Lower Duwamish Waterway
Early Action Area 5

Summary of
Site Characterization Activities:
Basin Oil Property

Washington State Department of Ecology
Toxics Cleanup Program
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August 2010

Table of Contents

Figures

Tables

Acronyms and Abbreviations

ARI	Analytical Resources Incorporated
AST	aboveground storage tank
bgs	below ground surface
BEHP	bis(2-ethylhexyl)phthalate
DW	dry weight
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
HCID	hydrocarbon identification
LDW	Lower Duwamish Waterway
mg/kg	milligrams per kilograms
MTCA	Model Toxics Control Act
NAPL	non-aqueous phase liquid
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pg/g	picogram per gram
PID	photo-ionization detector
PVC	polyvinyl chloride
SAIC	Science Applications International Corporation
SVOC	semivolatile organic compound
TEQ	toxic equivalent
TPH	total petroleum hydrocarbons
TSCA	Toxic Substance Control Act
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 former Basin Oil Company property (Basin Oil) in May 2009.

The former Basin Oil property is located on the west side of the Lower Duwamish Waterway (LDW), approximately 3.5 river miles from the south end of Harbor Island and just south of the South Park Bridge in King County, Washington (Figure 1). It consists of a small pie-shaped piece of property, approximately 80 feet wide at its base along S Donovan Street, and tapering to a point at the intersection of 17th Avenue S (west side) and Dallas Avenue S (east side) at the north end.

Basin Oil collected, transported, and marketed used oil. Beginning in 1987, Basin Oil leased the property from Malarkey Asphalt, then purchased the property in August 2000. The industrial operations of Basin Oil shared the site with its subsidiaries, Northwest Antifreeze Service and Basin Tank and Environmental Service. Basin Tank and Environmental Service closed in January 2002. Tank work was still performed under Basin Oil's name until 2004. The business was sold to Emerald Services Inc. in 2004, however the property still belongs to the former owner of Basin Oil. At the time the investigation described in this report was performed (May 2009), Basin Oil was in the process of demolishing the facility (Ecology 2007).

During an August 2004 inspection by Ecology and SPU, sludge samples were collected and analyzed from an oil/water separator and a catch basin at the site. The sludge contained high concentrations of petroleum and polycyclic aromatic hydrocarbons (PAHs; 183 to 4,300 mg/kg dry weight [DW]). In addition, it contained arsenic (98 and 248 mg/kg), zinc (711 and 830 mg/kg), bis(2-ethylhexyl)phthalate (BEHP; 41 and 84 mg/kg DW), and low levels of polychlorinated biphenyls (PCBs; 0.14 and 0.35 mg/kg DW). A U.S. Environmental Protection Agency (EPA) Toxic Substances Control Act (TSCA) inspection was conducted in May 2005. No issues of concern with respect to TSCA (which regulates PCBs over 50 mg/kg) were found (Ecology 2007).

Basin Oil has placed gravel in the disturbed areas at the south end of the property and installed a silt fence along the east side of the property to trap sediment in runoff that sheet flows off the site (Ecology 2007).

As part of the city of Seattle's interim action at Dallas Ave to address PCBs in the street, the City installed a temporary stormwater collection and treatment system to serve the newly paved roadways. Initially, the stormwater system collected runoff from the public right-of-way and the adjacent Basin Oil property and routed it to a temporary treatment system located on the south side of S Donovan Street. The runoff is stored in five 18,000-gallon storage tanks to allow runoff to be released to the sewer at a controlled rate. Effluent from the system has been sampled and tested, and PCBs have not been detected (at 0.1 µg/L) in any of the samples, including those from Basin Oil.

Ecology coordinated a multi-agency inspection of Basin Oil on March 14, 2007. The inspection included Ecology Hazardous Waste and Toxics Cleanup programs, Seattle Department of Development & Planning, Seattle Public Utilities, King County Water & Land Resources Division, and Public Health Seattle & King County. Ecology sent a letter to Basin Oil on April 17 listing the concerns and requirements of the agencies involved, as well as a comment from EPA.

Basin Oil removed all tanks, secondary containment walls, and drums prior to the 2009 investigation activities (fall 2007 through spring 2008). An effort was also made to remove suspected contaminated soil by removing visually stained soil in the south section of the property. Depth of excavation was estimated to range from one to three feet.

In April 2008, Ecology sent a letter to Basin Oil stating confirmation sampling details that needed to be carried out (Ecology 2008). The confirmation sampling was never completed by the owner, which resulted in the site characterization sampling described in this site characterization report.

Subsequent to the negotiation of an access agreement with Basin Oil, a sampling and analysis plan for the Basin Oil property (*Basin Oil Sampling, Sampling and Analysis Plan*) was prepared by SAIC in May 2009 (SAIC 2009). Sampling was conducted in May 2009.

Field activities conducted during these sampling events are described in Section 2.0. Investigation results are summarized in Sections 3.0 and 4.0, and Section 5.0 presents conclusions and recommendations. References are listed in Section 6.0.

2.0 Field Activities

2.1 Field Schedule

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

- Site walk and underground utilities location: May 6, 2009
- Soil borings and monitoring well installation: May 12-15, 2009
- Monitoring well development: May 18, 2009
- Site surveying and groundwater sampling: May 26, 2009

2.2 Soil Borings

Ten soil borings (BSB-1 to BSB-10, Figure 1) were advanced to total depths ranging from 14 to 16 feet below ground surface (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 portable direct-push rig was set on each boring location to continue down-hole advancement. Four soil borings were completed at the former concrete platforms (BSB-6 to BSB-8 and BSB-10).

Soil samples were collected from each soil boring by hand tools (hand auger and trowel) or direct-push cores. Soil cores from the drill rig were collected in 4-foot long acetate liners. Soil samples collected in cores or with hand tools were logged using standard techniques described below.

Each soil boring was logged for the following features:

- Color
- Moisture content (dry, damp, moist, or wet)
- Lithology (using the modified Unified Soil Classification System)
- Anthropogenic material
- Geological interpretation, if pertinent (e.g., fill, topsoil, till, etc.)
- Presence of sheen or non-aqueous phase liquid (NAPL)
- Presence of odor or other indicators of contaminants
- Field screening results for organic vapor (using photoionization detector [PID])
- The boring logs for this investigation are provided in Appendix A.

Soil samples were collected every 2.5 feet, starting at 0-6 inches, for laboratory analysis. Only the top and bottom samples were analyzed and the rest of the samples were archived. However, if field screening techniques indicated the presence of contamination, the sample collected from that interval of contamination was analyzed as well. Validated analytical results are presented in Appendix B.

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. Downhole equipment such as push rods was pressure-washed between each boring.

Soil borings BSB-1 through BSB-5 were located in the southern portion of the Basin Oil property, and soil borings BSB-6 through BSB-10 were located in the northern area of the property (Figure 1).

At a minimum, two soil samples from each soil boring were submitted for laboratory analysis. As summarized in Table 1, each sample was analyzed for the following:

- Semi-volatile organic compounds (SVOCs) by EPA Method 8270
- Volatile organic compounds (VOCs) by EPA Method 8260
- PCBs by EPA Method 8082
- Eight Resource Conservation and Recovery Act (RCRA) metals by EPA Method 6020/7470/7471
- Total Solids by SM 2540 B-97
- Grain Size by ASTM D421/411
- Total petroleum hydrocarbons (TPH) for the gasoline range by Ecology Method NWTPH-Gx
- Total petroleum hydrocarbons for the diesel range by Ecology Method NWTPH-Dx extended, with silica gel cleanup

In addition to the proposed soil samples collected, two equipment rinsate samples were collected from the hand augers. One equipment rinsate sample was collected during each sampling day.

2.3 Surface Soil Sampling

Two surface soil samples were collected and submitted for laboratory analysis at intervals of 0–2 inches and 2–6 inches. The two surface soil samples (SS-1 and SS-2) were collected within undisturbed areas of the Basin Oil property, and adjacent to soil borings SBS-2 and SBS-9, respectively (Figure 1). Soil samples collected from SS-1 and SS-2 were submitted for laboratory analysis.

As summarized in Table 1, each sample was analyzed for the following:

- Dioxins/furans
- PCBs by EPA Method 8082

In addition to the proposed surface soil samples, one rinseate sample was collected from the sampling equipment.

2.4 Monitoring Well Installation

Two offsite groundwater monitoring wells, MW-12 and MW-13, were installed along 17th Ave S and S Donovan Street to the east and south of the property, respectively (Figure 1). Each boring

was advanced to 5 feet bgs using a hand auger before advancing with a hollow-stem auger drill rig. MW-12 was advanced to 28 feet bgs before a determination was made on the interval to set the well. A water-bearing zone was observed at 18 feet bgs, and the screen for MW-12 was set from 15.45 to 25.45 feet. MW-13 was advanced to 30.5 before a determination was made on the interval to set the well. The only water-bearing zone observed was at 4.5 feet bgs, and the screen for MW-13 was set from 3.5 to 13.5 feet bgs.

