West Coast Door

Remedial Investigation/ Feasibility Study

Prepared for

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List of Abbreviations and Acronyms

Abbreviation/Acronym	**Definition**
AGI	Applied Geotechnology, Inc.
AST	Aboveground Storage Tank
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
COC	Contaminant of Concern
cPAH	carcinogenic Polycyclic Aromatic Hydrocarbon
CPOC	Conditional Point of Compliance
CSM	Conceptual site model
CUL	Cleanup Level
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
DOT	Department of Transportation
EAI	Environmental Associates, Inc.
Ecology	Washington State Department of Ecology
ft	feet
HDPE	High Density Polyethylene
HSL	Hazardous Sites List

IDW	Investigation Derived Waste
ISTS	In-Situ Thermal Solidification
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
Abbreviation/Acronym	**Definition**
ORC	Oxyen Releasing Compound
PAH	Polycyclic Aromatic Hydrocarbon
PCE, Pacific Crest	Pacific Crest Environmental
PGG	Pacific Groundwater Group
PID	Photoionization Detector
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
TCE	Trichloroethene
TEQ	Toxic Equivalency Quotient
TIC	Tenants in Common
µg/L	micrograms per liter
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound
WAC	Washington Administrative Code

1.0 Introduction

1.1 BACKGROUND AND OVERVIEW

This remedial investigation/feasibility study (RI/FS) was prepared for the former West Coast Door facility (Site) located at 3133 South Cedar Street in Tacoma, WA on behalf of 3102 TIC (Tenants in Common). The RI/FS was performed voluntarily in response to the discovery of a creosote-like material discovered in subsurface soils during re-grading activities related to construction on the Site in 1986 (AGI 1990), as well as soil and groundwater contamination identified in several subsequent environmental investigations (AGI 1992; EAI 2006a, 2006b; PCE 2008, 2009).

1.2 PURPOSE

The purpose of the RI is to consolidate and present all Site data, identify the nature and extent of contamination, and create a conceptual site model (CSM) that identifies the contaminant release mechanisms, fate and transport mechanisms, pathways of exposure, and receptors for Site contaminants. The purpose of the FS is to evaluate remedial alternatives and, consistent with the Model Toxics Control Act (MTCA), select one of the alternatives as the Site cleanup action.

1.3 REGULATORY CONTEXT

This RI/FS was prepared as part of the Site's enrollment in the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP), Facility Id# 6308485. which the West Coast Door Site entered in April 2007. The RI/FS meets the requirements of MTCA as stated in Washington Administrative Code (WAC) 173-340-350.

1.4 SITE DESCRIPTION

1.4.1 Site Boundaries, Zoning, and Current Conditions

The West Coast Door Site consists of an irregularly-shaped parcel covering 10.43 acres of land in the City of Tacoma, Pierce County, Washington. It is bounded to the north by South Center Street, to the west by South Cedar Street, to the south by Sound Transit-owned railroad tracks, and to the east by South Pine Street. The property is zoned for industrial use and its western portion is occupied by adjoining north and south warehouse buildings of approximately 89,000 and 108,000 square feet, respectively (refer to Figures 1.1 and 1.2).

Approximately 95% of the surface area of the property is capped with impermeable surfaces including pavement and structures. The remaining 5% of uncapped surfaces consist of landscaping as required by the city of Tacoma.

Excavation and grading activities undertaken in 1986 as part of construction of the south warehouse revealed the presence of creosote-like material in subsurface soils. Approximately 10,500 pounds of material containing greater than 1% polycyclic aromatic hydrocarbons (PAHs) were excavated and disposed off-site under a RCRA dangerous waste permit (EAI 2006A, PCE 2008).

1.4.2 Current Use and Ownership

The Site is currently owned by 3102 TIC. The north warehouse, completed in 1985, and south warehouse, completed in 1987, are both occupied by Goodwill Industries.

1.4.3 Prior Use and Ownership

The subject property was originally the location of the Buffelen Pipe and Creosote Company/American Wood Pipe Company, which operated from the early 1900s to the mid 1930s. Manufacturing operations during this time included log storage, drying kilns, and a creosoting retort area located in the southwestern portion of the current south warehouse footprint. This retort area is the likely source of the PAH contamination discovered in 1986. A Sanborn map of the former pipe company operational areas is presented in Figure 1.2.

Monarch Door and Manufacturing Company began door manufacturing at the Site in the mid 1930s. West Coast Door, Inc. purchased the subject property in 1954. West Coast Door manufacturing operations included cutting, sanding and gluing of wood-veneered fiberboard core doors. These operations continued in both the north and south portions of the current warehouse after they were constructed in the mid-1980s. William B. Swensen purchased the property in the 1970, and operated it as West Coast Door until 1997. Door manufacturing operations ceased in 1997, at which point the facilities were converted to warehouse and office space use. Tenants in the southern warehouse included Total Recall Information Management, Thrifty Supply, and Goodwill Industries before moving to their current lease location in the north warehouse (PCE 2008). 3102 TIC purchased the property in August of 2000.

In addition to the current warehouse structure, five additional smaller buildings were constructed between 1961 and 1970 on the central and eastern portion of the subject property and were demolished after 2006. These structures included a showroom, office buildings, a truck service shop and a shipping/sawdust storage building.

Three storage tanks containing gasoline have previously existed on the Site, including two underground storage tanks (USTS) of 3,000 and 2,500 gallon capacity which were removed from the Site in 1989 by Langseth Environmental. Confirmation soil samples from this tank removal were submitted to the Tacoma-Pierce County Health department, which certified the tank removal as complete (TPCHD 1989). A third aboveground storage tank (AST), installed in 1990, was removed from the Site in 2005 and soil sampling conducted by EAI in the vicinity confirmed that gasoline was not released to soil (EAI 2006A). Former operational areas and structures are presented in Figure 1.3

1.4.4 Surrounding Property Use

Surrounding properties use is primarily warehouse or industrial operations. Adjacent property ownership and usage is presented in Figure 1.3.

Several contaminated sites lie adjacent to or near the West Coast Door Site. Immediately to the north of the property is the former City of Tacoma asphalt plant and materials testing laboratory. This facility is a known source of trichloroethene (TCE) contamination in groundwater resulting from improper disposal of the industrial solvent between 1963 and 1992 (EAI 2006A). A portion of the groundwater plume has been detected in well MW-2 located on the north edge of the West Coast door property. A 2005 indemnity agreement between the City of Tacoma and

Swensen Enterprises acknowledges that the city is the source of the contamination and is responsible for its cleanup. To the northwest of the property is TAM Engineering, which has also released chlorinated solvents to groundwater. Both are on the Ecology Hazardous Sites List (HSL) and are awaiting cleanup.

Parker Paint is located across the Sound Transit right-of-way directly south of the Site. Parker Paint has several documented releases of petroleum solvents to groundwater (PCE 2008).

Southeast of the property approximately 1,300 feet to the south-southwest is the Well 12A/South Tacoma Channel Superfund Site. Groundwater in this area was contaminated by chlorinated solvents and petroleum compounds by a former solvent recycling facility, which was located to the east of the Site on property that was operated by the Time Oil Company (see Figure 1.3). In the 1980s, it was discovered that City of Tacoma municipal drinking well (Well 12A) was contaminated by a groundwater plume originating at the Time Oil Site and migrating east and southwest. The City of Tacoma pumps Well 12A for drinking water during periods of low reservoir levels, along with other city wells in the vicinity. The purpose of pumping 12A is to capture any contaminants before the plume can be drawn into the other nearby wells. Water that is pumped by 12A undergoes air stripping prior to being combined with other well waters for municipal consumption (Giaudrone 2012). There are also several groundwater extraction wells near the Time Oil property that further contain the plume near its source area as part of a remedial action

2.0 Site Characterization Activities

2.1 PRE-RI/FS ENVIRONMENTAL INVESTIGATIONS

Subsequent to the discovery of PAH-contaminated soil under the south warehouse in 1986, several investigations have been undertaken to determine the extent of potential soil, groundwater and soil vapor contamination resulting from past creosoting operations at the Site. All investigation locations are presented in Figure 1.4.

2.1.1 1992 Applied Geotechnology Inc. Phase 2 Environmental Site Assessment

Applied Geotechnology Inc. (AGI) performed a soil and groundwater investigation on behalf of Puget Sound National Bank in order to assess potential for contamination. AGI advanced 5 soil borings (B-1 through B-5) inside the warehouse building and immediately to the east and installed 3 monitoring wells (MW-1, MW-2 and MW-3) near the southeast, northeast and northwest corners of the warehouse.

Soil samples were analyzed for volatile organic compounds (VOCs), gasoline and diesel petroleum hydrocarbons, PAHs and phenols. Monitoring well groundwater samples were analyzed for VOCs and metals. One groundwater sample collected from MW-2 in the vicinity of the City of Tacoma Materials Testing Lab exceeded the cleanup level for TCE, and all groundwater samples exceeded cleanup levels slightly for total chromium and lead concentrations; all other soil and groundwater analyte concentrations were below cleanup levels. Based on these results, AGI concluded that previous Site operations had not affected soil and groundwater quality.

2.1.2 2006 Environmental Associates Inc. Phase 2 Soil and Groundwater Sampling

Environmental Associates Inc (EAI) performed a limited soil and groundwater investigation in 2006 on behalf of Goodwill Industries when the organization was considering purchase of the subject property. EAI advanced four soil borings (SP1 through SP4), installed an additional monitoring well (MW-4) south of the warehouse in the inferred downgradient direction from the former creosoting retorts, and sampled groundwater in MW-1 and MW-4.

EAI identified preliminary Site contaminants of concern (COCs) as PAHs resulting from creosoting operations, and soil and groundwater samples were analyzed for PAHs including carcinogenic polycyclic aromatic hydrocarbonss (cPAHs). All soils samples had cPAH and naphthalene concentrations above both unrestricted industrial cleanup levels. However PAHs were detected below cleanup levels in groundwater samples and cPAHs were not detected at all.

A strong creosote-like odor was noticed in samples taken at depths corresponding to a soil layer with wood fragments that was interpreted to be the disturbed historical ground surface.

2.1.3 2006 Environmental Associates Inc. Supplemental Soil and Groundwater Exploration

EAI returned to the Site in 2006 to install 5 additional soil borings (SP5 through SP9) outside of the warehouse to the south and west and 2 additional monitoring wells (MW-5 and MW-6) to the southwest in the inferred down and cross-gradient directions of the former creosoting retorts. EAI also collected 6 shallow soil samples (SS-1 through SS-6, approximately 1 foot deep) to the east of the warehouse at the request of Goodwill Industries, in order to further investigate the chromium concentrations above cleanup levels in MW-2 groundwater reported previously by AGI.

Soil and groundwater samples were analyzed for PAHs, lead and chromium and compared to the project cleanup levels selected during the previous investigation. cPAHs were detected above the industrial-use cleanup levels in soil samples from the three borings immediately west and south of the warehouse (SP6, SP7 and SP8) and cPAHs and naphthalene were detected in MW-5 and MW-6 above cleanup levels. Chromium and lead were detected below cleanup levels in all samples. Based on these results, EAI recommended additional soil exploration inside the warehouse to the north and west and groundwater exploration in the Sound Transit right-of-way to the south.

2.1.4 2008 Pacific Crest Environmental Additional Soil and Groundwater Characterization

On behalf of Swensen Enterprises, Pacific Crest Environmental (Pacific Crest) completed a soil and groundwater investigation to define the extent of soil and groundwater contamination by PAHs. Pacific Crest advanced five soil borings (SB-1 through SB-5) to the north, south, east and west of the former creosoting retort area and installed three monitoring wells. Well MW-7 was located within the footprint of the former creosoting retort area, MW-8 inside the warehouse to the north, and MW-9 was located adjacent to MW-5 to examine deeper (70 feet below ground surface [bgs]) groundwater quality near the former creosoting retorts. Soil samples from soil borings and monitoring well installation were analyzed for PAHs and compared to MTCA Method A Industrial cleanup levels (CULs). One sample (SB-3) north of the creosoting operations had cPAH detections above cleanup levels. Reconnaissance groundwater samples collected from soil borings and monitoring well samples were analyzed for PAHs. Naphthalene concentrations exceeded cleanup levels in reconnaissance (i.e., Geoprobe™) groundwater samples collected west of the warehouse (SB-5, MW-7, MW-9) and cPAHs exceeded cleanup levels in all locations except the sample collected to the southeast (SB-2). Monitoring well groundwater samples had naphthalene concentrations exceeding cleanup levels in wells to the south and west of the warehouse (MW-5 and 6); cPAHs exceeded cleanup levels in those locations as well as in the warehouse (MW-7) and slightly exceeded cleanup levels in deeper groundwater (MW- 9). Based on these results, Pacific Crest recommended further delineation of groundwater contamination to the south and west of the warehouse, in the direction of Well 12A.

2.1.5 2009 Pacific Crest Environmental Additional Geoprobes

Pacific Crest returned to the Site in 2009 to advance six additional soil borings (SB-6 through SB-11) within the Sound Transit right-of-way to the south. See Figure 1.4. Groundwater samples were collected from the borings and analyzed for PAHs including naphthalene and VOCs. Naphthalene concentrations exceeded cleanup levels in samples from SB-5 and SB-9, closest to the warehouse. No other samples exceeded cleanup levels, indicating no off-site migration of the plume to the south.

2.2 RI/FS INVESTIGATIONS

Late in 2009, Floyd|Snider reviewed all existing data and identified additional data needed to define the nature and extent of contamination for purposes of the conceptual site model, assessment of cleanup alternatives, and selection of a preferred remedy. A work plan was prepared for Ecology review under the VCP. The primary data gaps identified by both Floyd|Snider and Ecology are as follows:

- Complete delineation of the naphthalene plume in Site groundwater. While plume extents to the north, south and east had been defined by previous investigations, concentrations in samples collected to the west and northwest of the warehouse suggested further naphthalene migration in this direction.
- Assessment of the vertical extents of the creosote-like contamination in the presumed source area of the former creosoting retort. This was also not well defined by previous investigations, which did not advance soil borings below approximately 11 feet bgs.
- Characterization of chromium in soils from the northern portion of the Site. The 2006 supplemental investigation performed by EAI reported a chromium concentration of 373 mg/kg in shallow soil sample SS-2. These soils were re-sampled at Ecology's request to determine whether a hazardous fraction of hexavalent chromium (Cr VI) was present.
- Investigation of the potential for naphthalene vapors derived from creosote in the former creosoting retort area to intrude into the warehouse. No previous studies evaluated indoor air quality

Data collection efforts for this RI/FS were undertaken between June 2010 and October 2013 and are summarized below.

2.2.1 2010 Floyd|Snider Well Installation and Soil and Groundwater Sampling

To assess potential westward migration of naphthalene in groundwater, Floyd|Snider installed three monitoring wells to the northwest of MW-5 and MW-6 where elevated naphthalene concentrations had been reported in previous investigations but had not been bounded. These new wells included MW-10 and MW-11 on the west side of City of Tacoma S. Cedar St right-of-way and MW-12 on West Coast Door Property east of S. Cedar St. (refer to Figure 1.4). Well borings were advanced using an 8-inch diameter hollow-stem auger (HSA), to a depth of approximately 46 feet bgs where previous well borings had noted strong creosote-like odors. Soils were sampled every 5 feet beginning at 10 feet bgs using an 18-inch split spoon and logged according to the unified soil classification system (USCS). Soil samples for laboratory analysis were collected from those intervals where visual or olfactory indications of contamination were observed, however these samples were held in archive because no creosote product was encountered and only odors were noted. Soil samples were homogenized in decontaminated stainless steel bowls and packed into laboratory provided glass jars.

Wells were installed following the "Minimum Standards for Construction and Maintenance of Wells" from WAC 173-160. Wells were completed using 2-inch diameter schedule 40 PVC riser pipe, with 0.010-inch slotted PVC screen set from 35 to 45 feet bgs in the groundwater interval assumed to be most impacted by naphthalene contamination. A sand pack of 20-40 Silica Sand was placed in the boreholes across the 35 to 45 feet bgs screened interval, and the remaining portion of each borehole was closed with bentonite chips. Wells were completed with flush-mounted surface monuments fixed in place with concrete. Monitoring well construction details are summarized in Table 2.1, and well installation logs are presented in Attachment A.

After a minimum of 24 hours following well installation, all wells were developed using a cleaned stainless steel bailer, a submersible whale pump, and PVC surge block. Each well was alternately purged with a whale pump until the purge water exhibited sustained clarity. Subsequent to development of MW-10, 11 and 12, the entire monitoring well network of 10 wells (except for wells MW-2 and MW-3 located north of the naphthalene impacted area) was sampled using low-flow techniques on June 21 and 22, 2010. A submersible pump attached to high-density polyethylene (HDPE) tubing was used to purge and sample the wells and a multi-parameter water quality meter was used to assess groundwater quality stabilization. Depth to water was recorded prior to and during purging to ensure that drawdown in the wells did not exceed 1 foot. Once water quality parameters had stabilized, wells were collected in laboratory provided bottles using a low flow rate to minimize VOC losses. The pump was decontaminated between wells using an Alconox detergent solution followed by a deionized water rinse; and the tubing was replaced between wells.

Groundwater samples were transported following chain-of-custody procedures to Friedman & Bruya, Inc. of Seattle, WA and were analyzed for PAHs by USEPA Method 8270. Selected samples (from MW-5, 6, 10, 11 and 12) were also analyzed for VOCs by USEPA Method 8260B.

In addition to monitoring well installation and sampling, soil boring SP2-B was advanced inside the warehouse in the area of the former creosoting retort (refer to Figure 1.4) on June 11, 2010. This boring was located adjacent to EAI borings SP-1 and SP-2 in which a creosote-like product was observed in soil but the borings were only advanced to 9 and 2 feet bgs respectively due to refusal. SP2-B was advanced using an 8-inch diameter HSA to a depth of 46 feet bgs, where a silt layer was observed in the MW-9 boring. Soils were sampled for observation every 2.5 feet bgs using an 18-inch split spoon and logged according to USCS classification. The presence of sheens and odors was recorded, and representative samples were also placed into sealed bags and analyzed with a photoionization detector (PID) to screen for volatile chemicals. Samples for laboratory analysis were collected from those intervals where high PID readings or visual or olfactory indications of contamination were noted. Soil samples were homogenized in decontaminated stainless steel bowls and packed into laboratory provided glass jars. After installation, the boring was backfilled using bentonite chips and the concrete floor of the warehouse was repaired. The SP2-B boring log is presented in Appendix A.

Soil Samples collected from SP-2B were transported following chain-of-custody procedures to Friedman & Bruya, Inc. and analyzed for PAHs by USEPA Method 8270A shallow soil sample, SS-2B, was also collected in the approximate location of the prior SS-2 sample to screen for hexavalent chromium in order fill the chromium data gap. Soils were excavated to a depth of 1 foot bgs using a decontaminated shovel, and the sample was collected from the undisturbed sidewall of the excavation from 0.5 to 1 foot bgs using a sealed, disposable plastic sampling spoon. The soil sample was placed directly into laboratory provided glass jars, and the excavation was backfilled with the excavated soils.

The soil sample from SS-2B was sent from Friedman & Bruya to Amtest Laboratories in Kirkland, WA for hexavalent chromium analysis by USEPA Method 200.8. All soil cuttings and monitoring well purge water generated during this event were placed into DOT-approved 55-gallon steel drums. Disposal of investigation derived waste (IDW) was coordinated by 3102 TIC.

2.2.2 2011 Additional Geoprobe and Monitoring Well Groundwater and Indoor Air Sampling

Samples from the newly-installed monitoring wells to the west of the previous investigations (MW-10 and MW-12) had elevated naphthalene concentrations, leaving the naphthalene plume unbounded to the west and northwest. To define the plume's extent in this direction, Floyd|Snider advanced 9 additional soil borings to collect reconnaissance groundwater samples to the west of MW-10 and MW-12. Floyd|Snider also collected additional monitoring well groundwater samples from selected monitoring wells. Indoor air samples were collected to assess the potential for soil vapor migration into the warehouse structure.

Additional soil borings SB-21 through SB-29 were advanced west of the S. Cedar St. right of way to the southwest, west and northwest of existing wells in order to determine the extent of naphthalene contamination in groundwater (refer to Figure 1.4). Groundwater samples were collected at two depth intervals in each boring, one sample between 35 and 40 feet bgs at the approximate depth of existing monitoring well screened intervals as well and a second shallower sample between 20 and 25 feet bgs within the top few feet of the saturated zone of subsurface soils. Borings were advanced on December 6 and 12, 2011.

To collect groundwater samples, a Geoprobe™ was used to advance a 1-inch diameter, 2 feet long retractable steel mesh screen with a disposable tip to the desired depth. Once the desired depth was reached, the disposable tip was dislodged and the casing surrounding the screen was retracted. Groundwater samples were then collected using a peristaltic pump with disposable HDPE and silicone tubing.

Sandy to gravelly dense soils were encountered in all Geoprobe™ boring locations, which made advancement of the screen to 40 feet bgs difficult. Due to the difficult drilling conditions, the screen was damaged on December 6th and the remaining groundwater samples were collected without a screen resulting in elevated sample turbidity. However, because the Geoprobe™ groundwater samples were only intended to provide reconnaissance level quality data, they remain valid qualitative samples.

Dense soils also caused a section of steel casing to break during boring installation on December 12th. As a result, the deeper (approximately 40 feet bgs) sample was not collected from SB-28. Several shallower (approximately 25 feet bgs) samples were not collected due to time constraints and the general lack of contamination found at this depth interval.

In addition to Geoprobe™ groundwater sample collection, a final round of groundwater samples were collected from wells MW-5, 6, 7, 9, 10, 11 and 12[1]. Monitoring well groundwater samples were collected on December 5th and 6th, 2011 as described in Section 2.2.1 above and analyzed for VOCs including naphthalene by USEPA Method 8260. A summary of water quality parameters observed during sampling events including December 2011 is presented in Table 2.2.

To assess potential vapor intrusion into the warehouse area from subsurface contamination, indoor air samples were collected in three locations inside the warehouse building and one upwind outdoor area. Samples were collected in accordance with Ecology guidance for indoor air sampling events (Ecology 2009). Samples were collected during the morning on Monday,

[1] MW-1, 2, 3 and 8 were not sampled because contaminants were consistently not detected in samples from these wells

December 5th, after the warehouse had been closed for the weekend to ensure that any intruding vapors would accumulate and not have opportunity to escape prior to sampling. Air samples were collected using thermal desorption tubes using a regulated flow air pump, with the pumping rate adjusted in order to collect approximately one liter of air over a one-hour time period.

Air samples were analyzed for naphthalene by USEPA Method TO-17. MTCA Method B air CUL was selected as the Site cleanup level; no air samples exceeded this cleanup level.

All soil cuttings and monitoring well purge water generated during this event were placed into DOT-approved 55-gallon steel drums. Disposal of IDW was coordinated by 3102 TIC.

2.2.3 2012 Additional Geoprobe Groundwater Sampling

Following the 2011 groundwater and indoor monitoring described above, Floyd|Snider submitted a preliminary draft RI/FS for Ecology feedback. After reviewing the RI/FS, Ecology requested additional delineation of the groundwater naphthalene plume to the west of the source area.

Additional Geoprobe borings SB-31 through SB-39 were advanced adjacent to and beneath the warehouse on the Shea property by ESN Northwest on November 12, 2012. These borings were located in 3 rows approximately 150, 200 and 300 feet to the west of the presumed source area and distributed evenly to the north and south to provide good spatial coverage across the estimated plume area defined by BIOSCREEN modeling (See Section 3.3 and exploration locations in Figure 1.4).The borings were first advanced to a depth of 40 feet bgs, or 43 feet below the grade of the warehouse floor, which roughly corresponds to the elevation of the 40-45 feet bgs zone of likely groundwater naphthalene contamination at the West Coast Door site. Groundwater grab samples were collected using a 4-foot long retractable screen with a disposable tip as described above. A second groundwater sample was also collected at each location from a depth approximately 5 feet below the top of the water table, or about 26 feet bgs.

Groundwater from the retractable screen was purged with a peristaltic pump until visually clear. Samples were collected in laboratory-provided bottles transported under chain-of-custody to ESN Northwest's laboratory for VOC analysis by USEPA Method 8260. Purge water generated during this event was placed into DOT-approved 55-gallon steel drums. Disposal of IDW was coordinated by 3102 TIC.

2.2.4 2012-2013 Quarterly Monitoring Well Groundwater Sampling

In addition to delineation of the groundwater naphthalene plume, Ecology also requested one year of quarterly groundwater monitoring from a subset of Site monitoring wells in order to confirm that naphthalene concentrations are stable within a reasonable range of seasonal fluctuations.

The quarterly monitoring network included MW-1, MW-5, MW-6, MW-7, MW-10, MW-11 and MW-12. Quarterly monitoring samples were collected on November 27, 2012 and March 5, June 4 and October 1, 2013. The deeper aquifer well MW-9 was also sampled during the first and last quarterly events. Wells were sampled using low-flow techniques generally consistent with those described above, however a bladder pump with disposable bladders was used to sample MW-9 and 3 rounds of supplemental dissolved oxygen (DO) measurements were collected in all wells with an optical DO probe which yields superior accuracy at low DO concentrations as compared to the standard membrane probe. Field water quality parameters for these events are summarized in Table 2.2.

Groundwater samples were collected in laboratory provided bottles and transported under chain-of-custody procedures. During the November 2012 event, samples from all monitoring wells were sent to ESN Northwest for analysis of VOCs by USEPA Method 8260 and cPAHs by USEPA Method 8270. During subsequent events, cPAHs were analyzed in samples collected from MW-6 and MW-9 only and samples from all wells were analyzed for VOCs, as recommended by Ecology. Samples collected during the March, June and October 2013 events were analyzed by ALS Laboratory in Everett, WA. Purge water generated during these events was placed into DOT-approved 55-gallon steel drums. Disposal of IDW was coordinated by 3102 TIC.

2.3 ENVIRONMENTAL INVESTIGATION FINDINGS

Significant findings from the RI data collection efforts as well as prior investigations are summarized below.

2.3.1 Site Geology and Hydrogeology

2.3.1.1 Geology

The Site lies in the South Tacoma Channel of the Nalley Valley of Tacoma. The South Tacoma Channel is filled by Vashon recessional outwash deposits, which were deposited in a high-energy glaciofluvial environment and are composed primarily of sand and gravel. The Vashon outwash was deposited in the South Tacoma Channel as a result of the channel acting as a spillway for proglacial lakes that formed during the recession of the Vashon ice sheet in the late Pleistocene. The valley is one of the major channels that connected glacial Lake Puyallup through progressively lower spillways into Lake Russell, the main proglacial lake in front of the receding Vashon Ice sheet.

The West Coast Door Site is relatively flat and underlain by poorly-graded medium sand and gravel to depths of 70 feet in well MW-9. These native deposits have been covered by a layer of fill consisting of gravel to silty sands ranging from 1 to 12 feet thick. Most significantly, a low-permeability silt layer was observed from approximately 44.5 to 47 feet bgs in the MW-9 and MW-12 borings and is assumed to be a discontinuous low permeability layer within the Vashon outwash. This silty layer appears to have acted as a barrier to downward migration of creosote, which is a dense non-aqueous phase liquid (DNAPL). A second low permeability silt layer was observed from 68 to 70 feet bgs in the MW-9 boring.

Subsurface Site geology is presented in further detail in east-west and north-south cross sections in Figures 2.1 and 2.2.

2.3.1.2 Hydrology

Groundwater first occurs at depths of approximately 25 feet below ground surface in an unconfined “water table” type aquifer in the sandy glacial outwash. A second regional aquifer lying within older, pre-Vashon deposits underlies the Site and is separated from the shallower glacial outwash aquifer by a semi-confining silt to clay layer at approximately 100 to 130 feet bgs (USEPA 2009).

A Site-wide potentiometric surface and groundwater flow direction was estimated using groundwater elevations recorded in monitoring wells during the June 2010 and December 2011 events. These data are presented in Figures 2.3 and 2.4 and suggest ground water mounding near the vicinity of MW-4 in the southwestern corner of the Site. The potentiometric maps imply a variable west-northwesterly groundwater flow direction from this mounding area with horizontal gradients of 0.019 ft/ft during the dry season and 0.009 ft/ft during the wet season. Locally, there are seasonal variations in the potentiometric surface with observed elevations during June 2010 and December 2011 monitoring events varying by approximately 1-2 feet across the Site. These local effects, in combination with drawdown effects during times of municipal well pumping, may alter the overall Site groundwater flow direction on a seasonal and localized level. Area-wide hydrogeologic work performed by others, however, suggests a groundwater divide in the vicinity of the Site, with flow direction switching from eastward toward the Tacoma Tideflats to westward toward the Puget Sound (ICF Kaiser 1992).

Additionally, hydrologic studies surrounding City of Tacoma Well 12A have found strong downward vertical gradients from the outwash sands to underlying deeper and older glacial deposits which may influence groundwater flow more strongly than horizontal gradients (Giaudrone 2012). A vertical gradient of 0.022 ft/ft was measured between the adjacent shallow and deep wells MW-5 and MW-9 during June 2010 monitoring and a vertical gradient of 0.014 ft/ft was observed between the same well pair during the December 2011 monitoring event. This vertical gradient is greater than the horizontal, supporting the theory that there is a strong downward component of flow that adds complexity to the interpretation of horizontal groundwater flow based solely on interpretation of the potentiometric surface.

While the West Coast Door Site lies within the theoretical capture zone of 12A (PCE 2008) its distance from well 12A and the limited pumping schedule of this well result in no detectable movement of contaminants from West Coast Door to the South.

Surrounding surface water bodies include Snake Lake approximately 0.7 miles to the southwest and the Thea Foss Waterway arm of Commencement Bay approximately 2.1 miles to the east.

2.3.2 Soil Quality

Prior investigations have identified soil contamination at the Site related to creosote compounds, primarily cPAHs and naphthalene. Other PAH compounds have been occasionally detected at concentrations less than applicable cleanup levels. cPAH toxic equivalency quotients (TEQs) range from non-detect in samples collected from west and southwest of the former creosoting retort area to 120 mg/kg in SP-3 located immediately north of the former creosoting operations. cPAH TEQs generally exceed MTCA Method A Industrial soil cleanup level of 2 mg/kg in samples collected within the former creosoting retort area and immediately south and north where regrading of impacted soils likely occurred in the mid 1980s. The greatest cPAH TEQ concentrations are generally observed in the top 15 feet of soils in the vicinity of the source area. A boring advanced by the City of Tacoma in the Cedar Street right-of-way in support of a new sewer line was located approximately 25 feet northeast of MW-10. A sample collected from 15 feet bgs from this boring was analyzed for cPAHs and diesel- and oil-range petroleum hydrocarbons. cPAHs were not detected and petroleum hydrocarbons were detetcted at concentrations less than their MTCA Method A cleanup levels (Radcliffe 2010).

Naphthalene concentrations follow a similar distribution to cPAHs, though the lateral extents of contamination in soil are more limited. Naphthalene concentrations range from non-detect to a maximum of 350 mg/kg in a sample collected from MW-7. Soil naphthalene concentrations exceed MTCA A Industrial cleanup level of 5.0 mg/kg only in samples collected from SP2-B, SP-4 and MW-7, all immediately within the area of the former creosoting retorts. The greatest naphthalene concentrations are generally observed in the saturated zone soils above the low permeability silt layer, from approximately 25 to 40 feet bgs.

Hexavalent chromium was detected 7.2 mg/kg in the shallow soil sample collected from SS2-B on the north side of the property, below MTCA Method A Industrial soil cleanup level of 19 mg/kg. Cadmium was detected in the City of Tacoma Cedar Street right-of-way boring at a concentration slightly greater than the Puget Sound background soil concentration and chromium was detected at a concentration less than Puget Sound background as reported by Ecology (Ecology 1994).

Maps showing cPAH TEQs and naphthalene concentrations in soil are presented in Figure 2.5 and 2.6. A summary of laboratory analytical data is presented in Table 2.3 and full laboratory analytical results for this remedial investigation are presented in Appendix B.

2.3.3 Groundwater Quality

Groundwater monitoring at the Site has established that the primary COC is naphthalene as it has the broadest distribution in groundwater and the highest concentrations. Other contaminants co-associated with naphthalene at concentrations that occasionally exceed cleanup levels include cPAHs and benzene. Naphthalene concentrations in monitoring well samples exceed MTCA A cleanup level of 160 µg/L. Values range from non-detect in samples from wells to the north, east and south, to a maximum concentration of 14,000 µg/L in the samples collected from MW-10 to the west in December 2011 and November 2012. Elevated naphthalene concentrations generally occur in groundwater west and northwest of the former creosoting retorts. MW-5 and MW-9, however, do not capture the contaminated groundwater despite their proximity to the former creosoting retorts. MW-5 is screened from 25 to 35 feet bgs, capturing groundwater from above the most contaminated interval located at approximately 40 to 45 feet bgs. MW-9 is screened from 60 to 70 feet bgs, and the silt layer observed at approximately 45 feet bgs likely confines the contamination above the MW-9 screened interval.

Benzene, toluene, ethylbenzene, and xylene (BTEX) compounds detected in groundwater are often found concurrently with elevated naphthalene concentrations and are presumed to have originated from creosote mixtures containing these compounds, rather than other former Site operations such as gasoline USTs. A maximum BTEX concentration was reported in thesample collected from MW-12 in June 2013 where benzene was detected at 14 µg/L, which is greater than MTCA Method A cleanup level of 5 µg/L. Ethylbenzene and xylene concentrations of 1,000 and 1,700 µg/L, respectively, also exceeded their respective Method A cleanup levels of 700 and 1000 µg/L in this sample. Samples collected from MW-10 also generally have ethylbenzene and xylene concentrations near or slightly in excess of their cleanup levels. No other samples collected from monitoring wells have had elevated BTEX concentrations.

cPAH detections in monitoring well groundwater are generally limited to the area of the former creosoting retorts, with cPAH TEQs exceeding MTCA Method A cleanup level of 0.1 µg/L detected in samples collected from .MW-5, MW-6 and MW-7. A maximum cPAH TEQ of 7.4 µg/L was detected in the sample collected from MW-6 in June 2010; subsequent quarterly monitoring samples collected from this well had cPAH TEQs of less than 1 µg/L. A cPAH TEQ of 0.55 µg/L was also detected in a sample collected from MW-9 in 2007, though this result was not replicated during the November 2011 or October 2013 monitoring events. cPAHs were also not detected in the samples collected from MW-5 or MW-7 during the November 2012 monitoring event.

TCE has been documented at concentrations greater than MTCA cleanup levels in groundwater from well MW-2 on the northern property boundary, due to a release from the City of Tacoma Materials Handling Lab (PGG 2001, PCE 2008). However, TCE was not detected at concentrations greater than cleanup levels in samples from the shallow aquifer wells monitored for this report and at concentrations approximately equal to the cleanup level in MW-9 suggesting that the TCE plume Site has had a minimal impact on the rest of the monitoring well network on the West Coast Door Site.

Maps showing naphthalene and BTEX concentrations in monitoring well groundwater are presented in Figure 2.7, 2.8 and 2.9. A summary of laboratory analytical data is presented in Table 2.4 and full laboratory analytical results for this remedial investigation are presented in Appendix B. Summary monitoring well groundwater analytical data for Site COCs is presented in Table 2.6.

Qualitative data in groundwater collected from the Geoprobe borings support the trends observed in monitoring well groundwater data. Naphthalene detections in these groundwater samples range from non-detect in samples collected to the north, south and east of the Site to a maximum of 17000 µg/L in the sample collected at 40 feet bgs from the MW-9 boring directly west of the source area. The extensive testing of Site groundwater via Geoprobe confirms that the plume appears constrained to a limited depth interval in the aquifer between approximately 40 to 45 feet bgs, which is immediately underlain by the observed low permeability silt layer. Samples collected from groundwater above this 40 to 45 feet bgs interval are generally free of naphthalene or other contaminants.

Borings farther west of the retort source area with elevated naphthalene in groundwater samples include SB-29, SB-21, SB-23 and SB-31 through SB-36.. These borings are located to the west and northwest of the source area. The maximum naphthalene concentration of 5400 µg/L was detected in SB-29 which is located immediately to the west of MW-10. Naphthalene concentrations decrease with distance to the west of the source area, with concentrations less than 10 µg/L in samples collected from SB-37, SB-38 and SB-39 under the Shea property warehouse. Similarly, BTEX compounds associated with naphthalene have been detected in reconnaissance groundwater samples from SB-21, SB-23, SB-29 and SB-31 through SB-36..

Generally, the vertical extents of groundwater contamination at the Site are well-defined and confined to the 40 to 45 feet bgs interval discussed above. The lateral extents of cPAHs in groundwater have been delineated in all directions by borings with no detectable cPAHs in groundwater grab samples, or low-level cPAH TEQ detections below their MTCA Method A cleanup level. Naphthalene and associated BTEX contamination have also been delineated in all directions by groundwater grab samples Geochemical modeling was also undertaken to estimate the future plume extents and is discussed in Section 3.3 below. Naphthalene and BTEX plume extents are presented in Figures 2.8 and 2.9.

A summary of reconnaissance groundwater analytical data is presented in Table 2.5 and full analytical data from this remedial investigation is presented in Appendix B.

2.3.4 Indoor Air Quality

The primary COC in indoor air is naphthalene, as it is present under the warehouse at elevated concentrations and has the ability to volatilize to form a soil gas. BTEX concentrations in soil are non-detect, or too low to present a concern. Naphthalene concentrations measured in indoor air range from 0.82 to 1.1 µg/m3 and do not exceed MTCA Method B screening level of 1.4 $\mu g/m^3$.

3.0 Conceptual Site Model

The following paragraphs synthesize the information described above and present a conceptual site model, a useful tool for identifying release mechanisms, fate and transport processes, pathways of concern, exposure points, and receptors.

3.1 CONTAMINANT RELEASE MECHANISM

The West Coast Door Site was occupied historically by a wood pipe factory which applied a creosote coating to finished pipe sections in pressurized retorts located in the southern portion of the current warehouse building. The loading and removal of creosote or pipe would likely have caused small to moderate releases of creosote. Although no historical accounts of large-scale spills have been found, spills and releases likely occurred in such an operation, especially after the pipe sections were removed from the retorts and allowed to drip dry.

As a result of past operations, creosote was released to Site soils. Releases appear to be near or under the approximate footprint of the creosoting retorts. Surface soils in the retort area were regraded following demolition of the factory in order to make way for the construction of the current warehouse. This regrading has caused the footprint of creosote-impacted soils to extend to the north and east of the retort area. The creosote footprint is currently below the southern portion of the warehouse.

3.2 AFFECTED MEDIA, SOURCE AREA AND CONTAMINANT DISTRIBUTION

Creosote releases that likely originated as surface spills were able to saturate soils and migrate downward through the unpaved, permeable ground surface and factory floors. Evidence of this contamination discovered through investigations includes strong asphalt- or naphthalene-like odors in subsurface soils and heavy rainbow sheens. The creosote material contains both cPAH and naphthalene components at concentrations significantly exceeding MTCA Method A Industrial CULs.

Evidence of soil contamination in the form of creosote-like odors and elevated cPAH concentrations has been encountered in the retort "source" area at depths as shallow as 2 feet bgs during earlier investigations (EAI 2006b). The SP-2B boring in the general location of the retort area was sampled extensively. Creosote derived cPAH contamination was found in the reworked upper soils of the vadose zone in this location. Also, heavy rainbow sheens on soil cores were encountered primarily in saturated zone soils in the SP-2B, MW-7 and MW-9 borings. These sheens correlate roughly with the depth of the greatest detected naphthalene concentrations in soil. The inherently viscous creosote tends to stay close to the area where it was released. At this Site, the source area soil contamination occurs under the paved existing warehouse footprint. The creosote-derived chemicals of primary concern at the Site are cPAHs and naphthalene. These tend to adsorb strongly to the organic matter in soil, which further limits their mobility.

A creosote product source area, however, has not been encountered at the Site. The density of the creosote may have caused much of the product to migrate downward, below the depth of many of the soil borings. Additionally, sufficient time has elapsed since the creosote was released that it has likely been extensively weathered and infiltrated into soil pores following downward migration. The presence of a low permeability silt layer under the retort area at 45 bgs, however, appears to have limited further downward migration of the creosote product. This is indicated by the sheens and elevated concentrations of the more soluble naphthalene fraction of the creosote encountered in saturated zone soils above approximately 45 feet bgs.

Groundwater exists in a shallow regional unconfined aquifer generally encountered at approximately 20 to 25 feet bgs. The overall groundwater flow measured using the potentiometric surface in monitoring wells appears to be to the north-northwest and is coincident with the overall shape of the naphthalene plume. Inconsistencies occur, however, in the groundwater flow direction due to strong downward gradients as well as localized mounding observed at MW-4 which appears to have directed local contaminant flow primarily to the west with lesser migration to the northwest.

Unsaturated soils containing creosote are currently covered with impermeable pavement, blocking infiltration of surface water and preventing leaching of contaminants from vadose zone soils. Because of this impermeable covering, the primary mechanism driving the naphthalene plume migration is the dissolution of soluble naphthalene and benzene from the creosote-containing saturated soils in the saturated source area. Monitoring well groundwater data suggest that the dissolved-phase groundwater plume emanating from the source area is most impacted in the 35 to 45 feet bgs interval directly above the low permeability silt layer. Markedly elevated contaminant concentrations in samples collected from this mid-aquifer depth interval as compared to the top of the saturated zone may be influenced by several factors, including a strong downward hydraulic gradient, a source area that occurs across a 25 to 45 feet bgs depth interval and possibly by biological degradation by aerobic bacteria in the more oxygen-rich interval of the uppermost saturated zone.

Groundwater data from the borings surrounding the monitoring well network demonstrate that the very elevated naphthalene concentrations in and close to the source area greatly lessen with distance downgradient from the source area. The reason for this dramatic decrease is attributable to the easily-degraded nature of naphthalene. The following section describes the attenuation of naphthalene in more detail.

3.3 CONTAMINANT FATE AND TRANSPORT

As discussed above, creosote-derived cPAH contamination is fairly immobile and confined to soils underlying the creosoting retort source area. Naphthalene, however, appears to be readily dissolving in groundwater from the source area soils under the former retorts and migrating westward due to localized groundwater flow. Nonetheless, the naphthalene plume has been fully bounded in all directions.

Observed naphthalene concentrations in groundwater samples decrease sharply, with distance from the source area. The samples collected from MW-10have hadnaphthalene detections between 12,000 and 14,000 µg/L, whereas the sample collected from SB-29 approximately 40 feet to the west had a naphthalene concentration of 5,400 µg/L, the sample from SB-35 approximately 140 feet to the west had a concentration of 1,800 µg/L, and the sample from SB-38 approximately 240 feet to the west had a concentration of 7.8 µg/L. Because of this rapid degradation, the plume completely attenuates under the Shea building and continued biodegradation will prevent it from migrating to the west side of this property. Due to difficult access issues preventing installation of a permanent monitoring well on the property to the west of the Shea warehouse, biological attenuation simulation was undertaken to supplement the collected data and more accurately estimate the future westward lateral extent of the groundwater naphthalene plume. Dissolved oxygen (DO) measurements were also collected with a highly accurate optical probe during quarterly groundwater monitoring to determine whether biological attenuation is occurring. Oxygen is typically consumed in the process of breaking down contamination via biological attenuation, resulting in greater DO concentrations observed in groundwater where contamination is not present and lesser DO concentrations in more contaminated areas. DO concentrations observed at the Site during groundwater monitoring suggest that biological attenuation of contamination is occurring; DO is generally greatest in wells with screened intervals outside the zone of greatest groundwater contamination. For example, wells MW-1, and MW-5, which are effectively upgradient of the naphthalene contamination, had an average measured DO concentration of 2.4 mg/L during quarterly monitoring. Average DO in MW-7 and MW-11, which are located on the plume fringes and have moderate naphthalene concentration, was 0.6 mg/L. Average DO in the more highly contaminated wells in the interior of the plume including MW-6, MW-10 and MW-12 was only 0.3 mg/L. This correlation is presented in further detail in Table 3.1. This indicates that oxygen is being consumed in the breakdown of naphthalene, and suggests that biological attenuation is a valid method for assessing plume containment and stability.

Biological attenuation was simulated using BIOSCREEN, a modeling tool developed by the USEPA. BIOSCREEN is commonly used to simulate biological attenuation of dissolved hydrocarbons in groundwater at sites where natural attenuation may be protective of human health.

BIOSCREEN model inputs were determined using representative site data, or typical values for similar environments for those parameters for which site-specific data were unavailable. The naphthalene plume was assumed to be originating at the soil source area and migrating westward in an approximately 10-foot thick zone above a presumed low permeability silt layer, with monitoring well MW-10 and soil borings MW-9 and SB-2B representing the most highly contaminated central zone of the plume. Using a conservative biodegradation half-life for naphthalene and assuming solute saturation of naphthalene in source area groundwater, the model predicts attenuation of naphthalene to concentrations less than the MTCA Method A cleanup level at a distance between 150 and 200 feet from the source area. This is fairly consistent with the observed Site conditions which show plume attenuation at a distance slightly greater than 200 feet west of the source area. The model shows stabilization of the plume at this distance over a period of 75 years, followed by slow recession, indicating that biological attenuation is at equilibrium with dissolution and will begin to advance when the source material is exhausted.

Based on the results of BIOSCREEN attenuation modeling, the naphthalene plume is being degraded rapidly at its fringes and not expected to migrate farther beneath the adjacent property. The contamination, therefore, is considered to be contained and not likely to impact surrounding water quality. The extent of the naphthalene plume in groundwater is shown on Figure 2.8, and full modeling inputs and graphical results are presented in Appendix C.

3.4 EXPOSURE PATHWAYS AND RECEPTORS

The Site is zoned for industrial use, with surrounding properties in industrial use as well. Therefore, use of industrial cleanup levels for soil is appropriate as the receptor of concern for soil would be industrial workers ingesting or contacting Site soil. The Site is covered with pavement, warehouse buildings with poured concrete floors, or compacted crushed gravel so there is currently no risk to Site workers. In the future, if the Site is redeveloped, or subsurface utility work is conducted, exposure to soils during these activities could pose a risk to construction workers.

Under MTCA (WAC 173-340-720), the designation of the highest beneficial use of groundwater in the relevant area governs the potential exposure to groundwater with respect to the Site. . The highest beneficial use of groundwater is as potable water. There are no drinking water wells on this Site, and shallow Site groundwater does not appear to be migrating towards municipal well 12A, however, because this aquifer is used for drinking water purposes, the highest beneficial of Site groundwater is considered to be as a source of drinking water. Therefore, use of Method A or B cleanup levels to protect groundwater as a drinking water source is appropriate. Soil vapor intrusion is not of concern, as indoor sampling results confirm that naphthalene concentrations are below both MTCA Method B and C CULs inside the warehouse. The warehouse is a large building with high ceilings, has good ventilation and dedicated ventilation systems in all enclosed spaces, and is currently unoccupied. These factors help to additionally minimize any human exposure to soil vapors.

In conclusion, the primary exposure pathway for the contaminants at this Site is based on groundwater for drinking water purposes. No other current pathways were identified, although exposure to soils could occur if land use changes in the future.

4.0 Feasibility Study

This section of the report identifies and discusses various cleanup alternatives for the Site COCs identified in the RI in the following media at concentrations greater than MTCA Method A CULs for groundwater and Method A Industrial CULs for soil.

4.1 SOIL

4.1.1 Carcinogenic Polycyclic Aromatic Hydrocarbons

The concentration of cPAHs exceeds the cleanup level of 2 mg/kg in certain Site soils. A maximum cPAH TEQ of 120 mg/kg was detected in the sample collected from the 3 to 4 feet bgs interval of SP-3, within the area of the former creosoting retorts (see Figure 2.5). Samples with cPAH TEQs exceeding cleanup levels were generally localized to borings within the warehouse, including SB-3 located to the north of the former retort area. The presence of cPAHs in this area is likely due to regrading activities in the early 1980s following cessation of the creosoting operations.

4.1.2 Naphthalene

The concentration of naphthalene also exceeds the cleanup level of 5 mg/kg in Site soils. A maximum naphthalene concentration of 470 mg/kg was detected in the sample collected from the 30-foot-bgs interval of Boring SP2-B (see Figure 2.6). Naphthalene concentrations exceeding the 5 mg/kg cleanup level followed a similar, though more spatially limited, pattern to cPAHs, with exceedances reported only in samples from source area Borings SP2-B, SB-4, and Well MW-7.

4.2 GROUNDWATER

4.2.1 Naphthalene

The naphthalene concentrations exceeding the 160 µg/L cleanup level are prevalent in monitoring well and Geoprobe™ groundwater samples and generally highest in a plume with lobes extending to the west and north-northwest of the source area, as shown on Figure 2.8. A maximum naphthalene concentration of 14,000 µg/L was detected in the samples collected from MW-10 during December 2011 and November 2012 monitoring (see Figure 2.9

4.2.2 Benzene, Toluene, Ethylbenzene, and Xylene

Several BTEX compounds were detected at concentrations exceeding the cleanup levels in Site groundwater. A maximum benzene concentration of 14 µg/L was detected in the sample collected from MW-12 during June 2013 monitoring. Maximum ethylbenzene concentrations of 1,000 µg/L and total xylene concentrations of 1,700 µg/L were also detected in the samples collected from MW-12 during the June 2010 and June 2013 monitoring events. As shown on Figure 2.9, BTEX contamination in groundwater generally follows the same spatial distribution as naphthalene, though with more limited extents of contamination at concentrations greater than cleanup levels.

4.3 CLEANUP LEVELS

Three approaches for establishing site CULs are presented under MTCA, defined as Methods A, B, and C. Method A CULs are applicable to soil and groundwater at sites with either unrestricted (residential) or industrial land use which have relatively few hazardous substances and where the cleanup action may be routine. The Method A cleanup levels are protective of human health and at least as stringent as concentrations specified in applicable state and federal laws (ARARs) and WAC 173-340-900, Tables 720-1,740-1 and 745-1. The West Coast Door Site is zoned for industrial use and is currently used for industrial purposes, therefore Method A Industrial CULs for soil are appropriate. Applicable CULS for industrial use are listed in the Method A table for both cPAHs and naphthalene, the two COCs at this Site. Method A CULs for groundwater are also appropriate, for the same reasons described above. Table 4.1 identifies Site COCs and lists their maximum reported concentrations and applicable CULs.

4.4 POINT OF COMPLIANCE

Points of compliance, or locations at which the cleanup levels shall be achieved, are established for each impacted medium at the site. For this Site, these impacted media include soil and groundwater. The points of compliance for each medium are discussed separately below.

4.4.1 Groundwater Conditional Point of Compliance

The standard point of compliance for groundwater under MTCA is “throughout the site from the uppermost level of the saturated zone extending vertically to the lowest depth which could potentially be affected by the site” (WAC 173-340-720 (8)). However, per MTCA (WAC 173-340-720(8)), where it can be demonstrated that it is not practicable to meet the cleanup levels throughout the site in a reasonable restoration time frame, a conditional point of compliance (CPOC) may be approved by Ecology. As discussed further in Section 4.3 below, no practicable technology has been identified to clean up the source area in a reasonable restoration time frame due to the presence of the source area under an existing building. Therefore, a CPOC at the downgradient property line is warranted at this Site.

4.4.2 Soil Points of Compliance

The MTCA standard point of compliance for soil (for direct contact protection) is from the ground surface to a depth of 15 feet bgs. This is the deepest depth at which workers may be reasonably exposed to soil (e.g., during trenching activities).

4.5 REMEDIAL ACTION OBJECTIVES

The following remedial action objectives were developed for the cleanup of this Site:

- Prevent exposure to soil by Site workers
- Prevent consumption of Site groundwater
- Prevent further off-Site migration of the plume
- Restore aquifer quality

4.6 SELECTION OF REMEDY ALTERNATIVES

This section identifies specific alternatives that are appropriate in addressing the remedial action objectives for the contamination found at the Site. The selection of the specific alternatives below was based on professional judgment and experience with implementation of remedies at similar sites, literature surveys, and vendor supplied information. The physical and chemical properties of Site COCs used to evaluate the effectiveness of potential remedies are presented in Table 4.2.

4.6.1 Permanent Remedies

Permanent cleanup actions are preferred by MTCA. These are defined as cleanup actions in which all cleanup standards can be met without further action being required at the Site.

For soil contamination, the only identified alternative that is permanent is excavation of the source area and regraded soils surrounding the source area. Several other soil cleanup alternatives were identified which do not achieve permanence (i.e., additional actions would be necessary). For groundwater, a similar situation exists, in which no alternatives were identified which can permanently achieve groundwater CULs without further action such as monitoring. However, several groundwater remedial alternatives were identified which are capable of reducing contaminant concentrations.

The remedial alternatives for this Site are limited by the contaminant source area lying as deep as 45 feet bgs beneath a large warehouse, with a plume that extends beneath the S. Center St. City right-of-way and terminates under the adjacent Shea property. This renders a full excavation remedy for all Site contamination technically and practically infeasible as it would necessitate destruction of the existing building, excavation of soil far below the water table, which is technically challenging, and reconstruction of the building. The cost for this remedy would be large and would involve intensive engineering, permitting, demolition, excavation, shoring, dewatering, soil disposal, backfilling, and reconstruction of the building. The total cost of excavation was not estimated in detail for these reasons, but would likely exceed $10-20 million, which is disproportionately expensive compared to the other remedies as described below. Because of this expense, the excavation alternative is not practical and is not retained for detailed analysis according to MTCA (WAC 173-340-350 (8)) which allows elimination of permanent remedies that are clearly disproportionate to other non-permanent remedies during the screening process.

4.6.2 Non-permanent Remedies

Non-permanent remedies are those which do not provide attainment of cleanup standards without further action such as operations and maintenance or institutional controls, but do provide an adequate degree of risk reduction by either containment or removal of a significant portion of contaminant mass and/or by implementation of physical barriers interrupting the human or ecological exposure pathway to contamination. Non-permanent remedies are more technically and practically feasible at this Site.

4.6.3 Identification and Screening of Remedial Technologies

A range of remedial technologies and actions for soil and groundwater are identified and summarized in Table 4.3. This table also presents preliminary analysis regarding technical feasibility and practicability of the various technologies, with several technologies retained for more detailed analysis as presented below.

4.7 DETAILED DESCRIPTION OF RETAINED REMEDIAL ALTERNATIVES

The remedial alternatives retained from Table 4.3 for more detailed evaluation are described below. Remedial alternatives for soil and groundwater are considered separately. This analysis includes both potential advantages and disadvantages of each alternative. These alternatives are presented conceptually in Figures 4.1 and 4.2.

4.7.1 Soil

Subsurface soils in the vicinity of the source area contain concentrations of cPAHs and naphthalene greater than CULs. Potential technologies to remediate these contaminants to satisfy the remedial action objectives are described below.

4.7.1.1 No Action

This alternative leaves conditions as they are without any further monitoring or cleanup. This alternative is retained for comparative purposes only.

4.7.1.2 Retain Existing Soil Barriers and Institutional Controls

Currently, the asphalt and concrete paving surfaces and buildings which cover approximately 90% of the Site, including the entire subsurface source, area act as a protective barrier that prevents human exposure via direct contact with the subsurface contaminated soils. Maintaining this barrier would provide long-term protection against potential exposure to contaminated soils. This would be done by requiring the appropriate institutional controls to be implemented. A restrictive covenant would be required at the Site to inspect and maintain the barrier and inform future land owners of the contamination. Subsurface utility work under the warehouse could still be performed, with proper health and safety precautions and advance notice given to Ecology. This alternative does not provide reduction in contaminant mass or concentration, as all existing contamination would be left in place.

4.7.1.3 In-Situ Thermal Solidification (ISTS)

In the ISTS process, a network of thermal conductor wells is constructed on-site. The conductor wells are electrically heated and gradually raise the temperature of the surrounding soil to a temperature at or slightly above the boiling point of water. This heating causes the more volatile creosote-derived compounds such as naphthalene and BTEX to steam distill from the creosote material, at which point the extracted steam vapors can be collected with a vacuum blower, condensed, and disposed of off-site.

This process causes the creosote to become a more asphalt-like solid, which reduces its ability to migrate and leach and allows it to be left in place as an inert mass. This technology does not effectively treat cPAH compounds.

ISTS systems create minimal disturbance to Site operations once installed. The implementation of this technology below the water table is complicated, however, by the fact that saturated zone soils must be dewatered before they can be heated to steaming temperatures.

4.7.2 Groundwater

Groundwater in the vicinity of the source area and extending to the west contains concentrations of naphthalene, benzene, ethylbenzene and xylenes greater than MTCA Method A CULs. Potential technologies to contain or treat these contaminants are described below.

