



**Draft
Data Gaps Report
Jacobson Terminals
Seattle, Washington**



**Prepared for
Washington State Department of Ecology**

**November 14, 2013
17800-43**





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DATA GAPS REPORT JACOBSON TERMINALS SEATTLE, WASHINGTON

INTRODUCTION

As part of preparing the Remedial Investigation (RI) Work Plan for the Jacobson Terminals property, Hart Crowser completed this Data Gaps Report to summarize available environmental data and identify additional environmental assessment requirements. On September 19, 2013, Hart Crowser reviewed Washington State Department of Ecology's Jacobson Terminals file and received copies of selected documents. Documents used to produce this report are listed in the references section. Discussions with Aspect Consulting, Ecology, and Scott and Al Jacobson during a site walk in July 2013 provided additional information on property operations and environmental conditions.

The Jacobson Terminals facility is located at 5355 28th Avenue Northwest in the Ballard district of Seattle as shown on Figure 1. The property boundaries are the Lake Washington Ship Canal (Ship Canal) to the east and south, Seaborn property to the east, Army Corps of Engineers (Corps) property to the west, and City of Seattle (City) property to the north. The property is currently owned by A & B Jacobson, LLC.

Soil and groundwater impacts have been identified at the property and a number of remedial activities have been completed at the facility and on surrounding properties since 1991. The Jacobson Terminals facility has been enrolled in Washington State Department of Ecology's Voluntary Cleanup Program (VCP) since 2001 under VCP number NW0611. Aspect Consulting (Aspect) has been the owner's environmental consultant since 2003.

This report summarizes current environmental conditions at the Terminals property and identifies data gaps to be addressed during the RI. Information about environmental conditions on the Market Street property to the north and the City property is also provided.

Our evaluation included:

- Visiting the site to observe accessible areas of the Terminals property and assess the condition of monitoring wells;

- Reviewing available environmental documents for the property; and
- Evaluating recent sampling data provided by Aspect.

This data gaps evaluation was performed pursuant to the Washington State Department of Ecology Toxics Cleanup Program Hazardous Substance Site Investigation & Remediation Contract (No. C1100144) and Work Assignment Number C1144QQ.

SITE DESCRIPTION AND HISTORY

The Terminals property is generally flat. The northwest corner, which is used for parking, is approximately 5 feet above the elevation of the rest of the property, at the approximate elevation of the City property/railroad tracks.

Large boat storage racks are located along the Lake Washington Ship Canal. Offices and small warehouses border the Corps property to the east. Access to the site is controlled by fencing and gates. (A site map is provided on Figure 2.) The Terminals property is zoned industrial (IGIU/45).

Current Site Use

The Terminals property is primarily used for boat storage. Large boat racks are located adjacent to the waterway and various marine businesses occupy the office spaces on the property.

The Seaborn property, located to the east, is used for boat moorage and office space. The Corps property contains offices, maintenance buildings, and a tourist facility for the Ship Canal Locks. The City property consists of a former Burlington Northern Railroad right of way and contains active railroad tracks. North of the City property and railroad tracks, at 2801 NW Market Street, is the Market Street property, which consists of a climbing gym and other commercial businesses.

Historical Site Use

Terminals Property

The property is located on a former estuarine tideflat. In the 1920s, the area was filled with sand dredged from the Lake Washington Ship Canal, wood waste, and construction debris. The property was the site of a lumber mill from approximately 1890 to the 1930s. Starting around 1940, the property was used

for loading and unloading boats and for storage. Alan and Brian Jacobson (partners in A&B Jacobson, LLC) purchased the property in 1975 and the property has been used as a marine support facility since that date.

Market Street Property

Approximately 14 interconnected buildings were constructed on the Market Street property from 1946 to 1955. Fuel tanks and shell casings were reportedly manufactured at the property before the factory switched to steel window frame manufacturing in the late 1940s. In 1955, the factory stopped producing steel frames and began producing aluminum window frames. This manufacturing process used extrusion presses, an anodizing circuit of 21 aboveground steel or concrete tanks, a paint room, ten underground storage tanks (USTs), and an interior drainage system that included 24 floor drains, trench drains, and sumps.

Wastewater from the Market Street property was discharged to the Lake Washington Ship Canal from approximately 1948 to 1978; in later years, the wastewater was treated on the property and discharged to the King County Metro wastewater collection system. Violations of the Metro permit for pH and metal discharge exceedances are documented in the project file. A video inspection of the sewer lines was conducted in the late 1970s and severe deterioration and disintegration of the lines was observed. The former owner of the property reportedly replaced the lines. Window manufacturing operations ceased at the Market Street property in 1989 (Hart Crowser 2000).

PREVIOUS ENVIRONMENTAL CHARACTERIZATION/CLEANUP ACTIVITIES

A number of environmental investigations and remedial actions have been completed at the Terminals, Corps, City, and Market Street properties. A summary of identified contaminants of concern and remedial activities are provided below.

Contaminants of Concern

Based on the results of historical environmental investigations completed at the properties, the major contaminants of concern (COCs) include:

- Metals in soil and groundwater on the Market Street and City properties;
- Chlorinated solvents (PCE, TCE, cis-DCE, and vinyl chloride) in groundwater on the Market Street, City, Corps, and Terminals properties;
- PCBs in soil at the Terminals property;

- Tri-, di-, and monochlorobenzenes in soil and groundwater at the Terminals property; and
- Petroleum hydrocarbons in soil at the Terminals property.

Groundwater monitoring was first conducted to delineate a vinyl chloride plume identified at the upgradient Market Street property. Historical releases of metals, low- and high-pH solutions, and solvents occurred on the Market Street and City properties during operations by Fentron Industries (Fentron). The releases created localized exceedances of metals in soil and groundwater and an extensive groundwater plume of tetrachloroethene (PCE) and associated degradation products (primarily trichloroethene [TCE], cis-1,2-dichloroethene [cis-DCE], and vinyl chloride). Prior to installation of a treatment wall in 1999, the plume extended from the Market Street and City properties onto the Corps and Terminals properties. A separate area of chlorinated solvents, located on the City property downgradient of the Market Street treatment wall was identified as the likely source of chlorinated solvent impacts on the Terminals property.

A historical release of transformer oil containing PCBs and trichlorobenzene on the northern portion of the Terminals property created a plume of several chlorinated benzene compounds in groundwater (Figure 2). Concentrations of PCBs and chlorinated benzenes above applicable cleanup levels have been identified in soil samples up to 18 feet below ground surface (bgs) near where the presumed transformer oil release occurred.

During construction activities in the early 1990s, a separate area of PCB- and petroleum-impacted soil was discovered at the Terminals property in an alley that borders that Corps property (Figure 2).

Remediation Activities

A number of remedial actions have been completed at the Terminals, City, and Market Street properties to address potential human and ecological exposure to the COCs described above. These cleanup actions were conducted under the VCP by both Fentron and Jacobson. The locations where remedial actions were implemented are shown on Figure 3.

Market Street Property

In 1989, seven of the ten USTs were taken out of service and all fluids, sludges, aboveground tanks, piping and other features associated with the anodizing process were removed from the Market Street property and disposed of, and the drains, catch basins, floors, and walls of the property were cleaned. In 1993,

Fentron decommissioned all ten USTs and removed approximately 100 tons of petroleum-impacted soil from the site.

In 1991, EMCON installed a pump-and-treat system along the southwestern portion of the property to address solvents in groundwater. The system did not fully capture the solvent plume and was shut down in 1999 and replaced with a passive treatment wall and zero-valent iron gates system.

The wall consists of three impermeable funnel sections constructed of cement bentonite that captures groundwater and directs it through two permeable gates filled with a mixture of granular iron and sand. At the same time, a magnesium oxide product (ORC) was injected into groundwater on the Terminals property to treat solvents that had already migrated past the newly constructed treatment wall. A deed restriction was also placed on the Market Street property that addresses residual contamination beneath the existing building (Hart Crowser 2000).

Terminals Property

In 2001 and 2002, Fenton's Reagent (acidified hydrogen peroxide and ferrous iron) was injected on the Terminals property to provide source area treatment of the PCB/chlorinated benzene plume and to provide a more aggressive oxygen enhancement for degrading cis-DCE and vinyl chloride. In December 2003, a continuous permeable treatment wall containing granular activated carbon and zero-valent iron was installed along the Lake Washington Ship Canal to remove PCBs and chlorinated benzenes from groundwater (Aspect 2003).

In 1996, PCB and petroleum contaminated soil was removed from between two buildings bordering the Corps Property. Much of the source material was removed, but confirmation sampling showed that petroleum hydrocarbon concentrations remained above cleanup levels in sidewall and bottom samples (Hart Crowser 1997).

ENVIRONMENTAL SETTING

This section describes the environmental setting of the property including climate, geology, hydrogeology, and surface water hydrology.

Geology

Terminals property soils generally consist of approximately 10 feet of fill overlying native estuarine sediment. The fill is a diverse mixture of silty sand, silt,

wood waste, and occasional debris. A layer of wood waste approximately 6 to 10 feet deep has been identified over much of the northern portion of the property. Below the fill layer is native sand or silty sand to 16 to 18 feet deep. Beneath the sand layer is a layer of silty clay, typically 1 to 4 feet thick. Below this layer are discontinuous layers of sand and silt of increasing density. Two generalized geologic cross sections are provided on Figures 4 and 5 (Hart Crowser 2002).

Hydrogeology

Groundwater Flow Patterns

Shallow groundwater in the area generally flows toward the south-southeast before discharging into the Lake Washington Ship Canal. Groundwater elevations on the upgradient Market Street property is typically 12 to 14 feet. Groundwater elevations on the Terminals property are typically 7 to 8 feet. Groundwater is typically encountered 4 to 7 feet bgs on the Site. The groundwater elevation fluctuates approximately 2 feet seasonally and depends largely on the elevation of the Ship Canal, which is adjusted seasonally by the Corps of Engineers. A map showing groundwater elevation contours from 2005 is provided on Figure 6 (Aspect 2003 and Hart Crowser 2002).

Groundwater elevations have typically been lower near the sewer line in the JT-9 area than the rest of the property. A sewer camera survey performed in April 2003 indicated that a connection to the site side sewer was located in this area. The camera noted water flowing in at the side sewer connection with significant scale buildup. The sewer line is located below the water table (see Figure 6); therefore, leakage of shallow groundwater into the sewer could result in the observed groundwater depression (Aspect 2003).

Groundwater Flow Rates

An upward gradient has been reportedly identified between the deeper water-bearing zone (beneath the silty clay layer) and the shallower water-bearing zone, with the hydrostatic head typically 1 to 2 feet greater at wells JT-5 and MW-8D than at adjacent shallower wells (Aspect 2003).

Saturated-zone soils at the site are reported to have generally low hydraulic conductivity. Slug tests performed in 2003 indicated that at five of six wells tested, the average hydraulic horizontal gradient was 0.02 foot per foot across the property, and assuming a porosity of 0.4, the estimated groundwater flow rate is 0.1 foot per day (40 feet per year). Using the maximum calculated hydraulic conductivity in the remaining well, the groundwater flow rate would be

0.7 foot per day (250 feet per year). Using vinyl chloride (a very mobile compound in groundwater) as a conservative tracer, groundwater velocity was calculated at approximately 0.4 foot per day, or 150 feet per year (Aspect 2003).

Ship Canal Surface Water Hydrology

In 1914, Lake Union was hydraulically connected to Lake Washington by construction of the Montlake Cut between Portage Bay and Union Bay. Lake Union was also connected to the then marine waters of Salmon Bay by construction of the Fremont Cut. The connection to Shilshole Bay and Puget Sound, and a manner to control water levels, was established by constructing the Hiram M. Chittenden Locks. The Fremont Cut and Montlake Cut comprise the Lake Washington Ship Canal. The locks and dam maintain the Ship Canal water level.

These modifications increased inflow to Lake Union by diverting the outflow from Lake Washington into the Montlake Cut and, hence, Lake Union, which now drains west into Salmon Bay. During periods of high water flow, the north part of Lake Union can flush (complete exchange of water) in about seven days. However, the southern part of Lake Union does not completely flush and remains relatively stagnant. Opening the locks also allows periodic influx of dense salt water from Puget Sound into the Ship Canal. Because the saltwater is heavier than freshwater, it sinks to the bottom of the canal and moves eastward following the density gradient into Lake Union. The balance between the saltwater intrusion and the flushing rate at a given time varies. During the rainy season and spring thaw, runoff from the Cascade foothills is high and the lake is flushed. In the summer, as the runoff flow decreases and lock openings increase, saltwater intrusion increases.

The US Army Corps of Engineers maintains the water level in Lake Washington and Lake Union by regulating flow through the locks on the western end of Salmon Bay. Lake Union water levels vary by roughly 2 feet on a yearly basis, from 20 feet during the winter months to 22 feet during the summer months.

The Lake Washington Ship Canal from the locks (river mile 1.0) to Lake Washington (river mile 8.6) is designated as “lake class” by the Washington State Department of Ecology (Ecology), stipulating that water quality must meet the requirements for most, if not all of the following uses: wildlife habitat; general recreation; fish reproduction, rearing, and harvest; water supply; and stock watering. However, it should be noted that elevated salinity levels within the portion of the Ship Canal adjacent to the Terminals property would likely severely limit its potential use as a source for potable water.

NATURE AND EXTENT OF CONTAMINATION

There are three areas of elevated COCs at the site. For the purposes of this report the areas have been identified as follows:

- Chlorinated ethene area along the City property boundary;
- PCB/Chlorinated benzene area on the Terminals property; and
- Petroleum area bordering the Corps property.

A description of each area and the affected media is presented below. COC areas are shown on Figure 2. Soil analytical data is presented in Table 1 and groundwater analytical data is presented in Tables 2 and 3. The estimated extent of COCs in groundwater is shown on Figures 7 and 8 and recent groundwater chemistry data is presented in Figure 9. PCB and 1,2,4-trichlorobenzene occurrences in soil are shown on Figures 10 and 11, respectively.

Chlorinated Ethene Area

This area consists of PCE and its degradation products TCE, cis-DCE, and vinyl chloride originating from properties located north of the Terminals facility. The primary source areas for the chlorinated ethenes appear to occur along the railroad tracks on the City property. The estimated extent of the chlorinated ethene occurrences in groundwater is shown on Figure 7.

Soil

The original source of the detected chlorinated ethene occurrences on the Terminals property is not known. Low soil concentrations of PCE and TCE were detected at BR-1 and BR-2 (maximums of 0.96 and 0.62 mg/kg, respectively), but no significant soil source of PCE or TCE has been identified. Soil occurrences were co-located with groundwater occurrences at depths below 20 feet, above the silt confining layer. The limited extent suggests a one-time historical release of a small quantity of contaminated material, which migrated down to the silt confining layer (Aspect 2003 and Hart Crowser 2002).

Groundwater

The depth of affected groundwater within the chlorinated ethene source area is approximately 20 to 22 feet; below this depth is a confining layer of very dense, sandy silt. The maximum detected concentrations of PCE and TCE within the City property source area (both detected at BR-1) were 900 and 1,500 ug/L, respectively. Downgradient of the chlorinated ethene source area, PCE and TCE

are typically not detected, but relatively high concentrations of vinyl chloride (maximum of 650 ug/L, at IP-6) and somewhat lower concentrations of cis-DCE have been detected during past monitoring events.

Some of these concentrations may be residual levels from the Market Street property plume before the treatment wall was installed. Groundwater concentrations of chlorinated ethenes exiting the treatment wall have been very low or non-detect since it was installed in 1999. Vinyl chloride concentrations have declined steadily since installing the Market Street property iron wall and performing *in situ* oxidation on the Terminals property (Aspect 2003).

