RESULTS OF YEAR 3 (2007) OMMP SAMPLING WITHIN THE HEAD OF THE THEA FOSS WATERWAY

INTRODUCTION

This memorandum presents the results of supplemental sediment sampling and analysis in the Head of the Thea Foss Waterway conducted by the City of Tacoma (City) as part of the Head of the Thea Foss Waterway Remediation Project, Year 3 (2007) Operations, Maintenance, and Monitoring Plan (OMMP) activities. This works was performed in cooperation with the Utilities. Specifically, included in this memorandum are the following:

- The results of sediment samples collected from the compliance interval (0-10 cm) from seven sampling locations (i.e., WC-10 through WC-12, S-15, S-17, S-19, and S-24) in the area where additional cap material was placed to address recontamination caused by dredge residuals; and
- The results of sediment samples collected from the compliance interval from 11 sampling locations (i.e., WC-01 through WC-09, WC-13, and WC-14) in the southern portion of the Head of the Thea Foss Waterway (i.e., below and south of the SR 509 bridge and south of the additional cap material placement area) where bis(2-ethylhexyl)phthalate (DEHP) was previously detected at concentrations exceeding the SQO.

The Year 3 sampling and analysis was performed in accordance with the following plans and memorandums:

- The OMMP for the Head of the Thea Foss Waterway;
- The requirements for sampling and analysis to evaluate the area of additional cap material placement presented in a memorandum to the Environmental Protection Agency (EPA) dated April 28, 2006; and
- The requirements for additional sampling and analysis in the southern portion of the Head of the Thea Foss Waterway to evaluate the presence of DEHP and polycyclic aromatic hydrocarbons (PAHs) presented in a memorandum to EPA dated November 28, 2006.

The following sections summarize the field activities, laboratory analyses, analytical results, and the recommended next steps for the Head of the Thea Foss Waterway.

FIELD ACTIVITIES

Year 3 OMMP sampling activities within the Head of the Thea Foss Waterway were conducted on May 16-17, 2007. Sediment samples were collected from a total of 18 sampling locations as shown in Figure 1. Field personnel for both the City and the Utilities were present during the sampling event. Sediment samples collected from the compliance interval (0-10 cm) were collected by a representative of the City. Sediment samples collected from the early warning interval (0-2 cm) were collected by a representative of the Utilities. A representative of the United States Army Corps of Engineers, Emile Pitre, was present on May 16, 2007, to provide oversight for EPA. Sediment samples were collected from aboard the *Mary Beth*, a 43-foot

sampling vessel, using a Van Veen grab sampler. Acceptable penetration (i.e., 10 cm or greater) with the grab sampler was achieved at all sampling locations.

The grab sampler was inserted into the sediment column and brought to the surface for sample processing. The sediment sample was visually classified and the thickness of surface silt and total penetration measured. The sediment descriptions, along with the sampling time, and sampling coordinates were recorded on sample collection forms (Attachment A). Photographs of each sediment grab were also taken (Attachment B). The measured silt thicknesses are presented in Table 1.

The surface 10 cm of each grab sample was removed first from the grab sampler for the compliance interval (0-10 cm) sample. The 0-10 cm sediment interval was placed in a decontaminated stainless steel bowl and homogenized until the sediment was uniform in color and texture. Appropriate sediment sampling containers were filled with the homogenized sediment, the sample labels completely filled out, and the containers stored on ice.

A rinseate blank quality control sample was also collected following sample collection at location WC-05. The decontamination procedures used between sample collection (seawater rinse, alconox scrub, deionized water rinse) were performed on the non-dedicated field equipment (i.e., stainless steel bowl and spoon) and then a deionized rinse water sample was collected and the container stored on ice.

On May 17, 2007, at the completion of sampling, all samples stored in the coolers containing ice were submitted under a chain-of-custody to Analytical Resources Incorporated (ARI) of Tukwila, Washington for analysis.

LABORATORY ANALYSIS

The analytes specified for an individual sample collected from the compliance interval in the Head of the Thea Foss Waterway was dependant on whether the sample was collected from the additional cap material placement area or the southern portion of the Head of the Thea Foss Waterway (i.e., south of the additional cap material placement area). The samples collected from the seven locations within the additional cap material placement area (i.e., WC-10 through WC-12, S-15, S-17, S-19, and S-24) were submitted for the following analyses:

- Total Organic Carbon (TOC) (PSEP);
- Total Solids (USEPA Method 160.3);
- Grain Size (PSEP);
- Semi-Volatile Organic Compounds (SVOCs) (USEPA Method 8270);
- Metals (i.e., lead, zinc, and mercury) (USEPA Method 6010B and 7471A);
- DDT, DDE, and DDD (USEPA Method 8081); and
- Polychlorinated Biphenyls (PCBs) (USEPA Method 8082).

These analyses were specified in a memorandum submitted to EPA on April 28, 2006.

Samples collected from the 11 locations within the southern portion of the Head of the Thea Foss Waterway (i.e., WC-01 through WC-09, WC-13, and WC-14) were submitted for the following analyses:

- TOC (PSEP);
- Total Solids (USEPA Method 160.3); and
- SVOCs (i.e., PAHs, phthalates, and phenol) (USEPA Method 8270).

These analyses were specified in a memorandum submitted to EPA on November 28, 2006.

Dibenzofuran was also reported by the laboratory for samples collected within the southern portion of the Head of the Thea Foss Waterway.

The rinseate blank sample was submitted for the following analyses:

- SVOCs (USEPA Method 8270);
- Metals (i.e., lead, zinc, and mercury) (USEPA Method 6010B and 7471A);
- DDT Compounds (USEPA Method 8081); and
- Polychlorinated Biphenyls (USEPA Method 8082).

Copies of the chain-of-custody records are included in the laboratory analytical reports provided in Attachment C.

ANALYTICAL RESULTS

The detected concentrations of most chemicals were substantially below the SQOs in samples collected from the compliance interval during Year 3 (2007) within the Head of the Thea Foss Waterway (Table 1). Only DEHP was detected at a concentration greater than the SQO at more than one sample station. Figure 2 presents the DEHP concentrations detected in samples collected from the compliance interval within the Head of the Thea Foss Waterway. The only other parameters that were detected at concentrations greater than the SQOs were four PAHs and total HPAHs that were detected at one station, WC-02.

No chemicals were detected at concentrations greater than the SQOs in samples collected from the seven locations within the additional cap material placement area (i.e., WC-10 through WC-12, S-15, S-17, S-19, and S-24). The detected concentrations of DEHP in samples from the additional cap placement area were at or below one half of the SQO. The detected concentrations of all other chemicals were at or below one tenth of the SQOs in samples collected from the additional cap material placement area.

DEHP was detected at concentrations greater than the SQO in the 11 samples collected from locations within the southern portion of the Head of the Thea Foss Waterway (i.e., WC-01 through WC-09, WC-13, and WC-14) (Table 1 and Figure 2). The highest DEHP concentration detected in Year 3 (2007) (i.e., 4,900 ug/kg) was detected at station WC-02. The highest DEHP concentration in Year 2 (2006) (i.e., 7,700 ug/kg) was also detected at station WC-02)

Four PAHs including phenanthrene, benzo(a)pyrene, benzofluoranthene, and fluoranthene, and total HPAHs were detected at concentrations greater than the SQOs in the sample collected from location WC-02 (Table 1). Three other HPAHs including benzo(a)anthracene, dibenz(a,h)anthracene, and pyrene, were also detected at concentrations that were at the SQO in the sample collected from WC-02. Fluoranthene was detected in the sample collected from station WC-05 at a concentration greater than the SQO in Year 2 (2006). However, the detected concentration of fluoranthene and other PAHs were less than the SQOs in the sample collected from station WC-05 in Year 3 (2007). The detected concentrations of all other PAHs and chemicals at locations within the southern portion of the Head of the Thea Foss Waterway were generally at or below one half of the SQOs.

Phenol was detected at one station, WC-01, at a concentration greater than the SQO (i.e., 650 ug/kg) in Year 2 OMMP sampling. As a result, phenols were included in the analyses for samples collected from the southern portion of the Head of the Thea Foss Waterway in Year 3. Phenol was not detected at a concentration greater than the SQO in samples collected in Year 3 and phenol was not detected in the sample collected from station WC-01. The maximum phenol concentration (i.e., 140 ug/kg at WC-02) detected in Year 3 samples was approximately one third of the SQO.

Figures 3 through 5 show the change in concentrations at each sample location within the Head of the Thea Foss Waterway for DEHP, low molecular weight PAHs (LPAHs) and high molecular weight PAHs (HPAHs), respectively. Figure 3 shows that there has been a decrease in the DEHP concentration at 11 of 18 sample stations from Year 2 (2006) to Year 3 (2007). Additionally, Figure 3 shows that DEHP concentrations are less than the SQO in the area where additional cap material has been placed (i.e., WC-10 through WC-12, S-15, S-17, S-19, and S-24) and greater than the SQO in the southern portion of the Head of the Thea Foss Waterway (i.e., WC-01 through WC-09, WC-13, and WC-14).

Figures 4 and 5 show that LPAH and HPAH concentrations decreased in nine and eleven of 18 stations, respectively. Figures 4 and 5 show that the detected total LPAH and HPAH concentrations are less than the SQOs throughout the Head of the Thea Foss Waterway except at station WC-02 where total HPAH concentrations are greater than the SQO.

The overall average concentrations are generally lower from Year 2 to Year 3 in the Head of the Thea Foss Waterway. Table 2 presents a comparison of the average detected chemical concentrations in Year 3 (2007) to Year 2 (2006) as well as the percent change in the averages from Year 2 to Year 3. As Table 2 shows, the average detected concentrations for all but four HPAHs decreased between Year 2 and Year 3. The percent decrease in the average detected concentrations between Year 2 and Year 3 ranges from one percent to approximately 100 percent. The percent increase in the average detected concentrations for the four HPAHs ranges from seven percent to 25 percent. The average detected concentrations of the HPAHs with identified increases were approximately one third of the SQOs.