4.7.2.1 No Action

This alternative leaves conditions as they are without any further monitoring or cleanup. This alternative is retained for comparative purposes only.

4.7.2.2 Natural Attenuation and Long-term Monitoring

The naphthalene and BTEX contaminants found in groundwater are all readily biodegradable, especially in aerobic conditions as observed in Site groundwater. Natural attenuation relies on a self-sustaining degradation process that occurs in the subsurface in aerobic environments. BIOSCREEN modeling, discussed in further detail in Appendix C, supports the conclusion that natural attenuation is occurring, as does the examination of water quality data which shows rapid attenuation of contamination concentrations with distance from the source area. This remedy monitors the limited plume extent until the point at which naphthalene is fully leached out of the source area creosote. The anticipated restoration time frame is at least 30 years, however no dependence on pumping is necessary. After leaching diminishes, the remaining creosote will no longer be a significant source of groundwater contamination and the plume will likely recede back to the property limits. This alternative requires long-term monitoring to verify that biological attenuation is still occurring. The initial capital costs to implement the remedy are low given that the appropriate well network is in place. According to Ecology Guidance, natural attenuation requires some degree of source removal or control, which has been partially accomplished by previous removal of some of the contaminated source area soils prior to building of the warehouse. Surface water infiltration into the source area that could otherwise exacerbate the continued leaching of naphthalene and BTEX is very limited by the asphalt cover and buildings covering 95% of the Site ground surface. Moreover, site stormwater is collected and treated prior to discharge in accordance with City of Tacoma municipal stormwater requirements.

4.7.2.3 Low Permeability Containment Barrier

This remedy ideally involves placement of a clay slurry wall extending entirely around the source area and extending below the zone of contamination and into an aquitard. The slurry wall acts as a low permeability "cage," effectively trapping the contamination in place and preventing contaminated groundwater inside the wall from migrating outside the barrier. This remedy cannot be fully implemented because the intervening warehouse building prevents construction of a slurry wall around the entire source area. Instead, a potential slurry wall would extend around the outside of the warehouse to the south, east and west sides of the source area, but leave the north side open. To contain groundwater on the north side, groundwater extraction wells would be installed inside the warehouse to maintain an inward hydraulic gradient, which would require construction and maintenance of a pumping and treatment system. This type of system would require maintenance and generate a liquid waste stream, requiring treatment and disposal until the creosote no longer leaches naphthalene or BTEX.

4.7.2.4 In-situ Treatment Bio Barrier

The rate of natural bioremediation by indigenous bacteria can be accelerated by subsurface injection of compounds which stimulate aerobic respiration. Two bioremediation technologies are discussed below.

Bioremediation by Injection of Oxygen Releasing Compound

This alternative consists of injecting oxygen releasing compound (ORC) into the area of groundwater contamination. ORC is a proprietary blend of phosphate and magnesium peroxide that releases oxygen slowly when hydrated. The ORC is mixed with water to form a slurry that is injected into the groundwater zone using a Geoprobe delivery system. The ORC adsorbs onto soil particles and slowly releases oxygen into groundwater for periods of up to a year. The continuous supply of oxygen facilitates aerobic biodegradation of contaminants in groundwater or saturated soils. The injection phase of the remedy is performed relatively quickly and includes monitoring both to gauge effectiveness and to measure the decrease of oxygen levels to determine of or when re-injections would be required. The effectiveness of this technology is often limited by subsurface conditions, such as presence of building structure and tight soils. Injection point quantity and spacing is determined based on-site conditions such as soil types and depth of contamination. Multiple injection events over a longer time frame would likely be required to achieve remediation of the groundwater plume due to the high concentration of organic contaminants in this area

Enhanced Bioremediation via Injection of Amendments

This alternative involves the installation of permanent injection wells through which amendments, such as oxygen and nutrients, are injected into the aquifer. If necessary, the amendments can also be pumped from the aquifer via the injection wells and re-circulated across the treatment zone to increase dispersion and effectiveness. This alternative greatly accelerates the rate of natural bioremediation of dissolved BTEX and naphthalene. Enhanced bioremediation would likely involve at least 12 to 24 months of sporadic injections and monthly operational monitoring. The effectiveness of this technology is often limited by subsurface conditions, such as presence of building structure and tight soils. Additional study would also be to determine the type and volume of amendments and number and spacing of injection wells required to treat the accessible plume area.

4.7.2.5 Chemical Oxidation

This technology employs in-situ application of strong chemical oxidizers such as the hydroxyl radical, ozone, persulfate or permanganate ions to chemically break down organic contamination. The application can be accomplished via gas infusion in specialized wells (e.g., ozone sparging) or injection under pressure of a fluid containing a diluted oxidizer into the contaminant zone, where it breaks down the contamination it encounters, typically along the more permeable pathways. This process is only effective for contamination in the dissolved phase. The oxidizer is non-selective and may also react with natural soil organic matter and minerals, which limits its effectiveness under these conditions. Similarly to air sparging and amendment injection, this technology is limited by tight formations, as the oxidant may only reach a limited area and may travel along preferential pathways in the formation.

One specific treatment process employs pulse injection of up to four reagents (ozone, hydrogen peroxide, oxygen, and air) into the saturated zone to create the hydroxyl radical, which is capable of breaking down most organic compounds. Ozone is generated on-site using an ozone generator; waste streams are not generated from the treatment system. This alternative requires approximately 12 to 24 months of injection and monitoring with reapplication as necessary if the plume reestablished itself after treatment has ended. Pilot testing on-site would be required to determine the effectiveness of the technology prior to full scale application.

4.8 COMPARATIVE EVALUATION OF ALTERNATIVES

The objective of a remedial alternative is to reduce the risks to human health and the environment from the COCs in the soils and groundwater by achieving the specific remedial action objectives. Under MTCA regulation, permanent cleanup alternatives are preferred; however, if a permanent remedy is not technically possible, or if the costs of a permanent remedy are clearly disproportionate to the extra degree of protection it would provide, the permanent remedy is considered impractical (WAC 173-340-350). As discussed above, the only permanent remedy for this Site is excavation, which is impractical due to existing improvements and is not considered further. Therefore, the remaining remedies for comparative evaluation are all non-permanent remedies because they all leave some degree of source material in place and require further actions after implementation. When non-permanent remedies are selected, institutional controls and long-term monitoring may be required. Institutional controls are measures or actions to limit or prevent activities that may interfere with the integrity of the cleanup action or result in exposure to the hazardous substances on the Site as outlined in MTCA WAC 173-340-440(1).

In order to determine which of the remaining cleanup alternatives provides the greatest level of benefit for the associated cost, a comparative evaluation is performed. Under MTCA, preference is given to those remedies that use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time frame, and consider public concerns. This evaluation is presented in detail in Table 4.4. Conceptual cost estimates to support the comparative evaluation are presented in Appendix D.

The following section discusses the results of the comparative evaluation of the various remedial alternatives. These alternatives were developed to address Site contamination in subsurface soils and groundwater. The criteria used for the alternatives evaluation are as follows:

- **Protectiveness:** ability to protect human health and the environment by reducing risk, meeting cleanup standards, and improving overall environmental quality.
- **Permanence:** ability to permanently reduce the toxicity, mobility or volume of contaminants and to eliminate the potential for future substance releases.
- **Long-term Effectiveness:** degree of certainty of success associated with the alternatives' technology, and the reliability of the technology to provide protection from exposure while contaminants remain on-site. The magnitude of risk remaining on-site, and the efficacy of controls that may be used to mitigate this risk are also a considered.

- **Management of Short-term Risks:** ability to control risks to human health and the environment associated with the alternative during construction and implementation of the remedy.
- **Technical and Administrative Implementability:** ability to be implemented, which includes technical feasibility, ready availability of necessary facilities, equipment, and services, and the size and impact of the remedy on current existing Site operations.
- **Cost:** the benefit provided by each alternative is compared to the cost of implementation, maintenance, and long-term monitoring of the alternative to determine the most cost effective, beneficial remedy proposed.
- Additionally, all alternatives retained for evaluation meet the threshold criteria outlined in MTCA. Threshold criteria ensure that all proposed remedies protect human health and the environment, comply with cleanup standards, comply with all applicable state and federal laws, and allow for compliance monitoring.

4.8.1 Soil Remedial Action Evaluation Summary

The only practical remedy for soil at the West Coast Door Site is to maintain the current soil barrier of buildings and asphalt and concrete surfacing which together prevent worker contact with subsurface contaminated soil and prevent infiltration of surface water through source soils. This remedy would require placement of a deed restriction on the property which permanently requires these improvements to be maintained and contains additional restrictions regarding subsurface intrusion and disturbance. The soil barrier alternative (i.e., Retain Existing Soil Barriers) is the most beneficial of the remedies, providing protection of human health and management of short-term risks while remaining very cost effective. (see Table 4.4). The costs associated with this remedy over 30 years are approximately $33,000, including the cost of annual cap inspections. Accordingly, the soil barrier alternative is preferable to the no action alternative. The other alternative evaluated, In-Situ Thermal Solidification (ISTS), is considered impractical to implement, is prohibitively costly, and would provide little net environmental benefit as it would neither treat cPAHs nor fully remove the naphthalene from the source creosote.

4.8.2 Groundwater Remedial Action Evaluation Summary

The groundwater remedies evaluated for the Site vary widely in their effectiveness, restoration time frame, and cost. Some, such as the barrier wall, are constrained by practicability concerns. None of the groundwater remedies are permanent, as the source material would still remain in place and untreated. Therefore, rebound of contaminant levels may occur following shutdown of any of the proposed active treatment remedies. The costs associated with long-term monitoring are equivalent for any of the groundwater remedies and were estimated for a period of 30 years.

One significant difference between the treatment remedies evaluated is restoration time frame. Attainment of cleanup levels at the conditional point of compliance is expected to be obtained in approximately 1 to 2 years for both bioremediation and for in-situ oxidization. The other remedies considered, such as a barrier wall and monitored natural attenuation, are not expected to attain a comparable degree of cleanup until several decades and therefore, do not have as reasonable of a restoration time frame. However, as long as the groundwater plume is stable or shrinking, human health is protected by each remedy. 5-year reviews by the Department of Ecology will be necessary to confirm that the plume is being maintained at its current extents.

Results of the groundwater cleanup alternative evaluation indicate that the most readily implementable remedy for groundwater that best satisfies the cost disproportionate cost analysis is monitored natural attenuation with institutional controls and long-term monitoring. This alternative is preferable to the no action alternative because it provides the benefits of protection of human health and management of short-term risks. The costs of this remedy over 30 years is estimated to be approximately $140,000, though this cost could change based on the final monitoring schedule. Samples collected from a network of existing monitoring wells would tested for naphthalene semi-annually for first 5 years, then annually for the subsequent 25 years, to confirm that the naphthalene plume is stable or shrinking. This monitoring network would include MW-6, MW-10, MW-11 and MW-12 which are at or directly downgradient of the conditional point of compliance. Monitoring results would be provided to Ecology in an annual report. Appendix E contains a model restrictive covenant; a Site-specific restrictive covenant will need to be developed as part of this remedy implementation.

5.0 References

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West Coast Door

Remedial Investigation/ Feasibility Study

Tables

Table 2.1
Monitoring Well Construction and Groundwater Elevation Data

Well ID	Total Depth (ft bgs)	Screened Interval (ft bgs)	Top of Well Casing Elevation (ft NGVD29)	Collected By	Water Level Date	Water Level (ft TOC)	Water Elevation (ft NGVD29)
MW-1	44	23.5–43.5	247.02	Pacific Crest	10/20/2006	29.41	217.61
				Pacific Crest	6/13/2007	26.28	220.74
				Pacific Crest	9/14/2007	25.88	221.14
				Pacific Crest	3/20/2008	25.31	221.71
				Floyd|Snider	6/22/2010	23.63	223.39
				Floyd|Snider	11/27/2012	18.49	228.53
				Floyd|Snider	3/5/2013	18.91	228.11
				Floyd|Snider	6/4/2013	18.71	228.31
				Floyd|Snider	10/1/2013	17.34	229.68
MW-2	44*	23.5–43.5*	247.36	Pacific Crest	10/20/2006	30.02	217.34
				Pacific Crest	6/6/2007	26.81	220.55
				Pacific Crest	6/13/2007	26.82	220.54
				Pacific Crest	9/14/2007	26.43	220.93
				Pacific Crest	3/20/2008	25.87	221.49
MW-3	45	23.5–43.5	247.55	Pacific Crest	10/20/2006	30.14	217.41
				Pacific Crest	6/13/2007	26.97	220.58
				Pacific Crest	9/14/2007	26.59	220.96
				Pacific Crest	3/20/2008	26.01	221.54
MW-4	35	25–35	246.27	Pacific Crest	10/20/2006	27.56	218.71
				Pacific Crest	6/13/2007	24.92	221.35
				Pacific Crest	9/14/2007	24.49	221.78
				Pacific Crest	3/20/2008	23.67	222.60
				Floyd|Snider	6/20/2010	21.61	224.66
				Floyd|Snider	12/5/2011	20.77	225.50
MW-5	35	25–35	246.09	Pacific Crest	10/20/2006	28.28	217.81
				Pacific Crest	6/13/2007	24.94	221.15
				Pacific Crest	9/14/2007	24.78	221.31
				Pacific Crest	3/20/2008	23.91	222.18
				Floyd|Snider	6/20/2010	22.00	224.09
				Floyd|Snider	12/5/2011	20.11	225.98
				Floyd|Snider	11/27/2012	19.16	225.98
				Floyd|Snider	3/5/2013	19.03	226.93
				Floyd|Snider	6/4/2013	18.82	227.06
				Floyd|Snider	10/1/2013	18.34	227.27
MW-6	35	25–35	245.97	Pacific Crest	10/20/2006	28.58	217.39
				Pacific Crest	6/13/2007	25.12	220.85
				Pacific Crest	9/14/2007	24.74	221.23
				Pacific Crest	3/20/2008	24.10	221.87
				Floyd|Snider	6/20/2010	22.42	223.55
				Floyd|Snider	12/6/2011	20.23	225.74
				Floyd|Snider	11/27/2012	19.16	226.81
				Floyd|Snider	3/5/2013	18.94	227.03
				Floyd|Snider	6/4/2013	18.81	227.16
				Floyd|Snider	10/1/2013	18.79	227.18
MW-7	40	25–40	248.18	Pacific Crest	6/13/2007	27.26	220.92
				Pacific Crest	9/14/2007	26.85	221.33
				Pacific Crest	3/20/2008	26.85	221.33
				Floyd|Snider	6/20/2010	24.21	223.97
				Floyd|Snider	12/5/2011	22.2	225.98
				Floyd|Snider	11/27/2012	21.22	226.96
				Floyd|Snider	10/1/2013	20.55	227.63
MW-8	40	25–40	248.24	Pacific Crest	6/13/2007	27.61	220.63
				Pacific Crest	9/14/2007	27.23	221.01
				Pacific Crest	3/20/2008	26.64	221.60
				Floyd|Snider	6/22/2010	25.02	223.22
MW-9	70	60–70	245.99	Pacific Crest	9/14/2007	24.88	221.11
				Pacific Crest	3/20/2008	24.36	221.63
				Floyd|Snider	6/20/2010	22.74	223.25
				Floyd|Snider	12/5/2011	20.55	225.44
				Floyd|Snider	11/27/2012	19.75	226.24
				Floyd|Snider	10/1/2013	19.48	226.51
MW-10	46	35–45	244.22	Floyd|Snider	6/22/2010	20.84	223.38
				Floyd|Snider	12/6/2011	16.8	227.42
				Floyd|Snider	11/27/2012	17.63	226.59
				Floyd|Snider	3/5/2013	17.32	226.90
				Floyd|Snider	6/4/2013	17.11	227.11
				Floyd|Snider	10/1/2013	17.26	226.96
MW-11	46	35–45	243.55	Floyd|Snider	6/22/2010	19.85	223.70
				Floyd|Snider	12/5/2011	17.78	225.77
				Floyd|Snider	11/27/2012	16.73	226.82
				Floyd|Snider	3/5/2013	16.48	227.07
				Floyd|Snider	6/4/2013	16.26	227.29
				Floyd|Snider	10/1/2013	16.42	227.13

Table 2.1
Monitoring Well Construction and Groundwater Elevation Data

Well ID	Total Depth (ft bgs)	Screened Interval (ft bgs)	Top of Well Casing Elevation (ft NGVD29)	Collected By	Water Level Date	Water Level (ft TOC)	Water Elevation (ft NGVD29)
MW-12	46	35–45	243.97	Floyd|Snider	6/22/2010	22.16	221.81
				Floyd|Snider	12/6/2011	18.95	225.02
				Floyd|Snider	11/27/2012	18.17	225.80
				Floyd|Snider	3/5/2013	17.74	226.23
				Floyd|Snider	6/4/2013	17.54	226.43
				Floyd|Snider	10/1/2013	17.61	226.36

Note:
* Well installation log not available, estimated from concurrent MW-1 and MW-3 construction details.

Abbreviations:
bgs Below ground surface
ft Feet
NGVD National Geodetic Vertical Datum of 1929
TOC Top of casing

Table 2.2
Water Quality Monitoring Parameter Data

Well ID	Sampled By	Sample Date	Temperature (°C)	Specific Conductance (mS/cm)	pH	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Comments
MW-1	Pacific Crest	3/21/2008	14.25	0.102	6.35	7.20	553.8	39.7	cloudy
	Floyd|Snider	6/22/2010	14.32	0.150	8.71	2.87[1]	-79.2	NA	clear, no odor
	Floyd|Snider	11/27/2012	13.95	0.123	6.31	1.51[2]	355	1.0	clear, no odor
	Floyd|Snider	3/5/2013	12.00	0.131	6.16	4.30[1]/2.01[2]	112	99.1	clear, no odor
	Floyd|Snider	6/4/2013	14.10	0.126	6.31	5.84[1]/1.40[2]	212	22.0	clear, no odor
	Floyd|Snider	10/1/2013	14.30	0.140	6.12	2.24[1]	355	11.0	clear, no odor
MW-3	Pacific Crest	3/21/2008	13.39	0.239	5.88	2.27	601.1	33.4	cloudy
MW-4	Pacific Crest	3/21/2008	13.94	0.125	6.30	0.16	363.8	2.25	cloudy
	Floyd|Snider	6/21/2010	14.49	0.104	6.83	NA	-109.5	NA	clear, very faint odor
	Floyd|Snider	12/5/2011	14.5	0.125	6.27	2.00[1]	108	4.0	clear, no odor
MW-5	Pacific Crest	3/24/2008	14.75	0.401	6.18	0.19	71.8	65.6	sheen w/odor
	Floyd|Snider	6/21/2010	14.31	0.218	6.64	NA	-35.1	NA	clear, no odor
	Floyd|Snider	12/5/2011	13.54	0.266	5.99	5.00[1]	197	45.1	clear, slight naphthalene odor
	Floyd|Snider	11/27/2012	12.65	0.233	6.02	2.29[2]	196	6.9	clear, slight naphthalene odor
	Floyd|Snider	3/5/2013	13.80	0.242	6.07	7.10[1]/3.52[2]	154	22.7	clear, slight naphthalene odor
	Floyd|Snider	6/4/2013	15.40	0.185	6.06	7.26[1]/3.90[2]	257	32.8	clear, no odor
	Floyd|Snider	10/1/2013	15.00	0.260	5.77	2.61[1]	323	0.0	clear, no odor
MW-6	Pacific Crest	3/24/2008	14.61	0.254	6.14	0.20	72.9	21.2	sheen w/odor
	Floyd|Snider	6/21/2010	15.33	0.210	6.27	NA	-77.1	NA	cloudy, strong naphthalene odor
	Floyd|Snider	12/6/2011	15.41	0.202	5.89	2.30[1]	180	55.8	turbid, moderate-strong naphthalene odor
	Floyd|Snider	11/27/2012	14.53	0.211	5.91	0.16[2]	144	3.2	naphthalene odor
	Floyd|Snider	3/5/2013	12.80	0.220	5.87	4.30[1]/0.24[2]	141	40.0	moderate-strong naphthalene odor
	Floyd|Snider	6/4/2013	14.80	0.190	5.91	4.30[1]/0.0[2]	193	0.0	moderate naphthalene odor
	Floyd|Snider	10/1/2013	15.80	0.230	5.73	0.83[1]	142	0.0	moderate-strong naphthalene odor
MW-7	Pacific Crest	6/7/2007	15.54	0.266	6.60	0.91	NA	NA	cloudy w/odor
	Pacific Crest	3/24/2008	15.59	0.174	6.71	0.04	-57.8	30.2	cloudy w/odor
	Floyd|Snider	6/21/2010	15.86	0.200	6.34	NA	-149.9	NA	clear, moderate naphthalene odor
	Floyd|Snider	12/5/2011	15.35	0.183	6.33	0.38[1]	15	130	cloudy, moderate naphthalene odor
	Floyd|Snider	11/27/2012	13.93	0.159	6.76	0.12[2]	49	9.5	clear, no odor
	Floyd|Snider	10/1/2013	14.50	0.170	6.44	1.37[1]	62	0.0	clear, slight-moderate naphthalene odor
MW-8	Pacific Crest	6/7/2007	15.16	0.333	6.63	3.49	NA	NA	clear, no odor
	Pacific Crest	3/21/2008	15.05	0.250	6.56	2.12	528.7	10.82	clear, no odor
	Floyd|Snider	6/22/2010	15.31	0.348	6.56	NA	-90.9	NA	clear, no odor
MW-9	Pacific Crest	9/14/2007	15.71	0.369	6.87	2.35	-137.3	NA	clear w/odor
	Pacific Crest	3/24/2008	13.86	0.366	6.64	0.2	105.3	1.52	clear
	Floyd|Snider	6/21/2010	14.24	0.264	7.05	NA	-123.9	NA	clear, no odor
	Floyd|Snider	12/5/2011	13.8	0.338	6.53	1.9[1]	151	2	clear, no odor
	Floyd|Snider	11/27/2012	10.13	0.311	6.65	0.09[2]	179	0.0	clear, no odor
	Floyd|Snider	10/1/2013	14.10	0.370	6.42	1.45[1]	269	14.0	clear, no odor
MW-10	Floyd|Snider	6/22/2010	14.88	0.259	7.20	NA	-168.7	NA	clear, strong naphthalene odor
	Floyd|Snider	12/6/2011	13.63	0.234	7.15	0.5[1]	-69	16.1	clear, moderate-strong naphthalene odor
	Floyd|Snider	11/27/2012	12.08	0.217	7.20	0.08[2]	-28	26.9	clear, strong naphthalene odor
	Floyd|Snider	3/5/2013	12.60	0.245	7.00	5.40[1]/0.14[2]	-125	57.3	clear, strong naphthalene odor
	Floyd|Snider	6/4/2013	16.00	0.227	7.00	4.14[1]/0.00[2]	-93	223	turbid, strong naphthalene odor
	Floyd|Snider	10/1/2013	14.70	0.250	6.92	1.06[1]	-101	10.0	clear, strong naphthalene odor
MW-11	Floyd|Snider	6/22/2010	14.83	0.161	6.95	NA	-132.9	NA	clear, no odor
	Floyd|Snider	12/5/2011	13.15	0.135	6.90	0.53[1]	123	134	no odor
	Floyd|Snider	11/27/2012	13.75	0.129	7.05	0.20[2]	55	14.5	clear, no odor
	Floyd|Snider	3/5/2013	12.90	0.129	6.83	1.10[1]/0.48[2]	113	46.0	clear, no odor
	Floyd|Snider	6/4/2013	13.80	0.122	7.07	4.25[1]/0.00[2]	172	119	no odor
	Floyd|Snider	10/1/2013	13.80	0.120	6.79	1.45[1]	243	41.0	clear, no odor
MW-12	Floyd|Snider	6/22/2010	14.559	0.409	8.67	NA	-136.3	NA	clear, naphthalene odor
	Floyd|Snider	12/6/2011	14.06	0.437	6.88	0.64[1]	-49	9	strong naphthalene odor
	Floyd|Snider	11/27/2012	12.19	0.401	7.07	0.05[2]	17	3.2	clear, moderate naphthalene odor
	Floyd|Snider	3/5/2013	13.50	0.472	6.88	5.80[1]/0.12[2]	-77	10.1	clear, slight-moderate naphthalene odor
	Floyd|Snider	6/4/2013	16.30	0.441	6.85	3.70[1]/0.00[2]	-108	45.8	clear, strong naphthalene odor
	Floyd|Snider	10/1/2013	14.80	0.460	6.73	1.34[1]	-102	0.0	clear, moderate-strong naphthalene odor

Abbreviations
- ORP Oxidation/reduction potential
- NA Not applicable
- NTU Nephelometric turbidity units
- mS Millisiemens
- mV Millivolts

Table 2.3
Soil Analytical Data

Location		B2	B3	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	MTCA A Industrial Use CUL	
Sample ID		B2-6.0	B3-5.5	SP1-7-8	SP2-1-2	SP3-3-4	SP4-3-4	SP5-3-4	SP6-3-4	SP7-7-8	SP8-3-4	SP9-7-8		
Sample Date		5/4/1992	5/4/1992	7/20/2006	7/20/2006	7/20/2006	7/20/2006	9/12/2006	9/12/2006	9/12/2006	9/12/2006	9/12/2006		
Semivolatile Organic Compounds by USEPA 8270														
1-Methylnaphthalene	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	mg/kg	0.27	0.098 U	5.9	29	2.6	5.0 U	0.0050 U	0.25 U	0.25 U	0.25 U	0.0050 U	5	mg/kg
Total Naphthalenes	mg/kg	0.27	0.098 U	5.9	29	2.6	5.0 U	0.0050 U	0.25	0.25 U	0.25 U	0.0050 U	5	mg/kg
Acenaphthene	mg/kg	0.20 U	0.20 U	9.9	2.5 U	2.5 U	31	0.0050 U	0.42	0.25 U	0.25 U	0.0050 U	NA	
Acenaphthylene	mg/kg	0.20 U	0.20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Anthracene	mg/kg	0.29	0.23	28	0.78	170	150	0.0076	5.5	0.52	1.0	0.005 U	NA	
Benzo(a)anthracene	mg/kg	0.88	0.51	33	15	52	55	0.023	6.5	2.1	1.4	5.0 U	NA	
Benzo(a)pyrene	mg/kg	1.5	0.81	45	24	93	50	0.038	5.9	6.4	2.3	5.0 U	2	mg/kg
Benzo(b)fluoranthene	mg/kg	0.71	0.41	67	47	87	62	0.066	5.4	9.6	3.0	5.0 U	NA	
Indeno(1,2,3-cd)pyrene	mg/kg	0.81	0.41	25	17	49	20	0.019	2.5	2.9	2.4	5.0 U	NA	
Benzo(k)fluoranthene	mg/kg	0.37	0.22	18	15	34	24	0.019	1.6	2.3	0.87	5.0 U	NA	
Chrysene	mg/kg	1.0	0.60	45	25	240	99	0.037	6.8	5.2	2.4	5.0 U	NA	
Dibenzo(a,h)anthracene	mg/kg	0.68	0.040 U	7.0	5.8	18	6.9	0.0060	0.89	1.1	0.67	5.0 U	NA	
cPAH TEQ ND=0[1,2]	mg/kg	1.9	0.97	60	34	120	68	0.052	7.7	8.3	3.2	0.0	2	mg/kg
cPAH TEQ ND=1/2 RL[1,3]	mg/kg	1.9	0.97	60	34	120	68	0.052	7.7	8.3	3.2	3.8	2	mg/kg
Fluoranthene	mg/kg	3.0	1.9	76	11	50	180	0.028	11	3.3	2.1	0.0050 U	NA	
Fluorene	mg/kg	0.20	0.12	4.7	2.5 U	3.4	29	0.0050 U	3.5	0.25 U	0.25 U	0.0050 U	NA	
Phenanthrene	mg/kg	2.1	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Pyrene	mg/kg	3.6	0.13	87	14	60	150	0.039	16	5.9	3.0	0.0050 U	NA	
Benzo(g,h,i)perylene	mg/kg	0.96	0.46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).
2 Calculated using detected cPAH concentrations.
3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

NA Not available
cPAH Carcinogenic polycyclic aromatic hydrocarbon
TEQ Toxic equivalency quotient
ND Non-detect
RL Reporting Limit
U Undetected
CUL Cleanup Level

Table 2.3
Soil Analytical Data

Location		MW-07		MW-08		MW-09				SB-01		SB-02		MTCA A Industrial Use CUL	
Sample ID		MW7-17.5-19	MW7-25-26.5	MW8-15-16.5	MW8-25-26.5	MW9-24-25	MW9-45-47	MW9-55.5-57.5	MW9-68-70	SB1-19-20.5	SB1-9-10	SB2-14-15.5	SB2-19-20.5		
Sample Date		01/26/2007	01/26/2007	01/31/2007	01/31/2007	09/06/2007	09/06/2007	09/06/2007	09/06/2007	01/29/2007	01/29/2007	01/29/2007	01/29/2007		
Semivolatile Organic Compounds by USEPA 8270															
1-Methylnaphthalene	mg/kg	1.5	70	0.0069 U	0.0069 U	0.55	0.16	0.0072 U	0.0085 U	0.0072 U	0.0072 U	0.0074 U	0.0077 U	NA	
2-Methylnaphthalene	mg/kg	2.8	130	0.0069 U	0.0069 U	0.031	0.16	0.0072 U	0.0085 U	0.0072 U	0.0072 U	0.0074 U	0.0077 U	NA	
Naphthalene	mg/kg	2.0	150	0.0081	0.0069 U	0.064	3.8	0.0072 U	0.0085 U	0.0072 U	0.0072 U	0.0074 U	0.0077 U	5	mg/kg
Total Naphthalenes	mg/kg	6.3	350	0.0081	0.0069 U	0.65	4.1	0.0072 U	0.0085 U	0.0072 U	0.0072 U	0.0074 U	0.0077 U	5	mg/kg
Acenaphthene	mg/kg	3.9	49	0.0085	0.0069 U	3.9	0.029	0.0072 U	0.0085 U	0.011	0.0072 U	0.0074 U	0.0077 U	NA	
Acenaphthylene	mg/kg	0.12	2.7	0.061	0.0069 U	0.093	0.0093 U	0.0072 U	0.0085 U	0.0084	0.0099	0.011	0.0077 U	NA	
Anthracene	mg/kg	1.5	16	0.098	0.0069 U	7.0	0.0093 U	0.0072 U	0.0085 U	0.027	0.0087	0.0074 U	0.0077 U	NA	
Benzo(a)anthracene	mg/kg	1.4	6.7	0.33	0.0069 U	2.1	0.0093 U	0.0072 U	0.0085 U	0.050	0.025	0.0074 U	0.0077 U	NA	
Benzo(a)pyrene	mg/kg	0.66	3.8	0.29	0.0069 U	0.83	0.0093 U	0.0072 U	0.0085 U	0.053	0.030	0.0074 U	0.0077 U	2	mg/kg
Benzo(b)fluoranthene	mg/kg	0.92	4.9	0.83	0.011	1.1	0.0093 U	0.0072 U	0.0085 U	0.051	0.030	0.0074 U	0.0077 U	NA	
Indeno(1,2,3-cd)pyrene	mg/kg	0.25	1.4	0.37	0.0069 U	0.33	0.0093 U	0.0072 U	0.0085 U	0.024	0.016	0.0074 U	0.0077 U	NA	
Benzo(k)fluoranthene	mg/kg	0.34	2.0	0.26	0.0069 U	0.46	0.0093 U	0.0072 U	0.0085 U	0.017	0.0099	0.0074 U	0.0077 U	NA	
Chrysene	mg/kg	1.1	7.1	0.47	0.0069 U	2.5	0.0093 U	0.0072 U	0.0085 U	0.06	0.030	0.0074 U	0.0077 U	NA	
Dibenzo(a,h)anthracene	mg/kg	0.092	0.54	0.13	0.0069 U	0.15	0.0093 U	0.0072 U	0.0085 U	0.0082	0.0072 U	0.0074 U	0.0077 U	NA	
cPAH TEQ ND=0[1,2]	mg/kg	0.97	5.4	0.49	0.0011	1.3	0.0	0.0	0	0.069	0.038	0.0	0.0	2	mg/kg
cPAH TEQ ND=1/2 RL[1,3]	mg/kg	0.97	5.4	0.49	0.0060	1.3	0.0070	0.0054	0.0064	0.069	0.039	0.0056	0.0058	2	mg/kg
Fluoranthene	mg/kg	6.1	35	0.42	0.0069 U	9.5	0.0093 U	0.011	0.0085 U	0.084	0.038	0.0074 U	0.0077 U	NA	
Fluorene	mg/kg	4.0	39	0.012	0.0069 U	2.9	0.0093 U	0.0072 U	0.0085 U	0.0085	0.0072 U	0.0074 U	0.0077 U	NA	
Phenanthrene	mg/kg	11	90	0.15	0.0069 U	23	0.0093 U	0.025	0.0085 U	0.097	0.024	0.0074 U	0.0077 U	NA	
Pyrene	mg/kg	4.8	32	0.42	0.0069 U	7.6	0.0093 U	0.0097	0.0085 U	0.15	0.059	0.0074 U	0.0077 U	NA	
Benzo(g,h,i)perylene	mg/kg	0.27	1.5	0.39	0.0069 U	0.32	0.0093 U	0.0072 U	0.0085 U	0.031	0.021	0.0074 U	0.0077 U	NA	

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).
2 Calculated using detected cPAH concentrations.
3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

NA Not available
cPAH Carcinogenic polycyclic aromatic hydrocarbon
TEQ Toxic equivalency quotient
ND Non-detect
RL Reporting Limit
U Undetected
CUL Cleanup Level

Table 2.3
Soil Analytical Data

Location		SB-03		SB-04		SB-05		SP2-B				MTCA A Industrial Use CUL	
Sample ID		SB3-10-11.5	SB3-15-16.5	SB4-10-11.5	SB4-20-21.5	SB5-15-16.5	SB5-35-35-36.5	SP2-B-15.0	SP2-B-30.0	SP2-B-35.0	SP2-B-45.0		
Sample Date		01/31/2007	01/31/2007	05/11/2007	05/11/2007	05/11/2007	05/11/2007	06/11/2010	06/11/2010	06/11/2010	06/11/2010		
Semivolatile Organic Compounds by USEPA 8270													
1-Methylnaphthalene	mg/kg	0.47	0.066	0.0081 U	0.0077 U	0.0072 U	0.19	NA	NA	NA	NA	NA	
2-Methylnaphthalene	mg/kg	0.54	0.070	0.0081 U	0.0077 U	0.0072 U	0.16	NA	NA	NA	NA	NA	
Naphthalene	mg/kg	0.55	0.041	0.0081 U	0.0077 U	0.0072 U	1.4	0.20 U	470	160	0.13	5	mg/kg
Total Naphthalenes	mg/kg	1.56	0.18	0.0081 U	0.0077 U	0.0072 U	1.8	0.20 U	470	160	0.13	5	mg/kg
Acenaphthene	mg/kg	0.75	0.078	0.0081 U	0.0077 U	0.0072 U	0.23	0.20 U	69	37	0.092	NA	
Acenaphthylene	mg/kg	0.52	0.10	0.011	0.0077 U	0.0072 U	0.0084	0.63	4.2	2.0 U	0.010 U	NA	
Anthracene	mg/kg	3.3	0.30	0.015	0.0077 U	0.0072 U	0.066	1.3	28	15	0.031	NA	
Benzo(a)anthracene	mg/kg	5.3	0.49	0.012	0.0077 U	0.0072 U	0.0083 U	1.2	13	7.7	0.015	NA	
Benzo(a)pyrene	mg/kg	5.4	0.49	0.11	0.017	0.0072 U	0.0083 U	26	6.3	3.9	0.010 U	2	mg/kg
Benzo(b)fluoranthene	mg/kg	6.3	0.55	0.093	0.016	0.0072 U	0.0083 U	31	8.2	5.3	0.010 U	NA	
Indeno(1,2,3-cd)pyrene	mg/kg	2.8	0.26	0.12	0.017	0.0072 U	0.0083 U	14	4.0 U	2.0 U	0.010 U	NA	
Benzo(k)fluoranthene	mg/kg	2.1	0.22	0.054	0.0099	0.0072 U	0.0083 U	5.6	4.0 U	2.0 U	0.010 U	NA	
Chrysene	mg/kg	6.5	0.59	0.068	0.010	0.0072 U	0.0083 U	15	13	8.2	0.015	NA	
Dibenzo(a,h)anthracene	mg/kg	0.85	0.086	0.036	0.0077 U	0.0072 U	0.0083 U	4.7	4.0 U	2.0 U	0.010 U	NA	
cPAH TEQ ND=0[1,2]	mg/kg	7.2	0.66	0.14	0.021	0.0	0.0	31.8	8.6	5.3	0.0017	2	mg/kg
cPAH TEQ ND=1/2 RL[1,3]	mg/kg	7.2	0.66	0.14	0.022	0.0054	0.0063	31.8	9.2	5.6	0.0087	2	mg/kg
Fluoranthene	mg/kg	10	0.98	0.0081 U	0.0077 U	0.0072 U	0.12	0.94	54	32	0.057	NA	
Fluorene	mg/kg	1.2	0.16	0.0081 U	0.0077 U	0.0072 U	0.19	0.2 U	61	34	0.055	NA	
Phenanthrene	mg/kg	11	1.0	0.0081 U	0.0077 U	0.0072 U	0.54	0.49	140	82	0.14	NA	
Pyrene	mg/kg	15	1.3	0.0099	0.0077 U	0.0072 U	0.08	5.2	43	26	0.045	NA	
Benzo(g,h,i)perylene	mg/kg	3.4	0.30	0.15	0.021	0.0072 U	0.0083 U	13	4.0 U	2 U	0.010 U	NA	

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).
2 Calculated using detected cPAH concentrations.
3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

NA Not available
cPAH Carcinogenic polycyclic aromatic hydrocarbon
TEQ Toxic equivalency quotient
ND Non-detect
RL Reporting Limit
U Undetected
CUL Cleanup Level

Table 2.4
Monitoring Well Groundwater Analytical Data

Location		MW-01								MW-03	MTCA A CUL	
Sample Date		05/04-05/92	7/28/2006	9/21/2006	06/22/2010	11/27/2012	3/5/2013	6/4/2013	10/1/2013	03/21/2008		
Volatile Organic Compounds by USEPA Method 8260												
1,1,1-Trichloroethane	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	200	µg/L
1,1-Dichloroethane	µg/L	0.20 U	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	NA	NA	
1,2,4-Trimethylbenzene	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	NA	
1,3,5-Trimethylbenzene	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	NA	
Benzene	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	5	µg/L
Chloroform	µg/L	0.20 U	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.79	NA	
Chloromethane	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	NA	
cis-1,2-Dichloroethene	µg/L	0.20 U	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	NA	
Cymene	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	NA	0.20 U	NA	
Ethylbenzene	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	700	µg/L
iso-Propylbenzene	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	NA	
Methyl iso butyl ketone	µg/L	NA	NA	NA	NA	1.0 U	10 U	10 U	10 U	2.0 U	NA	
Naphthalene	µg/L	NA	NA	NA	NA	1.6	2.0 U	2.0 U	2.0 U	1.0 U	160	µg/L
n-Propylbenzene	µg/L	NA	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	NA	
Styrene	µg/L	NA	NA	NA	1 U	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	NA	
Toluene	µg/L	0.50 U	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	1000	µg/L
Trichloroethene	µg/L	0.20 U	NA	NA	NA	1.0 U	2.0 U	2.0 U	2.0 U	0.20 U	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	NA	NA	4.0 U	4.0 U	4.0 U	0.40 U	NA	
Xylene (ortho)	µg/L	NA	NA	NA	NA	NA	2.0 U	2.0 U	2.0 U	0.20 U	NA	
Xylene (total)	µg/L	0.5	NA	NA	NA	1.0 U	6.0 U	6.0 U	6.0 U	0.60 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270												
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Naphthalene	µg/L	NA	0.10 U	NA	0.77	0.10 U	NA	NA	NA	0.013	NA	
Total Naphthalenes	µg/L	NA	0.10 U	NA	0.77	0.10 U	NA	NA	NA	0.013	160	µg/L
Acenaphthene	µg/L	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Anthracene	µg/L	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Benzo(a)anthracene	µg/L	NA	0.10 U	NA	0.10 U	0.10 U	NA	NA	NA	0.0099 U	NA	
Benzo(a)pyrene	µg/L	NA	0.10 U	NA	0.10 U	0.10 U	NA	NA	NA	0.0099 U	0.10	µg/L
Benzo(b)fluoranthene	µg/L	NA	0.10 U	NA	0.10 U	0.10 U	NA	NA	NA	0.0099 U	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	0.10 U	NA	0.10 U	0.10 U	NA	NA	NA	0.0099 U	NA	
Benzo(k)fluoranthene	µg/L	NA	0.10 U	NA	0.10 U	0.10 U	NA	NA	NA	0.0099 U	NA	
Chrysene	µg/L	NA	0.10 U	NA	0.10 U	0.10 U	NA	NA	NA	0.0099 U	NA	
Dibenzo(a,h)anthracene	µg/L	NA	0.10 U	NA	0.10 U	0.10 U	NA	NA	NA	0.0099 U	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	0	NA	NA	0	NA	NA	NA	0	0.10	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	0.071 U	NA	NA	0.076 U	NA	NA	NA	0.0075 U	0.10	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	0.10 U	NA	NA	NA	0.0099 U	NA	
Fluoranthene	µg/L	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Fluorene	µg/L	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Pyrene	µg/L	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.099 U	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx												
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.4
Monitoring Well Groundwater Analytical Data

Location		MW-04				MW-05					MTCA A CUL	
Sample Date		7/28/2006	03/24/2008	06/21/2010	12/05/2011	9/19/2006	03/24/2008	06/21/2010	12/05/2011	11/27/2012		
Volatile Organic Compounds by USEPA Method 8260												
1,1,1-Trichloroethane	µg/L	NA	1 U	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	NA	1 U	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	NA	6.0	NA	2.0 U	NA	59	1.1	2.0 U	1.0 U	NA	
1,3,5-Trimethylbenzene	µg/L	NA	2.6	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	NA	
Benzene	µg/L	NA	1.0 U	NA	2.0 U	NA	20 U	0.35 U	2.0 U	1.0 U	5	µg/L
Chloroform	µg/L	NA	1.0 U	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	NA	
Chloromethane	µg/L	NA	5.0 U	NA	2.0 U	NA	100 U	10 U	2.0 U	1.0 U	NA	
cis-1,2-Dichloroethene	µg/L	NA	1.0 U	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	NA	
Cymene	µg/L	NA	1.0 U	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	NA	
Ethylbenzene	µg/L	NA	1.0 U	NA	2.0 U	NA	36	1.0 U	2.0 U	1.0 U	700	µg/L
iso-Propylbenzene	µg/L	NA	1.9	NA	2.0 U	NA	24	1.0 U	2.0 U	1.0 U	NA	
Methyl iso butyl ketone	µg/L	NA	10 U	NA	10 U	NA	200 U	10 U	10 U	1.0 U	NA	
Naphthalene	µg/L	NA	130	NA	4.8	NA	3200		31	9.3	160	µg/L
n-Propylbenzene	µg/L	NA	1.3	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	NA	
Styrene	µg/L	NA	1.0 U	1 U	2.0 U	NA	38	1.0 U	2.0 U	1.0 U	NA	
Toluene	µg/L	NA	5.0 U	NA	2.0 U	NA	100 U	1.0 U	2.0 U	1.0 U	1000	µg/L
Trichloroethene	µg/L	NA	1.0 U	NA	2.0 U	NA	20 U	1.0 U	2.0 U	1.0 U	NA	
Xylene (meta & para)	µg/L	NA	2.0 U	NA	4.0 U	NA	140	2.0 U	4.0 U	NA	NA	
Xylene (ortho)	µg/L	NA	1.0 U	NA	2.0 U	NA	95	1.0 U	2.0 U	NA	NA	
Xylene (total)	µg/L	NA	3.0 U	NA	6.0 U	NA	240	3.0 U	6.0 U	1.0 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270												
1-Methylnaphthalene	µg/L	NA	43	NA	NA	NA	190	NA	NA	0.1 U	NA	
2-Methylnaphthalene	µg/L	NA	5.8	NA	NA	NA	180	NA	NA	0.8	NA	
Naphthalene	µg/L	36	85	5.1	NA	8300	2200	0.39	NA	11	NA	
Total Naphthalenes	µg/L	36	130	5.1	4.8	8300	2600	0.39	31	11.8	160	µg/L
Acenaphthene	µg/L	45	62	30	NA	370	120	NA	NA	0.9	NA	
Acenaphthylene	µg/L	NA	3.3	NA	NA	NA	9.1	NA	NA	0.1 U	NA	
Anthracene	µg/L	3.9	3.9	1.3	NA	110	20	NA	NA	0.1 U	NA	
Benzo(a)anthracene	µg/L	0.10 U	0.017	0.1 U	NA	50 U	6.2	2.7	NA	0.1 U	NA	
Benzo(a)pyrene	µg/L	0.10 U	0.0097 U	0.1 U	NA	50 U	2.8	1.6	NA	0.1 U	0.10	µg/L
Benzo(b)fluoranthene	µg/L	0.10 U	0.0097 U	0.1 U	NA	50 U	2.9	2.4	NA	0.1 U	NA	
Indeno(1,2,3-cd)pyrene	µg/L	0.10 U	0.0097 U	0.1 U	NA	50 U	1.2	0.62	NA	0.1 U	NA	
Benzo(k)fluoranthene	µg/L	0.10 U	0.0097 U	0.1 U	NA	50 U	2.5	0.59	NA	0.1 U	NA	
Chrysene	µg/L	0.10 U	0.014	0.1 U	NA	50 U	6.8	3.5	NA	0.1 U	NA	
Dibenzo(a,h)anthracene	µg/L	0.10 U	0.0097 U	0.1 U	NA	50 U	0.50	0.17	NA	0.1 U	NA	
cPAH TEQ ND=0[1,2]	µg/L	0	0.0018	0	NA	0	4.2	2.3	NA	0	0.10	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	0.076 U	0.0086	0.0755 U	NA	38 U	4.2	2.3	NA	0.0755 U	0.10	µg/L
Benzo(g,h,i)perylene	µg/L	NA	0.0097 U	NA	NA	NA	1.3	NA	NA	0.1 U	NA	
Fluoranthene	µg/L	1.0	3.6	1.8	NA	120	28	NA	NA	0.1 U	NA	
Fluorene	µg/L	21	21	6.5	NA	230	67	NA	NA	0.1 U	NA	
Phenanthrene	µg/L	NA	16	4.6	NA	NA	100	NA	NA	0.1 U	NA	
Pyrene	µg/L	0.50	2.7	1.2	NA	110	27	NA	NA	0.1 U	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx												
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	5.8	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, pres Undetected

2 Calculated using detected cP Cleanup Level

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.4
Monitoring Well Groundwater Analytical Data

Location		MW-05			MW-06						MTCA A	
Sample Date		3/5/2013	6/4/2013	10/1/2013	9/19/2006	03/24/2008	06/21/2010	12/06/2011	11/27/2012	3/5/2013	CUL	
Volatile Organic Compounds by USEPA Method 8260												
1,1,1-Trichloroethane	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	1.0 U	2.0 U	1.0 U	2.0 U	200	µg/L
1,1-Dichloroethane	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	1.0 U	2.0 U	1.0 U	2.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	2.5	2.0 U	2.0 U	NA	170	91 J	150	170	160	NA	
1,3,5-Trimethylbenzene	µg/L	2.0 U	2.0 U	2.0 U	NA	62	51	51	63	57	NA	
Benzene	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	0.35 U	2.0 U	1.0 U	2.0 U	5	µg/L
Chloroform	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	1.0 U	2.0 U	1.0 U	2.0 U	NA	
Chloromethane	µg/L	2.0 U	2.0 U	2.0 U	NA	250 U	10 U	2.0 U	1.0 U	2.0 U	NA	
cis-1,2-Dichloroethene	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	1.0 U	2.0 U	1.0 U	2.0 U	NA	
Cymene	µg/L	2.0 U	2.0 U	NA	NA	50 U	6.2	6.4	5.2	6.3	NA	
Ethylbenzene	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	7.6	2.1	3.0	2.1	700	µg/L
iso-Propylbenzene	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	7.5	6.0	7.1	7.1	NA	
Methyl iso butyl ketone	µg/L	10 U	10 U	10 U	NA	500 U	10 U	10 U	1.0 U	10 U	NA	
Naphthalene	µg/L	70	5.0	2.0 U	NA	9200	NA	9200	9700	1100	160	µg/L
n-Propylbenzene	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	4.7	3.2	5.1	2.0 U	NA	
Styrene	µg/L	2.0 U	2.0 U	2.0 U	NA	58	9.2	3.5	1.0 U	2.0 U	NA	
Toluene	µg/L	2.0 U	2.0 U	2.0 U	NA	250 U	1.0 U	2.0 U	1.0 U	2.0 U	1000	µg/L
Trichloroethene	µg/L	2.0 U	2.0 U	2.0 U	NA	50 U	1.0 U	2.0 U	1.0 U	2.0 U	NA	
Xylene (meta & para)	µg/L	4.0 U	4.0 U	4.0 U	NA	140	56	27	NA	23	NA	
Xylene (ortho)	µg/L	2.0 U	2.0 U	2.0 U	NA	80	48	25	NA	19	NA	
Xylene (total)	µg/L	6.0 U	6.0 U	6.0 U	NA	220	104	52	63	42	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270												
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	390	NA	NA	800	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	490	780	NA	1000	NA	NA	
Naphthalene	µg/L	NA	NA	NA	1700	5500	5900	NA	9800	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	1700	6380	6700	9200	12000	NA	160	µg/L
Acenaphthene	µg/L	NA	NA	NA	430	200	220	NA	6.9	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	21	20	NA	240	NA	NA	
Anthracene	µg/L	NA	NA	NA	85	12	19	NA	7.6	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	7.0	3.3	6.9	NA	0.10 U	0.75	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	4.7	1.7	5.9	NA	0.10 U	0.48	0.10	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	4.9	1.7	7.8	NA	0.10 U	0.45	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	2.0 U	0.67	5.0 U	NA	0.10 U	0.35	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	3.2	1.5	5.0 U	NA	0.10 U	0.35	NA	
Chrysene	µg/L	NA	NA	NA	9.4	3.2	6.8	NA	0.90	0.77	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	2.0 U	0.29	5.0 U	NA	0.10 U	0.29	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	6.3	2.5	7.4	NA	0.0090	0.71	0.10	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	6.5	2.5	8.2	NA	0.084	0.71	0.10	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	0.72	2.2	NA	0.10 U	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	54	21	31	NA	11	NA	NA	
Fluorene	µg/L	NA	NA	NA	200	65	89	NA	54	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	52	110	NA	26	NA	NA	
Pyrene	µg/L	NA	NA	NA	41	17	30	NA	7.1	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx												
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	14	NA	NA	NA	NA	500	µg/L

Notes:
1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of
2 Calculated using detected cPAH concentrations.
3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

U Undetected
CUL Cleanup Level

Abbreviations:
cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.4
Monitoring Well Groundwater Analytical Data

Location		MW-06		MW-07							
Sample Date		6/4/2013	10/1/2013	03/24/2008	6/7/2007	06/21/2010	12/05/2011	11/27/2012	10/1/2013	MTCA A CUL	
Volatile Organic Compounds by USEPA Method 8260											
1,1,1-Trichloroethane	µg/L	2.0 U	2.0 U	0.2 U	NA	NA	2.0 U	1.0 U	2.0 U	200	µg/L
1,1-Dichloroethane	µg/L	2.0 U	2.0 U	0.2 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	150	170	0.93	NA	NA	18	1.0 U	2.4	NA	
1,3,5-Trimethylbenzene	µg/L	54	65	0.28	NA	NA	6.6	1.0 U	2.0 U	NA	
Benzene	µg/L	2.0 U	2.0 U	0.2 U	NA	NA	2.0 U	1.0 U	2.0 U	5	µg/L
Chloroform	µg/L	2.0 U	2.0 U	0.2 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Chloromethane	µg/L	2.0 U	2.0 U	1 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
cis-1,2-Dichloroethene	µg/L	2.0 U	2.0 U	0.2 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Cymene	µg/L	5.1	NA	0.2 U	NA	NA	2.0 U	1.0 U	NA	NA	
Ethylbenzene	µg/L	2 U	3.1	3	NA	NA	2.0 U	1.0 U	2.0 U	700	µg/L
iso-Propylbenzene	µg/L	5.5	6.5	1.4	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Methyl iso butyl ketone	µg/L	10 U	10 U	2.0 U	NA	NA	10 U	1.0 U	10 U	NA	
Naphthalene	µg/L	10000	12000	43	NA	NA	890	2.8	120	160	µg/L
n-Propylbenzene	µg/L	2.0 U	4.4	0.81	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Styrene	µg/L	2.0 U	2.0 U	0.23	NA	1.0 U	2.0 U	1.0 U	2.0 U	NA	
Toluene	µg/L	2.0 U	2.0 U	1.0 U	NA	NA	2.0 U	1.0 U	2.0 U	1000	µg/L
Trichloroethene	µg/L	2.0 U	2.0 U	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Xylene (meta & para)	µg/L	16	21	0.82	NA	NA	4.0 U	NA	4.0 U	NA	
Xylene (ortho)	µg/L	14	18	1.4	NA	NA	2.0 U	NA	2.0 U	NA	
Xylene (total)	µg/L	30	39	2.2	NA	NA	6.0 U	1.0 U	6.0 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270											
1-Methylnaphthalene	µg/L	470	480	13	15	NA	NA	0.1 U	NA	NA	
2-Methylnaphthalene	µg/L	710	980	1.8	1.9	NA	NA	1.6	NA	NA	
Naphthalene	µg/L	7400	9900	34	70	1200	NA	3.6	NA	NA	
Total Naphthalenes	µg/L	8600	11360	49	87	1200	890	5.2	NA	160	µg/L
Acenaphthene	µg/L	170	190	25	28	NA	NA	1.2	NA	NA	
Acenaphthylene	µg/L	15	22	0.81	1.1	NA	NA	2.4	NA	NA	
Anthracene	µg/L	6.0	20.0 U	5.2	9.5	NA	NA	0.10 U	NA	NA	
Benzo(a)anthracene	µg/L	0.74	0.68	1.0	7.7	0.96	NA	0.10 U	NA	NA	
Benzo(a)pyrene	µg/L	0.52	0.49	0.43	3.9	0.43	NA	0.10 U	NA	0.10	µg/L
Benzo(b)fluoranthene	µg/L	0.55	0.45	0.40	3.8	0.58	NA	0.10 U	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	0.16	0.54	0.16	1.4	0.18	NA	0.10 U	NA	NA	
Benzo(k)fluoranthene	µg/L	0.54	0.31	0.37	3.1	0.21	NA	0.10 U	NA	NA	
Chrysene	µg/L	0.78	0.69	1.1	7.5	0.93	NA	0.10 U	NA	NA	
Dibenzo(a,h)anthracene	µg/L	0.080 U	0.440	0.076	0.59	0.10 U	NA	0.10 U	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	0.73	0.74	0.64	5.6	0.63	NA	0	NA	0.10	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	0.73	0.74	0.64	5.6	0.64	NA	0.076 U	NA	0.10	µg/L
Benzo(g,h,i)perylene	µg/L	0.23	0.61	0.18	1.5	NA	NA	0.10 U	NA	NA	
Fluoranthene	µg/L	6.3	7	9.1	29	NA	NA	2.3	NA	NA	
Fluorene	µg/L	35	49	13	17	NA	NA	4.1	NA	NA	
Phenanthrene	µg/L	22	22	17	28	NA	NA	1.1	NA	NA	
Pyrene	µg/L	4.9	4.2	6.6	25	NA	NA	0.2	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx											
Diesel Range Hydrocarbons	mg/L	NA	NA	0.49	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations Carcinogenic polycyclic aromatic hydrocarbon
Toxic Equivancy Factors, presented in T Not available
2 Calculated using detected cPAH concen Non-detect
3 Calculated using detected cPAH concen Reporting Limit
Toxicity equivalency quotient

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.4
Monitoring Well Groundwater Analytical Data

