Draft Supplemental Soil and Groundwater Characterization Work Plan Jacobson Terminals Property Seattle, Washington

Prepared for
Washington State Department of Ecology

March 6, 2014
17800-43

HARTCROWSER

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Prepared by
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DRAFT SUPPLEMENTAL SOIL AND GROUNDWATER CHARACTERIZATION WORK PLAN
JACOBSON TERMINALS PROPERTY
SEATTLE, WASHINGTON

1.0 SCOPE OF WORK AND BACKGROUND INFORMATION

This supplemental Work Plan describes objectives, procedures, and rationale for performing additional sampling and analysis activities to support the Remedial Investigation at the Jacobson Terminals Property (Terminals Property), located at 5355 28th Avenue Northwest in the Ballard district of Seattle, Washington (Figure 1). These investigations are being conducted under contract to the Washington State Department of Ecology (Ecology).

The scope of work described in this supplemental Work Plan is designed to acquire additional data in support of a Remedial Investigation (RI) at the property. Our work will include advancing hollow stem auger and push probe borings, installing monitoring wells, and collecting soil and groundwater samples for chemical analysis.

The tasks to be accomplished are as follows:

- Advance two hollow-stem auger borings to approximately 30 feet below ground surface (bgs) and collect soil samples for analysis of chemicals of concern (COCs).

- Install two 2-inch monitoring wells (one in each hollow-stem auger location).

    - One well will be located adjacent to the east side (downgradient) of the Terminals treatment wall. The well screen will extend from approximately 25 to 30 feet bgs.

    - One well will be located adjacent to existing monitoring well JT-8. The well screen will extend from approximately 25 to 30 feet bgs. To reduce the potential for vertical contaminant migration during drilling activities, a conductor casing will be embedded into the silt/clay layer at approximately 17 to 20 feet bgs.

- Advance ten push-probe soil borings within and around the perimeter of the impacted area to further delineate the vertical and lateral extent of COCs.

    - Push-probe borings will be advanced to a depth of approximately 18 to 20 feet bgs.

- Up to six of the push-probe borings will be advanced to approximately 25 to 30 feet bgs to characterize soil COC concentrations below the silt/clay layer. A conductor casing will be embedded into the silt/clay layer to minimize vertical migration of contaminants during drilling.

- If impacts are observed during field screening, up to five additional borings may be advanced to delineate the extent of contamination. We will consult Ecology before advancing any additional borings beyond the ten planned.

- Submit up to 40 soil samples to Analytical Resources, Inc., (ARI) for analysis of Volatile Organic Compounds (VOCs) and Polychlorinated Biphenyls (PCBs) using standard laboratory turnaround times. Five of these samples will be from the previous investigation. We plan to analyze bottom samples from borings JT-US-003, JT-US-007, JT-US-009, JT-US-012, and JT-US-025 for PCBs.

- Collect five groundwater samples, including one duplicate sample, from four wells (MW-8D, JT-5, and the two wells that will be installed during this supplemental work).

  - Samples will be collected using low-flow sampling techniques and a peristaltic pump. During purging we will measure field parameters such as pH, oxidation/reduction potential, conductivity, and dissolved oxygen.

  - Groundwater samples will be analyzed for VOCs, PCBs, and total suspended solids (TSS).

  - Both new wells and one of the existing wells (JT-5) will be developed before sampling.

  - Development and sample collection will be accomplished in two days.

  - Slug testing will be completed in wells JT-8, IP-14, JT-9, and in one of the newly installed wells to determine aquifer properties for potential dewatering analysis.

We assume it will take approximately five days to complete these drilling and sampling activities.

1.1 Site Background and History

Jacobson Terminals (Terminals property) is located at 5355 28th Avenue NW, which is on the north shore of the Lake Washington Ship Canal in the Ballard district of Seattle, Washington. The entire site as defined by Ecology includes portions of three additional properties: the 2801 NW Market Street property (Market Street property), a former Burlington Northern Railroad right of way now owned by the City of Seattle (City property), and the Hiram Chittenden Locks property owned by the US Army Corps of Engineers (Corps property).

Hart Crowser was authorized to complete the Jacobson Terminals Investigation and Cleanup on September 17, 2013. Following analysis of the Remedial Investigation (RI) data, it was determined that the lateral and vertical extent of contaminants of concern (COCs) at the site was not fully delineated. The RI data suggest that COCs potentially extend deeper than 18 feet bgs and beyond the RI explorations to the north, west, and east.

