Lower Duwamish Waterway
Early Action Area 2

Summary of Additional Site Characterization Activities:

Trotsky and Douglas Management Company Properties

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Acronyms and Abbreviations

2LAET	Second Lowest Apparent Effects Threshold value
bgs	below ground surface
BBP	butylbenzylphthalate
BEHP	bis(2-ethylhexyl)phthalate
btoc	below top of casing
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	Cleanup Screening Level
DMC	Douglas Management Company
DW	dry weight
EAA-2	Early Action Area 2
Ecology	Washington State Department of Ecology
gpm	gallons per minute
HCID	hydrocarbon identification
ICS	Industrial Container Services
LAET	Lowest Apparent Effects Threshold
LDW	Lower Duwamish Waterway
MTCA	Model Toxics Control Act
NAPL	non-aqueous phase liquid
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDT	Pacific Daylight Time
PID	photo-ionization detector
PVC	polyvinyl chloride
SAIC	Science Applications International Corporation
SCAP	Source Control Action Plan
SQS	Sediment Quality Standard
SVOC	semivolatile organic compound
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-Dx	diesel-range petroleum hydrocarbons
TPH-Gx	gasoline-range petroleum hydrocarbons
VOC	volatile organic compound

1.0 Introduction

This report was prepared by Science Applications International Corporation (SAIC) on behalf of the Washington State Department of Ecology (Ecology); it summarizes the results of environmental sampling conducted at the Early Action Area 2 (EAA-2) source control area in 2007/2008. Site characterization activities were carried out at the Trotsky and Douglas Management Company properties.

EAA-2 is located approximately 2.2 miles from the south end of Harbor Island on the west side of the Lower Duwamish Waterway (LDW) Superfund site, just south of the First Avenue S. Bridge in King County, Washington (Figure 1). It consists of a small inlet, approximately 80 feet wide at its mouth and tapering to a narrow stream at its head. Sediments in the inlet have accumulated chemical contaminants from numerous sources, both historical and potentially ongoing.

Properties immediately adjacent to EAA-2 are currently owned by Douglas Management Company (DMC) to the north and Herman and Jacqualine Trotsky (referred to as the Trotsky property) to the south (Figure 2). The Trotsky property is the current location of Industrial Container Services (ICS), a steel drum reconditioning facility. Most of the submerged portion of the EAA-2 inlet is owned by Herman and Jacqualine Trotsky, therefore it is referred to in this report as the Trotsky inlet. Boyer Towing, Inc. owns the land just east and southeast of the Trotsky property; Boyer Towing is not adjacent to the inlet.

The inlet itself was once part of a large tidal marsh that encompassed the lower 6 miles of the Duwamish River. The current location of the DMC property was part of Duwamish Turning Basin No. 2; aerial photos indicate that the triangular parcel that comprises the DMC site was filled sometime between 1960 and 1969 (SAIC 2008b).

EAA-2 has been identified as a high priority site for sediment cleanup. Ecology, as the lead agency for source control, is responsible for identifying and reducing ongoing releases of pollutants in order to prevent sediments from being recontaminated once cleanup has been undertaken. In June 2007, SAIC prepared a *Summary of Existing Information and Identification of Data Gaps* (Data Gaps) report, which identified data gaps related to potential sediment recontamination at EAA-2 (SAIC 2007b). Ecology's *Source Control Action Plan* (SCAP) for EAA-2 identified actions needed to address the data gaps (Ecology 2007). These action items included performing additional site characterization at the Trotsky and DMC properties to evaluate current concentrations of contaminants in groundwater, bank soils, intertidal sediments, and seeps.

In April 2007, SAIC prepared a *Sampling and Analysis Plan for Additional Site Characterization Activities* (SAIC 2007a), which described planned characterization at the Trotsky and DMC properties. Due to difficulties in obtaining an access agreement for sampling at the DMC property, field activities conducted in April and May 2007 focused on the Trotsky property and the Trotsky inlet. The activities and sampling results were presented in the July 2007 *Data Report, Additional Site Characterization Activities* (SAIC 2007c).

Subsequent to the negotiation of an access agreement with DMC, a revised sampling and analysis plan for the DMC property (*Sampling and Analysis Plan, Site Characterization Activities, Douglas Management Company Property*) was prepared by SAIC in June 2008 (SAIC 2008a). Sampling was conducted in May and June 2008.

This report summarizes the results of the 2007 sampling event at the Trotsky property and the 2008 sampling event at the DMC property, and replaces the July 2007 *Data Report* (SAIC 2007c). Field activities conducted during these sampling events are described in Section 2.0. Investigation results are summarized in Section 3.0, and Section 4.0 presents conclusions and recommendations. References are listed in Section 5.0.

2.0 Field Activities

Section 2.1 describes field activities conducted at the Trotsky property and the Trotsky inlet in April and May 2007. Section 2.2 describes field activities conducted at the DMC property in June and July 2008.

2.1 Trotsky Property and Inlet (2007)

2.1.1 Field Schedule

Investigation activities included sampling and analysis of subsurface soil, groundwater, seep water, stormwater outfall solids and water, and intertidal sediment. Specific activities and field schedule are listed below:

- Site walk and underground utilities locate: April 17, 2007
- Soil borings and monitoring well installation: April 23 and 24, 2007
- Location and elevation surveying: May 4, 2007
- Groundwater gradient study: May 4, 2007
- Outfall water sampling: May 4, 2007
- Seep sampling: May 4 and 7, 2007
- Sediment sampling: May 4, 7, and 8, 2007
- Outfall sediment sampling: May 8, 2007
- Groundwater sampling: May 22 and 23, 2007

2.1.2 Soil Borings

Three soil borings, MW-1, MW-2, and MW-3, were advanced to depths of between 25.5 and 26.5 feet below ground surface (bgs) using a hollow-stem auger drill rig operated by Cascade Drilling, Inc. (Figure 3).

Split-spoon soil samples were collected at 2.5-feet intervals for visual characterization and field screening with a photo-ionization detector (PID). Based on field indications of contamination, one to three soil samples were collected from each boring for chemical analysis (Table 1). Boring logs, showing sampled intervals and PID field screening results, are presented in Appendix A. Sample depths and elevations are listed in Table 2.

The Sampling and Analysis Plan (SAIC 2007a) had included two additional soil borings, MW-4 and MW-5, to be located on the east side of the Trotsky property, near the Second Avenue S. drainage ditch (Figure 3). These borings and the associated monitoring wells to be installed at these locations were intended to sample groundwater that might infiltrate into the Second Avenue S. storm drain line that discharges to the Trotsky inlet. During the site walk on April 17, 2007, Ecology staff and the SAIC field manager decided to eliminate these borings. It was decided instead to collect a water sample from the outfall of the drain line where it discharges into the Trotsky inlet. This water sample, along with a sample of storm drain solids from the outfall pipe, would represent potential inputs from the Second Avenue S. storm drain basin to the Trotsky inlet.

2.1.3 Monitoring Well Installation

Monitoring wells, consisting of pre-cleaned, 2-inch diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) pipe and 0.010-inch slotted PVC well screen, were installed in each boring. Wells were screened from 4 to 24 feet bgs. Screens were sand packed with clean #2-12 Colorado silica sand. Wells were completed with a bentonite and concrete surface seal and equipped with steel flush-mount monuments and locking watertight plugs. Following installation, wells were developed by surging and pumping using a submersible pump.

The locations and top-of-casing elevations of the three new monitoring wells, (MW-1, MW-2, and MW-3) plus four existing monitoring wells (B-1, B-2, B-4, and B-5) were surveyed to 0.01 feet by Bush, Roed, and Hitchings, Inc. (Figure 3; Table 2). Former monitoring well B-3, which was an offsite upgradient well located across First Avenue S. to the west, was destroyed during construction of the First Avenue S. bridge.

2.1.4 Groundwater Gradient Determination

Water levels in the three new monitoring wells (MW-1, MW-2, and MW-3), plus four existing monitoring wells (B-1, B-2, B-4, and B-5), were measured with a water level meter at approximately one-hour intervals over the course of a tidal cycle in order to estimate groundwater gradient and flow direction. Measurements were performed on May 4, 2007 between 4:26 AM and 3:50 PM; during this period, the approximate tidal height in the Lower Duwamish Waterway adjacent to the site (based on data from tidal station #9447130) varied by over 11 feet, from +7.68 feet at 5:26 AM (high tide) to -3.54 feet at 12:26 PM (low tide). Measurements are presented in Table 3.

All wells responded to some degree to the tidal change in the river. Wells MW-3, MW-2, and B-1 were the most affected, varying by approximately 7 feet, 6 feet, and 5 feet, respectively. Figures 4 and 5 show water-table elevation contours at high- and low-water level conditions in the monitoring wells. During low-water conditions, the gradient at the site is to the northeast toward the adjacent slip and river. During high-water conditions, the gradient at the site is to the south and southwest. The times of high- and low-water conditions in these wells lagged high- and low-tide levels in the river by between one and two hours (Figure 6).

2.1.5 Sediment Sampling

Sediment samples (SED-1, SED-2, SED-3, and SED-4) were collected at four intertidal locations within the slip (Figure 3). Locations were identified in conjunction with Ecology staff, and were based on proximity to potential contaminant sources and visual indications of contamination. The four stations were all located on the south (Trotsky) side of the slip axis. Samples were collected from the upper four inches of the sediment using pre-cleaned stainless steel scoops and were analyzed for the parameters shown on Table 1.

2.1.6 Outfall Solids Sampling

One solids sample was collected from the Second Avenue S. storm drain outfall (Figure 3). Solids from approximately one foot inside the end of the outfall pipe were collected using the method described in Section 2.1.5. It is not known whether this sample represents solids transported down the storm drain pipe or whether it is a build-up of inlet sediments from tidal influences. The solids sample was analyzed for the parameters shown on Table 1.

2.1.7 Groundwater Sampling

Groundwater samples were collected from the three new monitoring wells plus existing wells B-1 and B-2 (Figure 3). Wells B-3, B-4, and B-5 were not sampled. B-3, an offsite upgradient well, was destroyed during construction of the First Avenue S. bridge. B-4 and B-5 were judged to be unsuitable for groundwater monitoring because they had been damaged and left open for an extended period of time (SAIC 2007b, Appendix C).

Samples were collected using a peristaltic pump; new tubing was used for each well. Wells were purged at a low flow rate (< 0.5 gallons per minute [gpm]) until field measurements of pH, conductivity, temperature, and turbidity stabilized (Table 4). Samples were analyzed for the parameters listed on Table 1. For metals analyses, both filtered and non-filtered samples were collected. Filtered samples were collected in the field using disposable, in-line, 0.45-micron nitrocellulose filters. Wells were sampled during low water level conditions when the gradient toward the Trotsky inlet was steepest and potential dilution of groundwater by surface water was expected to be minimal. No product or non-aqueous phase liquid (NAPL) was encountered during the sampling of any of the monitoring wells.

2.1.8 Seep Sampling

Two seeps within the intertidal zone of the slip were sampled (Figure 3). Seeps were identified in conjunction with Ecology staff. The two seeps sampled in 2007 were both located on the south (Trotsky) side of the slip. The seep identified as “Seep 2” in this investigation is the same seep identified as “LDW-SP-56” in *Data Report: Survey and Sampling of Lower Duwamish Waterway Seeps* (Windward 2004).

Samples were taken by collecting the seep flow in a partially buried, wide-mouth, polyethylene bottle. The bottle was buried horizontally with its open mouth facing upslope so as to intercept the seep flow. Water was withdrawn from the bottle from a small hole in the bottle’s side with a peristaltic pump and discharged into sample bottles. New bottles and sample tubing were used on each seep. Samples were analyzed for the parameters listed on Table 1.

For metals analyses, both filtered and non-filtered samples were collected. Filtered samples were collected in the field using disposable, in-line, 0.45-micron nitrocellulose filters. Field measurements of pH, temperature, conductivity, and salinity are summarized in Table 4.

2.1.9 Outfall Water Sampling

One sample of water was collected from the Second Avenue S. storm drain outfall (Figure 3). The sample was collected late during an ebb tide to minimize the potential for collecting river water rather than outfall water. The sample conductivity (2,660 µS/cm) and salinity (0.1 percent) were low, which indicates that the water most likely originated from the storm drain rather than from the LDW. The sample was collected with a peristaltic pump using new sample tubing. Samples were analyzed for the parameters listed on Table 1. For metals analyses, both filtered and non-filtered samples were collected. Filtered samples were collected in the field using disposable, in-line, 0.45-micron nitrocellulose filters. Field measurements of pH, temperature, conductivity, and salinity are summarized in Table 4.

2.2 Douglas Management Company Property (2008)

2.2.1 Field Schedule

Investigation field activities included sampling and analysis of subsurface soil, groundwater, and an intertidal seep. Specific activities and field schedule are listed below:

- Site walk and underground utilities location: May 30, 2008
- Soil borings, monitoring well installation, and well development: June 18 – 20, 2008
- Well surveying, and groundwater sampling: July 16 – 17, 2008
- Bank soil and seep sampling: July 18, 2008

2.2.2 Soil Borings

Five soil borings (MW-8 to MW-12, Figure 7) were advanced to total depths ranging from 21.5 to 36.5 feet bgs. Soil borings were hand-cleared to 5 feet bgs to avoid possible utility damage by using a hand auger. After each soil boring location was hand-cleared, a truck mounted hollow stem auger drilling rig was set on each boring location to continue down-hole advancement.

Soil samples were collected from each soil boring by 2-inch (diameter) by 18-inch split spoon sampler. Soil samples were collected at 5-foot intervals. Soils collected were logged using standard techniques for the following features:

- Color
- Moisture content (dry, damp, moist, or wet)
- Lithology (using the modified Unified Soil Classification System)
- Geological interpretation, if pertinent (e.g., fill, topsoil, till, etc.)
- Presence of sheen or NAPL
- Presence of contaminant odor
- Field screening results for organic vapor (using PID)
- Other indications of contamination (e.g., discoloration)

Based upon field screening results, soil samples that potentially contained contaminants were collected for laboratory analysis. If field screening techniques did not indicate the presence of contamination, a soil sample was collected from near the water table for laboratory analysis.

Between each borehole, all soil sampling equipment (hand auger, trowel, etc.) and field screening equipment (metal bowls, spoons, sheen pan) were decontaminated using a three-part wash/rinse process consisting of a Liquinox™ wash, a tap water rinse and a de-ionized water rinse. Down hole equipment, such as augers, were pressure-washed between each boring.

Soil borings MW-8 through MW-12 were located and completed as planned, with the exception of MW-9. At MW-9, during hand augering at approximately 4 feet bgs, a void was encountered that appeared to be the back side of concrete emplaced for shoreline erosion control. A field decision was made to relocate this boring approximately 7 feet northward. The soil boring, and subsequent monitoring well installation, was completed without incident.

A minimum of one soil sample from each soil boring was submitted for laboratory analysis; analytes are listed in Table 5. Boring logs, showing sampled intervals and PID field screening results, are presented in Appendix A. Soil sample depths and elevations are listed in Table 2. Total petroleum hydrocarbons (TPH) in the gasoline range and diesel range were analyzed only if the hydrocarbon identification (HCID) analysis indicated constituent concentrations within the respective range.

2.2.3 Monitoring Well Installation

All five soil borings (MW-8 to MW-12) were completed as groundwater monitoring wells (Figure 7). After each borehole was advanced to 21.5 to 36.5 feet bgs, a determination was made regarding the interval to set the well. The screen intervals for each well straddle the top of the water table, such that the top is always within a portion of the screen, regardless of tidal or seasonal influence. Generally, the determined well screen interval consisted of fine sand at from 10 to 20 feet bgs. Each well was backfilled with Bentonite so as to set the bottom of the casing at 20 feet bgs.

Each monitoring well was constructed of factory sealed 2-inch diameter PVC pipe. Each well includes 10 feet of 0.010-inch slotted screen surrounded by the pre-pack 20/40 silica sand for a filter pack. The remaining annular space in the borehole around the pre-pack well screen was backfilled with 2/12 sand, up to approximately 8 feet bgs (or two feet above the screen interval). The interval from 2 to 8 feet bgs was backfilled with hydrated bentonite powder. Each monitoring well was completed with a watertight cap and flush-grade well vault, which was secured with concrete from ground surface to 2 feet bgs.

2.2.4 Monitoring Well Development

Following installation, each of the five new monitoring wells was developed by pumping water and any fine sediment using a positive displacement, down hole, electric pump. Turbidity rapidly cleaned up in all five new wells due to the presence of pre-pack sand.

In addition, the five existing wells that could be located (MW-1 thru MW-5) were redeveloped, except for MW-2 which was found to be unsuitable for redevelopment. MW-2 was observed to have soil completely filling the screen interval of the casing. At MW-4, chunks of foam needed to be removed before redevelopment could begin. MW-5 was very dirty in appearance and appeared to have been allowing surface run-off to enter the well due to the well cap configuration. To some extent, it appeared that all of the existing wells may have been allowing surface water to enter the wells. This was likely due to the vertical cuts in the PVC casing that had been placed at the time of well construction years ago. The vertical cuts were too long and were not covered by the PVC slip cap, as is usually the case. At each of the existing wells, a field alteration was performed that will prevent surface water from entering the wells in the future. The top of the PVC casing was trimmed to form a straight, right angle, cut and a “J-plug” gasket-type compression cap was installed.

2.2.5 Well Surveying and Groundwater Sampling

The locations and top-of-casing elevations of the five new monitoring wells (MW-8 thru MW-12) and five existing monitoring wells (MW-1 thru MW-5) were surveyed by Bush, Roed & Hitchings, Inc. (Table 6). Groundwater elevations at the DMC property are shown in Figure 8. During low-water tide conditions, the gradient at most of the site is to the northeast, toward the adjacent LDW. There appears to be a tidal reversal area in the vicinity of MW-4, as shown in Figure 7.

Groundwater was sampled during low-tide periods, on July 16-17, 2008. The groundwater sampling event took place during and following a significant low tide. During the sampling event, groundwater samples were collected from each of the five newly installed monitoring wells and four existing monitoring wells.[1] Each of the monitoring wells was purged using standard low-flow procedures. Groundwater was purged and sampled using a peristaltic pump with disposable silicon and polyethylene tubing. A short piece of silicon tubing was necessary where tubing passed over the pump head rollers.

Groundwater samples were collected and submitted for laboratory analysis; analytes are listed in Table 5.

2.2.6 Bank Soil Sampling

The bank areas along the DMC property were examined to identify exposed areas that could erode and enter the inlet. Field observations determined that nearly the entire bank is protected by bulkheads or concrete in various forms. Concrete was found poured over the bank surface, and as stacked slab fragments. No suitable sampling locations were identified; therefore no bank soil samples were collected.[2]

2.2.7 Seep Sampling

One seep was confirmed and sampled, near the head of the inlet (SP-1, Figure 7). The seep sample was collected by using a modified polyethylene bottle as a temporary weir which allowed any entrained soil to settle out and to supply sufficient water depth to collect the seep flow. A peristaltic pump with disposable tubing was used to transfer the seep water from the “weir” into the sample bottles.

[1] Only four of the existing monitoring wells were sampled; well MW-2 was not suitable for development and sampling as described in Section 2.2.4 above.
[2] Historically, the site was used as a concrete batch mix plant. As such, “off-spec” or surplus material may have been used to cap the shoreline bank as an erosion control measure.

Field measurements indicate that the conductivity of this seep sample is very low (239 µS/cm), compared to the seeps that were sampled in 2007 at the Trotsky property (6,350 to 8,530 µS/cm). It is possible that the seep is the result of a broken water pipe in the vicinity or may be related to the West Seattle reservoir overflow that discharges to the head of the Trotsky inlet.

The seep water sample was collected and submitted for laboratory analysis; analytes are listed in Table 5.

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3.0 Investigation Results

This section presents investigation results for site characterization activities performed at EAA-2 in 2007 and 2008. Sections 3.1 presents results of soil, groundwater, sediment, seep, and outfall sampling conducted during April through May 2007 at the Trotsky property. Section 3.2 presents results of soil, groundwater, and seep sampling conducted during June through July 2008 at the DMC property.

3.1 Trotsky Property

The following discussion of results pertains to the geology and hydrogeology of the Trotsky Property, and the analytical results for soil, groundwater, sediment, seep, outfall solids and outfall water samples collected at this property in April through May 2007.

3.1.1 Geology and Hydrogeology

Subsurface soil samples were collected during drilling for installation of the three groundwater monitoring wells, MW-1, MW-2, and MW-3. Figure 9 presents a lithologic cross-section that extends from well MW-1 at the Trotsky property, across the inlet to wells MW-10 and MW-12 at the DMC property. Based on field observations, the soil boring descriptions (Appendix A), and the results of the groundwater gradient determination described in Section 2.1.4, the following observations were made regarding the geology and hydrogeology of the Trotsky upland property.

Material observed in the soil boring samples appeared to be fill and native river flood plain deposits. The upper 15 to 20 feet bgs in each boring was variable in type, color, and thickness. Generally, this upper interval consisted of silty sands and sandy silts; gray, brown and black in color. In MW-2, the top 10 feet consisted of gravel with wood debris and is probably a fill material. The interval from 15 to 20 bgs appears to be a transition zone from silty sand to a primarily fine sand unit.

During soil boring activities, the water table typically was encountered at 7.5 to 12.5 feet bgs. As a result of this observation and along with historic water level information from the existing onsite wells, the three monitoring wells were screened from 24 feet to 4 feet bgs in order to capture tidally-influenced groundwater fluctuations.

Based on the groundwater gradient measurements described in Section 2.1.4, groundwater is expected to flow toward and discharge to the LDW and Trotsky inlet for areas immediately adjacent to the shoreline during low-water conditions (Figure 4). During high-water conditions, groundwater appears to move away from the waterway, to the south and southwest, as shown in Figure 5.

3.1.2 Soil Analytical Results

Laboratory analysis results for soil samples are presented in Appendix B. A summary of chemicals detected in soil samples is presented in Table 7. This table includes those chemical parameters that were detected at least once in any onsite soil sample. For screening purposes, the sample results are compared to Model Toxics Control Act (MTCA) Method A and B Soil Cleanup Levels, as well as draft soil-to-sediment screening levels (SAIC 2006).[3] Soil-to-sediment screening levels apply to the transport of contaminants from soil to groundwater, which subsequently may be discharged directly to the LDW or which may enter a storm drain system and be discharged to the LDW via an outfall. Because the soil-to-sediment screening levels for metals are associated with a large degree of uncertainty due to underlying variability in the partitioning coefficients used in the calculations (SAIC 2006), soil metals concentrations were also compared directly to their corresponding Sediment Quality Standard (SQS) values. This comparison would be applicable to the transport of contaminated soil directly to the LDW via erosion.

Chemical concentrations that exceed these levels are highlighted in Table 7. A summary of chemicals with exceedances of the MTCA soil cleanup levels and/or draft soil-to-sediment screening levels is provided in Table 8. In general, chemical concentrations were highest in boring MW-1 at 5 feet bgs. This boring is located nearest the Industrial Container Services drum washing operation. Relatively high chemical concentrations were also observed in boring MW-2, mainly at 15 feet bgs. MW-3, located on the eastern edge of the Trotsky property, was relatively clean.

The following text briefly summarizes the major soil analytical results, listed by chemical group.

Metals

Chromium, lead, and mercury exceeded the MTCA Method A soil cleanup levels, while arsenic exceeded the MTCA Method B soil cleanup level. In addition, copper, lead, mercury, and zinc exceeded the draft soil-to-sediment screening levels, and lead and mercury exceeded the SQS.

- Mercury: Concentrations in soil ranged from 0.019 to 2.01 mg/kg, exceeding the soil-to-sediment screening level in four of six samples, and the MTCA Method A cleanup level in one sample. The highest concentration of mercury was observed at MW-1 (5 feet and 12.5 feet bgs), however concentrations at MW-2 (10 feet and 15 feet bgs) also exceeded the screening levels.
- Arsenic: Concentrations in soil ranged from 1.14 to 11.7 mg/kg, exceeding the MTCA Method B soil cleanup level in all six soil samples.
- Lead: Concentrations in soil ranged from 1.82 to 836 mg/kg, exceeding the MTCA Method A soil cleanup level in one of six samples and the draft soil-to-sediment screening level in three of six samples. The highest concentrations of lead were observed

[3] These draft screening levels were developed to assist in the identification of upland properties which may pose a potential risk of recontamination of sediments at Slip 4. The screening levels incorporate a number of conservative assumptions, including the absence of contaminant dilution and ample time for contaminant concentrations in soil, sediment, and groundwater to achieve equilibrium. In addition, the screening levels do not address issues of contaminant mass flux from upland to sediments nor do they address the area or volume of sediment that might be affected by upland contaminants. Because of these assumptions and uncertainties, these screening levels are most appropriately used for one-sided comparisons. If contaminant concentrations in upland soil or groundwater are below these screening levels, then it is unlikely that they will lead to exceedance of marine Sediment Management Standards. However, upland concentrations that exceed these screening levels *may or may not* pose a threat to sediments; additional site-specific information must be considered in order to make such an assessment.

at MW-1 (5 feet bgs). Concentrations at MW-2 (7.5 feet and 15 feet bgs) exceeded the draft soil-to-sediment screening level but not the MTCA cleanup level.

- Copper: Concentrations in soil ranged from 13.1 to 284 mg/kg, and exceeded the draft soil-to-sediment screening level in two samples: MW-1 (5 feet bgs) and MW-2 (15 feet bgs).
- Zinc: Concentrations in soil ranged from 18.1 to 220 mg/kg, and exceeded the soil-to-sediment screening level in three samples: MW-1 (5 feet bgs) and MW-2 (7.5 and 15 feet bgs).
- Chromium: Concentrations in soil ranged from 8.7 to 56.6 mg/kg, and exceeded the MTCA Method A soil cleanup level at three locations: MW-1 (5 feet bgs) and MW-2 (7.5 and 15 feet bgs).

Polychlorinated Biphenyls (PCBs)

PCBs were detected at concentrations above MTCA Method B cleanup levels and soil-to-sediment screening levels in all five samples collected from borings MW-1 and MW-2. In particular, MW-1 (at 5 feet bgs) contained total PCBs at 76.5 mg/kg, which significantly exceeds the MTCA Method B cleanup level (0.5 mg/kg) and the soil-to-sediment screening level (0.065 mg/kg).

Pesticides

Lindane was detected in one sample (MW-2, 15 feet bgs) at a concentration at 0.013 mg/kg, slightly above the MTCA Method A cleanup level of 0.01 mg/kg. DDD, DDE, DDT, and chlordane were detected in several samples collected from borings MW-1 and MW-2, but at concentrations below the MTCA Method B cleanup levels.

Semivolatile Organic Compounds (SVOCs)

Benzo(a)pyrene (MW-2 at 15 feet bgs) and total carcinogenic polycyclic aromatic hydrocarbons (cPAH; MW-1 at 5 feet bgs, MW-2 at 7.5 and 15 feet bgs) were detected at concentrations above MTCA Method A and B soil cleanup levels. In addition, a wide variety of SVOCs were detected in soil samples at concentrations above draft soil-to-sediment screening levels, including chlorobenzenes, polycyclic aromatic hydrocarbons (PAHs), and phthalates, as described below.

- Chlorobenzenes: 1,2,4-Trichlorobenzene (one sample), 1,2-dichlorobenzene (two samples), and 1,4-dichlorobenzene (two samples) were detected at concentrations significantly above the draft soil-to-sediment screening levels. In particular, 1,2-dichlorobenzene (<0.01 to 0.98 mg/kg) and 1,4-dichlorobenzene (<0.01 to 2.4 mg/kg) were detected in MW-1 at concentrations exceeding the screening levels by more than two orders of magnitude.
- PAHs: Seventeen PAH compounds were detected in soil samples collected at the Trotsky property. Benzo(a)pyrene (0.28 mg/kg) exceeded the MTCA Method A and B soil cleanup levels. Thirteen PAHs were detected at concentrations above draft soil-to-sediment screening levels. Ten PAHs exceeded screening levels in both MW-2 (15 feet

bgs) and MW-1 (5 feet bgs). The highest exceedances were observed for fluorene, acenaphthene, phenanthrene, and dibenzofuran in MW-1 (5 feet bgs).

