CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD **January 12, 2010**

SUBJECT: DMMP DETERMINATION REGARDING THE QUALITY OF SEDIMENT TO BE EXPOSED BY DREDGING, TO VERIFY COMPLIANCE WITH THE WASHINGTON STATE ANTIDEGRADATION POLICY, FOR THE PERCIVAL LANDING REDEVELOPMENT PROJECT, OLYMPIA, WASHINGTON (NWS-2009-1194).

1. **Introduction**. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Department of Ecology, and the Environmental Protection Agency) with regulatory authority regarding the quality of sediment that will be exposed by dredging for the Percival Landing Redevelopment project, proposed by the City of Olympia Parks, Arts and Recreation Department (OPARD). The project area is in Lower Budd Inlet (see Figure 1) and includes dredging 19,100 cy of material for navigation and habitat creation. The dredged material will be disposed at a Subtitle D landfill. Because this project does not involve in-water disposal, a DMMP suitability determination is not required. Instead, an antidegradation determination is needed, as will be documented in this memorandum.

2. **Background**. Sediment sampling and testing were not coordinated with the DMMP agencies. In November 2009, Anchor QEA informed the DMMP agencies about the project (Anchor, 2009) and requested that the DMMP agencies review the data in order to make an antidegradation determination. The original design (Figure 2) called for dredging in three areas to provide adequate water depth for planned floating elements. Sediment sampling was based on this preliminary design. The design was later changed (Figure 3) to include tidal inlet and habitat restoration areas. The dredging depth was also changed.

Table 1. Project Summary

Proposed dredging volume	19,100 cubic yards
Proposed disposal site	Upland; no return water
Project ranking	High
SAP received	N/A
SAP approved	N/A
Sampling dates	February 2008 (sediment); June 2009 (soil)
Data memo submitted	November 30, 2009
DAIS Tracking number	N/A
USACE Permit Application Number	NWS-2009-1194
DAIS Tracking Number	PERLA-1-A-O-292
Recency Determination	N/A

3. **Sediment Sampling**. Sediment core samples were collected from three locations using a vibracore. Sediment samples were taken from three depth intervals at each sampling station. Samples C1-01,

C2-01 and C3-01 represented the dredging prism from the preliminary design. Samples C1-01A, C2-01A and C3-01A represented 2 feet of overdredge depth. Samples C1-01Z, C2-01Z and C3-01Z were z-samples, representing the sediment that would be exposed by dredging. Table 2 includes the sample depths.

4. **Chemical Analysis**. The samples representing the dredging prism and overdepth were analyzed for the standard list of DMMP chemicals of concern, plus tributyltin and dioxins. The z-samples were not analyzed and were, in fact, discarded prior to review of project data by the DMMP agencies. The chemical results, compared to DMMP and SMS guidelines, can be found in Tables 3 and 4 respectively.

5. **Sediment Evaluation**. No DMMP suitability determination is required for the proposed dredged material to be disposed at the upland facility. However, a determination regarding the quality of the post-dredge sediment surface with respect to the DMMP antidegradation guidelines (DMMP, 2008) was required. While the sediment characterization reflected the original design and not the revised proposal, the data provided sufficient information for the DMMP agencies to make a determination. Table 5 summarizes the data and indicates that the post-dredge surface in the vicinity of sampling stations C1 and C3 would likely be degraded relative to the existing surface sediment. In addition, the sediment in the vicinity of sampling station C2, while no longer slated for dredging, includes elevated levels of mercury and dioxin.

6. **Design Modification**. On the basis of this determination, the DMMP agencies requested that Anchor QEA confer with OPARD on design modifications that would address the sediment quality issues. Anchor QEA submitted a dredge-and-cover design (Anchor, 2010) on January 5 that would result in a one-foot layer of clean surface sediment in the areas to be dredged and a six-inch cover in the vicinity of station C2 (see Figure 4). The DMMP agencies agreed that the modified design meets the intent of the antidegradation guidelines.

7. **Soil Sampling and Evaluation**. In addition to the sediment samples, upland soil samples were taken from the areas that will be excavated for the tidal inlet and habitat creation areas. Soil samples were collected from five locations with a push core. The data indicated that the material to be excavated is predominantly sand, without any detected DMMP or SMS exceedances. The DMMP agencies determined that the surface to be exposed by excavation in these areas meets the antidegradation guidelines.

8. **References**.

Anchor, 2009. *Summary of Findings from Sediment and Soil Sampling and Chemical Analysis Percival Landing Redevelopment Project, Olympia, Washington.* A technical memorandum prepared by Anchor QEA, Seattle, Washington. November 30, 2009.

Anchor, 2010. *Dredging at Percival Landing, Olympia.* A memorandum prepared by Anchor QEA, Seattle, Washington. January 5, 2010.

DMMP, 2008. Quality of Post-Dredge Sediment Surfaces (Updated) – 2008 Sediment Management Annual Review Meeting Clarification Paper. Dredged Material Management Program. June 2008.

Concur:

1/14/10
Date

David Fox, P.E. - Seattle District Corps of Engineers

1/14/10
Date

Erika Hoffman - Environmental Protection Agency

January 14, 2010
Date

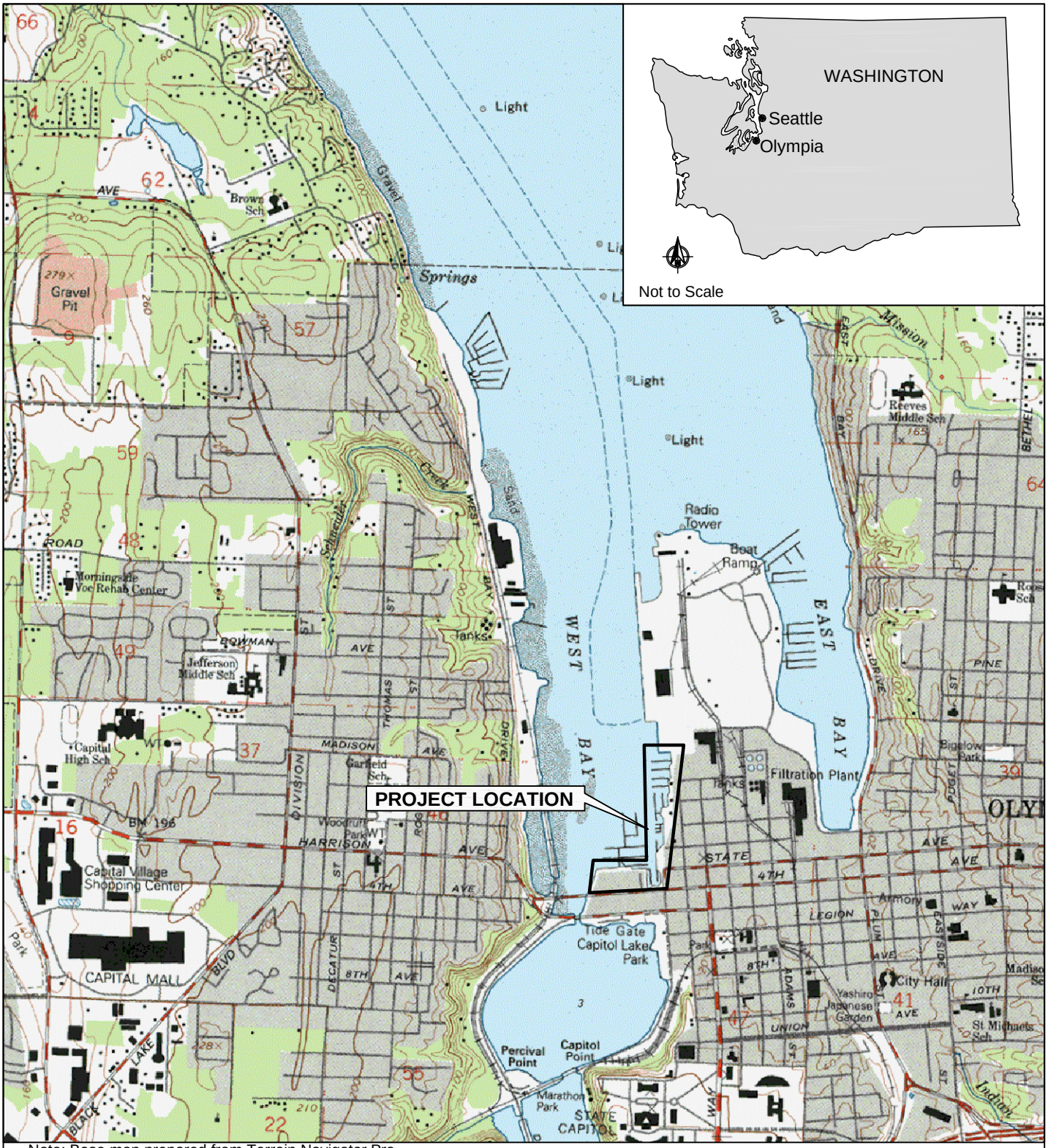
Laura Inouye - Washington Department of Ecology

