

**Duwamish/Diagonal Sediment Remediation Project
4-Acre Residuals Interim Action Closure Report**

**Prepared for:
King County Department of Natural Resources and Parks
Elliott Bay/Duwamish Restoration Program**

**Prepared by:
Anchor Environmental, L.L.C.**

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1 INTRODUCTION

1.1 Background

Between November 2003 and March 2004, the Elliott Bay/Duwamish Restoration Program (EBDRP) implemented the Duwamish/Diagonal Sediment Remediation Project in the vicinity of the King County (the County) Duwamish Combined Sewer Overflow (CSO) outfall and the City of Seattle (the City) Diagonal Way CSO/Storm Drain (SD) outfall on the Duwamish River (Figure 1). The Closure Report (EBDRP 2005) describes dredging, transport, disposal, and capping methods employed for the 2003/2004 project, the objective of which was to remediate contaminated sediment within a 7-acre area immediately adjacent to the Duwamish/Diagonal CSO/SD (denoted in EBDRP 2005 as Areas A and B). The 2003/2004 project included removal of 3 to 5 feet of contaminated sediments from Areas A and B to allow for placement of an effective capping layer, isolating remaining chemicals from the environment and returning the site to approximately the bottom elevations that existed prior to dredging.

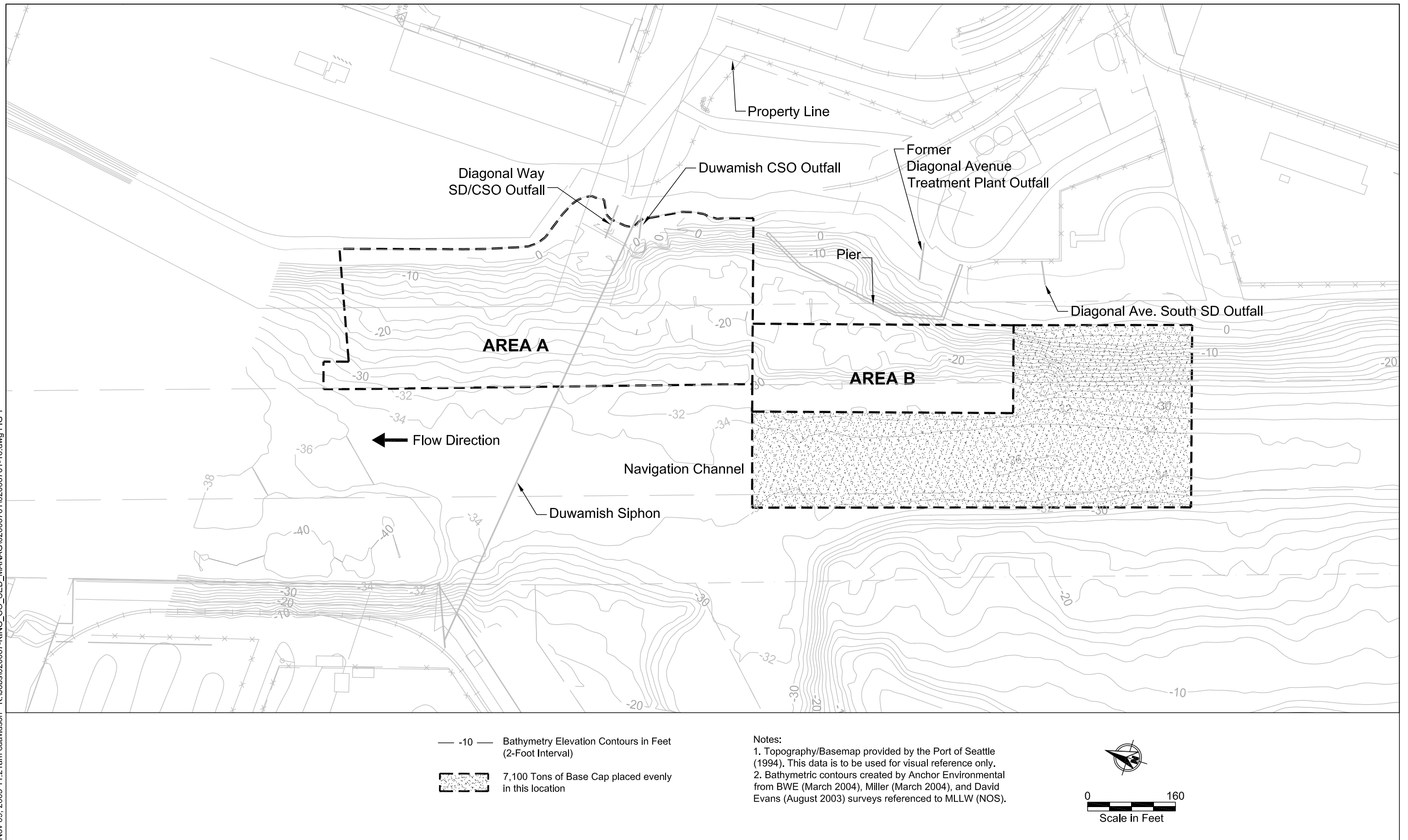
Sediment dredging residuals are defined as contaminated sediments that either remain after dredging or have been spread to adjacent areas as a result of dredging. Some form of dredging residuals could be expected to occur at most sediment cleanup sites; however, the magnitude of release varies widely between projects based on a range of site-specific and operational factors (Desrosiers et al. 2005; USEPA 2005). Both the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) required the County to monitor for movement of dredging residuals beyond the site boundary by measuring the pre-construction and post-construction sediment chemistry at 12 stations outside the 2003/2004 dredging and capping project boundary (EBDRP 2005), as described in the agency-approved sediment monitoring plan found in the *Duwamish/Diagonal Interim Action Residual Remedy Proposal* (KCDNRP 2005; included in Appendix A).

Analysis of the sampling data revealed that 2003/2004 project dredging activities had increased surface sediment concentrations of polychlorinated biphenyls (PCBs) around the margin of Area B to a higher degree than dredging residuals adjacent to Area A (Figure 1). The occurrence of a greater amount of dredging residuals near Area B was consistent with the contractor's initial operations in this area that did not use required best management

practices (BMPs) to minimize spread of dredging residuals. As a result, the County examined six prospective remedial actions to reduce elevated PCB levels caused by the dredging residuals and, after consultation with Ecology and EPA, selected the thin layer placement remedy (also known as Enhanced Natural Recovery [ENR]) as the best way to quickly reduce the elevated PCB values within the 4-acre dredge residual area around Area B. Appendix B provides a summary of comments to the plan and responses. Appendix C includes the final plan, technical specifications, and permits required to implement the project.



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1.2 Objectives

The remedy for the Duwamish/Diagonal dredge residuals involved the placement of a thin layer of clean sand material to a minimum thickness of 6 inches (15.2 centimeter [cm]) over an identified 4-acre area (see Figure 1) of dredging residuals to reduce PCB values and accelerate the natural recovery timeframe in this area. To ensure the minimum thickness of 6 inches, the design called for placing 7,100 tons of sand, which would yield an average thickness of 9 inches, to help ensure that the entire 4-acre ENR area would receive at least 6 inches of cover material. These required thicknesses were increased from the initial design of minimum 4 inches (average 7 inch thickness) based on a request by Ecology. The thin layer ENR remedy has been similarly used for sediment residual management at other sediment cleanup sites in Puget Sound and nationally, such as in areas immediately adjacent to the Puget Sound Naval Shipyard confined aquatic disposal facility. The Duwamish/Diagonal site ENR action provided a layer of clean cover material to immediately cover sediments with elevated PCB concentrations. Over time, the natural process of bioturbation is expected to mix clean sediment into underlying sediment containing PCBs. Monitoring will continue to be performed to document the effectiveness of the thin-layer placement and bioturbation process and to compare it to natural recovery rates in the area surrounding Area A, which had significantly smaller increases in PCB concentrations following dredging.

2 CONSTRUCTION ACTIVITIES

2.1 Timeline

- In late summer 2004, the County hired Anchor Environmental, L.L.C. (Anchor) to investigate possible remedies to address the PCB residuals and presented data documenting the residuals to Ecology.
- On November 16, 2004, Ecology notified the County that additional work would be required to address the PCB residuals distributed during the original remediation work in cleanup Area B at the Duwamish/Diagonal site (see Appendix B), and that the work should be completed as soon as possible.
- On December 4, 2004, the County met with Miller Contracting to discuss a potential scope of work for a residuals cleanup remedy that involved placing a thin layer of sand over an area of approximately 4 acres.
- On December 8, 2004, the County met with the U.S. Army Corps of Engineers (Corps) to determine if placement of an average of 7 inches (original design) of sand in the navigation channel would be acceptable. There were no overriding objections from the Corps.
- On December 10, 2004, the County sent a memorandum to Ecology that outlined several proposed remedies for reducing the PCB residuals that were dispersed during the original cleanup action. The memorandum proposed placing a thin layer of sand over an area of about 4 acres bordering Area B, as previously discussed.
- In late December 2004, the County and Ecology agreed that the placement would be monitored by three methods: chemical testing, sediment profile imaging (SPI), and diver installed and monitored sediment stakes.
- On December 30, 2004, the County met with stakeholders to determine if placement of an average of 7 inches (original design) of sand in the navigation channel would be acceptable. The stakeholders that attended the meeting included the Corps' Regulatory Section, the Corps' Navigation Section, the Pilots' Association, marine transport contractors, and the Port of Seattle. The Muckleshoot Indian Tribe did not attend, but sent their concerns ahead of time. There were no overriding objections.
- In January 2005, a pre-construction meeting was held with the Corps and Ecology.
- Between January 31 and February 2, 2005, the County collected pre-ENR surface sediment samples at 14 stations (the original 12 pre- and post-construction stations



DUD_1C through DUD_12C, plus two additional stations, DUD_13C and DUD_14C).

- In early February 2005, Ecology provided comments to the County on the original construction specifications that required the contractor to place a minimum of 4 inches (10 cm) of ENR sand. Ecology requested that a minimum of 6 inches (15 cm) of ENR sand be placed at all locations, and monitored at all measuring stake locations.
- On February 8, 2005, the pre-construction SPI camera survey was performed.
- On February 10, 2005, the contractor was officially notified of the requirement to place a total of 7,100 tons of material at the site. This resulted in a change of material volume (from an average of 7 inches to an average of 9 inches).
- On February 11, 2005, the pre-construction meeting was held with Miller Contracting.
- On February 16, 2005, divers installed 11, ½-inch-diameter plastic water pipe sections into the sediment to serve as bottom stakes needed to measure thickness of the ENR.
- On February 18, 2005, the contractor was mobilized to the site.
- On February 19, 2005, the contractor began placing ENR sand. Divers monitored placement thickness as the contractor adjusted placement methods.
- On February 25, 2005, construction was complete after 5 days of sand placement.
- On February 26, 2005, divers confirmed placement thickness at all measuring stakes.
- On March 4, 2005, the post-construction SPI camera survey was performed.
- Between March 16 and 24, 2005, the County collected post-ENR surface sediment samples at seven stations within the 4-acre sand placement area.

2.2 ENR Placement Activities

The contractor subdivided the 4-acre site into a grid of 30-foot-wide by 50-foot-long cells, and calculated the amount of ENR sand required to obtain an average thickness of 9 inches throughout the site (Figure 2). This quantity of material amounted to three buckets in each cell.

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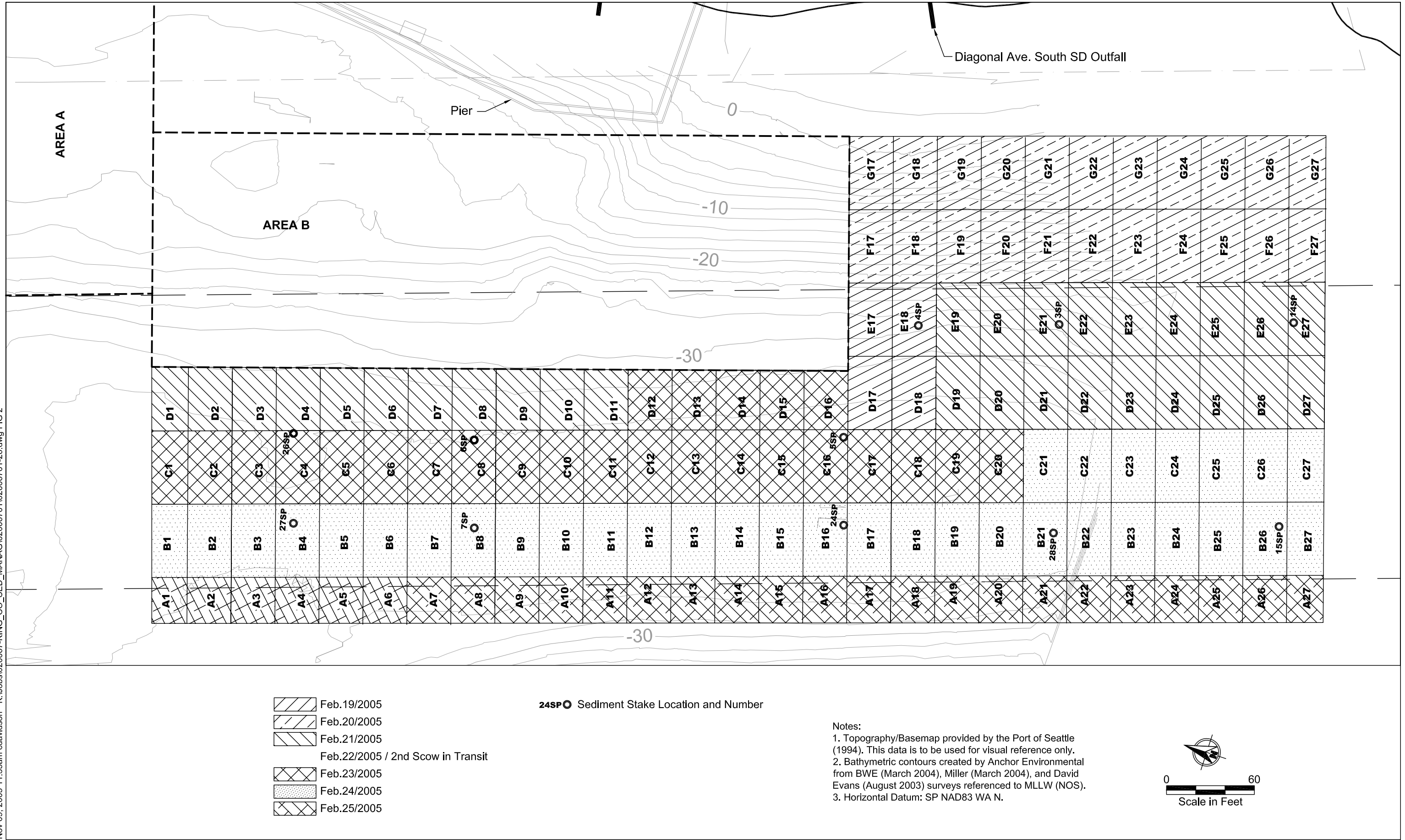


Figure 2
Contractor Placement Grid
Duwamish/Diagonal 4-Acre Residuals Interim Action
Seattle, Washington

The contractor began placing ENR material on Saturday, February 19, 2005. They used a 16 cubic yard (CY) skip box on an EX1800 hydraulic excavator to place the material. The skip box was opened slightly so that the load of sand would be placed while the skip box was swung over the 50-foot-long cell. The skip box was located just above the water surface during the swing. Appendix D includes photographs of the ENR sand placement activities. The contractor expected to place three skip boxes in each cell (approximately 42 CY) by cracking open the skip box and swinging it over the cell. Each skip box load would cover an area 10-feet-wide over a 50-foot radial distance.

An initial test plot cell was used to determine the effectiveness of the placement method and to adjust placement operations as necessary. Cell E18 (with sediment stake 4SP; see Figure 2) was selected because it was in a location near the northern edge of the ENR placement area and allowed the contractor to not have to position equipment within a previously covered cell. After placement of three buckets of material in the cell, divers from Anchor entered the water to verify the depth of sand at the stake. They observed 2 inches of sand at stake 4SP and throughout the cell. The divers swam 30 feet north of stake 4SP, placed another temporary stake there (30N), and measured 3 inches of sand at that stake. After the divers returned to the surface, the contractor placed an additional four buckets in cell E18, but the contractor changed the placement method from a sweeping motion of the bucket to small, discrete openings at multiple locations along the 50-foot path of the bucket across the cell. The divers re-entered the water and observed the thickness at stake 4SP increased by one inch to a total of 3 inches of sand. The divers placed five additional temporary stakes at the distances and in the directions from 4SP listed in Table 1, and found the thickness of sand ranged from 0.2 to 0.5 feet (2 to 6 inches).

Table 1
Test Placement Thicknesses Near Sediment Stake 4SP

Identification	Distance (feet)	Direction	Thickness (feet)	Comments
East	7	East	0.3	--
10N	10	North	0.5	--
30N	30	North	0.3	Gravel below cap material
25N	25	North	0.2	--
35N	35	North	0.2	Gravel below cap material

The initial test plot data was discussed separately on site with the contractor and Ecology. It was agreed that the data revealed that ENR material was successfully dispersed using the

placement methods employed, but was depositing across several cells. It was agreed that material would be placed in the cell located north of cell E18 (cell E17) and the two cells west of those two cells (cells D17 and D18) to examine total depositional depths after a block of cells were covered. The contractor placed three buckets in each of these cells and the divers then re-entered the water to evaluate cover thicknesses. Table 2 summarizes the results. Monitoring data confirmed successful dispersal of ENR sand and demonstrated that the design thickness could be achieved through accumulation of material placed in adjacent cells. It was agreed that once three buckets of ENR sand were placed in each cell, all cells should meet the target thickness of a minimum of 6 inches (0.5 feet).

Table 2
Test Placement Thicknesses After Four Cells Near Sediment Stake 4SP Were Covered

Identification	Distance (feet)	Direction	Thickness (feet)	Comments
4SP	0	N/A	0.33	--
East	7	East	0.3	--
Halfway to 10N	5	North	0.66	No stake placed here
10N	10	North	0.5	--
30N	30	North	0.4	Gravel below cap material
25N	25	North	0.4	--
35N	35	North	0.1	Gravel below cap material
15S	15	South	0.3	--
10S	10	South	0.2	No stake placed here
40W	40	West	0.3	--
50W	50	West	0.3	--
50W25N	25	North	0.1	Distance and direction relative to 50W
50W30N	30	North	0.1	Distance and direction relative to 50W

The contractor placed ENR sand on the adjacent armored slope area on February 20, 2005 (rows F and G, see Figure 2). On February 21, they began by placing material in the two cells directly south of the four that had been previously filled (cells D19 and E19) and in two additional cells south of cell 4SP (cells E20 and E21). This placement sequence was completed in all cells in the area adjacent to stake 4SP. Table 3 summarizes the diver observations after this round of sand placement.



Table 3
Test Placement Thickness Results on February 21, 2005

Identification	Distance (feet)	Direction	Thickness (feet)	Comments
4SP	0	N/A	0.6	--
East	7	East	0.8	--
10N	10	North	0.8	--
30N	30	North	0.3	Gravel below cap material
25N	25	North	0.4	--
35N	35	North	0.5	Gravel below cap material
15S	15	South	0.4	--
40W	40	West	0.6	--
50W	50	West	0.5	--
50W25N	25	North	0.2	Distance and direction relative to 50W. No material placed near this station.
50W30N	30	North	0.2	Distance and direction relative to 50W. No material placed near this station.
30S	30	South	0.9	Magnetic anomaly noted (compressor dumped on bottom)
60S	60	South	0.5	--

The stations that received ENR sand from placement both within that cell and in adjacent cells generally met the minimum cap thickness objectives of 6 inches (0.5 feet). Stations that had yet to receive ENR sand from placement in adjacent cells generally were less thick than the minimum objectives. These results were consistent with the previous conclusion that placement methods would meet target thicknesses at the completion of construction. These results were discussed with Ecology and County personnel and with the contractor. The contractor was directed to continue placing the ENR sand in a similar manner throughout the remainder of the site. The contractor continued placing sand on February 21. On February 22, the divers returned to the site to measure the thickness of the ENR sand at several of the monitoring sediment stakes, as a further test of the effectiveness of the placement method. Table 4 presents the sand thicknesses observed at those stakes.

Table 4
Test Placement Thickness Results on February 22, 2005

Identification	Thickness (feet)	Comments
3SP	0.7	--
14SP	0.3	This stake is located in the southernmost cell. Material thicknesses near the stake varied from 0.6 feet (40'E), 0.4 feet (40'SE), 0.4 feet (35'S), 0.5 feet (20'S), 0.4 feet (20'W), to 1.1 feet (20'N).
26SP	0.5	--
6SP	0.6	--



The contractor continued placing ENR sand at the same rate in the remainder of the site. They also placed some additional sand along the southern edge of the site to ensure adequate thicknesses in this area (i.e., near stake 14SP). The contractor completed placement on February 25, 2005. Divers from Anchor returned to the site on February 26 to verify the depths of sand at the remainder of the stakes. The complete results are summarized in Table 5 and Figure 3, and verify that minimum ENR sand placement was 0.5 feet (6 inches), consistent with the project objectives.

Table 5
Sediment Stake Thickness Results

Identification	Thickness (feet)	Comments
4SP	0.6	February 21 measurement; all adjacent cells placed
3SP	0.7	February 22 measurement; all adjacent cells placed
14SP	0.5	February 26 measurement
26SP	0.5	February 22 measurement; sediment had not been placed in Row B at time of measurement
6SP	0.6	February 22 measurement; sediment had not been placed in Row B at time of measurement
27SP	0.6	February 26 measurement
7SP	0.6	February 26 measurement
24SP	0.5	February 26 measurement
5SP	0.7	February 26 measurement
28SP	0.7	February 26 measurement
15SP	1.1	February 26 measurement

Appendices E and F provide the Contractor and Inspector Daily Reports, respectively.

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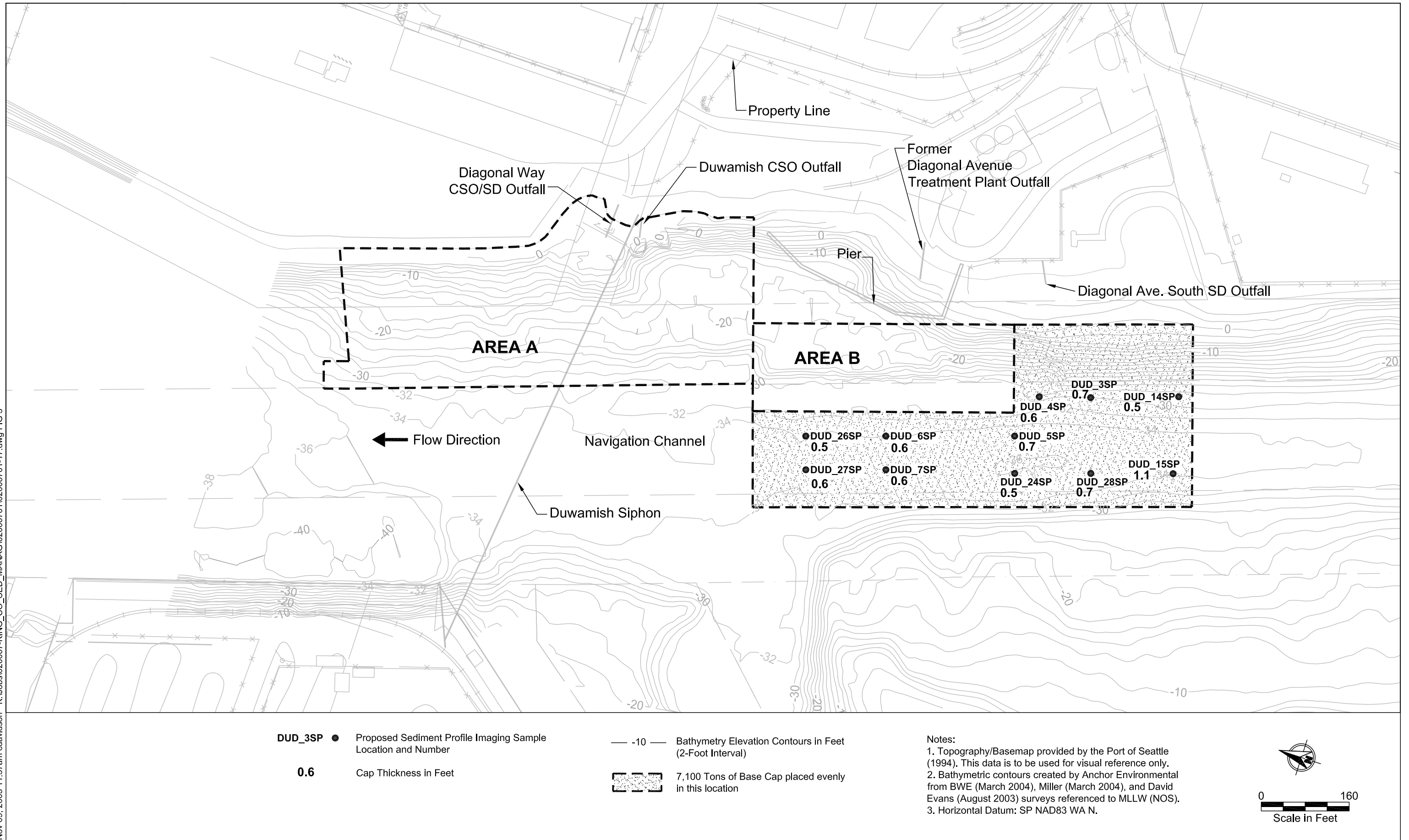


Figure 3
Year 0 Sediment Stake Results
Duwamish/Diagonal 4-Acre Residuals Interim Action
Seattle, Washington

3 COMPLIANCE MONITORING

3.1 Sediment Profile Imaging

Germano and Associates was retained to perform SPI camera surveys before and after the placement of ENR sand. Of the 28 SPI sample locations, 20 were co-located with the chemistry sample stations (11 of which also were sediment stake locations; see Figure 4 and Table 6). Appendix G provides the SPI reports and photographs. The pre-construction (baseline) SPI surveys were performed in the area beyond the boundary of the original Duwamish/Diagonal project (Areas A and B) to determine if the depth of dredge residuals or the original Duwamish/Diagonal cap sand that settled outside the original project boundaries for cleanup Areas A and B would still be visible 1 year post-placement. The Year 1 SPI surveys also provided a baseline for comparison to future SPI images. Post-construction SPI photos were only taken on the 4-acre ENR site to provide a baseline for that portion of the project site.

Table 6
SPI and Sediment Stake Monitoring Locations

SMP ID	SPI Stations*	SPI and Stake Stations**	EASTING-SP NAD 83 WA N	NORTHING-SP NAD 83 WA N
DUD_1SP	X		1267168	208754
DUD_2SP	X		1267175	208651
DUD_3SP	X	X	1267146	208144
DUD_4SP	X	X	1267116	208239
DUD_5SP	X	X	1267025	208263
DUD_6SP	X	X	1266950	208501
DUD_7SP	X	X	1266902	208486
DUD_8SP	X		1266864	208920
DUD_9SP	X		1266784	209157
DUD_10SP	X		1266663	209517
DUD_11SP	X		1266844	209535
DUD_12SP	X		1266813	209630
DUD_13SP	X		1267240	207858
DUD_14SP	X	X	1267193	208002
DUD_15SP	X	X	1267057	207968
DUD_16SP	X		1266834	208758
DUD_17SP	X		1266742	208877
DUD_18SP	X		1266629	209454
DUD_19SP	X		1266738	209538
DUD_20SP	X		1266766	209772
DUD_21SP	X		1266717	209913
DUD_22SP	X		1266606	209715
DUD_23SP	X		1266681	209120
DUD_24SP	X	X	1266968	208242
DUD_25SP	X		1267110	207808
DUD_26SP	X	X	1266916	208625
DUD_27SP	X	X	1266857	208606
DUD_28SP	X	X	1267011	208111

* This group of 28 stations was required to be sampled one time prior to placement of the ENR

** This group of 11 stations was required to be sampled once in 2005 (baseline) and again in 2006 as part of post ENR placement monitoring

The pre-construction SPI photos showed the presence of both residuals and sand cap material in limited locations around the site. Camera penetration varied from 4 to 17 cm (2 to 7 inches), largely due to variations in the amount of sand present at the stations. The dredge residuals are by nature very similar in color to the surface sediment that exists in the dredged river channel (denoted in this report as “native” sediment); consequently the dredge residuals were not easily identified in the photos. This is not surprising, as these samples were collected 1 year after dredging activities and some mixing of the surface layer had occurred. Generally, the native sediments appeared to be dark, olive-gray silt/clay overlying light gray, cohesive silty clay. The light gray clay was never observed at the sediment-water interface in undisturbed samples. Therefore, the best visual evidence of the presence of dredge residuals was the presence of light gray clasts and smears of light gray



sediment in the upper portion of the sediment column. Generally, the stations where dredge residuals were noted were located in the 4-acre ENR project area. Capping materials from the original Duwamish/Diagonal cap (sand or habitat mix) were more easily identified in the pre-construction survey. Greater quantities of capping material were generally observed at locations closer to Areas A and B, with thicknesses ranging from zero, to trace amounts, to 5 cm (2 inches) at stations north of Area A (DUD_11SP and DUD_12SP, which are co-located with chemistry stations DUD_11C and DUD_12C).

The post-construction SPI photos of the 4 acre ENR area showed the presence of ENR sand at every location to the depth of penetration of the SPI camera. Camera penetration varied from 6 to 13 cm (2 to 5 inches). Similar to the pre-construction SPI survey, variations in penetration depths were largely due to differences in the amount of sand present and the degree of sand compaction at different survey stations. Penetration depths for a given station were generally less during the post-construction monitoring than during the pre-construction monitoring due to the increased shear strength of the coarser sand in the ENR area compared to the native river bottom sediment. Because the maximum penetration depth of the SPI camera in the ENR area was less than 6 inches, the SPI camera survey could not be substituted for measuring stakes as a way of measuring the total thickness of the ENR sand (the SPI camera images did not identify any areas of inadequate cover thickness).

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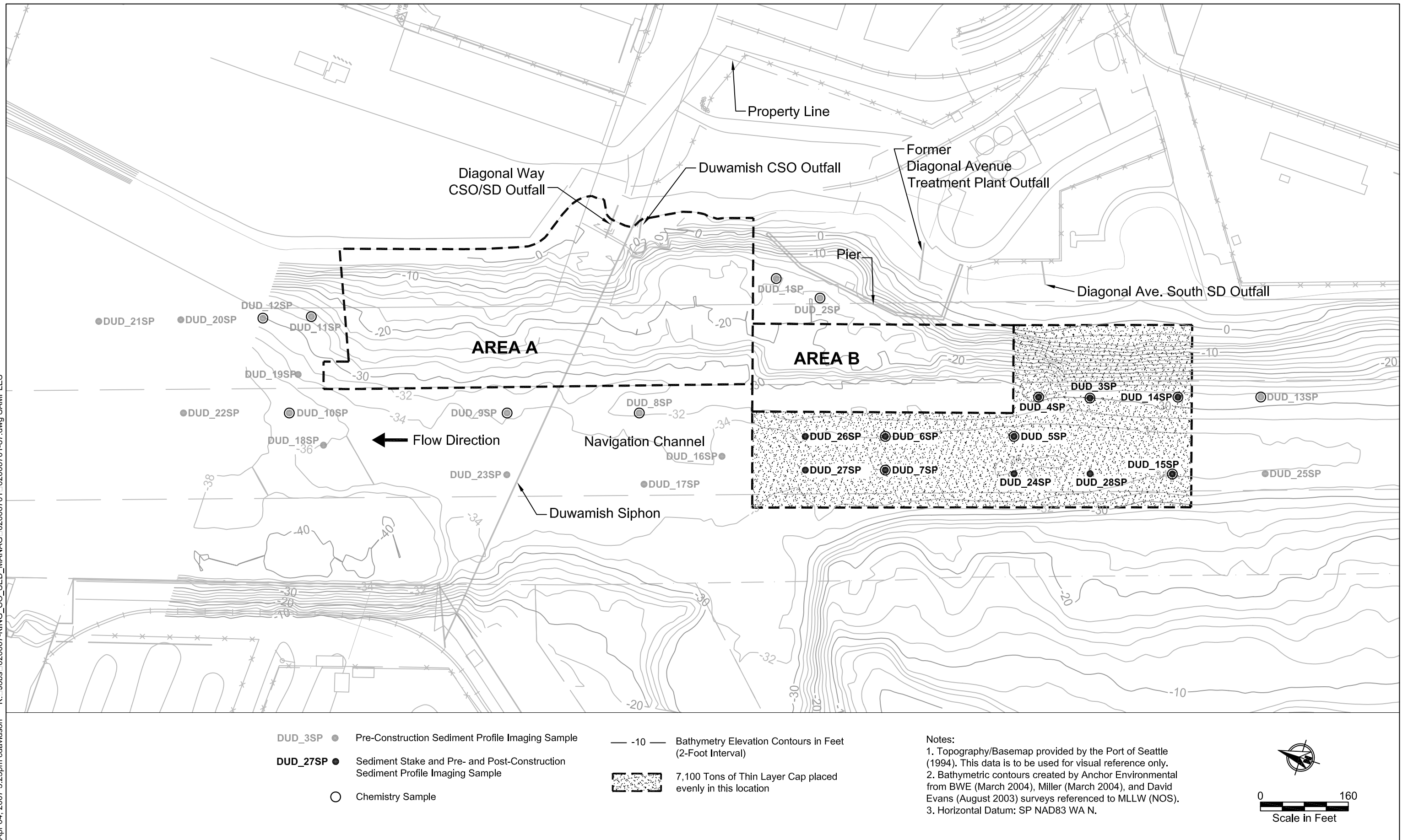


Figure 4
Stake and Sediment Profile Imaging Sample Locations
Duwamish/Diagonal 4-Acre Residuals Interim Action
Seattle, Washington

3.2 Sediment Stakes

Eleven 1/2-inch-diameter PVC pipes, ranging between 4 and 5 feet in length, were placed at the locations shown in Figure 4. The stakes were scribed every inch over the top 2 feet of the stake. The stakes were installed by divers on February 16, 2005, such that 18 inches of each of the stakes extended above the mudline. Section 2.2 describes the results of the monitoring activities. During the monitoring, the divers examined the depth of sediment at each stake by measuring the distance from the top of the stake to the new mudline. After taking readings, they also carefully dug the ENR material away from the base of the stake to ensure that placement activities had not pushed the stake further into the bottom and thereby provide a false reading. None of the stakes were pushed further into the bottom by the placement activities.

3.3 Water Quality Monitoring

Water quality monitoring occurred during placement of the ENR material. The regulatory point of compliance for turbidity was set at a distance 300 feet from the point of sand placement; however, the regulatory agencies requested that measurements also be collected at 150 feet, 100 feet, and 50 feet from the point of placement to determine if placement of ENR material would displace a significant amount of in-situ sediments. The additional monitoring was agreed upon, on the condition that there were no safety issues associated with performing the water quality monitoring in close proximity to the working derrick. Potential safety issues were identified at the 50 foot water quality monitoring station, so no monitoring data were collected at that location. Water samples were collected at each station at depths 90 cm below the water surface and at 60 cm above the river bottom. These samples were analyzed onboard the vessel with a Hach meter. During the initial (2003/2004) Areas A and B remediation project, water samples were analyzed in situ with a meter and also sent to the laboratory for confirmational analysis, which required 12 to 24 hours turn-around time to get lab results. Because of poor correlation between the in situ and laboratory readings, the laboratory instrument was brought out into the field for the ENR placement to provide more timely results (i.e., data available in less than 1 hour).

The County also deployed a probe to measure turbidity and dissolved oxygen at one of the intermediate water quality monitoring stations, and to determine if there was any correlation between the two parameters. The plan was to collect continuous data over the

period of time that it took to place three to five buckets of material. It was important to make sure the contractor was in full production mode to get the best information possible. The equipment was not available for deployment prior to February 24. Unfortunately, upon deployment, the probe failed after several minutes and the data were inconclusive.

There were eight water column turbidity monitoring events performed during the 5 days that sand was placed for the ENR cap. The measured values and calculated change in turbidity units are listed in Table 7 and document that the water quality standard (i.e., increases in turbidity of less than 10 Nephelometric Turbidity Units [NTUs]) was met at the compliance distance of 300 feet. The surface station at 300 feet showed little change in turbidity from the reference station. The maximum increase in turbidity observed at the surface station was only 0.7 NTU during the ebb tide on February 21, 2005. The bottom station at 300 feet had a turbidity increase of 2 to 3 NTU for most measurements and the only increase above 3 NTU was an increase of approximately 7 NTU during the flood tide of February 21, 2005. The observed change at the 150 foot station was higher then the 300 foot station only about half the time (four out of eight times) and the maximum increase of approximately 8 NTU at 150 feet on February 19, 2005 did not exceed the standard of 10 NTU increase, but was higher than the approximate 3 NTU change observed at 300 feet, which was collected during the same sampling event.

Table 7
Water Column Turbidity Measurements During Placement

Date	Time	Tide	Surface Measurements			Bottom Measurements				
			Reference	300 foot value	Change	Reference	300 foot value	Change	150 foot value	Change
February 19, 2005	15:24	Ebb	2.7	2	-0.7	2.1	4.71	2.61	10	7.9
February 21, 2005	8:56	Ebb	1.7	2.4	0.7	1.4	3.7	2.3	2.5	1.1
February 21, 2005	12:02	flood	1.8	2	0.2	1.3	8.5	7.2	8.8	7.5
February 22, 2005	8:45	Ebb	1.8	2.16	0.36	1.82	3.55	1.73	2.7	0.88
February 22, 2005	12:33	flood	2.13	1.84	-0.29	1.71	1.39	-0.32	1.81	0.1
February 24, 2005	9:15	Ebb	1.8	1.7	-0.1	2.4	4.5	2.1	3.6	1.2
February 24, 2005	13:48	flood	2.59	1.76	-0.83	1.71	3.87	2.16	4.34	2.63
February 25, 2005	9:37	Ebb	2.02	1.9	0.12	2	2	0	4.2	2.2

All results reported in NTU

Change of more than 10 NTU at 300 feet would exceed standard



4 POST-CONSTRUCTION MONITORING

On March 16 and 24, 2005, a scuba diver collected the post-construction sediment chemistry samples at the seven stations on the ENR remedy site (DUD_3C to DUD_7C, DUD_14C, and DUD_15C) (see Table 8 and Figure 5). These samples provided the year zero baseline sediment chemistry for long-term monitoring on the ENR remedy site. The purpose of this monitoring is to evaluate the effectiveness of the ENR to lower surface sediment concentrations to below the Sediment Management Standards (SMS). The thin sand layer placed over the 4-acre area is expected to be mixed by bioturbation over time into the surface sediments, resulting in relatively uniform sediment concentrations throughout the biologically active layer. The year zero samples represent the thin layer material before mixing occurs.

These samples were collected by scuba diver instead of a van Veen grab sampler to avoid the possibility of obtaining a sample from one of the depressions that were created during the placement of the ENR sand by the spuds used to hold the barges in place. The depressions were created prior to placement of the ENR sand. The divers collected a single sediment sample at each station on the ENR remedy site with a 6-inch-diameter stainless steel coring device. The diver inserted the coring device all the way into the ENR sand (a vent on top of the device allowed visual confirmation of full penetration) to collect a 10 cm deep sample. Sediment was moved away from one side of the corer so that a flat plate could be inserted into a horizontal slot 10 cm from the top of the sampler, thus capturing the bottom of the 10 cm sample.

The complete chemistry data for the year zero baseline stations on the ENR remedy site are contained in Appendix H¹ and the summary of detected SMS chemicals contained in Table 9 shows there were low concentrations of all chemicals. PCBs were undetected at six stations (DUD_3C, DUD_4C, DUD_5C, DUD_7C, and DUD_15C) and the value was only 2 parts per

¹All data presented herein are qualified as detailed in their respective sample data group QA reviews (Appendix H). The QA reviews and narrative (specifically defined as QA1) were conducted in accordance with guidelines established through the Puget Sound Dredged Disposal Analysis (PSDDA) program, Sediment Management Standards (WAC 173-204-610) and the Sediment Sampling and Analysis Appendix (Ecology 2003). Other approaches incorporated in the QA reviews have been established through collaboration between the King County Environmental Laboratory and the Washington State Department of Ecology Sediment Management Unit.



billion (ppb) at station DUD_6C. The highest PCB value was 32 ppb at station DUD_14C. The values for bis(2-ethylhexyl)phthalate (BEHP) ranged from 9 to 15 ppb (stations DUD_7C and DUD_5C, respectively) except for one value of 70 ppb at station 14C.