During the most recent groundwater sampling event conducted in April 2013, chlorinated ethenes were still present at concentrations exceeding screening levels in several wells upgradient of the Terminals property (including wells IW-9I and BR-2) but were generally not detected in wells sampled on the property (Figure 9).

Vapor

No VOCs were detected in vapor samples collected from sanitary sewer manholes hydraulically upgradient or downgradient of the chlorinated ethene source area and the vinyl chloride plume (Hart Crowser 2002).

PCB/Chlorinated Benzene Area

The northern portion of the Terminals property was impacted by a historical release of transformer oil containing PCBs and chlorobenzenes (Figure 2). Soils in this area contain elevated concentrations of PCBs, 1,2,4-trichlorobenzene, and other chlorobenzene compounds. Chlorinated ethenes have also been detected in soil and groundwater in this area, but have been attributed to upgradient sources.

The original source is not known, but PCB and trichlorobenzene mixtures were historically used as dielectric fluids in transformers. The shape and location of the contaminated area imply a historical release near IP-1, -4, and -5, which migrated downward until reaching the silt confining layer at an approximate depth of 16 to 18 feet. Contaminant concentrations in the PCB/chlorinated benzene source area are highest just above the silt confining layer, while occurrences in the unsaturated zone are limited and generally at much lower concentrations. No evidence of free product has been observed in wells and injection points installed in the source area, and no contamination above cleanup levels has been observed in the soil or groundwater beneath the confining silt and clay layer.

Contaminant migration along the top of the confining layer in the direction of groundwater flow may account for the southeastern lobe of the source area. The elongation along the sewer line might be from either contaminant migration toward the line or from spreading of contaminated material during installation and backfilling of the sewer line in 1974, if the release occurred earlier (Aspect 2003 and Hart Crowser 2002).

Soil

PCBs. PCBs have been detected in unsaturated zone soils in the source area at concentrations up to 18 mg/kg. Concentrations exceeding the industrial direct contact soil screening level of 10 mg/kg were detected in two locations in the unsaturated zone: 17 mg/kg at SP-24 and 18 mg/kg at SP-5. Multiple PCB detections above the practical quantification limit (PQL) have also been detected in unsaturated zone soils. In the saturated zone (below 8 feet deep), PCB occurrences are more widespread at concentrations up to 880 mg/kg. The approximate area of PCB occurrences is shown on Figure 10 and includes pre- and post-Interim Action detections. Following the Interim Action, the estimated PCB hotspot area (PCB concentrations greater than 100 mg/kg) reportedly decreased by approximately 40 percent; however, PCB concentrations as high as 690 mg/kg were still detected in soil following the final injection round (Aspect 2003 and Hart Crowser 2002).

1,2,4-Trichlorobenzene. This analyte has generally not been detected in unsaturated zone soils in the source area. In the saturated zone of the source area, 1,2,4-trichlorobenzene was detected at concentrations up to 560 mg/kg before the Interim Action and at concentrations up to 360 mg/kg after the Interim Action. The approximate area of 1,2,4-trichlorobenzene occurrences is shown on Figure 11 and includes pre- and post-Interim Action detections. The distribution of 1,2,4-trichlorobenzene generally correlates with PCB occurrences shown on Figure 10 (Hart Crowser 2002).

1,4-Dichlorobenzene. This analyte has been detected in unsaturated zone source area soils at concentrations up to 0.28 mg/kg. In the saturated zone, 1,4-dichlorobenzene was detected at concentrations up to 11 mg/kg before the Interim Action and at concentrations up to 15 mg/kg after the Interim Action. 1,4-dichlorobenzene is generally collocated with 1,2,4-trichlorobenzene but usually at concentrations 1 to 2 orders of magnitude lower (Hart Crowser 2002).

Groundwater

Groundwater monitoring data indicate that the 1,4-dichlorobenzene plume in groundwater extends from the source area southeast toward the Ship Canal. Concentrations have historically been highest in groundwater at approximate depths of 14 to 17 feet, just above the silt confining layer.

Groundwater sampling results are presented in Tables 2 and 3 and groundwater quality data collected from the most recent sampling event (April 2013) are shown on Figure 9. The estimated extent of chlorinated ethene and chlorinated benzene groundwater exceedances are presented on Figures 7 and 8, respectively.

PCBs. Before and during the Interim Action, PCBs were not detected in groundwater at wells JT-3 or JT-6, which are located downgradient of the source area. PCBs were detected in groundwater following the Interim Action at concentrations of 1.5 ug/L at JT-3 and 0.2 ug/L at JT-6 in 2002. Following construction of the treatment wall, PCBs were generally not detected in JT-6 and JT-12. PCB groundwater sampling results are presented in Table 3.

1,2,4-Trichlorobenzene. Before the Interim Action, 1,2,4-trichlorobenzene was encountered in the source area (IP-2) at a concentration of 4,700 ug/L but was not detected in groundwater downgradient. A low concentration (54 ug/L) was detected at well JT-6 in 2002, downgradient of the source area. During the 2013 groundwater sampling event, 1,2,4-trichlorobenzene was not detected above laboratory reporting limits in downgradient wells (Aspect 2013). Concentrations of 1,2,4-trichlorobenzene have been below screening levels since 2004 and are plotted on Figure 12.

1,4-Dichlorobenzene. Before the Interim Action, 1,4-dichlorobenzene was intermittently detected at well JT-3 at concentrations up to 44 ug/L, and was regularly detected at well JT-6 at concentrations up to 360 ug/L. 1,4-dichlorobenzene was also detected in the source area at concentrations up to 1,300 ug/L (at IP-1). After the Interim Action, 1,4-dichlorobenzene concentrations were generally lower, except at IP-7 and IP-8. In June 2002, the highest concentration of 1,4-dichlorobenzene detected in the Source Area was 450 ug/L at IP-8, and the 1,4-dichlorobenzene concentration detected at JT-6 was 68 ug/L. Concentrations of 1,4-dichlorobenzene in compliance monitoring wells have decreased following the Interim Action and have been below cleanup levels in long-term monitoring wells since 2007 (Aspect 2013). Concentrations of 1,4-dichlorobenzene have been below screening levels since 2001 and are plotted on Figure 13.

Vinyl Chloride. Before the Interim Action, vinyl chloride was detected across the northwestern area of the Terminals property at concentrations up to 620 ug/L. Elevated concentrations were generally detected north of the sewer line at injection points IP-6, IP-10, and IP-13, where vinyl chloride was detected at concentrations up to 650 ug/L. Vinyl chloride concentrations in groundwater downgradient of injection points decreased significantly during the Interim Action, with concentrations at injection points and wells south of the sewer line less than 100 ug/L and often below detection limits. Concentrations of vinyl chloride in downgradient wells have not been detected above cleanup levels since 2010. Concentrations near the source area have decreased but remain above cleanup levels. Concentrations of chlorinated solvents over time are plotted on Figure 14.

Sediment

On behalf of A & B Jacobson, LLC, in 1998, Hart Crowser collected two grab sediment samples, from approximately 0 to 10 centimeters bgs in the Ship Canal adjacent to monitoring wells JT-12 and JT-6. Samples were reportedly collected from behind the pier bulkhead. Sediment samples were analyzed for metals (including arsenic, cadmium, chromium, copper, lead, tin, and zinc), toluene, and trichlorofluoromethane. Arsenic was reportedly detected at 17 and 24 mg/kg, above the current Washington State Freshwater Sediment Cleanup Objective criteria of 14 mg/kg, but below the Freshwater Sediment Screening Level of 120 mg/kg. Other metal concentrations were either below applicable screening levels or not detected. These sediment samples were not analyzed for PCBs or chlorinated benzenes.

No report documenting sediment sample collection was located in Ecology or Hart Crowser files. Field notes, hand sketches, and a table were located in the Hart Crowser archive file.

Petroleum-Contaminated Soil Area

This area contained petroleum- and PCB-impacted soil originally identified during construction activities in 1993. The contamination was located east of the equipment storage building on the Corps property, in the alley between the Jacobson transformer building and the Pirelli-Jacobson Marine Storage Building (Figure 2). A remedial excavation was completed to remove the impacted soil in 1996.

Soil

Oil- and diesel-range petroleum hydrocarbons remain in soil in the western portion of the property, adjacent to the Corps property. Excavation sidewall samples contained diesel- and oil-range petroleum hydrocarbon concentrations ranging from 48 mg/kg to 22,000 mg/kg, but physical site constraints prevented further soil removal. All verification soil samples had PCB concentrations below the MTCA Method A industrial soil cleanup level of 10 mg/kg (Hart Crowser 1997).

Groundwater

Groundwater samples were collected from monitoring wells HC-MW-1 through -3 following the excavation. Oil- and diesel-range petroleum hydrocarbons and PCBs were either detected below cleanup levels or below laboratory detection limits following the cleanup action. A "No Further Action" letter was issued for the cleanup by Ecology in 1998. However, during a 2010 periodic review, Ecology indicated that the cleanup may not be protective of groundwater quality.

In 2010, Aspect installed a monitoring well (MW-4) in the area where the residual contamination was left in place (Figure 2). Groundwater samples were collected from this well and two existing wells (MW-2 and MW-3). PCBs were detected in all three wells. The total PCBs concentration measured in well MW-4 (0.6 ug/L) exceeded the surface water protection screening level, as well as the MTCA Method A cleanup level of 0.1 ug/L PCBs. Diesel was not detected in any of the wells.

Residual PCB- and petroleum-impacted soil and groundwater in this area are likely unrelated to contamination in the PCB/Chlorinated Benzene Area.

PRELIMINARY CONCEPTUAL SITE MODEL FOR SOURCES, PATHWAYS, AND EXPOSURES

A conceptual site model (CSM) presents the links between contaminant sources, release mechanisms, exposure pathways and routes, and receptors to summarize the current understanding of the risk to human health and the environment. The CSM is dynamic and may be refined throughout the cleanup action process as additional information becomes available. Figure 15 graphically illustrates the preliminary CSM developed for the PCB/chlorinated benzene area.

A historical release of transformer oil resulted in introduction of PCBs and chlorinated benzenes to Terminals property soil, creating a secondary source. Secondary release mechanisms include fugitive dust, plant uptake, infiltration and leaching to groundwater, and volatilization. Groundwater can also potentially impact surface water. Exposure routes potentially include inhalation, ingestion, and dermal contact.

Potential human receptors include workers inside the Terminals property buildings, potential workers during future development of the site, and utility workers. Terrestrial ecological receptors include plants and animals exposed to impacted media, as well as secondary food chain consumers such as birds and mammals.

A Terrestrial Ecological Evaluation (TEE) was not completed for the Terminals Property because it qualifies for a TEE exemption. As detailed in WAC 173-340-7491, the property is covered by asphalt, creating a physical barrier between contaminated media and plants and wildlife, qualifying the property for exemption from TEE requirements. To formally qualify for this exemption, institutional controls to maintain the asphalt will need to be put in place, requiring a formal written agreement between the property owner and Ecology. Assuming these steps are taken, a TEE is not required for the Terminals Property.

For a contaminant to present a risk to human health and/or the environment, the pathway from the contaminant to the receptor must be complete. The potential exposure pathways and whether they are considered complete are summarized below.

Soil. On-site soil may contain elevated concentrations of PCBs, chlorinated benzenes, and oil-range hydrocarbons. The site is paved and, therefore, there is no exposure pathway unless the pavement is removed. Workers digging in the soil for future development or utility work may be exposed to elevated concentrations without adequate personal protective equipment and safety procedures. Routes of exposure include incidental ingestion and direct contact. Available data indicate that soil contamination does not extend off-property.

Groundwater. Three potential exposure routes exist for groundwater: inhalation of vapors, incidental ingestion, and direct contact. Complete pathways for incidental ingestion and direct contact only exist if workers are digging in soil below the water table. Volatile aromatic compounds dissolved in Terminals property groundwater may volatilize out of the liquid phase and migrate upward into unsaturated soil pore spaces. Given that the nearest Terminal buildings are located over 80 feet upgradient of the PCB/chlorinated benzene plume, indoor

air impacts are unlikely. There is a potential for on-site and off-site utility workers to be exposed to vapors.

Surface Water. Shallow groundwater beneath the property migrates to the Lake Washington Ship Canal. There is a potential for dissolved contaminants to impact the aquatic environment.

Soil Gas. Volatilization of chlorinated benzenes in the soil can lead to concentrations in the soil gas that may migrate to the surface. Impacts to indoor air within existing Terminal buildings is unlikely given their distance from the plume. However, this pathway may exist for utility workers.

Fugitive Dust. The fugitive dust pathway does not exist while the site is paved. Fugitive dust could be a potential pathway if the pavement is removed and workers are digging in the soil.

Plant Uptake. The PCB/chlorinated benzene area and surrounding Terminals property are predominantly paved or covered by building foundations. Plants are not grown for human consumption within the impacted areas and, therefore, the pathway is incomplete.

The main exposure pathways that exist at the site that are not currently mediated are migration of dissolved contaminants to adjacent surface water and the inhalation risk to utility workers. Several pathways are potentially complete only if property or utility work includes digging in the soil or groundwater.

ESTABLISHMENT OF SCREENING LEVELS

Preliminary soil screening levels are presented in Table 1 and groundwater screening levels are presented in Tables 2 and 3.

Soil, Groundwater, and Sediment Screening Criteria

Groundwater

Groundwater screening levels have historically been compared to surface water protection criteria. Depending on the COC, either MTCA Method B freshwater screening criteria or State freshwater screening criteria as defined in WAC 173-201A were used (Hart Crowser 1999).

For this report, screening levels were updated based on the most conservative freshwater screening levels for consumption of organisms: Federal Clean Water

Act Section 304, National Toxics Rule 40 CFR 131, or MTCA Method B surface water criteria, whichever is lower. Groundwater screening levels can be found in Table 2.

Soil

Soil screening levels have historically been compared to MTCA Method A Industrial screening levels or MTCA Method C Direct Contact Levels for Industrial Sites (Hart Crowser 1999).

To evaluate whether COC concentrations in soil are protective of adjacent surface waters, screening levels were calculated using Ecology's Three-Phase Partitioning Model (WAC 173-340-474). This model provides a conservative estimate for establishing a soil concentration that will not cause groundwater contamination above an acceptable level. Surface water screening values presented in Table 2 were used to compute soil screening levels protective of the groundwater exposure pathway. Soil screening levels can be found in Table 1.

Sediment

Sediment data collect during the RI will be compared to the Washington State Freshwater Sediment Cleanup Objective Criteria and Freshwater Sediment Screening Levels as defined in WAC 173-204.

ENVIRONMENTAL DATA GAPS

The focus of this interim action will be to remove PCB- and chlorinated benzene-impacted soil on the Terminals property. The data gaps to be addressed during the RI are listed by media below and are limited to contamination on the Terminals property.

Soil

Numerous soil investigations have been completed at the Site to delineate PCB- and chlorinated benzene-contaminated soil. To support development of the RI and IAWP, additional contaminant delineation will be needed within and around the source area. Current soil analytical data will be needed to assess contaminant concentrations and distribution to evaluate remedial options. The extent of PCB detections above screening levels is shown on Figure 10, covering approximately 2,500 square feet and extending approximately 18 feet bgs. The

approximate vertical distribution of PCB detections above screening levels is shown on Cross Sections A-A' and B-B' (Figures 4 and 5).

