SITE SUMMARY REPORT

Investco/Looney Site
1147 Dock Street
Tacoma, Washington

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Prepared for:

Mr. William Looney
PO Box 1435
Tacoma, Washington 98401

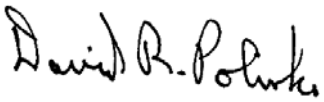
Prepared by:

V Environmental LLC
PO Box 18612
Spokane, Washington 99228-0612

Prepared by:

Verna Lee Teller, MSES
Principal Project Scientist

Reviewed by:



David R. Polivka P.G./P.H.G.
Environmental Services Manager

V Environmental

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EXECUTIVE SUMMARY

In accordance with the Agreed Order DE 3373 signed November 17, 2006 between Mr. William A. Looney and the Washington State Department of Ecology (WDOE) V Environmental LLC has prepared this Site Summary Report (SSR), which summarizes existing information about the site history, geology, potential contaminant sources, past soils and groundwater investigations, completed interim actions, and nature and extent of remaining contamination.

The Property is situated east of the downtown area of the City of Tacoma on the Thea Foss Waterway. A review of historical records including historical aerial photographs, historical city directories, and information contained in previous reports, indicated that the Property was occupied by the Consumer Central Heating Plant from 1920 to 1980. The Property building was vacant by 1980 and demolished in 1985. The Property has remained unused except for parking since 1985. The south half of the Property is vacant, unpaved land and the northern half of the Property currently contains several old foundation walls and slabs. The Property is adjacent to the Thea Foss Waterway, which is part of the Federal Commencement Bay Nearshore/Tideflats Superfund site.

The Round 2 Data Evaluation Report for the Thea Foss Waterway (HartCrowser, January 17, 1997) indicated the presence of mercury in concentrations greater than Sediment Quality Objectives (SQO) in intertidal and subsurface sediments in the waterway offshore of the Property. During an area-wide investigation conducted by the Washington State Department of Ecology (WDOE), laboratory analytical results of soil samples indicated that fill material present on the embankment of the Property contained mercury in concentrations greater than Model Toxic Cleanup Act (MTCA) Method A Soil Cleanup levels. Based on chemical analyses of soil samples collected during subsurface soil and sediment investigations between the years 1992 and 1997, WDOE determined that the Property represented a source of mercury to the Thea Foss Waterway.

Three site investigations and three remediation by excavation activities were conducted at the Property between the years 1992 and 2005 and include the following:

- Hart Crower decommissioned two 35,000 underground storage tanks (UST) by excavation and overexcavated petroleum-containing soils (1992). Subsequent to and as part of the recommendations of the UST activity, Hart Crowser advanced one soil boring and installed four groundwater monitoring wells in the upland area of the Property (1992);

- The Washington Department of Ecology (WDOE) conducted an Area-Wide Investigation of the properties along the Thea Foss (1993) that included observations and soil and sediment samples;

- JS Jones conducted a limited subsurface soil and sediment investigation (1996);

- The Washington Department of Ecology (WDOE) conducted a preliminary sediment investigation;

- The WDOE Interim Action (1997); and

- V Environmental LLC (V Environmental) conducted a Phase II Environmental Site Assessment and Site Investigation (2005) of the subsurface soils and groundwater in the upland area of the Property.

Mercury was also not detected in groundwater samples collected from the uplands portion of the site (V Environmental 2005) nor was it detected in leach tests conducted on the mercury-containing soils and sediments (WDOE 1997). Petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAHs) were not detected in groundwater samples (V Environmental 2005,).

Laboratory analytical results conducted on confirmation soil samples collected during the upland investigations, including decommissioning of two 35,000-gallon underground storage tanks and overexcavation of petroleum-containing soils and an investigation of the soils and groundwater of the upland area of the Property and overexcavation of mercury-containing soils, indicate that the upland areas do not represent a threat to the Thea Foss Waterway. Additionally, the 1998 Interim Action (WDOE) resulted in approximately 75 percent of the shoreline being encapsulated behind a geotextile fabric anchored by quarry spalls and sand.

Three areas of the Property continue to contain metals in concentrations above MTCA Method A cleanup criteria and include the following:

- Mercury remains in the sediments at concentrations greater than the SQOs but are encapsulated behind the geotextile fabric that is anchored with rip-rap, sand and rocks. WDOE determined that these sediments do not represent a threat to the Thea Foss Waterway and have instituted a Restrictive Covenant to prevent any disturbance of the encapsulated area.

- Mercury-containing soils in concentrations greater than MTCA Method A Cleanup levels (4.5 mg/kg) remain on the bank south of WDOE's Interim Action. Laboratory analytical results indicate that the mercury is not leachable. It is the opinion of V Environmental that, based on locations of borings and test pits of previous investigations and that the non-soil fill that was identified on the northern shoreline as the primary source of mercury was not observed on the exposed south shoreline, that the limited amount of mercury-containing soils on the Property represents a low threat to the Thea Foss Waterway. Based on the steepness of the south bank and shoreline, V Environmental considers the threat of direct pathway exposure for human contact to be low.

- Lead in a concentration greater than MTCA Method A Groundwater Cleanup levels was identified in one boring (B-2, 24 µg/L) on the southeast corner of the Property. Since this groundwater is not currently used as a potable water source and it is unlikely that it will ever be used as a source for potable water, V Environmental considers it appropriate to apply a surface water criteria for the Property (Surface Water Applicable or Relevant and Appropriate Requirements (ARAR) for Aquatic Life Marine/Acute – Ch. 173-201A WAC is 210 µg/L).

This Executive Summary is presented solely for introductory purposes and the information contained in this section should be used only in conjunction with the full text of this report. A complete description of the project, Site conditions, scope of work, investigative methods, and findings are contained in the following sections of this report.

1.0 INTRODUCTION

V Environmental LLC (VE) has completed a Site Summary Report (SSR) of the parcel located at 1147 Dock Street in Tacoma, Tax Parcel Number 8950001971, County of Pierce, Washington, the Property. Figure 1 shows the location of the Property.

This SSR was completed in general accordance with Section VII (A) of Agreed Order DE3373 between Mr. William A. Looney and WDOE, signed November 17, 2006. This report summarizes existing information about the site history, geology, potential contaminant sources, past soils and groundwater investigations, completed interim actions, nature and extent of remaining contamination and presents our opinion of the current subsurface soil and groundwater conditions at the Property. Historical information presented in the SSR was obtained from previous reports, including WDOE's *Interim Action Report*.

1.1 BACKGROUND

A review of historical records including historical aerial photographs, historical city directories, and information contained in previous reports, indicates that the Property was occupied by the Consumer Central Heating Plant from 1920 to 1980. The plant is reported to have had a 200-foot high smokestack and a conveyor system to accept refuse or hog fuel from barges. According to a Hart Crowser July 13, 2002 report numbered J-4676-13[1], the plant used three 750-horsepower boilers to supply heat to Tacoma businesses, which in 1942 encompassed an area bounded by the waterway to Fawcett Avenue between 6th and 15th Streets. The plant burned mill tailings/sawdust from local woodworking mills until 1965 when it began using Bunker C oil. The Property building was vacant by 1980 and demolished in 1985. The Property has remained unused except for parking. The south half of the Property is vacant, unpaved land and the northern half of the Property currently contains several old foundation walls and slabs. The Property is adjacent to the Thea Foss Waterway, which is part of the Federal Commencement Bay Nearshore/Tideflats Superfund site.

V Environmental reviewed historical aerial photographs at Walker & Associates in Seattle, Washington. In the 1946 and 1969 aerial photographs, approximately half of the property (north side) appeared to be covered with a building. A small area on the south side of the building appeared to include a dock for access to the City Waterway. In the 1969 aerial photograph, the structures on the water had been removed but the buildings remained. In the 1992 aerial photograph, the buildings and docks had been removed from the Site, which appeared to be covered with low-growing grasses and weeds. The quality of the photographs prevented a more certain determination of land use at the site.

During an area-wide investigation in 1993, WDOE identified man-made fill material placed along the bank of the Property and collected soil samples from the fill material. Laboratory analytical results of the samples indicated the presence of mercury in concentrations greater than Commencement Bay Sediment Quality Objectives (SQO) of 0.59 milligrams/kilogram (mg/kg). Based on the laboratory analytical results and combined with chemical analyses from the Round 2 Data Evaluation Report for the Thea Foss Waterway (Hart Crowser, 1997), WDOE determined the Property to be a source of mercury to the Thea Foss Waterway.

[1] This file is cited based on information contained in WDOE's Interim Action Report.

2.0 GEOLOGY AND GROUNDWATER SYSTEM CHARACTERISTICS

The Port of Tacoma area was originally a tidal marsh southeast of a delta front located between what is now 11th Street and Lincoln Avenue and a tidal flat northwest of that front. The tidal flat was exposed only at lowest tides and extended out to about the present position of the developed port areas. The marsh extended back, southeast from a front roughly parallel to and between 11th Street and Lincoln Avenue and had an elevation of about +10 to +15 feet, mean lower low water. The tidal flat extended beyond the tidal marsh to about the present position of the developed port area and was exposed only during the lowest tides[2].

The thickness of the fill varies greatly throughout the Port. The thickest fill intervals exist northwest of 11th Street where it may exceed 25 feet and the thinnest in the agricultural areas in the southeast port of the project area[3].

The area between South 15th Street and South 11th Street was filled with dredged material around the turn of the century. Existing logs from the Property indicate the dredged material is typically a loose, dark brown, fine to medium sand with shell fragments. The existing boring logs indicate the shallow soils over the dredge material are slightly silty, gravelly sand and range from up to 17 feet in thickness and thinning to 5 feet moving to the north and west. Native tideflat/alluvial dense sands are inferred to occur around an elevation of 0 feet, mean sea level, or deeper. Distinguishing native soils and dredge fill can be difficult giving their similarity in texture and shell content[4].

Groundwater is typically encountered between 10 and 14 feet below ground surface. Groundwater flow direction is expected to flow east toward the Thea Foss Waterway. Tidal fluctuations in the waterway are likely to cause groundwater elevation fluctuations beneath the Property to some degree with less response farther from the waterway.

The Site includes an upland area, which is mostly level, and a steep 15-foot embankment that adjoins the west side of the Thea Foss Waterway, also known as the City Waterway. The City of Tacoma is located on the west bluff above the Site. Upland site elevation is approximately 11 feet above mean sea level.

[2] Hart Crowser, undated, *Geology of the Port of Tacoma*
[3] Ibid
[4] Ibid

3.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Five previous subsurface investigations have been conducted at the Site including the following:

- HartCrowser, September 1992, Bunker C Oil Underground Storage Tank Removal and Closure Assessment and subsequent groundwater monitoring;
- Washington State Department of Ecology, 1993, Area-Wide Investigation;
- JS Jones, 1996, Limited Subsurface Investigation;
- Washington State Department of Ecology, 1998, Interim Action Cleanup Report;
- V Environmental, October 2005, Phase II Environmental Site Assessment; and
- V Environmental, December 2005, Site Investigation

The information presented below was obtained from the above-listed reports and from reports cited in WDOE's *Interim Action* report. The scope of work for this SSR did not include verifying the data presented in the reports. V Environmental believes that the information obtained from these reports is reliable. However, V Environmental cannot and does not warrant or guarantee that the information provided by these other sources is accurate or complete. Copies of the reports are presented in Appendix A.

3.1 1992 UST REMOVAL AND CLOSURE

During the period October 20 to 23, 1992, Hart Crowser decommissioned and removed by excavation two 35,000-gallon Bunker C Oil underground storage tanks (USTs). In order to excavate the USTs, Hart Crowser removed the concrete slab located directly over the tanks and excavated soils around the tanks. Approximately 120 cubic yards of soil were excavated in order to remove the USTs and placed in a visqueen-lined and covered area south of the tank excavation.

Approximately 4,300 gallons of product were pumped from the USTs and transported to a waste oil disposal facility.

The USTs were inerted and removed on October 23, 1992 and shipped to a disposal facility. The tanks, residual fluids, and sludges were disposed of in accordance with all applicable local, state, and federal regulations.