Table 8
5-Year Sediment Monitoring Program for Duwamish/Diagonal 4-Acre Thin-Layer ENR

Chemistry Station	SPI Station	Station Position	Bottom Stake Site	Sampling Years							
				2004 Post-Dredge	2005 Before*	2005 After**	2006 Annual	2007 Annual	2008 Annual	2009 Annual	2010 Annual
DUD_1C	DUD_1SP	Off ENR		CH	CH, SPI		CH	CH	CH	CH	CH
DUD_2C	DUD_2SP	Off ENR		CH	CH, SPI		CH	CH	CH	CH	CH
DUD_3C	DUD_3SP	On ENR	Yes	CH	CH, SPI	CH, SPI, ST	CH, SPI, ST	CH	CH	CH	CH
DUD_4C	DUD_4SP	On ENR	Yes	CH	CH, SPI	CH, SPI, ST	CH, SPI, ST	CH	CH	CH	CH
DUD_5C	DUD_5SP	On ENR	Yes	CH	CH, SPI	CH, SPI, ST	CH, SPI, ST	CH	CH	CH	CH
DUD_6C	DUD_6SP	On ENR	Yes	CH	CH, SPI	CH, SPI, ST	CH, SPI, ST	CH	CH	CH	CH
DUD_7C	DUD_7SP	On ENR	Yes	CH	CH, SPI	CH, SPI, ST	CH, SPI, ST	CH	CH	CH	CH
DUD_8C	DUD_8SP	Off ENR		CH	CH, SPI		CH	CH	CH	CH	CH
DUD_9C	DUD_9SP	Off ENR		CH	CH, SPI		CH	CH	CH	CH	CH
DUD_10C	DUD_10SP	Off ENR		CH	CH, SPI		CH	CH	CH	CH	CH
DUD_11C	DUD_11SP	Off ENR		CH	CH, SPI		CH	CH	CH	CH	CH
DUD_12C	DUD_12SP	Off ENR		CH	CH, SPI		CH	CH	CH	CH	CH
DUD_13C	DUD_13SP	Off ENR			CH, SPI		CH	CH	CH	CH	CH
DUD_14C	DUD_14SP	On ENR	Yes		CH, SPI	CH, SPI, ST	CH, SPI, ST	CH	CH	CH	CH
DUD_15C	DUD_15SP	On ENR	Yes		CH, SPI	CH, SPI, ST	?, SPI, ST	?	?	?	CH
DUD_16C	DUD_16SP	Off ENR			CH, SPI						
DUD_17C	DUD_17SP	Off ENR			CH, SPI						
DUD_18C	DUD_18SP	Off ENR			CH, SPI						
DUD_19C	DUD_19SP	Off ENR			CH, SPI						
DUD_20C	DUD_20SP	Off ENR			CH, SPI						
	DUD_21SP	Off ENR			SPI						
	DUD_22SP	Off ENR			SPI						
	DUD_23SP	Off ENR			SPI						
	DUD_24SP	On ENR	Yes		SPI	SPI, ST	SPI, ST				
	DUD_25SP	Off ENR			SPI						
	DUD_26SP	On ENR	Yes		SPI	SPI, ST	SPI, ST				
	DUD_27SP	On ENR	Yes		SPI	SPI, ST	SPI, ST				
	DUD_28SP	On ENR	Yes		SPI	SPI, ST	SPI, ST				

CH Chemistry Sample

SPI Sediment Profile Imaging

ST Stake Measurement

? Annually if "2005 Before" is greater than Cleanup Screening Level (CSL) or only one time in 2010 if "2005 Before" is greater than Sediment Quality Standards (SQS)

* Chemistry samples collected January 31 to February 2, 2005; SPI performed February 8, 2005

** Chemistry samples collected March 29, 2005; SPI performed March 4, 2005



Table 9
Summary of March 2005 Post Construction Surface Sediment Indicator Chemical Concentrations
in 4-acre ENR Area

Station	Fines (% by vol)	TOC (% dry wt)	Total PCBs (µg/kg dry wt)	Total PCBs (mg/kg OC)	Bis (2- ethylhexyl) phthalate (µg/kg dry wt)	Bis (2- ethylhexyl) phthalate (mg/kg OC)	Benzylbutyl phthalate (ug/kg dry wt)	Benzylbutyl phthalate (mg/kg OC)	Mercury (mg/kg dry wt)
DUD 3C	2.9%	0.054% U	2.9 U	N/A	9.1	N/A	13	N/A	0.023 U
DUD 4C	2.4%	0.050% U	3 U	N/A	14	N/A	7.1 U	N/A	0.024 U
DUD 4C (dup)	0.5% U	0.050% U	3 U	N/A	11	N/A	7.3	N/A	0.024 U
DUD 5C	0.5% U	0.050% U	2.9 U	N/A	15	N/A	6.8 U	N/A	0.024 U
DUD 6C	0.5% U	0.051% U	2	N/A	12	N/A	6.8 U	N/A	0.023 U
DUD 7C	0.5% U	0.052% U	2.9 U	N/A	9	N/A	6.9 U	N/A	0.022 U
DUD 14C	3.4%	0.297%	32.4	N/A	70	N/A	11	N/A	0.024 U
DUD 15C	0.5% U	0.049% U	2.8 U	N/A	8.7	N/A	6.8 U	N/A	0.024 U

Notes:

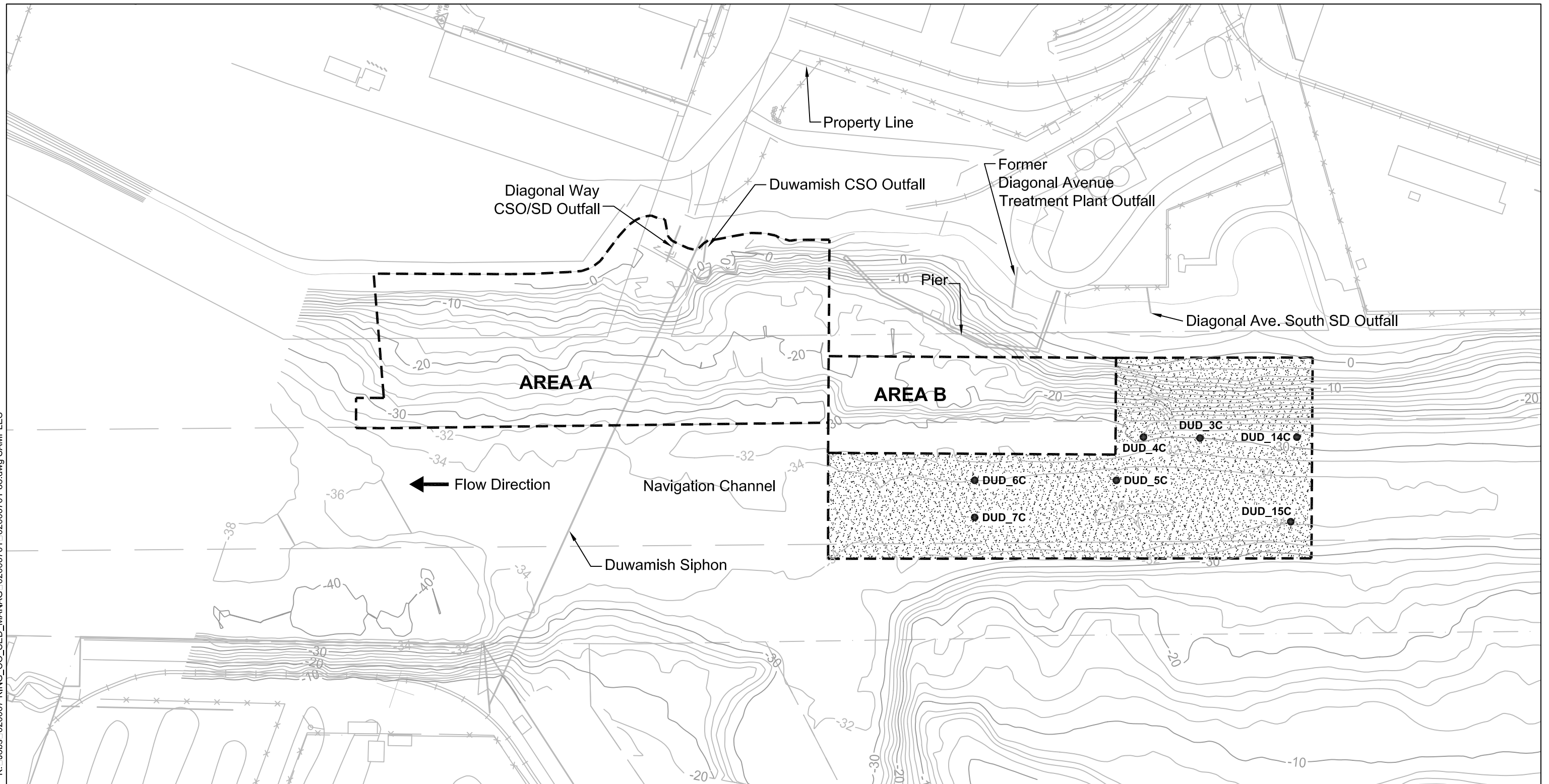
NA = Non Applicable Calculation; TOC less than 0.5%


J = Estimated value

U = Value undetected at reported method detection limit

The presence of low concentrations of chemicals in the ENR sand layer is suggestive of some mixing of the underlying sediments into or on top of the sand layer during placement. The low levels of chemicals also suggest there was not significant remobilization of contaminated sediments during this placement method.

Apr 04, 2007 3:20pm cdauidson K:\Jobs\020067-KING_CO_SED_MANAG\02006701-88.dwg SAMPLES



- DUD_3C ●** ENR Remedy Site Chemistry Stations
- -10 — Bathymetry Elevation Contours in Feet (2-Foot Interval)
-  7,100 Tons of Thin Layer Cap placed evenly in this location

Notes:

1. Topography/Basemap provided by the Port of Seattle (1994). This data is to be used for visual reference only.
2. Bathymetric contours created by Anchor Environmental from BWE (March 2004), Miller (March 2004), and David Evans (August 2003) surveys referenced to MLLW (NOS).
3. Horizontal Datum: SP NAD83 WA N.



0 160
Scale in Feet

5 DEVIATIONS

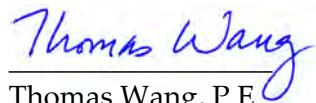
The following deviations from the *Duwamish/Diagonal Interim Action Residual Remedy Proposal* (KCDNRP 2005) were noted:

- The original concept plan submitted to Ecology called for placing 5,500 tons of ENR sand over the site, which equated to an average thickness of 7 inches, and performance specifications for the contractor set at a minimum and maximum thickness of 4 and 10 inches, respectively. Ecology requested that the minimum thickness be increased to 6 inches (evaluated at each measuring stake), so the total quantity was adjusted to 7,100 tons of ENR sand, which was equal to an average thickness of 9 inches over the site.
- The water quality monitoring plan called for continuous monitoring for turbidity and dissolved oxygen over a short time period at a station located 100 or 150 feet from the point of sand placement. Unfortunately, the probe failed 4 minutes after deployment, so these data were not collected.
- The sediment monitoring plan originally called for sampling the post-construction surface with a van Veen grab sampler from the *RV Liberty*. However, based on initial observations, it was apparent that divers could collect a more representative sediment sample. That is, when the divers were taking bottom stake measurements, they observed numerous depressions in the bottom surface caused by the spuds that were used to hold the barges in place during cap placement activities. The barges only placed their spuds in the ENR areas prior to placement of the ENR sand; consequently, the ENR sand was placed over all of the depressions. However, there was concern that if a sediment sample was collected from a depression, the results might not be representative. See Section 4 for details on the diver sampling method.



6 AFFIDAVIT

The remedial action for the contaminated sediments at the 4-Acre Residuals Interim Action Site adjacent to the Duwamish/Diagonal CSO/SD site on the Duwamish River has been completed in substantial compliance with the *Duwamish/Diagonal Interim Action Residual Remedy Proposal* (KCDNRP 2005) dated January 21, 2005.



Thomas Wang, P.E.

Anchor Environmental, L.L.C.

7 REFERENCES

- Desrosiers, R., C. Patmont, E. Appy, and P. LaRosa. 2005. Effectively Managing Dredging Residuals: Balancing Remedial Goals and Construction Costs. Proceedings of the Third International Conference on Remediation of Contaminated Sediments, January 24–27, 2005, New Orleans, Louisiana, Battelle Press.
- Elliott Bay/Duwamish Restoration Program (EBDRP). 2005. *Duwamish/Diagonal CSO/SD Sediment Remediation Project Closure Report*. Panel Publication 39. Prepared by the EcoChem Team and Anchor Environmental, L.L.C. for the Elliott Bay/Duwamish Restoration Panel. July 2005.
- King County Department of Natural Resources and Parks (KCDNRP). 2005. *Duwamish/Diagonal Interim Action Residual Remedy Proposal*. Memorandum to Washington Department of Ecology. Dated January 21, 2005. King County
- U.S. Environmental Protection Agency (USEPA). 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. December 2005.
<http://www.epa.gov/superfund/resources/sediment>

APPENDIX A

RESIDUAL REMEDY PROPOSAL



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

November 16, 2004

RECEIVED BY

Mr. Don Theiler
Director, Wastewater Treatment Division
King County
Department of Natural Resources and Parks
201 S. Jackson
Seattle, WA 98104

NOV 23 2004

NORTH SATELLITE OFFICE

Dear Mr. Theiler:

RE: Requirement for a Continuation of the Duwamish/Diagonal Way Combined Sewer Overflow/Storm Drain (CSO/SD) Interim Sediment Remedial Action

The Department of Ecology has reviewed the pre- and post-action sediment sample results for the Duwamish/Diagonal Way CSO/SD sediment remedial action that was completed in February of 2004. It is clear from this review that concentrations of PCBs have increased significantly in one area of the interim action site. This area is immediately to the west and south of Area B of the original dredge plan. These increases are more than would be expected from dredging operations using best management practices for environmental dredging of contaminated sediments, as required under the US Army Corps of Engineers Nationwide 38 permit issued for this project.

Under authority of the 1991 Natural Resource Damage Assessment Consent Decree between King County, the City of Seattle, the Department of Ecology, and the National Oceanic and Atmospheric Administration, and under authority of the Model Toxics Control Act, Chapter 70.105D RCW and Chapter 173-340 WAC, the Department of Ecology requires a continuation of the interim remedial action in this area, as specified below.

King County will submit an interim action plan to Ecology for its approval to address the issue described above. The interim action plan shall include the following elements:

- a draft project plan, including maps and schedules,
- a draft water quality monitoring plan to be implemented during the action,
- a draft plan to supervise contractor practices during the action, and a draft sediment monitoring plan for the action area that will include pre-action sediment samples to determine extent of contamination, and post-action sediment samples to determine the short- and long-term effectiveness of the action, as well as the extent of any remaining contamination in the area.

Mr. Don Theiler
November 16, 2004
Page 2

Due to the ongoing Superfund investigation of the Lower Duwamish Waterway by the US Environmental Protection Agency, the Department of Ecology and the Lower Duwamish Waterway Group (City of Seattle, Port of Seattle, King County, The Boeing Company), this will be considered a continuation of the interim action, and is not the final remedy for this area. The Lower Duwamish Waterway Group will continue to investigate a full range of long-term cleanup options for this area in the upcoming site Feasibility Study.

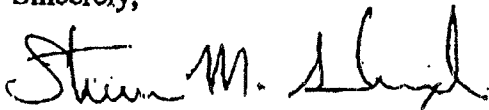
In addition, King County will contact the US Army Corps of Engineers, the US Fish and Wildlife Service, and other relevant permitting agencies to pursue any required permits, or conditions under existing permits, for this action. In order to accelerate this project, we recommend that King County contact the Corps of Engineers navigation section as soon as possible to discuss any proposal to place sand or other materials within the navigation channel.

King County will work closely with Ecology to monitor and supervise contractor practices and the implementation of the water quality monitoring plan during the action. This interim action will be completed this season (2004-05), in order to reduce risks from the PCBs as quickly as possible.

We would also like to remind King County that they have agreed to eight additional samples to assess the impact of the remedial action on the surrounding sediments, above and beyond those listed above. We would like to meet with King County as soon as possible to discuss placement of these samples.

For further information, contact Rick Huey, Lower Duwamish Waterway site project manager, at 425-649-7256.

Sincerely,



Steven M. Alexander
Northwest Regional Office
Toxics Cleanup Program

SA:RH:ct

cc: Jim Pendowski, Ecology TCP
Allison Hiltner, USEPA Region 10



Sediment Management Standards Cleanup Action Decision Amendment

Duwamish/Diagonal CSO/SD

January 18, 2004

Introduction

The Department of Ecology has reviewed the pre- and post-action sediment sample results for the Duwamish/Diagonal Way CSO/SD sediment remedial action that was completed in February of 2004. It is clear from this review that concentrations of polychlorinated biphenyls (PCBs) have increased significantly in one area of the interim action site. This area is immediately to the West and South of Area B of the original dredge plan. These increases are more than would be expected from dredging operations using best management practices for environmental dredging of contaminated sediments, as required under the US Army Corps of Engineers Nationwide 38 permit issued for this project.

Under authority of the 1991 Natural Resource Damage Assessment Consent Decree between King County, the City of Seattle, the Department of Ecology and the National Oceanic and Atmospheric Administration, and under authority of the Model Toxics Control Act, Chapter 70.105D RCW and Chapter 173-340 WAC, the Department of Ecology requires a continuation of the interim remedial action in this area, as specified below:

- Due to the ongoing Superfund investigation of the Lower Duwamish Waterway by the US Environmental Protection Agency, the Department of Ecology and the Lower Duwamish Waterway Group (City of Seattle, Port of Seattle, King County, The Boeing Company), this will be considered a continuation of the interim action.
- The intent of this action is to immediately lower PCB exposure risks in the southwest portion of Area B, not to achieve a final remedy for this area. Ecology expects the Lower Duwamish Waterway Group to investigate a full range of long-term cleanup options for this area in the upcoming site Feasibility Study.

- In addition, King County will contact the US Army Corps of Engineers, the US Fish and Wildlife Services, and other relevant permitting agencies to pursue any required permits, or conditions under existing permits, for this action.
- Water quality and sediment monitoring will be implemented as proposed in the attached plan. Ecology and EPA will continue to work with King County on the development of the sediment monitoring plan.
- King County will work closely with Ecology to monitor and inspect contractor practices and the implementation of the water quality monitoring plan during the action.
- This interim action will be completed this season (2004-05), in order to reduce risks from the PCBs as quickly as possible.

This action is proceeding under the same legal authority (Model Toxics Control Act, Chapter 70.105D RCW and Chapter 173-340 WAC, and Chapter 173-204 WAC the State Sediment Management Standards) as the action that was completed in February of 2004.

This draft Cleanup Action Decision Amendment has been prepared by Ecology to document that the proposed cleanup method is consistent with the Sediment Management Standards, in accordance with WAC 173-204. Currently, the cleanup action is scheduled for completion by March 1, 2004.

For further information, contact:

Washington State Department of Ecology
 Rick Huey
 Lower Duwamish Project Manager
 Northwest Regional Office
 Toxics Cleanup Program
 Bellevue, WA 98008-5452
 425-649-7256
 rhue461@ecy.wa.gov



Memorandum

To: Department of Ecology

From: King County

Date: January 21, 2005

Re: Duwamish Diagonal Interim Action Residual Remedy Proposal

Background

The Duwamish/Diagonal Sediment Remediation Project occurred during the 2003-2004 dredging season (November to March). The contractor selected by King County was Miller Contracting. Their initial efforts, which began in the more highly contaminated “Area B” portion of the site, resulted in a higher proportion and of water quality exceedances for total suspended solids (TSS) proximal to the dredging operations than during the remainder of the project. Those exceedances also had much higher exceedance ratios than other TSS exceedances throughout the remainder of the project, and appeared to be the result of relatively high production rates, overfilling of the dredge bucket, and other operations (EBDRP 2004). King County and permit oversight staff notified the contractor that it would enforce the provisions of the contract to require that the contractor follow Best Management Practices (BMPs) to control sediment releases associated with dredging operations. Dredging operations for the remainder of the project, including all dredging in the primary “Area A” region of the site, occurred under much lower production rates and strict time penalties for overfilling among other methods to control operations and lower releases of sediment into the water column during dredging (EBDRP 2004).

Sediment residuals are defined as contaminated sediments that either remain at the dredge site after dredging, or have been spread to adjacent areas as a result of dredging. Residuals have been documented to occur at sediment cleanup sites, though the magnitude of release have rarely been quantified and likely varies widely between projects based on a range of site-specific and operational factors. Immediately prior to initiation of dredging activities (baseline sampling in October 2003), and also shortly following completion of the project in late March 2004, King County collected surface (0 to 10 cm) sediment residuals performance monitoring samples from 12 stations located immediately outside the project area, as described in the agency-approved Sediment Monitoring

Plan (King County 2003). The data revealed that dredging activities had increased surface sediment PCB concentrations around the southwest margin of “Area B” significantly higher than other site margins (Figure 1).

The occurrence of a greater amount of sediment residuals in the southwest margin of “Area B” was consistent with the contractor’s initial operations in this area that did not appear to have fully utilized practicable BMPs as required by the Corps Nationwide Permit 38 issued for the project. As a result, the Washington Department of Ecology (Ecology), the U.S. Environmental Protection Agency (EPA), and stakeholders requested that King County examine prospective further remedial actions to address the excess sediment residuals released during this portion of the project, which King County evaluated in summer 2004.

Potential Remedies

Six potential remedies were considered. These included the following supplemental response actions (listed in order of increasing permanence, as this term is generally defined under the Washington State Model Toxics Control Act [MTCA]):

Remedy 1. **Monitored Natural Recovery.** This remedy would rely on natural processes such as sedimentation to reduce risks associated with the sediment residuals, and would require monitoring the sediments over time to verify risk reductions and attainment of cleanup levels. Based on modeling performed during remedial design (EBDRP 2001), updated to reflect the post-construction monitoring data, monitored natural recovery would likely attain State Sediment Quality Standards (SQS) in the region surrounding “Area B” within a period of several years.¹ Monitoring would be performed to document the effectiveness of the natural recovery.

Remedy 2. **Enhanced Natural Recovery.** This remedy includes the placement of a thin layer of clean material (approximately 6 inches) over the sediment residuals to accelerate the natural recovery time frame (e.g., potentially to be accomplished by early 2005). This remedy has been employed for sediment residual management at other similar cleanup sites in Puget Sound, such as in areas immediately adjacent to the Puget Sound Naval Shipyard confined aquatic disposal facility. Enhanced natural recovery actions would provide a layer of clean cover material that would then be bioturbated through natural processes into the existing sediment bed. Monitoring would be performed to document the effectiveness of the thin-layer placement and bioturbation process.

¹Note: the sediment concentrations measured around “Area A” following the interim action are predicted to fall to pre-remediation levels within one to three years.

Remedy 3. **Thick Cap.** This remedy would include the placement of a relatively thick layer of clean materials that would isolate the sediment residuals to depths well below the biologically active surface sediment zone. Typically, a cap thickness of 3 feet is placed to ensure long-term isolation under worst-case sediment erosion conditions, although site-specific conditions may allow for a thinner cap section in some areas.

Remedy 4. **Thin Removal.** This remedy includes the “precision” removal of the sediment residuals (as defined by the practicable limit of current dredging technologies), potentially with a clean thin backfill layer to address remaining sediment residuals.

Remedy 5. **Dredge and Thick Cap.** This remedy includes removal of existing sediments to make room for the thick (3 foot) cap described above, so that there is no net change to the sediment surface elevation.

Remedy 6. **Deep Removal.** This remedy includes the removal and disposal of all sediment contaminants to the clean native contact, potentially including a clean backfill to address sediment residuals that may result from this action.

Evaluation of Potential Remedies

Remedy 1 – Monitored Natural Recovery would provide the least cost remedy but potentially take the longest to achieve cleanup standards. Monitoring would likely occur over a 2 to 5 year period depending on the results of the preceding rounds of sampling. This remedy could act like a pilot study with the results of the monitoring providing valuable information about the effectiveness of natural recovery as a long-term risk management option within the Lower Duwamish Waterway Superfund site. The total present worth cost of the Monitored Natural Recovery alternative is estimated at about \$100,000. This remedy was carried forward for further consideration.

Remedy 2 – Enhanced Natural Recovery could be easily implemented and may be able to be performed in the 2004-2005 dredging window, depending in part on resolution of contracting issues. Clean sand material could be placed at the site using mechanical or hydraulic methods. Based on recent bathymetric surveys of the site area, there is a small portion of the prospective remedial action area within the navigation channel that has currently shoaled to an elevation at or above (shallower than) -30 feet mean lower low water (MLLW), the federally-authorized channel depth. Thus, in order to implement the thin layer placement remedy within this shoaled portion of the waterway, the Corps would likely need to provide authorization under its Section 10 authorities. However, since the site area currently receives approximately 1.5 inches of new sediment deposition each year

(EBDRP 2001), a 6 inch layer placed in this area would only “use” approximately 4 years of channel capacity. Since this portion of the Lower Duwamish Waterway has not been dredged since 1968, potential further shoaling concerns associated with implementation of this remedy are likely to be minor. The cost to design, construct and monitor the effectiveness of this remedy is estimated to range from approximately \$500,000 to \$600,000, depending on the final size of the area to be covered, and construction methods employed. This remedy was carried forward for further consideration.

Remedy 3 – Thick Cap could likely not be implemented at the site, as most of the area of concern is located within the federal navigation channel. A 3-foot thick cap would raise the elevation of the bottom well above the authorized depth and would likely not be approved by the Corps under its Section 10 authorities. Thus, this remedy was eliminated from further consideration.

Remedy 4 – Thin Removal of only the dredge residuals is not practicable and potentially not technically feasible, as current dredging technologies are not capable of limiting removal to the anticipated depth of the residual layer (nominally 1 inch-thick in the zone surrounding “Area B”). Implementation of this remedy would require the removal of a thin layer of residuals (likely at least 12 inches) by either mechanical or hydraulic means. Mechanically this would be very difficult because dredging contractors would typically employ a bucket that dredges a larger thickness of material. This option would also result in the collection of relatively large amounts of water (requiring treatment and/or disposal), and would likely also remove subsurface materials that currently underlie the sediment residuals. Since existing sediment core data collected in this area reveal that contaminant concentrations increase with depth, implementation of this remedy could potentially expose subsurface contaminated sediments that contain chemical concentrations even higher than the current residual concentrations, also with attendant residuals release concerns (i.e., potentially leading to further spreading of residuals. If hydraulic methods were used, larger amounts of water would be generated. This water would need to be collected, sediments separated from the water, and the water tested prior to disposal in an appropriate location. The ability to remove a layer thin enough to avoid exposing subsurface contamination is also unlikely, leaving a similar problem as with mechanical removal. The unit (and total) cost of this remedy would be relatively high and disproportionate to the degree of protection provided. Leaving higher surface concentrations than pre-remedy levels is likely. Thus, this remedy was eliminated from further consideration.

Remedy 5 – Dredge and Thick Cap is not implementable prior to late 2005 at the earliest but more likely a year later. In order to implement this option a subsurface investigation would need to be performed to characterize the vertical extent of contamination and the concentrations that would be exposed prior to placing the thick cap. As discussed above, the vertical distribution of contamination observed in nearby cores is generally characterized by an increase in chemical concentrations with depth, particularly over the top 3 feet of the sediment column. Peak chemical concentrations are generally reported in cores within the site area at depth between roughly 3 and 6 feet below existing mudline. Thus, it would be important to characterize the location of this peak in order to design the remedy properly. Given the relatively high cost of implementing this action – on the order of \$1,000,000 for 10,000 cy of removal – King County would only be interested in implementing such an action as a final cleanup remedy for this part of the site. Since both Ecology and EPA have indicated that final cleanup actions can only be determined following completion of the ongoing remedial investigation/feasibility study (RI/FS) of the Lower Duwamish Waterway Site, this remedy was eliminated from further consideration.

Remedy 6 – Deep Removal has the same general difficulties as Remedy 5. The volume of removal required to achieve the clean native interface is currently not well characterized, and would require a major sampling effort to determine. Similar to the discussion provided above for Remedy 5, such an action will be considered as part of the Lower Duwamish Waterway RI/FS. Preliminary cost estimates for this remedy applied to the prospective sediment residuals cleanup acre are on the order of \$1,400,000 for 20,000 cy of removal. This remedy was eliminated from further consideration.

Proposed Remedy

Two different remedies (Remedy 1 – Monitored Natural Recovery and Remedy 2 – Enhanced Natural Recovery) were carried forward as potential supplemental remedies to address “Area B” sediment residuals resulting from the 2003/2004 Duwamish/Diagonal interim cleanup action. King County approached both Ecology and EPA to determine whether they had a preference for one over the other. A key factor for the agencies was to try to implement the supplemental remedy prior to March 2005. The agencies indicated that both Remedy 1 or 2 would: 1) be consistent with the timing concerns and 2) possibly provide benefits that could be applicable to the Lower Duwamish Waterway RI/FS and relevant to the eventual final cleanup decision.

King County is proposing to pursue implementation of Remedy 2 – Enhanced Natural Recovery, subject to confirmation on the extent of the placement area required, placement methods, and resolution of contracting issues. This remedy will provide faster return to pre-dredging sediment levels in the southwest margin of the site. In addition, King County proposes to monitor natural recovery of the other margin areas as a way to gain information about this second remediation technique that could also be applicable to the Lower Duwamish Waterway RI/FS.

Figure 2 (Sheet C-1) defines the proposed project boundaries for the Enhanced Natural Recovery. The intent is to cover the bottom of the navigation channel to the west of “Area B” and 25 feet up the side slope in order to cover the residuals that spread cross-current and to cover the area upstream to the extent that the residual levels are found at concentrations above those around Area A. It is anticipated that those areas further upstream of the cap boundaries should naturally recover at the same time scale as the margins around “Area A”. This upstream area will be monitored together with the margins of “Area A” to determine if natural recovery is occurring at an acceptable pace or additional action would be warranted.

The placement of 5500 tons of clean sand will be evenly distributed across the project boundaries resulting in an average 7-inch placement. A placement plan will be developed to ensure even distribution of each bucket of material throughout the boundary by defining each bucket placement box in a grid tied to a WinOps type software system. The placement will be verified by documentation of the software records which will show that each grid cell was covered and placement across each grid was uniform. Coverage on the sediment surface will be verified by measuring stakes placed on bottom at known locations within the placement grid. The stakes will be inspected by a diver survey following placement to determine if additional material needs to be added to areas within the site that have inadequate coverage. Specifications for the sand layer, placement procedures and best management practices (BMPs) are included in the Specification Sections attached.

Contractor Oversight

King County inspection and construction management will be undertaken to ensure that the work is performed and completed per the approved plans and specifications. Not later than 3 days after the effective date of Notice to Proceed, the Contractor shall submit to King County a detailed, written project Placement Plan. It is anticipated that the project will be consistent with the technical

specifications for thin layer placement attached. Field oversight will ensure operations will comply with all BMPs, placement is uniform and consistent with the placement plan and verify the WinOps-type system software documentation matches the placement grid. A post-placement diver-survey of measuring stakes in the river bottom will determine placement thickness and require additional placement as necessary.

Monitoring Plan

Monitoring proposed for this remedy is a continuation of the two approved Sampling and Analysis Plans (SAPs) for Water Quality Monitoring and Sediment Monitoring (King County 2003a, b) for the original dredge and capping project implemented from November 2003 to March 2004. These original SAPs provided details of the monitoring conducted before, during and after the dredging and capping, so to expedite the process an Addendum was prepared for each SAP to cover the changes during placement of the enhanced natural recovery layer. Both addendums are attached to this document, but each addendum contains enough information that it can be used as a stand-alone document.

References

EBDRP. 2001. Duwamish/Diagonal CSO/SD Cleanup Study Report. Draft. Prepared by King County, Anchor Environmental and EcoChem for the Elliott Bay/Duwamish Restoration Program (EBDRP), Seattle WA. EBDRP Panel Publication 30.

EBDRP. 2004. Duwamish/Diagonal CSO/SD Sediment Remediation Project Closure Report. Draft. Prepared for the Elliott Bay/Duwamish Restoration Program (EBDRP) and King County Department of Natural Resources, Seattle, WA.

King County . 2003a. Duwamish/Diagonal Sediment Remediation, Dredging and Capping Operations, Water Quality Monitoring Sampling and Analysis Plan, Seattle, Wa.

King County . 2003b. Duwamish/Diagonal Sediment Remediation, Dredging and Capping Operations, Sediment Monitoring, Sampling and Analysis Plan, Seattle, Wa.

ADDENDUM TO WATER QUALITY MONITORING FOR DUWAMISH/DIAGONAL SEDIMENT REMEDIATION PROJECT

Introduction

The primary work for the Du/Di dredge and cap project was completed in March 2004. However, in November 2004, Ecology notified King County that additional work was needed to reduce PCB levels in the areas offshore and upstream of Area B. After evaluating various alternatives, the County selected enhanced natural recovery (ENR) as the interim remediation method and is proceeding with plans to have a thin layer of sand placed over about 4 acres of river bottom before the current dredge window ends in February 2005. Ecology and EPA requested that both water quality and sediment monitoring be conducted for this new work. To expedite the process, the County intends to provide addendum to the original two Sampling And Analysis Plans (SAPs) previously approved because the construction and monitoring for the ENR will be similar to the methods that were used during the original capping in 2004.

The final approved Water Monitoring SAP was dated October 28, 2003 and titled Duwamish/Diagonal Sediment Remediation, Dredging and Capping Operations, Water Quality Monitoring Sampling and Analysis Plan and includes all details of the monitoring activities. This addendum documents the modifications to that SAP needed to address the monitoring done for this phase of the work.

Monitoring Activities

The enhanced natural recovery method involves placing a layer of clean sand on the river bottom, which is similar to the actions that were previously used to place the clean base capping layer of sand over the original 7-acre capping area. The estimated duration of ENR placement is about one week so monitoring will continue during all daytime placement work. Ecology and other regulatory agencies will be notified prior to starting the ENR placement work. The "Study Objectives" presented on page 6 of the Water Monitoring SAP states that turbidity would be monitored during cap placement, but there is no need to measure chemicals of concern because the capping material consists of clean sand. This objective holds true for the ENR placement as well. Sample collection, handling, analysis and reporting will be the same as described in sections 7 through 10 of the Water Monitoring SAP except as noted below.

Summary of Modifications

Sampling Schedule: no change

Reference Stations Up Current: no change

Water Quality Compliance Station 300 Feet Down Current of ENR: no change

Station 150 Feet Down Current of ENR: drop surface sample and retain bottom sample

New Station 100 Feet Down Current of ENR: collect bottom sample if safe

New Station 50 Feet Down Current of ENR: collect bottom sample if safe

Turbidity Analysis: perform analysis on site instead of at the County lab

Turbidity Data Availability: available within one hour instead of 12 – 24 hours

Water Quality Compliance Station At 300 Feet

The water sampling schedule to collect turbidity for the ENR will be the same as previously used during capping and consists of sampling twice daily with one ebb tide per day and one flood tide per day. At the start of each tidal sampling event of the day, a reference station will be sampled up current from the ENR sand placement work. Sampling at the water quality compliance station located 300 feet down current of the ENR will follow the same sampling procedures used during the previous capping activities and the recording depth sounder will be used to locate the turbidity plume so sampling occurs near the centerline of the plume. Individual water samples will be collected from near the surface (90 cm below surface) and near the bottom (60 cm above the river bottom) with a water sampling bottle lowered on a line from the sampling vessel. However, to speed up

the availability of turbidity data, a Hach meter will be used on site to measure turbidity in the water samples instead of sending the samples to the lab as was done previously. The method for measuring turbidity with the Hach meter is standard EPA method number 180.1 and the data is considered as accurate as turbidity data from samples sent to lab for analysis. Measuring turbidity on site should provide results within one hour instead of 12 – 24 hours when samples were previously sent to the lab. Turbidity data will be reported for each water sample and a determination made whether the water sample exceeds the applicable standard that allows an increase of 10 NTU above background.

Stations Closer Than 300 Feet

The applicable turbidity standard that allows an increase of 10 NTU above background at the edge of the mixing zone (300 feet) was established primarily to protect fish from the detrimental effects of high turbidity in the water column. However, regulatory agencies also previously requested that turbidity be measured at the closer distance of 150 feet as a way of determining how much sediment was being disturbed into the water column. At this time EPA has requested that bottom sampling be conducted at progressively closer distances of 150 feet, 100 feet and 50 feet to determine whether placement of sand for the ENR will displace a significant amount of the contaminated bottom sediments, which could cause a redistribution of the contaminated sediment on the river bottom. The County will collect bottom samples at these closer distances as long as the work can be accomplished safely without the risk of coming in contact with the contractors bucket or sand that is being spread. Surface samples are not needed at these stations as the process targeted occurs along the bottom.

Coordination and approval must be obtained from the contractor to insure safety and that the contractor's work of spreading the sand evenly is not compromised by having the sampling vessel work so close to the moving bucket. The turbidity values that are obtained from these closer stations are not water quality compliance samples but an attempt to detect if placement activities are generating turbidity waves along the bottom. They will be reported to the regulatory agencies for their use and will not be judged based on the water quality standard that allows an increase of 10 NTU.

In addition to collecting the water sample for turbidity analysis at these closer stations, the County also plans to lower a probe to the bottom station to measure the changes in field turbidity and dissolved oxygen over time. To maximize the potential for detecting turbidity plumes generated by sand impacting the bottom, both turbidity and dissolved oxygen readings will be collected over the period of time it takes the contractor to spread 3 to 5 buckets of sand. The turbidity and dissolved oxygen data from the field probe will be reported to regulatory agencies along with the turbidity data for the water sample.

References

King County. 2003. Duwamish/Diagonal Sediment Remediation, Dredging and Capping Operations, Water Quality Monitoring Sampling and Analysis Plan, Seattle, Wa.

ADDENDUM TO SURFACE SEDIMENT CHEMISTRY MONITORING
FOR DUWAMISH/DIAGONAL SEDIMENT REMEDIATION PROJECT

Introduction

The primary work for the Du/Di dredge and cap project was completed in March 2004. However, in November 2004, Ecology notified King County that additional work was needed to reduce PCB levels in the areas offshore and upstream of Area B. After evaluating various alternatives, the County selected enhanced natural recovery (ENR) as the interim remediation method and is proceeding with plans to have a thin layer of sand placed over about 4 acres of river bottom before the current dredge window ends in February 2005. Ecology and EPA requested that both water quality and sediment monitoring be conducted for this new work. To expedite the process, the County intends to provide addendum to the original two Sampling And Analysis Plans (SAPs) previously approved because the construction and monitoring for the ENR will be similar to the methods that were used during the original capping in 2004.

The final approved Sediment Monitoring SAP was dated October 28, 2003 and titled Duwamish/Diagonal Sediment Remediation, Dredging and Capping Operations, Sediment Monitoring Sampling and Analysis Plan, and includes all details of the monitoring activities. This addendum documents the modifications to that SAP needed to address the monitoring done for this phase of the work.

Monitoring Activities

The ENR method involves placing a layer of clean sand on the river bottom, which is similar to the actions that were previously used to place the clean base-capping layer of sand over the original 7-acre capping area. The following "Study Objectives" that apply to constructing the cap and to defining existing and future chemical conditions both on and around the cap also apply for the ENR:

- 3.1 Measuring ... Cap Thickness,
- 3.3 Capping Material Monitoring,
- 3.4 Before and After Chemistry Beyond Boundary; and
- 3.6 Long-Term Monitoring of Chemical Concentrations on Cap Surface.

Prior to constructing the ENR, the County will also complete the remaining sediment sampling at eight stations that were included in the Sediment Monitoring SAP under Section 3.5, Additional Sediment Survey Beyond Boundary. Sample collection, handling, analysis and reporting will be the same as described in sections 7 through 12 of the Sediment Monitoring SAP except as noted below.

Summary of Modifications

Monitoring Activities Conducted Prior to ENR Placement

Measuring Chemistry in ENR sand prior to placement: no change

Resample 12 Pre- and Post-Dredging Chemistry Stations: collect stations DUD 1C to 12C prior to ENR

Add 2 New Chemistry Stations Upstream: sample stations DUD 13C and 14C prior to ENR

Collect Remaining 6 Survey Chemistry Stations Beyond Boundary: no change; DUD 15C to 20C

Add Collection Of Sediment At One Station For LDWG: new

Add 20 Sediment Profile Images at 20 Chemistry Stations Listed Above: new; 1C-SPI to 20C-SPI

Add 5 Sediment Profile Images at Non-Chemistry Stations; new; DUD 21C-SPI to 25C-SPI

Add Placing Bottom Stakes To Measure Thickness of ENR: new

Monitoring Activities Conducted After ENR Placement

Add Monitoring ENR Thickness Using Bottom Stakes: bottom stakes replace bathymetric surveys

Add Measuring Baseline Chemistry On Surface of ENR: DUD 3C-7C and 14C-15C
Add Taking 11 Sediment Profile Images At Stations Within ENR Boundary: new

Monitoring Activities Conducted Annually up to Five Years After ENR Placement

Sample 14 Pre- and Post-Dredge Stations: DUD 1C-14C (3C-7C, 14C within ENR)

Complete Description of Monitoring Plan Activities

Measuring Chemistry in ENR sand prior to placement:

Prior to placement of ENR a sample of the sand will be obtained from the contractor and submitted to the County lab for chemical testing to verify the material is chemically clean and suitable to use as ENR material.

Resample 12 Pre- and Post-Dredging Stations

In the months since the post-dredging samples were collected there is the potential that concentrations at these stations could change due to natural recovery processes in the river. Prior to placing the ENR, surface sediment chemistry will be monitored at the original 12 pre- and post-dredging surface sediment chemistry stations to document potential changes at all stations and to provide a starting baseline concentration for stations within the footprint of the ENR (3C-7C). Sample collection methods for the pre-ENR will repeat the 10 grab composites per station used previously to maximize comparability of data.

Add 2 New Chemistry Stations Upstream:

Two additional pre-ENR surface sediment chemistry samples will be added upstream of station C3 to help define residual concentrations in this area (stations DUD 13C and 14C; Figure 3). Station 13C is located 150 feet upstream from the edge of the ENR and in line with stations C3 and C4. Station 14C is located about 150 feet upstream from 3C and in line with the first three stations. However, 14C is located within the footprint of the ENR and will provide the sixth station for which there is baseline information prior to placement of the ENR. The initial round of sampling at these 2 pre-ENR stations will use the 10 grab composites per station to provide best comparability with the original 12 pre- and post-dredge stations.

Collect Remaining 6 Survey Chemistry Stations Beyond Boundary

The original sediment SAP included collecting sediment chemistry data at eight additional stations beyond the site boundary for a total of 20 stations. The locations for six of the eight additional surface stations are shown as 15C-20C in Figure 3. These 6 stations are not part of the long-term monitoring plan but will improve the understanding of the distribution of chemical concentrations in the area. The final 2 sediment stations will be located along the bank and inshore of Area A. The purpose of these samples is to collect bank material from upland soils that could erode onto the cap (a potential source of recontamination). The samples will be collected by hand at an elevation of +10ft MLLW at two locations with exposed soil that are subject to erosion by high tides. The exact locations will be determined in the field during collection and the locations fixed by hand held DGPS at that time.

Add Collection Of Sediment At One Station For LDWG:

The sediment sampling program for the Lower Duwamish Work Group (LDWG) identified one station near Duwamish/Diagonal site to perform dioxin analysis in addition to standard chemical analysis. The station selected is located offshore from station DUD 9C and the sediment sample will be collected by the County and provided to LDWG contract laboratory for analysis. Data will be reported directly to LDWG by their contract lab and be reported there. In addition, sub-samples at DUD 1C and 11C will be collected for dioxin analysis by LDWG. The two dioxin sub-samples will be provided to LDWG. LDWG will provide all sample jars.

Add 20 Sediment Profile Images at 20 Chemistry Stations Listed Above

In an attempt to gain additional understanding about the distribution of residuals prior to placing the ENR, a grid of locations will be sampled by sediment profile imaging (SPI) methods. SPI sampling will be co-located with all 20 of the pre-ENR sediment chemistry monitoring stations (stations DUD 1SP – 20SP; Figure 4).

Add 5 Sediment Profile Images at Non-Chemistry Stations

Additional SPI measurements will be collected at one station within the ENR (DUD 24SP) and 4 stations (DUD 21SP to 23SP, 25SP) located at greater distance from the cap than first 20 SPI stations (Figure 4). Station 24SP is located offshore from 5C. Station 25SP is located offshore from 13C and is 150 feet upstream of ENR boundary. Station 23SP is located offshore from 9C at the LDWG dioxin station. Station 22SP is located 200 feet downstream of 10C and 21SP is located 150 feet downstream of 20C.