1/14/10
Date

David Vagt - Washington Department of Natural Resources

Copies furnished:

DMMP Signatories
Darren Habel, Corps Regulatory
Bruce McDonald, Anchor QEA
DMMO file



Note: Base map prepared from Terrain Navigator Pro
USGS 7.5 minute quadrangle map of Tumwater, Washington.

Jan 27, 2008 12:50pm cdavidson K:\Jobs\070487-Percival Landing\07048701\07048701-008.dwg FIG 1

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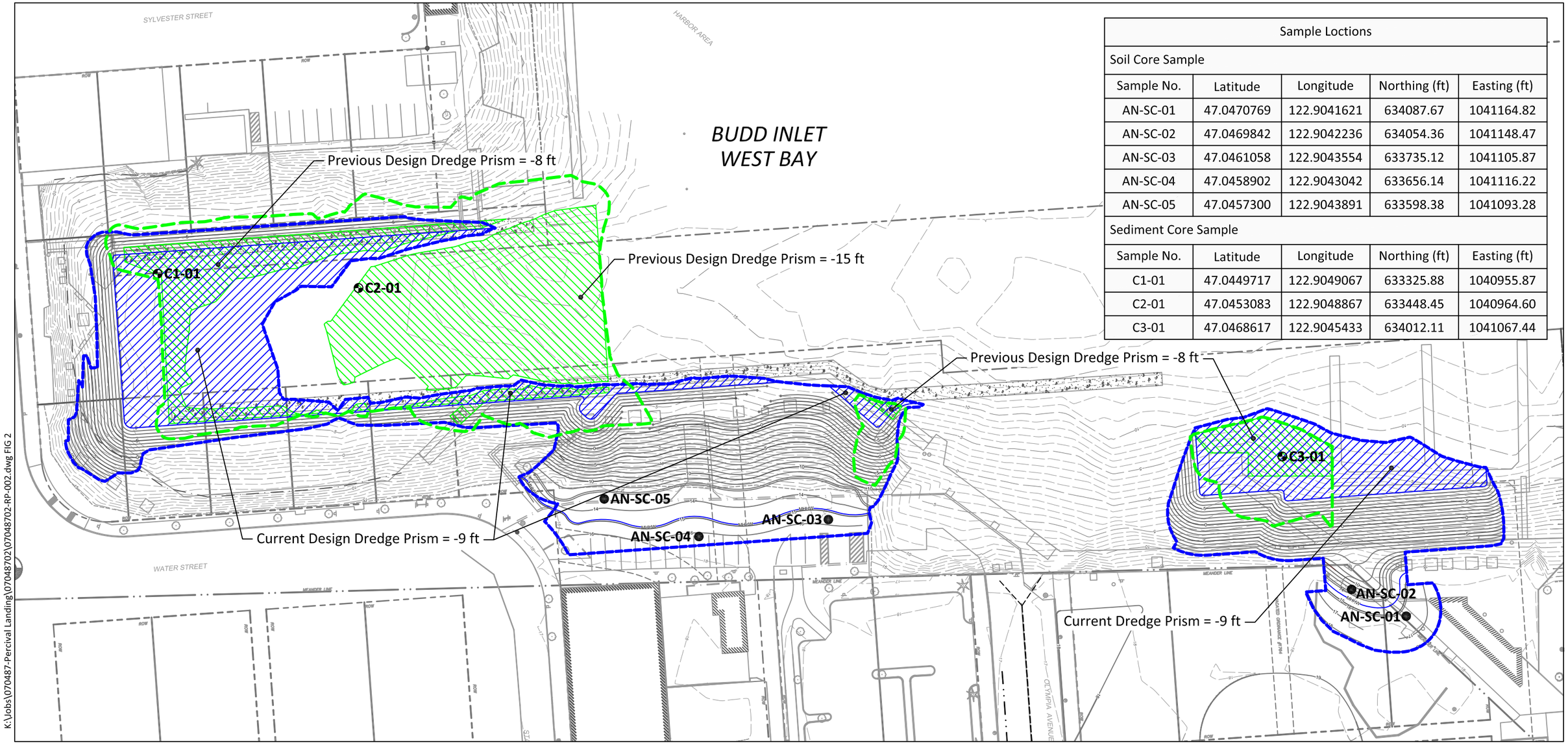
Figure 1
Vicinity Map
Percival Landing Sediment Characterization
Olympia, Washington



Sample Loctions				
Soil Core Sample				
Sample No.	Latitude	Longitude	Northing (ft)	Easting (ft)
AN-SC-01	47.0470769	122.9041621	634087.67	1041164.82
AN-SC-02	47.0469842	122.9042236	634054.36	1041148.47
AN-SC-03	47.0461058	122.9043554	633735.12	1041105.87
AN-SC-04	47.0458902	122.9043042	633656.14	1041116.22
AN-SC-05	47.0457300	122.9043891	633598.38	1041093.28
Sediment Core Sample				
Sample No.	Latitude	Longitude	Northing (ft)	Easting (ft)
C1-01	47.0449717	122.9049067	633325.88	1040955.87
C2-01	47.0453083	122.9048867	633448.45	1040964.60
C3-01	47.0468617	122.9045433	634012.11	1041067.44

HORIZONTAL DATUM: Washington State Plane South, NAD 83/96 CORS.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

LEGEND:

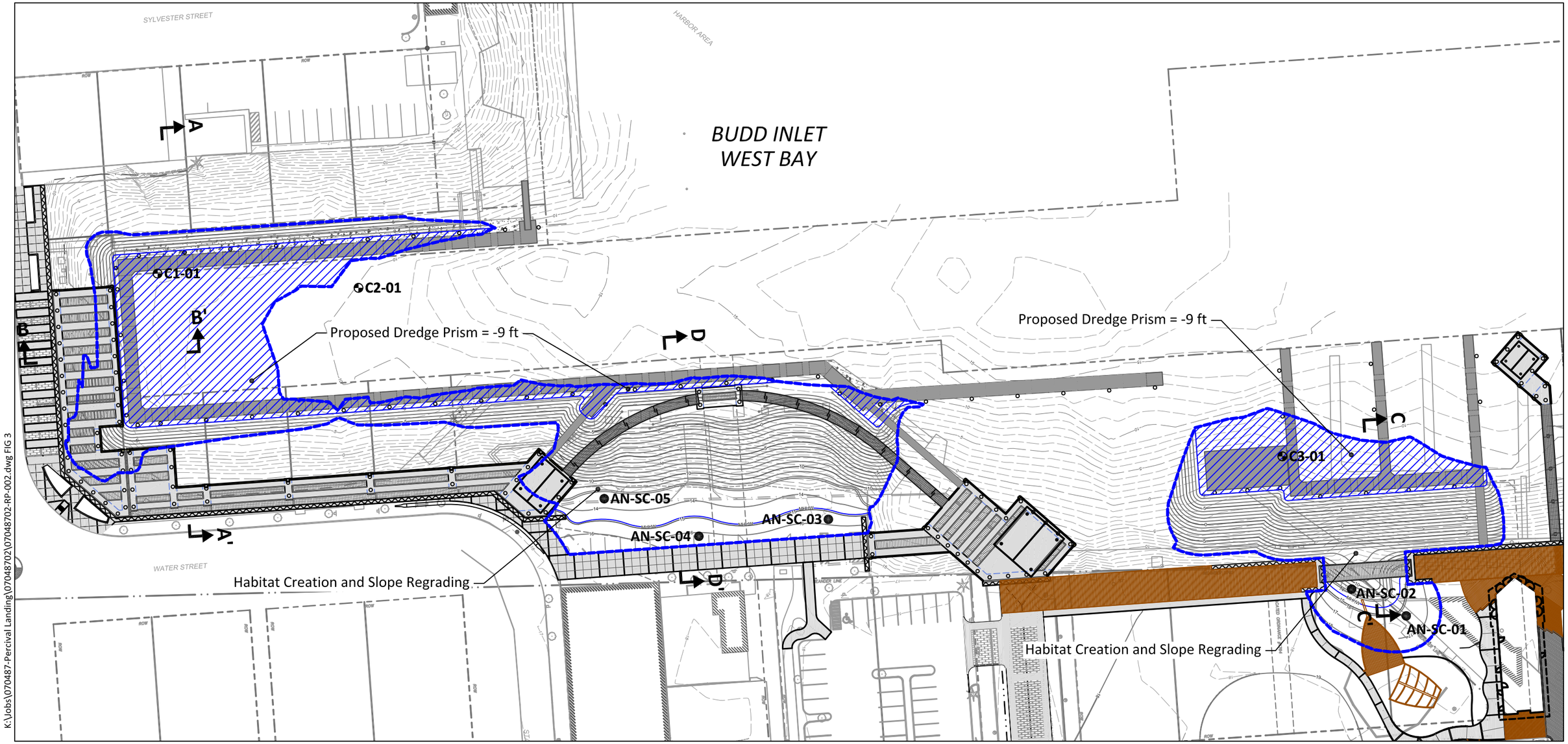
- Current Dredge Design Prism
- Previous Dredge Design Prism
- Current Dredge Design Daylight Limits
- Previous Dredge Design Daylight Limits
- AN-SC-01 Soil Core Sample Location
- C2-01 Sediment Core Sample Location
- Existing Contour
- Current Proposed Contour

0 60
Scale in Feet

K:\Jobs\070487-Percival Landing\07048702\07048702-RP-002.dwg FIG 2
Nov 20, 2009 4:32pm tgriga

ANCHOR QEA

Figure 2
Sediment and Soil Sample Locations with Original and Current Dredge Areas
Percival Landing Major Rehabilitation - Section A
Olympia, Washington



K:\Jobs\070487-Percival Landing\07048702\07048702-RP-002.dwg FIG 3

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HORIZONTAL DATUM: Washington State Plane South, NAD 83/96 CORS.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

LEGEND:

- Current Dredge Design Prism
- Current Dredge Design Daylight Limits
- D D' Section Location
- AN-SC-01 Soil Core Sample Location
- C2-01 Sediment Core Sample Location
- Existing Contour
- Current Proposed Contour

0 60
Scale in Feet

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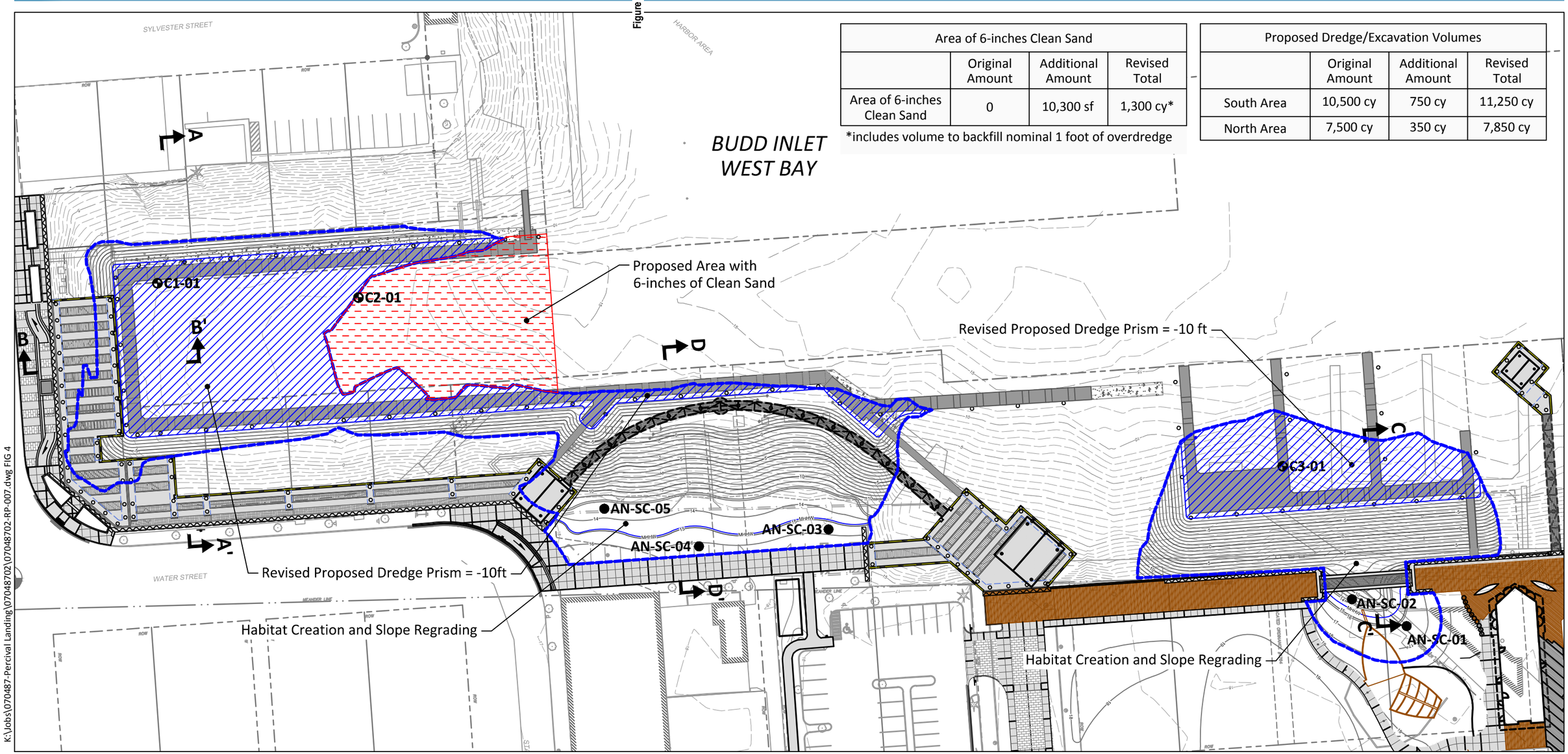
Figure 3
Plan View of Proposed Dredging and Habitat Improvements
Percival Landing Major Rehabilitation - Section A
Olympia, Washington

Figure 4

Area of 6-inches Clean Sand			
	Original Amount	Additional Amount	Revised Total
Area of 6-inches Clean Sand	0	10,300 sf	1,300 cy*

*includes volume to backfill nominal 1 foot of overdredge

Proposed Dredge/Excavation Volumes			
	Original Amount	Additional Amount	Revised Total
South Area	10,500 cy	750 cy	11,250 cy
North Area	7,500 cy	350 cy	7,850 cy



K:\Jobs\070487-Percival Landing\07048702\07048702-RP-007.dwg FIG 4

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HORIZONTAL DATUM: Washington State Plane South, NAD 83/96 CORS.
VERTICAL DATUM: Mean Lower Low Water (MLLW).