Please refer to the Soil, Groundwater, and Sediment Characterization Work Plan, Jacobson Terminals Property, dated December 19, 2013, for details on the current and historical land use at the site and a summary of previous environmental studies and cleanup activities at the site.

2.0 OBJECTIVES AND DESIGN OF THE SUPPLEMENTAL SOIL AND GROUNDWATER INVESTIGATION

The supplemental soil and groundwater investigation is intended to address the remaining data gaps at the site. The work will include installing wells and collecting groundwater and soil samples for chemical analysis.

2.1 Supplemental Soil Investigation

The supplemental soil investigation will include collecting soil samples from ten push probes and two hollow-stem auger borings to further delineate the horizontal and vertical extent of COCs. The hollow-stem auger and deep push probe borings will collect soil quality data below the silt/clay layer to determine if COCs are impacting the lower aquifer.

A maximum of 40 soil samples will be analyzed for VOCs and PCBs. This total includes analysis of PCBs of five samples previously submitted to the laboratory during the initial RI.

The soil boring locations are shown on Figure 2.

2.2 Supplemental Groundwater Investigation

Hart Crowser will conduct a supplemental groundwater investigation to evaluate deep groundwater conditions at the site and determine if COCs are impacting the lower aquifer. A total of five groundwater samples, including one duplicate sample, will be collected from four wells: the two newly installed wells and two existing wells (MW-8D and JT-5). All groundwater samples will be collected using low-flow sampling techniques and will be analyzed for PCBs, VOCs, and total suspended solids (TSS).

The groundwater monitoring wells to be sampled are shown on Figure 2.

3.0 FIELD SAMPLING METHOD REQUIREMENTS

This section describes the general requirements for naming, collecting, and evaluating samples.

3.1 General Procedures

3.1.1 Sample Identification

This investigation will include collecting samples of upland soil and groundwater. The components of the sample names will be as follows:

Project: JT=Jacobson Terminals

Type of sample: MW=monitoring well; US=upland soil

Location ID: ##

For example, an upland soil sample could be named: JT-US-13

3.1.2 Sample Containers and Labels

Sample container requirements vary according to analyte and sample matrix. Precleaned sample containers will be obtained from the analytical laboratory. Sample containers shall be cleaned following the requirements described in Specifications and Guidance for Contaminant-Free Sample Containers (EPA 1992, OSWER Directive 92.0-05a).

Please refer to the Soil, Groundwater, and Sediment Characterization Work Plan, Jacobson Terminals Property, dated December 19, 2013, for details regarding sample containers.

3.1.3 Field Documentation Procedures

Field notes will be maintained during sample collection. The following information will be included in the field notes:

- Names of the field sampling crew, including person(s) collecting and logging the samples;
- Weather conditions;
- GPS coordinates of each sampling location;
- Date and time of collection of each sample;
- Sample location; and
- Any deviation from the approved sampling plan.

This information will be recorded on the appropriate field forms.

3.1.4 Equipment Decontamination and Waste Disposal

Staff will wear disposable nitrile gloves when collecting samples, and will put on a clean pair of gloves before starting work on a new sample in order to prevent cross contamination. All non-dedicated equipment will be cleaned between uses according to the procedures described below.

Soil Sample Equipment Decontamination

Reusable soil sampling equipment (e.g., stainless steel spoons and bowls) will be thoroughly decontaminated before use following this procedure:

- Rinse with water and wash with a scrub brush until free of soil;
- Wash with Liquinox detergent and tap water;
- Rinse with tap water; and
- Rinse three times with distilled or deionized water.

Monitoring Well Development and Sample Equipment Decontamination

Since the monitoring wells do not have dedicated pumps, a stainless steel bailer and pump will be used to develop the wells. The equipment will be decontaminated using the following procedure:

- Wash with Liquinox detergent and tap water;
- Rinse with tap water; and
- Rinse three times with distilled or deionized water.

New, disposable polyethylene tubing and a peristaltic pump will be used to collect groundwater from each monitoring well.

Field-Generated Waste Disposal

All soil cuttings and development and purge water will be drummed and stored on site until sampling is completed. Soil and water will be disposed of properly when work is complete. All disposable supplies and personal protective equipment such as gloves and paper towels will be placed in heavy-duty garbage bags and placed in a normal refuse container for disposal as solid waste.