Add Placing Bottom Stakes To Measure Thickness of ENR

Because the thickness of the ENR is only six inches, the standard bathymetric survey instruments cannot accurately measure the thickness. In order to accurately measure the thickness of the ENR it is necessary to use measuring stakes, which are placed into the river bottom. Flexible stakes are desired to minimize potential to snag fishing gill nets used by tribal fisherman. However, if stakes are too flexible and weak they will collapse when sand is added. Stakes made from thin-walled plastic water pipe that is ½ inch in diameter have the advantage of being strong enough to withstand placement of the sand but also weak enough to break or dislodge if snagged without damaging fishing nets. The white colored plastic pipe improves the diver's ability to locate the measuring stake under poor visibility conditions on the river bottom. Installation of stakes would either be by diver hammering stakes into bottom or other means. Stakes would be installed so that only about 10 inches of each stake would be extending above the surface of the ENR after it is installed. The stakes will have markings every 1 inch and be surveyed by diver after placement to provide a zero elevation prior to ENR placement. Stakes will be co-located with the seven stations used to measure chemistry on the ENR and four other non-chemistry SPI stations on the ENR (Figure 5) so that depth information collected will also be useful in interpreting the chemistry data collected on the ENR.

Add Monitoring ENR Thickness Using Bottom Stakes

Thickness of the ENR will be determined by diver surveys of stakes driven into the bottom prior to placement of the ENR. Each stake will be surveyed by diver after placement of the ENR to document how thick a layer of ENR sand was placed at each stake. Any stakes that have less than six inches of sand will be identified. The contractor will be instructed to add the calculated amount of sand needed to produce a final ENR thickness of six inches based on the first round placement records and results. After the additional sand is placed, the County will consult with Ecology to determine whether a second application of additional sand is warranted.

Add Measuring Baseline Chemistry On Surface of ENR

Shortly after placing the ENR, the six surface sediment stations located within the boundary and footprint of the ENR (stations 3C-7C and 14C) will be re-sampled to provide a year 0 baseline for that area. To document changes in chemical levels on the ENR over time, these six stations on the ENR will be monitored yearly for a period of up to five years or until 1) the sediment concentrations reach pre-action levels or 2) a final remedial action for the area is initiated, whichever comes first.

Add Taking Sediment Profile Images At 11 Stations Within ENR Boundary

A short time after the ENR is placed additional SPI measurements will be taken at stations within the ENR so it is possible to correlation the SPI reading with the ENR thickness measurements taken at stake locations co-located with 7 chemistry stations (DUD 3C-7C, 14C-15C) and 4 non-chemistry stake locations within the ENR (DUD 24C-SPI, 26C-SPI to 28C-SPI). Station 24C-SPI is located offshore from 5C. Station 28C-SPI is located offshore of 3C and down stream of 15C. Station 26C-SPI is located about 150 feet downstream of 6C and 27C-SPI is located about 150 feet downstream of 7C. The post-ENR SPI monitoring will be collected shortly after ENR placement in order to determine whether SPI measurements could be used effectively to measure the ENR thickness instead of using bottom stakes. Also, the 11 post-ENR SPI stations will be monitored again after one year to document benthic recolonization of the ENR.

Add Annual Monitoring

The 14 surface sediment stations DUD 1C - 14C will be sampled yearly after the ENR is installed to evaluate the effectiveness of the ENR remedy and the natural recovery of the other areas not treated by ENR. Monitoring will continue yearly for a period up to 5 years or until 1) the sediment concentrations reach pre-action levels or 2) a final remedial action for the area is initiated, whichever comes first. Sample collection methods for the post-ENR monitoring will repeat the 10 grab composites per station used previously to maximize comparability of data at all stations located off of the ENR itself. Note that the on-ENR sampling will not be able

to use the 10-grab composite sampling used previously because over time the 10 grab composite from each station would significantly remove a portion of the thin layer that we are trying to monitor. All post-construction sampling on the ENR will use a single grab sample for each station if possible.

References

King County. 2003. Duwamish/Diagonal Sediment Remediation, Dredging and Capping Operations, Sediment Monitoring Sampling and Analysis Plan, Seattle, Wa.

K:\Jobs\020067-KING_CO_SED_MANAG\02006701\02006701-74.dwg APPX FIG 1

Nov 09, 2005 1:10pm cdavidson

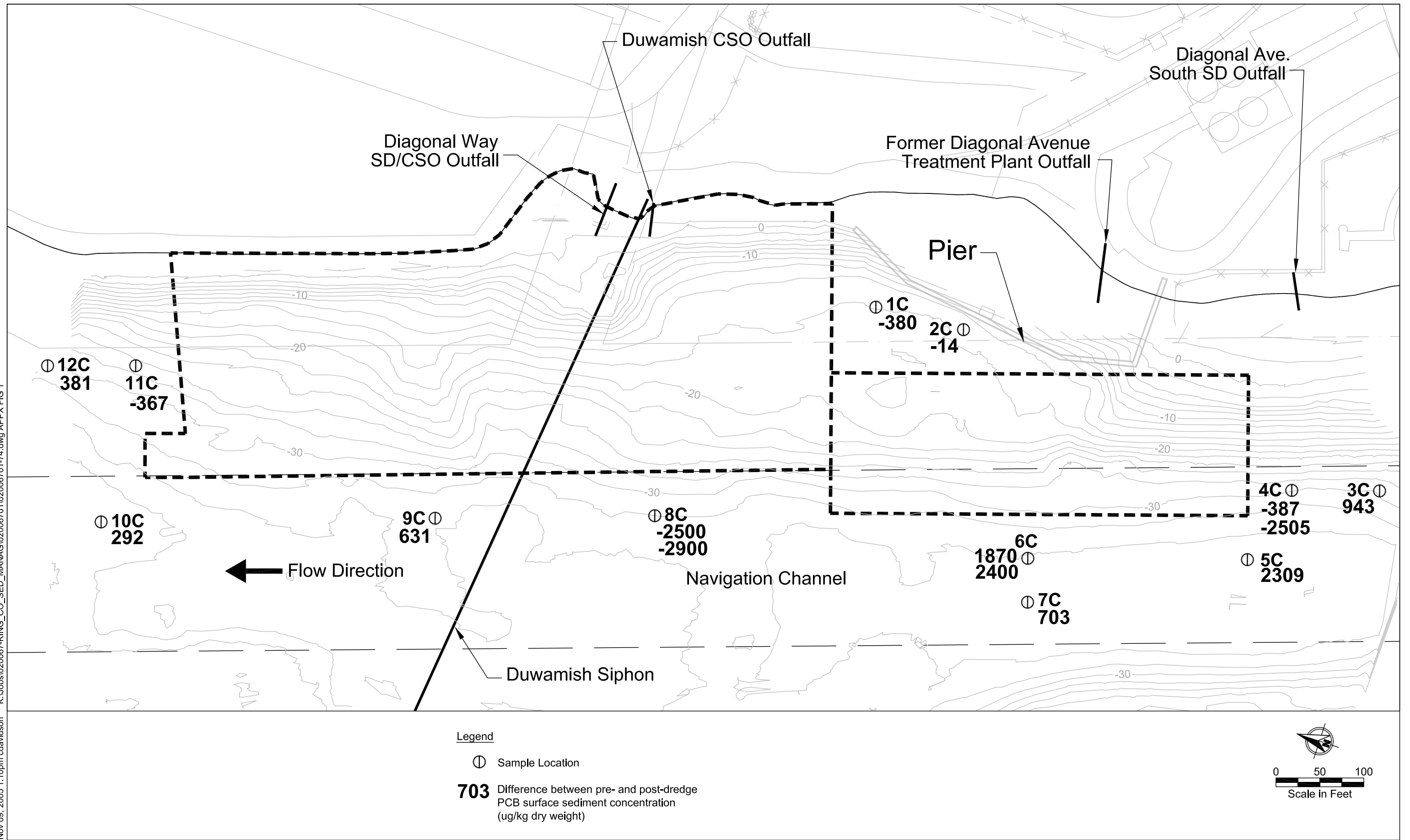
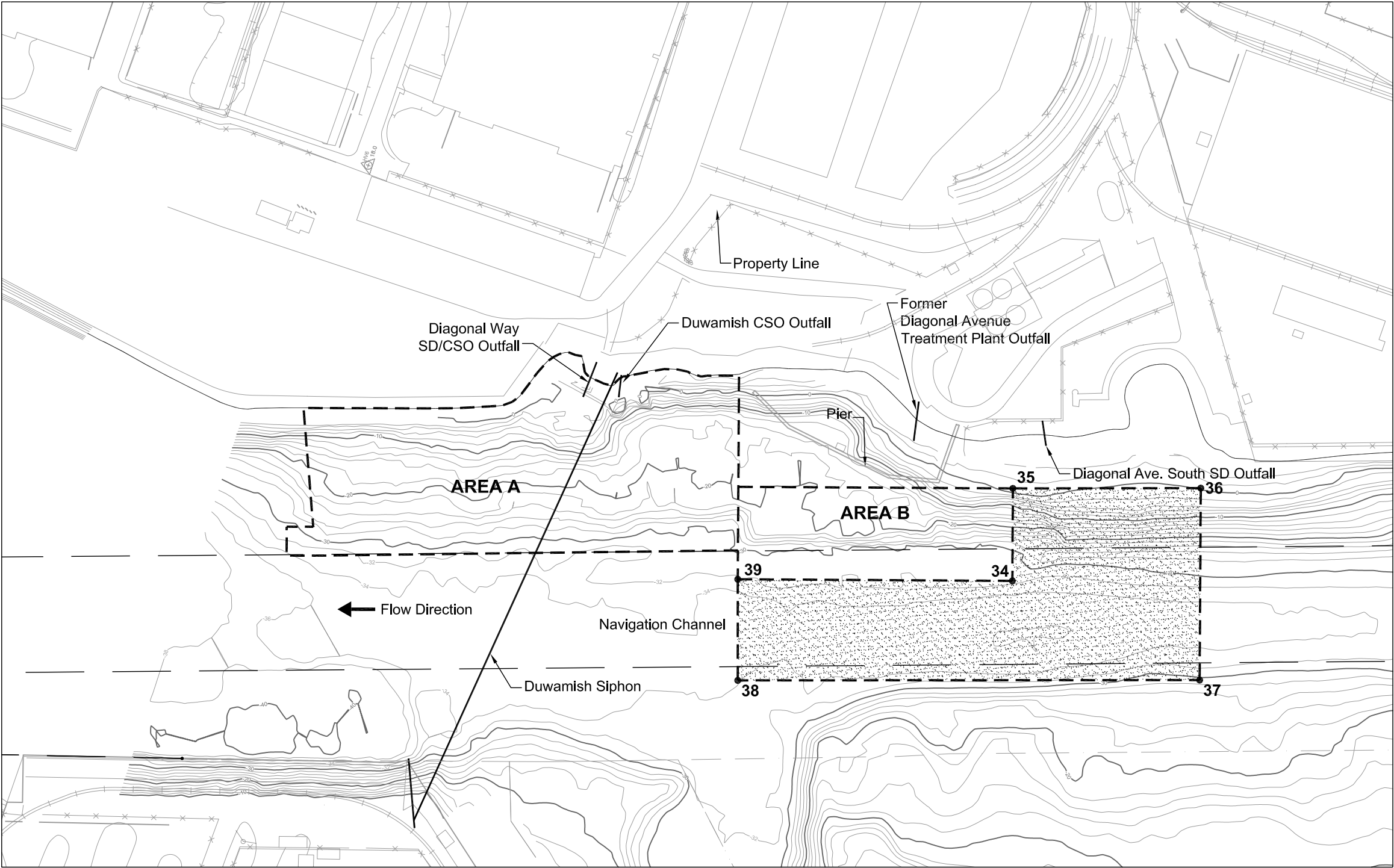


Figure 1
Difference Between Pre- and Post-dredge PCB Surface Sediment Concentration
Duwamish/Diagonal
Seattle, Washington


K:\Jobs\020067-KING_CO_SED_MANAG\02006701\Capping 100-Percent\02006701-PLACE02.dwg SHEET C-1
Dec 10, 2004 3:05pm dholmer

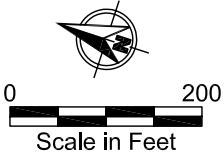
Capping Coordinates:		
Point	Easting	Northing
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35	1267225.46	208326.69
36	1267326.45	208017.77
37	1267009.92	207916.98
38	1266762.45	208676.68
39	1266928.89	208730.76



— -10 — Bathymetry Elevation Contours in Feet
(2-Foot Interval)

Notes:
1. Topography/Basemap provided by the Port of Seattle (1994). This data is to be used for visual reference only.
2. Bathymetric contours created by Anchor Environmental from BWE (March 2004), Miller (March 2004), and David Evans (August 2003) surveys referenced to MLLW (NOS).

 5,500 Tons of Base Cap placed evenly in this location.
37• Control point location and number



DRAFT



REVISIONS					
REV	DATE	BY	APP'D	DESCRIPTION	

DESIGNED BY: B. MCDONALD
DRAWN BY: D. HOLMER
CHECKED BY: J. VERDUIN
APPROVED BY: _____
FILE: _____
DATE: DECEMBER 2, 2004

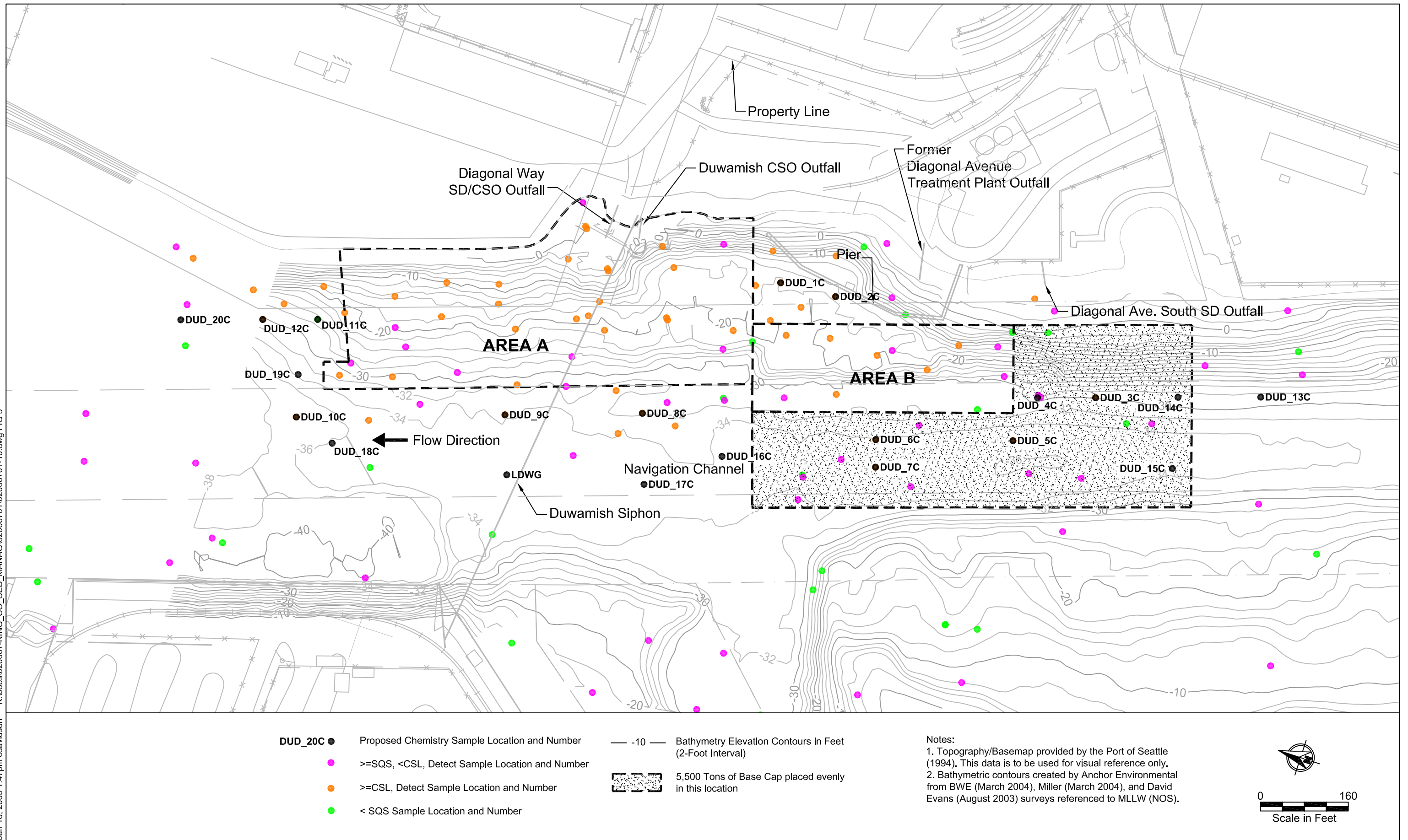
**D/D THIN LAYER
PLACEMENT PROJECT**

THIN LAYER PLACEMENT PLAN

DRAWING NO. 02006701-CAP02
PROJECT NO. 020067-01
SHEET NO. 2 OF 2
SHEET C-1

Figure 2

K:\Jobs\020067-KING_CO_SED_MANAG\02006701\02006701-10.dwg FIG 3
Jan 18, 2005 1:47pm cdauidson



K:\Jobs\020067-KING_CO_SED_MANAG\02006701\02006701-11.dwg FIG 4
Jan 20, 2005 11:19am cdaivdson

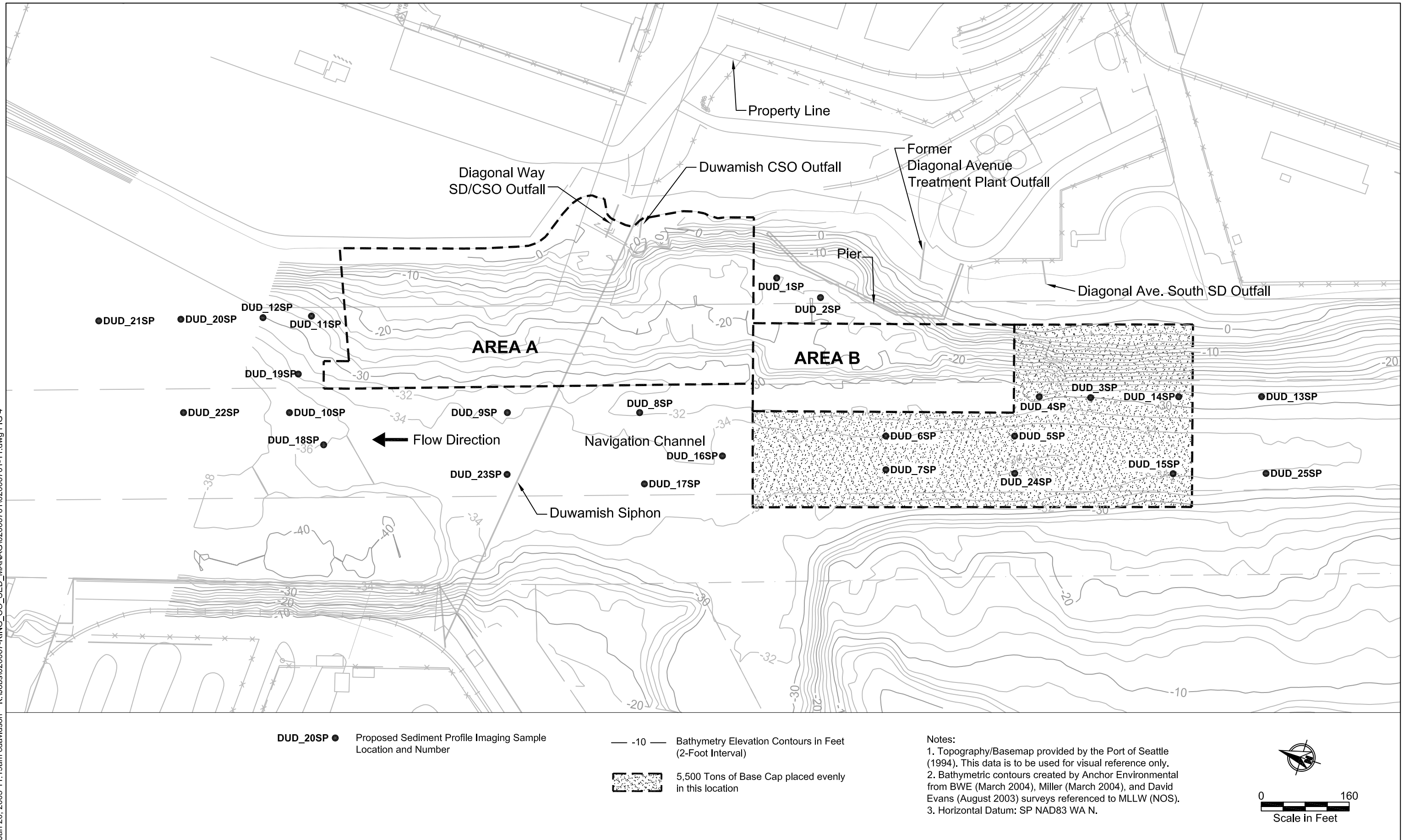


Figure 4
Proposed Sediment Profile Imaging Sample Locations
Duwamish Diagonal
Seattle, Washington

K:\Jobs\020067-KING_CO_SED_MANAG\02006701\02006701-11.dwg FIG 5
Jan 20, 2005 11:19am cdauidson

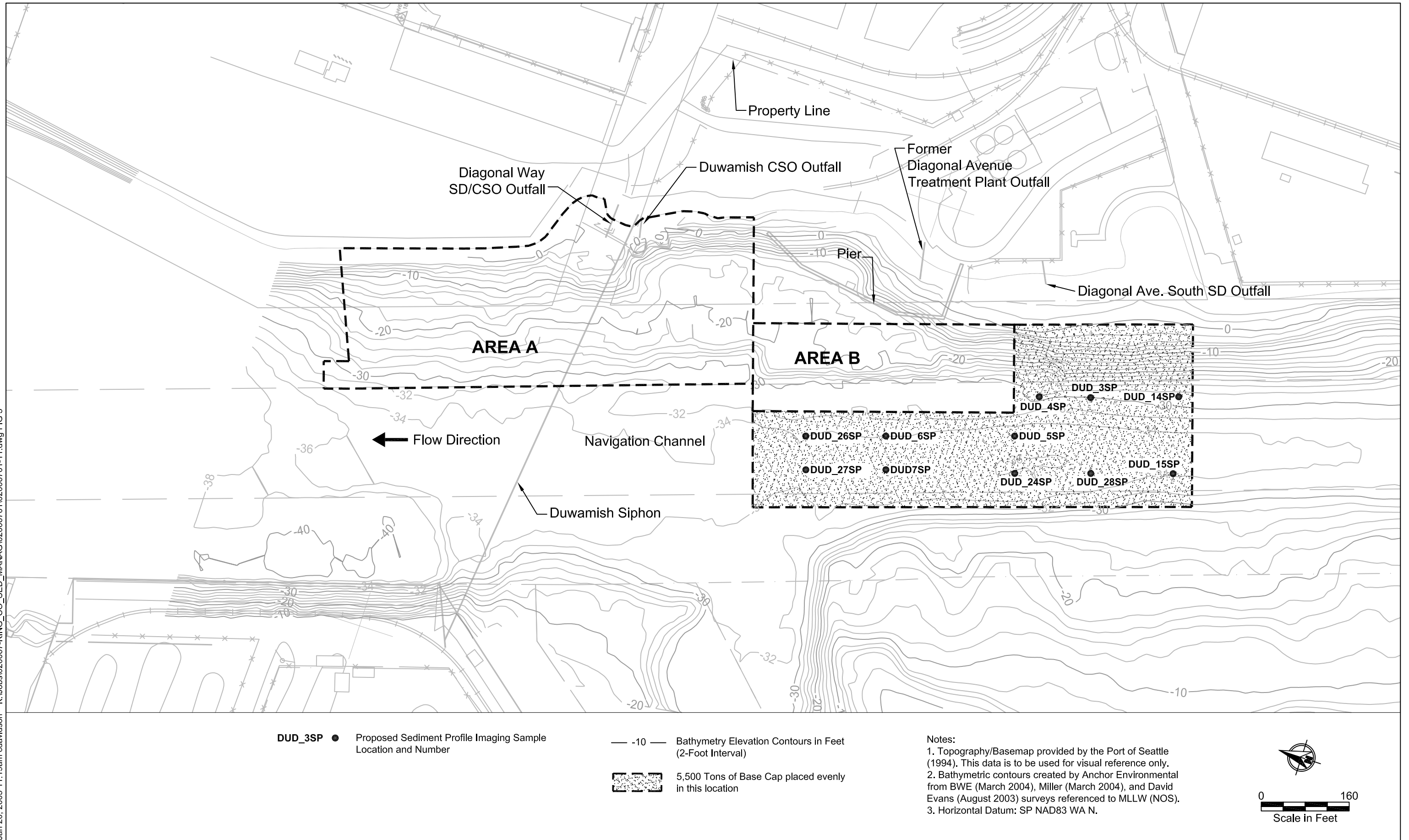


Figure 5
Proposed Stake and Sediment Profile Imaging Sample Locations
Duwamish Diagonal
Seattle, Washington

APPENDIX B

RESPONSIVENESS SUMMARY COMMUNICATIONS

- 1. Is there a revised org chart? Who is the referenced KCDNRP Project Representative and what is their relationship to Jeff, Pat, and Priscilla? Who is (are) the inspector(s) and to whom do they report?**

An organization chart is not available at this time as there are some positions being recruited. The KCDNRP Project Representative for the Duwamish/Diagonal Thin Layer Placement Project is Ukwenga Oleru. The KCDNRP Project Representative responsibilities include, but are not limited to, serving as the County's point of contact for the Contractor. The KCDNRP Project Representative shall be responsible for ensuring strict compliance with the terms of the Contract and safeguarding the interest of the County in its contractual relationships. The Project Representative shall have the authority to administer the Contract.

Jeff Stern is the King County representative of the Elliott Bay Duwamish Restoration Program (EBDRP) Panel, the Duwamish/Diagonal Sediment Remediation Project sponsor. The Duwamish/Diagonal Sediment Remediation Project was performed by King County for the EBDRP Panel. Pat Romberg is the King County in-house sediment specialist that worked on the project. Priscilla Hackney is the project manager for the Duwamish/Diagonal Thin Layer Placement Project. Ukwenga and Priscilla both support the same Acting Asset Management Section Manager, Eddie Tate, and are matrixed to the Duwamish/Diagonal Thin Layer Placement Project. Jeff Stern supports Planning and Compliance Section Manager, Greg Bush, and Pat Romberg supports the Water and Land Resources Division Manager, Daryl Grigsby, and both are matrixed to the Duwamish/Diagonal Thin Layer Placement Project.

Keith Nordlund is the inspector for the Duwamish/Diagonal Thin Layer Placement Project, and he reports to Ukwenga Oleru, KCDNRP Project Representative.

- 2. It is unclear what level of oversight is planned. The objective is clear but the plan to achieve it is not. Previous oversight efforts were unsatisfactory (e.g., significant omissions in KC inspection reports). Inspection schedules and procedures should be specified. We didn't really get a chance to talk about this at the last mtg w/KC.**

The KCDNRP Project Representative will chair a meeting of representatives of the Contractor, County staff, and other affected agencies prior to beginning construction. The purpose of the

meeting will be to establish lines of authority and communication within the Contract team, to discuss the administrative requirements of the Contract, to distribute forms to the Contractor to be utilized on the Contract, to discuss design, design intent, community and permitting issues, and to define the duties and responsibilities of all parties. Discussion will cover specific Drawings, Specifications, facility entry/exit and sign-in/sign-out procedures, unusual job site conditions, schedules of completion, source of cap material, contingency plans, health and safety, mobilization, equal employment regulations, civil rights requirements, apprenticeship programs, and other pertinent features of the Contract. Notification of the preconstruction conference will be made at least seven days prior to the conference.

Ecology will be notified as to when thin layer placement in-water work will begin.

The KCDNRP Project Representative will chair progress meetings to discuss the agenda items listed below including plans for the following day's meeting and to evaluate progress to date and since the last meeting. The meeting will be at a standing time to be mutually agreed to between the KCDNRP Project Representative and the Contractor Representative. Anticipated agenda items for the daily progress meetings include:

- Review and approve minutes of previous meeting.*
- Review work progress since last meeting.*
- Note field observations, problems, and decisions.*
- Review and discuss daily water quality monitoring results.*
- Identify problems that impede planned progress.*
- Contractor needs list to allow the construction schedule to be met.*
- Develop corrective measures and procedures to regain planned schedule.*
- Update construction schedule as indicated.*
- Review planned work during next scheduled look-ahead period per Section 01310.*
- Coordinate projected work with other contractors.*
- Review submittal schedules and status of outstanding submittals.*
- Discuss maintaining quality and work standards.*
- Review safety measures. Identify and discuss areas of concern.*
- Other items as required.*

It is anticipated that one shift per day over a 10-work-day period will be adequate to complete the in-water thin layer placement work. King County will provide inspection and monitoring of Contractor activities at all times when the Contractor is on site. The Contractor will be observed from the Contractor office aboard the work barge. King County inspection reports will be complete and include, but not limited to, the following topics, Construction Activities, Miscellaneous Occurrences, Safety/Accidents, Problems Encountered and Resolutions, Tests Conducted, Work Rejected, Instructions Given to Contractor and Changes Initiated, Visitors and Reason at Site and Equipment Used. Completed King County inspection reports will be submitted daily to Bradley Helland (email: BHEL461@ECY.WA.gov) of the Washington State Department of Ecology (Ecology).

Turbidity will be measured, consistent with the approved Water Quality Monitoring Plan. Turbidity field results will be reported daily by Romberg (phone: 206 296-8251) to Bradley Helland of Ecology.

Once the work is underway, regulatory agents and stakeholders should direct their concerns to Ukwenga Oleru (phone: 206 263-3214; cell: 206 276-3753), KCDNRP Project Representative, or Keith Nordlund (phone: 206 263-3204; cell: 206 384-5744), Inspector, whoever is onsite, with the designated authority to contact the Contractor. Regulatory agents and stakeholders should also confirm their concerns with Priscilla Hackney (phone: 206 684-1791), Project Manager. Should they be unable to reach Priscilla, contact Eddie Tate (phone: 206 263-6602), Asset Management Section Acting Manager.

- 3. The criteria for monitoring are unacceptable. Monitoring is required by SMS for sediments at a contaminated site when sediments are above SQS. Until some other monitoring/remediation plan is in place, some entity is responsible for monitoring until SQS levels are achieved. Because KC is responsible for spreading contamination as a result of improperly implementing cleanup at this early action area, and because this contamination cannot be separated from existing contamination in the vicinity of the project area, KC should assume this responsibility. Otherwise, it devolves to LDWG.**

King County recognizes SMS requirements for monitoring following implementation of an supplemental enhanced natural recovery action in the area, and has discussed with EPA and

Ecology its detailed monitoring plans at the Duwamish/Diagonal site. Monitoring efforts implemented to date by King County have been performed not only to address SMS requirements for cleanup of this site, but also to fulfill a broader objective of informing a comprehensive evaluation of monitored natural recovery (MNR). Such efforts are relevant to development of practicable cleanup plans in the Lower Duwamish Waterway (LDW) Site, and also throughout the region. Since the LDW is emerging as one of the better studied MNR sites nationally, the County's ongoing monitoring efforts also have a broader national interest. If the final remedy is not forthcoming after five years of monitoring and the sediments remain constant above the SQS, King County will discuss with Ecology any further monitoring needs.

4. Some SPI samples should be placed near the pier/beach area shoreward of Area B.

As shown on Figure 3 of the Duwamish Diagonal Interim Action Residual Remedy Proposal memo, two stations (DUD 1C and DUD 2C) will be co-located with their counterpart sediment profile imaging (SPI) stations (DUD 1SP and DUD 2SP) near the pier/beach area shoreward of Area B.

5. The WQM addendum is missing a previously-supplied reference.

The previously-supplied reference, Duwamish/Diagonal Sediment Remediation Dredging and Capping Operations Water Quality Monitoring Sampling and Analysis Plan, October 28, 2003 (Water Quality Monitoring Plan) has been included in the revised version of the Duwamish Diagonal Interim Action Residual Remedy Proposal memo.

6. Related to comment 1 and 2 above, Ecology needs to be clear about the relationship/authority between KC, their contractor, and Ecology (and EPA).

The KCDNRP Project Representative is the County's point of contact for the Contractor. Should Ecology have concerns regarding the Contractor's work, please contact Ukwenga Oleru, designated KCDNRP Project Representative for the Duwamish/Diagonal Thin Layer Placement Project, or other King County staff identified above under comment response Nos. 1 and 2.

7. **KC sections 01310 and 00700 are referenced but not provided. Some cursory review of these should be performed.**

Sections 01310 and 00700 are attached in email.

8. **The old Figure 3, which was a cross-section, is missing. I don't remember asking them to change this, so why was it removed?**

The project plan set now contains two sheets, T-1 and C-1, previously discussed and attached in this email. Old Figure 3 (Sheet C-2) was deleted because we are no longer specifying the placement of four inches of base cap material with six inches of over placement (minimum thickness = 4"; maximum thickness = 10"; average thickness = 7"). We are now specifying that 5,500 tons be placed evenly over an approximate four acre area (average thickness = 7"), with diver-survey of measuring stakes placed on the bottom of the placement area to verify the thickness of material placed over the entire site. The change in specifications was due to the impracticability in confirming compliance (performance) with the original specification represented by old Figure 3 (typically used certified bathymetric surveys have a tolerance of six inches).

9. **Ecology will want to see the referenced Placement Plan prepared by KC's contractor.**

Ecology will be provided a copy of the Placement Plan when King County accepts it.

10. **The proposed remedy leaves residual contamination in place.**

King County proposes to address only the southwest corner of the site (Area B), despite significant CSL exceedances caused by residual deposition adjacent to the northern portion of the site (Area A) as well. Further, King County proposes to leave Area B residual contamination in place upstream (south) of the proposed residual remedy boundary, rather than cap to the limits of the residual contamination or even to the limits of SMS/CSL exceedances. Not only does this incomplete remedy fall short of public expectations, but leaving upstream dredging-related contamination in place threatens to shorten the effective time of the interim action. The residual remedy should address all CSL exceedances caused by dredging residuals, especially upstream of and contiguous with the proposed boundary.

The proposed interim remedy is intended to address Area B margin residual contamination that is believed to be associated with contractor deficient dredging practices causing excessive (relative to Area A margin) sediment releases. Dredging in Area A of the site occurred under much lower production rates and strict time penalties for overfilling among other methods to control operations and lower releases of sediment into the water column. The proposed interim remedy plans not to address Area A margin residual contamination because the margin residual contamination did not increase to the same high levels like the Area B margin, and the residual contamination is not likely due to contractor faulty performance. Additionally, it was projected that areas receiving residuals at such levels as Area A margin would recover to pre-dredge sediment levels on their own, without enhanced natural recovery acceleration, within the next several years.

A key factor in selecting the proposed interim action is that it may be implemented prior to March 2005, thereby accelerating the overall effectiveness of the remedial action, specifically to control PCB exposure associated with the highest post-dredge residuals by March 2005. This would reduce the Duwamish organisms' exposure created by the residuals in that area to pre-release (or better) levels as soon as possible.

Capping (thick cap) of the Area B margin residual contamination could likely not be implemented as most of the area of concern is located within the federal navigation channel. A 3-foot thick cap would raise the elevation of the bottom well above the authorized depth and would likely not be approved by the Corps under its Section 10 authorities.

Dredging & Thick Cap and Deep Removal are not feasible for this interim action as stated in the Interim Remedy Proposal. The Dredging & Thick Cap and Deep Removal alternatives will be considered as part of the Lower Duwamish Waterway remedial investigation/feasibility study (RI/FS), for final cleanup of the Duwamish.

11. The CAD Amendment should clearly state that the interim remedy does not remove residual contamination and will not become a de facto permanent remedy in the future.

King County's responsible action removing residual contamination now rather than waiting for a permanent riverwide RI/FS should not be considered a de facto permanent solution in the future. The remedy does nothing to remove PCBs from the river, but rather temporarily isolates

them and subsequently dilutes them through bioturbation. Any permanent remedy would require their removal, and the CAD Amendment should clarify and provide assurances that this short term action will not compromise the final cleanup action expected in this area.

It is not appropriate to address Superfund comments under this interim action.

12. The CAD Amendment should clarify the expected performance time of the remedy.

Is the proposed remedy expected to maintain PCB levels below the CSL until completion of the RI/FS and implementation of the final cleanup action (if so, refer to #2)? If PCB levels return to pre-remedy or >CSL concentrations in a year to two, will the remedy need to be repeated? The CAD Amendment should clearly state the performance expectations of the project, and outline corrective measures to be taken if the remedy fails.

The purpose of the proposed remedy is to mitigate the increases of PCB concentrations resulting from dredging. The proposed remedy is expected to reduce PCB levels to below pre-dredge surface sediment PCB concentrations. The remedy is not intended to ensure that the area is brought below SMS standards. It is anticipated that the Lower Duwamish Waterway cleanup decisions will be made during 2008-9. Final cleanup of the Duwamish Waterway will follow the decisions, and at that time further remedy at the site, if needed, will be addressed. Also, monitoring of the remedy will be performed to document its effectiveness and the bioturbation process.

13. The proposed remedy is a thin layer cap, not (enhanced) natural recovery.

Natural recovery does not occur in the case of persistent bioaccumulative toxins like PCBs. The thin layer cap proposed for this project will not "enhance" the breakdown or natural recovery of PCBs. Rather the cap is designed and intended to provide a temporary barrier and intermediate dilution of PCB concentration through bioturbation - mixing with clean material. None of the PCBs will be removed from the system, through "natural" or any other means. The term natural recovery is misleading to the public and should be removed. The proposed remedy is a thin layer cap.

Both SMS and EPA guidance documents define and discuss the applicability of enhanced natural recovery (ENR; aka "thin layer cover") in sediment cleanup evaluations. Sediment ENR is

differentiated from sediment capping remedies, which rely on chemical isolation, erosion protection, and consideration of consolidation and operational issues to ensure an effective design. An isolating cap is typically designed at a thickness of three feet and may include additional thicknesses of coarse armoring material. The proposed ENR remedy is not a thin layer cap, in that it does not rely on the long-term integrity of the placed cover layer to ensure the protectiveness of the remedy. Rather, as discussed in detail in EPA's latest (December 2005) sediment remediation guidance, monitored natural recovery and ENR are remedies for contaminated sediment that use ongoing, naturally occurring processes to contain or reduce the bioavailability or toxicity of contaminants in sediment. While the ENR remedy does not remove PCBs from the river, it effectively reduces exposure of organisms to PCBs, and thereby reduces the amount of PCBs that enter the food chain. It is also important to note that ENR-based remedies usually involve acquisition of information over time to confirm that risk-reduction processes are occurring. King County's efforts to develop this information base is described in the response to Comment #3.

14. A top layer of habitat mix should be considered for the project.

While the proposed remedy consists of only an average 7" layer of clean material, the cap is sufficient to cover the existing habitat at the site. A top layer of habitat mix should be considered to mitigate the impact of the project.

Habitat mix may be placed to enhance or create better habitat for juvenile salmon to feed. Juvenile salmon typically feed in much shallower water depths than the majority of the enhanced natural recovery area. The material being placed is closer to the existing sediment than habitat mix and will provide better habitat substrate at these depths.

15. The source of the capping material should be identified.

What is the intended source of the capping material? Will sampling of the material be required? Specifically, if capping material is coming from the Turning Basin, thorough testing is needed prior to use in this remedy. Turning Basin sediments may be contaminated. In addition, the WRIA 9 Committee has recommended that Turning Basin no longer be dredged (and by extension, used as a source for clean fill) due to habitat disturbances caused by dredging.

There are not plans for thin layer placement material to come from the Turning Basin. The placement material shall be clean, free-draining sand from a recognized quarry. The material will be tested physically and chemically to show it is suitable for use as thin layer placement (ENR) material.

16. Original and residual remedy project descriptions are incomplete and misleading.

As noted in our previous comments on the project Fact Sheet, the descriptions of the original Duwamish/Diagonal CSO and residual remedy project descriptions contain unsubstantiated and misleading statements. The Draft CAD Amendment (page 1) states that, "concentrations of PCBs have increased significantly in one area of the interim action site," referring to the southwest of Area B. In fact, concentrations increased "significantly" (above CSL levels and by up to 631 ug/kg dw higher than pre-dredge levels) adjacent to Area A as well. It is accurate to say that the greatest exceedances were seen near Area B, but certainly not the only "significant" ones.

King County's Residual Remedy Proposal states that a "higher proportion" of TSS water quality exceedances occurred at the beginning of the project, and that the early TSS exceedances had "higher exceedance ratios" than those throughout the remainder of the project. However, only the second of these statements is accurate (though it is unclear what is meant by a "higher proportion" when discussing frequency). There was no reduction in the frequency of days the dredging violated TSS requirements over the life of the project, and incidents increased whenever dredging resumed in Area B. At best, the statement is misleading. The proposal also states that the exceedances "appeared" to result from high production rates, overfilling and "other operations," with no possible consideration given to the choice of technology and variations in the nature of the sediments (soft vs. consolidated). There is no basis for making these determinations based on the information provided, and doing so here and in the fact sheet appears more designed for "spin" than providing factual information.

For the purpose of this project, "significant" is defined as increases over pre-project concentrations that would not naturally recover to pre-project levels within a few years. That area is being addressed by the proposed project.

The water quality data clearly shows exceedance frequencies were higher during the first two weeks of the project when the majority of Area B removal occurred. This was also when the highest production rates and frequency of overfilling also occurred.

- 17. We support this proposal because it will result in an immediate reduction in exposure of organisms to surface sediment contaminants found in Area “B” and, therefore, risk. The proposed action does, however, not constitute a comprehensive or final solution to the increased risk posed by other sediments in the area, e.g., Area “A”.**

The proposed action will provide rapid improvement for stations located adjacent to Area B that exceed sediment management standards for PCBs. Also, there are stations adjacent to Area A that exceed the sediment management standards for PCBs and the decision about remediation for these areas will be determined in the future during the Lower Duwamish River Superfund RI/FS process.

- 18. We agree that the proposed work should proceed under a NWP 38 with the following understandings:**

- **the applicant will work with all regulatory and resource agencies to finalize mutually satisfactory plans to monitor both the water quality during the proposed action and the surface sediment quality after placement of the sand layer, and**
- **this monitoring plan will be implemented under the existing “MTCA equivalent” agreed order and so an individual water quality certification is not required**
- **provisions of the monitoring plan are fully enforceable using MTCA authority**

The County will work with all regulatory and resource agencies to finalize mutually satisfactory monitoring plans for both the water column and sediment and then implement these approved plans just as the County did with previous sediment cleanup projects at Duwamish/Diagonal SD/CSO and Norfolk CSO/SD.