LEGEND:

- Current Dredge Design Daylight Limits
- Current Dredge Design Prism (includes 1 ft overdredge and 1 ft sand)
- 6 inches Sand Cover Only
- ●AN-SC-01 Soil Core Sample Location
- ✪C2-01 Sediment Core Sample Location
- Existing Contour
- Current Proposed Contour
- D D' Section Location

0 60
Scale in Feet

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Figure 4
Plan View of Proposed Dredging and Habitat Improvements
Percival Landing Major Rehabilitation - Section A
Olympia, Washington

Table 2 – Sediment Samples (from Anchor, 2009)

Sample	Top depth	Bottom depth	Top elevation (MLLW)	Bottom elevation (MLLW)
C1-01	0	2.3	-6.2	-8.5
C1-01A	2.3	4.7	-8.5	-10.9
C1-01Z	4.7	6	-10.9	-12.2
C2-01	0	3.1	-9.7	-12.8
C2-01A	3.1	5.6	-12.8	-15.3
C2-01Z	5.6	6.3	-15.3	-16
C3-01	0	3.4	-4.5	-7.9
C3-01A	3.4	5.5	-7.9	-10
C3-01Z	5.5	7	-10	-11.5

Table 3 (Table 1 from Anchor, 2009)
Chemical Concentrations in Sediment Samples, Compared to PSDDA Open-water Disposal Criteria

Location ID:				C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample ID:				C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample Date:				2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08
Depth Interval (feet):	DMMP-SL	DMMP-BT	DMMP-ML	0 to 2.3	2.3 to 4.7	4.7 to 6.0	0 to 3.1	3.1 to 5.6	5.6 to 6.3	0 to 3.4	3.4 to 5.5	5.5 to 7.0
Conventionals (percent)												
Liquid Limit				48.4	52.1	--	56.2	51.5	--	44.7	25.7	--
Plastic Limit				29	33.5	--	36.7	26.5	--	28.2	20.2	--
Plasticity Index				19.5	18.6	--	19.5	24.9	--	16.6	5.5	--
Conventional Parameters (percent)												
Total organic carbon				2.69	4.16	--	3.3	3.68	--	2.16	0.97	--
Total solids				54	51.4	51.3	39.7	50.3	58.4	53.6	68.3	77.6
Total volatile solids				8.64	10.7	--	9.8	9.96	--	7.27	3.46	--
Conventional Parameters (mg/kg)												
Ammonia				48.3 J	100 J	--	136 J	137 J	--	45.6 J	15.4 J	--
Sulfide				233	166	--	676	119	--	846	32.4	--
Grain size (pct)												
Total Gravel				9.3	1.59	--	3.21	0.81	--	24.2	10.33	--
Total Sand				40.93	25.33	--	10.73	8.64	--	39.15	61.46	--
Total Silt				31.7	45.7	--	44.7	61.3	--	27.3	20.4	--
Total Clay				21.4	23.8	--	35.1	23.1	--	19.9	17.8	--
Total Fines (silt + clay)				53.1	69.5	--	79.8	84.4	--	47.2	38.2	--
Porewater TBT (µg/l)												
Tributyltin (ion)	0.15	0.15		0.081 U	0.12 U	--	0.078 U	0.17 U	--	0.063 J	0.13 U	--
Metals (mg/kg)												
Antimony	150		200	0.16 J	0.3 J	--	0.26 J	0.24 J	--	0.2 J	0.14 J	--
Arsenic	57	507.1	700	5.62	5.57	--	7.85	9.16	--	7.21	3.19	--
Cadmium	5.1	11.3	14	1.52	2.23	--	2.67	2.84	--	1.51	0.604	--
Chromium		267		22.7	27	--	34.5	33.7	--	22.4	15.1	--
Copper	390	1027	1300	57.5	53.5	--	76.9	69.7	--	42.2	17.6	--
Lead	450	975	1200	47.2 J	84.9 J	--	92.2 J	105 J	--	199 J	38.9 J	--
Mercury	0.41	1.5	2.3	0.311	0.485	--	0.712	0.797	--	0.304	0.122	--
Nickel	140	370	370	19.7	22.7	--	27.5	27.9	--	18.3	14.5	--
Selenium		3		0.9	1	--	1.3	1.2	--	0.7	0.5	--
Silver	6.1	6.1	8.4	0.543	0.344	--	3.34	1.52	--	1.12	0.321	--
Zinc	410	2783	3800	101	137	--	131	140	--	126	42.8	--
PCB Aroclors (µg/kg)												
Aroclor 1016				12 U	17 U	--	36 U	17 U	--	41 U	10 U	--
Aroclor 1221				20 U	24 U	--	70 U	20 U	--	23 U	30 U	--
Aroclor 1232				13 U	150 U	--	300 U	160 U	--	29 U	280 U	--
Aroclor 1242				16 U	10 U	--	13 U	21 U	--	45 U	10 U	--
Aroclor 1248				10 U	10 U	--	13 U	10 U	--	10 U	10 U	--
Aroclor 1254				43	10 U	--	110	43	--	71	19	--
Aroclor 1260				10 U	10 U	--	13 U	20	--	10 U	10 U	--
Total PCB Aroclors (U = 0)	130		3100	43	150 U	--	110	63	--	71	194	--
PCB Aroclors (mg/kg-OC)												
Total PCB Aroclors (U = 0)		38		1.5985	3.6058 U	--	3.3333	1.712	--	3.287	1.9588	--
Aromatic Hydrocarbons (µg/kg)												
Total DMMP LPAH (U = 0)	5200		29000	932	12620	--	290	555	--	1921	10987	--
Naphthalene	2100		2400	210 J	570 J	--	25 J	140 J	--	140 J	550 J	--
Acenaphthylene	560		1300	69 J	630 J	--	31 J	50 J	--	81 J	67 J	--
Acenaphthene	500		2000	170 J	840 J	--	11 J	28 J	--	280 J	460 J	--
Fluorene	540		3600	83	680	--	21	45	--	250	1200	--
Phenanthrene	1500		21000	240	6500	--	140	210	--	830	8100	--
Anthracene	960		13000	160	3400	--	62	82	--	340	610	--
2-Methylnaphthalene	670		1900	110	200	--	13 J	47	--	64	310	--
Total DMMP HPAH (U = 0)	12000		69000	2130	30130	--	1451	1407	--	7661	8789	--
Fluoranthene	1700	4600	30000	430	6800	--	180	230	--	2000	3900	--
Pyrene	2600	11980	16000	610	7900	--	320	420	--	1600	3100	--
Benzo(a)anthracene	1300		5100	170	3500	--	110	89	--	640	310	--
Chrysene	1400		21000	250	3300	--	190	150	--	1300	660	--
Total DMMP Benzofluoranthenes (b,j,k) (U = 0)	3200		9900	315	3700	--	269	195	--	1100	470	--
Benzo(b)fluoranthene				310	2700	--	200	160	--	840	350	--
Benzo(k)fluoranthene				10 U	1000	--	69	35	--	260	120	--
Benzo(a)pyrene	1600		3600	150	2600	--	130	110	--	410	150	--
Indeno(1,2,3-c,d)pyrene	600		4400	110	1400	--	120	97	--	290	91	--
Dibenzo(a,h)anthracene	230		1900	10 U	200	--	22	17	--	61	19	--
Benzo(g,h,i)perylene	670		3200	100	730	--	110	99	--	260	89	--
Total DMMP PAH (U = 0)				3062	42750	--	1741	1962	--	9582	19776	--

Table 3 (Table 1 from Anchor, 2009)
Chemical Concentrations in Sediment Samples, Compared to PSDDA Open-water Disposal Criteria