Site soil data from within and around the source area was collected prior to or immediately following the previous interim actions completed in 2002 and 2003. The vertical and horizontal extent of the contamination has likely been altered by the previous interim actions. Collection of soil samples from borings installed within and around the source area will be needed to refine the current vertical and horizontal extent of the PCB, chlorinated benzene, and chlorinated ethene contamination. Metals data will be need for remediation planning and waste profiling. Soil samples should be analyzed for VOCs, PCBs, and metals. Additional soil sample analysis to assess potential *in situ* remediation options should include extended diesel-range petroleum hydrocarbons and total organic carbon (TOC) analysis.

Groundwater

Groundwater conditions have been monitored in several wells located downgradient of the PCB/chlorinated benzene source area since the 2003 Interim Action. Results of this long-term groundwater monitoring indicate that 1-4-dichlorobenzene concentrations have historically been below screening levels in compliance monitoring wells JT-6 and JT-12. However, groundwater samples have not been collected recently from within and adjacent to the source area. In general, groundwater samples from this area were last collected immediately before or after the Interim Actions. Additional sampling in and around the source area will be needed to assess current groundwater conditions.

In 2010, PCBs were detected in groundwater at the Terminals property at MW-4, located within the petroleum-contaminated soil area. Wells in this area should also be sampled to assess current groundwater PCB concentrations associated with the residual soil contamination left in place following the 1996 remedial excavation.

On October 3, 2013, Hart Crowser personnel completed a site walk and observed the condition of groundwater monitoring wells on the Terminals property. Monitoring and injection wells were determined to be in acceptable condition, but many well monuments were missing bolts and full of water. Well caps were generally in good condition and it appeared that surface water was likely not entering the wells. We recommend that all monitoring wells sampled during the RI be repaired and developed before sampling.

Groundwater samples should be analyzed for VOCs and PCBs. Analysis for total and dissolved metals will be needed to assess potential groundwater treatment options if contaminant excavation is the selected remedial action. Additional analysis, including total organic carbon, alkalinity, nitrates, sulfates, and chloride should also be analyzed to assess subsurface conditions for potential *in situ* bioremediation remediation.

Sediment

No data has been collected to determine whether COCs from the Terminals and Market Street properties have impacted adjacent sediment in the Lake Washington Ship Canal. Sediment sampling will be needed to determine if sediment has been impacted by historical contaminant releases discussed in this report.

Sediment adjacent to the Terminals property dock should be sampled using boat-mounted vibracore equipment to depths of 5 feet below the mudline. Samples should be analyzed for volatiles (including dichlorobenzenes and 1,2,4-trichlorobenzene), PCBs, total metals, and total organic carbon analysis.

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Table 1 - Historical Soil Sampling Analytical Results

Location	Date	Sample Depth in Feet	PCB Concentration in mg/kg Aroclor 1260	Concentration of Chlorinated Aliphatic Compounds in ug/kg						Concentration of Chlorinated Benzenes in ug/kg						Concentration of Other Detected VOCs in ug/kg												
				Vinyl Chloride	1,1-DCE	trans-DCE	cis-DCE	TCE	PCE	CB	1,3-DCB	1,4-DCB	1,2-DCB	1,2,4-TCB	1,2,3-TCB	Chloroform	Benzene	Toluene	Xylenes	1,2,4-TMB	1,3,5-TMB	n-Butylbenzene	HCB	Naphthalene				
January 2002 Railroad Track Investigation																												
SP-32	1/15/2002	16 to 20	--	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
SP-35	1/30/2002	16 to 20	--	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	330	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
SP-35	1/30/2002	20 to 23	--	50 U	50 U	50 U	50 U	50 U	6.7 J	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	160	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
January 2002 Performance Monitoring																												
IP-1(B)	1/15/2002	8 to 12	0.2	50 U	50 U	50 U	50 U	50 U	50 U	950	280	790	100	420	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
IP-1(B)	1/15/2002	12 to 16	0.2	50 U	50 U	50 U	50 U	50 U	50 U	50	200	170	50 U	200	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
IP-6(B)	1/15/2002	8 to 12	6	50 U	50 U	50 U	50 U	50 U	50 U	3,400	650	1,300	120	1,200	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
SP-2(B)	1/15/2002	12 to 16	410	50 U	50 U	50 U	50 U	350	1,400	50 U	50 U	50 U	50 U	200	300	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	500	350	
SP-4(B)	1/15/2002	8 to 12	210	50 U	50 U	50 U	50 U	50 U	330	2,000	2,600	11,000	1,500	270,000	12,000	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
SP-6(B)	1/15/2002	12 to 16	800	50 U	50 U	50 U	50 U	50 U	6.7 J	210	1,900	2,000	500	130,000	5,900	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
SP-19(B)	1/15/2002	12 to 16	0.2 U	50 U	50 U	50 U	50 U	50 U	6.7 J	50 U	120	140	50 U	7,800	690	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
SP-26(B)	1/15/2002	12 to 16	0.2 U	50 U	50 U	50 U	50 U	50 U	6.7 J	220	350	290	50 U	2,100	140	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
SP-36	1/29/2002	12 to 16	210	50 U	50 U	50 U	50 U	50 U	6.7 J	150	1,500	1,200	280	240,000	4,500	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	110	
SP-37	1/29/2002	13.5 to 15.5	0.2 U	50 U	50 U	50 U	50 U	50 U	6.7 J	50 U	1,100	1,000	140	8,200	250	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	68	
SP-38	1/29/2002	13 to 16	880	50 U	50 U	50 U	50 U	50 U	6.7 J	420	13,000	11,000	3,200	310,000	2,400	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-39	1/29/2002	10 to 13	0.2 U	50 U	50 U	50 U	50 U	50 U	6.7 J	88	470	410	130	1,900	2,400	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-39	1/29/2002	13 to 16	0.2 U	50 U	50 U	50 U	50 U	50 U	6.7 J	50 U	300	260	50 U	3,000	190	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-40	1/29/2002	10 to 13	0.2	50 U	50 U	50 U	50 U	50 U	6.7 J	170	130	180	50 U	710	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-40	1/29/2002	13 to 16	0.2 U	50 U	50 U	50 U	50 U	50 U	6.7 J	50 U	160	120	50 U	440	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
March 2002 Railroad Monitoring Well Installation																												
BR-1	4/11/2002	21.5 to 23	--	50 U	50 U	50 U	380	20 U	330	50 U	50 U	50 U	50 U	50 U	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
BR-2	4/11/2002	22 to 23.5	--	8 U	50 U	50 U	470	620	960	50 U	50 U	50 U	50 U	50 U	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
June 2002 Confirmation Soil Sampling																												
SP-41	6/5/2002	12 to 16	290	50 U	50 U	50 U	50 U	20 U	20 U	6,600	5,600	15,000	1,100	84,000	7,200	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	200	
SP-42	6/5/2002	8 to 12	690	50 U	50 U	50 U	1,500	130	20 U	5,000	5,600	14,000	820	14,000	7,800	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	710
SP-42	6/5/2002	12 to 16	2.4	50 U	50 U	50 U	50 U	20 U	20 U	610	970	2,500	130	6,300	180	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	180	
SP-43	6/5/2002	8 to 12	42	50 U	50 U	50 U	50 U	20 U	20 U	22,000	4,200	4,800	640	27,000	1,000	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-43	6/5/2002	12 to 16	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	390	700	850	180	6,600	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-44	6/5/2002	8 to 12	200	50 U	50 U	50 U	50 U	20 U	20 U	880	2,100	7,800	2,100	180,000	26,000	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	690	
SP-44	6/5/2002	12 to 16	290	50 U	50 U	50 U	50 U	20 U	20 U	190	1,500	1,000	430	98,000	9,000	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-45	6/5/2002	4 to 8	0.33	50 U	50 U	50 U	50 U	20 U	20 U	760	290	340	100	3,500	370	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-45	6/5/2002	8 to 12	0.2 U	50 U	50 U	50 U	400	20 U	20 U	110	50 U	210	50 U	1,600	220	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-45	6/5/2002	12 to 16	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	50 U	940	550	88	3,200	290	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-46	6/5/2002	12 to 16	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	50 U	1,600	1,200	190	4,600	190	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-47	6/5/2002	8 to 12	0.2 U	830	50 U	50 U	4,300	20 U	20 U	50 U	150	200	290	14,000	2,200	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-47	6/5/2002	12 to 16	250	50 U	50 U	50 U	50 U	20 U	20 U	50 U	1,500	2,000	1,300	360,000	18,000	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-48	6/5/2002	8 to 12	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	50 U	1,400	2,000	1,000	170,000	4,000	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-48	6/5/2002	12 to 16	70	50 U	50 U	50 U	50 U	20 U	20 U	50 U	1,200	1,400	790	33,000	3,000	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-49	6/5/2002	12 to 16	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	320	250	300	50 U	2,500	400	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
June 2003 Installation of Well JT-11																												
JT-11	6/3/2003	13 to 19	--	50 U	50 U	50 U	50 U	20 U	20 U	50 U	400	190	50 U	50 U	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
October 2003 Wall Design Investigation																												
SP-51	10/3/2003	18 to 21	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	50 U	110	95	50 U	50 U	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-53	10/3/2003	4 to 8	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	
SP-53	10/3/2003	16 to 19	0.2 U	50 U	50 U	50 U	50 U	20 U	20 U	50 U	830	350	50 U	50 U	50 U	50 U	20 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	

Notes:

Data table compiled by Aspect Consulting, LLC.

A = Screening level based on soil concentrations protective of surface water (WAC 173-340-474) using the 3-Phase Partitioning Model based on groundwater migration to surface water.

PCB and many VOC screening levels for surface water protection are below the PQL.

J Estimated value

U Not detected at indicated detection limit

-- Not analyzed

Bold Exceeds screening level protective of surface water (A).

Table 2 - Historical Groundwater Monitoring Analytical Results

Well	Location	Date	Concentration of Chlorinated Ethene Compounds in ug/L						Concentration of Chlorinated Benzene Compounds in ug/L						Concentration of Other Detected Volatile Organic Compounds in ug/L														
			Vinyl Chloride	1,1-DCE	trans-DCE	cis-DCE	TCE	PCE	CB	1,3-DCB	1,4-DCB	1,2-DCB	1,2,4-TCB	1,2,3-TCB	Chloromethane	Dibromomethane	1,1-DCA	1,2-DCA	1,1,2-TCA	1,1,2,2-TeCA	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	1,3,5-TMB	1,2,4-TMB	Chloroform	
Screening Level (A)			2.40	3.2 ^B	10,000	na	12.7 ^C	3.3	1,600	960	190	1,300	1.96 ^C	na	na	na	na	37	16	4	22.7 ^C	15,000	2,100	na	4940 ^C	na	470		
BR-1	City Property	4/15/2002	59	1 U	1 U	1300	400	450	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	36	1.3	1 U	1 U	1 U	1 U	1 U	1 U	
		6/4/2002	130	1 U	9.3	1000	420	400	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	27	1.2	3.7	1 U	1 U	1 U	1 U	1 U	
		3/13/2003	0.2 U	1 U	1 U	2200	900	1,500	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
BR-2	City Property	4/15/2002	41	8.9	1 U	660	620	1,400	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	89	1 U	1 U	8.7	1 U	1 U	1 U	1 U	
		4/15/2004	11	1.0	4.8	890	400	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.5	na	na	na	1 U	na	11	2.3	1 U	5.1	1.2	1 U	1 U	
		7/6/2004	15	1 U	1 U	2,400	570	1,000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	20	1 U	1 U	1 U	1 U	1 U	1 U	
		10/1/2004	11	1 U	1 U	950	290	850	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	12	1 U	1 U	1 U	1 U	1 U	1 U	
		1/25/2005	4	1 U	1 U	740	270	610	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	5.7	1 U	1 U	1 U	1 U	1 U	1 U	
		4/18/2005	0.22	1 U	1 U	140	35	72	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1	1 U	1 U	1 U	1 U	1 U	1 U	
		10/19/2005	11	1 U	2.5	560	160	550	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	4.4	2.6	2.9	2	1 U	1 U	1 U	
		4/21/2006	5.6	1 U	2.3	520	81	210	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	2.9	1 U	1 U	1 U	1 U	1 U	1 U	
		4/24/2007	8.9	1 U	3.0	640	59	110	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	4.5	1 U	1 U	1 U	1 U	1 U	1 U	
		4/22/2008	10	1 U	2.8	420	31	27	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	4.2	1 U	1 U	1 U	1 U	1 U	1 U	
		4/27/2009	33	1 U	4.0	560	29	21	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	9.2	1 U	1 U	1 U	1 U	1 U	1 U	
		4/27/2010	22	1 U	2.0	320	4.7	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	5.4	1.2	1 U	1.6	1 U	1 U	1 U	
		4/13/2011	7.1	1 U	1.0	110	1.0	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	2.6	1 U	1 U	1 U	1 U	1 U	1 U	
		4/19/2012	12	1 U	1 U	87	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
		4/12/2013	140	1.2	1.8	190	1.1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	3.9	1 U	1 U	1.0	1 U	1 U	1 U	
HC-MW-3	Corps Property	12/11/1997	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	1 U	na	na	na	0.2 U	na	0.5 U	0.5 U	0.5 U	0.5 U	--	--	--	0.2 U	
		4/8/1998	5 U	1 U	1 U	1 U	1 U	1 U	--	--	--	--	--	--	--	na	na	na	1 U	na	1 U	1 U	1 U	1 U	--	--	--	--	
		1/20/2000	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	--	--	--	1 U	
		4/7/2000	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	--	--	--	1 U	
		7/7/2000	5 U	5 U	5 U	5 U	16	1 U	5 U	1 U	1 U	1 U	--	--	5 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	--	--	--	1 U	
		10/10/2000	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	na	na	na	5 U	na	5 U	1 U	5 U	1 U	1 U	1 U	1 U	5 U	
		2/25/2003	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	na	na	na	5 U	na	5 U	1 U	5 U	1 U	1 U	1 U	1 U	5 U	
		5/1/2003	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		10/1/2003	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		12/18/2003	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/15/2004	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/18/2005	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/21/2006	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/24/2007	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/23/2008	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/27/2009	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4/27/2010	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
4/13/2011	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
4/19/2012	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
4/11/2013	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
IG-1A	West Treatment Gate	1/27/2005	2.7	1 U	1 U	33	2.6	14	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/18/2005	0.2 U	1 U	1 U	18	2.0	9.6	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/21/2006	1.1	1 U	1 U	16	1.1	5.2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/24/2007	0.5	1 U	1 U	57	1 U	3.2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.0	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/23/2008	1.7	1 U	1 U	11	1 U	2.9	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/25/2009	2.1	1 U	1 U	3.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/27/2010	0.2 U	1 U	1 U	1.6	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/12/2011	0.92	1 U	1 U	9.9	1 U	1.9	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4/19/2012	3.2	1 U	1 U	11	1 U	1.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2.6	1 U	1 U	1 U	1 U	1 U	1 U		
4/12/2013	1.5	1 U	1 U	8.1	8.2	35	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
IG-2	West Treatment Gate	1/20/2000	67	5 U	5 U	130	14	42	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5												