- Phthalates: Bis(2-ethylhexyl)phthalate (BEHP; four samples) and butylbenzylphthalate (BBP; one sample) were detected in soil samples collected from MW-1 and MW-2 at concentrations slightly above the draft soil-to-sediment screening level.
- Other SVOCs: Pentachlorophenol was detected in one of six samples (MW-2, 15 feet bgs) at a concentration of 0.37 mg/kg, above the draft soil-to-sediment screening level of 0.037 mg/kg.

Petroleum Hydrocarbons

TPHs were detected at concentrations above MTCA Method A soil cleanup levels in three of five soil samples collected from MW-1 and MW-2. The highest concentrations were observed in MW-1 (5 feet bgs).

3.1.3 Groundwater Analytical Results

Laboratory analysis results for groundwater samples are presented in Appendix B. A summary of chemicals detected in groundwater samples is presented in Table 9. This table includes those chemical parameters that were detected at least once in any groundwater sample. For screening purposes, the sample results are compared to MTCA Method A and B groundwater cleanup levels, as well as draft groundwater-to-sediment screening levels (SAIC 2006).[4]

Chemical concentrations that exceed these levels are highlighted in Table 9. A summary of chemicals with exceedances of the MTCA cleanup levels and/or groundwater-to-sediment screening levels is provided in Table 10. NAPL was not encountered during the sampling of any of the monitoring wells.

In general, chemical concentrations were highest in well MW-1. This well is located nearest the Industrial Container Services drum washing operation, and is the same location as the highest soil analytical results described in Section 3.1.2 above. The following text briefly summarizes the major groundwater analytical results, listed by chemical group.

Metals

Total arsenic, chromium, and lead exceeded the MTCA Method A groundwater cleanup levels; in addition, lead, mercury, and zinc exceeded the groundwater-to-sediment screening levels.

[4] These draft screening levels were developed to assist in the identification of upland properties which may pose a potential risk of recontamination of sediments at Slip 4. The screening levels incorporate a number of conservative assumptions, including the absence of contaminant dilution and ample time for contaminant concentrations in soil, sediment, and groundwater to achieve equilibrium. In addition, the screening levels do not address issues of contaminant mass flux from upland to sediments nor do they address the area or volume of sediment that might be affected by upland contaminants. Because of these assumptions and uncertainties, these screening levels are most appropriately used for one-sided comparisons. If contaminant concentrations in upland soil or groundwater are below these screening levels, then it is unlikely that they will lead to exceedance of marine Sediment Management Standards. However, upland concentrations that exceed these screening levels *may or may not* pose a threat to sediments; additional site-specific information must be considered in order to make such an assessment.

- Arsenic: Concentrations of total arsenic in groundwater ranged from 1.17 to 30 ug/L, exceeding the MTCA Method B groundwater cleanup level in all five wells sampled and the Method A groundwater cleanup level in four wells.
- Mercury: Concentrations of total mercury in groundwater ranged from 0.03 to 0.38 ug/L, exceeding the groundwater-to-sediment screening level in all five monitoring wells.
- Lead: Concentrations of total lead in groundwater ranged from 0.065 to 77.5 ug/L, exceeding the MTCA Method A groundwater cleanup level and groundwater-to-sediment screening level in three of the five monitoring wells by factors of 5.2 and 6.0, respectively. The highest concentrations of lead were observed in wells MW-1 and B-1.
- Chromium: Concentrations of total chromium in groundwater ranged from 0.75 to 75.1 ug/L, slightly exceeding the MTCA Method A and B groundwater cleanup levels in three of the five monitoring wells.
- Zinc: Concentrations of total zinc in groundwater ranged from 13.8 to 94.6 ug/L, slightly exceeding the groundwater-to-sediment screening level in monitoring well B-1.

PCBs

PCBs were detected in groundwater at concentrations above MTCA Method A and B groundwater cleanup levels in four of the five wells (MW-1, MW-2, B-1, and B-2) and above groundwater-to-sediment screening levels in three wells (MW-1, MW-2, and B-2). Total PCB concentrations ranged from <0.02 to 4.54 ug/L. The concentration of total PCBs in MW-1 exceeded the MTCA B groundwater cleanup level by more than a factor of 100.

Pesticides

Aldrin was detected in well B-2 at 0.02 ug/L, which exceeded the MTCA Method B cleanup level. No other pesticides exceeded MTCA cleanup level or screening levels in groundwater at the Trotsky property.

SVOCs

A wide variety of SVOCs were detected in groundwater samples. Total cPAH exceeded the MTCA Method B groundwater cleanup level in four of the five samples, and exceeded the MTCA Method A cleanup level in all but MW-2. In addition, 1,4-dichlorobenzene (B-2 and MW-1) and 2-methylnaphthalene (MW-1) exceeded MTCA Method B groundwater cleanup levels, and benzo(a)pyrene (B-2, MW-1, and MW-2) exceeded both MTCA Method A and B groundwater cleanup levels. Hexachlorobenzene (B-1 and MW-1) and pentachlorophenol (MW-1) also exceeded the MTCA Method B groundwater cleanup level

Many SVOCs exceeded the draft groundwater-to-sediment screening levels, as described below.

- PAHs: Seventeen PAH compounds were detected in groundwater samples collected at the Trotsky property, eight of them at concentrations above groundwater-to-sediment screening levels. The highest exceedances were observed for benzo(a)anthracene, chrysene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(b)fluoranthene, all of which had maximum exceedance factors greater than 50.

- Phthalates: Six phthalate compounds were detected in groundwater samples collected at the Trotsky property; BEHP (0.84 ug/L) slightly exceeded the groundwater-to-sediment screening level in well MW-2. Although BEHP was not detected in MW-1, the reporting limit was elevated in this sample (20 ug/L) and therefore the result is inconclusive.
- Other SVOCs: 2,4-Dimethylphenol, 2-methylphenol, 4-methylphenol, pentachlorophenol, and phenol were detected in groundwater samples; 2,4-dimethylphenol, 2-methylphenol, N-nitrosodiphenylamine, and pentachlorophenol exceeded groundwater-to-sediment screening levels. In addition, hexachlorobenzene in wells MW-1 and B-2 exceeded both the MTCA Method B groundwater cleanup level and groundwater-to-sediment screening level.

TPH

Gasoline, diesel, and residual range organics exceeded the MTCA Method A groundwater cleanup levels in MW-1.

3.1.4 Sediment Analytical Results

Laboratory analysis results for sediment samples collected in the Trotsky inlet are presented in Appendix B. A summary of chemicals detected in the sediment samples is presented in Table 11. This table includes only those chemical parameters that were detected at least once in any sediment sample. For screening purposes, the sediment results are compared to the Washington SQS and Cleanup Screening Level (CSL) values. For most organics, the SQS and CSL values are presented as organic-carbon normalized concentrations. Organic-carbon normalized sampling results are presented in Table 12. Organic carbon normalization is not considered to be appropriate for samples with TOC concentrations less than or equal to 0.5 percent or greater than or equal to 4.0 percent; in these cases, the dry weight chemical concentrations were compared to the Lowest Apparent Effects Threshold (LAET) value (corresponding to the SQS) and the second lowest AET (2LAET; corresponding to the CSL). Samples SED-1 and SED-2 contained total organic carbon (TOC) concentrations greater than 4.0 percent, and therefore chemical concentrations in these samples were compared to the LAET and 2LAET values, instead of the SQS or CSL.

Chemical concentrations that exceed these levels are highlighted in Tables 11 and 12. In general, the highest chemical concentrations were observed in samples SED-1 and SED-2. A summary of chemicals with exceedances is provided in Table 13. The following text briefly summarizes the major sediment analytical results, listed by major chemical group.

Metals

Cadmium, chromium, copper, lead, mercury, silver, and zinc were detected above the SQS and CSL values in samples SED-1 and SED-2. The highest chemical concentrations were detected in sample SED-1, and the highest exceedances were observed for mercury (247 mg/kg dry weight), lead (10,400 mg/kg), and zinc (4,580 mg/kg).

PCBs

Very high levels of PCBs were detected in SED-1 (2,930 mg/kg dry weight [DW] total PCBs) and SED-2 (231 mg/kg DW total PCBs), however PCBs exceeded the SQS/CSL or LAET/2LAET values in every sediment sample. The PCB concentration in SED-1 corresponds to an exceedance factor of 22,500, and consisted of about 50 percent Aroclor 1254, 30 percent Aroclor 1242, and 20 percent Aroclor 1260.

Pesticides

DDT compounds were detected in all sediment samples at concentrations ranging from 0.07 to 77 mg/kg DW (total DDT compounds). No SQS/CSL values are available for pesticides.

SVOCs

A variety of SVOCs were detected in sediment samples, including chlorobenzenes, PAHs, phthalates, and phenols. The highest concentrations were found in SED-1 and SED-2. The highest exceedances of screening criteria were for: 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, BEHP, BBP, and pentachlorophenol.

3.1.5 Seep Analytical Results

Two seep samples were collected from the south side of the Trotsky inlet during sampling in 2007 (SEEP-1 and SEEP-2 in Figure 3); one seep sample was collected from the north side of the inlet in 2008 (SP-1 in Figure 7). Laboratory analysis results for the seep samples are presented in Appendix B. A summary of chemicals detected in these samples is presented in Tables 9 and 18. For screening purposes, the seep sample results were compared to MTCA Method A and B groundwater cleanup levels and the groundwater-to-sediment screening levels (SAIC 2006). Chemical values that exceed these levels are highlighted and/or shown in bold text in Tables 9 and 18. A summary of these exceedances for each chemical parameter is provided in Table 14.

No chemicals were detected above MTCA cleanup levels or groundwater-to-sediment screening levels in SP-1 (collected from the north side of the inlet).

Metals

Arsenic was detected in SEEP-1 and SEEP-2 at 6.97 to 7.5 ug/L, respectively, exceeding both the MTCA Method A and Method B groundwater cleanup levels. Mercury was detected in SEEP-1 at 0.04 ug/L, exceeding the groundwater-to-sediment screening level by a factor of 270.

PCBs

PCBs were detected in SEEP-1 and SEEP-2 (on the south side of the inlet). The concentration of PCBs in SEEP-1 was 0.5 ug/L, which exceeds both the MTCA Method A and B groundwater cleanup levels.

Pesticides

DDT (SEEP-1 and SEEP-2) and Lindane (SEEP-2 only) were detected at concentrations below MTCA cleanup levels.

SVOCs

SVOCs detected in seep samples included several PAHs, phthalates, 1,4-dichlorobenzene, and pentachlorophenol. No SVOC exceedances were observed.

3.1.6 Second Avenue S. Outfall Analytical Results

During site characterization activities at the Trotsky property in 2007, one sample of water and one solids sample were collected from the Second Avenue S. outfall pipe, which discharges to the Trotsky inlet as shown in Figure 3. Outfall sampling exceedances are listed in Table 15. Total arsenic was detected in the water sample at a concentration of 8.77 ug/L, which exceeds the MTCA Method A and B groundwater cleanup levels. The outfall pipe solids sample contained BEHP at 2.2 mg/kg dry weight (DW; 117 mg/kg organic carbon [OC]) and BBP at 0.88 mg/kg DW (47 mg/kg OC), which exceeded the SQS. In addition, PCBs were detected in the outfall solids sample at 3.6 mg/kg DW (191 mg/kg OC), which also exceeded the SQS.

Other chemicals detected in the outfall water sample, but not exceeding MTCA groundwater cleanup levels or groundwater-to-sediment screening levels (Table 8) include: cadmium, chromium, copper, lead, silver, zinc, DDT compounds, Aldrin, acenaphthylene, BBP, diethylphthalate, dimethylphthalate, di-n-butylphthalate, fluoranthene, phenanthrene, phenol, and pyrene. In the outfall solids sample (Tables 11 and 12), the following chemicals were detected but did not exceed the SQS/CSL: arsenic, cadmium, chromium, copper, lead, mercury, silver, zinc, DDT compounds, Lindane, 2-methylnaphthalene, various PAHs, dimethylphthalate, and petroleum hydrocarbons (diesel and residual range).

3.2 Douglas Management Company Property

The following discussion of results pertains to the geology and hydrogeology of the DMC Property, and the analytical results for soil and groundwater samples collected at this property in June-July 2008.

3.2.1 Geology and Hydrogeology

Based on historical research and field activity observation, it is probable that most of the soil observed in the cuttings and cores is artificial fill placed at the site when an old turning basin was filled prior to 1969 (Dames & Moore 1991). Therefore the following descriptions of material encountered during hollow stem auguring activities are generalized and typically are discontinuous between borings. From top to bottom, these materials are:

- An upper interval of fill identified throughout the site. This includes road base material below the large asphalt portion of the site. This material is rocky or gravelly, with some sand and silt, and is up to 1 foot thick.

- A layer of silty, fine- to coarse-grained sand and gravel. It has a maximum thickness of up to 25 feet, but more typically is 12 feet or less. This interval consists of fill material.
- A layer of sandy gravel with silt, up to 12 feet thick (only seen in MW-2, MW-9, MW-10, and MW-12). This interval consists of fill material.
- A layer of silt and sandy silt. This interval also includes some silty sand and sand, and is assumed to consist of fill material. The total interval has a thickness of 7 to 15 feet.
- In the two deeper borings, a lower layer of silt and silty fine- to medium-grained sand was observed. This interval has a thickness of at least 11 feet (identified only at MW-8, MW-12, and Dames & Moore soil boring SB-5).

Figure 9 presents a lithologic cross-section that extends from well MW-1 at the Trotsky property, across the inlet to wells MW-10 and MW-12 at the DMC property.

During soil boring activities, the water table typically was located in the fourth interval listed above. As a result, the five wells were screened either in the sand or in the sandier portions of that interval. The well screen placement is consistent with existing onsite wells, and strategically placed considering historical water level information such that the top of the water table remains within the screened interval.

Based on historical data (Dames & Moore 1991) and one SAIC groundwater monitoring round, groundwater is expected to flow toward and discharge to the LDW and inlet for areas immediately adjacent to the shoreline. Interior portions of the site appear to display a pressure ridge between tidal cycles where water flows both toward and away from the waterway. Groundwater elevations are shown in Figure 8.

3.2.2 Soil Analytical Results

Laboratory analysis results for soil samples are presented in Appendix B. A summary of chemicals detected in the soil samples is presented in Table 16. This table includes only those chemical parameters that were detected at least once in any onsite soil sample. For screening purposes, the sample results are compared to MTCA Method A and B Soil Cleanup Levels, as well as soil-to-sediment screening levels (SAIC 2006). Chemical concentrations that exceed these levels are highlighted in Table 16. A summary of chemicals with exceedances is provided in Table 17. The following text briefly summarizes the major soil analytical results, listed by major chemical group.

Metals

As shown in Tables 16 and 17, arsenic exceeded the MTCA Method B soil cleanup level in all six samples, and chromium exceeded the Method A soil cleanup level in three samples. In addition, copper, lead, mercury, and zinc exceeded draft soil-to-sediment screening levels in one or more samples. Concentrations of metals were highest in MW-8 (30 feet bgs), except mercury which was highest in MW-10 (20 feet bgs).

- Arsenic: Concentrations in soil ranged from 3.72 to 19.7 mg/kg; all samples exceeded the MTCA Method B soil cleanup level.

- Chromium: Concentrations in soil ranged from 12.1 to 69.5 mg/kg, with exceedances of the MTCA Method A soil cleanup level in MW-8, MW-9, and MW-10.
- Mercury: All sample results exceeded the soil-to-sediment screening level; concentrations ranged from 0.068 to 0.635 mg/kg, with the highest detection in MW-10.
- Zinc: All sample results exceeded the soil-to-sediment screening level for zinc, with concentrations ranging from 40.4 to 835 mg/kg. The highest concentration was detected in MW-08 at 30 feet bgs.
- Copper: One sample (MW-08) slightly exceeded the soil-to-sediment screening level.

PCBs

PCBs exceeded the MTCA Method B soil cleanup level in two samples (MW-10 at 20 feet bgs and MW-12 at 25 feet bgs). PCB concentrations exceeded the draft soil-to-sediment screening level in five of the six samples. Total PCBs were detected at 27 mg/kg in MW-10 (20 feet bgs); these consisted primarily of Aroclor 1248 and Aroclor 1254. PCBs were detected at 1.7 mg/kg in MW-12 (25 feet bgs), with concentrations in the other borings ranging from 0.059 to 0.29 mg/kg.

Pesticides

Chlorinated pesticides (DDT compounds) were detected in all soil samples, at concentrations below MTCA soil cleanup levels. The maximum detected chlorinated pesticide concentration was for 2,4'-DDD with a concentration of 1.3 mg/kg (MW-10).

SVOCs

A variety of SVOCs were detected in soil samples, including PAHs and phthalates. None exceeded the MTCA soil cleanup levels. Three chemicals were detected at concentrations above soil-to-sediment screening levels (BEHP, naphthalene, and 2-methylnaphthalene). These exceedances occurred in boring MW-12.

Petroleum Hydrocarbons

Gasoline-range petroleum hydrocarbons exceeded the MTCA Method A soil cleanup level in one sample from MW-12 (100 mg/kg). Diesel and heavy oil range hydrocarbons were detected at concentrations below MTCA soil cleanup levels.

Volatile Organic Compounds (VOCs)

VOCs were detected in soil samples from all five borings. Benzene (<0.055 to 0.071 mg/kg) was detected in borings MW-10 (20 feet bgs) and MW-12 (15 feet bgs) at concentrations slightly exceeding the MTCA Method A soil cleanup level (0.052 and 0.071 mg/kg, respectively). In addition, naphthalene was detected at 1.5 mg/kg, above the soil-to-sediment screening level, in MW-12 (15 feet bgs).

3.2.3 Groundwater Analytical Results

Laboratory analysis results for groundwater samples are presented in Appendix B. A summary of chemicals detected in groundwater samples is presented in Table 18. This table includes only those chemical parameters that were detected at least once in any groundwater samples. For screening purposes, the sample results were compared to MTCA Method A and B groundwater cleanup levels and groundwater-to-sediment screening levels (SAIC 2006).

Chemical concentrations that exceed these levels are highlighted in Table 18. A summary of chemicals with exceedances of the MTCA cleanup levels and/or groundwater-to-sediment screening levels is provided in Table 19. NAPL was not encountered during the sampling of any of the monitoring wells.

Arsenic, PCBs, benzene, and TPH-diesel range organics exceeded the MTCA Method A and/or B groundwater cleanup levels in one or more samples. None of the chemicals detected in groundwater at the DMC property exceeded the groundwater-to-sediment screening levels. The following text briefly summarizes the major groundwater analytical results, listed by chemical group.

Metals

As shown in Table 18, arsenic is the only metal that exceeded MTCA groundwater cleanup levels. One sample (MW-9), at 5.4 µg/L, slightly exceeded the Method A cleanup level, and exceeded the Method B cleanup level by a factor of 54. It should be noted, however, that the detection limit of 5 ug/L for the remaining samples is significantly higher than the MTCA Method B cleanup level (0.058 ug/L).

PCBs

PCBs were detected at low levels in groundwater from MW-9, MW-10, and MW-12, and ranged in concentration from 0.034 to 0.11 ug/L. The highest detection (in MW-10) exceeds the MTCA Method A and B groundwater cleanup levels.

Pesticides

Low levels of DDT, dieldrin, and heptachlor were detected in groundwater samples; however none of the concentrations exceeded MTCA groundwater cleanup levels.

SVOCs

Several PAHs, phenol, and isophorone were detected in groundwater samples; however none of the detected concentrations exceeded MTCA groundwater cleanup levels or groundwater-to-sediment screening levels.

TPH

Petroleum hydrocarbons were detected in wells MW-4, MW-5, and MW-12. Concentrations of diesel-range petroleum hydrocarbons (680 to 750 ug/L) exceeded the MTCA Method A groundwater cleanup level (500 ug/L) in all three of these wells.

VOCs

Eleven volatile organic compounds were detected in groundwater samples, mainly in wells MW-3, MW-4, and MW-12, with detections of individual compounds in wells MW-9 (benzene), MW-10 (benzene), and MW-11 (chloroform). Benzene is the only volatile organic compound (VOC) that was detected at concentrations above MTCA groundwater cleanup levels; it was detected at 59, 89, and 100 ug/L in MW-12, MW-3, and MW-4, respectively.

4.0 Summary and Conclusions

Table 20 lists the chemicals detected at concentrations above cleanup or screening levels in all media sampled. Figures 10 and 11 present soil sampling results for chemicals detected at concentrations above MTCA Method A or B soil cleanup levels or draft soil-to-sediment screening levels, respectively. Figures 12 and 13 present groundwater sampling results for chemicals detected at concentrations above MTCA Method A or B groundwater cleanup levels or draft groundwater-to-sediment screening levels, respectively. These results are discussed by major chemical group below.

4.1 Metals

Metals were identified in sediment in the Trotsky inlet; of particular concern are mercury, lead, and zinc. The highest concentrations of these chemicals were detected in sample SED-1, located near the head of the inlet.

- Mercury was detected at 247 mg/kg in SED-1. Potential sources of mercury to sediments include soil and groundwater from the Trotsky property, where mercury was detected at concentrations significantly above screening levels in soil samples from Trotsky borings MW-1 (2.01 mg/kg) and MW-2 (0.318 mg/kg), in groundwater samples from wells B-1 (0.38 ug/L), MW-1 (0.28 ug/L), and MW-2 (0.12 ug/L), and in seep sample SEEP-1[5] (0.04 ug/L). In addition, mercury was detected at a concentration significantly above the screening level in soil at the DMC property, in boring MW-10 (.635 mg/kg), which is the nearest DMC boring to sediment sample SED-1. Mercury was not, however, detected in DMC groundwater at levels of concern.
- Similarly, lead was detected at 10,400 mg/kg in SED-1 and 4,280 mg/kg in SED-2; both samples are located near the main industrial area at the Trotsky property. Lead was also detected at levels of concern in nearby soil (836 mg/kg at boring MW-1) and groundwater (36.5 ug/L in well MW-1) at the Trotsky property. Lead was also detected at a fairly high concentration (562 mg/kg) at the DMC property, in boring MW-8 located near the mouth of the Trotsky inlet.
- Zinc was detected in sediment at 4,580 mg/kg (SED-1) and 2,140 mg/kg (SED-2). Results at the adjacent Trotsky and DMC properties showed a similar pattern to lead: zinc in soil at the Trotsky property was detected at 220 mg/kg in boring MW-1 and 25.1 ug/L in well MW-1, while zinc in soil at DMC was detected at 835 mg/kg in MW-8.
- While arsenic was not detected above screening levels in sediment, it was present at concentrations significantly above the MTCA Method B cleanup level in soil and groundwater at the Trotsky property, in the water sample collected from the Second Avenue S. outfall, in seeps, and in soil and groundwater at the DMC property. Arsenic exceeded the MTCA Method A groundwater cleanup level in one groundwater well (MW-1), both seeps, and the outfall water sample at the Trotsky property, and in one well at the DMC property (MW-9).

[5] It should be noted that the detection limit for mercury in SEEP-2 was 0.2 ug/L, which is significantly higher than the groundwater-to-sediment screening level.

Arsenic, chromium, copper, lead, mercury, and zinc are metals typically found in ship maintenance activities, which historically took place in this vicinity. Arsenic detections in soil are all below MTCA Method B soil cleanup levels.

4.2 PCBs

Figures 14 and 15 present PCB concentrations in soil and groundwater samples, respectively. PCBs were detected at very high concentrations in sediments in the Trotsky inlet (2,930 mg/kg DW in SED-1, 231 mg/kg DW in SED-2), with a maximum exceedance factor of 22,500. All sediment samples exceeded the SQS and CSL value for total PCBs. Potential sources of PCBs include soil and groundwater at the Trotsky property, the Second Avenue S. storm drain line, and soil and groundwater at the DMC property. The highest upland concentrations of PCBs were detected in soil samples from Trotsky borings MW-1 (76.5 mg/kg DW) and MW-2 (11.9 mg/kg DW); groundwater also contained relatively high concentrations of PCBs (25.1 ug/L at MW-1). MW-1 is the Trotsky boring located closest to sediment sample SED-1. Solids from the Second Avenue S. outfall contained PCBs at 3.6 mg/kg DW (191 mg/kg OC).

PCBs were also present at levels of concern in soil samples collected at the DMC property, with the highest concentration of 27 mg/kg DW found at boring MW-10 (20 feet bgs). MW-10 is the DMC boring located closest to sediment sample SED-1. Groundwater from well MW-10 and MW-12 exceeded the MTCA Method B groundwater cleanup level for PCBs.

4.3 PAHs

A wide variety of PAHs were detected in Trotsky inlet sediments at concentrations above the SQS. Many of these were also detected in soil and groundwater samples collected at the Trotsky property. The highest concentrations of PAHs in Trotsky soil samples were detected in boring MW-1, nearest to sediment sample SED-1, however numerous screening level exceedances were also observed in soil samples from boring MW-2. The highest groundwater concentrations of PAHs were observed at Trotsky wells MW-1 and B-2.

Well MW-12 at the DMC property contained 2-methylnaphthalene at 2.2 ug/L; this is likely related to petroleum hydrocarbon releases from underground tanks formerly at this location.

4.4 Phthalates

BEHP, BBP, and dimethylphthalate were detected at concentrations above the SQS/CSL values in Trotsky inlet sediments. The highest exceedances were for BBP, which was also detected above screening levels in Second Avenue S. outfall solids (0.88 mg/kg DW, 47 mg/kg OC) and slightly above the screening level in soils from Trotsky boring MW-2 (0.11 mg/kg DW). Phthalates were not detected in any water samples at levels of concern.

4.5 Other SVOCs

Chlorobenzenes, pentachlorophenol, and phenol were detected in Trotsky inlet sediments at concentrations above SQS/CSL values. The highest concentrations of these chemicals were detected in sediment sample SED-1. However, because elevated detection limits were reported by the analytical laboratory for sample SED-2, these chemicals may also be present at levels of concern in this sample.

The listed chemicals were also detected at concentrations of concern in soil and/or groundwater samples collected from the Trotsky property. As described above for other contaminants, concentrations were highest in soil and groundwater from MW-1, located closes to sediment sample SED-1.

4.6 Petroleum Hydrocarbons

Gasoline, diesel, and residual range hydrocarbons were detected above MTCA cleanup levels in soil and groundwater at the Trotsky property. Again, the highest concentrations were detected in soil and groundwater at Trotsky well MW-1. Diesel range hydrocarbons were detected slightly above the MTCA cleanup level in groundwater at DMC wells MW-5 and MW-5.

4.7 VOCs

VOCs analyses were conducted only for samples collected at the DMC property, due to a site history of leaking underground petroleum tanks. Benzene was detected in DMC borings MW-10 and MW-12 at concentrations slightly above the MTCA Method A soil cleanup level, but below the Method B soil cleanup level. In groundwater, benzene was detected at high concentrations (59 to 100 ug/L) in DMC wells MW-3, MW-4, and MW-12. These three wells are all near the former locations of underground petroleum storage tanks and fueling station (Figure 7).

4.8 Conclusions and Recommendations

Soil and groundwater at the Trotsky property, to the south of the Trotsky inlet, is contaminated with chemicals at concentrations above MTCA cleanup levels and draft soil-to-sediment and groundwater-to-sediment screening levels. In particular, soil samples near MW-1 (5 feet bgs) and MW-2 (15 feet bgs) contained the highest contaminant concentrations; groundwater concentrations were highest at MW-1, MW-2, and B-2. Contamination may be the result of historical drum reconditioning operations at this facility. MW-1, the location with highest contaminant levels, is located near the facility “back door” in an area where debris disposal and discharge of rinse water may have occurred.

Due to physical site access restrictions, no data were collected to the west and south of the sample locations shown in Figures 10 through 13; thus, it is not possible to estimate the horizontal extent of soil and groundwater contamination with the existing data. The vertical extent of soil contamination near MW-2 has also not been determined.