Location		MW-08			MW-09							
Sample Date		06/07/2007	03/21/2008	06/22/2010	03/24/2008	09/14/2007	06/21/2010	12/05/2011	11/27/2012	10/1/2013	MTCA A CUL	
Volatile Organic Compounds by USEPA Method 8260												
1,1,1-Trichloroethane	µg/L	NA	0.20 U	NA	0.29	NA	NA	2.0 U	1.0 U	2.0 U	200	µg/L
1,1-Dichloroethane	µg/L	NA	0.20 U	NA	0.29	NA	NA	2.0 U	1.0 U	2.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
1,3,5-Trimethylbenzene	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Benzene	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	5	µg/L
Chloroform	µg/L	NA	0.70	NA	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Chloromethane	µg/L	NA	1.0 U	NA	1.0 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
cis-1,2-Dichloroethene	µg/L	NA	0.20 U	NA	0.21	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Cymene	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	1.0 U	NA	NA	
Ethylbenzene	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	700	µg/L
iso-Propylbenzene	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Methyl iso butyl ketone	µg/L	NA	2.0 U	NA	2.0 U	NA	NA	10 U	1.0 U	10.0 U	NA	
Naphthalene	µg/L	NA	1.0 U	NA	13	NA	NA	2.0 U	3.7	2.0 U	160	µg/L
n-Propylbenzene	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	1.0 U	2.0 U	NA	
Styrene	µg/L	NA	0.20 U	1.0 U	0.20 U	NA	1.0 U	2.0 U	1.0 U	2.0 U	NA	
Toluene	µg/L	NA	1.0 U	NA	1.0 U	NA	NA	2.0 U	1.0 U	2.0 U	1000	µg/L
Trichloroethene	µg/L	NA	0.69	NA	4.7	NA	NA	2.0 U	6.7	5.9	NA	
Xylene (meta & para)	µg/L	NA	0.40 U	NA	0.40 U	NA	NA	4.0 U	NA	4.0 U	NA	
Xylene (ortho)	µg/L	NA	0.20 U	NA	0.20 U	NA	NA	2.0 U	NA	2.0 U	NA	
Xylene (total)	µg/L	NA	0.60 U	NA	0.60 U	NA	NA	6.0 U	1.0 U	6.00 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270												
1-Methylnaphthalene	µg/L	0.099 U	0.10 U	NA	0.94	140	NA	NA	0.10 U	0.023	NA	
2-Methylnaphthalene	µg/L	0.099 U	0.10 U	NA	0.52 U	150	NA	NA	0.10 U	0.020 U	NA	
Naphthalene	µg/L	0.099 U	0.19	0.10 U	8.9	440	0.32	NA	0.10 U	0.020 U	NA	
Total Naphthalenes	µg/L	0.99 U	0.19	0.10 U	9.8	730	0.32	2.0 U	0.10 U	0.023	160	µg/L
Acenaphthene	µg/L	0.099 U	0.17	NA	6.0	94	NA	NA	0.10 U	0.12	NA	
Acenaphthylene	µg/L	0.099 U	0.10 U	NA	0.27	4.7	NA	NA	0.10 U	0.020 U	NA	
Anthracene	µg/L	0.099 U	0.10 U	NA	3.7	9.6	NA	NA	0.10 U	0.039	NA	
Benzo(a)anthracene	µg/L	0.015	0.021	0.10 U	0.40	0.53	0.14	NA	0.10 U	0.021	NA	
Benzo(a)pyrene	µg/L	0.0099 U	0.010 U	0.10 U	0.037	0.37	0.10 U	NA	0.10 U	0.029 U	0.10	µg/L
Benzo(b)fluoranthene	µg/L	0.011	0.012	0.10 U	0.047	0.44	0.10 U	NA	0.10 U	0.020 U	NA	
Indeno(1,2,3-cd)pyrene	µg/L	0.0099 U	0.011	0.10 U	0.012	0.29	0.10 U	NA	0.10 U	0.072	NA	
Benzo(k)fluoranthene	µg/L	0.011	0.012	0.10 U	0.044	0.28	0.10 U	NA	0.10 U	0.020 U	NA	
Chrysene	µg/L	0.011	0.017	0.10 U	0.34	0.55	0.11	NA	0.10 U	0.020 U	NA	
Dibenzo(a,h)anthracene	µg/L	0.0099 U	0.010 U	0.10 U	0.010 U	0.24	0.10 U	NA	0.10 U	0.070	NA	
cPAH TEQ ND=0[1,2]	µg/L	0.0038	0.0058	0	0.091	0.55	0.015	NA	0	0.016	0.10	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	0.0098	0.011	0.076 U	0.091	0.55	0.085	NA	0.076 U	0.033	0.10	µg/L
Benzo(g,h,i)perylene	µg/L	0.0099 U	0.010	NA	0.012	0.29	NA	NA	0.10 U	0.077	NA	
Fluoranthene	µg/L	0.099 U	0.10 U	NA	6.8	6.6	NA	NA	0.10 U	0.068	NA	
Fluorene	µg/L	0.099 U	0.10 U	NA	4.9	52	NA	NA	0.10 U	0.089	NA	
Phenanthrene	µg/L	0.099 U	0.10 U	NA	16	61	NA	NA	0.10 U	0.18	NA	
Pyrene	µg/L	0.099 U	0.10 U	NA	5.2	4.9	NA	NA	0.10 U	0.060	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx												
Diesel Range Hydrocarbons	mg/L	NA	0.27 U	NA	0.32	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.4
Monitoring Well Groundwater Analytical Data

Location		MW-10						MW-11				
Sample Date		06/22/2010	12/06/2011	11/27/2012	03/05/2013	06/04/2013	10/1/2013	06/22/2010	12/05/2011	11/27/2012	MTCA A CUL	
Volatile Organic Compounds by USEPA Method 8260												
1,1,1-Trichloroethane	µg/L	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	230	310	440	230	170	150	1.0 U	2.0 U	1.0 U	NA	
1,3,5-Trimethylbenzene	µg/L	90	110	87	77	63	57	1.0 U	2.0 U	1.0 U	NA	
Benzene	µg/L	1.3	2.0 U	1.6	2.0 U	2.0 U	2.0 U	0.35 U	2.0 U	1.0 U	5	µg/L
Chloroform	µg/L	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	NA	
Chloromethane	µg/L	10 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	10 U	2.0 U	1.0 U	NA	
cis-1,2-Dichloroethene	µg/L	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	NA	
Cymene	µg/L	11	13	9.8	29	22	NA	1.0 U	2.0 U	1.0 U	NA	
Ethylbenzene	µg/L	660	720	890	520	330	360	1.0 U	2.0 U	1.0 U	700	µg/L
iso-Propylbenzene	µg/L	41	42	40	36	27	28	1.0 U	2.0 U	1.0 U	NA	
Methyl iso butyl ketone	µg/L	10 U	10 U	1.0 U	10 U	10 U	10 U	10 U	10 U	1.0 U	NA	
Naphthalene	µg/L	NA	14000	14000	2300	12000	12000	NA	2.1	1.7	160	µg/L
n-Propylbenzene	µg/L	14	15	16	2.0 U	12	12	1.0 U	2.0 U	1.0 U	NA	
Styrene	µg/L	15	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	NA	
Toluene	µg/L	61	71	52	49	40	40	1.0 U	2.0 U	1.0 U	1000	µg/L
Trichloroethene	µg/L	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	NA	
Xylene (meta & para)	µg/L	790	950	NA	660	490	500	2.0 U	4.0 U	NA	NA	
Xylene (ortho)	µg/L	460	510	NA	370	310	290	1.0 U	2.0 U	NA	NA	
Xylene (total)	µg/L	1300	1500	1900	1000	800	790	3.0 U	6.0 U	1.0 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270												
1-Methylnaphthalene	µg/L	NA	NA	510	NA	NA	NA	NA	NA	0.10 U	NA	
2-Methylnaphthalene	µg/L	NA	NA	430	NA	NA	NA	NA	NA	0.10 U	NA	
Naphthalene	µg/L	10000	NA	11000	NA	NA	NA	3.1	NA	0.10 U	NA	
Total Naphthalenes	µg/L	10000	14000	12000	NA	NA	NA	3.1	2.1	0.10 U	160	µg/L
Acenaphthene	µg/L	NA	NA	6.9	NA	NA	NA	NA	NA	0.10 U	NA	
Acenaphthylene	µg/L	NA	NA	240	NA	NA	NA	NA	NA	0.10 U	NA	
Anthracene	µg/L	NA	NA	0.10 U	NA	NA	NA	NA	NA	0.10 U	NA	
Benzo(a)anthracene	µg/L	0.10 U	NA	0.10 U	NA	NA	NA	0.10 U	NA	0.10 U	NA	
Benzo(a)pyrene	µg/L	0.10 U	NA	0.10 U	NA	NA	NA	0.10 U	NA	0.10 U	0.10	µg/L
Benzo(b)fluoranthene	µg/L	0.10 U	NA	0.10 U	NA	NA	NA	0.10 U	NA	0.10 U	NA	
Indeno(1,2,3-cd)pyrene	µg/L	0.10 U	NA	0.10 U	NA	NA	NA	0.10 U	NA	0.10 U	NA	
Benzo(k)fluoranthene	µg/L	0.10 U	NA	0.10 U	NA	NA	NA	0.10 U	NA	0.10 U	NA	
Chrysene	µg/L	0.10 U	NA	0.10 U	NA	NA	NA	0.10 U	NA	0.10 U	NA	
Dibenzo(a,h)anthracene	µg/L	0.10 U	NA	0.10 U	NA	NA	NA	0.10 U	NA	0.10 U	NA	
cPAH TEQ ND=0[1,2]	µg/L	0	NA	0	NA	NA	NA	0	NA	0	0.10	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	0.076 U	NA	0.076 U	NA	NA	NA	0.076 U	NA	0.076 U	0.10	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	0.10 U	NA	NA	NA	NA	NA	0.10 U	NA	
Fluoranthene	µg/L	NA	NA	0.10 U	NA	NA	NA	NA	NA	0.10 U	NA	
Fluorene	µg/L	NA	NA	0.10 U	NA	NA	NA	NA	NA	0.10 U	NA	
Phenanthrene	µg/L	NA	NA	0.10 U	NA	NA	NA	NA	NA	0.10 U	NA	
Pyrene	µg/L	NA	NA	0.10 U	NA	NA	NA	NA	NA	0.10 U	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx												
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:
1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).
2 Calculated using detected cPAH concentrations.
3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:
cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.4
Monitoring Well Groundwater Analytical Data

Location		MW-11			MW-12						MTCA A CUL	
Sample Date		03/05/2013	06/04/2013	10/1/2013	06/22/2010	12/06/2011	11/27/2012	03/05/2013	06/04/2013	10/1/2013		
Volatile Organic Compounds by USEPA Method 8260												
1,1,1-Trichloroethane	µg/L	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	200	µg/L
1,1-Dichloroethane	µg/L	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	2.0 U	2.0 U	2.0 U	270	300	1.1	13	230	230	NA	
1,3,5-Trimethylbenzene	µg/L	2.0 U	2.0 U	2.0 U	110	110	1.0 U	3.5	86	96	NA	
Benzene	µg/L	2.0 U	2.0 U	2.0 U	13	12	1.0 U	2.0 U	14	13	5	µg/L
Chloroform	µg/L	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	NA	
Chloromethane	µg/L	2.0 U	2.0 U	2.0 U	10 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	NA	
cis-1,2-Dichloroethene	µg/L	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	NA	
Cymene	µg/L	2.0 U	2.0 U	NA	10	13	1.0 U	2.7	53	NA	NA	
Ethylbenzene	µg/L	2.0 U	2.0 U	2.0 U	1000	890	1.4	38	1000	900	700	µg/L
iso-Propylbenzene	µg/L	2.0 U	2.0 U	2.0 U	55	46	1.0 U	2.2	40	37	NA	
Methyl iso butyl ketone	µg/L	10 U	10 U	10 U	10 U	10 U	1.0 U	10 U	10 U	10 U	NA	
Naphthalene	µg/L	380	2.0 U	7.6	NA	11000	3700	210	12000	7500	160	µg/L
n-Propylbenzene	µg/L	2.0 U	2.0 U	2.0 U	16	16	1.0 U	2.0 U	17	15	NA	
Styrene	µg/L	2.0 U	2.0 U	2.0 U	1.2	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	NA	
Toluene	µg/L	2.0 U	2.0 U	2.0 U	270	350	1.0 U	15	370	370	1000	µg/L
Trichloroethene	µg/L	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	NA	
Xylene (meta & para)	µg/L	4.0 U	4.0 U	4.0 U	1100	940	NA	16	1100	1000	NA	
Xylene (ortho)	µg/L	2.0 U	2.0 U	2.0 U	600	530	NA	30	610	530	NA	
Xylene (total)	µg/L	6.0 U	6.0 U	6.0 U	1700	1500	1.0 U	46	1720	1530	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270												
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	0.10 U	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	0.10 U	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	8400	NA	0.10 U	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	8400	11000	0.10 U	NA	NA	NA	160	µg/L
Acenaphthene	µg/L	NA	NA	NA	NA	NA	2.7	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	7.8	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	0.10 U	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	0.27	NA	0.10 U	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	0.10 U	NA	0.10 U	NA	NA	NA	0.10	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	0.10 U	NA	0.10 U	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	0.10 U	NA	0.10 U	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	0.10 U	NA	0.10 U	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	0.23	NA	0.10 U	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	0.10 U	NA	0.10 U	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	0.029	NA	0	NA	NA	NA	0.10	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	0.099	NA	0.076 U	NA	NA	NA	0.10	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	0.10 U	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	1.8	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	0.10 U	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	0.10 U	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	1.3	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx												
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

	Location	MW-07		MW-09	SB-01	SB-02	MTCA A CUL	
	Sample ID	MW7-GW-45	MW7-52.5-GW	MW9-40-GW	SB1-34-GW	SB2-34-GW		
	Sample Da	1/26/2007	1/26/2007	9/6/2007	01/29/2007	01/29/2007		
Volatile Organic Compounds by USEPA Method 8260								
1,1,1-Trichloroethane	µg/L	NA	NA	NA	NA	NA	200	µg/L
1,1-Dichloroethane	µg/L	NA	NA	NA	NA	NA	NA	
1,2,4-Trimethylbenzene	µg/L	NA	NA	NA	NA	NA	NA	
1,3,5-Trimethylbenzene	µg/L	NA	NA	NA	NA	NA	NA	
Benzene	µg/L	NA	NA	NA	NA	NA	5	µg/L
Chloroform	µg/L	NA	NA	NA	NA	NA	NA	
Chloromethane	µg/L	NA	NA	NA	NA	NA	NA	
Carbon Disulfide	µg/L	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	NA	NA	NA	NA	NA	NA	
Cymene	µg/L	NA	NA	NA	NA	NA	NA	
Ethylbenzene	µg/L	NA	NA	NA	NA	NA	700	µg/L
iso-Propylbenzene	µg/L	NA	NA	NA	NA	NA	NA	
Methyl iso butyl ketone	µg/L	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	NA	
n-Butylbenzene	µg/L	NA	NA	NA	NA	NA	NA	
n-Propylbenzene	µg/L	NA	NA	NA	NA	NA	NA	
p-Isopropyltoluene	µg/L	NA	NA	NA	NA	NA	NA	
sec-Butylbenzene	µg/L	NA	NA	NA	NA	NA	NA	
Styrene	µg/L	NA	NA	NA	NA	NA	NA	
Toluene	µg/L	NA	NA	NA	NA	NA	1000	µg/L
Trichloroethene	µg/L	NA	NA	NA	NA	NA	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	NA	NA	NA	
Xylene (ortho)	µg/L	NA	NA	NA	NA	NA	NA	
Xylene (total)	µg/L	NA	NA	NA	NA	NA	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270								
1-Methylnaphthalene	µg/L	67	360	2900	0.87	0.50	NA	
2-Methylnaphthalene	µg/L	99	410	4700	0.95	0.37	NA	
Naphthalene	µg/L	200	810	9100	5.7	1.0	NA	
Total Naphthalenes	µg/L	370	1600	17000	7.5	1.9	NA	
Acenaphthene	µg/L	70	420	2500	0.86	0.61	NA	
Acenaphthylene	µg/L	3.9	19	110	0.12 U	0.096 U	NA	
Anthracene	µg/L	15	190	1100	0.13	0.11	NA	
Benzo(a)anthracene	µg/L	15	110	610	0.081	0.011	NA	
Benzo(a)pyrene	µg/L	15	56	310	0.095	0.014	0.1	µg/L
Benzo(b)fluoranthene	µg/L	18	76	410	0.093	0.026	NA	
Indeno(1,2,3-cd)pyrene	µg/L	6.9	20	110	0.056	0.013	NA	
Benzo(k)fluoranthene	µg/L	6.1	31	140	0.032	0.0096 U	NA	
Chrysene	µg/L	21	110	660	0.10	0.020	NA	
Dibenzo(a,h)anthracene	µg/L	2.6	8.2	49	0.015	0.0096 U	NA	
cPAH TEQ ND=0[1,2]	µg/L	20	82	450	0.12	0.019	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	20	82	450	0.12	0.020	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	7.5	22	110	0.072	0.020	NA	
Fluoranthene	µg/L	39	500	2300	0.16	0.096 U	NA	
Fluorene	µg/L	46	380	2000	0.57	0.36	NA	
Phenanthrene	µg/L	73	1100	5600	0.70	0.62	NA	
Pyrene	µg/L	35	430	2000	0.21	0.096 U	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx								
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivalency Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-03	SB-04	SB-05	SB-06		SB-07		
Sample ID		SB3-33-GW	SB4-35-GW	SB5-35-GW	SB6-22-RWG	SB6-37-RGW	SB7-24-RGW	MTCA A CUL	
Sample Date		01/31/2007	05/11/2007	05/11/2007	4/2/2009	4/2/2009	4/2/2009		
Volatile Organic Compounds by USEPA Method 8260									
1,1,1-Trichloroethane	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	200	µg/L
1,1-Dichloroethane	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
1,2,4-Trimethylbenzene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
1,3,5-Trimethylbenzene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
Benzene	µg/L	NA	NA	NA	NA	NA	NA	5	µg/L
Chloroform	µg/L	NA	NA	NA	1.1	0.20	1.0	NA	
Chloromethane	µg/L	NA	NA	NA	NA	NA	NA	NA	
Carbon Disulfide	µg/L	NA	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
Cymene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Ethylbenzene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	700	µg/L
iso-Propylbenzene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
Methyl iso butyl ketone	µg/L	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	1.0 U	1.3 U	1.0 U	NA	
n-Butylbenzene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
n-Propylbenzene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
p-Isopropyltoluene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
sec-Butylbenzene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
Styrene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
Toluene	µg/L	NA	NA	NA	1.0 U	1.0 U	1.0 U	1000	µg/L
Trichloroethene	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	0.40 U	0.40 U	0.40 U	NA	
Xylene (ortho)	µg/L	NA	NA	NA	0.20 U	0.20 U	0.20 U	NA	
Xylene (total)	µg/L	NA	NA	NA	0.60 U	0.60 U	0.60 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270									
1-Methylnaphthalene	µg/L	0.20	0.12 U	190	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	0.26	0.12 U	310	NA	NA	NA	NA	
Naphthalene	µg/L	0.76	0.12 U	1200	NA	NA	NA	NA	
Total Naphthalenes	µg/L	1.2	0.12 U	1700	NA	NA	NA	NA	
Acenaphthene	µg/L	0.18	0.12 U	170	NA	NA	NA	NA	
Acenaphthylene	µg/L	0.14 U	0.12 U	11 U	NA	NA	NA	NA	
Anthracene	µg/L	0.17	0.12 U	30	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	0.15	0.020	14	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	0.12	0.14	6.3	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	0.14	0.16	8.8	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	0.065	0.15	2.4	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	0.051	0.054	3.9	NA	NA	NA	NA	
Chrysene	µg/L	0.17	0.11	13	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	0.021	0.039	1.1 U	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	0.16	0.18	9.3	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	0.16	0.18	9.4	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	0.079	0.19	2.3	NA	NA	NA	NA	
Fluoranthene	µg/L	0.39	0.12 U	71	NA	NA	NA	NA	
Fluorene	µg/L	0.18	0.12 U	120	NA	NA	NA	NA	
Phenanthrene	µg/L	0.79	0.12 U	200	NA	NA	NA	NA	
Pyrene	µg/L	0.42	0.12 U	51	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx									
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-07	SB-08		SB-09		SB-10			
Sample ID		SB7-37-RGW	SB8-26-RGW	SB8-42-RGW	SB9-32-RGW	SB9-43-RGW	SP10-29	SB10-44	MTCA A CUL	
Sample Date		4/2/2009	4/2/2009	4/2/2009	4/1/2009	4/1/2009	5/12/2009	5/12/2009		
Volatile Organic Compounds by USEPA Method 8260										
1,1,1-Trichloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	20 U	0.20 U	0.20 U	200	µg/L
1,1-Dichloroethane	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	20 U	0.20 U	0.20 U	NA	
1,2,4-Trimethylbenzene	µg/L	0.20 U	0.20 U	0.20 U	1.2	140	0.20 U	0.20 U	NA	
1,3,5-Trimethylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.73	60	0.20 U	0.20 U	NA	
Benzene	µg/L	NA	NA	NA	NA	NA	0.20 U	0.72	5	µg/L
Chloroform	µg/L	1.60	1.1	0.64	0.26	20 U	0.20 U	0.20 U	NA	
Chloromethane	µg/L	NA	NA	NA	NA	NA	1.0 U	1.0 U	NA	
Carbon Disulfide	µg/L	NA	NA	NA	NA	NA	0.20 U	0.41	NA	
cis-1,2-Dichloroethene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	20 U	0.20 U	0.20 U	NA	
Cymene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Ethylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	20 U	0.20 U	1.3	700	µg/L
iso-Propylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.95	20 U	0.20 U	0.20 U	NA	
Methyl iso butyl ketone	µg/L	NA	NA	NA	NA	NA	2.0 U	2.0 U	NA	
Naphthalene	µg/L	1.0 U	1.0 U	1.0 U	11	4500	1.0 U	1.0 U	NA	
n-Butylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	47	0.20 U	0.20 U	NA	
n-Propylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.81	20 U	0.20 U	0.20 U	NA	
p-Isopropyltoluene	µg/L	0.20 U	0.20 U	0.20 U	0.75	20 U	0.20 U	0.20 U	NA	
sec-Butylbenzene	µg/L	0.20 U	0.20 U	0.20 U	0.66	20 U	0.20 U	0.20 U	NA	
Styrene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	20 U	0.20 U	0.20 U	NA	
Toluene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	100 U	1.0 U	1.3	1000	µg/L
Trichloroethene	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	20 U	0.20 U	0.20 U	NA	
Xylene (meta & para)	µg/L	0.40 U	0.40 U	0.40 U	0.40 U	40 U	0.40 U	0.40 U	NA	
Xylene (ortho)	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	20 U	0.20 U	0.20 U	NA	
Xylene (total)	µg/L	0.60 U	0.60 U	0.60 U	0.60 U	60 U	0.60 U	0.60 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270										
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Acenaphthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	NA	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx										
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-11		SB-21		SB-22	SB-23	SB-24	MTCA A CUL	
Sample ID		SB11-29	SB11-44	WCD-SB21-24.0-120611	WCD-SB21-39.0-120611	WCD-SB22-39.0-120611	WCD-SB23-39.0-120611	WCD-SB24-39.0-		
Sample Date		5/12/2009	5/12/2009	12/06/2011	12/06/2011	12/06/2011	12/06/2011	12/06/2011		
Volatile Organic Compounds by USEPA Method 8260										
1,1,1-Trichloroethane	µg/L	0.20 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	0.20 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	0.20 U	0.2 U	1.0 U	19	1.0 U	25	1.0 U	NA	
1,3,5-Trimethylbenzene	µg/L	0.20 U	0.2 U	1.0 U	6.9	1.0 U	8.3	1.0 U	NA	
Benzene	µg/L	0.20 U	0.2 U	1.0 U	14	1.0 U	3.1	1.0 U	5	µg/L
Chloroform	µg/L	0.20 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Chloromethane	µg/L	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Carbon Disulfide	µg/L	0.20 U	0.2 U	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	0.20 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Cymene	µg/L	NA	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Ethylbenzene	µg/L	0.20 U	0.2 U	1.0 U	91	1.0 U	85	1.0 U	700	µg/L
iso-Propylbenzene	µg/L	0.20 U	0.25	1.0 U	3.2	1.0 U	6.4	1.0 U	NA	
Methyl iso butyl ketone	µg/L	2.0 U	2 U	1.0 U	6.3	1.0 U	1.0 U	1.0 U	NA	
Naphthalene	µg/L	1.0 U	1 U	1.0 U	640	1.0 U	920	1.0 U	NA	
n-Butylbenzene	µg/L	0.20 U	0.2 U	NA	NA	NA	NA	NA	NA	
n-Propylbenzene	µg/L	0.20 U	0.2 U	1.0 U	1.1	1.0 U	2.0	1.0 U	NA	
p-Isopropyltoluene	µg/L	0.20 U	0.2 U	NA	NA	NA	NA	NA	NA	
sec-Butylbenzene	µg/L	0.20 U	0.2 U	NA	NA	NA	NA	NA	NA	
Styrene	µg/L	0.20 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Toluene	µg/L	1.8	1.5	1.4	39	1.0 U	13	1.0 U	1000	µg/L
Trichloroethene	µg/L	0.20 U	0.2 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Xylene (meta & para)	µg/L	0.40 U	0.4 U	NA	NA	NA	NA	NA	NA	
Xylene (ortho)	µg/L	0.20 U	0.2 U	NA	NA	NA	NA	NA	NA	
Xylene (total)	µg/L	0.60 U	0.6 U	1.0 U	97	1.0 U	61	1.0 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270										
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Acenaphthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	NA	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx										
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-25		SB-26		SB-27		MTCA A CUL	
Sample ID		WCD-SB25-23.0-121211	WCD-SB25-37.0-121211	WCD-SB26-23.0-121211	WCD-SB26-37.0-121211	WCD-SB27-23.0-121211	WCD-SB27-37.0-121211		
Sample Date		12/12/2011	12/12/2011	12/12/2011	12/12/2011	12/12/2011	12/12/2011		
Volatile Organic Compounds by USEPA Method 8260									
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,3,5-Trimethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Benzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5	µg/L
Chloroform	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Chloromethane	µg/L	1.0 U	2.0	1.0 U	2.3	1.0 U	3.3	NA	
Carbon Disulfide	µg/L	NA	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Cymene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Ethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	700	µg/L
iso-Propylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Methyl iso butyl ketone	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Naphthalene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
n-Butylbenzene	µg/L	NA	NA	NA	NA	NA	NA	NA	
n-Propylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
p-Isopropyltoluene	µg/L	NA	NA	NA	NA	NA	NA	NA	
sec-Butylbenzene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Styrene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Toluene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1000	µg/L
Trichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	NA	NA	NA	NA	
Xylene (ortho)	µg/L	NA	NA	NA	NA	NA	NA	NA	
Xylene (total)	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270									
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	NA	NA	NA	NA	
Acenaphthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx									
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-28	SB-29		SB-31		MTCA A CUL	
Sample ID		WCD-SB28-23.0-121211	WCD-SB29-25.0-120611	WCD-SB29-39.0-120611	WCD-SB31-22-26'	WCD-SB31-36-40'		
Sample Date		12/12/2011	12/06/2011	12/06/2011	11/12/2012	11/12/2012		
Volatile Organic Compounds by USEPA Method 8260								
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	1.0 U	1.0 U	140	9.0	60	NA	
1,3,5-Trimethylbenzene	µg/L	1.0 U	1.0 U	51	3.0	20	NA	
Benzene	µg/L	1.0 U	1.0 U	7.7	1.0 U	1.4	5	µg/L
Chloroform	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Chloromethane	µg/L	1.0	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Carbon Disulfide	µg/L	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1 U	1 U	NA	
Cymene	µg/L	1.0 U	1.0 U	1.0 U	1 U	1 U	NA	
Ethylbenzene	µg/L	1.0 U	1.0 U	620	24	150	700	µg/L
iso-Propylbenzene	µg/L	1.0 U	1.0 U	23	1.0	10	NA	
Methyl iso butyl ketone	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Naphthalene	µg/L	1.0 U	1.0 U	5400	1400	2700	NA	
n-Butylbenzene	µg/L	NA	NA	NA	1.0 U	1.0 U	NA	
n-Propylbenzene	µg/L	1.0 U	1.0 U	10	1.0 U	4.0	NA	
p-Isopropyltoluene	µg/L	NA	NA	NA	NA	NA	NA	
sec-Butylbenzene	µg/L	NA	NA	NA	1 U	1 U	NA	
Styrene	µg/L	1.0 U	1.0 U	1.0 U	1 U	1 U	NA	
Toluene	µg/L	1.0 U	1.0 U	95	3.5	20	1000	µg/L
Trichloroethene	µg/L	1.0 U	1.2	1.0 U	1.0 U	1.0 U	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	NA	NA	NA	
Xylene (ortho)	µg/L	NA	NA	NA	NA	NA	NA	
Xylene (total)	µg/L	1.0 U	1.0 U	740	42	340	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270								
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	NA	NA	NA	
Acenaphthene	µg/L	NA	NA	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx								
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-32		SB-33		SB-34			
Sample ID		WCD-SB32-22-26'	WCD-SB32-36-40'	WCD-SB33-22-26'	WCD-SB33-36-40'	WCD-SB34-26-30'	WCD-SB34-39-	MTCA A CUL	
Sample Da		11/12/2012	11/12/2012	11/12/2012	11/12/2012	11/19/2012	11/19/2012		
Volatile Organic Compounds by USEPA Method 8260									
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	25	100	10	45	7.9	61	NA	
1,3,5-Trimethylbenzene	µg/L	9.0	40	2.0	11	2.0	18	NA	
Benzene	µg/L	1.0 U	2.0	1.0 U	1.0 U	1.0 U	2.7	5	µg/L
Chloroform	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Chloromethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Carbon Disulfide	µg/L	NA	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Cymene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Ethylbenzene	µg/L	60	180	8.0	36	23	160	700	µg/L
iso-Propylbenzene	µg/L	4.0	20	1.0	6.0	1.4	13	NA	
Methyl iso butyl ketone	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Naphthalene	µg/L	1100	1600	1300	2300	280	540	NA	
n-Butylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
n-Propylbenzene	µg/L	1.0	7.0	1.0 U	3.0	1.0 U	3.5	NA	
p-Isopropyltoluene	µg/L	NA	NA	NA	NA	NA	NA	NA	
sec-Butylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Styrene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Toluene	µg/L	6.0	28	1.0 U	3.0	2.6	20	1000	µg/L
Trichloroethene	µg/L	2.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	NA	NA	NA	NA	
Xylene (ortho)	µg/L	NA	NA	NA	NA	NA	NA	NA	
Xylene (total)	µg/L	110	400	9.0	47	36	310	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270									
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	NA	NA	NA	NA	
Acenaphthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx									
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).
2 Calculated using detected cPAH concentrations.
3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-35		SB-36		SB-37		MTCA A CUL	
Sample ID		WCD-SB35-26-30'	WCD-SB35-39-43'	WCD-SB36-26-30'	WCD-SB36-39-43'	WCD-SB37-26-30'	WCD-SB37-35-39'		
Sample Da		11/19/2012	11/19/2012	11/19/2012	11/19/2012	11/19/2012	11/19/2012		
Volatile Organic Compounds by USEPA Method 8260									
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	5.4	67	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,3,5-Trimethylbenzene	µg/L	1.8	23	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Benzene	µg/L	1.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5	µg/L
Chloroform	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Chloromethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Carbon Disulfide	µg/L	NA	NA	NA	NA	NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Cymene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Ethylbenzene	µg/L	10	98	1.0 U	1.0 U	1.0 U	1.0 U	700	µg/L
iso-Propylbenzene	µg/L	1.1	13	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Methyl iso butyl ketone	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Naphthalene	µg/L	320	1800	880	97.0	1.0 U	19.0	NA	
n-Butylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
n-Propylbenzene	µg/L	1.0 U	5.3	1.0 U	1.0 U	1.0 U	1.0 U	NA	
p-Isopropyltoluene	µg/L	NA	NA	NA	NA	NA	NA	NA	
sec-Butylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Styrene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Toluene	µg/L	1.0	6.9	1.0 U	1.0 U	1.0 U	1.0 U	1000	µg/L
Trichloroethene	µg/L	1.0 U	1.0 U	1.1	1.0 U	1.0 U	1.1	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	NA	NA	NA	NA	
Xylene (ortho)	µg/L	NA	NA	NA	NA	NA	NA	NA	
Xylene (total)	µg/L	15	180	1.0 U	1.0 U	1.0 U	1.0 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270									
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	NA	NA	NA	160	µg/L
Acenaphthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx									
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.5
Reconnaissance Groundwater Analytical Data

Location		SB-38		SB-39			
Sample ID		WCD-SB38-26-30'	WCD-SB38-39-43'	WCD-SB39-26-30'	WCD-SB39-39-43'		
Sample Da		11/19/2012	11/19/2012	11/19/2012	11/19/2012	MTCA A CUL	
Volatile Organic Compounds by USEPA Method 8260							
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	200	µg/L
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,2,4-Trimethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
1,3,5-Trimethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Benzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	5	µg/L
Chloroform	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Chloromethane	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Carbon Disulfide	µg/L	NA		NA	NA	NA	
cis-1,2-Dichloroethene	µg/L	1.0 U	NA U	1.0 U	1.0 U	NA	
Cymene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Ethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	700	µg/L
iso-Propylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Methyl iso butyl ketone	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Naphthalene	µg/L	1.0 U	7.8	1.0 U	1.0 U	NA	
n-Butylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
n-Propylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
p-Isopropyltoluene	µg/L	NA	NA	NA	NA	NA	
sec-Butylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Styrene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Toluene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1000	µg/L
Trichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	NA	
Xylene (meta & para)	µg/L	NA	NA	NA	NA	NA	
Xylene (ortho)	µg/L	NA	NA	NA	NA	NA	
Xylene (total)	µg/L	1 U	1 U	1.0 U	1.0 U	1000	µg/L
Semivolatile Organic Compounds by USEPA Method 8270							
1-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	
2-Methylnaphthalene	µg/L	NA	NA	NA	NA	NA	
Naphthalene	µg/L	NA	NA	NA	NA	NA	
Total Naphthalenes	µg/L	NA	NA	NA	NA	160	µg/L
Acenaphthene	µg/L	NA	NA	NA	NA	NA	
Acenaphthylene	µg/L	NA	NA	NA	NA	NA	
Anthracene	µg/L	NA	NA	NA	NA	NA	
Benzo(a)anthracene	µg/L	NA	NA	NA	NA	NA	
Benzo(a)pyrene	µg/L	NA	NA	NA	NA	0.1	µg/L
Benzo(b)fluoranthene	µg/L	NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	µg/L	NA	NA	NA	NA	NA	
Benzo(k)fluoranthene	µg/L	NA	NA	NA	NA	NA	
Chrysene	µg/L	NA	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	µg/L	NA	NA	NA	NA	NA	
cPAH TEQ ND=0[1,2]	µg/L	NA	NA	NA	NA	0.1	µg/L
cPAH TEQ ND=1/2 RL[1,3]	µg/L	NA	NA	NA	NA	0.1	µg/L
Benzo(g,h,i)perylene	µg/L	NA	NA	NA	NA	NA	
Fluoranthene	µg/L	NA	NA	NA	NA	NA	
Fluorene	µg/L	NA	NA	NA	NA	NA	
Phenanthrene	µg/L	NA	NA	NA	NA	NA	
Pyrene	µg/L	NA	NA	NA	NA	NA	
Total Petroleum Hydrocarbons by NWTPH-Dx							
Diesel Range Hydrocarbons	mg/L	NA	NA	NA	NA	500	µg/L

Notes:

1 Calculation of cPAH TEQ concentrations was performed using the California Environmental Protection Agency 2005 Toxic Equivancy Factors, presented in Table 708-2 of WAC 173-340-900 (Ecology 2007).

2 Calculated using detected cPAH concentrations.

3 Calculated using detected cPAH concentrations plus one-half the reporting limit for cPAHs that were not detected.

Abbreviations:

cPAH Carcinogenic polycyclic aromatic hydrocarbon
NA Not available
ND Non-detect
RL Reporting Limit
TEQ Toxicity equivalency quotient
U Undetected
CUL Cleanup Level

Table 2.6
Monitoring Well Groundwater Analytical Data for Site Contaminants of Concern

Well ID	Date	Benzene (µg/Kg)	Ethylbenzene (µg/Kg)	Toluene (µg/Kg)	Xylene (total) (µg/Kg)	Naphthalene (µg/Kg)	Total Naphthalenes (µg/Kg)	cPAH TEQ ND=1/2 RL (µg/Kg)
MW-1	6/22/2010	NA	NA	NA	NA	NA	0.77	NA
	11/27/2012	1 U	1 U	1 U	1 U	1.6	0.1 U	0.076 U
	3/5/2012	2 U	2 U	2 U	6 U	2 U	NA	NA
	6/4/2012	2 U	2 U	2 U	6 U	2 U	NA	NA
	10/1/2013	2 U	2 U	2 U	6 U	2 U	NA	NA
MW-5	6/21/2010	0.35 U	1 U	1 U	3 U		0.39	**2.283**
	12/5/2011	2 U	2 U	2 U	6 U	31	31	NA
	11/27/2012	1 U	1 U	1 U	1 U	9.3	12	0.076 U
	3/5/2013	2 U	2 U	2 U	6 U	70	NA	NA
	6/4/2013	2 U	2 U	2 U	6 U	5	NA	NA
	10/1/2013	2 U	2 U	2 U	6 U	2 U	NA	NA
MW-6	6/21/2010	0.35 U	7.6	1 U	104	NA	**6700**	8.188
	12/6/2011	2 U	2.1	2 U	52	**9200**	**9200**	NA
	11/27/2012	1 U	3	1 U	63	**9700**	**12000**	0.084
	3/5/2013	2 U	2.1	2 U	42	**1100**	NA	**0.71**
	6/4/2013	2 U	2 U	2 U	30	**10000**	**8600**	**0.73**
	10/1/2013	2 U	3.1	2 U	39	**12000**	NA	**0.26**
MW-7*	6/21/2010	NA	NA	NA	NA	NA	**1200**	0.6373
	12/5/2011	2 U	2 U	2 U	6 U	**890**	**890**	NA
	11/27/2012	1 U	1 U	1 U	1 U	2.8	5.2	0.076 U
	10/1/2013	2 U	2 U	2 U	6 U	120	NA	NA
MW-9	6/21/2010	NA	NA	NA	NA	NA	0.32	0.0851
	12/5/2011	2 U	2 U	2 U	6 U	2	2 U	NA
	11/27/2012	1 U	1 U	1 U	1 U	3.7	0.1 U	0.076 U
	10/1/2013	2 U	2 U	2 U	6 U	2 U	NA	0.033
MW-10	6/22/2010	1.3	660	61	**1300**	NA	**10000**	0.0755 U
	12/6/2011	2 U	**720**	71	**1500**	**14000**	**14000**	NA
	11/27/2012	1.6	**890**	52	**1900**	**14000**	**12000**	0.076 U
	3/5/2013	2 U	520	49	**1000**	**2300**	NA	NA
	6/4/2013	2 U	330	40	800	**12000**	NA	NA
	10/1/2013	2 U	360	40	790	**12000**	NA	NA
MW-11	6/22/2010	0.35 U	1 U	1 U	3 U	NA	3.1	0.0755 U
	12/5/2011	2 U	2 U	2 U	6 U	2.1	2.1	NA
	11/27/2012	1 U	1 U	1 U	1 U	1.7	0.1 U	0.076 U
	3/5/2013	2 U	2 U	2 U	6 U	**380**	NA	NA
	6/4/2013	2 U	2 U	2 U	6 U	2	NA	NA
	10/1/2013	2 U	2 U	2 U	6 U	7.6	NA	NA
MW-12	6/22/2010	**13**	**1000**	270	**1700**	NA	**8400**	0.0993
	12/6/2011	**12**	**890**	350	**1500**	**11000**	**11000**	NA
	11/27/2012	1 U	1.4	1 U	1	**3700**	0.1 U	0.076
	3/5/2013	2 U	38	15	46	**210**	NA	NA
	6/4/2013	**14**	**1000**	370	**1720**	**12000**	NA	NA
	10/1/2013	**13**	**900**	370	**1530**	**7500**	NA	NA
MTCA A CUL		5	700	1000	1000	160	160	0.1

Notes

bold Indicates a concentration that exceeds the MTCA Method A CUL

* Well could not be sampled in March and June 2013 due to access issues with warehouse tenant

Abbreviations

CUL Cleanup Level

NA Not available or not analyzed

U Undetected

Table 3.1
Groundwater Monitoring Well Naphthalene and Dissolved Oxygen Concentrations

Well ID	Sample Date	Dissolved Oxygen (mg/L)	Naphthalene (ug/L)
Upgradient Wells			
MW-1	11/27/2012	1.51	1.6
MW-1	3/5/2013	2.01	2
MW-1	6/4/2013	1.4	2
MW-1	10/1/2013	2.24	2
MW-5	11/27/2012	2.29	9.3
MW-5	3/5/2013	3.52	70
MW-5	6/4/2013	3.9	5
MW-5	10/1/2013	2.61	2
	Ugradient Well Average	2.4	11.7
Plume Fringe Wells			
MW-7	11/27/2012	0.12	2.8
MW-7	10/1/2013	1.37	120
MW-11	11/27/2012	0.2	1.7
MW-11	3/5/2013	0.48	**380**
MW-11	6/4/2013	0	2
MW-11	10/1/2013	1.45	7.6
	Plume Fringe Well Average	0.6	85.7
Plume Interior Wells			
MW-6	11/27/2012	0.16	**9700**
MW-6	3/5/2013	0.24	**1100**
MW-6	6/4/2013	0	**10000**
MW-6	10/1/2013	0.83	**12000**
MW-10	11/27/2012	0.08	**14000**
MW-10	3/5/2013	0.14	**2300**
MW-10	6/4/2013	0	**12000**
MW-10	10/1/2013	1.06	**12000**
MW-12	11/27/2012	0.05	**3700**
MW-12	3/5/2013	0.12	**210**
MW-12	6/4/2013	0	**12000**
MW-12	10/1/2013	1.34	**7500**
Plume Interior Well Average		0.3	8043

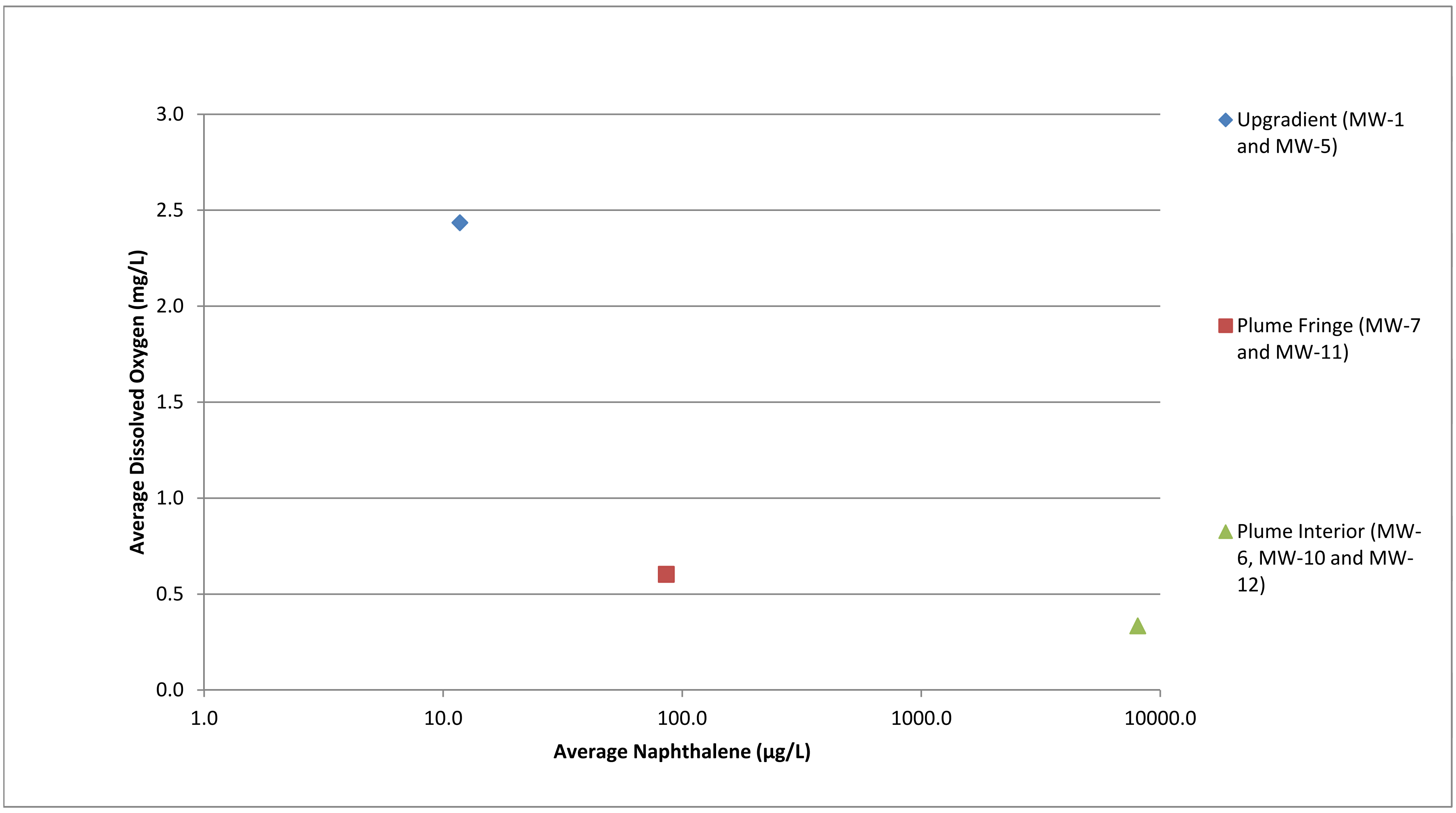

Table 4.1
Summary of Contaminants of Concern and Cleanup Levels

Analyte	Proposed Cleanup Level	Unit	Cleanup Level Basis	Maximum Reported Concentration	Unit	Sample ID
Soil						
Naphthalene	5	mg/kg	MTCA Method A Industrial Table Value	470	mg/kg	SP2-B-30.0
cPAH TEQ	2	mg/kg	MTCA Method A Industrial Table Value	120	mg/kg	SP3-3-4
Groundwater						
Naphthalene	160	µg/L	MTCA Method A Table Value	14,000	µg/L	WCD-MW10-120611
Benzene	5	µg/L	MTCA Method A Table Value	14	µg/L	WCD-SB21-39.0-120611
Ethylbenzene	700	µg/L	MTCA Method A Table Value	1,000	µg/L	WCD-MW12-42
Xylenes	1,000	µg/L	MTCA Method A Table Value	1,700	µg/L	WCD-MW12-42

Abbreviations:
cPAH Carcinogenic polycyclic aromatic hydrocarbon
TEQ Toxic equivalency quotient

Table 4.2
Physical and Chemical Properties of Site Contaminants of Concern

Contaminant of Concern	CAS Number	Boiling Point (°C)	Melting Point (°C)	Specific Gravity	Form at 20°C	Vapor Pressure at 25°C (atm)	Solubility at 20°C (mg/L)	Henry's Law Constant at 25°C (atm-m³/mol)	Partitioning Coeffiecient Organic Carbon to Water (K_{oc}) (cm³/g)	Mobility in Water
VOCs										
1-Methylnaphthalene	90-12-0	245 [1]	-22 [1]	1.022 [1]	Liquid	7.10E-05 [1]	25.8 at 25°C [1]	3.6E-04 [1]	NA	Moderate
2-Methylnaphthalene	91-57-6	241 [1]	34.6 [1]	1.0076 [1]	Solid	8.90E-05 [1]	24.6 at 25°C [1]	5.0E-04 [1]	2450 [1]	Moderate
Naphthalene	91-20-3	218 [1]	80.5 [1]	1.15 [1]	Solid	1.14E-04 [1]	31.7 at 25°C [1]	4.6E-04 [1]	1200 [2]	Moderate
Benzene	71-43-2	80.1 [1]	5.5 [1]	0.879 [1]	Liquid	0.0987 at 20°C [1]	0.188 at 25°C [1]	0.0055 [1]	63.1 to 79.4 [1]	High
Ethylbenzene	100-41-4	136.19 [1]	-94.98 [1]	0.867 [1]	Liquid	0.0125 [1]	152 [1]	0.0079 [1]	166 to 251 [1]	High
Xylenes (mixture)	1330-20-7	137-140 [1]	--	0.864 [1]	Liquid	0.00884 at 21°C [1]	106 at 25°C [1]	--	--	Moderate
m-Xylene	*108-38-3*	*139.1*	*-47.8*	*0.864* [4]	*Liquid*	*0.01091*	*161 at 25°C*	*0.0072*	*1580*	*Moderate*
o-Xylene	*95-47-6*	*144.5*	*-25.2*	*0.880*	*Liquid*	*0.00870*	*178 at 25°C*	*0.0052*	*1320*	*Moderate*
p-Xylene	*106-42-3*	*138.4*	*13.2*	*0.861*	*Liquid*	*0.0116*	*162 at 25°C*	*0.0069*	*1410*	*Moderate*
cPAHs										
Benzo(a)pyrene	50-32-8	310 to 312 [3] at 0.013 atm	179 [5]	1.351 [6]	Solid	7.22E-12 [7] (extrapolated value)	1.62E-03 [8]	4.6E-07 [9]	1.02E+06 [10]	Low
Benzo(a)anthracene	56-55-3	437.6 [11]	160 [12]	1.25 [13]	Solid	6.58E-12 [14]	9.40E-03 [15]	3.4E-06 [10]	3.98E+05 [10]	Low
Benzo(b)fluoranthene	205-99-2	716 [16]	168 [17]	NA	Solid	6.58E-10 [18]	0.0015 [16]	1.1E-04 [16]	1.23E+06 [10]	Low
Benzo(k)fluoranthene	207-08-9	480 [17]	217 [17]	NA	Solid	1.28E-12 [19]	8.00E-04 [20]	5.8E-07 [9]	1.23E+06 [10]	Low
Chrysene	218-01-9	448 [17]	258.2 [17]	1.274 [12]	Solid	8.20E-12 [21]	0.0063 [16]	9.4E-05 [16]	3.98E+05 [10]	Low
Dibenz(a,h)anthracene	53-70-3	524 [22]	269.5 [17]	1.282 [4]	Solid	1.26E-12 [23]	0.0005 [4]	7.3E-08 [24]	3.80E+06 [10]	Low
Indeno(1,2,3-c,d)pyrene	193-39-5	536 [22]	163.6 [4]	NA	Solid	1.00E-10 [25]	6.20E-02 [26]	3.5E-07 [9]	3.47E+06 [10]	Low

Notes:

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Abbreviations:

NA Not available
USEPA U.S. Environmental Protection Agency

Table 4.3
Preliminary Screening of Remedial Alternatives

Remedial Alternative	Description	Disadvantages?	Retain for Further Evaluation? (yes/no)
Soil			
No Action	Leave site in current state; for comparison purposes to other remedies.	No reduction in contaminant concentrations, no monitoring, no institutional controls	Yes
Retain Existing Soil Barriers with Institutional Controls	Maintenance of current impermeable concrete building floor over soil source area. Protective equipment to be worn by workers if subsurface work is undertaken within the zone of soil contamination. Instititonal controls to alert future buyers of contamiation in place.	Does not remove source material.	Yes
Excavation	Excavation of soils uniformly to a depth of approximately 45 ft bgs within the footprint of the former creosoting retort at minimum, with possible additional excavation at this depth depending on the results of confirmation sampling. Soils in approximately 787,000 sq ft of the presumed regraded area would need to be excavated to a depth of approximately 15 ft bgs. No clean overburden assumed.	Would require demolition of the south warehouse and its foundations as well as limited disturbance to the west in the S. Cedar St. right-of-way. Would require rerouting of any subsurface utilities, construction of a temporary shoring system, and dewatering to excavation below water table. Redirection of traffic on S. Cedar St. Some excavated soils may be classified as Dangerous Waste or Extremely Dangerous Waste, requiring more expensive disposal. Signficant permitting challenges. Very high expense ($10-20MM)	No
In-Situ Thermal Solidification (ISTS)	Heating elements in thermal wells heat subsurface soils to temperature at or slightly above boiling point of water. Volatiles (BETX and Naphthalene) are distilled for vapor recovery, residual heavy end contamination is solidified and remains in soil but cannot leach.	Requires signficant construction activities inside building and subsequent economic loss, also requires dewatering in saturated zone. Intensive energy demands may require new electrical service, and systems require approximately 6 months to construct.	Yes
Chemical Oxidation	Injection of oxidants such as hydroxyl radical, ozone, hydrogen peroxide or permanganate into source area soils. Oxidants react with contaminants to break down into non-hazardous carbon dioxide, water and inorganic choloride. Effective for treating BETX. Short time frame and little to no waste material generated.	Limited by tight formations and presence of contaminated groundwater which displaces oxidants; small radius of influence due to reactivity. Not cost-effective for large volumes of contamination where large volumes of oxidant required. Not proven effective for treating PAHs.	No
Bioventing	*In-situ* method that both volatilizes and bioremediates petroleum hydrocarbons. Works by injecting very low pressure air into the subsurface soils with a blower or compressor; fresh air supplies oxygen to soil microbes to enhanceaerobic biodegradation of contaminants. Injected air typically not recovered during treatment because contaminants in the air flow are biodegraded in subsurface soil. Found to be effective for remediation of certain more degradable SVOC compounds such as naphthalene, would help to reduce input of naphthalene from the source area soils to groundwater.	Period of operation would extend for estimated 36 to 72 months. Remedy not considered permanent for site, not effective on cPAH compounds. Cannot effectively treat very highly contaminated soils.	No
Groundwater			
No Action	Leave site in current state; for comparison purposes.	No monitoring to estalish if plume is expanding or shrinking.	Yes
Monitored Natural Attenuation with Institutional Controls	BIOSCREEN modeling shows plume attenuating within 150-200 feet from source area. Monitoring would be continued on annual or bi-annual basis, and site groundwater could not be pumped for drinking water use.	No reduction in contaminant loads beyond what is naturally occuring. Potential long monitoring schedule of 10+ years.	Yes
Low Permeability Containment Barrier (Slurry Wall)	Placement of a slurry wall extending entirely around and deeper into the subsurface than the groundwater contamination plume, effectively trapping the contamination in place and preventing further groundwater migration of napthalene from the now trapped source area inside the barrier	Would require and open north end due to intervening warehouse. Pumping would likely be required inside building to maintain inward gradient so groundwater flows into the wall, which would necessitate a long term pump and treat system. Generates a liquid waste stream which requires treatment and disposal for several years.	Yes

Table 4.3
Preliminary Screening of Remedial Alternatives

Remedial Alternative	Description	Disadvantages?	Retain for Further Evaluation? (yes/no)
In-well stripping	Injection of compressed air into a well that is screened in both the saturated and vadose zone. Air is injected into the well at its lower well screen lifts the water inside the well casing. Water is stripped of its volatiles and oxygenated, then re-injected into the vadose zone just above the water table through the upper well screen, creating a circulation zone around the well. A separate vacuum pump removes the stripped volatiles from the well casing. The extracted air is treated at the ground surface to remove volatiles before discharge.	Systems are typically operational for a period of 18 to 24 months before the amount of extracted mass reaches asymptotic levels. This technology is only effective for volatiles and not effective for the heavier hydrocarbons and cPAH compounds.	No
Air Sparging	Installation of multiple sparge wells and a compressed air system to convey air to the sparge wells. Compressed air is injected into each sparge well in a zone below the contaminant to allow dispersion and spreading of the injected air mass upward through the contaminated soils containing the groundwater plume. Volatile organics are stripped from groundwater at an increased rate due to increased exposure of contaminated water to air.Aalso enhances bioremediation by increasing the dissolved oxygen content of groundwater. Volatilespartition into the unsaturated soil where they undergo bioremediation.	Typically require approximately 36 months of operational monitoring. The ability of the air to reach the contamination may be limited in those areas where silt layers exist, as these tighter soils do not allow for effective dispersion of the injected air. Air sparging also has difficulty treating compounds that have low vapor pressures such as napthalene which are resistant to stripping.	No
Insitu Bioremediation	.Injection of oxygen-releasing compound or nutrient/amendments into area of groundwater contamination using a Geoprobe or permanent well delivery system. Installed in a row of injection points to form a "biobarrier". Increased oxygen will accelerate bacteriological breakdown of napthalene and BTEX. Includes 12-24 months of monitoring to guage effectiveness.	Multiple injections may be required to achieve cleanup levels due to high concentrations of organic contaminants. Effectiveness of technology is limited by tight formations and silt layers which reduce area of influence of injection sites and may create preferential pathways which prevent all of subsurface from being exposed to remedy.	Yes
Chemical Oxidation	In-situ application of strong chemical oxidizers such as the hydroxyl radical, ozone, persulfate or permanganate to chemically break down organic contamination. A fluid containing a diluted oxidizer is injected into the saturated zone under pressure and disperses via injection pressure along permeable groundwater zones, where it breaks down the contamination it encounters.	Only effective for contamination in the dissolved phase, and only effective in areas in which direct contact between the oxidizer and contaminant can occur. The oxidizer is non-selective and may also react with natural soil organic matter and minerals, which limits its effectiveness under these conditions. Ttechnology is limited by tight formations, as the ozone may not reach only a limited area and may travel along preferential pathways in the formation.	Yes
Pump and Treat	Installation of 5-6 conventional pumping wells with above ground treatment of the water, and disposal to the sanitary sewer or re-injection downgradient of the groundwater plume if suitably clean effluent is achieved. Goal is containment of groundwater contamination.	Little actual reduction in contaminant mass given large ratio of source soil mass in the saturated zone compared to the mass of contaminants in groundwater. Source soils would continue to leach to groundwater for many years. Long term capture strategy that would require continuous operation for a long time period, thus having a significant long term operations and maintenance expense.	No