Soil samples were collected every 2.5 feet, starting at 0-6 inches, for laboratory analysis. At a minimum, two soil samples from each soil boring were submitted for laboratory analysis. Only the top two intervals were analyzed, while the rest of the samples were archived. However, if field screening techniques indicated the presence of contamination, the sample collected from that interval of contamination was also analyzed. As summarized in Table 2, each sample was analyzed for the following:

- SVOCs by EPA Method 8270
- VOCs by EPA Method 8260
- PCBs by EPA Method 8082
- Eight RCRA metals by EPA Method 6020/7470/7471
- Total solids by SM 2540 B-97
- Grain size by ASTM D421/411
- TPH for the gasoline range by Ecology Method NWTPH-Gx
- TPH for the diesel range by Ecology Method NWTPH-Dx extended, with silica gel cleanup

In addition to the soil samples, two rinsate samples were collected from the hand augers.

Each monitoring well was constructed of factory sealed, 2-inch diameter, Schedule 40, polyvinyl chloride (PVC) pipe. Each well includes 10 feet of 0.010-inch slotted screen surrounded by the pre-pack 2/12 Monterey 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 13.5 feet bgs for MW-12 and 2.5 feet bgs for MW-13. Hydrated bentonite chips were used to backfill each monitoring well up to 2 feet bgs. Each well was completed with a watertight cap and flush-grade well vault, which was secured with concrete from ground surface to 2 feet bgs.

Following installation, each monitoring well was developed by surging the well with a stainless-steel bailer and then pumping water and any fine sediment using a whale pump. Both wells were purged dry several times due to slow recharge, and approximately 10 well volumes of groundwater were removed. Turbidity rapidly cleaned up in both wells due to the presence of pre-pack sand.

The locations and top-of-casing elevations of the new monitoring wells (MW-12 and MW-13) were surveyed by Bush, Roed & Hitchings, Inc. (Table 3).

2.5 Groundwater Sampling

The groundwater sampling event was correlated with the Port of Seattle's groundwater sampling event, and took place on the same day. Groundwater was sampled during a lower low-tide period, on May 26, 2009. During the sampling event, groundwater samples were collected from each of the two newly installed monitoring wells. Each of the monitoring wells was purged using standard low-flow procedures. Groundwater was purged and sampled using a peristaltic pump with disposable Teflon and silicon tubing.

Groundwater samples were collected and submitted to Analytical Resources Inc. (ARI) for laboratory analysis. As shown in Table 2, each groundwater sample from the first event was analyzed for the following constituents:

- SVOCs by EPA Method 8270
- VOCs by 8260
- PCBs by EPA Method 8082
- cPAHs by SIM 8270
- Eight RCRA metals (total and dissolved) by EPA Method 6020/7470/7471
- Total suspended solids by SM 2540 B-97
- TPH for the gasoline range by Ecology Method NWTPH-Gx
- TPH for the diesel range by Ecology Method NWTPH-Dx extended, with silica gel cleanup

In addition, a duplicate sample was collected for MW-12 and a rinsate sample was collected from the nitrile gloves and analyzed for phthalates. It should be noted that groundwater samples were submitted as both filtered and unfiltered for the eight RCRA metals. The groundwater samples were filtered using an in-line, 0.45-micron nitrocellulose filter.

3.0 Geology and Hydrogeology

The following discussion of results pertains to the geology and hydrogeology of the Basin Oil Property.

Subsurface soil samples were collected during drilling of ten soil borings (BSB-1, BSB-2, BSB-3, BSB-4, BSB-5, BSB-6, BSB-7, BSB-8, BSB-9, and BSB-10), and during drilling for installation of two monitoring wells (MW12 and MW-13). Based on field observations, the soil boring descriptions (Appendix A), and the results of the May 2009 groundwater monitoring event, the following observations were made regarding the geology and hydrogeology of the Basin Oil property.

Material observed in the soil boring samples appeared to be fill and native river/floodplain deposits, underlain by glacial till. The following geologic units were identified at the site (from top to bottom):

1. The shallow soils encountered from directly beneath the paving (asphalt or concrete) consisted of crushed gravel (road base) fill material. This material extends from below the pavement (asphalt/concrete) to a maximum thickness of 3 feet.

2. A layer of silt, interbedded with silty sands and sandy silts, was identified throughout the site; it is up to 8 feet in maximum thickness. The silt layer was encountered directly beneath the surface or fill material (where present).

3. A layer of fine to coarse sand was identified; this unit has a maximum thickness of at least 9 feet (identified only at BSB-1, BSB-3, BSB-4, BSB-5).

Two distinct lower units were identified:

4. A gray to olive gray silt was encountered in borings located on the southwestern corner of the property (BSB-1, BSB-2, BSB-4, BSB-9 and BSB-10) and monitoring well MW-13; it is up to a maximum thickness of 11 feet bgs.

5. A second lower unit was encountered in borings located in the northern and eastern sections of the property (BSB-3, BSB-5, BSB-6, BSB-7, BSB-9, and MW-12), consisting of a brown to dark brown medium to coarse sand and gravel material, with a maximum thickness of approximately 12 feet.

During soil boring activities, the water table was encountered at 4 to 17.5 feet bgs. As a result of this observation, monitoring wells MW-12 and MW-13 were screened from 25.45 to 15.45 feet bgs and 13.5 to 3.5 feet bgs respectively.

Overall, two main hydrogeologic units are recognized: an upper sand unit (geologic unit 3; see above) that is saturated in its lower part; and a lower sand and gravel unit (unit 5). The material forming unit 2 was mostly described as moist, and it may be considered to become locally saturated due to the interbedded sand found within the unit.

Based on the groundwater measurements collected during the May 2009 event, groundwater is expected to flow toward the northeast to the Lower Duwamish Waterway.

4.0 Analytical Results

4.1 Soil Analytical Results

The validated laboratory analysis results for soil boring samples are presented in Appendix B, and data validation reports are presented in Appendix C. For screening purposes, the sample results are compared to Model Toxics Control Act (MTCA) Method A and B soil cleanup levels, and to draft soil-to-sediment screening levels (SAIC 2006).[1] 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.

Chemical values that exceed these levels are highlighted in Tables 5 and 6. The following text briefly summarizes the major findings of the chemical analyses, listed by major chemical group. No analytes above the laboratory detection limits were identified in the collected equipment rinsate samples.

In general, PAH concentrations were highest near the west side of the property, near 17th Avenue S, at sample locations BSB-1 and MW-12 (Figure 1). Relatively higher concentrations of metals and petroleum hydrocarbons were observed on the northern portion of the property, at sample locations BSB-10, BSB-7 and BSB-6. Methylene chloride and acetone were generally the only VOCs detected, except at BSB-6 and BSB-10, where several VOCs were detected t low concentrations (i.e., below MTCA Method A or B soil cleanup levels).

4.1.1 Surface Soil Samples

Four surface samples were collected from two locations and were analyzed for dioxins/furans and PCBs. A summary of the surface sample analytical result exceedances is presented in Table 5.

PCBs

PCBs were not detected in the surface soil samples collected at the Basin Oil property.

[1] 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.

Dioxins/Furans

As shown in Table 5, dioxin/furan 2,3,7,8-TCDD toxic equivalency quotients (TEQs) ranged from 0.25 to 1.6 pg/g[2]. No samples exceeded the MTCA Method B cleanup level for dioxins/furans.

4.1.2 Soil Borings

A summary of subsurface soil analytical results is presented in Table 6. The following text briefly summarizes the major findings of the chemical analyses, listed by major chemical group.

Metals

As shown in Tables 6, samples exceeded one or more screening criterion for arsenic, chromium, copper, lead, mercury, and zinc. Arsenic exceeded the MTCA Method B soil cleanup level (0.67 mg/kg) in all samples analyzed; concentrations ranged from 0.7 to 18 mg/kg. Chromium exceed the MTCA Method A soil cleanup level (19 mg/kg) in most samples, with concentration between 1.9 and 60 mg/kg.

Copper, lead, mercury, and zinc exceeded the draft soil-to-groundwater screening levels in a subset of samples. Copper exceeded the screening level in four samples (maximum concentration of 92.4 mg/kg in boring BSB-10); lead exceeded the screening level in one sample (83 mg/kg in MW-12); mercury exceeded the screening level in 10 samples (maximum concentration 0.14 mg/kg in MW-12); and zinc exceeded the screening level in 21 samples (maximum concentration of 195 mg/kg in boring BSB-7).

