of the September 2011 groundwater monitoring will be provided as an addendum to the RI Report.

Based on comments from Ecology and information collected to date, monitored natural attenuation (MNA) will be evaluated as a technically feasible cleanup alternative for the Capital Site. The Capital Site will be defined based on results of the RI in accordance with WAC 173-340-200. Therefore, the subset of monitoring wells that will be used for the September 2011

groundwater monitoring are consistent with the monitoring requirements of the *Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation* prepared by Ecology (2005).

Selection of monitoring wells for ongoing groundwater monitoring was based on an evaluation of COPCs in each specific groundwater-bearing zone. Therefore, the monitoring wells selected for groundwater monitoring are listed specific to the water-bearing zone consistent with the guidance for MNA.

2.2.1 Water Table Zone

The September 2011 groundwater monitoring will be conducted at Capital monitoring wells MW-7, MW-8, CI-9-WT, CI-10-WT, CI-11-WT, CI-13-WT, and CG-137-WT. Capital will use HVOC groundwater results from ABP monitoring well ABP-CG-140-WT and BDC monitoring well BDC-6-WT, which will be sampled by ABP and BDC, respectively.

2.2.2 Shallow Zone

The September 2011 groundwater monitoring will be conducted at Capital monitoring wells CI-10-35, CI-8-40, CI-11-30, CI-13-30, CI-15-40, and CG-137-40. Capital will use HVOC groundwater results from BDC monitoring wells BDC-6-30 and BDC-11-40, which will be sampled by BDC.

2.2.3 Intermediate Zone

The September 2011 groundwater monitoring will be conducted at Capital monitoring wells CI-MW-1-60, CI-10-65, CI-12-60, CI-15-60, and CI-137-50. Capital will use HVOC groundwater results from ABP monitoring well ABP-CG-140-70 and BDC monitoring well BDC-6-60, which will be sampled by ABP and BDC, respectively.

2.3 SEPTEMBER 2011 GROUNDWATER MONITORING PROGRAM SCHEDULE

In accordance with the Agreed Order, Capital completed four consecutive groundwater monitoring events at the Capital groundwater monitoring well network in June, September, and December 2010 and March 2011. A partial event was conducted in March 2010 at a subset of monitoring wells because access considerations did not allow installation of the complete Capital

groundwater monitoring well network at the time. The results of the five groundwater monitoring events have been provided to Ecology and will be summarized and evaluated in the RI Report to be submitted to Ecology in draft format in July 2011.

Based on the Ecology Comment Letters, Ecology requires that Capital conduct groundwater monitoring during the review and revision period for the draft RI Report in 2011. Capital will conduct groundwater monitoring activities at a subset of monitoring wells in September 2011.

2.4 LABORATORY ANALYSES

The laboratory analyses selected for the September 2011 groundwater monitoring are based on the results of groundwater monitoring in 2010 and March 2011 completed to date.

2.4.1 Halogenated Volatile Organic Compounds

The results of groundwater monitoring completed for the RI through 2011 detected concentrations of HVOCs above screening levels in monitoring wells located within the Capital Area of Investigation. It is Farallon's opinion that, when considered collectively relative to the water-bearing zone, the concentrations of HVOCs detected at the Capital Area of Investigation define the spatial extent of the HVOC plume across the various zones. The monitoring wells noted above have been selected for monitoring of the extent of the HVOC plume in 2011. The monitoring wells noted above will be sampled in September 2011 for HVOCs by U.S. Environmental Protection Agency Method 8260B.

2.4.2 1,4-Dioxane

Concentrations of 1,4-dioxane above screening levels were detected in groundwater samples collected from monitoring wells CI-7-40, CI-8-40, CI-7-60, and CI-MW-1-60 in June 2010. The Ecology Comment Letters noted that Capital should "discuss" with PSC, BDC, and ABP the groundwater monitoring needs for 1,4-dioxane at these monitoring wells and at monitoring wells where 1,4-dioxane exceeds laboratory detection limits, and present proposed plans to Ecology consistent with a joint decision. Capital discussed the detection of 1,4-dioxane with PSC and ABP and concluded that the data objectives of the RI for 1,4-dioxane have been achieved and that further groundwater monitoring for 1,4-dioxane is not warranted.