Decontamination wash and rinse water will also be drummed and stored on site,

3.2 Soil Borings and Well Installation

Push Probe Investigation

This push-probe investigation will include advancing up to 10 direct-push probe explorations to refine the understanding of the nature and extent of contamination at the site. The proposed probe locations are shown on Figure 2. These locations may be modified after work begins based on our field observations.

The area to be investigated will be located and marked in the field by a Hart Crowser field representative. We will contract with a private utility locating company to search for utilities at the proposed probe locations. Note that there may be other underground obstacles such as concrete slabs that cannot be detected by a utility locator; therefore, multiple push probe attempts near each target location may be necessary if undetected obstacles are encountered.

Direct-push probes will be advanced to a depth of approximately 18 feet below ground surface (bgs) using a truck-mounted drill rig. Four borings shown on Figure 2 will be advanced to approximately 25 to 30 bgs to characterize COC

concentrations below the clay/silt layer. Up to two additional borings will be advanced below the clay/silt layer, selection of these deeper borings will be determined based on soil conditions observed at the time of drilling.

The work will be conducted by a driller subcontracted by Hart Crowser, and a Hart Crowser field representative will supervise all drilling and sample collection activities.

Push probe samples will be collected continuously in approximately 5-foot intervals from dedicated, disposable acetate liners. All samples will be classified in general accordance with ASTM Method D 2888 and all pertinent characteristics of the subsurface conditions will be recorded on the boring logs.

We will evaluate samples in the field using visual observations, headspace vapor screening, and water sheen testing for potential soil contamination at approximately 2.5-foot intervals. One soil sample will be collected from each 5-foot sampling interval. Two to three soil samples from each probe will be submitted for chemical analysis according to the following protocol:

- If we observe no evidence of soil contamination, then we will submit the soil collected from at or just below the water table and at the bottom of the boring, above the silt/clay layer, for chemical analysis. In deeper borings, at least one sample will be selected for analysis from below the silt/clay layer.

- If we observe evidence of soil contamination, we will select up to three samples for chemical analysis including at least one sample from the zone exhibiting the most significant evidence of contamination.

After the samples are collected, the probe locations will be abandoned in accordance with the State of Washington Administrative Code on Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC).

Samples will be collected in pre-cleaned sample containers provided by the analytical laboratory, packed in an ice-chilled cooler, and submitted to the laboratory using chain of custody protocols.

Hollow-Stem Auger and Monitoring Well Installation

This subsurface investigation will include installation of two deep monitoring wells to collect soil and groundwater data from below the silt/clay layer. The proposed well locations are shown on Figure 2.

The area to be investigated will be located and marked in the field by a Hart Crowser field representative. We will contract with a private utility locating company to search for utilities at the proposed probe locations. Note that there may be other underground obstacles such as concrete slabs that cannot be detected by a utility locator; therefore, multiple attempts near each target location may be necessary if undetected obstacles are encountered.

The soil borings will be advanced to a depth of approximately 30 feet bgs using a truck-mounted drill rig. In the western boring (located adjacent to JT-8) a 16-inch-diameter auger will be advanced to approximately 17 feet and conductor casing will be embedded into the silt/clay layer. An 8-inch-diameter auger will be used to advance the boring to 30 feet bgs.

Monitoring wells will be installed in each boring and screens will be set from approximately 25 to 30 feet. Final depths will be determined after consultation with the project manager. Monitoring wells will consist of 2-inch PVC casing and 5 feet of 10-slot screen. The work will be conducted by a driller subcontracted by Hart Crowser, and a Hart Crowser field representative will supervise all drilling and sample collection activities.

Soil samples will be collected at 5-foot intervals from clean stainless steel split-spoon samplers. All samples will be classified in general accordance with ASTM Method D 2888 and all pertinent characteristics of the subsurface conditions will be recorded on the boring logs.

We will evaluate all samples in the field using visual observations, headspace vapor screening, and water sheen testing for potential soil contamination. Up to three soil samples from each boring will be submitted for chemical analysis according to the following protocol:

- In the eastern boring (east of the treatment wall), if we observe no evidence of soil contamination, one soil sample will be collected from below the silt/clay layer. If contamination is observed above the silt/clay layer, up to two samples will be selected for analysis from the areas exhibiting the most significant evidence of contamination.

- In the western boring (located adjacent to JT-8) up to two soil samples will be collected from below the silt/clay layer from the area exhibiting the most significant evidence of contamination. If no evidence of soil contamination is observed, the sample immediately below the silt/clay layer will be selected for analysis.

Samples will be collected in pre-cleaned sample containers provided by the analytical laboratory, packed in an ice-chilled cooler, and submitted to the laboratory using chain of custody protocols.

