Lower Duwamish Waterway Superfund Site

Terminal 117 Early Action Area

T-117 UPLAND SOIL - JUNE 2005
FIELD SAMPLING AND DATA REPORT

For submittal to:

US Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, WA 98101

November 15, 2005

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Table of Contents

List of Tables and Figures

Acronyms

Acronym	definition
ARI	Analytical Resources, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
City	City of Seattle
COC	chain of custody
DO	dissolved oxygen
DOF	Dalton, Olmsted and Fuglevand, Inc.
dw	dry weight
EAA	early action area
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
FS	feasibility study
PAH	polycyclic aromatic hydrocarbon
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
MLLW	mean lower low water
MW	monitoring well
NAPL	non-aqueous-phase liquid
NTU	nephelometric turbidity unit
Onsite	Onsite Enterprises, Inc.
ORP	oxygen-redox potential
PCB	polychlorinated biphenyl
Port	Port of Seattle
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI	remedial investigation
RM	river mile
Spc	specific conductance
SPT	standard penetration depth
T-117	Terminal 117
TOC	total organic carbon
TPH	Total petroleum hydrocarbon
Windward	Windward Environmental LLC

1.0 Introduction

This data report presents the results of the soil and water investigation conducted in June 2005 at the Terminal 117 (T-117) site in accordance with the addendum to the T-117 Quality Assurance Project Plan (QAPP) (Windward et al. 2005). T-117 was identified as an early action area (EAA) of the Lower Duwamish Waterway (LDW) Superfund site. This investigation of T-117 was conducted under the existing LDW Administrative Order on Consent (Cohen 2003) signed by the City of Seattle (City), King County, the Port of Seattle (Port), and The Boeing Company—working together in the LDW as the Lower Duwamish Waterway Group (LDWG. Work at T-117 is sponsored by two of the four LDWG members: the Port and the City.

This work was performed as part of an iterative process to provide additional information on the nature and extent of polychlorinated biphenyls (PCBs) in soils and groundwater to assist in cleanup decisions and design. Subsurface soil samples were collected from three upland regions of T-117: the unpaved upland area along the northern shoreline; beneath the pavement along the shoreline edge of the site; and the ditch along the southern boundary of the site. Two new groundwater monitoring wells were also installed to extend the existing network northward and facilitate sampling from wells along the entire shoreline. All shoreline monitoring wells and upgradient monitoring well (MW) 3 were also monitored for the presence of free product. A geophysical survey was conducted along the eastern portion of the shoreline paved area to delineate the fill placed as part of the 1999 upland removal action.

1.1 SITE DESCRIPTION

1.1.1 T-117 early action area

T-117 EAA is located on the west side of the LDW from approximately RM 3.5-3.7, as measured from the southern tip of Harbor Island. The area generally consists of the intertidal zone extending from the top of the shoreline bank (~ +13 ft mean lower low water [MLLW]) to the slope of the navigation channel (~ -9 ft MLLW) and is bordered by South Park Marina to the north and the Boeing South Park facility to the south.

1.1.2 T-117 adjacent upland property

The adjacent upland portion of the west shore of the T-117 EAA includes the Port's T-117 property. This property, the former Malarkey Asphalt Company site, is located at 8700 Dallas Avenue South in Seattle, Washington. The upland T-117 property covers approximately 5.5 ac including a 50-60-ft (15-18-m)-wide section of land adjacent to the shoreline owned by the Port as successor in interest to the King County Commercial Waterway District No. 1. In 1999, the Port acquired the additional inland parcels that made up the former Malarkey property between the shoreline parcel and

Dallas Avenue South. These properties were consolidated to form the present-day T-117. Adjacent properties include Basin Oil Company on the west side of Dallas Avenue, Boeing Company to the south, and South Park Marina to the north/northwest.