The average detected DEHP concentration in the Head of the Thea Foss Waterway has decreased by approximately 22 percent from 2006 to 2007. The average detected DEHP concentration in Year 3 (i.e., 1,922 ug/kg) is 1.5 times the SQO.

Additionally, the maximum detected DEHP concentration also decreased from Year 2 (i.e., 7,700 ug/kg) to Year 3 (i.e., 4,900 ug/kg).

The average detected phenol concentration in Year 3 samples collected from the Head of the Thea Foss Waterway was approximately one tenth of the SQO.

Data Quality Review

A Level III / Tier II data quality review was performed on the data resulting from laboratory analysis. The analytical data was validated in accordance with the following:

- EPA CLP National Functional Guidelines for Inorganic Data Review (2004); and
- EPA CLP National Functional Guidelines for Organic Data Review (1999).

No qualifiers were added to the analytical results based on the data quality review. The data was determined to be of acceptable quality for use as qualified. Memorandums presenting the results of the data quality review are included in Attachment C.

Conclusions and Recommended Next Steps

The results from Year 3 monitoring performed in the Head of the Thea Foss Waterway are summarized as follows:

- DEHP and other chemical concentrations did not exceed the SQOs within the additional cap material placement area;
- DEHP concentrations are at or less than one half of the SQO within the additional cap material placement area;
- DEHP was detected at concentrations exceeding the SQO at 11 stations within the southern portion of the Head of the Thea Foss Waterway;
- DEHP concentrations decreased at 11 of 18 sampling locations from Year 2 to Year 3;
- The average detected DEHP concentration decreased approximately 20 percent within the Head of the Thea Foss Waterway between 2006 and 2007 and the maximum detected DEHP concentration decreased from Year 2 (i.e., 7,700 ug/kg) to Year 3 (i.e., 4,900 ug/kg);
- The average detected DEHP concentration in Year 3 (i.e., 1,922 ug/kg) is 1.5 times the SQO;
- The detected concentration of four PAHs and Total HPAHs, exceeded the SQOs at sample location WC-02;
- The detected concentrations of all other chemicals, including PAHs and phenol, at locations within the Head of the Thea Foss Waterway were generally at or below one half of the SQOs.

Based on the results, it is recommended that the next step be to perform Year 4 monitoring within the Head of the Thea Foss Waterway as specified in the OMMP for the Head of the Thea Foss Waterway Remediation Project. Sampling to be performed in Year 4 (2008) within the Head of the Thea Foss Waterway will include collection of samples from the compliance interval from all 18 stations sampled in Year 3 (2007) and Year 2 (2006) monitoring activities. The results of Year 4 sampling will provide data to further characterize and evaluate chemical concentration trends in the Head of the Thea Foss Waterway including the additional cap material placement area and the southern portion of the Head of the Thea Foss Waterway.

The Phthalate Workgroup, which is comprised of representatives from EPA, the Washington State Department of Ecology, the cities of Tacoma and Seattle, King County, as well as public stakeholders, is continuing to identify and evaluate recommendations and actions to address the recontamination of sediment by DEHP at cleanup sites within the Puget Sound. The Workgroup is developing recommendations to address phthalate reaccumulation at cleanup sites. The need for follow-up actions, if any, in the Head of the Thea Foss Waterway will be reconsidered in conjunction with the recommendations from this workgroup.

REFERENCES

City of Tacoma. 2006. *Head of Thea Foss Waterway Operations, Maintenance, and Monitoring Plan Response to Year 2 Chemical and Biological Test Results.* November 28, 2006.

PERCo. 2006. *Response to the U.S. Army Corps of Engineers' (USACE) April 13, 2006 Comments on the Remediation Project Sampling Plans For the Head of the Thea Foss Waterway*. April 28, 2006.

Tetra Tech FW, Inc. 2003*. Operations, Maintenance, and Monitoring Plan, Head of the Thea Foss Waterway Remediation Project, Tacoma, Washington*. Prepared for PacifiCorp Environmental Remediation Company and Puget Sound Energy. July 2003.

Tables

Table 1 - Head of the Thea Foss Waterway Year 3 (2007) Surface Sample (0-10cm) Results

Table 2 – Detected Analyte Averages for Year 2 (2006) and Year 3 (2007) Surface Sample (0-10cm) Results

Figures

Figure 1 – Year 3 (2007) OMMP Sample Locations

Figure 2 – Year 3 (2007) OMMP Bis(2-ethylhexyl)phthalate (DEHP) Concentrations (0-10cm)

Figure 3 – Bis(2-ethylhexyl)phthalate (DEHP) Concentrations Year 2 (2006) and Year 3 (2007)

Figure 4 – Low Molecular Weight Polycyclic Aromatic Hydrocarbon (LPAH) Concentrations Year 2 (2006) and Year 3 (2007)

Figure 5 – High Molecular Weight Polycyclic Aromatic Hydrocarbon (HPAH) Concentrations Year 2 (2006) and Year 3 (2007)

Attachments

Attachment A – Surface (0-10cm) Sediment Sample Collection Forms

Attachment B – Surface (0-10cm) Sediment Sample Photographs

Attachment C – Analytical Laboratory Data Reports and Data Quality Reviews (on CD)

Table 1
Head of the Thea Foss Waterway Year 3 (2007) Surface Sample (0-10cm) Results

	Area		Southern Portion of the Head of the Thea Foss Waterway										
	Station		WC-01	WC-02	WC-03	WC-04	WC-05	WC-06	WC-07	WC-08	WC-09	WC-13	WC-14
	Sample ID		WC-01-070516-G	WC-02-070516-G	WC-03-070516-G	WC-04-070517-G	WC-05-070516-G	WC-06-070517-G	WC-07-070516-G	WC-08-070516-G	WC-09-070516-G	WC-13-070516-G	WC-14-070516-G
	Sample Date		5/16/2007	5/16/2007	5/16/2007	5/17/2006	5/16/2007	5/17/2006	5/16/2007	5/16/2007	5/16/2007	5/16/2007	5/16/2007
	Sample Depth		0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Parameter	**Silt Thickness (cm)**		**2**	**13[c]**	**13**	**13**	**14**	**12**	**12[c]**	**7**	**9**	**8**	**13[c]**
Conventionals	**Units**	**SQO**											
Total Organic Carbon	mg/kg	NA	45,500	68,600	25,400	33,000	50,300	65,800	46,500	27,100	43,000	33,300	28,400
Total Solids	%	NA	60.8	35.6	60.4	56.1	52.4	56.9	58	55.6	55	55.4	57.1
Gravel	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Very Coarse Sand	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coarse Sand	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Medium Sand	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fine Sand	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Very Fine Sand	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coarse Silt	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Medium Silt	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fine Silt	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Very Fine Silt	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8-9 Phi Clay	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9-10 Phi Clay	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
> 10 Phi Clay	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Fines	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals													
Lead	mg/kg	450	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	mg/kg	410	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	mg/kg	0.59	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs													
2-Methylnaphthalene	µg/kg	670	77 U	160 U	69 U	34 J	55 J	85 U	47 J	60	45	88 J	44
Acenaphthene	µg/kg	500	77 U	94 J	69 U	47 J	74 J	44 J	74 J	94	73 J	140	63 J
Acenaphthylene	µg/kg	1,300	77 U	160 U	69 U	66 U	92 U	85 U	84 U	31	36	69 J	30 J
Anthracene	µg/kg	960	120	320	76	99	180	110	170	160	150	240	120
Fluorene	µg/kg	540	47 J	120 J	69 U	34 J	51 J	85 U	50 J	57 J	47 J	82	52 J
Naphthalene	µg/kg	2,100	64 J	93 J	50 J	91	130	84 J	120	160	130	220	110
Phenanthrene	µg/kg	1,500	680	2,100	340	440	740	520	700	530	450	710	400
Total LPAH	µg/kg	5,200	911	2,727	466	745	1,230	758	1,161	1,092	931	1,549	819
Benzo(a)anthracene	µg/kg	1,600	540	1,600	330	420	720	470	660	440	380	590	380
Benzo(a)pyrene	µg/kg	1,600	580	1,700	410	510	850	590	760	600	500	840	490
Benzofluoranthenes (total)	µg/kg	3,600	1,560	4,900	1,140	1,420	2,300	1,720	2,100	1,560	1,350	2100	1,390
Benzo(g,h,i)perylene	µg/kg	720	210	570	150	200	600	220	490	280	160	340	230
Chrysene	µg/kg	2,800	750	2,200	480	600	1,000	720	940	630	560	960	520
Dibenzo(a,h)anthracene	µg/kg	230	53 J	230	39 J	40 J	110 J	85 U	90 J	86	48	69 J	45
Fluoranthene	µg/kg	2,500	1,500	4,800	900	940	1,900	1,400	1,800	1,100	1,100	1,400	980
Indeno(1,2,3-cd)pyrene	µg/kg	690	220	600	160	190	530	210	460	260	230	320	220
Pyrene	µg/kg	3,300	1,100	3,300	770	1,000	1,600	1,200	1,400	1,000	950	1,400	910
Total HPAH	µg/kg	17,000	6,513	19,900	4,379	5,320	9,610	6,530	8,700	5,956	5,278	8,019	5,165
Dimethyl phthalate	µg/kg	160	77 U	160 U	69 U	66 U	92 U	85 U	84 U	27 U	16 J	34 U	32 U
Diethylphthalate	µg/kg	200	77 U	160 U	69 U	66 U	92 U	85 U	84 U	27 U	26 U	34 U	32 U
Di-n-butyl phthalate	µg/kg	1,400	77 U	160 U	50 J	66 U	66 J	85 U	72 J	41	78	42	27 J
Butyl benzyl phthalate	µg/kg	900	180	350	94	200	210	160	240	150	120	150	120
bis(2-ethylhexyl)phthalate	µg/kg	1,300	2,300	4,900	1,800	2,300	4,000	2,800	3,600	2,000	2,200	2,700	2,100
Di-n-octyl phthalate	µg/kg	6,200	72 J	260	67 J	53 J	130	93	130	54 J	74 J	74 J	61
Phenol	µg/kg	420	77 U	140 J	69 U	66 U	92 U	85 U	84 U	46	23 J	33 J	32 J
2-Methylphenol	µg/kg	63	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- & 4-Methylphenol	µg/kg	670	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	µg/kg	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	µg/kg	360	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Head of the Thea Foss Waterway Year 3 (2007) Surface Sample (0-10cm) Results