Table 2 - Historical Groundwater Monitoring Analytical Results

Well	Location	Date	Concentration of Chlorinated Ethene Compounds in ug/L						Concentration of Chlorinated Benzene Compounds in ug/L						Concentration of Other Detected Volatile Organic Compounds in ug/L														
			Vinyl Chloride	1,1-DCE	trans-DCE	cis-DCE	TCE	PCE	CB	1,3-DCB	1,4-DCB	1,2-DCB	1,2,4-TCB	1,2,3-TCB	Chloromethane	Dibromomethane	1,1-DCA	1,2-DCA	1,1,2-TCA	1,1,2,2-TeCA	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	1,3,5-TMB	1,2,4-TMB	Chloroform	
	Screening Level (A)		2.40	3.2 ^B	10,000	na	12.7 ^C	3.3	1,600	960	190	1,300	1.96 ^C	na	na	na	37	16	4	22.7 ^C	15,000	2,100	na	4940 ^C	na	470			
IG-3	East Treatment Gate	1/20/2000	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	--	--	1 U		
		4/7/2000	5 U	5 U	5 U	5 U	5.8	3.2	5 U	4.5 C	4.7 C	4.7 C	--	--	5 U	5.1	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	4.2	--	--	1 U	
		7/6/2000	5 U	5 U	5 U	3.0 J	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		10/10/2000	5 U	5 U	5 U	5 U	4.8	13	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		1/15/2001	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		4/9/2001	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		7/10/2001	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		10/22/2001	5 U	5 U	5 U	5 U	1 U	19	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		4/15/2002	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		10/1/2002	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		5/1/2003	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		11/3/2003	5 U	5 U	5 U	3.5	1 U	3.6	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		4/27/2004	0.2 U	1 U	1 U	1.2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/18/2005	0.2 U	1 U	1 U	1 U	1 U	3.4	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/21/2006	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/24/2007	0.2 U	1 U	1 U	1.3	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/23/2008	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		4/25/2009	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4/28/2010	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
4/12/2011	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
4/19/2012	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
4/12/2013	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
IG-4	East Treatment Gate	1/20/2000	15	5 U	5 U	25	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	--	--	1 U		
		4/7/2000	5 U	5 U	5 U	5 U	1 U	3.2	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		7/6/2000	21	5 U	5 U	2.6 J	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		10/10/2000	5 U	5 U	5 U	5 U	1 U	2.6	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		1/15/2001	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		4/9/2001	5 U	5 U	5 U	5 U	5.1	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		7/9/2001	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		10/22/2001	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		4/15/2002	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		10/1/2002	5 U	5 U	5 U	5 U	1 U	1 U	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	--	--	1 U	
		5/1/2003	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		11/3/2003	5 U	5 U	5 U	5 U	1 U	1.2	5 U	1 U	1 U	1 U	--	--	5 U	5 U	5 U	5 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
		4/27/2004	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
		4/18/2005	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
		4/21/2006	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
		4/24/2007	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
		4/23/2008	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
		4/25/2009	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
4/28/2010	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U			
4/12/2011	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U			
4/19/2012	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U			
4/11/2013	0.2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U			
IP-1	Terminals Property	2/20/2001	5 U	5 U	5 U	5 U	1 U	1 U	5 U	140	1300	670	--	--	5 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	--	--	1 U		
		4/10/2001	4.8	1 U	1 U	7	1 U	1 U	55	100	140	59	850	110	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
		7/10/2001	0.2 U	1 U	1 U	1 U	1 U	1 U	16	44	330	580	1200	1300	1 U	na	na	na	1 U	na	1 U	1 U	1 U	1 U	1 U	1 U	1 U		
		10/22/2001	0.2 U	1 U	1 U	2.9	1 U	1 U	23	34	300	550	9000	850	1 U	na	na	na	1 U	na	3.4	1 U	1 U	1 U	1 U	1 U	1 U		
		12/17/2001	5.5	1 U	1 U	11	1 U	1 U	16	17	200	230	11000	2500	1 U	na	na	na	1 U	na	4.7	1 U	1 U	1 U	1 U	1 U	1 U		
		6/3/2002	0.2 U	1 U	1 U	1 U	1 U	1 U	6.9	11	160	310	4000	92	1 U	na	na	na	1 U	na	3.1	1 U	1 U	1 U	1 U	1 U	1 U		
IP-2	Terminals Property	2/20/2001	5 U	5 U	5 U	15	1 U																						

Table 3 - PCB Concentrations in Groundwater

Sample Location	Sampling Date	Total Suspended Solids in mg/L	PCB Concentration in ug/L (Aroclor 1260)
Screening Levels Protective of Surface Water(A)			6.400E-05
JT-3	4/10/2001	--	0.4 U
	12/17/2001	--	0.017 U
	6/4/2002	7.4	1.5
	10/1/2002	1 U	0.033 U
JT-6	4/10/2001	--	0.4 U
	12/17/2001	1.4	0.017 U
	6/4/2002	23	0.2
	10/1/2002	3.1	0.056
	6/12/2003	25	0.089
	11/3/2003	5.2	0.03 U
	1/25/2005	51	0.05 U
	7/22/2005	68.2	0.03 U
JT-12	11/3/2003	3.8	0.03 U
	1/25/2005	6.0	0.015 U
	8/26/2005	2.2	0.01 U
MW-4	3/10/2010	NA	0.6 ¹

Notes:

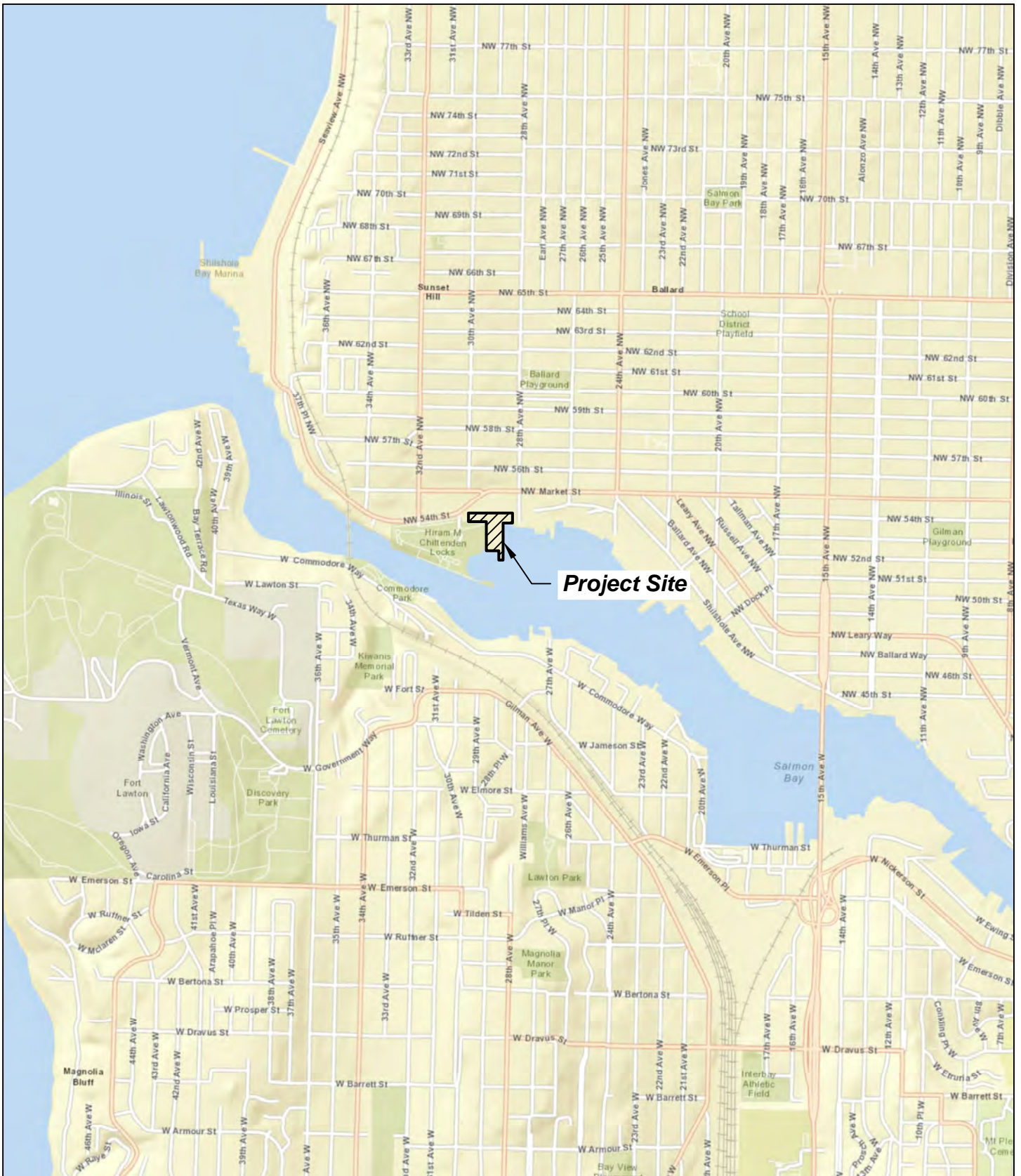
A - Clean Water Act S304 Freshwater Screening Level for Consumption of Organisms based on groundwater Screening Level below PQL.

1 - Not known whether concentration is for PCB mixture or Aroclor 1260. (Aspect 2010)


NA - Not Available.

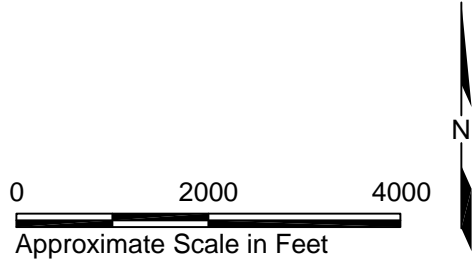
-- Not analyzed

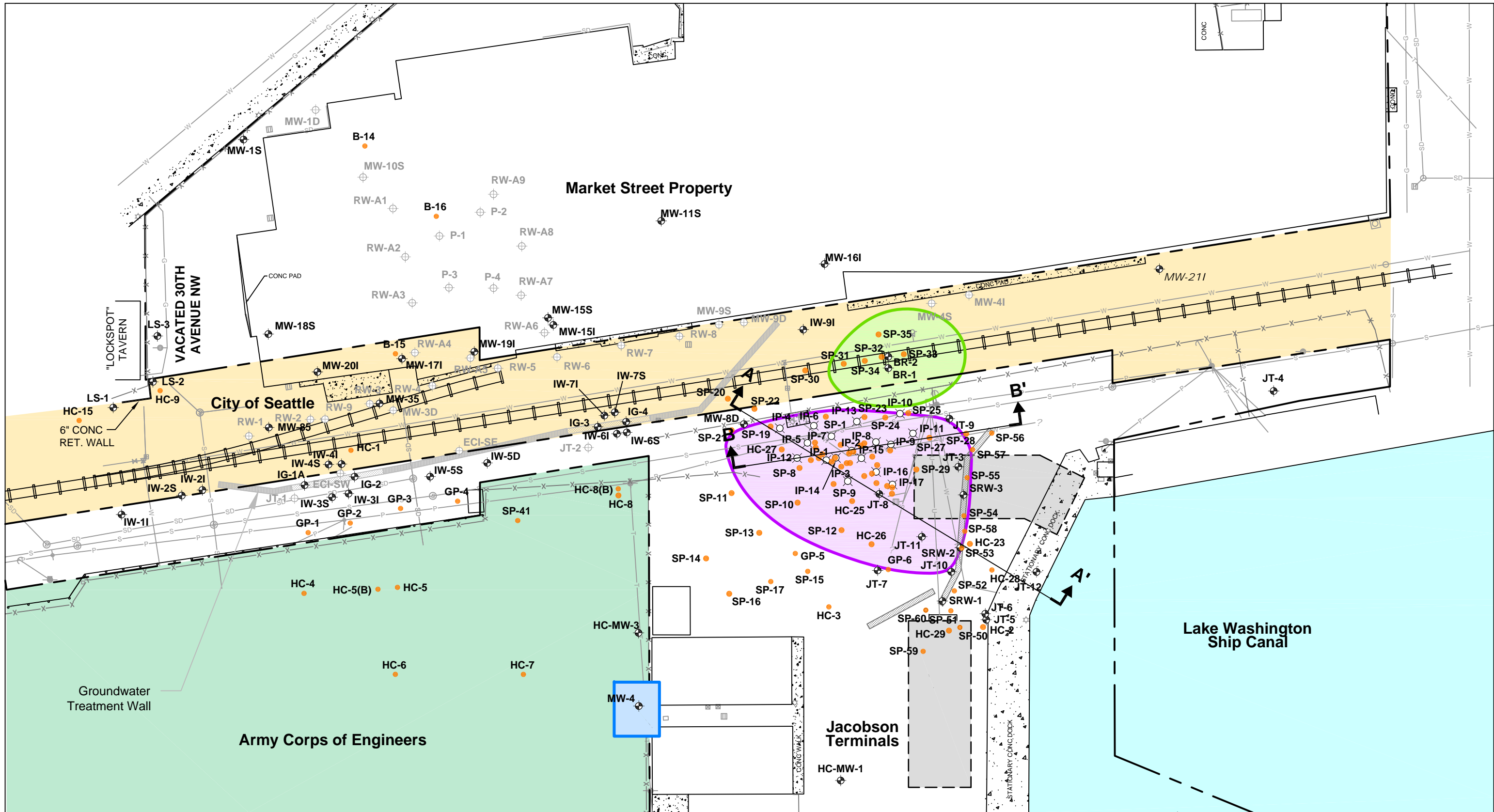
U Not detected at indicated detection limit



Source: Base map prepared from ArcGIS Online, 2013.

Jacobson Terminals Seattle, Washington	
Vicinity Map	
17800-43	10/13
	Figure 1





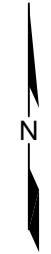
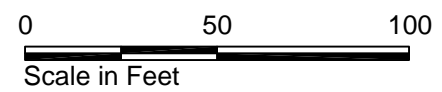
- MW-18S** Existing Monitoring Well
- RW-2** Former Monitoring Well, Recovery Well, or Piezometer (Abandoned)
- IP-5** Injection Well
- SP-41** Soil Boring
Note: Labels removed from several borings in "IP" area for clarity. Refer to "Interim Cleanup Action Summary", Hart Crowser, July 18, 2002.
- Property Boundary

- Concrete Surface
- Cement-Bentonite Groundwater Treatment Wall
- Permeable Iron/Sand Gate
- Overhead Power
- Sanitary Sewer Line
- Water Line
- Utility Line

- City of Seattle Property
- Iron/GAC Groundwater Treatment Wall
- Boat Storage Rack
- Cross Section Location and Designation