The asphalt-coated single-wall steel tanks were 11.5 feet in diameter and 42 feet long, and held approximately 35,000 gallons each. The USTs had evidence of corrosion with severe pitting but no holes were evident. No existing piping was found during the excavation.

Each UST was bedded (6 to 12 inches below bottom of tank) and surrounded by pea gravel (0 to 12 inches) which extended to slightly below the concrete slab. Soil units encountered in the excavation generally consisted of the following:

- Concrete slab from surface to a depth of about 1.5 feet;
- Loose, moist, fine brown to black, slightly silty sand with trace organic from a depth of about 1.5 to 11 feet; and

- Loose, wet, fine to black, slightly silty sand with trace organics from about 11 to 13.5 feet (the bottom of each UST was approximately 13.5 feet below existing grade). At the time of the UST removal, groundwater was approximately 12 feet below existing grade.

Visible contamination was noted on the bottom of the southern tank (Figure 3) and in the southeast corner of the excavation from a depth of 9 feet to the groundwater level. The UST excavation verification soil samples and soil stockpile characterization samples were collected on November 4, 1992 and submitted to the Hart Crowser *FAST* Laboratory for TPH (WTPH-418.1).

Six sidewall soil samples were collected from just above the groundwater (estimated depth of 11 feet below existing grade) at locations shown on Figure 3. Additionally, one soil sample was collected from between the former tanks (B/W-Tank), one soil sample from the former Tank 2 bottom beneath the groundwater (Bottom), and one soil sample one foot south of SW-Wall (SW-Wall-2).

One split soil sample from the excavation (SE-Wall) was submitted to Analytical Technologies, Inc., laboratory for the following analyses:

- PAHs (EPA Method 8310);
- Priority Pollutant Metals;
- PCBs (EPA Method 8080); and
- Volatile Organics (EPA Method 8240).

Soil was collected from the side walls and bottom of the excavation using the excavator bucket or a stainless steel hand augur with extensions. Soil samples obtained from the center of the excavator bucket or with the hand augur were placed in a stainless steel bowl with a stainless steel spoon, transferred to chemically cleaned, airtight glass sample jars, labeled, placed in an insulated cooler with ice, and transported under chain of custody protocol to the HartCrowser *FAST* Laboratory in Seattle, Washington for analyses.

The tank excavation stockpile soil characterization samples were obtained by digging six to 12 inches into the soil at three locations using stainless steel sampling equipment. The individual soil samples were field composited and submitted for laboratory analysis.

Soil samples were field screened for possible volatile organics contamination by half filling a headspace jar with soil, covering the opening with aluminum foil and a screw top lid, and placing the jar in a warm location for 10 to 15 minutes. Organic vapor headspace measurements were taken using a HNu photoionization detector (PID) fitted with an 11.7 eV lamp.

Between samples, the sampling equipment was decontaminated using an Alconox wash and successive rinses of tap and deionized water.

During sampling, HartCrowser noted that there was from 0 to 2.5 feet of groundwater (11 feet from surface) in the bottom of the excavation. A layer of emulsion and sheen was floating on top of the groundwater. The emulsion was removed from the excavation using a pump truck and absorbent materials. Floating absorbent material was left in the excavation to capture any remaining hydrocarbons. Approximately 850 gallons of emulsion and water were pumped from the excavation and transported to a permitted disposal facility.

Table 1 summarizes the detected concentrations of TPH in the tank excavation verification soil samples and stockpiled soil characterization samples. Analytical results indicated concentrations above the MTCA Method A TPH cleanup level of 200 mg/kg in the following soil samples:

- Between the tanks (B/W-TANK) – 10,000 mg/kg
- Southeast excavation wall (SE-WALL) – 10,000 mg/kg
- Beneath tank 2 (Bottom) – 3,500 mg/kg
- North excavation wall (N-WALL) – 210 mg/kg

The remaining four excavation soil samples (S-M-WALL, SE-WALL-W, W-WALL, and E-WALL) and for stockpile soil samples (SP-1, SP-2, SP-3, and SP-4) had detected TPH concentrations below 200 mg/kg.

Table 1. Excavation and Stockpile Soil Sample Test Results (UST Investigation, 1992, Hart Crowser)

Sample ID	Sample Date	TPH Concentration (mg/kg)
SP-1	11/5/92	130
SP-2	11/5/92	140
SP-3	11/5/92	99
SP-4	11/5/92	120
S-M-WALL	11/5/92	25U
SE-WALL*	11/5/92	**10,000**
SE-WALL-2	11/5/92	27
W-WALL	11/5/92	25U
N-WALL	11/5/92	210
E-WALL	11/5/92	25U
B/W TANK*	11/5/92	**10,000**
BOTTOM*	11/5/92	**3,500**
RS-1	12/11/92	50U
RS-2	12/11/92	82

* Subsequently removed during over excavation; U not detected a detection limit indicated

The split sample (SE-WALL) detected analytes are summarized in Table 2. Analytical results indicated the presence of PAHs with total concentrations of cPAHs above the MTCA Method A cleanup level of 1 mg/kg.

Low concentrations of ethylbenzene and total xylenes were detected but are below MTCA Method A cleanup levels of 20 mg/kg for each.

Six Priority Pollutant Metals were detected at the following concentrations:

- Arsenic – 2.7 mg/kg
- Chromium – 8.5 mg/kg
- Copper – 8.8 mg/kg
- Lead – 2.2 mg/kg

- Nickel – 7.4 mg/kg
- Zinc – 13.8 mg/kg

The detected Priority Pollutants Metals were within background concentrations, which were presented in a separate Bison Engineering, Inc. document entitled *Addendum #1, Phase II Environmental Site Assessment, Thea Foss Waterway, Tacoma, Washington*, dated December 17, 1990.

Mercury or PCBs were not detected in the sample and volatile organics were either undetected or were well below the MTCA Method A cleanup standards.

Table 2. Split Soil Sample (Southeast Wall) Test Results

Detected Analyte	Concentration in mg/kg
EPA Method 8240	
Volatile Organics	
Ethylbenzene	0.46
Total Xylenes	0.46
EPA Method 8310	
PAHs	
Fluorene	7.8
Phenanthrene	11.0
Fluoranthene	14.0
Pyrene	8.3
Benzo(A)Anthracene	33.0
*Chrysene	23.0
*Benzo(B)Fluoranthene	13.0
*Dibenzo(A,H)Anthracene	6.0
Benzo(G,H,I)Perylene	10.0
Priority Pollutant Metals	
Antimony	3.4U
Arsenic	2.7
Beryllium	0.57U
Cadmium	0.57U
Chromium	8.5
Copper	8.8
Lead	2.2
Mercury	0.29U
Nickel	7.4
Selenium	1.1U
Silver	1.1U
Thallium	1.1U
Zinc	13.8

*cPAHs; U not detected at detection limit indicated

Additional excavation was conducted on December 11, 1992 to remove soils with TPH concentrations above 200 mg/kg. Suspected hotspots below the groundwater were also dredged until the remaining soil was visibly clean. The soil was placed in two visqueen-lined areas, bordered with bales and covered with visqueen. According to the WDOE Interim Action, these soils were transported offsite for disposal during the early stages of the 1997 Interim Action.

Two verification soil samples (RS-1 and RS-2) were collected from the south wall as shown on Figure 3. Analytical results indicated detected concentrations of TPH below 200 mg/kg as shown in Table 1.

Prior to the additional excavation, no emulsion or sheen was noted on the groundwater in the excavation. After the dredging, there was a layer of emulsion and sheen floating on the water. The emulsion was removed with adsorbent materials and a pump truck and the resulting 250 gallons of oily water were taken to a permitted disposal facility.

The excavation was backfilled on December 14 and 15, 1992. Import pit run was initially placed in the excavation to 2 feet above ground water without compaction. The 120 cubic yards of soil from the original UST tank excavation were then placed in the excavation. The soil was placed in 10 to 12 inch lifts and compacted to a moderately dense non-yielding condition with a vibratory roller compactor. The remainder of the excavation was backfilled with import pit run and compacted as described above.

With the presence of groundwater in the excavation, Hart Crowser recommended drilling one boring beneath the former south tank bottom and installing three monitoring wells.

In 1994, HartCrowser installed four monitoring wells (MW-1, MW-2, MW-3, and MW-4) and one soil boring (B-1) on the Property. Figure 3 shows the location of the monitoring wells and soil boring. Soil samples from each of the wells and the boring were tested for TPH. The samples were obtained from the bottom of the borings 10 to 16½ feet below grade. TPH was not detected in the soil from the monitoring well borings. The soil sample from the soil boring contained 141 mg/kg TPH. The soil was analyzed for PAH and found to contain 0.66 mg/kg carcinogenic PAH.

Petroleum hydrocarbons were not detected in any of the monitoring well water samples, but the detection limit was equal to the MTCA Method A groundwater standard of 1 mg/kg. However, if groundwater cleanup standards were to be set for the site, they would likely be for protection of the adjacent surface water, which has typically been set at 10 mg/kg for similar sites.

Table. 3 Upland Soils – TPH (Hart Crowser; Monitoring Wells and Boring, 1994)

Sample Name	Sample Date	WTPH-418.1	WTPH-D
MW1-S3	8/15/94	<50	
MW2-S2	8/15/94	<50	
MW3-S3	8/15/94	<50	
MW4-S3	8/15/94	<50	<50 oil; <20 diesel
B1-S1	8/15/94	<50	111 oil; 31 diesel
MTCA (mg/kg)		200	200

Table 4. Upland Soils – PAHs (Hart Crowser, Monitoring Wells and Boring, 1994)

Constituent	Laboratory Results µg/kg
Acenapthene	<220
Acenaphthylene	<220
Anthracene	130
Fluorene	<22
Naphthalene	<110
Phenanthrene	350
Benzo(a)Anthracene	<22
Benzofluoranthenes	<44
Benzo(ghi)Perylene	<22
Benzo(a)Pyrene	140
Chrysene	520
Dibenzo(ah)Anthracene	<43
Fluoranthene	1,600
Indeno(123cd)pyrene	<22
Pyrene	300
Total CPAH	**726**

Carcinogenic PAH are shown in bold. MTCH Method A Cleanup level for CPAH is 1,000 µg/kg (1 mg/kg).
Undetected quantities added in at ½ detection limit.

3.2 1993 WDOE AREA-WIDE INVESTIGATION

In 1993, during an area-wide investigation as a part of its source control responsibilities for the CBN/T Superfund project, WDOE discovered a man-made fill material along the banks of the Property.

WDOE tentatively identified the fill material as consolidated ash and boiler wastes. The surface of the fill consisted mostly of a gray substrate which contained small pieces of black charred-appearing material. Also present with the gray substance in parts of the fill was a white grainy substance which appeared to be a precipitate. Parts of the soil were very soft and claylike, while other areas, which tended to be reddish-brown in color rather than gray, were hard and vitrified in appearance.

No fill was observed beneath the concrete pier, but was found north and south of the pier. Along the north 50 to 60 feet shoreline of the site (north of the concrete pier), a foundation wall was noted parallel to the shoreline. Clean sandy soils behind the foundation wall were observed through breaks in the wall. Clean sandy soils were also observed beneath the slab in the middle of the shoreline area. Based on these observations, WDOE determined that the contamination did not penetrate into the site uplands. The fill observed south of the concrete pier appeared to have been dumped over the edge of the bank, resulting in a steep bluff made of fill. The southern third of the shoreline did not contain any visible fill.

WDOE staff obtained samples from the surface by compositing spoonfuls of the material from the top 0 to 2 inches over an approximate four square feet for each sample. Four of the six WDOE samples tested for metals contained mercury above the Commencement Bay SQO of 0.59 mg/kg. The highest concentration was identified in sample INVB1 which contained 38.3 mg/kg mercury (Figure 4). One of the samples exceeded the SQO for lead

and two slightly exceeded the SQO for zinc. The two WDOE samples that were tested for PAH did not contain LPAH or HPAH at levels above the SQO. Bis (2ethylhexyl) phthalate was not detected in either of those samples, although the detection limit in sample INVB1 was significantly above the SQO. Sample INVB3 was analyzed for PCBs. No PCBs were detected.