	Area		Southern Portion of the Head of the Thea Foss Waterway										
	Station		WC-01	WC-02	WC-03	WC-04	WC-05	WC-06	WC-07	WC-08	WC-09	WC-13	WC-14
	Sample ID		WC-01-070516-G	WC-02-070516-G	WC-03-070516-G	WC-04-070517-G	WC-05-070516-G	WC-06-070517-G	WC-07-070516-G	WC-08-070516-G	WC-09-070516-G	WC-13-070516-G	WC-14-070516-G
	Sample Date		5/16/2007	5/16/2007	5/16/2007	5/17/2006	5/16/2007	5/17/2006	5/16/2007	5/16/2007	5/16/2007	5/16/2007	5/16/2007
	Sample Depth		0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Parameter	**Silt Thickness (cm)**		**2**	**13[2]**	**13**	**13**	**14**	**12**	**12[2]**	**7**	**9**	**8**	**13[2]**
Conventionals	**Units**	**SQO**											
Benzyl alcohol	µg/kg	73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic acid	µg/kg	650	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	µg/kg	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	µg/kg	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	µg/kg	110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	µg/kg	51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	µg/kg	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	µg/kg	540	77 U	160 U	69 U	66 U	92 U	85 U	84 U	24 J	24 J	34 J	21 J
Hexachlorobutadiene	µg/kg	11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	µg/kg	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides													
4,4'-DDE	µg/kg	9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	µg/kg	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	µg/kg	34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs													
Aroclor 1016	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (total)	µg/kg	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Concentrations highlighted in red exceed the SQO.

NA Not Available

1 Sample duplicate S-15-070516-G-D is a duplicate of sample S-15-070516-G.

2 Grab sampler did not penetrate through the silt and into cap material at this station. Therefore, the identified silt thickness is the depth of sample recovery.

U Undetected

J The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quanity.

Table 1
Head of the Thea Foss Waterway Year 3 (2007) Surface Sample (0-10cm) Results

	Area		Addiitonal Cap Material Placement Area							
	Station		WC-10	WC-11	W-12	S-15	S-15	S-17	S-19	S-24
	Sample ID		WC-10-070516-G	WC-11-070516-G	WC-12-070517-G	S-15-070516-G	S-15-070516-G-D[1]	S-17-070516-G	S-19-070516-G	S-24-070516-G
	Sample Date		5/16/2007	5/16/2007	5/17/2007	5/16/2007	5/16/2007	5/16/2007	5/16/2007	5/16/2007
	Sample Depth		0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Parameter	**Silt Thickness (cm)**		**1**	**3**	**2**	**3**	**3**	**2**	**4**	**1**
Conventionals	**Units**	**SQO**								
Total Organic Carbon	mg/kg	NA	8,610	7,640	12,400	15,700	9,770	16,200	8,480	24,000
Total Solids	%	NA	86.6	87.1	77.1	86	85.8	81.6	88.4	85.3
Gravel	%	NA	61.1	60.3	58.9	57	53.6	48.2	61.2	65.9
Very Coarse Sand	%	NA	11.9	13.7	11.8	13	11.5	13.5	14.7	9.2
Coarse Sand	%	NA	9.6	10.7	10.5	10.5	10.8	12.6	10.8	6.9
Medium Sand	%	NA	8.8	7.8	8.1	10.5	12.7	11.2	6.3	6.4
Fine Sand	%	NA	3.6	1.9	2.7	3.1	4.5	4.8	1.8	3.3
Very Fine Sand	%	NA	1	0.5	1	0.6	0.9	1.4	0.6	1.4
Coarse Silt	%	NA	0.5	0.5	0.6	0.8	0.5	1.1	0.3	1
Medium Silt	%	NA	0.7	0.8	1.4	0.9	1.1	1.4	0.9	1.5
Fine Silt	%	NA	0.7	1	1.5	0.9	1.1	1.4	0.8	1.3
Very Fine Silt	%	NA	0.5	0.8	1.1	0.9	1.1	1.3	0.7	1
8-9 Phi Clay	%	NA	0.4	0.6	0.7	0.6	0.7	0.9	0.5	0.6
9-10 Phi Clay	%	NA	0.2	0.4	0.5	0.4	0.6	0.8	0.4	0.5
> 10 Phi Clay	%	NA	0.8	0.9	1.2	1	1.1	1.5	0.8	1
Total Fines	%	NA	3.9	5.1	7.1	5.3	6.1	8.3	4.5	6.9
Metals										
Lead	mg/kg	450	10	12	18	10	12	15	11	23
Zinc	mg/kg	410	49	53	62	55	52	58	5	69
Mercury	mg/kg	0.59	0.04 U	0.05 U	0.05 U	0.04 U	0.05 U	0.06 U	0.04 U	0.05
SVOCs										
2-Methylnaphthalene	µg/kg	670	20 U	20 U	12 J	20 U	20 U	20 U	20 U	20 U
Acenaphthene	µg/kg	500	20 U	20 U	30	20 U	20 U	11 J	15 J	11 J
Acenaphthylene	µg/kg	1,300	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Anthracene	µg/kg	960	18 J	14 J	43	20	20 J	26	23	30
Fluorene	µg/kg	540	20 U	20 U	16 J	20 U	20 U	20 U	12 J	11 J
Naphthalene	µg/kg	2,100	12 J	11 J	26	15 J	13 J	22	19 J	22
Phenanthrene	µg/kg	1,500	94	67	190	87	91	100	82	150
Total LPAH	µg/kg	5,200	124	92	317	122	124	159	151	224
Benzo(a)anthracene	µg/kg	1,600	82	70	130	73	81	95	64	140
Benzo(a)pyrene	µg/kg	1,600	98	82	160	94	100	120	81	160
Benzofluoranthenes (total)	µg/kg	3,600	260	228	400	250	290	320	192	460
Benzo(g,h,i)perylene	µg/kg	720	80	64	90	57	59	60	38	73
Chrysene	µg/kg	2,800	130	110	200	120	140	150	88	210
Dibenzo(a,h)anthracene	µg/kg	230	24	12 J	18 J	14 J	13 J	16 J	20 U	18 J
Fluoranthene	µg/kg	2,500	210	170	320	200	230	220	130	350
Indeno(1,2,3-cd)pyrene	µg/kg	690	72	54	88	55	56	59	39	72
Pyrene	µg/kg	3,300	180	160	280	160	180	210	150	300
Total HPAH	µg/kg	17,000	1,136	950	1,686	1,023	1,149	1,250	782	1,783
Dimethyl phthalate	µg/kg	160	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Diethylphthalate	µg/kg	200	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Di-n-butyl phthalate	µg/kg	1,400	20 U	20 U	13 J	20 U	20 U	20 U	20	14 J
Butyl benzyl phthalate	µg/kg	900	24	29	33	25	26	32	18 J	54
bis(2-ethylhexyl)phthalate	µg/kg	1,300	410	640	640	500	590	620	300	790
Di-n-octyl phthalate	µg/kg	6,200	12 J	30	21	24	28	26	12 J	29
Phenol	µg/kg	420	20 U	22	20 U	14 J	18 J	22	20 U	22
2-Methylphenol	µg/kg	63	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
3- & 4-Methylphenol	µg/kg	670	20 U	14 J	20 U	20 U	20 U	20 U	20 U	20 U
2,4-Dimethylphenol	µg/kg	29	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Pentachlorophenol	µg/kg	360	99 U	99 U	99 U	98 U	98 U	100 U	100 U	100 U