Therefore, based on the known source of 1,4-dioxane near the PSC facility, the lack of a history of 1,4-dioxane use at the Capital Property, and the distribution of 1,4-dioxane concentrations in groundwater that indicate an up-gradient source of 1,4-dioxane, Capital will not collect groundwater samples for analysis for 1,4-dioxane in the September 2011 groundwater monitoring.

2.4.3 Ferric Iron and Manganese

Ferric iron and manganese are included as COPCs in the RI Work Plan; however, ferric iron and manganese are geochemical indicators of MNA (Ecology 2005) and occur naturally in subsurface environments. Although ferric iron and manganese have been detected above the screening levels for the Capital Area of Investigation, additional information is not needed to characterize the geochemical processes occurring in the subsurface of the Capital Area of Investigation. Therefore, the monitoring wells selected for the September 2011 groundwater monitoring will not be sampled for ferric iron or manganese.

2.5 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

The analytical results of the September 2011 groundwater monitoring will be evaluated in accordance with the requirements of the Capital VI Assessment Work Plan and the Addendum to the VI Assessment Work Plan. The analytical results of the groundwater samples will be evaluated to determine whether there is a potential for a VI exposure pathway for HVOCs to enter commercial and industrial buildings located within the Capital Area of Investigation, in accordance with the regulatory guidance documents.

4.0 REPORTING

The September 2011 groundwater monitoring results will be presented in quarterly progress reports as required under the Agreed Order. The semiannual progress 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 and an interpretation of plume conditions based on the chemical data collected during the reporting period.