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Figures

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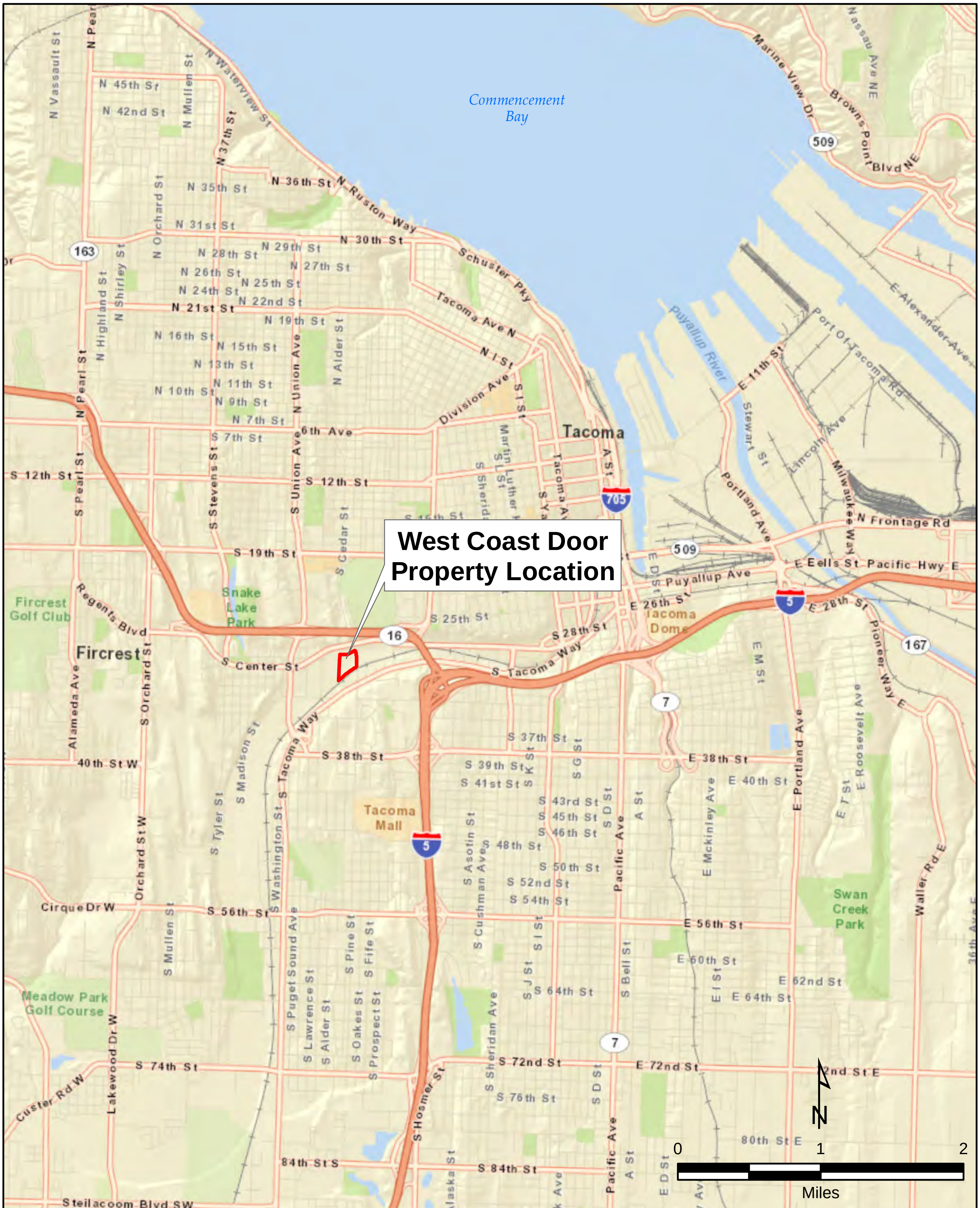

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Figure 1.1
Vicinity Map

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 1.1 (Vicinity Map).mxd
4/17/2012

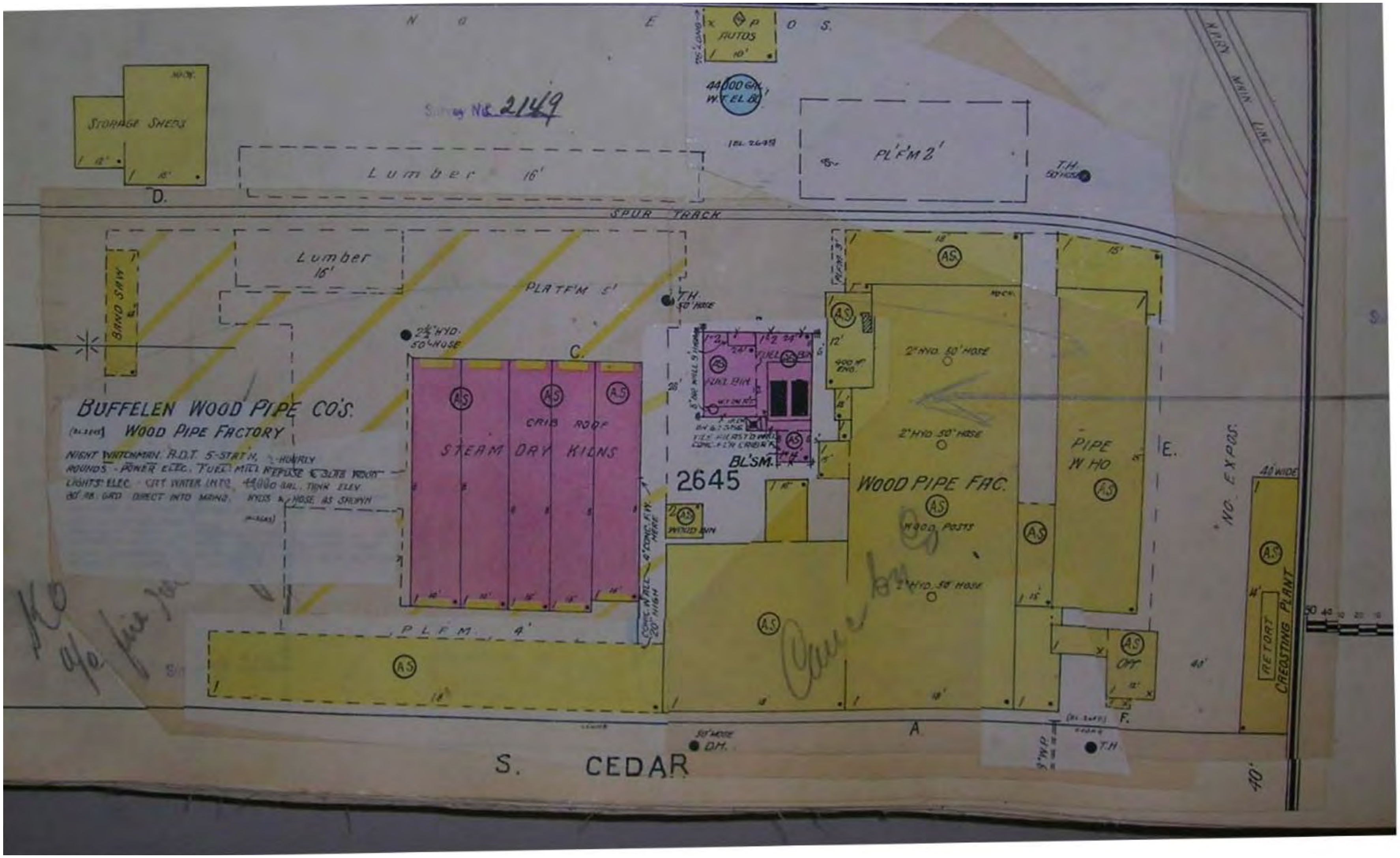
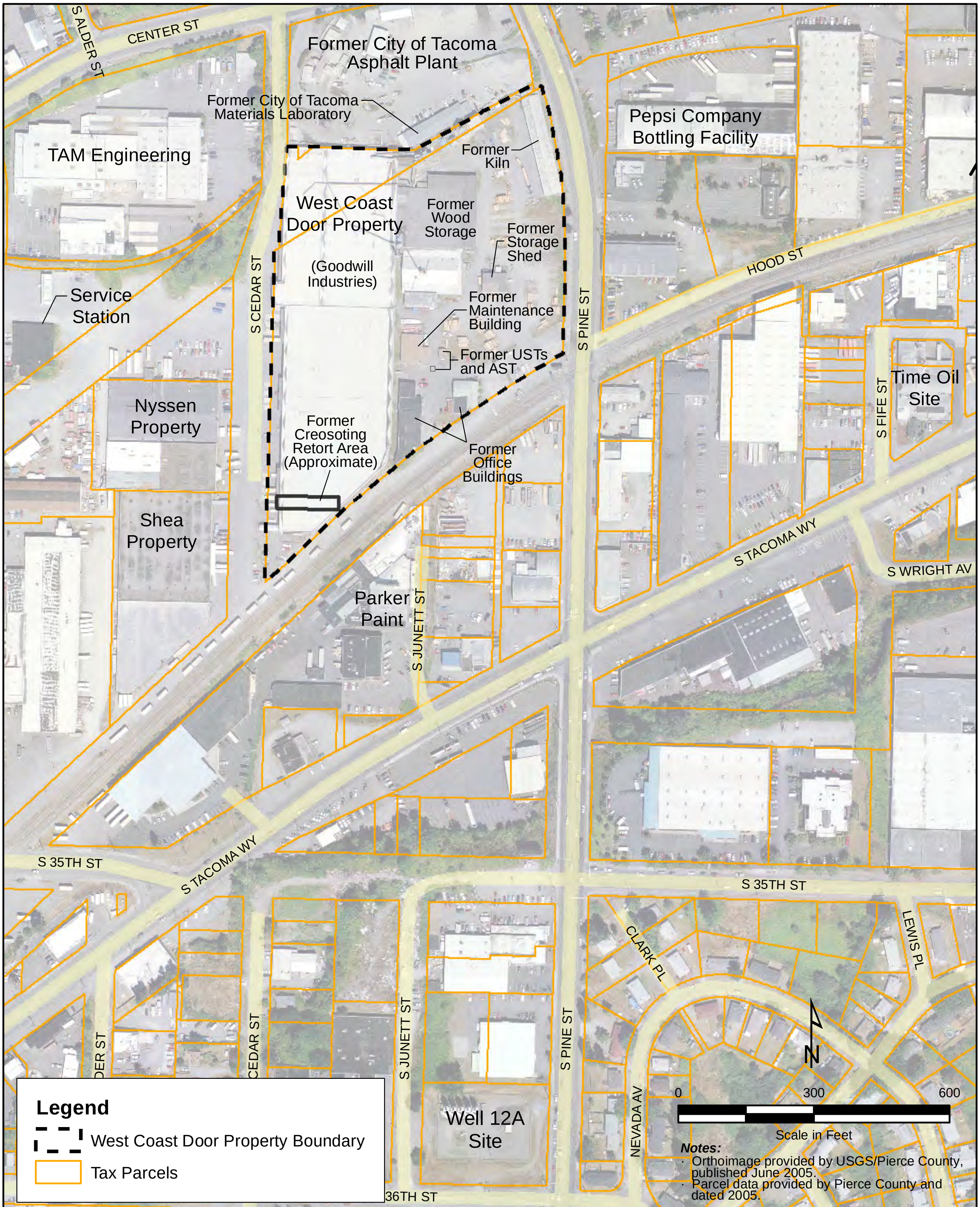


Image from Sanborn Maps

FLOYD | SNIDER strategy ▪ science ▪ engineering	**Remedial Investigation/Feasibility Study** **West Coast Door** **Tacoma, Washington**	Figure 1.2 Former Creosoting Facility Operations

January



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Tacoma, Washington

Figure 1.3
Historical Site Operations and Surrounding Property Use

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 1.3 (Historical Site Operations and Surrounding Prop Use).mxd
6/13/2012

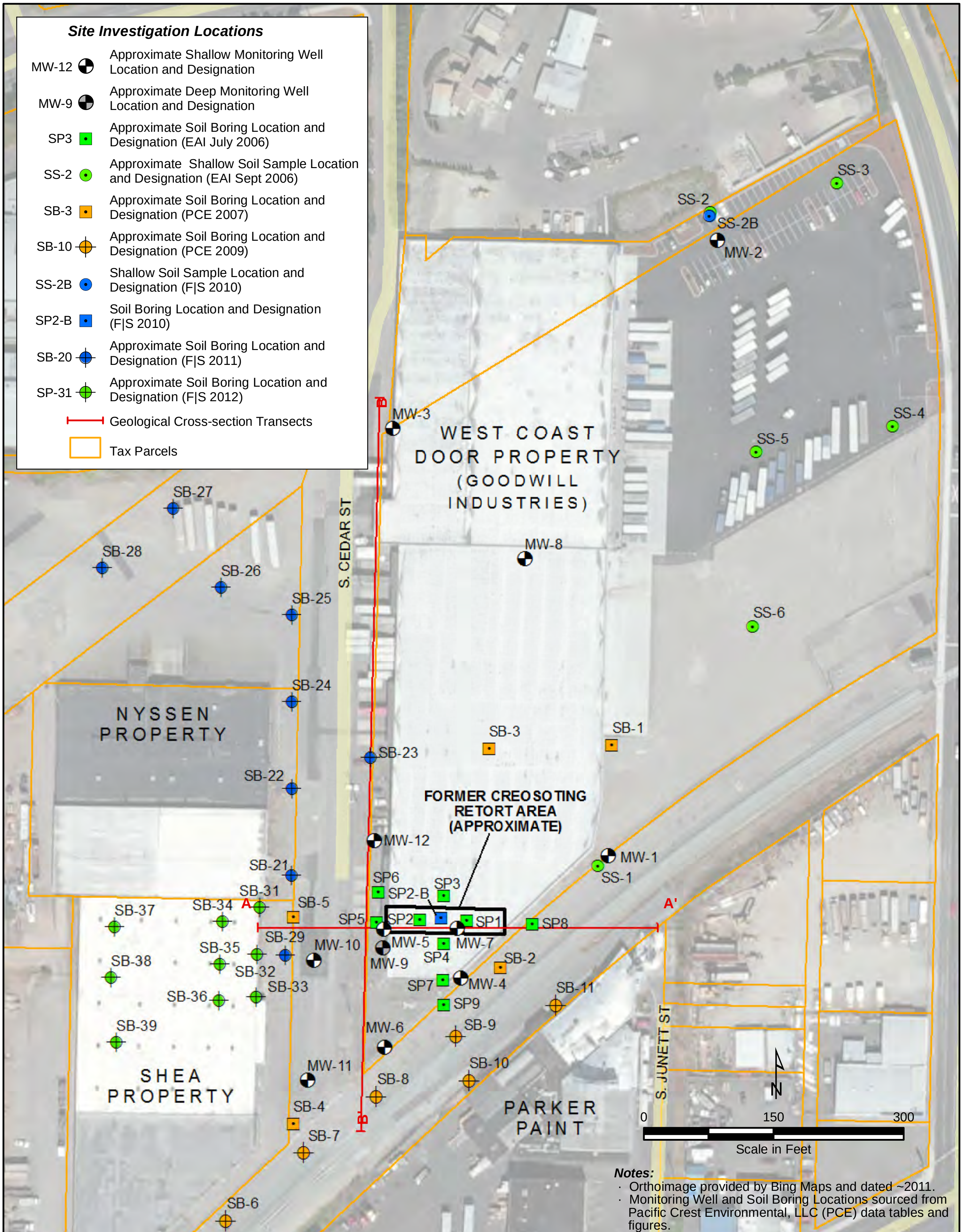

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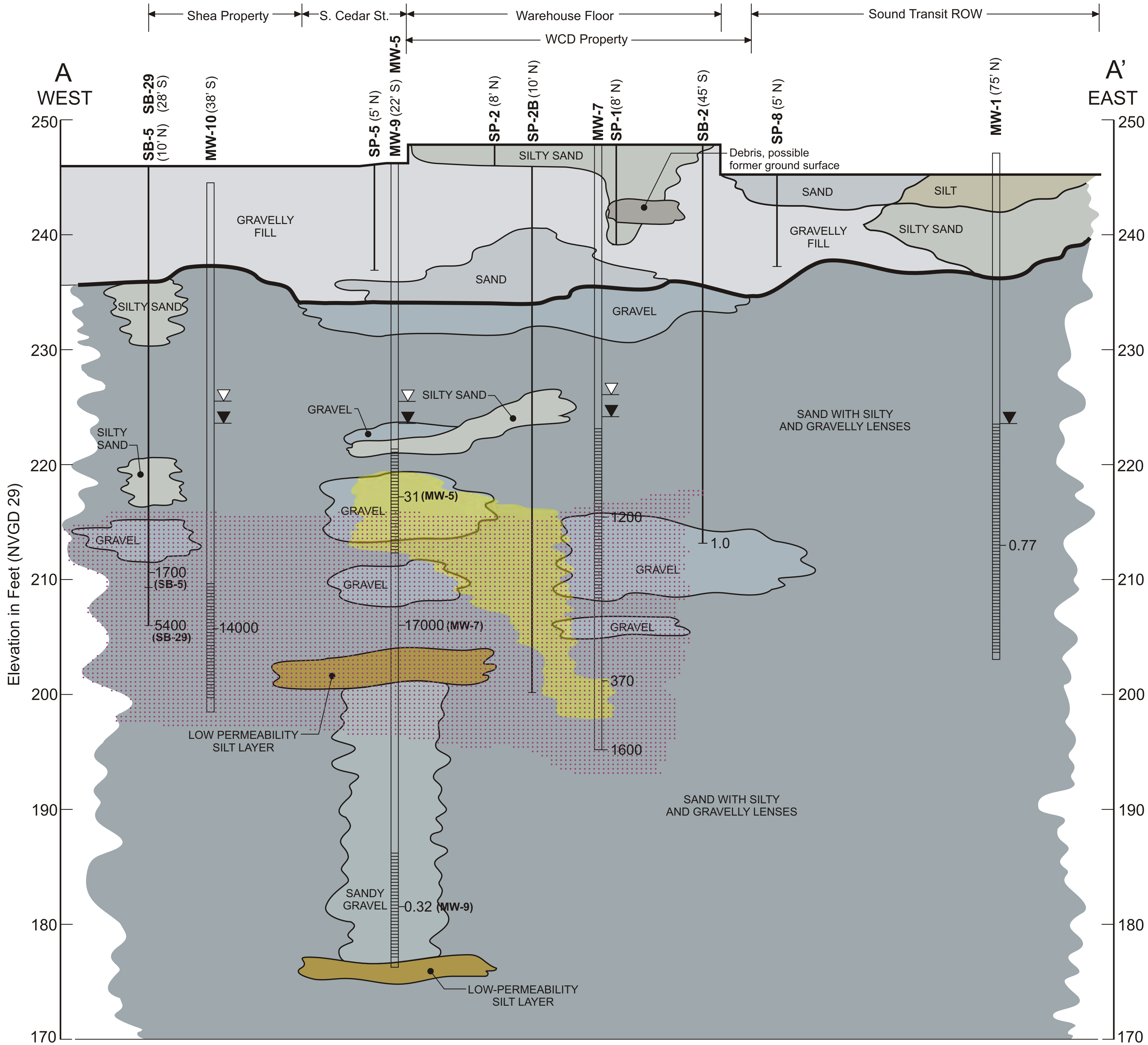
Figure 1.4
Exploration Locations and Cross-section

File: F:\projects\Swensen-WCD\GIS\MXD\Figure 1 (Exploration Locations REV Aug 2010).mxd
Date: 8/5/2010



(5' N) Offset Distance and Direction in Feet

Soil Boring

1.0 Reconnaissance Sample Napthalene Concentration in $\mu g/L$

Monitoring Well

370 Reconnaissance Sample Napthalene Concentration in $\mu g/L$

Screened Interval

0.77 Maximum Monitoring Sample Napthalene Concentration in $\mu g/L$

Approximate Extent of Groundwater Napthalene Concentration greater than 160 $\mu g/L$ (MTCA A CUL)

Approximate Groundwater Contamination Source Area (based on field indications — see report text for detailed explanation)

Potentiometric Surface (December 2011)

Potentiometric Surface (June 2010)

Notes:
1. Elevation profile from Pacific Crest Environmental 2008.
2. Reconnaissance samples collected during multiple investigations, 2007 - 2011.
3. Maximum monitoring well napthalene concentrations from 2010 and 2011 monitoring.

Horizontal Scale in Feet: 0, 50, 100

Vertical Scale in Feet: 0, 10, 20

Vertical Exaggeration X 5

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Figure 2.1
Geologic Cross Section A-A' and Groundwater Contamination Source Area

January 2014 DRAFT

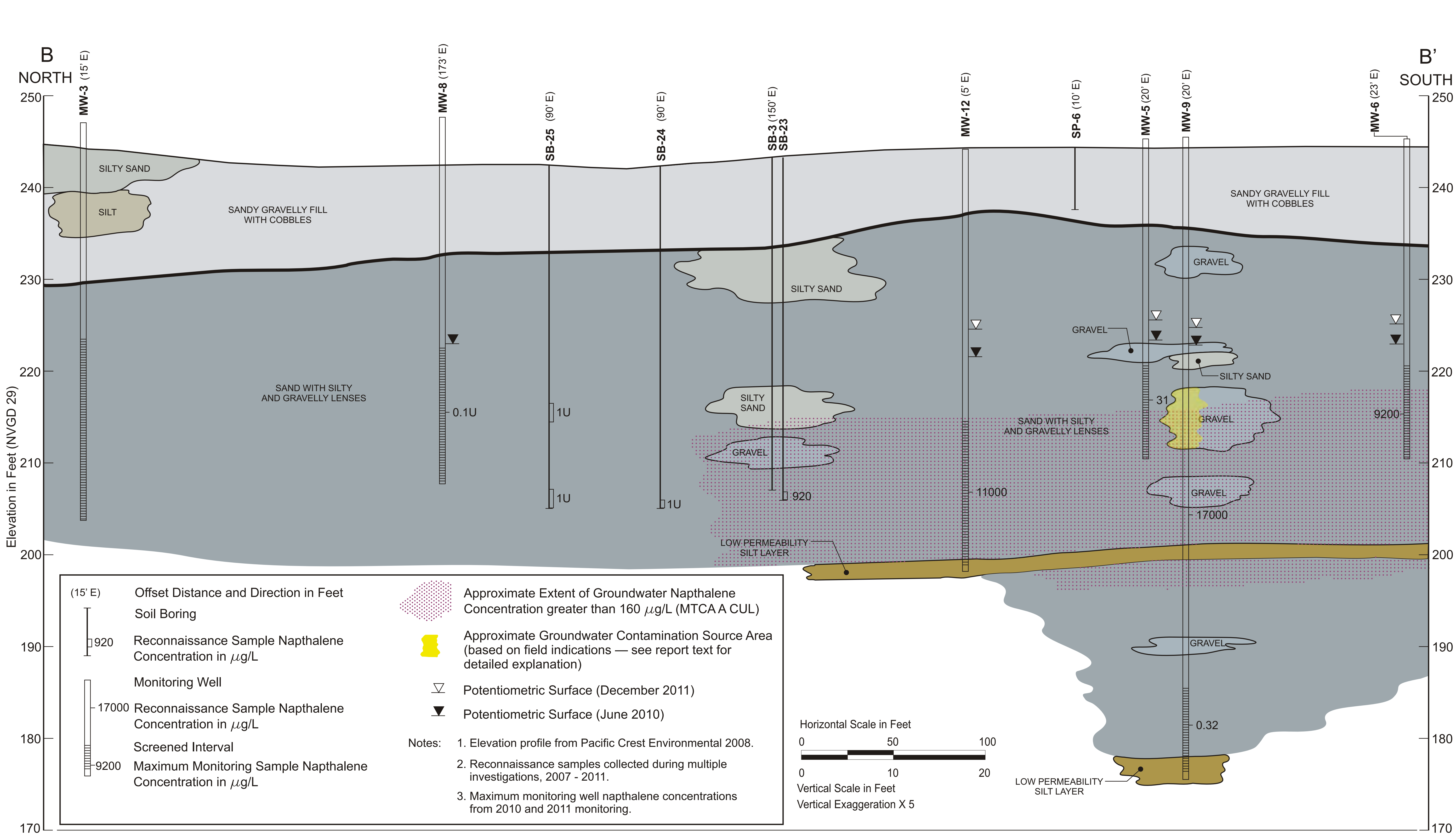

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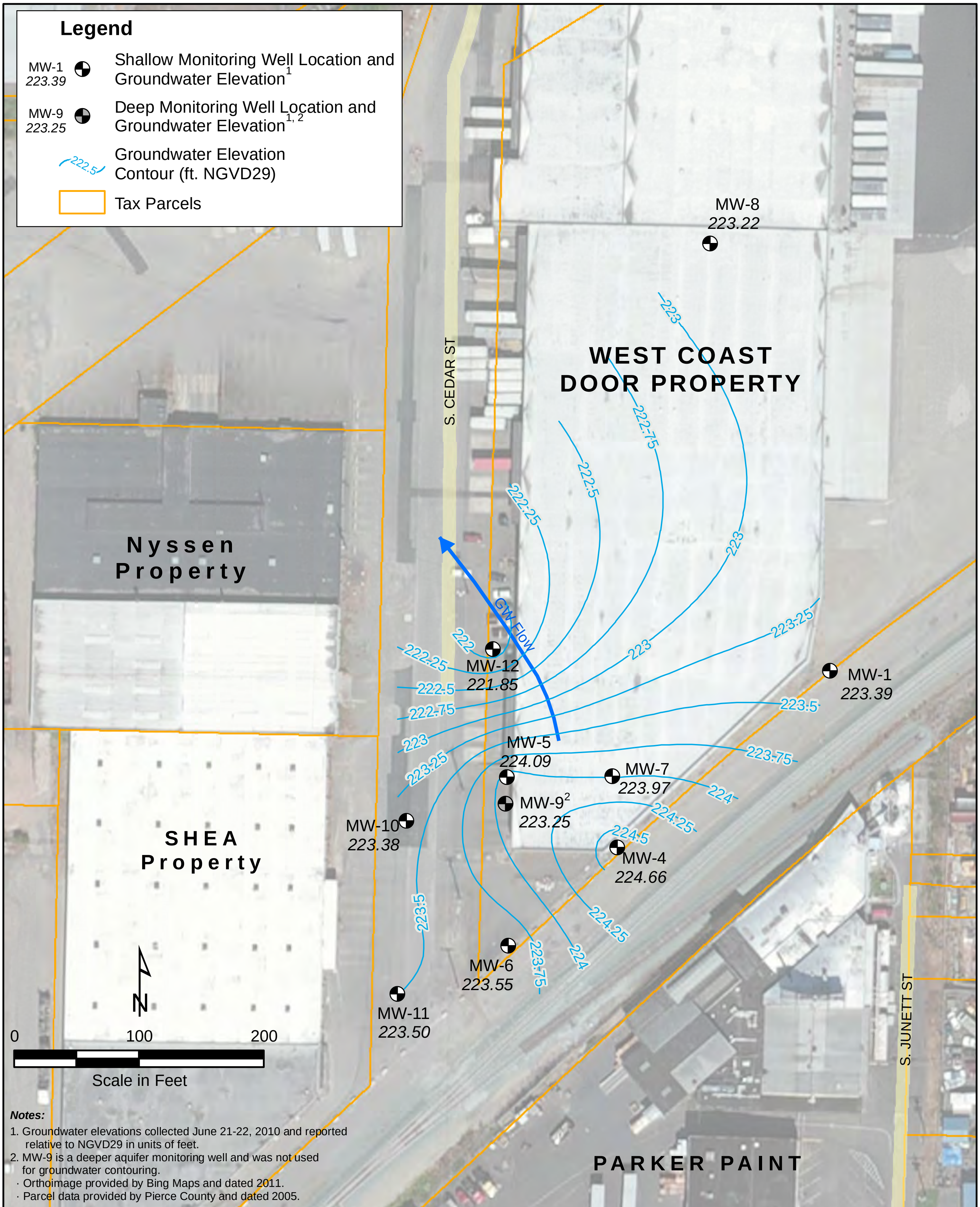
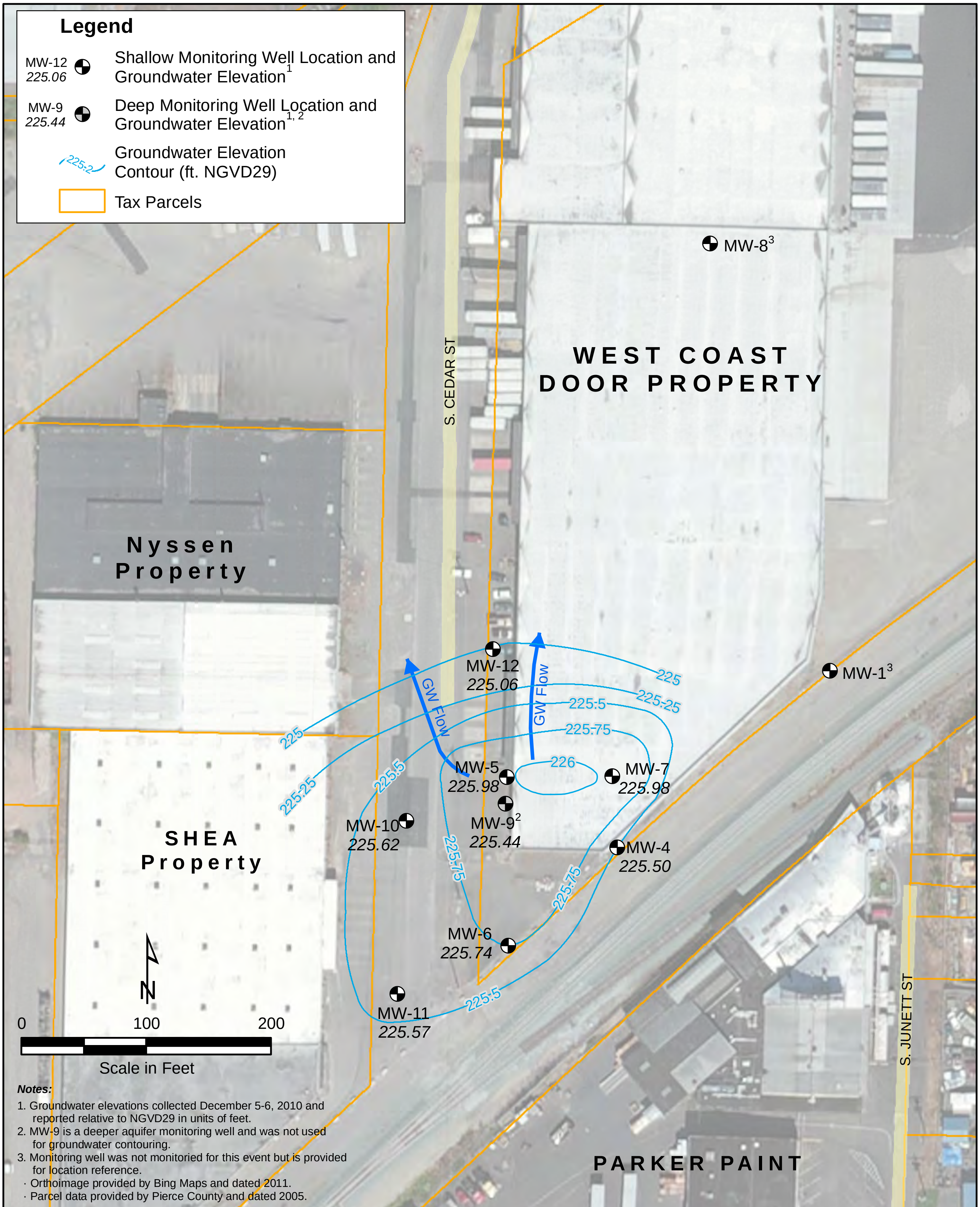
Figure 2.2
Geologic Cross Section B-B' and Groundwater Contamination Source Area

January 2014 DRAFT



FLOYD | SNIDER strategy ▪ science ▪ engineering	**Remedial Investigation/ Feasibility Study West Coast Door Tacoma, Washington**	Figure 2.3 Groundwater Elevation Map June 2010

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 2.3 (Dry Season GW Elevations June 2010).mxd
6/14/2012



Notes:

1. Groundwater elevations collected December 5-6, 2010 and reported relative to NGVD29 in units of feet.
2. MW-9 is a deeper aquifer monitoring well and was not used for groundwater contouring.
3. Monitoring well was not monitoried for this event but is provided for location reference.

· Orthoimage provided by Bing Maps and dated 2011.
· Parcel data provided by Pierce County and dated 2005.

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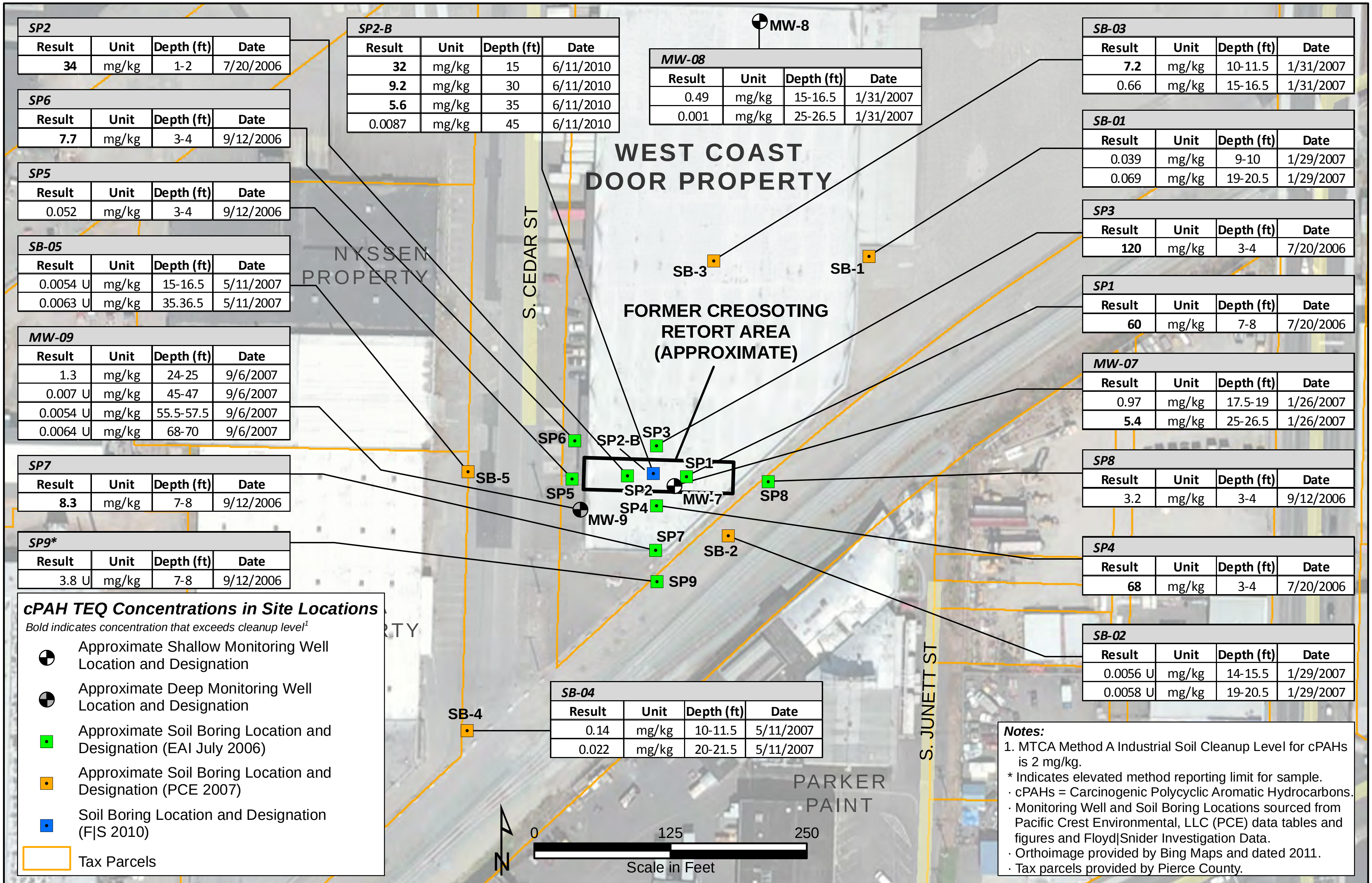
Figure 2.4
Groundwater Elevation Map
December 2011

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 2.4 (Wet Season GW Elevations Dec 2011).mxd
6/14/2012



SP2

Result	Unit	Depth (ft)	Date
34	mg/kg	1-2	7/20/2006

SP6

Result	Unit	Depth (ft)	Date
7.7	mg/kg	3-4	9/12/2006

SP5

Result	Unit	Depth (ft)	Date
0.052	mg/kg	3-4	9/12/2006

SB-05

Result	Unit	Depth (ft)	Date
0.0054 U	mg/kg	15-16.5	5/11/2007
0.0063 U	mg/kg	35.36.5	5/11/2007

MW-09

Result	Unit	Depth (ft)	Date
1.3	mg/kg	24-25	9/6/2007
0.007 U	mg/kg	45-47	9/6/2007
0.0054 U	mg/kg	55.5-57.5	9/6/2007
0.0064 U	mg/kg	68-70	9/6/2007

SP7

Result	Unit	Depth (ft)	Date
8.3	mg/kg	7-8	9/12/2006

SP9*

Result	Unit	Depth (ft)	Date
3.8 U	mg/kg	7-8	9/12/2006

SP2-B

Result	Unit	Depth (ft)	Date
32	mg/kg	15	6/11/2010
9.2	mg/kg	30	6/11/2010
5.6	mg/kg	35	6/11/2010
0.0087	mg/kg	45	6/11/2010

MW-08

Result	Unit	Depth (ft)	Date
0.49	mg/kg	15-16.5	1/31/2007
0.001	mg/kg	25-26.5	1/31/2007

SB-03

Result	Unit	Depth (ft)	Date
7.2	mg/kg	10-11.5	1/31/2007
0.66	mg/kg	15-16.5	1/31/2007

SB-01

Result	Unit	Depth (ft)	Date
0.039	mg/kg	9-10	1/29/2007
0.069	mg/kg	19-20.5	1/29/2007

SP3

Result	Unit	Depth (ft)	Date
120	mg/kg	3-4	7/20/2006

SP1

Result	Unit	Depth (ft)	Date
60	mg/kg	7-8	7/20/2006

MW-07

Result	Unit	Depth (ft)	Date
0.97	mg/kg	17.5-19	1/26/2007
5.4	mg/kg	25-26.5	1/26/2007

SP8

Result	Unit	Depth (ft)	Date
3.2	mg/kg	3-4	9/12/2006

SP4

Result	Unit	Depth (ft)	Date
68	mg/kg	3-4	7/20/2006

SB-02

Result	Unit	Depth (ft)	Date
0.0056 U	mg/kg	14-15.5	1/29/2007
0.0058 U	mg/kg	19-20.5	1/29/2007

SB-04

Result	Unit	Depth (ft)	Date
0.14	mg/kg	10-11.5	5/11/2007
0.022	mg/kg	20-21.5	5/11/2007

cPAH TEQ Concentrations in Site Locations

Bold indicates concentration that exceeds cleanup level[1]

- Approximate Shallow Monitoring Well Location and Designation
- Approximate Deep Monitoring Well Location and Designation
- Approximate Soil Boring Location and Designation (EAI July 2006)
- Approximate Soil Boring Location and Designation (PCE 2007)
- Soil Boring Location and Designation (F|S 2010)
- Tax Parcels

Notes:

1. MTCA Method A Industrial Soil Cleanup Level for cPAHs is 2 mg/kg.

* Indicates elevated method reporting limit for sample.
· cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons.
· Monitoring Well and Soil Boring Locations sourced from Pacific Crest Environmental, LLC (PCE) data tables and figures and Floyd|Snider Investigation Data.
· Orthoimage provided by Bing Maps and dated 2011.
· Tax parcels provided by Pierce County.

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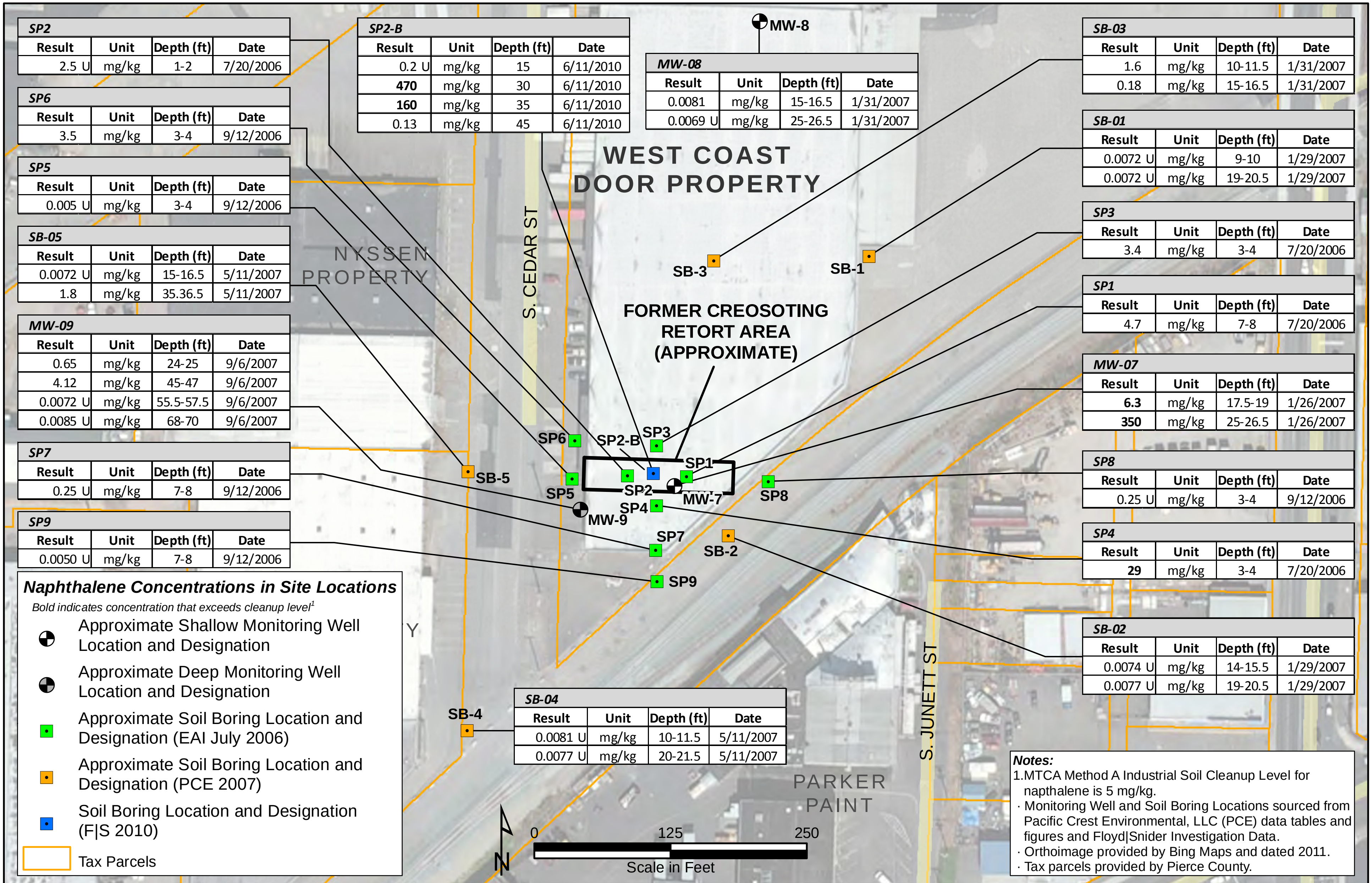
Figure 2.5
cPAH TEQ Concentrations in Soil

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 2.5 (cPAH TEQ Conc in Soil - Callout Boxes Letter Landscape).mxd
6/14/2012



SP2

Result	Unit	Depth (ft)	Date
2.5 U	mg/kg	1-2	7/20/2006

SP6

Result	Unit	Depth (ft)	Date
3.5	mg/kg	3-4	9/12/2006

SP5

Result	Unit	Depth (ft)	Date
0.005 U	mg/kg	3-4	9/12/2006

SB-05

Result	Unit	Depth (ft)	Date
0.0072 U	mg/kg	15-16.5	5/11/2007
1.8	mg/kg	35.36.5	5/11/2007

MW-09

Result	Unit	Depth (ft)	Date
0.65	mg/kg	24-25	9/6/2007
4.12	mg/kg	45-47	9/6/2007
0.0072 U	mg/kg	55.5-57.5	9/6/2007
0.0085 U	mg/kg	68-70	9/6/2007

SP7

Result	Unit	Depth (ft)	Date
0.25 U	mg/kg	7-8	9/12/2006

SP9

Result	Unit	Depth (ft)	Date
0.0050 U	mg/kg	7-8	9/12/2006

SP2-B

Result	Unit	Depth (ft)	Date
0.2 U	mg/kg	15	6/11/2010
470	mg/kg	30	6/11/2010
160	mg/kg	35	6/11/2010
0.13	mg/kg	45	6/11/2010

MW-08

Result	Unit	Depth (ft)	Date
0.0081	mg/kg	15-16.5	1/31/2007
0.0069 U	mg/kg	25-26.5	1/31/2007

SB-03

Result	Unit	Depth (ft)	Date
1.6	mg/kg	10-11.5	1/31/2007
0.18	mg/kg	15-16.5	1/31/2007

SB-01

Result	Unit	Depth (ft)	Date
0.0072 U	mg/kg	9-10	1/29/2007
0.0072 U	mg/kg	19-20.5	1/29/2007

SP3

Result	Unit	Depth (ft)	Date
3.4	mg/kg	3-4	7/20/2006

SP1

Result	Unit	Depth (ft)	Date
4.7	mg/kg	7-8	7/20/2006

MW-07

Result	Unit	Depth (ft)	Date
6.3	mg/kg	17.5-19	1/26/2007
350	mg/kg	25-26.5	1/26/2007

SP8

Result	Unit	Depth (ft)	Date
0.25 U	mg/kg	3-4	9/12/2006

SP4

Result	Unit	Depth (ft)	Date
29	mg/kg	3-4	7/20/2006

SB-02

Result	Unit	Depth (ft)	Date
0.0074 U	mg/kg	14-15.5	1/29/2007
0.0077 U	mg/kg	19-20.5	1/29/2007

SB-04

Result	Unit	Depth (ft)	Date
0.0081 U	mg/kg	10-11.5	5/11/2007
0.0077 U	mg/kg	20-21.5	5/11/2007

Naphthalene Concentrations in Site Locations

Bold indicates concentration that exceeds cleanup level[1]

- Approximate Shallow Monitoring Well Location and Designation
- Approximate Deep Monitoring Well Location and Designation
- Approximate Soil Boring Location and Designation (EAI July 2006)
- Approximate Soil Boring Location and Designation (PCE 2007)
- Soil Boring Location and Designation (F|S 2010)
- Tax Parcels

Notes:

1. MTCA Method A Industrial Soil Cleanup Level for napthalene is 5 mg/kg.

- Monitoring Well and Soil Boring Locations sourced from Pacific Crest Environmental, LLC (PCE) data tables and figures and Floyd|Snider Investigation Data.
- Orthoimage provided by Bing Maps and dated 2011.
- Tax parcels provided by Pierce County.

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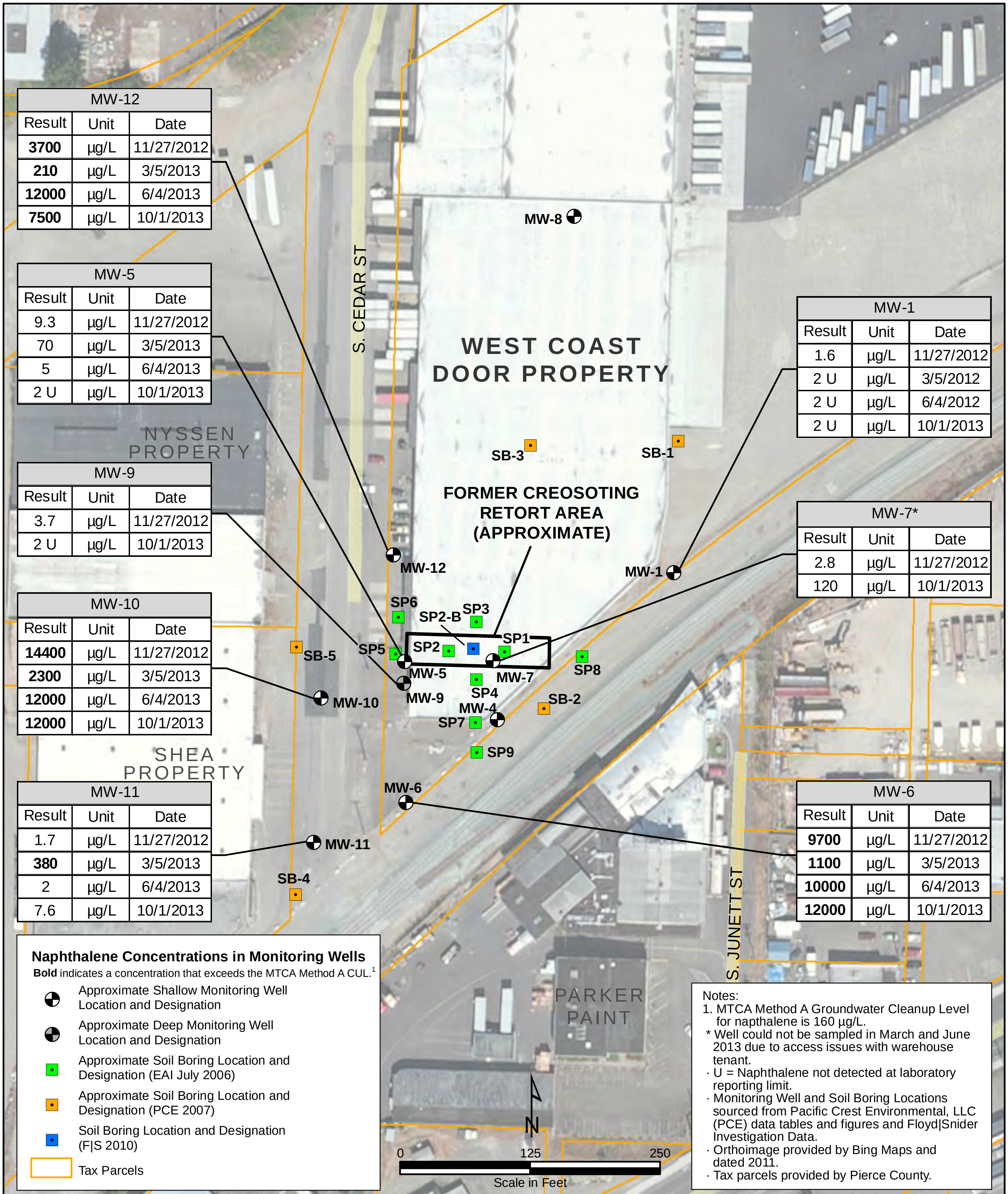
Tacoma, Washington

Figure 2.6
Naphthalene Concentrations in Soil

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 2.6 (Naphthalene Conc in Soil - Callout Boxes Letter Landscape).mxd
6/14/2012



MW-12		
Result	Unit	Date
3700	µg/L	11/27/2012
210	µg/L	3/5/2013
12000	µg/L	6/4/2013
7500	µg/L	10/1/2013

MW-5		
Result	Unit	Date
9.3	µg/L	11/27/2012
70	µg/L	3/5/2013
5	µg/L	6/4/2013
2 U	µg/L	10/1/2013

MW-9		
Result	Unit	Date
3.7	µg/L	11/27/2012
2 U	µg/L	10/1/2013

MW-10		
Result	Unit	Date
14400	µg/L	11/27/2012
2300	µg/L	3/5/2013
12000	µg/L	6/4/2013
12000	µg/L	10/1/2013

MW-11		
Result	Unit	Date
1.7	µg/L	11/27/2012
380	µg/L	3/5/2013
2	µg/L	6/4/2013
7.6	µg/L	10/1/2013

MW-1		
Result	Unit	Date
1.6	µg/L	11/27/2012
2 U	µg/L	3/5/2012
2 U	µg/L	6/4/2012
2 U	µg/L	10/1/2013

MW-7*		
Result	Unit	Date
2.8	µg/L	11/27/2012
120	µg/L	10/1/2013

MW-6		
Result	Unit	Date
9700	µg/L	11/27/2012
1100	µg/L	3/5/2013
10000	µg/L	6/4/2013
12000	µg/L	10/1/2013

Naphthalene Concentrations in Monitoring Wells

Bold indicates a concentration that exceeds the MTCA Method A CUL.[1]

- Approximate Shallow Monitoring Well Location and Designation
- Approximate Deep Monitoring Well Location and Designation
- Approximate Soil Boring Location and Designation (EAI July 2006)
- Approximate Soil Boring Location and Designation (PCE 2007)
- Soil Boring Location and Designation (F|S 2010)
- Tax Parcels

Notes:
1. MTCA Method A Groundwater Cleanup Level for napthalene is 160 µg/L.
* Well could not be sampled in March and June 2013 due to access issues with warehouse tenant.
· U = Naphthalene not detected at laboratory reporting limit.
· Monitoring Well and Soil Boring Locations sourced from Pacific Crest Environmental, LLC (PCE) data tables and figures and Floyd|Snider Investigation Data.
· Orthoimage provided by Bing Maps and dated 2011.
· Tax parcels provided by Pierce County.