3.3 Soil Screening and Analysis

Soil samples will be field screened for evidence of petroleum-related contamination using: (1) visual examination; (2) water sheen testing; and (3) headspace vapor screening using a PID. The effectiveness of field screening varies with temperature, moisture content, organic content, soil type, and age of contaminant, and the presence or absence of a sheen or headspace vapor does not necessarily indicate the presence or absence of petroleum hydrocarbons.

Visual examination consists of inspecting the soil for stains that may indicate contamination. Visual screening is generally more effective when contamination is related to heavy petroleum hydrocarbons such as motor or hydraulic oil, or when hydrocarbon concentrations are high.

Water sheen testing involves placing a small volume of soil in a pan of water and observing the water surface for signs of sheen. Sheens are classified as follows:

No Sheen (NS)	No visible sheen on water surface.
Slight Sheen (SS)	Light colorless film, spotty to globular; spread is irregular, not rapid, areas of no sheen remain, film dissipates rapidly.
Moderate Sheen (MS)	Light to heavy film, may have some color or iridescence, globular to stringy, spread is irregular to flowing; few remaining areas of no sheen on water surface.
Heavy Sheen (HS)	Heavy colorful film with iridescence; stringy, spread is rapid; sheen flows off the sample; most of the water surface may be covered with sheen.

Headspace vapor screening is intended to indicate the presence of volatile organic vapors and involves placing a soil sample in a plastic sample bag. Air is captured in the bag and the bag is shaken to expose the soil to the air trapped in the bag. The PID probe is then inserted in the bag and the instrument measures the concentration of organic vapors in the sample headspace. The highest vapor reading for each sample is then recorded on the boring log. The PID measures

concentrations in ppm (parts per million), is calibrated to isobutylene, and can typically quantify organic vapor concentrations in the range of 0 to 1,000 ppm.

All field screening observations will be recorded on the boring logs, and this information will be used to select which samples to submit for chemical analysis.

3.4 Groundwater Sample Collection Methods

Groundwater samples will be collected from the two wells that will be installed during this work task and from two existing monitoring wells. We will develop the new wells and well JT-5 before we collect groundwater samples from them.

3.4.1 Groundwater Monitoring Well Development

The depth to water in each well will be measured prior to well development using an electronic interface probe. Wells will be developed by pumping and surging until either: (a) water from the wells becomes visibly clear, (b) turbidity measurements stabilize, or (c) a minimum of 10 well volumes are purged.

The development water will be stored in drums on site until all the samples have been collected. The development and purge water will be disposed of properly after the analytical results are available for review.

3.4.2 Groundwater Field Measurements

We will use low-flow sampling procedures to collect samples from the groundwater monitoring wells. The project staff will measure water quality parameters (pH, temperature, specific conductance, turbidity, oxidation-reduction potential [ORP], and dissolved oxygen) in the field using a hand-held probe and record the results on a well observation form. The probe will be calibrated according to the manufacturer's procedures, and staff will perform a calibration check in the field before using the instrument.

3.4.3 Groundwater Sample Collection

We will collect groundwater samples no sooner than 24 hours after the wells are developed. First we will measure the depth to water in each well using an electronic interface probe; this probe can also be used to determine the thickness of the layer of free product, if present, in a well. If floating free product is detected, we will not collect a sample from the well.

All groundwater samples will be collected through new, disposable polyethylene tubing using a peristaltic pump and low-flow sampling techniques. Staff will use

a flow-through cell to monitor groundwater field parameters including oxygen, temperature, conductivity, and pH, unless the well contains free product. The water samples will be collected directly into the pre-cleaned containers provided by the analytical laboratory, packed in an ice-chilled cooler, and submitted to the laboratory using chain of custody protocols.

4.0 SAMPLE HANDLING PROCEDURES

Please refer to Soil, Groundwater, and Sediment Characterization Work Plan, Jacobson Terminals Property, dated December 19, 2013, for specifications regarding sample handling procedures.

5.0 LABORATORY ANALYTICAL METHODS

Please refer to the Soil, Groundwater, and Sediment Characterization Work Plan, Jacobson Terminals Property, dated December 19, 2013, for descriptions of the laboratory analytical methods to be used for this supplemental work.