5.0 REFERENCES

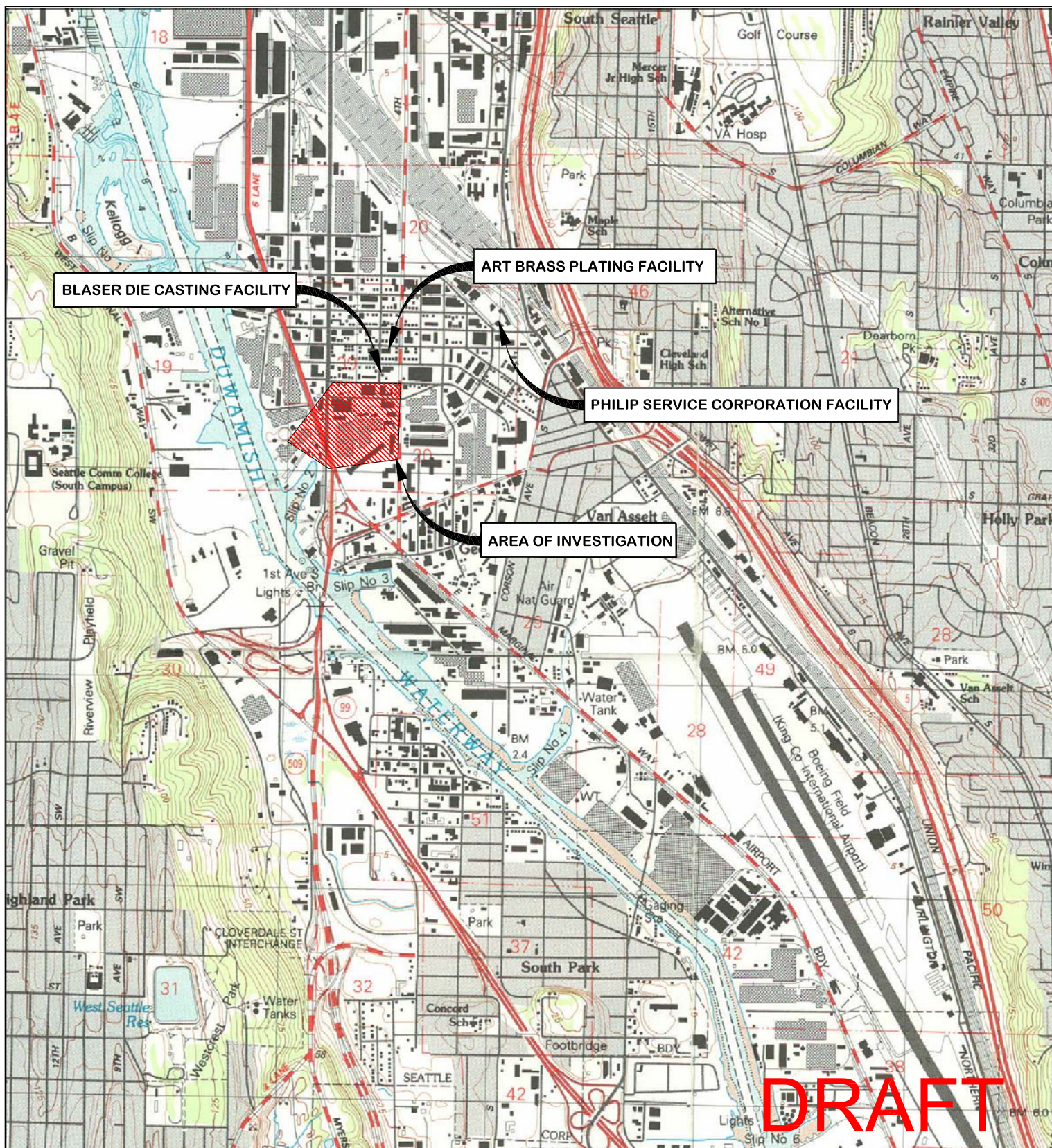
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- Washington State Department of Ecology (Ecology). 2005. *Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation*. Publication No. 05-09-091 (Version 1.0). July.
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- . 2011c. Letter Regarding Draft Post-Remedial Investigation Groundwater Monitoring Work Plan. From Ed Jones, Environmental Engineer, Hazardous Waste and Toxics Reduction Program. To Ronald S. Taylor, President, Capital Industries, Inc. May 24.

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FIGURES

SEPTEMBER 2011
GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004



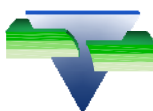
REFERENCE: 7.5 MINUTE USGS QUADRANGLE SOUTH SEATTLE, WASHINGTON. DATED 1983

0 500

APPROXIMATE SCALE IN METERS



WASHINGTON



FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 1

CAPITAL AREA OF INVESTIGATION
LOCATION MAP
SEPTEMBER 2011
GROUNDWATER MONITORING PLAN
CAPITAL INDUSTRIES, INC., SEATTLE, WA