1.2 SAMPLE DESIGN

The primary focus of this investigation was to collect additional subsurface soil data to delineate the vertical and lateral extent of PCB contamination along the unpaved upland area of the northern shoreline, beneath the pavement along the shoreline edge of the site, and in the ditch along the southern boundary. This investigation also further evaluated groundwater as a potential contamination pathway for PCBs and non-aqueous phase liquid (NAPL). The following types of samples were collected:

- Deep soil borings (0-20 ft) along the top of the bank at the north end of the site (Two of these boring locations were completed as new monitoring wells)
- Shallow borings (0-9 ft) along the eastern shoreline edge of pavement cap
- Direct-push probes (0-3 ft) in the southern drainage ditch
- NAPL measurement in monitoring wells
- Groundwater sampling from new and existing monitoring wells

Soil borings were advanced along the shoreline to collect both soil chemistry data as well as geotechnical data, i.e. Standard Penetration Test (SPT), to assist the upland cleanup design. Elsewhere, soil samples were collected with direct-push probe equipment to collect subsurface samples where geotechnical SPT data was not required. A geophysical survey was conducted before the shoreline soil collection to determine the eastern extent of fill placed following the 1999 removal action in order to determine the most appropriate sampling location along that portion of the shoreline.

Groundwater chemical data was collected from two new wells along the northern shoreline and four existing shoreline wells to evaluate whether PCBs are being transported in groundwater. All site wells, including inland MW 3, were also evaluated for the presence of NAPL in groundwater.

1.3 REPORT ORGANIZATION

This report is organized into sections addressing field methods, laboratory methods, results, and references. The following Appendices support the text:

- Appendix A – results tables
- Appendix B – data management
- Appendix C – NAPL observation tables
- Appendix D – proposed field changes memorandum

- Appendix E – geophysical/ground penetrating radar survey
- Appendix F – data validation
- Appendix G – analytical lab data
- Appendix H – field forms, logs, and notes
- Appendix I – chain of custody forms

2.0 Field Methods

2.1 SAMPLE COLLECTION

All field activities were performed under the direction of the field coordinator or other qualified personnel, with EPA oversight as appropriate. Sampling was accomplished by a joint operation of Windward Environmental LLC (Windward), Onsite Enterprises, Inc. (Onsite), and Dalton, Olmsted and Fuglevand, Inc. (DOF). Soil borings, monitoring well construction, and geoprobes were accomplished under the direction of DOF with assistance from a Cascade Drilling. The geophysical survey utilizing ground-penetrating radar was conducted by Golder Associates. The various sampling methods are discussed below.

2.1.1 Soil boring collection and monitoring well construction

Soil borings and monitoring well installations were conducted using a hollow-stem auger drill, penetrating up to 19 ft, deployed from a drill rig. Detailed descriptions of soil boring sampling and well installation methods are found in Section 3.2.2.4 of the QAPP (Windward et al. 2003) and descriptions of the supplemental soil boring sampling methods are in the QAPP addendum (Windward et al. 2005).

2.1.2 Push probe soil sample collection

Push probe sampling was completed with a 2-ft. long piston-operated sampler with a positive release system to limit the potential for cross contamination in the probe. All of the eastern shoreline samples with "PS" in the location ID were supposed to be sampled by direct-push probes advanced from truck-mounted equipment, but hard substrate made it difficult, so soil borings were conducted with a hollow-stem auger drill rig penetrating up to 9 ft at all locations except for PS1A and PS2A. See Appendix D, technical memorandum on proposed field changes for additional details. Prior to collection of the shoreline sampling location adjacent to the 1999 removal action area, a geophysical survey was conducted to determine the eastern extent of fill placed following the removal action in order to determine the most appropriate sampling location along that portion of the shoreline. The results of the survey can be found in Appendix E.

Eight direct-push probe locations, shown in Figure 1, were originally planned to be completed along three transects in the southern drainage ditch. Because of accessibility

issues to this portion of the site, these probes were manually advanced 3 ft below ground surface with an electric portable jack hammer.