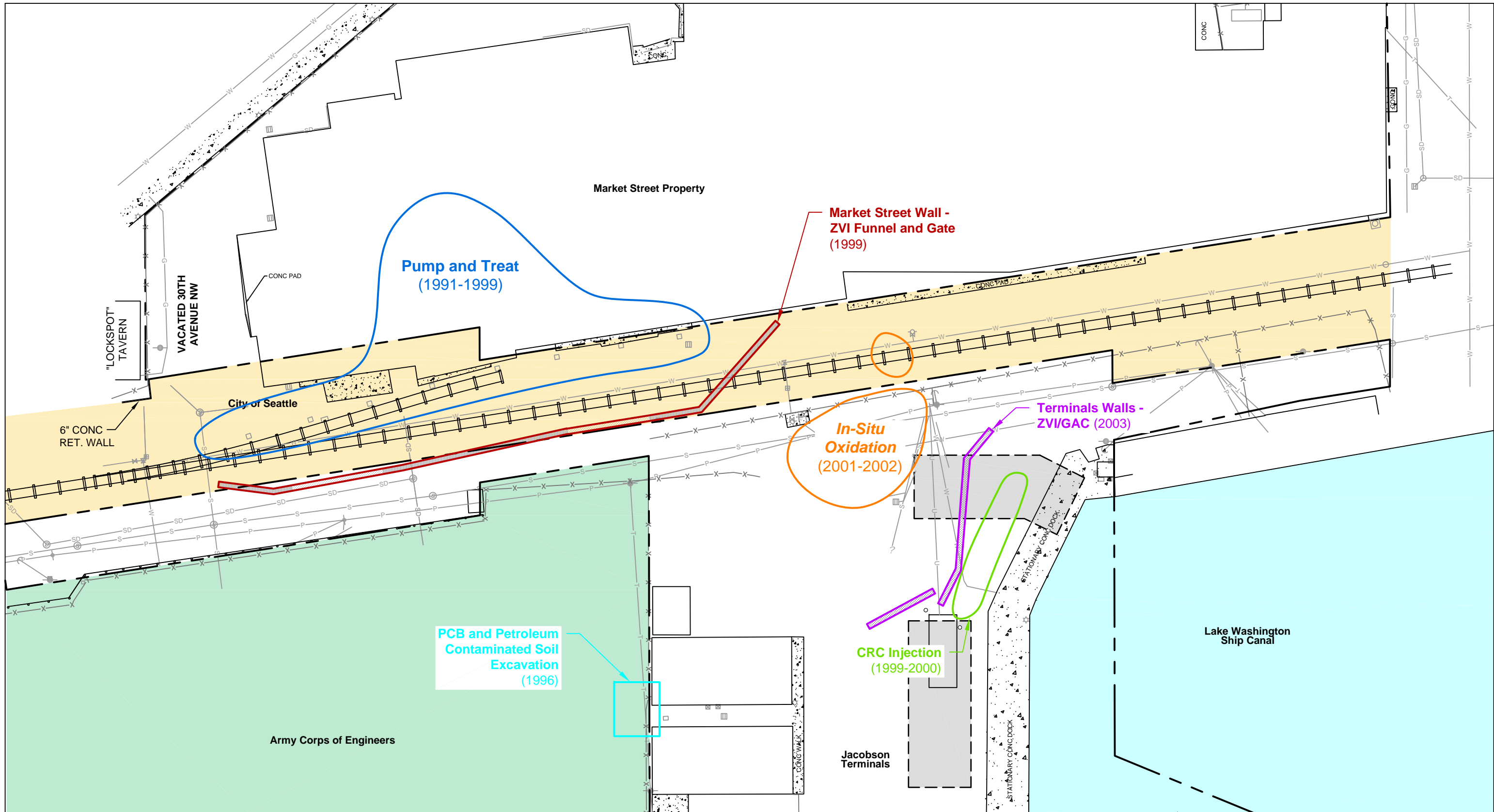
- Notes:**
1. Base map prepared from AutoCAD file "020030-02.dwg," provide by Aspect Consulting, 10/08/13.
 2. Utility locations are approximate.

- Jacobson Terminal COC Areas**
- Petroleum Area
 - Chlorinated Ethene Area
 - PCB and Chlorinated Benzene Area



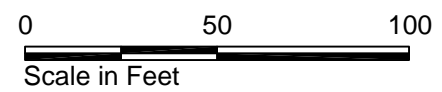
Jacobson Terminals Seattle, Washington	
Site Plan	
17800-43	11/13
Figure 2	

EAL 11/8/13 1780043-004.dwg



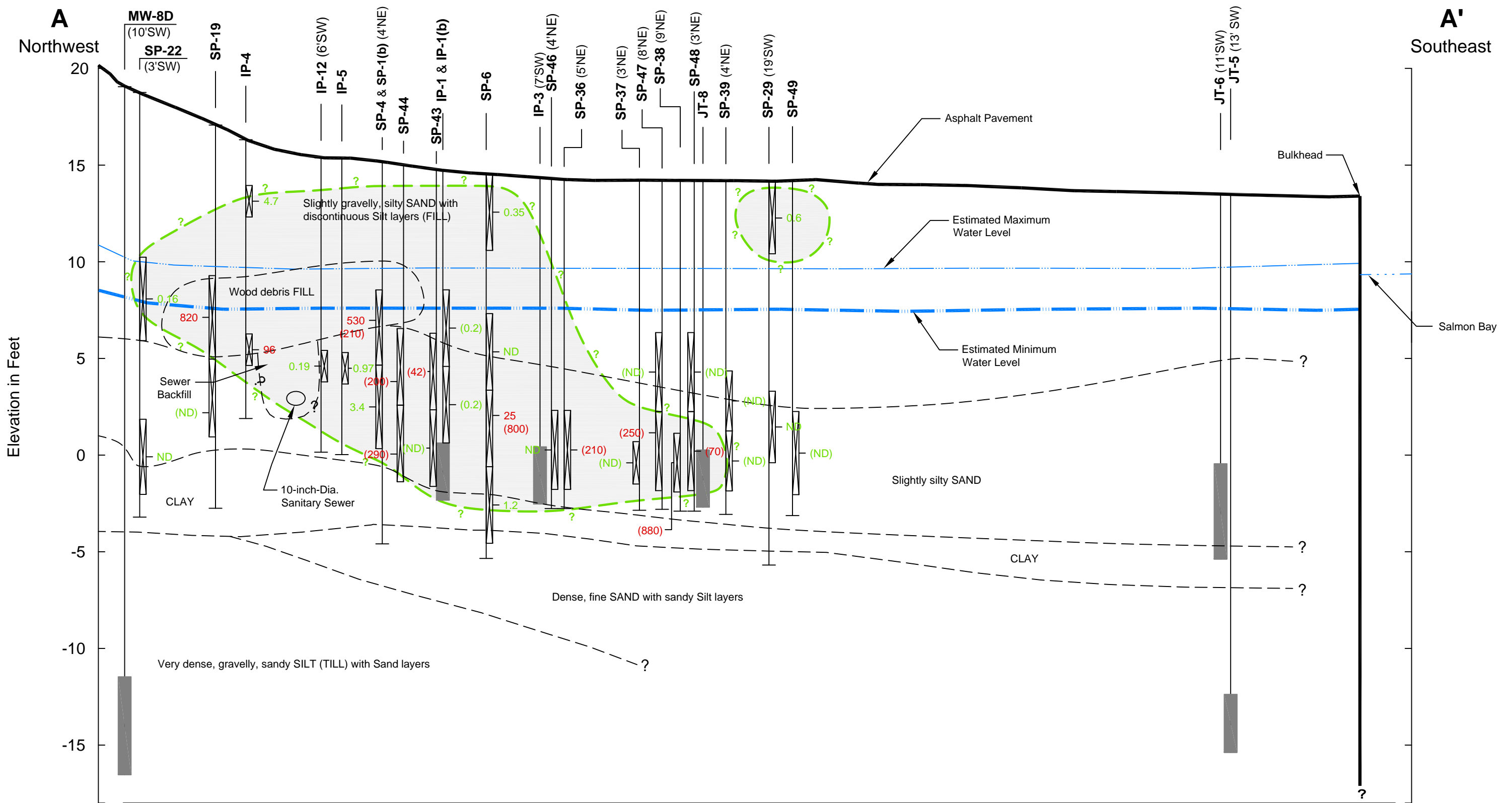
	Property Boundary		City of Seattle Property
	Concrete Surface		Iron/GAC Groundwater Treatment Wall
	Cement-Bentonite Groundwater Treatment Wall		Boat Storage Rack
	Permeable Iron/Sand Gate		
	Overhead Power		
	Sanitary Sewer Line		
	Water Line		
	Utility Line		

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

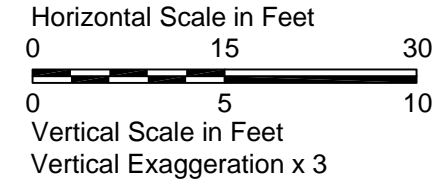


Jacobson Terminals Seattle, Washington	
Remediation Areas	
17800-43	10/13
	Figure 3

EAL 10/18/13 1780043-007.dwg



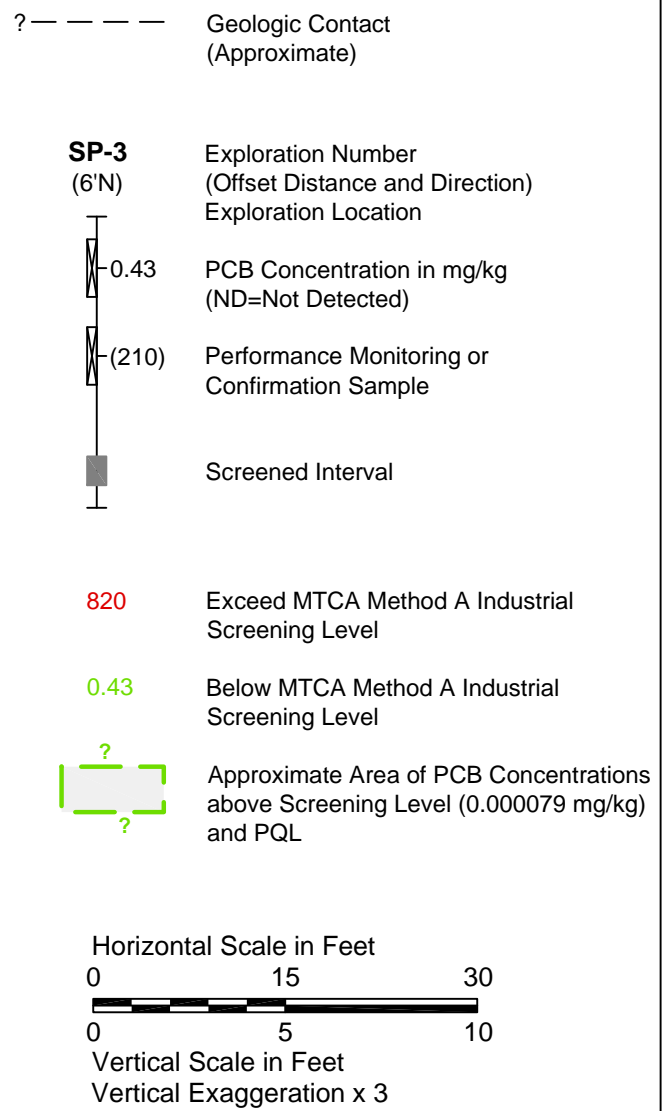
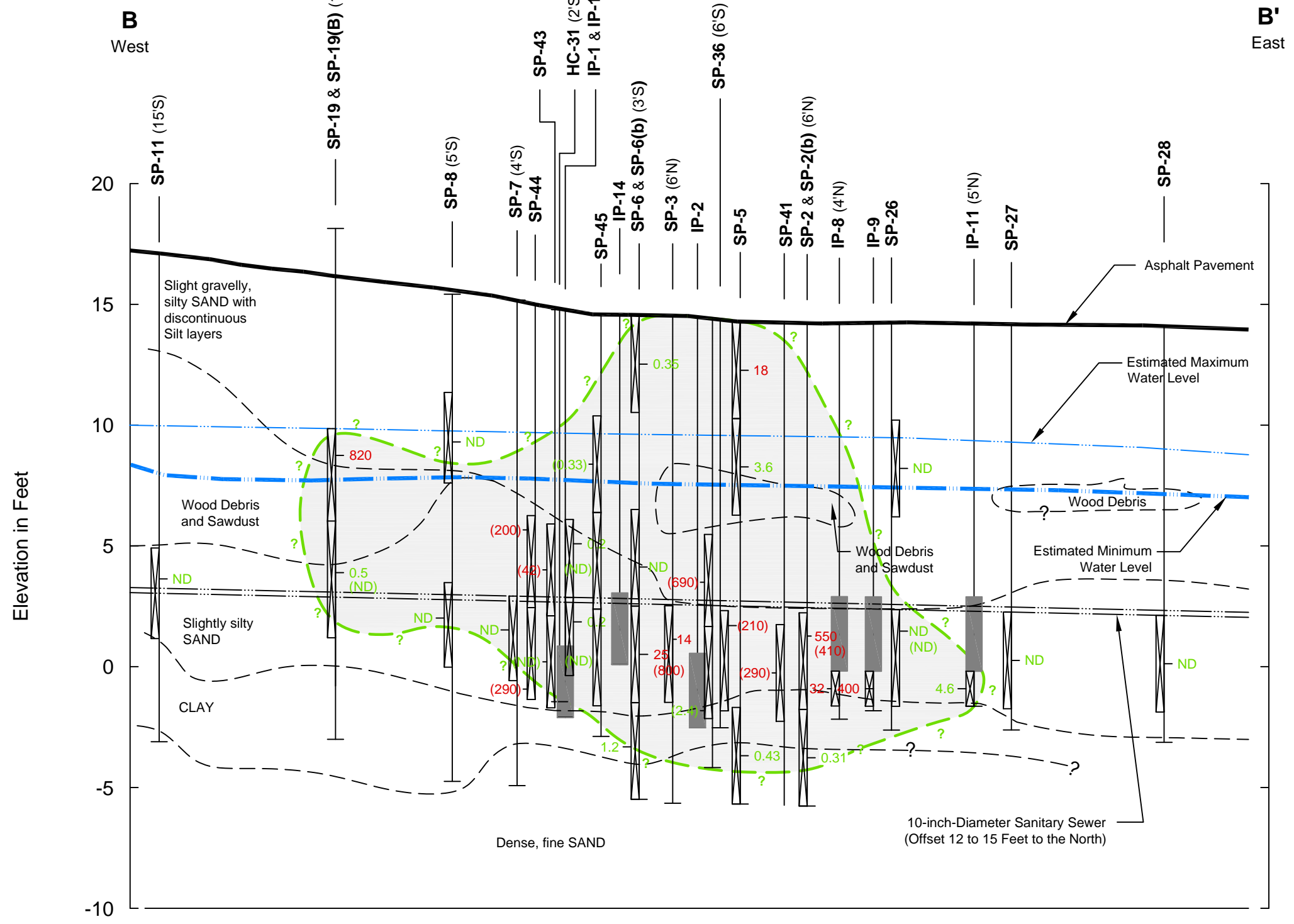
MW-8D (10' S)	Exploration Number (Offset Distance and Direction) Exploration Location	— — — ?	Geologic Contact (Approximate)
0.43	PCB Concentration in mg/kg (ND=Not Detected)	820	Exceed MTCA Method A Industrial Screening Level
(210)	Performance Monitoring or Confirmation Sample	0.43	Below MTCA Method A Industrial Screening Level
■	Screened Interval	?	Approximate Area of PCB Concentrations above Screening Level (0.000079 mg/kg)



Notes:
 1. Contacts between soil units are based upon interpolation between borings and represent our interpretation of subsurface conditions based on currently available data.
 2. Cross section developed from AutoCAD files provided by Aspect, dated 12/2005.