PCBs

PCBs were detected in subsurface soil samples at concentrations ranging from <0.03 to 1.0 mg/kg dry weight (DW); three samples (in borings BSB-3, BSB-6, and BSB-7) exceeded the MTCA Method B cleanup level of 0.5 mg/kg DW for total PCBs, and seven additional samples exceeded the soil-to-sediment screening level of 0.065 mg/kg DW.

TPH

Gasoline-range and heavy oil (residual)-range petroleum hydrocarbons exceed Method A screening levels in two samples: BSB-6 (0-6 in) and BSB-10 (0-6 in); these were collected in the vicinity of the northern aboveground storage tank (AST) basin. Concentrations exceed the Method A Cleanup Levels by a factor of 22 for gasoline-range hydrocarbons and by a factor of 2 for heavy-range hydrocarbons.

SVOCs

PAHs exceeded the draft soil-to-sediment screening levels in borings BSB-1, BSB-6 (one compound only), BSB-7, BSB-10, and MW-12. Most detections were in the 0-6 inch soil interval. The highest concentrations were found in MW-12 (0-6 inches), where PAH

[2] Results cited are for TEQs calculated using one-half the detection limit for non-detected congeners.

concentrations were up to two orders of magnitude higher than the screening levels. MTCA Method A and B soil cleanup levels for benzo(a)pyrene were exceeded in MW-12.

BEHP was detected in four samples at concentrations above the soil-to-sediment screening levels, with a maximum concentration of 1.9 mg/kg DW in boring BSB-10.

VOCs

Carbazole exceeded the MTCA Method B soil cleanup level in one sample (MW-12). Benzene exceeded the MTCA Method B soil cleanup level in one sample (BSB-10).

4.2 Groundwater Analytical Results

The validated laboratory analysis results for groundwater samples are presented in Appendix B and the data validation reports are presented in Appendix C. For screening purposes, the sample results were compared to MTCA Method A and B groundwater cleanup levels and to draft groundwater-to-sediment screening levels (SAIC 2006).[3]

Chemical values that exceed these levels are highlighted in Table 7. The following text briefly summarizes the major findings of the chemical analyses, listed by major chemical group. No analytes above the laboratory detection limits were identified in the collected equipment rinseate samples.

Note that non-aqueous phase liquid (NAPL) was not encountered during the sampling of any of the monitoring wells.

4.2.1 Groundwater Samples

Metals

As shown in Table 7, results for all samples exceed the Method A and B groundwater cleanup levels for arsenic. The maximum concentration of arsenic (18.6 ug/L) was identified in a field duplicate sample collected from monitoring well MW-12.

PCBs

PCBs were not detected in any groundwater samples from Basin Oil.

[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.

SVOC

SVOCs were not detected in any groundwater samples from Basin Oil.

TPH

TPH was not detected in any groundwater samples from Basin Oil.

VOCs

Chloromethane, acetone, and chloroform were detected in groundwater samples, at concentrations below the MTCA Method B groundwater cleanup levels.

4.2.2 Trip Blank TB-052609

Trichloroethene, cis-1,2-dichloroethene, and tetrachloroethene exceeded the Method B groundwater cleanup level in the quality control sample TB-052609. The trip blank was subsequently re-analyzed (outside the method recommended holding times), and these compounds were not detected (<0.2 ug/L). Chloromethane was detected in the trip blank re-analysis at 0.3 ug/L, just above the detection limit.

5.0 Summary and Conclusions

As part of the May 2009 site characterization study described in this report, samples were collected from 10 soil borings and two groundwater monitoring wells at and adjacent to the Basin Oil property (Figure 1). Results indicate that:

- One or more soil samples exceeded MTCA Method A or Method B soil cleanup levels for the following chemicals: arsenic, chromium, heavy oil, gasoline-range organics, benzo(a)pyrene, benzene, and carbazole.

- Groundwater samples from both wells exceeded the MTCA Method B groundwater cleanup level for arsenic.

- Additional chemicals exceeded draft soil-to-sediment screening levels in one or more soil samples collected at the Basin Oil property: copper, lead, mercury, zinc, total PCBs, various PAHs, butyl benzyl phthalate, BEHP, and dibenzofuran.

- Chlorinated solvents were not detected in soil samples, and were detected at low concentrations (below the MTCA Method B groundwater cleanup levels) in groundwater samples.

- The Basin Oil property does not currently appear to represent a source of chlorinated solvents to Terminal 117, located downgradient of Basin Oil.

- Exceedances of MTCA soil cleanup levels and soil-to-sediment screening levels are localized, with highest PAH concentrations in the 0-6 inch soil interval on the west side of the property (BSB-1 and MW-12), and the highest petroleum hydrocarbon concentrations in the 0-6 inch soil interval in the northern portion of the property (near BSB-6, BSB-7, and BSB-10). Metals exceeded MTCA Method A or B soil cleanup levels or soil-to-sediment screening levels throughout the property.

- Because (a) the site is small, (b) elevated soil contaminant concentrations are localized and near the surface, and (c) no contaminants (except arsenic) were detected in groundwater at concentrations above screening levels, the Basin Oil property is not believed to represent a significant potential source of contaminants to Terminal 117 or Dallas Avenue.

6.0 References

Ecology. 2007. Hazardous Waste & Toxics Reduction Program Compliance Report. Site Inspection: Basin Oil. Washington State Department of Ecology. August 15, 2007.

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SAIC. 2009. Lower Duwamish Waterway, Basin Oil, Seattle, Washington: Basin Oil Sampling – Sampling and Analysis Plan. Final. Prepared for Washington State Department of Ecology by Science Applications International Corporation. May 2009.

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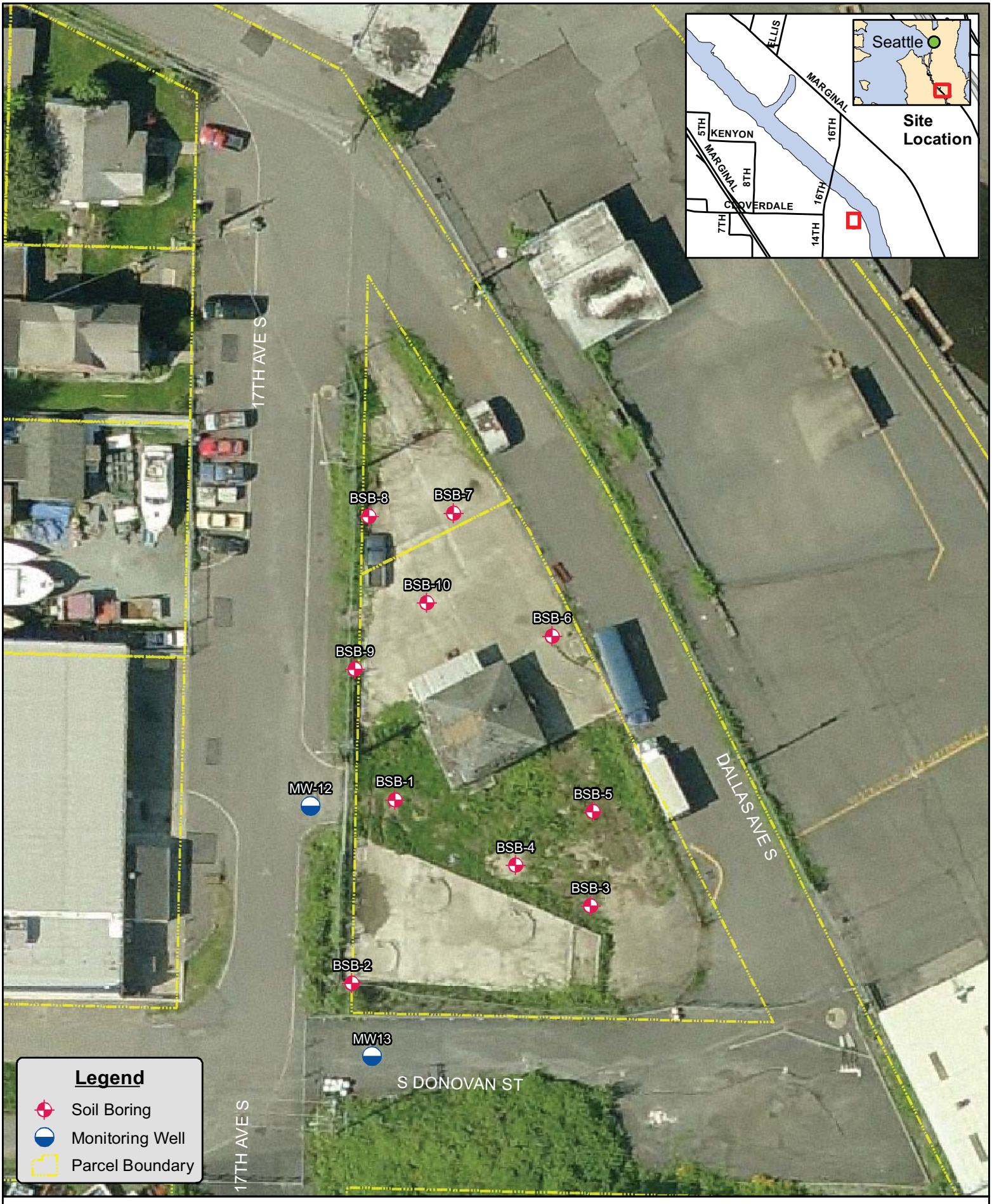
LIMITATIONS

As part of this report, SAIC's investigation was restricted to collection and analysis of a limited number of environmental samples, visual observations and field data, in addition to summarizing available information from previous site documents. Because the current investigation consisted of evaluating a limited supply of information, SAIC may not have identified all potential items of concern. This report is intended to be used in its entirety; taking or using excerpts from this report is discouraged.



