6.0 Post Construction Monitoring

6.1 SEDIMENT CHEMISTRY STATIONS ON CAP SURFACE IN CLEANUP AREAS A AND B

The *Sediment Monitoring Sampling And Analysis Plan* is included in Appendix G and contains long-term monitoring requirements for changes in the surface sediment chemistry over a period of 10 years in cleanup Areas A and B. Figure 11 shows the five surface sediment monitoring stations in Area A (1A to 5A) and three stations in cleanup Area B (1B to 3B), which are intended to provide information about any recontamination on the cap surface over time. The first year baseline samples were collected in cleanup Areas A and B on June 1, 2004 (Year 0 sampling event). Complete chemical results are reported in Appendix D. Table 9 contains summarized results of detected SMS chemicals. All values are reported only in dry weight because this is the most useful value to show changes in chemical concentrations over time. The TOC values at most stations are too low to accurately TOC normalize the data.

Six of the surface grab stations are located in areas covered with habitat mix (stations 1A to 3A and 1B to 3B), which contains a large amount of gravel and makes it difficult to collect a representative sample with the standard grab sampler. At Station 3A, no sediment sample could be collected because only larger gravel was present. At three other stations (2A, 1B, and 2B) it was necessary to field sieve the samples through a 1-cm mesh stainless steel screen to remove large gravel. All sediment passing through the screen was retained as the sample (small gravel and finer). At each of the three stations this represented about 80 percent of the total volume collected by the grab sampler.

The dry weight baseline chemical concentrations for BEHP and PCBs are plotted in Figure 11 next to each of the stations on the cap surface, because these two chemicals were the most significant in determining sediment cleanup boundaries. Station 5A had the lowest concentrations for both chemicals and these values were less then the detection limits of 34 ppb for BEHP and 1.7 for PCB. Station 5A is located in the offshore downstream corner of Area A where there is capping sand without any habitat mix. There was no blank contamination, so all BEHP values are usable as reported. The highest baseline BEHP values occur in Area A at stations 1A and 2A, which have values of 442 and 324 ppb, respectively. These two stations are located closest to the Diagonal Way CSO/SD outfall pipe, which is where the highest BEHP concentrations occurred prior to remediation. The concentration at 4A was 120 ppb, which falls within the range of values in Area B. The lowest value on Area B is 89 ppb at station 3B. Both stations 1B and 2B have similar higher values of 158 and 168 ppb.

For PCBs, the highest baseline concentrations occur in Area B with station 1B at 120 ppb and station 2B at 82 ppb. At both of these stations, the samples were sieved to remove large gravel that was about 20 percent of the volume. The highest PCB value in Area A was 46.7 ppb at station 2A; this sample was also sieved to remove large gravel. The

lowest PCB value in Area B was 30.8 ppb at station 3B; this value is fairly similar to the value at station 1A (46.7 ppb), which is located closest to station 3B. The two lowest detected PCB values were at stations 1A and 4A with values of 18.5 and 20 ppb, respectively.