5.1.1 Chemical Analysis of Soil Samples

Selected soil samples will be analyzed for the following:

- Volatile Organic Compounds (VOCs) by EPA Method 8260C
- Polychlorinated Biphenyls (PCBs) by EPA Method 8082A

5.1.2 Chemical Analysis of Water Samples

All groundwater samples will be analyzed for the following:

- VOCs by EPA Method 8260C
- PCBs by EPA Method 8082A
- TSS by SM240D.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

Please refer to the Soil, Groundwater, and Sediment Characterization Work Plan, Jacobson Terminals Property, dated December 19, 2013, for a complete description of QA/QC requirements.

7.0 DATA ANALYSIS, RECORDKEEPING, AND REPORTING REQUIREMENTS

Please refer to the Soil, Groundwater, and Sediment Characterization Work Plan, Jacobson Terminals Property, dated December 19, 2013, for details of data analysis, recordkeeping, and reporting requirements.

8.0 SCHEDULE

The supplemental soil and groundwater investigation is planned for March 11 through 18. Laboratory analytical results should be available 2 to 3 weeks following receipt of the samples at the laboratory, and a QA validation will be completed within 2 weeks of receipt of the laboratory results. The draft IA Work Plan will be submitted 6 weeks after receipt of final analytical results.

9.0 PROJECT PERSONNEL AND RESPONSIBILITIES

Please refer to the Soil, Groundwater, and Sediment Characterization Work Plan, Jacobson Terminals Property, dated December 19, 2013, for a list of key staff members and their project functions.

10.0 REFERENCES

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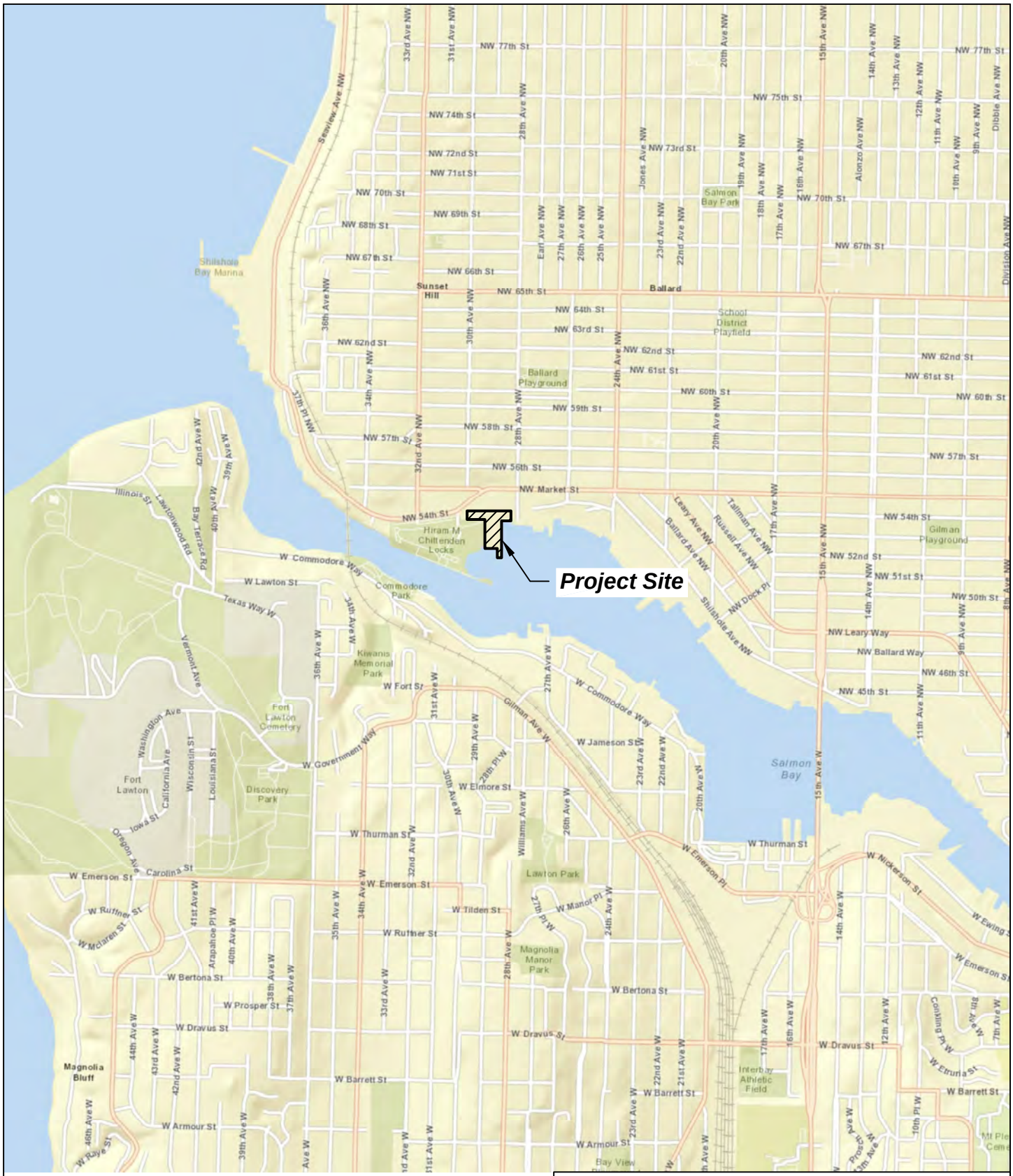