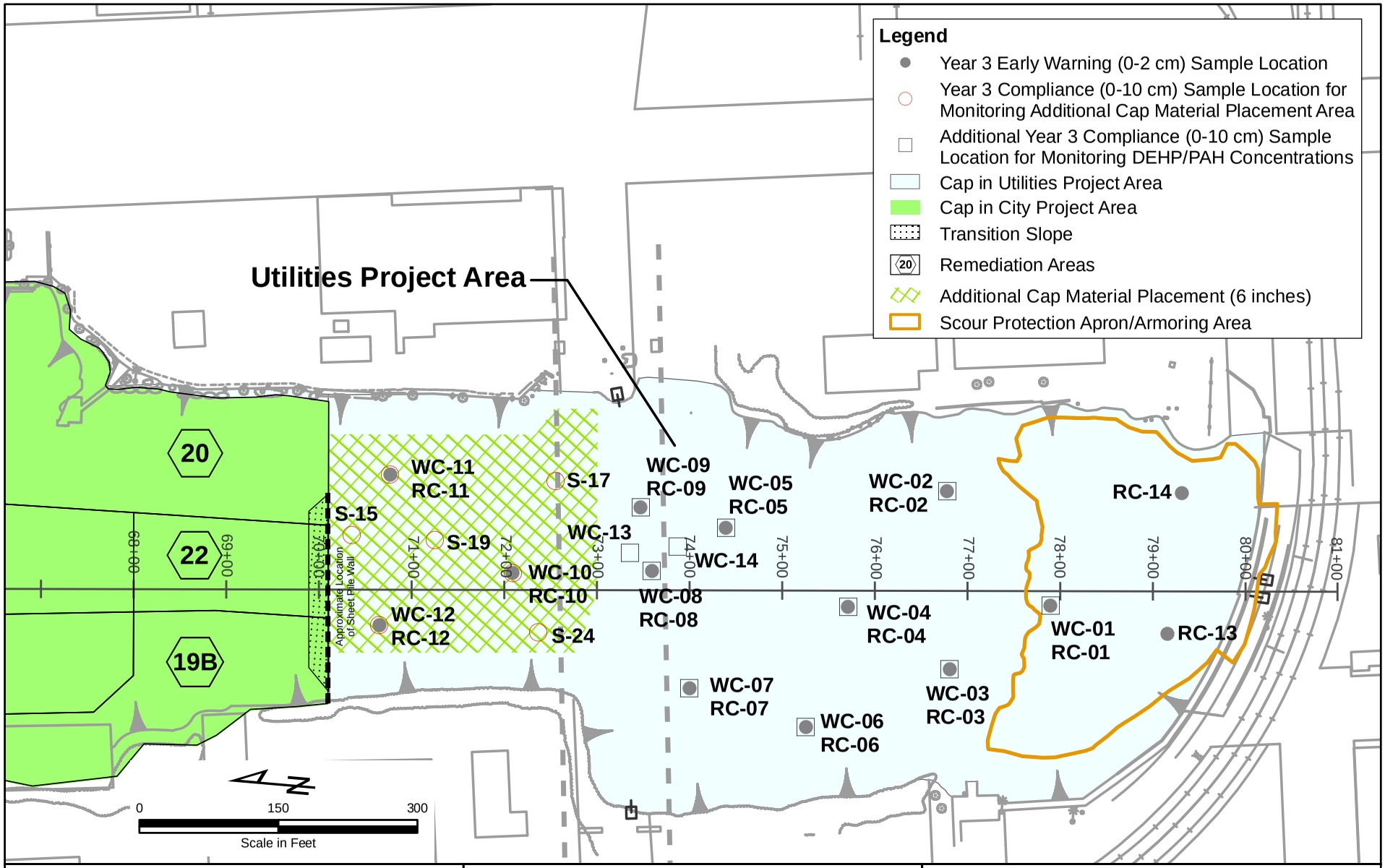
Table 1
Head of the Thea Foss Waterway Year 3 (2007) Surface Sample (0-10cm) Results

	Area		Addiitonal Cap Material Placement Area							
	Station		WC-10	WC-11	W-12	S-15	S-15	S-17	S-19	S-24
	Sample ID		WC-10-070516-G	WC-11-070516-G	WC-12-070517-G	S-15-070516-G	S-15-070516-G-D[1]	S-17-070516-G	S-19-070516-G	S-24-070516-G
	Sample Date		5/16/2007	5/16/2007	5/17/2007	5/16/2007	5/16/2007	5/16/2007	5/16/2007	5/16/2007
	Sample Depth		0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Parameter	Silt Thickness (cm)		1	3	2	3	3	2	4	1
Conventionals	**Units**	**SQO**								
Benzyl alcohol	µg/kg	73	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Benzoic acid	µg/kg	650	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
1,2-Dichlorobenzene	µg/kg	50	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,3-Dichlorobenzene	µg/kg	170	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,4-Dichlorobenzene	µg/kg	110	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,2,4-Trichlorobenzene	µg/kg	51	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Hexachlorobenzene	µg/kg	22	0.98 U	1.1	0.98 U	0.94 U	0.95 U	0.98 U	0.97 U	0.95 U
Dibenzofuran	µg/kg	540	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Hexachlorobutadiene	µg/kg	11	0.98 U	0.97 U	0.98 U	0.94 U	0.95 U	0.98 U	0.97 U	0.95 U
N-Nitrosodiphenylamine	µg/kg	28	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Pesticides										
4,4'-DDE	µg/kg	9	2 U	1.9 U	2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
4,4'-DDD	µg/kg	16	2 U	1.9 U	2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
4,4'-DDT	µg/kg	34	2 U	1.9 U	2 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
PCBs										
Aroclor 1016	µg/kg	NA	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	9.8 U
Aroclor 1242	µg/kg	NA	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	9.8 U
Aroclor 1248	µg/kg	NA	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	9.8 U
Aroclor 1254	µg/kg	NA	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	9.8 U
Aroclor 1260	µg/kg	NA	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	18
Aroclor 1221	µg/kg	NA	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	9.8 U
Aroclor 1232	µg/kg	NA	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	9.8 U
PCBs (total)	µg/kg	300	9.9 U	9.7 U	9.9 U	9.7 U	9.8 U	10 U	9.8 U	18

Table 2
Detected Analyte Averages for Year 2 (2006) and Year 3 (2007) Surface Sample (0-10cm) Results

Parameter	Units	SQO	Head of the Thea Foss Waterway			
			2006 Average	2007 Average	Change in Average (%)	Enrichment Ratio for 2007 Average
Metals						
Lead	mg/kg	450	39	14	(64)	0.03
Zinc	mg/kg	410	104	44	(58)	0.11
Mercury	mg/kg	0.59	0.16	0.05	(69)	0.08
SVOCs						
2-Methylnaphthalene	µg/kg	670	100	47	(53)	0.07
Acenaphthene	µg/kg	500	125	59	(52)	0.12
Acenaphthylene	µg/kg	1300	62	32	(48)	0.02
Anthracene	µg/kg	960	172	107	(38)	0.11
Fluorene	µg/kg	540	115	48	(58)	0.09
Naphthalene	µg/kg	2,100	152	77	(49)	0.04
Phenanthrene	µg/kg	1,500	532	466	(13)	0.31
Total LPAH	µg/kg	5,200	923	754	(18)	0.15
Benzo(a)anthracene	µg/kg	1,600	422	399	(6)	0.25
Benzo(a)pyrene	µg/kg	1,600	494	479	(3)	0.30
Benzofluoranthenes (total)	µg/kg	3,600	1,151	1,314	14	0.36
Benzo(g,h,i)perylene	µg/kg	720	204	217	7	0.30
Chrysene	µg/kg	2,800	656	576	(12)	0.21
Dibenzo(a,h)anthracene	µg/kg	230	48	57	18	0.25
Fluoranthene	µg/kg	2,500	1,202	1,079	(10)	0.43
Indeno(1,2,3-cd)pyrene	µg/kg	690	171	213	25	0.31
Pyrene	µg/kg	3,300	1,041	893	(14)	0.27
Total HPAH	µg/kg	17,000	5,300	5,221	(1)	0.31
Dimethyl phthalate	µg/kg	160	ND	16	NA	NA
Diethylphthalate	µg/kg	200	ND	ND	NA	NA
Di-n-butyl phthalate	µg/kg	1,400	152	42	(72)	0.03
Butyl benzyl phthalate	µg/kg	900	134	122	(9)	0.14
bis(2-ethylhexyl)phthalate	µg/kg	1,300	2,480	1,922	(22)	1.48
Di-n-octyl phthalate	µg/kg	6,200	116	68	(41)	0.01
Phenol	µg/kg	420	650	39	(94)	0.09
2-Methylphenol	µg/kg	63	ND	ND	NA	NA
3- & 4-Methylphenol	µg/kg	670	650	14	(98)	0.02
2,4-Dimethylphenol	µg/kg	29	ND	ND	NA	NA
Pentachlorophenol	µg/kg	360	ND	ND	NA	NA
Benzyl alcohol	µg/kg	73	ND	ND	NA	NA
Benzoic acid	µg/kg	650	ND	ND	NA	NA
1,2-Dichlorobenzene	µg/kg	50	ND	ND	NA	NA
1,3-Dichlorobenzene	µg/kg	170	ND	ND	NA	NA
1,4-Dichlorobenzene	µg/kg	110	ND	ND	NA	NA
1,2,4-Trichlorobenzene	µg/kg	51	ND	ND	NA	NA
Hexachlorobenzene	µg/kg	22	4	ND	NA	NA
Dibenzofuran	µg/kg	540	64	26	(60)	0.05
Hexachlorobutadiene	µg/kg	11	ND	ND	NA	NA
N-Nitrosodiphenylamine	µg/kg	28	ND	ND	NA	NA
Pesticides						
4,4'-DDE	µg/kg	9	ND	ND	NA	NA
4,4'-DDD	µg/kg	16	ND	ND	NA	NA
4,4'-DDT	µg/kg	34	ND	ND	NA	NA
PCBs						
Aroclor 1016	µg/kg	NA	ND	ND	NA	NA
Aroclor 1242	µg/kg	NA	ND	ND	NA	NA
Aroclor 1248	µg/kg	NA	27	ND	NA	NA
Aroclor 1254	µg/kg	NA	38	ND	NA	NA
Aroclor 1260	µg/kg	NA	37	18	(51)	NA
Aroclor 1221	µg/kg	NA	ND	ND	NA	NA
Aroclor 1232	µg/kg	NA	ND	ND	NA	NA
PCBs (total)	µg/kg	300	90	18	(80)	0.06