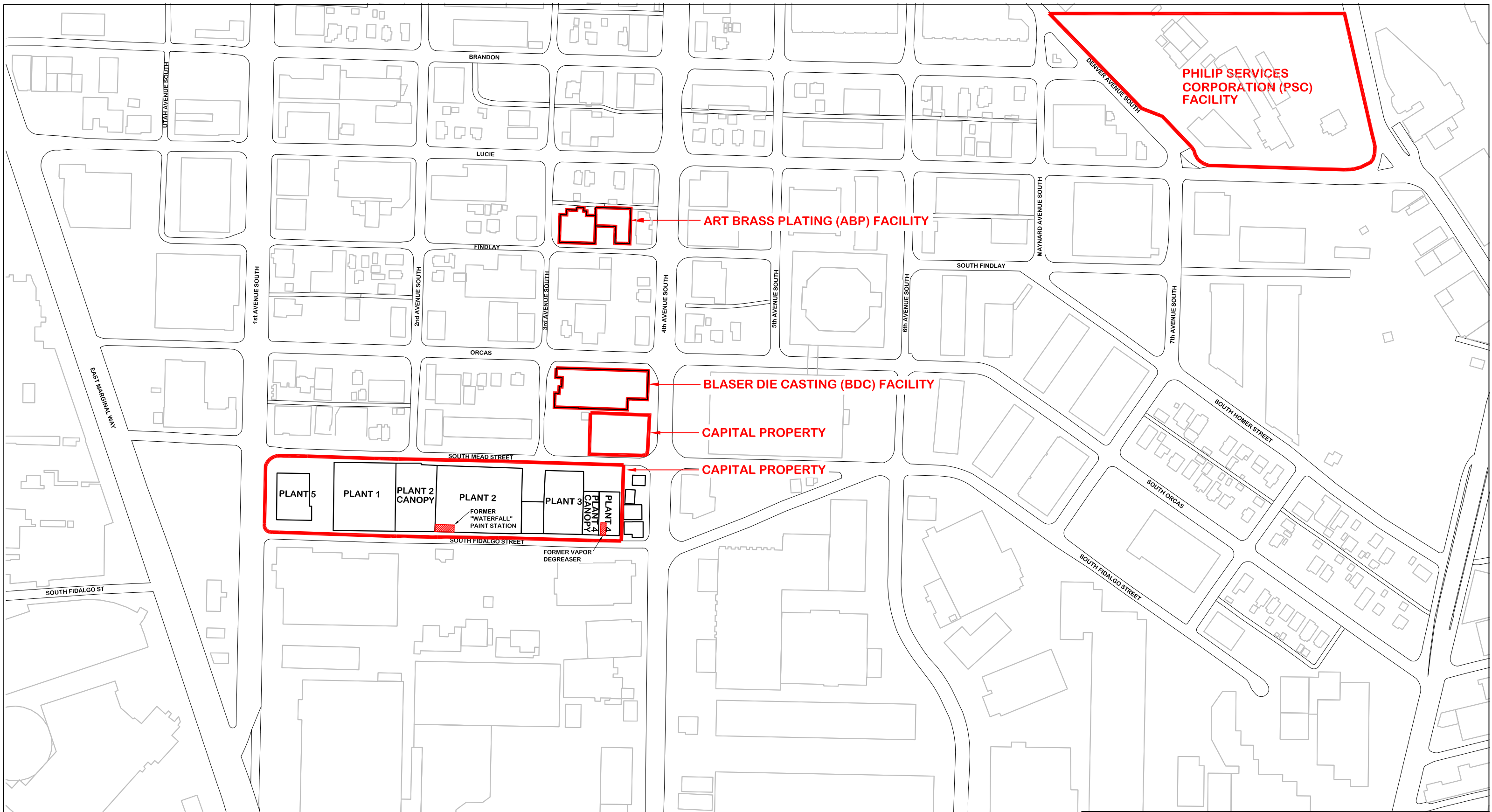
FARALLON PN: 457-004

Drawn By: DEW

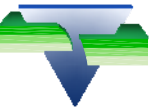
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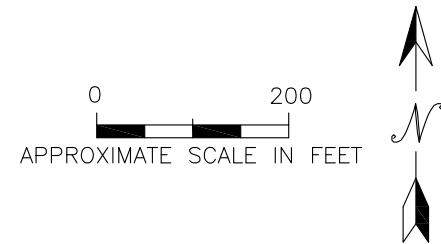
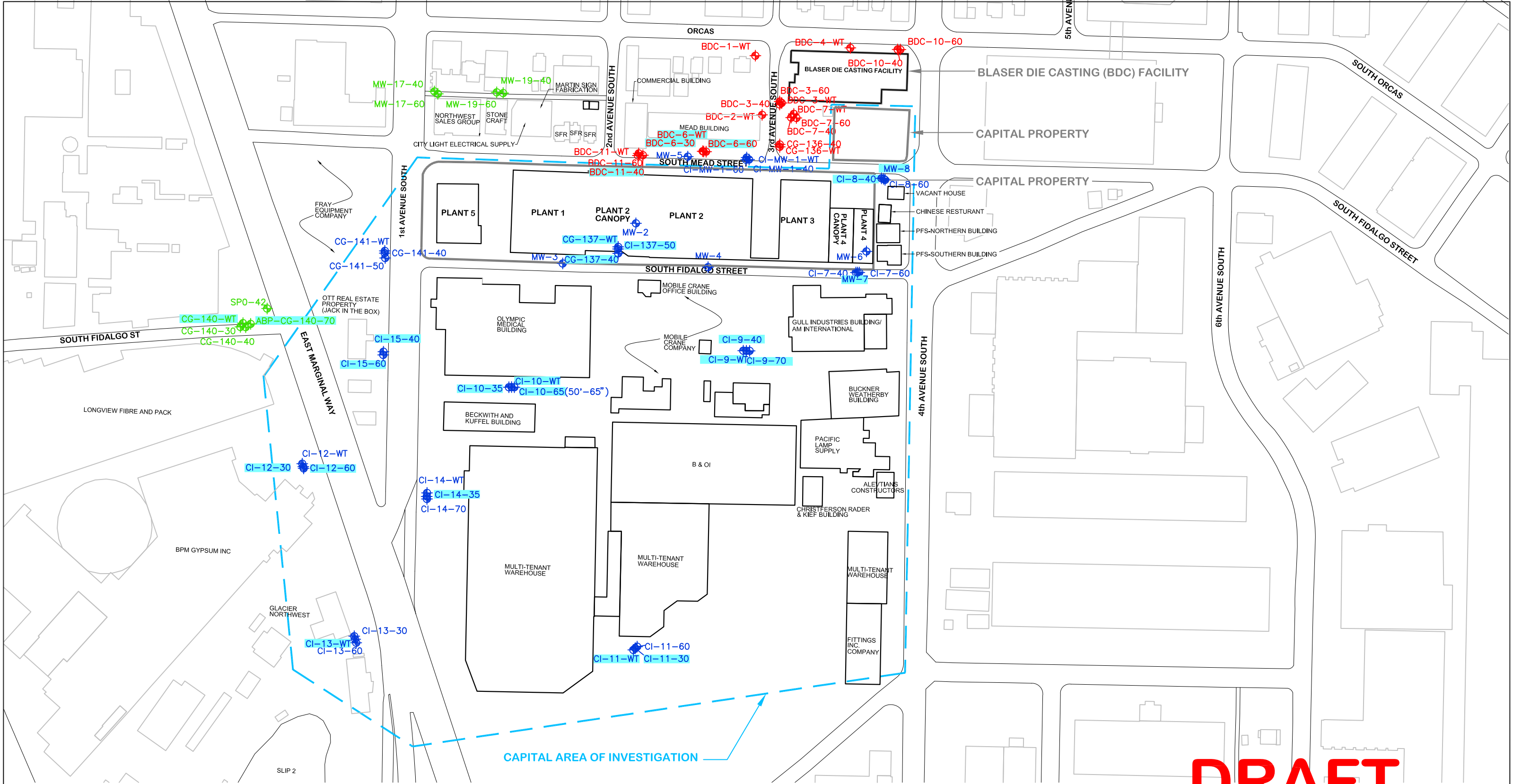
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 FARALLON CONSULTING 975 5th Avenue Northwest Issaquah, WA 98027		FIGURE 2	
		REGIONAL PLAN MAP SEPTEMBER 2011 GROUNDWATER MONITORING PLAN CAPITAL INDUSTRIES, INC. SEATTLE, WASHINGTON FARALLON PN: 457-004	
Drawn By:DEW	Checked By:DC/PJ	Date:6/29/11	Disk Reference:457004i



LEGEND

	CAPITAL INDUSTRIES MONITORING WELL		PSC MONITORING WELL
	BLASER DIE CASTING BORING MONITORING WELL		ART BRASS PLATING BORING MONITORING WELL
	SEPTEMBER 2011 GROUNDWATER MONITORING WELL		

ALL LOCATIONS ARE APPROXIMATE

FARALLON CONSULTING
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Issaquah, WA 98027