WDOE characterized the material for waste disposal by testing for TCLP metals. There were no exceedances of TCLP metals criteria. One sample identified as BANKCOMP was tested for TCLP mercury only and submitted to a 96-hour static acute bioassay using rainbow trout. The bioassay resulted in 100 percent survival. Based on the TCLP and bioassay results, WDOE determined the material was not a hazardous waste.

Table 5. North Shoreline Sediments - Metals and TPH (WDOE, 1993-1997)

Sample Name	Date	TPH MTCA	Cadmium	Copper	Lead	Mercury	Zinc	Antimony	Arsenic	Beryllium	Chromium	Nickel	Selenium	Silver	Thallium
SPB1	12/7/93	NA	1U	203	13	0.136	116	NA	NA	NA	NA	NA	NA	NA	NA
SPB2	12/7/93	NA	0.2U	181	111J	**4.76**	202	NA	NA	NA	NA	NA	NA	NA	NA
SPB3	4/28/94	NA	0.96P	163	125	**2.21**	242	NA	NA	NA	NA	NA	NA	NA	NA
INV BI	3/2/95	NA	0.39P	321N	**764N**	**38.3**	**550N**	6.9J	9.83	0.24P	20	75.7	0.4U	0.3U	0.5UN
INV B2	3/2/95	NA	0.46P	178N	95.7N	**2.22**	**459N**	3.6J	5.62	0.31P	20.1	32.2	0.4U	0.79P	0.5UN
INV B4	3/11/97	NA	NA	NA	NA	0.027	NA	NA	NA	NA	NA	NA	NA	NA	NA
MTCA A (mg/kg)		200	5.7	390	450	0.59	410	150	57	*	*	140	*	*	*

J: estimated result; N: spike sample recovery not within limits; P: detected above detection limits but below minimum quantitation limit; U: not detected at the concentration shown or above; NA: not analyzed; * Method B cleanup levels have not been established

Table 6. North Shoreline Sediments – PAHs (WDOE, 1993-1997)

Sample Name	Date	Acenapthene	Acenapthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	2-Methyl naphthalene	Total LPAH			
SPB1	12/7/93	NA	NA	NA	NA	NA	NA	NA	NA			
SPB2	12/7/93	NA	NA	NA	NA	NA	NA	NA	NA			
SPB3	4/28/94	NA	NA	NA	NA	NA	NA	NA	NA			
INV BI	3/2/95	425U	215J	337J	92.1J	542J	1260J	365J	3023.6			
INV B2	3/2/95	38.1U	42.9	109	19J	44.6	420	59	713.5			
INV B4	3/11/97	NA	NA	NA	NA	NA	NA	NA	NA			
MTCA A (µg/kg)		500	1,300	960	540	2,100	1,500	670	5,200			
Sample Name	**Date**	**Benzo(a) Anthracene**	**Benzo-Fluoranthene**	**Benzo(ghi) Perylene**	**Benzo(a) Pyrene**	**Chrysene**	**Dibenzo(ah) Anthracene**	**Fluoranthene**	**Indeno(123cd) Pyrene**	**Pyrene**	**Total HPAH**	**B2EHP**
SPB1	12/7/93											
SPB2	12/7/93											
SPB3	4/28/94											
INV BI	3/2/95	972	2,332	628	957	1,450	425UJ	2310	**717**	1,890	11,469	14,200UJ
INV B2	3/2/95											
INV B4	3/11/97											
MTCA A (µg/kg)		1,600	3,600	720	1,600	2,800	230	2,500	690	3,300	17,000	1,300

J: estimated result; N: spike sample recovery not within limits; P: detected above detection limits but below minimum quantitation limit; U: not detected at the concentration shown or above; NA: not analyzed

3.3 1996 LIMITED SUBSURFACE INVESTIGATION

JS Jones & Associates (JS Jones) excavated five test pits in June 1996 (Figure 4). One test pit was located just south of the concrete pier and a second test pit was located just north of the concrete pier. Underneath the surface layer of a gray ashy substance, the soils north of the concrete pier contained a mass of black sludgy sediment mixed with small wood splinters. This material did not have a petroleum odor and contained 14.3 mg/kg mercury and 2,720 mg/kg petroleum hydrocarbons. A composite of the ashy matrix not including the black sediment was obtained from both test pits. This sample contained 3.64 mg/kg mercury and TPH was not detected. A sample of what appeared to be made of sediments in the bottom of the south test pit contained 1.29 mg/kg mercury but was not tested for TPH or PAH. Laboratory analyses of the soils from the north and south test pits indicated very low concentrations of PAHs. Based on the configuration of the fill, it appeared to have been dumped over the bank after the pier was constructed, which was at least as early as 1930 (Sanborn Fire Insurance Maps).

JS Jones also collected a soil sample from beneath the concrete pier. This sample contained 0.116 mg/kg mercury and 106 mg/kg TPH.

JS Jones collected one composite sample from the sediments in the south shoreline (Composite, S Shoreline). The sampling methods or tidal elevations of the sample aliquots are not known. This composite sample contained 0.087 mg/kg mercury, 100 mg/kg TPH and low levels of PAHs (Table 5). All levels were below the MTCA Method A cleanup levels.

JS Jones collected a composite sample (Composite Upper Site) from three upland test pits. Mercury, cadmium and lead were not detected. Copper and zinc were detected at levels below the MTCA cleanup levels. TPH was not detected and PAHs were detected at very low levels.

WDOE collected one soil sample from one of the JS Jones upland test pits located upland of the fill area just south of the concrete slab foundation. This sample was collected from the top one to two feet of soils in the depression remaining from TP2. The pit contained materials similar in appearance to some of the fill observed on the bank. The sample was collected from a light brown grainy soil that looked as though it could be boiler residue or mixed with boiler residue. Laboratory analyses indicated the soils contained mercury at a concentration of 0.449 mg/kg, which is below MTCA Method A soil cleanup criteria (2.0 mg/kg) and below SQOs for mercury (0.59 mg/kg).

Table 7. North Shoreline Sediments - Metals and TPH (JS Jones, 1996)

Sample Name	Date	TPH MTCA	Cadmium	Copper	Lead	Mercury	Zinc	Antimony	Arsenic	Beryllium	Chromium	Nickel	Selenium	Silver	Thallium
Black N of Slab	6/17/96	**2720**	0.25U	132	48.4	**14.3**	142	NA	NA	NA	NA	NA	NA	NA	NA
Matrix N of Slab	6/17/96	100U	0.25U	81.1	74	**3.64**	240	NA	NA	NA	NA	NA	NA	NA	NA
Middle S of Slab Muck	6/17/96	NA	0.25U	134	59	**1.29**	177	NA	NA	NA	NA	NA	NA	NA	NA
Subsoil under Slab	6/17/96	106	0.25U	17.5	18.5	0.116	45.5	NA	NA	NA	NA	NA	NA	NA	NA
MTCA (mg/kg)		200	5.7	390	450	0.59	410	150	57	*	*	>140	*	*	*

J: estimated result; N: spike sample recovery not within limits; P: detected above detection limits but below minimum quantitation limit; U: not detected at the concentration shown or above; NA: not analyzed; * Method B cleanup levels have not been established

Table 8. North Shoreline Sediments – PAHs (JS Jones, 1996)

Sample Name	Date	Acenapthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	2-Methyl naphthalene	Total LPAH			
Black N of Slab	6/17/96	20U	20U	20U	33.5	33.6	31.1	NA	128.2			
Matrix N of Slab	6/17/96	20U	37.7	53.8	28.3	20U	199	NA	467			
Middle S of Slab Muck	6/17/96	NA	NA	NA	NA	NA	NA	NA	NA			
Subsoil under Slab	6/17/96	152	452	150U	150U	150U	150U	NA	904			
MTCA (µg/kg)		500	1,300	960	540	2,100	1,500	670	5,200			
Sample Name	**Date**	**Benzo(a) Anthracene**	**Benzo-Fluoranthene**	**Benzo(ghi) Perylene**	**Benzo(a) Pyrene**	**Chrysene**	**Dibenzo(ah) Anthracene**	**Fluoranthene**	**Indeno(123cd) Pyrene**	**Pyrene**	**Total HPAH**	**B2EHP**
Black N of Slab	6/17/96	100U	200U	100U	NA	39.9	100U	94	100U	76.3	510.2	NA
Matrix N of Slab	6/17/96	314	356	241	344	363	100U	512	243	604	3,027	NA
Middle S of Slab Muck	6/17/96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Subsoil under Slab	6/17/96	55.8	95.8	117	78	176	169	174	16.4	141	1,023	NA
MTCA (µg/kg)		1,600	3,600	720	1,600	2,800	230	2,500	690	3,300	17,000	1,300

J: estimated result; N: spike sample recovery not within limits; P: detected above detection limits but below minimum quantitation limit; U: not detected at the concentration shown or above; NA: not analyze

Table 9. South Shoreline Sediments – Metals (JS Jones 1996)

Sample Name	Sample Date	Cadmium	Copper	Lead	Mercury	Zinc
Composite S Shoreline	6/17/96	<0.25	30.6	88.2	0.0872	166
MTCA (mg/kg)		5.7	390	450	0.59	410

Table 10. South Shoreline Sediments – PAHs (JS Jones 1996)

Sample Name	**Date**	**Acenapthene**	**Acenaphthylene**	**Anthracene**	**Fluorene**	**Naphthalene**	**Phenanthrene**	**Total LPAH**				
South Shoreline Composite	6/17/96	33.3	48.3	83.5	47.9	<20	329	552				
MTCA (µg/kg)		500	1,300	960	540	2,100	1,500	5,200				
Sample Name	**Date**	**Benzo(a) Anthracene**	**Benzo-Fluoranthene**	**Benzo(ghi) Perylene**	**Benzo(a) Pyrene**	**Chrysene**	**Dibenzo(ah) Anthracene**	**Fluoranthene**	**Indeno(123cd) Pyrene**	**Pyrene**	**Total HPAH**	**TPH**
South Shoreline Composite	6/17/96	335	557	189	318	423	<100	845	198	612	3,527	100
MTCA (µg/kg)		1,600	3,600	720	1,600	2,800	230	2,500	690	3,300	17,000	No SQO

Table 11. Upland Soils – Metals and TPH (JS Jones 1996)

Sample Name	Date	WTPH-418.1	WTPH-D	Cadmium	Copper	Lead	Mercury	Zinc
Composite Upper Site	6/17/96	<100	Na	<0.25	12.5	<10	<0.05	33.8
MTCA (mg/kg)		200	200	2	2,960*	250	2	24,000*

* cleanup level as indicated in WDOE's Interim Action report

Table 12. Upland Soils – PAH (JS Jones, 1996)

Constituent	Laboratory Results µg/kg
Acenapthene	<20
Acenaphthylene	<20
Anthracene	<20
Fluorene	<20
Naphthalene	<20
Phenanthrene	<20
Benzo(a)Anthracene	20.1
Benzofluoranthenes	<200
Benzo(ghi)Perylene	<100
Benzo(a)pyrene	<100
Chrysene	32.1
Dibenzo(ah)Anthracene	<100
Fluoranthene	37.8
Indeno(123cd)pyrene	<100
Pyrene	48.3
Total CPAH	**302.2**

3.4 1998 INTERIM ACTION CLEANUP REPORT

WDOE determined, based on investigations conducted by JS Jones, Hart Crowser and WDOE, that the north shoreline fill samples consistently contained elevated levels of mercury above both the SQO and MTCA Method A cleanup criteria. The contaminated sediments were not found to be hazardous wastes. The south shoreline surface sediments did not appear to be contaminated. WDOE also determined that, based on the available samples from the soils obtained during the installation of the monitoring wells and boring, the soils of the site upland are not significantly contaminated. It was WDOE's opinion, based on the initial samples, that groundwater was not contaminated at levels that would adversely affect surface water in the Thea Foss Waterway.

Based on the aforementioned site investigations excluding the USTs decommissioning and excavation, WDOE determined that the contaminated fill in the intertidal area was a source of mercury to the Thea Foss Waterway. WDOE's remedial action consisted of removal and disposal of contaminated fill material from along the northern 120 feet of shoreline. The contaminated fill was present from the top of bank to below the mean lower low water level (MLLW).