Location ID:				C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample ID:				C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample Date:				2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08
Depth Interval (feet):	DMMP-SL	DMMP-BT	DMMP-ML	0 to 2.3	2.3 to 4.7	4.7 to 6.0	0 to 3.1	3.1 to 5.6	5.6 to 6.3	0 to 3.4	3.4 to 5.5	5.5 to 7.0
Chlorinated Hydrocarbons (µg/kg)												
1,3-Dichlorobenzene	170			10 UJ	10 UJ	--	13 UJ	10 UJ	--	10 UJ	9.9 UJ	--
1,4-Dichlorobenzene	110		120	**8.1 J**	10 UJ	--	**6.8 J**	**3.9 J**	--	**3.4 J**	9.9 UJ	--
1,2-Dichlorobenzene	35		110	10 UJ	10 UJ	--	13 UJ	10 UJ	--	10 UJ	9.9 UJ	--
1,2,4-Trichlorobenzene	31		64	10 U	10 U	--	13 U	10 U	--	10 U	9.9 UJ	--
Hexachlorobenzene	22	168	230	10 U	10 U	--	13 U	10 U	--	10 U	9.9 U	--
Phthalates (µg/kg)												
Dimethyl phthalate	71		1400	10 U	10 U	--	13 U	10 U	--	10 U	9.9 U	--
Diethyl phthalate	200		1200	**7.6 J**	10 U	--	**4.9 J**	10 U	--	10 U	**3.5 J**	--
Di-n-butyl phthalate	1400		5100	**18 J**	20 U	--	**37**	**19 J**	--	**21**	**26**	--
Butylbenzyl phthalate	63		970	10 U	10 U	--	**15**	10 U	--	**70**	9.9 U	--
Bis(2-ethylhexyl) phthalate	1300		8300	**240**	100 U	--	**140**	**39 J**	--	**190**	**40 J**	--
Di-n-octyl phthalate	6200		6200	10 U	10 U	--	13 U	10 U	--	10 U	9.9 U	--
Phenols (µg/kg)												
Phenol	420		1200	30 U	**40**	--	38 U	**19 J**	--	30 U	30 UJ	--
2-Methylphenol (o-Cresol)	63		77	10 UJ	**13 J**	--	13 UJ	**2.4 J**	--	10 UJ	9.9 UJ	--
4-Methylphenol (p-Cresol)	670		3600	**140 J**	**96 J**	--	**17 J**	**31 J**	--	**29 J**	**17 J**	--
2,4-Dimethylphenol	29		210	50 UJ	**17 J**	--	63 UJ	**130 J**	--	**6.5 J**	**25 J**	--
Pentachlorophenol	400	504	690	100 U	100 U	--	130 U	100 U	--	100 U	99 U	--
Miscellaneous Extractables (µg/kg)												
Benzyl alcohol	57		870	20 UJ	20 UJ	--	**5 J**	**6.4 J**	--	20 UJ	20 UJ	--
Benzoic acid	650		760	200 UJ	200 UJ	--	260 UJ	200 UJ	--	200 UJ	200 UJ	--
Dibenzofuran	540		1700	**65**	**210**	--	**11 J**	**31**	--	**94**	**410**	--
Hexachloroethane (method SW8081)	1400		14000	1 U	1 U	--	1.3 U	1 U	--	1 U	1 U	--
Hexachloroethane (method SW8270)	1400		14000	10 UJ	10 UJ	--	13 UJ	10 UJ	--	10 UJ	9.9 UJ	--
Hexachlorobutadiene (method SW8270)	29		270	10 U	10 U	--	13 U	10 U	--	10 U	9.9 U	--
Hexachlorobutadiene (method SW8081)	29		270	2.5 U	1.9 U	--	2.3 U	1.5 U	--	3.3 U	1.7 U	--
N-Nitrosodiphenylamine	28		130	**16**	10 U	--	**5.8 J**	10 U	--	10 U	9.9 U	--
Volatile Organics (µg/kg)												
Trichloroethene (TCE)	160		1600	8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U
Tetrachloroethene (PCE)	57		210	8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U
Ethylbenzene	10		50	8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U
o-Xylene				8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U
m,p-Xylene				8.8 U	**0.49 J**	9.7 U	13 U	10 U	8.2 U	8.5 U	**0.3 J**	6.6 U
Total Xylene (U = 0)	40		160	8.8 U	**0.49**	9.7 U	13 U	10 U	8.2 U	8.5 U	**0.3**	6.6 U
Pesticides & PCBs (µg/kg)												
Total DDx (U = 0)	6.9	50	69	**3**	1 U	--	**22.8**	**6.5**	--	**20.8**	**0.78**	--
4,4'-DDD (p,p'-DDD)				2.5 U	1 U	--	**6.7**	**2.9**	--	**6.1**	1.6 U	--
4,4'-DDE (p,p'-DDE)				1.5 U	1 U	--	**6.5 J**	**1.7**	--	**2.7**	**0.78 J**	--
4,4'-DDT (p,p'-DDT)				**3 J**	1 U	--	**9.6**	**1.9**	--	**12 J**	1.5 U	--
Aldrin	10			1 U	1 U	--	1.3 U	1 U	--	1 U	1 U	--
Chlordane (technical)				1 U	1 U	--	1.3 U	1 U	--	1 U	1 U	--
Dieldrin	10			1 U	1 U	--	1.3 U	1 U	--	1 U	1 U	--
Heptachlor	10			1 U	1 U	--	1.3 U	1 U	--	1 U	1 U	--
gamma-BHC (Lindane)	10			1.8 U	2.8 U	--	1.8 U	3.2 U	--	3.5 U	2.6 U	--
Chlordane				15 U	12 U	--	22 U	13 U	--	14 U	11 U	--
Total DMMP Chlordane (U = 0)	10	37		2 U	1 U	--	**4.8**	**0.92**	--	**2.4**	**0.6**	--
alpha-Chlordane (cis-Chlordane)				1 U	1 U	--	1.3 U	1 U	--	1 U	1 U	--
cis-Nonachlor				2 U	1 U	--	**4.8**	**0.92 J**	--	**2.4 J**	**0.6 J**	--
trans-Nonachlor				1 U	1 U	--	1.3 U	1 U	--	1 U	1 U	--

Table 3 (Table 1 from Anchor, 2009)
Chemical Concentrations in Sediment Samples, Compared to PSDDA Open-water Disposal Criteria

Location ID:				C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample ID:				C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample Date:				2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08
Depth Interval (feet):	DMMP-SL	DMMP-BT	DMMP-ML	0 to 2.3	2.3 to 4.7	4.7 to 6.0	0 to 3.1	3.1 to 5.6	5.6 to 6.3	0 to 3.4	3.4 to 5.5	5.5 to 7.0
Dioxin Furans (ng/kg)												
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)				4.25279	3.227529	--	21.0905	8.60751	--	9.9308	4.62789	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)				4.25834	3.227529	--	21.0905	8.60751	--	9.9424	4.63524	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)				0.203 J	0.468 J	--	0.749 J	0.577 J	--	0.338 J	0.241 J	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)				0.619 J	0.87 J	--	2.84 J	1.46 J	--	1.47 J	0.875 J	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)				1.1 J	0.452 J	--	4.56 J	0.902 J	--	2.25 J	0.897 J	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)				4.47 J	0.814 J	--	24.6	3.73 J	--	14.4	4.84	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)				2.95 J	0.843 J	--	12.8	2.44 J	--	6.77	2.7 J	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)				126	5.36	--	547	36	--	298	98	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)				1470	34.7	--	4640 J	171	--	2460	660	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)				0.8 J	3.92	--	2.42	3.63	--	1.13	1	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)				0.565 J	1.91 J	--	2.42 J	3.35 J	--	1.07 J	0.603 J	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)				0.678 J	2.55 J	--	3.76 J	4.27 J	--	1.48 J	1.02 J	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)				1.57 J	1.78 J	--	17.7	12	--	4.89 J	2.95 J	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)				0.901 J	1.13 J	--	7.17	6.7	--	2.42 J	1.32 J	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)				0.111 U	0.0691 J	--	0.232 J	0.429 J	--	0.232 U	0.147 U	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)				0.676 J	0.834 J	--	5.38	4.21 J	--	1.54 J	2.17 J	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)				22.4	1.63 J	--	177	128	--	53.4	39	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)				0.931 J	0.216 J	--	6.09	6.73	--	2.11 J	1.05 J	--
1,2,3,4,5,6,7,8-Octachlorodibenzofuran (OCDF)				98.1	1.83 J	--	406	87.7	--	112	72	--
Total Tetrachlorodibenzo-p-dioxin (TCDD)				2.93	17.7	--	18.2	24.5	--	8.58	10.4	--
Total Pentachlorodibenzo-p-dioxin (PeCDD)				8.99	17.1	--	31.1	29.7	--	18.2	10.3	--
Total Hexachlorodibenzo-p-dioxin (HxCDD)				45.2	15.5	--	187	48	--	103	41.8	--
Total Heptachlorodibenzo-p-dioxin (HpCDD)				499	15.5	--	1450	80.1	--	783	232	--
Total Tetrachlorodibenzofuran (TCDF)				13.6	87.9	--	52.6	84.5	--	31.9	27.5	--
Total Pentachlorodibenzofuran (PeCDF)				14.3	26.2	--	133	138	--	62.1	38.9	--
Total Hexachlorodibenzofuran (HxCDF)				28.4	10.2	--	259	140	--	93	55.5	--
Total Heptachlorodibenzofuran (HpCDF)				74.6	2.77 J	--	483	213	--	153	102	--