A variety of chemicals, including metals, PCBs, and SVOCs, have been identified in Trotsky inlet sediments, particularly at locations SED-1 and SED-2. Of particular concern in sediment are PCBs, mercury, and PAHs. Soil and groundwater samples collected at the Trotsky property in locations near these sediment samples (specifically location MW-1) indicate the presence of many of these same COCs at concentrations significantly above regulatory or screening levels. During low tide conditions, groundwater flows from the Trotsky property towards the inlet and the LDW.

Therefore, contaminant concentrations in inlet sediments, particularly PCBs, may be a result of historical or ongoing practices at the Trotsky property. Data suggest that mercury in sediment may be at least partially attributable to ongoing discharges of dissolved mercury in groundwater.

Further investigations are needed at the Trotsky property, including collection of subsurface soil and groundwater samples from the previously inaccessible area of the site to the west and south of MW-1 (i.e., the area upgradient of SED-1 and SED-2). These investigations should include analysis for all sediment contaminants as well as an attempt to identify subsurface NAPL that may be a reservoir of or transport medium for PCBs to the adjacent aquatic environment.

Compared to the Trotsky property, concentrations of many contaminants are generally lower at the DMC property, located on the north side of the Trotsky inlet. Several metals (arsenic, chromium, and lead), PCBs, benzene, and petroleum hydrocarbons are present in soil at concentrations above MTCA cleanup levels. High concentrations of benzene (89 to 100 ug/L) were detected in wells MW-03 and MW-04, near the center of the DMC property and in the vicinity of former underground fuel storage tanks and a fuel dispensing location. VOC analyses were not performed for samples collected at the Trotsky property. No chemicals exceeded draft groundwater-to-sediment screening levels at the DMC property.

DMC well MW-2 is in poor condition and not useable because the casing is filled with soil to the surface. This well lies between MW-10 and MW-12, two wells with exceedances of MTCA cleanup levels for PCBs, benzene, and diesel-range petroleum hydrocarbons. It would be useful to further characterize soil (PCBs) and groundwater (benzene and water levels) if this well were replaced. With MW-2 water level data missing, and lack of data from a tidal survey, it is difficult to predict the groundwater flow pattern for the site.

Benzene concentrations, although high, may not impact inlet sediments. Although the net groundwater flow is offsite to the LDW and the Trotsky inlet, most of the subsurface site material is fine-grained sand and silt. Fine-grained soils tend to slow groundwater velocity and cause adsorption of contaminants onto the fine soil grains. The slow movement of groundwater may allow more time for biodegradation of organics to occur and slow discharge to surface water bodies. Additionally, the site is asphalt-covered, which acts as a cap to surface water infiltration. As long as the site remains covered, surface water percolation should be low.

Potential for soil erosion from the DMC property to the inlet is low. The bank is rip rapped with concrete slabs or poured concrete cap. As long as this armoring stays in good condition, erosion is likely to be minimal.

Figure 9 shows soil PCB concentrations at MW-1 (Trotsky property), in inlet sediment, and at MW-10 and MW-12 (DMC property). PCB concentrations decrease from south to north (e.g., from Trotsky property towards DMC property). One hypothesis that could explain this pattern is that PCBs may have been discharged from the Trotsky property before the current DMC site location was filled in the 1960s. PCB-contaminated sediments were then buried beneath the fill material. However, no information on PCB concentrations in the fill material itself is available, and few soil samples collected at the DMC property have been analyzed for PCBs. Therefore, it is not possible to make a conclusive statement regarding the source of PCBs at EAA-2.

Based on the storm drain solids sample collected from the Second Avenue S. storm drain pipe near the outfall, PCBs and phthalates in the storm drain system may be contributing PCBs and phthalates to Trotsky inlet sediments. Additional storm drain solids samples are needed to determine the source of PCBs and phthalates in the Second Avenue S. storm drain system.

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5.0 References

Dames & Moore. 1991. Report, Soil and Ground-Water Assessment, 7100 2nd Avenue Southwest, Seattle, Washington. Prepared for Alaska Marine Lines. March 6, 1991.

Ecology. 2007. Lower Duwamish Waterway, Source Control Action Plan for Early Action Area 2. Produced by Sarah Good, Toxics Cleanup Program, Northwest Regional Office, Washington State Department of Ecology, and Science Applications International Corporation. June 2007.

SAIC. 2006. Soil and Groundwater Screening Criteria, Source Control Action Plan, Slip 4, Lower Duwamish Waterway. Prepared for Washington State Department of Ecology. Prepared by Science Applications International Corporation (SAIC), Bothell, WA. August 2006 (Revised February 2007).

SAIC. 2007a. Lower Duwamish Waterway, Early Action Area 2, Sampling and Analysis Plan for Additional Site Characterization Activities. Prepared by Science Applications International Corporation for Toxics Cleanup Program, Northwest Regional Office, Washington State Department of Ecology. April 2007.

SAIC. 2007b. Lower Duwamish Waterway, Early Action Area 2, Summary of Existing Information and Identification of Data Gaps. Prepared by Science Applications International Corporation for Toxics Cleanup Program, Northwest Regional Office, Washington State Department of Ecology. February 2007.

SAIC. 2007c. Lower Duwamish Waterway, Early Action Area 2, Data Report – Additional Site Characterization Activities. Prepared by Science Applications International Corporation for Toxics Cleanup Program, Northwest Regional Office, Washington State Department of Ecology. July 2007.

SAIC. 2008a. Lower Duwamish Waterway, Early Action Area 2, Sampling and Analysis Plan, Site Characterization Activities, Douglas Management Company Property. Prepared by Science Applications International Corporation for Toxics Cleanup Program, Northwest Regional Office, Washington State Department of Ecology. June 2008.

SAIC. 2008b. Lower Duwamish Waterway, Early Action Area 2, Supplemental Data Gaps Report, Douglas Management Company Property, 7100 2nd Avenue SW, Seattle. Prepared by Science Applications International Corporation for Washington State Department of Ecology, Toxics Cleanup Program. December 2008.

Windward. 2004. Data Report: Survey and Sampling of Lower Duwamish Waterway Seeps. Prepared by Windward Environmental, LLC. November 18, 2004.

Figures

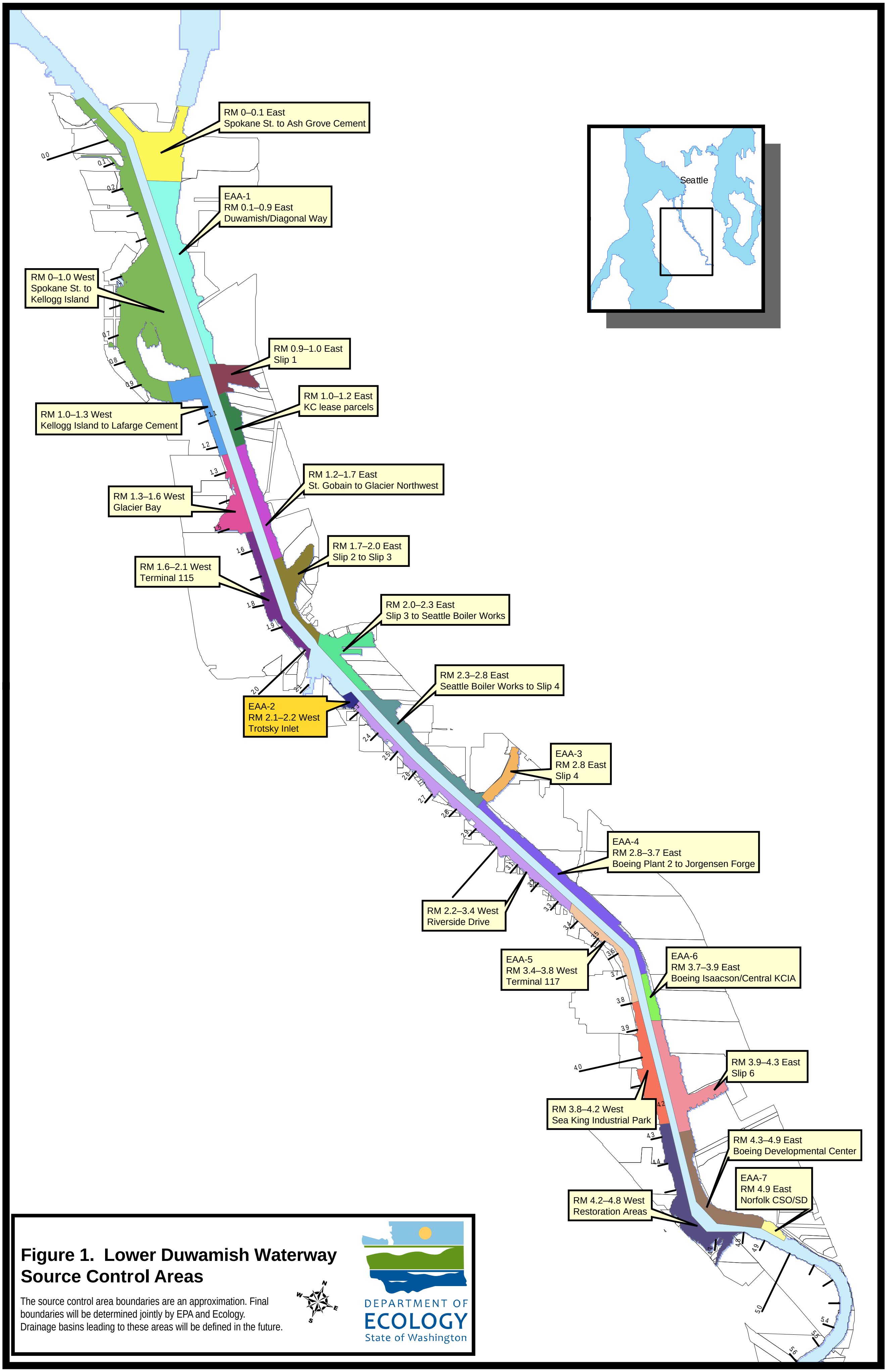
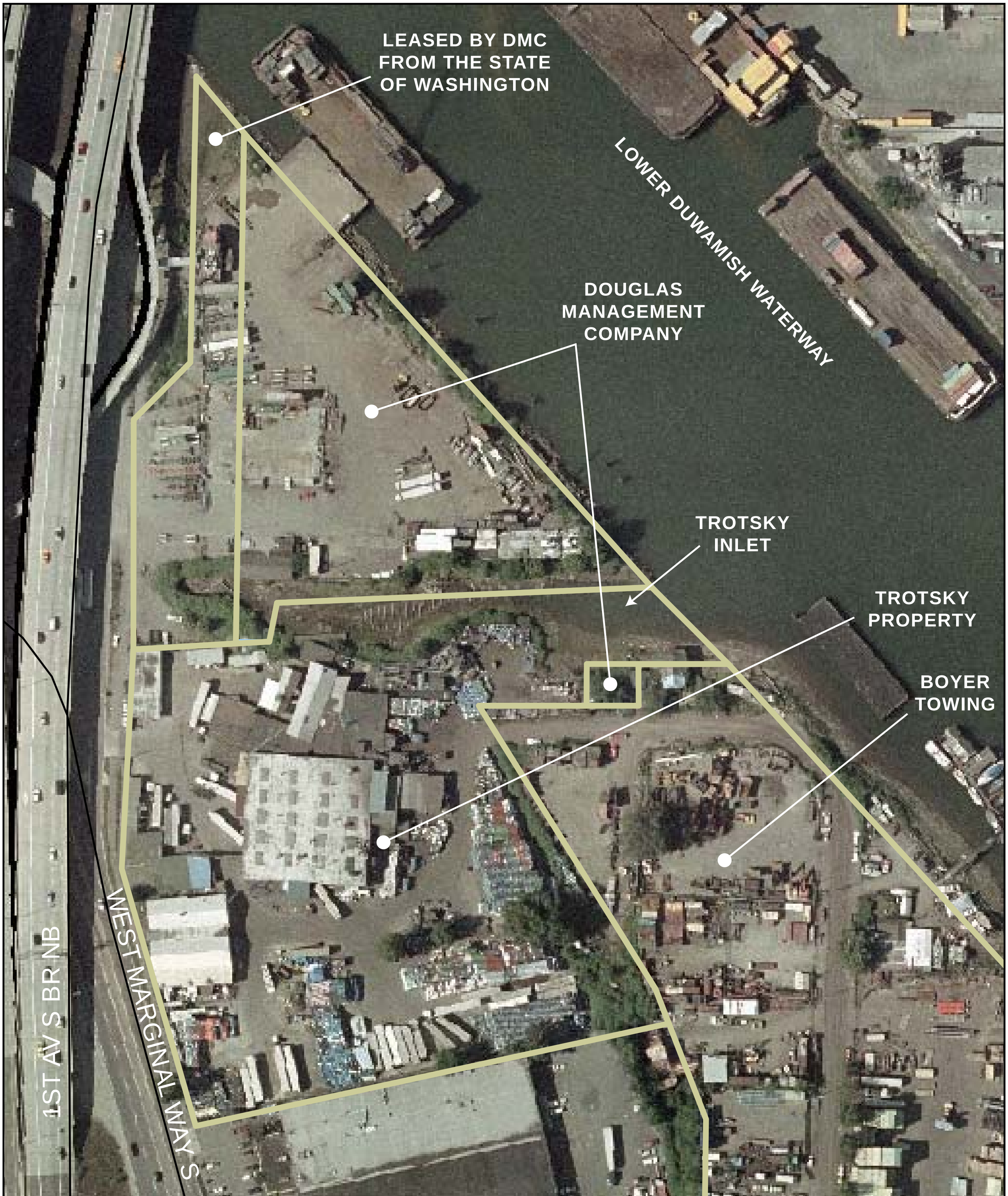


Figure 1. Lower Duwamish Waterway Source Control Areas

The source control area boundaries are an approximation. Final boundaries will be determined jointly by EPA and Ecology. Drainage basins leading to these areas will be defined in the future.



Key
Parcel Boundary
Road
WA State Plane North, NAD83
N

Figure 2. Early Action Area 2 (Trotsky Inlet)

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Figure 3. Sampling Locations, April-May 2007

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X:\LDW\gis\projects\EAA2\2007\GWelevations_071007.mxd 07/13/07

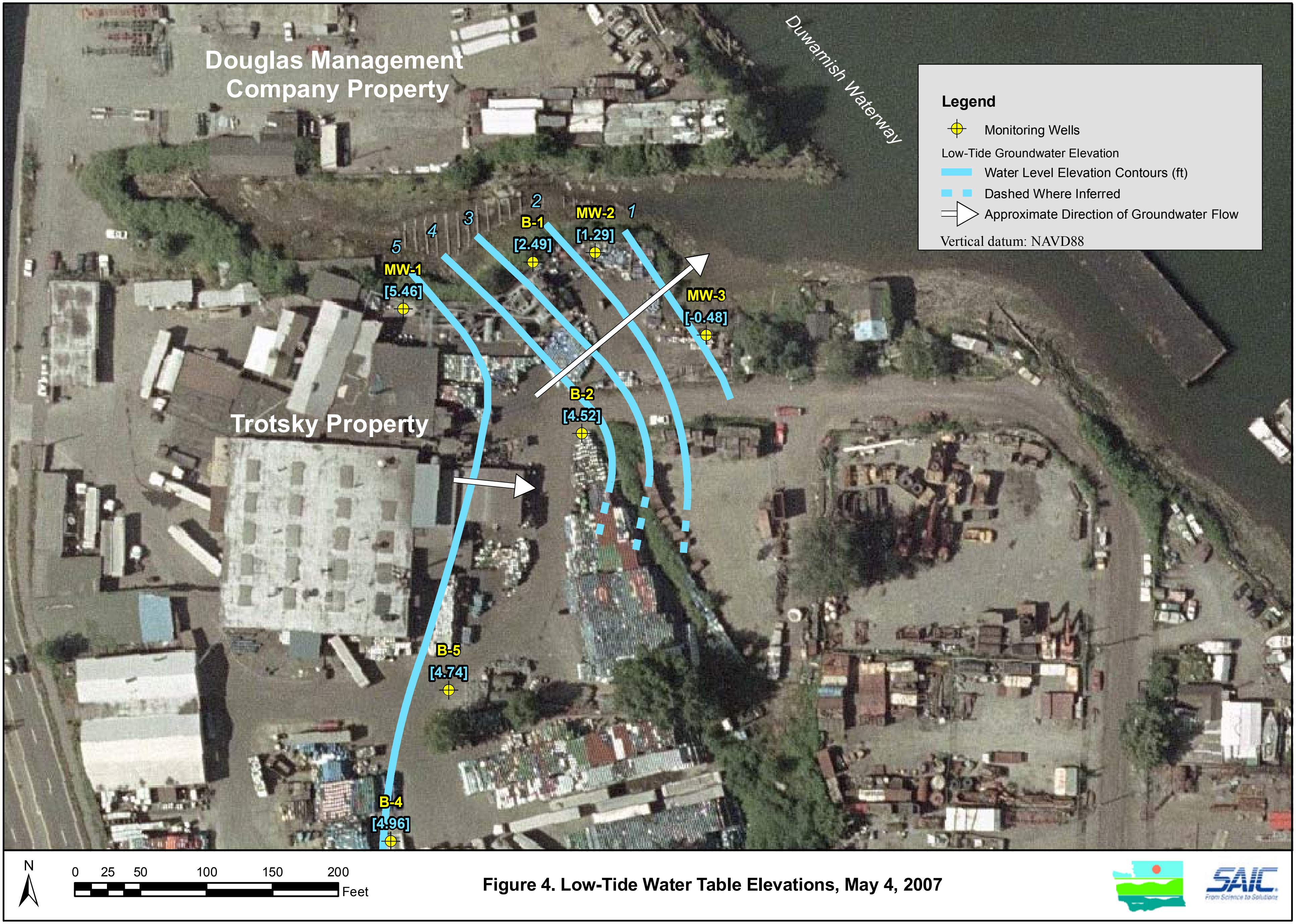

Figure 4. Low-Tide Water Table Elevations, May 4, 2007

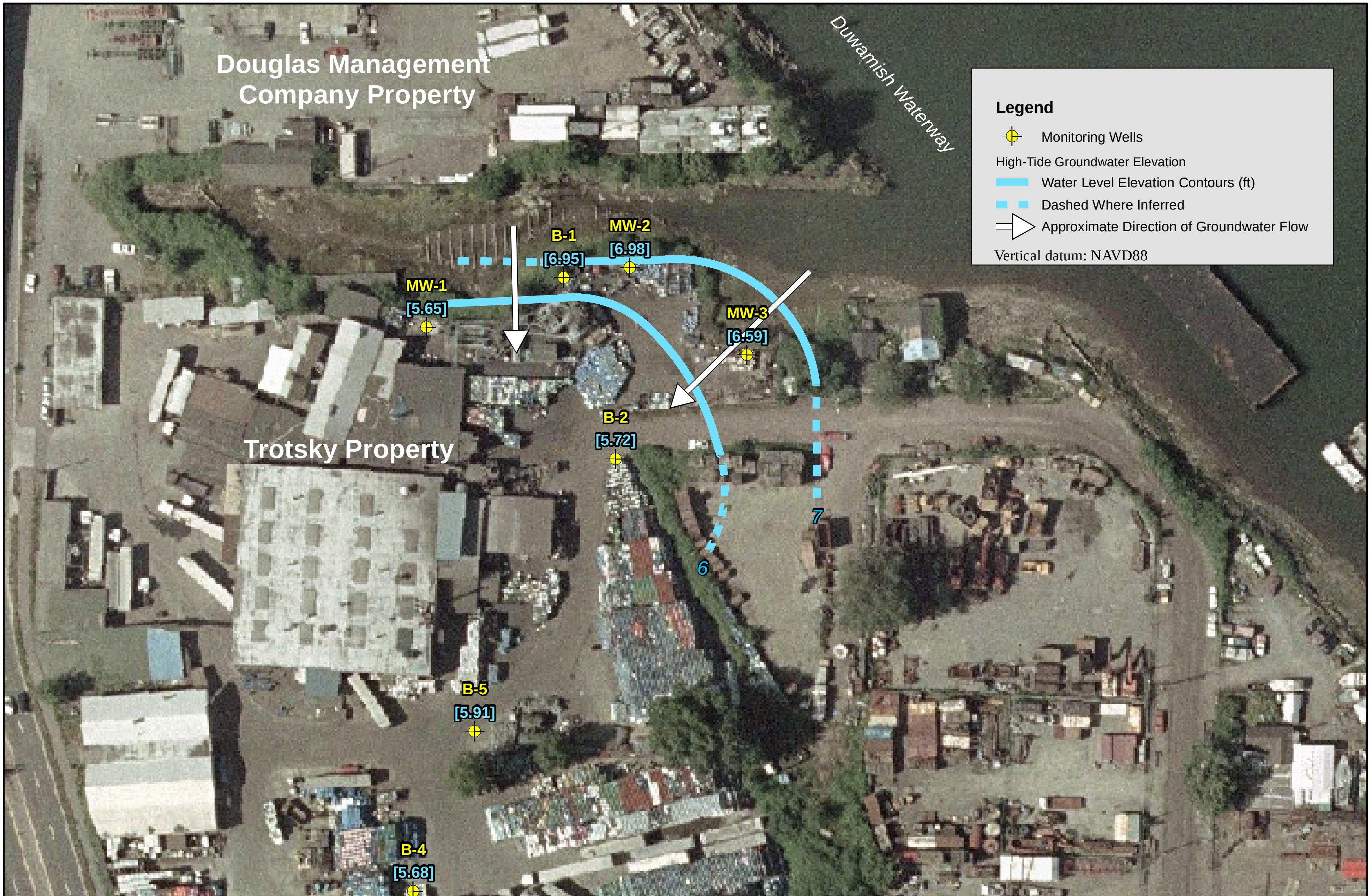

Figure 5. High-Tide Water Table Elevations, May 4, 2007

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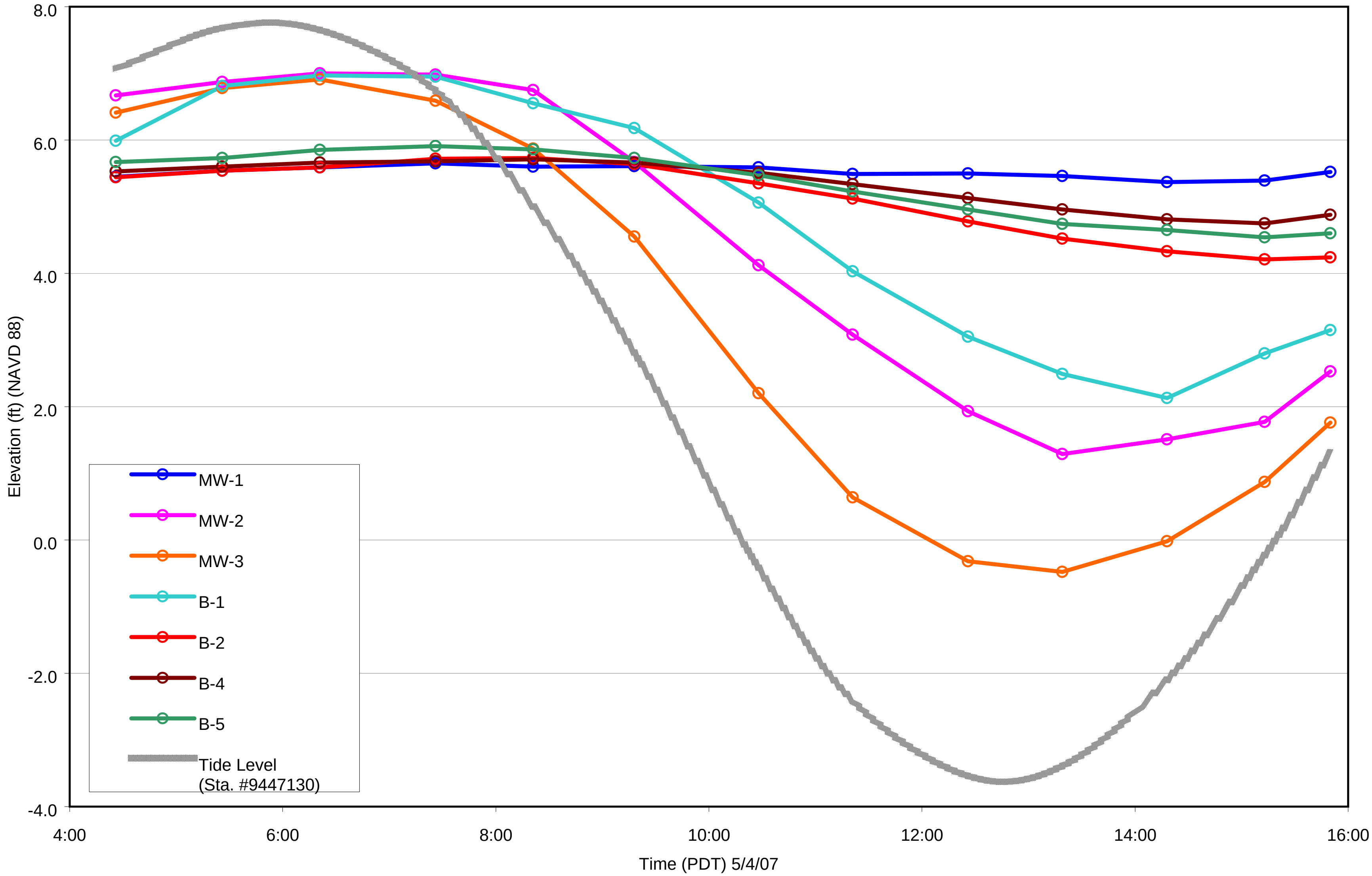
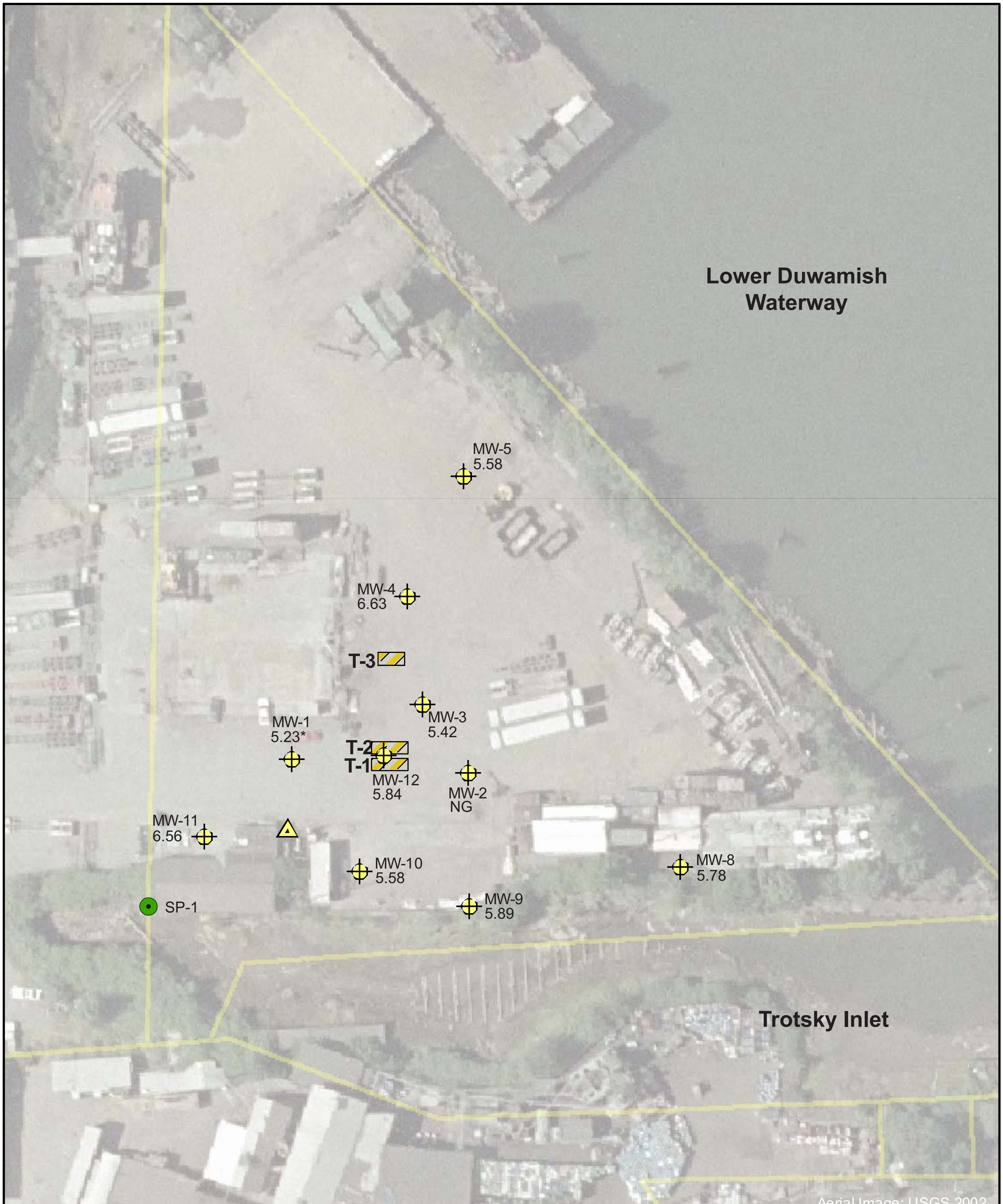