Notes:
NA Not applicable
ND Not detected



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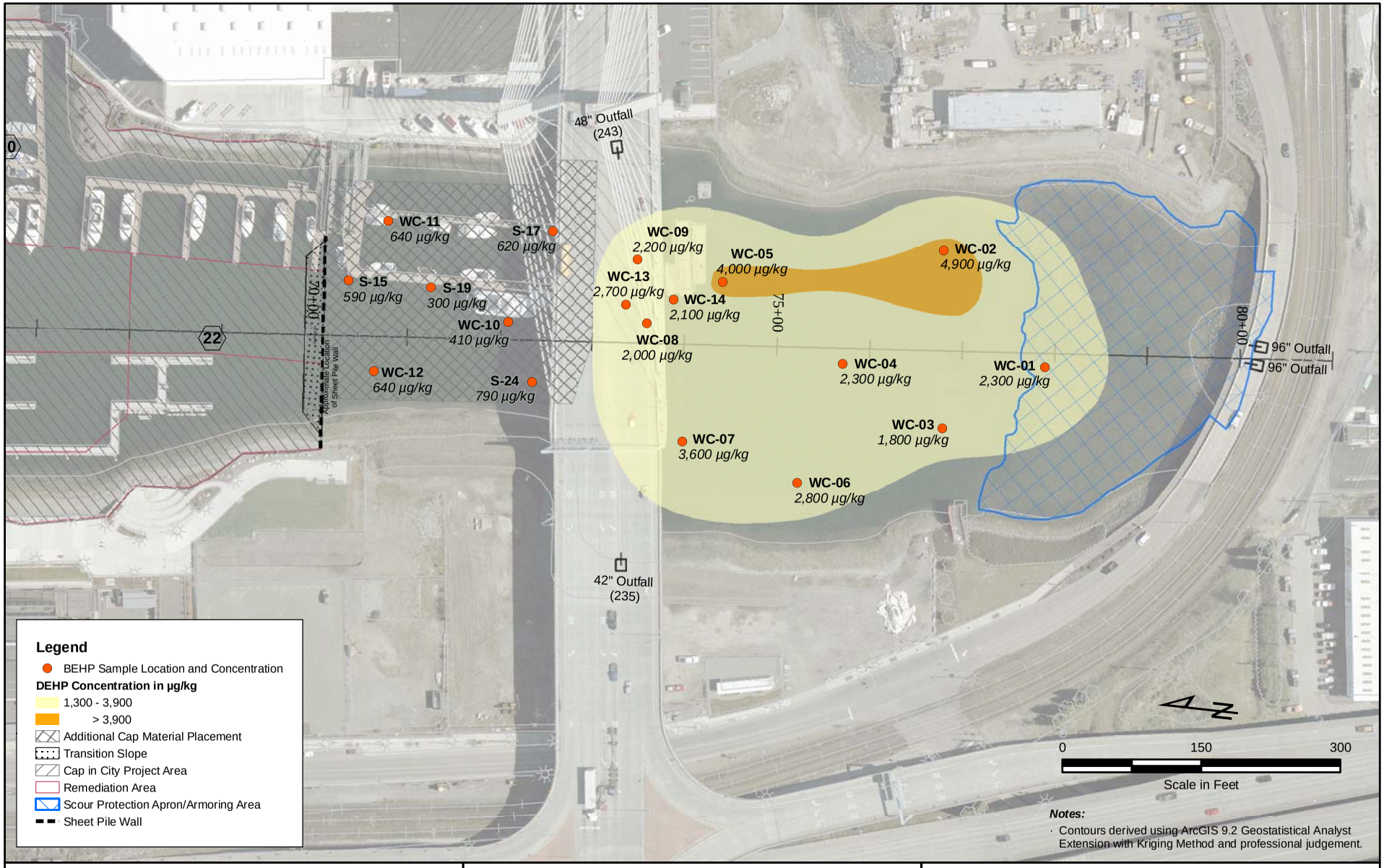
Head of The Thea Foss Waterway
Year 3 (May 2007) OMMP Sampling
Tacoma, Washington

Figure 1
Year 3 (2007) OMMP Sample Locations

File: F:\projects\KPFF Foss\GIS\Revised OMMP\Utilities OMMP Head Sampling\MXD\July 2007 Memo Figures\Figure 1 (Year 3 OMMP Sample Locations).mxd
Date: 8/7/2007



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Head of Thea Foss Waterway
Year 3 (May 2007) OMMP Sampling
Tacoma, Washington

Figure 2
Year 3 (2007) Bis(2-ethylhexyl)phthalate (DEHP) Concentrations (0 - 10cm)

File: F:\projects\KPFF Foss\GIS\Revised OMMP\Utilities OMMP Head Sampling\MXD\July 2007 Memo Figures\Figure 2 (Year 3 DEHP Conc (0-10cm) Contours).mxd
Date: 8/7/2007

Figure 3
Head of the Thea Foss Waterway
Bis(2-ethylhexyl)phthalate (DEHP) Concentrations Year 2 (2006) and Year 3 (2007)

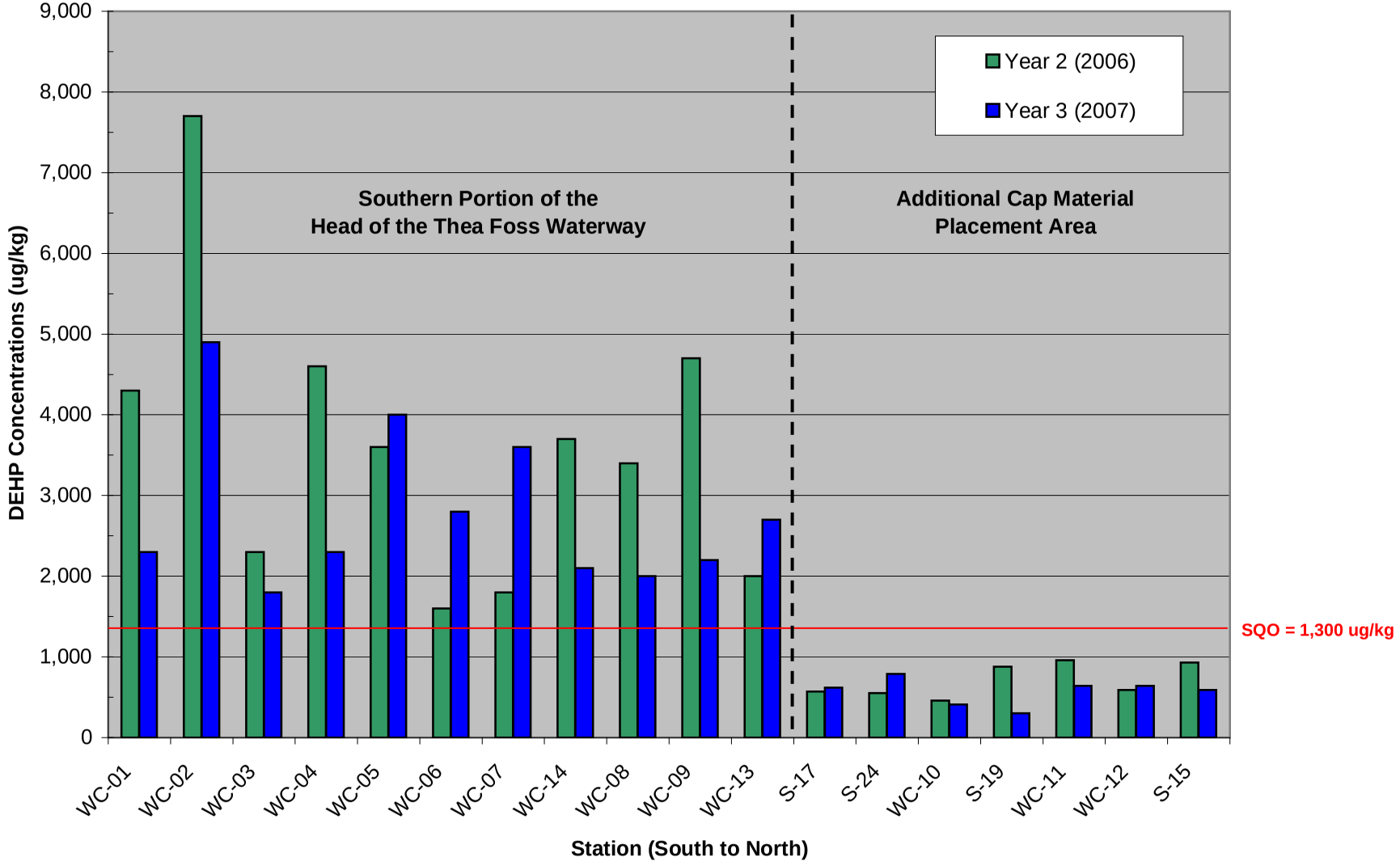


Figure 4
Head of Thea Foss Waterway
Low Molecular Weight Polycyclic Aromatic Hydrocarbon (LPAH) Concentrations
Year 2 (2006) and Year 3 (2007)