FIGURE 3

CAPITAL AREA OF INVESTIGATION SHOWING
MONITORING WELL LOCATIONS
SEPTEMBER 2011
GROUNDWATER MONITORING PLAN
CAPITAL INDUSTRIES, INC., SEATTLE, WA

FARALLON PN: 457-004

Drawn By:DEW	Checked By:DC/PJ	Date:6/29/11	Disk Reference:457004i
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TABLES

SEPTEMBER 2011
GROUNDWATER MONITORING PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

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

Monitoring Well or Well Cluster	Installed By	Location Name ¹	Total Depth (feet bgs)	Screen Interval (feet bgs)	Screen Length (feet)	Aquifer Zone ¹
CI-1	Capital	MW-1	20	10 to 20	10	Water Table
	Blaser	CI-MW-1-40	40	30 to 40	10	Shallow
	Blaser	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 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.

Blaser = Blaser Die Casting

Capital = Capital Industries, Inc.

PSC = Philip Service Corporation

Table 2
Summary of September 2011 Groundwater Monitoring Activities and Objectives
Capital Industries, Inc.
Seattle, Washington
Farallon PN: 457-004

Well Identification	Monitoring Objectives			
	Water Level	Vapor Intrusion	HVOC Plume Centerline	HVOC Select Plume Boundary
Water Table Zone				
MW-2	x			
MW-3	x			
MW-4	x			
MW-5	x			
MW-6	x			
MW-7	x	x	x	
MW-8	x			x
CI-9-WT	x		x	
CI-10-WT	x	x	x	
CI-11-WT	x			x
CI-12-WT	x			
CI-13-WT	x			x
CI-14-WT	x			
CG-137-WT	x	x	x	
CG-141-WT	x			
CI-MW-1-WT	x			
ABP-CG-140-WT				x
BDC-6-WT		x	x	
Shallow Zone				
CI-7-40	x			
CI-8-40	x			x
CI-9-40	x			
CI-10-35	x		x	
CI-11-30	x			x
CI-12-30	x		x	
CI-13-30	x			x
CI-14-35	x		x	
CI-15-40	x			x
CG-137-40	x			x
CG-141-40	x			
CI-MW-1-40	x			
BDC-6-30				x
BDC-11-40				x

Table 2
Summary of September 2011 Groundwater Monitoring Activities and Objectives
Capital Industries, Inc.
Seattle, Washington
Farallon PN: 457-004

Well Identification	Monitoring Objectives			
	Water Level	Vapor Intrusion	HVOC Plume Centerline	HVOC Select Plume Boundary
Intermediate Zone				
CI-7-60	x			
CI-8-60	x			
CI-9-70	x			
CI-10-65	x		x	
CI-11-60	x			
CI-12-60	x			x
CI-13-60	x			
CI-14-70	x			
CI-15-60	x		x	
CI-137-50	x		x	
CG-141-50	x			
CI-MW-1-60	x			x
<i>ABP-CG-140-70</i>				x
<i>BDC-6-60</i>			x	

NOTES:

Monitoring wells in **bold** denote the monitoring wells that Capital Industries will use for the July through December 2011 groundwater monitoring activities.

CI = Capital Industries

HVOCs = halogenated volatile organic compounds

Monitoring wells in ***italics*** denote monitoring wells that will be sampled by other PLPs. Capital Industries will use the data from the other PLPs sampling events.

PLP= potentially liable party

Water level measurements will be collected in all wells noted above during Quarters 1 through 4 in coordination with Philip Service Corporation (PSC). Groundwater level measurements will not be collected in Art Brass Plating (ABP) and Blaser Die Casting (BDC) monitoring wells.

Groundwater sampling will be conducted semiannually in March and September.

HVOC plume centerline and boundary monitoring wells were selected based on the approximate extent of HVOCs. In some areas HVOCs are commingled with HVOC plumes from other sources, and determining the difference between the plume centerline and boundary is not possible.