Figure 6. Graph of Water Table and Tide Height Elevations: May 4, 2007
Trotsky Property

Figure 7. DMC Property Groundwater Sampling Locations



Key

* Water level not stabilized
2", 4" diameter monitoring well
Site Bench Mark Location
Former UST Location
Outfall/Seep Location
Property Boundary

Figure 8. DMC Property Groundwater Elevation June 20, 2008

Feet
0 25 50 100 150 200

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N

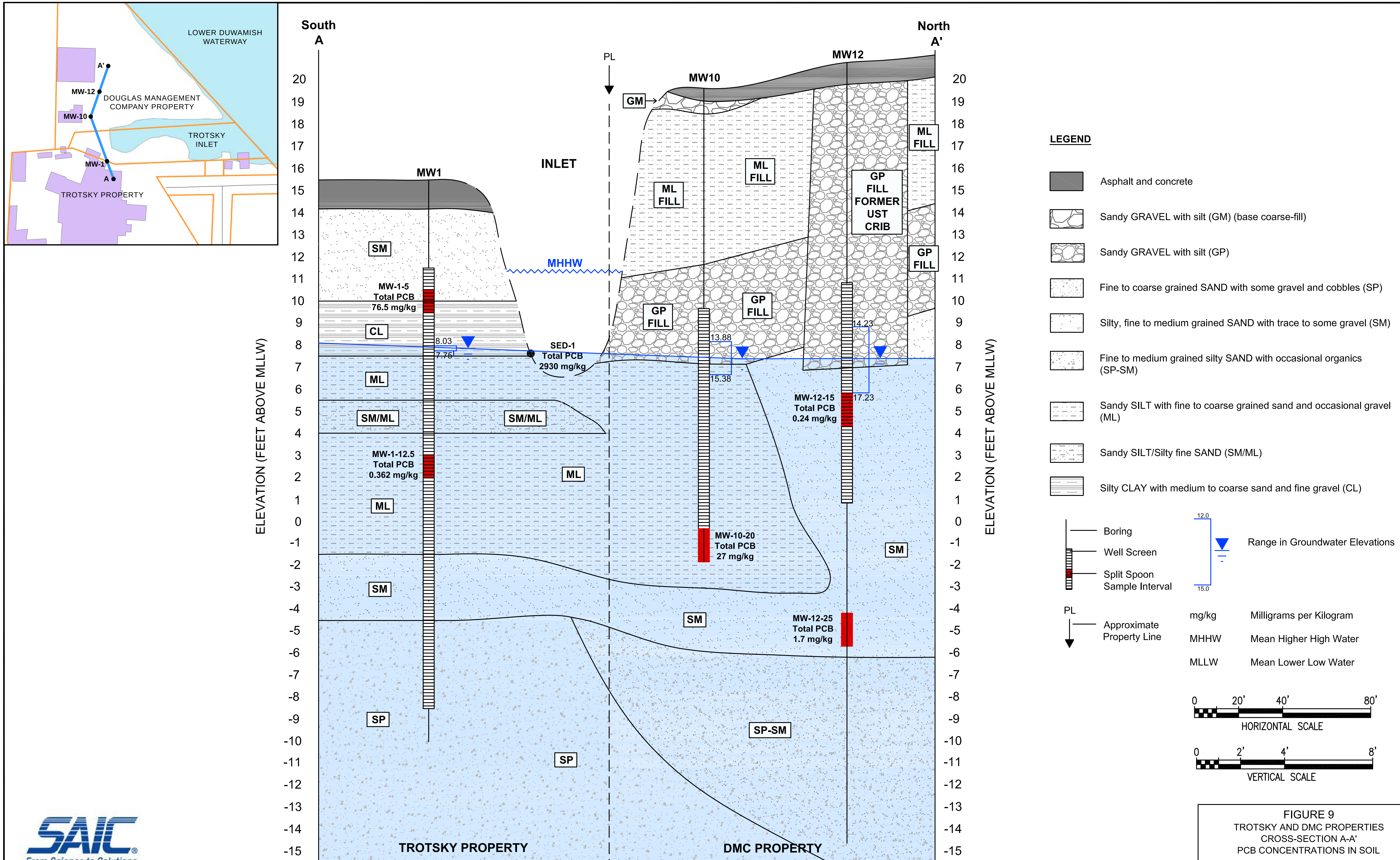
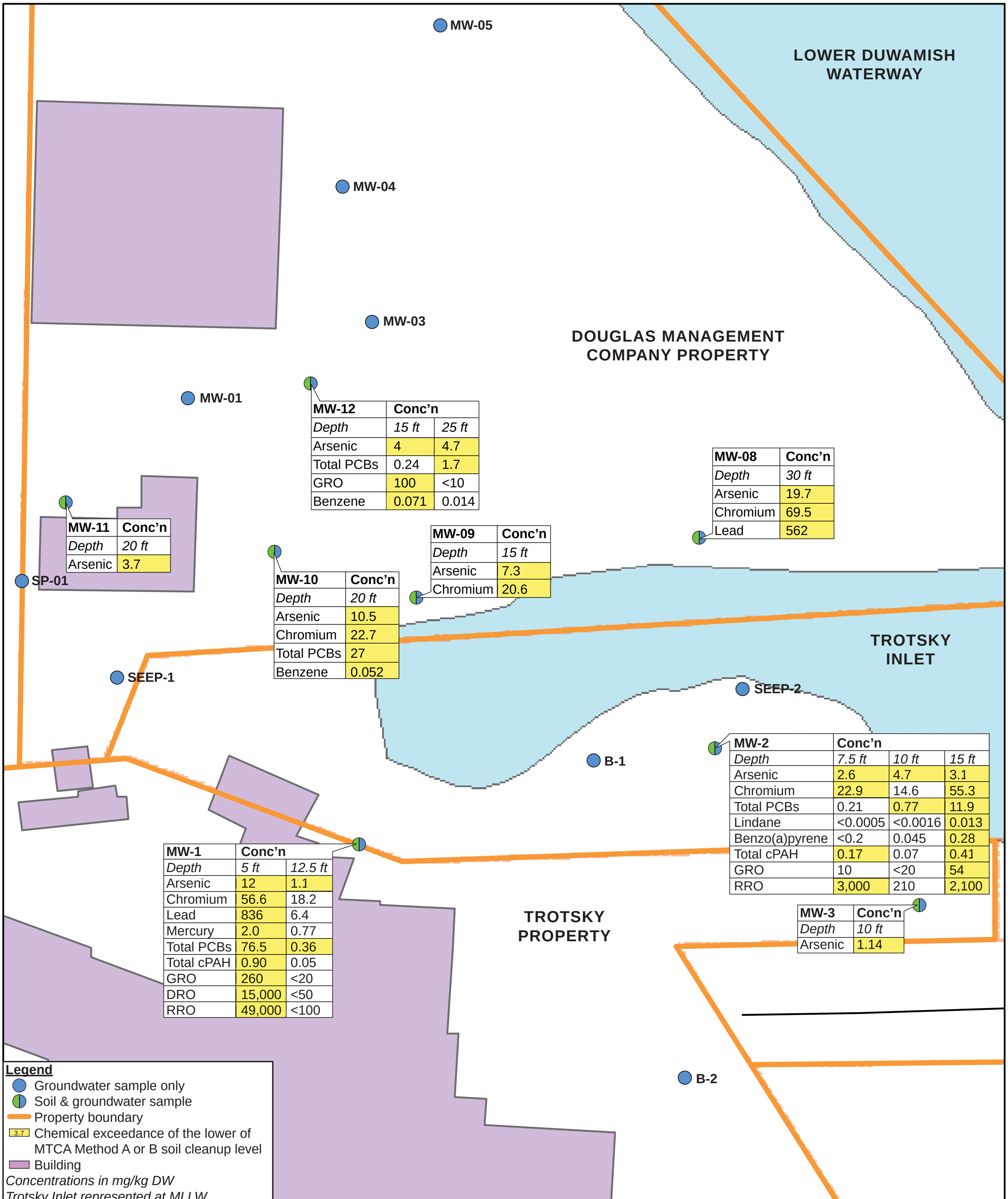


FIGURE 9
TROTSKY AND DMC PROPERTIES
CROSS-SECTION A-A'
PCB CONCENTRATIONS IN SOIL

FILE NAME: AA'.dwg
DATE: 04/02/09



MW-12	Conc'n	
Depth	*15 ft*	*25 ft*
Arsenic	4	4.7
Total PCBs	0.24	1.7
GRO	100	<10
Benzene	0.071	0.014

MW-08	Conc'n
Depth	*30 ft*
Arsenic	19.7
Chromium	69.5
Lead	562

MW-11	Conc'n
Depth	*20 ft*
Arsenic	3.7

MW-09	Conc'n
Depth	*15 ft*
Arsenic	7.3
Chromium	20.6

MW-10	Conc'n
Depth	*20 ft*
Arsenic	10.5
Chromium	22.7
Total PCBs	27
Benzene	0.052

MW-2	Conc'n		
Depth	*7.5 ft*	*10 ft*	*15 ft*
Arsenic	2.6	4.7	3.1
Chromium	22.9	14.6	55.3
Total PCBs	0.21	0.77	11.9
Lindane	<0.0005	<0.0016	0.013
Benzo(a)pyrene	<0.2	0.045	0.28
Total cPAH	0.17	0.07	0.41
GRO	10	<20	54
RRO	3,000	210	2,100

MW-1	Conc'n	
Depth	*5 ft*	*12.5 ft*
Arsenic	12	1.1
Chromium	56.6	18.2
Lead	836	6.4
Mercury	2.0	0.77
Total PCBs	76.5	0.36
Total cPAH	0.90	0.05
GRO	260	<20
DRO	15,000	<50
RRO	49,000	<100

MW-3	Conc'n
Depth	*10 ft*
Arsenic	1.14

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Figure 10. Chemicals Detected in Soil at Concentrations Above MTCA Method A or B Cleanup Levels DMC and Trotsky Properties

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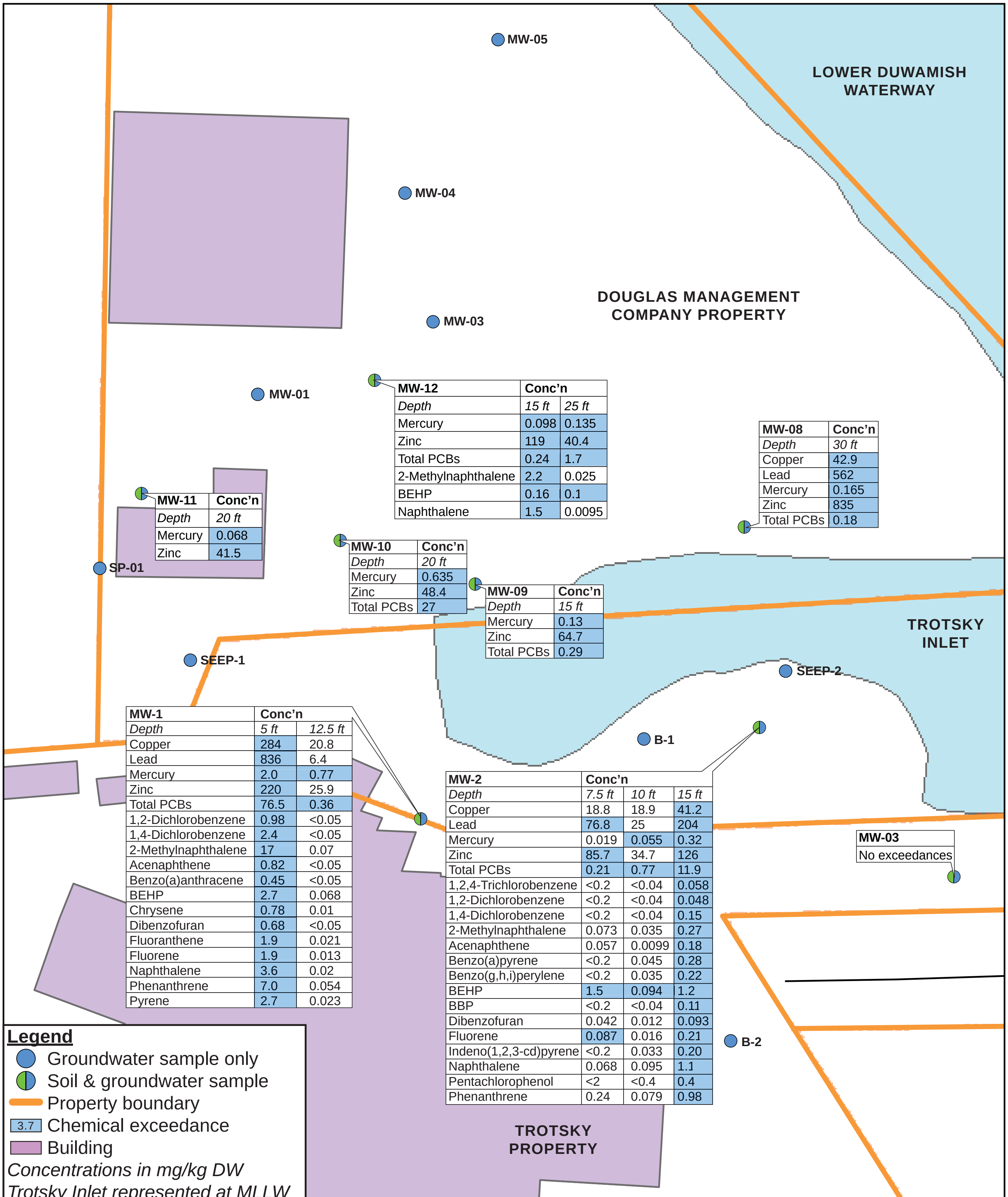

MW-12	Conc'n	
Depth	*15 ft*	*25 ft*
Mercury	0.098	0.135
Zinc	119	40.4
Total PCBs	0.24	1.7
2-Methylnaphthalene	2.2	0.025
BEHP	0.16	0.1
Naphthalene	1.5	0.0095

MW-08	Conc'n
Depth	*30 ft*
Copper	42.9
Lead	562
Mercury	0.165
Zinc	835
Total PCBs	0.18

MW-11	Conc'n
Depth	*20 ft*
Mercury	0.068
Zinc	41.5

MW-10	Conc'n
Depth	*20 ft*
Mercury	0.635
Zinc	48.4
Total PCBs	27

MW-09	Conc'n
Depth	*15 ft*
Mercury	0.13
Zinc	64.7
Total PCBs	0.29

MW-1	Conc'n	
Depth	*5 ft*	*12.5 ft*
Copper	284	20.8
Lead	836	6.4
Mercury	2.0	0.77
Zinc	220	25.9
Total PCBs	76.5	0.36
1,2-Dichlorobenzene	0.98	<0.05
1,4-Dichlorobenzene	2.4	<0.05
2-Methylnaphthalene	17	0.07
Acenaphthene	0.82	<0.05
Benzo(a)anthracene	0.45	<0.05
BEHP	2.7	0.068
Chrysene	0.78	0.01
Dibenzofuran	0.68	<0.05
Fluoranthene	1.9	0.021
Fluorene	1.9	0.013
Naphthalene	3.6	0.02
Phenanthrene	7.0	0.054
Pyrene	2.7	0.023

MW-2	Conc'n		
Depth	*7.5 ft*	*10 ft*	*15 ft*
Copper	18.8	18.9	41.2
Lead	76.8	25	204
Mercury	0.019	0.055	0.32
Zinc	85.7	34.7	126
Total PCBs	0.21	0.77	11.9
1,2,4-Trichlorobenzene	<0.2	<0.04	0.058
1,2-Dichlorobenzene	<0.2	<0.04	0.048
1,4-Dichlorobenzene	<0.2	<0.04	0.15
2-Methylnaphthalene	0.073	0.035	0.27
Acenaphthene	0.057	0.0099	0.18
Benzo(a)pyrene	<0.2	0.045	0.28
Benzo(g,h,i)perylene	<0.2	0.035	0.22
BEHP	1.5	0.094	1.2
BBP	<0.2	<0.04	0.11
Dibenzofuran	0.042	0.012	0.093
Fluorene	0.087	0.016	0.21
Indeno(1,2,3-cd)pyrene	<0.2	0.033	0.20
Naphthalene	0.068	0.095	1.1
Pentachlorophenol	<2	<0.4	0.4
Phenanthrene	0.24	0.079	0.98

MW-03
No exceedances

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Figure 11. Chemicals Detected in Soil at Concentrations Above Draft Soil-to-Sediment Screening Levels DMC and Trotsky Properties

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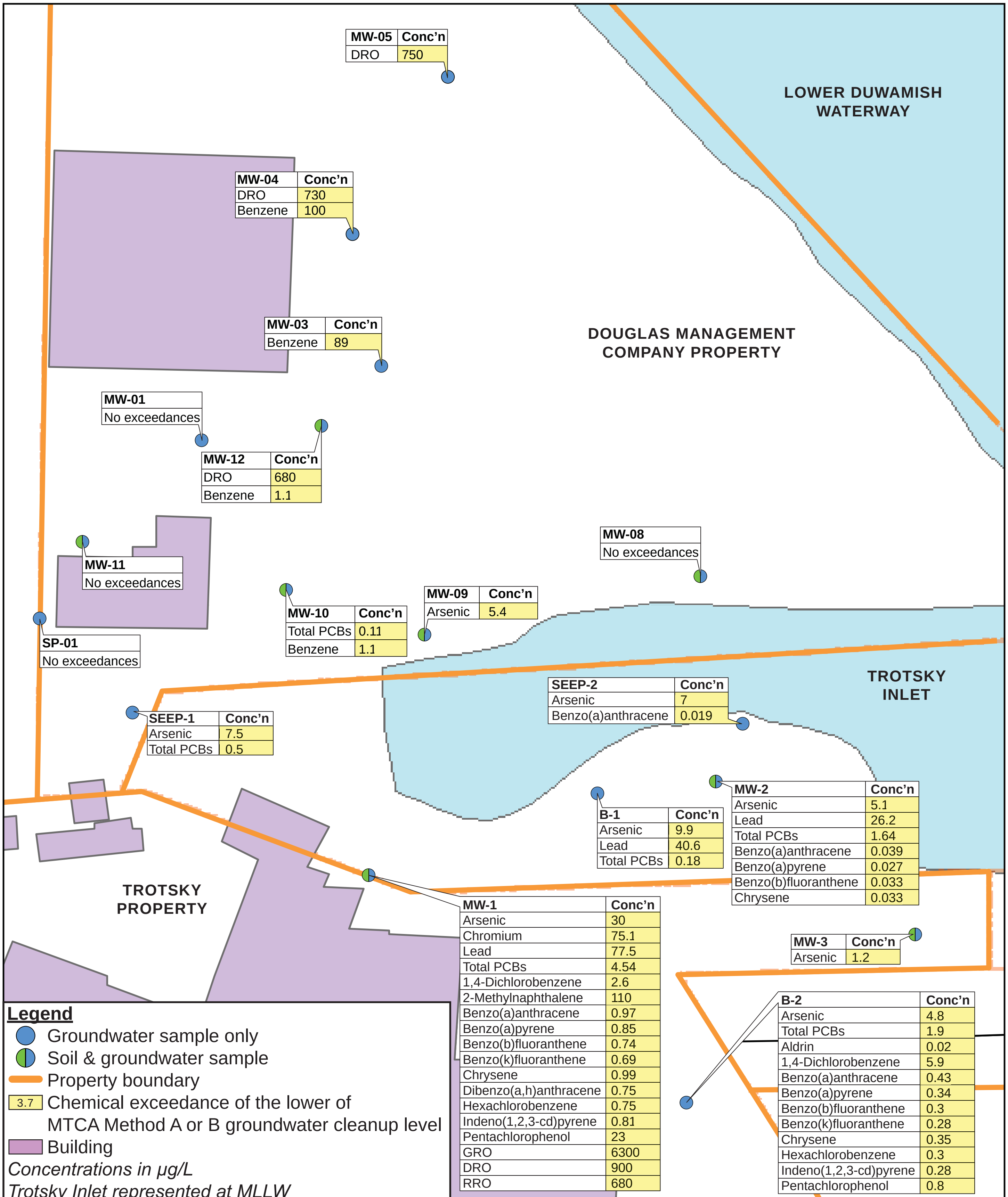

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Figure 12. Chemicals Detected in Groundwater at Concentrations Above MTCA Method A or B Cleanup Levels at DMC and Trotsky Properties

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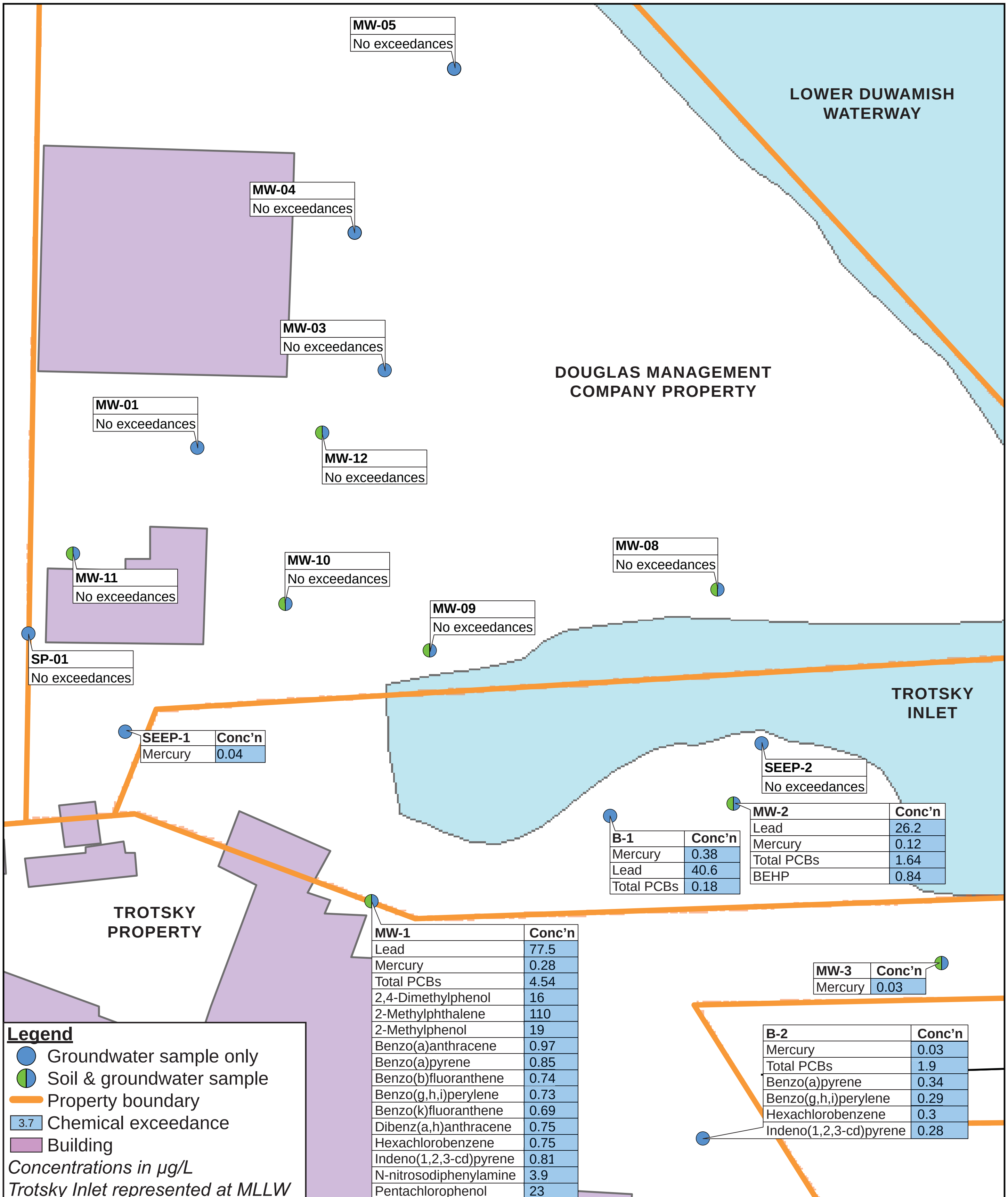

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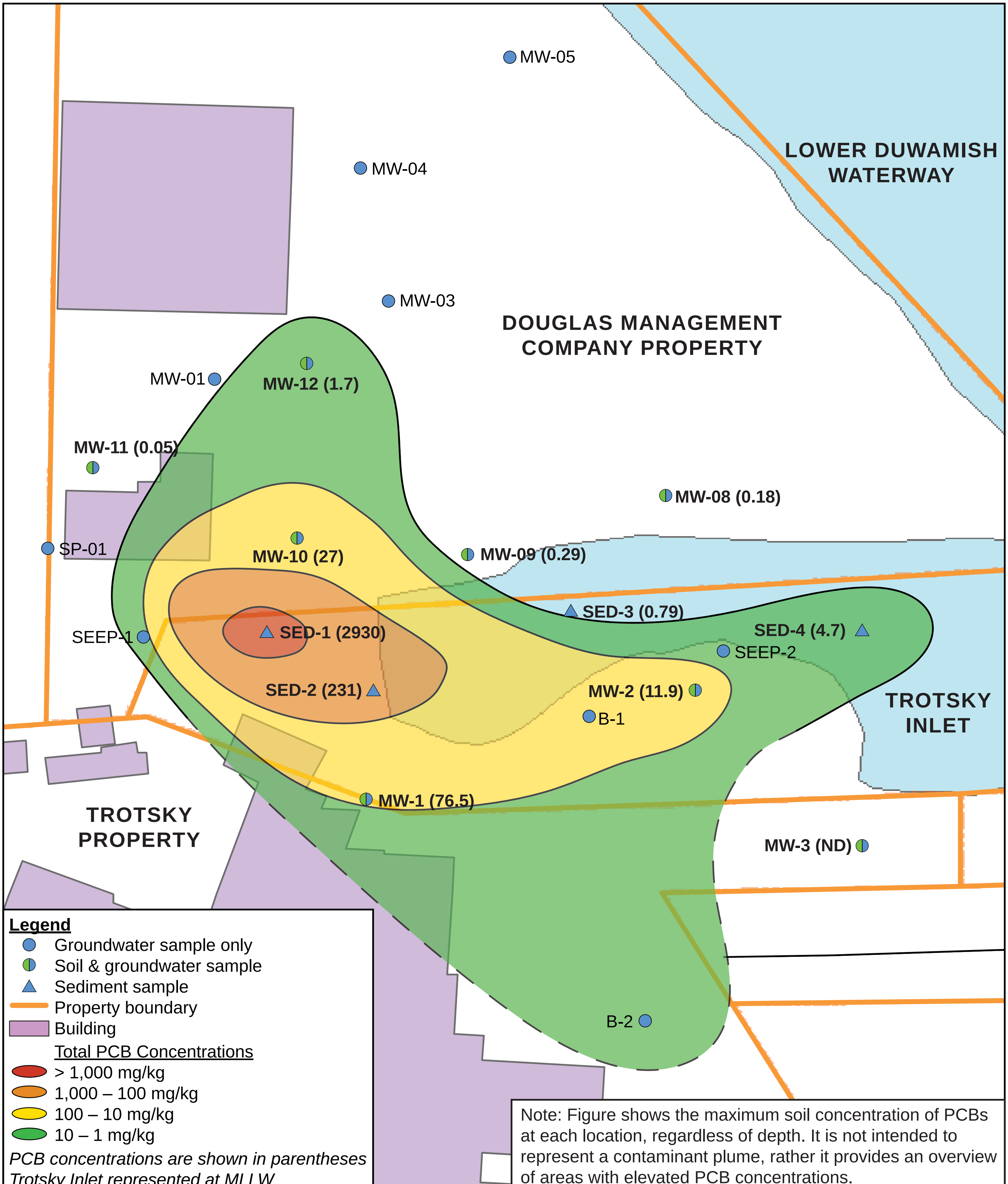
Figure 13. Chemicals Detected in Groundwater at Concentrations Above Draft Groundwater-to-Sediment Screening Levels at DMC and Trotsky Properties

SAIC From Science to Solutions



Note: Figure shows the maximum soil concentration of PCBs at each location, regardless of depth. It is not intended to represent a contaminant plume, rather it provides an overview of areas with elevated PCB concentrations.