Note: Aerial image is from 2009

Figure 1. Soil Boring and Monitoring Well Locations

DEPARTMENT OF ECOLOGY State of Washington

N

Projection: Lambert Conformal Conic
Datum: NAD83

0 25 50 100 Feet

1 in = 42 feet

SAIC From Science to Solutions

Table 1. Summary of Soil Laboratory Analyses
Basin Oil Property

Soil Boring/ Groundwater Monitoring Well ID	Sample Depth (feet bgs)	Sample Date	Dioxin/Furans (SW 8290/1631)	VOCs (SW 8260)	SVOCs (SW 8270)	PCBs (SW 8082)	Gasoline-Range Hydrocarbons (NWTPH-Gx)	Diesel and Motor Oil-Range Hydrocarbons (NWTPH-Dx)	Total and Dissolved Metals (EPA 7470/7471/6010)	Total Solids (SM 2540 B-97)	Grain Size (ASTM D421/422)
BSB-1	0-0.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-1	15	5/12/2009		x	x	x	x	x	x	x	x
BSB-2	0-0.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-2	12.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-3	0-0.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-3	10	5/12/2009				x					
BSB-3	12.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-3	15	5/12/2009		x	x	x	x	x	x	x	x
BSB-4	0-0.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-4	12.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-5	0-0.5	5/12/2009		x	x	x	x	x	x	x	x
BSB-5	5	5/12/2009		x	x	x	x	x	x	x	x
BSB-5	12.5	5/12/2009				x					
BSB-5	15	5/12/2009		x	x	x	x	x	x	x	x
BSB-6	0-0.5	5/13/2009		x	x	x	x	x	x	x	x
BSB-6	2.5	5/13/2009		x	x		x	x			
BSB-6	15	5/13/2009		x	x	x	x	x	x	x	x
BSB-7	0-0.5	5/13/2009		x	x	x	x	x	x	x	x
BSB-7	2.5	5/13/2009					x	x			
BSB-7	15	5/13/2009		x	x	x	x	x	x	x	x
BSB-8	0-0.5	5/13/2009		x	x	x	x	x	x	x	x
BSB-8	2.5	5/13/2009		x	x	x	x	x	x	x	x
BSB-8	15	5/13/2009		x	x	x	x	x	x	x	x
BSB-9	0-0.5	5/13/2009		x	x	x	x	x	x	x	x
BSB-9	15	5/13/2009		x	x	x	x	x	x	x	x
BSB-10	0-0.5	5/13/2009		x	x	x	x	x	x	x	x
BSB-10	2.5	5/13/2009		x	x	x	x	x	x	x	x
BSB-10	15	5/13/2009		x	x	x	x	x	x	x	x
MW-12	0-0.5	5/14/2009		x	x	x	x	x	x	x	x
MW-12	2.5	5/14/2009		x	x	x	x	x	x	x	x
MW-13	0-0.5	5/14/2009		x	x	x	x	x	x	x	x
MW-13	2.5	5/14/2009		x	x	x	x	x	x	x	x
SS-1	0-2 inches	5/12/2009	x			x					
SS-1	2-6 inches	5/12/2009	x			x					
SS-2	0-2 inches	5/13/2009	x			x					
SS-2	2-6 inches	5/13/2009	x			x					

VOC = volatile organic compound
SVOC = semivolatile organic compound
PCB = polychlorinated biphenyl
Total Metals includes: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc
x = Indicates one or more analyte was measured on the date provided

Table 2. Summary of Groundwater Laboratory Analyses
Basin Oil Property

Groundwater Monitoring Well ID	Sample Date	Dioxin/Furans (SW 8290/1631)	VOCs (SW 8260)	SVOCs (SW 8270)	PCBs (SW 8082)	cPAH (SIM 8270)	Gasoline-Range Hydrocarbons (NWTPH-Gx)	Diesel and Motor Oil-Range Hydrocarbons (NWTPH-Dx)	Total Metals (EPA 7470/7471/6010)	Dissolved Metals (EPA 7470/7471/6010)	Total Suspended Solids (SM 2540 B-97)
GW-12-052609	5/26/2009		x	x	x		x	x	x	x	x
GW-13-052609	5/26/2009		x	x	x		x	x	x	x	x
GW-052609-FD	5/26/2009		x	x	x		x	x	x	x	x
TB-052609	5/26/2010		x	x			x				
ER-051209-1	5/12/2009	x			x						
ER-051209-2	5/12/2009		x	x	x			x	x		
ER-051309-1	5/13/2009		x	x	x			x	x		
ER-051509-1	5/15/2009		x	x	x			x	x		
ER-052609	5/26/2009			x							

VOC = volatile organic compound

SVOC = semivolatile organic compound

PCB = polychlorinated biphenyl

Total Metals includes: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc

x = Indicates one or more analyte was measured on the date provided

Table 3. Groundwater Elevation Data
Basin Oil Property

Well/Soil ID	Sample Date	Depth-to-Water Collection Time	Ground Elevation (NAVD 88)	Top of Casing (TOC)	DTW (feet below TOC)	GW Elevation (feet above NAVD 88)	GW Elevation (feet above MLLW)	Coordinates (Northing / Easting)
Basin Oil								
MW-12	5/26/09	1235	22.07	21.82	5.37	16.45	18.83	195325.33 / 1275176.87
MW-13	5/26/09	1245	25.73	25.38	4.30	21.08	23.46	195239.60 / 1275198.03
T-117								
MW-01	5/26/09	1250	--	21.87	8.09	--	13.78	--
MW-02	5/26/09	1223	--	15.48	8.51	--	6.97	--
MW-03	5/26/09	1300	--	16.45	10.45	--	6.00	--
MW-04R	5/26/09	1237	--	18.86	11.75	--	7.11	--
MW-05R	5/26/09	1232	--	17.33	11.28	--	6.05	--
MW-06	5/26/09	1227	--	16.32	12.66	--	3.66	--
MW-07	5/26/09	1250	--	19.85	16.38	--	3.47	--
MW-08R	5/26/09	1243	--	19.40	15.29	--	4.11	--
MW-9	5/26/09	1223	--	23.40	14.49	--	8.91	--
MW-10	5/26/09	1228	--	22.83	13.39	--	9.44	--
MW-11	5/26/09	1226	--	23.07	13.63	--	9.44	--

Basin Oil Ground Elevation = NAVD 88 (Bush, Roed & Hitching, Inc. 2009)
T-117 Elevation data provided by AECOM 2009
Mean Low Low Water (MLLW) = NAVD + 2.38 feet
All values measured in feet