Chemical analyses of the material revealed that it contained levels of mercury above the Sediment Quality Objective (SQO) for Commencement Bay, which is 0.59 mg/kg. The Round 2 Data Evaluation Report for the Thea Foss Waterway (Hart Crowser, 1997) showed mercury in intertidal and subsurface sentiments in the waterway offshore from the site in concentrations exceeding the SQO for the waterway. WDOE determined that it was necessary to move forward with a cleanup using WDOE funds due to the continued lack of cooperation from the site owners and the need to control the contaminant source prior to the start of Superfund cleanup efforts which were slated to begin in 1999.

WDOE determined that an interim action was necessary:

1. To control the source of mercury to the Thea Foss Waterway. In addition, the interim action was necessary to eliminate the risk to human health from direct contact with the material and from fish which may have been contaminated with mercury from the site.

2. To remove as much of the material from the site as is technically feasible considering equipment limitations and the difficulties of working in the intertidal area and then to isolate any remaining contaminants from the environment.

The interim action was designed by a WDOE staff registered professional engineer and included removing the foundation walls and slab at the top of the bank to allow for re-grading the bank to a stable grade. The contaminated material was removed to the extent possible working within the constraints of the tides and was scheduled during a period of low tides to enable the removal of contaminants to the Mean Lower Low Water (MLLW) level, which is equal to approximately -6.3 feet mean sea level (msl). The exposed surface was covered with a geotextile fabric sufficient to prevent passage of fine sediments and covered with quarry spalls and rip-rap. Treated wood pilings within the construction area were to be cut off at the excavated grade but, due to site conditions, were pulled up.

WDOE developed a SEPA checklist and issued a Determination of Nonsignificance after opportunity for public comment. WDOE coordinated with the City of Tacoma regarding shoreline permit requirements and with the Washington Department of Fish and Wildlife (WDFW) regarding fish habitat issues. WDOE staff also coordinated with Natural Resource Damages Trustee representatives from the National Oceanic and Atmospheric Administration (NOAA) to address habitats concerns. To improve habitat of the finished project, WDOE added two-inch round rock to fill the interstitial space in the rip-rap, and overlain by a surface layer of 3/8-inch-minus gravel and coarse sand mixture to provide a more appropriate habitat than the exposed rip-rap. Removal of the concrete slab pier also enhanced habitat by removing the shaded area associated with it. WDOE notified the US Army Corps of Engineers on July 2, 1997 that the project was eligible for coverage under Nationwide Permit #38 (COE nationwide permit for environmental cleanup activities) and received COE authorization for the project on July 29, 1997.

WDOE issued bid specifications for the project in early July 1997 and awarded the contract to Smith Technology on August 1, 1997. Work commenced on the project on August 13, 1997 and WDOE staff Kelly Susewind, Environmental Engineer, and Joyce Mercuri, Environmental Specialist, were present at all times during the construction.

A floating oil/silt control boom was installed around the site to prevent contaminants or debris from discharging to the Thea Foss Waterway. The concrete slab pier and broken up dock along the north shore of the site were removed. Two small piles comprising a total of about 20 cubic yards of petroleum contaminated soils left over from removal of the underground storage tanks were transported off site for disposal.

The intertidal sediments were removed with an excavator with an extension boom stationed at the top of the bank. Initially the contractor planned to create a bench along the top of the bank to allow the excavator to reach the lowest tidal elevation, while also pulling back the top of the bank as called for in the specifications. The contractor's initial attempts to break up the concrete foundation slab in the center of the site were not successful. The contractor then requested that WDOE allow them to leave the foundation walls and slabs in place, which resulted in a steeper slope and a greater amount of quarry spalls. This change order was approved by WDFW. Debris and contaminated soils were stockpiled in a lined area surrounded by hay bales until they were transported off site for disposal.

Cutting off the pilings at the excavated grade proved to be very difficult due to inadequate equipment (chainsaw blades could not withstand the sandy conditions) and WDOE allowed the contractor to break pilings off with the excavator bucket or pull them up with chains. WDOE noted small sheens on sediments near some of the broken off pilings but no significant releases to the waterway were observed.

Beneath the surface crust of a gray and brownish colored ash material, the area north of the concrete pier area primarily contained an odorless black unconsolidated material mixed with wood shavings, similar to the material in the sample identified as “Black N. of Slab.” As the excavation approached the MLLW, the material became very difficult to remove due to saturation and when the approximate +1 foot tidal elevation was reached, WDOE determined it was not possible to continue excavating due to the extreme saturation. In addition to the material being difficult to excavate, the time needed to lay the geotextile and begin backfilling the excavation was limited due to the change in tides. At approximately +1

to 0 feet MLLW, a rim of a very hard, reddish-brown unconsolidated material remained beyond the reach of the excavator (See Figure 5).

On August 19, 1997 confirmation samples were collected, the excavation area was covered with geotextile fabric, and backfilling began. The geotextile fabric chosen was Synthetic Industries Geotex, Nonwoven #801. The specifications for that product are included in Appendix 5 and a sample can be found in the WDOE Southwest Regional Office files.

The geotextile was anchored in place at the toe of the slope by placing a shallow trench at the toe of the fill, laying the textile, filling in the trench with quarry spalls, then wrapping the fabric back over the fill and anchoring it with additional spalls and rip-rap. Site rubble and contaminated soils were disposed up at the Olympic View Landfill. Approximately 1000 tons of contaminated soils were removed from the site.

The excavated slope on top of the geotextile fabric was backfilled with 900 tons eight-inch quarry spalls anchored with 500 tons of 24-inch rip-rap. Eighty-five tons of 1½-inch round rock was added to fill in the spaces in the rip-rap, then covered with 85 tons of 3/8-inch pea gravel mixed with coarse sand. Along a portion of the north bank, the toe of the rip-rap rests on a layer of vitrified ash that could not be removed with the available equipment during the cleanup.

Confirmation samples were collected from the bottom and south sidewall of the excavation on August 19, 1997 (Figure 5). As tide conditions allowed, samples from the eastern half and from the western half of the excavated area were taken approximately every 10-15 feet along the shoreline. Only one sample each was obtained at locations six and seven due to the incoming tide. Two additional confirmation samples were obtained on August 21. Samples were analyzed at Sound Analytical Services, Inc. in Fife, Washington. All samples for analyzed for mercury and every other sample was analyzed for lead, zinc, and semi-volatile organics. Confirmation sample results are shown in Tables 7 and 8 below. Datasheets from all confirmation samples are presented in Appendix B.

WDOE noted that it was difficult to obtain good representative confirmation samples due to the extreme disturbance of the sediments from the excavator and the saturated conditions at the low tidal elevation. The silty black unconsolidated material that was predominate in the excavated material at the north part of the fill area remained present at the bottom of the excavation but brown mud and a gray silty layer were observed below the black silt in places. WDOE was unable to remove the black silt to obtain a clean sample of the underlying sediments due to the saturated conditions. Small sheens resulting from removal of the treated wood pilings were observed on the sediments in the confirmation sample areas

Table 13. South Shoreline Metals (WDOE, Interim Action, March 1997)

Sample Name	Sample Date	Cadmium	Copper	Lead	Mercury	Zinc
South 1	3/1/97	Na	na	na	0.344	na
South 2	3/1/97	Na	na	na	0.125	na
South 3	3/1/97	Na	na	na	0.137	na
South 4	3/1/97	Na	na	na	0.153	na
MTCA A (mg/kg)		5.7	390	450	0.59	410

na: not analyzed

Table 14. Upland Soils – Metals and TPH (WDOE, March 1997)

Sample Name	Date	WTPH-418.1	WTPH-D	Cadmium	Copper	Lead	Mercury	Zinc
UST Pile	3/11/97		771 oil					
TP-2	3/11/97						0.449	
MTCA A (mg/kg)		200	200	2	2,960*	250	2	24,000*

Table 15. Confirmation Samples – Metals (WDOE, Interim Action, August 1997)

	Sample ID	Sample Date	Lead	Mercury	Zinc
Screening Samples	SS1 (66801-01)	8/17/97		20	
	Screen1	8/17/97		0.12	
	Screen2 (68801-03)	8/17/97		0.45	
	Screen3 (66801-04)	8/17/97		2.8	
Post-Excavation Confirmation Samples	1W (66842-01)	8/19/97	82	**0.82**	170
	1E (66842-02)	8/19/97	na	**1.2**	na
	1X (66842-03)	8/19/97	na	**1.3**	na
	2W (66842-04)	8/19/97	na	**2.8**	na
	2E (66842-05)	8/19/97	120	**4.4**	230
	3W (66842-06)	8/19/97	37	**1.7**	78
	3E (66842-07)	8/19/97	na	**8**	na
	4W (66842-08)	8/19/97	na	**1.8**	na
	4E (66842-09)	8/19/97	120	**29**	260
	5W (668420-10)	8/19/97	170	**26**	**460**
	5E (66842-11)	8/19/97	na	**2.5**	na
	6W (66842-12)	8/19/97	92	**18**	280
	7EW (66842-13)	8/19/97	330	**2.5**	380
	Dock (68842-14)	8/19/97		0.35	
	SSidewall (66842-15)	8/19/97	290	**4.2**	**410**
	SW1 (66842-16)	8/19/97		0.22	
	Southfdn (66992-01)	8/21/97		<0.16	
	Southpipe (66992-02)	8/21/97	51	**1.1**	60
	MTCA A (mg/kg)	8/21/97	450	0.59	410
Leach Test Samples	Seep* (67067-1)	8/27/97	na	<0.2	na
	4E-Leached (67075-1)	8/19/97	na	<0.2	na
Post-Cleanup Water Samples	SeepNorth (67426-01)	9/15/97		<0.2	
	Upwelling (67426-02)	9/15/97		<0.2	
	MTCA A (mg/kg)				

*Seep water used to leach sample 4E

Table 16. Confirmation Samples – PAHs (WDOE, Interim Action, 1997)

	Sample Name	Date	Acenapthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	2-Methyl naphthalene	Total LPAH	Di-n-butyl phthalate	Diethyl phthalate	Dinitro Toluene
Post Excavation Confirmation Samples	1W	8/19/97	120U	1100	**1600**	440	160	**4900**	190U	**8340**	380		
	2E	8/19/97	170U	310	370	260	220	1400	270U	2780			
	3W	8/19/97	120U	280	310	140U	230U	790	190U	1705			
	4E	8/19/97	150U	180	320	170U	280U	1200	230U	2115			
	5W	8/19/97	180U	150U	270U	200U	340U	260	280U	970			
	6W	8/19/97	190U	180U	290U	210U	370U	320U	300U	920			
	7EW	8/19/97	170U	310	850	190U	330U	1600	270U	3240			
	SSIDEWALL	8/19/97	150U	130U	230U	170U	290U	320	240U	925			
	SOUTHPIPE	8/21/97	66U	49U	1U	42U	44U	55U	63U	185			
Leach Test Sample	SEEP*	8/12897	0.62U	0.58U	0.54U	0.73U	0.41U	0.45U	0.52U		0.82JB1	1.6B1	0.37J
	1W LEACHED	8/19/97	0.63U	0.59U	0.54U	0.74U	0.42U	0.45U	0.53U		1.3J	0.67J	0.83U
Post-Cleanup	SEEPNORTH	9/15/97	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U		1.1U	1.1U	1.1U
	MTCA A (µg/kg)		500	1,300	960	540	2,100	1,500	670	5,200			

	Sample Name	Date	Benzo(a) Anthracene	Benzo-Fluoranthene	Benzo(ghi) Perylene	Benzo(a) Pyrene	Chrysene	Dibenzo(ah) Anthracene	Fluoranthene	Indeno(123cd) Pyrene	Pyrene	Total HPAH	B2EHP
Post Excavation Confirmation Samples	1W	8/19/97	**3800**	**6850**	**2600**	**6000**	**3300**	**610**	**6600**	**2700**	**8400**	**41045**	150U
	2E	8/19/97	750	1870	**740**	1300	830	220U	**2500**	**690**	2300	11090	210U
	3W	8/19/97	700	1390	550	1100	740	150U	1600	510	2000	8665	150U
	4E	8/19/97	610	1200	430	710	730	180U	1800	450	1500	7520	180U
	5W	8/19/97	200U	340	310U	270	200	220U	490U	140U	490	1980	220U
	6W	8/19/97	220U	890U	330U	230U	170U	240U	220U	150U	290U	1370	230U
	7EW	8/19/97	730	1990	**860**	1300	920	210U	2100	**750**	2500	11255	210U
	SSIDEWALL	8/19/97	170U	370	240	270	210	190U	530	200	500	2500	190U
	SOUTHPIPE	8/21/97	30U	92U	13U	340U	61U	32U	66U	32U	49U	205	180
Leach Test Sample	SEEP*	8/28/97	0.87U	1.32U	2.5U	0.42U	0.51U	0.6U	0.73U	0.26U	0.58U		0.41JB1
	1W LEACHED	8/19/97	0.88U	1.34U	2.6U	0.42U	0.51U	0.61U	0.73U	0.26U	0.59U		1JB1
Post-Cleanup	SEEPNORTH	9/15/97	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U	1.1U		1.1U
	MTCA A (µg/kg)		1,600	3,600	720	1,600	2,800	230	2,500	690	3,300	17,000	1,300

U: not detected at or above the level shows; J analyte was identified but quantity is estimated; B1: the analyte was detected in the associated method blank. The concentration was determined not to be significantly higher than the associated method blank (less than 10x the blank concentration.