- 19. We recommend that the aforementioned monitoring plan specify that a) a “minimum 6 inches of clean fill” be placed on the contaminated sediment, b) “biological recover” is listed as an additional monitoring objective, and c) the scope of Sediment Profile Imagery work that is currently proposed be expanded to assess “biological recovery.”**

The monitoring plan includes a provision to use bottom stakes and divers to insure that a minimum of 6 inches of sand is placed over the area. The baseline SPI camera survey was

conducted in 2005 and another SPI camera survey was added in 2006 (1-year post) that will provide the requested "biological recovery" information.

20. All monitoring data must be provided to Ecology: water quality data in EIM format and sediment quality monitoring results in SEDQUAL-compatible format.

The County routinely provides data to Ecology so the monitoring data for this project will be provided to Ecology in the required format.

21. The monitoring that was done for the (poorly performed) dredging won't be very useful for monitoring a thin-layer placement. E.g., if they wait for an hour after placement begins (and I'm assuming that this placement won't be continuous) then they won't measure anything. Three hundred feet (since the material is expected to be sand) is excessive: I'd monitor at 50, 100 and 150 feet with attention to looking for resuspension of the underlying material by the placement action. I don't care so much if the clean material moves offsite (in fact that is probably a "good" side effect of this project) during the actual placement. I'd also be more concerned with relatively near-term (a few days) turnaround on monitoring to determine that there has been at least close-to the about 7 inches/at least 1 foot placement target reached.

I don't see DO as a WQ measurement to be monitored. It should be. DO change might be a good parameter (or not) to indicate "disturbance" and resuspension. That will need to be fairly close to the actual placement area--not far removed 300 feet. Basically I just don't see that this element has been thought through. I understand that a sediment "verification" plan has yet to be developed.

However, compliance monitoring (which in my mind includes WQ and construction) is needed.

The County recognizes the need to determine fairly rapidly whether a minimum of 6 inches of sand was placed over the area so bottom stakes and diver survey measurements were added to the monitoring plan. Also, to satisfy EPA's request to look for a potential mud wave during placement of clean sand, the County included a supplemental water column survey activity that involves lowering a continuous reading portable turbidity and DO meter to a depth just above the river bottom at distances of 50, 100 and 150 feet from the sand placement work and trying to

measure any short term changes in either turbidity and DO. The County recognizes that monitoring at 300 feet down stream is the only required distance for turbidity compliance and that the additional monitoring is experimental and not required for compliance monitoring.

APPENDIX C

REMEDY TECHNICAL SPECIFICATIONS, PLANS, AND PERMITS

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

- A. This Section contains a summary of the work in this contract and other known work in the vicinity of the Contract work.
- B. The work to be performed under this Contract consists of furnishing all tools, equipment, materials, supplies, and manufactured articles; furnishing all labor, transportation, and services, including fuel, power, water, and essential communications; and performing all work or other operations required for the fulfillment of the Contract, in strict accordance with the Contract Documents. Provide work complete. Provide all work, materials, and services not expressly indicated in the Contract Documents which may be necessary for the complete and proper construction of the work.

1.02 WORK OF THIS PROJECT

- A. The work on this project is follow-up work from the Duwamish/Diagonal project performed during the 2003-2004 work window located adjacent to this project site.
- B. The work of this Contract consists of:
 - 1. The Contractor will place a Thin Layer in the cleanup area defined on the Drawings with clean material. Clean sediment will be obtained from an approved material source. The quantity of material required to be placed is equivalent to 9 inches and is to be placed evenly throughout the site.
- C. Accomplishment of work in the Contract Documents shall meet all requirements and dates specified by Section 01014.
- D. The above description is not intended to be complete. The work to be completed is provided for in the Contract Documents. The listing in Paragraph 01010-1.02A is not intended to relieve the Contractor of the responsibility for reading and understanding the Contract Documents.

1.03 GEOTECHNICAL CONDITIONS

Geotechnical conditions are addressed in Section 01036 and APPENDIX A of these specifications.

1.04 SPECIFICATION LANGUAGE

- A. Specifications are written mostly in imperative and streamlined form. Unless indicated otherwise, this imperative language is directed to the Contractor. Additionally, the words "shall be" shall be included by inference where a colon (:) is used within sentences or phrases.
 - 1. Examples:
 - a. Aggregate: ASTM C33
 - b. Adhesive: Spread with notched trowel.
- B. Related Section: Individual Specification sections may include a paragraph entitled "Related Sections". Specification sections are listed within the paragraph to assist the Contractor in

locating related work. This list is not necessarily all-inclusive. Use all specifications required to complete the work.

- C. Meet the following state of Washington legal requirements whenever there is reference to certification of documents by an architect, engineer, land surveyor, or landscape architect:
 - 1. Architect: RCW 18.08.420(7), RCW 18.08.440(5), WAC 308-12-081
 - 2. Engineers and land surveyors: RCW 18.43.070. RCW 18.43.130(8)(h), WAC 196-24-095.
 - 3. Landscape architects: RCW 18.96.150
- D. Whenever there is wording stating that an item is "as specified" or "as shown", the reference is to all Technical Specifications and all Drawings in the Contract Documents. Stating "as specified" or "as shown" does not refer necessarily to a Drawing or Specification, but it refers to either.
- E. Unless otherwise indicated, all materials and equipment incorporated into the Work shall be as specified and shall be new and of good quality.

PART 2 MATERIALS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01014
WORK SEQUENCE

PART 1 GENERAL

1.01 CONTRACT TIME

- A. The Contractor shall have in-water activities complete by March 1, 2005. The Contractor shall have all cleanup activities complete by March 30, 2005. Failure of the Contractor to meet any of the above milestones or finish within the Contract Time will result in assessment of damages in accordance with Section 00700.

1.02 MILESTONES AND SEQUENCE OF WORK

- A. The purpose of the milestones, sequence, and limitations of construction are to insure that the Contractor understands the limitations placed on its work by the specific characteristics of the project and the facility. The Contractor shall schedule and conduct its work in a manner consistent with achieving these purposes, and the construction schedule shall comply with and include the specific sequence milestones and limitations of work specified in this Section. Refer to Section 02221. Failure of the Contractor to complete specified work by the milestones and Contractor remobilization during the following in-water construction season shall be at no cost to the County.
- B. Milestones:
 - 1. Upon completion of placement of 9 inches of clean material evenly throughout the site, KC will perform a diver-survey, which will be used to verify the thickness of material placed throughout the site by the Contractor. The Contractor will provide 24-hour notice to KC prior to the completion of placement.
 - 2. KC will identify any stake locations that have less than 6 inches of coverage, and will instruct the Contractor to place an additional layer of material to provide a minimum thickness of 6 inches for the area associated with the stake.
 - 3. KC will perform a diver survey at stakes that receive additional material to determine whether 6 inches of coverage was obtained and report to regulatory agencies.
 - 4. Upon completion of required placement of clean material and satisfaction of the KCDNRP Project Representative, the Contractor will perform a post-placement bathymetric survey.
 - 5. The fish closure window for the Duwamish Waterway established for this project is from March 2 to October 31, 2005. No in-water construction activities are permitted during the fish closure window, including placement and pile installation and/or removal, if required.
- C. All work shall be sequenced in a logical planned manner. This specifically may include, but is not limited to:
 - 1. Commence and complete placing clean sediment as shown on plans to the satisfaction of the KCDNRP Project Representative.
 - 2. Coordinate with KCDNRP for KCDNRP to perform diver-survey.
 - 3. Coordinate with KCDNRP to perform post-Thin Layer placement survey.
- D. After award of the Contract, submit a draft construction schedule bar chart that includes all bid items, milestones, construction window, and work sequence described in Sections 00300 and 01014. The draft schedule will be discussed in the preconstruction conference as discussed in Section 01200 and 01310.

1.03 TIME RESTRICTIONS

- A. Thin Layer placement may occur 24 hours each day. However, state noise regulations Chapter 173-60 WAC and the City of Seattle Noise Ordinance must be adhered to.

- B. Submit a schedule of working hours in accordance with Section 00700. The Contractor shall be liable for the premium costs of King County's overtime inspection, in accordance with Section 00700.

1.04 APPROVAL OF SCHEDULE

- A. Scheduling of the work shall be in accordance with the provisions of Section 01310.

1.05 PROJECT CONSTRUCTION COORDINATION

- A. In accordance with the provisions of Section 00700, designate a representative to be on the site at all times during the construction. This representative shall be capable of giving direct field orders as the need arises. Official project communication shall be conducted between the Contractor's representative and the KCDNRP Project Representative.

1.06 SPECIAL PRECAUTIONS

- A. Take special precautions to protect operating mechanical equipment, power supply and distribution equipment, and instrumentation equipment from exposure to weather, concrete dust, debris, dirt, and water during the construction period.

1.07 CONSTRAINTS

- A. During installation of the Duwamish siphon sewer lines in 1965 to 1967, sediment was dredged and backfilled near the outfalls and across the waterway. The siphon pipes (42-inch and 21-inch diameter pipes) were buried in a trench that was dredged across the river bottom.
- B. A portion of the area to be placed with clean material is within the Navigation Channel as shown in the Drawings.
- C. Results of water quality monitoring during construction to comply with State water quality standards may affect construction activities. Also, the placement shall not disturb significant amounts of contaminated bottom sediment as sand contacts the river bottom. The County shall not incur additional expenses due to delays to changes resulting from water quality monitoring.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01062

PERMITS AND EASEMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies permit and easement acquisition, requirements, and conditions.

1.02 PERMITS

- A. The County has acquired the following permits:
1. US Army Corps of Engineers (USACE) (NWP38) dated January 27, 2005.
 - a. Endangered Species Act Section 7 Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Amendment to the Biological Opinion for the Duwamish Diagonal Capping Project, Duwamish Waterway dated January 12, 2005; referenced by the USACE NWP38.
 2. Washington State Department of Fisheries & Wildlife (WDFW), Hydraulic Project Approval dated December 27, 2005.
 3. Washington State Department of Ecology (Ecology), Sediment Management Standards Cleanup Action Decision Amendment Duwamish/Diagonal CSO/SD dated January 18, 2005.
 4. Exemption Letter from City of Seattle, Shoreline Management Act Substantial Development Permit dated November 5, 2002 and Exemption of Clear and Grade, dated January 8, 2003.
- B. Copies of the permits obtained by the County are included in Attachment A to this Section. Unless otherwise indicated, comply and be responsible for all terms and conditions and permit requirements contained in such permits. These permits were obtained as a part of a dredging and capping project located adjacent to the thin layer placement location of this project and have been amended.
- C. The following lists permit conditions which are not the responsibility of the Contractor:
1. The permittee shall notify the AHB (Area Habitat Biologist – Laura Praye by telephone number (425) 379-2306, by FAX at (425) 338-1066 or mail at least seven working days prior to the start of construction activities.
- D. The following lists permit conditions which are the responsibility of the Contractor (see attached Water Quality addendum):
1. If at the 300-foot water quality compliance station the water samples exceed the standard of 10 NTU above background, the Contractor shall comply with County direction to modify material placement operations, or to stop material placement. Any time delays associated with County direction to modify operations will be at the Contractor's own expense.
 2. Hatch meter and field turbidity results and field dissolved oxygen (DO) results of near-bottom water samples collected closer than 300 feet will be reported to regulatory agencies. If the regulatory agencies determine that the turbidity and DO results of near-bottom water samples collected closer than 300 feet indicate that placement of the Thin Layer material displaces unacceptable amounts of contaminated bottom sediments, the Contractor shall comply with County direction to modify material placement operations, or to stop material placement. Any time delays associated with County direction to modify operations will be at the Contractor's own expense.
 3. The Contractor shall not take a threatened or endangered species, in particular the bull trout and chinook salmon. The Contractor shall comply with the following reasonable and prudent measure (RPM) to minimize the take of Puget Sound (PS) salmon and PS/Coastal bull trout.
 - a. Minimize take during construction by avoiding or minimizing adverse effects of thin layer placement activities on PS chinook salmon and PS/Coastal bull trout.
- E. Permit milestones: Section 01014.

1.03 EASEMENTS

- A. The County has acquired the following right-of-entry:
 - 1. Port of Seattle Access Agreement.
- B. Easement milestones: Section 01014.
- C. County will acquire the following easements: None.

1.04 PERMITS AND EASEMENTS OBTAINED BY CONTRACTOR

- A. Be responsible for and obtain all other permits and easements required to perform the work not listed in Paragraph 01062-1.02 and Paragraph 01062-1.03 in accordance with Section 00700.
- B. Prepare and submit to the proper authority or owner all information required for the issuance of such permits or easements. Pay all costs thereof including agency inspections and easement costs unless specifically provided otherwise in the Contract.
- C. Provide a copy of each permit and easement to the KCDNRP Project Representative prior to pursuing any work covered by the permit or easement.
- D. When required by the permit and during work progress covered by the permit, the work shall be inspected by the issuing agency.
- E. Provide a copy of the completed permit with the issuing agency acceptance or easement owner release.

1.05 SUBMITTALS

- A. Procedures: Section 01300.
- B. Permits and easements obtained by the Contractor.
- C. Approvals when work is complete for permits obtained by the Contractor.
- D. Easement releases.

1.06 POSTING PERMITS AND EASEMENTS

- A. Permits and easements, including those obtained by the Contractor, shall be posted at the site of the work.

1.07 CONSTRUCTION RESTORATION ACCEPTANCE FORM

- A. Whenever work is performed on property other than street right way, provide a written easement restoration acceptance form from the easement grantor or easement grantor's agent for each property, parcel, or area certifying that the restoration of structures and/or surfaces has been completed to the satisfaction of the property owner, and that the owner has no claims for damages on account of such restoration.
- B. The easement restoration acceptance shall comply with the requirements as set forth in the form provided by the KCDNRP Project Representative. If, in the opinion of the KCDNRP Project Representative, the release is unreasonably withheld by the easement owner, the County may, at its sole discretion, not require the easement restoration acceptance to be completed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

ATTACHMENT A

PERMITS



STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE

16018 Mill Creek Boulevard • Mill Creek, Washington 98012 • (425) 775-1311 FAX (425) 338-1066

February 9, 2005

King County
ATTENTION: Terry Smith
201 S. Jackson St Suite 600
Seattle, WA 98104-3855

**SUBJECT: Duwamish Diagonal Sediment Remediation; Request for sand increase,
King County, HPA # F1962-5**

Dear Ms. Smith,

This letter is to authorize an increase of sand at the Duwamish Diagonal Sediment Remediation Site, as described in your request on February 9, 2005. The increase includes a thin layer of sand to average 9 inches over a 4 acre site, for a total of 7,100 tons of clean sand.

Thank you for the opportunity to provide this information. If you have any additional questions, please contact me at (425) 379-2306 or prayerimp@dfw.wa.gov.

Sincerely,

A handwritten signature in cursive script that reads "Laura Praye".

Laura Praye
Habitat Biologist

LP:lp



Washington
Department of
FISH and
WILDLIFE

HYDRAULIC PROJECT APPROVAL

RCW 77.55.100 - Appeal pursuant to Chapter 34.05 RCW

North Puget Sound
16018 Mill Creek Boulevard
Mill Creek WA, 98012-1296
(425) 775-1311

Issue Date: January 27, 2005

Control Number: 00000F1962-5

Expiration Date: December 31, 2006

FPA/Public Notice #:

<u>PERMITTEE</u>	<u>AUTHORIZED AGENT OR CONTRACTOR</u>
King County ATTENTION: Terry Smith 201 S Jackson St Suite 600 Seattle WA, 98104-3855 206-684-1480 Fax: 206-684-1741	

Project Name: Duwamish Diagonal Sediment Remediation

Project Description: Add an enhanced natural recovery layer to contaminated sediments

PROVISIONS

1. Work below the ordinary high water line shall not occur from March 2 through October 14 of any year for the protection of migrating juvenile salmonids.
2. Work shall be accomplished per plans and specifications approved by the Washington Department of Fish and Wildlife entitled Place Enhanced Natural Recovery Layer Over Contaminated Sediments and dated January 24, 2005, except as modified by this Hydraulic Project Approval. A copy of these plans shall be available on site during construction.
3. This HPA authorizes the contaminated area to be covered with a thin layer of sand to average 7 inches over a 4 acre site, for a total of 5,500 tons of clean sand.
4. Enhanced natural recovery material shall consist of clean sand and be graded as specified in the plans entitled D/D Thin Layer Placement, and dated January 24, 2005.
5. No dredging is allowed under this permit. All work shall consist of depositing a thin layer of clean sand over previously contaminated areas.
6. This HPA authorizes the use of up to 2 spuds and up to 2 anchors to stabilize and position the derrick. The contractor shall not place spuds in areas that have received a thin layer cover. Once the contractor moves upstream and re-positions, the previous positioning area will be covered with a thin layer of clean sand.
7. Monitoring plans and surveys shall be provided to the Department of Fish and Wildlife. If the WDFW has concerns from the survey results further investigation may be undertaken.
8. Removal or destruction of overhanging bankline vegetation shall be limited to that necessary for the construction of the project.
9. Intertidal wetland vascular plants shall not be adversely impacted due to project activities (e.g., barge shall not ground, equipment shall not operate, and other activities shall not occur in intertidal wetland vascular plants). If such vegetation is adversely impacted, it shall be replaced using proven methodology.



Washington
Department of
FISH and
WILDLIFE

HYDRAULIC PROJECT APPROVAL

North Puget Sound
16018 Mill Creek Boulevard
Mill Creek WA, 98012-1296
(425) 775-1311

Issue Date: January 27, 2005

Control Number: 00000F1962-5

Expiration Date: December 31, 2006

FPA/Public Notice #:

10. All natural habitat features on the beach larger than 12 inches in diameter, including trees, stumps, logs, and large rocks, shall be retained on the beach following construction. These habitat features may be moved during construction if necessary.

11. Project activities shall be conducted to minimize siltation of the beach area and bed.

12. If at any time, as a result of project activities, fish are observed in distress, a fish kill occurs, or water quality problems develop (including equipment leaks or spills), immediate notification shall be made to the Washington Department of Ecology at 1-800-258-5990, and to the Area Habitat Biologist listed below.

13. All debris or deleterious material resulting from construction shall be removed from the beach area and bed and prevented from entering waters of the state.

14. No petroleum products or other deleterious materials shall enter surface waters.

15. Wood treated with preservatives, trash, waste, or other deleterious materials shall not be burned below the ordinary high water line. Limited burning of untreated wood or similar material may be allowed at or above the mean higher high water line.

16. Project activities shall not degrade water quality to the detriment of fish life.

PROJECT LOCATIONS

Location #1 Duwamish

Work Start:01-27-2005 Work End:12-31-2006

<u>WRIA</u>	<u>WATERBODY</u>		<u>TRIBUTARY TO</u>		<u>COUNTY</u>
08.9000	Wria 08 Marine		null		King
<u>1/4 SEC.</u>	<u>Section</u>	<u>Township:</u>	<u>Range:</u>	<u>Latitude:</u>	<u>Longitude</u>
SE 1/4	18	24 N	04 E	N 47.559	W 122.344
<u>DRIVING DIRECTIONS:</u>					

NOTES

APPLY TO ALL HYDRAULIC PROJECT APPROVALS

This Hydraulic Project Approval pertains only to the provisions of the Washington State Fisheries and Wildlife Code, specifically RCW 77.55 (formerly RCW 75.20). Additional authorization from other public agencies may be necessary for this project. The person(s) to whom this Hydraulic Project Approval is issued is responsible for applying for and obtaining any additional authorization from other public agencies (local, state and/or federal) that may be necessary for this project.

This Hydraulic Project Approval shall be available on the job site at all times and all its provisions followed by the person(s) to whom this Hydraulic Project Approval is issued and operator(s)



Washington
Department of
FISH and
WILDLIFE

HYDRAULIC PROJECT APPROVAL

North Puget Sound
16018 Mill Creek Boulevard
Mill Creek WA, 98012-1296
(425) 775-1311

Issue Date: January 27, 2005

Control Number: 00000F1962-5

Expiration Date: December 31, 2006

FPA/Public Notice #:

performing the work.

This Hydraulic Project Approval does not authorize trespass.

The person(s) to whom this Hydraulic Project Approval is issued and operator(s) performing the work may be held liable for any loss or damage to fish life or fish habitat that results from failure to comply with the provisions of this Hydraulic Project Approval.

Failure to comply with the provisions of this Hydraulic Project Approval could result in a civil penalty of up to one hundred dollars per day or a gross misdemeanor charge, possibly punishable by fine and/or imprisonment.

All Hydraulic Project Approvals issued pursuant to RCW 77.55.100 or 77.55.200 are subject to additional restrictions, conditions or revocation if the Department of Fish and Wildlife determines that new biological or physical information indicates the need for such action. The person(s) to whom this Hydraulic Project Approval is issued has the right pursuant to Chapter 34.04 RCW to appeal such decisions. All Hydraulic Project Approvals issued pursuant to RCW 77.55.110 may be modified by the Department of Fish and Wildlife due to changed conditions after consultation with the person(s) to whom this Hydraulic Project Approval is issued: PROVIDED HOWEVER, that such modifications shall be subject to appeal to the Hydraulic Appeals Board established in RCW 77.55.170.

APPEALS INFORMATION

IF YOU WISH TO APPEAL THE ISSUANCE OR DENIAL OF, OR CONDITIONS PROVIDED IN A HYDRAULIC PROJECT APPROVAL, THERE ARE INFORMAL AND FORMAL APPEAL PROCESSES AVAILABLE.

A. INFORMAL APPEALS (WAC 220-110-340) OF DEPARTMENT ACTIONS TAKEN PURSUANT TO RCW 77.55.100, 77.55.110, 77.55.140, 77.55.190, 77.55.200, and 77.55.290: A person who is aggrieved or adversely affected by the following Department actions may request an informal review of:

(A) The denial or issuance of a Hydraulic Project Approval, or the conditions or provisions made part of a Hydraulic Project Approval; or

(B) An order imposing civil penalties. A request for an INFORMAL REVIEW shall be in WRITING to the Department of Fish and Wildlife HPA Appeals Coordinator, 600 Capitol Way North, Olympia, Washington 98501-1091 and shall be RECEIVED by the Department within 30-days of the denial or issuance of a Hydraulic Project Approval or receipt of an order imposing civil penalties. If agreed to by the aggrieved party, and the aggrieved party is the Hydraulic Project Approval applicant, resolution of the concerns will be facilitated through discussions with the Area Habitat Biologist and his/her supervisor. If resolution is not reached, or the aggrieved party is not the Hydraulic Project Approval applicant, the Habitat Environmental Services Division Manager or his/her designee shall conduct a review and recommend a decision to the Director or his/her designee. If you are not satisfied with the results of this informal appeal, a formal appeal may be filed.

B. FORMAL APPEALS (WAC 220-110-350) OF DEPARTMENT ACTIONS TAKEN PURSUANT TO



Washington
Department of
FISH and
WILDLIFE

HYDRAULIC PROJECT APPROVAL

North Puget Sound
18018 Mill Creek Boulevard
Mill Creek WA, 98012-1296
(425) 775-1311

Issue Date: January 27, 2005

Control Number: 00000F1962-5

Expiration Date: December 31, 2006

FPA/Public Notice #:

RCW 77.55.100 OR 77.55.140: A person who is aggrieved or adversely affected by the following Department actions may request a formal review of:

(A) The denial or issuance of a Hydraulic Project Approval, or the conditions or provisions made part of a Hydraulic Project Approval;

(B) An order imposing civil penalties; or

(C) Any other 'agency action' for which an adjudicative proceeding is required under the Administrative Procedure Act, Chapter 34.05 RCW.

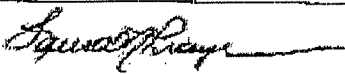
A request for a FORMAL APPEAL shall be in WRITING to the Department of Fish and Wildlife HPA Appeals Coordinator, shall be plainly labeled as 'REQUEST FOR FORMAL APPEAL' and shall be RECEIVED DURING OFFICE HOURS by the Department at 600 Capitol Way North, Olympia, Washington 98501-1091, within 30-days of the Department action that is being challenged. The time period for requesting a formal appeal is suspended during consideration of a timely informal appeal. If there has been an informal appeal, the deadline for requesting a formal appeal shall be within 30-days of the date of the Department's written decision in response to the informal appeal.

C. FORMAL APPEALS OF DEPARTMENT ACTIONS TAKEN PURSUANT TO RCW 77.55.110, 77.55.200, 77.55.230, or 77.55.290: A person who is aggrieved or adversely affected by the denial or issuance of a Hydraulic Project Approval, or the conditions or provisions made part of a Hydraulic Project Approval may request a formal appeal. The request for FORMAL APPEAL shall be in WRITING to the Hydraulic Appeals Board per WAC 259-04 at Environmental Hearings Office, 4224 Sixth Avenue SE, Building Two - Rowe Six, Lacey, Washington 98504; telephone 360/459-6327.

D. FORMAL APPEALS OF DEPARTMENT ACTIONS TAKEN PURSUANT TO CHAPTER 43.21L RCW: A person who is aggrieved or adversely affected by the denial or issuance of a Hydraulic Project Approval, or the conditions or provisions made part of a Hydraulic Project Approval may request a formal appeal. The FORMAL APPEAL shall be in accordance with the provisions of Chapter 43.21L RCW and Chapter 199-08 WAC. The request for FORMAL APPEAL shall be in WRITING to the Environmental and Land Use Hearings Board at Environmental Hearings Office, Environmental and Land Use Hearings Board, 4224 Sixth Avenue SE, Building Two - Rowe Six, P.O. Box 40903, Lacey, Washington 98504; telephone 360/459-6327.

E. FAILURE TO APPEAL WITHIN THE REQUIRED TIME PERIODS RESULTS IN FORFEITURE OF ALL APPEAL RIGHTS. IF THERE IS NO TIMELY REQUEST FOR AN APPEAL, THE DEPARTMENT ACTION SHALL BE FINAL AND UNAPPEALABLE.

ENFORCEMENT OFFICER: Chandler (34) [Sergeant]

Laura Praye	425-379-2306		for Director WDFW
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CC: Margaret Glowacki, DPD, City of Seattle
Loree Randall, DOE, Lacey Office
Suzanne Skadowski, COE, Seattle
John Malick, EPA

REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

JAN 27 2005

Regulatory Branch

Ms. Terry Smith
King County Department of Natural Resources
Wastewater Treatment Division
201 South Jackson, KSC-NR 0503
Seattle, Washington 98104

Reference: 200200548
King County

Dear Ms. Smith:

In a letter dated November 18, 2004, you requested a modification to the referenced Nationwide Permit (NWP) 38 verification issued to you on June 19, 2003 and modified on March 11, 2004. The work authorized by NWP 38 was to dredge 65,500 cubic yards of contaminated sediment and cap the dredged area with 72,000 cubic yards of clean fill material, over a 7-acre area in the Lower Duwamish Waterway at Seattle, Washington. You requested a permit modification to place an additional 6- to 12-inch thick layer of clean sand over 4.3 acres adjacent to the dredge area in order to provide "enhanced natural recovery" of the surface sediments.

We have reviewed your modified proposal and verified that NWP 38 authorizes this project under current regulations. In order for this NWP authorization to be valid, you must ensure that the work is performed in accordance with the enclosed approved modified plans dated January 20, 2005, and the following special conditions that we have added to ensure that this project would have no more than a minimal adverse impact on the aquatic environment:

a. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the United States Army Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

-2-

b. The permittee shall implement and abide by the documents entitled *Construction and Post-Construction Monitoring Plan for Expanded Duwamish/Diagonal Sediment Cleanup Project*, dated May 2003 and amendments entitled *Addendum to Water Quality Monitoring for Duwamish/Diagonal Sediment Remediation Project*, and *Addendum to Surface Sediment Chemistry Monitoring for Duwamish/Diagonal Sediment Remediation Project*, prepared by King County, dated January 20, 2005, in their entirety. Final water quality and sediment monitoring plans must be approved by the U.S. Army Corps of Engineers and Environmental Protection Agency prior to start of work. All required monitoring reports as detailed in the monitoring plans must be submitted to the U.S. Army Corps of Engineers, Regulatory Branch and Environmental Protection Agency.

c. By accepting this permit, the permittee agrees to accept potential liability for both response costs and natural resource damages, to the same extent as would be inherent under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended (42 U.S.C. 9601 et. seq.). Further, the permittee agrees that this permit does not exclude the permittee from liability under the CERCLA or the 1989 Washington State Model Toxic Control Act (R.C.W. 70.105), nor does the permit waive any liability for response costs, damages, and any other costs that may be assessed under CERCLA. Additionally, the permittee agrees that the permittee will be financially responsible for any logistic problems associated with the construction and operation of this project and potential cleanup operations in this portion of the lower Duwamish Waterway.

d. In order to protect bull trout and chinook salmon, you may conduct the authorized activities beginning immediately and until March 1, 2005. You shall not conduct work authorized by this permit after March 1, 2005.

e. This U.S. Army Corps of Engineers permit does not authorize the permittee to take a threatened or endangered species, in particular the bull trout and chinook salmon. In order to legally take a listed species, you must have a separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a Biological Opinion (BO) under ESA Section 7, with "incidental take" provisions with which you must comply). The enclosed BO prepared jointly by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) (NMFS reference number 2002/01376, USFWS reference number 1-3-05-FR-0124) dated March 17, 2003, amended May 21, 2003, and January 12, 2005, contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the BO. This authorization under this U.S. Army Corps of Engineers permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of the attached BO, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BO, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your U.S. Army Corps of Engineers permit. However, the USFWS/NMFS is the appropriate authority

-3-

to determine compliance with the terms and conditions of its BO, and with the ESA. For further clarification on this point, you should contact the USFWS/NMFS. Should the USFWS/NMFS determine that the conditions of the BO have been violated, normally the USFWS/NMFS will enforce the violation of the ESA, or refer the matter to the Department of Justice.

f. If work will take place after March 2005, the permittee shall contact Mr. Glenn St. Amant of the Muckleshoot Indian Tribe Fisheries Division at (253) 876-3130 prior to conducting work, to seek approval of a new work window.

g. The permittee must provide a copy of the permit transmittal letter, the permit form, and drawings to all contractors performing any of the authorized work.

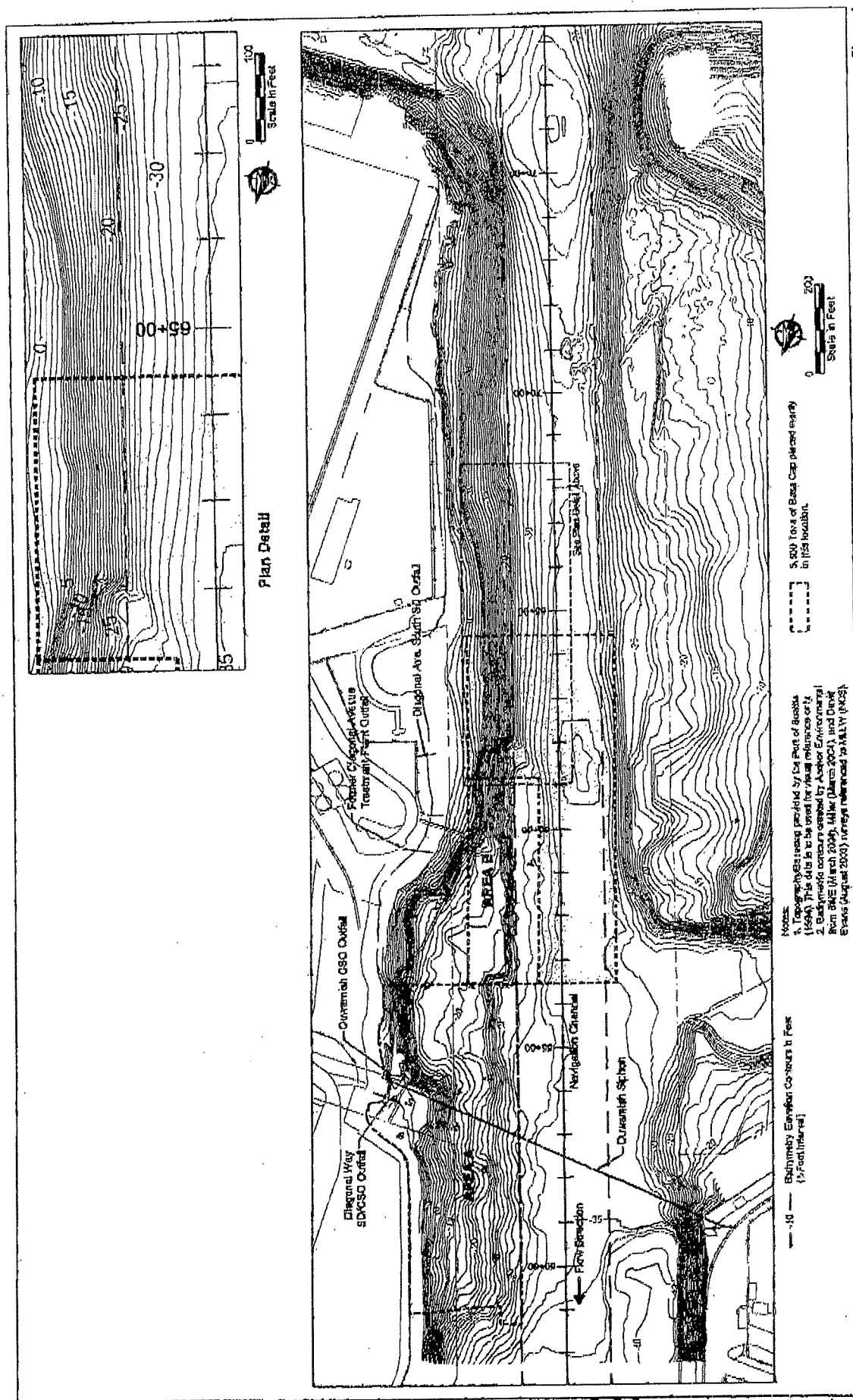
This NWP verification and special conditions supersede the plans authorized by this office for case number 200200548 on June 19, 2003, and March 11, 2004. This NWP verification is valid for 2 years from the date of this letter. All other terms and conditions contained in the original NWP verification that have not been amended remain in full force and effect. If you have any questions, please contact Suzanne Skadowski at (206) 764-6984 or email Suzanne.A.Skadowski@usace.army.mil.

Sincerely,



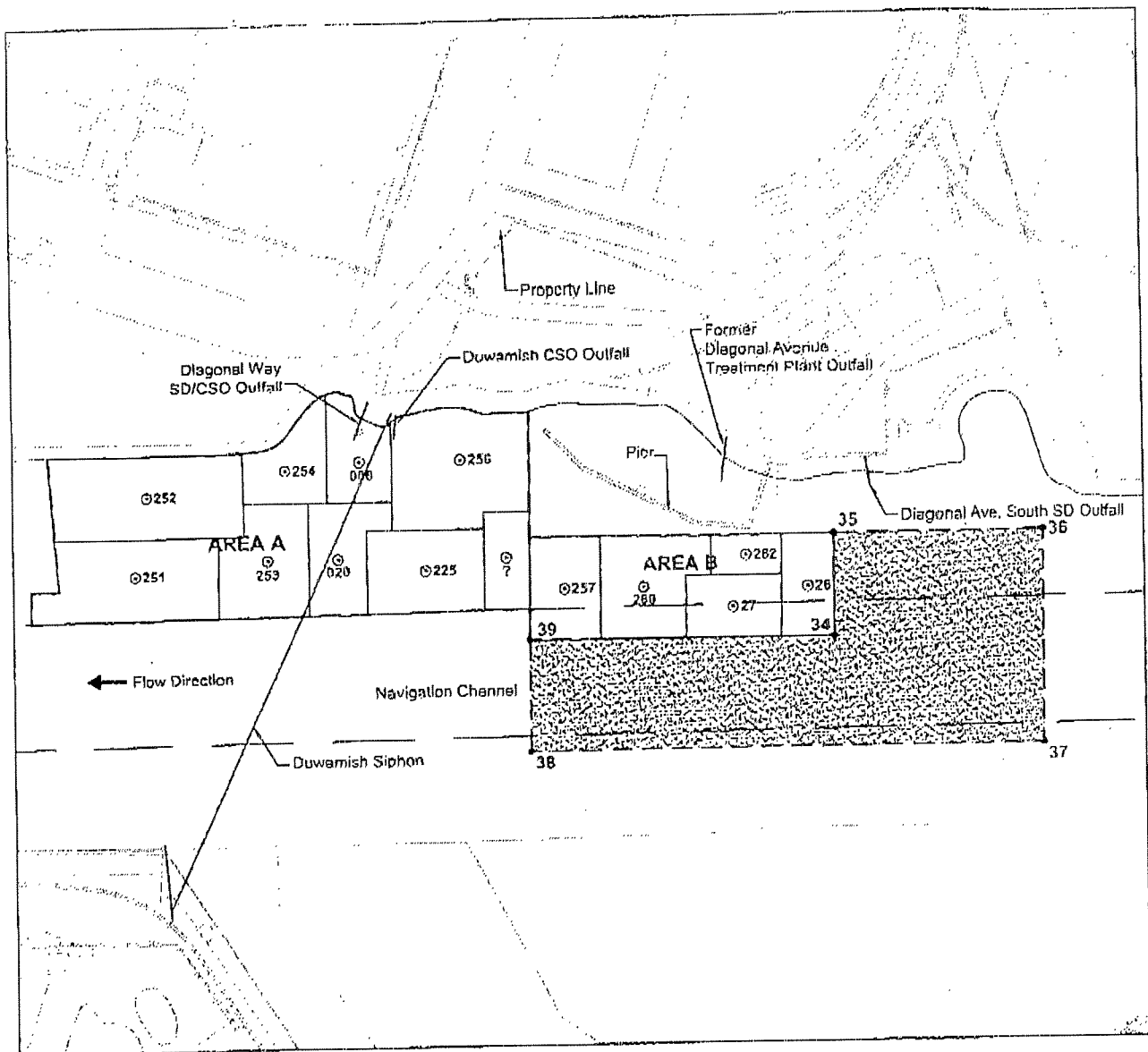
Ann R. Ubrich
Chief, Application Review Section

Enclosures

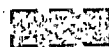


COE reference: 200200548
Applicant: King County Dept. of Natural Resources
 Date: January 20, 2005
 Sheet 1 of 4

ANCHOR



— 10 — Bathymetry Elevation Contours in Feet
(2-Foot Interval)



Minimum 4" layer to maximum 10" of Base Cap
placed in this location.

37 • Control point location and number

Notes:

1. Topography/Basemap provided by the Port of Seattle (1994). This data is to be used for visual reference only.
2. Bathymetric contours created by Anchor Environmental from BWE (March 2004), Miller (March 2004), and David Evans (August 2003) surveys referenced to MLLW (NOS).

Capping Coordinates:

Point	Easting	Northing
34	1267073.00	208278.15
35	1267225.46	208326.69
36	1267326.45	208017.77
37	1267009.92	207916.98
38	1266762.45	208676.68
39	1266928.89	208730.76



0 250
Scale in Feet

PURPOSE: Place Thin Layer of Sand Over
Contaminated Sediments

DATUM: LAT
LONG
DATUM: MLLW=0

ADJACENT PROPERTY OWNERS:
Port of Seattle

NAME: Enhanced Natural Recovery Cap Plan

REFERENCE #: 200200546 *King County*

SITE LOCATION ADDRESS:
Duwamish River
River Mile 1

PROPOSED: Place Enhanced Natural
Recovery Cap Over
Contaminated Sediments

IN: In Duwamish River
NEAR/AT: At
COUNTY OF: King STATE: WA
SHEET: S1

DATE: November 12, 2004

K:\Jobs\03067-KING_CO_SED_MANAG\02067011-Capping-SD\Permit\02067011-CAP02.dwg SHEET S1

Nov 17 2004 3:04pm cda:rdson

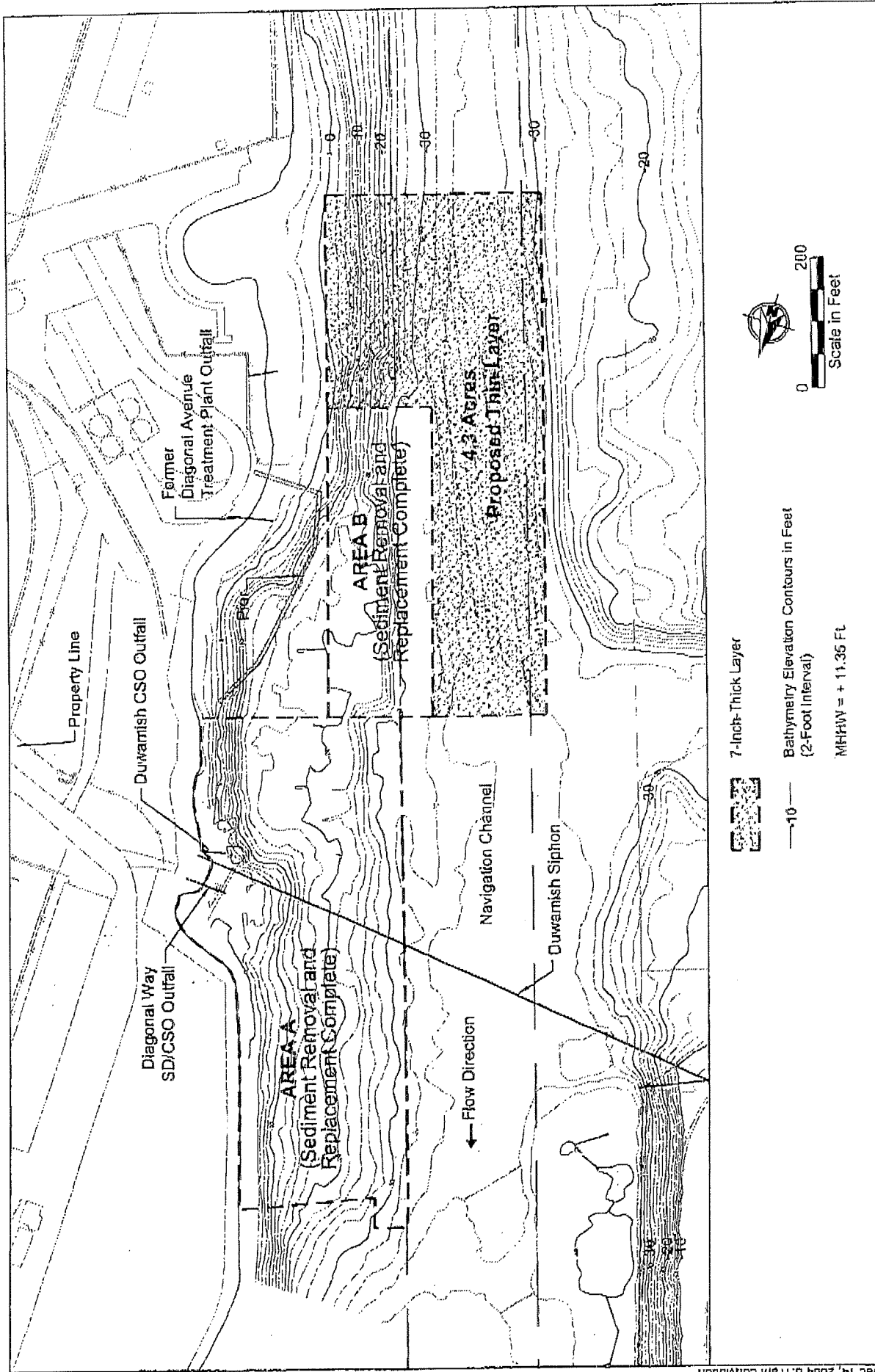
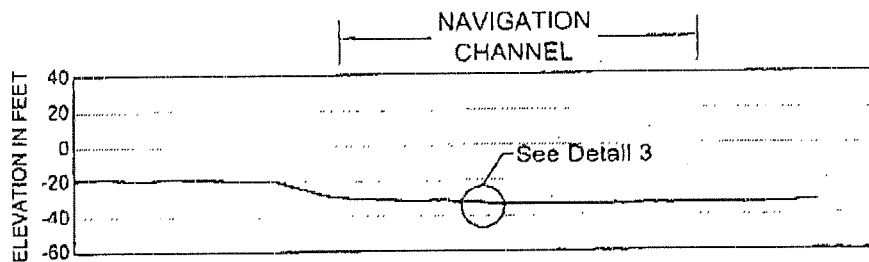


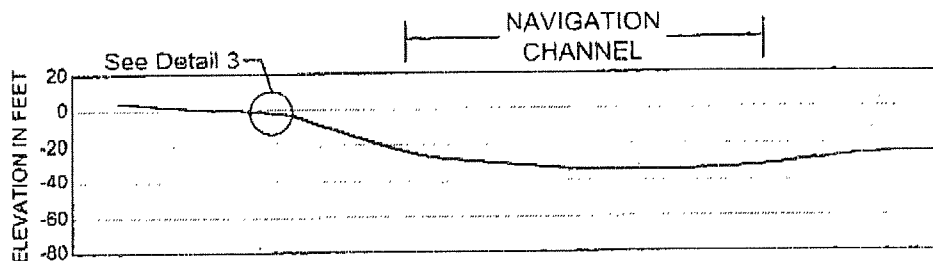
Figure 1
Thin Layer Capping Plan
Duwamish Diagonal Thin Layer Capping Project

COE reference: 200200548
Applicant: King County Dept. of Natural Resources
Date: January 20, 2005
Sheet 3 of 4



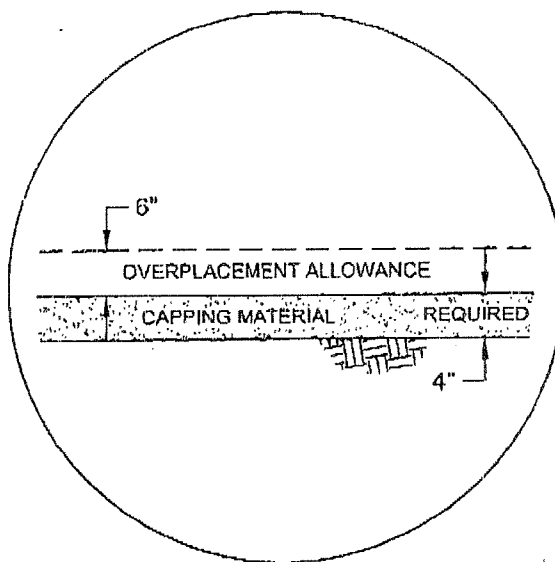


1 CAPPING CROSS SECTION
C-2



2 CAPPING CROSS SECTION
C-2

0 100
Scale in Feet



DETAIL 3- THIN LAYER CAP (TYP.)