Source: Base map prepared from ArcGIS Online, 2013.

0 2000 4000

Approximate Scale in Feet

N

Jacobson Terminals
Seattle, Washington

Vicinity Map

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Figure
1

EAL 10/18/13 1780043-001.dwg

City of Seattle Property

Corps Property

Lake Washington Ship Canal

CONC PAD

CONC WALK

STATIONARY CONC DOCK

RW-A7 RW-A6 RW-5 RW-6 RW-7 RW-8 MW-9S MW-9D MW-15S MW-15I MW-4S MW-4I IW-9I SP-35 SP-32 SP-33 BR-2 SP-34 BR-1 SP-31 SP-30 SP-20 SP-22 JT-US-17 JT-US-15 JT-US-14 JT-US-13 IW-7S IW-7I IG-4 IG-3 IW-6I IW-6S JT-2 MW-8D JT-US-16 IP-4 SP-19 JT-US-18 SP-21 JT-US-1 IP-6 IP-13 SP-1 SP-23 IP-10 JT-US-12 SP-25 SP-24 JT-9 JT-US-11 SP-28 SP-56 IP-11 JT-US-5 SP-27 JT-US-3 IP-7 JT-US-2 IP-5 HC-27 JT-US-20 JT-US-19 IP-2 IP-8 IP-9 JT-US-10 SP-57 IP-15 IP-14 IP-1 IP-12 SP-8 JT-US-9 JT-3 SP-29 JT-US-21 JT-US-4 IP-16 JT-US-6 JT-US-22 IP-3 SP-9 IP-17 JT-US-25 SP-55 JT-8 JT-US-8 SRW-3 JT-US-23 JT-US-24 HC-25 SP-10 SP-11 HC-8(B) HC-8 SP-41 JT-US-7 SP-54 SP-58 SP-12 SP-13 HC-26 JT-11 JT-SS-01 HC-23 SRW-2 SP-53 GP-5 SP-14 SP-15 JT-7 GP-6 JT-10 HC-28 JT-12 JT-SS-02 SP-17 SP-16 HC-3 SP-52 SRW-1 SP-60 JT-6 JT-SS-03 SP-51 JT-5 HC-29 SP-50 HC-2 JT-SS-04 HC-MW-3 SP-59 JT-SS-05 HC-7 JT-4

MW-18S Existing Monitoring Well

RW-2 Former Monitoring Well, Recovery Well, or Piezometer (Abandoned)

IP-5 Injection Well

SP-41 Soil Boring

Note: Labels removed from several borings in "IP" area for clarity. Refer to "Interim Cleanup Action Summary", Hart Crowser, July 18, 2002.

Property Boundary

Concrete Surface

Cement-Bentonite Groundwater Treatment Wall

Permeable Iron/Sand Gate

Overhead Power

Sanitary Sewer Line

Water Line

Utility Line

Iron/GAC Groundwater Treatment Wall

Boat Storage Rack

Proposed Hollow Stem Auger Boring with Monitoring Well

Proposed Push Probe Location

Proposed Deep Push Probe Location

JT-SS-01 Sediment Sampling Location and Number

JT-US-1 Push Probe Sampling Location and Number

Estimated Area with Possible PCB Concentrations > 50 mg/kg

Estimated Area with PCB Concentration above Screening Level (0.000076 mg/kg)

Notes:

1. Base map prepared from AutoCAD file "020030-02.dwg," provided by Aspect Consulting, 10/08/13.
2. Utility locations are approximate.

0 30 60

Scale in Feet

N

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Seattle, Washington

Proposed Additional Explorations

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Figure **2**

17800043-028.dwg 03/6/14 EAL