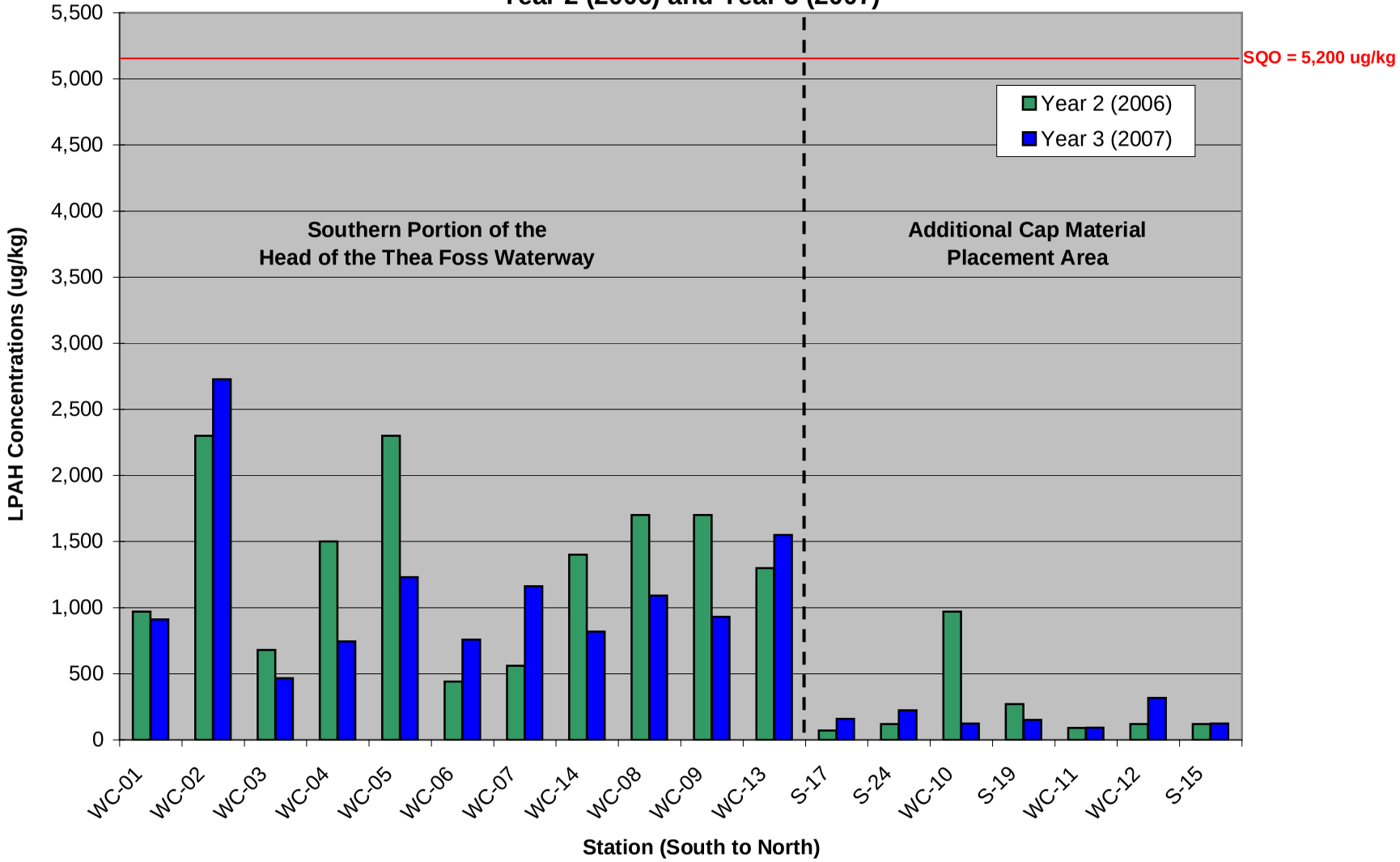
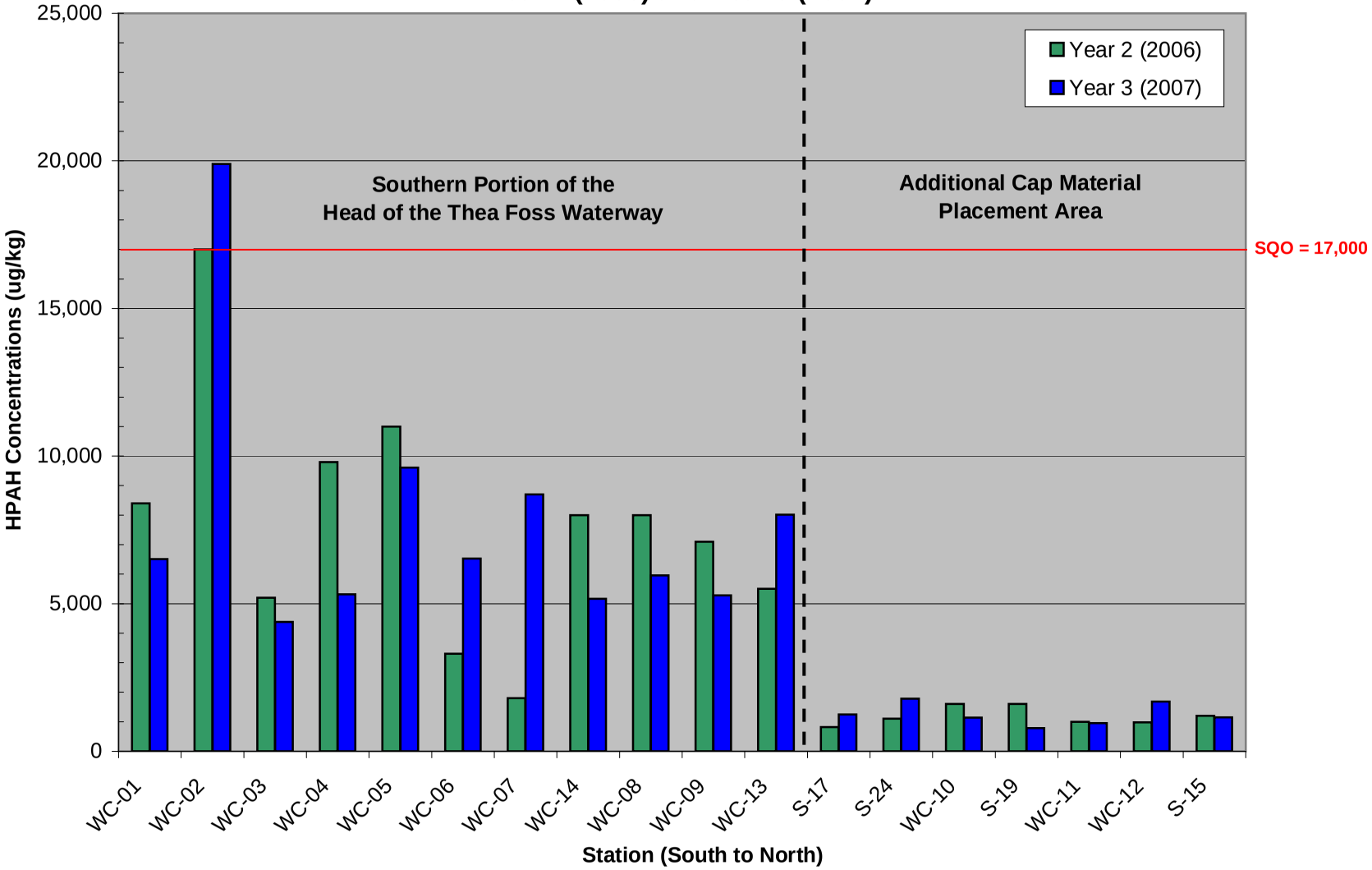


Figure 5
Head of Thea Foss Waterway
High Molecular Weight Polycyclic Aromatic Hydrocarbon (HPAH) Concentrations
Year 2 (2006) and Year 3 (2007)



Attachment A

Surface (0-10cm) Sediment Sample Collection Forms

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather:

Field Personnel: JSM, JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-01-~~051~~ 070516-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: _____ (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1107	702002.6	1160586.1						Y	collected by hand

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): _____

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
Surface plant & wast (cig butts, plastic) debris, Approx. ~2cm surface organic debris (tree needles) & silt. Thin dark brown layer (2cm) silt over black silty sand w/ gravel

Sample containers filled (number and type): No noted odor or sheen. worm present in sample
→ 2 annelida/polychaete worms
* see below
Slight H_2S, reduced odor

Laboratory analysis:
(1)-4oz TOC/TS
(1)-~~16~~ 8oz SVOCs (PAHs, Phthalates, Phenol)

Comments etc:
Walked out @ low tide ~ -3 ft, difficult to penetrate 10cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: Partly sunny ~50°F

Field Personnel: JSM & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-02-070516-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 19.5ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1807	702133.7	1160722.6	✓	✓	✓	✓	✓	Y	Penetration: 10cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Bath

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
10 cm black soft silt w/ abundant tree leaves/sticks, some garbage
No odor or sheen.

Sample containers filled (number and type):
(1) - 4oz TOC/TS
(1) - 8oz SVOCs (PAHs, Phenol, Phthalates)

Laboratory analysis:
See above

Comments etc:
Silt thickness: 10cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07
Weather: Partly cloudy 50°F
Field Personnel: JSU & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-03-070516-6

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 19.24 (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1832	702106.5	1160505.2	✓	✓	✓	✓	✓	Y	Penetration: 15cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Bath

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
Dk gray silt w/ shell fragments and 1mm RDP, over last 2cm of sandy silt w/ fine grained sand. No odor, or sheen.

Sample containers filled (number and type):
(1)- 4oz TOC/TS
(1)- 8oz SVOCs (PAHs, Phenol, Phthalates)

Laboratory analysis:
See above

Comments etc:
Silt thickness: 13cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/17/07

Weather: overcast 45°F

Field Personnel: JSU & JH

Sample Type:

- [x] 1. Surface Sample (0-10 cm)
- [ ] 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-04-070517-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 13.9 ft (A)

Predicted Tide Elevation _____ (B)

Mudline Elevation _____ (B-A)

Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	849	702205.6	1160560.3	✓	✓	✓	✓	✓	Y	Penetration: 17cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Bam

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
13 cm dk gry soft silt w/ 1mm RPD (brown) on surface, over sandy silt w/ fine grained sand. Multiple worms. H_2S odor upon disturbance. No shell debris
Bottom sand - cap material? homogenizing.
Shell preserved.

Sample containers filled (number and type):
(1) - 4oz TOC/TS
(1) - 8oz SVOCs (PAHs, Phenol, Phthalates)

Laboratory analysis:
See above

Comments etc:
Silt thickness: 13cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: Sunny ~58°F

Field Personnel: JSH & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-05-070514-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 139 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1423	702363.5	1160645.35	✓	✓	✓	✓	✓	Y	Penetration: 16cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
Approx 14cm dark gray silt (RPD ~1mm), worm tubes and plant debris, once disturbed - slight H_2S odor, mussel shell (rock)

Sample containers filled (number and type):
(1) - 4oz TOC/TS
(1) - 8oz SVOCs (PAHs, Phthalates, Phenol)

Laboratory analysis:
see above

Comments etc:
Silt thickness: 14CM

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/17/07

Weather: Overcast ~ 45°F

Field Personnel: JSU & JH

Sample Type:

- [x] 1. Surface Sample (0-10 cm)
- [ ] 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-06-0705~~16~~17-6

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 13.8 ft (A)

Predicted Tide Elevation _____ (B)

Mudline Elevation _____ (B-A)

Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	825	702238.7	1160432.5	✓	✓	✓	✓	✓	Y	Penetration: 13cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Bath

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
12 cm of dark gray silt soft (1 mm RPD), over 1 cm of sandy silt w/ fine grained sands. Several ~~[illegible]~~ worms present. Slight H_2S odor upon disturbance. No sheen.
→ crab in second 0-2cm grab.