0 2
Scale in Feet

PURPOSE: Place Thin Layer of Sand Over Contaminated Sediments

DATUM: LAT
LONG
DATUM: MLLW=0

ADJACENT PROPERTY OWNERS:
Port of Seattle

NAME: Enhanced Natural Recovery Cross Sections

REFERENCE #: 200200548 King County

SITE LOCATION ADDRESS:
Duwamish River
River Mile 1

PROPOSED: Place Enhanced Natural Recovery Cap Over Contaminated Sediments

IN: In Duwamish River
NEAR/AT: At
COUNTY OF: King STATE: WA
SHEET: S2

DATE: November 2004

Sheet 4 of 4

January 20, 2005

K:\job\020067-KING_CO_SED_MANAG\02006701\Capping-S4Percon\02006701-CAP03.dwg CORPS SHIT 1

Nov 17, 2004 3:57pm edavidson

ACCESS AGREEMENT FOR SEDIMENT REMEDIATION

1. This license agreement, dated January 29, 2005, is granted by the PORT OF SEATTLE, a Washington State municipal corporation (hereafter, the "Port") to KING COUNTY, a Washington State municipal corporation (hereafter, the "County").
2. The Port is the owner of certain real property located in the Duwamish Waterway ("Port Submerged Land"). The County seeks access to portions of the Port Submerged Land in order to undertake placement of enhanced natural recovery layer (ENR) (hereinafter "remediation." The approximate location of the remediation is described on attached Exhibit A.
3. The County acknowledges this license is intended solely to provide the County with a temporary right of entry onto Port-owned property to undertake remediation.
4. The Port grants the County, its contractors, subcontractors, and suppliers (collectively "County") reasonable access to the portion of the Port Submerged Land depicted in Exhibit A (hereinafter "Premises") for the sole purpose of undertaking remediation in the Duwamish Waterway as required by the Washington State Department of Ecology ("Ecology") and the Environmental Protection Agency ("EPA") to ensure compliance with Chapter 173-204 WAC the State Sediment Management Standards ("SMS") and CERCLA (also know as Superfund). The County will not conduct remediation or testing beyond what is required by Ecology and the EPA, unless it has obtained prior written approval from the Port's Manager of Corporate Environmental Programs.
 - A. The County will forward the Duwamish/Diagonal Sediment Remediation Project Closure Report ("Closure Report") to the Port concurrently with transmittal of the Closure Report to Ecology and the EPA.
 - B. The County will provide finalized post construction data on areas of remediation completed March, 2004 within thirty days of the completion of the reports.
 - C. The County will provide a complete set of final post-construction as-built prepared by the County, with information on elevation and sediment chemistry within thirty days of final preparation of the information.
5. A. The Port, its officers, employees and agents, shall not be liable for any injury (including death) to any persons or for damage to any property regardless of how such injury or damage be caused, sustained or alleged to have been sustained by the County or by others, including but not limited to all persons directly or indirectly employed by the County, or any agents, contractors, subcontractors, licensees and

invitees of the County, as a result of any condition (including existing or future defects in the Premises) or occurrence (including failure or interruption of utility service) whatsoever related in any way to the Premises or the areas adjacent thereto or related in any way to the County's use or occupancy of the Premises and of areas adjacent thereto. The County agrees to defend and hold and save the Port harmless from all liability and expenses (including attorney's fees, costs, and all expenses of litigation) in connection with any such items of actual or alleged injury or damage, except when such injury or damage is caused by sole negligence of the Port. The County expressly agrees that its duty to defend and indemnify the Port includes negligent acts which are concurrent, contributory, or both, by the Port, resulting in said damage or injury. However, to the extent this License is construed to be subject to RCW 4.24.115, and where the injury or damage arises from the concurrent negligence of the Port and the County, the County's indemnity will only extend to its negligence.

B. In consideration of the Port's execution of this license agreement, the County hereby waives any immunity the County may have under applicable workers' compensation benefit or disability laws (including but not limited to Title 52 RCW) in connection with the foregoing indemnity. Such waiver shall not prevent the County from asserting such immunity against any other persons or entities.

6. The County shall not disturb the Port-owned real property other than to the extent that such disturbances are necessary for the completion of the required remediation.

7. The County shall comply with all applicable federal, state and local laws, ordinances, and regulations in conducting its activities pursuant to this license.

8. The County shall keep the Premises free and clear of any liens and encumbrances arising out of its activities relating to this license.

9. This license will terminate on April 1, 2005. The Port may terminate this license upon 48 hours' written notice in the event the County breaches the terms of this license.

10. This license may be executed in one or more counterparts, each of which may be deemed an original. All such counterparts together shall constitute one and the same document.

DATED this 28 day of January, 2005.

LICENSEE:

LICENSOR:

KING COUNTY

PORT OF SEATTLE

By: [Signature]

By: [Signature]

Its: Division Director WTD
Department of Natural Resources & Parks

Its: Managing Director Seaport

EXHIBIT A

Dec-17-2004 3:43pm dholanar January 24, 2005

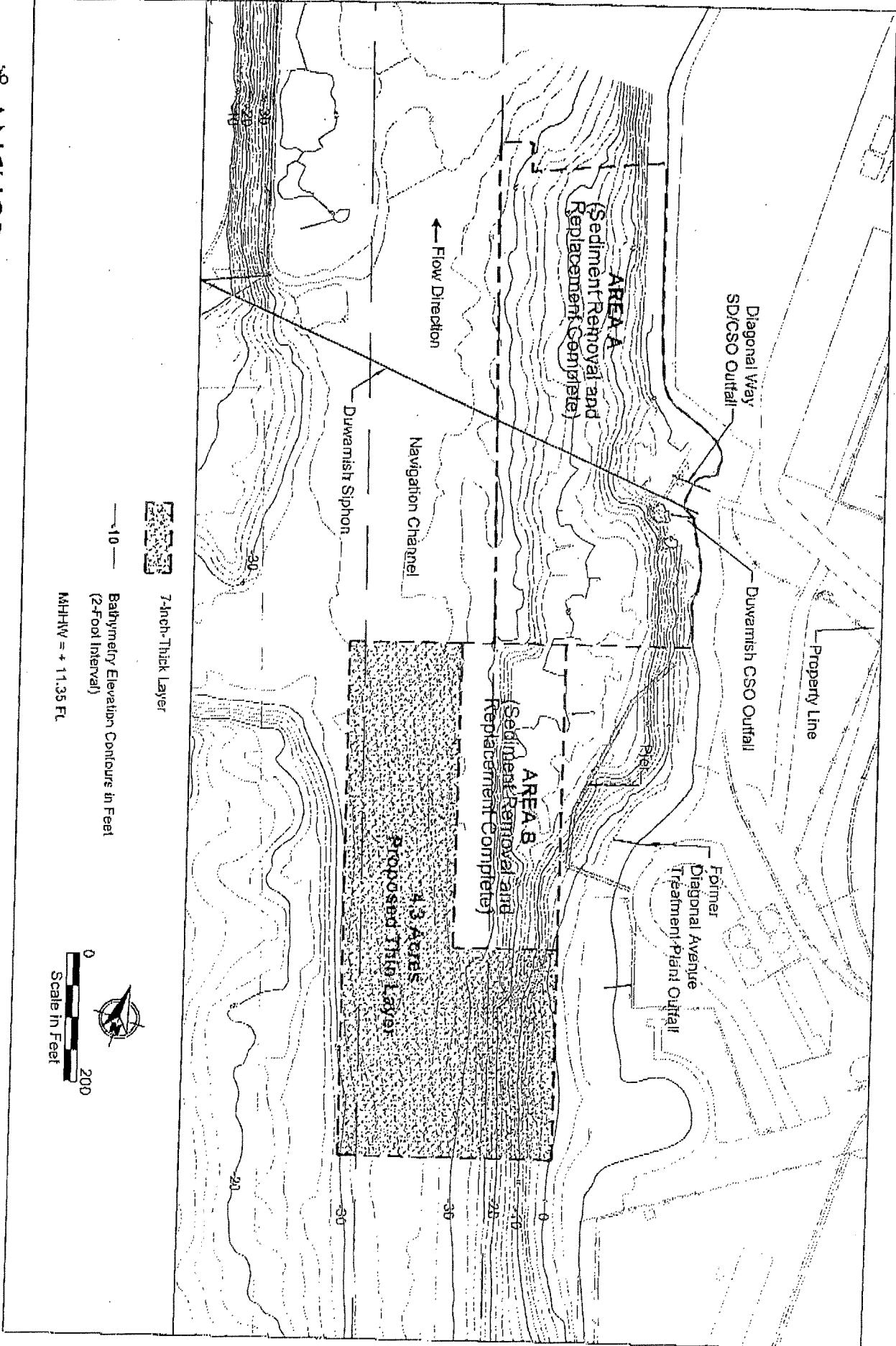


Figure 1
Thin Layer Placement Plan
Duwamish Diagonal Thin Layer Placement Project

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies earthwork, which consists of excavation, material, backfilling, compacting, and grading.
- B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
 - 1. Section 01560: Environmental Controls.
 - 2. Section 02221: Thin Layer Placement.

1.02 QUALITY ASSURANCE

- A. Referenced Standards. This provision incorporates by reference the latest version of the following standards. In case of conflict between the referenced standard and the requirements of this Section, this Section shall control.

<u>Reference</u>	<u>Title</u>
AASHTO T176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D422	Grain Size Distribution
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM E329	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
SW846-6000/7000 Series	Priority Pollutant Metals (EPA Methods)
SW846-Method 8260	Volatile Organic Compounds (EPA Method as modified by Puget Sound Estuary Program [PSEP])
SW846-Method 8270	Semi-Volatile Organic Compounds (EPA Method as modified by PSEP)
SW846-Method 8281	Pesticide (EPA Method as modified by PSEP)
SW846-Method 8282	Polychlorinated Biphenyls (PCBs) (EPA Method as modified by PSEP)
Standard Methods [SM] 5310B	Total Organic Carbon

- B. Tests:

- 1. A characterization of any and all imported material shall be performed by the Contractor prior to any on-site placement. The characterization will include analysis of a borrow source sample, site inspection, and site characterization.
- 2. Remove surface material at locations designated by the King County Department of Natural Resources and Parks (KCDNRP) Project Representative and provide such assistance as necessary for sampling and testing.
- 3. Testing by the KCDNRP Project Representative does not relieve the Contractor of its responsibility to determine to its own satisfaction when and if its work meets the Specifications.
- 4. Tests will be made in accordance with ASTM E329 in accordance with the following:

<u>Test</u>	<u>Standard Procedure</u>
Moisture content	ASTM D2216
Gradation	ASTM C136; ASTM D422
Priority Pollutant Metals	EPA SW846 6000/7000 Series
Volatile Organic Compounds	EPA SW846-Method 8240

Semi-Volatile Organic Compounds
Pesticides
PCBs
Total Organic Carbon

EPA SW846-Method 8270
EPA SW846-Method 8281
EPA SW846-Method 8282
SM 5310B

C. Inspection of Materials at the Site:

1. Truckloads or barges of import material shall be visually inspected by the Contractor upon delivery. Materials shall be inspected for the presence of foreign, recycled, or reprocessed material. The KCDNRP Project Representative may at any and all times perform an independent inspection. Material may be rejected if identified as substandard or test results show it to be substandard. Materials may be segregated for testing based on appearance or odor. Segregated materials may be tested according to designated procedures at the KCDNRP Project Representative's discretion.

1.03 SUBMITTALS

- A. Procedures: Section 01300.
- B. Source Identification: Prior to borrow source sampling, the Contractor shall provide documentation of the origin of borrow source materials and maps identifying specific location(s) of borrow sources.
- C. Samples of all fill materials to be used 14 days in advance of use. Samples shall consist of 0.5 cubic feet of each type of material. Each sample should be composited from no less than five subsamples taken throughout any one source. The Contractor shall assure that the samples(s) are representative of all materials to be imported.
- D. Inspection of Source: The borrow source shall be inspected by the Contractor. During such inspection, the Contractor shall assure that the materials to be delivered to the site are likely to meet the appropriate specifications. The Contractor shall provide the KCDNRP Project Representative with five-day notice of such inspections. At the KCDNRP Project Representative's discretion, the KCDNRP Project Representative or a representative may accompany the Contractor to witness such inspections. This witnessing shall in no way release the Contractor from complying with the specifications and shall in no way be construed as approval of any particular source of material.
- E. Laboratory test reports and samples of fill materials to be used: The Contractor shall provide the results of such tests at least five days before delivery of the materials to the site. Contractor's certification that the samples tested and the results provided are representative of materials that shall be delivered to the site. The results shall be provided in report form, with the reports clearly identifying the following:
 1. Source of samples.
 2. Sampling dates.
 3. Chain of custody.
 4. Sampling locations.
 5. Moisture density relationships and gradation test reports and curves.
 5. Gradation tests for non-cohesive materials.
 6. Dredged Material Management Program chemical test results as identified in subparagraph 1.02.B.4, of this Section.

PART 2 MATERIALS

2.01 FILL MATERIALS

- A. Base Cap Material
 1. Base cap material shall be clean, free-draining sand from a recognized and established borrow site or from a dredge site. The material shall be free of all objectionable coating and shall be suitable for open-water disposal when tested against the Dredged Material Management Program chemical guidelines.

2. Material shall be graded between the limits specified below:

<u>U.S. Standard Sieve Size</u>	<u>Percent by Weight Passing</u>
3/4 inch	100
U.S. No. 4	90 to 100
U.S. No. 10	60 to 85
U.S. No. 40	10 to 40
U.S. No. 200	0 to 2

PART 3 EXECUTION

3.01 CLASSIFICATION OF FILL

- A. Placement of Clean Material: Section 02221.
- B. Material type is specified in the contract drawings.
- C. Clean material average layer depth is specified in Section 01010.

END OF SECTION

SECTION 02221

THIN LAYER PLACEMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies requirements for capping of the dredged area.
- B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
 - 1. Document 00420 – Qualifications Information
 - 2. Document 00700 – General Conditions
 - 3. Document 00800 – Supplemental Conditions
 - 4. Section 01012 – Reference Material
 - 5. Section 01014 – Work Sequence
 - 6. Section 01063 – Health and Safety
 - 7. Section 01090 – Reference Standards
 - 8. Section 01195 – Protection and Maintenance of Property and Work
 - 9. Section 01200 – Contract Meetings
 - 10. Section 01300 – Submittals Procedure
 - 11. Section 01310 – Progress Schedules and Reports
 - 12. Section 01560 – Environmental Controls
 - 13. Section 02200 – Earthwork

1.02 QUALITY ASSURANCE

- A. Referenced Statutes and Regulations: This provision incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between these statutes and regulations, the more stringent shall control.

<u>Reference</u>	<u>Title</u>
33 U.S.C. 410	Rivers and Harbor Act
Chapter 296-62 WAC	WISHA General Occupational Health Standards
Chapter 296-67 WAC	WISHA Process Safety Management Standards
Chapter 296-155 WAC	WISHA Safety Standards for Construction
RCW 49.17	Washington Industrial Safety and Health Act (WISHA)

1.03 SUBMITTALS

- A. Procedures: Section 01300.

1.04 CONSTRUCTION PERIOD

- A. The work described in the following sections shall be performed during the period November 1, 2004 through March 1, 2005. Due to fisheries restrictions, no in-water work can be performed during the periods March 2 through October 31, 2005.

1.05 PLACEMENT

- A. The project area is located on the east bank and in the Navigation Channel of the Duwamish River and is approximately four acres in size. The required Thin Layer involves placing the amount of material within the area shown on the Drawings.

1.06 JOB CONDITIONS

- A. See APPENDIX B for geotechnical information on the site. The explorations are representative of the subsurface conditions at their respective locations. The Contractor shall determine the soil classification to his own satisfaction prior to bidding. Variations in the type of materials encountered may occur which do not materially differ from those indicated in this contract, and if encountered, will not be considered as basis for claims due to differing site conditions. The Contractor shall verify the quantity of sediments to be placed with a Thin Layer of clean material from the information on the drawings.
- B. E-Shaped Pier: An E-shaped pier is located east of the northern portion of the site. This pier shall not be damaged during cleanup operations, as defined in Section 01195 Protection and Maintenance of Property and Work.
- C. Control of pollutants other than sediment: All pollutants other than sediment that occur on site during construction shall be handled and disposed of in a manner that does not contaminate stormwater. Fueling of Contractor's equipment shall be performed away from storm drain outlets. Extreme care shall be taken to prevent fuel spills. A Contractor's representative shall be present at all times when equipment is being fueled. In the event of a spill the Fire Department or Coast Guard (if the spill occurs in the River) shall be called. Absorbent oil pads and drip pans shall be placed beneath the vehicle being fueled and under parked vehicles (overnight and otherwise). Absorbent materials, shovels, and five gallon buckets shall be provided and maintained for spill cleanup. No vehicle maintenance other than emergency repair shall be performed on the project site, nor are engine fluids to be stored on the project site.
- D. Interference with navigation: A portion of the project site is located within the Duwamish Waterway Navigational Project, with the remaining portion of the site adjacent to the navigational channel. The Contractor shall conduct its operations in a manner that will minimize interference with shipping and navigational activities, and comply with Coast Guard regulations.
- E. Protection of existing structures: Section 01095.

1.07 MISPLACED MATERIAL

- A. Should the Contractor, during the execution of the work, lose, dump, throw overboard, sink or misplace any material, cap, barge, machinery, or appliance, the Contractor shall promptly recover and remove the same. The Contractor shall give immediate verbal notice, followed by written confirmation, of the description and location of such obstructions to the King County Department of Natural Resources and Parks (KCDNRP) Project Representative and shall mark and buoy such obstructions until they are removed. Should the Contractor refuse, neglect, or delay compliance with this requirement, such obstructions may be removed by KCDNRP or its agents, and the cost of such operations may be deducted from any money due to the Contractor, or may be recovered from his bond. The liability of the Contractor for the removal of a vessel wrecked or sunk without his fault or negligence shall be limited to that provided in Sections 15, 19, and 20 of the River and Harbor Act of 3 March 1899 (33 U.S.C. 410 et seq.).

1.08 DEFINITIONS

- A. Ton: Short Ton equals 2,000 pounds (avoirdupois).

1.09 PLACEMENT PLAN

- A. Not later than 3 days after the effective date of Notice to Proceed, the Contractor shall submit to KCDNRP a detailed, written project Placement Plan. Refer to Section 01300 for submittal requirements. As a minimum, the plan shall contain the following:
 - 1. Order in which the work is to be performed indicating the work sequence; number, types and capacity of equipment to be used; hours of operation; methods of operation and the time

- required to complete each activity. A list of key personnel and supervisory chain will be included.
2. Source of Thin Layer placement materials and the methods, procedures and equipment to be used for transporting Thin Layer placement materials to the site.
 3. Methods, procedures and equipment to be used for placement of Thin Layer materials. Procedures and equipment to be used for layout of the work and positioning of placement equipment; and environmental monitoring, including procedures for emergency spill containment and removal operations. It is anticipated that placement will be based on dividing the site into a grid of small boxes that will be tied to the WinOps software system to spread a given amount of clean material within each box to arrive at the required average 9-inch thickness for the entire site. The Contractor will provide WinOps records that document each box received the required amount of material that was defined in the plan that will be accepted by KC. Additionally, KC will have a series of measuring stakes installed at the bottom of the placement area. The Contractor will be required to identify the stake locations relative to the WinOps grid used for material placement. The measuring stakes will be inspected during the diver-survey to determine if less than 6 inches of material covers the stakes, and if so, the Contractor will be required to place additional material to achieve 6 inches.
 4. Name(s) of equipment operator(s) having a minimum of 1 – 2 years of experience operating the selected equipment under contaminated sediment working conditions who will be retained to complete the Thin Layer Placement work.
 5. Provisions to demonstrate methods, procedures, equipment and operator(s) proficiency in implementing Placement Plan to the satisfaction of the County.

PART 2 MATERIALS

2.01 BASE CAP MATERIAL

- A. Material used as the base cap layer for the site as indicated on the Drawings, shall comply with specifications provided in Section 02200 Earthwork.

PART 3 EXECUTION

3.01 QUALITY CONTROL

- A. The Contractor shall furnish for review by KCDNR, after the Contract is awarded, its Contractor Quality Control (CQC) plan. This plan will be used to document the inspections, monitoring, surveys and other actions to be taken by the Contractor to ensure that the work complies with all contract requirements. The Contractor shall clearly discuss how he will control and monitor Thin Layer placement to ensure proper coverage and thickness are obtained. The Contractor shall assure that all required gauges, targets, ranges and other survey markers are in place and properly maintained. The Contractor shall install a tide gauge or staff at the capping location so that the operator and hydrographic surveyors can observe the water level at all times.
- B. The Contractor shall prepare and maintain a daily CQC report of operations and furnish a copy to the KCDNRP Project Representative on the day after the date of the report. (See Section 01999 for sample form). Information to be included in the report will be the date, period covered by the report, equipment used, description of activity as identified by stationing and offset, quantity of Base Cap material placed that day and to date, downtime and delays to the operation, safety, and other relevant comments concerning the conduct of the operation. The report shall include the results of all inspections, surveys and monitoring activities and shall be signed by the Contractor's superintendent.

3.02 SURVEYS

- A. Diver-survey: Upon completion of placement of clean material evenly throughout the site as demonstrated by quality control actions taken by the Contractor, KC will perform a diver-survey of the measuring stakes placed on the bottom of the placement area. The diver-survey will be used to verify the thickness of material placed throughout the site by the Contractor. If the diver-survey determines that portions of the site have material thickness of less than 6 inches, the Project Representative will direct the contractor to adjust its placement procedure to place additional material, in the areas of the site having material thickness of less than 6 inches, to assure compliance with the Drawings and permit requirements, at no additional expense to KC.
- B. Post-Placement Bathymetric Survey: A post-placement bathymetric survey will be performed by the Contractor and a chart provided to KC that also shows channel lines. The soundings will be in NOS MLLW. The Drawings show a detailed bathymetric survey from March 2003.
- C. Survey Conference: At the Pre-construction Conference specified in Section 01200 Part 1.02, the Contractor's chief surveyor shall meet with the KCDNRP Project Representative to discuss survey procedures, datums, methods, and equipment to be used for the Contractor's surveys. Any additional horizontal or vertical control references, not shown on the drawings, will be provided to the Contractor at this time.
- D. Ranges and Tide Gauges: The Contractor shall furnish, set and maintain in good order, all ranges, buoys, and other markers necessary to define the Work and to facilitate inspection. The Contractor shall establish and maintain a tide gauge or board in a location where it may be clearly seen during Thin Layer placement operations and inspections. The Contractor shall also install an automatic recording tide gauge with water level sensor. The tide gauge shall provide a continuous recording of tidal change for every 15-minute interval or each 0.1 foot change, whichever occurs first. Tidal changes shall be recorded in MLLW datum, with these changes visually provided to the equipment operator at all times during the Thin Layer placement process to allow proper adjustment of cap depth. All costs for providing the tide gauges and other survey control shall be included in the bid price for placement.
- E. Positioning Equipment and Methods: The Contractor shall employ a suitable method to locate and control horizontal placement position that will include: Differential Global Positioning System (DGPS) tied to the WINOPs system. Accuracy of vertical positioning shall result in a thin layer with minimum thickness of 6 inches.

3.03 CONDUCT OF PLACEMENT

- A. Layout of Work: An accurate method of horizontal control shall be established by the Contractor before placement begins. The proposed method and maintenance of the horizontal control system shall be subject to the approval of the KCDNRP Project Representative and if, at any time, the method fails to provide accurate location for the placement operation, the Contractor may be required to suspend its placement operation. The Contractor shall lay out work from horizontal and vertical control points indicated on the drawings and shall be responsible for all measurements taken from these points. The Contractor shall furnish at its own expense all stakes, templates, platforms, equipment, range markers, transponder stations, and labor as may be required to lay out the work from the control points shown on the drawings. It shall be the responsibility of the Contractor to maintain all points established for the work until authorized to remove them. If such points are destroyed by the Contractor or disturbed through its negligence prior to authorized removal, they shall be replaced by the Contractor at own expense.
- B. Placement of Clean Material: Thin Layer Placement material shall be placed from the bottom (toe) of the slope upward. The Contractor shall pay particular attention to the conditions of issued permits and authorizations requiring minimizing turbidity and disturbance of contaminated bottom sediments as placement material contacts the river bottom and adherence to water quality requirements. Up to 2 spuds and up to 2 anchors may be used to stabilize and position the barge. Spudding within the placement area can only occur within unplaced portions of the area. No anchoring will be allowed within the placement area. No spudding, anchoring, or

disturbance of any kind shall occur to the existing adjacent cap area completed during the 2003-2004 work window.

- C. Best Management Practices (BMPs) during Placement: To minimize the take of Puget Sound (PS) chinook salmon and PS/Coastal bull trout and siltation of the beach area and bed, the Contractor shall implement the following BMPs:
1. An experienced KCDNRP Project Representative and/or inspector will oversee work activities to ensure implementation of BMPs and adherence to all work plans.
 2. The rate of Thin Layer placement material distribution over the project area should be slow to avoid turbidity clouds, resuspension of contaminated bottom sediments into the water column, and impacts to any fish species that may be present. If the KCDNRP Project Representative directs the Contractor to slow material distribution speed, or to stop material distribution, any time delays will be at the Contractor's own expense.
 3. The Contractor will adhere to the KC-accepted material distribution rate per unit area such that the thickness of material placed will be equivalent to 9 inches evenly throughout the site.
 4. If fish kill occurs or fish are observed in distress, the project activity shall immediately cease and WDFW Habitat Program shall be notified immediately.
 5. The bucket used to distribute clean material above water shall not be used under water to change the bottom elevation of the site.
- D. Placement: No placement may occur during the period March 2 through October 31, 2005, which is the fishery closure period in the Duwamish River established for this project, unless an extension is granted by the appropriate regulatory agencies in advance.
- E. No compaction is required. Sufficient material shall be placed evenly across the site in the quantity defined on the Drawing to achieve a minimum of 6 inches.

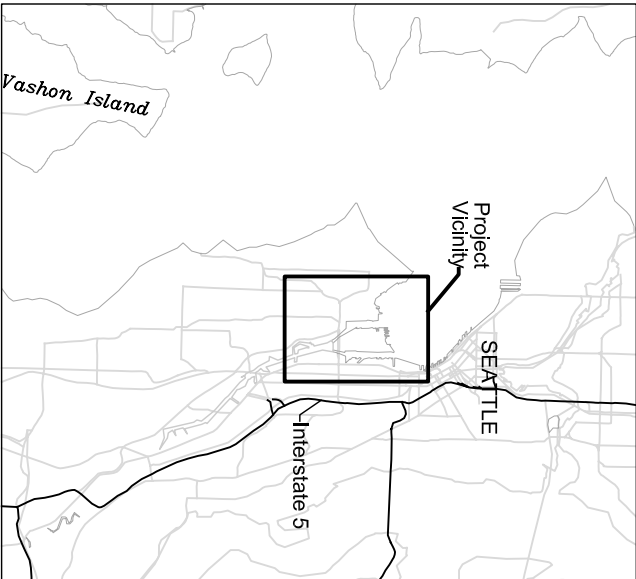
END OF SECTION

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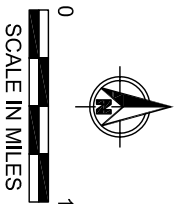
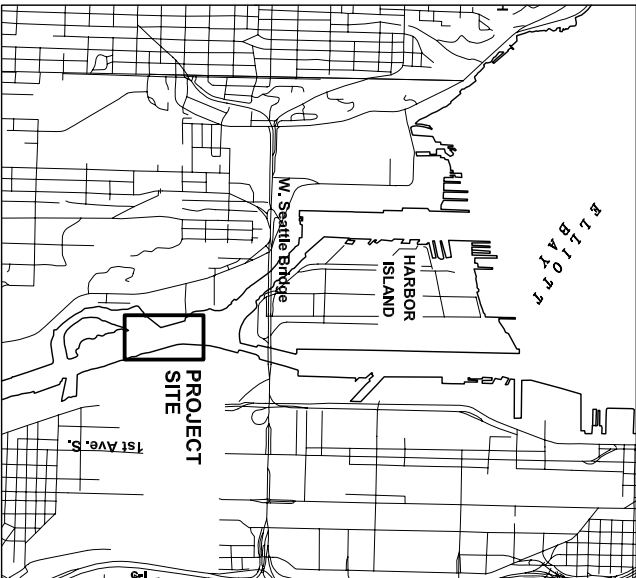
D/D THIN LAYER PLACEMENT PROJECT

KING COUNTY DEPARTMENT OF NATURAL RESOURCES AND PARKS

LOCATION MAP



PROJECT VICINITY



DRAWING INDEX

SHEET #	SHEET TITLE
T-1	COVER SHEET
C-1	THIN LAYER PLACEMENT PLAN

COVER SHEET

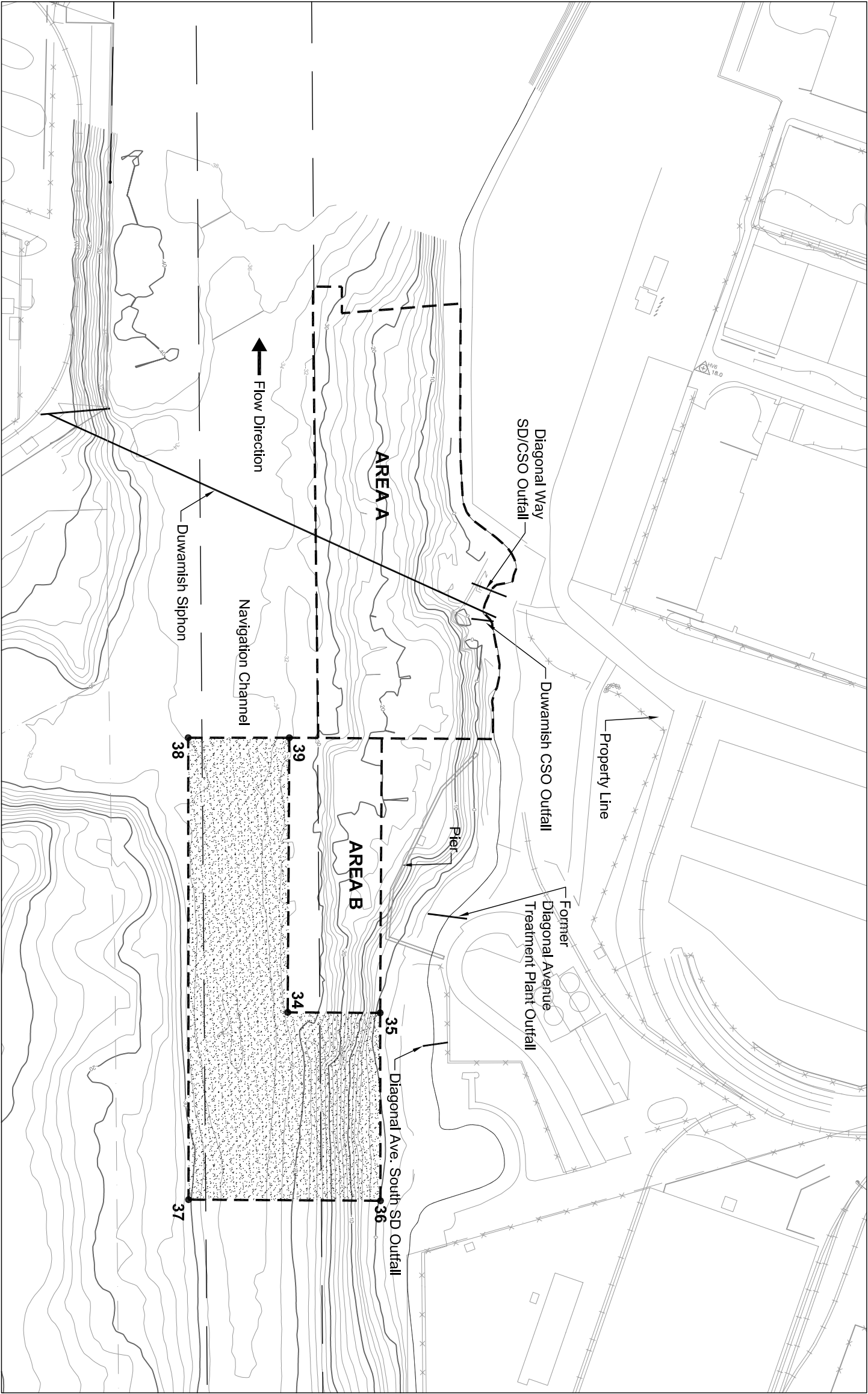
DESIGNED B. McDONALD
DRAWN S. DEKLEVA
CHECKED J. VERDUIN
SCALE AS NOTED
DATE DECEMBER 2, 2004
DESIGN REVIEW

SHEET 1 OF 2

SHEET T-1



Capping Coordinates:		
Point	Easting	Northing
34	1267073.00	208278.15
35	1267225.46	208326.69
36	1267326.45	208017.77
37	1267009.92	207916.98
38	1266762.45	208676.68
39	1266928.89	208730.76




— -10 — Bathymetry Elevation Contours in Feet
(2-Foot Interval)

- Notes:
1. Topography/Basemap provided by the Port of Seattle (1994). This data is to be used for visual reference only.
 2. Bathymetric contours created by Anchor Environmental from BWE (March 2004), Miller (March 2004), and David Evans (August 2003) surveys referenced to MLLW (NOS).


 5,500 Tons of Base Cap placed evenly in this location.

 37 Control point location and number





ANCHOR
ENVIRONMENTAL, L.L.C.