Table 4. Field Measurements for Groundwater Samples
Basin Oil Property

Sample	Date / Time	Volume Purged (L)	Depth to Water (ft)	Temperature (C°)	pH	EC (mS)	D.O. (mg/L)	Redox (mVolts)	Turbidity (NTU)
GW-12-052609 (MW-12)	5/26/09 / 1330	0.5	5.87	21.33	8.3	0.786	3.51	113.6	--
	5/26/09 / 1333	0.58	5.96	21.73	8.29	0.786	3.56	112.4	--
	5/26/09 / 1336	0.60	6.10	21.67	8.31	0.788	3.66	111.1	--
	5/26/09 / 1339	0.64	6.18	20.76	8.33	0.799	3.83	109.6	--
	5/26/09 / 1342	0.70	6.27	19.71	8.35	0.799	3.85	108.3	--
	5/26/09 / 1345	0.75	6.33	19.34	8.35	0.792	3.79	107.7	--
	5/26/09 / 1348	0.8	6.39	19.35	8.30	0.784	3.47	110.1	--
	5/26/09 / 1351	0.85	6.46	19.35	8.28	0.782	3.25	110.1	--
	5/26/09 / 1354	0.90	6.54	19.70	8.29	0.782	3.19	107.8	--
	5/26/09 / 1357	1	6.63	19.75	8.30	0.782	3.22	106.5	--
	5/26/09 / 1400	1.10	6.69	19.70	8.32	0.785	3.35	105.7	90.6
	5/26/09 / 1403	--	6.72	--	--	--	--	--	90.6
GW-13-052609 (MW-13)	5/26/09 / 1610	0.5	4.50	20.71	7.29	2.034	5.29	90.5	Clear
	5/26/09 / 1613	0.65	4.50	21.07	7.38	2.030	4.65	66.8	Clear
	5/26/09 / 1616	0.80	4.50	21.46	7.35	2.031	4.48	82.1	Clear
	5/26/09 / 1619	0.95	4.51	21.81	7.38	2.032	4.09	88.5	Clear
	5/26/09 / 1622	1.10	4.52	22.14	7.41	2.033	3.95	91.3	Clear
	5/26/09 / 1625	1.25	4.53	22.32	7.06	2.036	4.10	90.7	Clear
	5/26/09 / 1628	1.4	4.54	22.55	7.48	2.036	3.97	87.6	Clear
	5/26/09 / 1631	1.55	4.55	22.65	7.51	2.037	3.96	84.4	Clear
	5/26/09 / 1634	1.70	4.56	22.74	7.53	2.038	3.90	74.7	Clear
	5/26/09 / 1637	1.85	4.58	22.77	7.52	2.040	3.95	73.5	Clear
	5/26/09 / 1640	2.00	4.59	22.71	7.55	2.041	3.98	73.4	Clear
	5/26/09 / 1643	2.15	4.60	22.81	7.56	2.048	4.01	73.3	Clear

L = Liters
ft = feet
C° = degree Celcius
mS = milliSiemens per centimeter
mg/L = miligrams per Liter
mVolts = millivolts
NTU = Nephelometric Turbidity Unit
(--) not measured

Table 5. Sampling Results: Surface Soil
Basin Oil Property

Group	Parameter	MTCA Method A	MTCA Method B	Sediment Screening Level[A]	SS-1 0-2 inch 5/12/2009	SS-1 2-6 inch 5/12/2009	SS-2 0-2 inch 5/13/2009	SS-2 2-6 inch 5/13/2009
PCBs (mg/kg)	Aroclor 1221	--	--	--	0.032 U	0.032 U	0.032 U	0.032 U
	Aroclor 1232	--	--	--	0.032 U	0.032 U	0.032 U	0.032 U
	Aroclor 1242	--	--	--	0.032 U	0.032 U	0.032 U	0.032 U
	Aroclor 1016	--	5.6	--	0.032 U	0.032 U	0.032 U	0.032 U
	Aroclor 1248	--	--	--	0.032 U	0.032 U	0.032 U	0.032 U
	Aroclor 1254	--	1.6	--	0.032 U	0.032 U	0.032 U	0.032 U
	Aroclor 1260	--	--	--	0.032 U	0.032 U	0.032 U	0.032 U
	Total PCBs	1.0	0.5	0.065	0.032 U	0.032 U	0.032 U	0.032 U
Dioxin/ Furan (pg/g)	2,3,7,8-TCDD	--	--	--	**0.225 J**	**0.279 J**	0.117 U	0.0899 U
	1,2,3,7,8-PECDD	--	--	--	**0.4 J**	0.251 U	**0.361 J**	0.154 U
	1,2,3,4,7,8-HXCDD	--	--	--	**0.519 J**	0.182 U	**0.384 J**	0.173 U
	1,2,3,6,7,8-HXCDD	--	--	--	**2.19 J**	**0.44 J**	**1.09 J**	0.251 U
	1,2,3,7,8,9-HXCDD	--	--	--	**1.34 J**	**0.509 J**	**0.955 J**	0.232 U
	1,2,3,4,6,7,8-HPCDD	--	--	--	**36.4**	**5.54**	**25**	**2.37 J**
	OCDD	--	--	--	**223**	**42.9**	**181**	**14.4**
	2,3,7,8-TCDF	--	--	--	0.137 U	0.0528 U	**0.649**	0.076 U
	1,2,3,7,8-PECDF	--	--	--	0.146 U	0.0608 U	**0.258 J**	0.164 U
	2,3,4,7,8-PECDF	--	--	--	0.184 U	0.0795 U	**0.58 J**	0.214 U
	1,2,3,4,7,8-HXCDF	--	--	--	**0.213 J**	0.0512 U	**0.454 J**	0.0829 U
	1,2,3,6,7,8-HXCDF	--	--	--	**0.189 J**	0.056 U	**0.54 J**	0.0939 U
	2,3,4,6,7,8-HXCDF	--	--	--	**0.191 J**	0.0509 U	**0.758 J**	0.087 U
	1,2,3,7,8,9-HXCDF	--	--	--	0.103 U	0.0851 U	**0.183 J**	0.142 U
	1,2,3,4,6,7,8-HPCDF	--	--	--	**2.8**	**0.367 J**	**4.94**	**0.324 J**
	1,2,3,4,7,8,9-HPCDF	--	--	--	0.223 U	0.0918 U	**0.297 J**	0.102 U
	OCDF	--	--	--	**2.92 J**	0.464 U	**4.79**	0.349 U
	TEQ 0 DL	--	11	--	**1.55**	**0.45**	**1.40**	**0.03**
	TEQ 1/2 DL	--	11	--	**1.59**	**0.61**	**1.46**	**0.25**
	TEQ 1 DL	--	11	--	**1.63**	**0.77**	**1.52**	**0.46**

Detections are shown in **bold** text.

[A] SAIC 2006; draft soil-to-sediment screening levels based on Sediment Management Standards (SMS) Cleanup Screening Level (CSL) values (SAIC 2006).

TEQ = Toxic Equivalency Quotient
DL = Detection Limit

Table 6: Sampling Results: Soil Borings
Basin Oil Property
(All concentrations in mg/kg DW)