2.1.3 Monitoring well sample collection and NAPL monitoring

Two newly constructed wells (MW-7 and MW-8) were developed after installation using surge and bail techniques after well construction. Newly constructed wells MW-7 and MW-8 and existing shoreline wells MW-2, MW-4, MW-5, and MW-6 were sampled using low-flow techniques. Detailed descriptions of the sample collection methods are found in Section 3.2.2.8 of the QAPP (Windward et al. 2003). Well sampling times were selected to coincide with a falling tide to help ensure the collection of water representative of the site. All wells were purged prior to sampling. Water levels in the wells responded to tidal fluctuations and were observed to recharge after purging, indicating good communication with the surrounding groundwater.

An additional free product investigation was conducted in the shoreline wells (MW-2, MW-4, MW-5, MW-6, MW-7, MW-8) and inland well MW-3 prior to the sampling of the shoreline wells. This work was performed using interface probes to periodically check for the presence of NAPL during a representative portion of the tide cycle (see Appendix C for additional details).

2.2 SAMPLE PROCESSING

The soil sampling processing occurred at upland T-117 property. After homogenization, soil samples were placed in appropriate-sized, certified-clean, wide-mouth glass jars capped with Teflon®-lined lids (QAPP Table 3-7). Visible organisms and debris were removed prior to distribution to sample containers; removed materials were noted in the field logbooks. All groundwater samples were placed in appropriately-sized, certified glass or high density polyethylene bottles capped with Teflon®-lined lids (QAPP Table 3-8). Each container was sealed, labeled, and stored under conditions specified in Table 2-1 of the QAPP.

2.3 FIELD EQUIPMENT DECONTAMINATION

To prevent cross-contamination of samples, all sampling processing equipment that came in contact with the soil underwent the following decontamination procedures prior to collection activities at each location:

- Rinse with tap water and wash with scrub brush until free of soil
- Wash with phosphate-free detergent and tap water
- Rinse with tap water
- Rinse with distilled water

There were no cases in which samples were suspected of having higher levels of contaminants, so no extra decontamination steps were conducted. Between boring

locations the auger stems and drill bit were steam cleaned in a self-contained decontamination trailer.

Sampling equipment used for collecting water samples was pre-cleaned and used only once per sample, so decontamination between samples was not necessary.

2.4 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

Field duplicate samples were collected to evaluate the effectiveness of field decontamination and homogenization procedures. Soil duplicates were prepared from the same batch of homogenized sediment. All samples collected were documented in the site logbook. Table 2-1 lists the field duplicate sample IDs and the corresponding sample IDs collected from the same location.

Table 2-1. Duplicate sample IDs

SAMPLE ID	DUPLICATE SAMPLE ID
T117-PD1-01	T117-DUPL1
T117-PS2A-02	T117-DUPL2
T117-PS4-04	T117-DUPL3

Three rinsate blanks were collected after processing samples from T117-PS1A, T117-PS5, T117-PD4. Rinsate blanks were collected by running deionized water over decontaminated sample processing equipment and collecting the water in clean sample jars.

2.5 DISPOSAL OF UNUSED SAMPLE MATERIAL

Unused soil and contaminated water from the soil borings was collected in drums and stored on the property until it was transferred to a proper disposal facility. All disposable sampling materials and personnel protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, were placed in heavyweight garbage bags or other appropriate containers. Disposable supplies were removed from the site by sampling personnel and placed in a normal refuse container for disposal as solid waste.

2.6 SAMPLE IDENTIFICATION SCHEME

The location ID naming convention is described below. The first four characters are T-117, to designate the T-117 area. The next two characters identify the type of location, based on the medium sampled or sampling method, followed by consecutive numbers to identify the specific location within the T-117 area:

- MW – monitoring well location, followed by monitoring well number 2 to 8
- SB – soil boring location, followed by consecutive numbers 15 to 18
- PS – push probe shoreline location, followed by consecutive numbers 1 to 12

- PD – push probe ditch location, followed by consecutive numbers 1 to 8

Sample IDs are the same as location IDs, except for some that contain additional information, as follows:

- SB followed by two characters identifying the depth interval of soil collected, e.g., for SB-15 through SB-18, 01 = 0 to 1.5 ft, 02= 2.5 to 4 ft, 03 = 5 to 6.5 ft, 04 = 7.5 to 9 ft, 05 = 10 to 12.5 ft, 06= 17.5 to 19 ft;
- Rinsate blanks were assigned the same characters as the station identifier, followed by the identifier "RB"

2.7 SAMPLE DOCUMENTATION PROCEDURES

A field data log was used to note the date, time, and location of sampling stations, as well as additional parameters recorded in the field (see Appendix H). The following data were included in the field data log:

- Names of field coordinators and person(s) collecting and logging the samples
- Unique station identifier
- Date and time of collection
- Collection method
- Observations made during sample collection, including weather conditions, complications, and other details associated with sampling equipment or procedures

After groundwater collection, the following additional information was recorded on the collection form:

- Depth to bottom of monitoring well
- Depth to groundwater
- Tide elevation relative to MLLW
- Well volume
- Purge flow rate
- Purge time
- Purge volume
- Purge parameters: DO, temperature, pH, turbidity, Spc, ORP
- Groundwater observations, including the presence of product sheen or layer

Soil borings contained the following additional information that was recorded on the soil core log:

- Physical observations of soil, including the presence of foreign objects, color, presence of sheens, apparent grain size, moisture, and odor
- Borings were logged to record geologic stratigraphy and the presence of any water-bearing layers
- Penetration depth of the sampler
- Standard penetration test results

Soil borings in which monitoring wells were installed contain additional information that was recorded on the boring and well log.

2.8 CHAIN OF CUSTODY AND SAMPLE TRANSPORT PROCEDURES

Chain-of-custody (COC) forms were used to track sample custody (see Appendix I). Samples collected in the field were placed in a cooler with ice. All soil and water samples were hand-delivered to Analytical Resources, Inc (ARI) in Tukwila, WA.

2.9 FIELD DEVIATIONS FROM THE QAPP

Field deviations from the QAPP and QAPP addendum 4 included modifications to the sampling method used at shoreline push probe locations and sample location. These field deviations did not affect data quality, and are discussed in Appendix D, technical memorandum on proposed field changes .

3.0 Laboratory Methods

ARI conducted chemical and physical testing for each sample. All soil samples were analyzed for total PCBs, total solids and TOC. Select soil boring samples were also analyzed for grain size and geotechnical parameters. Monitoring well groundwater samples were analyzed for total PCBs, and TOC and total suspended solids. Groundwater from MW-2 was also analyzed for polycyclic aromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPHs) due to the trace presence of free product.

3.1 ANALYTICAL METHODS

The chemical and physical testing adhered to the most recent EPA analysis protocols. Grain-size analysis was conducted following PSEP (1986) protocols for soil. Table 3-1 summarizes specific methods used to analyze the samples.

Table 3-1. Summary of analytical methods

ANALYSIS	UNITS	RDL	METHOD	REFERENCE
Soil				
Polychlorinated biphenyls (PCBs)	µg/kg dw	19	GC/ECD	EPA 8082
TOC	% dw	0.02	combustion	Plumb, 1981
Total solids	% ww	0.01	oven-dried	SM254-G
Grain size	% dw	0.1	sieve	PSEP 1986
Water				
PAHs	µg/kg dw	20	GC/MS	EPA 8270
PCBs	µg/kg dw	19	GC/ECD	EPA 8082
TPH	µg/kg dw	0.5	GC/FID	NWTPH-Dx NWTPH-G
TOC	% dw	0.02	combustion	EPA 415.1
Total suspended solids (TSS)	% ww	0.01	oven-dried	EPA 160.2

dw – dry weight basis
ECD – electron capture detection
GC – gas chromatography
MS – mass spectrometry
PSEP – Puget Sound Estuary Program
RDL – reporting detection limit
ww – wet weight basis
FID – flame ionization detector

3.2 QA/QC FOR CHEMICAL/PHYSICAL TESTING

Data quality objectives and laboratory quality control procedures are discussed in Section 2.4 of the QAPP. Analytical results were validated by Ecochem. The results of the validations are presented in Appendix F.