*seep water from adjacent steam plant (city –owned) site

Confirmation samples from the bottom of the excavation (1W through 7EW) contained mercury ranging from 0.35 mg/kg under the former concrete pier to 29 mg/kg at sample 4E. One sample, 5W, slightly exceeded the SQO (460 mg/kg) for zinc. Sample 1W contained 8,340 µg/kg LPAH and 41,045 µg/kg HPAH compared to the SQO of 5,200 µg/kg and 17,000 µg/kg respectively. No other samples contained total HPAH or LPAH above the SQO. A few individual HPAH exceeded the SQO; however, based on the fact that the initial characterization samples of the fill did not contain PAH above the SQO, WDOE determined that these exceedances in the sample were the result of isolated contamination from removal of the treated wood pilings and were not indicative of PAH contamination in the remaining sediments. Bis (2-ethylhexyl) phthalate was detected below the SQO in one sample (180 µg/kg).

Sample 4E, which contained the highest concentration of mercury, and sample 1W, which contained the highest concentration of PAH, were subjected to a leach test utilizing filtered seep water from an adjacent site. The purpose of the leach test was to determine whether the sediments encapsulated behind the geotextile fabric and riprap would leach contaminants to the Thea Foss Waterway. The water, which was analyzed for conductivity, mercury, and semi-volatile organics, was found to be salt water and did not contain mercury or PAH. Some phthalates were detected in the seep water, but were also detected in the method blank. The samples were prepared utilizing a modified Toxicity Characteristic Leaching Procedure using the seep water as the leaching medium. The leachate sample for 4E did not contain mercury at a detection limit of 2 µg/kg. The marine acute water quality standard for the protection of aquatic life is 2.1 µg/L for mercury. The marine chronic standard is 0.025 µg/kg. The leachate sample for 1W did not contain PAH at the detection limit shown on the datasheets in Appendix B. The leachate sample for 1W did contain detectable concentrations of diethylphthalate, di-n-butylphthalate, and bis (2-ethylhexyl) phthalate, and the method blank for the seep water contained phthalates as well.

Confirmation samples were obtained at the south end of the excavation (Figure 5). Sample SCREEN2 consisted of light brown sandy soil. It was obtained from about 4 feet below the top of the bank, prior to the full excavation at the south end of the site. It contained 0.45 mg/kg mercury. Additional excavation revealed brown sand mixed with man-made materials such as broken tiles and bricks and a light grainy sand. A sample of the sand (SW1) contained 0.22 mg/kg mercury. At the final lateral and vertical extent of excavation, sample SSIDEWALL was obtained by compositing sediments at the 0-1 foot MLLW level along the final base of the south side wall. This sample contained 4.2 mg/kg mercury and 410 mg/kg zinc. These are above the MTCA sediment cleanup standard of 0.59.mg/kg.

Two additional confirmation samples were obtained near the south end of the site. Sample SOUTHFDN was obtained from some ash material found below a box-like foundation wall that was uncovered just to the south of the concrete slab. Mercury was not detected in this sample. Sample SOUTHPIPE was obtained from an area with coarse red and black sand with possible charred pieces in it located around a metal pipe about 3 feet below the top of the bank and the extreme south end of the excavation. This sample contained 1.1 mg/kg mercury and PAH were not detected.

On September 15, 1997, approximately one month after the cleanup was complete, WDOE obtained seep and marine water samples from the site. WDOE examined the shoreline

throughout the cleanup area for seeps and identified one extremely small seep at the north end of the site at approximately the 0-foot tidal level. Sample SEEPNORTH was obtained by clearing a space in the gravel below the seep and dipping a pre-cleaned glass jar into the pool that formed in the sand. According to WDOE, the flow from this the seep was very slow and it took approximately 15 minutes to obtain enough sample for the planned analysis. Due to the small size of the seep in the potential for stirring up contaminated sediments when gathering the sample, the sample was filtered before analysis. This sample was analyzed for mercury and semi-volatile organics. Mercury was not detected above the detection limit of 0.2 µg/kg.

3.5 2005 PHASE II ENVIRONMENTAL SITE ASSESSMENT

The objectives of this Phase Two ESA were to understand the subsurface conditions at the Site to facilitate property transactions.

The scope of work for this investigation was developed through discussions with Mr. Jeff Jones, representing the current owner, Ms. Joyce Mercuri (Ecology), and background information. Previous environmental investigations suggested that potential significant impact to Site soils and groundwater would be in the vicinity of the former USTs and Site building and along the bank above the Thea Foss shoreline. Boring locations were selected based on previous environmental investigations as well as to provide an overall Site soil condition. At the request of Ecology, laboratory analyses for soil and groundwater were based on Table 830-1 in the Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC amended February 12, 2001 and included selected metals. Laboratory analytes for each boring were selected based on boring location as well as the need to characterize Site soils and groundwater.

Work on the project included the following general tasks:

- Advance eight (8) boreholes using a Geoprobe direct-push drilling method;
- Collect and submit soil and groundwater samples for laboratory analysis for diesel-range and gasoline-range petroleum hydrocarbons, BTEX, PCBs, PAHs, semi-volatile compounds and RCRA 8 metals (lead, chromium, cadmium, barium, silver, arsenic, selenium, and mercury);
- Incorporate previous environmental investigation data into a more detailed Site map;
- Document observations in field notes and borehole logs; and
- Prepare a report.

A detailed description of VE field procedures is presented In Appendix C.

At the time of VE's field effort, the subject Site was vacant. Previous Site buildings were razed and the construction debris removed from the Site in 1980. Portions of the building footprint and a concrete slab near the middle of the shoreline are currently present on Site.

On September 12, 2005, eight boreholes (B-1 through B-8) were advanced by a Washington State licensed driller, ESN, using a direct push drilling unit. The boreholes were drilled in accessible locations in the vicinity of the removed UST, near the corners and center of the Site, and along the edge of the bank overlooking the Thea Foss Waterway.

The locations were chosen based on historic site activities and to provide overall Site soil conditions (Figure 6).

A Washington State Licensed Hydrogeologist was present on the Site to direct drilling and sampling, and to visually classify soils in accordance with the Unified Soil Classification System (USCS). All boreholes were logged and soil cores assessed for chemical odors and staining. Observations, along with other relevant geologic and hydrologic conditions encountered during drilling, were recorded on borehole logs, copies of which are presented in Appendix C.

Soil samples collected from sampling sleeves at four foot intervals were placed in laboratory-prepared glass jars labeled with borehole number, sample interval, time, date, VE project number, and required analyses. Filled sample containers were placed immediately in a chilled ice chest and stored there until delivered to the project laboratory.

With the exception of boring B-8, groundwater samples were collected from the direct-push borings by advancing the sampling probe to the desired depth and the sampling ports opened. The probe was advanced into the water-bearing formation, and the sampling ports on the probe opened. The sample was collected using a peristaltic pump. Each boring was purged a minimum of three borehole volumes of water to minimize the effects of the drilling. The sample containers were then filled from the discharge of the peristaltic pump. Each sample was labeled with a unique alphanumeric sample number.

The samples were collected in a particular order to assure that the samples most likely to change rapidly when exposed to the atmosphere were collected first. The order for collecting samples was as follows:

1. Volatile Organic compounds (VOCs)
2. NWTPH-G
3. NWTPH-Dx
4. Metals

At boring B-8, a sample was not obtained because the probe did not encounter water due to refusal at 8 feet bgs on what appeared to be concrete.

Selected soil samples were submitted under chain-of-custody protocol to Libby Environmental in Olympia, Washington, for chemical analysis. A total of 23 soil and seven groundwater samples were selected for analysis for diesel-range petroleum hydrocarbons, gasoline-range petroleum hydrocarbons, BTEX, PAHs, PCBs, semi-volatile compounds and RCRA 8 metals. Not all samples were analyzed for all constituents. The analyses on each sample were determined based on historic site activities. A copy of the chain-of-custody form and laboratory-prepared analytical reports are provided in Appendix C. Analytical results are summarized in Table 9 and 10.

Table 17. Upland Soil Samples from Borings – Metals and TPH (V Environmental, Phase II ESA, September 2005)

Sample ID	Date Collected	Lead	Chromium	Cadmium	Barium	Silver	Arsenic	Selenium	Mercury	Benzene	Toluene	Ethylbenzene	Xylenes	Gasoline	Diesel
B1-4	9/12/05	20	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B1-7	9/12/05	40	<2.0	<1.0	<1.0	<1.0	<2.0	<10	1.8	na	na	na	na	na	na
B1-11	9/12/05	9.1	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B2-4	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B2-7	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B2-11	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B3-4	9/12/05	2.2	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B3-7	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B3-11	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B3-11 dup	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B4-4	9/12/05	6.9	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	<20
B4-7	9/12/05	2	<2.0	<1.0	<1.0	<1.0	<2.0	<10	**2.9**	na	na	na	na	na	<20
B4-11	9/12/05	1.9	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	<20
B5-4	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	<0.02	<0.05	<0.05	<0.05	<10	<20
B5-7.5	9/12/05	16	<2.0	<1.0	<1.0	<1.0	<2.0	<10	0.4	<0.02	<0.05	<0.05	<0.05	<10	<20
B5-11	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	1.5	<0.02	<0.05	<0.05	<0.05	<10	<20
B6-4	9/12/05	63	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	<20
B6-7	9/12/05	1.7	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	<20
B6-11	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	<20
B7-4	9/12/05	9.3	<2.0	<1.0	<1.0	<1.0	<2.0	<10	1.4	na	na	na	na	na	na
B7-7	9/12/05	<1.0	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B7-11	9/12/05	1.6	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B8-4	9/12/05	11	<2.0	<1.0	<1.0	<1.0	<2.0	<10	<0.4	na	na	na	na	na	na
B8-7	9/12/05	1.2	<2.0	<1.0	<1.0	<1.0	<2.0	<10	**2.1**	na	na	na	na	na	na
B8-7 dup	9/12/05	1.1	<2.0	<1.0	<1.0	<1.0	<2.0	<10	**2.1**	na	na	na	na	na	na
MTCA A (mg/kg)		250	2000	2.0	5600*	400*	20	400*	2.0	0.03	7	6	9	100	2,000

na: not analyzed; * MTCA Method A standards not available and MTCA Method B standards used.