Parameter	MTCA Method A	MTCA Method B	Draft Soil-to-Sediment Screening Level[A]	BSB-1 0-6 inch 5/12/2009	BSB-1 15 feet 5/12/2009	BSB-2 0-6 inch 5/12/2009	BSB-2 12.5 feet 5/12/2009	BSB-3 0-6 inch 5/12/2009	BSB-3 10 feet 5/12/2009	BSB-3 12.5 feet 5/12/2009	BSB-3 15 feet 5/12/2009	BSB-4 0-6 inch 5/12/2009	BSB-4 12.5 feet 5/12/2009	BSB-5 0-6 inch 5/12/2009	BSB-5 5 feet 5/12/2009	BSB-5 12.5 feet 5/12/2009	BSB-5 15 feet 5/12/2009	BSB-6 0-6 inch 5/13/2009	BSB-6 2.5 feet 5/13/2009	BSB-6 15 feet 5/13/2009	BSB-7 0-6 inch 5/13/2009
Metals																					
Arsenic	20	0.67	590	**3.1**	**3**	**3.2**	**2.2**	**7.2**	--	**3.1**	**3.9**	**4.6**	**2.4**	**6.5**	**0.7**	NA	**2.9**	**8.3 J**	NA	**1.4 J**	**7.5 J**
Beryllium	--	160	--	**0.1**	**0.2**	**0.1**	**0.2**	**0.3**	--	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**	0.1 U	NA	**0.2**	0.1 U	NA	0.1 U	**0.1**
Cadmium	2.0	80	1.7	0.2 U	0.2 U	0.2 U	0.2 U	**0.3**	--	0.2 U	0.2 U	0.2 U	0.2 U	**0.4**	0.2 U	NA	0.2 U	0.4	NA	0.2 U	**0.6**
Chromium	19	240	270	**19.9**	**29.2**	**25.4**	**33.5**	**18**	--	**35.9**	**30.4**	**18.3**	**35**	**31.5**	**13.9**	NA	**19.7**	**45.8 J**	NA	**11.3 J**	**23.9 J**
Copper	--	3,000	39	**23.7**	**19.5**	**13.9**	**19.5**	**21.9**	--	**12.6**	**11.9**	**26.3**	**16.9**	**29.1**	**12.1**	NA	**13.5**	**48.3 J**	NA	**12.2 J**	**52.3 J**
Lead	250	--	67	**8**	**2**	2 U	**2.0**	**21**	--	2 U	2 U	**6.0**	2 U	**35**	2 U	NA	2 U	21	NA	2 U	**18**
Mercury	2.0	24	0.03	**0.05**	**0.03**	**0.04**	**0.03**	**0.09**	--	0.03 U	**0.03**	**0.06**	**0.03**	**0.10**	0.02 U	NA	**0.02**	**0.07**	NA	0.02 U	**0.03**
Nickel	--	1,600	--	**11**	**35**	**29**	**41**	**16**	--	**27**	**27**	**12**	**41**	**15**	**6.0**	NA	**22**	**29 J**	NA	**8 J**	**40 J**
Zinc	--	24,000	38	**48 J**	**45 J**	**39 J**	**40 J**	**65 J**	--	**32 J**	**30 J**	**40 J**	**41 J**	**80 J**	**25 J**	NA	**32 J**	**87**	NA	**41**	**195**
PCBs																					
Aroclor 1242	--	--	**--**	0.031 U	0.03 U	0.033 U	0.032 U	0.032 U	0.031 U	0.16 U	0.032 U	0.031 U	0.031 U	0.031 U	0.033 U	0.031 U	0.032 U	0.16 U	NA	0.032 U	0.16 U
Aroclor 1254	--	1.6	0.065	0.031 U	0.03 U	0.033 U	0.032 U	0.032 U	0.031 U	0.16 U	0.032 U	0.031 U	0.031 U	0.031 U	0.033 U	0.031 U	0.032 U	0.16 U	NA	0.032 U	0.16 U
Aroclor 1260	--	--	0.065	**0.096**	0.03 U	0.033 U	0.032 U	0.032 U	0.031 U	**1.0**	0.032 U	**0.15**	0.031 U	**0.12**	0.033 U	0.031 U	0.032 U	**0.56**	NA	0.032 U	**0.99**
Total PCBs	1.0	0.5	0.065	**0.096**	0.03 U	0.033 U	0.032 U	0.032 U	0.031 U	**1.0**	0.032 U	**0.15**	0.031 U	**0.12**	0.033 U	0.031 U	0.032 U	**0.56**	NA	0.032 U	**0.99**
Petroleum Hydrocarbons																					
Diesel Range Organics	2000	--	**--**	**58**	5.2 U	5.5 U	5.3 U	6.2 U	--	6 U	6 U	**56**	5.4 U	**36**	5 U	NA	5.4 U	**900**	6.2 U	5.6 U	**430**
Heavy Oil	2000	--	**--**	**240**	10 U	11 U	11 U	**35**	--	12 U	12 U	**64**	11 U	**150**	10 U	NA	11 U	**840**	**36**	11 U	**470**
Gasoline Range Organics	30	--	**--**	6.7 U	5.6 U	6 U	5.4 U	7.8 U	--	5.9 U	6.7 U	7.1 U	5.3 U	6.7 U	5.7 U	NA	7.1 U	**250**	**9.7 J**	8.4 U	**1100**
Semivolatile Organic Compounds (SVOCs)																					
Naphthalene	5.0	1,600	0.2	0.06 U	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	**0.6**
Acenaphthene	--	4,800	0.06	**0.21**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	**0.11**
Fluorene	--	3,200	0.081	**0.15**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	**0.2**
Phenanthrene	--	--	0.49	**1.7**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	**0.26**
Anthracene	--	24,000	1.2	**0.33**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
1-Methylnaphthalene	--	--	--	0.06 U	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	**0.20**	NA	0.063 U	**1.0**
2-Methylnaphthalene	--	--	0.073	0.06 U	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	**0.22**	NA	0.063 U	**1.3**
Fluoranthene	--	3,200	1.2	**2.4**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Pyrene	--	2,400	1.4	**1.6**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Benzo(a)anthracene	--	--	0.27	**0.93**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Chrysene	--	--	0.46	**1.0**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Benzo(b)fluoranthene	--	--	0.45	**0.89**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Benzo(k)fluoranthene	--	--	0.45	**0.78**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Benzo(a)pyrene	0.1	0.14	0.21	**0.98**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Indeno(1,2,3-cd)pyrene	--	--	0.088	**0.5**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Dibenz(a,h)anthracene	--	--	0.033	**0.14**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Benzo(g,h,i)perylene	--	--	0.078	**0.53**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Butylbenzylphthalate	--	16,000	0.066	0.06 U	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
bis(2-Ethylhexyl)phthalate	71	1,600	0.078	**0.06**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	**0.28**	0.058 U	NA	0.063 U	**1.0**	NA	0.063 U	**0.58**
Dibenzofuran	--	160	0.059	**0.071**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	**0.076**
Volatile Organic Compounds (VOCs)																					
Ethylbenzene	6	8,000	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.0018**	NA	0.001 U	0.6 U
m, p-Xylene	--	160,000	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.039**	NA	0.001 U	**14**
o-Xylene	--	160,000	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.0068**	NA	0.001 U	**4.0**
1,3,5-Trimethylbenzene	--	4,000	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.093 J**	NA	0.001 U	**5.4**
1,2,4-Trimethylbenzene	--	4,000	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.58**	NA	0.001 U	**13**
Isopropylbenzene	--	--	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.013 J**	NA	0.001 U	0.6 U
n-Propylbenzene	--	--	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.029 J**	NA	0.001 U	0.6 U
sec-Butylbenzene	--	--	**--**	0.0012 UJ	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.0094 J**	NA	0.001 U	0.6 U
4-Isopropyltoluene	--	--	**--**	0.0012 U	0.0008 U	0.0009 U	0.009 U	**0.0065**	--	0.0011 U	0.0011 U	**0.0042**	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.017 J**	NA	0.001 U	0.6 U
n-Butylbenzene	--	--	**--**	0.0012 UJ	0.0008 U	0.0009 U	0.009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	**0.016 J**	NA	0.001 U	0.6 U
Carbazole	--	50	**--**	**0.23**	0.058 U	0.063 U	0.06 U	0.066 U	--	0.06 U	0.06 U	0.061 U	0.06 U	0.059 U	0.058 U	NA	0.063 U	0.18 U	NA	0.063 U	0.065 U
Methylene Chloride	0.02	130	**--**	**0.0044**	**0.0025**	**0.0028**	**0.003**	**0.0052**	--	**0.018**	**0.0042**	**0.0047**	**0.002**	**0.0046**	**0.003**	NA	**0.0024**	**0.0061**	NA	**0.0031**	12 U
Acetone	--	8,000	**--**	**0.13**	**0.036**	**0.031**	**0.04**	**0.29**	--	**0.04**	**0.037**	**0.15**	**0.030**	**0.19**	**0.046**	NA	**0.024**	**0.12**	NA	**0.026**	3 U
Carbon Disulfide	--	8,000	**--**	0.0012 U	**0.0008**	0.0009 U	0.0009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	**0.0008**	0.0011 U	0.001 U	NA	0.0009 U	**0.0049**	NA	0.001 U	0.6 U

Table 6: Sampling Results: Soil Borings
Basin Oil Property
(All concentrations in mg/kg DW)