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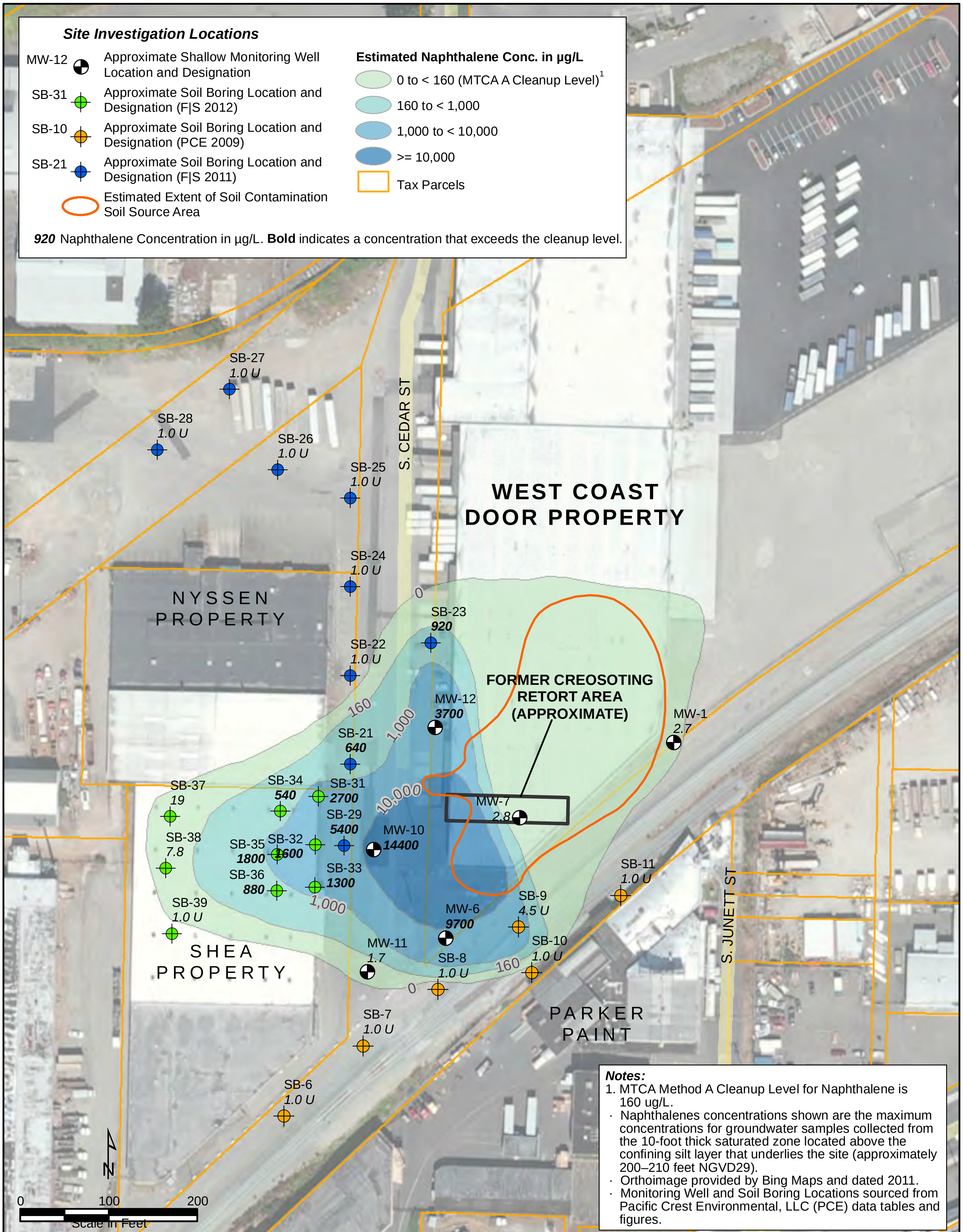
Tacoma, Washington

Figure 2.7
Quarterly Monitoring of Napthalene Concentrations in Groundwater Monitoring Wells

I:\GIS\Projects\Swensen_WCD\MXD\RevisedRIFS_Nov2013\Figure 2.7 (Quarterly Monitoring Napthalene Concentrations in GW Monitoring Wells) 20131029.mxd 10/30/2013



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West Coast Door
Tacoma, Washington

Figure 2.8
Naphthalene Concentrations in Shallow (34 - 45 ft bgs) Groundwater and Estimated Plume Extents - December 2012

F:\projects\Swensen-WCD\GIS\MXD\Post RIFS 2012\Figure 2.8 (Naphthalene Conc in GW and Estimated Plume Extents December 2012).mxd 10/30/2013

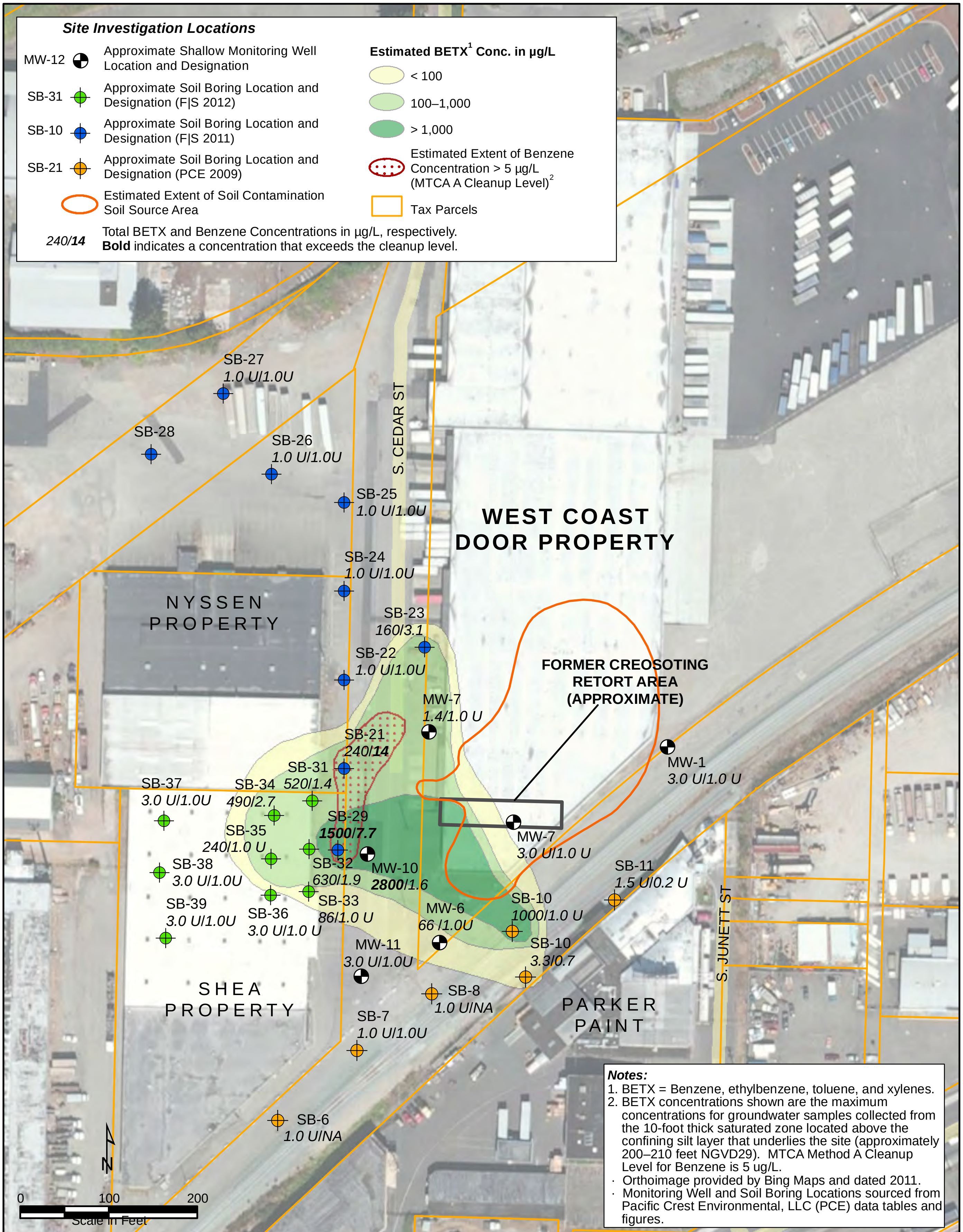

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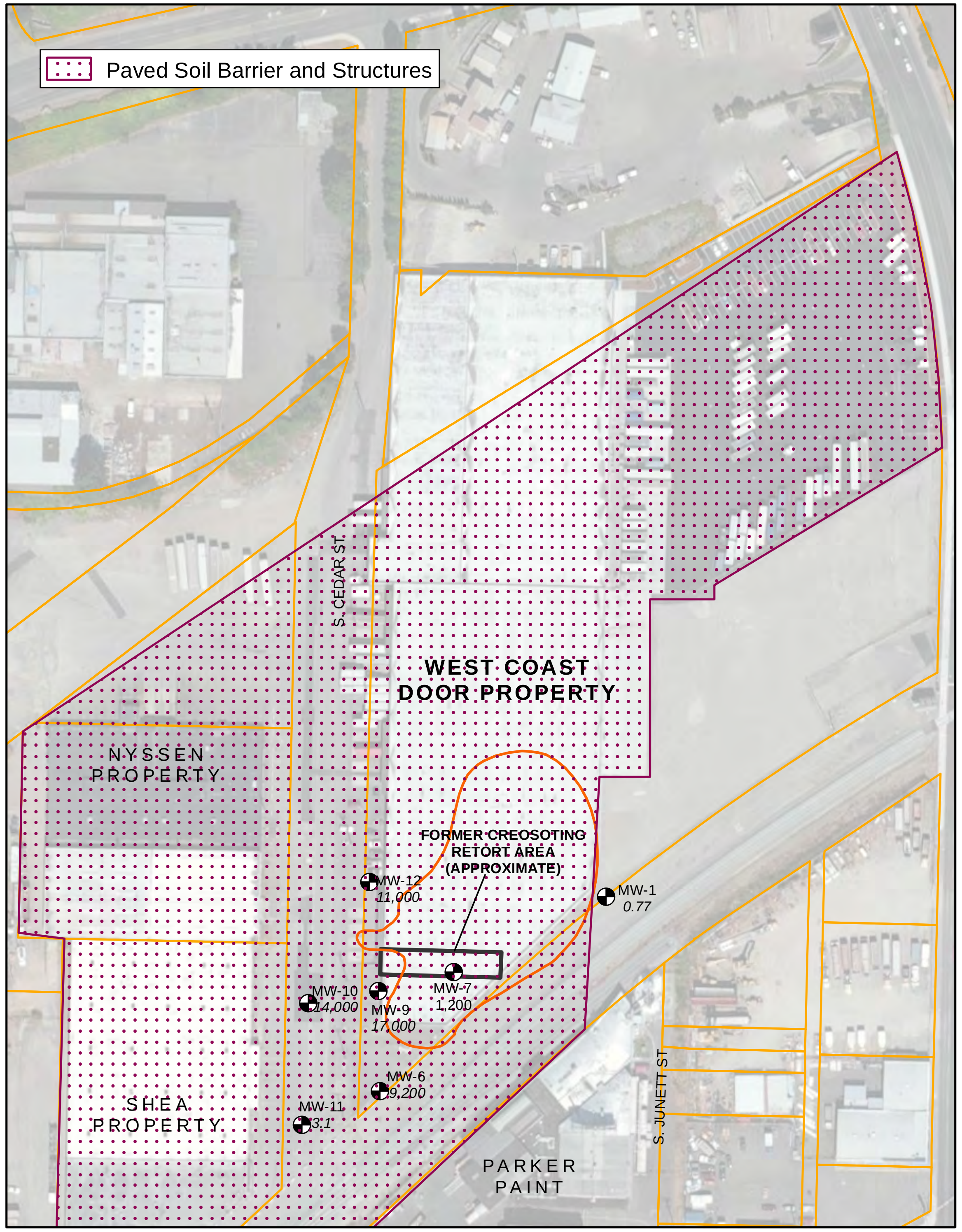
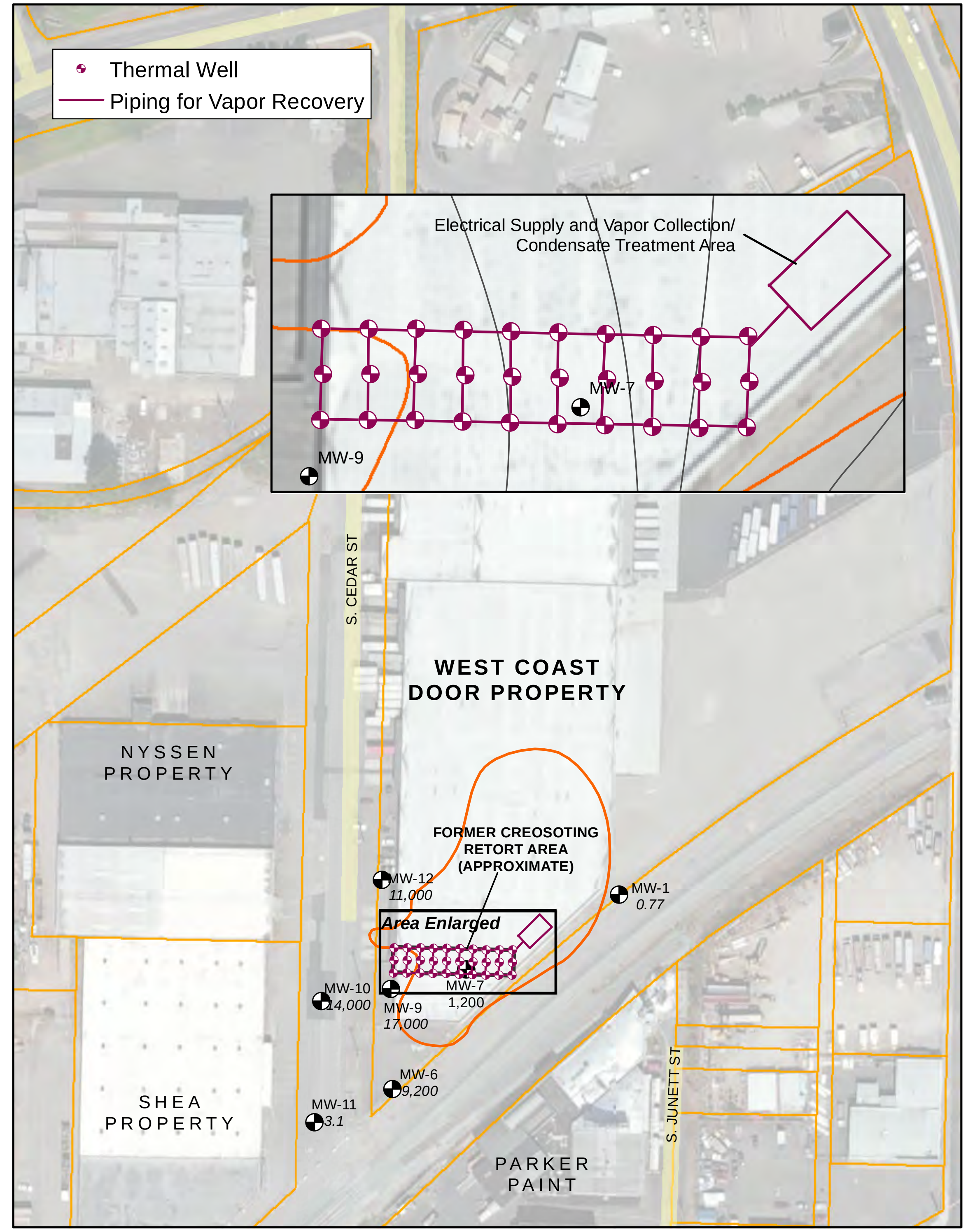
Figure 2.9
Total BTEX and Benzene Concentrations in Shallow (35 - 45 ft bgs) Groundwater and Estimated Plume Extents

F:\projects\Swensen-WCD\GIS\MXD\Post RIFS 2012\Figure 2.9 (Total BTEX and Benzene Conc in GW December 2012).mxd
10/30/2013

Notes:
- Orthoimage provided by Bing Maps and dated 2011.
- Monitoring Well Locations sourced from Pacific Crest Environmental, LLC (PCE) data tables and figures.



Remedial Alternative 1: Retain Existing Soil Barriers



Remedial Alternative 2: In-situ Thermal Solidification

Legend
- Approximate Monitoring Well Location and Designation
- Estimated Extent of Soil Contamination Soil Source Area above Cleanup Levels
- Tax Parcels

N

0 100 200 400

Scale in Feet

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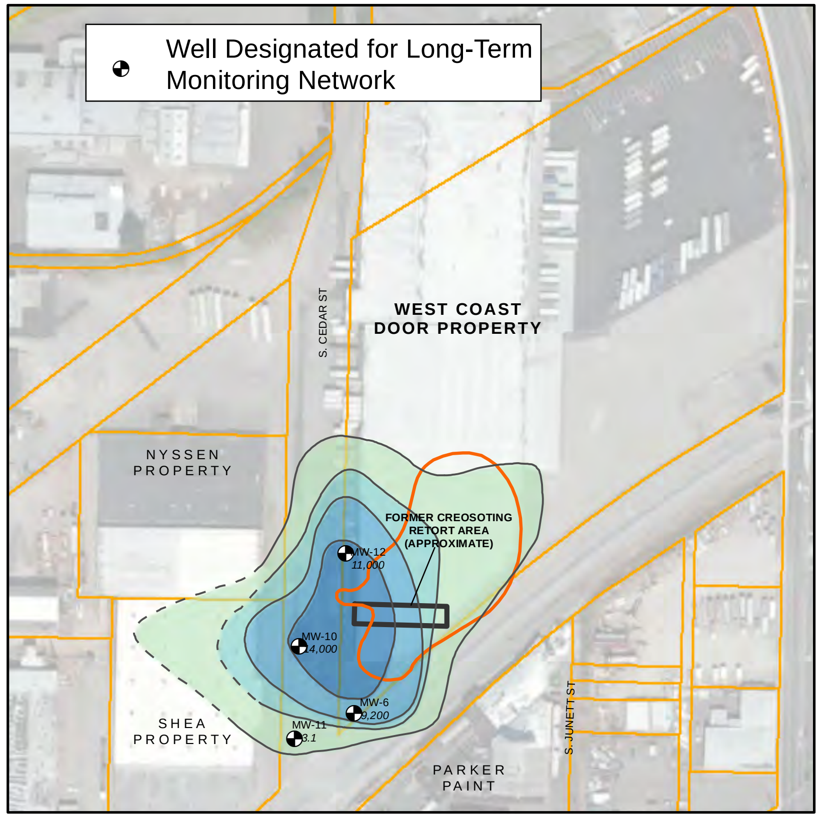
West Coast Door
Tacoma, Washington

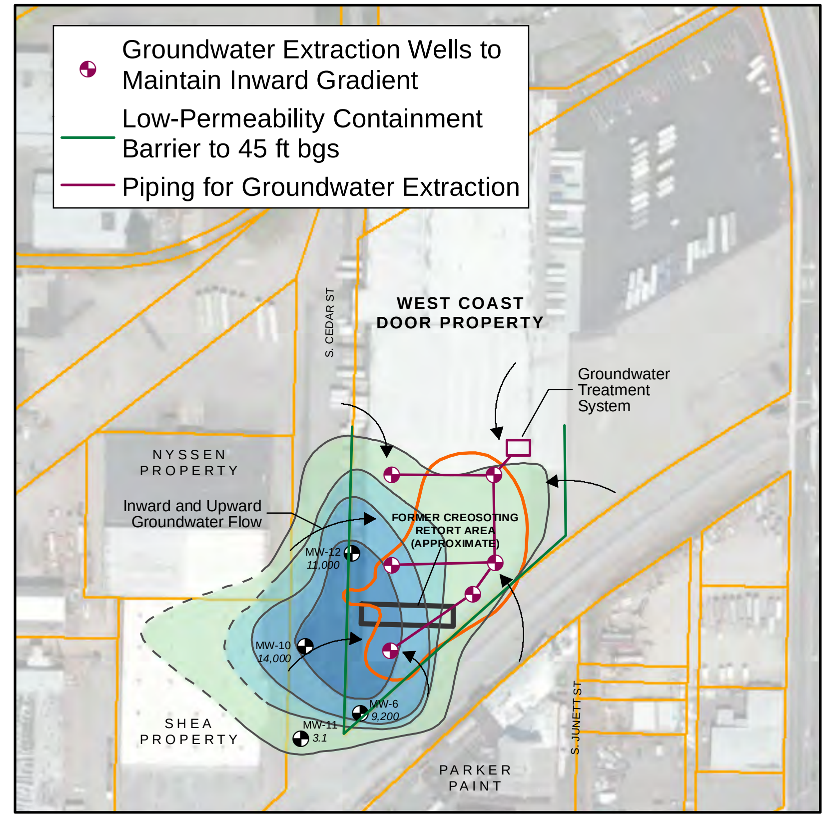
Figure 4.1
Soil Remedial Alternatives

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 4.1 (Soil Alternatives).mxd
6/14/2012

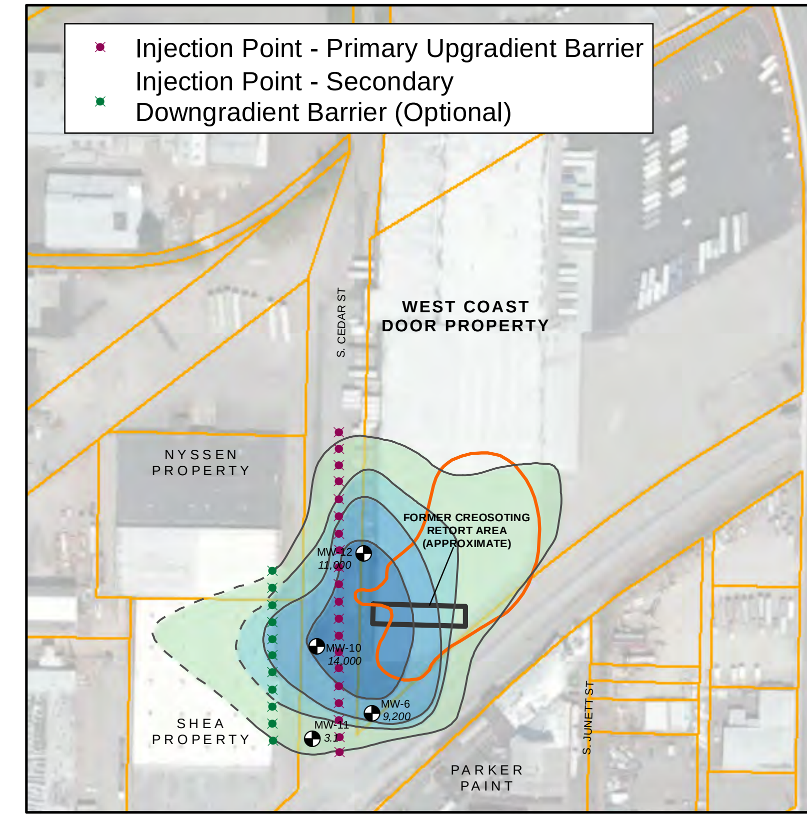
January 2014 DRAFT



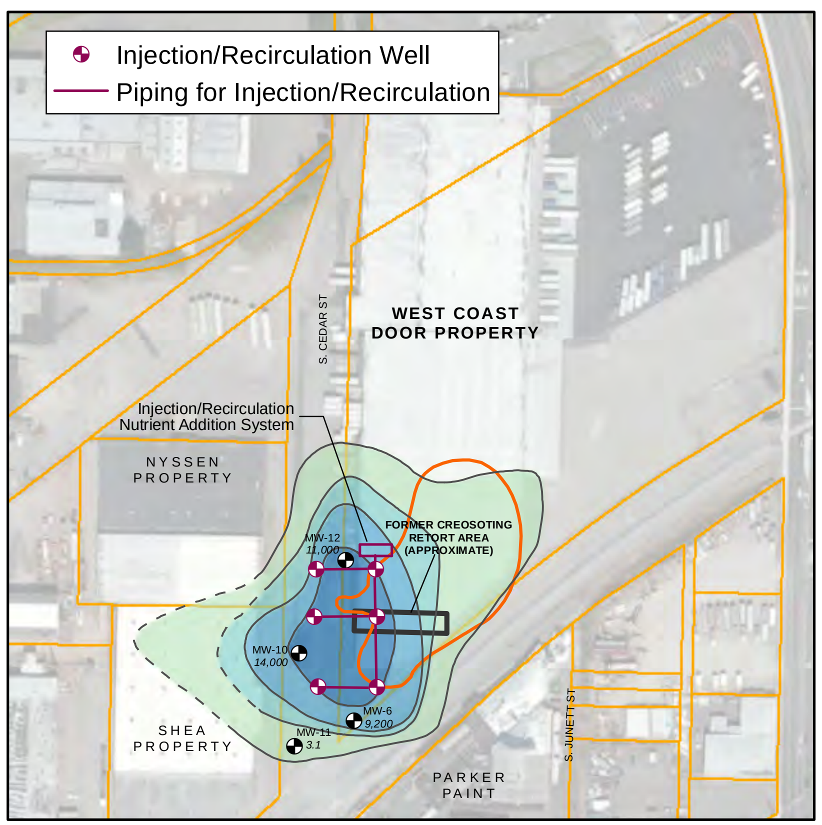
Remedial Alternative 1: Natural Attenuation and Long-Term Monitoring



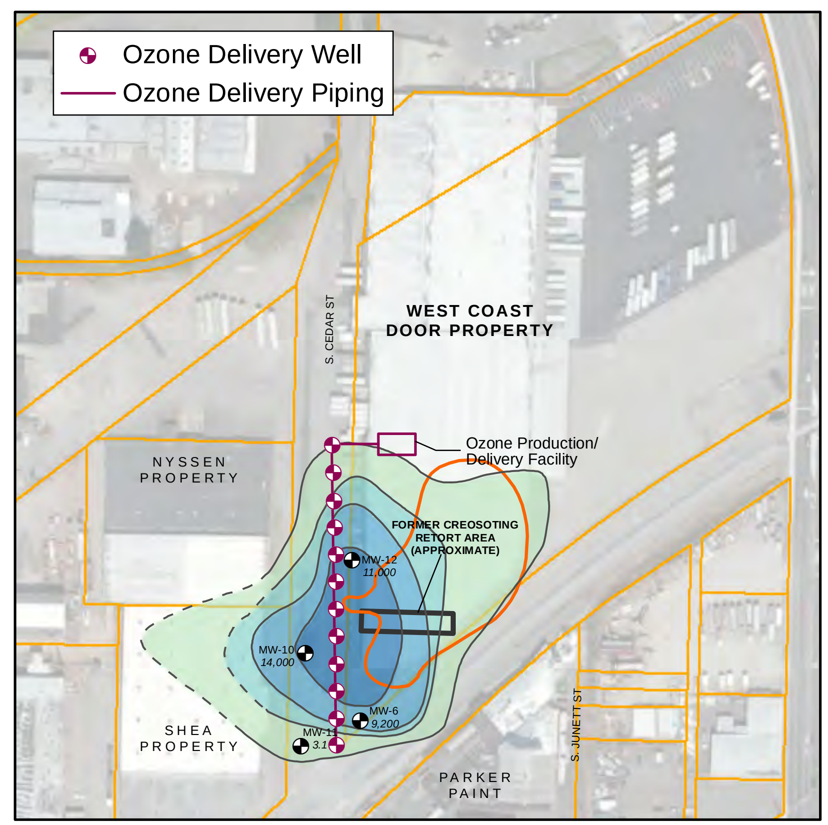
Remedial Alternative 2: Low-Permeability Containment Barrier



Remedial Alternative 3: In-Situ Bio Barrier with ORC Injection



Remedial Alternative 4: Enhanced Bioremediation (via Injection of Amendments)



Remedial Alternative 5: In-Situ Ozone Oxidation

Legend

- Well Designated for Long-Term Monitoring Network
- Estimated Extent of Soil Contamination Soil Source Area

Estimated Naphthalene Conc. in µg/L

- 0 to < 160 (MTCA A Cleanup Level)
- 160 to < 1,000
- 1,000 to < 10,000
- >= 10,000
- Estimated Extent Based on Bioscreen Plume Model
- Tax Parcels

Notes:

- Orthoimage provided by Bing Maps and dated 2011.
- Monitoring Well Locations sourced from Pacific Crest Environmental, LLC (PCE) data tables and figures.

N

0 100 200 400

Scale in Feet

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West Coast Door
Tacoma, Washington

Figure 4.2
Groundwater Remedial Alternatives

F:\projects\Swensen-WCD\GIS\MXD\RIFS 2012\Figure 4.2 (Groundwater Alternatives).mxd
6/14/2012

January 2014 DRAFT

West Coast Door

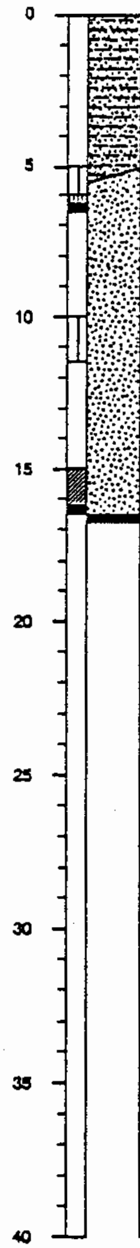
Remedial Investigation/ Feasibility Study

Appendix A
Soil Boring and Monitoring Well Logs

Equipment: Mobile B-61

Land Surface Elevation: ______ Date: 4/30/92

Laboratory Tests	Moisture Content (%)	OVM	Blows per Foot	Depth	Description
		ND		0	BROWN SILTY SAND (SM) dense, moist; with some gravel (Fill).
		ND	11	5	BROWN GRAVELLY SAND (SP) medium dense, moist; with some silt.
			51	10	
		ND	36	15	Becomes dense, with a trace of silt and gravel.



Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Log of Boring 1

Puget Sound National Bank/West Coast Door - Phase II
Tacoma, Washington

PLATE 6

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,536.003	SES	JBA	18 Jun 92		

KB 01155

BORING SP1

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0		Damp			Cocrete-slab-on-grade. Sand, gravel, fill, with broken glass, and wood debris.	SP1-3-4	
				SM			
5		Damp			Creosote odor in soil mixed with wood debris at 5 to 6 feet below the ground surface. Sample pushed to 8 feet, with poor recovery.	SP1-7-8	
10					Boring terminated at 9 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with concrete.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe

ENVIRONMENTAL ASSOCIATES, INC.
1380 - 112th Avenue NE, Suite 300
Bellevue, Washington 98004

BORING SP1

West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-1	07/20/06	RBR	A-1

BORING SP2

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0		Damp		SM	Cocrete-slab-on-grade. Sand, gravel, fill, dark brown, woody debris, with a strong creosote odor.	SP2-1-2	
					Boring terminated at 2 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with concrete.		
5							
10							
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

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ASSOCIATES, INC.

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Bellevue, Washington 98004

BORING SP2

West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-1	07/20/06	RBR	A-2

BORING SP3

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0					Cocrete-slab-on-grade.		
		Damp			Sand, gravel, fill, brick debris, brown.		
				SM	Creosote odor in soil mixed with wood debris at 3 to 4 feet below the ground surface.	SP3-3-4	
5					Sand, gravel, medium to coarse sand, with gravel, no odor below 5 feet.	SP3-7-8	
		Damp					
10						SP3-10-11	
					Boring terminated at 11 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with concrete.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

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Bellevue, Washington 98004

BORING SP3

West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-1	07/20/06	RBR	A-3

BORING SP4

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0					Cocrete-slab-on-grade.		
					Sand, gravel, fill, brown.		
		Damp		SM	Sand, gravel, organic woody debris, dark brown, slight creosote odor.	SP4-3-4	
5		Damp		GM	Sandy-gravel, medium to coarse sand, mixed with gravel, brown. No odor.	SP4-7-8	
10		Damp				SP4-10-11	
					Boring terminated at 11 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with concrete.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

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Bellevue, Washington 98004

BORING SP4

West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-1	07/20/06	RBR	A-4

BORING SP5

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0		Damp			Asphalt pavement / gravel base.		
				GP	Sandy-Gravel, gravel with medium to coarse sand, and cobbles, brown.	SP5-3-4	0.0
5							
						SP5-6-7	0.0
		Damp					
						SP5-8-9	0.0
10					Boring terminated at 9 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with asphalt.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

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BORING SP5

Former West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-2	09/12/06	RBR	A-1

BORING SP6

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0		Damp			Asphalt pavement / gravel base.		
5				GP	Sandy-Gravel, gravel with medium to coarse sand, and cobbles, brown.	SP6-3-4	0.0
		Damp				SP6-6-7	0.0
10					Boring terminated at 7 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with asphalt.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

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Bellevue, Washington 98004

BORING SP6

Former West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-2	09/12/06	RBR	A-2

BORING SP7

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0		Damp			Asphalt pavement / gravel base.		
				GP	Sandy-Gravel, gravel with medium to coarse sand, and cobbles, brown.	SP7-3-4	0.0
5		Damp					
					Slight odor (not distinguishable) at 7 feet	SP7-7-8	0.0
10					Boring terminated at 8 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with asphalt.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

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1380 - 112th Avenue NE, Suite 300
Bellevue, Washington 98004

BORING SP7

Former West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-2	09/12/06	RBR	A-3

BORING SP8

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0		Damp		SP	Sand, fine to medium sand, with gravel, brown.	SP8-3-4	0.0
5		Damp		GP	Sandy-Gravel, gravel with medium to coarse sand, and cobbles, brown.	SP8-7-8	0.0
10					Boring terminated at 8 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with asphalt.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

ENVIRONMENTAL ASSOCIATES, INC.

1380 - 112th Avenue NE, Suite 300
Bellevue, Washington 98004

BORING SP8

Former West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-2	09/12/06	RBR	A-4

BORING SP9

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Sample	Head Space Analysis -PID (ppm)
0		Damp		SP	Sand, fine to medium sand, organic, with gravel, dark-brown.	SP9-3-4	0.0
5		Damp		GP	Sandy-Gravel, gravel with medium to coarse sand, and cobbles, brown.	SP9-7-8	0.0
10					Boring terminated at 8 feet (refusal). Groundwater not encountered. Boring abandoned with granular bentonite and patched with asphalt.		
15							
20							
25							
30							
35							
40							

Sampler: Continuous Sample collected in 4-foot sections.
Driller: ESN-LAR Strataprobe.

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1380 - 112th Avenue NE, Suite 300
Bellevue, Washington 98004

BORING SP9

Former West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-2	09/12/06	RBR	A-5

LOG OF BORING SB-1

Date/Time Started	: 1-29-07/1040
Date/Time Completed	: 1-29-07/1204
Total Boring Depth	: 35'
Depth to water ATD	: 24'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
4.0 - 5.5	X	4.0 - 5.5 GRAVEL minor sand, trace silt (80% fine to coarse gravel, 15% fine to coarse sand, 5% silt), brown, moist.	GP		100	20/21/21	6.2	-
9.0 - 10.0	X	9.0 - 10.0 GRAVEL minor sand, trace silt (80% fine to coarse gravel, 15% fine to coarse sand, 5% silt), brown-gray, wet.	GP		100	14/15/19	16.2	SB1-9-10
14.0 - 15.5	X	14.0 - 15.5 SAND minor gravel, trace silt (85% fine to coarse sand, 10% fine to coarse gravel, 5% silt), brown, moist.	SP		100	34/30/19	0.0	-
19.0 - 19.5	X	19.0 - 19.5 SAND minor silt, trace gravel (85% fine to coarse sand, 10% silt, 5% coarse gravel), brown, moist.	SP		100	29-50/5"	70.2	SB1-19-20.5
19.5 - 20.5		19.5 - 20.5 Gravelly SAND trace silt (50% medium to coarse sand, 45% fine to coarse gravel, 5% silt), brown, moist.	SP					

Depth scale: 0, 5, 10, 15, 20

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: James Goble
Equipment	: CME
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-1

LOG OF BORING SB-1

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Date/Time Started	: 1-29-07/1040
Date/Time Completed	: 1-29-07/1204
Total Boring Depth	: 35'
Depth to water ATD	: 24'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
20	X		SP		100	29-50/5"	70.2	SB1-19-20.5
25	X	24.0 - 25.5 Gravelly SAND trace silt (50% medium to coarse sand, 45% fine to coarse gravel, 5% silt), brown, wet.	SP		90	26-50/6"	2.6	-
30	X	29.0 - 30.5 SAND trace gravel, trace silt (90% fine to coarse sand, 5% fine gravel, 5% silt), brown, wet, assorted cobbles.	SP		100	50/6"	34.1	-
35	X	34.0 - 35.0 SAND with gravel (80% medium to coarse sand, 20% fine gravel), gray-brown, wet.	SP		100		22	SB1-34-GW
40								

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: James Goble
Equipment	: CME
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-1

LOG OF BORING SB-2

Date/Time Started	: 1-29-07/0818
Date/Time Completed	: 1-29-07/1008
Total Boring Depth	: 35'
Depth to water ATD	: 20'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
0								
4.0 - 5.5	X	4.0 - 5.5 GRAVEL with sand, trace silt (75% fine to coarse gravel, 20% fine to coarse sand, 5% silt), brown, dry.	GP		100	26/28/23	30.1	-
9.0 - 10.5	X	9.0 - 10.5 GRAVEL with sand, trace silt (75% fine to coarse gravel, 20% fine to coarse sand, 5% silt), brown, dry.	GP		10	50/6"	22.3	-
14.0 - 15.5	X	14.0 - 15.5 SAND minor silt (interbedded 100% coarse sand with 90% coarse sand, 10% silt), brown, moist.	SP		100	29-50/6"	24.6	SB2-14-15.5
19.0 - 20.5	X	19.0 - 20.5 SAND minor silt, trace gravel (85% medium to coarse sand, 10% silt, 5% fine to coarse gravel), brown, wet.	SP		100	36-50/6"	10.6	SB2-19-20.5

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: James Goble
Equipment	: CME
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-2

LOG OF BORING SB-2

PACIFIC CREST ENVIRONMENTAL
1533 Bendigo Boulevard North PO Box 952
North Bend, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Date/Time Started	: 1-29-07/0818
Date/Time Completed	: 1-29-07/1008
Total Boring Depth	: 35'
Depth to water ATD	: 20'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
20	X		SP		100	36-50/6"	10.6	SB2-19-20.5
25	X	24.0 - 25.0 SAND (100% fine to medium sand), brown, wet.	SP		100	35-50/6"	29.7	-
30	X	29.0 - 30.5 SAND trace gravel, trace silt (90% fine to coarse sand, 5% fine to coarse gravel, 5% silt), gray, wet.	SP		100	26-50/6"	107	-
35	X	34.0 - 35.0 GRAVEL minor sand, trace silt (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), gray, wet.	GP		100		15.1	SB2-34-GW
40								

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: James Goble
Equipment	: CME
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-2

(Page 2 of 2)

LOG OF BORING SB-3

Date/Time Started	: 1-31-07/1141
Date/Time Completed	: 1-31-07/1416
Total Boring Depth	: 33'
Depth to water ATD	: 25'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 140

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
0 - 5		0.0 - 5.0 Soil cuttings are rounded cobbles with some sand and silt.	GP					
10 - 11.5	X	10.0 - 11.5 SAND with silt, minor gravel (70% fine to medium sand, 20% silt, 10% coarse gravel), brown, dry, no odor.	SP		5	50/1"	49.2	SB3-10-11.5
15 - 16.5	X	15.0 - 16.5 GRAVEL minor sand, trace silt (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown, moist, no odor.	GP		40	50/3"	35.7	SB3-15-16.5
20								

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: Steve Choate
Equipment	: CME 65
Pacific Crest Rep.	: Annica Nord

Date/Time Started	: 1-31-07/1141
Date/Time Completed	: 1-31-07/1416
Total Boring Depth	: 33'
Depth to water ATD	: 25'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 140

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
20	X	20.0 - 21.5 NO RECOVERY.	-		0	50/1"	-	-
25	X	25.0 - 26.5 NO RECOVERY. Sampler is wet.	-		0	50/0"	-	-
		Soil cuttings are mostly cobbles with some sand and silt.						
30	X	30.0 - 31.5 NO RECOVERY.	-		0	50/1"	-	-
	X	33.0 - 34.5 GRAVEL with minor sand, minor silt (80% fine to coarse gravel, 10% fine to coarse sand, 10% silt), brown, wet, no odor.	GP		5	50/3"	96.6	SB3-33-GW
35								
40								

08-13-2008 \\Pacific-8e185af\public\Project Files\112 Swensen\112-001 West Coast Door Property\Boring Logs\SB3.bo

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: Steve Choate
Equipment	: CME 65
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-4

Date/Time Started	: 5-11-07/0949
Date/Time Completed	: 5-11-07/1135
Total Boring Depth	: 35'
Depth to water ATD	: 25'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
5	X	5.0 - 6.5 Sandy GRAVEL minor silt (65% fine to coarse gravel, 25% fine to coarse sand, 10% silt), brown, moist, no odor.	GP		60	50/6"	16.5	-
10	X	10.0 - 10.5 Silty SAND (70% fine to coarse sand, 30% silt), brown, moist, no odor.	SM		100	20/25/22	16.2	SB4-10-11.5
		10.5 - 11.5 SAND trace silt (95% fine to medium sand, 5% silt), brown, moist, no odor.	SP					
15	X	15.0 - 16.5 SAND with gravel with silt (70% fine to coarse sand, 20% fine to coarse gravel, 10% silt), brown, moist, no odor.	SP		90	41-50/6"	15.5	-
20								

Drilling Company : Cascade Drilling, Inc.
Drilling Foreman : James Goble
Equipment : CME
Pacific Crest Rep. : Annica Nord

LOG OF BORING SB-4

LOG OF BORING SB-4

Date/Time Started	: 5-11-07/0949
Date/Time Completed	: 5-11-07/1135
Total Boring Depth	: 35'
Depth to water ATD	: 25'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
20	X	20.0 - 21.5 SAND with gravel with silt (70% fine to coarse sand, 20% fine to coarse gravel, 10% silt), brown, moist, no odor. Cobble at bottom of sampler.	SP		35	50/6"	30.6	SB4-21-21.5
25	X	25.0 - 25.75 SAND with gravel with silt (70% fine to coarse sand, 20% fine to coarse gravel, 10% silt), brown, moist, no odor.	SP		40	50/6"	27.0	-
		25.75 - 26.5 SAND trace silt (95% fine sand, 5% silt), brown, wet, no odor.	SP					
30	X	30.0 - 31.5 SAND trace silt (95% fine to medium sand, 5% silt), brown, wet, no odor. Cobble at the bottom of the sampler.	SP		35	50/6"	25.1	-
35	X	35.0 - 36.5 SAND (100% fine to medium sand), brown, wet, no odor.	SP		30	50/6"	21.2	SB4-35-GW
40								

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: James Goble
Equipment	: CME
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-4

LOG OF BORING SB-5

Date/Time Started	: 5-11-07/1301
Date/Time Completed	: 5-11-07/1425
Total Boring Depth	: 35'
Depth to water ATD	: 20'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
0								
5	X	5.0 - 6.5 Sandy GRAVEL minor silt (70% fine to coarse gravel, 20% fine to coarse sand, 10% silt), brown, moist, no odor.	GP		80	17/18/21	34.5	-
10	X	10.0 - 10.5 Sandy GRAVEL minor silt (70% fine to coarse gravel, 20% fine to coarse sand, 10% silt), brown, moist, no odor. Large cobble.	SM		55	40-50/6"	35.8	-
		10.5 - 11.5 Silty SAND (70% fine sand, 30% silt), brown, moist, no odor.	SM					
15	X	15.0 - 15.5 Silty SAND minor gravel (60% fine to coarse sand, 30% silt, 10% fine gravel), brown, moist, no odor.	SM			46-50/2"	39.6	SB5-15-16.5
		15.5 - 16.5 SAND with gravel, trace silt (70% fine to coarse sand, 25% fine to coarse gravel, 5% silt), brown, moist, no odor.	SP					
20								

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: James Goble
Equipment	: CME
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-5

LOG OF BORING SB-5

Date/Time Started	: 5-11-07/1301
Date/Time Completed	: 5-11-07/1425
Total Boring Depth	: 35'
Depth to water ATD	: 20'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 300

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
20	X	20.0 - 21.5 Gravelly SAND minor silt (45% fine to coarse sand, 45% fine to coarse gravel, 10% silt), brown, wet, no odor.	SP		100	40-50/6"	36.6	-
25	X	25.0 - 25.5 Gravelly SAND minor silt (45% fine to coarse sand, 45% fine to coarse gravel, 10% silt), brown, wet, no odor.	SP		100	29-50/6"	32.6	-
		25.5 - 26.5 Silty SAND trace silt (65% fine sand, 35% silt), brown, wet, no odor.	SM					
30	X	30.0 - 30.5 Gravelly SAND minor silt (45% fine to coarse sand, 45% fine to coarse gravel, 10% silt), brown, wet, no odor.	SP		60	50/6"	42.2	-
		30.5 - 31.0 GRAVEL minor sand, minor silt (70% fine gravel, 15% fine to coarse sand, 15% silt), brown, wet, no odor.	GP					
35	X	35.0 - 36.5 Gravelly SAND trace silt (60% fine to coarse sand, 35% fine gravel, 5% silt), gray, wet, creosote odor.	SP		50	50/6"	43.8	SB5-35-36.5 SB5-35-GW
40								

Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: James Goble
Equipment	: CME
Pacific Crest Rep.	: Annica Nord

LOG OF BORING SB-5

LOG OF BORING SB-6

PACIFIC CREST ENVIRONMENTAL
1533 Bendigo Boulevard North PO Box 952
North Bend, WA 98045

Site Name: West Coast Door
Client: Swensen Enterprises, LLC

Project #: 112-001

Date/Time Started	: 4-01-2009 / 8:18
Date/Time Completed	: 4-01-2009 / 4:28
Total Boring Depth	: 39 feet
Depth to water ATD	: 20 feet
Elevation (ft)	: NA
Drilling Method	: Direct Push & HSA
Sampler Type	: Macro-Core & piston sampler

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	PID (ppm)	Sample ID
0		No Sampling above 28 feet bgs. From auger cuttings: From Approximately 0 - 12: GRAVEL and coarse to medium sand	GP		-	-	
10		From Auger Cuttings: From Approximately 12 -28: SAND trace silt, trace gravel (90% fine to medium grained sand, 5% silt, 5% gravel), medium brown, moist, no odor.	SP		-	-	SB6-22-RGW
20					-	-	
	X	28 -31.5 SAND (100% medium to coarse grained sand), light brown to medium gray, wet, no odor.	SP		100	0.0	
30		31.5 - 32 SAND minor silt (85% fine sand, 15% silt), medium gray, wet, no odor.	SP				
	X	32 - 32.5 SAND (100% fine sand) medium gray, wet, no odor.	SP				
		32.5 - 35 Silty SAND (65% fine sand, 35% silt), medium gray, moist, no odor.	SM		100	0.1	SB6-37-RGW
	X	35 - 39 Sandy SILT (60% SILT, 40% fine sand), medium gray, moist, no odor.	ML		100	0.3	
40		Bottom of Boring at 39 feet bgs					

Drilling Company	: ESN Northwest
Drilling Foreman	: Noel Knopf
Equipment	: AMS Powerprobe 9630
Pacific Crest Rep.	: Monty Busbee

LOG OF BORING SB-6

LOG OF BORING SB-9

Date/Time Started	: 4-01-2009 / 8:45
Date/Time Completed	: 4-02-2009 / 4:28
Total Boring Depth	: 43 feet
Depth to water ATG	: 24.13
Elevation (ft)	: NA
Drilling Method	: Direct Push
Sampler Type	: screen-point groundwater
	: Macro-core

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door
Client: Swensen Enterprises, LLC

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	PID (ppm)	Sample ID
0	X	0 - 4 Sandy GRAVEL with silt (50% gravel, 30% fine to coarse sand, 20% silt), light to dark gray, dry, no odor	GP-GM		70	0.0	
	X	4 - 8 As above	GP-GM		80	0.0	
10	X	8 - 12 As above	GP-GM		50	0.0	
	X	12 - 12.5 SAND (100% coarse sand), medium brown, moist, no odor.					
		12.5 - 16 Sandy GRAVEL with silt (50% gravel, 30% fine to coarse sand, 20% silt), light to dark gray, moist, no odor.	GP-GM		60	0.0	
	X	16 - 19 As above.	GP-GM		100	0.0	
		19 - 20 SAND to Sandy Silty GRAVEL (Slough?) medium gray, moist, no odor.	GP-SM				
20	X	20 - 21GRAVEL with sand to SAND (Slough *4 foot sampler filled from one foot of advancement).	GP		100*	0.0	
	X	21 - 22 As above.	GP		100*	0.0	
		Broken probe rods and sampler. Advancing boring with hollow stem augers to 40 feet.					
					-	-	SB9-32-RGW
30							

04-13-2009 \\Pacific-8e185af\public\Project Files\112 Swensen\112-001 West Coast Door Property\Boring Logs\SB9.bo

Drilling Company	: ESN Northwest
Drilling Foreman	: Noel Knopf
Equipment	: AMS Powerprobe 9630
Pacific Crest Rep.	: Monty Busbee

LOG OF BORING SB-9

LOG OF BORING SB-9

Site Name: West Coast Door
Client: Swensen Enterprises, LLC

Project #: 112-001

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Date/Time Started	: 4-01-2009 / 8:45
Date/Time Completed	: 4-02-2009 / 4:28
Total Boring Depth	: 43 feet
Depth to water ATG	: 24.13
Elevation (ft)	: NA
Drilling Method	: Direct Push
Sampler Type	: screen-point groundwater
	: Macro-core

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	PID (ppm)	Sample ID
30							
					-	-	SB9-32-RGW
		40 - 41 SAND (100% fine to coarse sand), medium gray, wet, VOC odor.					
40	X	41 - 42 GRAVEL with sand (70% gravel, 30% fine to medium sand), medium gray, wet, VOC odor.	SP / GP		100	4.6	
	X	42 - 43 Silty SAND (60% fine to medium sand, 40% silt), medium gray, wet, slight VOC odor.	SM				
	X	43 - 43.5 GRAVEL trace silt (95% gravel, 5% silt), medium gray, moist, VOC odor.	GM / SM		100	3.1	SB9-43-RGW
	X	43.5 - 45 Silty SAND (60% fine to medium sand, 40% silt), medium gray, moist, VOC odor.	SP				
	X	45 - 45.5 SAND trace silt (95% fine to medium sand, 5% silt), medium gray, moist, VOC odor.	SM		100	-	
	X	45.5 - 49 Silty SAND (60% fine to medium sand, 40% silt), medium gray, moist, VOC odor.					
		Bottom of Boring at 49 feet bgs					
50							
60							

Drilling Company	: ESN Northwest
Drilling Foreman	: Noel Knopf
Equipment	: AMS Powerprobe 9630
Pacific Crest Rep.	: Monty Busbee

LOG OF BORING SB-9

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Boring ID: SP2-B

Drill Date: June 11, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 24

Coordinate System: NAD83/98
Ground Surf Elev. and Datum: 245.9 NGVD 29
Latitude/Northing: 697992.86
Longitude/Easting: 1149534.32
Boring Location:

Client: Bill Swensen
Project: Swensen-WCD
Task:
Address: 3133 Cedar St, Tacoma, WA.

Remarks: Boring backfilled with bentonite chips to 5 feet bgs, then concrete patched.

PID (ppm)	SAMPLE ID	BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				0–1	Concrete	Concrete with underlying pea gravel at surface.
				1–4.5	GW-GM	Very dark brown and black, well graded rounded GRAVEL with sand (20 to 35%), silt (10%), moist, no odor (FILL).
0.0		50/6"		2.5		
0.0	SP2B-5.0	50/3"		5	SW	Very dark brown, well graded fine to coarse SAND, fine and coarse gravel (15%), silt (5%). Moist, no odor; trace silver, waxy sheen.
0.0		50/3"		7.5		Same as above. Slight oily odor, moist, trace silver sheen.
0.0		50/4"		10		Same as above. Gravel (30 to 40%). No odor, no sheen. Possible fill.
0.0		50/4"		12.5	GW-GM	Dark grayish brown well graded fine and coarse GRAVEL with sand (20 to 30%), silt (10%), moist to wet, no odor, trace silver sheen.
0.2	SP2B-15.0	50/6"		15	SP	Dark brown poorly graded fine SAND with rounded gravel (20 to 30%), silt (<5%), moist, slight oily odor and trace silver sheen and paraffin floaters.
0.1		50/6"		17.5	SW	Dark brown well graded fine to coarse SAND with fine and coarse gravel, silt (<5%), moist, no odor, colorless oily sheen.

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
= denotes groundwater table

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Boring ID: SP2-B

Drill Date: June 11, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 24

Coordinate System: NAD83/98
Ground Surf Elev. and Datum: 245.9 NGVD 29
Latitude/Northing: 697992.86
Longitude/Easting: 1149534.32
Boring Location:

Client: Bill Swensen
Project: Swensen-WCD
Task:
Address: 3133 Cedar St, Tacoma, WA.

Remarks: Boring backfilled with bentonite chips to 5 feet bgs, then concrete patched.

PID (ppm)	SAMPLE ID	BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
0.0		75/5"			SP-SM	Dark brown poorly graded fine SAND with fine and coarse gravel (~30%), silt (5 to 10%), moist, no odor, trace silver sheen.
0.3		50/5"			SP	Dark brown grading down to gray with bluish-gray mottles, poorly graded fine SAND with gravel (15 to 25%), silt (<5%), moist to wet, no odor, trace silver sheen.
7.6	SP2B-25.0	50/6"				Same as above. No gravel. Sand coarsening with depth. Strong naphthalene odor, no sheen.
15.8		50/6"				Same as above. Strong naphthalene odor, sheen test yields foamy water but no sheen.
94	SP2B-30.0	50/6"				Same as above. Strong naphthalene odor, strong rainbow sheen.
136		50/6"			SW	Gray, well graded SAND, gravel (5%), silt (<5%). Strong naphthalene odor, sheen on soil. Heaving sand in sampler.
74	SP2B-35.0					Same as above. Gravel (15 to 20%).
99		50/6"			SP	Gray, poorly graded fine and medium SAND (10% coarse), no gravel, silt (<5%), wet, strong naphthalene odor, sheen on soil.

Depth scale (FT BGS): 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40

Notes:
FT BGS = feet below ground surface
ppm = parts per million
--- Dashed contact line in soil description indicates a gradational contact
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Boring ID: SP2-B

Drill Date: June 11, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

Coordinate System: NAD83/98
Ground Surf Elev. and Datum: 245.9 NGVD 29
Latitude/Northing: 697992.86
Longitude/Easting: 1149534.32
Boring Location:

Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 24

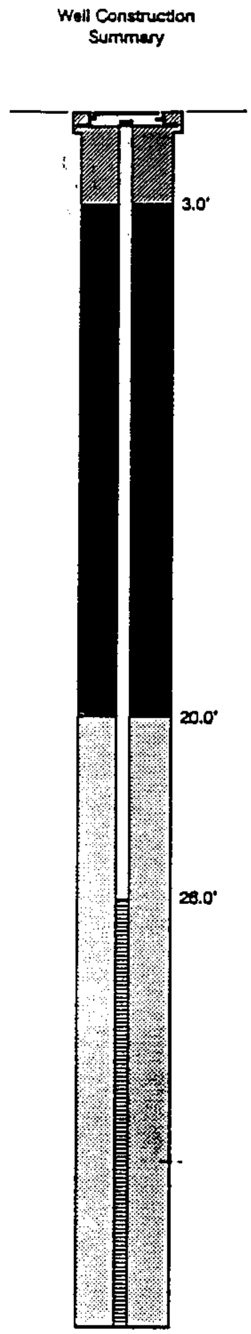
Client: Bill Swensen
Project: Swensen-WCD
Task:
Address: 3133 Cedar St, Tacoma, WA.

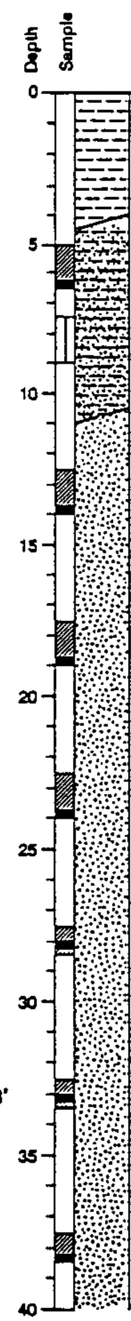
Remarks: Boring backfilled with bentonite chips to 5 feet bgs, then concrete patched.

PID (ppm)	SAMPLE ID	BLOW COUNT	DRIVEN / RECOVERED	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
				40		No recovery at 40' bgs and driller reports heaving stops, suggesting possible silt layer.
3.0	SP2B-42.0	100/6"		42	SP	Same as above, slight naphthalene odor.
0.9	SP2B-45.0	50/6"		44–45	SW	Gray well graded SAND with fine and coarse gravel, looks like sample of soil heaved into auger, slight naphthalene odor, wet.
				46		

Equipment Mobile B-57

Land Surface Elevation ______ Date 4/29/92





Sheen	OVM	Blows per Foot	Description
	ND		DARK BROWN SANDY SILT (ML) very stiff, wet; with some gravel.
	ND	28	BROWN SILTY SAND (SM) dense, moist; with gravel, and a trace of cobbles.
	–	43	
			GRAY BROWN SAND (SP) very dense, moist; medium to coarse grained, with some gravel.
	ND	60	
	ND	88	With a trace of gravel.
	ND	45	With a trace of silt.
	ND	78	Becomes saturated, with some silt.
	ND	96/0.8'	Becomes gravelly, with a trace of cobbles.
	ND	92	With a trace of gravel.