Sample containers filled (number and type):
(1) - 4oz TOC/TS
(1) - 8oz SVOCS (PAHs, Phenol, P)

Laboratory analysis:
See above

Comments etc:
Silt thickness: 12cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: Sunny 60°F

Field Personnel: JSH ? JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-07-070516-6

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 15.0 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1510	707376.9	1160462.8	✓	✓	✓	✓	✓	Y	Penetration: 11cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): BOTH

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
~10cm of dark gray silt w/ one crab, worms, H_2S odor upon disturbance (RPD ~1mm) plastic debris (1 piece w 3 invertebrates), 1 cockle.

Sample containers filled (number and type):
(1) 4oz TOC/TS
(1) 8oz SVOCs (PAHs, Phthalates, Phenol)

Laboratory analysis:
See above

Comments etc:
Silt thickness: ~~[illegible]~~ 11cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: ~~Partly~~ sunny ~ ~~55~~ 60°F

Field Personnel: JSM & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-08-070516-6

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 18.2ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1600	*7034345	1160568.0	✓	✓	✓	✓	✓	Y	Penetration = 1 ft

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
7cm dark gray silt, over medium to fine poorly graded sand gray sand w/ worms
slight H_2S odor when homogenized

Sample containers filled (number and type):
(1) 4oz - TOC/TS
(1) 8oz - SVOCs (PAHs, Phthalates, Phenol)

Laboratory analysis:
See above

Comments etc:
Silt thickness: 7cm
* proposed coordinates, survey station and prism used to locate sampling station under SR9 bridge due to interference w/ GPS.

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07
Weather: Partly sunny ~ 55°F
Field Personnel: JSU & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-09-070516-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 20.5 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1734	702452.3	1160653.5	✓	✓	✓	✓	✓	Y	Penetration: 13cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
9cm of dark gray soft silt over 4 cm dark gray fine sand, well graded several polychaete worms. No odor or sheen.

Sample containers filled (number and type):
(1) - 4 oz - TOC/TS
(1) - 8 oz SVOCs (PAHs, Phthalates, Phenol)

Laboratory analysis:
see above

Comments etc:
Silt thickness: 9 cm
*Proposed station coordinates, stn location determined by survey prism from snag - bridge interference w/ GPS.

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: Sunny ~65°F

Field Personnel: JSH & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-13-070516-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plan South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 19.5 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1642	702459.5	1160603.4	✓	✓	✓	✓	✓	Y	Penetration: 13cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
dark gray/black silt (8 cm) over dk gray black gravelly sand, well graded. Worms - several present, wrapers - garbage on surface

Sample containers filled (number and type):
(1) - 4oz TOC/TS
(1) - 16oz SVOCs (PAHs, Phthalates, Phenol)

Laboratory analysis:
See above

Comments etc:
Silt thickness: 8cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07
Weather: Partly sunny ~65°F
Field Personnel: JSM & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-14-070516-6

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 20.7 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1712	702379.3	1160605.1	✓	✓	✓	✓	✓	Y	Penetration: 13cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
13cm of dark gry to black soft silt w/ 1mm RDP layer on top. Slight H_2S odor upon disturbance. Several worms, plant fibers & sticks.

Sample containers filled (number and type):
(1) - 4oz TOC/TS
(1) - 16oz SVOCs (PAHs, Phenol, Phthalates)

Laboratory analysis:
see above

Comments etc:
Silt thickness: 13cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: Partly Sunny ~55°F

Field Personnel: JSU & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-10-070516-a

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane S.

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 9.8 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1332	702580	1160568	✓	✓	✓	✓	✓	Y	Penetration = 10cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
- Approx. 1cm dark gray silt (soft) w/ ~1mm RPD, over coarse sand cap material. One worm tube, no odor or sheen, 1 worm/

Sample containers filled (number and type):
(1)- 4oz metals (1)-16oz GS
(1)- 4oz TOC/TS (1)-16oz SVOCs/PCB/Pest

Laboratory analysis:
see above

Comments etc:
Silt thickness: 1cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: overcast ~50°F

Field Personnel: JSM & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-11-070516-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 8.0 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1011	702712.6	1160665.6	✓	✓	✓	✓	✓	Y	Penetration = 15cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
~2.5-3cm dark gray silt over coarse sand cap material

Sample containers filled (number and type):
(1) 4oz metals (1) 16oz GS
(1) 4oz TOC/TS (1) 16 oz SVOCs/PCBs/Pest.

Laboratory analysis:
see above

Comments etc:
Silt thickness: 3cm - 2cm

* RC-11 grab for Utilities 0-2cm sample had 2cm silt, penetration 15cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/17/07

Weather: Overcast ~40°F

Field Personnel: JSU & JH

Sample Type:

- [x] 1. Surface Sample (0-10 cm)
- [ ] 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. WC-12-070517-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 14.5 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	800	702714.7	1160496.5	✓	✓	✓	✓	✓	Y	Penetration: 11cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Bola

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
~2cm dark gray silt on (1mm RPD), over coarse sand cap material
no odor or sheen.

Sample containers filled (number and type):
(1) - 4oz TOC/TS (1) - 16oz GS
(1) - 4oz Metals (1) - 16oz SVOCs/PCBs/Pesticides

Laboratory analysis:
See above

Comments etc:
Silt thickness: 1.5 - 2cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather:

Field Personnel: JSU & JH & LB

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. S-15-070516-6

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) HOZ. NAD 1983 WA South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 10.8 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1-	917	702759.3	1160587.6	✓	✓	✓	✓	✓	Y	Penetration 14cm - no recovery

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Bath alconox and DI water

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
- 3cm of dark gray silt overlying coarse sand cap material
shell fragment, no odor or sheen

Sample containers filled (number and type):
(1) - 4oz for TS/TOC (1) 16oz for GS
(1) - 4oz for Metals (1) 16oz for SVOCs/PCBs/Pesticides

Laboratory analysis:
- See above

Comments etc:
Silt thickness: 3cm
Total recovery/penetration: 14cm

* Sm on overside of docked boat, ~10ft from target location

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: overcast ~ 45°F - 50°

Field Personnel: JSM, JH, LB

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Duplicate

Sample ID/Design. S-15-070516-GD

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 10.8 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	9:26	702759.3	1160587.6	✓	✓	✓	✓	✓	Y	14" penetration

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
- 3 cm of dark gray soft silt overlying coarse sand cap material, shell fragment, no odor or sheen

Sample containers filled (number and type):
(1) - 4oz TOC/TS (1) - 16oz GS
(1) - 4oz Metals (1) - 16oz SVOCs/PCBs/Pesticides

Laboratory analysis:
See above

Comments etc:
Silt thickness: 3cm

*Stn. on overside of docked boat ~ 10 ft from target

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: Overcast - 50°F

Field Personnel: JSM & JH, RB

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. S-17-070516-G (S-17-070516-G-MS) MS/MSD QC sample

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 WA State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 6.9ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1217	702546.9	1160673.6	✓	✓	✓	✓	✓	Y	Penetration = 11cm
MS/MSD Same grab	1227	- "	"	✓	✓	✓	✓	-	"	" same

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): BQW

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
- Top vineer of silt-brown, over ~2cm of dark gray/black silt over coarse sand cap material (1mm RPD), no odor, debris, sheen

Sample containers filled (number and type):
(1) - 4oz metals (1) - 16oz GS
(1) - 4oz TOC/TS (1) - 16oz SVOCs/PCBs/Pesticides

* MS/MSD sample were collected (1) 4oz metals, (1) 16oz SVOCs PCB/PZH (1) 4oz TOC

Laboratory analysis:
See above

Comments etc:
Silt thickness: 1-2cm

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/16/07

Weather: overcast ~50°F

Field Personnel: JSM & JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. S-19-0705H-G

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plane South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 99 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	945	702659.5	1160587.0	N	✓	✓	✓	✓	Y	Penetration = 15cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other): Both

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
- 4 cm of dark gray silt (soft), over coarse sand cap material
live crab (dungeness) in grab, no odor or sheen

Sample containers filled (number and type):
(1) 4oz - TOC/TS (1) 16oz TS
(1) 4oz - metals (1) 16oz SVOCs/ PCBs/ Pesticides

Laboratory analysis:
See above

Comments etc:
Silt thickness: 4cm

* Stn on other side of Coaned Dock ~10ft from target

SURFACE SEDIMENT SAMPLE COLLECTION FORM

Date/Time Collected: 5/12/07

Weather: partly sunny ~55°F

Field Personnel: JSH : JH

Sample Type:

☑ 1. Surface Sample (0-10 cm)
☐ 2. Next Surface Sample (10- 20 cm)

Sample ID/Design. S-24-070516-6

Sample Method (Van Veen Surface Grab/Diver Core-Cookie Cutter, Other)

Datum (Horizontal/Vertical) NAD 83 Wa State Plan South

Sample Types 1, 2, 3, 4, 5:
*If sample type 4, were reference samples collected? ☐ Yes ☑ No

Leadline Water Dept: 3.6 ft (A)
Predicted Tide Elevation _____ (B)
Mudline Elevation _____ (B-A)
Actual Tide Elevation _____

Run # or Composite Pt	Time	Latitude (Northing)	Longitude (Easting	Sample Criteria (Surface Grab Only) 1	2	3	4	5	Accept Sample Y/N	Comments (Include depth of sample)
1	1247	702549.2	1160507.8	✓	✓	✓	✓	✓	Y	Penetration = 11 cm

Acceptance criteria: 1 Overlying water is present, 2 Water has low turbidity, 3 Sampler is not over filled, 4 Sample surface is flat, 5 Desired sample depth is reached

Decon Procedure (Alconox Wash, DI water rinse, other):_____

Sediment Sample Description

Sediment Sample Description (density, moisture, color, minor constituents, major constituents, other observations - *see field ref cards):
- ~1cm of dark gray silt (RPD 1mm) over coarse sand cap material
two worm tubes, 1 ghost shrimp in grab (small ~3.4cm), no odor or sheen

Sample containers filled (number and type):
(1) - 4oz TOC/TS (1) - 16oz SVOCs/PCBs/Pesticides
(1) - 4oz metals (1) - 16oz GS

Laboratory analysis:
See above

Comments etc:
Silt thickness: 1 - 1.5 cm

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: FLOYD|SNIDER & CITY OF TACOMA	Phone: (206) 292-2078
Client Contact: Jessi Massingale	
Client Project Name: Head of Thea Foss - CCT Sampling	
Client Project #:	Samplers: J. Massingale

Page: 1 of 3

Date: 5/17/07 Ice Present?