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Figure 14. Total PCB Concentrations in Soil and Sediment at Trotsky and DMC Properties

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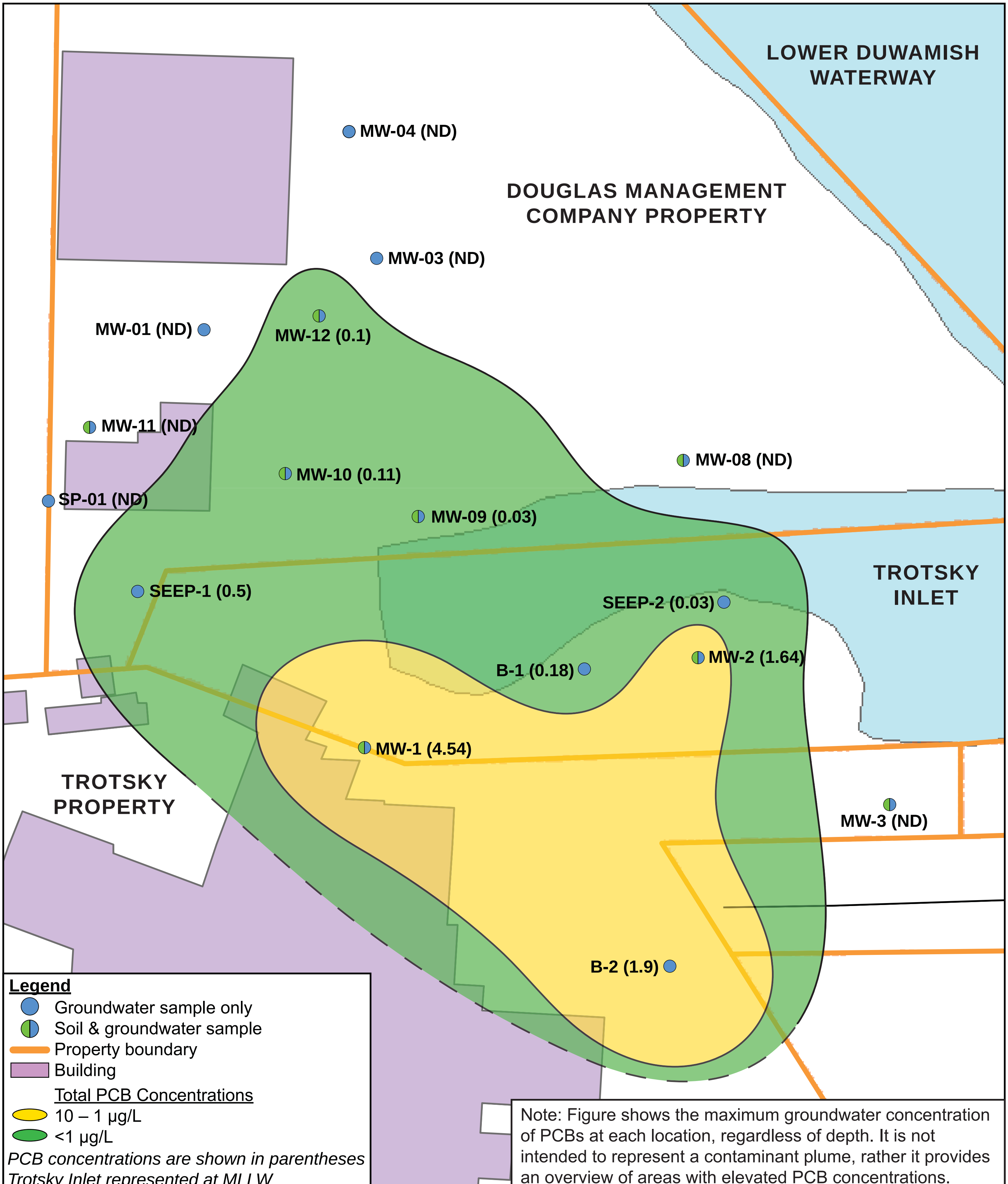

Note: Figure shows the maximum groundwater concentration of PCBs at each location, regardless of depth. It is not intended to represent a contaminant plume, rather it provides an overview of areas with elevated PCB concentrations.

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Figure 15. Total PCB Concentrations in Groundwater at Trotsky and DMC Properties

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Tables

Table 1: Summary of Laboratory Analyses Performed
Trotsky Property (April-May 2007)

Station	Sample	Depth (ft bgs)	Date Collected	Lab Sample Delivery Group	Metals, total (SW6020/ 7470A/ 7471A)	Metals, dissolved (SW6020/ 7470A/ 7471A)	SVOCs (SW7270C)	Pesticides (SW8081A)	PCBs (SW8082)	HCID (NW-HCID)	TPH-Gx (NWTPH-Gx)	TPH-Dx (NWTPH-Dx)	TOC (SW9060M)	Total solids (EPA160.3M)
Soil														
MW-1	MW-1-5	5	4/23/2007	KO703475	●		●	●	●	●	●	●	●	●
MW-1	MW-1-12.5	12.5	4/23/2007	KO703475	●		●	●	●	●			●	●
MW-2	MW-2-7.5	7.5	4/24/2007	KO703475	●		●	●	●	●	●	●	●	●
MW-2	MW-2-10	10	4/24/2007	KO703475	●		●	●	●	●		●	●	●
MW-2	MW-2-15	15	4/24/2007	KO703475	●		●	●	●	●	●	●	●	●
MW-2	MW-2-15-FD	15	4/24/2007	KO703475	●		●	●	●	●	●	●	●	●
MW-3	MW-3-10	10	4/24/2007	KO703475	●		●	●	●	●			●	●
Sediment														
SED-1	SED-1	0.33	5/4/2007	KO703896	●		●	●	●	●		●	●	●
SED-2	SED-2	0.33	5/4/2007	KO703896	●		●	●	●	●	●	●	●	●
SED-3	SED-3	0.33	5/4/2007	KO703896	●		●	●	●	●		●	●	●
SED-4	SED-4	0.33	5/7/2007	KO703993	●		●	●	●	●		●	●	●
SED-4	SED-4-FD	0.33	5/7/2007	KO703993	●		●	●	●	●		●	●	●
Outfall Solids														
OUTFALL	SED-5	0.33	5/8/2007	KO703993	●		●	●	●	●		●	●	●
Groundwater														
B-1	B-1	--	5/22/2007	KO704473	●	●	●	●	●	●		●	●	
B-2	B-2	--	5/22/2007	KO704473	●	●	●	●	●	●	●	●	●	
MW-1	MW-1	--	5/22/2007	KO704473	●	●	●	●	●	●	●	●	●	
MW-1	MW-1-FD	--	5/22/2007	KO704473	●	●	●	●	●	●	●	●	●	
MW-2	MW-2	--	5/22/2007	KO704473	●	●	●	●	●	●		●	●	
MW-3	MW-3-10	--	5/22/2007	KO704473	●	●	●	●	●	●			●	
Seep Water														
SEEP-1	SEEP-1	--	5/4/2007	KO703896	●	●	●	●	●	●			●	
SEEP-2	SEEP-2	--	5/7/2007	KO703993	●	●	●	●	●	●			●	
SEEP-2	SEEP-2-FD	--	5/7/2007	KO703993	●	●	●	●	●	●			●	
Outfall Water														
OUTFALL	OUTFALL-1	--	5/4/2007	KO703896	●	●	●	●	●	●		●	●	

Notes:

TPH-Gx and/or TPH-Dx were analyzed in those samples where hydrocarbon identification (HCID) indicated these ranges were present.

HCID - hydrocarbon identification
PCB - polychlorinated biphenyl
SVOC - semivolatile organic compound
TPH-Gx - gasoline-range petroleum hydrocarbons
TPH-Dx - diesel-range petroleum hydrocarbons; includes quanitification of both diesel and heavy oil (residual) fractions
TOC - total organic carbon

Table 2: Ground Surface to Elevation Conversion for Trotsky and DMC Property Soil Samples

	Ground Elevation	Depth to Sample	NAVD 88 Elevation Sample Interval		MLLW Elevation Sample Interval	
Trotsky Property						
MW01-5	13.01	5	8.01	6.51	10.39	8.89
MW01-12.5	13.01	12.5	0.51	-0.49	2.89	1.89
MW02-7.5	12.38	7.5	4.88	4.38	7.26	6.76
MW02-10	12.38	10	2.38	0.88	4.76	3.26
MW02-15	12.38	15	-2.62	-4.12	-0.24	-1.74
MW03-10	13.13	10	3.13	1.63	5.51	4.01
DMC Property						
MW08-30	17.51	30	-12.49	-13.99	-10.11	-11.61
MW09-15	16.92	15	1.92	0.42	4.3	2.8
MW10-20	17.18	20	-2.82	-4.32	-0.44	-1.94
MW11-15	18.06	15	3.06	1.56	5.44	3.94
MW12-15	18.35	15	3.35	1.85	5.73	4.23
MW12-25	18.35	25	-6.65	-8.15	-4.27	-5.77

Ground Elevation=NAVD 88, City of Seattle
MLLW Elevation=NAVD+2.38 feet
All values in feet

Table 3: Water Table and Tidal Elevation Data
Trotsky Property

Well	MW-1		MW-2		MW-3		B-1		B-2		B-4		B-5		Tide Level
Top of Casing Elevation	12.54 ft		12.38 ft		12.61 ft		13.86 ft		13.96 ft		17.25 ft		13.91 ft		(Station #9447130)
Time (PDT) 5/4/2007	Depth to Water (ft btoc)	Water-Level Elev. (ft)	Depth to Water (ft btoc)	Water-Level Elev. (ft)	Depth to Water (ft btoc)	Water-Level Elev. (ft)	Depth to Water (ft btoc)	Water-Level Elev. (ft)	Depth to Water (ft btoc)	Water-Level Elev. (ft)	Depth to Water (ft btoc)	Water-Level Elev. (ft)	Depth to Water (ft btoc)	Water-Level Elev. (ft)	Water-Level Elev. (ft)
4:26	-7.09	5.45	-5.71	6.67	-6.20	6.41	-7.87	5.99	-8.52	5.44	-11.72	5.53	-8.24	5.67	7.07
5:26	-7.00	5.54	-5.51	6.87	-5.83	6.78	-7.05	6.81	-8.42	5.54	-11.65	5.6	-8.18	5.73	7.68
6:21	-6.95	5.59	-5.38	7.00	-5.70	6.91	-6.89	6.97	-8.37	5.59	-11.59	5.66	-8.06	5.85	7.65
7:26	-6.89	5.65	-5.40	6.98	-6.02	6.59	-6.91	6.95	-8.24	5.72	-11.57	5.68	-8.00	5.91	6.74
8:21	-6.94	5.60	-5.63	6.75	-6.74	5.87	-7.31	6.55	-8.23	5.73	-11.54	5.71	-8.05	5.86	5.00
9:18	-6.93	5.61	-6.71	5.67	-8.06	4.55	-7.68	6.18	-8.32	5.64	-11.59	5.66	-8.18	5.73	2.81
10:28	-6.95	5.59	-8.26	4.12	-10.41	2.20	-8.80	5.06	-8.61	5.35	-11.74	5.51	-8.44	5.47	-0.42
11:21	-7.05	5.49	-9.30	3.08	-11.97	0.64	-9.83	4.03	-8.84	5.12	-11.91	5.34	-8.68	5.23	-2.41
12:26	-7.04	5.50	-10.45	1.93	-12.93	-0.32	-10.81	3.05	-9.18	4.78	-12.12	5.13	-8.95	4.96	-3.54
13:19	-7.08	5.46	-11.09	1.29	-13.09	-0.48	-11.37	2.49	-9.44	4.52	-12.29	4.96	-9.17	4.74	-3.39
14:18	-7.17	5.37	-10.87	1.51	-12.63	-0.02	-11.73	2.13	-9.63	4.33	-12.44	4.81	-9.26	4.65	-2.10
15:13	-7.15	5.39	-10.61	1.77	-11.74	0.87	-11.06	2.80	-9.75	4.21	-12.50	4.75	-9.37	4.54	-0.23
15:50	-7.02	5.52	-9.85	2.53	-10.85	1.76	-10.71	3.15	-9.72	4.24	-12.37	4.88	-9.31	4.60	1.31

Notes:

Elevations, including tide heights, are referenced to NAVD88.
Times shown reflect the approximate mid-point of each water-level measurement round. Each round included all seven wells and took about 15 minutes to complete.
btoc - below top of casing
ft - feet
PDT - Pacific Daylight Time

Table 4: Field Measurements for Water Samples
Trotsky Property

Sample	pH	Conductivity (µS/cm)	Salinity (%)	Temperature (C)	Turbidity (NTU)	Notes
SEEP-1	6.5	6,350	0.3	19.9	34	Q = ~0.1 gpm
SEEP-2	6.4	8,530	0.5	12.7	159	Q = ~5 gpm; same location as LDW-SP-56 of Windward (2004)
OUTFALL-1	5.5	2,660	0.1	11.9	75	pH based on test strip; pH meter would not calibrate
MW-1	8	5,300	0.3	13.9	140	
MW-2	6.5	15,000	0.8	12.3	89	
MW-3	5.9	3,400	0.2	12.8	45	
B-1	6.3	<500	<0.05	15.1	480	
B-2	6.7	1,300	0.1	13.6	240	

Note:
Q = flow rate
NTU - Nephelometric Turbidity Units
µS/cm - microsiemens per centimeter

Table 5: Summary of Laboratory Analyses Performed
DMC Property (June-July 2008)

Station	Sample	Depth (ft bgs)	Date Collected	Lab Sample Delivery Group	Metals, total (SW6020/ 7471A/ 7060A)	Mercury (EPA1631E)	VOCs (SW8260B)	SVOCs (SW7270C)	Pesticides (SW8081A)	PCBs (SW8082)	HCID (NW-HCID)	TPH-Gx (NWTPH-Gx)	TPH-Dx (NWTPH-Dx Ext.)	TOC (SW9060M)	Total solids (EPA160.3M)	Chloride (EPA300.0)
Soil																
MW-08	MW-08-30	30	6/18/2008	K0805491	●		●	●	●	●	●	●	●	●	●	
MW-09	MW-09-15	15	6/18/2008	K0805491	●		●	●	●	●	●		●	●	●	
MW-10	MW-10-20	20	6/18/2008	K0805491	●			●	●	●	●		●	●	●	
MW-11	MW-11-15	15	6/19/2008	K0805577	●		●	●	●	●	●			●	●	
MW-12	MW-12-15	15	6/19/2008	K0805577	●		●	●	●	●	●	●	●	●	●	
MW-12	MW-12-25	25	6/19/2008	K0805577	●		●	●	●	●	●		●	●	●	
Groundwater																
MW-01	MW-01	--	7/16/2008	K0806545	●	●	●	●	●	●	●		●			●
MW-03	MW-03	--	7/16/2008	K0806545	●	●	●	●	●	●	●					●
MW-04	MW-04	--	7/16/2008	K0806545	●	●	●	●	●	●	●	●	●			●
MW-04	MW-04-FD	--	7/16/2008	K0806545	●	●	●	●	●	●	●	●	●			●
MW-05	MW-05	--	7/17/2008	K0806616	●	●	●	●	●	●	●		●			●
MW-08	MW-08	--	7/17/2008	K0806616	●	●	●	●	●	●	●					●
MW-09	MW-09	--	7/17/2008	K0806616	●	●	●	●	●	●	●					●
MW-10	MW-10	--	7/17/2008	K0806616	●	●	●	●	●	●	●					●
MW-11	MW-11	--	7/17/2008	K0806616	●	●	●	●	●	●	●					●
MW-12	MW-12	--	7/16/2008	K0806545	●	●	●	●	●	●	●	●	●			●
Seeps																
SP-01	SP-01	--	7/18/2008	K0806616	●	●	●	●	●	●	●					●

Notes:

TPH-Gx and/or TPH-Dx were analyzed in those samples where hydrocarbon identification (HCID) indicated these ranges were present.

HCID - hydrocarbon identification
PCB - polychlorinated biphenyl
SVOC - semivolatile organic compound
TOC - total organic carbon
TPH-Gx - gasoline range petroleum hydrocarbons
TPH-Dx - diesel range petroleum hydrocarbons
VOC - volatile organic compound

Table 6: Groundwater Well Summary
Douglas Management Company Property

Monitoring Well	Coordinates		Elevation	
	Easting	Northing	Top of Casing	Ground Elevation
MW-01	1269870.15	200451.97	17.54	18.06
MW-02	1269947.14	200456.25	17.32	17.75
MW-03	1269931.95	200482.01	17.46	18.34
MW-04	1269935.59	200539.60	16.72	17.87
MW-05	1269977.86	200608.64	15.67	16.56
MW-06	Unable to Locate			
MW-07	Unable to Locate			
MW-08	1270060.25	200399.74	17.16	17.51
MW-09	1269979.52	200384.27	16.47	16.92
MW-10	1269915.27	200386.63	16.90	17.18
MW-11	1269834.30	200407.55	17.83	18.06
MW-12	1269907.84	200465.48	18.04	18.35

Survey Notes:

Horizontal Datum
-- Based upon NAD83/91, Washington State Plane Coordinate System, North Zone. US Survey Feet

-- Coordinates shown hereon are based upon grid projections. Angles and distances inversed between these grid coordinates will produce grid distances.

Vertical Datum
-- Based upon NAVD 88; as published by the City of Seattle.

Table 7: Soil Sampling Results
Trotsky Property

All concentrations in mg/kg DW, except as noted

Group	Parameter	MW-1-5	MW-1-12.5	MW-2-7.5	MW-2-10	MW-2-15[C]	MW-3-10	MTCA Soil Cleanup Levels		Draft Soil-to-Sediment Screening Level[A]	Sediment Quality Standard (SQS)
		4/23/2007	4/23/2007	4/24/2007	4/24/2007	4/24/2007	4/24/2007	Method A (unrestricted land use)	Method B		
Metals	Arsenic	11.7	1.11	2.61	4.69	3.1	1.14	20	0.67	590	57
	Cadmium	0.858	0.095	0.322	0.121	0.537	0.078	2	80	1.7	5.1
	Chromium	56.6	18.2	22.9	14.6	55.3	8.7	19	240	270	260
	Copper	284	20.8	18.8	18.9	41.2	13.1	--	3000	39	390
	Lead	836	6.44	76.8	25	204	1.82	250	--	67	450
	Mercury	2.01	0.771	0.019	0.055	0.318	0.019	2	24	0.03	0.41
	Silver	0.44	0.11	0.45	0.04	0.13	0.03	--	400	0.61	--
	Zinc	220	25.9	85.7	34.7	126	18.1	--	24000	38	410
PCBs	PCB-Aroclor 1242	51 J	0.24	0.1 J	0.4 J	6.3 J	0.0049 U	--	--	0.065	
	PCB-Aroclor 1254	18 J	0.081	0.065 J	0.16 J	2.8 J	0.0049 U	--	1.6	0.065	
	PCB-Aroclor 1260	7.5 J	0.041	0.046 J	0.21 J	2.8 J	0.0049 U	--	--	0.065	
	PCBs, total calc'd	76.5	0.362	0.211	0.77	11.9	--	--	0.5	0.065	
Pesticides	2,4'-DDD	0.19 U	0.0011 U	0.0049 J	0.0082 J	0.19 J	0.00049 U	--	4.2	--	
	2,4'-DDE	0.16 U	0.0033	0.0018 J	0.00032 J	0.037 U	0.00049 U	--	2.9	--	
	2,4'-DDT	0.41 J	0.0024	0.0022 U	0.01 J	0.2 J	0.00049 U	3	2.9	--	
	4,4'-DDD	0.017 U	0.0005 U	0.0026	0.0049	0.19 J	0.00049 U	--	4.2	--	
	4,4'-DDE	1.9 J	0.021 J	0.0064	0.0081	0.34 J	0.00049 U	--	2.9	--	
	4,4'-DDT	0.49 J	0.0032	0.005 J	0.0073	0.048 U	0.00049 U	3	2.9	--	
	Chlordane	0.26 U	0.024 U	0.032 J	0.011 U	0.035 U	0.0049 U	--	2.9	--	
	Lindane	0.03 U	0.0012 J	0.00049 U	0.0016 J	0.013 J	0.00049 U	0.01	0.77	--	
SVOCs	1,2,4-Trichlorobenzene	1 U	0.05 U	0.2 U	0.04 U	0.058 J	0.01 U	--	800	0.0025	
	1,2-Dichlorobenzene	0.98 J	0.05 U	0.2 U	0.04 U	0.048 J	0.01 U	--	7200	0.0038	
	1,4-Dichlorobenzene	2.4 J	0.05 U	0.2 U	0.04 U	0.15 J	0.01 U	--	42	0.015	
	2-Methylnaphthalene	17 J	0.067 J	0.073 J	0.035 J	0.27 J	0.01 U	5[B]	320	0.073	
	Acenaphthene	0.82 J	0.05 U	0.057 J	0.0099 J	0.18 J	0.01 U	--	4800	0.06	
	Acenaphthylene	1 U	0.05 U	0.2 U	0.0085 J	0.063 J	0.01 U	--	--	0.069	
	Anthracene	0.91 J	0.05 U	0.06 J	0.022 J	0.2 J	0.01 U	--	24000	1.2	
	Benzo(a)anthracene	0.45 J	0.05 U	0.038 J	0.046 J	0.26 J	0.01 U	--	--	0.27	
	Benzo(a)pyrene	1 U	0.05 U	0.2 U	0.045 J	0.28 J	0.01 U	0.1	0.14	0.21	
	Benzo(b)fluoranthene	1 U	0.05 U	0.2 U	0.051 J	0.3 J	0.01 U	--	--	0.45	
	Benzo(ghi)perylene	1 U	0.05 U	0.2 U	0.035 J	0.22 J	0.01 U	--	--	0.078	
	Benzo(k)fluoranthene	1 U	0.05 U	0.2 U	0.017 J	0.12 J	0.01 U	--	--	0.45	
	Bis(2-ethylhexyl)phthalate	2.7 J	0.068 J	1.5 J	0.094 J	1.2 J	0.0051 J	--	71	0.078	
	Butylbenzylphthalate	1 U	0.05 U	0.2 U	0.04 U	0.11 J	0.01 U	--	16000	0.066	
	Chrysene	0.78 J	0.01 J	0.066 J	0.054 J	0.31 J	0.01 U	--	--	0.46	
	Dibenzofuran	0.68 J	0.05 U	0.042 J	0.012 J	0.093 J	0.01 U	--	160	0.059	
	Dimethylphthalate	1 U	0.05 U	0.2 U	0.04 U	0.038 J	0.01 U	--	80000	0.094	
	Di-n-butylphthalate	1 U	0.05 U	0.13 J	0.04 U	0.15 J	0.01 U	--	8000	2	
	Fuoranthene	1.9 J	0.021 J	0.12 J	0.1 J	0.89 J	0.01 U	--	3200	1.2	
	Fluorene	1.9 J	0.013 J	0.087 J	0.016 J	0.21 J	0.01 U	--	3200	0.081	

Table 7: Soil Sampling Results
Trotsky Property

All concentrations in mg/kg DW, except as noted

Group	Parameter	MW-1-5	MW-1-12.5	MW-2-7.5	MW-2-10	MW-2-15[C]	MW-3-10	MTCA Soil Cleanup Levels		Draft Soil-to-Sediment Screening Level [A]	Sediment Quality Standard (SQS)
		4/23/2007	4/23/2007	4/24/2007	4/24/2007	4/24/2007	4/24/2007	Method A (unrestricted land use)	Method B		
	Indeno(1,2,3-cd)pyrene	1 U	0.05 U	0.2 U	0.033 J	0.2 J	0.01 U	--	--	0.088	
	Naphthalene	3.6 J	0.02 J	0.068 J	0.095 J	1.1 J	0.01 U	5[B]	1600	0.2	
	Pentachlorophenol	10 U	0.5 U	2 U	0.4 U	0.37 J	0.1 U	--	8.3	0.037	
	Phenanthrene	7 J	0.054 J	0.24 J	0.079 J	0.98 J	0.0023 J	--	--	0.49	
	Phenol	3 U	0.038 J	0.59 U	0.12 U	0.051 J	0.03 U	--	48000	0.12	
	Pyrene	2.7 J	0.023 J	0.11 J	0.11 J	0.79 J	0.01 U	--	2400	1.4	
	Total cPAH	0.9	0.045	0.17	0.068	0.41	0.009 U	0.1[D]	0.14[D]	--	
TPH	Gasoline Range Organics	260 J	20 U	10 J	20 U	54 J	20 U	30	--	--	
	Diesel Range Organics	15000 J	50 U	1000 J	61 J	1000 J	50 U	2000	--	--	
	Residual Range Organics	49000 J	100 U	3000 J	210 J	2100 J	100 U	2000	--	--	
Other	Total Solids	76.3%	74.0%	80.0%	86.3%	80.4%	77.6%	--	--	--	
	Total Organic Carbon	4.25%	0.28%	1.63%	2.60%	4.01%	0.30%	--	--	--	

Notes:

Table includes all parameters detected in soil in at least one sample during this study.
Yellow shaded cells are data that exceed MTCA Method A or Method B soil cleanup levels or draft soil-to-sediment screening levels (SAIC 2006).
U = Parameter not detected at the stated reporting level
J = Estimated concentration
[A] SAIC 2006; draft soil-to-sediment screening levels based on SMS CSL values and assuming saturated soil conditions.
[B] Method A Soil Cleanup Level is for total naphthalenes
[C] Field duplicate was collected at this location; result listed is higher of the two detections or lowest detection limit.
[D] For cPAHs, cleanup level for benzo(a)pyrene applies to total cPAHs calculated using the toxicity equivalency method.