3.3 LABORATORY DEVIATIONS FROM THE QAPP

There were no deviations from the QAPP for laboratory analyses.

4.0 Results

Results of the soil and water chemistry analyses are summarized below. These results have undergone data validation, as described in detail in Appendix F. The results presented in this report are of good quality and should be considered acceptable for all project uses. Raw laboratory data can be found in Appendix G.

Significant figure rules were applied when summing for totals (i.e. summing of aroclors for total PCBs). A detailed discussion of the hierarchical approach used in averaging laboratory replicates, calculating totals, and application of significant figures is presented in Appendix B.

4.1 SAMPLING LOCATIONS AND SAMPLE CHARACTERISTICS

The sample locations and descriptions are presented in Table 4-1 (soil), and Table 4-2 (monitoring wells). All coordinates are reported in Washington State Plane North (NAD 83, US survey feet).

Table 4-1. Soil sample locations

LOCATION	SAMPLER TYPE	DATE	START TIME	X	Y	# SAMPLE INTERVALS	TOTAL DEPTH (ft)
South Ditch							
T117-PD-1	PP	6/8/05	0930	1275575	195202	3	3
T117-PD-2	PP	6/8/05	1001	1275577	195185	3	3
T117-PD-3	PP	6/8/05	1030	1275594	195164	3	3
T117-PD-4	PP	6/8/05	0910	1275560	195195	3	3
T117-PD-5	PP	6/8/05	0905	1275561	195179	3	3
T117-PD-6	PP	6/8/05	1040	1275561	195169	3	3
T117-PD-7	PP	6/8/05	0815	1275528	195177	3	3
T117-PD-8	PP	6/8/05	0840	1275526	195172	3	3
Shoreline							
T117-SB-15	HSA	6/6/05	1420	1275131	195735	8	19
T117-SB-16	HSA	6/6/05	1320	1275175	195715	8	19
T117-SB-17	HSA	6/6/05	1145	1275240	195743	9	21.5
T117-SB-18	HSA	6/6/05	0930	1275290	195716	7[a]	19
T117-PS-1A	PP	6/8/05	1115	1275137	195746	2	4
T117-PS-2A	PP	6/8/05	1130	1275177	195728	3	6
T117-PS-3	HSA	6/21/05	1405	1275239	195724	4	9
T117-PS-4	HSA	6/21/05	1325	1275281	195703	4	9
T117-PS-5	HSA	6/21/05	1235	1275336	195676	4	9
T117-PS-6	HSA	6/21/05	1155	1275318	195662	4	9
T117-PS-7	HSA	6/21/05	1455	1275347	195626	4	9
T117-PS-8	HSA	6/21/05	1005	1275383	195599	4	9
T117-PS-10	HSA	6/21/05	0850	1275462	195483	4	9
T117-PS-12	HSA	6/21/05	0815	1275509	195344	4	9

[a] no recovery on 7.5-9 ft sample interval

HSA – hollow stem auger

PP – push probe

Table 4-2. Groundwater sample locations and *in situ* measurements

Location	Date	Time	X	Y	Flow Rate (ml/sec)	Temp (ºC)	DO	pH	ORP	Spc	Turbidity (NTU)
T117-MW-2	6/22/05	0718	1275519	195352	6.25	16.64	0.49	6.38	-3	671.9	19.1
T117-MW-4	6/22/05	0632	1275393	195594	6.25	16.24	6.93	6.22	429	13056	0.74
T117-MW-5	6/20/05	0713	1275432	195548	6.67	16.01	6.46	6.55	377	5708	1.46
T117-MW-6	6/20/05	0636	1275503	195427	6.25	15.71	7.62	6.12	391	3205	4.57
T117-MW-7	6/20/05	0458	1275131	195735	7.7	13.95	4.52	5.84	375	263.3	1.44
T117-MW-8	6/20/05	0533	1275290	195716	7.7	13.81	6.86	8.35	379	15084	1.38

DO — dissolved oxygen

ORP—oxygen-redox potential

Spc—specific conductance

NTU – nephelometric turbidity unit

4.2 SOIL

4.2.1 Physical Characteristics

All soil samples were analyzed for percent solids and TOC, which are summarized in Appendix A. Some soil boring samples were also selected for grain size analysis based on visual classification, selected to represent the major soil units found in the boring. The raw laboratory results for grain size, TOC, and total solids are presented in Appendix G.