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Log of Monitoring Well 1 (0-40')

Puget Sound National Bank/West Coast Door - Phase II
Tacoma, Washington

PLATE **3a**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,536.003	SES	[signature]	16 Jun 92		

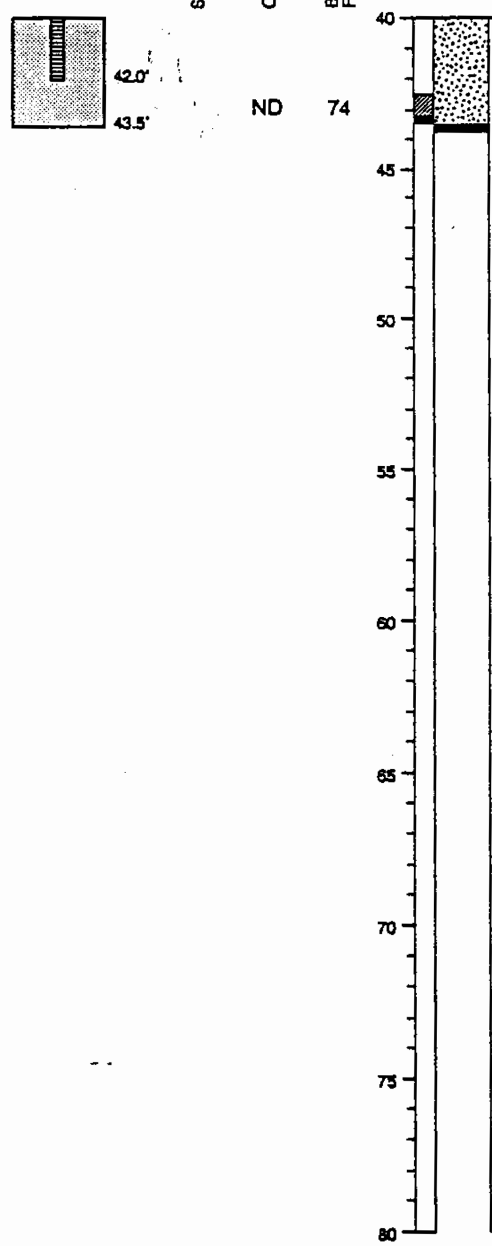
KB 01149

Equipment Mobile B-57

Land Surface Elevation ______ Date 4/29/92

Well Construction Summary

Sheen	OVM	Blows per Foot	Depth	Sample
	ND	74		



Groundwater encountered at 27 feet during drilling.

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Log of Monitoring Well 1 (40-43.5')

Puget Sound National Bank/West Coast Door - Phase II
Tacoma, Washington

PLATE **3b**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,536.003	SES		18 Jun 92		

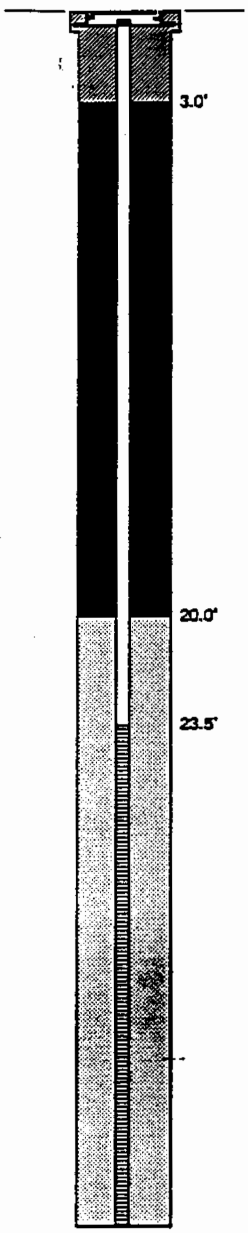
ling.

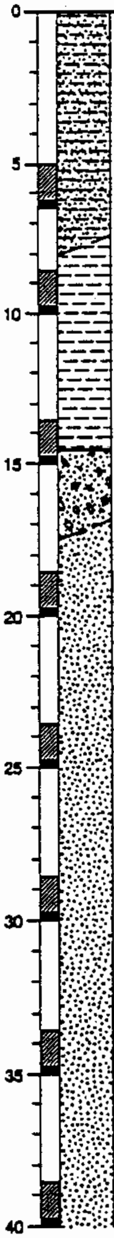
PLATE 4b

Equipment Mobile B-61

Land Surface Elevation ______ Date 4/30/92

Well Construction Summary





Depth	Sheen	OVM	Blows per Foot	Description
0		ND		RED BROWN SILTY SAND (SM) dense, moist; with a trace of gravel (Fill).
5		ND	39	Becomes brown (Native).
10		ND	36	GRAY BROWN SILT (ML) hard, moist.
15		ND	29	BROWN GRAVEL (GP) medium dense, moist; with some sand and silt. BROWN GRAVELLY SAND (SP) dense, moist; with a trace of cobbles.
20		ND	54	
25		ND	71	Becomes very dense.
30		ND	84	Becomes saturated, medium coarse grained, with some gravel and silt.
35		ND	91/0.9'	Becomes medium grained.
40		ND	52	

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Log of Monitoring Well 3 (0-40')

Puget Sound National Bank/West Coast Door - Phase II
Tacoma, Washington

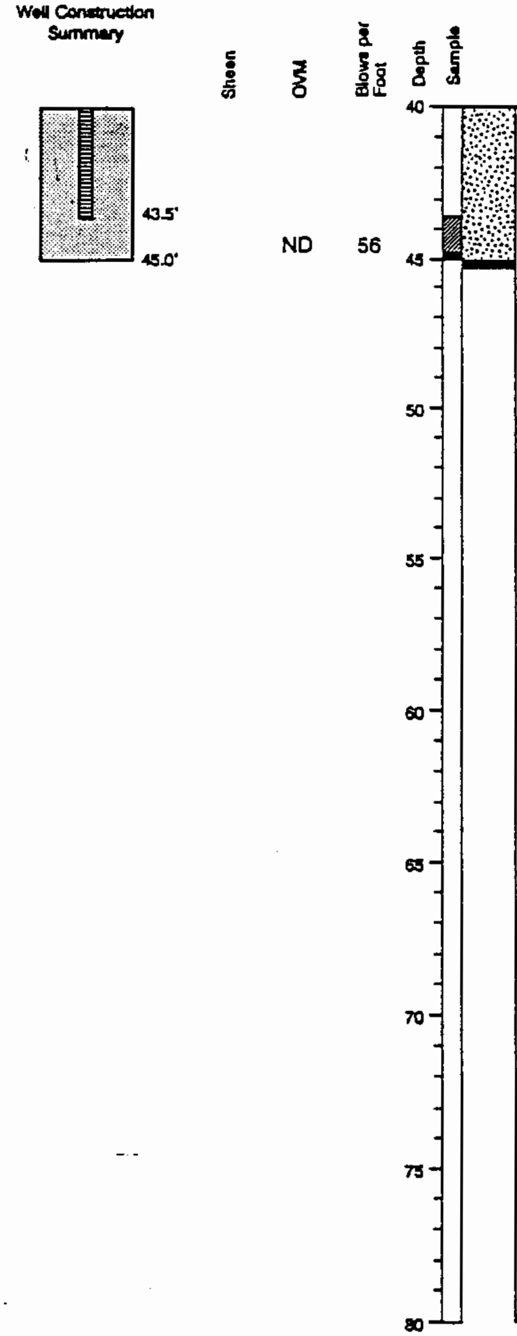
PLATE **5a**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,536.003	SES	JBL	18 Jun 92		

KB 01153

Equipment Mobile B-61

Land Surface Elevation | Date 4/30/92



Groundwater encountered at 27 feet during drilling.

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

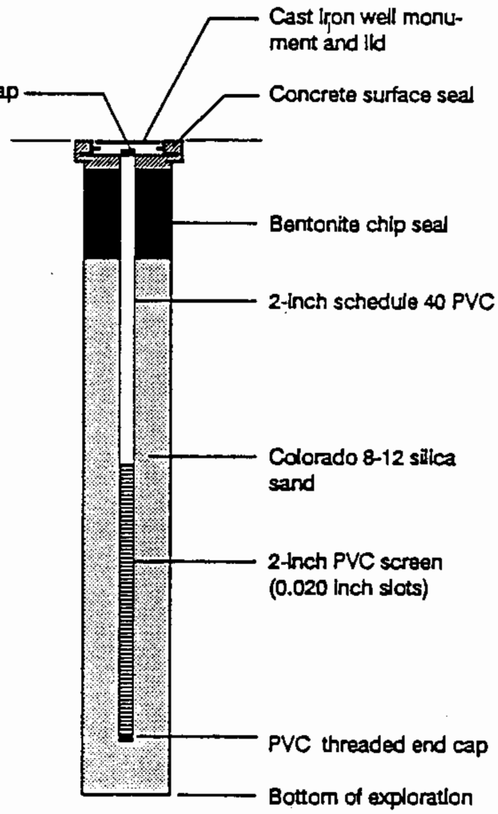
Log of Monitoring Well 3 (40-45')

Puget Sound National Bank/West Coast Door - Phase II
Tacoma, Washington

PLATE **5b**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,536.003	SES	[signature]	18 Jun 92		

KB 01154



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Geology & Hydrogeology

Monitoring Well Construction

Puget Sound National Bank/West Coast Door - Phase II
Tacoma, Washington

PLATE **2**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,536.003	SES	[signature]	18 Jun 92		

KB 01148

BORING LOG MW-4

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Head Space Analysis (ppm)
0	concrete					
5	bentonite	Damp	50(4)	GP	Sandy-Gravel, gravel and cobbles with medium to coarse sand, brown. No odor	
10		Moist	26		Sandy-Gravel, gravel and cobbles with medium to coarse sand, brown. No odor	
15		Moist	50(6)		*No Recovery at 15 foot interval, sand in drill cutting.*	
20		Moist/ Wet	50(6)	SP	Sand, Medium to coarse, with gravel, brown. No odor.	
25	sand	Wet	50(6)		Sand, Medium to coarse, with gravel, gray. Slight creosote odor.	
30		Wet	50(6)		Sand, Medium to coarse, with gravel, gray. No odor.	
35		Wet	50(6)		Sand, Medium to coarse, with gravel, gray. No odor.	
					Boring terminated at 35 feet.	
40						

Sampler: Split-spoon. Soil sampled collected every 5 feet beginning at 2.5 feet below ground surface.
Driller: Cascade Drilling, Inc. Hollow-stem auger.
Monitoring Well: 2"-PVC, Screened 25' to 35', 0.010" Slot

ENVIRONMENTAL ASSOCIATES, INC.

1380 - 112th Avenue NE, Suite 300
Bellevue, Washington 98004

BORING LOG MW-4

West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-1	07/28/06	RBR	A-5

BORING LOG MW-5

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Head Space Analysis (ppm)
0	concrete					
5		Damp	32	GP	Sandy-Gravel, gravel and cobbles with medium to coarse sand, brown. No odor	
10	bentonite	Damp	27	SP	Sand, fine to medium sand, with minor gravel. No odor	
15			50(3)		*No Recovery at 15 foot interval, sand in drill cutting.*	
20		Damp/ Moist	24	SP	Sand, fine to medium sand, with gravel, brown. No odor.	
25		Wet	63	GP	Sandy-Gravel, Gravel, with medium to coarse sand, brown to gray. Strong creosote odor.	
30	sand	Wet	50(6)	GP	Sandy-Gravel, Gravel, with medium to coarse sand, gray. Strong creosote odor.	
35		Wet	50(6)	SP	Gravely Sand, Medium to coarse sand, with gravel, gray. Strong creosote odor.	
					Boring terminated at 35 feet.	
40						

Sampler: Split-spoon. Soil sampled collected every 5 feet beginning at 2.5 feet below ground surface.
Driller: Cascade Drilling, Inc. Hollow-stem auger.
Monitoring Well: 2"-PVC, Screened 25' to 35', 0.010" Slot

ENVIRONMENTAL ASSOCIATES, INC.

1380 - 112th Avenue NE, Suite 300
Bellevue, Washington 98004

BORING LOG MW-5

Former West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-3	09/18/06	RBR	A-6

BORING LOG MW-6

Depth/ Sample	Well Design	Moisture/ Water Table	Blows / Foot	USCS	DESCRIPTION	Head Space Analysis (ppm)
0	concrete					
5		Damp	22	GP	Sandy-Gravel, gravel and cobbles with medium to coarse sand, brown. No odor	
10	bentonite	Damp	28	GP	Sandy-Gravel, gravel and cobbles with medium to coarse sand, brown. No odor	
15		Damp	43	SP	Sand, medium to course sand, with some gravel, brown. No odor.	
20		Damp	38	SP	Sand, medium to course sand, with some gravel, brown. Slight creosote odor.	
25		Damp/ Moist	33	SP	Sand, fine to medium sand, with some gravel, gray. Strong creosote odor.	
30	sand	Wet	39	SP	Sand, fine to medium sand, with some gravel, gray. Strong creosote odor.	
35		Wet	18	SP	Gravely Sand, medium to coarse sand, with gravel, gray. Moderate creosote odor.	
					Boring terminated at 35 feet.	
40						

Sampler: Split-spoon. Soil sampled collected every 5 feet beginning at 2.5 feet below ground surface.
Driller: Cascade Drilling, Inc. Hollow-stem auger.
Monitoring Well: 2"-PVC, Screened 25' to 35', 0.010" Slot

ENVIRONMENTAL ASSOCIATES, INC.

1380 - 112th Avenue NE, Suite 300
Bellevue, Washington 98004

BORING LOG MW-6

Former West Coast Door Property
3133 South Cedar Street
Tacoma, Washington 98409

Job Number:	Date:	Logged by:	Plate:
JN-26192-3	09/18/06	RBR	A-7

LOG OF WELL MW-7

Date/Time Started	: 1-26-07/0827
Date/Time Completed	: 1-26-07/1415
Total Boring Depth	: 52.5'
Total Well Depth	: 40'
Depth to water ATD	: 27.5'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 3" diameter 18'
Drive Hammer (lbs)	: 140

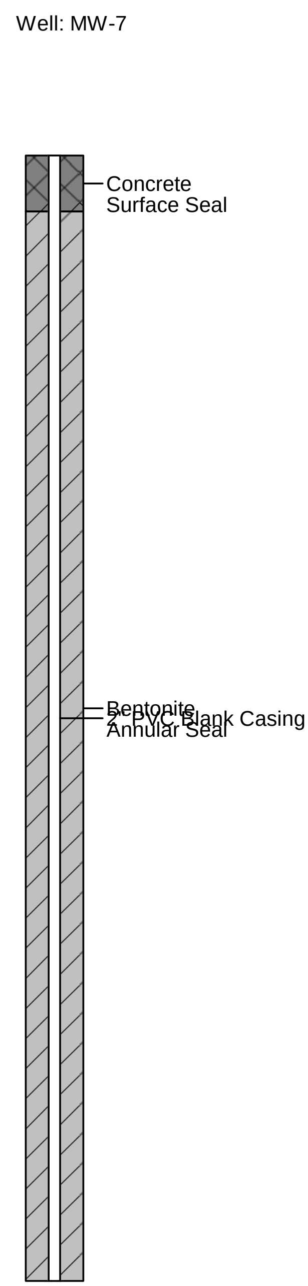
PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	% Recovery	Blow Count	PID (ppm)	Sample ID
0		0.0 - 0.5 Concrete.					
		0.5 - 1.0 Pea gravel.	GP				
		1.0 - 2.5 Silty SAND with strong creosote odor, dry.	SM				
		2.5 - 3.0 Concrete.					
5	X	5.0 - 6.5 Cobble.	-	5	50/3"	-	-
	X	7.5 - 9.0 Broken Cobble.	-	2	50/1"	-	-
10	X	10.0 - 11.5 SAND with gravel, trace silt (80% medium to coarse sand, 15% fine to coarse gravel, 5% silt), brown, moist.	SP	4	50/2"	-	-
	X	12.5 - 14.0 GRAVEL, trace sand, trace silt (90% fine gravel, 5% coarse sand, 5% silt), brown, moist.	GP	5	50/3"	44.8	-
15	X	15.0 - 16.5 GRAVEL, trace sand, trace silt (90% fine to coarse gravel, 5% coarse sand, 5% silt), brown, moist.	GP	5	50/3"	30	-
	X	17.5 - 18.25 Gravelly SAND trace silt (55% coarse sand, 40% fine gravel, 5% silt), brown, moist, creosote odor.	SP	50	50/6"	67.0	MW7-17.5-19
		18.25 - 19.0 SAND (100% fine sand), brown, moist, strong creosote odor.	SP				
20							



Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: Steve Choate
Equipment	: CME 65
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-7

LOG OF WELL MW-7

PACIFIC CREST ENVIRONMENTAL
1533 Bendigo Boulevard North PO Box 952
North Bend, WA 98045

Site Name: West Coast Door Property

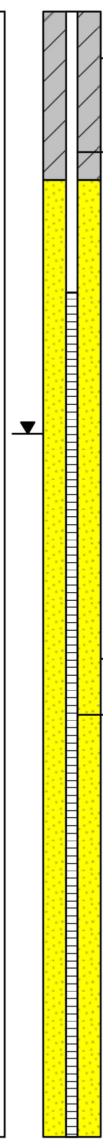
Client: William Swensen

Project #: 112-001

Date/Time Started	: 1-26-07/0827
Date/Time Completed	: 1-26-07/1415
Total Boring Depth	: 52.5'
Total Well Depth	: 40'
Depth to water ATD	: 27.5'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 3" diameter 18'
Drive Hammer (lbs)	: 140

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
20	X	20.0 - 21.5 Gravelly SAND trace silt (55% coarse sand, 40% fine gravel, 5% silt), brown, moist, creosote odor.	SP		5	50/3"	64	-
	X	22.5 - 24.0 SAND trace gravel (95% medium to coarse sand, 5% coarse gravel), gray, moist, creosote odor.	SP		20	50/4"	60.2	-
25	X	25.0 - 26.5 SAND trace gravel (95% medium to coarse sand, 5% coarse gravel), gray, moist, creosote odor.	SP		50	50/6"	65	MW7-25-26.5
	X	27.5 - 29.0 SAND (100% fine to coarse sand), gray, wet, slight creosote odor.	SP		100	29/30/39	22	-
30	X	30.0 - 31.5 SAND (100% fine to coarse sand), gray, wet, slight creosote odor.	SP		40	33/36/39	32.8	-
	X	32.5 - 34.0 GRAVEL minor sand (85% fine to coarse gravel, 15% medium to coarse sand), dark gray, wet, slight musty odor.	GP		15	27/30/32	61.2	-
35	X	35.0 - 36.5 NO RECOVERY	-		1	29/31/32	-	-
	X	37.5 - 39.0 NO RECOVERY.	-		-	50/2"	-	-
40								

Well: MW-7



Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: Steve Choate
Equipment	: CME 65
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-7

LOG OF WELL MW-7

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PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

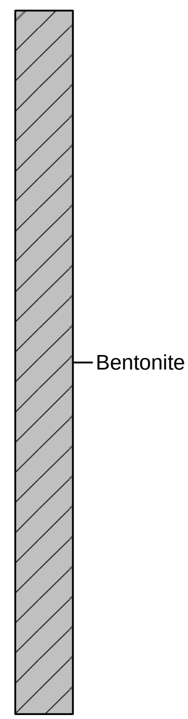
Client: William Swensen

Project #: 112-001

Date/Time Started	: 1-26-07/0827
Date/Time Completed	: 1-26-07/1415
Total Boring Depth	: 52.5'
Total Well Depth	: 40'
Depth to water ATD	: 27.5'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 3" diameter 18'
Drive Hammer (lbs)	: 140

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
40	X	40.0 - 41.0 SAND (100% fine to medium sand), gray, wet, slight creosote odor.	SP		20	50/4"	22	-
		41.0 - 41.5 Sandy GRAVEL (50% fine to coarse gravel, 50% medium to coarse sand), gray, wet, slight creosote odor.	GP					
	X	42.5 - 44.0 Gravelly SAND (60% fine to coarse sand, 40% fine to coarse gravel), gray, wet, creosote odor.	SP		35	50/6"	44.8	-
45	X	45.0 - 46.5 SAND (100% fine to coarse sand), gray, wet, creosote odor.	SP		75	32-50/4"	34.8	MW7-GW-45
	X	47.5 - 49.0 NO RECOVERY.	-		-	50/6"	-	-
50	X	50.0 - 51.5 SAND (100% fine to coarse sand), gray, wet, heavy rainbow sheen, strong petroleum odor.	SP		100	50/4"	37.1	-
	X	52.5 - 54.0 NO RECOVERY.	-		-	-	-	MW7-52.5-GW
55								
60								

Well: MW-7



Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: Steve Choate
Equipment	: CME 65
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-8

PACIFIC CREST ENVIRONMENTAL
1533 Bendigo Boulevard North PO Box 952
North Bend, WA 98045

Site Name: West Coast Door Property

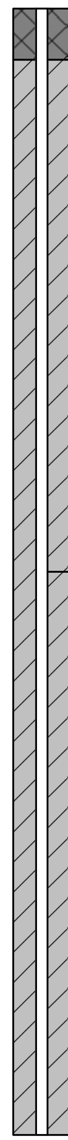
Client: William Swensen

Project #: 112-001

Date/Time Started	: 1-31-07/0850
Date/Time Completed	: 1-31-07/1100
Total Boring Depth	: 40'
Total Well Depth	: 40'
Depth to water ATD	: 30'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 140

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
0		0.0 - 0.5 Concrete.						
		0.5 - 5.0 Soil cuttings are sandy with mainly rounded cobbles.	GP					
5	X	5.0 - 6.5 NO RECOVERY.	-		0	50/1"	-	-
		Driller comments that below 8 feet, he is not drilling in fill material.						
10	X	10.0 - 11.5 Sandy GRAVEL with silt, fill, dry.	GP		3	50/2"	32.7	-
15	X	15.0 - 16.5 SAND minor silt, minor gravel (75% fine to coarse sand, 15% silt, 10% fine gravel), brown, dry.	SP		30	50/4"	166	MW8-15-16.5
20	X	20.0 - 21.5 SAND minor gravel, trace silt (85% fine to coarse sand, 10% fine gravel, 5% silt), brown-yellow, slightly moist.	SP		20	50/5"	96.6	-

Well: MW-8



Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: Steve Choate
Equipment	: CME 65
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-8

LOG OF WELL MW-8

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PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

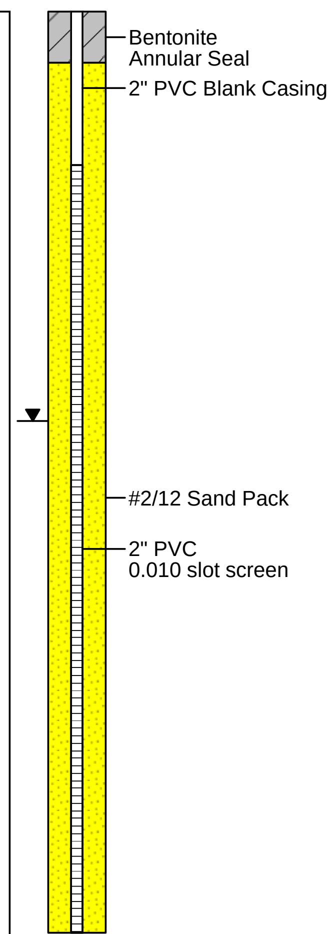
Client: William Swensen

Project #: 112-001

Date/Time Started	: 1-31-07/0850
Date/Time Completed	: 1-31-07/1100
Total Boring Depth	: 40'
Total Well Depth	: 40'
Depth to water ATD	: 30'
Elevation (ft)	: NA
Drilling Method	: HSA
Sampler Type	: D+M S.S. 2" diameter 18'
Drive Hammer (lbs)	: 140

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	Blow Count	PID (ppm)	Sample ID
22								
25.0	X	25.0 - 26.5 SAND trace gravel, trace silt (90% fine to coarse sand, 5% fine gravel, 5% silt), brown, slightly moist.	SP		50	50/6"	69/115	MW8-25-26.5
27								
30.0	X	30.0 - 31.5 SAND trace silt (95% fine to coarse sand, 5% silt), brown, wet, no odor.	SP		50	50/6"	35.9	-
32								
35.0	X	35.0 - 36.5 SAND minor gravel, trace silt (85% fine to coarse sand, 10% fine gravel, 5% silt), brown-gray, wet, assorted cobbles.	SP		70	50/6"	93.6	-
37								
40.0	X	40.0 - 41.5 SAND (100% fine to coarse sand), gray-brown, wet, no odor.	SP		55	50/6"	23	-
42								

Well: MW-8



Drilling Company	: Cascade Drilling, Inc.
Drilling Foreman	: Steve Choate
Equipment	: CME 65
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-8

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LOG OF WELL MW-9

(Page 1 of 4)

Date/Time Started	: 9-6-2007/0915
Date/Time Completed	: 9-7-2007/1100
Total Boring Depth	: 70'
Total Well Depth	: 70'
Depth to water ATD	: 25'
Elevation	: 245.99'
Drilling Method	: Sonic
Sampler Type	: Sonic Core Sampler

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

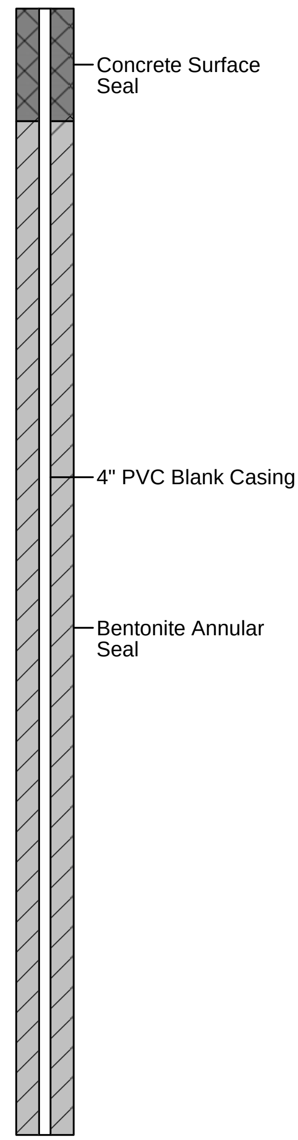
Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	PID (ppm)	Lab No.
0		0.0 - 0.5 Asphalt.					
		0.5 - 2.5 GRAVEL, minor sand, trace silt, (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown-gray, moist, no odor.	GP		100	0.0	-
		2.5 - 5.0 GRAVEL, minor sand, trace silt, (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown, moist, no odor.	GP		100	0.0	-
5		5.0 - 7.5 GRAVEL, minor sand, trace silt, (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown, moist, no odor.	GP		100	-	-
		7.5 - 10.0 GRAVEL, minor sand, trace silt, (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown, moist, no odor.	GP		100	0.0	-
10		10.0 - 12.0 SAND, (100% fine to medium sand), light brown, moist, no odor.	SP		100	0.0	-
		12.0 - 12.5 Sandy GRAVEL, (65% fine to coarse gravel, 35% fine to coarse sand), light brown-gray, moist, no odor.	GP				
		12.5 - 15.0 Sandy GRAVEL, (65% fine to coarse gravel, 35% fine to coarse sand), light brown-gray, moist, no odor.	GP		100	-	-
15		15.0 - 17.5 Gravelly SAND, trace silt, (55% fine to coarse sand, 40% fine to coarse gravel, 5% silt), brown-gray, moist, no odor.	SP		100	-	-
		17.5 - 20.0 Gravelly SAND, trace silt, (55% fine to coarse sand, 40% fine to coarse gravel, 5% silt), brown-gray, moist, no odor.	SP		100	1.5	-
20							

Well: MW-9



Drilling Company	: Boat Longyear Drilling, Inc.
Drilling Foreman	: Dale
Equipment	: Sonic
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-9

Date/Time Started	: 9-6-2007/0915
Date/Time Completed	: 9-7-2007/1100
Total Boring Depth	: 70'
Total Well Depth	: 70'
Depth to water ATD	: 25'
Elevation	: 245.99'
Drilling Method	: Sonic
Sampler Type	: Sonic Core Sampler

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

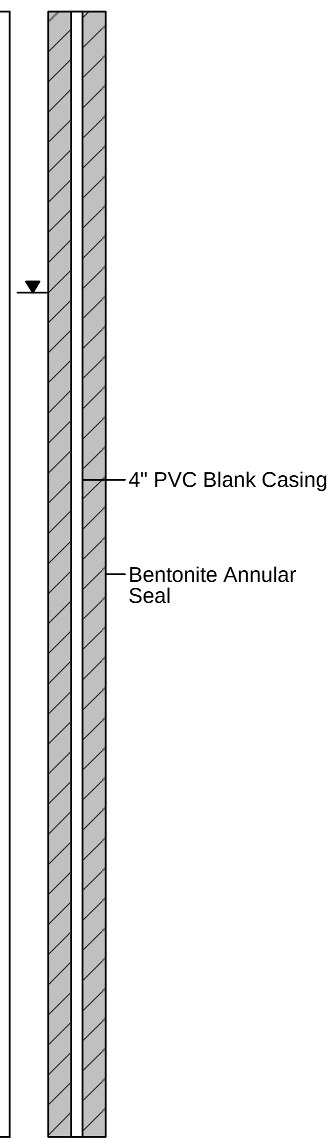
Site Name: West Coast Door Property

Client: William Swensen

Project #: 112-001

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	PID (ppm)	Lab No.
20		20.0 - 21.0 SAND, minor gravel, trace silt (85% fine to coarse sand, 10% fine gravel, 5% silt), dark brown, moist, no odor.	SP		100	0.0	-
		21.0 - 23.0 SAND, with silt (80% fine to coarse sand, 20% silt), gray-brown, moist, no odor.	SP		100	0.0	-
		23.0 - 24.0 GRAVEL, with sand, trace silt, (75% fine to coarse gravel, 20% fine to coarse sand, 5% silt), gray, moist, no odor.	GP		100	3.8	MW9-24-25
		24.0 - 25.0 Silty SAND, (60% fine sand, 40% silt), gray, wet, creosote odor, assorted cobbles.	SP-SM				
25		25.0 - 27.0 SAND, (100% find sand), gray, wet, strong creosote odor.	SP		100	0.0	-
		27.0 - 27.5 GRAVEL, with sand, (80% fine to coarse gravel, 20% fine to coarse sand), gray, wet, rainbow sheen, strong creosote odor.	GP				
		27.5 - 30.0 GRAVEL, with sand, (80% fine to coarse gravel, 20% fine to coarse sand), gray, wet, heavy rainbow sheen, strong creosote odor.	GP		100	0.0	-
30		30.0 - 32.5 GRAVEL, with sand, (80% fine to coarse gravel, 20% fine to coarse sand), gray, wet, heavy rainbow sheen, strong creosote odor.	GP		100	2.6	-
		32.5 - 35.0 Gravelly SAND, (55% fine to coarse sand, 45% fine to coarse gravel), gray, wet, strong creosote odor, heavy rainbow sheen.	SP		100	1.6	-
35		35.0 - 37.0 SAND, minor gravel, (90% fine to coarse sand, 10% fine to coarse gravel), gray, wet, creosote odor.	SP		100	0.0	-
		37.0 - 37.5 GRAVEL, with sand, (75% fine to coarse gravel, 25% fine to coarse sand), gray, wet, creosote odor, slight sheen evident on soil.	GP				
		37.5 - 40.0 GRAVEL, with sand, (75% fine to coarse gravel, 25% fine to coarse sand), gray, wet, creosote odor, slight sheen evident on soil.	GP		100	-	MW9-40-GW
40							

Well: MW-9



Drilling Company	: Boat Longyear Drilling, Inc.
Drilling Foreman	: Dale
Equipment	: Sonic
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-9

LOG OF WELL MW-9

Date/Time Started	: 9-6-2007/0915
Date/Time Completed	: 9-7-2007/1100
Total Boring Depth	: 70'
Total Well Depth	: 70'
Depth to water ATD	: 25'
Elevation	: 245.99'
Drilling Method	: Sonic
Sampler Type	: Sonic Core Sampler

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Site Name: West Coast Door Property

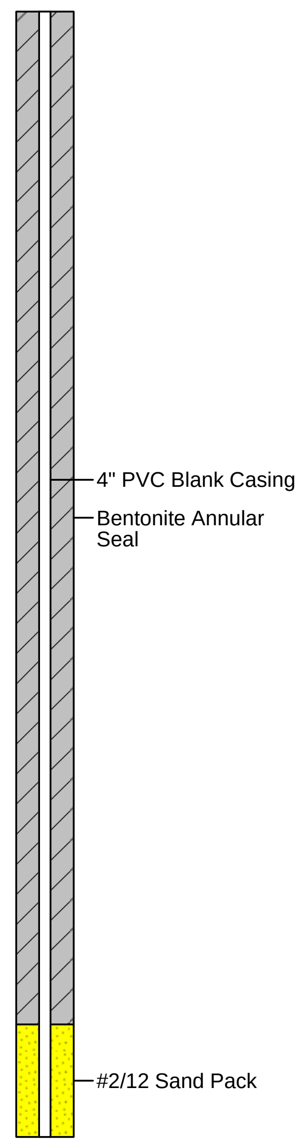
Client: William Swensen

Project #: 112-001

Depth In Feet	Description	USCS
40	40.0 - 42.5 SAND (100% fine to medium sand), gray, wet, creosote odor.	SP
	42.5 - 44.5 SAND (100% fine to medium sand), gray, wet, creosote odor.	SP
45	44.5 - 47.0 Sandy SILT, (50% silt, 50% fine sand), gray, moist, very dense, no odor.	ML
	47.0 - 50.0 Sandy GRAVEL, trace silt, (55% fine to coarse gravel, 40% fine to coarse sand, 5% silt), brown, wet, no odor.	GP
50	50.0 - 52.5 GRAVEL, with sand, trace silt, (75% fine to coarse gravel, 20% fine to coarse sand, 5% silt), brown, wet, no odor.	GP
	52.5 - 53.5 GRAVEL, with sand, trace silt, (75% fine to coarse gravel, 20% fine to coarse sand, 5% silt), brown, wet, no odor.	GP
	53.5 - 54.0 GRAVEL, trace sand, trace silt, (90% fine to coarse gravel, 5% fine to coarse sand, 5% silt), brown, wet, no odor.	GP
	54.0 - 55.0 Sandy GRAVEL, trace silt, (55% fine to coarse gravel, 40% fine to coarse sand, 5% silt), brown, wet, creosote odor.	GP
55	55.0 - 55.5 GRAVEL, trace sand, trace silt, (90% fine to coarse gravel, 5% fine to coarse sand, 5% silt), brown, wet, slight creosote odor.	GP
	55.5 - 57.5 Gravelly SAND, (55% fine to coarse sand, 45% fine to coarse gravel), gray-brown, wet, very sight to no creosote odor.	SP
	57.5 - 59.5 Sandy GRAVEL, trace silt, (70% fine to coarse gravel, 25% fine to coarse sand, 5% silt), wet, brown, slight creosote odor.	GP
60	59.5 - 60.0 GRAVEL, trace sand, trace silt, (90% fine to coarse gravel, 5% fine to coarse sand, 5% silt), brown, wet, no odor.	GP

Sample interval (ft)	% Recovery	PID (ppm)	Lab No.
40.0 - 42.5	100	-	-
42.5 - 44.5	100	-	-
44.5 - 47.0	100	0.0	MW9-45-47
47.0 - 50.0	100	0.0	-
50.0 - 52.5	100	-	-
52.5 - 55.0	100	-	-
55.0 - 57.5	100	0.0	MW9-55.5-57.5
57.5 - 60.0	100	-	-

Well: MW-9



Drilling Company	: Boat Longyear Drilling, Inc.
Drilling Foreman	: Dale
Equipment	: Sonic
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-9

LOG OF WELL MW-9

Site Name: West Coast Door Property

Client: William Swensen

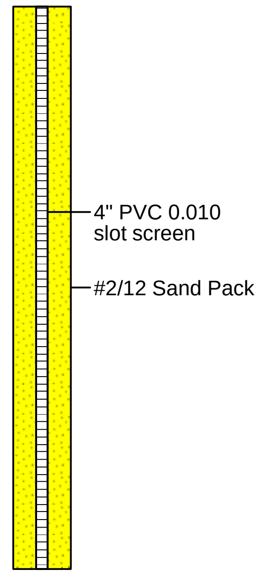
Project #: 112-001

PACIFIC CREST ENVIRONMENTAL
1533 BENDIGO BOULEVARD NORTH PO BOX 952
NORTH BEND, WA 98045

Date/Time Started	: 9-6-2007/0915
Date/Time Completed	: 9-7-2007/1100
Total Boring Depth	: 70'
Total Well Depth	: 70'
Depth to water ATD	: 25'
Elevation	: 245.99'
Drilling Method	: Sonic
Sampler Type	: Sonic Core Sampler

Depth In Feet	Samples	Description	USCS	Graphic	% Recovery	PID (ppm)	Lab No.
60	X	60.0 - 64.0 GRAVEL, minor sand, trace silt, (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown, wet, no odor.	GP		100	-	-
65	X	64.0 - 67.0 GRAVEL, minor sand, trace silt, (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown, wet, no odor.	GP		100	0.0	-
	X	67.0 - 67.5 GRAVEL, minor sand, trace silt, (85% fine to coarse gravel, 10% fine to coarse sand, 5% silt), brown, wet, no odor.	GP				
70		67.5 - 70.0 Sandy SILT, (60% silt, 40% very fine sand), gray, moist, no odor, very dense.	ML		100	0.0	MW9-68-70
75							
80							

Well: MW-9



Drilling Company	: Boat Longyear Drilling, Inc.
Drilling Foreman	: Dale
Equipment	: Sonic
Pacific Crest Rep.	: Annica Nord

LOG OF WELL MW-9

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Monitoring Well ID: MW-10

Drill Date: June 10, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

Ground Surf Elev. & Datum: 244.5 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 697945.61
Longitude/Easting: 1149387.71
Casing Elevation: 244.22 ft

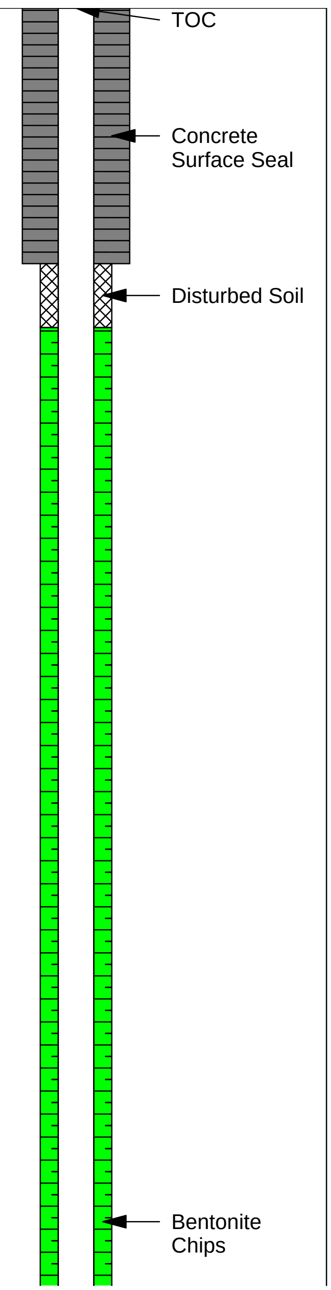
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 21.84*

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks: *Depth to water from top of casing from 6/22/10 groundwater sampling.

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
			0	Asphalt	Asphalt at surface.
			1	GW	Dark brown well graded rounded GRAVEL with sand (30 to 40%), silt (<5%), moist (FILL).
			7		Driller report gravel stops at approximately 7 feet bgs.
			7.5	SW	Brown well graded fine to coarse SAND, gravel (10 to 15%), silt (<5%), wet, no odor, no sheen (Glacial outwash).
0.0		3 3 3	10		
0.0		18 50/6"	15		Same as above.

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-10

Drill Date: June 10, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

Ground Surf Elev. & Datum: 244.5 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 697945.61
Longitude/Easting: 1149387.71
Casing Elevation: 244.22 ft

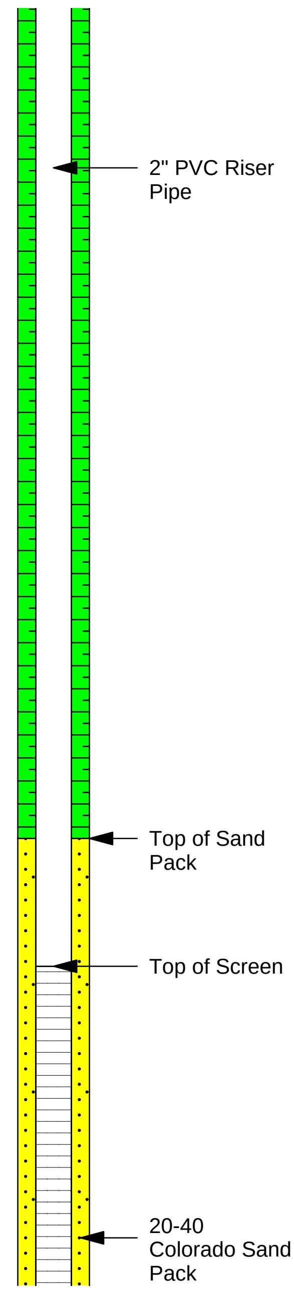
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 21.84*

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks: *Depth to water from top of casing from 6/22/10 groundwater sampling.

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
0.0		50/6"	20	SW	
			21	SP	Dark grayish brown grading down to gray, poorly graded fine and medium SAND, silt (<5%), wet, no odor, no sheen.
			22		
			23		
			24		
0.0		50/6"	25		Same as above, gravel (5 to 10%). Heaving sand below 25' bgs.
			26		
			27		
			28		
			29		
0.0		50/5"	30		Same as above, trace gravel.
			31		
			32		
			33		
			34		
6.0; Soil Sample MW10-35'		50/6"	35	SP	Same as above. Fine gravel (5 to 10%), slight naphthalene odor.
			36		
			37		
			38		
			39		
			40		

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-10

Drill Date: June 10, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

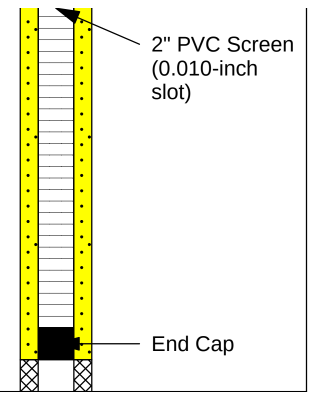
Ground Surf Elev. & Datum: 244.5 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 697945.61
Longitude/Easting: 1149387.71
Casing Elevation: 244.22 ft

Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 21.84*

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks: *Depth to water from top of casing from 6/22/10 groundwater sampling.

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)	MONITORING WELL DETAIL
		50/6"	40	SP	Gray, poorly graded fine and medium SAND, silt (<5%), wet, slight naphthalene odor, no sheen.	
			41			
			42			
			43			
			44			
		50/5"	45		Same as above, gravel (5 to 10%).	
			46			



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-11

Drill Date: June 10, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

Ground Surf Elev. & Datum: 243.9 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 697807.34
Longitude/Easting: 1149380.41
Casing Elevation: 243.35 ft

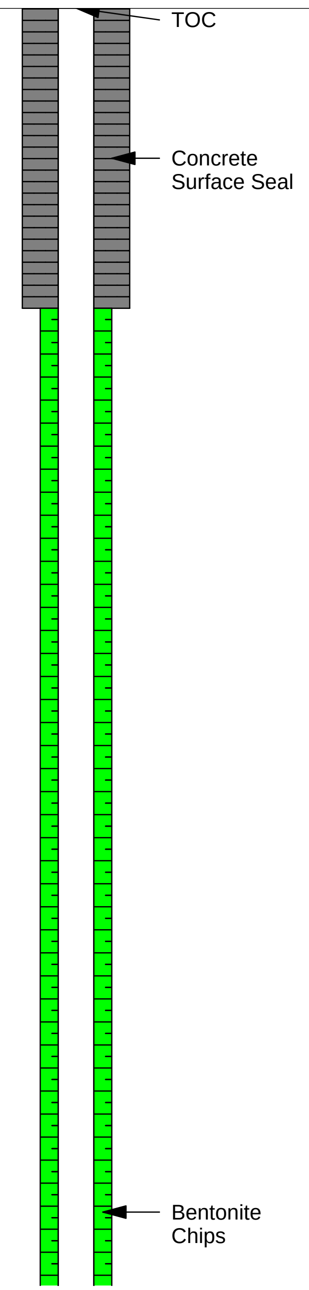
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 18.5

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks:

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
			0	Asphalt	Asphalt at surface.
			1	SW	Dark yellowish brown, grading to dark grayish brown, well graded fine to coarse SAND with fine and coarse rounded gravel (35 to 45%), silt (<5%), moist, no odor (FILL).
			5		Driller says less gravelly below 6' bgs.
			6	SP	See below.
		18 18 25	10	SP	Dark yellowish brown grading down to mottled yellowish brown and dark yellowish brown, poorly graded, fine SAND, no gravel, silt (<5%), moist, no odor (glacial outwash).
0.0		26 50/6"	15		Same as above. Gravel (5%), no odor, no sheen.
			18.5 ▼		
			20		

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-11

Drill Date: June 10, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

Ground Surf Elev. & Datum: 243.9 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 697807.34
Longitude/Easting: 1149380.41
Casing Elevation: 243.35 ft

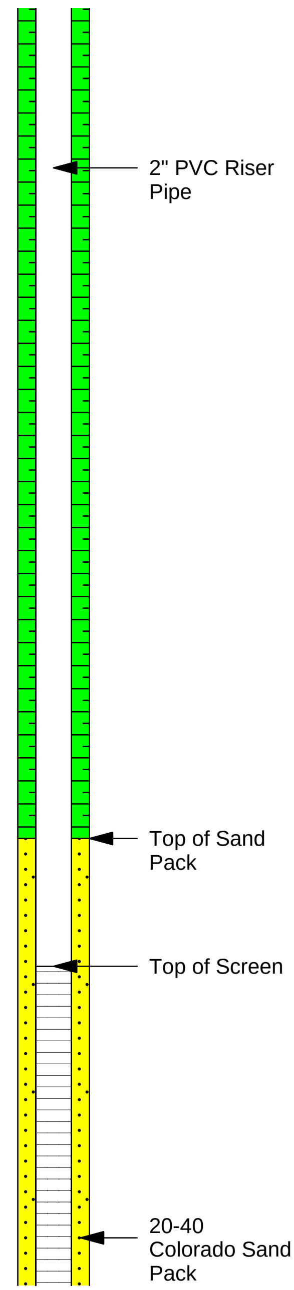
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 18.5

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks:

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
0.0; Soil Sample MW11-20'		24 50/6"	20	SP	Same as above, mottled gray and dark yellowish brown, trace gravel, wet. Possible trace sheen, black oily residue on sample spoon and fine silver specks.
0.0		50/6"	25		Same as above, grayish brown, no gravel, no odor, no sheen.
			27		Driller reports heave.
0.0		50/6"	30		Same as above.
0.0		50/6"	35		Same as above. SAND with some fine and coarse gravels in shoe of sampler.

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

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Monitoring Well ID: MW-11

Drill Date: June 10, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

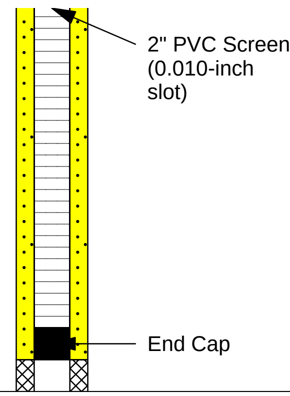
Ground Surf Elev. & Datum: 243.9 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 697807.34
Longitude/Easting: 1149380.41
Casing Elevation: 243.35 ft

Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 46 ft bgs
Groundwater ATD (ft bgs): 18.5

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks:

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)	MONITORING WELL DETAIL
0.0; Soil Sample MW11-40'		50/6"	40	SP	Same as above, dark grayish brown, no gravel.	
			41			
			42			
			43			
			44			
0.0		50/5"	45		Same as above.	
			46			



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-12

Drill Date: June 11, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 47 ft bgs
Groundwater ATD (ft bgs): 23.2

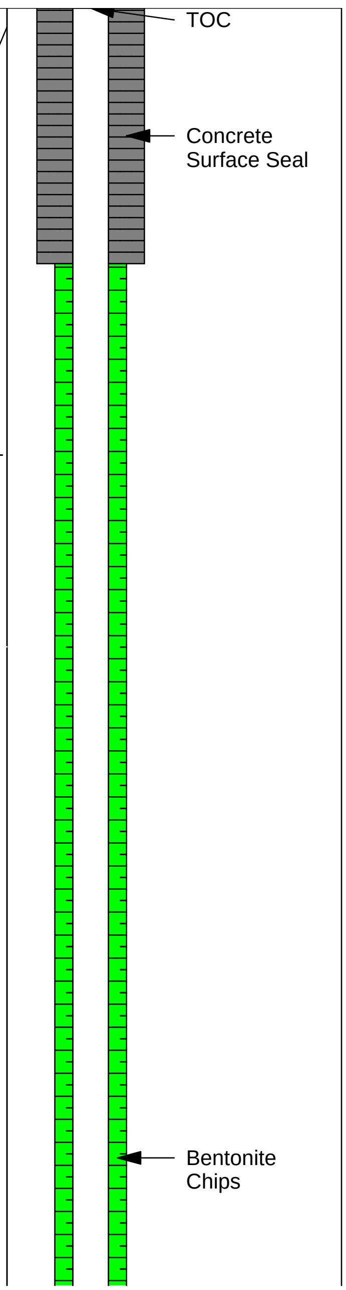
Ground Surf Elev. & Datum: 244.5 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 698082.94
Longitude/Easting: 1149457.03
Casing Elevation: 243.97 ft

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks:

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
			0	Asphalt	Asphalt at surface.
			1	GW	Dark brown well graded fine and coarse rounded GRAVEL with sand (30 to 45%-decreasing with depth), silt (<5%). 20% rounded cobbles, moist (FILL).
			6		Driller reports gravel ends at approximately 7' bgs.
			7	SP	See below.
		50/3"	10	SP	Dark yellowish brown, poorly graded SAND, gravel (<5%), silt (<5%), moist, no odor, no sheen.
0.0		50/6"	15		Same as above. No gravel.
			20		

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

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Monitoring Well ID: MW-12

Drill Date: June 11, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

Ground Surf Elev. & Datum: 244.5 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 698082.94
Longitude/Easting: 1149457.03
Casing Elevation: 243.97 ft

Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 47 ft bgs
Groundwater ATD (ft bgs): 23.2

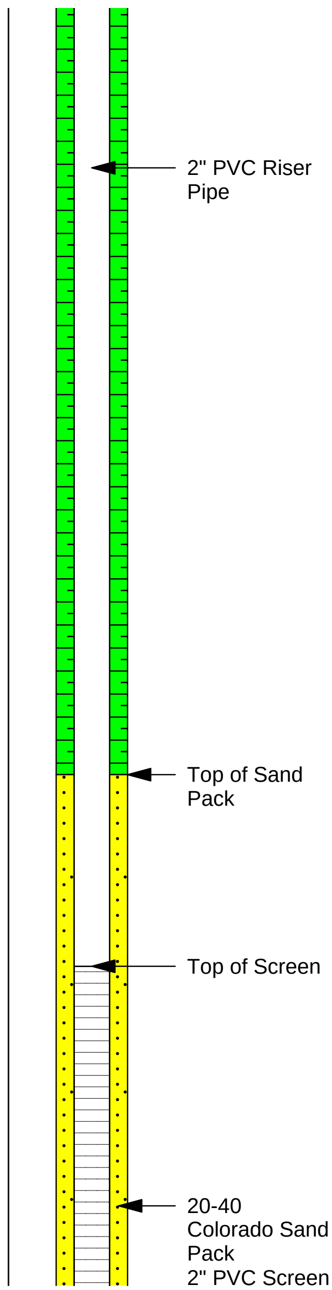
Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks:

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
0.0		50/3"	20	SP	Same as above, mottled dark gray and dark grayish brown, silt (10%), moist, no odor, no sheen.
0.0		50/5"	25		Same as above, dark grayish brown, fine and coarse rounded gravel (10 to 15%), silt (<5%), wet.
0.1		50/6"	30		Same as above, gray to dark gray, gravel (5 to 10%), slight naphthalene odor, no sheen.
0.4		50/5"	35		Gray well graded fine to coarse SAND with gravel (~15%), silt (<5%), trace clay, wet, slight naphthalene odor, no sheen.

Depth scale: 20–40 ft bgs; groundwater table symbol at approximately 23.2 ft.

MONITORING WELL DETAIL



Notes:
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Monitoring Well ID: MW-12

Drill Date: June 11, 2010
Logged By: John LaManna
Drilled By: Curtis Askew / Cascade Drilling

Ground Surf Elev. & Datum: 244.5 NGVD 29
Coordinate System: NAD83/98
Latitude/Northing: 698082.94
Longitude/Easting: 1149457.03
Casing Elevation: 243.97 ft

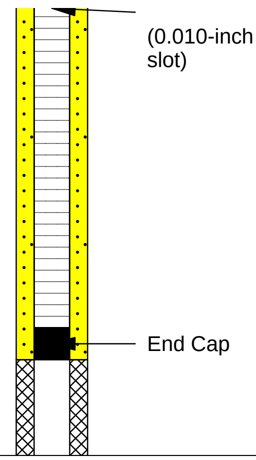
Drill Type: CME 75; 4-inch HSA
Sample Method: 18" D&M Split-spoon
Boring Diameter: 8"
Boring Depth (ft bgs): 47 ft bgs
Groundwater ATD (ft bgs): 23.2

Client: Bill Swensen
Project: Swensen-WCD
Site Location: 3133 Cedar St, Tacoma, WA.

Remarks:

PID Reading /Sample ID	DRIVE / RECOVERY	BLOW COUNT	DEPTH FT BGS	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS: (color, texture, moisture, MAJOR CONSTITUENT, odor, staining, sheen, debris, etc.)
15.5; Soil Sample MW12-40'		50/6"	40	SP	Driller reports significant heave at 40' bgs. Gray, poorly graded fine SAND, gravel (10 to 15%), silt (5%), wet, strong naphthalene odor. No sheen on soil with sheen test but driller reports sheen on water on sampler.
			41		
			42		
			43		
			44		
5.8		50/5"	45	ML	Gray laminated SILT, stiff. 1" sandy silt bed. Naphthalene odor, no sheen.
			46		
			47		

MONITORING WELL DETAIL



Notes:
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

West Coast Door

Remedial Investigation/ Feasibility Study

Appendix B
Laboratory Data and Data Validation
(Provided on CD-ROM)

West Coast Door

Remedial Investigation/ Feasibility Study

Appendix C
BIOSCREEN Modeling

DRAFT

1.0 INTRODUCTION AND INPUT PARAMETERS

This BIOSCREEN modeling was undertaken in order to determine the westward lateral extent of naphthalene contamination above the MTCA Method A CUL in Site groundwater, in lieu of additional subsurface exploration on private property. The extents of naphthalene contamination to the north, east and south have been determined by explorations on property owned by Swensen Enterprises, the City of Tacoma, or other public entities. Modeling was projected over a time period of 30 years in order to simulate Site conditions in the future after termination from the VCP, and for an additional 70 years beyond termination to simulate long term site conditions. Inputs for the BIOSCREEN model were based on observed site conditions, representative standard inputs as defined in the USEPA-authored BIOSCREEN User's Manual, or peer-reviewed scientific literature.

1.1 BIOSCREEN Input Parameters

Input parameters for the BIOSCREEN model were chosen based on known Site conditions. For those instances in which a parameter could not be directly measured from the available data set, values were chosen according to literature review or the BIOSCREEN User's Manual, using the most conservative value given. The source area was assumed to originate in the approximate area of impacted soils underlying the former creosoting retort. The maximum concentration of naphthalene in groundwater was assumed to be 17 mg/L, the concentration observed in the reconnaissance sample collected from the MW-9 boring advanced in the vicinity of the former retort.

Degradation by solute transport with first-order decay was assumed to be the primary transport model. This model was chosen because it most closely matches site conditions, including ready availability of dissolved oxygen in groundwater to support aerobic degradation and bioavailability of naphthalene rate-limited by slow dissolution of a solid-state NAPL source (HHS 2005), indicating that the solute degradation rate is likely proportional to its concentration. The BIOSCREEN model accounts for both biodegradation and source zone concentration half-life in its calculations (Newell et al 1996).

Generally, hydrogeologic characteristics were based on BIOSCREEN model default values or literature values. Hydraulic gradient, however, was measured directly from site data and hydraulic conductivity was obtained from hydrologic study undertaken on the former City of Tacoma Materials Handling Lab property immediately north of the site (PGG 2001). Plume length, width, and contaminant concentrations were also based directly on measured data. Distances from the source area were measured horizontally from approximate westward extent of the former creosoting retort.

Model inputs and their rationales for use are presented in further detail in Table C.1.