Jacobson Terminals Seattle, Washington	
Generalized Geologic Cross Section A-A'	
17800-43	11/13
	Figure 4

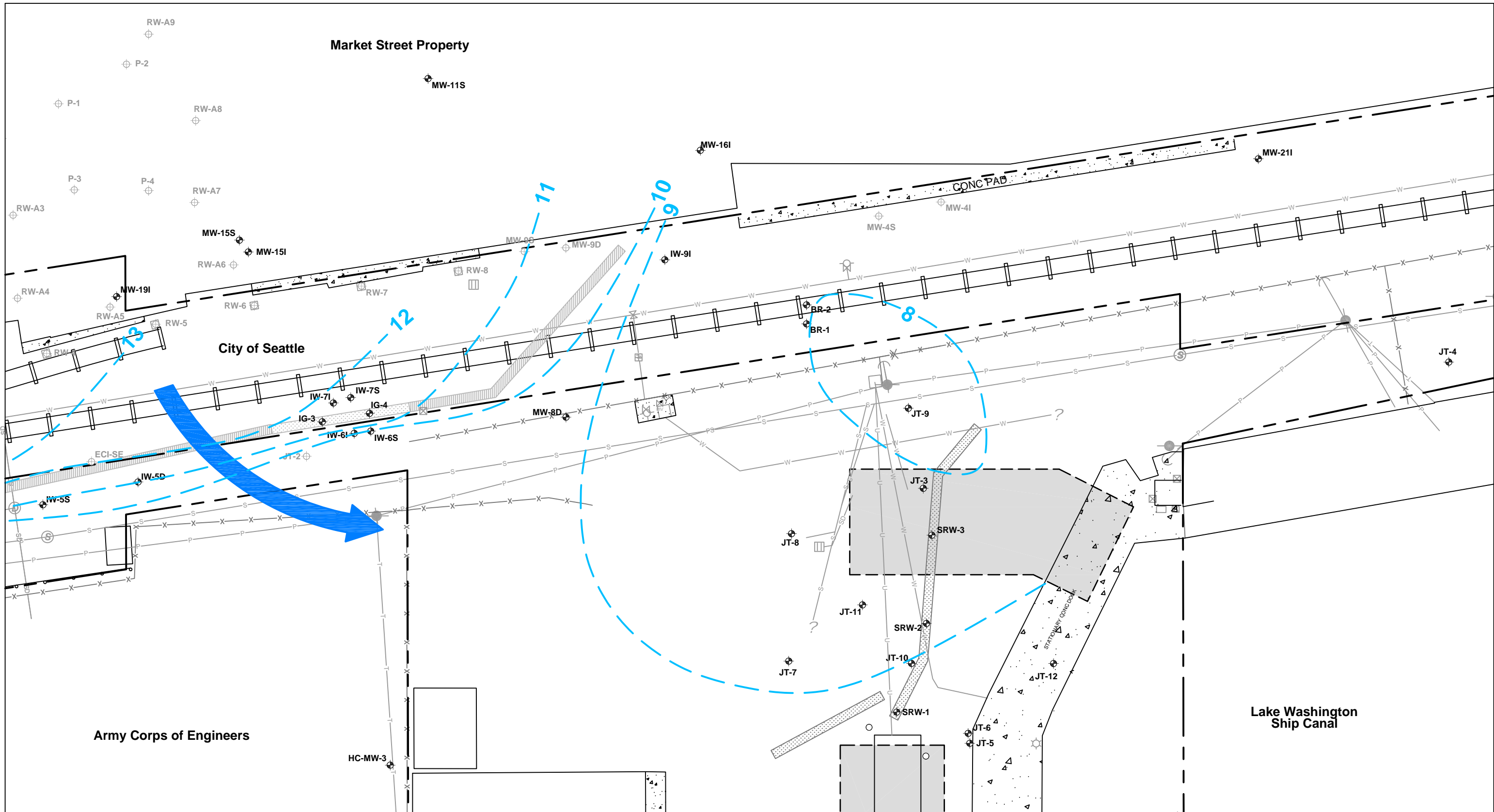
EAL 11/8/13 1780043-002.dwg



- Notes:**
1. Contacts between soil units are based upon interpolation between borings and represent our interpretation of subsurface conditions based on currently available data.
 2. Cross section developed from AutoCAD files provided by Aspect, dated 12/2005.

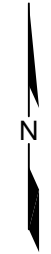
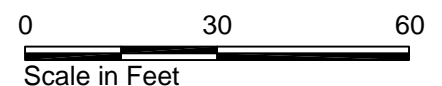
Jacobson Terminals Seattle, Washington	
Generalized Geologic Cross Section B-B'	
17800-43	11/13
	Figure 5

Market Street Property



MW-18S	Existing Monitoring Well		Overhead Power
RW-2	Former Monitoring Well, Recovery Well, or Piezometer (Abandoned)		Sanitary Sewer Line
	Property Boundary		Water Line
	Concrete Surface		Utility Line
	Cement-Bentonite Groundwater Treatment Wall		Iron/GAC Groundwater Treatment Wall
	Permeable Iron/Sand Gate		Boat Storage Rack
	Groundwater Elevation Contour		Inferred Groundwater Gradient

- Notes:**
1. Base map prepared from AutoCAD file "020030-02.dwg," provided by Aspect Consulting, 10/08/13.
 2. Utility locations are approximate.
 3. Groundwater data from VCP Cleanup Status Report Memorandum prepared by Aspect Consulting, 12/12/05.



Lake Washington Ship Canal

Jacobson Terminals
Seattle, Washington

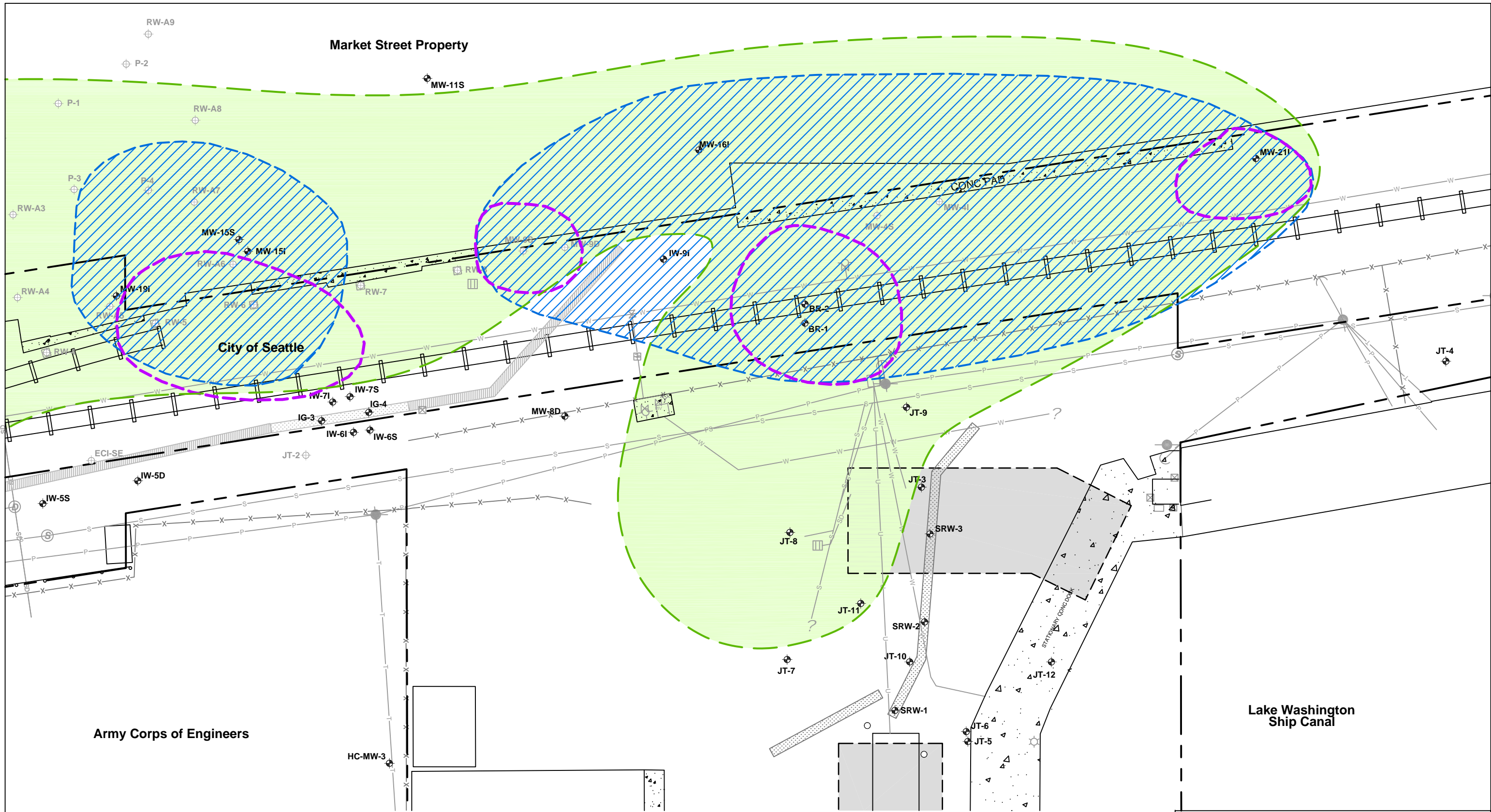
Groundwater Elevation Contours
April 2005

17800-43

10/13



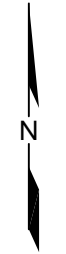
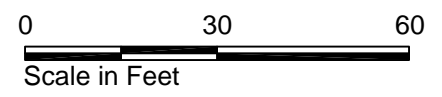
Figure
6



- | | | | |
|---------------|--|--|-------------------------------------|
| MW-18S | Existing Monitoring Well | | Overhead Power |
| RW-2 | Former Monitoring Well, Recovery Well, or Piezometer (Abandoned) | | Sanitary Sewer Line |
| | Property Boundary | | Water Line |
| | Concrete Surface | | Utility Line |
| | Cement-Bentonite Groundwater Treatment Wall | | Iron/GAC Groundwater Treatment Wall |
| | Permeable Iron/Sand Gate | | Boat Storage Rack |

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

- Estimated Extent of TCE
 - Estimated Extent of PCE
 - Estimated Extent of Vinyl Chloride
- Based on 2005 estimates and 2013 groundwater sampling data



Lake Washington Ship Canal

Jacobson Terminals
Seattle, Washington

**Estimated Extent of Chlorinated Ethenes
in Groundwater**

17800-43

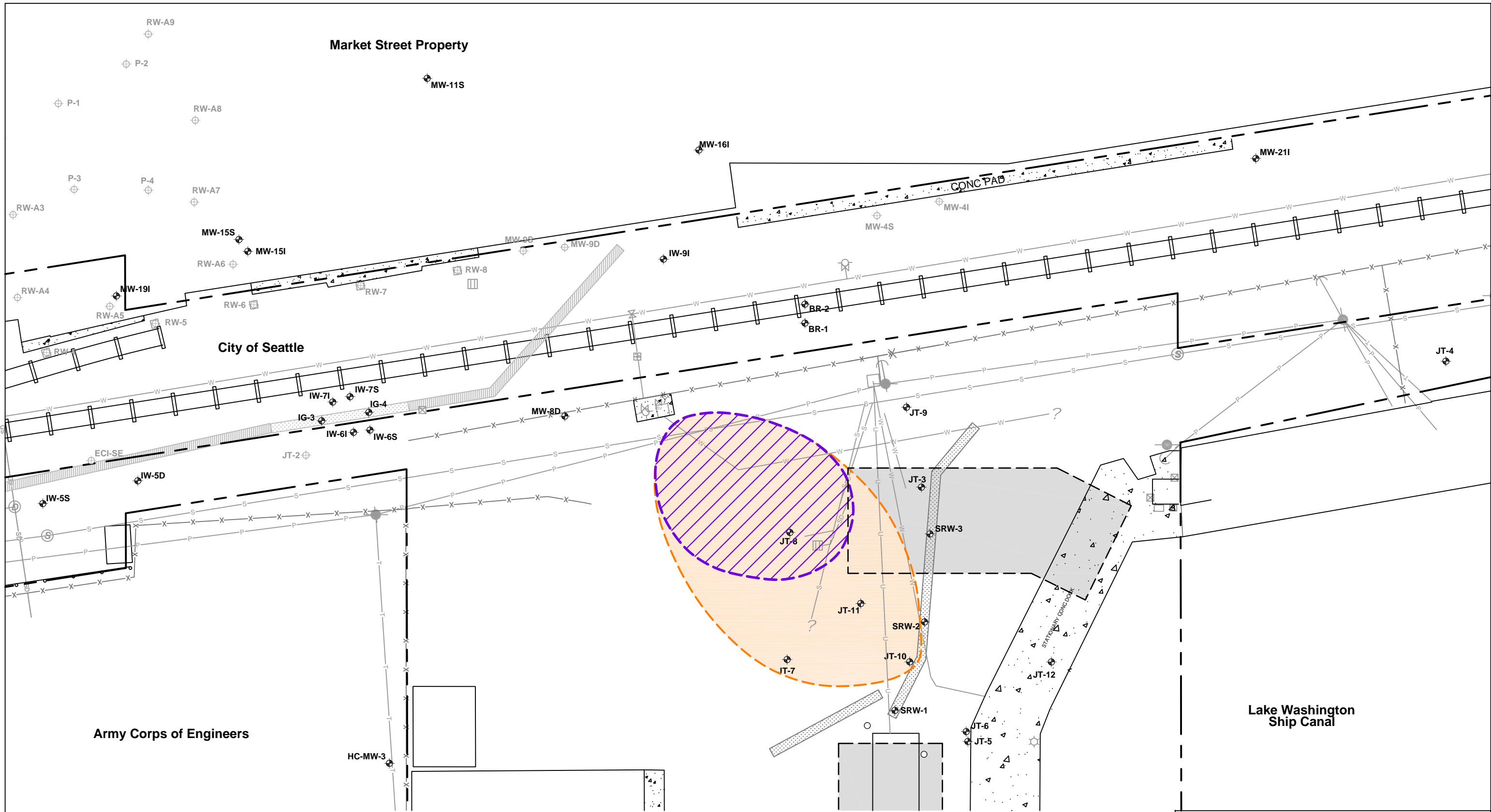
10/13



Figure
7

EAL 10/18/13 1780043-009.dwg

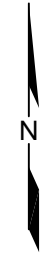
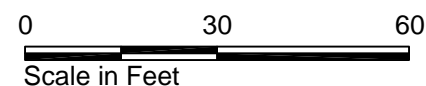
Market Street Property



- | | | | |
|---------------|--|-----|-------------------------------------|
| MW-18S | Existing Monitoring Well | —P— | Overhead Power |
| RW-2 | Former Monitoring Well, Recovery Well, or Piezometer (Abandoned) | —S— | Sanitary Sewer Line |
| | Property Boundary | —W— | Water Line |
| | Concrete Surface | —U— | Utility Line |
| | Cement-Bentonite Groundwater Treatment Wall | | Iron/GAC Groundwater Treatment Wall |
| | Permeable Iron/Sand Gate | | Boat Storage Rack |

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

Estimated Extent of 1,2,4-Trichlorobenzene
 Estimated Extent of 1,2,4-Dichlorobenzene
 Based on 2005 estimates and 2013 groundwater sampling data