Table 3 (Table 1 from Anchor, 2009)
Chemical Concentrations in Sediment Samples, Compared to PSDDA Open-water Disposal Criteria

Notes:

	Detected concentration is greater than DMMP Screening Level
	Detected concentration is greater than DMMP Bioaccumulation Trigger
	Detected concentration is greater than DMMP Maximum Level Marine Guideline
	Non-detected concentration is above one or more identified screening levels

J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte
U	The analyte was analyzed for but not detected above the sample reporting limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit
U= 1/2	Falf of the detection limit is included in the sum of results (applies to dioxin/furan TEQ calculation only)
BOLD	Denotes detections
mg/kg	Milligram per kilogram, dry weight
ng/kg	Nanogram per kilogram, dry weight
µg/kg	Microgram per kilogram, dry weight
µg/l	Microgram per liter
--	No numerical criterion of this type for this chemical
HPAH	High molecular weight polycyclic aromatic hydrocarbon
LPAH	Low molecular weight polycyclic aromatic hydrocarbon
DMMP-SL	Dredged Management Material Program screening level
DMMP-BT	Dredged Management Material Program bioaccumulation trigger
DMMP-ML	Dredged Management Material Program maximum level
TEQ	Toxic Equivalents Quotient (values as of 2005, World Health Organization)

Total LPAH (Low PAH) are the total of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene and Anthracene. 2-Methylnapthalene is not included in the sum of LPAHs.

Total HPAH (High PAH) are the total of Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzofluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenzo(a,h)anthracene and Benzo(g,h,i)perylene
Total PAH are the total of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzofluoranthenes, Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenzo(a,h)anthracene and

Benzo(j)fluoranthene is included in the total of benzo(b&k)fluoranthenes

Sum DDT consists of the sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT

Total Chlordane includes alpha-chlordane (cis-chlordane), beta-chlordane (trans-chlordane), cis-nonaclor, trans-nonaclor and oxychlordane.

Total xylene is the sum of o-, m-, p- isomers
Totals are calculated as the sum of all detected results (U=0). If all results are not detected, the highest reporting limit value is reported as the sum.

Table 4 (Table 2 from Anchor, 2009)
Chemical Concentrations in Sediment Samples, Compared to Sediment Management Standards

Location ID			C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample ID			C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample Date			2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08
Depth Interval (feet)	CSL	SQS	0 to 2.3	2.3 to 4.7	4.7 to 6.0	0 to 3.1	3.1 to 5.6	5.6 to 6.3	0 to 3.4	3.4 to 5.5	5.5 to 7.0
Conventionals (mg/kg)											
Ammonia	--	--	48.3 J	100 J		136 J	137 J		45.6 J	15.4 J	
Sulfide	--	--	233	166		676	119		846	32.4	
Conventionals (percent)											
Liquid Limit	--	--	48.4	52.1		56.2	51.5		44.7	25.7	
Plastic Limit	--	--	29	33.5		36.7	26.5		28.2	20.2	
Plasticity Index	--	--	19.5	18.6		19.5	24.9		16.6	5.5	
Total organic carbon	--	--	2.69	4.16		3.3	3.68		2.16	0.97	
Total solids	--	--	54	51.4	51.3	39.7	50.3	58.4	53.6	68.3	77.6
Total volatile solids	--	--	8.64	10.7		9.8	9.96		7.27	3.46	
Dioxin/Furans (ng/kg)											
2,3,7,8-TCDD	--	--	0.203 J	0.468 J		0.749 J	0.577 J		0.338 J	0.241 J	
1,2,3,7,8-PeCDD	--	--	0.619 J	0.87 J		2.84 J	1.46 J		1.47 J	0.875 J	
1,2,3,4,7,8-HxCDD	--	--	1.1 J	0.452 J		4.56 J	0.902 J		2.25 J	0.897 J	
1,2,3,6,7,8-HxCDD	--	--	4.47 J	0.814 J		24.6	3.73 J		14.4	4.84	
1,2,3,7,8,9-HxCDD	--	--	2.95 J	0.843 J		12.8	2.44 J		6.77	2.7 J	
1,2,3,4,6,7,8-HpCDD	--	--	126	5.36		547	36		298	98	
OCDD	--	--	1470	34.7		4640 J	171		2460	660	
2,3,7,8-TCDF	--	--	0.8 J	3.92		2.42	3.63		1.13	1	
1,2,3,7,8-PeCDF	--	--	0.565 J	1.91 J		2.42 J	3.35 J		1.07 J	0.603 J	
2,3,4,7,8-PeCDF	--	--	0.678 J	2.55 J		3.76 J	4.27 J		1.48 J	1.02 J	
1,2,3,4,7,8-HxCDF	--	--	1.57 J	1.78 J		17.7	12		4.89 J	2.95 J	
1,2,3,6,7,8-HxCDF	--	--	0.901 J	1.13 J		7.17	6.7		2.42 J	1.32 J	
1,2,3,7,8,9-HxCDF	--	--	0.111 U	0.0691 J		0.232 J	0.429 J		0.232 U	0.147 U	
2,3,4,6,7,8-HxCDF	--	--	0.676 J	0.834 J		5.38	4.21 J		1.54 J	2.17 J	
1,2,3,4,6,7,8-HpCDF	--	--	22.4	1.63 J		177	128		53.4	39	
1,2,3,4,7,8,9-HpCDF	--	--	0.931 J	0.216 J		6.09	6.73		2.11 J	1.05 J	
OCDF	--	--	98.1	1.83 J		406	87.7		112	72	
Total TCDD	--	--	2.93	17.7		18.2	24.5		8.58	10.4	
Total PeCDD	--	--	8.99	17.1		31.1	29.7		18.2	10.3	
Total HxCDD	--	--	45.2	15.5		187	48		103	41.8	
Total HpCDD	--	--	499	15.5		1450	80.1		783	232	
Total TCDF	--	--	13.6	87.9		52.6	84.5		31.9	27.5	
Total PeCDF	--	--	14.3	26.2		133	138		62.1	38.9	
Total HxCDF	--	--	28.4	10.2		259	140		93	55.5	
Total HpCDF	--	--	74.6	2.77 J		483	213		153	102	
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 0)	--	--	4.25	3.23	--	21.09	8.61	--	9.93	4.63	--
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	--	--	4.26	3.23	--	21.09	8.61	--	9.94	4.64	--
Grain size (percent by weight passing)											
Gravel			9.3	1.59		3.21	0.81		24.2	10.33	
Sand			40.93	25.33		10.73	8.64		39.15	61.46	
Silt	--	--	31.7	45.7		44.7	61.3		27.3	20.4	
Clay	--	--	21.4	23.8		35.1	23.1		19.9	17.8	
Fines	--	--	53.1	69.5		79.8	84.4		47.2	38.2	
Metals (mg/kg)											
Antimony			0.16 J	0.3 J		0.26 J	0.24 J		0.2 J	0.14 J	
Arsenic	93.0	57.0	5.62	5.57		7.85	9.16		7.21	3.19	
Cadmium	6.70	5.10	1.52	2.23		2.67	2.84		1.51	0.604	
Chromium	270	260	22.7	27		34.5	33.7		22.4	15.1	
Copper	390	390	57.5	53.5		76.9	69.7		42.2	17.6	
Lead	530	450	47.2 J	84.9 J		92.2 J	105 J		199 J	38.9 J	
Mercury	0.590	0.410	0.311	0.485		0.712	0.797		0.304	0.122	
Nickel			19.7	22.7		27.5	27.9		18.3	14.5	
Selenium			0.9	1		1.3	1.2		0.7	0.5	
Silver	6.10	6.10	0.543	0.344		3.34	1.52		1.12	0.321	
Zinc	960	410	101	137		131	140		126	42.8	
Porewater TBT (µg/l)											
Tri-n-Butyltin (ion)[1]	0.15	0.05	0.081 U	0.12 U		0.078 U	0.17 U		0.063 J	0.13 U	