1.2 Results

After 1 year of degradation at the most conservative half-life of 80 days, the BIOSCREEN model results show a naphthalene concentration of 0.686 mg/L at a distance of 100 ft from the source area and a concentration of 0.090 mg/L at a distance of 150 ft. During years 2 and 3 of modeling, projected naphthalene concentrations increase to 0.187 mg/L at a distance of 150 ft from the source area and 0.044 mg/L at a distance of 200 ft. The maximum estimated extent of naphthalene contamination greater that the CUL of 0.160 mg/L is, therefore, within approximately 175 feet or less of the source area. This distance remains at approximately 175 feet, with estimated concentrations decreasing slightly, when modeling is expanded over 2, 3, 4 and 5, 7, 10, years; after 15 years, the extent of naphthalene concentrations above 0.160 mg/L withdraws to between 100 and 150 feet. The plume extent is estimated to be approximately 100 feet after about 100 years. These results are consistent with naphthalene concentrations measured in geoprobe groundwater grab samples collected within and downgradient of the plume in 2011 and 2012, and suggest that biodegradation will continue to contain the groundwater naphthalene plume to its current extents. The reaction is rate-limited by dissolution of naphthalene in groundwater, and gradual retreat of the plume will begin to occur only after the source material has been exhausted.

Using the more aggressive half-life of 20 days, the extent of the plume after one year of degradation is modeled to be between 50 and 100 feet from the source area. Similarly to the 80 day half-life scenario, the plume remains at this extent for 30 years and begins to withdraw after 50 years. In both cases, the dissolution of naphthalene in groundwater appears to be the factor that most limits the rate of degradation. The 80 day half-life model, however, more accurately predicts measured groundwater concentrations at the outset of modeling (i.e. at an elapsed time of only 1 year), suggesting that this model may more closely reflect actual Site conditions.

Detailed modeling results for the 80-day half-life scenario are presented in graphical form in Attachment C.1. Results for the 20-day half-life scenario are presented in Attachment C.2.

2.0 REFERENCES

Newell C.J., R.K. McLeod, J. Gonzales. 1996. *Bioscreen, Natural Attenuation Decision Support System, User's Manual*. Version 1.3. U.S. Environmental Protection Agency, Office of Research and Development, Washington DC, USA. EPA/600/R-96/087.

Pacific Groundwater Group (PGG). 2001. *Groundwater Capture Zone Investigation Report, City of Tacoma Materials Handling Lab*. June 28.

United States Department of Health and Human Services (HHS). 2005. *Toxicological Profile for Naphthalene, 1-Methylnaphthalene and 2-Methylnaphthalene*. Public Health Service, Agency for Toxic Substance and Disease Registry. August.

Howard, P.H. 1989. *Handbook of Environmental Fate and Exposure Data for Organic Chemicals*: Volume 1: Large Production and Priority Pollutants.

State of Washington. Rev 2003. Washington Administrative Code 173-340-717: *Deriving soil concentrations for groundwater protection*. Table 747-1.

United States Environmental Protection Agency (USEPA). 2003. *Contaminant Candidate List Regulatory Support Document for Naphthalene*. Office of Water (4607M) Standard and Risk Management Division, Washington, DC, USA. EPA-815-R-03-14. July.

Table C.1 BIOSCREEN Model Input Parameters

Parameter	Value	Unit	Source/Description
1. Hydrogeology			
Hydraulic Conductivity	0.07	cm/sec	BIOSCREEN manual advises rates of 0.001 to 1.0 cm/sed for clean sands. Pump test on adjacent City of Tacoma Materials Handling Laboratory parcel yielded aquifer transmissivity of 5000 sq ft/day (PGG 2001), which translates to 0.07 cm/sec in the approximately 25-foot thick saturated zone observed at the site.
Hydraulic Gradient	0.0025	ft/ft	Average gradient calculated between MW-7 and MW-10 groundwater elevations measured during June 2011 (0.003 ft/ft) and December 2011 (0.002 ft/ft) monitoring events.
Porosity	0.3	--	BIOSCREEN default for fine sand is 0.10 to 0.30; default for medium sand is 0.15 to 0.30. Used most conservative value of 0.3.
2. Dispersion			
Estimated Plume Length	175	ft	Derived from best-fit of distance from source area vs. concentration plot for groundwater samples; tested this distance in BIOSCREEN model along with worst-case-scenario distance of 375 feet (west of Shea property boundary) and confirmed that both resulted in modeled length of approximately 175 ft.
3. Adsorption			
Soil Bulk Density	1.5	kg/L	BIOSCREEN model default.
Partition Coefficient (Koc)	1190	L/kg	Ecology CLARC database[1]
Fraction Organic Carbon (foc)	0.001		BIOSCREEN model default for sand.
4. Biodegradation			
1st Order Decay Coefficient (λ)	3.2 to 13.9	--	Related to half life by the equation Thalf=ln2/λ
Solute Half Life	0.05 to 0.22	year	ASTDR (HHS 2005)[1] cites soil half-lifes of up to 105 days observed in solid waste sites and 11-18 days observed in sands with 0.2-0.6% organic carbon. Howard (1989, USEPA 2003)[1] reports a few hours to a few days in soils contaminated with other PAHS and greater than 80 days in otherwise clean soils. Used 80 days as conservative estimate, 20 days for more aggressive model.
5. General			
Modeled Area Length	500 ft	ft	Based on measured plume extents.
Modeled Area Width	500 ft	ft	Based on measured plume extents.
Simulation Time	1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 50, 75, 100	years	Approximate monitoring schedule before 5 year review, then increasing intervals to show long-term conditions.
6. Source Data			
Source Thickness in Saturated Zone	10	ft	Represents contaminated zone above silty confining layer, based on observations of odors in soil borings and soil and groundwater analytical data.
Source Zone 1 Width, Concentration	185, 1.6	ft, mg/L	Based on measured Site data.
Source Zone 2 Width, Concentration	75, 10	ft, mg/L	Baed on measured Site data.
Source Zone 3 Width, Concentration	30, 17	ft, mg/L	Width is based on approximate footprint of creosoting retort. Concentration represents maximum observed in the MW-9 grab sample collected from the approximate groundwater source area. Creosote solubility is governed by Raoult's Law, whereby each component's theoretical solubilty is equal to its solubility in pure water multiplied by its mole fraction in the mixture. With a mole fraction of about 10% in creosote and a water solubility of 31 mg/L, creosote would theoretically be saturated at 3.1 mg/L. The maximum observed concentration, therefore, also assumes preferential dissolution of naphthalene from the creosote source material.
Soluble Mass	8200	kg	Area of creosote-impacted soil presumed to be equal to the area footprint of the former creosoting retort times the impacted soil thickness observed in boring SB-2B. Assumed bulk soil density of 1.5 kg/L from model default. At a maximum soil naphthalene concentration of 470 mg/Kg in the upper 7.5 ft of the impacted area (27.5-35 ft bgs) and 160 mg/Kg in the lower 10 ft (35-45 ft bgs), total theoretical naphthalane mass is about 8200 kg.
7. Field Data for Comparison			
Concentration	5.4	mg/L	Measured qualitative groundwater concentration in SB-29.
Distance from Source	100	ft	Measured from former creosoting retort to SB-29, used in year 1 model only to check fit of data.

Notes

1 Full references are included in Appendix text refrerences.

Abbreviations

ASTDR Agency for Toxic Substance and Disease Registry
MTCA Model Toxics Control Act
WSDOE Washington State Department of Ecology

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.4

Swensen-WCD
RI/FS
Run Name

Data Input Instructions:

115	1. Enter value directly....or
or	2. Calculate by filling in grey cells below. (To restore formulas, hit button below).
0.02	
Variable*	Data used directly in model.
20	Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	603.5	(ft/yr)
or		or	
Hydraulic Conductivity	K	7.0E-02	(cm/sec)
Hydraulic Gradient	i	0.0025	(ft/ft)
Porosity	n	0.3	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	15.5	(ft)
Transverse Dispersivity*	alpha y	1.6	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	375	(ft)

3. ADSORPTION

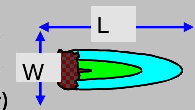
Retardation Factor*	R	7.7	(-)
or		or	
Soil Bulk Density	rho	1.7	(kg/l)
Partition Coefficient	Koc	1190	(L/kg)
FractionOrganicCarbon	foc	1.0E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	3.2E+0	(per yr)
or		or	
Solute Half-Life	t-half	0.22	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	1.65	(mg/L)
Delta Nitrate*	NO3	0.7	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	22.4	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	500	(ft)
Modeled Area Width*	500	(ft)
Simulation Time*	1	(yr)



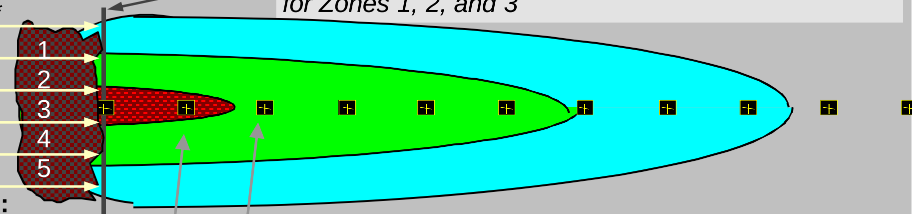
6. SOURCE DATA

Source Thickness in Sat.Zone* 10 (ft)

Source Zones:

Width* (ft)	Conc. (mg/L)*	Zone
185	1.6	1
75	10	2
30	17	3
75	10	4
185	1.6	5

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Source Halflife (see Help):

Inst. React.	1st Order	
10	40	(yr)

Soluble Mass 8200 (Kg)
In Source NAPL, Soil

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)			5.4								
Dist. from Source (ft)	0	50	100	150	200	250	300	350	400	450	500

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

Recalculate This Sheet

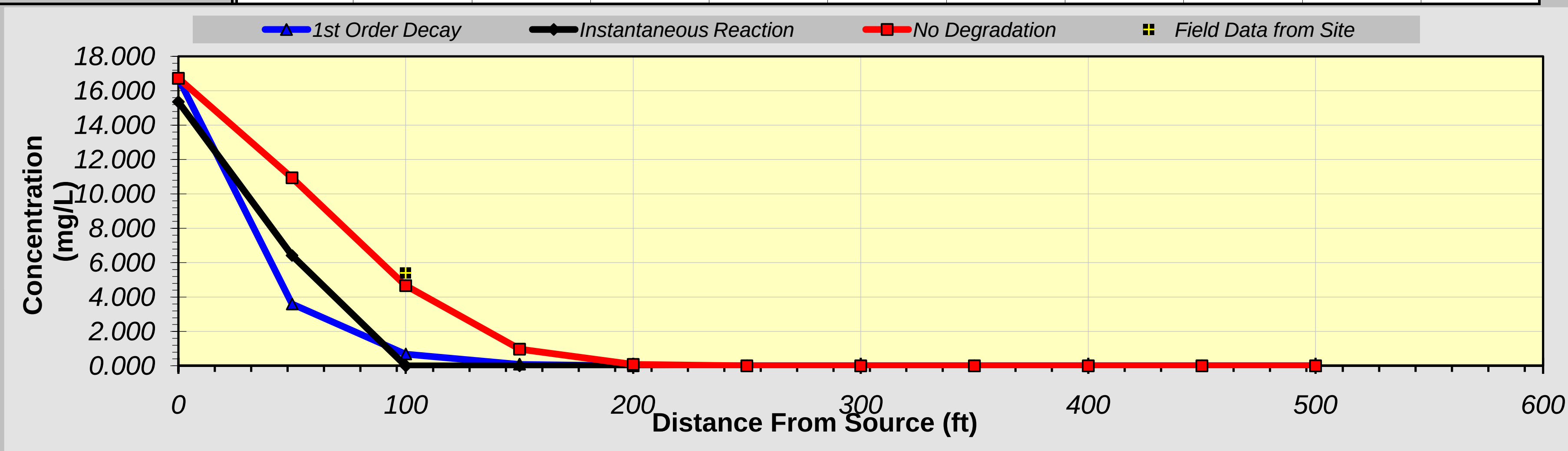
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	16.726	10.942	4.656	0.974	0.087	0.003	0.000	0.000	0.000	0.000	0.000
1st Order Decay	16.726	3.598	0.686	0.090	0.006	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	15.365	6.426	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site			5.400								



Calculate Animation

Time:

1 Years

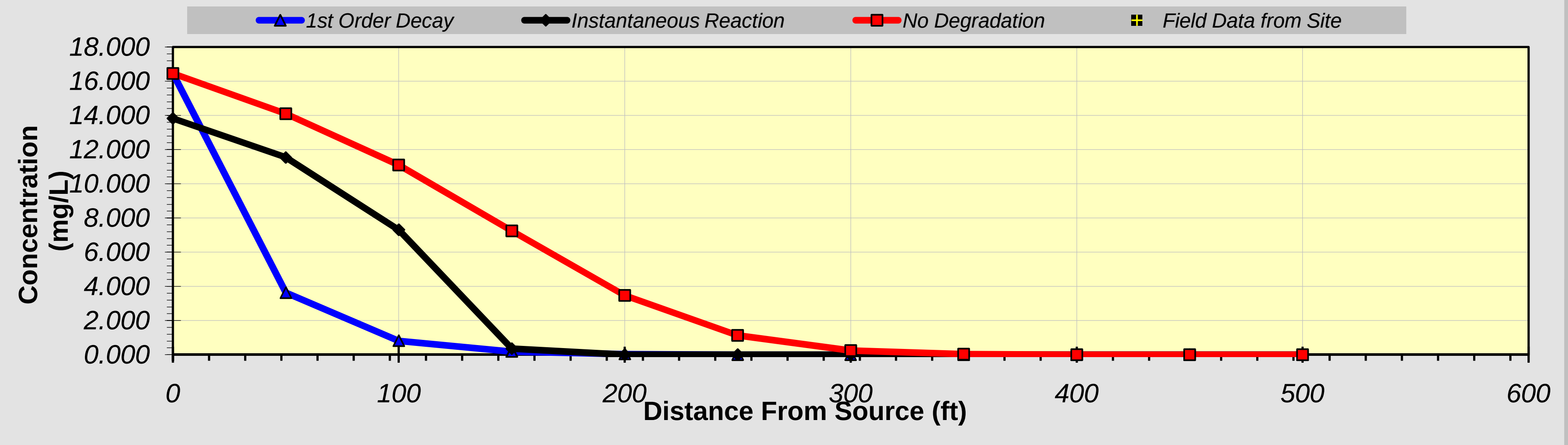
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	16.456	14.094	11.100	7.243	3.465	1.134	0.243	0.033	0.003	0.000	0.000
1st Order Decay	16.456	3.628	0.815	0.186	0.040	0.008	0.001	0.000	0.000	0.000	0.000
Inst. Reaction	13.829	11.543	7.305	0.358	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

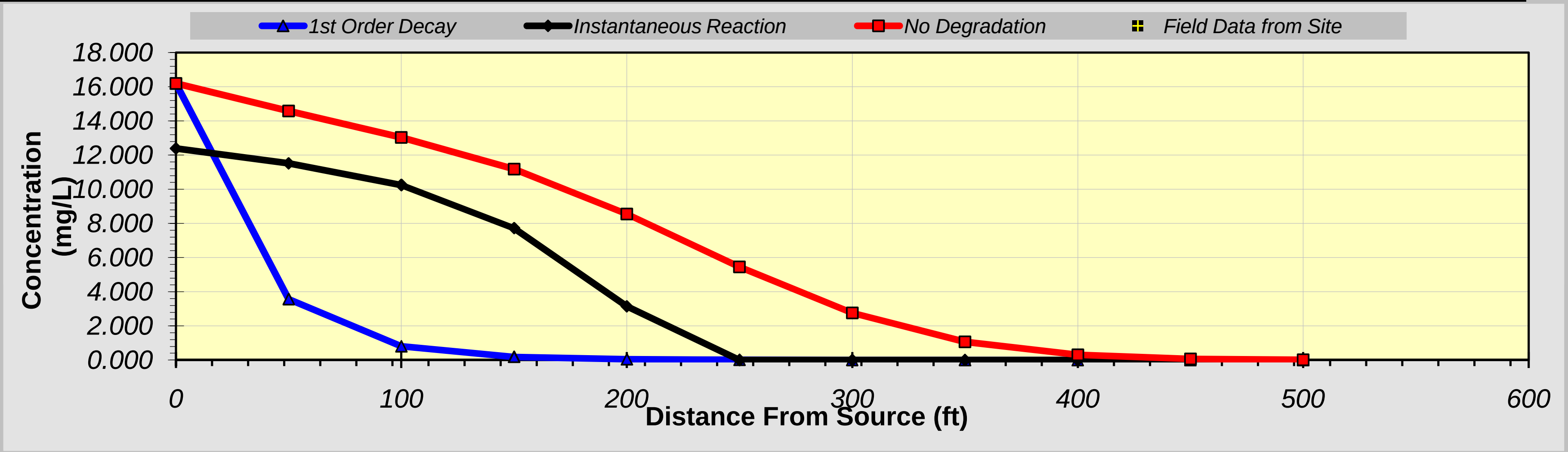
Time: 2 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	50	100	150	200	250	300	350	400	450	500
No Degradation	16.191	14.587	13.037	11.179	8.552	5.461	2.760	1.073	0.314	0.068	0.011
1st Order Decay	16.191	3.571	0.804	0.187	0.044	0.010	0.002	0.001	0.000	0.000	0.000
Inst. Reaction	12.386	11.518	10.247	7.719	3.143	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

3 Years

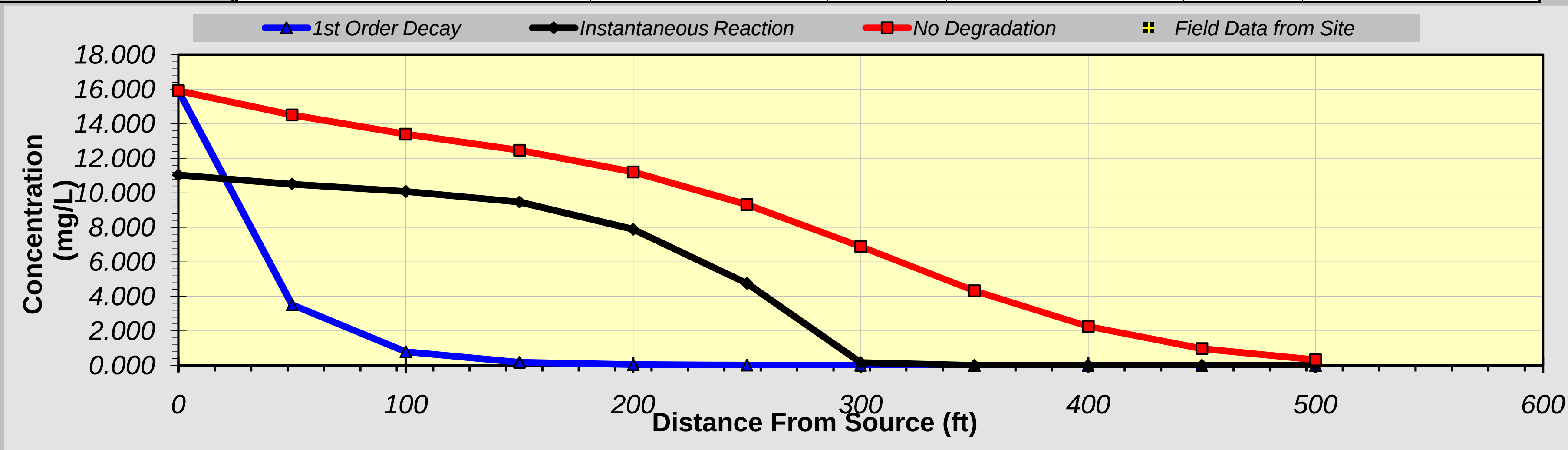
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	15.930	14.522	13.405	12.478	11.213	9.325	6.888	4.327	2.261	0.966	0.332
1st Order Decay	15.930	3.513	0.791	0.184	0.043	0.010	0.002	0.001	0.000	0.000	0.000
Inst. Reaction	11.029	10.509	10.083	9.471	7.887	4.757	0.159	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

4 Years

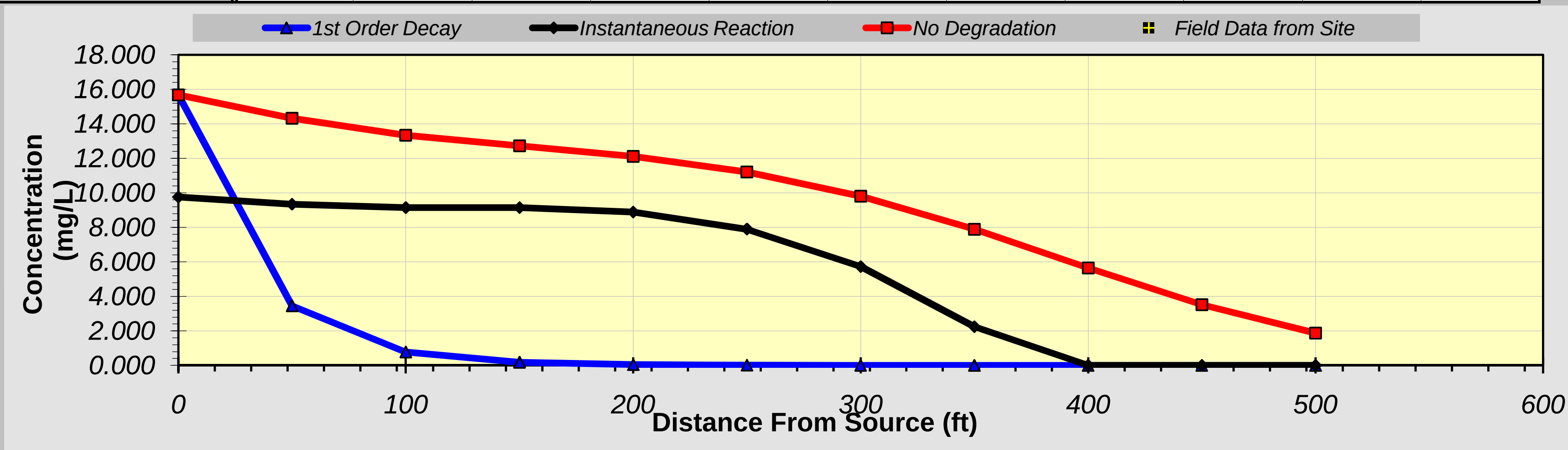
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	15.673	14.329	13.343	12.735	12.117	11.210	9.807	7.882	5.653	3.517	1.881
1st Order Decay	15.673	3.457	0.778	0.181	0.043	0.010	0.002	0.001	0.000	0.000	0.000
Inst. Reaction	9.754	9.340	9.145	9.145	8.888	7.894	5.722	2.239	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time: 5 Years

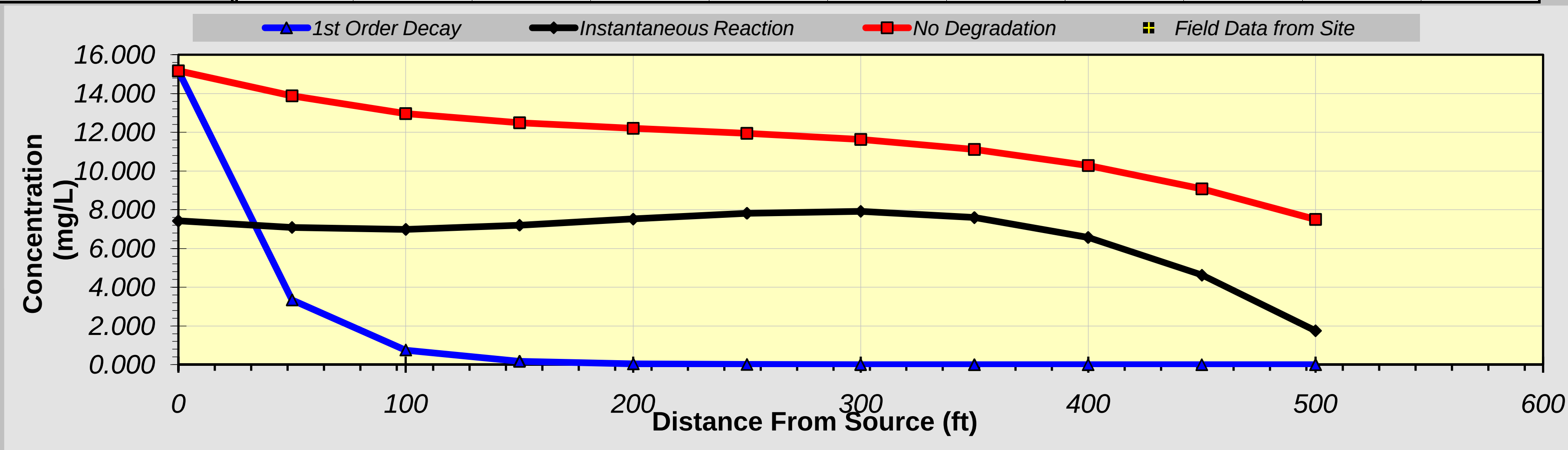
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	15.171	13.884	12.967	12.497	12.200	11.946	11.624	11.112	10.288	9.074	7.498
1st Order Decay	15.171	3.346	0.753	0.175	0.041	0.010	0.002	0.001	0.000	0.000	0.000
Inst. Reaction	7.427	7.091	6.991	7.202	7.523	7.819	7.922	7.598	6.571	4.627	1.751
Field Data from Site											



Calculate Animation

Time:

7 Years

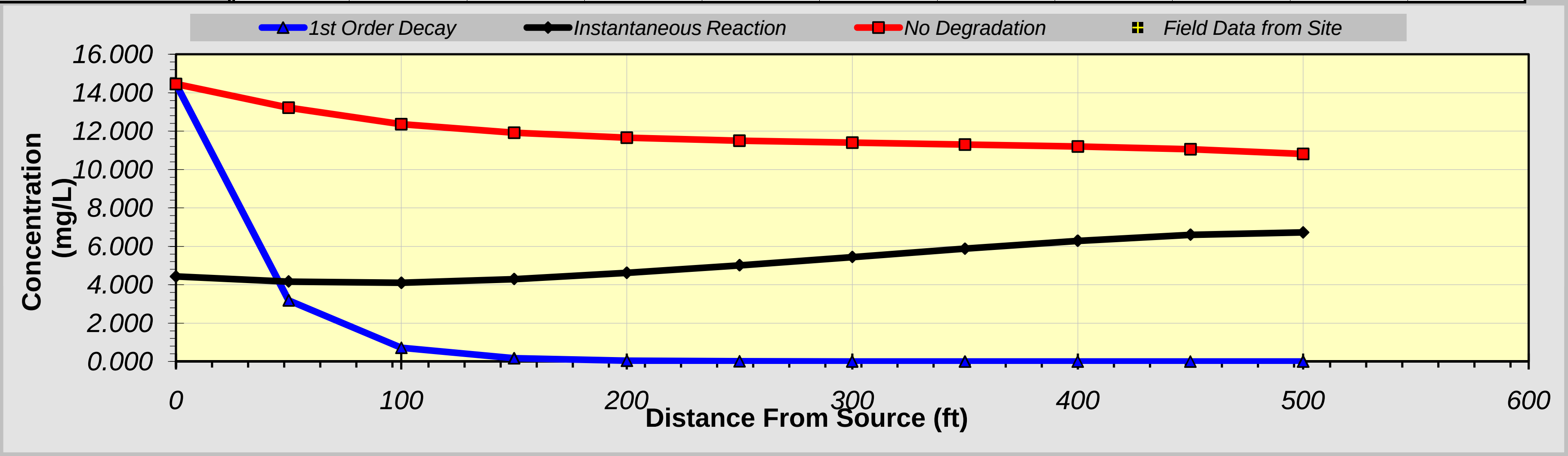
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	14.449	13.224	12.354	11.916	11.665	11.507	11.398	11.306	11.203	11.052	10.805
1st Order Decay	14.449	3.187	0.717	0.167	0.039	0.009	0.002	0.001	0.000	0.000	0.000
Inst. Reaction	4.427	4.164	4.096	4.295	4.618	5.010	5.438	5.876	6.285	6.599	6.719
Field Data from Site											



Calculate Animation

Time:

10 Years

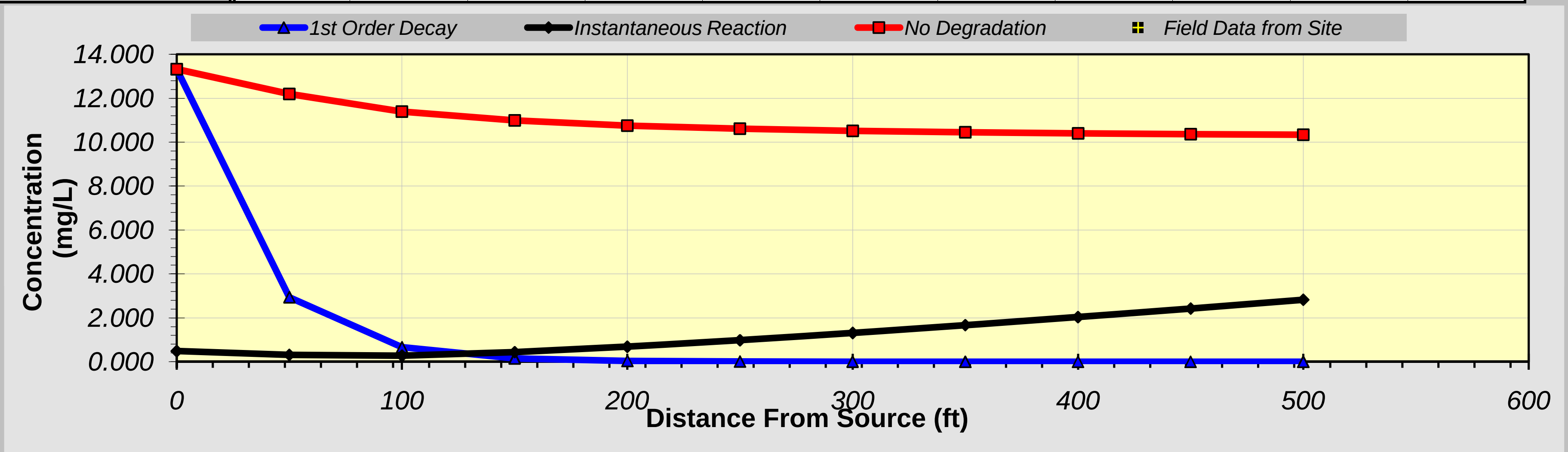
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	13.321	12.191	11.389	10.986	10.755	10.612	10.519	10.453	10.405	10.367	10.335
1st Order Decay	13.321	2.938	0.661	0.154	0.036	0.009	0.002	0.000	0.000	0.000	0.000
Inst. Reaction	0.485	0.312	0.279	0.437	0.685	0.984	1.314	1.667	2.038	2.425	2.826
Field Data from Site											



Calculate Animation

Time: 15 Years

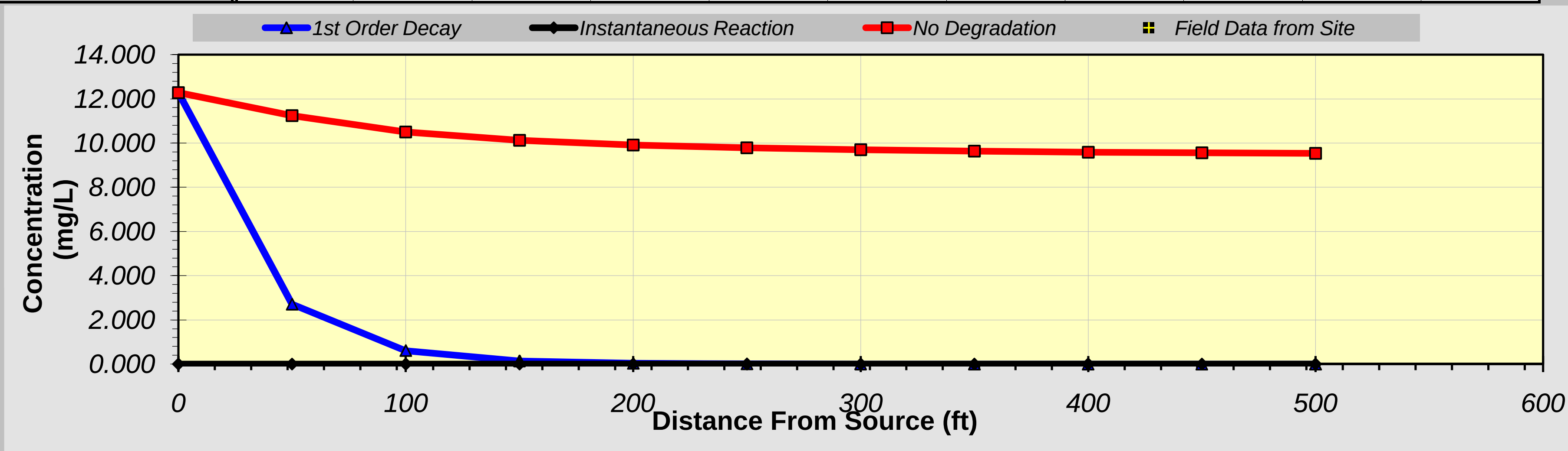
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	12.281	11.239	10.500	10.128	9.915	9.784	9.697	9.637	9.592	9.558	9.530
1st Order Decay	12.281	2.708	0.610	0.142	0.033	0.008	0.002	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

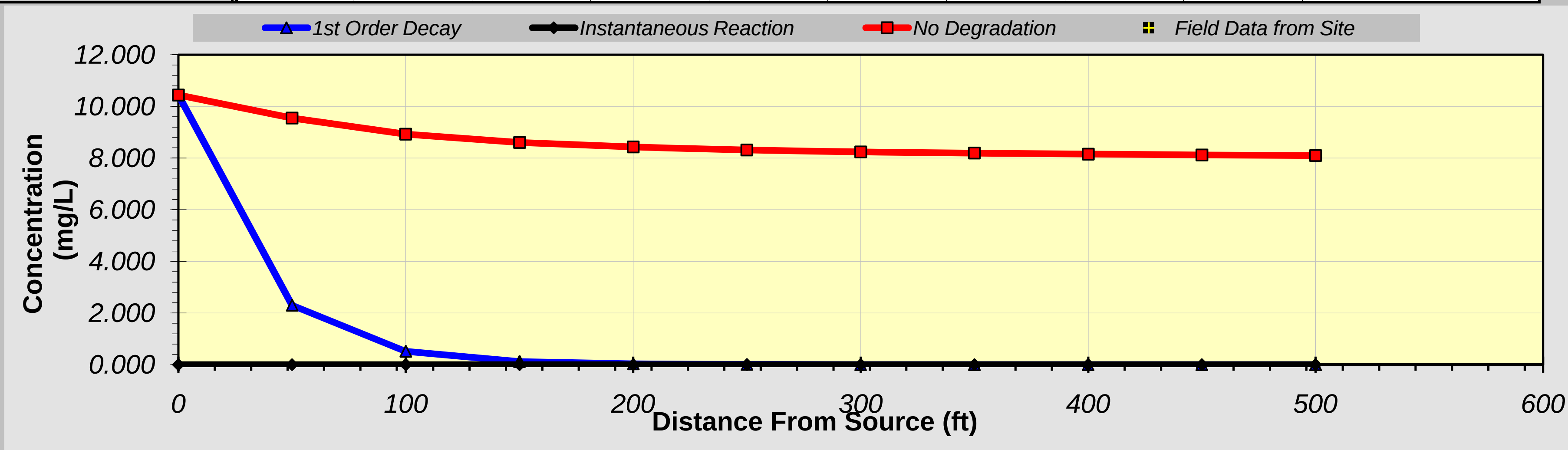
20 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	50	100	150	200	250	300	350	400	450	500
No Degradation	10.438	9.553	8.924	8.608	8.427	8.316	8.242	8.191	8.153	8.124	8.100
1st Order Decay	10.438	2.302	0.518	0.120	0.028	0.007	0.002	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time: 30 Years

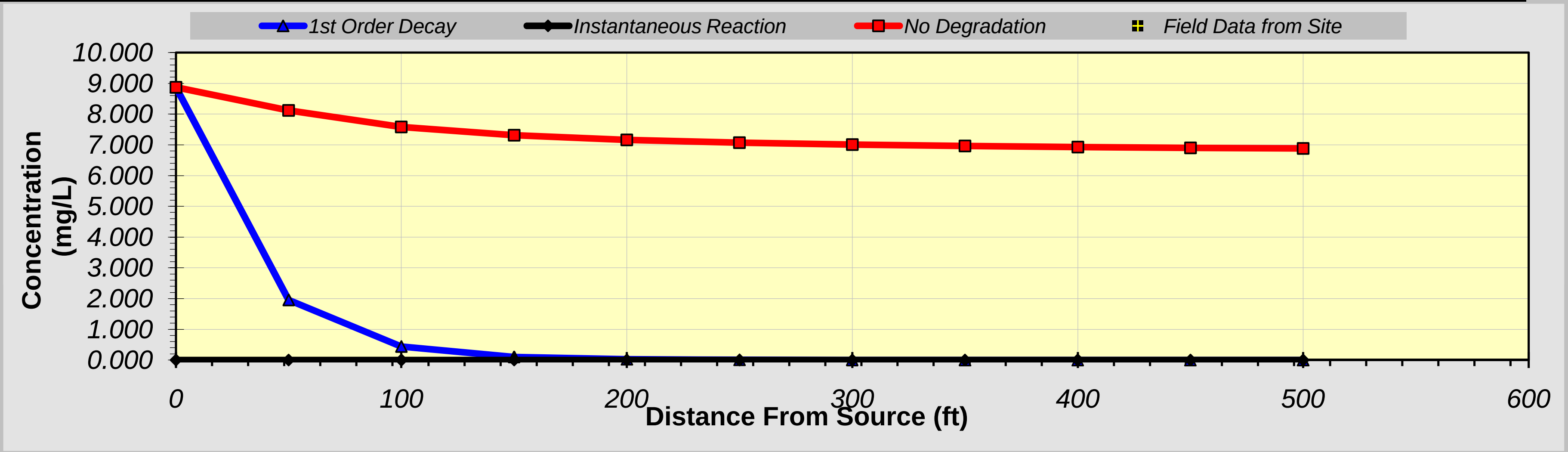
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	8.871	8.119	7.585	7.316	7.163	7.068	7.005	6.962	6.929	6.905	6.884
1st Order Decay	8.871	1.957	0.440	0.102	0.024	0.006	0.001	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

40 Years

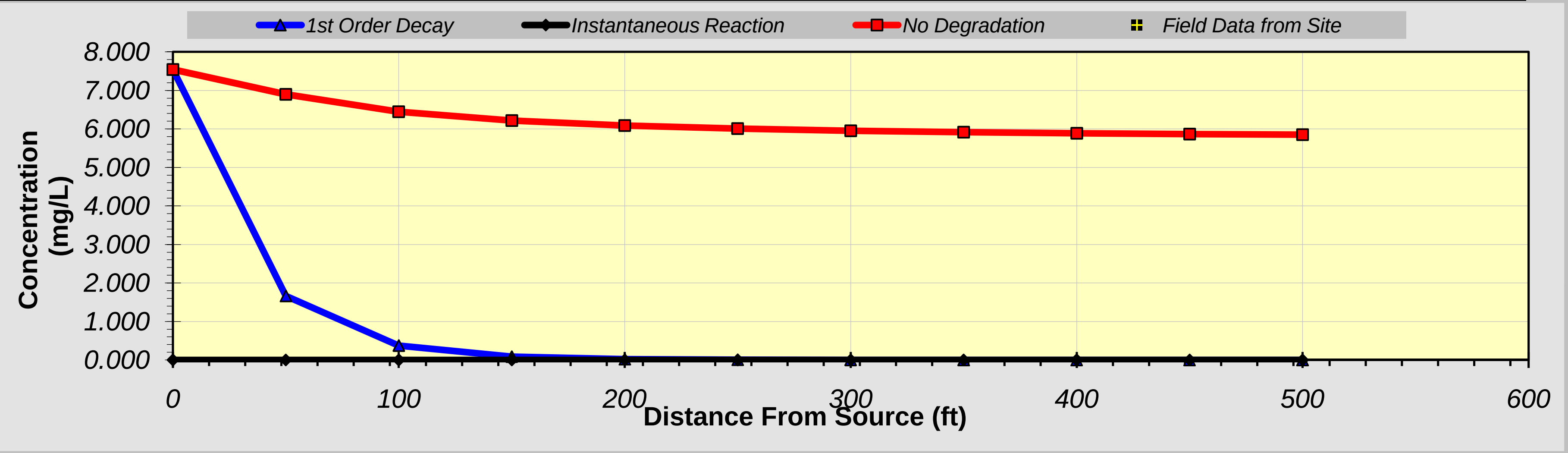
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	7.540	6.901	6.447	6.218	6.088	6.007	5.954	5.917	5.890	5.868	5.851
1st Order Decay	7.540	1.663	0.374	0.087	0.021	0.005	0.001	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time: 50 Years

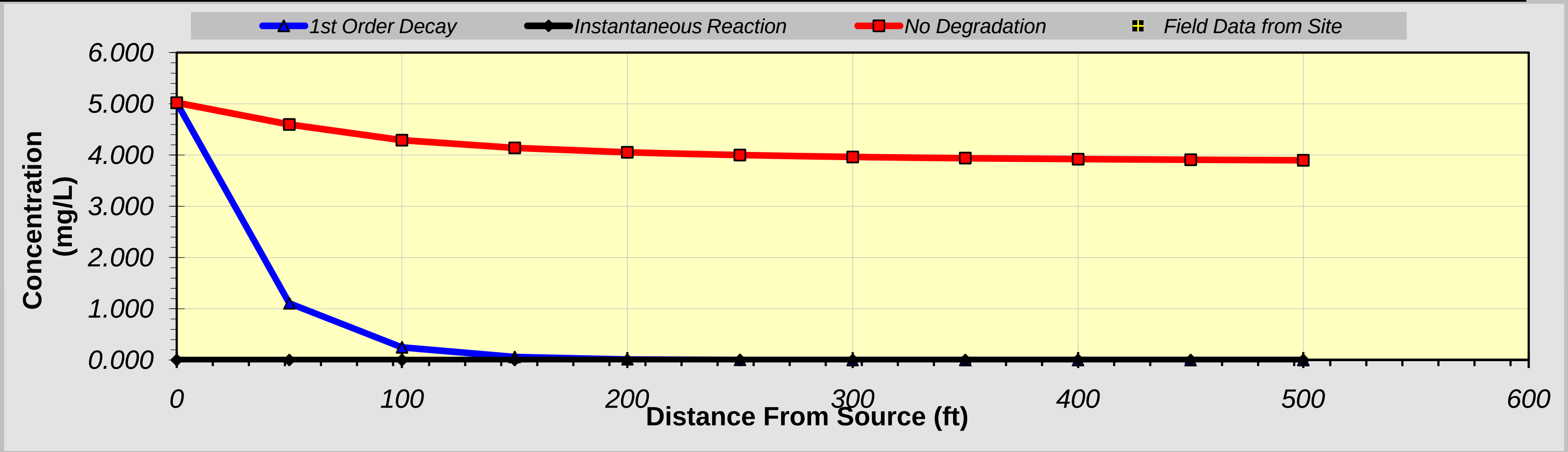
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	5.022	4.596	4.294	4.141	4.054	4.001	3.965	3.941	3.922	3.908	3.897
1st Order Decay	5.022	1.107	0.249	0.058	0.014	0.003	0.001	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

75 Years

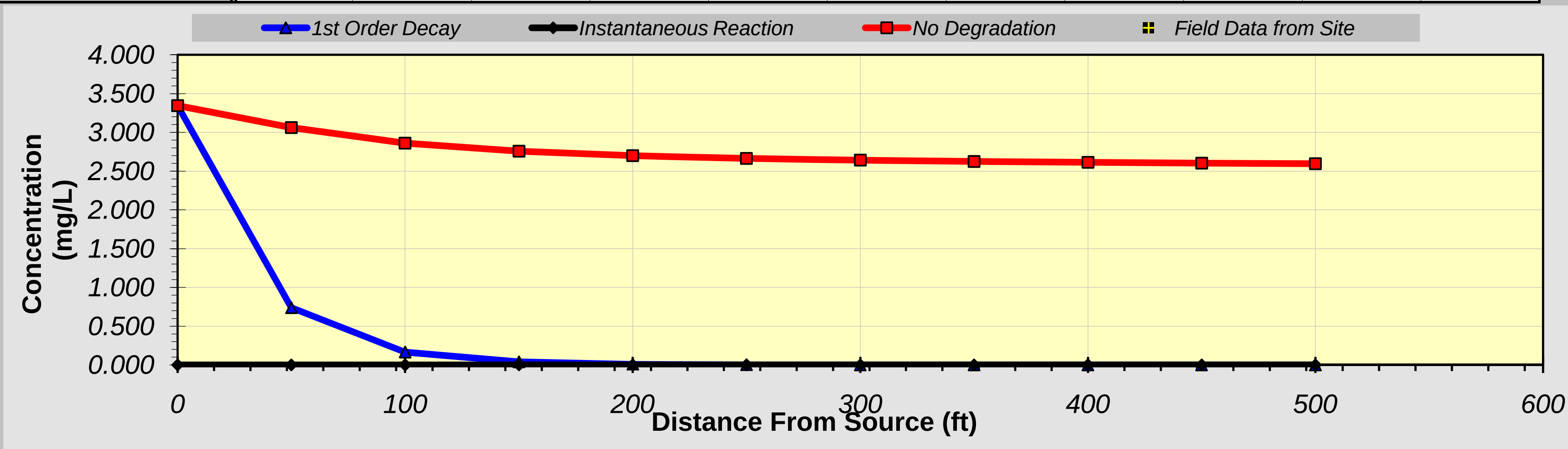
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	3.344	3.061	2.859	2.758	2.700	2.664	2.641	2.624	2.612	2.603	2.595
1st Order Decay	3.344	0.738	0.166	0.039	0.009	0.002	0.001	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

100 Years

Return to Input

Recalculate This Sheet

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.4

Swensen-WCD
RI/FS
Run Name

Data Input Instructions:

115	1. Enter value directly....or
or	2. Calculate by filling in grey cells below. (To restore formulas, hit button below).
0.02	
Variable*	Data used directly in model.
20	Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	603.5	*(ft/yr)*
or		or	
Hydraulic Conductivity	*K*	7.0E-02	*(cm/sec)*
Hydraulic Gradient	*i*	0.0025	*(ft/ft)*
Porosity	*n*	0.3	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	15.5	*(ft)*
Transverse Dispersivity*	*alpha y*	1.6	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		or	
Estimated Plume Length	*Lp*	375	*(ft)*

3. ADSORPTION

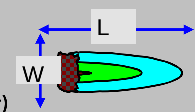
Retardation Factor*	*R*	7.7	*(-)*
or		or	
Soil Bulk Density	*rho*	1.7	*(kg/l)*
Partition Coefficient	*Koc*	1190	*(L/kg)*
FractionOrganicCarbon	*foc*	1.0E-3	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	1.4E+1	*(per yr)*
or		or	
Solute Half-Life	*t-half*	0.05	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*	1.65	*(mg/L)*
Delta Nitrate*	*NO3*	0.7	*(mg/L)*
Observed Ferrous Iron*	*Fe2+*	16.6	*(mg/L)*
Delta Sulfate*	*SO4*	22.4	*(mg/L)*
Observed Methane*	*CH4*	6.6	*(mg/L)*

5. GENERAL

Modeled Area Length*	500	*(ft)*
Modeled Area Width*	500	*(ft)*
Simulation Time*	1	*(yr)*



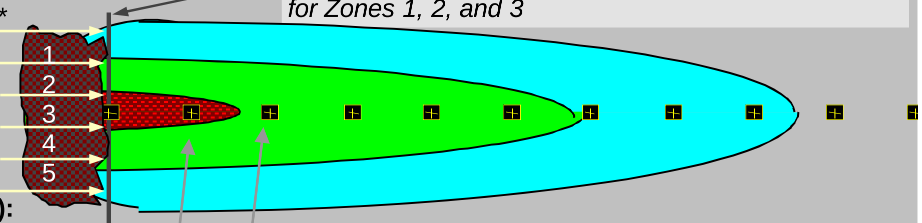
6. SOURCE DATA

Source Thickness in Sat.Zone* 10 *(ft)*

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3

Source Zones:

Width* (ft)	Conc. (mg/L)*
185	1.6
75	10
30	17
75	10
185	1.6



View of Plume Looking Down

Source Halflife (see Help):

Inst. React.	1st Order	
10	40	*(yr)*

Soluble Mass 8200 *(Kg)*

In Source NAPL, Soil

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)			5.4								
Dist. from Source (ft)	0	50	100	150	200	250	300	350	400	450	500

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | **View Output**

RUN ARRAY | **View Output**

Help | Recalculate This Sheet

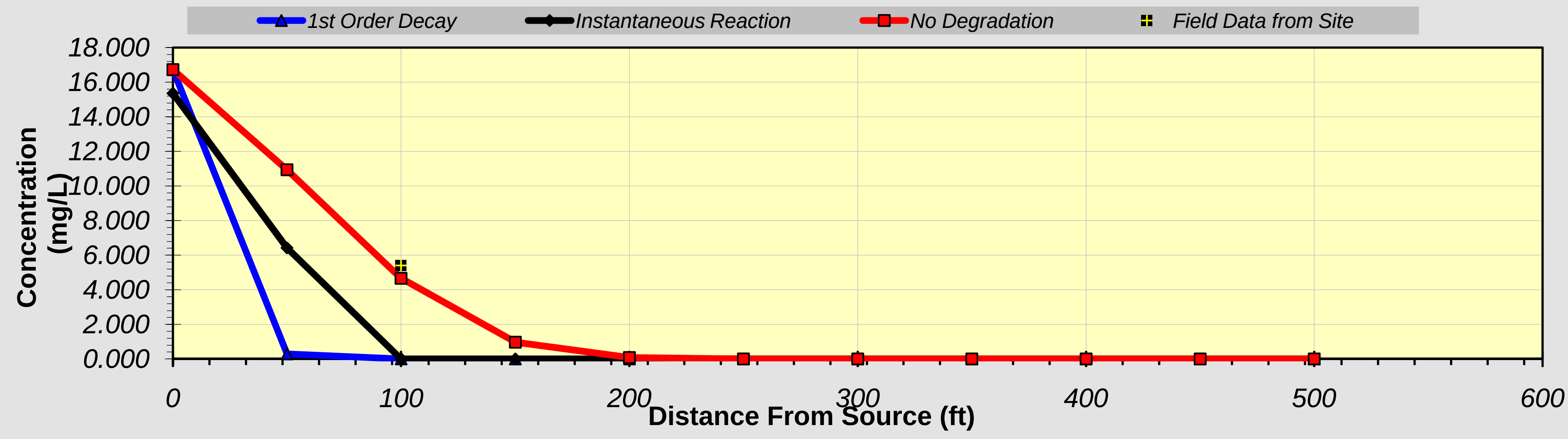
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	16.726	10.942	4.656	0.974	0.087	0.003	0.000	0.000	0.000	0.000	0.000
1st Order Decay	16.726	0.285	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	15.365	6.426	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site			5.400								



Calculate Animation

Time:

1 Years

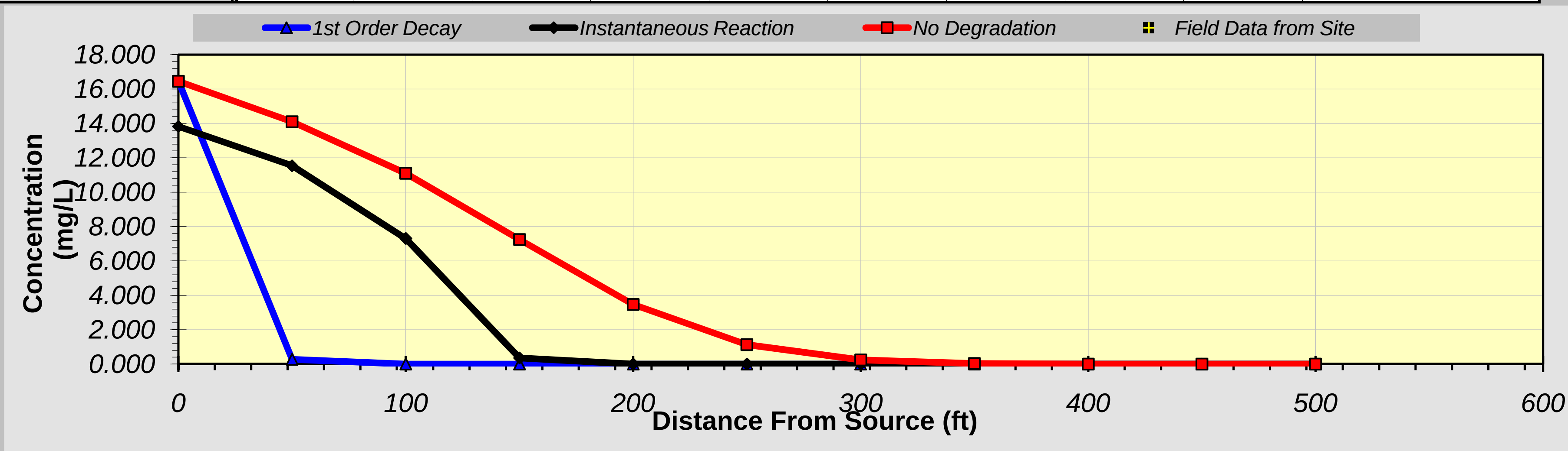
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	16.456	14.094	11.100	7.243	3.465	1.134	0.243	0.033	0.003	0.000	0.000
1st Order Decay	16.456	0.281	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	13.829	11.543	7.305	0.358	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time: 2 Years

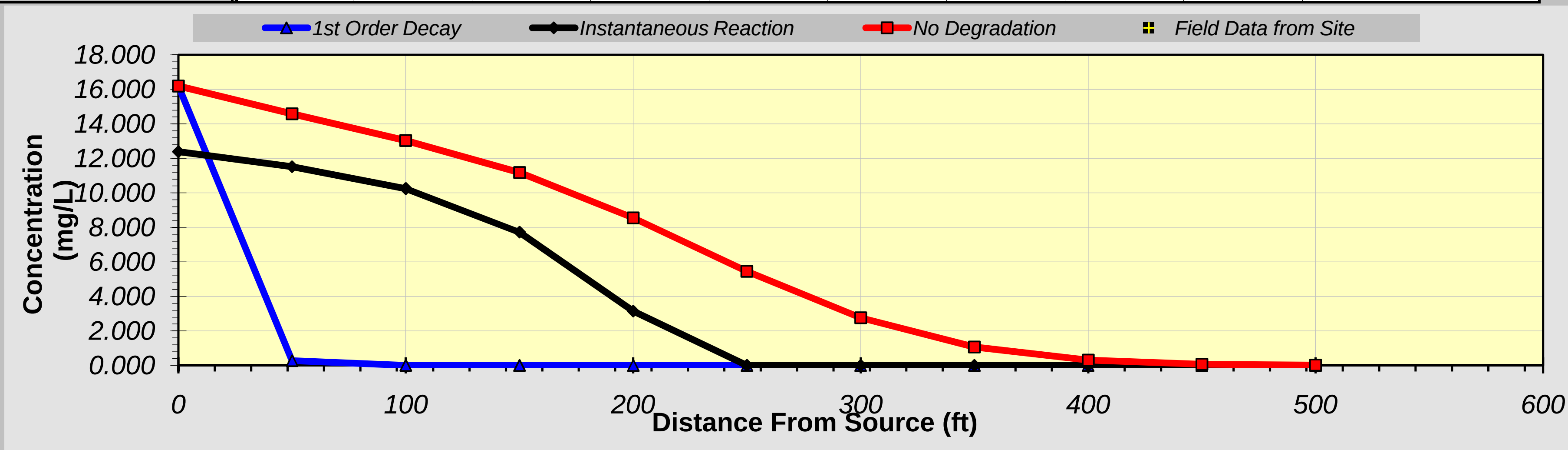
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	16.191	14.587	13.037	11.179	8.552	5.461	2.760	1.073	0.314	0.068	0.011
1st Order Decay	16.191	0.276	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	12.386	11.518	10.247	7.719	3.143	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