4.2.2 Chemistry Results

All soil samples were analyzed for PCBs. The PCB results for the soil samples are summarized below in Table 4-3 and are shown on Figure 1. The results on Figure 1 shows the depth with the greatest PCB concentration at each location. All analytical results from the soil samples can be found in Appendix A.

Table 4-3. PCB soil sample results

LOCATION ID	SAMPLE ID	DEPTH (ft)	TOTAL PCBS (ppm dw)
South Ditch			
T117-PD-1	T117-PD-1-01	0-1	78
	T117-PD-1-02	1-2	0.4
	T117-PD-1-03	2-3	0.068
T117-PD-2	T117-PD-2-01	0-1	1.5
	T117-PD-2-02	1-2	0.034
	T117-PD-2-03	2-3	0.019 U
T117-PD-3	T117-PD-3-01	0-1	0.23
	T117-PD-3-02	1-2	0.020 U
	T117-PD-3-03	2-3	0.020 U
T117-PD-4	T117-PD-4-01	0-1	24
	T117-PD-4-02	1-2	180
	T117-PD-4-03	2-3	21
T117-PD-5	T117-PD-5-01	0-1	130
	T117-PD-5-02	1-2	9.2
	T117-PD-5-03	2-3	18
T117-PD-6	T117-PD-6-01	0-1	1.64
	T117-PD-6-02	1-2	0.42
	T117-PD-6-03	2-3	0.042 J
T117-PD-7	T117-PD-7-01	0-1	4.1
	T117-PD-7-02	1-2	0.02
	T117-PD-7-03	2-3	0.0082
T117-PD-8	T117-PD-8-01	0-1	0.26
	T117-PD-8-02	1-2	0.014
	T117-PD-8-03	2-3	0.036
Shoreline			
T117-PS-1A	T117-PS-1A-01	0-2	18
	T117-PS-1A-02	2-4	20
T117-PS-2A	T117-PS-2A-01	0-2	39
	T117-PS-2A-02	2-4	43
	T117-PS-2A-03	4-6	2
T117-PS-3	T117-PS-3-01	0-1.5	760
	T117-PS-3-02	2.5-4	19
	T117-PS-3-03	5-6.5	7.2
	T117-PS-3-04	7.5-9	2.7
T117-PS-4	T117-PS-4-01	0-1.5	960
	T117-PS-4-02	2.5-4	1.9
	T117-PS-4-03	5-6.5	0.28