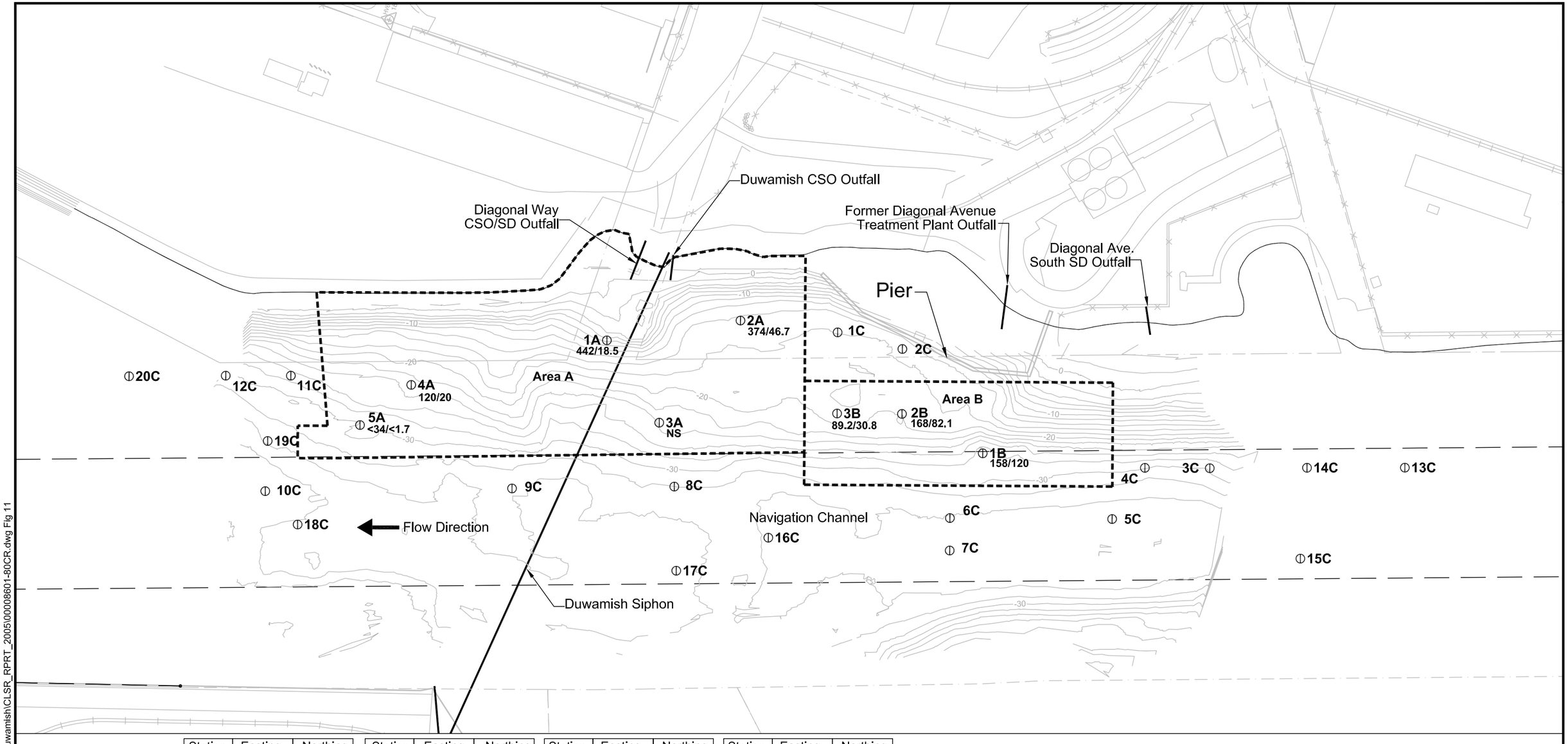
Baseline samples for the cap were collected June 1, 2004, which was about 2 months after the Duwamish/Diagonal project was completed. There is no way to know whether the presence of higher baseline BEHP values in Area A and higher PCB values in Area B reflect the conditions immediately after the cap was placed or whether these values were influenced by potential input sources during the 2 months before the baseline samples were collected. The highest baseline BEHP values were at stations 1A and 2A located closest to the Diagonal CSO/SD outfall, which is suspected to be the primary input source for BEHP to the cap. The highest baseline PCB value occurred at station 1B (120 ppb), which is located approximately 100 feet inshore from where the highest post-construction PCB values were found beyond the site boundary (3,160 and 3,390 ppb in replicate samples at station 6C). Potential recontamination during the two months before collecting the baseline samples should be easier to determine when the results for the 1-year post-construction cap samples are available.[1]

[1] These one-year cap samples were collected April 27, 2005, and were submitted to the King County Environmental Lab for analysis. Results for the 1-year post-capping samples will be presented to regulatory agencies in a future data report.