Table 4 (Table 2 from Anchor, 2009)
Chemical Concentrations in Sediment Samples, Compared to Sediment Management Standards

Location ID			C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample ID			C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample Date			2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08
Depth Interval (feet)	CSL	SQS	0 to 2.3	2.3 to 4.7	4.7 to 6.0	0 to 3.1	3.1 to 5.6	5.6 to 6.3	0 to 3.4	3.4 to 5.5	5.5 to 7.0
PAHs (mg/kg-OC[2])											
Total LPAH[3]	780	370	**34.66**	**303**		**8.786**	**15.081**		**88.93**	**1132.91**	
Naphthalene	170	99	**7.81 J**	**13.7 J**		**0.758 J**	**3.8 J**		**6.48 J**	**56.7 J**	
Acenaphthylene	66	66	**2.57 J**	**15.1 J**		**0.939 J**	**1.36 J**		**3.75 J**	**6.91 J**	
Acenaphthene	57	16	**6.32 J**	**20.2 J**		**0.333 J**	**0.761 J**		**13 J**	**47.4 J**	
Fluorene	79	23	**3.09**	**16.3**		**0.636**	**1.22**		**11.6**	**124**	
Phenanthrene	480	100	**8.92**	**156**		**4.24**	**5.71**		**38.4**	**835**	
Anthracene	1200	220	**5.95**	**81.7**		**1.88**	**2.23**		**15.7**	**62.9**	
2-Methylnaphthalene	64	38	**4.09**	**4.81**		**0.394**	**1.28**		**2.96**	**32**	
Total HPAH[4]	5300	960	**79.2**	**723.81**		**43.967**	**38.233**		**354.62**	**906.52**	
Fluoranthene	1200	160	**16**	**163**		**5.45**	**6.25**		**92.6**	**402**	
Pyrene	1400	1000	**22.7**	**190**		**9.7**	**11.4**		**74.1**	**320**	
Benzo(a)anthracene	270	110	**6.32**	**84.1**		**3.33**	**2.42**		**29.6**	**32**	
Chrysene	460	110	**9.29**	**79.3**		**5.76**	**4.08**		**60.2**	**68**	
Benzo(b)fluoranthene	--	--	**11.5**	**64.9**		**6.06**	**4.35**		**38.9**	**36.1**	
Benzo(k)fluoranthene	--	--	0.372 U	**24**		**2.09**	**0.951**		**12**	**12.4**	
Total Benzofluoranthenes[5]	450	230	**11.5**	**88.9**		**8.15**	**5.301**		**50.9**	**48.5**	
Benzo(a)pyrene	210	99	**5.58**	**62.5**		**3.94**	**2.99**		**19**	**15.5**	
Indeno(1,2,3-cd)pyrene	88	34	**4.09**	**33.7**		**3.64**	**2.64**		**13.4**	**9.38**	
Dibenzo(a,h)anthracene	33	12	0.372 U	**4.81**		**0.667**	**0.462**		**2.82**	**1.96**	
Benzo(g,h,i)perylene	78	31	**3.72**	**17.5**		**3.33**	**2.69**		**12**	**9.18**	
Total PAH	--	--	**113.86**	**1026.81**		**52.753**	**53.314**		**443.55**	**2039.43**	
PCBs (mg/kg-OC[2])											
Aroclor 1016	--	--	0.446 U	0.409 U		1.09 U	0.462 U		1.9 U	1.03 U	
Aroclor 1221	--	--	0.743 U	0.577 U		2.12 U	0.543 U		1.06 U	3.09 U	
Aroclor 1232	--	--	0.483 U	3.61 U		9.09 U	4.35 U		1.34 U	28.9 U	
Aroclor 1242	--	--	0.595 U	0.24 U		0.394 U	0.571 U		2.08 U	1.03 U	
Aroclor 1248	--	--	0.372 U	0.24 U		0.394 U	0.272 U		0.463 U	1.03 U	
Aroclor 1254	--	--	**1.6**	0.24 U		**3.33**	**1.17**		**3.29**	**1.96**	
Aroclor 1260	--	--	0.372 U	0.24 U		0.394 U	**0.543**		0.463 U	1.03 U	
Total PCB	65	12	**1.6**	3.61 U		**3.33**	**1.233**		**3.29**	**1.96**	
Pesticides (mg/kg-OC[2])											
4,4'-DDD	--	--	0.0929 U	0.024 U		**0.203**	**0.0788**		**0.282**	0.165 U	
4,4'-DDE	--	--	0.0558 U	0.024 U		**0.197 J**	**0.0462**		**0.125**	**0.0804 J**	
4,4'-DDT	--	--	**0.112 J**	0.024 U		**0.291**	**0.0516**		**0.556 J**	0.155 U	
Total DDT	--	--	**0.112 J**	0.024 U		**0.691**	**0.1766**		**0.963**	**0.0804 J**	
Aldrin	--	--	0.0372 U	0.024 U		0.0394 U	0.0272 U		0.0463 U	0.103 U	
alpha-Chlordane	--	--	0.0372 U	0.024 U		0.0394 U	0.0272 U		0.0463 U	0.103 U	
Chlordane (total)	--	--	0.558 U	0.288 U		0.667 U	0.353 U		0.648 U	1.13 U	
cis-Nonachlor	--	--	0.0743 U	0.024 U		**0.145**	**0.025 J**		**0.111 J**	**0.0619 J**	
Dieldrin	--	--	0.0372 U	0.024 U		0.0394 U	0.0272 U		0.0463 U	0.103 U	
gamma-BHC (Lindane)	--	--	0.0669 U	0.0673 U		0.0545 U	0.087 U		0.162 U	0.268 U	
gamma-Chlordane	--	--	0.0372 U	0.024 U		0.0394 U	0.0272 U		0.0463 U	0.103 U	
Heptachlor	--	--	0.0372 U	0.024 U		0.0394 U	0.0272 U		0.0463 U	0.103 U	
trans-Nonachlor	--	--	0.0372 U	0.024 U		0.0394 U	0.0272 U		0.0463 U	0.103 U	

Table 4 (Table 2 from Anchor, 2009)
Chemical Concentrations in Sediment Samples, Compared to Sediment Management Standards