Table 8: Soil Sampling Exceedance Summary
Trotsky Property

Group	Parameter	Range of Conc'ns (mg/kg)	MTCA Method A Soil Cleanup Level (mg/kg)	Maximum Exceedance Factor	MTCA Method B Soil Cleanup Level	Maximum Exceedance Factor	Draft Soil-to-Sediment Screening Level[A] (mg/kg)	Maximum Exceedance Factor
Metals	**Arsenic**	1.14 - 11.7	20	<1	0.67	**17**	590	<1
	Chromium	8.7 - 56.6	19	3.0	240	<1	270	<1
	Copper	13.1 - 284	--	--	3000	<1	39	7.3
	Lead	1.82 - 836	250	3.3	--	--	67	**12**
	Mercury	0.019 - 2.01	2	1.0	24	<1	0.03	**67**
	Zinc	18.1 - 220	--	--	24000	<1	38	5.8
PCBs	**PCB-Aroclor 1242**	<0.0049 - 51	--	--	--	--	0.065	**785**
	PCB-Aroclor 1254	<0.0049 - 18	--	--	1.6	**11**	0.065	**277**
	PCB-Aroclor 1260	<0.0049 - 7.5	--	--	--	--	0.065	**115**
	Total PCBs	0.211 - 76.5	--	--	0.5	**153**	0.065	**1180**
Pesticides	Lindane	<0.00049 - 0.013	0.01	1.3	--	--	--	--
SVOCs	**1,2,4-Trichlorobenzene**	<0.01 - 0.058	--	--	800	<1	0.0025	**23**
	1,2-Dichlorobenzene	<0.01 - 0.98	--	--	7200	<1	0.0038	**258**
	1,4-Dichlorobenzene	<0.01 - 2.4	--	--	42	<1	0.015	**160**
	2-Methylnaphthalene	<0.01 - 17	5[B]	3.4	320	<1	0.073	**233**
	Acenaphthene	<0.01 - 0.82	--	--	4800	<1	0.06	**14**
	Benzo(a)anthracene	<0.01 - 0.45	--	--	--	--	0.27	1.7
	Benzo(a)pyrene	<0.01 - 0.28	0.1	2.8	0.14	2.0	0.21	1.3
	Benzo(ghi)perylene	<0.01 - 0.22	--	--	--	--	0.078	2.8
	Bis(2-ethylhexyl)phthalate	0.0051 - 0.16	--	--	71	<1	0.078	2.1
	Butylbenzylphthalate	<0.01 - 0.11	--	--	16000	<1	0.066	1.7
	Chrysene	<0.01 - 0.78	--	--	--	--	0.46	1.7
	Dibenzofuran	<0.01 - 0.68	--	--	160	<1	0.059	**12**
	Fluoranthene	<0.01 - 1.9	--	--	3200	<1	1.2	1.6
	Fluorene	<0.01 - 1.9	--	--	3200	<1	0.081	**23**
	Indeno(1,2,3-cd)pyrene	<0.01 - 0.2	--	--	--	--	0.088	2.3
	Naphthalene	<0.01 - 0.46	5[B]	<1	1600	<1	0.2	1.9
	Pentachlorophenol	<0.01 - 0.37	--	--	8.3	<1	0.037	**10**
	Phenanthrene	0.0023 - 7	--	--	--	--	0.49	**14**
	Pyrene	<0.02 - 2.7	--	--	2400	<1	1.4	1.9
TPH	Gasoline Range Organics	10 - 260	30	8.7	--	--	--	--
	Diesel Range Organics	<50 - 15000	2000	7.5	--	--	--	--
	Residual Range Organics	<100 - 49000	2000	**25**	--	--	--	--

Notes:

Table includes all parameters detected in soil that exceed cleanup/screening levels in at least one sample.
Exceedance factors were calculated as the maximum detected concentration divided by soil cleanup level or screening level
Maximum Exceedance Factor indicates the largest exceedance factor for each parameter across all samples; factors of 10 or greater are shown in bold text.

[A] SAIC 2006; draft soil-to-sediment screening levels based on SMS CSL values and assuming saturated soil conditions.

[B] Method A Soil Cleanup Level is for total naphthalenes

Table 9: Water Sampling Results
Trotsky Property

All concentrations in ug/L

Group	Parameter	B-1	B-2	MW-1[B,C]	MW-2	MW-3	SEEP-1	SEEP-2[C]	OUTFALL-1	MTCA Groundwater Cleanup Levels		Draft Groundwater-to Sediment Screening Levels[A]
		5/22/2007	5/22/2007	5/22/2007	5/22/2007	5/22/2007	5/4/2007	5/7/2007	5/4/2007	Method A	Method B	
Metals, Dissolved	Arsenic	3.9	4.7	25.7	4.17	0.98	6.62	7.42	9.07	5	0.058	370
	Cadmium	0.02 U	0.02 U	0.233	0.02 U	0.026	0.017 J	0.046	0.165	5	8	3.4
	Chromium	2.56	2.16	43	1.37	0.74	2.71	3.07	1.5	50	48	320
	Copper	3.03	0.22 J	36.4	12.3	4.9	1.81	1.9	8.91	--	590	120
	Lead	0.065	0.038	36.5	0.252	0.095	0.281	0.163	0.249	15	--	13
	Mercury	0.03 J	0.2 U	0.12 J	0.03 J	0.03 J	0.2 U	0.2 U	0.2 U	2.0	4.8	0.0074
	Silver	0.1 U	0.1 U	0.22	0.06 J	0.1 U	0.01 J	0.008 J	0.006 J	--	80	1.5
	Zinc	1.23	0.45 J	25.1	7.58	13.2	6.3	23.2	70.5	--	4800	76
Metals, Total	Arsenic	9.02	4.78	30	5.06	1.17	7.51	7.0	8.77	5	0.058	370
	Cadmium	2.47	0.01 J	0.466	0.109	0.018 J	0.119	0.071	0.171	5	8	3.4
	Chromium	21.4	1.99	75.1	6.58	0.75	4.92	1.99	2.1	50	48	320
	Copper	23.1	0.72	70.6	11.3	3.53	7.14	2.31	11.5	--	590	120
	Lead	40.6	0.299	77.5	26.2	0.065	11.8	0.842	2.06	15	--	13
	Mercury	0.38	0.03 J	0.28	0.12 J	0.03 J	0.04 J	0.2 U	0.2 U	2.0	4.8	0.0074
	Silver	0.1 U	0.1 U	0.38	0.15	0.1 U	0.041	0.01 J	0.019 J	--	80	1.5
	Zinc	94.6	1.68	46.2	34.4	13.8	32.3	27	57.8	--	4800	76
PCBs	PCB-Aroclor 1242	0.13	1.7 J	2.9 J	0.75 J	0.02 U	0.021 U	0.02 U	0.029 U	--	--	--
	PCB-Aroclor 1248	0.02 U	0.2 U	0.2 U	0.2 U	0.02 U	0.021 U	0.0094 J	0.031 U	--	--	1.5
	PCB-Aroclor 1254	0.035	0.14 J	1.1 J	0.47 J	0.02 U	0.021 U	0.017 J	0.021 U	--	--	0.86
	PCB-Aroclor 1260	0.014 J	0.069 J	0.54 J	0.42 J	0.02 U	0.5	0.02	0.02 U	--	--	0.31
	PCBs-Total, calc'd	0.179	1.909	4.54	1.64	NA	0.5	0.026	NA	0.1	0.044	1.5
Pesticides	2,4'-DDD	0.0011 U	0.022 U	0.0049 U	0.051 J	0.00048 U	0.016 J	0.00049 U	0.0025 U	--	--	--
	2,4'-DDE	0.00048 U	0.0096 U	0.02 J	0.013 U	0.00034 J	0.013 U	0.00049 U	0.0025 U	--	--	--
	2,4'-DDT	0.001 J	0.0096 U	0.072 J	0.052 J	0.00048 U	0.011 U	0.00042 J	0.0025 U	0.3	0.26	--
	4,4'-DDD	0.0015	0.0096 U	0.0048 U	0.026 J	0.00048 U	0.013 J	0.00049 U	0.0067 J	--	--	--
	4,4'-DDE	0.0018	0.041 U	0.1 J	0.08 J	0.00064 U	0.016	0.0022	0.0056 J	--	--	--
	4,4'-DDT	0.0014	0.01 U	0.041 U	0.04 U	0.0013 J	0.09 J	0.002 J	0.0025 U	0.3	0.26	--
	Aldrin	0.00092	0.02 J	0.0048 U	0.0096 U	0.00048 U	0.00053 U	0.00049 U	0.0012 J	--	0.0026	--
	cis-Chlordane	0.00052	0.026 J	0.019 J	0.0096 U	0.00048 U	NR	0.0049 U	NR	--	0.25	--
	gamma-Chlordane	0.0015 U	0.013 J	0.055 J	0.022 J	0.00048 U	NR	0.00049 U	NR	--	0.25	--
	Lindane	0.0014	0.012 J	0.021 J	0.0096 U	0.00038 J	0.00053 U	0.0011 J	0.0025 U	0.2	0.67	--
SVOCs	1,2,4-Trichlorobenzene	0.2 U	0.34 J	2.7 J	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U	--	80	2.5
	1,2-Dichlorobenzene	0.031 J	1.9 J	4.5 J	0.15 J	0.2 U	0.23 U	0.2 U	0.2 U	--	720	5.2
	1,4-Dichlorobenzene	0.03 J	5.9 J	2.6 J	0.48	0.2 U	1.3	0.2 U	0.2 U	--	1.8	21
	2,4-Dimethylphenol	2 U	20 U	16 J	2 U	2 U	2.3 U	2 U	2 U	--	160	2
	2-Methylnaphthalene	0.2 U	0.76 J	110 J	0.17 J	0.2 U	0.23 U	0.2 U	0.2 U	--	32	31
	2-Methylphenol	0.48 U	4.8 U	19 J	0.48 U	0.48 U	0.56 U	0.49 U	0.5 U	--	400	7.1
	4-Methylphenol	0.062 J	4.8 U	12 J	0.48 U	0.48 U	0.56 U	0.49 U	0.5 U	--	40	77

Table 9: Water Sampling Results
Trotsky Property

All concentrations in ug/L

Group	Parameter	B-1	B-2	MW-1[B,C]	MW-2	MW-3	SEEP-1	SEEP-2[C]	OUTFALL-1	MTCA Groundwater Cleanup Levels		Draft Groundwater-to Sediment Screening Levels[A]
		5/22/2007	5/22/2007	5/22/2007	5/22/2007	5/22/2007	5/4/2007	5/7/2007	5/4/2007	Method A	Method B	
	Acenaphthene	0.2 U	0.76 J	1.8 J	0.22	0.2 U	0.23 U	0.2 U	0.2 U	--	960	9.3
	Acenaphthylene	0.2 U	0.37 J	0.9 J	0.2 U	0.2 U	0.23 U	0.2 U	0.033 J	--		11
	Anthracene	0.058 J	1.1 J	1.2 J	0.18 J	0.088 J	0.23 U	0.2 U	0.2 U	--	4800	59
	Benzo(a)anthracene	0.2 U	0.43 J	0.97 J	0.039 J	0.2 U	0.23 U	0.019 J	0.2 U	--	--	0.63
	Benzo(a)pyrene	0.2 U	0.34 J	0.85 J	0.027 J	0.2 U	0.23 U	0.2 U	0.2 U	0.1	0.012	0.27
	Benzo(b)fluoranthene	0.2 U	0.3 J	0.74 J	0.033 J	0.2 U	0.23 U	0.2 U	0.2 U	--	--	0.56
	Benzo(ghi)perylene	0.2 U	0.29 J	0.73 J	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U	--	--	0.029
	Benzo(k)fluoranthene	0.2 U	0.28 J	0.69 J	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U	--	--	0.57
	Benzoic acid	4.8 U	48 U	100 J	7.2	2.4 J	5.6 U	4.9 U	5 U	--	64000	2200
	Bis(2-ethylhexyl)phthalate	0.96 U	9.6 U	20 U	0.84 J	0.96 U	1.2 U	0.98 U	3.7 U	--	6.3	0.47
	Butylbenzylphthalate	0.2 U	2 U	1.1 J	0.079 J	0.2 U	0.23 U	0.2 U	0.073 J	--	3200	6.8
	Chrysene	0.2 U	0.35 J	0.99 J	0.033 J	0.2 U	0.23 U	0.2 U	0.2 U	--	--	1.9
	Dibenz(a,h)anthracene	0.2 U	2 U	0.75 J	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U	--	--	0.013
	Dibenzofuran	0.2 U	0.47 J	1.3 J	0.082 J	0.2 U	0.23 U	0.2 U	0.2 U	--	32	5.1
	Diethylphthalate	0.2 U	1.4 J	1.0 J	0.073 J	0.2 U	0.049 J	0.028 J	0.16 J	--	13000	870
	Dimethylphthalate	0.2 U	2 U	3.9 U	0.2 U	0.2 U	0.23 U	0.014 J	0.061 J	--	16000	140
	Di-n-butylphthalate	0.2 U	0.59 J	3.9 U	0.085 J	0.045 J	0.11 J	0.069 J	0.13 J	--	1600	1200
	Di-n-octylphthalate	0.2 U	0.42 J	1 J	0.2 U	0.2 U	0.23 U	0.2 U	4.6 U	--	320	23
	Fluoranthene	0.2 U	0.53 J	1.1 J	0.13 J	0.2 U	0.047 J	0.023 J	0.038 J	--	640	17
	Fluorene	0.2 U	0.66 J	2.1 J	0.18 J	0.2 U	0.23 U	0.2 U	0.2 U	--	640	7
	Hexachlorobenzene	0.2 U	0.3 J	0.75 J	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U	--	0.055	0.029
	Indeno(1,2,3-cd)pyrene	0.2 U	0.28 J	0.81 J	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U	--	--	0.033
	Naphthalene	0.2 U	2 U	46 J	1.1	0.2 U	0.23 U	0.012 J	0.2 U	160	160	92
	N-Nitrosodiphenylamine	0.2 U	1.2 J	3.9 J	0.2 U	0.2 U	0.23 U	0.2 U	0.2 U	--	--	2
	Pentachlorophenol	2 U	0.8 J	23 J	0.16 J	2 U	0.064 J	0.98 U	0.99 U	--	0.73	10
	Phenanthrene	0.2 U	0.46 J	2.2 J	0.27	0.2 U	0.23 U	0.017 J	0.026 J	--	--	23
	Phenol	0.48 U	4.8 U	1.5 J	0.48 U	0.48 U	0.56 U	0.49 U	1.2	--	4800	220
	Pyrene	0.2 U	0.48 J	1.2 J	0.12 J	0.2 U	0.045 J	0.021 J	0.038 J	--	480	20
	Total cPAH	0.18	0.51	1.6	0.086	--	--	--	--	0.1	0.012	--
TPH	Gasoline Range Organics	250 U	480 J	6300 J	250 U	250 U	--	--	NR U	800	--	--
	Diesel Range Organics	27 J	64 J	900 J	160 J	630 U	--	--	250 U	500	--	--
	Residual Range Organics	19 J	480 U	680 J	280 J	630 U	--	--	500 U	500	--	--

Notes:

Table includes all parameters detected in groundwater during this study.
Yellow shaded cells are data that exceed MTCA Method A or Method B groundwater cleanup levels or groundwater-to-sediment screening levels.
For MTCA Method B, the lower of the two values for carcinogenic and non-carcinogenic risk was used.
NR - Not reported by laboratory.
NA - Not applicable. Total PCBs were calculated as the sum of detected Aroclors; therefore, if no Aroclors were detected, total PCBs were not calculated.

Table 9: Water Sampling Results
Trotsky Property

All concentrations in ug/L

Group	Parameter	B-1	B-2	MW-1[B,C]	MW-2	MW-3	SEEP-1	SEEP-2[C]	OUTFALL-1	MTCA Groundwater Cleanup Levels		Draft Groundwater-to Sediment Screening Levels [A]
		5/22/2007	5/22/2007	5/22/2007	5/22/2007	5/22/2007	5/4/2007	5/7/2007	5/4/2007	Method A	Method B	

U = Parameter not detected at the stated reporting level.

J = Estimated concentration.

[A] SAIC 2006; draft groundwater-to-sediment screening levels are based on SMS CSL values.

[B] Reporting limits for SVOCs were elevated in this sample; some chemicals listed as not detected may be present at concentrations above groundwater cleanup or screening levels.

[C] Field duplicate was collected at this location; result listed is higher of the two detections or lowest detection limit.

[D] For cPAHs, cleanup level for benzo(a)pyrene applies to total cPAHs calculated using the toxicity equivalency method.

Table 10: Groundwater Sampling Exceedance Summary
Trotsky Property

Group	Parameter	Range of Conc'ns (ug/L)	MTCA Method A Groundwater Cleanup Level (ug/L)	Maximum Exceedance Factor	MTCA Method B Groundwater Cleanup Level (ug/L)	Maximum Exceedance Factor	Draft Groundwater-to-Sediment Screening Levels[A] (ug/L)	Maximum Exceedance Factor
Metals, Total	**Arsenic**	1.17 - 30	5	6	0.058	**517**	370	<1
	Chromium	0.75 - 75.1	50	1.5	48	1.6	320	<1
	Lead	0.065 - 77.5	15	5.2	--	--	13	6
	Mercury	0.03 - 0.38	2	<1	4.8	<1	0.0074	**51**
	Zinc	1.68 - 94.6	--	--	4800	<1	76	1.2
PCBs	PCB-Aroclor 1254	<0.02 - 1.1	--	--	--	--	0.86	1.3
	PCB-Aroclor 1260	<0.02 - 0.54	--	--	--	--	0.31	1.7
	PCBs-Total, calc'd	0.179 - 4.54	0.1	**45**	0.044	**103**	1.5	3
Pesticides	Aldrin	<0.00048 - 0.02	--	--	0.0026	7.7	--	--
SVOCs	1,4-Dichlorobenzene	<0.2 - 5.9	--	--	1.8	3.3	21	<1
	2,4-Dimethylphenol	<2 - 16	--	--	160	<1	2	8
	2-Methylnaphthalene	<0.2 - 110	--	--	32	3.4	31	3.5
	2-Methylphenol	<0.48 - 19	--	--	400	<1	7.1	2.7
	Benzo(a)anthracene	<0.2 - 0.97	--	--	0.012	**81**	0.63	1.5
	Benzo(a)pyrene	<0.2 - 0.85	0.1	8.5	0.012	**71**	0.27	3.1
	Benzo(b)fluoranthene	<0.2 - 0.74	--	--	0.012	**62**	0.56	1.2
	Benzo(ghi)perylene	<0.2 - 0.73	--	--	--	--	0.029	**25**
	Benzo(k)fluoranthene	<0.2 - 0.69	--	--	0.012	**58**	0.56	1.2
	Bis(2-ethylhexyl)phthalate	<0.96 - 0.84		--	6.3	<1	0.47	1.8
	Chrysene	<0.2 - 0.99	--	--	0.012	**83**	1.9	<1
	Dibenz(a,h)anthracene	<0.2 - 0.75	--	--	0.012	**63**	0.013	**58**
	Hexachlorobenzene	<0.2 - 0.75	--	--	0.055	**14**	0.029	**26**
	Indeno(1,2,3-cd)pyrene	<0.2 - 0.81	--	--	0.012	**68**	0.033	**25**
	N-Nitrosodiphenylamine	<0.2 - 3.9	--	--	--	--	2	2
	Pentachlorophenol	<2 - 23	--	--	0.73	**32**	10	2.3
	Total cPAH	0.086 - 1.6	0.1	**16**	0.012	**133**	--	--
TPH	Gasoline Range Organics	<250 - 6300	800	7.9	--	--	--	--
	Diesel Range Organics	27 - 900	500	1.8	--	--	--	--
	Residual Range Organics	19 - 680	500	1.4	--	--	--	--

Notes:

Exceedance factors were calculated as the maximum detected concentration divided by the MTCA cleanup level or groundwater-to-sediment screening level
Maximum exceedance value indicates the largest exceedance factor for each parameter across all samples
Exceedance factors greater than 1 are highlighted in yellow; chemicals of greatest concern (i.e., exceedance factors >10) are shown in **Bold**
[A] SAIC 2006; draft groundwater-to-sediment screening levels based on SMS CSL values

Table 11: Sediment Sampling Results
Trotsky Inlet

Group	Parameter	SED-1 (mg/kg DW)	SED-2 (mg/kg DW)	SED-3 (mg/kg DW)	SED-4 (mg/kg DW)	SED-4-FD (mg/kg DW)	SED-5 (OUTFALL) (mg/kg DW)	SQS (mg/kg DW)	CSL (mg/kg DW)	LAET (mg/kg DW)	2LAET (mg/kg DW)
Metals	Arsenic	48.7	0.77	2.6	3.7	2.3	7.8	57	93	--	--
	Cadmium	36.3	6.69	0.153	0.714	0.603	1.13	5.1	6.7	--	--
	Chromium	1680	507	15.1	28.5	22.6	48.8	260	270	--	--
	Copper	1090	157	19.6	34.4	28.5	146	390	390	--	--
	Lead	10400	4280	35.9	137	115	225	450	530	--	--
	Mercury	247	59.5	0.21	0.203	0.179	0.296	0.41	0.59	--	--
	Silver	19	0.676	0.174	0.13	0.231	0.918	6.1	6.1	--	--
	Zinc	4580	2140	43.5	175	141	255	410	960	--	--
PCBs	PCB-Aroclor 1242	850 J	70 J	0.21 J	0.89 J	2.7 J	0.6 J	--	--	--	--
	PCB-Aroclor 1254	1500 J	120 J	0.36 J	0.74 J	2 J	1.3 J	--	--	--	--
	PCB-Aroclor 1260	580 J	41 J	0.22 J	0.3 J	0.98 U	1.7 J	--	--	--	--
	PCBs, total calc'd	2930	231	0.79	1.93	4.7	3.6	--	--	0.13	1
Pesticides	2,4'-DDD	22 U	1.8 U	0.0099 U	0.015 U	0.028 U	0.11 J	--	--	--	--
	2,4'-DDT	45 U	5.9 J	0.021 J	0.032 J	0.044 J	0.15 J	--	--	--	--
	4,4'-DDD	15 J	2 J	0.0066 J	0.022 J	0.034 J	0.035	--	--	--	--
	4,4'-DDE	16 J	3.6 J	0.02 J	0.042 J	0.06 J	0.21 J	--	--	--	--
	4,4'-DDT	46 J	5.8 J	0.022 J	0.047 J	0.051 J	0.00099 U	--	--	--	--
	Lindane	10 U	1 U	0.0099 U	0.0098 U	0.0098 U	0.0017 J	--	--	--	--
SVOCs	1,2,4-Trichlorobenzene	0.94 J	2.1 U	0.049 U	0.1 U	0.1 U	0.1 U	--	--	0.031	0.051
	1,2-Dichlorobenzene	0.67 J	2.1 U	0.049 U	0.1 U	0.1 U	0.1 U	--	--	0.035	0.05
	1,4-Dichlorobenzene	2 U	1.1 J	0.049 U	0.1 U	0.1 U	0.1 U	--	--	0.11	0.12
	2-Methylnaphthalene	1.6 J	0.49 J	0.049 U	0.028 J	0.032 J	0.035 J	--	--	0.67	1.4
	4-Methylphenol	0.51 J	2.1 U	0.03 J	0.1 U	0.1 U	0.1 U	0.67	0.67	--	--
	Acenaphthene	0.47 J	2.1 U	0.012 J	0.1 U	0.041 J	0.1 U	--	--	0.5	0.73
	Acenaphthylene	0.48 J	2.1 U	0.049 U	0.1 U	0.1 U	0.1 U	--	--	1.3	1.3
	Anthracene	0.63 J	0.75 J	0.012 J	0.023 J	0.15 J	0.035 J	--	--	0.96	4.4
	Benzo(a)anthracene	0.53 J	4.2 J	0.019 J	0.087 J	0.34 J	0.067 J	--	--	1.3	1.6
	Benzo(a)pyrene	0.94 J	3.3 J	0.019 J	0.09 J	0.26 J	0.07 J	--	--	1.6	3
	Benzo(b)fluoranthene	1.1 J	4.5 J	0.031 J	0.14 J	0.42 J	0.13 J	--	--	--	--
	Benzo(ghi)perylene	0.91 J	2.2 J	0.02 J	0.088 J	0.21 J	0.098 J	--	--	0.67	0.72
	Benzo(k)fluoranthene	0.38 J	2 J	0.012 J	0.053 J	0.15 J	0.036 J	--	--	--	--
	Bis(2-ethylhexyl)phthalate	6.5 J	17 J	0.14 J	0.76 J	0.42 J	2.2 J	--	--	1.3	1.9
	Butylbenzylphthalate	3.3 J	2.1 U	0.049 U	0.1 U	0.1 U	0.88 J	--	--	0.063	0.9
	Chrysene	0.92 J	4.8 J	0.022 J	0.098 J	0.29 J	0.074 J	--	--	1.4	2.8
	Dibenzo(a,h)anthracene	0.32 J	0.57 J	0.049 U	0.02 J	0.042 J	0.1 U	--	--	0.23	0.54
	Dibenzofuran	2 U	2.1 U	0.0083 J	0.1 U	0.035 J	0.1 U	--	--	0.54	0.7
	Dimethylphthalate	0.44 J	2.1 U	0.049 U	0.013 J	0.1 U	0.13 J	--	--	0.071	0.16
	Fluoranthene	1.1 J	7.3 J	0.054 J	0.17 J	1 J	0.17 J	--	--	1.7	2.5
	Fluorene	0.44 J	2.1 U	0.0098 J	0.1 U	0.081 J	0.019 J	--	--	0.54	1
	Indeno(1,2,3-cd)pyrene	0.77 J	1.9 J	0.02 J	0.085 J	0.21 J	0.069 J	--	--	0.6	0.69

Table 11: Sediment Sampling Results
Trotsky Inlet

Group	Parameter	SED-1 (mg/kg DW)	SED-2 (mg/kg DW)	SED-3 (mg/kg DW)	SED-4 (mg/kg DW)	SED-4-FD (mg/kg DW)	SED-5 (OUTFALL) (mg/kg DW)	SQS (mg/kg DW)	CSL (mg/kg DW)	LAET (mg/kg DW)	2LAET (mg/kg DW)
	Naphthalene	0.84 J	2.1 U	0.017 J	0.034 J	0.1 U	0.035 J	--	--	2.1	2.4
	Pentachlorophenol	14 J	21 U	0.49 U	1 U	1 U	1 U	0.36	0.69	--	--
	Phenanthrene	1.4 J	0.72 J	0.032 J	0.057 J	0.8 J	0.097 J	--	--	1.5	5.4
	Phenol	0.74 J	6.2 U	0.024 J	0.3 U	0.3 U	0.3 U	0.42	1.2	--	--
	Pyrene	1.5 J	7.7 J	0.053 J	0.19 J	0.82 J	0.22 J	--	--	2.6	3.3
TPH	Gasoline Range Organics	20 U	200 J	20 U	20 U	20 U	20 U	--	--	--	--
	Diesel Range Organics	10000 J	6800 J	100 J	380 J	210 J	280 J	--	--	--	--
	Residual Range Organics	20000 J	15000 J	400 J	1500 J	650 J	1200 J	--	--	--	--
Other	Total Solids	57.7%	48.6%	85.5%	84.1%	80.7%	71.7%	--	--	--	--
	Total Organic Carbon	12.00%	6.45%	1.07%	0.95%	1.02%	1.88%	--	--	--	--

Notes:

Table includes all parameters detected in sediment during this study.
Yellow shaded cells are data that exceed one or more cleanup or screening levels.
U = Parameter not detected at the stated reporting level
J = Estimated concentration
SQS = Sediment Quality Standard
CSL = Cleanup Screening Level
LAET = Lowest Apparent Effects Threshold
2LAET = Two times the LAET

Table 12: Sediment Sampling Results, Organic-Carbon Normalized
Trotsky Inlet

All concentrations in mg/kg OC, except as noted

Group	Parameter	SED-1[A]	SED-2[A]	SED-3	SED-4	SED-4-FD	SED-5 (Outfall)	SQS	CSL
	Total Organic Carbon	12.0%	6.45%	0.01	0.95%	1.02%	1.88%		
PCBs	PCB-Aroclor 1242	--	--	20	94	265	32	--	--
	PCB-Aroclor 1254	--	--	34	78	196	69	--	--
	PCB-Aroclor 1260	--	--	21	32	ND	90	--	--
	PCBs, total calc'd	--	--	74	203	461	191	12	65
SVOCs	1,2,4-Trichlorobenzene	--	--	ND	ND	ND	ND	0.81	1.8
	1,2-Dichlorobenzene	--	--	ND	ND	ND	ND	2.3	2.3
	1,4-Dichlorobenzene	--	--	ND	ND	ND	ND	3.1	9
	2-Methylnaphthalene	--	--	ND	2.9	3.1	1.9	38	64
	Acenaphthene	--	--	1.1	ND	4.0	ND	16	57
	Acenaphthylene	--	--	ND	ND	ND	ND	66	66
	Anthracene	--	--	1.1	2.4	15	1.9	220	1200
	Benzo(a)anthracene	--	--	1.8	9.2	33	3.6	110	270
	Benzo(a)pyrene	--	--	1.8	9.5	25	3.7	99	210
	Benzo(b)fluoranthene	--	--	2.9	15	41	6.9	--	--
	Benzo(ghi)perylene	--	--	1.9	9.3	21	5.2	31	78
	Benzo(k)fluoranthene	--	--	1.1	5.6	15	1.9	--	--
	Bis(2-ethylhexyl)phthalate	--	--	13	80	41	117	47	78
	Butylbenzylphthalate	--	--	ND	ND	ND	47	4.9	64
	Chrysene	--	--	2.06	10	28	3.9	110	460
	Dibenzo(a,h)anthracene	--	--	ND	2.1	4.1	ND	12	33
	Dibenzofuran	--	--	0.78	ND	3.4	ND	15	58
	Dimethylphthalate	--	--	ND	1.4	ND	6.9	53	53
	Fuoranthene	--	--	5.0	18	98	9.0	160	1200
	Fluorene	--	--	0.92	ND	7.9	1.0	23	79
	Indeno(1,2,3-cd)pyrene	--	--	1.9	8.9	21	3.7	34	88
	Naphthalene	--	--	1.6	3.6	ND	1.9	99	170
	Phenanthrene	--	--	3.0	6.0	78	5.2	100	480
	Pyrene	--	--	5.0	20	80	12	1000	1400
	Total benzofluoranthenes			4.0	20	56	8.8	230	450
	Total HPAH			23	107	367	50	960	5300
	Total LPAH			7.7	12	105	9.9	370	780

Notes:

Yellow shaded cells are data that exceed the SQS or CSL values.