3 Years

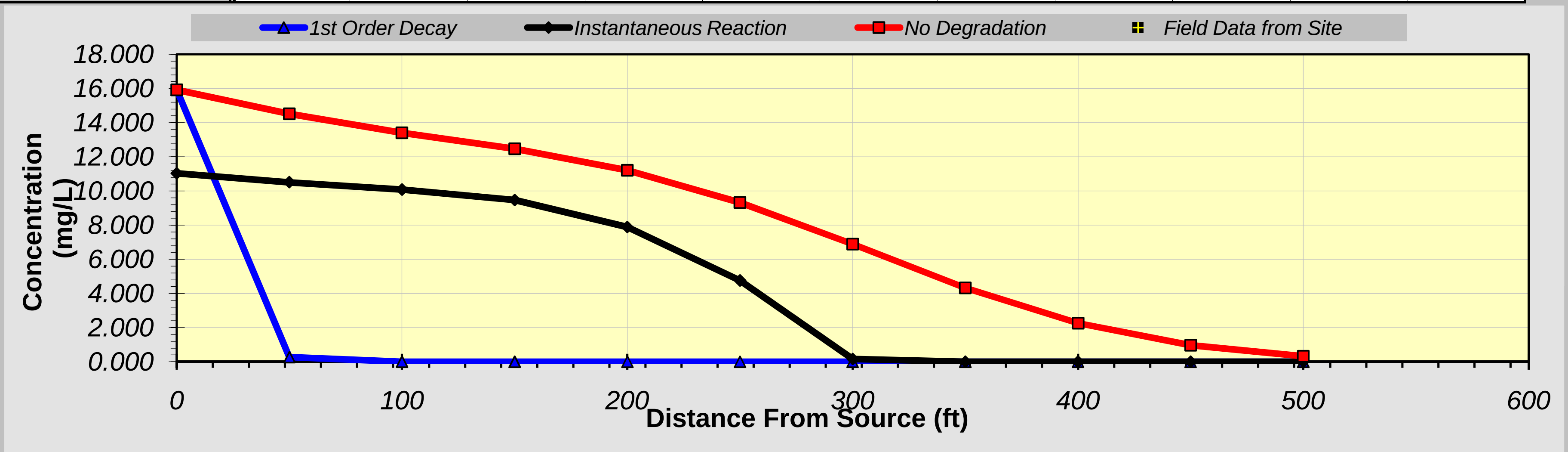
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	15.930	14.522	13.405	12.478	11.213	9.325	6.888	4.327	2.261	0.966	0.332
1st Order Decay	15.930	0.272	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	11.029	10.509	10.083	9.471	7.887	4.757	0.159	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

4 Years

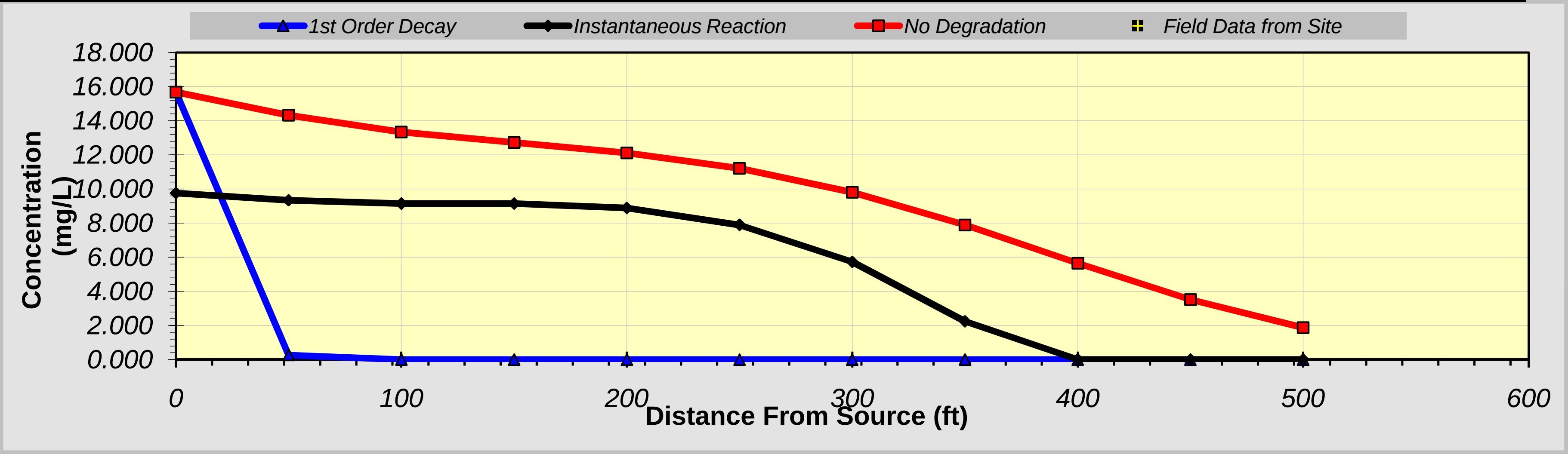
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	15.673	14.329	13.343	12.735	12.117	11.210	9.807	7.882	5.653	3.517	1.881
1st Order Decay	15.673	0.267	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	9.754	9.340	9.145	9.145	8.888	7.894	5.722	2.239	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time: 5 Years

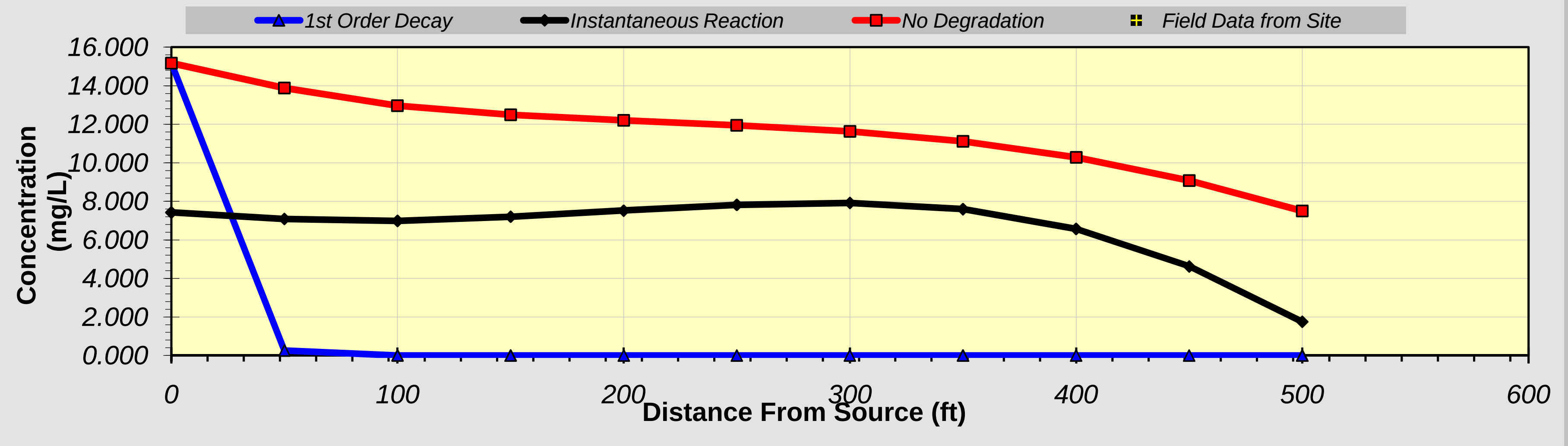
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	15.171	13.884	12.967	12.497	12.200	11.946	11.624	11.112	10.288	9.074	7.498
1st Order Decay	15.171	0.259	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	7.427	7.091	6.991	7.202	7.523	7.819	7.922	7.598	6.571	4.627	1.751
Field Data from Site											



Calculate Animation

Time: 7 Years

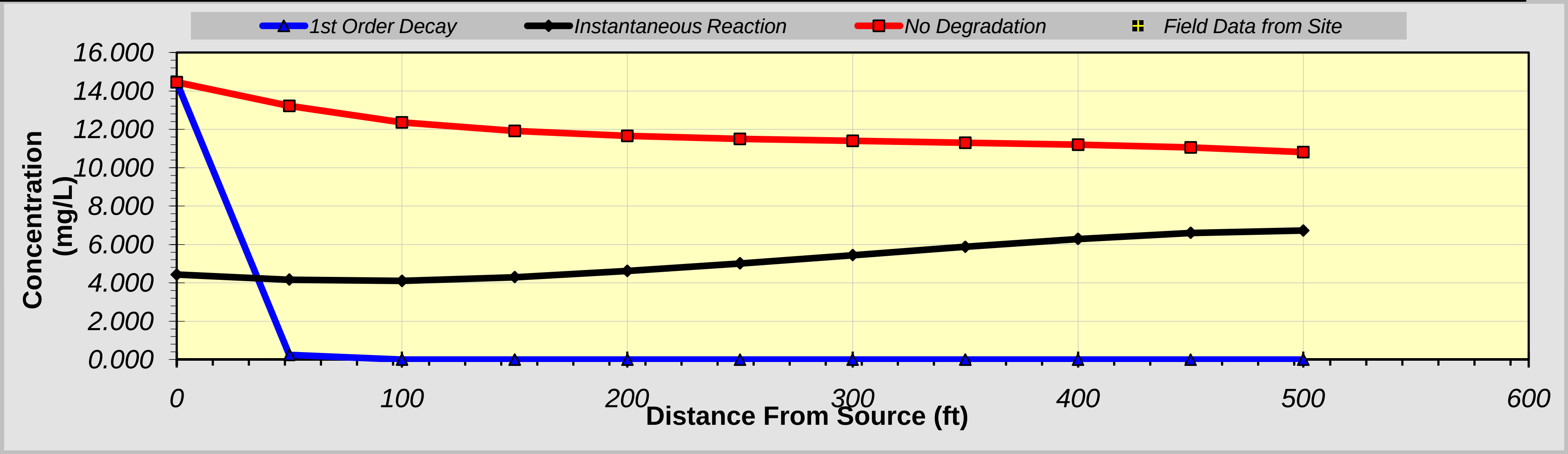
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	14.449	13.224	12.354	11.916	11.665	11.507	11.398	11.306	11.203	11.052	10.805
1st Order Decay	14.449	0.246	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	4.427	4.164	4.096	4.295	4.618	5.010	5.438	5.876	6.285	6.599	6.719
Field Data from Site											



Calculate Animation

Time:

10 Years

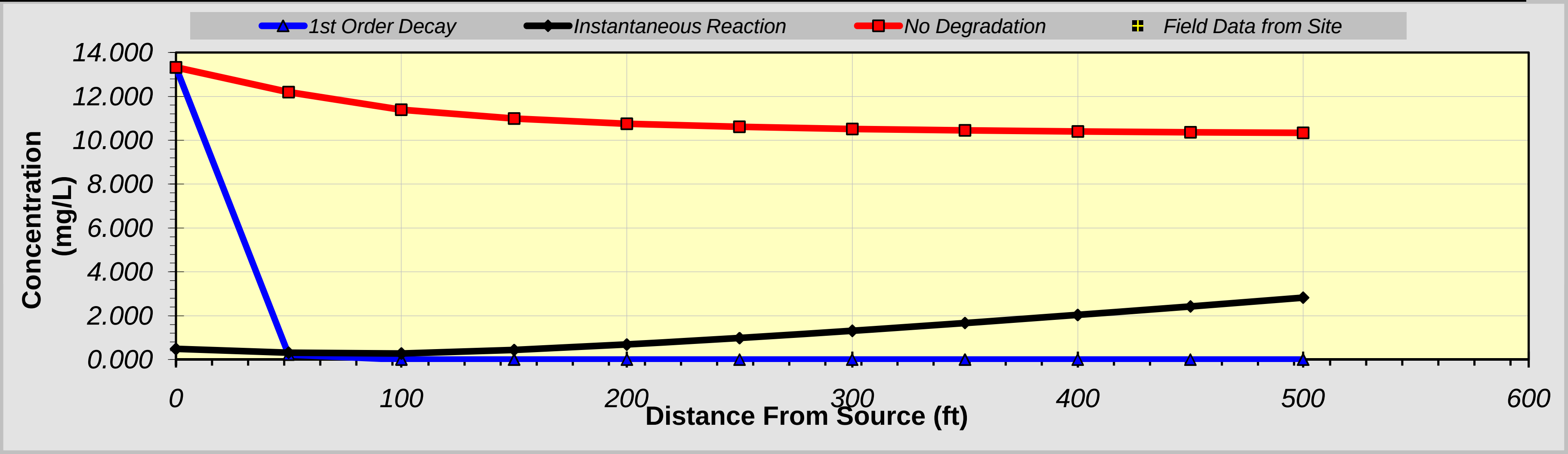
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	13.321	12.191	11.389	10.986	10.755	10.612	10.519	10.453	10.405	10.367	10.335
1st Order Decay	13.321	0.227	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.485	0.312	0.279	0.437	0.685	0.984	1.314	1.667	2.038	2.425	2.826
Field Data from Site											



Calculate Animation

Time:

15 Years

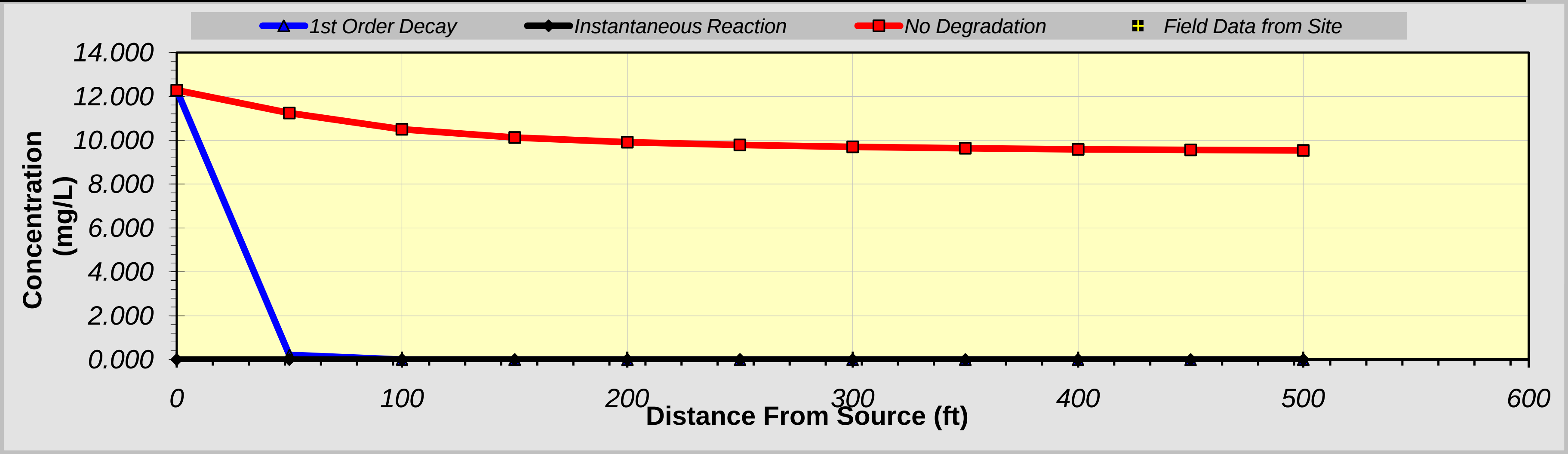
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	12.281	11.239	10.500	10.128	9.915	9.784	9.697	9.637	9.592	9.558	9.530
1st Order Decay	12.281	0.209	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

20 Years

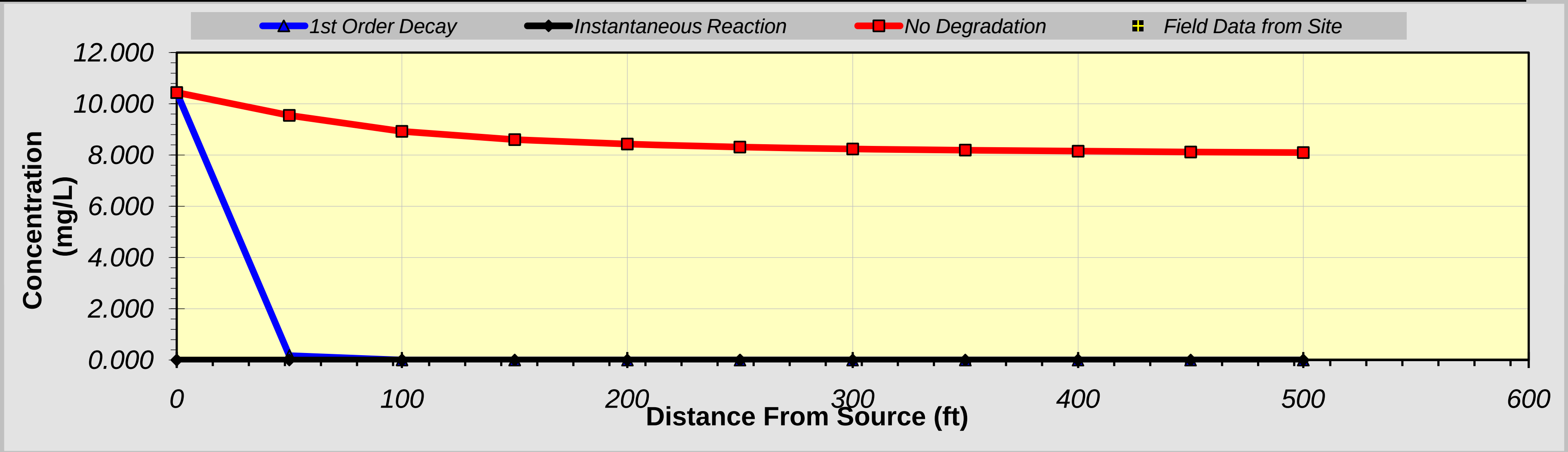
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	10.438	9.553	8.924	8.608	8.427	8.316	8.242	8.191	8.153	8.124	8.100
1st Order Decay	10.438	0.178	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time: 30 Years

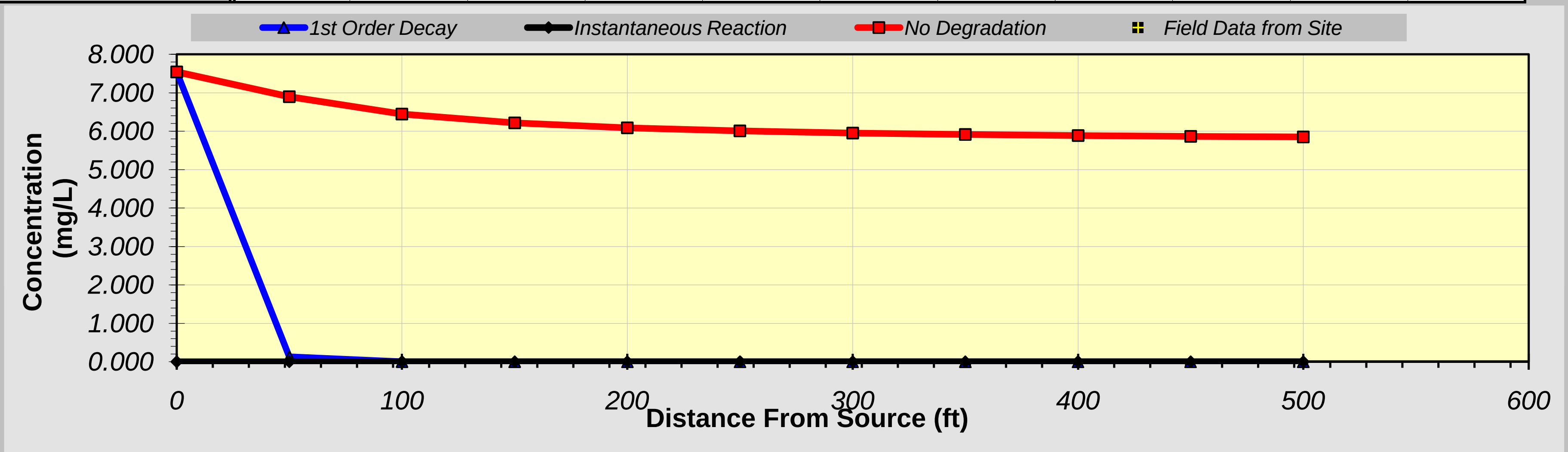
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	7.540	6.901	6.447	6.218	6.088	6.007	5.954	5.917	5.890	5.868	5.851
1st Order Decay	7.540	0.129	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

50 Years

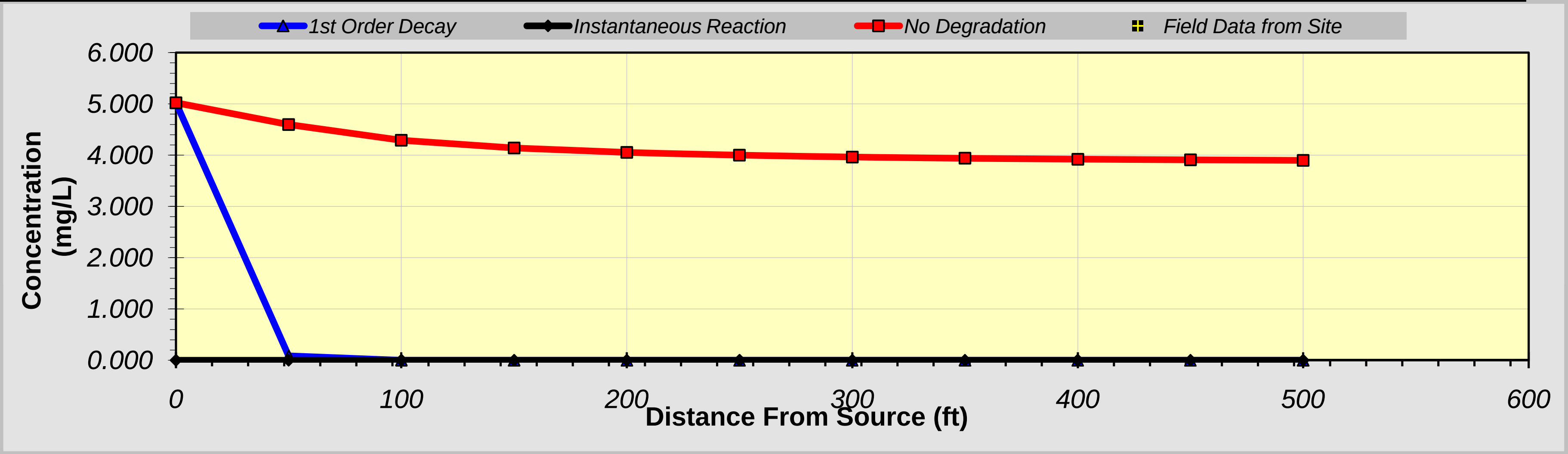
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	5.022	4.596	4.294	4.141	4.054	4.001	3.965	3.941	3.922	3.908	3.897
1st Order Decay	5.022	0.086	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

75 Years

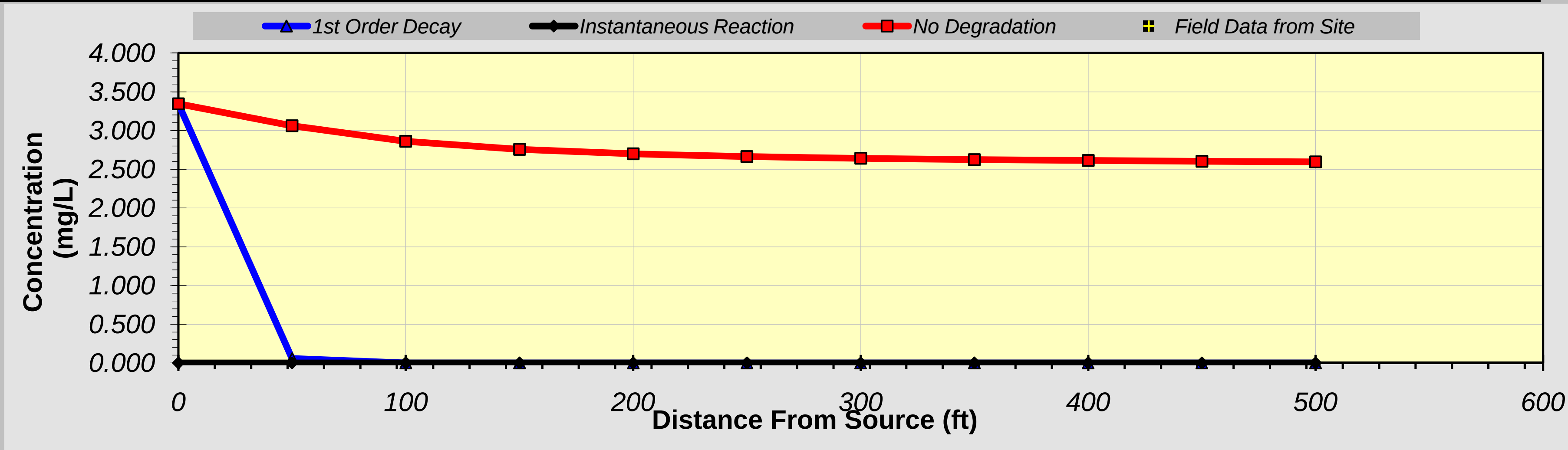
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	50	100	150	200	250	300	350	400	450	500
No Degradation	3.344	3.061	2.859	2.758	2.700	2.664	2.641	2.624	2.612	2.603	2.595
1st Order Decay	3.344	0.057	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate Animation

Time:

100 Years

Return to Input

Recalculate This Sheet

West Coast Door

Remedial Investigation/ Feasibility Study

Appendix D
Engineers Calculations

DRAFT

Appendix D Engineers Calculations

Remedial Options Cost Estimate for Groundwater Contamination Plume						
1) Natural Attentuation and Long Term Monitoring						
Action	Units	Unit Cost		Quantity	Total Cost	
Short-term Monitoring Sampling (semi-annual, 4 wells, 5 years, one person-day of field work plus equipment)	event	$	1,500	10	$	15,000
Short-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	event	$	1,200	10	$	12,000
Long-term Monitoring (annual, 4 wells, 25 years, one person-day of fiel	event	$	1,500	25	$	37,500
Long-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	evet	$	1,200	25	$	30,000
Reporting (annual)	event	$	1,000	30	$	30,000
				Remedy Subtotal	$	124,500
Contingency	--		15%		$	18,675
				Total Remedy Cost	$	143,175

2) Low-Permeability Containment Barrier						
Action	Units	Unit Cost		Quantity	Total Cost	
Installation						
Groundwater Extraction System Installation						
Construction Mobilization and Demobilization	ls	$	25,000	1	$	25,000
Field Oversight	day	$	1,000	60	$	60,000
Installation of 1050 Linear ft of Slurry Wall to 45 ft bgs	sf	$	6	47250	$	283,500
Installation of 6 Extraction Wells to 45 ft bgs	each	$	10,000	6	$	60,000
20 gpm Carbon or Ozone Treatment System	ls	$	200,000	1	$	200,000
Piping and Electrical from Wells	ls	$	25,000	1	$	25,000
Groundwater Extraction System Installation Subtotal					$	653,500
Design and Management	--		15%		$	98,025
				Installation Subtotal	**$**	**751,525**
Operations, Maintenance and Monitoring						
Sanitary Wewer Discharge Fees for Treated Effluent	year	$	67,000	30	$	2,010,000
Maintenance (30 years)	year	$	20,000	30	$	600,000
Short-term Monitoring Sampling (semi-annual, 4 wells, 5 years, one person-day of field work plus equipment)	event	$	1,500	10	$	15,000
Short-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	event	$	1,200	10	$	12,000
Long-term Monitoring (annual, 4 wells, 25 years, one person-day of field work plus equipment)	event	$	1,500	25	$	37,500
Long-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	evet	$	1,200	25	$	30,000
Reporting (annual)	event	$	1,000	30	$	30,000
				Operation, Maintenance and Monitoring Subtotal	**$**	**2,734,500**
Total Remedy						
Installation and O&M Subtotal					$	3,486,025
Contingency*	--		30%		$	1,045,808
				Total Remedy Cost	**$**	**4,531,833**

3) In-Situ Treatment Bio Barrier: Bioremediation via Injection of Oxygen Releasing Compound (ORC)						
Action	Units	Unit Cost		Quantity	Total Cost	
Installation						
Injection Event						
Field Oversight	day	$	1,000	12	$	12,000
ORC Injection Point Drilling (5-6 per day, 32 total, 2 events)	day	$	2,000	12	$	24,000
Ecology Injection Point Fees	each	$	65	64	$	4,160
ORC Chemical Solution (2 events)	lb	$	10	7200	$	72,000
Injection Event Subtotal					$	112,160
Design and Management	--		15%		$	16,824
				Installation Subotal	**$**	**128,984**
Operations, Maintenance and Monitoring						
Additional Injection Events (assumes contaminant rebound occurs)	event	$	112,160	2	$	224,320
Short-term Monitoring Sampling (semi-annual, 4 wells, 5 years, one person-day of field work plus equipment)	event	$	1,500	10	$	15,000
Short-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	event	$	1,200	10	$	12,000
Long-term Monitoring (annual, 4 wells, 25 years, one person-day of fiel	event	$	1,500	25	$	37,500
Long-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	evet	$	1,200	25	$	30,000
Reporting (annual)	event	$	1,000	30	$	30,000
				Operations, Maintenance and Monitoring Subtotal	**$**	**348,820**
Total Remedy						
Installation and O&M Subtotal					$	477,804
Contingency			15%		$	71,671
				Total Remedy Cost	**$**	**549,475**

Remedial Options Cost Estimate for Groundwater Contamination Plume							
4) In-Situ Treatment Bio Barrier: Enhanced Bioremediation via Injection of Amendments (PermeOx)							
Action	Units	Unit Cost		Quantity	Total Cost	
Installation							
Injection System Installation							
Construction Mobilization and Demobilization	ls	$	15,000	1	$	15,000
Field Oversight	day	$	1,000	40	$	40,000
Installation of 6 Pumping/extraction Wells	each	$	6,000	6	$	36,000
PermeOx Amendment (enhanced bioremediation)	lbs	$	6	42000	$	252,000
Piping and Electrical from Wells	ls	$	25,000	1	$	25,000
Injection System Installation Subtotal					$	368,000
Design and Management	--		15%		$	55,200
				Installation Subtotal	**$**	**423,200**
Operations, Maintenance and Monitoring					$	423,200
Operations and Maintenance	year	$	20,000	2	$	40,000
Additional Injection System Operation (assumes contaminant rebound occurs)	year	$	292,000	2	$	584,000
Additional Field Oversight (assumes contaminant rebound occurs)	day	$	1,000	20	$	20,000
Short-term Monitoring Sampling (semi-annual, 4 wells, 5 years, one person-day of field work plus equipment)	event	$	1,500	10	$	15,000
Short-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	event	$	1,200	10	$	12,000
Long-term Monitoring (annual, 4 wells, 25 years, one person-day of fiel	event	$	1,500	25	$	37,500
Long-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	evet	$	1,200	25	$	30,000
Reporting (annual)	event	$	1,000	30	$	30,000
	Operations, Maintenance and Monitoring Subtotal				**$**	**768,500**
Total Remedy						
Installation and O&M Subtotal					$	1,191,700
Contingency*	--		30%		$	357,510
				Total Remedy Cost	**$**	**1,549,210**

5) Chemical Oxidation (via Ozone)						
Action	Units	Unit Cost		Quantity	Total Cost	
Installation						
Delivery Well System Installation						
Construction Mobilization and Demobilization	ls	$	15,000	1	$	15,000
Field oversight	day	$	1,000	40	$	40,000
Ozone Production and Delivery System Componens	ls	$	76,000	1	$	76,000
Ozone Delivery Well Installation	each	$	2,000	12	$	24,000
Piping and Electrical from Wells	ls	$	25,000	1	$	25,000
System Startup	day	$	3,800	4	$	15,200
Hydrogen Peroxide**	lbs	$	0.09	720	$	65
Delivery Well System Installation Subtotal					$	195,265
Design and Management	--		15%		$	29,290
				Installation Subtotal	**$**	**224,555**
Operations, Maintenance and Monitoring						
Operations and Maintenance (including electricity)	year	$	30,000	1	$	30,000
Additional Years System Operation (assumes contaminant rebound occurs)	year	$	45,265	2	$	90,530
Additional Field Oversight (assumes contaminant rebound occurs)	day	$	1,000	20	$	20,000
Short-term Monitoring Sampling (semi-annual, 4 wells, 5 years, one person-day of field work plus equipment)	event	$	1,500	10	$	15,000
Short-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	event	$	1,200	10	$	12,000
Long-term Monitoring (annual, 4 wells, 25 years, one person-day of fiel	event	$	1,500	25	$	37,500
Long-term Monitoring Laboratory Analytical Costs, Data QC, Ecology Database Upload	evet	$	1,200	25	$	30,000
Reporting (annual)	event	$	1,000	30	$	30,000
	Operations, Maintenance and Monitoring Subtotal				**$**	**265,030**
Total Remedy						
Installation and O&M Subtotal					$	489,584
Contingency*	--		30%		$	146,875
				Total Remedy Cost	**$**	**636,459**

**Contingency increased due to complexity of construction*

***Hydrogen peroxide required due to high concentrations of naphthalene and light oils*

West Coast Door

Remedial Investigation/ Feasibility Study

Appendix E
Model Restrictive Covenant

After Recording Return
Original Signed Covenant to: [1]
Scott Rose (Voluntary Cleanup Program)
and
Toxics Cleanup Program
Department of Ecology
300 Desmond Drive
Lacey, WA 98503

Environmental Covenant

(8/21/13 version)

Grantor: 3102 TIC
Grantee: State of Washington, Department of Ecology
Brief Legal Description: SW quarter of Section 7, Township 20 North, Range 3 East of the W.M.
Tax Parcel Nos.: 0320073069, 0320073070

RECITALS [2]

a. This document is an environmental (restrictive) covenant (hereafter "Covenant") executed pursuant to the Model Toxics Control Act ("MTCA"), chapter 70.105D RCW and Uniform Environmental Covenants Act ("UECA"), chapter 64.70 RCW.

b. The Property that is the subject of this Covenant is part or all of a site commonly known as West Coast Door, VCP ID #SW0865. The Property is legally described in Exhibit A, and illustrated in Exhibit B, both of which are attached (hereafter "Property"). If there are differences between these two Exhibits, the legal description in Exhibit A shall prevail. [3]

c. The Property is the subject of remedial action under MTCA. This Covenant is required because residual contamination remains on the Property after completion of remedial actions. Specifically, the following principle contaminants remain on the Property on the southern parcel (#0320073070): [4]

---

[1] Some counties keep the original covenant, others don't. If the signed original is available, it must be sent to Ecology. If the signed original is not available, send a legible copy to Ecology.

[2] This section is primarily used to describe this document and its purpose. It should not be used for substantive binding provisions.

[3] Note that an environmental covenant applies to a specific Property, not the site (which may comprise several properties or "parcels"). A precise legal description of the Property (or Property interest such as an easement) is essential to know where the covenant applies. If there is any uncertainty, the Grantor must have the Property (or Property interest) surveyed and a legal description prepared by a licensed surveyor. If the contaminated area includes multiple parcels, each parcel must have the covenant recorded on the title. If contamination remains on only part of a larger Property, the restrictions may apply to just the smaller area, but the covenant must still be recorded on the title for all parcels encompassing the contaminated area.

[4] List the contaminants for the associated media. If more than a few are present, list the top three to five for each medium.

Medium	Principle Contaminants Present
Soil	Naphthalene and cPAHs as a creosote mixture
Groundwater	Naphthalene and BTEX
Surface Water/Sediment	n/a

d. It is the purpose of this Covenant to restrict certain activities and uses of the Property to protect human health and the environment and the integrity of remedial actions conducted at the site. Records describing the extent of residual contamination and remedial actions conducted are available through the Washington State Department of Ecology. This includes a RI/FS report prepared for the Property.

e. This Covenant grants the Washington State Department of Ecology, as holder of this Covenant, certain rights specified in this Covenant. The right of the Washington State Department of Ecology as a holder is not an ownership interest under MTCA, Chapter 70.105D RCW or the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") 42 USC Chapter 103.

COVENANT

3102 TIC, as Grantor [5] and owner of the Property hereby grants to the Washington State Department of Ecology, and its successors and assignees, (hereafter "Ecology") the following covenants. Furthermore, it is the intent of the Grantor that such covenants shall run with the land and be binding on all current and future owners of any portion of, or interest in, the Property.

Section 1. General Restrictions and Requirements.

The following general restrictions and requirements shall apply to the Property:

a. Interference with Remedial Action. The Grantor shall not engage in any activity on the Property that may impact or interfere with the remedial action and any operation, maintenance, inspection or monitoring of that remedial action without prior written approval from Ecology.

b. Protection of Human Health and the Environment. The Grantor shall not engage in any activity on the Property that may threaten continued protection of human health or the environment without prior written approval from Ecology. This includes, but is not limited to, any activity that results in the release of residual contamination that was contained as a part of the remedial action or that exacerbates or creates a new exposure to residual contamination remaining on the Property.

c. Continued Compliance Required. Grantor shall not convey any interest in any portion of the Property without providing for the continued adequate and complete operation, maintenance and monitoring of remedial actions and continued compliance with this Covenant.

d. Leases. Grantor shall restrict any lease for any portion of the Property to uses and activities consistent with this Covenant and notify all lessees of the restrictions on the use of the Property.

[5] If there is more than one Grantor, use the term "Grantors" here and throughout this document.

e. Amendment to the Covenant. Grantor must notify and obtain approval from Ecology at least sixty (60) days in advance of any proposed activity or use of the Property in a manner that is inconsistent with this Covenant.[6] Before approving any proposal, Ecology must issue a public notice and provide an opportunity for the public to comment on the proposal. If Ecology approves the proposal, the Covenant will be amended to reflect the change.

Section 2. Specific Prohibitions and Requirements.

In addition to the general restrictions in Section 1 of this Covenant, the following additional specific restrictions and requirements shall apply to the Property.

a. Land use.
b. Containment of soil/waste materials.
c. Stormwater facilities.
d. Groundwater use.
e. Monitoring

[6] Examples of inconsistent uses are: using the Property for a use not allowed under the covenant (for example, mixed residential and commercial use on a property that is restricted to industrial uses); OR, drilling a water supply well when use of the groundwater for water supply is prohibited by the covenant.

Section 3. Access.

a. The Grantor shall maintain clear access to all remedial action components necessary to construct, operate, inspect, monitor and maintain the remedial action.

b. The Grantor freely and voluntarily grants Ecology and its authorized representatives, upon reasonable notice, the right to enter the Property at reasonable times to evaluate the effectiveness of this Covenant and associated remedial actions, and enforce compliance with this Covenant and those actions, including the right to take samples, inspect any remedial actions conducted on the Property, and to inspect related records.

c. No right of access or use by a third party to any portion of the Property is conveyed by this instrument.

Section 4. Notice Requirements.

a. Conveyance of Any Interest. The Grantor, when conveying any interest **[within the area of the Property described/illustrated in Exhibit C**, including but not limited to title, easement, leases, and security or other interests, must:

- **i.** Notify Ecology at least thirty (30) days in advance of the conveyance. [7]
- **ii**. Include in the conveying document a notice in substantially the following form, as well as a complete copy of this Covenant:

NOTICE: THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL COVENANT GRANTED TO THE WASHINGTON STATE DEPARTMENT OF ECOLOGY ON [DATE] AND RECORDED WITH THE PIERCE COUNTY AUDITOR UNDER RECORDING NUMBER [RECORDING NUMBER]. USES AND ACTIVITIES ON THIS PROPERTY MUST COMPLY WITH THAT COVENANT, A COMPLETE COPY OF WHICH IS ATTACHED TO THIS DOCUMENT.

- **iii.** Unless otherwise agreed to in writing by Ecology, provide Ecology with a complete copy of the executed document within thirty (30) days of the date of execution of such document.

b. Reporting Violations. Should the Grantor become aware of any violation of this Covenant, Grantor shall promptly report such violation to Ecology.

c. Emergencies. For any emergency or significant change in site conditions due to Acts of Nature (for example, flood, fire) resulting in a violation of this Covenant, the Grantor is authorized to respond to such an event in accordance with state and federal law. The Grantor

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[7] Ecology may waive this notice provision for some units at a Property where the anticipated use is a multi-tenant/owner building where some owners or tenants are unlikely to be exposed to residual contamination. For example: upper story apartments or condominiums, or commercial tenants in a strip mall, with limited rights to use the grounds under and around the building (such as for parking).

If Ecology agrees to such a waiver, the circumstances of the waiver will be detailed in paragraph 4.a.i. In addition to the specific circumstances, this provision must include the following statement: "Waiver of this advance notice to Ecology for these transactions does not constitute waiver of this notice for the entire Property nor a waiver of the requirement in Section 4.a.ii. to include this notice in any document conveying interest in the Property."

must notify Ecology of the event and response actions planned or taken as soon as practical but no later than within 24 hours of the discovery of the event.

d. Any required written notice, approval, or communication shall be personally delivered or sent by first class mail to the following persons. Any change in this contact information shall be submitted in writing to all parties to this Covenant.

3012 TIC PO Box 111615 Tacoma, WA 98411-1615 (253) 274-0828	Environmental Covenants Coordinator Washington State Department of Ecology Toxics Cleanup Program P.O. Box 47600 Olympia, WA 98504 – 7600 (360) 407-6000

As an alternative to providing written notice and change in contact information by mail, these documents may be provided electronically in an agreed upon format at the time of submittal.

Section 5. Modification or Termination.

a. If the conditions at the site requiring a Covenant have changed or no longer exist, then the Grantor may submit a request to Ecology that this Covenant be amended or terminated. Any amendment or termination of this Covenant must follow the procedures in Chapter 64.70 RCW and Chapter 70.105D RCW and any rules promulgated under these chapters.

b. **[Optional]** By signing this agreement, per RCW 64.70.100, the original signatories to this agreement, other than Ecology, agree to waive all rights to sign amendments to and termination of this Covenant. [8]

Section 6. Enforcement and Construction.

a. This Covenant is being freely and voluntarily granted by the Grantor.

b. Grantor shall provide Ecology with an original signed Covenant and proof of recording within ten (10) days of execution of this Covenant.

c. Ecology shall be entitled to enforce the terms of this Covenant by resort to specific performance or legal process. All remedies available in this Covenant shall be in addition to any and all remedies at law or in equity, including Chapter 70.105D RCW and Chapter 64.70 RCW. Enforcement of the terms of this Covenant shall be at the discretion of Ecology, and any forbearance, delay or omission to exercise its rights under this Covenant in the event of a breach of any term of this Covenant is not a waiver by Ecology of that term or of any subsequent breach of that term, or any other term in this Covenant, or of any rights of Ecology under this Covenant.

d. The Grantor, upon request by Ecology, shall be obligated to pay for Ecology's costs to process a request for any modification or termination of this Covenant and any approval required by this Covenant.

[8] As time passes, the original grantor and other signers of the covenant may no longer exist as viable entities. This is intended to allow future amendments or termination of the covenant without Ecology having to seek court authorization, as provided by RCW 64.70.100.

e. This Covenant shall be liberally construed to meet the intent of the Model Toxics Control Act, chapter 70.105D RCW and Uniform Environmental Covenants Act, chapter 64.70 RCW.

f. The provisions of this Covenant shall be severable. If any provision in this Covenant or its application to any person or circumstance is held invalid, the remainder of this Covenant or its application to any person or circumstance is not affected and shall continue in full force and effect as though such void provision had not been contained herein.

g. A heading used at the beginning of any section or paragraph or exhibit of this Covenant may be used to aid in the interpretation of that section or paragraph or exhibit but does not override the specific requirements in that section or paragraph.

The undersigned Grantor warrants he/she holds the title to the Property and has authority to execute this Covenant.

EXECUTED this ______ day of __________________, 20___.

William Swensen, 3102 TIC

[SIGNATURE]_________________
[TITLE]

Dated: __________________

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

[SECTION MANAGER SIGNATURE - if VCP or Order.]
[PROGRAM MANAGER SIGNATURE - if Consent Decree.]__
[TITLE]

Dated: __________________

GRANTOR INDIVIDUAL ACKNOWLEDGMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of __________________, 20__, I certify that ____________________ personally appeared before me, and acknowledged that **he/she** is the individual described herein and who executed the within and foregoing instrument and signed the same at **his/her** free and voluntary act and deed for the uses and purposes therein mentioned.

____
Notary Public in and for the State of
Washington, residing at _______________.
My appointment expires_______________.

GRANTOR CORPORATE ACKNOWLEDGMENT

STATE OF ____________________
COUNTY OF __________________

On this ______ day of __________________, 20__, I certify that ____________________ personally appeared before me, acknowledged that **he/she** is the __________________________ of the corporation that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that **he/she** was authorized to execute said instrument for said corporation.

____
Notary Public in and for the State of
Washington, residing at _______________.
My appointment expires_______________.

Exhibit A

LEGAL DESCRIPTION

CHICAGO TITLE INSURANCE COMPANY
A.L.T.A. COMMITMENT

SCHEDULE A
(Continued)

Order No.: 4311768
Your No.: SWENSEN / MERIT CO

LEGAL DESCRIPTION EXHIBIT
(Paragraph 4 of Schedule A continuation)

PARCEL A:

THAT PORTION OF THE SOUTHWEST QUARTER OF SECTION 7, TOWNSHIP 20 NORTH, RANGE 3 EAST OF THE W.M., DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE SOUTHERLY RIGHT OF WAY LINE OF THE OREGON AND WASHINGTON RAILROAD COMPANY AND THE EAST LINE OF CEDAR STREET;
THENCE NORTH 01°40'28" EAST ALONG SAID EAST LINE OF CEDAR STREET, A DISTANCE OF 200 FEET;
THENCE NORTH 88°19'32" EAST, A DISTANCE OF 306.676 FEET TO A POINT ON THE SOUTHERLY RIGHT OF WAY LINE OF SAID OREGON AND WASHINGTON RAILROAD COMPANY;
THENCE SOUTH 58°33'50" WEST ALONG SAID SOUTHERLY RIGHT OF WAY LINE, A DISTANCE OF 336.13 FEET TO THE PLACE OF BEGINNING, IN TACOMA, PIERCE COUNTY, WASHINGTON.

PARCEL B:

BEGINNING AT THE INTERSECTION OF THE NORTHERLY LINE OF THE RIGHT OF WAY OF THE NORTHERN PACIFIC RAILWAY COMPANY WITH THE EXTENSION NORTH OF THE WEST LINE OF PINE STREET IN JUNETTS ADDITION TO TACOMA, W.T., AS PER MAP THEREOF RECORDED IN BOOK 2 OF PLATS, AT PAGE 66, RECORDS OF PIERCE COUNTY AUDITOR, BEING A LINE PARALLEL WITH AND 40 FEET WEST OF THE EAST LINE OF THE SOUTHWEST QUARTER OF SECTION 7, TOWNSHIP 20 NORTH, RANGE 3 EAST OF THE WILLAMETTE MERIDIAN;
THENCE ON SAID LINE OF PINE STREET, NORTH 634.41 FEET TO THE SOUTHERLY LINE OF THE RIGHT OF WAY OF THE OREGON AND WASHINGTON RAILWAY;
THENCE ON SAID OREGON AND WASHINGTON RAILWAY LINE, SOUTH 57°08' WEST 728.30 FEET TO THE EAST LINE OF SOUTH CEDAR STREET AS LAID OUT BY THE CITY OF TACOMA PRIOR TO ITS VACATION BY THE CITY OF TACOMA UNDER ORDINANCE NO. 12145, RECORDED JANUARY 7, 1942 UNDER AUDITOR'S FILE NO. 1292821;
THENCE ON SAID LINE OF SOUTH CEDAR STREET, SOUTH 731.07 FEET TO SAID NORTHERLY LINE OF NORTHERN PACIFIC RAILWAY COMPANY'S RIGHT OF WAY';
THENCE ON SAID RIGHT OF WAY LINE NORTHEASTERLY TO THE PLACE OF BEGINNING

TOGETHER WITH THE EAST 45 FEET OF CEDAR STREET VACATED BY THE CITY OF TACOMA UNDER ORDINANCE NO. 12145, RECORDED JANUARY 7, 1942 UNDER AUDITOR'S FILE NO. 1292821;

EXCEPT THAT PORTION THEREOF CONVEYED TO THE CITY OF TACOMA, A MUNICIPAL CORPORATION BY DEED RECORDED JANUARY 10, 1968 UNDER AUDITOR'S FILE NO. 2222205, RECORDS OF PIERCE COUNTY, IN TACOMA, PIERCE COUNTY, WASHINGTON.

LEGAL DESCRIPTION EXHIBIT
(Paragraph 4 of Schedule A continuation)

PARCEL C:

THAT PORTION OF THE SOUTHWEST QUARTER OF SECTION 7, TOWNSHIP 20 NORTH, RANGE 3 EAST OF THE W.M., DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE SOUTHERLY RIGHT OF WAY LINE OF THE OREGON AND WASHINGTON RAILROAD COMPANY AND THE EAST LINE OF CEDAR STREET;
THENCE NORTH 0°00'00" EAST ALONG THE EAST LINE OF SAID CEDAR STREET, 200 FEET;
THENCE NORTH 90°00'00" WEST 25.00 FEET;
THENCE SOUTH 3°15'17" WEST 224.B3 FEET TO THE SOUTHERLY RIGHT OF WAY LINE OF SAID OREGON AND WASHINGTON RAILROAD COMPANY;
THENCE NORTH 57°03'28" EAST ALONG SAID RIGHT OF WAY 45.00 FEET TO THE PLACE OF BEGINNING, IN TACOMA, PIERCE COUNTY, WASHINGTON.

PARCEL D:

THAT PORTION OF THE SOUTHWEST QUARTER OF SECTION 7, TOWNSHIP 20 NORTH, RANGE 3 EAST OF THE W.M., DESCRIBED AS FDLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF THE NORTHEAST QUARTER OF SAID SOUTHWEST QUARTER;
THENCE SOUTH B9°48'07" WEST ALONG THE SOUTH LINE OF SAID SUBDIVISION 46.00 FEET;
THENCE NORTH 0°19'32" WEST PARALLEL WITH THE WEST LINE THEREOF, 44.00 FEET TO THE TRUE POINT OF BEGINNING;
THENCE THROUGH A CURVE TO THE LEFT WITH A RADIUS POINT BEARING SOUTH 89°40'28" WEST 916.73 FEET AND HAVING A CENTRAL ANGLE OF 23°44'04" FOR AN ARC LENGTH OF 379.75 FEET;
THENCE NORTH 57°03'28" EAST 21.00 FEET;
THENCE THROUGH A CURVE TO THE RIGHT WITH A RADIUS POINT BEARING SOUTH 71°47'10" WEST 1238.10 FEET AND HAVING A CENTRAL ANGLE OF 17°53'16" FOR AN ARC LENGTH OF 3B6.55 FEET TO THE TRUE POINT OF BEGINNING, IN TACOMA, PIERCE COUNTY, WASHINGTON.

PARCEL E:

THAT PORTION OF THE SOUTHWEST QUARTER OF SECTION 7, TOWNSHIP 20 NORTH, RANGE 3 EAST OF THE W.M., DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE SOUTHERLY RIGHT OF WAY LINE OF THE OREGON AND WASHINGTON RAILROAD COMPANY AND THE EAST LINE OF CEDAR STREET;

LEGAL DESCRIPTION EXHIBIT
(Paragraph 4 of Schedule A continuation)

THENCE NORTH 58°33'50" EAST ALONG SAID SOUTHERLY RIGHT OF WAY LINE, A DISTANCE OF 366.13 FEET TO THE TRUE POINT OF BEGINNING;
THENCE NORTH 58°33'50" EAST ALONG SAID SOUTHERLY RIGHT OF WAY LINE, A DISTANCE OF 275.82 FEET TO THE WEST RIGHT OF WAY LINE OF THE CEDAR STREET-PINE STREET TRANSITION AND THE BEGINNING OF A NON-TANGENT CURVE CONCAVE TO THE WEST HAVING A RADIUS OF 1,105.37 FEET AND TO WHICH BEGINNING A RADIAL LINE BEARS NORTH 71°34'35" EAST;
THENCE NORTHWESTERLY 16.12 FEET ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 00°59'09";
THENCE ON A NON-TANGENT LINE SOUTH 65°33'18" WEST 31.19 FEET;
THENCE SOUTH 31°01'04" EAST 3.55 FEET;
THENCE SOUTH 61°00'36" WEST 292.26 FEET;
THENCE SOUTH 88°19'32" EAST 52.09 FEET TO THE POINT OF BEGINNING, IN TACOMA, PIERCE COUNTY, WASHINGTDN.

Exhibit B

PROPERTY MAP

Exhibit C

MAP ILLUSTRATING LOCATION OF RESTRICTIONS

(SEE RI/FS FIGURES 2.8 AND 2.9 FOR AREAS OF SOIL AND GROUNDWATER CONTAMINATION)

Exhibit D

SUBORDINATION AGREEMENT

KNOW ALL PERSONS, That ________________________________, the owner and holder of that certain ____________________________ (Instrument) bearing the date the _______ day of _______________, 20____, executed by _____________________________________, _________________________, and recorded in the office of the County Auditor of _________________________ County, State of Washington, on the _______________, 20____, under Auditor's File Number ____________, does hereby agree that said Instrument shall be subordinate to the interest of the State of Washington, Department of Ecology, under the environmental (restrictive) covenant dated ______________________, 20____, executed by ____, and recorded in _________________________ County, Washington under Auditor's File Number _________________.

Dated ________, 20___.

NAME

____

STATE OF _____________________
COUNTY OF ___________________

On this ______ day of ___________________, 20____, I certify that __________________ ______ personally appeared before me, and acknowledged that **he/she** is the individual described herein and who executed the within and foregoing instrument and signed the same at **his/her** free and voluntary act and deed for the uses and purposes therein mentioned.

____
Notary Public in and for the State of Washington, residing at _______________.
My appointment expires_______________.

APPENDIX 1

SITE-SPECIFIC COVENANT PROVISIONS

a. Land Use. [9]

Industrial Land Use: The remedial action for the Property is based on a cleanup designed for industrial property. As such, the Property shall be used in perpetuity only for industrial uses, as that term is defined in the rules promulgated under Chapter 70.105D RCW. Prohibited uses on the Property include but are not limited to residential uses, childcare facilities, K-12 public or private schools, parks, grazing of animals, growing of food crops, and non-industrial commercial uses.

b. Containment of Soil/Waste Materials. [10]

The remedial action for the Property is based on containing contaminated soil under a cap consisting of asphalt pavement and concrete building foundations11 and located as illustrated in Exhibit C. The primary purpose of this cap is to prevent surface water infiltration through the contaminated materials As such, the following restrictions shall apply within the area illustrated in Exhibit C.

The Grantor shall not alter or remove the existing structures on the Property in any manner that would expose contaminated soil, result in a release to the environment of contaminants, or create a new exposure pathway, without prior written approval of Ecology. Should the Grantor propose to remove all or a portion of the existing structures illustrated in Exhibit C so that access to the underlying contamination is feasible, Ecology may require treatment or removal of the underlying contaminated soil.

The Grantor covenants and agrees that it shall annually, or at another time as approved in writing by Ecology, inspect the asphalt cap and building and report within thirty (30) days of the inspection the condition of the asphalt cap and building and any changes to the cap/building that would impair its performance.

c. Stormwater facilities.

To minimize the potential for mobilization of contaminants remaining in the soil and groundwater on the Property, no stormwater infiltration facilities or ponds shall be constructed within the area of the Property illustrated in Exhibit C. All stormwater catch basins, conveyance systems, and other appurtenances located within this area shall be of water-tight construction.[12]

d. Groundwater Use.

The groundwater within the area of the Property illustrated in Exhibit C remains contaminated and shall not be extracted for any purpose other than temporary construction dewatering, investigation, monitoring or remediation. Drilling of a well for any water supply purpose is strictly prohibited. Groundwater extracted from within this area for any purpose shall be

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[9] Use one of these restrictions only if the underlying zoning allows the use.

[10] Waste materials means solid wastes as defined in Chapter 70.95 RCW or hazardous wastes as defined in Chapter 70.105 RCW and the rules promulgated under these statutes.

[11] Such as: an X foot thick layer of clean soil; an engineered cap consisting of X inches of clean soil overlying a X mil thick geomembrane and/or clay layer; asphalt pavement; an X square foot building, etc.]

[12] NOTE: Most local ordinances require on-site infiltration of runoff. If redevelopment of the Property is anticipated, the cleanup plan should reserve an area for this infiltration to occur without exacerbating leaching of residual soil contamination or enhancing movement of contaminants within the groundwater.

considered potentially contaminated and any discharge of this water shall be done in accordance with state and federal law.

e. Monitoring.

Several groundwater monitoring wells are located on the Property to monitor the performance of the remedial action. The Grantor shall maintain clear access to these devices and protect them from damage. The Grantor shall report to Ecology within forty-eight (48) hours of the discovery of any damage to any monitoring device. Unless Ecology approves of an alternative plan in writing, the Grantor shall promptly repair the damage and submit a report documenting this work to Ecology within thirty (30) days of completing the repairs.

West Coast Door

Remedial Investigation/ Feasibility Study

Appendix F
Previous Investigation Documentation
(Provided on CD-ROM)