Parameter	MTCA Method A	MTCA Method B	Draft Soil-to-Sediment Screening Level[A]	BSB-1 0-6 inch 5/12/2009	BSB-1 15 feet 5/12/2009	BSB-2 0-6 inch 5/12/2009	BSB-2 12.5 feet 5/12/2009	BSB-3 0-6 inch 5/12/2009	BSB-3 10 feet 5/12/2009	BSB-3 12.5 feet 5/12/2009	BSB-3 15 feet 5/12/2009	BSB-4 0-6 inch 5/12/2009	BSB-4 12.5 feet 5/12/2009	BSB-5 0-6 inch 5/12/2009	BSB-5 5 feet 5/12/2009	BSB-5 12.5 feet 5/12/2009	BSB-5 15 feet 5/12/2009	BSB-6 0-6 inch 5/13/2009	BSB-6 2.5 feet 5/13/2009	BSB-6 15 feet 5/13/2009	BSB-7 0-6 inch 5/13/2009
2-Butanone	--	--	--	**0.0093**	0.004 U	0.0044 U	0.0046 U	**0.038**	--	0.0054 U	0.0054 U	**0.0073**	0.0038 U	**0.014**	0.0048 U	NA	0.0046 U	0.0046 U	NA	0.0053 U	3 U
Benzene	0.03	18	--	**0.0064**	0.0008 U	0.0009 U	0.0009 U	**0.0091**	--	0.0011 U	0.0011 U	**0.0013**	0.0008 U	**0.0045**	0.001 U	NA	0.0009 U	**0.0019**	NA	0.001 U	0.6 U
2-Hexanone	--	--	--	0.0058 U	0.004 U	0.0044 U	0.0046 U	0.0068 U	--	0.0054 U	0.0054 U	0.0061 U	0.0038 U	0.0057 U	0.0048 U	NA	0.0046 U	0.0046 U	NA	0.0053 U	3 U
Tetrachloroethene	0.05	1.9	--	0.0012 U	0.0008 U	0.0009 U	0.0009 U	0.0014 U	--	0.0011 U	0.0011 U	0.0012 U	0.0008 U	**0.0018**	0.001 U	NA	**0.001**	0.0009 U	NA	0.001 U	0.6 U
Toluene	7	6,400	--	0.0012 U	0.0008 U	0.0009 U	0.0009 U	**0.003**	--	**0.0011**	0.0011 U	0.0012 U	0.0008 U	0.0011 U	0.001 U	NA	0.0009 U	0.0009 U	NA	0.001 U	0.6 U
Other Parameters																					
Total Solids (% DW)	--	--	--	80.4	90.2	84.6	84.7	74.3		84.7	80.8	77.7	87.4	79.6	90.2	NA	89.4	87.5	NA	86.5	93.5
Grain Size (%)																					
Gravel	--	--	--	7.2	13	21.2	27.8	0.1 U		36.4	12.7	2.4	25.7	1	0.1 U	NA	67.9	59.8	NA	2.4	60.9
Sand	--	--	--	13.5	46	49.8	39.8	2.8		51	80.6	6.6	40	15.3	67.2	NA	25	27	NA	96.1	32.6
Silt	--	--	--	54.6	25.8	21.8	17.8	57.2		5.4	2.4	57.8	17.8	74.4	27.5	NA	4	8.8	NA	1.5	3.1
Clay	--	--	--	24.6	15	7.3	14.6	39.7		7.2	4.2	33.2	16.7	9.3	5.2	NA	3.1	4.2	NA	0.1 U	3.6

Table includes all parameters detected in soil in at least one sample. during this study. Detections are shown in **bold** text.

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 conditions.

Table 6: Sampling Results: Soil Borings
Basin Oil Property
(All concentrations in mg/kg DW)

Parameter	MTCA Method A	MTCA Method B	Draft Soil-to-Sediment Screening Level[A]	BSB-7 2.5 feet 5/13/2009	BSB-7 15 feet 5/13/2009	BSB-8 0-6 inch 5/13/2009	BSB-8 2.5 feet 5/13/2009	BSB-8 15 feet 5/13/2009	BSB-9 0-6 inch 5/13/2009	BSB-9 15 feet 5/13/2009	BSB-10 0-6 inch 5/13/2009	BSB-10 2.5 feet 5/13/2009	BSB-10 15 feet 5/13/2009	MW-12 0-6 inch 5/14/2009	MW-12 2.5 feet 5/14/2009	MW-13 0-6 inch 5/14/2009	MW-13 2.5 feet 5/14/2009
Metals																	
Arsenic	20	0.67	590	NA	**1.0 J**	**2.9 J**	**2.3 J**	**0.9 J**	**3.8 J**	**2.2 J**	**2.3 J**	**16 J**	**2.7 J**	**18 J**	**4.2 J**	**4.3 J**	**4.1 J**
Beryllium	--	160	--	NA	0.1 U	**0.1**	0.1 U	**0.1**	**0.2**	**0.2**	0.3 U	0.1 U	**0.2**	**0.3**	**0.3**	**0.2**	**0.2**
Cadmium	2.0	80	1.7	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.6 U	0.2 U	0.2 U	**0.7**	0.3 U	0.2 U	0.2 U
Chromium	19	240	270	NA	**1.9 J**	**20.8 J**	**7.9 J**	**11.2 J**	**15.1 J**	**33.9 J**	**60 J**	**11.2 J**	**21.7 J**	**22.5**	**18.7**	**54.1**	**49.1**
Copper	--	3,000	39	NA	**2.1 J**	**40.3 J**	**9.5 J**	**12.8 J**	**12.3 J**	**17.4 J**	**92.4 J**	**13.6 J**	**14.8 J**	**36.9**	**24.8**	**29.3**	**24.3**
Lead	250	--	67	NA	2 U	**4.0**	**2.0**	2 U	**3.0**	**2.0**	**14**	**3.0**	2 U	**83 J**	**5.0 J**	**6.0 J**	**3.0 J**
Mercury	2.0	24	0.03	NA	0.02 U	0.02 U	0.03 U	0.02 U	**0.03**	**0.03**	**0.03**	**0.03**	0.03 U	**0.14**	**0.04**	**0.06**	**0.05**
Nickel	--	1,600	--	NA	**3.0 J**	**20 J**	**9.0 J**	**9.0 J**	**9.0 J**	**38 J**	**42 J**	**7.0 J**	**29 J**	**18**	**12**	**54**	**49**
Zinc	--	24,000	38	NA	**6.0**	**62**	**27**	**39**	**43**	**51**	**88**	**40**	**36**	**133**	**42**	**50**	**50**
PCBs																	
Aroclor 1242	--	--	**--**	NA	0.031 U	0.032 U	0.031 U	0.031 U	0.032 U	0.033 U	0.031 U	0.032 U	0.032 U	**0.066**	0.032 U	0.032 U	0.031 U
Aroclor 1254	--	1.6	0.065	NA	0.031 U	0.032 U	0.031 U	0.031 U	0.032 U	0.033 U	**0.077 J**	0.032 U	0.032 U	**0.066**	0.032 U	0.032 U	0.031 U
Aroclor 1260	--	--	0.065	NA	0.031 U	**0.11**	**0.061**	0.031 U	**0.064**	0.033 U	**0.14**	**0.038**	0.032 U	**0.14**	0.032 U	**0.15**	0.031 U
Total PCBs	1.0	0.5	0.065	NA	0.031 U	**0.11**	**0.061**	0.031 U	**0.064**	0.033 U	**0.22**	**0.038**	0.032 U	**0.27**	0.032 U	**0.15**	0.031 U
Petroleum Hydrocarbons																	
Diesel Range Organics	2000	--	**--**	**7.8**	5.3 U	**740**	5.2 U	5 U	**8.7**	5.3 U	**1800**	5.3 U	5.3 U	**520**	6.5 U	**41**	6.3 U
Heavy Oil	2000	--	**--**	**52**	11 U	**1300**	10 U	10 U	**40**	11 U	**5200**	**18**	11 U	**350**	13 U	**77**	13 U
Gasoline Range Organics	30	--	**--**	7.8 UJ	7.2 U	6 U	7.6 U	6.2 U	8.2 U	4.7 U	**660**	8.6 U	6.8 U	6.2 U	7.8 U	6.8 U	7 U
Semivolatile Organic Compounds (SVOCs)																	
Naphthalene	5.0	1,600	0.2	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**0.94**	0.066 U	0.064 U	**3.7**	0.062 U	0.062 U	0.062 U
Acenaphthene	--	4,800	0.06	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**0.26**	0.066 U	0.064 U	**55**	0.062 U	0.062 U	0.062 U
Fluorene	--	3,200	0.081	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**0.5**	0.066 U	0.064 U	**44**	0.062 U	0.062 U	0.062 U
Phenanthrene	--	--	0.49	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**0.85**	0.066 U	0.064 U	**460**	**0.38**	0.062 U	0.062 U
Anthracene	--	24,000	1.2	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**780**	**0.064**	0.062 U	0.062 U
1-Methylnaphthalene	--	--	--	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**1.6**	0.066 U	0.064 U	**4.9**	0.062 U	0.062 U	0.062 U
2-Methylnaphthalene	--	--	0.073	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**2.7**	0.066 U	0.064 U	**4.8**	0.062 U	0.062 U	0.062 U
Fluoranthene	--	3,200	1.2	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**600**	**0.76**	0.062 U	0.062 U
Pyrene	--	2,400	1.4	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**0.23**	0.066 U	0.064 U	**560**	**0.5**	0.062 U	0.062 U
Benzo(a)anthracene	--	--	0.27	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**240**	**0.25**	0.062 U	0.062 U
Chrysene	--	--	0.46	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**0.24**	0.066 U	0.064 U	**250**	**0.27**	0.062 U	0.062 U
Benzo(b)fluoranthene	--	--	0.45	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**230**	**0.32**	0.062 U	0.062 U
Benzo(k)fluoranthene	--	--	0.45	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**140**	**0.22**	0.062 U	0.062 U
Benzo(a)pyrene	0.1	0.14	0.21	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**240**	**0.28**	0.062 U	0.062 U
Indeno(1,2,3-cd)pyrene	--	--	0.088	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**66**	**0.089**	0.062 U	0.062 U
Dibenz(a,h)anthracene	--	--	0.033	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**23**	0.062 U	0.062 U	0.062 U
Benzo(g,h,i)perylene	--	--	0.078	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**54**	**0.086**	0.062 U	0.062 U
Butylbenzylphthalate	--	16,000	0.066	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**0.27**	0.066 U	0.064 U	1.8 U	0.062 U	0.062 U	0.062 U
bis(2-Ethylhexyl)phthalate	71	1,600	0.078	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	**1.9**	0.066 U	0.064 U	1.8 U	0.062 U	0.062 U	0.062 U
Dibenzofuran	--	160	0.059	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**19**	0.062 U	0.062 U	0.062 U
Volatile Organic Compounds (VOCs)																	
Ethylbenzene	6	8,000	**--**	0.0014 UJ	0.0011 U	0.001 U	0.0013 U	0.0012 U	0.0012 U	0.001 U	**2.1 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
m, p-Xylene	--	160,000	**--**	0.0014 UJ	0.0011 U	0.001 U	0.0013 U	0.0012 U	0.0012 U	0.001 U	**10 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
o-Xylene	--	160,000	**--**	0.0014 UJ	0.0011 U	0.001 U	0.0013 U	0.0012 U	0.0012 U	0.001 U	**3.9 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
1,3,5-Trimethylbenzene	--	4,000	**--**	0.0014 UJ	0.0011 U	0.001 UJ	0.0013 U	0.0012 U	0.0012 U	0.001 U	**2.0 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
1,2,4-Trimethylbenzene	--	4,000	**--**	0.0014 UJ	0.0011 U	0.001 U	0.0013 U	0.0012 U	0.0012 U	0.001 U	**6.2 J**	0.0013 U	0.0012 U	**0.0014**	0.0011 U	0.0011 U	0.0014 U
Isopropylbenzene	--	--	**--**	0.0014 UJ	0.0011 U	0.001 UJ	0.0013 U	0.0012 U	0.0012 U	0.001 U	**0.12 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
n-Propylbenzene	--	--	**--**	0.0014 UJ	0.0011 U	0.001 UJ	0.0013 U	0.0012 U	0.0012 U	0.001 U	**0.63 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
sec-Butylbenzene	--	--	**--**	0.0014 UJ	0.0011 U	0.001 UJ	0.0013 U	0.0012 U	0.0012 U	0.001 U	0.0012 UJ	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
4-Isopropyltoluene	--	--	**--**	0.0014 UJ	0.0011 U	0.001 UJ	0.0013 U	0.0012 U	**0.0036**	0.001 U	**0.16 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
n-Butylbenzene	--	--	**--**	0.0014 UJ	0.0011 U	0.001 UJ	0.0013 U	0.0012 U	0.0012 U	0.001 U	**0.54 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
Carbazole	--	50	**--**	NA	0.06 U	0.17 U	0.061 U	0.063 U	0.064 U	0.058 U	0.17 U	0.066 U	0.064 U	**55**	0.062 U	0.062 U	0.062 U
Methylene Chloride	0.02	130	**--**	**0.0071 J**	**0.0036**	**0.005**	**0.0076**	**0.0036**	**0.0035**	0.0021 U	0.0023 UJ	**0.0031**	**0.0036**	**0.0036**	**0.0061**	**0.0055**	**0.0046**
Acetone	--	8,000	**--**	**0.5 J**	**0.033**	**0.072**	**0.072**	**0.028**	**0.11**	**0.029**	0.0058 UJ	**0.045**	**0.032**	**0.16**	**0.049**	**0.032**	**0.03**
Carbon Disulfide	--	8,000	**--**	0.0014 UJ	0.0011 U	**0.0019**	0.0013 U	0.0012 U	0.0012 U	0.001 U	**0.015 J**	0.0013 U	0.0012 U	**0.0025**	0.0011 U	0.0011 U	0.0014 U