ND - Not Detected

[A] Organic carbon normalization is not considered to be appropriate for TOC concentrations less than or equal to 0.5% or greater than or equal to 4.0%. In these cases, dry weight chemical concentrations were compared to the LAET or 2LAET values (see Table 11).

Table 13: Sediment Sampling Exceedance Summary
Trotsky Inlet

Group	Parameter	Range of Conc'ns (mg/kg DW)	Range of Conc'ns (mg/kg OC)	SQS	SQS Units	Maximum Exceedance Factor	LAET (mg/kg DW)	Maximum Exceedance Factor
Metals	Cadmium	0.153 - 36.3	NA	5.1	mg/kg DW	7.1	--	--
	Chromium	15.1 - 1680	NA	260	mg/kg DW	6.5	--	--
	Copper	19.6 - 1090	NA	390	mg/kg DW	2.8	--	--
	Lead	35.9 - 10400	NA	450	mg/kg DW	**23**	--	--
	Mercury	0.179 - 247	NA	0.41	mg/kg DW	**602**	--	--
	Silver	0.13 - 19	NA	6.1	mg/kg DW	3.1	--	--
	Zinc	43.5 - 4580	NA	410	mg/kg DW	**11**	--	--
PCBs	**Total PCBs**	0.79 - 2930	74 - 461	12	mg/kg OC	**38**	0.13	**22,500**
SVOCs	**1,2,4-Trichlorobenzene**	<0.049 - 0.94	--	--	mg/kg OC	NA	0.031	**30**
	1,2-Dichlorobenzene	<0.049 - 0.67	--	--	mg/kg OC	NA	0.035	**19**
	1,4-Dichlorobenzene	<0.049 - 1.1	--	--	mg/kg OC	NA	0.11	**10**
	2-Methylnaphthalene	0.028 - 1.6	1.9 - 3.1	38	mg/kg OC	<1	0.67	2.4
	Benzo(a)anthracene	0.019 - 4.2	1.8 - 33	110	mg/kg OC	<1	1.3	3.2
	Benzo(a)pyrene	0.019 - 3.3	1.8 - 25	99	mg/kg OC	<1	1.6	2.1
	Benzo(ghi)perylene	0.02 - 2.2	1.9 - 21	31	mg/kg OC	<1	0.67	3.3
	Bis(2-ethylhexyl)phthalate	0.14 - 17	13 - 80	47	mg/kg OC	1.7	1.3	**13**
	Butylbenzylphthalate	<0.049 - 3.3	NA	NA	mg/kg OC	NA	0.063	**52**
	Chrysene	0.022 - 4.8	2.1 - 28	110	mg/kg OC	<1	1.4	3.4
	Dibenzo(a,h)anthracene	<0.049 - 0.57	2.1 - 4.1	12	mg/kg OC	<1	0.23	2.5
	Dimethylphthalate	<0.049 - 0.44	1.4	53	mg/kg OC	<1	0.071	6.2
	Fluoranthene	0.054 - 7.3	5.0 - 98	160	mg/kg OC	<1	1.7	4.3
	Indeno(1,2,3-cd)pyrene	0.02 - 0.77	1.9 - 21	34	mg/kg OC	<1	0.6	1.3
	Pentachlorophenol	<0.49 - 14	NA	0.36	mg/kg DW	**39**	--	--
	Phenol	0.024 - 0.74	NA	0.42	mg/kg DW	1.8	--	--
	Pyrene	0.053 - 7.7	5.0 - 80	1000	mg/kg OC	<1	2.6	3.0

Notes:

1 - Exceedance factors were calculated as the maximum detected concentration divided by the SQS or LAET

2 - Maximum exceedance values indicate the largest exceedance factor for each parameter across all samples

3 - Exceedance factors greater than 1 are highlighted in yellow; chemicals of greatest concern (i.e., exceedance factors >10) are shown in Bold

4 - For samples SED-1 and SED-2, which had TOC concentrations >4%, organic carbon normalization was considered inappropriate; therefore, chemicals detected in these two samples for which the SQS is expressed in units of mg/kg OC were compared to the LAET instead.

NA = Not applicable

Table 14: Seep Sampling Exceedance Summary
Trotsky Inlet

Group	Parameter	Range of Conc'ns (ug/L)	MTCA Method A Groundwater Cleanup Level (ug/L)	Maximum Exceedance Factor	MTCA Method B Groundwater Cleanup Level (ug/L)	Maximum Exceedance Factor	Draft Groundwater-to-Sediment Screening Levels[A] (ug/L)	Maximum Exceedance Factor
Metals, Total	**Arsenic**	<5 - 7.51	5	1.5	0.058	**129**	370	<1
	Mercury	< 0.0021 - 0.04	2	<1	4.8	<1	0.0074	5.4
PCBs	PCB-Aroclor 1260	<0.02 - 0.5	--	--	--	--	0.31	1.6
	Total PCBs	0.0254 - 0.5	0.1	5.0	0.044	**11**	1.5	<1

Notes:

Exceedance factors were calculated as the maximum detected concentration divided by the MTCA cleanup level or groundwater-to-sediment screening level
Maximum exceedance value indicates the largest exceedance factor for each parameter across all samples
Exceedance factors greater than 1 are highlighted in yellow; chemicals of greatest concern (i.e., exceedance factors >10) are shown in **Bold**
[B] SAIC 2006; draft groundwater-to-sediment screening levels based on SMS CSL values

Table 15: Outfall Sampling Exceedance Summary
Trotsky Inlet

Group	Parameter	Outfall Solids Conc'n (mg/kg DW)	Outfall Solids Conc'n (mg/kg OC)]	SQS (mg/kg DW)	SQS (mg/kg OC)	Maximum Exceedance Factor	Outfall Water Concentration (ug/L)	MTCA Groundwater Cleanup Level[A] (ug/L)	Maximum Exceedance Factor	Draft Groundwater-to-Sediment Screening Levels[B] (ug/L)	Maximum Exceedance Factor
Metals	**Arsenic**	7.8	--	57	--	<1	9.07	0.058	**156**	370	<1
PCBs	**Total PCBs**	3.6	191	--	12	**16**	--	--	**--**	--	--
SVOCs	Bis(2-ethylhexyl)phthalate	2.2	117	--	47	2.5	<3.7	6.3	<1	0.47	<1
	Butylbenzylphthalate	0.88	47	--	4.9	9.6	0.073	3200	<1	6.8	<1

Notes:

Exceedance factors were calculated as the maximum detected concentration divided by the MTCA cleanup level or groundwater-to-sediment screening level
Maximum exceedance value indicates the largest exceedance factor for each parameter across all samples
Exceedance factors greater than 1 are highlighted in yellow; chemicals of greatest concern (i.e., exceedance factors >10) are shown in **Bold**

[A] MTCA Groundwater Cleanup Level is lower of Method A and Method B

[B] SAIC 2006; draft groundwater-to-sediment screening levels based on SMS CSL values

Table 16: Soil Sampling Results
Douglas Management Company Property

All concentrations in mg/kg DW, except as noted

Group	Parameter	MW-08-30	MW-09-15	MW-10-20	MW-11-15	MW-12-15	MW-12-25	MTCA Soil Cleanup Levels		Draft Soil-to-Sediment Screening Levels [A]	Sediment Quality Standard (SQS)
		6/18/2008	6/18/2008	6/18/2008	6/19/2008	6/19/2008	6/19/2008	Method A (unrestricted land use)	Method B		
Metals	Arsenic	19.7	7.28	10.5	3.72	4	4.66	20	0.67	590	57
	Cadmium	1.66 J	0.348 J	0.16 J	0.146	0.43	0.181	2	80	1.7	5.1
	Chromium	69.5	20.6	22.7	13.3	16.7	12.1	19	240	270	260
	Copper	42.9	28.7	37.6	17.3	23.3	18.2	--	3000	39	390
	Lead	562 J	11.6 J	10.9 J	5.81	22.5	15	250	--	67	450
	Mercury	0.165	0.129	0.635	0.068	0.098	0.135	2	24	0.03	0.41
	Silver	0.303	0.231	0.112	0.087	0.065	0.056	--	400	0.61	--
	Zinc	835	64.7	48.4	41.5	119	40.4	--	24000	38	410
PCBs	PCB-Aroclor 1248	0.0078 U	0.081 U	15	0.0067 U	0.0059 U	0.8	--	--	0.065	
	PCB-Aroclor 1254	0.08	0.17	12	0.059	0.24	0.53	--	1.6	0.065	
	PCB-Aroclor 1260	0.1	0.12	0.76 U	0.0067 U	0.0059 U	0.4	--	--	0.065	
	PCBs, total calc'd	0.18	0.29	27	0.059	0.24	1.7	--	0.5	0.065	
Pesticides	2,4'-DDD	0.0068 J	0.0037 U	1.3 J	0.0014 U	0.0025 U	0.0085 U	--	4.2	--	
	4,4'-DDD	0.0027	0.0048	0.16	0.0013	0.0016	0.014	--	4.2	--	
	2,4'-DDE	0.001 J	0.0026 U	0.064 U	0.00067 U	0.00059 U	0.00063 U	--	2.9	--	
	4,4'-DDE	0.0015 J	0.0044 U	0.16	0.00067 U	0.00069 U	0.013 J	--	2.9	--	
	2,4'-DDT	0.0061	0.0094	0.48	0.0034	0.013 J	0.022	3	2.9	--	
	4,4'-DDT	0.0027 U	0.019	0.093	0.0035	0.0096	0.021	3	2.9	--	
SVOCs	2-Methylnaphthalene	0.067	0.006 J	0.054	0.0038 J	2.2	0.025	5[C]	320	0.073	
	Acenaphthene	0.014	0.0025 J	0.056	0.0066 U	0.037	0.0028 J	--	4800	0.06	
	Acenaphthylene	0.0057 J	0.0013 J	0.0033 J	0.0066 U	0.03 U	0.0015 J	--	--	0.069	
	Anthracene	0.014	0.0046 J	0.018	0.0022 J	0.021 J	0.0065	--	24000	1.2	
	Benzo(a)anthracene	0.021	0.01	0.015	0.0036 J	0.017 J	0.0098	--	--	0.27	
	Benzo(a)pyrene	0.019	0.006 J	0.0072 J	0.0025 J	0.015 J	0.0069	0.1	0.14	0.21	
	Benzo(b)fluoranthene	0.025	0.0093	0.01	0.004 J	0.021 J	0.0083	--	--	0.45	
	Benzo(ghi)perylene	0.013	0.0071 U	0.0046 J	0.0066 U	0.03 U	0.0049 J	--	--	0.078	
	Benzo(k)fluoranthene	0.0083	0.0032 J	0.0034 J	0.0066 U	0.03 U	0.0029 J	--	--	0.45	
	Bis(2-ethylhexyl)phthalate	0.019 J	0.029 J	0.038 J	0.014 J	0.16 J	0.1	--	71	0.078	
	Chrysene	0.031	0.014	0.016	0.0035 J	0.018 J	0.013	--	--	0.46	
	Dibenzofuran	0.0096	0.0042 J	0.023	0.0018 J	0.022 J	0.0024 J	--	160	0.059	
	Diethylphthalate	0.0079 U	0.0071 U	0.0076 U	0.0017 J	0.03 U	0.0063 U	--	64000	0.36	
	Fluoranthene	0.056	0.025	0.26	0.0091	0.045	0.033	--	3200	1.2	
	Fluorene	0.019	0.004 J	0.035	0.002 J	0.051	0.004 J	--	3200	0.081	
	Indeno(1,2,3-cd)pyrene	0.014	0.0043 J	0.0056 J	0.0066 U	0.03 U	0.0052 J	--	--	0.088	
	Naphthalene	0.065	0.0036 J	0.031	0.0066 U	0.46	0.0075	5[C]	1600	0.2	
	Phenanthrene	0.054	0.017	0.065	0.0076	0.1	0.018	--	--	0.49	
	Pyrene	0.057	0.022	0.17	0.01	0.048	0.027	--	2400	1.4	
	Total cPAHs	0.03	0.010	0.012	0.005	0.028	0.011	0.1[E]	0.14[E]	--	

Table 16: Soil Sampling Results
Douglas Management Company Property

All concentrations in mg/kg DW, except as noted

Group	Parameter	MW-08-30	MW-09-15	MW-10-20	MW-11-15	MW-12-15	MW-12-25	MTCA Soil Cleanup Levels		Draft Soil-to-Sediment Screening Levels[A]	Sediment Quality Standard (SQS)
		6/18/2008	6/18/2008	6/18/2008	6/19/2008	6/19/2008	6/19/2008	Method A (unrestricted land use)	Method B		
TPH	Gasoline Range Organics-NWTPH	7.7 J	20 U[D]	20 U[D]	20 U[D]	100 J	20 U[D]	30	--	--	
	Diesel Range Organics	670 J	43	72	50 U[D]	410 J	90	2000	--	--	
	Residual Range Organics (Heavy Oil)	970 J	100 J	180 J	100 U[D]	490 J	290 J	2000	--	--	
VOCs	1,2,4-Trimethylbenzene	0.0066 J	0.025 U	0.011 J	0.00017 J	0.38	0.0015 J	--	4000	--	
	1,3,5-Trimethylbenzene	0.0026 J	0.025 U	0.0047 J	0.022 U	0.091 J	0.023 U	--	4000	--	
	1,3-Dichlorobenzene	0.0068 U	0.0062 U	0.00038 J	0.0055 U	0.053 U	0.0056 U	--	--	--	
	1,4-Dichlorobenzene	0.0068 U	0.0062 U	0.00075 J	0.0055 U	0.053 U	0.0056 U	--	42	0.015	
	2-Butanone	0.027 U	0.025 U	0.032 U	0.0042 J	2.1 U	0.0065 J	--	48000	--	
	Acetone	0.047	0.032	0.051	0.027	0.31 J	0.038	--	8000	--	
	Benzene	0.0068 U	0.0062 U	0.052	0.0055 U	0.071	0.014	0.03	18	--	
	Bromomethane	0.0068 U	0.0011 J	0.0012 J	0.0055 U	0.053 U	0.0025 J	--	110	--	
	Carbon Disulfide	0.0014 J	0.002 J	0.0034 J	0.0022 J	0.053 U	0.0039 J	--	8000	--	
	CFC-12	0.0068 U	0.0062 U	0.0079 U	0.0055 U	0.055	0.0097	--	--	--	
	Chloromethane	0.0068 U	0.0062 U	0.0079 U	0.0055 U	0.022 J	0.00048 J	--	77	--	
	Ethylbenzene	0.0024 J	0.00025 J	0.0033 J	0.0055 U	0.085	0.0006 J	6	8000	--	
	Isopropylbenzene (Cumene)	0.0079 J	0.025 U	0.0061 J	0.022 U	0.11 J	0.001 J	--	8000	--	
	m,p-Xylenes	0.0049 J	0.0062 U	0.0034 J	0.00022 J	0.32	0.0016 J	9[B]	16000	--	
	Methylene Chloride	0.014 U	0.00033 J	0.00056 J	0.00041 J	0.095 J	0.0023 J	0.02	130	--	
	Naphthalene	0.0049 J	0.0028 J	0.0072 J	0.0068 J	1.5	0.0095 J	5	1600	0.2	
	n-Butylbenzene	0.00095 J	0.025 U	0.0026 J	0.022 U	0.4	0.0047 J	--	--	--	
	n-Propylbenzene	0.0016 J	0.025 U	0.0028 J	0.022 U	0.54	0.0048 J	--	--	--	
	o-Xylene	0.0024 J	0.0062 U	0.002 J	0.0055 U	0.085	0.00049 J	9[B]	16000	--	
	p-Isopropyltoluene	0.0011 J	0.025 U	0.0026 J	0.022 U	0.21 U	0.023 U	--	--	--	
	Sec-Butylbenzene	0.0013 J	0.025 U	0.0034 J	0.022 U	0.12 J	0.0015 J	--	--	--	
	Tetrachloroethene	0.0068 U	0.0062 U	0.0079 U	0.0055 U	0.016 J	0.0056 U	0.05	1.9	--	
	Toluene	0.00098 J	0.00045 J	0.0014 J	0.00065 J	0.18	0.0014 J	7	6400	--	
Other	Total Solids	64%	70.8%	65.9%	75.2%	84.8%	79.3%	--	--	--	
	Total Organic Carbon	2.26%	0.86%	2.29%	0.52%	1.33%	0.30%	--	--	--	

Notes:

Table includes all parameters detected in soil in at least one sample during this study.
Yellow shaded cells are data that exceed MTCA Method A or Method B soil cleanup levels or draft soil-to-sediment screening levels.
U = Parameter not detected at the stated reporting level
J = Estimated concentration
[A] SAIC 2006; draft soil-to-sediment screening levels based on SMS CSL values and assuming saturated soil conditions.
[B] Method A Soil Cleanup Level is for total xylenes
[c] Method A Soil Cleanup Level is for total naphthalenes
[D] HCID gasoline-range concentration, assuming saturated soil conditions.
[E] For cPAHs, cleanup level for benzo(a)pyrene applies to total cPAHs calculated using the toxicity equivalency method.

Table 17: Soil Sampling Exceedance Summary
Douglas Management Company Property

Group	Parameter	Range of Conc'ns (mg/kg)	MTCA Method A Soil Cleanup Level (mg/kg)	Maximum Exceedance Factor	MTCA Method B Soil Cleanup Level (mg/kg)	Maximum Exceedance Factor	Draft Soil-to-Sediment Screening Level[A] (mg/kg)	Maximum Exceedance Factor
Metals	**Arsenic**	3.72 - 19.7	20	<1	0.67	**29**	590	<1
	Chromium	12.1 - 69.5	19	3.7	240	<1	270	<1
	Copper	17.3 - 42.9	--	--	3000	<1	39	1.1
	Lead	5.81 - 562	250	2.2	--	--	67	8.4
	Mercury	0.068 - 0.635	2	<1	24	<1	0.03	**21**
	Zinc	40.4 - 835	--	--	24000	<1	38	**22**
PCBs	**PCB-Aroclor 1248**	<0.0059 - 0.8	--	--	--	--	0.065	**12**
	PCB-Aroclor 1254	0.059 - 12	--	--	1.6	7.5	0.065	**185**
	PCB-Aroclor 1260	<0.0059 - 0.4	--	--	--	--	0.065	6.2
	Total PCBs	0.059 - 27	--	--	0.5	**54**	0.065	**415**
SVOCs	**2-Methylnaphthalene**	0.0038 - 2.2	5[B]	<1	320	<1	0.073	**30**
	Bis(2-ethylhexyl)phthalate	0.014 - 0.16	--	--	71	<1	0.078	2.1
	Naphthalene	0.0036 - 0.46	5[B]	<1	1600	<1	0.2	2.3
	Total cPAHs	0.037 - 0.12	0.1[C]	1.2	0.14[C]	<1	--	--
TPH	Gasoline Range Hydrocarbons	7.7 - 100	30	3.3	--	--	--	--
VOCs	Benzene	<0055 - 0.071	0.03	2.4	18	<1	--	--
	Naphthalene	0.0028 - 1.5	5	<1	1600	<1	0.2	7.5

Notes:

Table includes all parameters detected in soil that exceed cleanup/screening levels in at least one sample.
Exceedance factors were calculated as the maximum detected concentration divided by the MTCA cleanup level or soil-to-sediment screening level
Maximum exceedance value indicates the largest exceedance factor for each parameter across all samples;
Exceedance factors greater than 1 are highlighted in yellow; chemicals of greatest concern (i.e., exceedance factors >10) are shown in **Bold**

[A] SAIC 2006; draft soil-to-sediment screening levels based on SMS CSL values and assuming saturated soil conditions.

[B] Method A Soil Cleanup Level is for total naphthalenes

[C] For cPAHs, cleanup level for benzo(a)pyrene applies to total cPAHs calculated using the toxicity equivalency method.

Table 18: Water Sampling Results
Douglas Management Company Property

All concentrations in ug/L, except as noted.

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Group	Parameter	MW-01	MW-03	MW-04	MW-04-FD	MW-05	MW-08	MW-09	MW-10	MW-11	MW-12	SP-01	MTCA Groundwater Cleanup Levels		Draft Groundwater-to-Sediment Screening Levels[A]
		7/16/2008	7/16/2008	7/16/2008	7/16/2008	7/17/2008	7/17/2008	7/17/2008	7/17/2008	7/17/2008	7/16/2008	7/18/2008	Method A	Method B	
Metals	Arsenic	5 U	5 U	5 U	5 U	5 U	5 U	5.4	5 U	5 U	5 U	5 U	5	0.058	370
	Cadmium	0.02 U	0.02 U	0.02 U	0.02 U	0.04	0.02 U	0.03	0.03	0.02 U	0.02 U	0.02 U	5	8	3.4
	Chromium	1.3	3.5	2.2	2.4	15.1	1.3	1.2	0.7	0.5	1.3	0.7	50	48	320
	Copper	0.3	2	0.3	0.2	1.6	0.5	0.9	0.3	0.9	0.5	1.6	--	590	120
	Lead	0.03	0.31	0.11	0.11	1.4	1.61	0.76	0.1	0.03	0.5	0.75	15	--	13
	Mercury	0.001 U	0.0026	0.001 U	0.0011	0.005	0.0025	0.0071	0.001	0.0012	0.0029	0.0021	2.0	4.8	0.0074
	Silver	0.02 U	0.02 U	0.02 U	0.02 U	0.04	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	--	80	1.5
	Zinc	0.7	6	1.1	1.4	13.2	6.5	4.6	1.3	8.3	2.5	4.1	--	4800	76
PCBs	PCB-aroclor 1242	0.02 U	0.02 U	0.02 U	0.02 U	0.023 U	0.02 U	0.02 U	0.11	0.02 U	0.1	0.02 U	--	--	--
	PCB-aroclor 1248	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.034	0.02 U	0.02 U	0.02 U	0.02 U	--	--	1.5
	Total PCBs	NA	NA	NA	NA	NA	NA	0.034	0.11	NA	0.1	NA	0.1	0.044	1.5
Pesticides	2,4'-DDT	0.0005 U	0.00049 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0016 U	0.00062 U	0.0005 U	0.0015	0.0005 U	0.3	0.26	--
	4,4'-DDT	0.0005 U	0.00049 U	0.002 U	0.0013 U	0.0014 U	0.0005 U	0.00049 U	0.0005 U	0.0005 U	0.0024 J	0.0005 U	0.3	0.26	--
	Dieldrin	0.0005 U	0.0041 J	0.0005 U	0.0005 U	0.004 J	0.0011 U	0.0012 U	0.0005 U	0.0005 U	0.0015 U	0.0038 U	--	0.0055	--
	Heptachlor	0.0005 U	0.00049 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.002 U	0.0013 J	0.0005 U	0.0005 U	0.00088 U	--	0.019	--
SVOCs	2-Methylnaphthalene	0.19 U	0.26	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.3	0.2 U	--	32	31
	Acenaphthene	0.19 U	5.7	0.2 U	0.2 U	0.2 U	0.2 U	0.28	0.68	0.2 U	0.19 U	0.35	--	--	9.3
	Isophorone	NR	NR	NR	NR	0.2	0.2 U	0.2 U	0.2 U	0.2 U	NR	0.2 U	--	46	--
	Naphthalene	0.19 U	8.9	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.19 U	0.2 U	160	160	92
	Phenanthrene	0.19 U	2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.19 U	0.2 U	--	--	23
	Phenol	0.48 U	2.2	3	2.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.48 U	0.5 U	--	4800	220
TPH	Gasoline Range Organics	--	--	350 J	350 J	--	--	--	--	--	250 U	--	800	--	--
	Diesel Range Organics	250 U	--	730 J	720 J	750 J	--	--	--	--	680 J	--	500	--	--
VOCs	1,2-Dichloroethane	0.5 U	2.5	2.9	2.9	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U	5	--	--
	1,3,5-Trimethylbenzene	2 U	2 U	2.3	2.3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	400	--
	Acetone	20 U	20 U	20 U	22	20 U	20 U	20 U	20 U	20 U	20 U	20 U	--	800	--
	Benzene	0.5 U	89	100	99	0.5 U	0.5 U	0.8	1.1	0.5 U	59	0.5 U	5	0.8	--
	Chloroform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.6	0.5 U	1.7	--	7.2	--
	Ethylbenzene	0.5 U	0.5 U	0.89	0.91	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	700	800	--
	m, p-Xylene	0.5 U	1.9	15	15	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1000[B]	1600[B]	--
	Naphthalene	2 U	13	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	160[C]	160	92
	n-Butylbenzene	2 U	2 U	3.5	3.4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	--	--	--
	o-Xylene	0.5 U	0.78	1.6	1.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1000[B]	1600[B]	--
	Toluene	0.5 U	0.89	3.9	4.1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.73	0.5 U	1000	640	--
Conventionals	Chloride	1420000	15500	25600	25400	268000	1820000	2030000	1150000	1800000	99000	541000	--	--	--

Notes:

Table includes all parameters detected in groundwater in at least one sample during this study.
Yellow shaded cells are data that exceed MTCA Method A or Method B groundwater cleanup levels.
No data exceeded the draft groundwater-to-sediment screening levels.
NA - Not applicable. Total PCBs were calculated as the sum of detected Aroclors; therefore, if no Aroclors were detected, total PCBs were not calculated.
U = Parameter not detected at the stated reporting level.
J = Estimated concentration.
[A] SAIC 2006; draft groundwater-to-sediment screening levels are based on SMS CSL values.
[B] Method A and Method B groundwater cleanup level is for total xylenes.
[c] Method A groundwater cleanup level is for total naphthalenes.