BRUCE McDONALD
STATE OF WASHINGTON
PROFESSIONAL ENGINEER
32855
EXPIRES: 10/30/04

REVISIONS				DESIGNED BY: B. McDONALD DRAWN BY: D. HOLMER CHECKED BY: J. VERJUN APPROVED BY: _____ FILE: _____ DATE: DECEMBER 2, 2004	D/D THIN LAYER PLACEMENT PROJECT THIN LAYER PLACEMENT PLAN	DRAWING NO. 02006701-CA-P02 PROJECT NO. 020067-01 SHEET NO. 2 OF 2 SHEET C-1
REV	DATE	BY	APPD	DESCRIPTION		

DRAFT

APPENDIX D

PHOTOS



Photo 1
Support barge and capping barge



Photo 2
EX1800 hydraulic excavator with 16 CY skip box



Photo 3
16 CY skip box



Photo 4
16 CY skip box with capping material



Photo 5
Placing ENR material

APPENDIX E

CONTRACTOR DAILY REPORTS

Contractor Daily Reports
provided on CD at back of report

APPENDIX F

INSPECTOR DAILY REPORTS



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 1 (2005)

KING COUNTY CONTRACT NO.: C33027C

CONTRACT TITLE: Duwamish/ Diagonal Sediment Remediation
Project

PRIME CONTRACTOR: Miller Contracting

TIME WORK STARTED: 0700

TIME WORK STOPPED: 1900 (KC APPROVED SCHEDULE)

Date						
Year	Month	Day	Inspector			
2005	February	19	Keith N.			
Day of the Week						
Sat	Sun	Mon	Tue	Wed	Thu	Fri
X						
Weather						
Clear	PC	Overcast	Fog	Rain		
X						
Temperature						
10-32	32-55	55-70	70-85	85+		
	X					

Construction Activities:	<p>0700hrs. - JJM Crew leaves for ME216/ME209 platform. 0900hrs. - SCUBA divers on site. 1000hrs. - Informed by JJM (B. Murphy) that the starter motor for the PACO unit that operates the spuds on the ME209 platform was inoperable, and that a replacement was being sought. 1223hrs. - JJM (B. Murphy) phoned from the barge to inform the Team that starter motor was replaced. 1230 -1300hrs. - Tug "Jennifer H." moved platform into position above stake position DUD 4SP; crew readied the equipment (including moving front loader over to the "Western Provider" aggregate barge for first trial placement).</p> <p>1300hrs. - JJM begins initial trial spreads using their Hitachi 1800 Excavator/16 cu. yd. "skip" unit over the agg. barge. 1311hrs. - 1st trial spread over water at stake position DUD 4SP (Present for initial Trials this Day: U. Oleru, J. Stern, P. Hackney, P. Romberg, KC/WTD; B. McDonald (the EoR), AE: B. Helland, Wa. DOE; J. Malak, US EPA). 1345 -1430hrs. - SCUBA crew reports on the results of JJM's 1st trial spreads at stake DUD 4SP. B. McDonald reports "uneven/ inconsistent results" in 35'± water after the 1st passes. 1440hrs. - JJM performs a 2nd group of trial spreads over the agg. barge to check their spreading methods. 1445hrs. - 2nd trial spreads over water in the area of stake DUD 4SP. 1505 - 1600hrs.- SCUBA team back in the water to analyze and report results. Once again, the divers are radioing B. McDonald of "uneven/ inconsistent results"; that sand is apparently spreading haphazardly over app. a four "cell" area at from 1"-3" average consistency. 1615 - 1630hrs. - "Jennifer H." moves JJM platform downriver to attempt a 3rd trial run in DUD 4SP area (37'± depth at that time). 1630 - 1717hrs. - 3rd trial spreading runs at stake position DUD 4SP. 1719hrs. - "Jennifer H." moves JJM platform upriver (S.) 1737 -1833hrs. - SCUBA team back in the water to analyze and report results of JJM's 3rd trial spreading runs. 1635 - 1900hrs. - Crew shuts down the platform.</p>
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U. Oleru 2/23/05
Ukwenga Oleru, Project Representative (Date)

Keith Nordlund 2/20/05
Keith Nordlund, Construction Inspector (2/20/05)



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 1 ('05)
CONTRACT NUMBER: #C33027C

Miscellaneous:	Team held first on site meeting at the KC Duwanish Pump Station between 0830-0930hrs.		
Safety/Accidents:	JJM did not report any Safety accidents/incidents to KC this day.		
Problems Encountered & Resolutions:	1) JJM platform was immobile from 0700hrs. until 1223hrs. due to a broken starter motor on the motor unit on ME209 that operated the spuds. JJM found and installed a complete replacement unit to resolve the problem. 2) Problem with the inconsistency of deep water trial spreads was not resolved this day. B. McDonald reported that the SCUBA team would not be available until Monday, 2/21/05 Holiday to check further deep water spreading trials. It was resolved between JJM (B. Murphy), and B. McDonald, with the concurrence of KC (U. Oleru) that JJM could begin thin capping in shallow "up slope" water E. of DUD 4SP.		
Test Conducted:	1311hrs. - cell. call to J. Blaine at KCEL that thin capping initial trial ops. were underway at DuWa/Diagonal site. 1440 -1545hrs. KCEL on site to perform Ebb tide turbidity/dissolved. Oxygen tests. 1530hrs - KCEL boat beached, and J. Blaine reported verbally that their onboard meter was showing very little turbidity movement out of river bottom soils, that most of the turbidity was showing up in the top 1/3 of the river water. Best guesstimate from B. McDonald was that the KCEL meter was reading the plume of clean fines from the blend sand spreading ops.		
Work Rejected:	No work was rejected this day by KC.		
Instructions Given to Contractor & Changes Initiated:	1830hrs. - Agreement was reached after field discussion between JJM (B. Murphy), and B. McDonald, with the concurrence by phone of KC (U. Oleru) that when no consistent pattern of sand spread was found after several trial runs this day in deep river water, that JJM could begin thin capping in the shallow "up slope" water E. of DUD 4SP. The rationale between the parties was that JJM could get consistent results with spreads in the shallow water just W. of the Park.		
Visitors to Site			
Equipment/ Personnel	<table><tr><td>Tug "Jennifer H." (Boyer, rented) ME216/ME209 Work Platform Manitowoc 4000W crane Hitachi 1800 series Excavator Front end loader (1)Barge "Western Provider" Crew Skiff</td><td>1- Supervisor 2-Tug crew 2- Survey Crew</td></tr></table>	Tug "Jennifer H." (Boyer, rented) ME216/ME209 Work Platform Manitowoc 4000W crane Hitachi 1800 series Excavator Front end loader (1)Barge "Western Provider" Crew Skiff	1- Supervisor 2-Tug crew 2- Survey Crew
Tug "Jennifer H." (Boyer, rented) ME216/ME209 Work Platform Manitowoc 4000W crane Hitachi 1800 series Excavator Front end loader (1)Barge "Western Provider" Crew Skiff	1- Supervisor 2-Tug crew 2- Survey Crew		

KCW 2/20/05



**KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION**

Inspector's Daily Construction Report

REPORT NUMBER: 2 (2005)

KING COUNTY CONTRACT NO.: C33027C

CONTRACT TITLE: Duwamish/ Diagonal Sediment Remediation
Project

PRIME CONTRACTOR: Miller Contracting

TIME WORK STARTED: 0700

TIME WORK STOPPED: 1900 (KC APPROVED SCHEDULE)

<u>Date</u>						
Year	Month	Day	Inspector			
2005	February	20	Keith N.			
<u>Day of the Week</u>						
Sat	Sun	Mon	Tue	Wed	Thu	Fri
	X					
<u>Weather</u>						
Clear	PC	Overcast	Fog	Rain		
X		t				
<u>Temperature</u>						
10-31	32-55	55-70	70-85	85+		
	X					

Construction Activities:	<p>0700hrs. - JJM Crew leaves for ME216/ME209 platform. 0738 - 1045hrs. JJM working on production thin layer capping in "up slope" area E. of stakes DUD 4SP to DUD 14SP (JJM grids G17 to G-26) 1045hrs. - JJM (B. Murphy) phoned from the barge to inform the KC about the ME216 platform spud problem. 1200hrs. - Tug "Jennifer H." repositions platform, capping work resumes in JJM grid/cell G26 in app. 20'± water.</p> <p>1212hrs. - "Jennifer H." pushes JJM platform downriver to begin spreads on (JJM) F line grid/cells using the Hitachi 1800 Excavator/16 cu. yd. "skip" unit. 1215hrs. Cell phone call to Jean on the KCEL Research boat to cancel Flood Tide Turbidity tests due to the duration of JJM spud equipment breakdown. 1231hrs. - JJM resumes thin capping spreads near DUD 4SP stake. 1430hrs. - 2nd line of production capping spreads ends in the area of stake DUD 14SP. 1433hrs. - "Jennifer H." moves JJM platform downriver to attempt a 3rd run in DUD 4SP area (JJM grids D19, E19) immediately S. of the four (4) cell (JJM grid/cells E17, E18, D17 and D18) trial placement area placed yesterday (2-19-05). 1520hrs. - B. Murphy, JJM, cell phoned this observer to confirm hydraulic hose blowout on the Hitachi Excavator. 1540hrs. - B. Murphy, JJM, calls this observer to cancel further capping operations this day.</p>
Miscellaneous:	1540 - 1600hrs. - Cell phoned B. Helland, DOE, and Jean on the KCEL boat, to confirm the JJM capping cancellation, and that Turbidity Tests for the afternoon Ebb Tide were also cancelled. Relieved by U. Oleru, left site.
Safety/Accidents:	JJM did not report any Safety accidents/incidents to KC this day.
Problems Encountered & Resolutions:	1) JJM platform was immobile from 1045hrs. until 1221hrs. due to problem with equipment associated with operating the spuds. This event occurred on crane barge ME216. JJM repaired

U. Oleru

2/23

Ukwenga Oleru, Project Representative (Date)

Keith Nordlund
Keith Nordlund, Construction Inspector (2/21/05)



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 2 ('05)

CONTRACT NUMBER: #C33027C

	the problem. 2) 1520hrs. the Hitachi 1800 Series Excavator blew out a hydraulic hose toward the direction of the ME209 deck. JJM went into spill response mode immediately, and little if any hydraulic fluid reached the river. The Contractor cell phoned (B. Murphy) at 1545hrs., that there would be no further thin layer capping due to the hydraulic break, cleanup and subsequent repair.														
Test Conducted:	No turbidity tests were taken this day because the timing and durations of JJM work, and breakdowns of JJM equipment listed above in the Problems Encountered section. The morning Ebb Tide test window had passed before JJM operations had gotten far enough along to perform a valid test (per Jean, KCEL).														
Work Rejected:	No work was rejected this day by KC.														
Instructions Given to Contractor & Changes Initiated:	0700-0740hrs. Received phone calls from each of the below listed persons confirming yesterday's agreement (reached after field discussion between JJM (B. Murphy), the EoR (B. McDonald, AE), and KC (U. Oleru) that JJM could begin thin layer capping in the shallow "up slope" water E. of DUD 4SP, in the shallow water (up to 20' depth) just W. of the Park.														
Visitors to Site	J. Stern (0900- 1106hrs), U. Oleru, KC (1600 -?) B. Helland, DOE (0900-1115hrs)														
Equipment/ Personnel	<table><tr><td>Tug "Jennifer H." (Boyer, rented)</td><td>1- Supervisor</td></tr><tr><td>ME216/ME209 Work Platform</td><td>2-Tug crew</td></tr><tr><td>Manitowoc 4000W crane</td><td>1-Survey Crew</td></tr><tr><td>Hitachi 1800 Series Excavator</td><td>1-Operator</td></tr><tr><td>Deere 744J Front end loader</td><td>5-Deck force</td></tr><tr><td>(1) Barge "Western Provider"</td><td></td></tr><tr><td>Crew Skiff</td><td></td></tr></table>	Tug "Jennifer H." (Boyer, rented)	1- Supervisor	ME216/ME209 Work Platform	2-Tug crew	Manitowoc 4000W crane	1-Survey Crew	Hitachi 1800 Series Excavator	1-Operator	Deere 744J Front end loader	5-Deck force	(1) Barge "Western Provider"		Crew Skiff	
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Hitachi 1800 Series Excavator	1-Operator														
Deere 744J Front end loader	5-Deck force														
(1) Barge "Western Provider"															
Crew Skiff															

KLN 2/21/05



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 3 (2005)

KING COUNTY CONTRACT NO.: C33027C

CONTRACT TITLE: Duwamish/ Diagonal Sediment Remediation
Project

PRIME CONTRACTOR: Miller Contracting

TIME WORK STARTED: 0700

TIME WORK STOPPED: 1900 (KC APPROVED SCHEDULE)

Date						
Year	Month	Day	Inspector			
2005	February	21	Keith N.			
Day of the Week						
Sat	Sun	Mon	Tue	Wed	Thu	Fri
Hol.						
Weather						
Clear	PC	Overcast	Fog	Rain		
X						
Temperature						
10-31	32-55	55-70	70-85	85+		
	X					

Construction Activities:	0700hrs. - JJM Crew leaves for ME216/ME209 platform. 0740hrs. - "Jennifer H." pushes work platform downriver to (JJM) grid/cells D18 E18. 0812hrs. JJM working production thin layer capping in an upriver progression between app. stake locs. DUD 4SP and DUD 14SP (JJM grid/cells D18 - D27, and E18 - E27). 0827 hrs. - SCUBA team on site. 0845hrs. - "Jennifer H." repositions JJM work platform. KCEL boat on site to run tests. (0909hrs. - Jean cell phone this observer that KCEL research boat was able to get a valid test from JJM production work, even when the JJM barge movements threatened to go past the Tide window). 0909 - 0945hrs. - JJM resumes production oriented capping. 0940 - 1100hrs. - B. McDonald and SCUBA team review the results of JJM production capping from yesterday and this morning. JJM platform on stand by. 1120hrs - JJM resumes production capping for D and E line cells after conference between EoR, KC and JJM about results of SCUBA investigation. 1130hrs. - SCUBA Team left the site for the day 1226hrs. - KCEL boat on site for Flood Tide event tests. At that time JJM platform was working in the area of stake loc. DUD 14SP. 1245 - 1440hrs. JJM completes capping work in D and E line cells. 1500hrs. - After short JJM Crew afternoon break, Tug "Jennifer H." begins pushing the JJM platform downriver, and into the Navigation Channel. 1520 - 1759hrs - JJM capping work resumes without significant interruptions, in JJM grid/cell D1 and ends in D11 to complete this Day's production run.
Miscellaneous:	1) 0800hrs. - Cell phoned B. Murphy, JJM, to confirm an app. time divers were anticipated on site. JJM had arranged <u>last night</u> with B. McDonald, AE, to contact the SCUBA team once they had worked capping a large enough area to warrant an investigation. 2) 1600hrs. - Cell phoned U. Oleru to update him on the Contractor's progress, and to inform him that we were beginning operations along the Navigation Channel.

Ukwenga Oleru 2/23
Ukwenga Oleru, Project Representative (Date)

Keith Nordlund 2/22/05
Keith Nordlund, Construction Inspector (2/22/05)



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 3 ('05)
CONTRACT NUMBER: #C33027C

Safety/Accidents:	JJM did not report any Safety accidents/incidents to KC this day.	
Problems Encountered & Resolutions:	No significant problems were reported by the Contractor regarding the work performed this day.	
Test Conducted:	Valid Turbidity tests were taken this day between 0845hrs - 0909hrs. (Ebb Tide), and between app. 1230 1245hrs. (Flood Tide) by KCEL (Jean). JJM (B. Murphy) was notified of the results of those tests as soon as CM received the information from the KCEL Research boat. All tests taken this day from JJM operations were within acceptable limits. B. Helland, DOE, was also given the information received from KCEL tests by this observer when he visited the site this day.	
Work Rejected:	No work was rejected this day by KC.	
Instructions Given to Contractor & Changes Initiated:	1125hrs. - Phoned U. Oleru, KC, with the information received from the SCUBA investigation of JJM's work to date. Mr. Oleru was further informed that B. McDonald was fairly satisfied that the spreading method arrived with JJM, late afternoon 2-19-05, was getting at least minimum (.5') acceptable cover results in the areas where the SCUBA team checked the stakes, even though the "drop deposits" were dispersing over a larger area than B. McDonald had anticipated. B. Murphy was fairly certain that with the type of grid patterns that JJM was running that the overlaps of material into additional cells would get the uniform thickness required by the agreement and specs. Note: in response to a question from this observer, B. McDonald said that he, and the other SCUBA team members have not seen any significant fish activity in the site areas they have been working.	
Visitors to Site	U. Oleru, KC; B. Helland, DOE	
Equipment/ Personnel	Tug "Jennifer H." (Boyer, rented) ME216/ME209 Work Platform Manitowoc 4000W crane Hitachi 1800 Series Excavator Deere 744J Front end loader (1) Barge "Western Provider" Crew Skiff	1- Supervisor 2-Tug crew 1-Survey Crew 1-Operator 5-Deck force

KLR 2/22/05



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 4 (2005)

KING COUNTY CONTRACT NO.: C33027C

CONTRACT TITLE: Duwamish/ Diagonal Sediment Remediation
 Project

PRIME CONTRACTOR: Miller Contracting

TIME WORK STARTED: 0700

TIME WORK STOPPED: 1900 (KC APPROVED SCHEDULE)

Date						
Year	Month	Day	Inspector			
2005	February	22	Keith N.			
Day of the Week						
Sat	Sun	Mon	Tue	Wed	Thu	Fri
X						
Weather						
Clear	PC	Overcast	Fog	Rain		
X						
Temperature						
10-12 arr	32-55	55-70	70-85	85+		
		pm				

Construction Activities:	<p>0700hrs. - JJM Crew leaves for ME216/ME209 work platform. 0720 - 0820hrs. - JJM crew replaced the hydraulic hose that ruptured (and was replaced with a field fix) 2/20/05, with a stronger hose section. 0820hrs. - "Jennifer H." pushes work platform downriver to (JJM) grid/cells D12 to D16, and JJM resumed thin layer capping work. 0830hrs. - KCEL boat on site to run tests. 0845hrs. - Jean cell phoned this observer that KCEL Research boat was able to get a test series from JJM production work, even when the JJM start time threatened to go past the Ebb Tide window). 0910hrs. - "Jennifer H." pushes JJM work platform downriver. 0924hrs. - JJM sets spuds, and begins thin layer capping in an upriver progression starting at (JJM) grid/cell C1 (seven cells N. of stake location DUD 6SP). 1112hrs. - JJM begins capping work in grid/cell C8 (loc. of stake DUD 6SP). "Jennifer H." continues upriver tows, punctuated by JJM setting spuds at new cell locations on C area cells. No significant breaks in JJM thin layer capping production observed on C area cells. 1235hrs. - Tug "Jennifer H." tows JJM work platform out of the Navigation Channel to allow passage of marine traffic. 1245hrs. - Barge "Anchorage Provider" passes downriver and through the site. 1240hrs - KCEL boat on site for Flood Tide turbidity tests. 1249hrs. - Tug "Jennifer H." begins pushing the JJM platform downriver, and into the Navigation Channel to resume "C" cell capping operations. 1252hrs. - B. McDonald, and AE SCUBA team on site. B. Helland, DOE, also arrives on site at this time. 1300hrs - JJM capping work resumes in JJM grid/cell C10. 1320hrs. - KCEL boat leaves site after taking Flood Tide turbidity tests with Hach Meter. 1515 - 1530hrs. - JJM stops production to allow "Tilbury Cement" barge to pass downriver in Nav. Channel. SCUBA team left water as well. 1530hrs. - 1600hrs. - JJM spreads the last of the blend sand from the materials barge "Western Provider". Spreading ends in (JJM) grid/cell C20 to complete this Day's production run. 1627hrs. - JD 744J Loader is lifted by crane from the "Western Provider" back on to the JJM work platform.</p>
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Attachments: 1) page, KCEL Turbidity Test info.

Ukwenga Oleru 2/23/05
 Ukwenga Oleru, Project Representative (Date)

Keith Nordlund 2/23/05
 Keith Nordlund, Construction Inspector (2/23/05)



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 4 ('05)

CONTRACT NUMBER: #C33027C

Miscellaneous:	1) 0800hrs. - Cell phoned B. Murphy, JJM, to confirm an app. time divers were anticipated on site, and to get JJM plan for the day. JJM (B. Murphy) said that JJM had arranged <u>last night</u> with B. McDonald, AE, to have the SCUBA team on site after 1200hrs. 2) 1430hrs. - Cell phoned U. Oleru to update him on the Contractor's progress.
Safety/Accidents:	JJM did not report any Safety accidents/incidents to KC this day.
Problems Encountered & Resolutions:	JJM (B. Murphy) reported that the first barge (Western Provider) would be emptied of sand this afternoon, and JJM would not get another barge out of the Lehigh Pit in B.C. until Thursday, 2-24-05. He informed the team that the original barge delivery schedule was based on smaller volume spreading equipment. Glacier Pit, Wash. was backed up with customers, and not an available option to supply sand for this project.
Test Conducted:	Valid Turbidity tests were taken this day between 0845hrs - 0915hrs. (Ebb Tide), and between app. 1233 - 1345hrs. (Flood Tide) by KCEL (Jean and David). JJM (B. Murphy) was notified of the results of those tests as soon as CM received the information from the KCEL Research boat. All tests taken this day from JJM operations were within acceptable limits. B. Helland, DOE, was also given the information received from KCEL tests by this observer when he visited the site this day (1252 - 1450hrs.).
Work Rejected:	No work was rejected this day by KC.
Instructions Given to Contractor & Changes Initiated:	1535 - 1600hrs. - U. Oleru, KC, was on site to receive the information from B. McDonald on the results of this day's SCUBA investigation of JJM's work to date. Mr. Oleru was informed that B. McDonald was fairly satisfied that the spreading method arrived with JJM, late afternoon, was getting at least minimum (.5') acceptable cover results in the areas where the SCUBA team checked the stakes, and that the wide dispersion in deep water is adding to the previous capping spreads in other cells. Note: B. McDonald said that he, and the other SCUBA team members did not see any significant fish movements through the site areas they investigated this day.
Visitors to Site	U. Oleru, KC; S. Jacobs, JJM; B. Helland, DOE; K. Takasaki, USACE
Equipment/ Personnel	<div> Tug "Jennifer H." (Boyer, rented) ME216/ME209 Work Platform Manitowoc 4000W crane Hitachi 1800 Series Excavator Deere 744J Front end loader (1) Barge "Western Provider" Crew Skiff </div> <div> 1- Supervisor 1-Tug captain 1-Survey Crew 2-Operators 4-Deck force </div>

Duwamish Diagonal Sediment Remediation Project Enhanced Natural Recovery Capping Project Turbidity Measurements

All results are report in NTU

Flood Tide										Ebb Tide							
Sample Date	Time	DUWREF (Surface) -reference s	MCTS	DUWREF (Bottom)	MCTS	DUW150S (Bottom)	DUW300S (Surface)	DUW300S (Bottom)		Time	DUWREF (Surface) -reference s	MCTS	DUWREF (Bottom)	MCTS	DUW150N (Surface)	DUW300N (Surface)	DUW300N (Bottom)
2/19/05	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		15:24	2.7	12.7	2.1	12.1	10	2	4.71
2/20/05	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2/21/05	12:02	1.8	11.8	1.3	11.3	8.8	2	8.5		8:56	1.7	11.7	1.4	11.4	2.5	2.4	3.7
2/22/05	12:33	2.13	12.13	1.71	11.71	1.81	1.84	1.39		8:45	1.8	11.8	1.82	11.82	2.7	2.16	3.55
2/23/05			10		10							10		10			
2/24/05			10		10							10		10			
2/25/05			10		10							10		10			
2/26/05			10		10							10		10			
2/27/05			10		10							10		10			
2/28/05			10		10							10		10			
3/1/05			10		10							10		10			
3/2/05			10		10							10		10			
3/3/05			10		10							10		10			
3/4/05			10		10							10		10			
3/5/05			10		10							10		10			
3/6/05			10		10							10		10			

All results are report in NTU

MCTS = Maximum Calculated Turbidity Standard

MCTS = Lab REF value plus 10 NTU when <50NTU

MCTS = Lab REF value plus 20 % when bkg >50NTU



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 5 (2005)

KING COUNTY CONTRACT NO.: C33027C

CONTRACT TITLE: Duwamish/ Diagonal Sediment Remediation
Project

PRIME CONTRACTOR: Miller Contracting

TIME WORK STARTED: 0700

TIME WORK STOPPED: 1900 (KC APPROVED SCHEDULE)

Date						
Year	Month	Day	Inspector			
2005	February	23	Keith N.			
Day of the Week						
Sat	Sun	Mon	Tue	Wed	Thu	Fri
				X		
Weather						
Clear	PC	Overcast	Fog	Rain		
X						
Temperature						
10-32	32-55	55-70	70-85	85+		
am		pm				

Construction Activities:	0945hrs. - Visited the site to confirm status of the work. Contractor ME209/ME216 platform is currently situated S. of the Contract Thin Layer Capping area with two spuds down. No activity was observed. 1030hrs. - Left site and returned to Matthews Pump Station.
Miscellaneous:	Note: While at the Duwamish/Diagonal site, cell phoned B. Murphy, JJM, and confirmed that JJM did not have any personnel on the site this day. JJM (B. Murphy) informed this observer that the second materials barge was still due in local waters early Thursday morning, 2-24-05, in time for a full shift that day.
Safety/Accidents:	JJM did not report any Safety accidents/incidents to KC this day.
Problems Encountered & Resolutions:	No problems were reported to KC by JJM.
Test Conducted:	Talked to Bob Kruger (phone call) this morning to cancel field Turbidity tests this day.
Work Rejected:	No work was rejected this day by KC.
Instructions Given to Contractor & Changes Initiated:	No field directives were issued to the Contractor this day by KC.
Visitors to Site	No visitors were observed during this KC site visit.

Attachments: none

Ukwenga Oleru 3/3/05
Ukwenga Oleru, Project Representative (Date)

Keith Nordlund 2/23/05
Keith Nordlund, Construction Inspector (2/23/05)

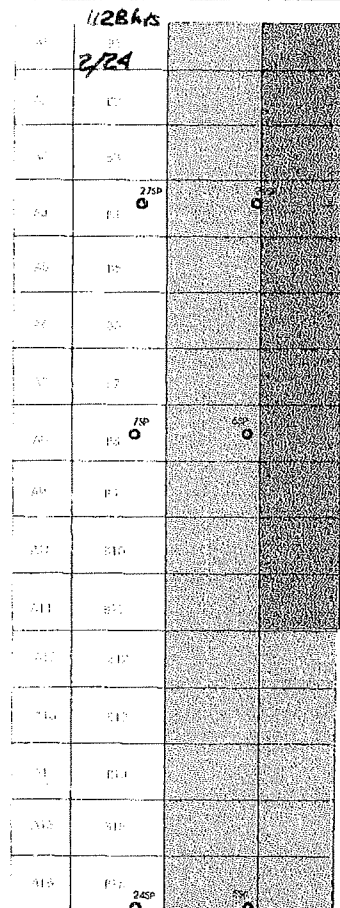


KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 5 (05)
CONTRACT NUMBER: #C33027C

Equipment/ Personnel	(On Standby) ME216/ME209 Work Platform Manitowoc 4000W crane Hitachi EX1800 Excavator Deere 744J Front end loader Crew Skiff	0 JJM personnel on site
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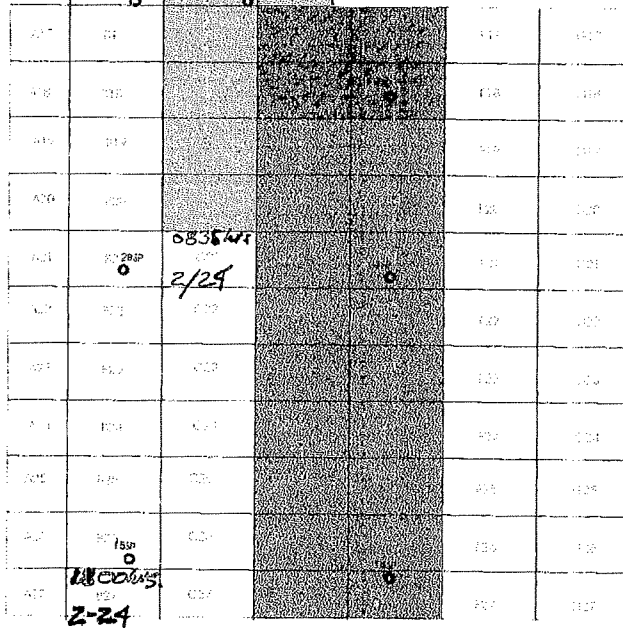
February 19, 2005

February 20, 2005

February 21, 2005

February 22, 2005

Scale
1"=60'



Duwamish Capping Project - Daily Progress Chart
Miller Contracting

Date: February 22, 2005
Finishing Cell: C 20



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 6 (2005)

KING COUNTY CONTRACT NO.: C33027C

CONTRACT TITLE: Duwamish/ Diagonal Sediment Remediation
Project

PRIME CONTRACTOR: Miller Contracting

TIME WORK STARTED: 0700

TIME WORK STOPPED: 1900 (KC APPROVED SCHEDULE)

Date						
Year	Month	Day	Inspector			
2005	February	24	Keith N.			
Day of the Week						
Sat	Sun	Mon	Tue	Wed	Thu	Fri
					X	
Weather						
Clear	PC	Overcast	Fog	Rain		
X						
Temperature						
10-32	32-55	55-70	70-85	85+		
am			pm			

Construction Activities:	0658hrs. - Two tugs leave with materials barge ITB -240 from Port of Seattle Pier at the N. end of the work site. 0700hrs. - JJM crew leaves for the work platform. 0724hrs. - JJM Manitowoc crane transfers 744J Loader to new materials barge "Alaska Provider"; JJM crew continues to prepare the platform to get underway, after a day off the site yesterday. 0820hrs. - JJM platform underway to the working area with assist from "Jennifer H". 0835hrs. - JJM begins thin layer capping in (JJM) grid/cells C20, C21 (N. of stake DUD 28SP). This observer cell phoned B. Kruger at KCEL to prepare for morning Ebb Tide tests. 0859hrs. - JJM repositions the materials barge to get the barge forecastle clear of the swing of the EX1800 Excavator. 0910hrs. - KCEL boat on site to begin Turbidity tests. 1055hrs. - JJM ends "C" area production capping in (JJM) grid/cell C27. 1100hrs. - "Jennifer H" begins pushing the work platform N. toward (JJM) grid/cell B1. 1128hrs. - JJM begins thin layer capping in "B" area (in the Navigation Channel, three JJM cells N. of stake DUD 27SP. 1115hrs. - B. Rudd, JJM, delivers newly updated JJM Progress Chart to this observer. Kym Takasaki, USACE, visited the site to confirm status of the work. Contractor ME209/ME216 platform is currently situated S. of the Contract Thin Layer Capping area with two spuds down. No activity was observed. 1030hrs. - Left site and returned to Matthews Pump Station. 1412hrs. - B. Kruger cell phoned this observer to confirm completion of Flood Tide Turbidity tests. JJM continues production capping in (JJM) "B" area with only minor breaks to lift spuds and move barge upriver. 1447hrs. - Spoke briefly with B. Murphy and B. Rudd, JJM on the beach. The work platform had just begun spreading in (JJM) grid/cell B16. 1500hrs. - B. Helland, DOE on site to observe capping work. 1800hrs. - JJM completes production run through "B" cells (near stake DUD 15SP).
Miscellaneous:	0900 - 0920hrs. - Met with B. Rudd, and JJM surveyor Matt, on the beach in the Duwamish/Diagonal Park area to discuss getting an updated JJM Progress Chart. Showed JJM a copy of the Fig. 5 drawing that reflects the stake layout in the working grounds. Up until

Attachments: 1) page, JJM Progress Chart

UR Oleru 3/3/05
Ukwenga Oleru, Project Representative (Date)

Keith Nordlund 2/25/05
Keith Nordlund, Construction Inspector (2/25/05)



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 6 ('05)

CONTRACT NUMBER: #C33027C

	today, JJM had been using stake layout shown in Fig. 4 drawing, which does not show stakes DUD -26SP, -27SP and -28SP. 1500 - 1530 hrs. - Met with B. Rudd, JJM and B. Helland, DOE at the Duwamish/Diagonal Park site. B. Helland is concerned that JJM has no contingency plan should divers find any of the work site areas short of .5' minimum coverage required by agreement for this job. B. Rudd called B. Murphy, JJM, and discussed DOE's concerns. This observer contacted U. Oleru about DOE's concerns. JJM will attempt to hold back some materials for touchup work, but that once the sand on this barge was gone, they had no assurance that their insurance would allow them to purchase any more	
Safety/Accidents:	JJM did not report any Safety accidents/incidents to KC this day.	
Problems Encountered & Resolutions:	No problems were reported to KC by JJM.	
Test Conducted:	Both Flood and Ebb Tide field Turbidity tests were taken this day. All test results showed the Contractor was within specified limits.	
Work Rejected:	No work was rejected this day by KC.	
Instructions Given to Contractor & Changes Initiated:	No field directives were issued to the Contractor this day by KC.	
Visitors to Site	Kym Takasaki, USACE; B. Helland, DOE; B. Murphy, JJM; U. Oleru, KC	
Equipment/ Personnel	Materials barge "Alaska Provider" ME216/ME209 Work Platform Manitowoc 4000W crane Hitachi EX1800 Excavator Deere 744J Front end loader Crew Skiff	1- Supervisor 2- Operators 4- Deck hands 1- Tug captain 1- Surveyor



February 19, 2005



February 20, 2005



February 21, 2005



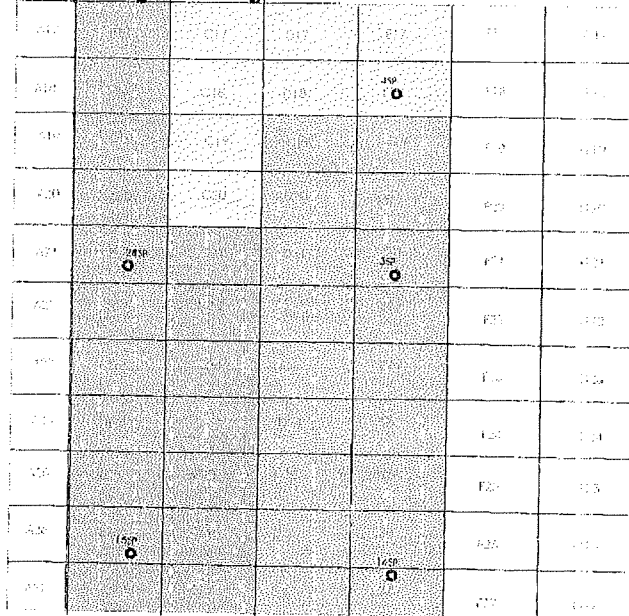
February 22, 2005



February 24, 2005



Scale
1"=60'



Duwamish Capping Project - Daily Progress Chart
Miller Contracting

Date: February 24, 2005
Finishing Cell: B 27



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 7 (2005)

KING COUNTY CONTRACT No.: C33027C

CONTRACT TITLE: Duwamish/ Diagonal Sediment Remediation
Project

PRIME CONTRACTOR: Miller Contracting

TIME WORK STARTED: 0700

TIME WORK STOPPED: 1900 (KC APPROVED SCHEDULE)

<u>Date</u>						
Year	Month	Day	Inspector			
2005	February	25	Keith N.			
<u>Day of the Week</u>						
Sat	Sun	Mon	Tue	Wed	Thu	Fri
						X
<u>Weather</u>						
Clear	PC	Overcast	Fog	Rain		
		X				
<u>Temperature</u>						
10-32	32-55	55-70	70-85	85+		
	X					

Construction Activities:	<p>0700hrs. - JJM crew leaves the beach for the work platform. Contractor ME209/ME216 work platform is currently situated S. of the C33027C contract Thin Layer Capping area, with two spuds down, near (JJM) grid/cell B27. 0740hrs. - JJM work platform gets underway (with assist from "Jennifer H"; materials barge "Alaska Provider") for the working grounds, at grid/cell A1 (nearest stake loc. is DUD 27SP). 0751hrs. - This observer cell phoned John Blaine to set up this morning KCEL Ebb Tide turbidity tests. 0759hrs. - JJM begins thin layer capping in (JJM) grid/cell A1 (N. of stake DUD 27SP). "Jennifer H." proceeds upriver with the work platform. JJM is capping at a steady pace with only occasional short stops to have the tug relocate the platform, and to pick and reset spuds. 0930hrs. - KCEL boat on site to begin Turbidity tests. 1000hrs. - This observer cell phoned work platform (B. Rudd, JJM) to come over and pick up KC personnel (E. Tate, P. Hackney) for pre-arranged visit to the work platform. 1010hrs. - KCEL boat leaves site after completing Ebb Tide Turbidity tests. 1035hrs. - JJM takes a short operations break to allow river traffic through the site. The JJM work platform was not required to pull off line during this event. 1045hrs. - KC personnel (E. Tate, P. Hackney) leave the work platform, and return to Duwamish/Diagonal Park area. B. Rudd, JJM, delivers newly updated JJM Progress Chart to this observer. 1045 - 1110hrs. Emile Petrie, USACE, visited the site to confirm status of the work. 1215hrs. - J. Irby, KC at the Duwamish/Diagonal Park area to observe the work. 1227 - 1300hrs. - JJM completes production in "A" and "27" grids, finishes the offloading of barge "Alaska Provider", and begins demobilization. Note: Per agreement with KC, and based on the best previous information (given to both B. McDonald and U. Oleru) on production progress provided by JJM, SCUBA Team will not be on site until tomorrow.</p>
Miscellaneous:	<p>1000hrs. - Met with B. Rudd, and JJM surveyor Matt, on the beach in the Duwamish/Diagonal Park area, and received an updated JJM Progress Chart. 1120hrs. - Met B. Murphy, JJM, in Duwamish/Diagonal Park area. At the request this observer, he cell</p>

Attachments: 1) page, JJM Progress Chart

U Oleru 3/3/05
Ukwenga Oleru, Project Representative (Date)

Keith Nordlund 2/25/05
Keith Nordlund, Construction Inspector (2/25/05)



KING COUNTY
DEPT. OF NATURAL RESOURCES
WASTEWATER TREATMENT DIVISION

Inspector's Daily Construction Report

REPORT NUMBER: 7 ('05)

CONTRACT NUMBER: #C33027C

	phoned B. Rudd to confirm near completion of "A" grid/cells. B. Murphy and B. Rudd, JJM, said that when "A" grid was completed, it was JJM's intention to spread any sand that was left on the "Alaska Provider" along "27" grid/cells (cells where B. McDonald and AE SCUBA team indicated areas of less than required .5' capping coverage on 2-23-05). B. Helland, DOE, had also expressed concern yesterday during a visit, that JJM did not appear to have a contingency plan, should divers find any of the work site areas short of .5' minimum coverage required by agreement for this job, should production use up all the "Alaska Provider" barge sand prior to final Dive Team inspection.	
Safety/Accidents:	JJM did not report any Safety accidents/incidents to KC this day.	
Problems Encountered & Resolutions:	No problems were reported to KC by JJM.	
Test Conducted:	Ebb Tide field Turbidity tests were taken this day. Production ended prior to workday Flood Tide event (tests were cancelled by this observer cell phone to J. Blaine). All field test results indicated the Contractor was within specified limits.	
Work Rejected:	No work was rejected this day by KC.	
Instructions Given to Contractor & Changes Initiated:	No field directives were issued to the Contractor this day by KC.	
Visitors to Site	Emile Petrie, USACE; E. Tate, P. Hackney, J. Kirby, KC; B. Murphy, JJM	
Equipment/ Personnel	Materials barge "Alaska Provider"	1- Supervisor
	ME216/ME209 Work Platform	2- Operators
	Manitowoc 4000W crane	4- Deck hands
	Hitachi EX1800 Excavator	1- Tug captain
	Deere 744J Front end loader	1- Surveyor
	Crew Skiff	

Construction Daily Report

Duwamish/Diagonal Sediment Remediation

Anchor Project Number: 020067-01

Book Number: 1

From 2/19/05 to _____





Work Hours: 0700 to 1900 Sub. to

Day: SAT

Date: 19 Feb 05

Weather AM: *Clear*

PM: 2:05

4

○F

Tides: Time: Height:

03410

10.5

0854

7.7

1244

9.10

2030

0.5

Contractor: Miller Contractors Sub:

Contractors Rep and Title: Brian Murphy

Work Day Charge: \$100.00 Day: 10 Reason:

Project Pictures? ☐ Yes ☐ No

Subjects

Visitors: Brad Holland, Jeff Stern, Priscilla Mackinnon

Diary (Report of Day's Operations, Orders given and received, discussions with contractor, visitors, unusual conditions, major material deliveries, delays)

0700 DEPART home

0800 Arrive Dragonfly Way Viewpoint. Keith Nordlund at KC on-site.

JJM Moving sand on supply barge

0830 Ukwenza Oleru, Jeff Stern, Priscilla Hackney, Brian Murphy, was

Bruce McDonald

Resident Engineer

Project Engineer



ANCHOR

ENVIRONMENTAL, L.L.C.

Diary (continued)

Date: 2/19/05 Report Number: 1

Ch 69
Tug 16

meet in Pre-Con coordination meeting.
 Water Quality monitoring @ 300' 150' 100'. John
 Blaine will be doing WQ cell 391 4482.
 Equipment: JSM will use EX1800 hydraulic excavator (veg oil)
 on barge 209. Crane is on 216 to move loader
 on to Material barge. Material barges: Western
 Provider Assist Tug Jennifer H. operated by
 Boyer Skip Box - 16 cy MAX capacity but
 will be 12-13 cy capacity. Hydraulic operation
 Working cells 50' x 30' which is ~ 3 1/2 boxes. About
 42 cy per cell.

0910 Eric Parker + Dale Dickinson on site

0930 Coordination meeting ends.

Discover starter Motor on Spud Winch broken. Miller
 Crew goes to get another one.

1230 Replacement Motor on site. Moving into position.

1315 Miller Placing Material in cell with 4SP stake,

1355 Divers in water to check coverage

Approx 2-3 inches placed within this cell + cell North and
 in cells to east. Additional stake was placed 30' North in
 adjacent cell - 3" deep here.

1430 ± Additional material - 3 or 4 buckets placed in same cell as before.

1500 Divers re-enter water to check status. 4SP has 3" of material.
 rebar 5-10' east of 4SP has 0.3' rebar 10' north has 0.5 ft.
 Rebar 30' north of 4SP has 0.3 ft. Placed new stakes 25 ft +
 35 ft N of 4SP both have about 0.2 ft of sand there. The 30' + 35'
 stakes have gravel as base. This is probably the cap of
 Area B.

1600 ± Discuss situation w/ Miller, King Co, at Ecology separately.
 We ~~believe~~ that the material is being widely dispersed. The
 speculate

current plan is to place Material in the cell north of the
 cell w/ 4SP and the 2 cells west of them. KC + Ecology
 Agree w/ this Plan. Miller directed to do this.

1730 Divers re-enter water + inspect all 4 cells. 4SP has 4"
 of material; half way to 10' North there is 0.6' to 0.7'. 10' N has
 0.5'; East Stake 0.3'; 30' North - 0.4'; 25' N - 0.4'; 35' N - 0.1';
 15' South - 0.3'; 10' South - 0.2'; Divers move west + place
 stakes at 40' W (0.3') 50' W (0.3') Divers North and
 place stakes 25' N of 50' W (50W 25N) and 30' N of 50' W
 (50W 30N). Both of these have 0.1' of material.

1830 Discuss w/ Miller. If Divers are Available, they will place
 material in 2 cells South of 4SP; if not they will work shore

1930 Depart site

2100 call Brian and inform him no divers for Sunday

Bruce McDonald
 Resident Engineer

Project Engineer


$$D/D$$

Daily Construction Report Number: 2

Work Hours: 0700 to 1700 Sub. to

Project Number: 020067-01 Day: Sunday Date: 2/20/05

Weather AM: clear L: 30 °F PM: clear H: 45 °F

Tides:	Time	Height
	0421	10.9
	0941	7.3
	1344	9.1
	2113	0.0

Contractor: Miller Sub:

Contractors Rep and Title: Brian Murphy

Work Day Charge: _____ Day: _____ Reason: _____

Project Pictures? ☐ Yes ☐ No Subject: _____

Visitors: _____

[illegible]

Diary (Report of Day's Operations, Orders given and received, discussions with contractor, visitors, unusual conditions, major material deliveries, delays)

0700 Contractor Arrives on site. Places ENR Material in the 2 ~~to~~ most easterly rows of cells which cover the slope
1430 Receive call from Brian Murphy. They have finished placing material on slope. He asks for direction.


Resident Engineer


Project Engineer



Diary (continued)

Date: 2/20/05

Report Number: 2

I direct Brian to place material in the 4 cells adjacent to and south of the cell w/ 45P
1530 I Brian calls & says they broke a hydraulic line and are repairing it. No spill in the water.
1600 Visit site. Miller's crew fires up excavator but there appears to be another leak. Depart site.
1730 Return to site. Miller has departed.

Bruce McDonald
Resident Engineer

Project Engineer



D/D

Work Hours: 0700 to Sub. to

Weather AM: Clear L: 30 °F PM: 5 H: 7 °F

Tides:	Time	Height
	0453	11.2
	1015	6.9
	1437	9.2
	2150	-0.2

Contractors Rep and Title: Brian Murphy

Project Pictures? ☐ Yes ☐ No Subject: _____

Visitors: _____

[illegible]

Dale Dickinson
Dennis Handlick
Bruce McDonald
450

0715 Arrive 1st Ave South Boat Ramp & load out boat = Bruce McAnold
0830 Arrive @ site. Miller still placing material in 4 o'ls south of 9SP
1014 down in water - Dale Dickman 4SP - 0.6 ft of cap; 25' N 0.4';
20" N 0.3' N; 35' N 0.5'; 10' N 0.8' 1'; 40' W - 0.6 ft;

Project Engineer



305 0.9 ft thick

Diary (continued)

Date: 21 Feb 2005

Report Number:

3

- 50' W - 0.5 ft; 50' W + 25' N - 0.2 ft; 50' W, 30' N - 0.2 ft;
~110' E = 0.8 ft; 155' - 0.4 ft; placing stakes at 30' south and
60' ft south of origin; thickness at 60' S = 0.50 ft; at 30' S - 0.9 ft.; the
30' S stake is near a compression on the bottom - creates magnetic anomaly;
1100 Diver out of water. Discuss measurements w/ Keith
& Brian. We agree that we are getting good coverage
when adjacent cells are placed. Contractor directed
to continue placing material in the 'E' line moving
south (this is the line w/ 4SP in it). Then move to
the 'D' line.
1115 Depart site for boat ramp.
1130 Call Jeff Stern @ King Co. & tell him our observations
and conclusions. He concurs with us. We will be
back on site tomorrow afternoon to dive on 3SP
and 14SP, assuming contractor is done there.
1200 Depart boat ramp.
1300 Arrive home after dropping GPS off w/ Eric

Resident Engineer

Project Engineer



ANCHOR
ENVIRONMENTAL, L.L.C.

 Δ/D

Daily Construction Report Number: 4

Work Hours: 0700 to Sub. 28 to

Project Number: 020067-01 Day: Tuesday Date: 22 Feb 04

Weather AM: clear L: 30 °F PM: clear H: °F

Tides:	Time	Height
	0520	11.3
	1044	6.3
	1525	9.4
	2224	-0.2

Contractor: Miller Contracting Sub:

Contractors Rep and Title: Brian Murphy

Work Day Charge: _____ Day: 2 Reason: _____

Project Pictures? ☐ Yes ☐ No Subject:

Visitors:

[illegible]

Diary (Report of Day's Operations, Orders given and received, discussions with contractor, visitors, unusual conditions, major material deliveries, delays)

0900 Contact Brian Murphey to determine how work is going. They finished the 'E' & D lines to the south + 'D' line from D1 to D11 yesterday. They will do D12-D16 + start on 'C' line today. still planning to meet @ ramp @ noon.