Table 9
2004 Baseline Chemistry at Cap Stations

Station Locator	DUD_1A			DUD_2A			DUD_4A			DUD_5A			DUD_5A rep			DUD_1B			DUD_2B			DUD_3B		
Date Sampled	1-Jun-04			1-Jun-04			1-Jun-04			1-Jun-04			1-Jun-04			1-Jun-04			1-Jun-04			1-Jun-04		
Sample Number	L32085-1			L32085-2			L32085-4			L32085-5			L32085-6			L32085-7			L32085-8			L32085-9		
% Solids	83.7			81.2			79.1			78.9			78.7			85.5			83.4			93.5		
% TOC	0.34			0.57			0.11			<0.05			<0.05			0.21			0.29			0.17		
	Value	Qual	Qual #	Value	Qual	Qual #	Value	Qual	Qual #	Value	Qual	Qual #	Value	Qual	Qual #	Value	Qual	Qual #	Value	Qual	Qual #	Value	Qual	Qual #
BNA Organics																								
(ug/kg dry weight)																								
LPAHs																								
Phenanthrene	45.5	G		47.8	G		27	RDL,G	40.5		<MDL,G	20		<MDL,G	20	30	<RDL,G	37.4	35	<RDL,G	38.4		<MDL,G	17
HPAHs																								
Benzo(a)anthracene	36.8	G		52.3	G		27.2	G		12	<RDL,G	20.5		<MDL,G	10	42	G		49	G		20.1	G	
Benzo(a)pyrene	42.3	G		57.5	G		37.3	G			<MDL,G	15		<MDL,G	15	61.2	G		54.9	G		27.2	G	
Benzo(b)fluoranthene	53.3			64.8			36.9				<MDL	15	15	<RDL	15	61.5			66.5			28.3		
Benzo(k)fluoranthene	40	L		62.2	L		34.8	L			<MDL,L	15		<MDL,L	15	56.7	L		57.9	L		27.1	L	
Benzo(g,h,i)perylene		<MDL	38	44	<RDL	78.8		<MDL	40		<MDL	41		<MDL	41		<MDL	37		<MDL	38		<MDL	34
Chrysene	59.7			112			43.1				<MDL	20		<MDL	20	61.6			77.3			34.2	RDL	34.2
Fluoranthene	88.4			114			57	<RDL	80.9		<MDL	41		<MDL	41	75.1			92.2			36	<RDL	68.4
Pyrene	82.1	G		85	G		49.3				<MDL	20		<MDL,G	20	65.7	G		75.4	G		34.2	RDL	34.2
Total HPAH	415.9			591.8			285.6			12			15			423.8			473.2			207.1		
Other BNAs																								
Benzoic Acid	270	<RDL	319	270	<RDL	329		<MDL	67		<MDL	67		<MDL	67		<MDL	62	260	<RDL	320	210	<RDL	57
Bis(2-Ethylhexyl)Phthalate	442			374			140				<MDL	34		<MDL	34	158			168			89.2		
PCBs																								
Aroclor 1248	4.25			11.3			4.31				<MDL	1.6		<MDL	1.7	37.8			21.3			8		
Aroclor 1254	10.5			25.2			10.5				<MDL	1.6		<MDL	1.7	65.5			40.8			16.9		
Aroclor 1260	3.79			10.2			5.16				<MDL	1.6		<MDL	1.7	17			20			5.9		
Total PCBs	18.5			46.7			20				<MDL	1.6		<MDL	1.7	120.3			82.1			30.8		
Metals																								
(mg/kg dry weight)																								
Arsenic, Total, ICP		<MDL	3		<MDL	3		<MDL	3		<MDL	3.2		<MDL	3	3.5	<RDL	14.5	5.9	<RDL	14.5		<MDL	2.6
Cadmium, Total, ICP		<MDL	0.18	0.2	<RDL	0.9		<MDL	0.18		<MDL	0.19		<MDL	0.18	0.18	<RDL	0.87	0.25	<RDL	0.87		<MDL	0.15
Chromium, Total, ICP	16.6			18.7			18.7			22.8			21.9			19.4			21.3			18.1		
Copper, Total, ICP	54.7			68.2			57.4			41.8			39.1			68.7			70.5			122		
Lead, Total, ICP	5.9	<RDL	9	11.3			4.8	<RDL	9.1		<MDL	1.9	2	<RDL	9.2	14.4			27.7			4.2	<RDL	7.7
Mercury, Total, CVAA		<MDL	0.024	0.037	<RDL	0.254		<MDL	0.025		<MDL	0.025		<MDL	0.025	0.025	<RDL	0.235	0.032	<RDL	0.24	0.022	<RDL	0.218
Silver, Total, ICP	0.84	<RDL,L	1.19	0.76	<RDL,L	1.2	0.97	<RDL,L	1.21	0.84	<RDL,L	1.29	0.91	<RDL,L	1.22	1	<RDL,L	1.16	0.96	<RDL,L	1.16	0.65	<RDL,L	1.03
Zinc, Total, ICP	43.8			48.3			37.8			26.5			32.9			48.1			67.5			38.4		

<MDL - Undetected at the method detection limit
<RDL - Detected below reporting detection limit
B - Blank contamination
G - Low standard reference material recovery
L- High standard reference material recovery



Station	Easting	Northing
1A	1267047	209089
2A	1267139	208902
3A	1266951	208973
4A	1266888	209354
5A	1266805	209410
1B	1267060	208484
2B	1267079	208621
3B	1267049	208716

Station	Easting	Northing
1C	1267168	208754
2C	1267175	208651
3C	1267146	208144
4C	1267116	208239
5C	1267025	208263
6C	1266950	208501
7C	1266902	208486
8C	1266864	208920