Table 6: Sampling Results: Soil Borings
Basin Oil Property
(All concentrations in mg/kg DW)

Parameter	MTCA Method A	MTCA Method B	Draft Soil-to-Sediment Screening Level[A]	BSB-7 2.5 feet 5/13/2009	BSB-7 15 feet 5/13/2009	BSB-8 0-6 inch 5/13/2009	BSB-8 2.5 feet 5/13/2009	BSB-8 15 feet 5/13/2009	BSB-9 0-6 inch 5/13/2009	BSB-9 15 feet 5/13/2009	BSB-10 0-6 inch 5/13/2009	BSB-10 2.5 feet 5/13/2009	BSB-10 15 feet 5/13/2009	MW-12 0-6 inch 5/14/2009	MW-12 2.5 feet 5/14/2009	MW-13 0-6 inch 5/14/2009	MW-13 2.5 feet 5/14/2009
2-Butanone	--	--	--	**0.03 J**	0.0055 U	0.0052 U	0.0066 U	0.0059 U	0.0061 U	0.0051 U	0.0058 UJ	0.0066 U	0.0062 U	**0.018**	0.0057 U	0.0055 U	0.0069 U
Benzene	0.03	18	--	**0.014 J**	0.0011 U	0.001 U	0.0013 U	0.0012 U	0.0012 U	0.001 U	**0.64 J**	0.0013 U	0.0012 U	**0.0082**	**0.0019**	0.0011 U	0.0014 U
2-Hexanone	--	--	--	0.0073 UJ	0.0055 U	0.0052 U	0.0066 U	0.0059 U	0.0061 U	0.0051 U	0.0058 UJ	0.0066 U	0.0062 U	**0.011**	0.0057 U	0.0055 U	0.0069 U
Tetrachloroethene	0.05	1.9	--	**0.0031 J**	0.0011 U	**0.0064**	0.0013 U	0.0012 U	0.0012 U	0.001 U	**0.025 J**	0.0013 U	0.0012 U	0.0012 U	0.0011 U	0.0011 U	0.0014 U
Toluene	7	6,400	--	0.0014 UJ	0.0011 U	0.001 U	0.0013 U	0.0012 U	0.0012 U	0.001 U	**2.4 J**	0.0013 U	0.0012 U	**0.002**	0.0011 U	0.0011 U	0.0014 U
Other Parameters																	
Total Solids (% DW)	--	--	--		89.7	94.3	92.1	87.5	80.8	93.1	89.3	90.9	88.5	NA	NA	NA	NA
Grain Size (%)																	
Gravel	--	--	--		1.4	73.3	0.1 U	4.4	0.6	33.2	51.8	0.2	0.7	NA	NA	NA	NA
Sand	--	--	--		96.9	22.3	59.5	93.8	11.8	37.6	29.1	44.5	95.7	NA	NA	NA	NA
Silt	--	--	--		1.7	2.4	36	1.4	75.6	15.2	11.8	49.2	2.3	NA	NA	NA	NA
Clay	--	--	--		0.1 U	2	4.5	0.4	11.9	13.8	7.4	6.1	1.3	NA	NA	NA	NA

Table includes all parameters detected in soil in at least one sample during this study. Detections are shown in **bold** text.

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 conditions.

Table 7. Sampling Results: Groundwater
Basin Oil Property
(All concentrations in ug/L)

Parameter	MTCA Groundwater Cleanup Levels		Draft GW-to-Sediment Screening Levels[A]	GW-052609-FD 5/26/2009	GW-12-052609 5/26/2009	GW-13-052609 5/26/2009	TB-052609[B] 5/26/2009
	Method A	Method B					
Total Metals							
Arsenic	5	0.058	370	**18.6**	**17.8**	**10.7**	ND
Selenium	--	--	--	0.5 U	0.5 U	2 U	ND
Dissolved Metals							
Arsenic	5	0.058	370	**20.4**	**17.7**	**9.4**	ND
Selenium	--	--	--	0.5 U	0.5 U	**1.7**	ND
VOCs							
Trichloroethene	5	0.49	--	0.2 U	0.2 U	0.2 U	**4.3**
Chloromethane	--	3.4	--	**0.4**	0.2 U	0.2 U	ND
Acetone	--	--	--	**3.3**	**2.5**	**2.6**	ND
Chloroform	--	7.2	--	**1**	**1.1**	**2**	ND
cis-1,2-Dichloroethene	--	0.081	--	--	--	--	**11**
Tetrachloroethene		5	--	--	--	--	**46**

Table includes all parameters detected in soil in at least one sample during this study. Detections are shown in bold text.

Yellow shaded cells are data that exceed MTCA Method A or Method B groundwater cleanup levels or draft groundwater-to-sediment screening levels (SAIC 2006).

ND = Not detected

U = Parameter not detected at the stated reporting level

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

[B] Trip blank sample was reanalyzed; listed VOCs were not detected (see Section 4.2.2)