Table 18 Upland Soil Samples - PAHs (V Environmental, Phase II ESA, September 2005)

Sample Name	Date	Acenapthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene					
B1-4	9/12/05	na	Na	na	na	na	na					
B1-7	9/12/05	na	Na	na	na	na	na					
B1-11	9/12/05	na	Na	na	na	na	na					
B2-4	9/12/05	na	Na	na	na	na	na					
B2-7	9/12/05	na	Na	na	na	na	na					
B2-11	9/12/05	na	Na	na	na	na	na					
B3-4	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B3-7	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B3-11	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B3-11 dup	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B4-4	9/12/05	na	Na	na	na	na	na					
B4-7	9/12/05	na	Na	na	na	na	na					
B4-11	9/12/05	na	Na	na	na	na	na					
B5-4	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B5-7.5	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B5-11	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B6-4	9/12/05	na	Na	na	na	na	na					
B6-7	9/12/05	na	Na	na	na	na	na					
B6-11	9/12/05	na	Na	na	na	na	na					
B7-4	9/12/05	na	Na	na	na	na	na					
B7-7	9/12/05	na	Na	na	na	na	na					
B7-11	9/12/05	na	Na	na	na	na	na					
B8-4	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B8-7	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
B8-7 dup	9/12/05	na	Na	na	na	Na	na					
MTCA B (µg/kg)		4,800	None listed	24,000	3,200	1,600	None listed					

na: not analyzed; * MTCA Method A standards not available and MTCA Method B standards used.

Table 18 (continued) Upland Soil Samples - PAHs (V Environmental, Phase II ESA, September 2005)

Sample Name	Date	Benzo(a) Anthracene	Benzo-Fluoranthene	Benzo(ghi) Perylene	Benzo(a) Pyrene	Chrysene	Dibenzo(ah) Anthracene	Fluoranthene	Indeno(123cd) Pyrene	Pyrene	B2EHP
B1-4	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B1-7	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B1-11	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B2-4	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B2-7	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B2-11	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B3-4	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B3-7	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B3-11	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B3-11 dup	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B4-4	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B4-7	9/12/05	na	Na	na	na	na	Na	na	na	na	na
B4-11	9/12/05	na	Na	na	na	na	na	na	na	na	na
B5-4	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B5-7.5	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B5-11	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B6-4	9/12/05	na	Na	na	na	na	na	na	na	na	na
B6-7	9/12/05	na	Na	na	na	na	na	na	na	na	na
B6-11	9/12/05	na	Na	na	na	na	na	na	na	na	na
B7-4	9/12/05	na	Na	na	na	na	na	na	na	na	na
B7-7	9/12/05	na	Na	na	na	na	na	na	na	na	na
B7-11	9/12/05	na	Na	na	na	na	na	na	na	na	na
B8-4	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B8-7	9/12/05	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	na
B8-7 dup	9/12/05	na	Na	na	na	na	na	na	na	na	na
MTCA A (µg/kg)		0.137	0.137	None listed	0.137	0.137	0.137	3,200	None listed	2,400	71.4

na: not analyzed; * MTCA Method A standards not available and MTCA Method B standards used.

Table 19 Upland Groundwater Samples – Metals, TPH, PAHs (V Environmental, Phase II ESA, September 2005)

		MTCA A µg/L	Date	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B7 dup	B-8
Metals	Lead	15	9/12/05	8	**24**	6	12	9	2	2	2	No sample
	Chromium	50	9/12/05	10	20	<0.1	30	40	<0.1	<0.1	<0.1	No sample
	Cadmium	5	9/12/05	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	No sample
	Barium	*	9/12/05	<.05	<.05	<.05	<.05	<.05	<.05	<.05	<.05	No sample
	Silver	*	9/12/05	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	No sample
	Arsenic	5	9/12/05	<.005	<.005	<.005	<.005	<.005	<.005	<.005	<.005	No sample
	Selenium	*	9/12/05	<.05	<.05	<.05	<.05	<.05	<.05	<.05	<.05	No sample
	Mercury	2	9/12/05	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	No sample
TPH	Benzene	5	9/12/05	na	na	na	na	<1	na	na	na	No sample
	Toluene	1,000	9/12/05	na	na	na	na	<1	na	na	na	No sample
	Ethylbenzene	700	9/12/05	na	na	na	na	<1	na	na	na	No sample
	Xylenes	1,000	9/12/05	na	na	na	na	<1	na	na	na	No sample
	Gasoline	1,000	9/12/05	na	na	na	na	<100	na	na	na	No sample
	Diesel	500	9/12/05	na	na	na	na	<200	na	na	na	No sample
PAHs	Naphthalene	160	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Acenaphthylene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Fluorene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Phenanthrene	*	9/12/05	na	na	<0.1	<0.1	<0.1	na	na	na	No sample
	Anthracene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Fluoranthene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Pyrene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Benzo(a)anthracene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Chrysene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Benzo(b)fluoranthene	*	9/12/05	na	na	<1	<1	<1	na	na	na	No sample
	Benzo(a)pyrene	*	9/12/05	na	na	<0.1	<0.1	<0.1	na	na	na	No sample
	Indeno(1,2,3-cd) pyrene	*	9/12/05	<1								No sample
	Dibenzo(a,h)anthracene	*	9/12/05	<1								No sample
	Benzo(ghi)perylene	*	9/12/05	<1								No sample

na: not analyzed; * MTCA Method A standards not available and MTCA Method B standards used.

Soils at approximately 7 feet bgs in Boreholes B-4 and B-8 contained mercury in concentrations slightly greater than MTCA Method A Soil Cleanup levels (2.9 mg/kg and 2.1 mg/kg respectively) (Table 1). These borings are located on the northeast corner of the Site near the edge of the bank leading down to the Thea Foss Waterway. Samples from borings B-1, B-5 and B-7 detected mercury below the MTCA Method A cleanup standards. Lead below MTCA cleanup levels was detected in the soil samples from boring B-1, B-3, B-4, B-5, B-6, B-7 and B-8. Chromium below the MTCA cleanup levels was detected in the soil sample from boring B-7 at 11 feet bgs.

In groundwater, lead was detected in all samples from the site. Except for Boring 2 in the southwest corner of the Property, all lead concentrations in groundwater were below the MTCA Method A groundwater cleanup levels of 15 µg/L. Chromium was also found in the groundwater below MTCA cleanup levels in the groundwater of borings B-1, B-2, B-4, and B-5.

No other analytes were identified as present in the soil or groundwater samples from the Site during this investigation.

3.6 2005 SITE INVESTIGATION

On December 5, 2005, V Environmental LLC completed a Supplemental Site Investigation at the Property. The investigation comprised excavating two test pits; collecting and analyzing soil samples suspected to be contaminated with mercury; evaluation of analytical data; and preparation of this report.

V Environmental located former Borings B-4 and B-8 (Figure 6) and an operator from Environmental Tank Services used a backhoe to excavate two test pits (TP-1 and TP-2) at these locations (Figure 7). A licensed hydrogeologist was present on the Site to visually classify soils in accordance with the Unified Soil Classification System (USCS). The test pits were logged and observations, along with other relevant geologic and hydrologic conditions encountered during excavation, were recorded on test pit logs, copies of which are presented in Appendix C. The soils from the excavation were placed on plastic until they can be transported offsite for disposal.

Soil samples were collected at the appropriate depths in TP1 from center of the backhoe bucket near the teeth but not adjacent to the metal sides. Because of slumping sand in TP2, soil samples were collected using a stainless steel hand-auger advanced into the sidewalls and base of the excavation. The soil samples were placed in laboratory-prepared glass jars labeled with sample identification number, time, date, VE project number, and required analyses. The filled sample containers were placed immediately in a chilled ice chest and stored there until delivered to the project laboratory.

A total of 10 soil samples were selected for analysis for mercury (Table 12).

TP-1 (former B4 location) was excavated on the northeast corner of the parcel as shown on Figure 6. TP-1 was approximately 10 feet wide, 10 feet long and 8 feet deep. The excavated material from TP1 consisted of medium sand and whole and partial bricks. TP-2 (former B8 location) was excavated approximately 15 feet south of TP-1. It was approximately 8 feet wide, 8 feet long and 8 feet deep. Excavated soils were dark brown,

fine to medium sand with shell fragments infrequently intermixed with embedded lenses of silt. All of the material excavated is interpreted to be fill material used when developing the site.

Table 20. Upland Soil Samples – Mercury (V Environmental, Site Investigation, November 2005

Sample Name	Sample Date	Mercury
TP1-B	11/9/2005	<0.5
TP1-N	11/9/2005	<0.5
TP1-S	11/9/2005	<0.5
TP1-E	11/9/2005	<0.5
TP1-W	11/9/2005	<0.5
TP2-B	11/9/2005	<0.5
TP2-N	11/9/2005	1.7
TP2-S	11/9/2005	<0.5
TP2-E	11/9/2005	<0.5
TP2-W	11/9/2005	<0.5
MTCA (mg/kg)		2.0

4.0 CONTAMINANT EXPOSURE PATHWAYS

Prior to WDOE's encapsulation of the embankment, human exposure routes for the mercury-contaminated soils were via direct contact with the soils. Exposure pathways for the waterway appear to be limited to sedimentation, based on the chemical analyses that indicate that the mercury is not leachable.

According to the WDOE Interim Action, public access to the Property was uncontrolled and WDOE staff observed homeless individuals in direct or close contact with the mercury-contaminated fill (eating and sleeping). The Property is also located adjacent to the Tacoma Sea Scouts and WDOE staff noted children playing along the bank near the filled area. The concrete slab dock was also frequented by fishermen.

With the encapsulation of the mercury-containing soils on the bank and shoreline with a geotextile fabric that is anchored in place with quarry spalls and sand, the direct contact exposure route has been eliminated.

Remediation and investigation activities appear to have characterized the subsurface soil conditions in the uplands portion of the Property. The subsurface soils were investigated to 11 feet below ground surface, to the depth of groundwater. Soils were sampled at four feet seven feet and 11 feet bgs. Mercury at concentrations above MTCA Method A cleanup levels for unrestricted land use was identified at two locations in the northeast quadrant of the Property. V Environmental excavated those soils in December 2005. Laboratory analysis of the soils from the other borings indicated the presence of mercury but not in concentrations greater than the cleanup criteria. Chemical analytical results from the upland investigations and confirmational sampling suggest that the soils at the Property are not significantly contaminated, which indicates a low potential for direct contact exposure to contaminated soils.

5.0 EXCLUSION FROM TERRESTRIAL ECOLOGICAL ASSESSMENT

Under the Model Toxics Control Act (MTCA), a Terrestrial Ecological Evaluation (TEE) is not required because the Site meets the criteria in WAC 173-340-7491 for an exclusion based on Exclusion 7, “There is less than one-quarter acre of contiguous undeveloped on or within 500 feet of any area of the property and the contaminants do not include the following: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

6.0 SUMMARY OF FINDINGS OF INVESTIGATIONS

Between 1992 and 2005, the following environmental investigations/remediations have occurred at the Property:

- The UST Decommissioning and Overexcavation of Petroleum-Contaminated Soils (Hart Crowser 1992). Laboratory analyses indicated that although metals and PAHs were present in the soils and groundwater at the Property, the concentrations were less than MTCA Method A Cleanup levels for Unrestricted Use. This investigation was concentrated primarily in the center of the Property.
- The 1993 Area-Wide Investigation that included the shorelines and uplands of properties along the Thea Foss Waterway. WDOE identified a non-soil fill on the northern two-thirds of the Property shoreline. The non-soil fill was not observed on the south shoreline. Based on laboratory analytical results from the offshore sediments, concentrations of mercury greater than the Commencement Bay SQOs were present in site sediments. WDOE's observation of mercury-containing non-soil fill on the bank of the Property in conjunction with the elevated concentrations of mercury in the sediments offshore suggested that the Property have been a source of mercury to the Thea Foss.
- The Limited Sediment Investigation and Sample Collection (JS Jones 1996). JS Jones collected sediment samples from the north and south shoreline of the Property. Laboratory analyses indicated the presence of mercury in the sediments on the north shoreline.

  Following protocol for composite samples (multiply the laboratory analytical results by four (number of samples in the composite), the concentration of zinc exceeds the SQO for sediments in the Thea Foss. Using this formula, the concentration of mercury did not exceed the SQO.