Bruce McDonald
Resident Engineer

Project Engineer



40 0.6 ft 40SE 0.4

Diary (continued)

Date: 2/22/05 Report Number: 4

1100 Depart home for site
 1200 Arrive boat ramp. Load out equipment
 1240 Depart ramp for D/A site
 1255 Arrive site to inspect 3SP, 14SP
 1337 Diver in water at 3SP - visibility is variable 0-5 ft
 at 3SP - cap thickness = 0.7 ft; at 5' west = 0.8 ft thick
 at 14SP - cap thickness = 0.3 ft; cackle clams and other bivalves
 are emerging to the surface; at 40' east, thickness = 0.6 ft; sand
 holes were observed - 2 to 3 ft deep and 4 to 5 ft across at the
 surface sloping inward with distance before surface; holes were made
 prior to application of capping material; at 40' SE - cap
 thickness is 0.4 ft; 35' S - 0.4 ft thick; at 20' S -
 thickness = 0.5 ft; 20' W - 0.4 ft thick; at 20' S -
 thickness is 1.1 ft; diver heard at 1415; at 26SP, 26SP -
 0.5 ft thickness; communication from Sealed Tug and Barge, 1508, that
 a tug/barge combination is enroute to provide local tow power.
 diver in water at 6SP at 1519; at 6SP - 0.6 ft thickness - tug/barge are
 approaching and diver is surfacing.
 1530 Diver finished. Go to beach and discuss results with
 Keith and Ukukenga.
 1600 Depart site for Boat Ramp
 1645 Depart boat ramp for Tacoma; Boat in tow for delivery to
 Eric Parker

diver
at 1503



Work Hours: 0730 to Sub. to

Weather AM: fog L: 35 °F PM: 40 °F H: 45 °F

Tides:	Time	Height
	0000	1.2
	0633	11.5
	1244	3.1
	1825	9.6

Contractor: Miller Sub: _____

Contractors Rep and Title: _____

Work Day Charge: _____ Day: _____ Reason: _____

Project Pictures? ☐ Yes ☐ No Subject: _____

Visitors: _____

[illegible]

Diary (Report of Day's Operations, Orders given and received, discussions with contractor, visitors, unusual conditions, major material deliveries, delays)

0730 Arrive Eric Parker's house. Hitch boat to truck; Load out gear
0800 Depart Tacoma for 1st Ave boat ramp
0830 Arrive 1st Ave boat ramp. Meet w/ Dale Dickinson
Load out boat and set up for diving operations

Bruce Mc Donald

Resident Engineer

Project Engineer

Project Engineer



4x6
2 ft

clam photos of 28 SP

Diary (continued)

Date: 26 Feb 05 Report Number: 5

at 7 SP - 0.6 ft cap thickness; Spudhole in 24 ft SSW of 7 SP - 7 ft diameter
at mudline and 2 ft deep; second spudhole 10 ft west of 7 SP - 4x6 and 1 ft mudline
and 2 ft deep; 3 1/2 ft NE 10 ft; 16 ft 23 ft at oval 6x4 ft 2 ft deep long side along channel;
at 27 SP - 0.6 ft cap thickness; 13 photos of first hole at 27 SP.
at 28 SP - 0.7 ft cap thickness; spudhole 9 ft E also 24 ft SW both 6' dia.
and 2 ft deep; at 24 SP - 0.5 ft cap thickness; spudhole 12 ft east,
5 ft dia and 2.5 ft deep - 3 photos taken; at 5 SP - 0.7 ft cap
thickness; spudhole 14 ft NNE; 5 ft dia circle and 1.5 ft deep; a spudhole is
in bottom; at 15 SP - 1 ft cap thickness; spudhole 12 ft NNW
4 ft dia and 1.5 ft deep; also 20 ft N 5 ft dia 2 ft deep;
at 14 SP; 0.5 ft cap thickness; a tug / barge passed 20 ft W 6 ft dia,
2 ft deep spudhole; tug / barge long passed 15 ft west of 14 SP; ~~apparent~~
~~in the dragging~~ up to 100 ft west, there was no evidence of dragging of Michel Chain.

1230 Depart D/D site for boat ramp

1300 Depart boat ramp w/ boat for Tacoma

1400 Arrive @ Eric Linker's house Return vessel & all rental Equipment

Bruce McDonald

Resident Engineer

Project Engineer

APPENDIX G

SPI PRE- AND POST-CONSTRUCTION REPORTS



GERMANO & ASSOCIATES, INC.
12100 SE 46th Place
Bellevue, WA 98006

www.remots.com

Telephone: (425) 865-0199 • Fax: (425) 865-0699 • Mobile: (425) 891-2121 • Email: joe@remots.com

March 2, 2005

Mr. Bruce McDonald
Mr. Clay Patmont
Anchor Environmental, LLC
1423 3rd Avenue, Suite 300
Seattle, WA 98101

RE: Duwamish Diagonal SPI Baseline Survey Results

Dear Bruce/Clay,

On February 8, 2005, scientists from Germano & Associates, Inc. performed an SPI survey at the 28 stations selected by Anchor Environmental for the baseline survey at the Duwamish Diagonal; the purpose of this initial SPI survey was to document conditions after the dredging and capping of the Areas A and B (Figure 1). This survey will serve as a baseline against which future surveys can be compared after the placement of additional cap material in the Enhanced Natural Recovery (ENR) area immediately adjacent to Area B (Figure 1). Additional goals of this survey included documenting the presence of any cap material from non-ENR construction that had spread outside Areas A&B, measuring the bioturbation depth of the resident infauna, and determining if any residual sediment dispersed from the dredging operation could be identified.

Three replicate profile images were taken at each location; the complete results of the image analysis are displayed in Table 1, and a separate CD with digital image files for all sediment profile images collected in the survey will be mailed to you under separate cover.

Results:

Prism Penetration Depth:

The SPI prism penetration depth was measured from the bottom of the image to the sediment-water interface. The area of the entire cross-sectional sedimentary portion of the image was digitized, and this number was divided by the calibrated linear width of the image to determine the average penetration depth. The stop collars on the camera (that prevent over-penetration in soft sediments) were set to their maximum height, and the only variation in the camera settings were the number of lead weights added to the camera chassis (Table 1); for the majority of the stations, the maximum number of lead weights that can be placed in the camera (5) were used, resulting in an extra 250 lbs of driving force for the prism. Prism penetration ranged from 3.8 - 17.3 cm (Figure 2), with

the variation mainly a function of the degree of consolidation and amount of sand in the sediment.

Presence of Cap Sands:

The key feature in identifying the cap sands was the sediment grain-size, followed by sorting and their presence in bands, laminae or layers (Figure 3). The capping materials used for backfilling the dredged remediation areas were graded medium sands and habitat mix, with each having particle sizes equal to or larger than 3-2 phi. Examples of habitat mix/medium sand can be seen in the images from Stations 11 and 19 (see image files on separate CD), while examples of the medium sand capping material can be seen at Stations 5, 6, 8, and 9 (see image files on separate CD).

In most cases the cap material is present at the sediment-water interface as a distinct layer that is in the process of being admixed into the sediment column via bioturbation or via physical processes (see image from Station 12). The sandy fraction of the capping material is the most widespread; this was an expected result, because the high gravel fraction of the “habitat mix” would help minimize spreading due to fluidization during placement. Also, the larger/heavier particles in the “habitat mix” would minimize the amount of time the particles are suspended in the water column and subject to current/tidal flows.

Ambient sands that were being transported down the Duwamish can also be seen in the upper portion of the sediment column at many stations (examples can be seen in the images from Stations 13 and 25 on enclosed CD). These differ from the cap materials in that the particle size is smaller (typically 4-3 phi to 3-2 phi), and they are mixed into the sediment column without a distinct contact between the sand layer and underlying silts. There may be some cap sand particles mixed with these “native sands” but there were not enough clear diagnostic criteria to unequivocally designate them as cap sands.

Bioturbation Depth

Evidence of deposit-feeding or burrowing infauna were found at all stations surveyed (Figure 4). Bioturbation depths ranged from 1.8 cm to more than 15 cm, with reworking depths increasing as stations were further away from the recently disturbed area and located on ambient bottom.

Residual Sediment from Dredging:

The identification of residual sediment spread from dredging activities is dependent on the optical properties of the dredged sediment. The best example we have for the optical properties of dredged sediment is characteristics of native sediments upstream of the dredged area (Stations 13, 14, 15, and 25; see images on enclosed CD). In addition, the syntactical evidence of sediment deposition, exclusive of cap material, was used in discerning potential dredged material residuals from ambient sediments. This interpretation was complicated by the sampling locations within a riverine/deltaic system,

where episodic deposition and remobilization of sediment is a commonplace, natural occurrence.

Native silts appeared to be a light gray, cohesive silt clay and dark olive-gray silt/clay. The dark olive gray sediment can be seen as a distinct subsurface band in most of the images from the site. The gray clay was never seen in at the sediment water interface in stations that exhibit *undisturbed* native sediment. The presence of light gray clasts and smears of light gray sediment (similar to that observed in the subsurface native sediments adjacent to the dredge prisms) in the upper portion of the sediment column was considered to be evidence of the presence of dredged residuals. There was too little optical difference to differentiate the olive-gray sediment from native deposition and dredged residuals, unless the dark gray sediment was present in discrete clasts or in a syntactically different layer.

Residuals were observed in some images, but were rarely present in continuous bands or as a distinct depositional layer. Thus residual characterization is limited to identifying discrete allochthons (typically present as cohesive mudclasts) in the sediment column, and their presence is noted in the comment field in Table 1; there was never a distinct layer of residuals in any of the images collected that we could measure.

If you have any questions or need additional information, please do not hesitate to get in touch.

Sincerely,

Joseph D. Germano, Ph.D.
President

Table 1. Complete analysis data and comments for profile images from the February 8, 2005 Baseline Survey; calibration image width = 14.59 cm. Values plotted in associated maps for the first 5 stations are the average value for the 3 replicate measurements.

Station	Rep	Time	Water Depth (m)	# of weights	Pen Area (sq. cm)	Mean Penetration (cm)	RPD Area (sq. cm)	Mean RPD (cm)	Cap Area (sq. cm)	Mean Cap Thickness (cm)	Bioturbation Depth (cm)
DuDi 01	A	15:02:58	8.9	5	150.00	10.28	14.69	1.01	Trace	Trace	6.26
DuDi 01	B	15:03:28	8.9	5	226.86	15.54	20.04	1.37	Trace	Trace	5.97
DuDi 01	C	15:04:29	9	5	189.46	12.98	16.73	1.15	0.00	0.00	4.17
DuDi 02	A	15:15:40	8.9	5	37.49	2.57	12.32	0.84	Trace	Trace	3.03
DuDi 02	B	15:19:36	9	5	238.73	16.36	18.76	1.29	22.55	1.55	7.57
DuDi 02	C	15:20:14	9	5	217.90	14.93	17.58	1.20	23.93	1.64	7.34
DuDi 03	A	11:10:13	11.1	3	224.35	15.37	44.91	3.08	Trace	Trace	11.60
DuDi 03	B	11:10:54	11	3	214.03	14.67	64.61	4.43	Trace	Trace	12.77
DuDi 03	C	11:12:02	11.2	3	184.10	12.61	53.49	3.67	Trace	Trace	9.22
DuDi 04	A	11:19:30	11.1	3	46.65	3.20	28.74	1.97	Trace	Trace	5.00
DuDi 04	B	11:20:07	11.1	3	110.42	7.57	37.04	2.54	Trace	Trace	5.37
DuDi 04	C	11:21:05	11.2	3	85.72	5.87	23.35	1.60	Trace	Trace	4.48
DuDi 05	A	11:41:42	13.1	4	180.82	12.39	37.10	2.54	21.08	1.44	7.57
DuDi 05	B	11:42:18	13.2	4	185.85	12.73	39.21	2.69	17.90	1.23	6.71
DuDi 05	C	11:43:26	13.1	4	183.09	12.55	31.65	2.17	18.97	1.30	12.23
DuDi 06	A	11:58:14	12.9	4	172.83	11.84	52.79	3.62	13.56	0.93	6.20
DuDi 07	A	12:05:45	13.2	4	190.52	13.05	28.34	1.94	0.00	0.00	12.82
DuDi 08	B	13:38:56	12.8	5	144.46	9.90	30.60	2.10	17.50	1.20	9.08
DuDi 09	A	13:46:19	13.1	5	103.75	7.11	57.37	3.93	86.59	5.93	6.23
DuDi 10	A	14:15:14	14.5	5	96.66	6.62	34.52	2.37	17.96	1.23	6.28
DuDi 11	A	14:35:44	11.6	5	76.28	5.23	34.13	2.34	76.28	5.23	5.23
DuDi 12	A	14:45:55	12.8	5	167.93	11.51	67.91	4.65	72.57	4.97	7.08
DuDi 13	B	10:50:17	10.9	2	216.68	14.85	40.75	2.79	0.00	0.00	11.20
DuDi 14	A	11:03:45	11.2	3	213.85	14.65	43.85	3.00	0.00	0.00	8.63
DuDi 15	E	16:04:52	13.9	5	177.90	12.19	30.90	2.12	0.00	0.00	12.25
DuDi 16	A	13:23:44	13.2	5	165.40	11.33	28.61	1.96	19.21	1.32	9.91

Station	Rep	Time	Water Depth (m)	# of weights	Pen Area (sq. cm)	Mean Penetration (cm)	RPD Area (sq. cm)	Mean RPD (cm)	Cap Area (sq. cm)	Mean Cap Thickness (cm)	Bioturbation Depth (cm)
DuDi 17	A	13:30:30	13.6	5	200.94	13.77	42.07	2.88	Trace	Trace	13.57
DuDi 18	A	14:09:20	14	5	135.72	9.30	29.68	2.03	Trace	Trace	8.77
DuDi 19	A	14:25:56	13.5	5	55.19	3.78	55.19	3.78	55.19	3.78	1.80
DuDi 20	A	16:30:18	14.8	5	164.71	11.29	20.21	1.38	7.72	0.53	9.40
DuDi 21	B	16:37:46	16.3	5	233.29	15.99	29.53	2.02	0.00	0.00	15.25
DuDi 22	A	16:20:22	15.5	5	221.25	15.16	34.37	2.36	0.00	0.00	12.48
DuDi 23	A	13:56:29	13.2	5	181.21	12.42	40.43	2.77	Trace?	Trace?	9.34
DuDi 24	A	11:50:35	13.1	4	170.53	11.69	54.65	3.74	0.00	0.00	12.08
DuDi 25	D	15:33:05	14.2	5	251.93	17.26	35.63	2.44	0.00	0.00	9.25
DuDi 26	A	12:13:53	12.9	4	101.32	6.94	24.84	1.70	12.75	0.87	6.94
DuDi 27	C	13:17:17	13.4	5	163.19	11.18	21.22	1.45	Trace	Trace	5.85
DuDi 28	B	10:40:58	12.9	2	135.44	9.28	25.61	1.75	0.00	0.00	8.28

Station	Rep	Comment
DuDi 01	A	8 cm of mixed dark, sandy silt over gray clay. Trace of cap material, top layer appears to be recent deposition.
DuDi 01	B	4.8 cm of recent deposition over homogeneous gray lay. Recent deposition contains distinct sand at SWI mixed with darker silt. Sand interpreted to trace amount of cap material (<1 cm) that has been admixed with other deposited sediment via bioturbation and physical processes.
DuDi 01	C	Dark gray to black, highly organic silt with some minor medium sand at SWI. RPD discontinuous. Very different from reps A and B due to the absence of the gray clay. RPD is appears to be both biologically and physically influenced. Some organic matter at SWI.
DuDi 02	A	Shallow penetration. Mix of fine to medium sand with silt/clay at SWI. Gray clay visible at bottom of frame. Gray clay is definitely refractory and unclear whither dredged cut or residual.
DuDi 02	B	Thin sand band at SWI with gray clay to 4 cm which is present at semi continuous band. Dark gray to black organic silt at depth. Gray clay appears to be residuals.
DuDi 02	C	Thin sand band at SWI with gray clay to 4 cm which is present at semi continuous band. Very similar to Rep B. Dark gray to black organic silt at depth. Gray clay appears to be residuals. Worm at left.
DuDi 03	A	Distinct layer of silty fine sand over black, organic methanogenic silt. Top sand layer is interpreted to be cap material. Deeper RPD. Burrow at bottom of RPD in left. Contact between sand and silt is pronounced.
DuDi 03	B	Very silty very fine sand over gray to black organic silt. Silty fine sand layer interpreted to be cap material. Organism at depth in right. Cap material is being bioturbated and admixed with underlying sediments. A few clots of gray clay in

Station	Rep	Comment
		lower portion of the sediment column (under cap) and are likely to be residuals. Nice pic.
DuDi 03	C	Very fine sandy silt over mottled gray clay over band of light gray clay. Topmost, oxidized fine sandy silt layer interpreted to be cap. The gray layer at bottom as well as the mottled sediment above appears to be residuals. Notable lack of black organic sediment in this pic. Burrow in center of frame.
DuDi 04	A	Firm very silty fine sand with some organic material. FeO-OH complexation on organics at right.
DuDi 04	B	Firm, very silty fine sand. High Iron content based on FeO in RPD. Polychaete in center.
DuDi 04	C	Firm, very silty fine sand. High Iron content based on FeO in RPD. Appears to be either erosional or subject to periodic resuspension event (e.g. prop-wash) based on the partial uncovered mudclasts at SWI. Mudclasts may be residuals.
DuDi 05	A	Layer of silty very fine sand over dark gray to black silt/clay. Relict RPD between these two layers. Top medium sand layer interpreted to be cap. Some admixing between layers occurring. Wood at SWI with epizoans. Relict void in relict RPD.
DuDi 05	B	Layer of silty very fine sand over dark gray to black silt/clay. Relict RPD between these two layers. Top layer interpreted to be cap. Some admixing between layers occurring. Large polychaete at right. SWI is sorted and shows periodic resuspensions, presumably from prop-wash.
DuDi 05	C	Layer of silty very fine sand over dark gray to black silt/clay. Relict RPD between these two layers. Top layer interpreted to be cap. Irregular SWI. Three reps are generally similar in terms of strata.
DuDi 06	A	Layer of medium to fine sand (cap) over mottled dark gray silt and light gray silt. Lower units appear to be mix of residuals. Some sorting at SWI, probably from prop wash.
DuDi 07	A	Layer of silty fine sand over mottled dark gray silt and light gray silt. Lower units appear to be mix of residuals. Two relict RPDs, possible 3 cm layer of residuals under oxidized layer. Bioturbation and mixing in process.
DuDi 08	B	Layered sorted fine sand and silt with fine sand at bottom of frame. Medium sand at SWI interpreted to be cap material. Distinct depositional layer which likely contains some residuals mixed with ambient riverine deposition.
DuDi 09	A	Sorted fine to medium sand over dark gray to black silt/clay. Thin band of light gray silt expressed out at contact between sand (cap) and gray native silt/clays. Light gray silts at contact interpreted to be residuals. Band is less than 0.5 thick and 5-6 cm below SWI.
DuDi 10	A	Sorted medium sand over gray poorly sorted silty fine sand. Upper portion of sand appears different (coarser) than underlying sand. Evidence of resuspension. No residuals. Kinetically active. Reps B and C show very thin (>0.5 cm) band of sand at SWI.
DuDi 11	A	Poorly sorted, silty, gravelly coarse sand. Interpreted to be mix of medium sand and habitat mix capping materials. No residuals observed in any of the three reps. Three reps are similar.
DuDi 12	A	Layered poorly sorted silty very fine sand over dark gray silt. The quantity of sand in the upper portion of the sediment column suggests that there is cap sand mixed with native sand.. Possible residual clast (approx 1 cm) in upper sediment column. Appears to be periodically mobile. Rep B shows a bedform and Rep C shows minimal sand. Unusual

Station	Rep	Comment
		station.
DuDi 13	B	Layered native fine sandy silts. Appears to natural deposition. No evidence of distinct residuals. Nemertean in center and void to left and below nemertean.
DuDi 14	A	Layered native , organic fine sandy silts. Relict RPD that appears to be due to native deposition. SWI slightly increased in sand content relative to Station 13. Reps are generally similar although layering more pronounced in C and sand content greatest in A.
DuDi 15	E	Layered, firm, native silt with a very minor trace of sand at SWI that is most likely not related to cap. Sand becoming admixed. FeO-OH complexation. Burrow at bottom right. No distinct residuals.
DuDi 16	A	Layered firm gray silt with thin veneer of fine to medium sand at SWI. Gray silt/clay clot at upper right may be residual and there are a few very small (1 mm) clots in upper portion of center SWI. Burrow lower left.
DuDi 17	A	Faintly layered, medium to light gray native silts with a slight increase in sand content near the SWI. Trace amounts of cap sand that is being incorporated into sediment column and does not form a distinct layer. No residuals. Bioturbation to depth.
DuDi 18	A	Dark gray native silt with minor amount of fine sand in upper sediment column/SWI. Trace amount of cap sand at SWI. Possible residual clasts at left.
DuDi 19	A	Poorly sorted, gravelly coarse sand. Interpreted to be mix of habitat mix and medium sand cap materials. Similar to DuDi 11.
DuDi 20	A	Layered gray to dark gray silts with sand veneer at SWI. Relict RPD 2.5 cm below SWI and recent deposition. Recent deposition appears sandier, but without light gray clay, possible residuals in this layer but no unequivocal evidence.
DuDi 21	B	Gray to dark gray native silts with slight increase in sand at SWI. Bioturbated. Possible gray clay residuals in upper right. Three reps are similar. Residuals are small (<1 cm diameter) isolated clots of gray clay.
DuDi 22	A	Gray to dark gray native silts with slight increase in sand at SWI. Bioturbated. Three reps are similar. No cap or residual sediments.
DuDi 23	A	Gray to dark gray layered silt with mixed sand and silt layer at SWI. Abrupt transition between silt and sand layer and upper sand interpreted to be cap material mixed with native deposition. No residuals.
DuDi 24	A	Tan silty very fine sand over layered gray native silt/clays. Top sands may contain minor cap sand, but equivocal. Oxidized burrow to depth of penetration.
DuDi 25	D	Tan silty fine sand over layered medium to light gray native silt/clay. Top sand assumed to be fine sands transported through natural runoff and RPD depositionally enhanced. Good pic for deep native sediments. Polychaete in center of frame.
DuDi 26	A	Abrupt transition of cap sand to native underlying sediment. Polychaetes against faceplate to depth
DuDi 27	C	Trace medium sand at SWI. Dark gray to black native silts. Thin irregular band of gray sediment under RPD which may be residuals. Burrow at left. Medium sand at SWI more pronounced in reps A and B.

Station	Rep	Comment
DuDi 28	B	Tan fine sandy silt over compact gray silt. Void lower right. Two reps have wood debris. No residuals.

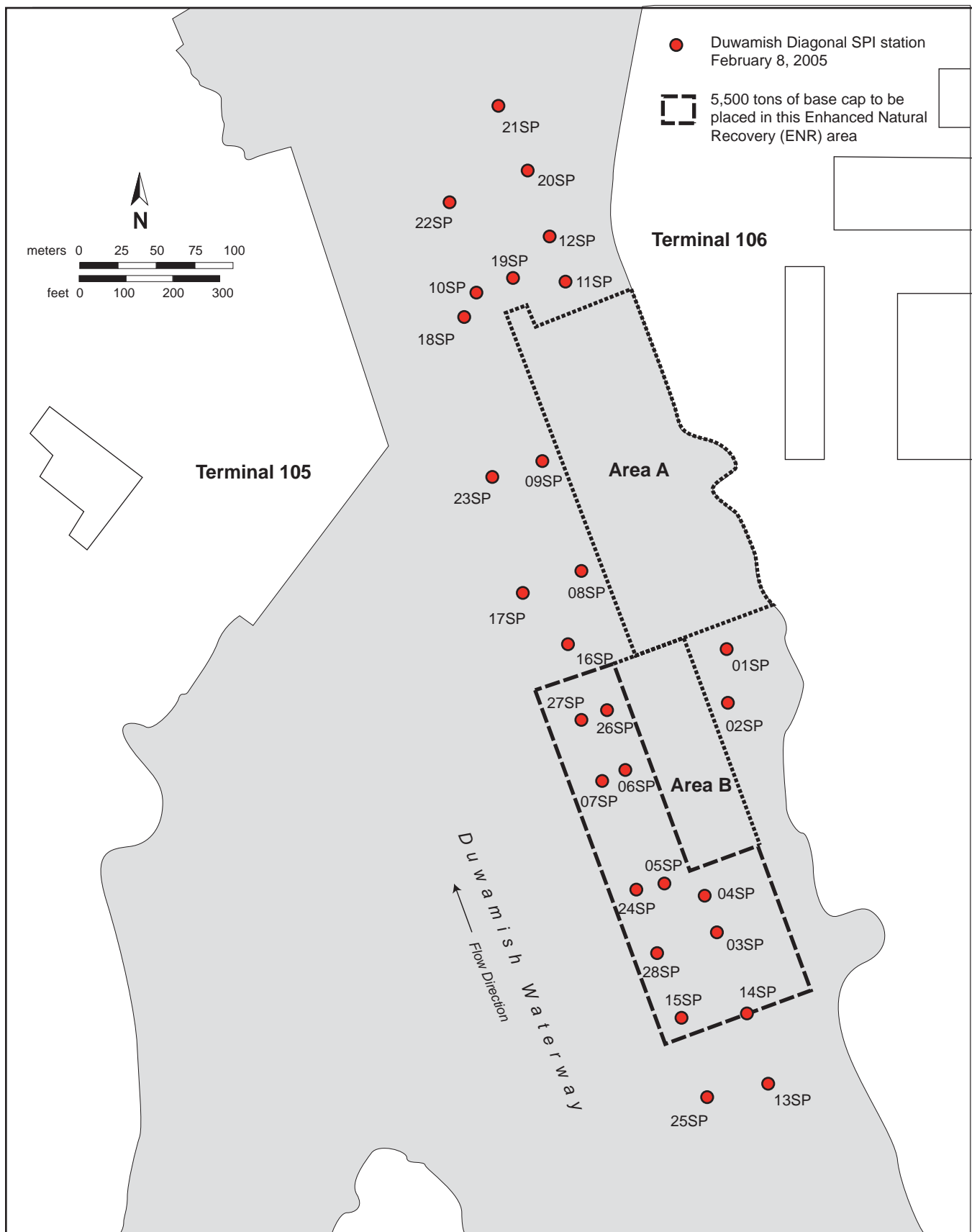


Figure 1. Map showing location of SPI stations sampled on February 8, 2005; Areas A and B had been previously dredged and capped.

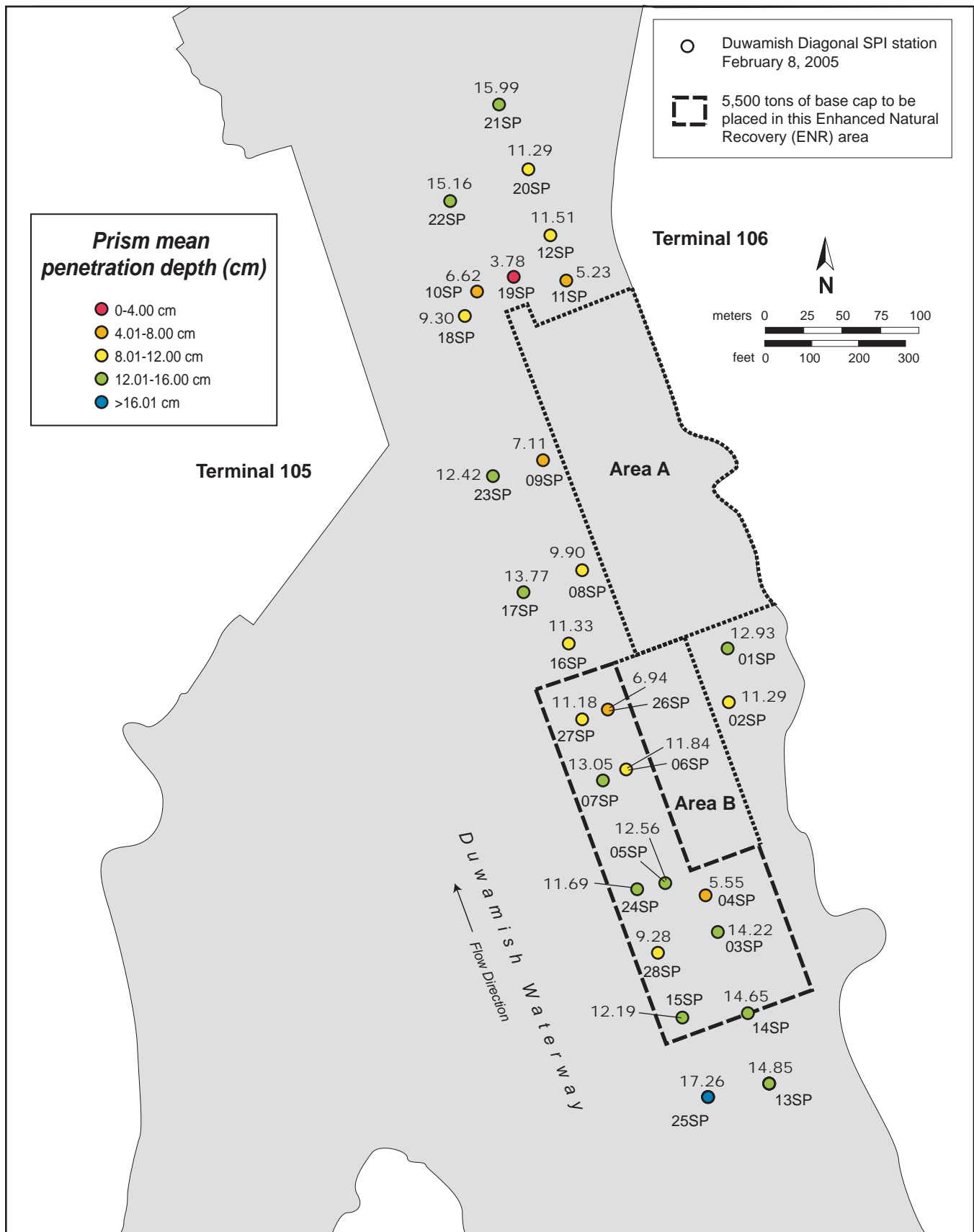


Figure 2. Mean prism penetration depth (cm); Duwamish Diagonal Baseline Survey.

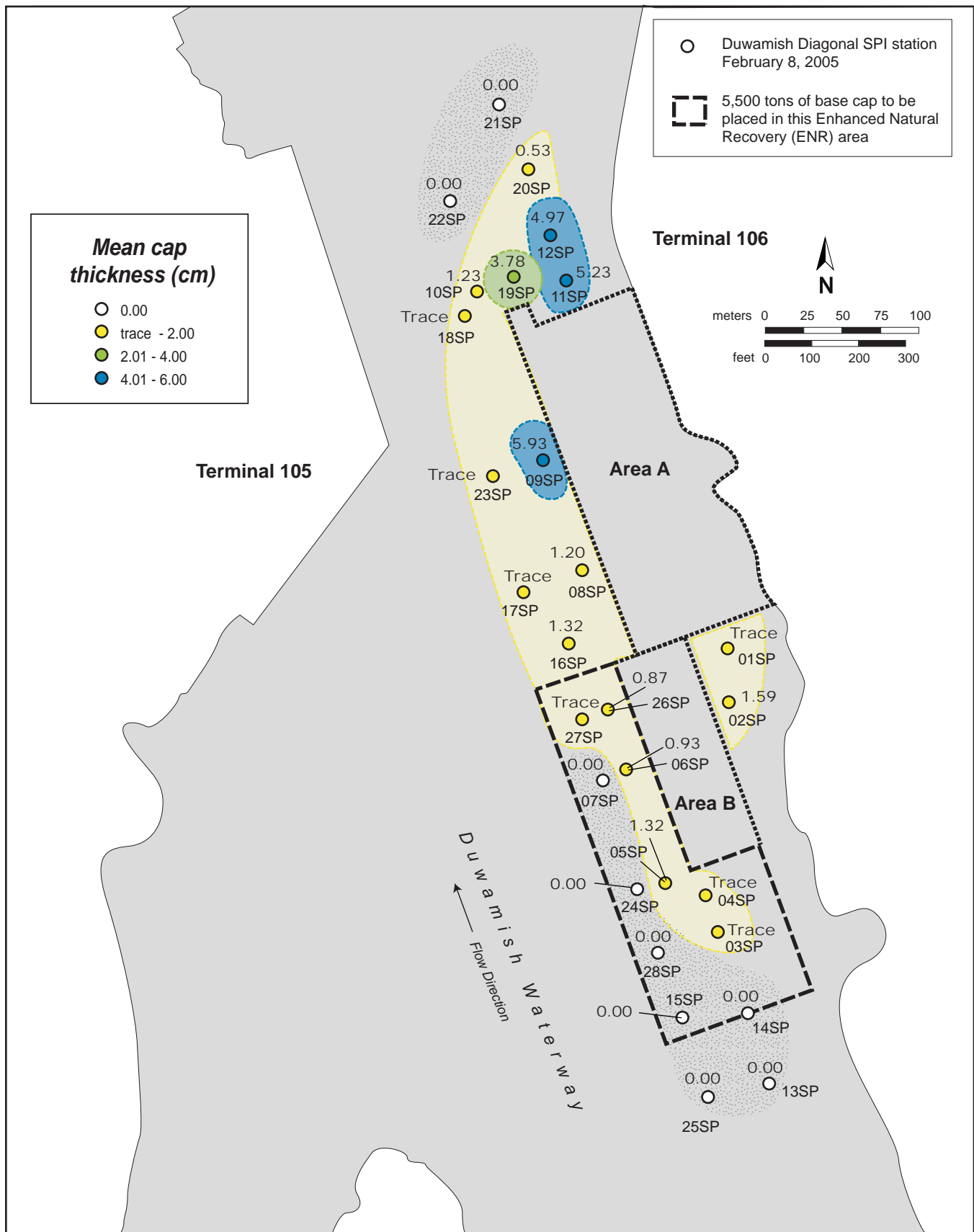


Figure 3. Mean cap thickness (cm); Duwamish Diagonal Baseline Survey.

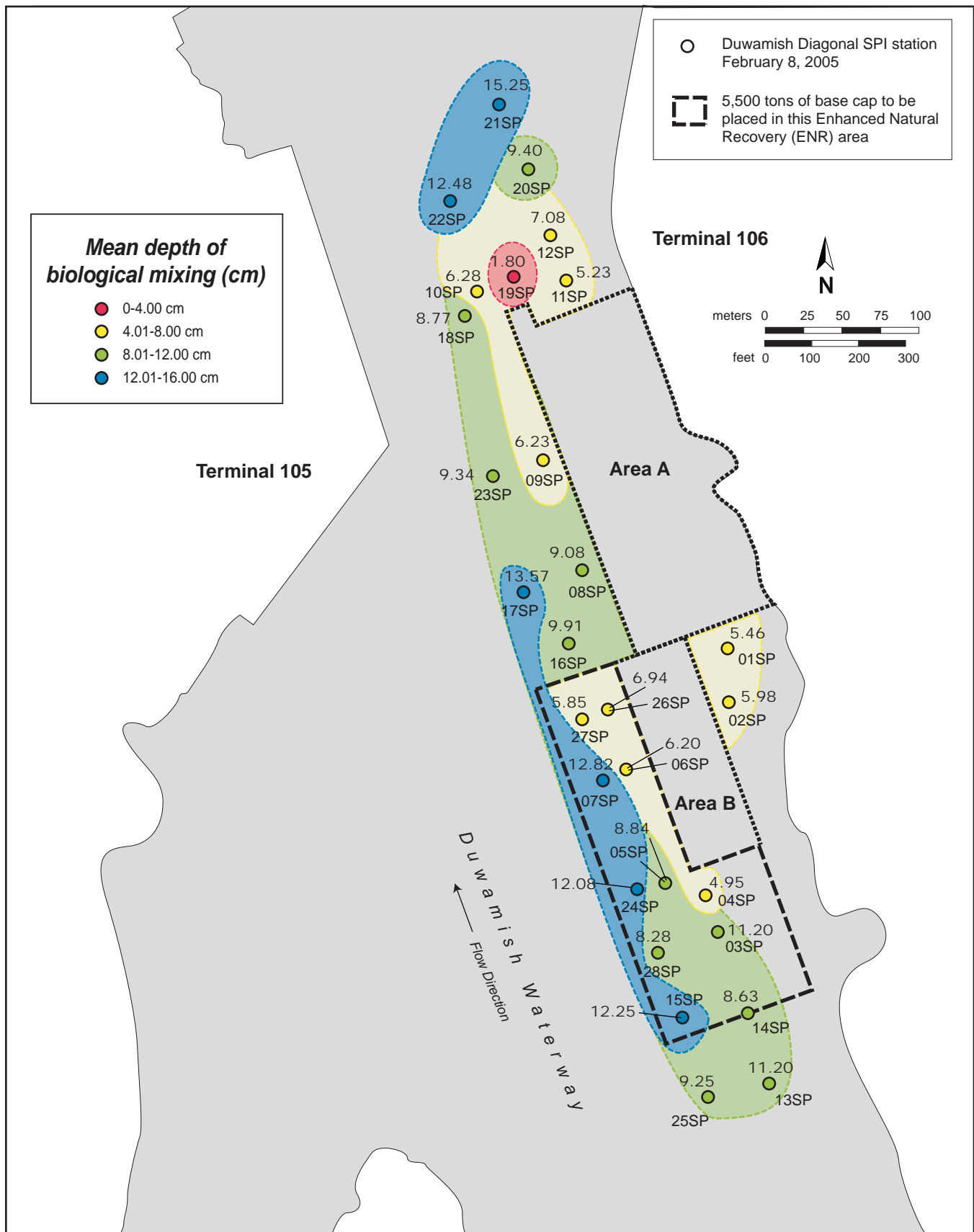


Figure 4. Mean depth of biological mixing (cm); Duwamish Diagonal Baseline Survey.



GERMANO & ASSOCIATES, INC.
12100 SE 46th Place
Bellevue, WA 98006

www.remots.com

Telephone: (425) 865-0199 • Fax: (425) 865-0699 • Mobile: (425) 891-2121 • Email: joe@remots.com

April 8, 2005

Mr. Bruce McDonald
Mr. Clay Patmont
Anchor Environmental, LLC
1423 3rd Avenue, Suite 300
Seattle, WA 98101

RE: Duwamish Diagonal SPI Initial Post-Cap Survey Results

Dear Bruce/Clay,

On March 4, 2005, scientists from Germano & Associates, Inc. performed an SPI survey at the 11 stations selected by Anchor Environmental for the initial post-cap survey at the Duwamish Diagonal; the purpose of this SPI survey immediately following the completion of capping operations was to document conditions after the base cap placement in the Enhanced Natural Recovery (ENR) area adjacent to Area B (Figure 1). Additional goals of this survey included measuring the bioturbation depth of the resident infauna.

Three replicate profile images were taken at each location; the complete results of the image analysis are displayed in Table 1, and a separate CD with digital image files for all sediment profile images collected in the survey is included in this package.

Results:

Prism Penetration Depth:

The SPI prism penetration depth was measured from the bottom of the image to the sediment-water interface. The area of the entire cross-sectional sedimentary portion of the image was digitized, and this number was divided by the calibrated linear width of the image to determine the average penetration depth. The stop collars on the camera (that prevent over-penetration in soft sediments) were set to their maximum height, and the maximum number of lead weights were added to the camera chassis (Table 1), resulting in an extra 250 lbs of driving force for the prism. Prism penetration ranged from 6.3 - 13.3 cm (Figure 2), with the variation mainly a function of the degree of consolidation in the cap sediment. A comparison of penetration depths between the baseline survey and this initial post-cap survey is displayed in Figure 2; not surprisingly, camera prism penetration was generally lower in this post-cap survey because of the increased shear strength of the coarser sediments as result of the capping operations.

Presence of Cap Sands:

Cap sands extending beyond the depth of the prism penetration were found at every station sampled. The predominant sediment grain-size major mode was 2-1 phi (medium sand), with a frequent occurrence of -1 to -2 phi granules mixed in with the medium sand (see image files from Stations 5 and 15 on the enclosed CD for examples of well-sorted and poorly-sorted sediments). All stations except Station 5 had a noticeable fraction of fine-grained muds (> 4 phi) in the upper layers.

Bioturbation Depth

Evidence of deposit-feeding or burrowing infauna was only found at one station (Station 3; see Table 1), but this was because of the short time between completion of capping operations and this initial post-cap survey (there was insufficient time for the infaunal community to completely recolonize and re-establish themselves in this newly-placed sand). I have no doubt that this area will be recolonized by quite a diverse benthic community given the wide range in sediment grain-size, and the measurements for this particular parameter should be very different after the next survey.

If you have any questions or need additional information, please do not hesitate to get in touch.

Sincerely,

A handwritten signature in black ink, appearing to read "Joe Germano", written in a cursive style. The signature is positioned to the left of a vertical red line.

Joseph D. Germano, Ph.D.
President

Table 1. Complete analysis data and comments for profile images from the March 4, 2005 Initial Post-Cap Survey; calibration image width = 14.59 cm. Values plotted in associated map for Stations 6 and 14 are the average value for the 2 replicate measurements.