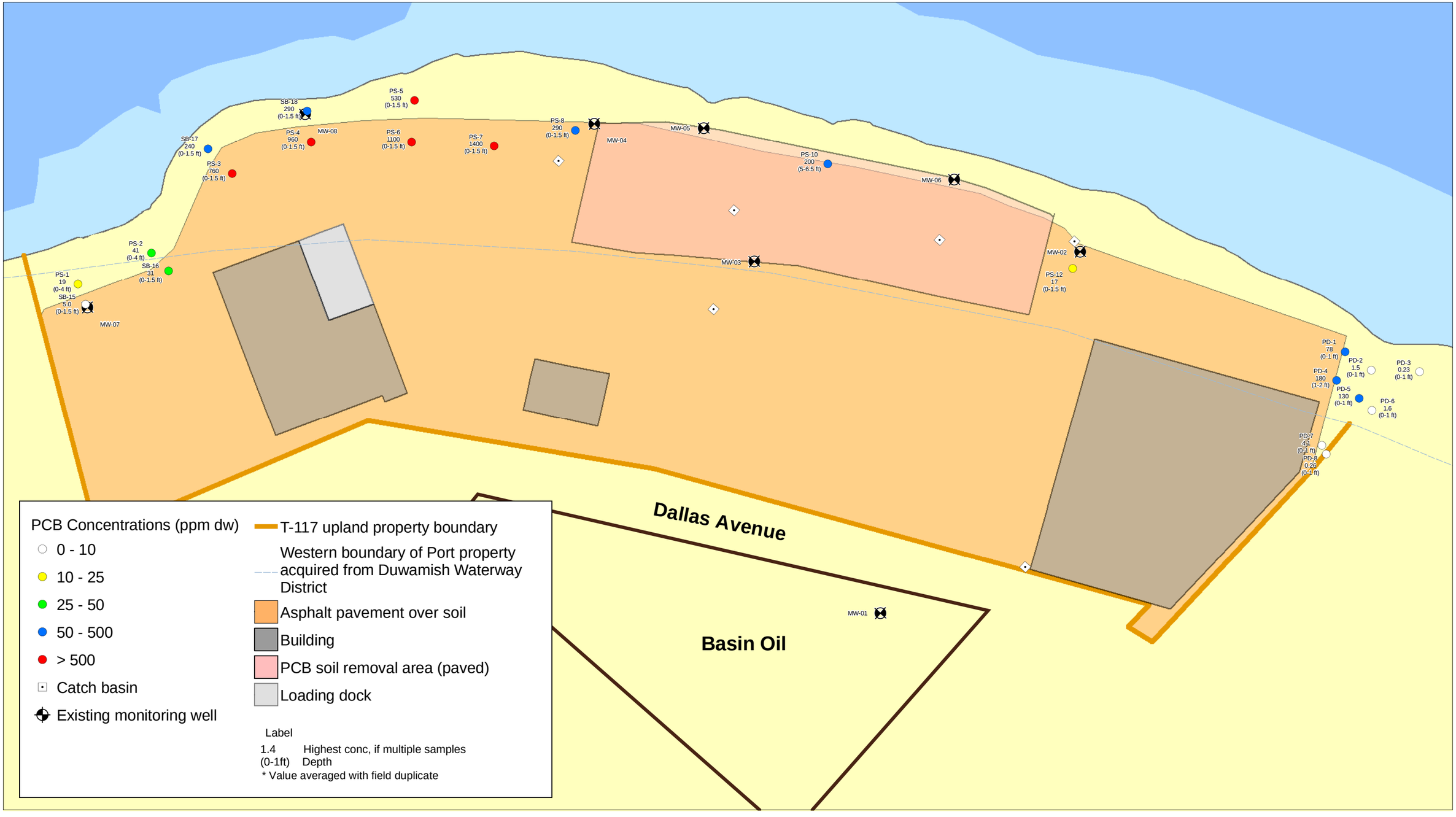
LOCATION ID	SAMPLE ID	DEPTH (ft)	TOTAL PCBS (ppm dw)
	T117-PS-4-04	7.5-9	0.26
T117-PS-5	T117-PS-5-01	0-1.5	530
	T117-PS-5-02	2.5-4	76
	T117-PS-5-03	5-6.5	12
	T117-PS-5-04	7.5-9	14
T117-PS-6	T117-PS-6-01	0-1.5	1100
	T117-PS-6-02	2.5-4	0.21
	T117-PS-6-03	5-6.5	2.1
	T117-PS-6-04	7.5-9	1
T117-PS-7	T117-PS-7-01	0-1.5	1400
	T117-PS-7-02	2.5-4	4.8
	T117-PS-7-04	7.5-9	110
T117-PS-8	T117-PS-8-01	0-1.5	290
	T117-PS-8-02	2.5-4	29
	T117-PS-8-03	5-6.5	1.2
	T117-PS-8-04	7.5-9	0.25
T117-PS-10	T117-PS-10-01	0-1.5	44
	T117-PS-10-02	2.5-4	50
	T117-PS-10-03	5-6.5	200
	T117-PS-10-04	7.5-9	0.081
T117-PS-12	T117-PS-12-01	0-1.5	17
	T117-PS-12-02	2.5-4	11
	T117-PS-12-03	5-6.5	0.034
	T117-PS-12-04	7.5-9	0.091
T117-SB-15	T117-SB-15-01	0-1.5	4.8
	T117-SB-15-02	2.5-4	0.051
	T117-SB-15-03	5-6.5	0.03
	T117-SB-15-04	7.5-9	0.020 U
	T117-SB-15-05	10-11.5	0.17
	T117-SB-15-06	12.5-14	0.020 U
	T117-SB-15-07	15-16.5	0.020 U
	T117-SB-15-08	20-21.5	0.062
T117-SB-16	T117-SB-16-01	0-1.5	31
	T117-SB-16-02	2.5-4	0.36
	T117-SB-16-03	5-6.5	0.19 U
	T117-SB-16-04	7.5-9	0.024
	T117-SB-16-05	10-11.5	0.052
	T117-SB-16-06	12.5-14	0.020 U
	T117-SB-16-07	15-16.5	0.020 U
	T117-SB-16-08	17.5-19	0.020 U