  According to laboratory analytical results, the upland soil sample collected from the JS Jones test pit did not contain mercury in a concentration greater than MTCA Method A Cleanup levels for Unrestricted Use.
- The WDOE Bank and Sediment Investigation and Remediation. Based on their investigation, WDOE conducted an Interim Action to remediate and encapsulate the north shoreline. Laboratory analyses of the sediments indicated that concentrations greater than the SQOs for mercury remain in the sediments at the Property but it was determined that the geotextile fabric anchored by quarry spalls, rip-rap, stones and sand would provide a sufficient barrier between the soils and the Waterway. The samples with the greatest concentration of mercury were identified in the sediments and lower bank area, which is now encapsulated, and not in the upper bank (see Figure 5).
- The Phase II ESA and Investigation of the Upland Soils (V Environmental 2005). V Environmental advanced eight borings across the Property and submitted both soil and groundwater samples for laboratory analyses. Mercury in concentrations greater than MTCA Method A Cleanup levels for Unrestricted Use was identified in soil in two borings in the northeast corner of the Property. V Environmental excavated two test pits in the area of these borings and collected soil samples from the bottom and sidewalls. Laboratory analyses of these samples indicated the presence of mercury in one sample (the northern sidewall of Boring 4) at 1.7 mg/kg, which is less than MTCA Method A

Cleanup levels for Unrestricted Use. The soils from this test pits remain staged on plastic on the site and are awaiting transportation.

WDOE drew the following conclusions from the Hart Crowser UST remediation, JS Jones limited investigation and from the Interim Action and include the following:

- The USTs were successfully overexcavated and the source of TPH in the Property soils has been removed.
- Non-soil fill was identified in the northern two-thirds of the embankment, which is the area that was encapsulated during WDOE's Interim Action. Mercury above the SQOs remains in place and are encapsulated by a geotextile fabric that is anchored by rip-rap, quarry spalls, sand, and rocks. They do not pose a threat to the Thea Foss Waterway.
- The non-soil fill was not observed on the south shoreline.
- WDOE observed that the uplands did not appear to be significantly contaminated.

Laboratory analytical results from the V Environmental investigations indicated the presence of metals in the subsoils at the Property, but not in concentrations greater than MTCA Method A Soil Cleanup levels for Unrestricted Use.

It is V Environmental's opinion that the Property has been sufficiently investigated and that the interim cleanup actions at the site have met the minimum requirements for cleanup actions under WAC 173-340-360 as protecting human health and the environment and with institutional controls, effectively permanently reduces mobility of hazardous substances. V Environmental bases this opinion on the following:

- The known recognized environmental conditions have been excavated or remediated (USTs).

- Subsurface soil samples collected to 11 feet below ground surface have not revealed concentrations of metals, TPH or PAHs above MTCA Method A Cleanup Levels for Unrestricted Use.

- The non-soil mercury-containing fill that was observed along the northern bank was not observed along the southern bank, which was not included in WDOE's Interim Action cleanup.

- One groundwater sample contained a concentration of lead above MTCA Method A Cleanup Levels. However, it is the opinion of V Environmental that since this groundwater is not currently used as a potable water source and it is unlikely that it will ever be used as a source for potable water, it appropriate to apply a surface water criteria for the Property (Surface Water Applicable or Relevant and Appropriate Requirements (ARAR) for Aquatic Life Marine/Acute – Ch. 173-201A WAC is 210 µg/L).

- Laboratory analyses of the soil sample identified as Southpipe indicated a concentration of 1.1 mg/kg of mercury, which is below the MTCA Method A Cleanup levels for Unrestricted Use. WDOE notes included in the Interim Report indicted that Screen2, which was collected from the south sidewall and contains 0.45 mg/kg mercury, is representative of upper soils at the south wall of the excavation.

It is V Environmental's opinion that the above investigations and conclusions warrant an opinion of No Further Action except for soil institutional controls for the site. The institutional controls should

include provisions for maintaining and not disturbing the geotextile membrane and underlying sediments.

7.0 REFERENCES

Hart Crowser, 1992,
Jones, JS, 1996
Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC
Round 2 Data Evaluation Report for the Thea Foss Waterway (Hart Crowser, January 17, 1997
V Environmental, October 2005, *Phase II Environmental Site Assessment*
Washington Department of Ecology, 1997

VE Project Number: 213-1
Drawn by: Verna Lee Teller

1147 Dock Street
Tacoma, Washington

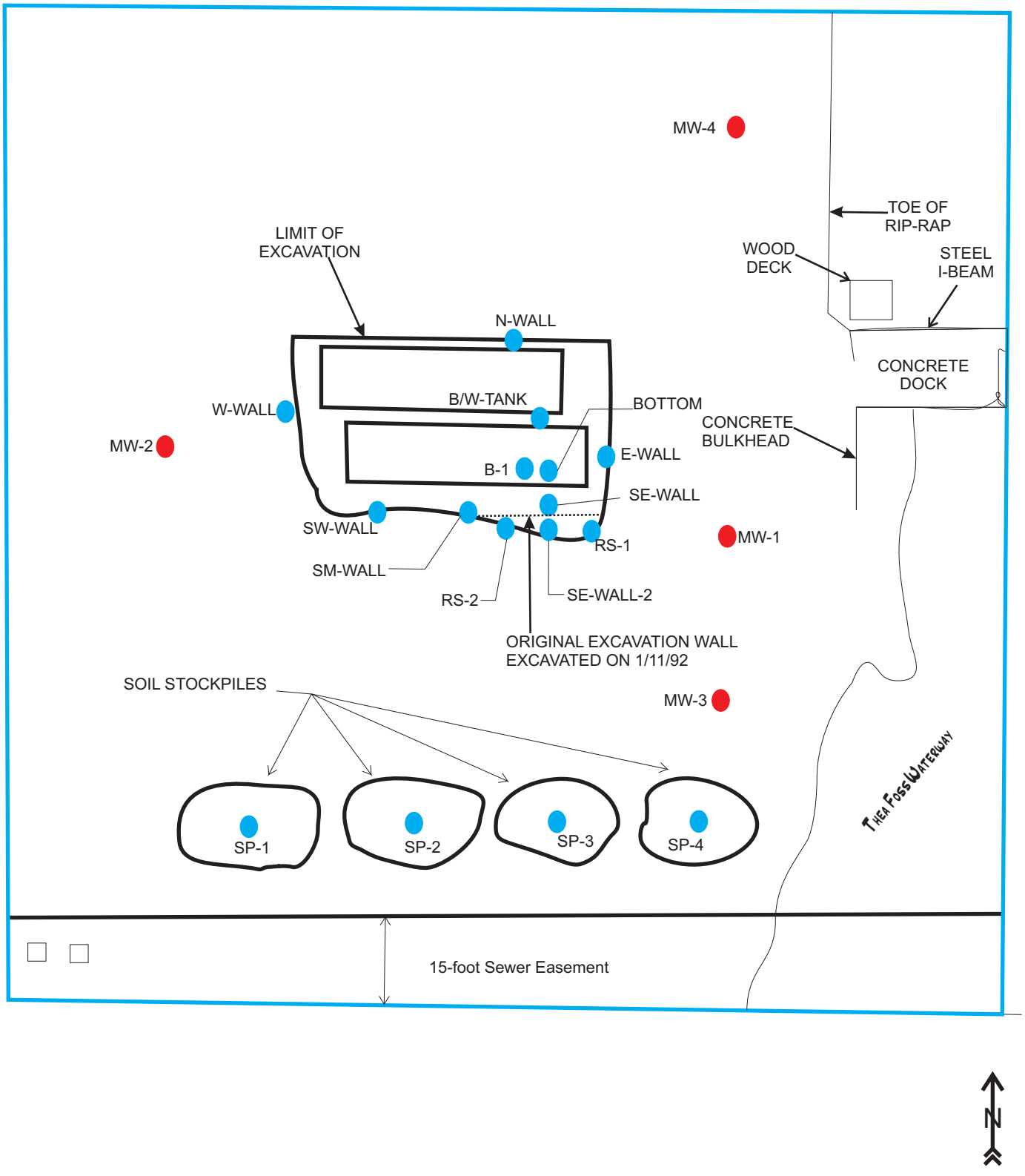
FIGURE 1
SITE LOCATION MAP
V ENVIRONMENTAL, LLC

VE Environmental

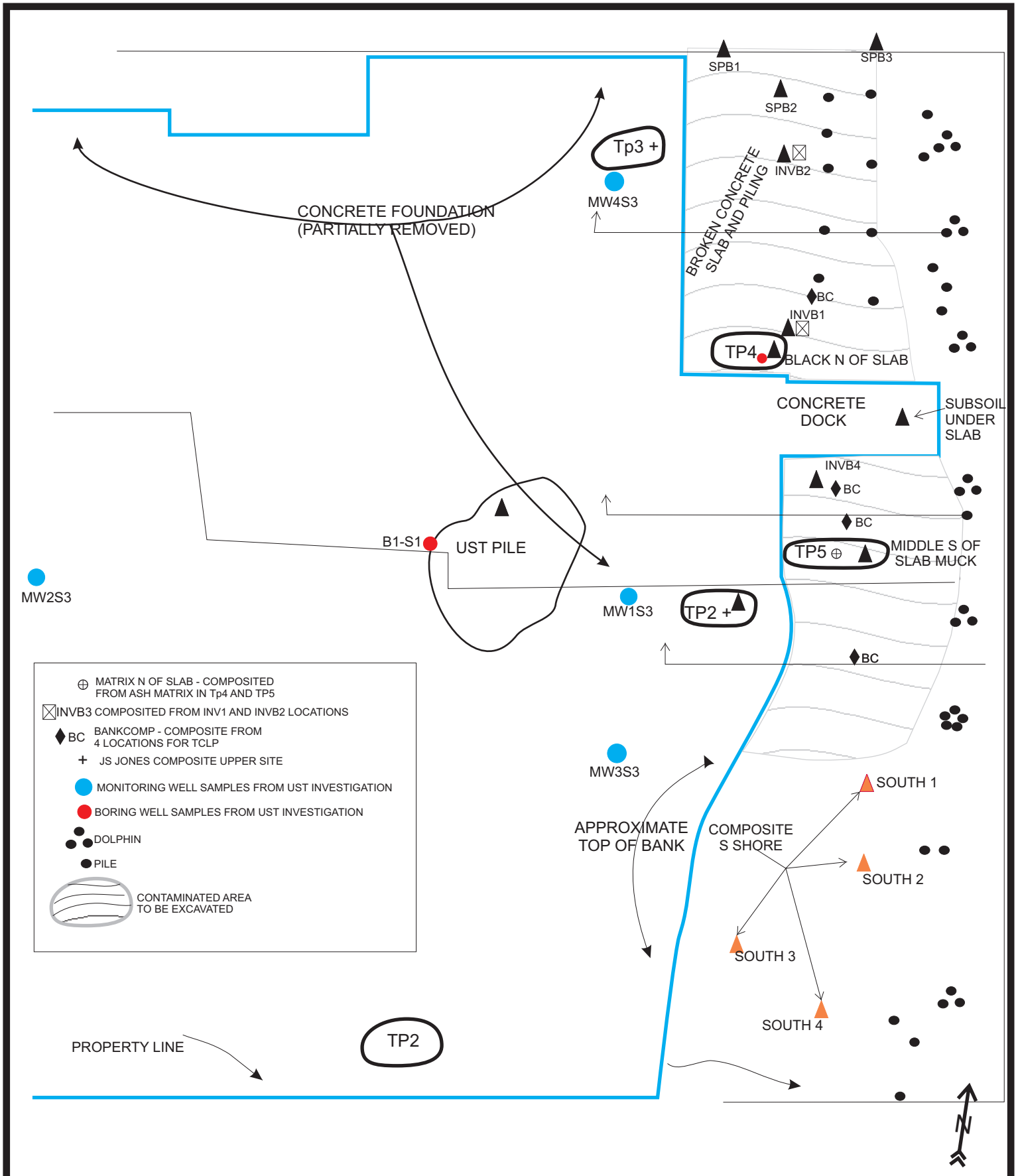
Site Summary Report
February 15, 2007

VE Project Number: 213-3
Drawn by: Verna Lee Teller

FIGURE 2
SITE PLAN
Phase II ESA and Site Investigation
1147 Dock Street
Tacoma, Washington