Location ID			C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample ID			C1-01	C1-01A	C1-01Z	C2-01	C2-01A	C2-01Z	C3-01	C3-01A	C3-01Z
Sample Date			2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08	2/14/08
Depth Interval (feet)	CSL	SQS	0 to 2.3	2.3 to 4.7	4.7 to 6.0	0 to 3.1	3.1 to 5.6	5.6 to 6.3	0 to 3.4	3.4 to 5.5	5.5 to 7.0
Semi-volatile organics (mg/kg-OC[2])											
1,2,4-Trichlorobenzene	1.80	0.810	0.372 U	0.24 U		0.394 U	0.272 U		0.463 U	1.02 UJ	
1,2-Dichlorobenzene	2.30	2.30	0.372 UJ	0.24 UJ		0.394 UJ	0.272 UJ		0.463 UJ	1.02 UJ	
1,3-Dichlorobenzene	--	--	0.372 UJ	0.24 UJ		0.394 UJ	0.272 UJ		0.463 UJ	1.02 UJ	
1,4-Dichlorobenzene	9.00	3.10	**0.301 J**	0.24 UJ		**0.206 J**	**0.106 J**		**0.157 J**	1.02 UJ	
2,4-Dimethylphenol	29.0	29.0	1.860 UJ	**0.409 J**		1.910 UJ	**3.530 J**		**0.301 J**	**2.58 J**	
2-Methylphenol	63.0	63.0	0.372 UJ	**0.313 J**		0.394 UJ	**0.065 J**		0.463 UJ	1.02 UJ	
4-Methylphenol	670	670	**5.20 J**	**2.310 J**		**0.515 J**	**0.842 J**		**1.340 J**	**1.75 J**	
Benzoic acid	650	650	7.430 UJ	4.810 UJ		7.880 UJ	5.430 UJ		9.260 UJ	20.60 UJ	
Benzyl alcohol	73.0	57.0	0.743 UJ	0.481 UJ		**0.152 J**	**0.174 J**		0.926 UJ	2.06 UJ	
bis(2-Ethylhexyl)phthalate	78.0	47.0	**8.920**	2.40 U		**4.240**	**1.060 J**		**8.80**	**4.12 J**	
Butylbenzylphthalate	64.0	4.90	0.372 U	0.24 U		**0.455**	0.272 U		**3.240**	1.02 U	
Dibenzofuran	58.0	15.0	**2.420**	**5.050**		**0.333 J**	**0.842**		**4.350**	**42.30**	
Diethylphthalate	110	61.0	**0.283 J**	0.24 U		**0.148 J**	0.272 U		0.463 U	**0.361 J**	
Dimethylphthalate	53.0	53.0	0.372 U	0.24 U		0.394 U	0.272 U		0.463 U	1.02 U	
Di-n-butylphthalate	1700	220	**0.669 J**	0.481 U		**1.120**	**0.516 J**		**0.972**	**2.68**	
Di-n-octylphthalate	4500	58.0	0.372 U	0.24 U		0.394 U	0.272 U		0.463 U	1.02 U	
Hexachlorobenzene	2.30	0.380	0.372 U	0.24 U		0.394 U	0.272 U		0.463 U	1.02 U	
Hexachlorobutadiene	6.20	3.90	0.372 U	0.24 U		0.394 U	0.272 U		0.463 U	1.02 U	
Hexachloroethane	--	--	0.372 UJ	0.24 UJ		0.394 UJ	0.272 UJ		0.463 UJ	1.02 UJ	
n-Nitroso-di-phenylamine	11.0	11.0	**0.595**	0.24 U		**0.176 J**	0.272 U		0.463 U	1.02 U	
Pentachlorophenol	690	360	3.720 U	2.40 U		3.940 U	2.720 U		4.630 U	10.20 U	
Phenol	1200	420	1.120 U	**0.962**		1.150 U	**0.516 J**		1.390 U	3.09 UJ	
Volatile organics (µg/kg)											
Ethylbenzene	--	--	8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U
m,p-Xylene	--	--	8.8 U	**0.49 J**	9.7 U	13 U	10 U	8.2 U	8.5 U	**0.3 J**	6.6 U
o-Xylene	--	--	8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U
Total Xylene	--	--	8.8 U	**0.49 J**	9.7 U	13 U	10 U	8.2 U	8.5 U	**0.3 J**	6.6 U
Tetrachloroethene	--	--	8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U
Trichloroethene	--	--	8.8 U	9.8 U	9.7 U	13 U	10 U	8.2 U	8.5 U	7.3 U	6.6 U

Notes:

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

U The analyte was analyzed for but not detected above the sample reporting limit.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

BOLD Denotes detections

mg/kg Milligram per kilogram, dry weight
ng/kg Nanogram per kilogram, dry weight
µg/kg Microgram per kilogram, dry weight
µg/l Microgram per liter

Denotes exceedance of SQS criteria
Denotes exceedance of both SQS and CSL criteria
-- No numerical criterion of this type for this chemical
HPAH High molecular weight polycyclic aromatic hydrocarbon
LPAH Low molecular weight polycyclic aromatic hydrocarbon
CSL Cleanup Screening Level (Washington Administrative Code [WAC] 173-204-520)
SQS Sediment Quality Standards (WAC 173-204-320)
TEQ Toxic Equivalents Quotient

Where laboratory analysis indicates a chemical is not detected in a sediment sample, the detection limit will be reported, except as noted. Where chemical criteria in this table represent the sums of individual compounds (e.g., total LPAHs and total HPAHs), isomers (e.g., total benzofluoranthenes), or groups of aroclors/congeners (e.g., total polychlorinated biphenyls [PCBs]), and a chemical analysis identifies an undetected value for one or more individual compounds, isomers, or groups of congeners, the Sediment Management Standards (SMS) require that the sum of the detected values should be used as the sum of the respective compounds or groups of isomers or aroclors/congeners. If all values are undetected, then the highest detection limit should be used as the sum of the respective compounds or groups of isomers or aroclors/congeners.

1 The Puget Sound Dredged Material Management Program (DMMP) criteria for interstitial water tributyltin (TBT) is 0.15 µg/L. This criteria is promulgated as a bioaccumulation trigger and is not an SMS standard but is included in this table as a reference only.

2 The listed values represent concentrations in parts per million (ppm) "normalized" on a total organic carbon (TOC) basis. To normalize to TOC, the dry-weight concentration for each parameter is divided by the decimal fraction representing the percent TOC content of the sediment.

3 The total LPAH criteria will be compared to the sum of the concentrations of the following LPAH compounds: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH definition under the SMS. Inclusion of 2-methylnaphthalene in the LPAH definition under the SMS is being considered. The total LPAH criteria are not the sums of the corresponding criteria listed for the individual LPAH compounds.

4 The total HPAH criteria will be compared to the sum of the concentrations of the following HPAH compounds: fluoranthene, pyrene, benzo[a]-anthracene, chrysene, total benzo-fluoranthenes, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene, and benzo[g,h,i]-perylene. The total HPAH criteria are not the sums of the corresponding criteria listed for the individual HPAH compounds.

5 The total benzofluoranthenes criteria will be compared to the sums of the concentrations of the b, j, and k isomers of benzofluoranthene.

Table 5
Sediment Data Summary
Percival Landing Antidegradation Determination

Sample	Top Elevation (MLLW)	Bottom Elevation (MLLW)	Current Design Depth (MLLW)	With Overdepth (MLLW)	Sample Approximately Represents	DMMP evaluation	SMS evaluation	Dioxin TEQ (u = 1/2 DL)	overall evaluation
C1-01	-6.2	-8.5	-9	-11	design prism	no exceedances	no exceedances	4.3	Hg and PAHs increasing with depth; no z-sample available for analysis
C1-01A	-8.5	-10.9			overdepth	Hg > SL 13 PAHs > SL fluoranthene > BT	Hg > SQS 3 PAHs > SQS	3.2	
C1-01Z	-10.9	-12.2			z-layer	no data	no data	no data	no data
C2-01	-9.7	-12.8	no dredge	NA	surface sediment to be left in place	Hg > SL Total DDT > SL	Hg > CSL	21.1	Hg and dioxin are a problem in the surface sediment to be left in place
C2-01A	-12.8	-15.3			NA	Hg > SL 2,4-dimethylphenol > SL	Hg > CSL	8.6	NA
C2-01Z	-15.3	-16			NA	no data	no data	no data	NA
C3-01	-4.5	-7.9	-9	-11	design prism	1 PAH > SL butylbenzyl phthalate > SL Total DDT > SL	no exceedances	9.9	PAHs and dibenzofuran increasing with depth; no z-sample available for analysis
C3-01A	-7.9	-10			design prism and overdepth	4 PAHs > SL	4 PAHs > SQS 2 PAHs > CSL dibenzofuran > SQS	4.6	
C3-01Z	-10	-11.5			overdepth and z-layer	no data	no data	no data	no data