Lake Washington Ship Canal

Jacobson Terminals
 Seattle, Washington

Estimated Extent of Chlorinated Benzenes in Groundwater

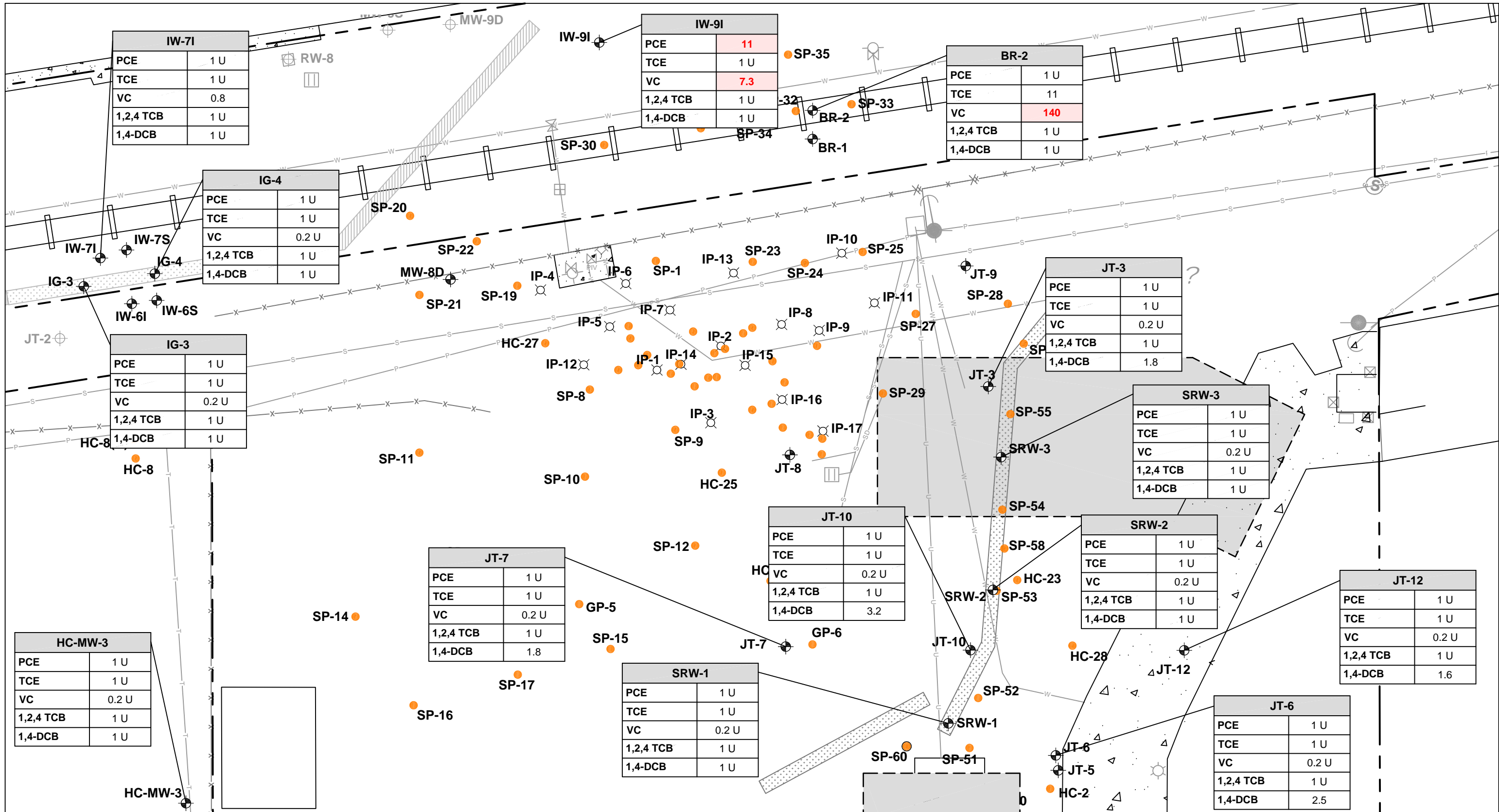
17800-43

11/13



Figure
8

EAL 11/12/13 1780043-011.dwg



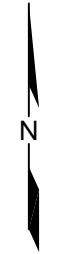
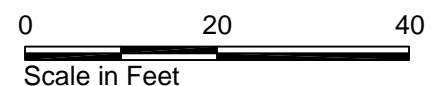
- MW-18S** Existing Monitoring Well
- RW-2** Former Monitoring Well, Recovery Well, or Piezometer (Abandoned)
- IP-5** Injection Well
- SP-41** Soil Boring
Note: Labels removed from several borings in "IP" area for clarity. Refer to "Interim Cleanup Action Summary", Hart Crowser, July 18, 2002.
- Property Boundary

- Concrete Surface
- Cement-Bentonite Groundwater Treatment Wall
- Permeable Iron/Sand Gate
- Overhead Power
- Sanitary Sewer Line
- Water Line
- Utility Line
- City of Seattle Property
- Iron/GAC Groundwater Treatment Wall
- Boat Storage Rack

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

Well Name		Concentrations in µg/kg
Tetrachloroethylene	PCE	1 U
Trichloroethylene	TCE	1 U
Vinyl Chloride	VC	0.2 U
1,2,4-Trichlorobenzene	1,2,4 TCB	1 U
1,4-dichlorobenzene	1,4-DCB	3.0

Bold, Shaded Value Exceeds Applicable MTCA Level

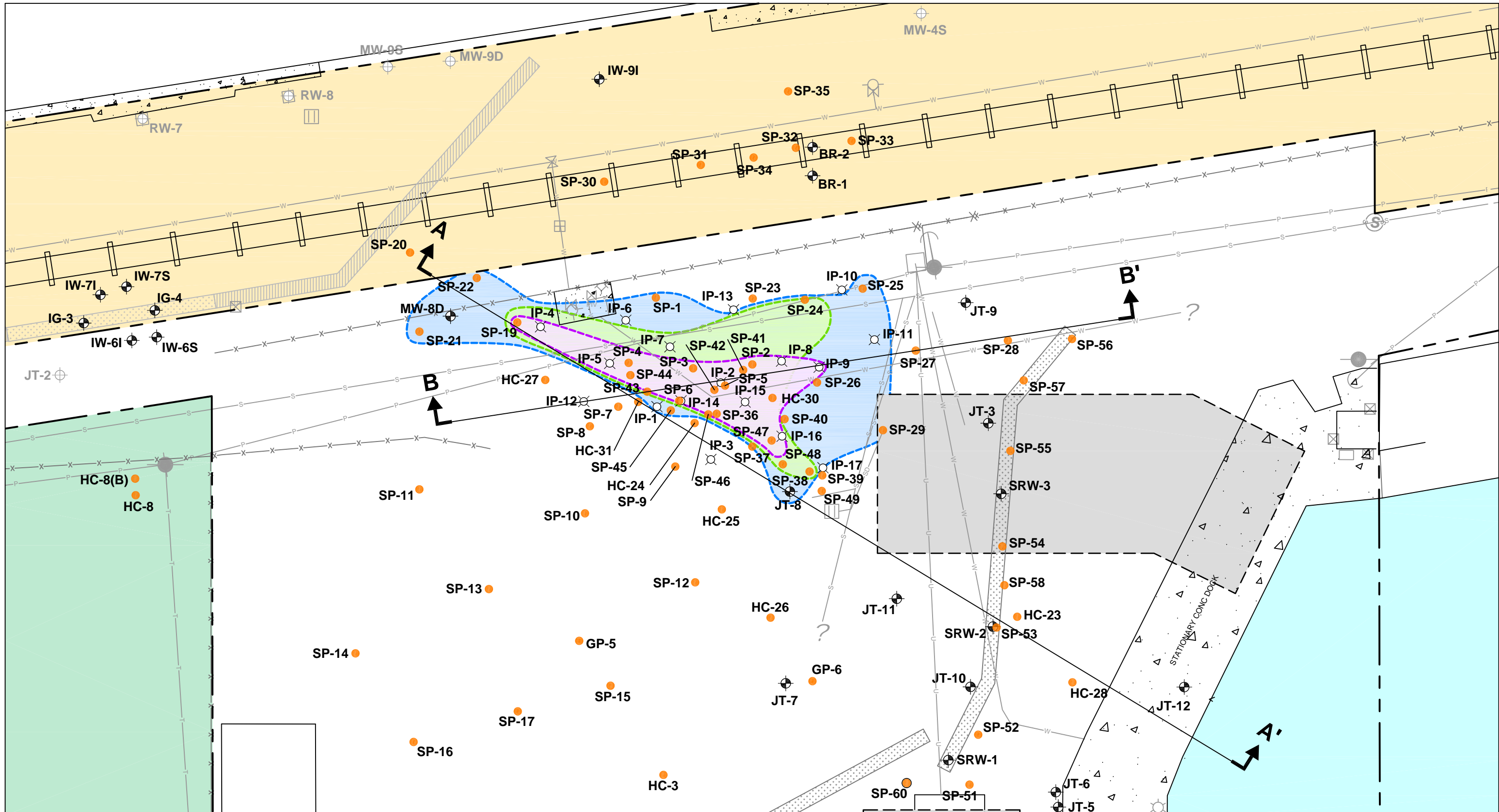


Jacobson Terminals
Seattle, Washington

2013 Groundwater COC Concentrations

17800-43 11/13

Figure **9**

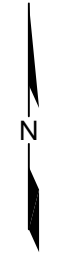
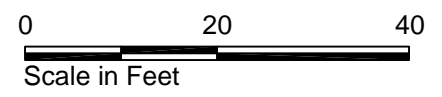


- MW-18S** Existing Monitoring Well
- RW-2** Former Monitoring Well, Recovery Well, or Piezometer (Abandoned)
- IP-5** Injection Well
- SP-41** Soil Boring
Note: Labels removed from several borings in "IP" area for clarity. Refer to "Interim Cleanup Action Summary", Hart Crowser, July 18, 2002.
- Property Boundary
- Concrete Surface
- Cement-Bentonite Groundwater Treatment Wall
- Permeable Iron/Sand Gate
- Overhead Power
- Sanitary Sewer Line
- Water Line
- Utility Line

- City of Seattle Property
- Iron/GAC Groundwater Treatment Wall
- Boat Storage Rack
- Cross Section Location and Designation

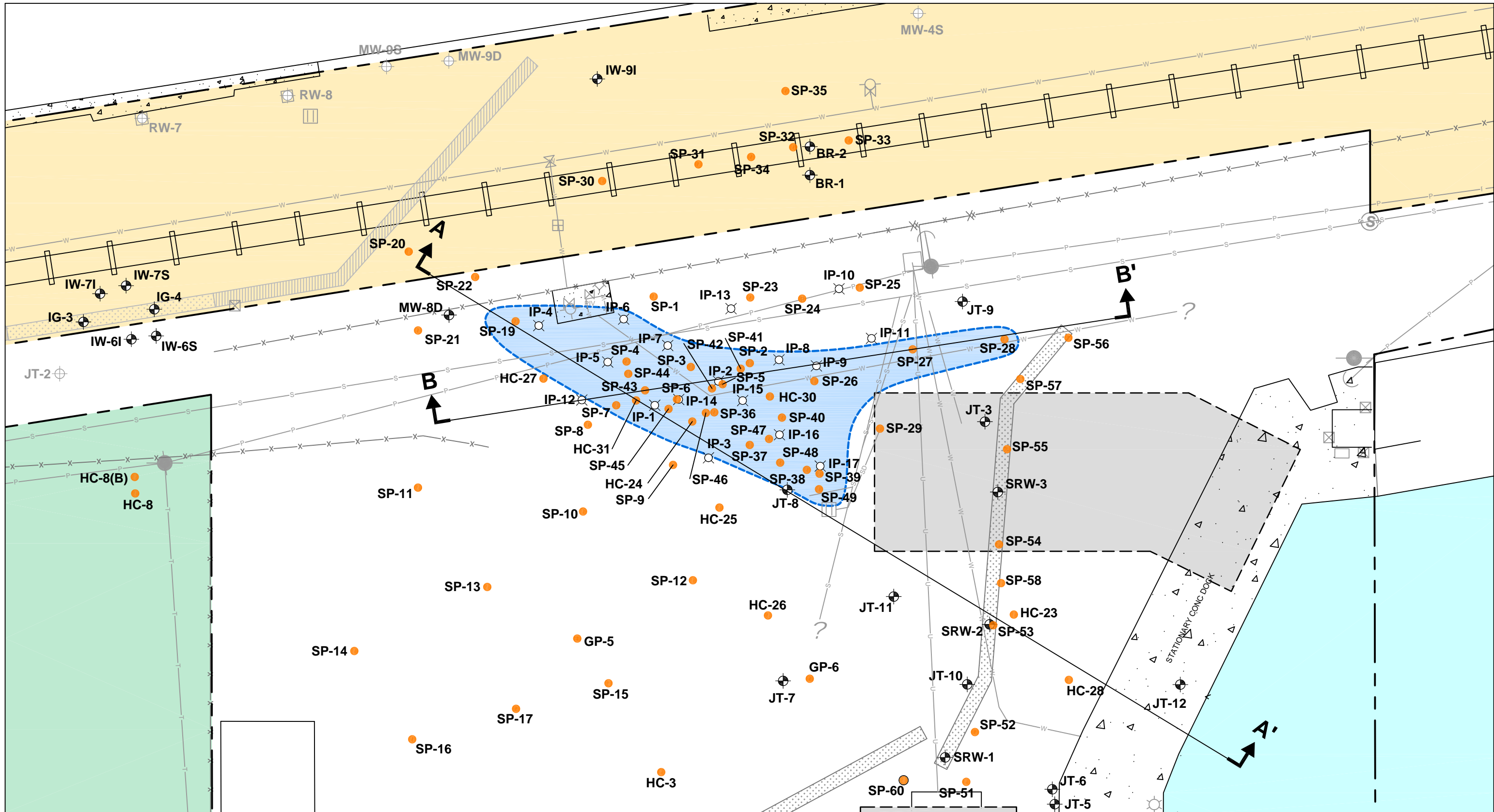
- Estimated Extent of PCB Occurrences**
- PCB Concentration and/or 1,2,4-TCB Concentration > 100 mg/kg
 - PCB Concentration > 10 mg/kg
 - PCB Concentration > Screening Level (0.000076 mg/kg)

- Notes:**
1. Base map prepared from AutoCAD file "020030-02.dwg," provided by Aspect Consulting, 10/08/13.
 2. Utility locations are approximate.
 3. PCB occurrences include pre- and post-interim action detections.