Table 19: Groundwater Sampling Exceedance Summary
DMC Property

Group	Parameter	Range of Conc'ns (ug/L)	MTCA Method A Groundwater Cleanup Level (ug/L)	Maximum Exceedance Factor	MTCA Method B Groundwater Cleanup Level (ug/L)	Maximum Exceedance Factor	Groundwater-to-Sediment Screening Levels[A] (ug/L)	Maximum Exceedance Factor
Metals, Total	**Arsenic**	<5 - 5.4	5	1.1	0.058	**93**	370	<1
PCBs	PCBs-Total, calc'd	0.034 - 0.11	0.1	1.1	0.044	2.5	1.5	<1
TPH	Diesel Range Organics	<250 - 750	500	1.5	--	--	--	--
VOCs	**Benzene**	<0.5 - 100	5	**20**	0.8	**125**	--	--

Notes:

Exceedance factors were calculated as the maximum detected concentration divided by the MTCA cleanup level or groundwater-to-sediment screening level
Maximum exceedance value indicates the largest exceedance factor for each parameter across all samples
Exceedance factors greater than 1 are highlighted in yellow; chemicals of greatest concern (i.e., exceedance factors >10) are shown in **Bold**
[A] SAIC 2006; draft groundwater-to-sediment screening levels based on SMS CSL values

Table 20
Summary of Chemical Exceedances

Chemical	Maximum Exceedance Factors							
	Trotsky Property		Second Ave. S. Outfall		Trotsky Inlet		DMC Property	
	Soil	Ground-water	Outfall Water	Outfall Solids	Seeps	Sedi-ment	Soil	Ground-water
Metals								
Arsenic	17	517	156		129		29	93
Cadmium						7.1		
Chromium	3.0	1.6				6.5	3.7	
Copper	7.3					2.8	1.1	
Lead	12	6.0				23	8.4	
Mercury	67	51			5.4	602	21	
Silver						3.1		
Zinc	5.8	1.2				11	22	
PCBs								
Aroclor 1242	785							
Aroclor 1248							12	
Aroclor 1254	277	1.3					185	
Aroclor 1260	115	1.7			1.6		6.2	
Total PCBs	1,180	103		16	11	22,500	415	2.5
Pesticides								
Aldrin		7.7		NS		NS		
Lindane	1.3			NS		NS		
PAHs								
2-Methylnaphthalene	233	3.5				2.4	30	
Acenaphthene	14							
Benzo(a)anthracene	1.7	81			1.6	3.2		
Benzo(a)pyrene	1.3	71				2.1		
Benzo(b)fluoranthene		62						
Benzo(ghi)perylene	2.8	25				3.3		
Benzo(k)fluoranthene		58						
Chrysene	1.7	83				3.4		
Dibenz(a,h)anthracene		63				2.5		
Dibenzofuran	12							
Fluoranthene	1.6					4.3		
Fluorene	23							
Indeno(1,2,3-cd)pyrene	2.3	68				1.3		
Naphthalene	1.9						7.5	
Phenanthrene	14							
Pyrene	1.9					3.0		
Phthalates								
Bis(2-ethylhexyl)phthalate	2.1	1.8		2.5		13	2.1	
Butylbenzylphthalate	1.7			9.6		52		
Dimethylphthalate						6.2		
Other SVOCs								
1,2,4-Trichlorobenzene	23					30		
1,2-Dichlorobenzene	258					19		
1,4-Dichlorobenzene	160	3.3				10		
2,4-Dimethylphenol		8.0						
2-Methylphenol		2.7						
Hexachlorobenzene		26						
N-Nitrosodiphenylamine		2.0						
Pentachlorophenol	10	32				39		
Phenol						1.8		
Petroleum Hydrocarbons								
TPH-gasoline	8.7	7.9						
TPH-diesel	7.5	1.8						1.5
TPH-residual	25	1.4						
VOCs								
Benzene	NA[1]	NA[1]	NA[1]	NA[1]	NA[2]	NA[1]	2.4	125

Notes:

Table lists only exceedance factors >1

NA - Not analyzed

NS - No screening level available

[1] VOCs were analyzed for only in samples collected in 2008 at the DMC property.

[2] Analyzed only in SP-1, the seep located along the northern side of the Trotsky inlet

Appendix A

Boring Logs/
Well Installation Diagrams

Appendix A

Boring Logs/
Well Installation Diagrams

Appendix A-1

Trotsky Property

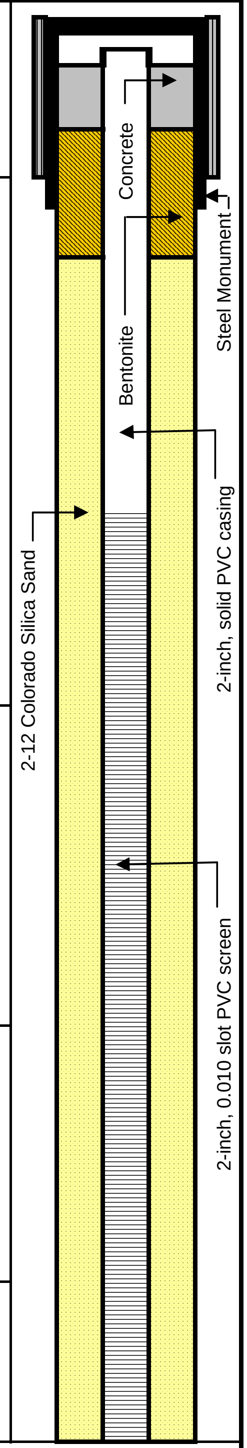
SOIL BORING LOG

BORING No: **MW-1**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 25.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.54'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
				0–1.4	Concrete	16 inches of Concrete
--	4.7	4 4 2		1.4–5.5	SM	Gray and brown silty fine to medium SAND with occassional coarse sand and fine gravel (dry, very loose), slight sheen, slight odor.
MW-1-5	131	9 11 23				
				5.5–8	CL	Black silty CLAY with medium to coarse sand and fine gravel (moist, Stiff), heavy sheen, strong odor.
--	202	14 20 29				Grades to a moderate sheen.
				8–10	ML	Gray Sand SILT (moist, very stiff), slight sheen, strong odor.
--	50.1	32 30 39		10–	SM/ML	Gray silty fine SAND (moist, very dense), slight sheen, slight odor.

Well Completion Details



SOIL BORING LOG

BORING No: **MW-1**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 25.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.54'

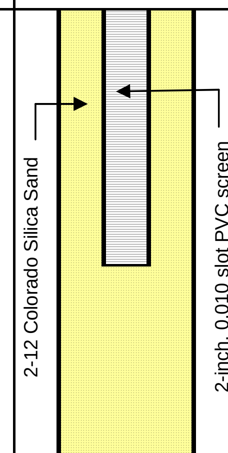
Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Well Completion Details
							SM/ ML	Gray silty fine SAND (moist, very dense), slight sheen, slight odor.	
MW-1-12.5	52.4	39 50/ 5"	▽ (approx. 12.5)			12 13 14	ML	Gray fine sandy SILT, trace clay (wet, hard), slight sheen, slight odor.	2-12 Colorado Silica Sand
--	50.8	22 29 26				15 16 17		As above, grading to no clay and increasing sand, no odor.	
--	2.6	30				18 19 20	SM	Dark gray silty fine SAND (moist, medium dense), no sheen, no odor.	2-inch, 0.010 slot PVC screen
--	6.5	27 50/4"				21 22	SP	Gray fine SAND with trace silt (wet, very dense), no sheen, no odor.	

SOIL BORING LOG

BORING No: **MW-1**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 25.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.54'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Well Completion Details
--	55.6	50/5"				23	SP	Gray fine SAND with trace silt (wet, very dense), no sheen, no odor.	
						24			
--	0	50/6"				25		Same as above.	
						26			
						27			
						28			
						29			
						30			
						31			
						32			
						33			



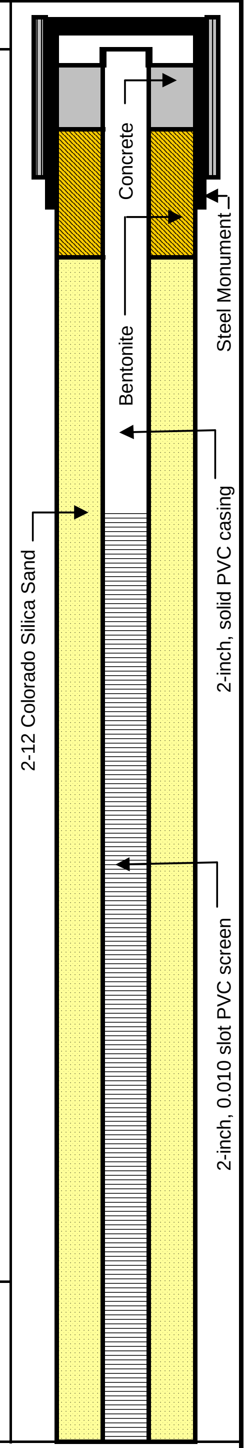
SOIL BORING LOG

BORING No: **MW-2**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.01'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample (Recovery / Interval)	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
					0	Con	5 inches of Concrete
					2	GM	Slight petroleum odor at 2 feet.
--	37.2	47 50/6"		2.5–3.5	3	GM	Black silty GRAVEL with sand (moist, very dense), slight sheen, slight odor.
--	71.1	50/2"		5–5.1	5	GM	Same as above, grades to with wood debris, little sand and occassional cobbles (moist, very dense), heavy sheen, strong odor.
MW-2-7.5	101	50/6"	▽	7.5–8	7.5	GM	Dark brown and black silty GRAVEL: with shredded wood pieces and organics (wet, very dense), heavy sheen, strong odor.
MW-2-10	45.1	11 11 12		10–11.5	10	SM	Dark Brown silty fine to coarse SAND with occassional fine gravel. Top 6 inches is a chunk of wood (wet, loose), heavy sheen, strong odor.

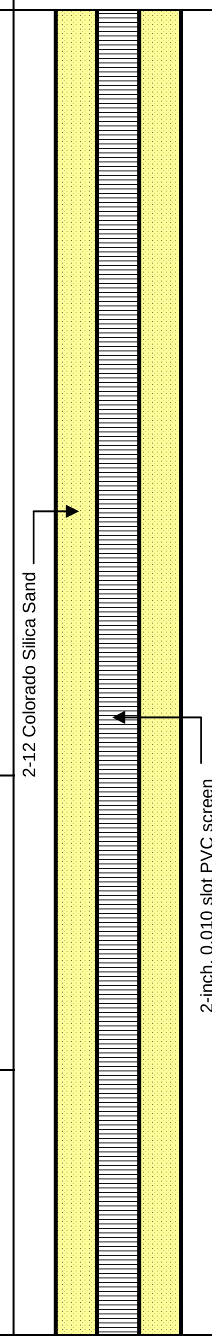
Well Completion Details



PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.01'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
--	102	12 12 17		12.5–14	SM	Black silty fine to coarse SAND with gravel and organics (wet, medium dense), slight sheen, slight odor.
MW-2-15 FD-1-042407	50.8	8 8 10		15–16.5	SM	As above, grading to (wet, loose), heavy sheen, strong odor.
--	212	8 9 14		17.5–19	CL	Black silty CLAY (wet/moist, stiff), no sheen, no odor.
--	--	17 20 22		20–21.5	SM	Black silty fine SAND (wet, dense), no sheen, no odor.

Well Completion Details

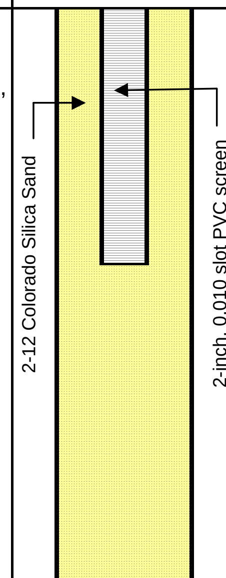


SOIL BORING LOG

BORING No: **MW-2**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26.5	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.01'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION	Well Completion Details
--	1.7	7 10 10				23 24	SP/SM	Black silty fine sand with shredded wood pieces (wet, medium dense), slight sheen, slight odor.	
--	2.9	15 20 22				25 26		Same as above grading to no sheen and some organics.	
						27 28 29 30 31 32 33			

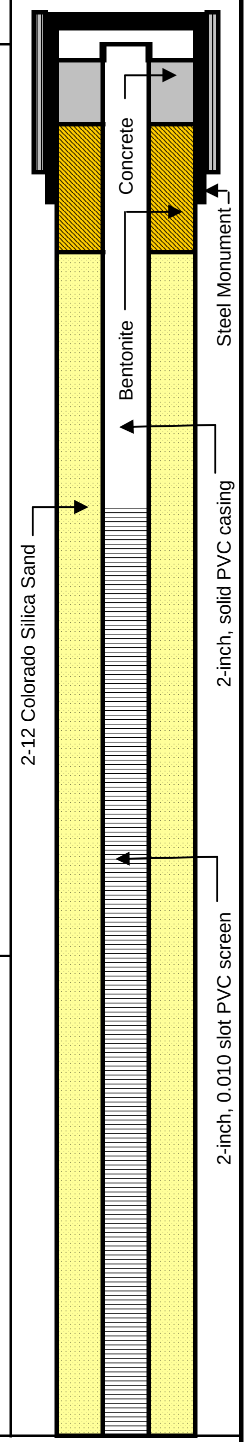


SAIC	**SOIL BORING LOG**	BORING No: **MW-3** PAGE 1 of 3

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.61'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample: Recovery / Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
					0	Con	5 inches of Concrete
--	0.6	6 7 7		2.5–4	2.5	SM	Brown silty fine to medium SAND with occassional fine gravel grading to silty fine sand (moist, loose), no sheen, no odor.
--	0.3	11 7 10		5–6.5	5	SM	Same as above, grading to trace of clay and increasing silt.
--	101	50/6"		7.5–8	7.5	SM/ML	Brown silty fine SAND/fine sandy SILT (moist, loose/stiff), no sheen, no odor.
MW-3-10	0.4	3 5 5	▽ (10)	10–11.5	10	SM/ML	Same as above, grading to orange mottling (wet, very loose/soft).

Well Completion Details



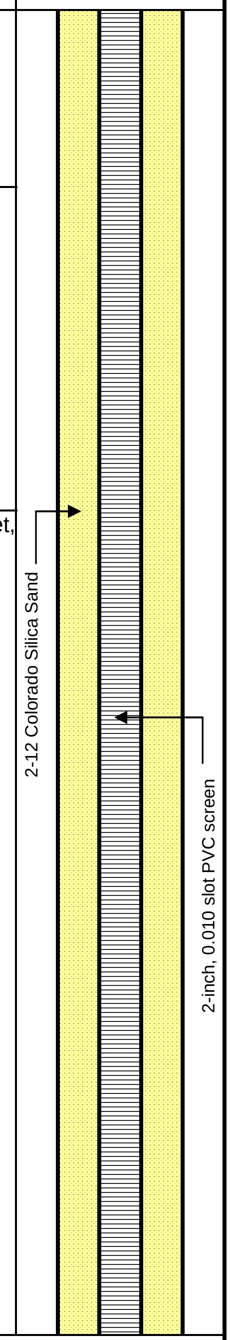
SOIL BORING LOG

BORING No: **MW-3**

- PROJECT: EAA-2
- LOCATION: 7152 1st Ave S, Seattle, WA
- CLIENT: Department of Ecology
- DATE: 04/23/07
- LOGGED BY: Tina King
- DRILLER: Cascade Drilling, Inc.
- DRILL METHOD: Concrete Core/Hollow-stem Auger
- SAMPLE METHOD: Split Spoon
- HOLE DIAMETER: 8.25 inches
- HOLE DEPTH: 26
- WELL DIAMETER: 2-inch
- WELL DEPTH: 24 feet
- WELL CASING: 2-inch PVC, Schedule 40
- WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
- FILTER PACK: 2-12 Colorado Silica Sand
- CASING ELEVATION: 12.61'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
				11–12.5	SM/ ML	Same as above.
--	0.4	4 7 9		12.5–15.5	SM	Brown sitly fine SAND (wet, dense), no sheen , no odor.
--	0.9	10 10 15		15		Same as above.
				15.25–22	SP/S M	Brown sitly fine SAND with increasing fine sand (wet, dense), no sheen, no odor.
--	0.01	15 20 27		17.5		Same as above, grading to dark brown at 18.5 and medium dense.
--	7.1	50/6"		20		Grades to dark brown to black silty fine to medium sand (moist, very dense), no sheen, musty odor.

Well Completion Details



SAIC

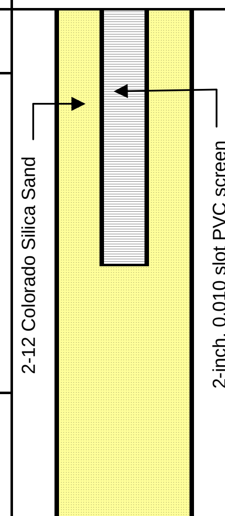
SOIL BORING LOG

BORING No: **MW-3**

PROJECT: EAA-2	DRILLER: Cascade Drilling, Inc.	WELL DIAMETER: 2-inch
LOCATION: 7152 1st Ave S, Seattle, WA	DRILL METHOD: Concrete Core/Hollow-stem Auger	WELL DEPTH: 24 feet
CLIENT: Department of Ecology	SAMPLE METHOD: Split Spoon	WELL CASING: 2-inch PVC, Schedule 40
DATE: 04/23/07	HOLE DIAMETER: 8.25 inches	WELL SCREEN: 0.010-inch slot, 2-24 feet bgs
LOGGED BY: Tina King	HOLE DEPTH: 26	FILTER PACK: 2-12 Colorado Silica Sand
		CASING ELEVATION: 12.61'

Analytical Sample Number	PID (ppm)	BLOWS/6"	Water Level	Sample Recovery	Sample Interval	DEPTH (ft.)	SOIL TYPE	LITHOLOGY / DESCRIPTION
							SP/SM	Same as above.
--	1.7	7 10 10				23 24	SM	Dark Brown Silty fin SAND, occassional medium sand (wet, Medium dense), no sheen, no odor.
--	0.4	32 50/6"				25	SP	Same as above grading to no sheen and some organics.
						26 27 28 29 30 31 32 33		

Well Completion Details



Appendix A-2

Douglas Management Company Property

Monitoring Well: MW-8

SAIC From Science to Solutions

Project: DMC	Date Started: 6/18/2008	Total Boring Depth: 36.5 ft	Well Diameter: 2 in
Client: Dept of Ecology	Date Completed: 6/18/2008	Hole Diameter: 8.25 in.	Well Screen: 0.010 Slot ft
Location: Seattle, WA	Driller: Cascade Drilling, INC	Well Depth: 20 ft	Filter Pack: 2/12 Sand
Logged By: TMK	Drill Method: Post Hole Dig and HSA	TOC Elevation: ft	Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	BLOWS/6"	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION	WELL DIAGRAM
							0	6 inches ASPHALT. Post hole dig to 5 feet below ground surface.	
					SP-SM		0.5–3	(SP-SM) Brown fine to medium SAND with silt and ocassional gravel (Fill). Loose, no odor, slight sheen.	
Moist	0.0	6 14 15			SM		5	(SM) Dark brown silty medium to coarse SAND with fine sand and gravel (Fill). Medium dense, no odor slight sheen.	
Moist	0.0	1 1 2			SM		10	(SM) Dark brown silty fine SAND (Fill). High silt content Loose, no odor, no sheen.	
Moist	0.0	1 1 2			SM		15	(SM) Black silty fine SAND (Fill). Very loose, no odor, no sheen.	
							18		▼

Depth scale (ft): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Monitoring Well: MW-8

Project: DMC
Client: Dept of Ecology
Location: Seattle, WA
Logged By: TMK

Date Started: 6/18/2008
Date Completed: 6/18/2008
Driller: Cascade Drilling, INC
Drill Method: Post Hole Dig and HSA

Total Boring Depth: 36.5 ft
Hole Diameter: 8.25 in.
Well Depth: 20 ft
TOC Elevation: ft

Well Diameter: 2 in
Well Screen: 0.010 Slot ft
Filter Pack: 2/12 Sand
Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	BLOWS/6"	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION	WELL DIAGRAM
Wet	0.0	2 2 2			SM		20–26	(SM) Black silty fine to medium SAND with shells (Fill). Loose, no odor, no sheen.	
Wet	0.0	1 3 4					25		
					ML		26–30	(ML) Black SILT with trace fine sand and shells (Fill). Soft, no odor, no sheen.	
Wet	5.0	2 2 2		MW-08-30	ML		30–33	(ML) Black SILT with fine sand and ocassional medium to coarse sand and shells (Fill). Very soft, no odor, moderate sheen.	
Wet	0.0	1 2 2			SM		33–36.5	(SM) Black silty fine to medium SAND (likely sluff from above), heaving sands. Very loose, slight odor, no sheen.	
							36.5	Bottom of borehole at 36.5 feet.	

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

Monitoring Well: MW-9

SAIC From Science to Solutions

Project: DMC
Client: Dept of Ecology
Location: Seattle, WA
Logged By: TMK

Date Started: 6/18/2008
Date Completed: 6/18/2008
Driller: Cascade Drilling, INC
Drill Method: Post Hole Dig and HSA

Total Boring Depth: 21.5 ft
Hole Diameter: 8.25 in.
Well Depth: 20 ft
TOC Elevation: ft

Well Diameter: 2 in
Well Screen: 0.010 Slot ft
Filter Pack: 2/12 Sand
Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	BLOWS/6"	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION	WELL DIAGRAM
							0–1	3 iinches ASPHALT. Post hole dig to 4 feet below ground surface.	
Moist	0.0	2 3 3			SM		4	(SM) Tan silty SAND with with gravel (suspect shore stabilization grouting) (Fill). Very dense, no odor, no sheen.	
Moist	0.0	6 9 10			GP-GM		10	(GP-GM) Brown sandy GRAVEL with silt and ocassional cobbles and concrete (Fill). Medium dense, no odor, no sheen.	
Moist	0.0	1 3 3		MW-9-15	ML		15	(ML) Dark brown SILT with organics and trace fine sand. (Fill?). Medium stiff, no odor, no sheen.	
							18		▼
Wet	2.1	2 3 4					20	Same as above.	
							21.5	Bottom of borehole at 21.5 feet.	

Monitoring Well: MW-10

Project: DMC
Client: Dept of Ecology
Location: Seattle, WA
Logged By: TMK

Date Started: 6/18/2008
Date Completed: 6/18/2008
Driller: Cascade Drilling, INC
Drill Method: Post Hole Dig and HSA

Total Boring Depth: 21.5 ft
Hole Diameter: 8.25 in.
Well Depth: 20 ft
TOC Elevation: ft

Well Diameter: 2 in
Well Screen: 0.010 Slot ft
Filter Pack: 2/12 Sand
Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	BLOWS/6"	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION	WELL DIAGRAM
							0	7 inches ASPHALT. Post hole dig to 5 feet below ground surface.	
Moist	0.0				GM		1	(GM) Brown sandy GRAVEL with silt (Base coarse-Fill). Very dense, no odor, no sheen.	
Moist	0.0	1 2 50			ML		5	(ML) Gray-white SILT with ocassional fine gravel and sand (Fill). Hard, no odor, slight sheen.	
Moist	0.0	8 22 23			GP		10	(GP) Tan-gray sandy GRAVEL with silt (Fill?). Very dense, no odor, no sheen.	
Wet	0.0	3 1 1			ML		15	(ML) Black SILT with ocassional gravel and trace organics (Fill?). Very soft, musty odor, no sheen.	
Wet	6.0	2 2 1		MW-10-20	ML		20	(ML) Same as above.	
							21.5	Bottom of borehole at 21.5 feet.	

Monitoring Well: MW-11

Project: DMC
Client: Dept of Ecology
Location: Seattle, WA
Logged By: TMK

Date Started: 6/19/2008
Date Completed: 6/19/2008
Driller: Cascade Drilling, INC
Drill Method: Post Hole Dig and HSA

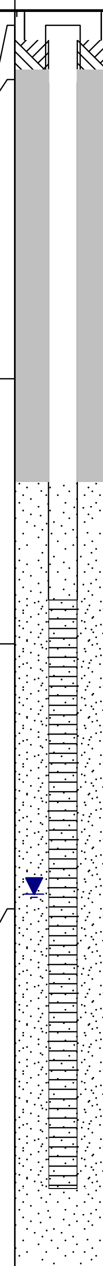
Total Boring Depth: 21.5 ft
Hole Diameter: 8.25 in.
Well Depth: 20 ft
TOC Elevation: ft

Well Diameter: 2 in
Well Screen: 0.010 Slot ft
Filter Pack: 2/12 Sand
Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	BLOWS/6"	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	DEPTH (ft)	LITHOLOGY/DESCRIPTION
						0–0.25	3 inches ASPHALT. Post hole dig to 5 feet below ground surface.
						0.25–1	8 inches CONCRETE.
						4	2 inch root in boring at approximately 5 feet below ground surface.
Moist	0.01	4 3 2	X		SM	5–6	(SM) Brown silty fine to medium SAND with coarse sand and ocassional gravel (Fill). Loose, no odor, slight sheen.
					ML	6–10.75	(ML) Light brown fine sandy SILT with trace large gravel (Fill). Soft, no odor, slight sheen.
Moist	0.03	4 4 4	X			10	Same as above.
					SP	10.75–15.25	(SP) Brown medium SAND with trace silt (Fill?). Loose, no odor, slight sheen.
Wet	0.01/0.02	1 1 1	X	MW-11-15		15	Same as above. Grades to wet.
					SM	15.25–20	(SM) Dark brown to black silty fine SAND (Fill?). Very loose, no odor, no sheen.
Wet	0.04	1 1 1	X		SM	20–21.5	(SM) Black silty fine SAND with trace organics (Fill?). Very loose, no odor, no sheen.

Bottom of borehole at 21.5 feet.

WELL DIAGRAM



Monitoring Well: MW-12

Project: DMC
Client: Dept of Ecology
Location: Seattle, WA
Logged By: TMK

Date Started: 6/19/2008
Date Completed: 6/19/2008
Driller: Cascade Drilling, INC
Drill Method: Post Hole Dig and HSA

Total Boring Depth: 36.5 ft
Hole Diameter: 8.25 in.
Well Depth: 20 ft
TOC Elevation: ft

Well Diameter: 2 in
Well Screen: 0.010 slot ft
Filter Pack: 2/12 Sand
Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	BLOWS/6"	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	DEPTH (ft)	LITHOLOGY/DESCRIPTION
					0–1	12 inches ASPHALT. Post hole dig to 4 feet below ground surface.
Moist	3.7			GP	1	(GP) Gray-brown fine to coarse sandy GRAVEL with silt (Likely UST fill). Dense, no odor, slight sheen.
Moist	2.5	50		GP	4	(GP) Same as above. Grades to very dense. Likely UST fill. Very little recovery.
Moist	3.6	5 4 5		GP	10	(GP) Same as above. Valid sample questionable, based on blow count comparison from above. Likely UST fill. Very little recovery. Possible beginning transition into different soil content.
Wet	28.6/2.1	2 2 1	MW-12-15	SM	13–20	(SM) Brown silty fine to coarse SAND with ocassional gravel (Fill). Loose, slight odor, slight sheen. Very little portion of sample to collect. Black silty fine SAND (Fill?). Very loose, no odor, no sheen.

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

WELL DIAGRAM

Monitoring Well: MW-12

Project: DMC
Client: Dept of Ecology
Location: Seattle, WA
Logged By: TMK

Date Started: 6/19/2008
Date Completed: 6/19/2008
Driller: Cascade Drilling, INC
Drill Method: Post Hole Dig and HSA

Total Boring Depth: 36.5 ft
Hole Diameter: 8.25 in.
Well Depth: 20 ft
TOC Elevation: ft

Well Diameter: 2 in
Well Screen: 0.010 slot ft
Filter Pack: 2/12 Sand
Well Casing: Schedule 40 PVC

MOISTURE CONTENT	ORGANIC VAPOR (ppm)	BLOWS/6"	SAMP. INTERVAL	ANALYTICAL SAMPLE	U.S.C.S. SYMBOL	GRAPHIC LOG	DEPTH (ft)	LITHOLOGY/DESCRIPTION	WELL DIAGRAM
Wet	1.1	2 2 2			SM		20–25	(SM) Same as above.	
Wet	13.2	1 1 2		MW-12-25	SM		25–28	(SM) Black silty fine to medium SAND with organics (Native?). Loose, slight odor, moderate sheen.	
Wet	3.3	4 5 6			SP-SM		28–35	(SP-SM) Black fine to medium SAND with silt. Medium dense, no odor, slight sheen.	
Wet	3.6	6 28 50			SP-SM		35–36.5	(SP-SM) Same as above.	
							36.5	Bottom of borehole at 36.5 feet.	

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

Appendix B

Analytical Results Summaries

(Provided on CD)

Appendix C

Laboratory Analytical Reports

(Provided on CD)

Appendix D

Field Log Books

(Provided on CD)

Appendix E

Photographs

(Provided on CD)