LOCATION ID	SAMPLE ID	DEPTH (ft)	TOTAL PCBS (ppm dw)
T117-SB-17	T117-SB-17-01	0-1.5	240
	T117-SB-17-02	2.5-4	88
	T117-SB-17-03	5-6.5	0.17
	T117-SB-17-04	7.5-9	0.074 U
	T117-SB-17-05	10-11.5	0.088 U
	T117-SB-17-06	12.5-14	0.067
	T117-SB-17-07	15-16.5	0.019 U
	T117-SB-17-08	17.5-19	0.019 U
	T117-SB-17-09	20-21.5	0.47
T117-SB-18	T117-SB-18-01	0-1.5	290
	T117-SB-18-02	2.5-4	9
	T117-SB-18-03	5-6.5	22
	T117-SB-18-04	10-11.5	19
	T117-SB-18-05	12.5-14	1.6
	T117-SB-18-06	15-16.5	0.094
	T117-SB-18-07	17.5-19	0.05

ppm dw – part per million dry weight

J – result estimated

U – result undetected at reporting limit shown



Source (1929); prepared by KH 08/22/05, revised 10/26/05, Map 2031

W:\Projects\03-08-12 T-117 (Malarkey)\Data\GIS\Upland Investigation

Figure 1. T-117 Maximum PCB concentrations at each station June 2005

4.3 GROUNDWATER

4.3.1 NAPL monitoring

A NAPL investigation was conducted on all site wells (MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, and MW-8 MW-6) to look for the presence of free product. During the investigation trace (<1mm) amount of product appeared in one well, MW-2, during a rise in water level in the well induced by tidal fluctuation in the adjacent river. No product was observed in any other the other wells. Water levels in the wells fluctuated as expected, and the monitoring timeframe successfully captured the slack water response in each well to the low tide event in the LDW. NAPL investigation data and calculated plots of tidal fluctuation in the wells are included in Appendix C.

4.3.2 Chemistry results

Groundwater quality samples were collected from the shoreline monitoring wells (MW-2, MW-4, MW-5, MW-6, MW-7, and MW-8 MW-6). The PCB results are summarized below in Table 4-4. Due to the presence of NAPL in MW-2, groundwater in that well was also analyzed for PAHs and TPHs. TPH-D was the only analyte detected in MW-2 at 0.5 mg/L. All analytical results from the groundwater samples can be found in Appendix A.

Table 4-4. PCB groundwater results

SAMPLE ID	TOTAL PCBS (ug/L)
T117-MW-2	0.16 U
T117-MW-4	0.06 U
T117-MW-5	0.04 J
T117-MW-6	0.18 U
T117-MW-7	0.08 U
T117-MW-8	0.08 U

J – result estimated

U – result undetected at reporting limit shown

5.0 References

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