Environmental	Site Summary Report February 15, 2007 VE Project Number: 213-3 Drawn by: Verna Lee Teller	**FIGURE 3** **UST Excavation Area** Hart Crowser 1147 Dock Street Tacoma, Washington



Environmental	Site Summary Report February 15, 2007 VE Project Number: 213-3 Drawn by: Verna Lee Teller	**FIGURE 4** **SEDIMENT & UPLAND INVESTIGATIONS** **JS JONES AND WDOE** 1147 Dock Street Tacoma, Washington

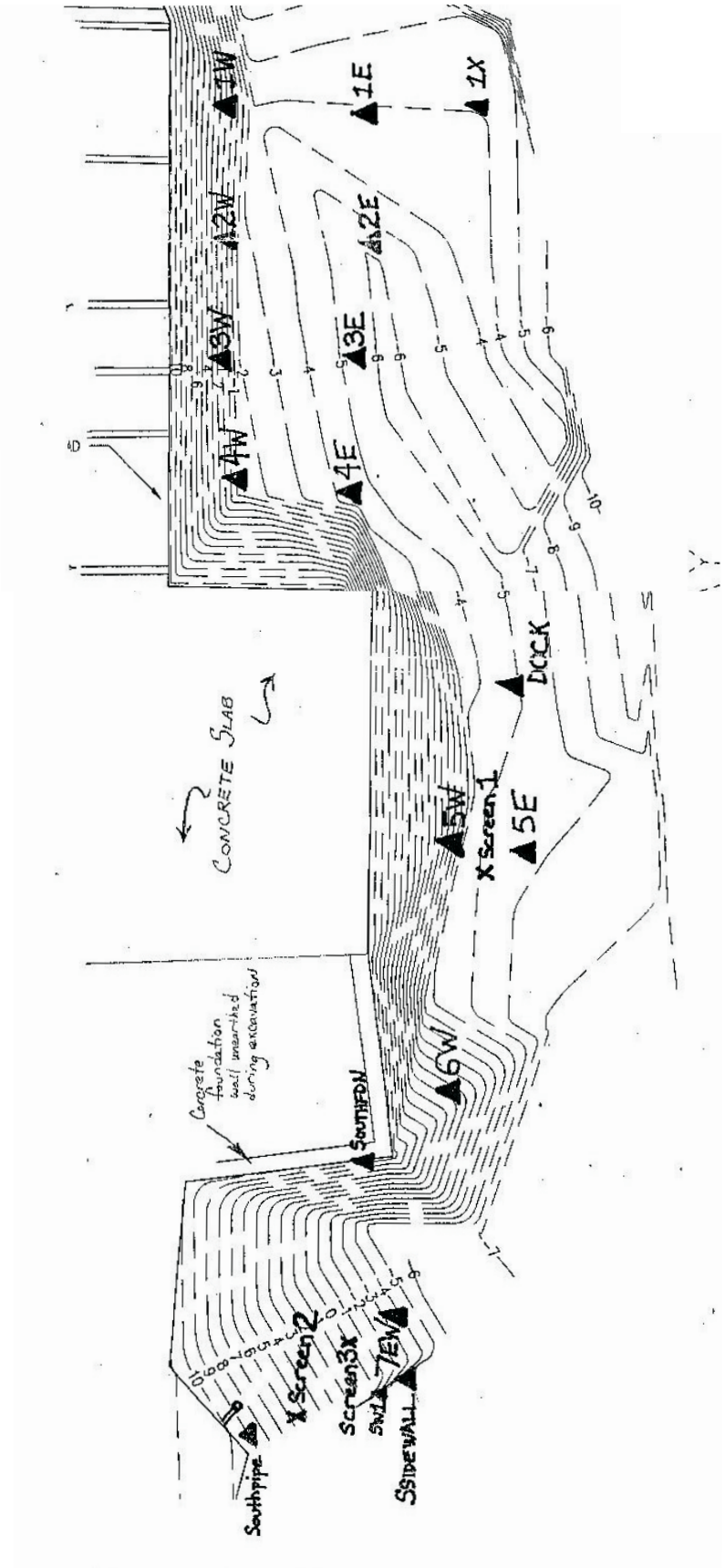


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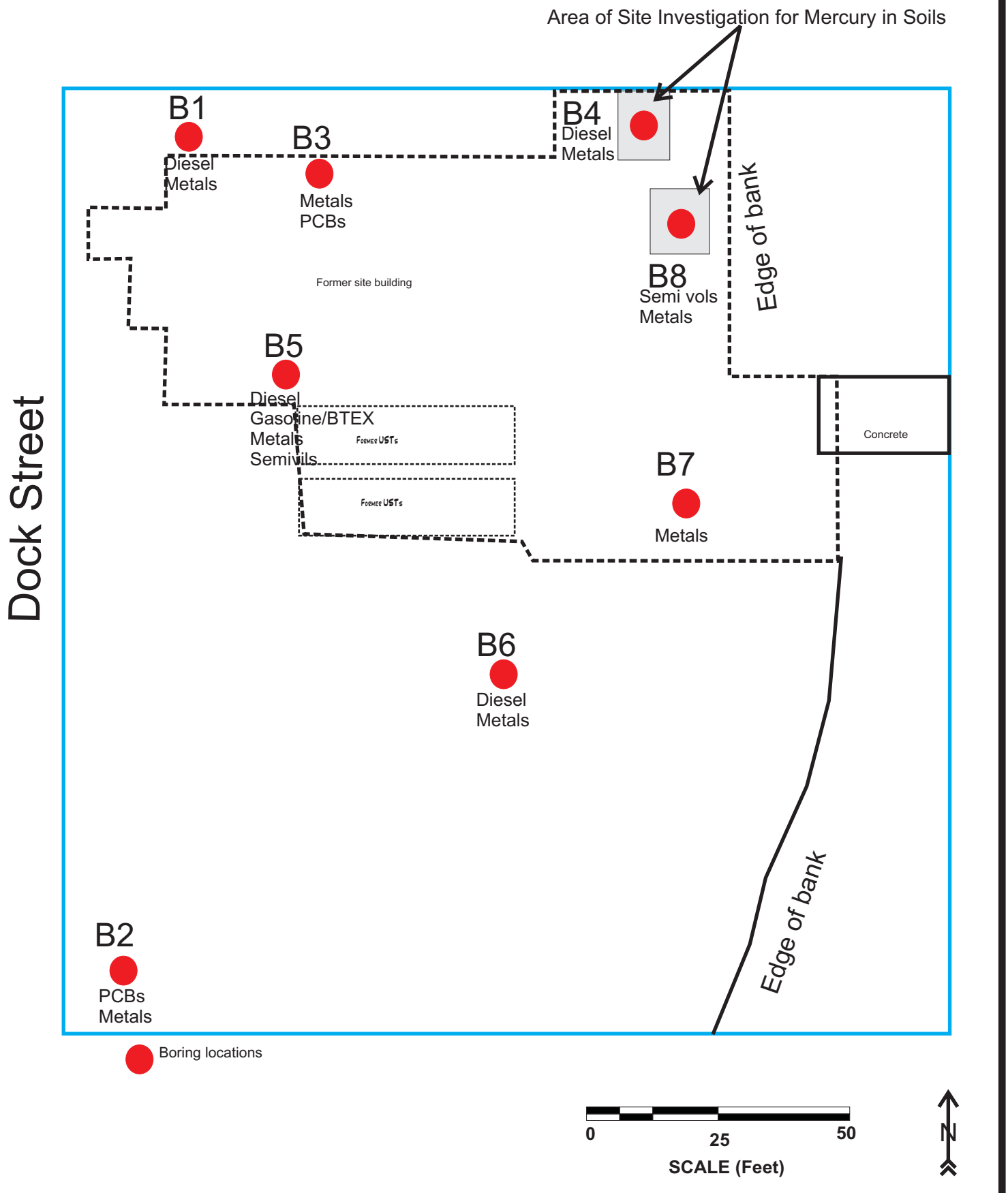
FIGURE 5
BANK SAMPLE LOCATIONS
WDOE INTERIM ACTION
1147 Dock Street
Tacoma, Washington



Environmental	Site Summary Report February 15, 2007 VE Project Number: 213-3 Drawn by: Verna Lee Teller	**FIGURE 6** **Location of Borings** Phase II ESA and Site Investigation 1147 Dock Street Tacoma, Washington

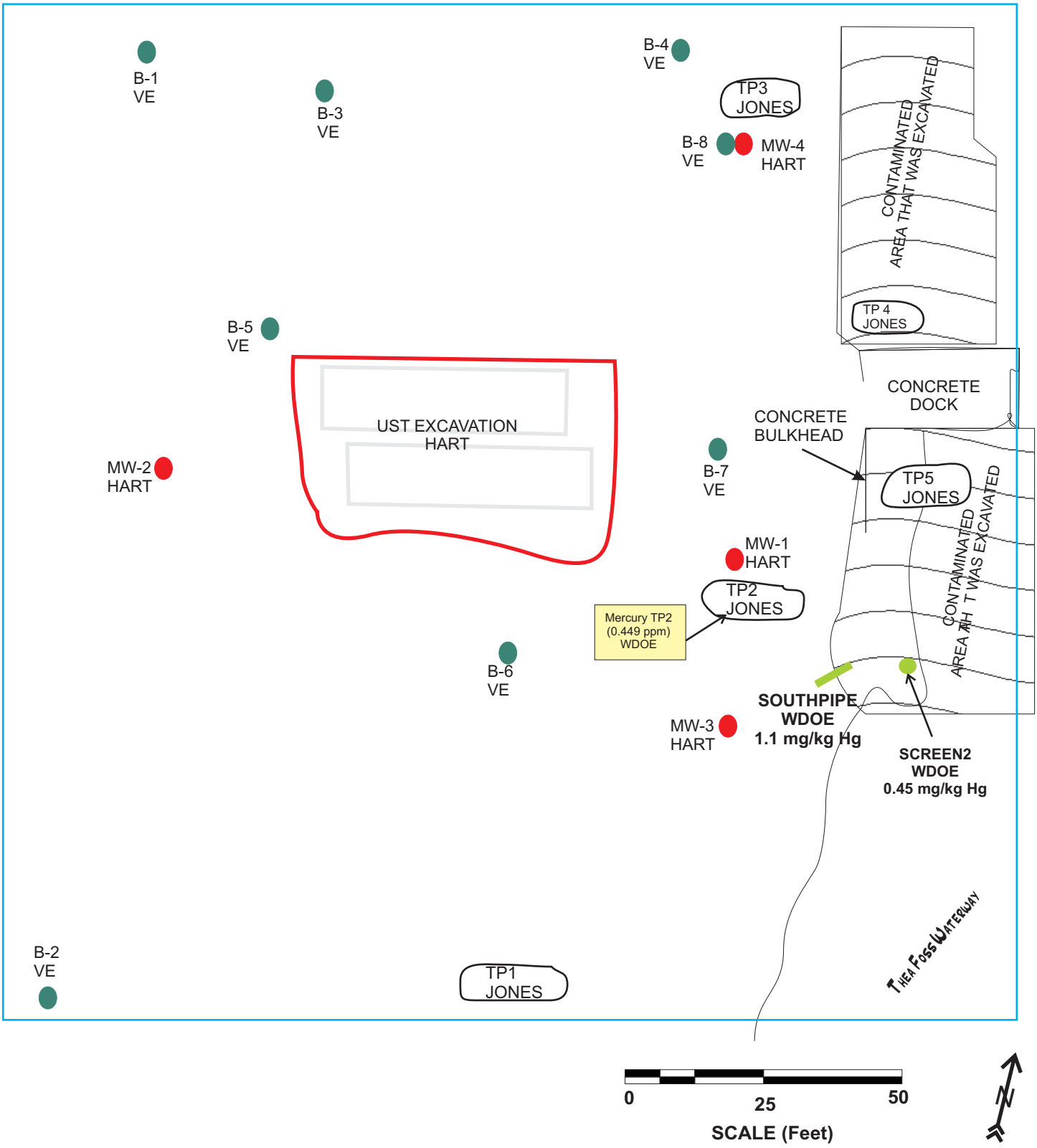


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FIGURE 7
Compilation of Investigations

1147 Dock Street
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