Station	Easting	Northing
9C	1266784	209157
10C	1266663	209517
11C	1266844	209535
12C	1266813	209630
13C	1267240	207858
14C	1267193	208002
15C	1267057	207968
16C	1266834	208758

Station	Easting	Northing
17C	1266742	208877
18C	1266629	209454
19C	1266738	209538
20C	1266766	209772

Legend:

- Sample Location
- 442/18.5 Baseline Chemistry Values for Bis(2ethylhexyl)phthalate and PCBs in ppb DW
- NS No Sample Possible

0 75 150
Scale in Feet

EcoChem Team

Duwamish/Diagonal Sediment Remediation Project

Cap Monitoring Stations In Area A and B Plus Baseline Chemistry Values for Bis(2-ethylhexyl)phthalate and PCBs

Figure 11

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Jul 28, 2005 10:14am dholmer

6.2 EIGHT ADDITIONAL SEDIMENT CHEMISTRY STATIONS BEYOND THE CAP SITE BOUNDARY

The sediment monitoring plan includes a requirement to collect sediment chemistry data at eight additional stations beyond the site boundary, for a total of 20 stations (original 12 stations plus 8 new stations). A summary of the sediment monitoring program is contained in Table 10, which shows that 10 additional stations will be sampled plus the original 12 stations. Eight additional stations (DUD_15C to DUD_20C) are positioned within the river to provide more information about distribution of chemicals in this part of the river and fill data gaps. The specific locations for these eight stations were established within the river in consultation with Ecology and EPA through the use of a summary map that showed all the existing surface sediment chemistry stations in this part of the river and whether each station exceeded SMS for any chemical. To investigate river bank erosion as a potential source of recontamination to Area A, the two river bank stations (DUD_30C and DUD_31C) are positioned upstream of the Duwamish/Diagonal outfalls. The locations of all 22 stations beyond the site boundary are shown in Figure 11 (12 original stations plus 10 additional stations), although these stations are not part of the annual long-term monitoring program for the project. Sediment samples were collected at the eight new stations in the river in February 2005, and bank sampling stations were identified during a field survey; however, King County has not yet received permission from the Port of Seattle to collect the bank samples.

It is important to remember that 15 of the 22 stations beyond the boundary are included in the 5-year sediment monitoring program for the 4-acre thin layer placement project (stations DUD_1C to DUD_15C), and the chemical results for those stations will be contained in future reports.

Table 10
Sumary of Surface Monitoring Stations and Schedule

Chemistry Stations	Station Position	Sampling Years													
		2003 Before	2004 After	2005 Once	2004 Baseline	2005 Annual	2006 Annual	2007 Annual	2008 Annual	2009 Annual	2010	2011	2012	2013	2014 Last
DUD_1A	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_2A	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_3A	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_4A	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_5A	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_1B	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_2B	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_3B	On Cap				CH	CH	CH	CH	CH	CH	?	?	?	?	CH
DUD_1C	Off Cap	CH	CH												
DUD_2C	Off Cap	CH	CH												
DUD_3C	Off Cap	CH	CH												
DUD_4C	Off Cap	CH	CH												
DUD_5C	Off Cap	CH	CH												
DUD_6C	Off Cap	CH	CH												
DUD_7C	Off Cap	CH	CH												
DUD_8C	Off Cap	CH	CH												
DUD_9C	Off Cap	CH	CH												
DUD_10C	Off Cap	CH	CH												
DUD_11C	Off Cap	CH	CH												
DUD_12C	Off Cap	CH	CH												
DUD_13C	Off Cap			CH											
DUD_14C	Off Cap			CH											
DUD_15C	Off Cap			CH											
DUD_16C	Off Cap			CH											
DUD_17C	Off Cap			CH											
DUD_18C	Off Cap			CH											
DUD_19C	Off Cap			CH											
DUD_20C	Off Cap			CH											
DUD_30C	Bank			CH											
DUD_31C	Bank			CH											

CH = chemistry sample

? = either annual sampling or less then annual sampling if the rate of changes in chemical concentrations on the cap are slow

2003 Before = 12 stations collected October 20 and 21, 2003

2004 After = 12 stations collected March 19 and 20, 2004

2005 Once = 8 off cap stations collected February 1 and 2, 2005

2004 Baseline = 8 cap stations collected June 1, 2004

2005 Annual = 8 cap stations collected April 27, 2005

2005 Once = bank stations identified and requested to sample