STATION	REP	Time	Water Depth (m)	Penetration Area (sq.cm)	Penetration Mean (cm)	Penetration Minimum (cm)	Penetration Maximum (cm)	RPD AREA	RPD Mean (cm)	Bioturbation Depth (cm)
DuDi Cap_03	B	8:31:19	12.2	188.22	12.90	12.57	13.19	Ind	Ind	5.38
DuDi Cap 04	A	8:38:37	12.3	141.94	9.73	9.48	9.91	Ind	Ind	0
DuDi Cap 05	C	8:45:58	13.9	152.43	10.44	10.42	10.57	Ind	Ind	0
DuDi Cap 06	A	8:51:53	13.5	131.13	8.98	7.23	10.57	Ind	Ind	0
DuDi Cap 06	C	8:54:26	13.2	111.12	7.61	7.11	7.97	Ind	Ind	0
DuDi Cap 07	A	9:24:26	13.9	121.92	8.35	8.17	8.65	Ind	Ind	0
DuDi Cap 14	A	8:19:09	12.1	178.16	12.21	11.74	12.51	Ind	Ind	0
DuDi Cap 14	B	8:19:46	12.1	209.19	14.33	13.88	14.48	Ind	Ind	0
DuDi Cap 15	C	9:08:22	13.2	93.35	6.40	6.28	7.85	Ind	Ind	0
DuDi Cap 24	A	9:18:56	14.0	129.28	8.86	8.65	9.08	Ind	Ind	0
DuDi Cap 26	A	8:58:14	13.3	174.41	11.95	11.28	12.42	Ind	Ind	0
DuDi Cap 27	B	9:36:18	13.5	92.56	6.34	5.97	6.71	Ind	Ind	0
DuDi Cap 28	C	9:14:13	14.0	132.97	9.11	8.63	9.45	Ind	Ind	0

STATION	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Bioturbation Depth (cm)	Cap Area (sq. cm)	Mean Cap Thickness (cm)		Minimum Cap Thickness (cm)		Maximum Cap Thickness (cm)	
DuDi Cap_03	2-1/-1--2	-2	>4	5.38	188.22	>	12.90	>	12.57	>	13.19
DuDi Cap 04	2-1/0--1	-2	>4	0	141.94	>	9.73	>	9.48	>	9.91
DuDi Cap 05	2-1	-2	>4	0	152.43	>	10.44	>	10.42	>	10.57
DuDi Cap 06	2-1/-1--2	-2	>4	0	131.13	>	8.98	>	7.23	>	10.57
DuDi Cap 06	2-1	-2	>4	0	111.12	>	7.61	>	7.11	>	7.97
DuDi Cap 07	2-1	-2	>4	0	121.92	>	8.35	>	8.17	>	8.65

STATION	Grain Size Major Mode (phi)	Grain Size Maximum (phi)	Grain Size Minimum (phi)	Bioturbation Depth (cm)	Cap Area (sq. cm)	Mean Cap Thickness (cm)		Minimum Cap Thickness (cm)		Maximum Cap Thickness (cm)	
DuDi Cap 14	2-1	-2	>4	0	178.16	>	12.21	>	11.74	>	12.51
DuDi Cap 14	2-1	-2	>4	0	209.19	>	14.33	>	13.88	>	14.48
DuDi Cap 15	-1 --2	-2	>4	0	93.35	>	6.40	>	6.28	>	7.85
DuDi Cap 24	2-1/-1--2	-2	>4	0	129.28	>	8.86	>	8.65	>	9.08
DuDi Cap 26	2-1	0	>4	0	174.41	>	11.95	>	11.28	>	12.42
DuDi Cap 27	2-1	-1	>4	0	92.56	>	6.34	>	5.97	>	6.71
DuDi Cap 28	2-1	-2	>4	0	132.97	>	9.11	>	8.63	>	9.45

STATION	Comments
DuDi Cap03	Tan coarse sand over sandy gravel. Cap material > penetration. Small blackish polychaete in upper right. Fine grained sediment content increases towards SWI and is likely a result from hydraulic sorting during cap placement. Mud tube in left background at SWI. Surface free of post-deposition fines. This rep had deepest penetration and all three reps are similar.
DuDi Cap 04	Tan coarse sand over sandy gravel. Cap material > penetration. Small polychaete tube in upper left and larger tube just beyond faceplate at SWI on the right. Fine grained sediment content increases towards SWI and is likely a result from hydraulic sorting during cap placement. All cap material retains an oxidized signature and RPD is indeterminate until sediment equilibrates. This rep had deepest penetration and all three reps are similar.
DuDi Cap 05	Tan coarse sand over with scattered gravel at bottom of frame. Cap material > penetration. Fine grained sediment content increases towards SWI and is likely a result from hydraulic sorting during cap placement. This station is highly sorted. SWI is devoid of fines. All cap material retains an oxidized signature and RPD is indeterminate until sediment equilibrates. This rep had deepest penetration and all three reps are similar.
DuDi Cap 06	Tan coarse sand over coarse sandy gravel. Cap material > penetration. All sediment retains oxidized signature from placement and RPD will be indeterminate until sediment equilibrates with seafloor surroundings. Piece of wood at SWI. Fining upwards sequence from hydraulic sorting during placement.
DuDi Cap 06	Cap > penetration. Tan coarse sand with some gravels at bottom of frame. Fining upwards sequence and moderately well sorted. Entire sediment column retains oxidized signature from placement. Finer grained and more sorted than Rep A.
DuDi Cap 07	Cap > penetration. Tan coarse sand with some gravels at bottom of frame. Fining upwards sequence and moderately well sorted. Entire sediment column retains oxidized signature from placement. A few small fecal strands at SWI. Three reps from this station similar.
DuDi Cap 14	Cap > penetration. Tan coarse sand with some gravels at the SWI and scattered gravel in the sediment column. Entire

STATION	Comments
	sediment column retains oxidized signature from placement. Piece of organic material projecting into water column at left SWI. Two patches of reduced, finer grained sediment at lower left and patches are very thin. Dusting of fines at SWI and a few small fecal strands in left SWI background. Small polychaete in upper right.
DuDi Cap 14	Tan coarse sand with minor gravel. Cap > penetration. Fining upward sequence and a band of slightly finer material at bottom of frame: two applications of cap material. Patch of reduced finer grained sediment in lower right. Elongate red polychaete at bottom right-center, possibly vertically migrating to reestablish commutation with the overlying water. Small polychaete in upper left. SWI is sorted relative to upper sediment column, vessel traffic or sampling activities. Sediment column retains oxidized signature.
DuDi Cap 15	Cap material > penetration. Tan very coarse sandy gravel. Almost bimodal distribution of sand and gravel. Settlement stake/pipe in left background. Sediment column retains oxidized signature. Three reps from this station are similar.
DuDi Cap 24	Cap material > penetration. Tan, poorly sorted coarse sand over poorly sorted, sandy gravel. High proportion of fines in sediment column. Fecal strand in water column. Sediment column retains oxidized signature. Three reps from this station are similar.
DuDi Cap 26	Cap material > penetration. Tan, well sorted coarse sand with minimal amounts of fines. Possible bedforms at SWI. Broken mud tube at left SWI. Sediment column retains oxidized signature. Three reps from this station are similar Rep A has the deepest penetration.
DuDi Cap 27	Cap material > penetration. Tan, well sorted, slightly gravelly, coarse sand with minimal amounts of fines. Angry crab at SWI. Sediment column retains oxidized signature. Three reps from this station are similar Rep C has the deepest penetration.
DuDi Cap 28	Cap material > penetration. Tan moderately to poorly sorted, fining upwards, gravelly coarse sand. High proportion of fines in upper sediment column relative to other stations. Small tubes at SWI background. Three reps from this station are similar.

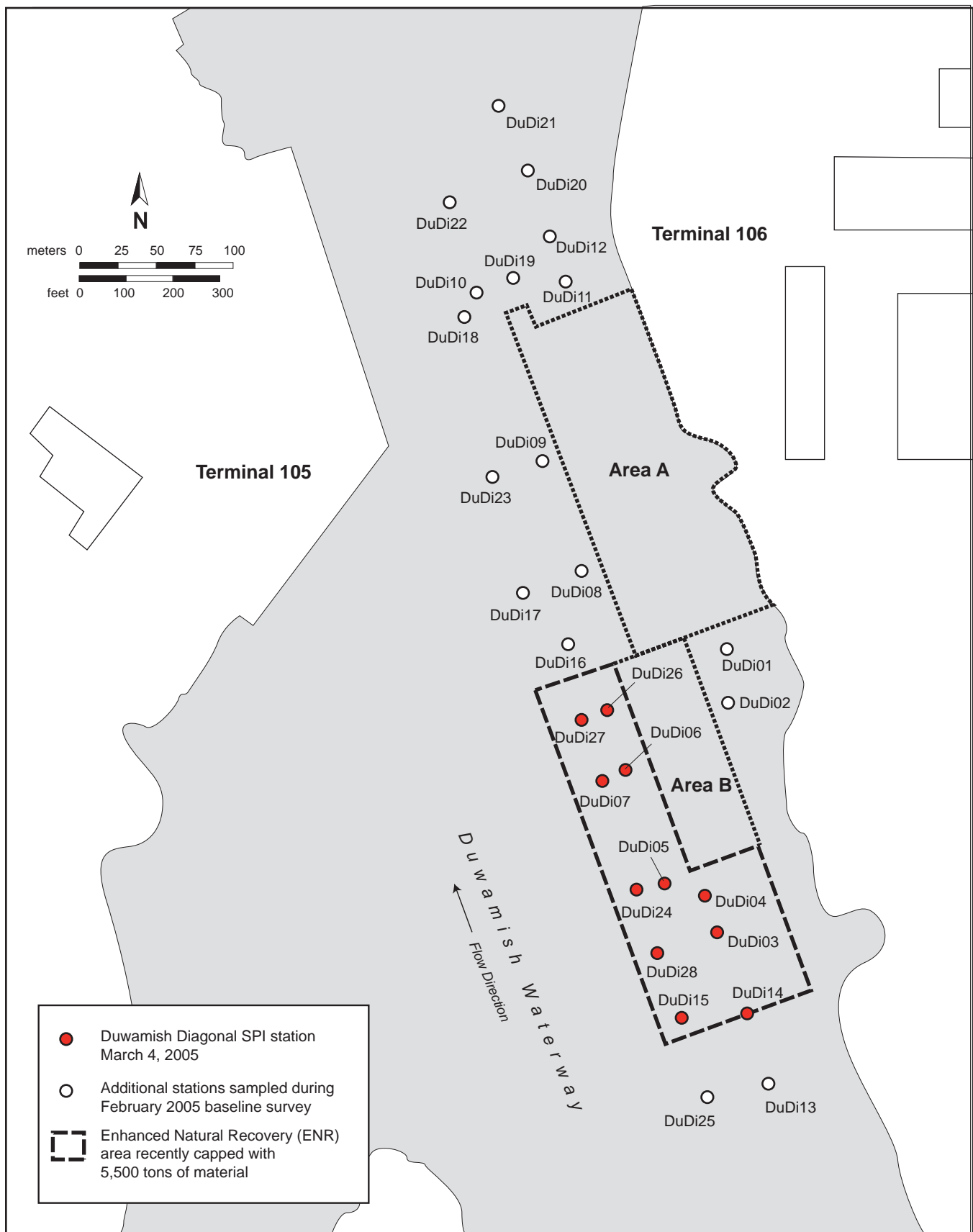


Figure 1. Map showing location of SPI stations sampled on March 4, 2005; Areas A and B had been previously dredged and capped.

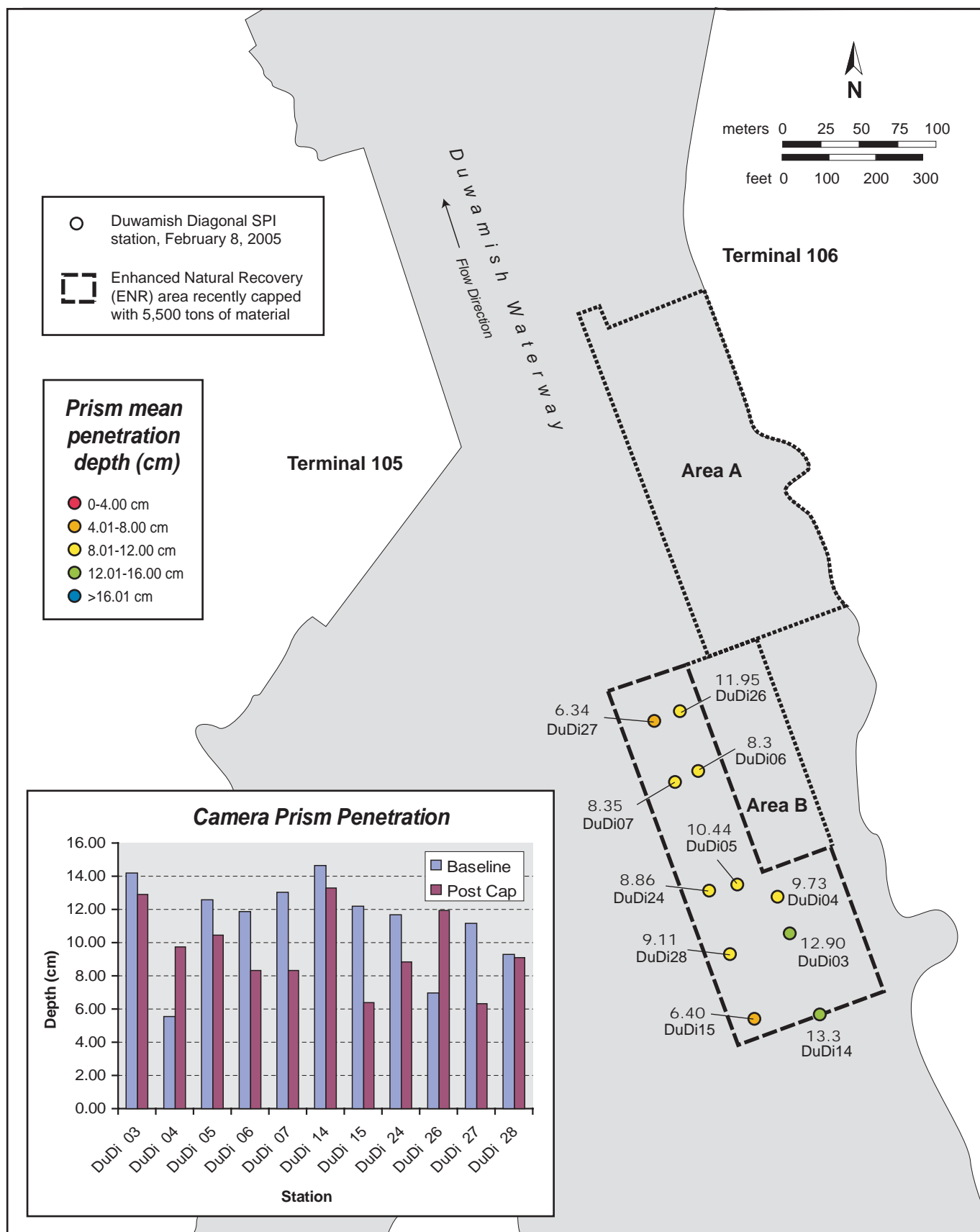


Figure 2. Mean prism penetration depth (cm); Duwamish Diagonal Initial Post Cap Survey.

SPI photographs
provided on CD at back of report

APPENDIX H

SEDIMENT CHEMISTRY DATA AND DATA QUALITY REVIEWS

Summary of Analytical Chemistry - AET Screening
Duwamish Diagonal Monitoring Data

	Location ID Sample ID Sample Date Depth Interval Sample Matrix Sample Type	Location ID Sample ID Sample Date Depth Interval Sample Matrix Sample Type		DUD_3C L29990-3 10/20/2003 0-10 cm SE N	DUD_3C L31520-3 3/29/2004 0-10 cm SE N	DUD_3C L34524-3 1/31/2005 0-10 cm SE N	DUD_3C L34971-3 3/16/2005 0-10 cm SE N	DUD_4C L29990-4 10/20/2003 0-10 cm SE N	DUD_4C L29990-5 10/20/2003 0-10 cm SE N	DUD_4C L31520-4 3/29/2004 0-10 cm SE N	DUD_4C L31520-5 3/29/2004 0-10 cm SE N	DUD_4C L34524-4 1/31/2005 0-7 cm SE N	DUD_4C L34524-5 1/31/2005 0-7 cm SE N	DUD_4C L34971-4 3/16/2005 0-9 cm SE N	DUD_4C L34971-5 3/16/2005 0-9 cm SE N	DUD_5C L29990-6 10/20/2003 0-10 cm SE N	DUD_5C L31520-6 3/29/2004 0-10 cm SE N	DUD_5C L34524-6 1/31/2005 0-10 cm SE N	DUD_5C L34971-6 3/24/2005 SE N	DUD_6C L29990-7 10/20/2003 0-10 cm SE N	DUD_6C L31520-15 3/30/2004 0-10 cm SE N	DUD_6C L31520-7 3/30/2004 0-10 cm SE N	DUD_6C L34524-7 1/31/2005 0-9 cm SE N	DUD_6C L34971-7 3/24/2005 SE N	DUD_7C L29990-8 10/20/2003 0-10 cm SE N	DUD_7C L31520-8 3/30/2004 0-10 cm SE N	DUD_7C L34524-8 1/31/2005 0-9 cm SE N	DUD_7C L34971-8 3/24/2005 SE N		
Conventionals (%)		SQS-AET	CSL-AET																											
Total solids	--	--		49.5	62.6	61.5	86.4	48.3	50.1	76.3	76.4	54.5	55.3	84.1	83.6	60.2	57	56.1	87.7	61.1	59.1	61.1	60.8	88.3	54.6	58.9	57.8	86.8		
Total Organic Carbon	--	--		2.16	1.19	1.14	0.054 U	2.38	2.12	0.248	0.232	1.37	1.26	0.05 U	0.05 U	1.27	1.73	1.75	0.05 U	1.43	1.59	1.52	1.31	0.051 U	1.54	1.51	1.38	0.052 U		
Grain Size (%)																														
Gravel	--	--		1.2 J	2.9 J	0.7 J	57.9	0.6 J	1 J	4	4.3	2.7	4.4	24.3	29.6	6.3 J	1.9 J	0.8 J	47.3	6.7 J	6.8 J	3.4 J	4.1	48.8	3.5 J	2.5 J	3.7	50.7		
Sand	--	--		32.4	54	57.3	41.4	32.4	33.2	76.7	81.7	46.2	49.3	74.5	69.9	52.3	43.5	46.9	50.3	50.8	49.6	54.9	57.2	49.9	34.9	40.5	43	47.9		
Silt	--	--		52.8	31.3	29.5	0.6	54.5	53.7	11.2	9.2	35.7	30.6	1.2	0.5 U	30.5	34.9	34.1	0.6	37.5	29	32	27.8	0.5	51	38.9	33.8	0.6		
Clay	--	--		13.5	14.1	10.4	2.3	12.2	12	6.3	6.7	9.4	12.6	1.2	0.5 U	10.8	21.3	14.9	0.5 U	5.1	14.9	14	8.1	0.5 U	10.7	16.7	12.4	0.5 U		
Fines	--	--		66.3	45.4	39.9	2.9	66.7	65.7	17.5	15.9	45.1	43.2	2.4	0.5 U	41.3	56.2	49	0.5 U	42.6	43.9	46	35.9	0.5 U	61.7	55.6	46.2	0.5 U		
Metals (mg/kg)																														
Arsenic	57	93		24 JL	4.2 U	6.2 J	3 U	25 JL	26.1 L	3.4 U	3.1 U	8.3 J	7.1 J	2.9 U	3.1 U	24.8 L	7.2 J	12 J	2.7 U	26 L	14 J	6.7 J	8.2 J	2.8 U	33.9 L	9.2 J	11 J	2.9 U		
Cadmium	5.1	6.7		0.73 J	0.97 J	0.75 J	0.17 U	0.7 J	0.78 J	0.22	0.3	0.5 J	0.47 J	0.17 U	0.18 U	0.61 J	1.48	1.7	0.16 U	1.41	0.9 J	1.98	0.77 J	0.17 U	0.88 J	1.1 J	0.67 J	0.17 U		
Chromium	260	270		37.2	31.2	35.3	15.6	38.1	38.5	18.3	19.2	31.6	30.6	13.6	13.5	33.6	47	48.5	14.1	35.7	24	47.8	33.2	15.3	34.6	34	32	13.2		
Copper	390	530		96.4	79.4	79.8	24.9	98.1	95.8	84.5	56.4	89.4	96.4	24.4	24.8	83.1	165	89.1	26.5	73	45.7	79.4	71.5	28.3	124	95.8	81.7	25.1		
Lead	450	530		67.9	50	47.6	1.7 U	66	71.9	6.9	10.1	48.3	38	1.7 U	1.8 U	92.2	74.4	76.6	1.6 U	129	49.4	104	54.1	1.7 U	145	78.1	69.7	1.7 U		
Mercury	0.41	0.59		0.24 J	0.21 J	0.23 J	0.023 U	0.29 J	0.3 J	0.035	0.041	0.24 J	0.24 J	0.024 U	0.024 U	0.27 J	0.3 J	0.29 J	0.024 U	0.411 *	0.32 J	0.26 J	0.23 J	0.023 U	0.394	0.25 J	0.26 J	0.022 U		
Zinc	410	960		164	106	105	22.9	166	198	41.4	61.3	112	103	24.4	23.1	152	182	145	19.7	201	92.4	260	118	25.1	203	161	138	21		
PCBs (µg/kg)																														
Aroclor 1016	--	--		2.6 UL	10 UL	200 U	1.5 U	2.7 UL	2.6 UL	1.7 U	1.7 U	6.2 U	31 U	1.5 U	1.6 U	2.2 UL	11 UL	700 U	1.5 U	2.1 UL	22 UL	10 UL	260 U	1.5 U	2.4 UL	11 UL	62 U	1.5 U		
Aroclor 1221	--	--		5.1 U	21 U	4.1 U	2.9 U	5.2 U	5 U	3.3 U	3.3 U	4.6 U	4.5 U	3 U	3 U	4.2 U	23 U	4.5 U	2.9 U	4.1 U	4.2 U	21 U	4.1 U	2.8 U	4.6 U	22 U	4.3 U	2.9 U		
Aroclor 1232	--	--		5.1 U	21 U	460 U	2.9 U	5.2 U	5 U	3.3 U	3.3 U	130 U	63 U	3 U	3 U	4.2 U	23 U	1600 U	2.9 U	4.1 U	42 U	21 U	640 U	2.8 U	4.6 U	22 U	130 U	2.9 U		
Aroclor 1242	--	--		2.6 U	10 U	230 U	1.5 U	2.7 U	2.6 U	1.7 U	1.7 U	70 U	33 U	1.5 U	1.6 U	2.2 U	11 U	770 U	1.5 U	2.1 U	22 U	10 U	310 U	1.5 U	2.4 U	11 U	74 U	1.5 U		
Aroclor 1248	--	--		75.6	473	311 J	1.5 U	107	1850	40	76.4	92.7 J	55.9 J	1.5 U	1.6 U	86	1050	875 J	1.5 U	394	810	1120	439 J	1.5 U	95.6	387	108 J	1.5 U		
Aroclor 1254	--	--		170	562	254	1.5 U	242	693	43.3	95	101	78.3	2.7	1.6 U	169	1120	995	3	656	954	1470	390	2	216	480	159	1.5 U		
Aroclor 1260	--	--		81.6	236 JL	255 J	1.5 U	143	189	21.5	63.2	62.6 J	47 J	1.5 U	1.6 U	85.9	481 JL	319 J	1.5 U	239	1620 JL	571 JL	160 J	1.5 U	116	263 JL	130 J	1.5 U		
Total PCBs (SMS)	130	1000		327 *	1271 * #	820 *	2.9 U	492 *	2732 * #	105	235 *	256 *	181 *	2.7	3 U	341 *	2651 * #	2189 * #	3	1289 * #	3384 * #	3161 * #	989 *	2	428 *	1130 * #	397 *	2.9 U		
LPAH (µg/kg)																														
Naphthalene	2100	2400		1100 UG	89 UG	23 U	16 U	1200 UG	1100 UG	73 U	73 U	26 U	25 U	17 U	17 U	93 UG	98 UG	25 U	16 U	92 UG	95 UG	92 UG	23 U	16 U	100 UG	95 UG	24 U	16 U		
Acenaphthylene	1300	1300		1200 U	96 U	24 U	17 U	1200 U	1200 U	79 U	79 U	28 U	27 U	18 U	18 U	100 U	110 U	27 U	17 U	98 U	100 U	98 U	25 U	17 U	110 U	100 U	26 U	17 U		
Acenaphthene	500	730		570 U	45 U	14 J	8.1 U	580 U	560 U	37 U	37 U	15 J	16 J	8.3 U	8.4 U	47 U	49 U	17 J	8 U	46 U	47 U	46 U	13 J	7.9 U	51 U	48 U	17 J	8.1 U		
Fluorene	540	1000		1100 U	83 U	21 UJ	15 U	1100 U	1000 U	68 U	68 U	24 UJ	24 UJ	15 U	16 U	86 U	91 U	25 J	15 U	85 U	88 U	85 U	28 J	15 U	95 U	88 U	24 J	15 U		
Phenanthrene	1500	5400		240 JLG	166 G	103 J	4.6 U	270 JLG	240 JLG	21 U	26	121 J	121 J	4.8 U	4.8 U	169 JLG	225 G	141 J	6.5	155 JLG	164 G	275 G	142 J	4.5 U	203 JLG	200 G	148 J	4.6 U		
Anthracene	960	4400		120 JG	68.1 G	50.7	4.6 U	120 JG	140 JG	21 U	21 U	70.3	59.7	4.8 U	4.8 U	58 G	105 G	67.7	4.8	72.5 G	85.4 G	94.4 G	72.7	4.5 U	70.3 G	82.5 G	82.4	4.6 U		
2-Methylnaphthalene	670	1400		1100 U	89 U	23 U	16 U	1200 U	1100 U	73 U	73 U	26 U	25 U	17 U	17 U	93 U	98 U	25 U	16 U	92 U	95 U	92 U	23 U	16 U	100 U	95 U	24 U	16 U		
Total LPAH	5200	13000		360	234.1	167.7	17 U	390	380	79 U	26	206.3	196.7	18 U	18 U	227	330	250.7	11.3	227.5	249.4	369.4	255.7	17 U	273.3	282.5	271.4	17 U		
HPAH (µg/kg)																														
Fluoranthene	1700	2500		670 JL	454	259	9.3 U	750 JL	660 JL	46	73	343	316	9.5 U	9.6 U	505 L	600	410	11	340 L	475	635	331	9.1 U	564 L	516	388	9.2 U		
Pyrene	2600	3300		731 L	447 G	307	5.2	749 L	723 L	46.9	71.6	312	275	7.7	5.1	600 L	575 G	439	11.6	630 L	557 G	617 G	329	6.3	852 L	577 G	438	4.8		
Benzo(a)anthracene	1300	1600		465 L	190	138	3.2	431 L	413 L	26.1	32.7	171	149	4.5	2.8	251 L	281	191	6.17	195 L	213	239	153	3.5	264 L	260	209	2.5		
Chrysene	1400	2800		630 JL	238	205	4.6 U	640 JL	677 L	39	41	279	230	5.9	4.8 U	334 L	288	264	8.1	304 L	259	298	234	5.7	344 L	311	330	4.6 U		
Benzo(b)fluoranthene	--	--		537	233	200	3.5 U	526	613	36.4	54.6	272	212	4.4	3.6 U	297	300	262	7.17	309	269	308	232	4.4	465	438	284	3.5 U		
Benzo(k)fluoranthene	--	--		661 L	151	174	3.5 U	430 JL	440 JL	16 U	16 U	177	172	5.2	3.6 U	289 L	284	196	5.6	280 L	178	177	155	4.4	388 L	224	242	3.5 U		
Benzo(a)pyrene	1600	3000		511 L	222	169	3.5 U	410 JL	440 JL	53.6	60.6	198	167	4.4	3.6 U	277 L	270	203	4.9	270 L	247	264	171	3.9	392 L	353	239	3.5 U		
Indeno(1,2,3-cd)pyrene	600	690		280 J	110 J	85	10 U	270 J	300 J	47 U	47 U	102	85.4	11 U	11 U	165	131	101	10 U	147	95 J	137	82.4	10 U	225	185	125	10 U		
Dibenzo(a,h)anthracene	230	540		570 UL	45 U	42.9	8.1 U	580 UL	560 UL	37 U	37 U	48.8	43.6	8.3 U	8.4 U	55 JL	49 U	49.2	8 U	46 UL	47 U	46 U	46.5	7.9 U	62 JL	56 J	65.9	8.1 U		
Benzo(g,h,i)perylene	670	720		280 J	96 JG	97.9	9.3 U	310 J	320 J	42 U	42 U	116	98.6	9.5 U	9.6 U	171	119 G	116	9.1 U	151	112 G	131 G	97.2	9.1 U	229	182 G	133	9.2 U		
Total benzo(a)fluoranthenes (SMS)	3200	3600		1198	384	374	3.5 U	956	1053	36.4	54.6	449	384	9.6	3.6 U	586	584	458	12.77	589	447	485	387	8.8	853	662	526	3.5 U		
Total HPAH (SMS)	12000	17000		4765	2141	1677.8	8.4	451																						

**Summary of Analytical Chemistry - AET Screening
Duwamish Diagonal Monitoring Data**

Location ID Sample ID Sample Date Depth Interval Sample Matrix Sample Type			DUD_14C L34524-16 2/2/2005 0-10 cm SE N	DUD_14C L34971-16 3/16/2005 0-10 cm SE N	DUD_15C L34524-17 2/2/2005 0-10 cm SE N	DUD_15C L34971-17 3/16/2005 0-10 cm SE N
Conventionals (%)						
Total solids	--	--	53.5	81.8	55.7	88.3
Total Organic Carbon	--	--	1.71	0.297	1.58	0.049 U
Grain Size (%)						
Gravel	--	--	0.1 UJ	32.9	1.9 J	56.1
Sand	--	--	34.1	61.5	34.7	44.4
Silt	--	--	46.7	2.3	41.8	0.5 U
Clay	--	--	14.9	1.1	16.4	0.5 U
Fines	--	--	61.6	3.4	58.2	0.5 U
Metals (mg/kg)						
Arsenic	57	93	8.6 J	2.9 U	14 J	2.9 U
Cadmium	5.1	6.7	0.9 JL	0.17 U	0.79 JL	0.18 U
Chromium	260	270	40.7	16	33	13.7
Copper	390	530	96.3	32.3	95	30.6
Lead	450	530	78.7	5.4	110	1.8 U
Mercury	0.41	0.59	0.28 J	0.024 U	0.25 J	0.024 U
Zinc	410	960	148	32	165	27.7
PCBs (µg/kg)						
Aroclor 1016	--	--	140 U	6.1 U	32 U	1.5 U
Aroclor 1221	--	--	4.7 U	3.1 U	4.5 U	2.8 U
Aroclor 1232	--	--	300 U	17 U	70 U	2.8 U
Aroclor 1242	--	--	160 U	15 U	38 U	1.5 U
Aroclor 1248	--	--	224 J	11.3	72.4 J	1.5 U
Aroclor 1254	--	--	275	13	114	1.5 U
Aroclor 1260	--	--	122 J	8.12	63.4 J	1.5 U
Total PCBs (SMS)	130	1000	621 *	32.4	250 *	2.8 U
LPAH (µg/kg)						
Naphthalene	2100	2400	26 U	17 U	25 U	16 U
Acenaphthylene	1300	1300	28 J	18 U	27 U	17 U
Acenaphthene	500	730	22 J	8.6 U	25.7	7.9 U
Fluorene	540	1000	30 J	16 U	29 J	15 U
Phenanthrene	1500	5400	171 J	24.3	205 J	4.5 U
Anthracene	960	4400	104	13.3	70.4	4.5 U
2-Methylnaphthalene	670	1400	26 U	17 U	25 U	16 U
Total LPAH (SMS)	5200	13000	355	37.6	330.1	17 U
HPAH (µg/kg)						
Fluoranthene	1700	2500	475	55.6	476	9.1 U
Pyrene	2600	3300	544	50.9	562	4.5 U
Benzo(a)anthracene	1300	1600	236	25.1	212	2.3 U
Chrysene	1400	2800	402	39.9	285	4.5 U
Benzo(b)fluoranthene	--	--	320	35.5	321	3.4 U
Benzo(k)fluoranthene	--	--	273	26.7	291	3.4 U
Benzo(a)pyrene	1600	3000	308	26.3	282	3.4 U
Indeno(1,2,3-cd)pyrene	600	690	162	17	145	10 U
Dibenzo(a,h)anthracene	230	540	68.8	8.6 U	70.2	7.9 U
Benzo(g,h,i)perylene	670	720	175	17	165	9.1 U
Total benzofluoranthenes (SMS)	3200	3600	593	62.2	612	3.4 U
Total HPAH (SMS)	12000	17000	2963.8	294	2809.2	10 U
Chlorinated Hydrocarbons (µg/kg)						
1,3-Dichlorobenzene	--	--	0.49 U	0.32 U	0.47 U	0.29 U
1,4-Dichlorobenzene	110	120	8.13	0.16 U	6.18	0.15 U
1,2-Dichlorobenzene	35	50	6.58	0.32 U	0.47 U	0.29 U
1,2,4-Trichlorobenzene	31	51	0.49 U	0.32 U	0.47 U	0.29 U
Hexachlorobenzene	22	70	1.2 U	0.81 U	1.2 U	0.75 U
Phthalates (µg/kg)						
Dimethylphthalate	71	160	21 U	13 U	20 U	12 U
Diethylphthalate	200	1200	11 U	7.3 U	12 J	6.8 U
Di-n-butylphthalate	1400	5100	28.4 B	22	23 B	12.5
Butylbenzylphthalate	63	900	46	11	33.9	6.8 U
bis(2-Ethylhexyl)phthalate	1300	1900	935	70	425	8.7
Di-n-octylphthalate	6200	--	15 U	9.8 U	14 U	9.1 U
Phenols (µg/kg)						
Phenol	420	1200	17 UJ	11 U	27 J	10 U
2-Methylphenol	63	72	30 U	20 U	29 U	18 U
4-Methylphenol	670	1800	30 U	20 U	29 U	18 U
2,4-Dimethylphenol	29	72	13 U	8.6 U	13 U	7.9 U
Pentachlorophenol	360	690	13 U	8.2 U	12 U	7.6 U
Misc Extractables (µg/kg)						
Benzyl alcohol	57	73	11 U	7.3 U	11 U	6.8 U
Benzoic acid	650	650	182 J	60	140 J	27
Dibenzofuran	540	700	26 UJ	17 U	25 UJ	16 U
Hexachloroethane	--	--	28 U	18 U	27 U	17 U
Hexachlorobutadiene	11	120	1.4 U	0.92 U	1.3 U	0.85 U
n-Nitrosodiphenylamine	28	40	37 U	24 U	36 U	23 U

Notes:

Bold: Detected.

* Exceeds SQS-AET dry wt criteria.

Exceeds CSL-AET dry wt criteria.

Italics: TOC <0.5% or >3%.

Shaded: Exceeds TOC applicable criteria.

Summary of Analytical Chemistry - SMS Screening
Duwamish Diagonal Monitoring Data

	Location ID	Sample ID	Sample Date	Depth Interval	Sample Matrix	Sample Type	SMS SQS	SMS CSL	DUD_3C L29990-3 10/20/2003 0-10 cm SE N	DUD_3C L31520-3 3/29/2004 0-10 cm SE N	DUD_3C L34524-3 1/31/2005 0-10 cm SE N	DUD_3C L34971-3 3/16/2005 0-10 cm SE N	DUD_4C L29990-4 10/20/2003 0-10 cm SE N	DUD_4C L29990-5 10/20/2003 0-10 cm SE N	DUD_4C L31520-4 3/29/2004 0-10 cm SE N	DUD_4C L31520-5 3/29/2004 0-10 cm SE N	DUD_4C L34524-4 1/31/2005 0-7 cm SE N	DUD_4C L34524-5 1/31/2005 0-7 cm SE N	DUD_4C L34971-4 3/16/2005 0-9 cm SE N	DUD_4C L34971-5 3/16/2005 0-9 cm SE N	DUD_5C L29990-6 10/20/2003 0-10 cm SE N	DUD_5C L31520-6 3/29/2004 0-10 cm SE N	DUD_5C L34524-6 1/31/2005 0-10 cm SE N	DUD_5C L34971-6 3/24/2005 0-10 cm SE N	DUD_6C L29990-7 10/20/2003 0-10 cm SE N	DUD_6C L31520-15 3/30/2004 0-10 cm SE N	DUD_6C L31520-7 3/30/2004 0-10 cm SE N	DUD_6C L34524-7 1/31/2005 0-9 cm SE N	DUD_6C L34971-7 3/24/2005 0-10 cm SE N	DUD_7C L29990-8 10/20/2003 0-10 cm SE N	DUD_7C L31520-8 3/30/2004 0-10 cm SE N	DUD_7C L34524-8 1/31/2005 0-9 cm SE N	DUD_7C L34971-8 3/24/2005 0-9 cm SE N
Conventionals (%)																																	
Total solids																																	
Total Organic Carbon																																	
Grain Size (%)																																	
Gravel																																	
Sand																																	
Silt																																	
Clay																																	
Fines																																	
Metals (mg/kg)																																	
Arsenic																																	
Cadmium																																	
Chromium																																	
Copper																																	
Lead																																	
Mercury																																	
Silver																																	
Zinc																																	
PCBs (mg/kg-OC)																																	
Total PCBs (SMS)																																	
LPAH (mg/kg-OC)																																	
Naphthalene																																	
Acenaphthylene																																	
Acenaphthene																																	
Fluorene																																	
Phenanthrene																																	
Anthracene																																	
2-Methylnaphthalene																																	
Total LPAH (SMS)																																	
HPAH (mg/kg-OC)																																	
Fluoranthene																																	
Pyrene																																	
Benzo(a)anthracene																																	
Chrysene																																	
Benzo(a)pyrene																																	
Indeno(1,2,3-cd)pyrene																																	
Dibenzo(a,h)anthracene																																	
Benzo(g,h,i)perylene																																	
Total benzofluoranthenes (SMS)																																	
Total HPAH (SMS)																																	
Chlorinated Hydrocarbons (mg/kg-OC)																																	
1,4-Dichlorobenzene																																	
1,2-Dichlorobenzene																																	
1,2,4-Trichlorobenzene																																	
Hexachlorobenzene																																	
Phthalates (mg/kg-OC)																																	
Dimethylphthalate																																	
Diethylphthalate																																	
Di-n-butylphthalate																																	
Butylbenzylphthalate																																	
bis(2-Ethylhexyl)phthalate																																	
Di-n-octylphthalate																																	
Misc Extractables (mg/kg-OC)																																	
Dibenzofuran																																	
Hexachlorobutadiene																																	
n-Nitrosodiphenylamine																																	
Phenols (µg/kg)																																	
Phenol																																	
2-Methylphenol																																	
4-Methylphenol																																	
2,4-Dimethylphenol																																	
Pentachlorophenol																																	
Misc Extractables (µg/kg)																																	
Benzyl alcohol																																	
Benzoic acid																																	

**Summary of Analytical Chemistry - SMS Screening
Duwamish Diagonal Monitoring Data**

	Location ID Sample ID Sample Date Depth Interval Sample Matrix Sample Type			DUD_14C L34524-16 2/2/2005 0-10 cm SE N	DUD_14C L34971-16 3/16/2005 0-10 cm SE N	DUD_15C L34524-17 2/2/2005 0-10 cm SE N	DUD_15C L34971-17 3/16/2005 0-10 cm SE N
		SMS SQS	SMS CSL				
Conventionals (%)							
Total solids		--	--	53.5	81.8	55.7	88.3
Total Organic Carbon		--	--	1.71	0.297	1.58	0.049 U
Grain Size (%)							
Gravel		--	--	0.1 UJ	32.9	1.9 J	56.1
Sand		--	--	34.1	61.5	34.7	44.4
Silt		--	--	46.7	2.3	41.8	0.5 U
Clay		--	--	14.9	1.1	16.4	0.5 U
Fines		--	--	61.6	3.4	58.2	0.5 U
Metals (mg/kg)							
Arsenic		57	93	8.6 J	2.9 U	14 J	2.9 U
Cadmium		5.1	6.7	0.9 JL	0.17 U	0.79 JL	0.18 U
Chromium		260	270	40.7	16	33	13.7
Copper		390	390	96.3	32.3	95	30.6
Lead		450	530	78.7	5.4	110	1.8 U
Mercury		0.41	0.59	0.28 J	0.024 U	0.25 J	0.024 U
Silver		6.1	6.1	2.54 L	1	2.24 L	1.1
Zinc		410	960	148	32	165	27.7
PCBs (mg/kg-OC)							
Total PCBs (SMS)		12	65	36.3 *	10.9	15.8 *	--
LPAH (mg/kg-OC)							
Naphthalene		99	170	1.52 U	5.72 U	1.58 U	--
Acenaphthylene		66	66	1.64 J	6.06 U	1.71 U	--
Acenaphthene		16	57	1.29 J	2.9 U	1.63	--
Fluorene		23	79	1.75 J	5.39 U	1.84 J	--
Phenanthrene		100	480	10 J	8.18	13 J	--
Anthracene		220	1200	6.08	4.48	4.46	--
2-Methylnaphthalene		38	64	1.52 U	5.72 U	1.58 U	--
Total LPAH (SMS)		370	780	20.8	12.7	20.9	--
HPAH (mg/kg-OC)							
Fluoranthene		160	1200	27.8	18.7	30.1	--
Pyrene		1000	1400	31.8	17.1	35.6	--
Benzo(a)anthracene		110	270	13.8	8.45	13.4	--
Chrysene		110	460	23.5	13.4	18	--
Benzo(a)pyrene		99	210	18	8.86	17.8	--
Indeno(1,2,3-cd)pyrene		34	88	9.47	5.72	9.18	--
Dibenzo(a,h)anthracene		12	33	4.02	2.9 U	4.44	--
Benzo(g,h,i)perylene		31	78	10.2	5.72	10.4	--
Total benzofluoranthenes (SMS)		230	450	34.7	20.9	38.7	--
Total HPAH (SMS)		960	5300	173	99	178	--
Chlorinated Hydrocarbons (mg/kg-OC)							
1,4-Dichlorobenzene		3.1	9	0.475	0.0539 U	0.391	--
1,2-Dichlorobenzene		2.3	2.3	0.385	0.108 U	0.0297 U	--
1,2,4-Trichlorobenzene		0.81	1.8	0.0287 U	0.108 U	0.0297 U	--
Hexachlorobenzene		0.38	2.3	0.0702 U	0.273 U	0.0759 U	--
Phthalates (mg/kg-OC)							
Dimethylphthalate		53	53	1.23 U	4.38 U	1.27 U	--
Diethylphthalate		61	110	0.643 U	2.46 U	0.759 J	--
Di-n-butylphthalate		220	1700	1.66 B	7.41	1.46 B	--
Butylbenzylphthalate		4.9	64	2.69	3.7	2.15	--
bis(2-Ethylhexyl)phthalate		47	78	54.7 *	23.6	26.9	--
Di-n-octylphthalate		58	4500	0.877 U	3.3 U	0.886 U	--
Misc Extractables (mg/kg-OC)							
Dibenzofuran		15	58	1.52 UJ	5.72 U	1.58 UJ	--
Hexachlorobutadiene		3.9	6.2	0.0819 U	0.31 U	0.0823 U	--
n-Nitrosodiphenylamine		11	11	2.16 U	8.08 U	2.28 U	--
Phenols (µg/kg)							
Phenol		420	1200	17 UJ	11 U	27 J	10 U
2-Methylphenol		63	63	30 U	20 U	29 U	18 U
4-Methylphenol		670	670	30 U	20 U	29 U	18 U
2,4-Dimethylphenol		29	29	13 U	8.6 U	13 U	7.9 U
Pentachlorophenol		360	690	13 U	8.2 U	12 U	7.6 U
Misc Extractables (µg/kg)							
Benzyl alcohol		57	73	11 U	7.3 U	11 U	6.8 U
Benzoic acid		650	650	182 J	60	140 J	27

Notes:

Bold: Detected.
 * Exceeds SQS-AET dry wt criteria.
 # Exceeds CSL-AET dry wt criteria.
 Italics: TOC <0.5% or >3%.
 Shaded: Exceeds TOC applicable criteria.
 -- TOC undetected; not normalized

Laboratory data and data quality reviews
provided on CD at back of report