No. of Coolers: Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Total (PSEP) Solids	Total (PSEP) Organic Carbon	Grain Size	SVOCs (ave) 8270	DDT Compounds 8081	PCBs 8082	Metals-Wet (Zn, Hg, Pb)		Notes/Comments
WC-10-070516-G	5/16/07	1332	Sed.	4	✓	✓	✓	✓	✓	✓	✓		
WC-11-070516-G	5/16/07	1011	Sed	4	✓	✓	✓	✓	✓	✓	✓		
WC-12-070517-G	5/~~16~~17/07	800	Sed	4	✓	✓	✓	✓	✓	✓	✓		
S-15-070516-G	5/16/07	917	Sed	4	✓	✓	✓	✓	✓	✓	✓		
S-15-070516-G-D	5/16/07	926	Sed	4	✓	✓	✓	✓	✓	✓	✓		
S-17-070516-G	5/16/07	1217	Sed	4	✓	✓	✓	✓	✓	✓	✓		
S-17-070516-G-MS	5/16/07	1227	Sed	~~4~~ 3	✓	✓		✓	✓	✓	✓		
S-19-070516-G	5/16/07	945	Sed	4	✓	✓	✓	✓	✓	✓	✓		
S-24-070516-G	5/16/07	1247	Sed	4	✓	✓	✓	✓	✓	✓	✓		

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
* See DQO tables provided to Sue, Same procedures as Tetra Tech Foss samples.	(Signature) Jessi Massingale	(Signature)	(Signature)	(Signature) Rob Conglton
	Printed Name: JESSI MASSINGALE	Printed Name: MATT WOLTMAN	Printed Name: MATT WOLTMAN	Printed Name: Rob Conglton
	Company: F/S	Company: F/S	Company: F/S	Company: ARI
	Date & Time: 5/17/07 1321	Date & Time: 5/17/07 1325	Date & Time: 1455	Date & Time: 5/17/07 1455

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: FLOYD|SNIDER : City of Tacoma	Phone: (206) 292-2078
Client Contact: Jessi Massingale	
Client Project Name: Head of Thea Foss - City Sampling	
Client Project #:	Samplers: J. Massingale

Page: 2 of 3	
Date: 5/17/07	Ice Present?
No. of Coolers:	Cooler Temps:

Sample ID	Date	Time	Matrix	No. Containers	Total Solids	Total Organic Carbon	SVOCs - 8270 + LPAHs, Phenol, Pentachlorophenol							Notes/Comments
WC-01-070516-6	5/16/07	1107	Sed.	2	✓	✓	✓							
WC-02-070516-6	5/16/07	1802	Sed	2	✓	✓	✓							
WC-03-070516-6	5/16/07	1832	Sed	2	✓	✓	✓							
WC-04-070516-6	5/16/07	849	Sed	2	✓	✓	✓							
WC-05-070516-6	5/16/07	1423	Sed	2	✓	✓	✓							
WC-06-070516-6	5/16/07	825	Sed	2	✓	✓	✓							
WC-07-070516-6	5/16/07	1510	Sed	2	✓	✓	✓							
WC-08-070516-6	5/16/07	1600	Sed	2	✓	✓	✓							
WC-09-070516-6	5/16/07	1734	Sed	2	✓	✓	✓							
WC-13-070516-6	5/16/07	1642	Sed	2	✓	✓	✓							

Comments/Special Instructions	Relinquished by:	Received by:	Relinquished by:	Received by:
* See DQO tables provided to Sue. Same procedures as Tetra Tech. Foss samples	(Signature) Jessi Massingale	(Signature)	(Signature)	(Signature) Bob Engelman
	Printed Name: JESSI MASSINGALE	Printed Name: MATT WOLTMAN	Printed Name: MATT WOLTMAN	Printed Name: Bob Engelman
	Company: F/S	Company: F/S	Company: F/S	Company: ARI
	Date & Time: 5/17/07 1321	Date & Time: 5/17/07 1325	Date & Time: 1455	Date & Time: 5/17/07 1455

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Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: FLOYD|SNIDER City of Tacoma	Phone: (206) 292-2078
Client Contact: Jessi Massingale	
Client Project Name: Head of Thea Foss - City Sampling	
Client Project #:	Samplers: J Massingale

Page: 3 of 3

Date: 5/17/07 | Ice Present?

No. of Coolers: | Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Total Solids	Total Organic Carbon	SVOCs - 8270 Ionic PAHs + Phenol & Phenolates	Metals (6010) (Zn, Hg, Pb)	PCBs (8082)	DDT Compounds (8081)	SVOCs (8270) all		Notes/Comments
WC-14-070516-G	5/16/07	1712	Sed	2	✓	✓	✓						
WC-05-RB	5/16/07	1446	Water	7				✓	✓	✓	✓		

Analysis Requested

Comments/Special Instructions

* See DQO tables supplied to Sue, same procedures as Utilities/Tetra Tech. Foss Samples.

Relinquished by: (Signature) Jessi Massingale	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature) Bob Crogleton
Printed Name: JESSI MASSINGALE	Printed Name: MATT WOLTMAN	Printed Name: MATT WOLTMAN	Printed Name: Bob Crogleton
Company: F/S	Company: F/S	Company: F/S	Company: ARI
Date & Time: 5/17/07 1321	Date & Time: 5/17/07 1325	Date & Time: 1455	Date & Time: 5/17/07 1455

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

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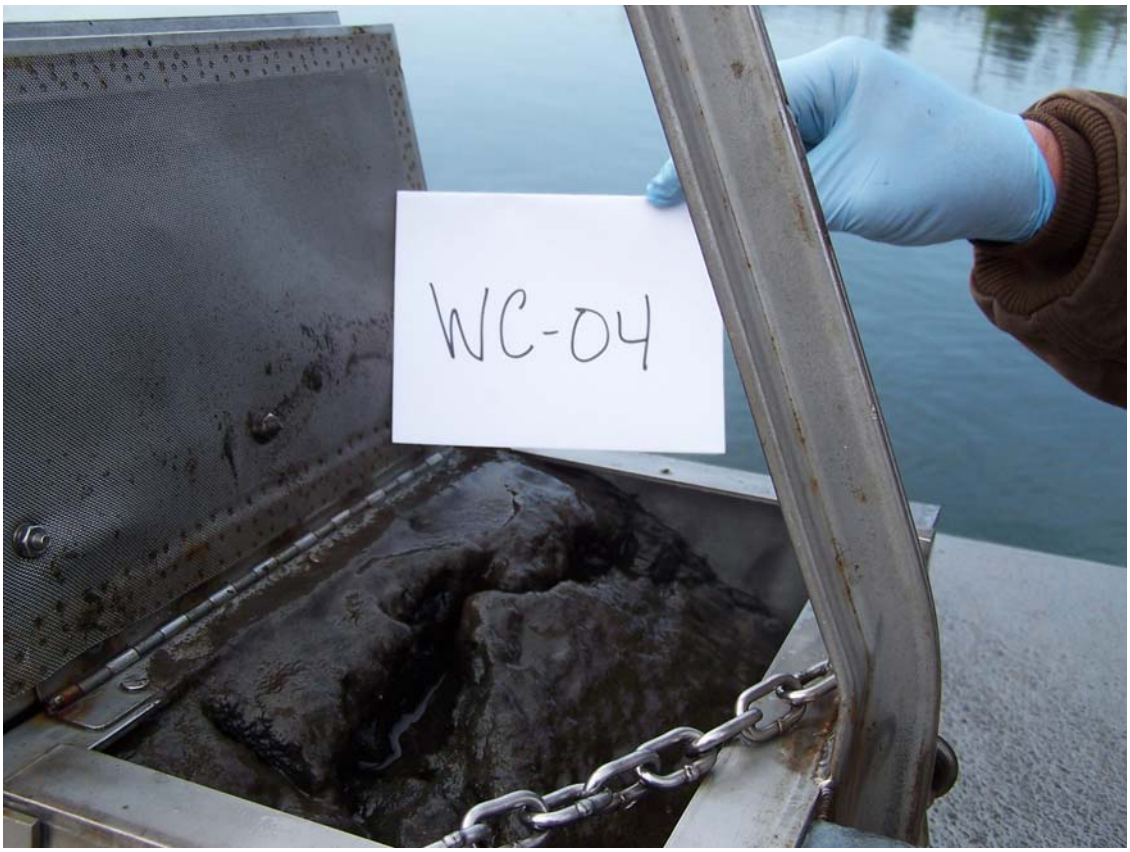
Attachment B

Surface (0-10cm) Sediment Sample Photographs

WC-01 5-16-2007 1106

WC-02 5-16-07 1717

WC-03 5-16-07 1734



WC-04 5-17-07 752

WC-05 5-16-07 1327

WC-06 5-17-07 739

WC-07 5-16-07 1512

WC-08 5-16-07 1503

WC-09 5-16-07 1636

WC-10 5-16-07 1301

WC-11 5-16-07 1013

WC-12 5-17-07 704

WC-13 5-16-07 1546

WC-14 5-16-07 1615

S-15 5-16-07 914

S-17 5-16-07 1217

S-19 5-16-07 946

S-24 5-16-07 1150

Attachment C

Analytical Laboratory Data Reports and Data Quality Reviews (on CD)