Jacobson Terminals Seattle, Washington	
PCB Occurrences in Soil	
17800-43	11/13
Figure 10	

EAL 11/12/13 1780043-008.dwg



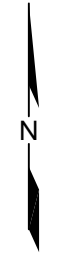
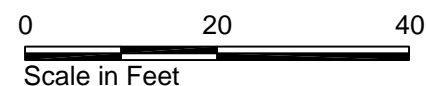
- MW-18S** Existing Monitoring Well
- RW-2** Former Monitoring Well, Recovery Well, or Piezometer (Abandoned)
- IP-5** Injection Well
- SP-41** Soil Boring
Note: Labels removed from several borings in "IP" area for clarity. Refer to "Interim Cleanup Action Summary", Hart Crowser, July 18, 2002.
- Property Boundary

- Concrete Surface
- Cement-Bentonite Groundwater Treatment Wall
- Permeable Iron/Sand Gate
- Overhead Power
- Sanitary Sewer Line
- Water Line
- Utility Line

- City of Seattle Property
- Iron/GAC Groundwater Treatment Wall
- Boat Storage Rack
- Cross Section Location and Designation

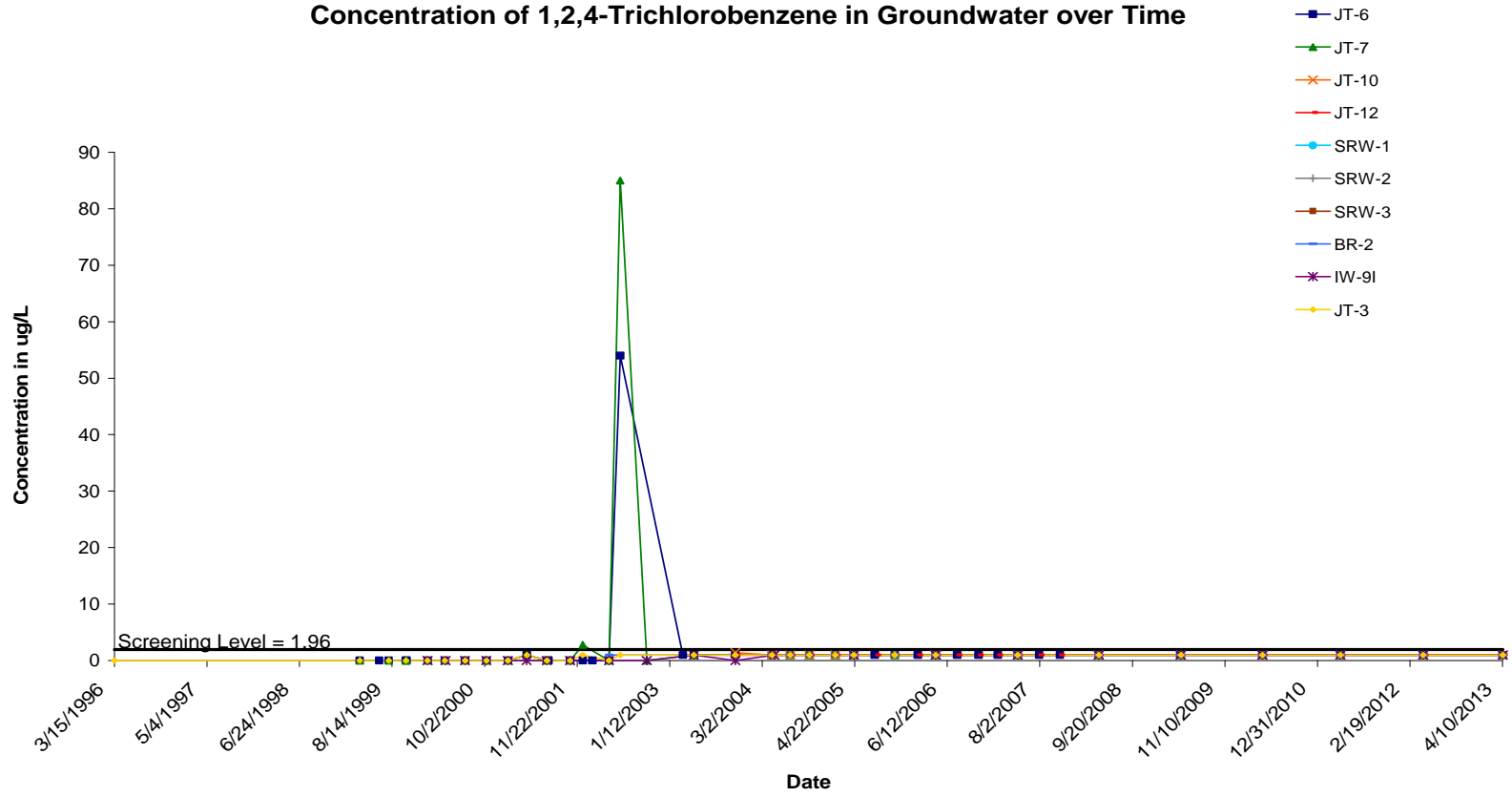
Estimated extent of 1,2,4-TCB concentration above screening level (5.4 mg/kg) and PQL

- Notes:**
1. Base map prepared from AutoCAD file "020030-02.dwg," provided by Aspect Consulting, 10/08/13.
 2. Utility locations are approximate.
 3. 1,2,4-TCB occurrences include pre- and post-interim action detections.




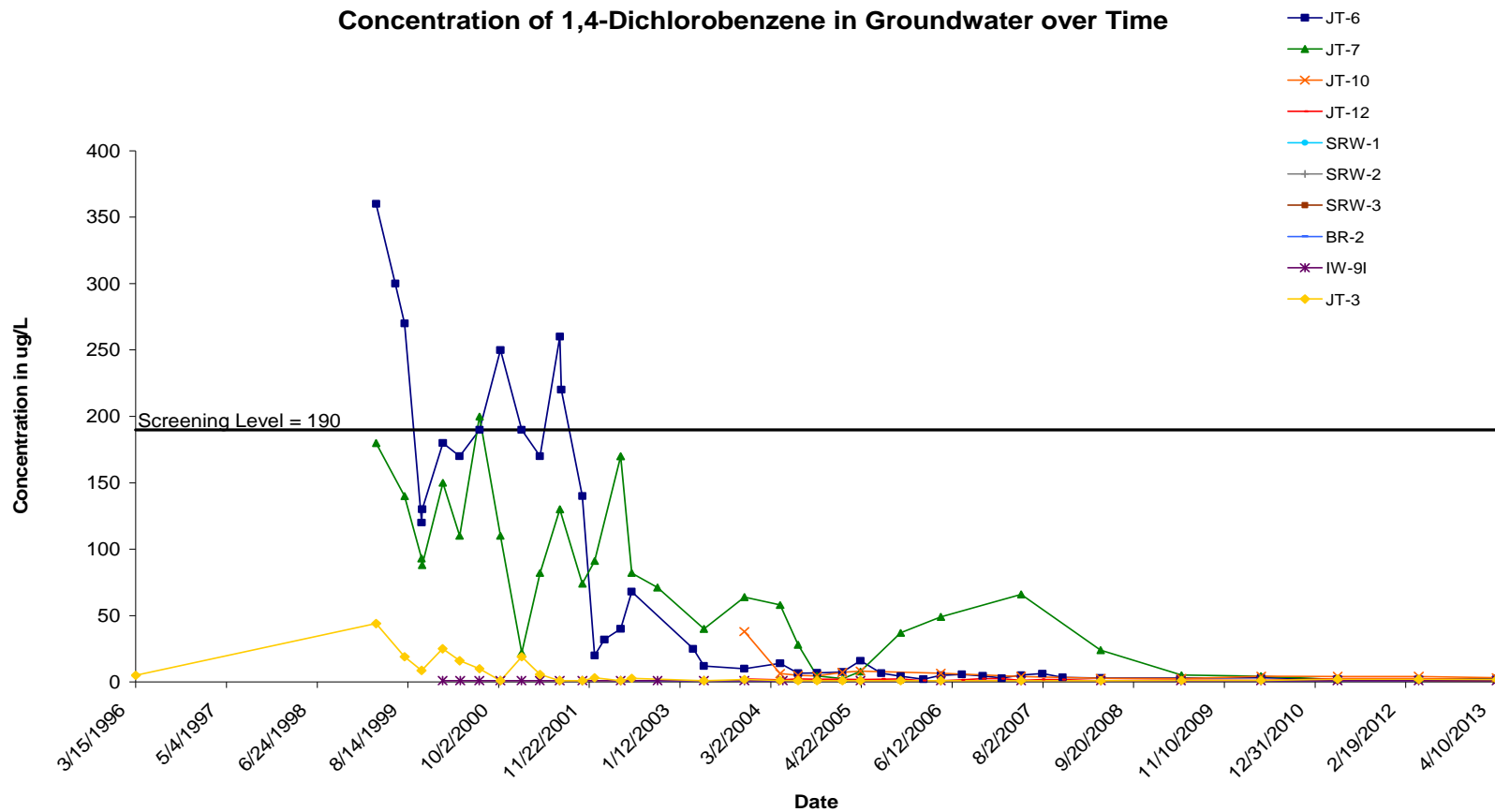
Jacobson Terminals Seattle, Washington	
1,2,4-Trichlorobenzene Occurrences in Soil	
17800-43	11/13
	Figure 11

EAL 11/12/13 1780043-014.dwg

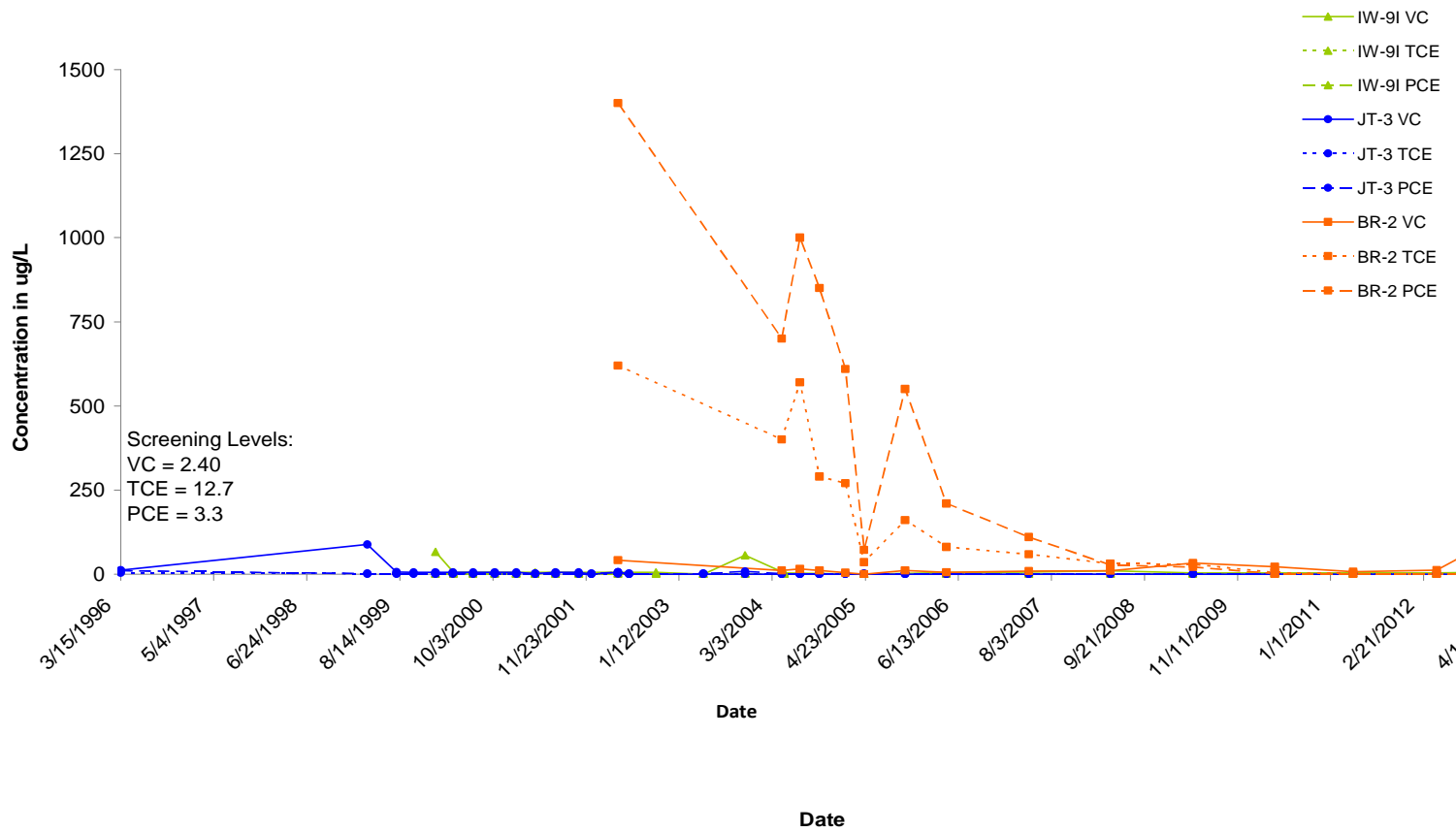


	<p>Jacobson Terminals Seattle, Washington</p>	<p>17800-43</p>
<p>Concentration of 1,2,4-Trichlorobenzene in Groundwater over Time</p>		
<p>12</p>	<p>Figure</p>	<p>13-Nov</p>

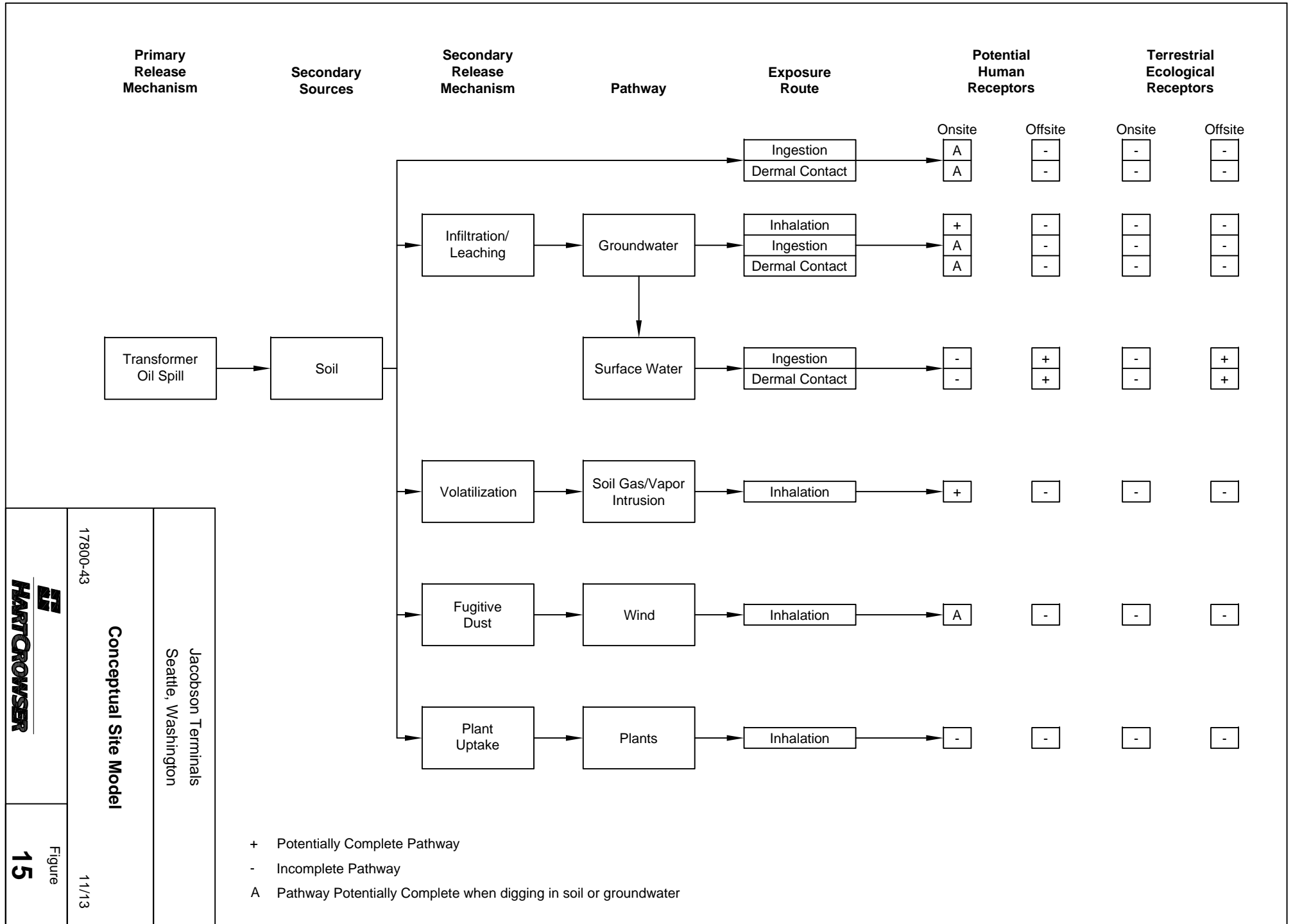
 HARTCROWSER	17800-43 Concentration of 1,4-Dichlorobenzene in Groundwater over Time	Jacobson Terminals Seattle, Washington
	13-Nov Figure 13	




Concentrations of Chlorinated Solvents in Groundwater over Time



	17800-43 Concentrations of Chlorinated Solvents in Groundwater over Time	Jacobson Terminals Seattle, Washington
	Figure 14	13-Nov



	17800-43	Jacobson Terminals Seattle, Washington
	Conceptual Site Model	
Figure 15	11/13	