CENWS-OD-TS-DM

MEMORANDUM FOR RECORD 17 June 2004

SUBJECT: **DETERMINATION OF THE SUITABILITY OF SEDIMENT PROPOSED TO BE DREDGED FROM THE PORT OF SEATTLE TERMINAL 46 DREDGING PROJECT (2004-00190) FOR OPEN-WATER DISPOSAL AT THE ELLIOTT BAY OPEN-WATER DISPOSAL SITE, AS EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT.**

1. The following summary reflects the consensus determination of the Agencies that comprise the regional Dredged Material Management Program (DMMP) for the State of Washington. The agencies include the Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency. The agencies are charged with determining the suitability of dredged material for in-water disposal and have evaluated the proposed dredging of 27,000 cubic yards from the Port of Seattle Terminal 46 berthing area in East Waterway, Elliott bay, Washington.

2. The project was ranked high for testing purposes. The sampling and analysis plan was approved on March 18, 2004 by the DMMP agencies for an estimated total dredged material footprint volume of 27,000 cubic yards. The sampling design called for collecting subsamples from within six DMMUs within the proposed dredging area. An additional DMMU located between Stations 7+00 and 24+00 consisting primarily of riprap with very little sediment representing approximately 4,900 cy of riprap material was excluded from the characterization effort with the concurrence of the DMMP agencies. Sampling within the six DMMUs commenced on March 22, 2004, and six vibracorer samples (two within each DMMU) were collected successfully within three DMMUs (DMMU-1, DMMU-2 and DMMU-3). However, repeated attempts to collect the required core samples at DMMUs 5 and 6 were unsuccessful due to the rocky substrate, which extended over both DMMUs. The decision was made to use divers to collect samples at these locations, and at under-pier DMMU-4 on March 25. At DMMU 6 divers reported only a few inches of material overlying the riprap and rocky substrate. They were forced to modify their proposed sampling approach and used a scoop to collect material at 4 locations within the two DMMUs, as deep as possible between the riprap, which amounted to about 2 inches of material on average at DMMUs 5 and 6. They were unable to collect a sample at DMMU 4 because of the presence of a Container Ship at that location. On April 13, they resumed vibracore sampling activities at DMMU 4, but due to presence of extensive riprap, they were forced to resort to diver core samples of approximately 1 foot in depth at four locations within the DMMU. Figures 1-4 depicts the vicinity map and location of each sample collected among the DMMUs being characterized. The composited samples were collected for both chemisty and potential biological testing. A tiered testing approach was initially proposed, and all samples for potential biological testing were archived at 4ºC pending completion of the chemical analyses.

3. Relevant dates for regulatory tracking purposes are included in Table 1.

Table 1. Regulatory Tracking Information and Dates

Initial SAP submittal date:	March 2, 2004
SAP approval letter date:	March 18, 2004
Sampling date(s):	March 22, 25, April 13, 2004
Sediment data characterization report submittal date:	June 16, 2004
DAIS Tracking Number	POS46-1-A-F-198
Recency Determination Date: High (2 years)	April 2006

4. The Sampling and Analysis Plan approved by the Agencies for testing for the six DMMUs was followed, and quality assurance/quality control guidelines specified by the PSDDA Users Manual were

generally complied with. The data gathered were deemed sufficient and acceptable for decision-making by the DMMP agencies based on best professional judgment.

5. Table 2 provides an analysis summary of the results of the conventional parameters analyzed for the six composited DMMUs and all analytes exceeding DMMP chemical guidelines. Table 3 contains a complete inventory of chemical testing results for the six composited DMMUs. Chemical analysis of the six DMMUs indicated that three of the DMMUs had no detected or undected exceedances of chemicals of concern. For the remaining three DMMUs, one two had mercury SL exceedances, and two had TBT SL exceedances, one had a 1,4-Dichlorobenzene SL exceedances, one had 2,4-Dimethylphenol, and two had Benzyl Alcohol exceedances. Bioaccumulation Triggers were exceeded for Mercury in one DMMU and in two DMMUs for TBT. The three remaining DMMUs therefore each required both bioassays and bioaccumulation testing to render a determination on suitability for unconfined-open-water disposal. The Port of Seattle determined that due to concerns about testing interfering with the tight construction schedule, they opted to not complete the biological testing. Therefore, DMMUs 3, 4, and 5, are considered unsuitable for unconfined open-water disposal based on Best-Professional-Judgement (BPJ) without completing the required biological testing.

6. The results of the chemical analysis for the six composited DMMUs, representing a total of 27,000 cy (=23,400 cy + 3,600 cy of overdepth + 10% contingency material) indicate that 13,961.5 cy is unsuitable for unconfined open-water disposal (e.g., DMMU's 3, 4, and 5) and 13,038.5 cy is suitable for unconfined open-water disposal (e.g., DMMU's 1, 2, and 6) at the Elliott Bay disposal site.

7. The uncharacterized DMMU located between Stations 7+00 and 24+00 consists predominately of riprap and is bounded on both sides by unsuitable material in DMMU-3, DMMU-4, and DMMU-5. Because of the concern for sediments bound to the riprap within the uncharacterized DMMU, the DMMP agencies are concerned about the potential suitability of this riprap for an upland beneficial use without some kind of washing to clean or remove the sediment bound to the riprap. The heavy concentration of riprap in unsuitable DMMU 5 also limits its utility for upland reuse, and all this material should be disposed of at an Ecology approved upland site.

8. This memorandum documents the suitability of sediment to be dredged from the Port of Seattle Terminal-46 Dredging Project for disposal at the Elliott Bay non-dispersive open-water disposal site. However, this suitability determination does not constitute final agency approval of the project. A dredging plan for this project must be completed as part of the final project approval process. A final decision will be made after full consideration of agency input, and after an alternatives analysis is done under Section 404(b)(1) of the Clean Water Act.

SUBJECT: **DETERMINATION OF THE SUITABILITY OF SEDIMENT PROPOSED TO BE DREDGED FROM THE PORT OF SEATTLE TERMINAL 46 DREDGING PROJECT F (2004-00190) OR OPEN-WATER DISPOSAL AT THE ELLIOTT BAY OPEN-WATER DISPOSAL SITE, AS EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT.**

Concur:

8 July 04 Date	David Kendall, Ph.D., Seattle District Corps of Engineers
8 July 2004 Date	Justine Barton/John Malek, Environmental Protection Agency
07/08/04 Date	Tom Gries/Cinde Donahue, Washington Department of Ecology
July 8, 2004 Date	Peter Leon, Washington Department of Natural Resources

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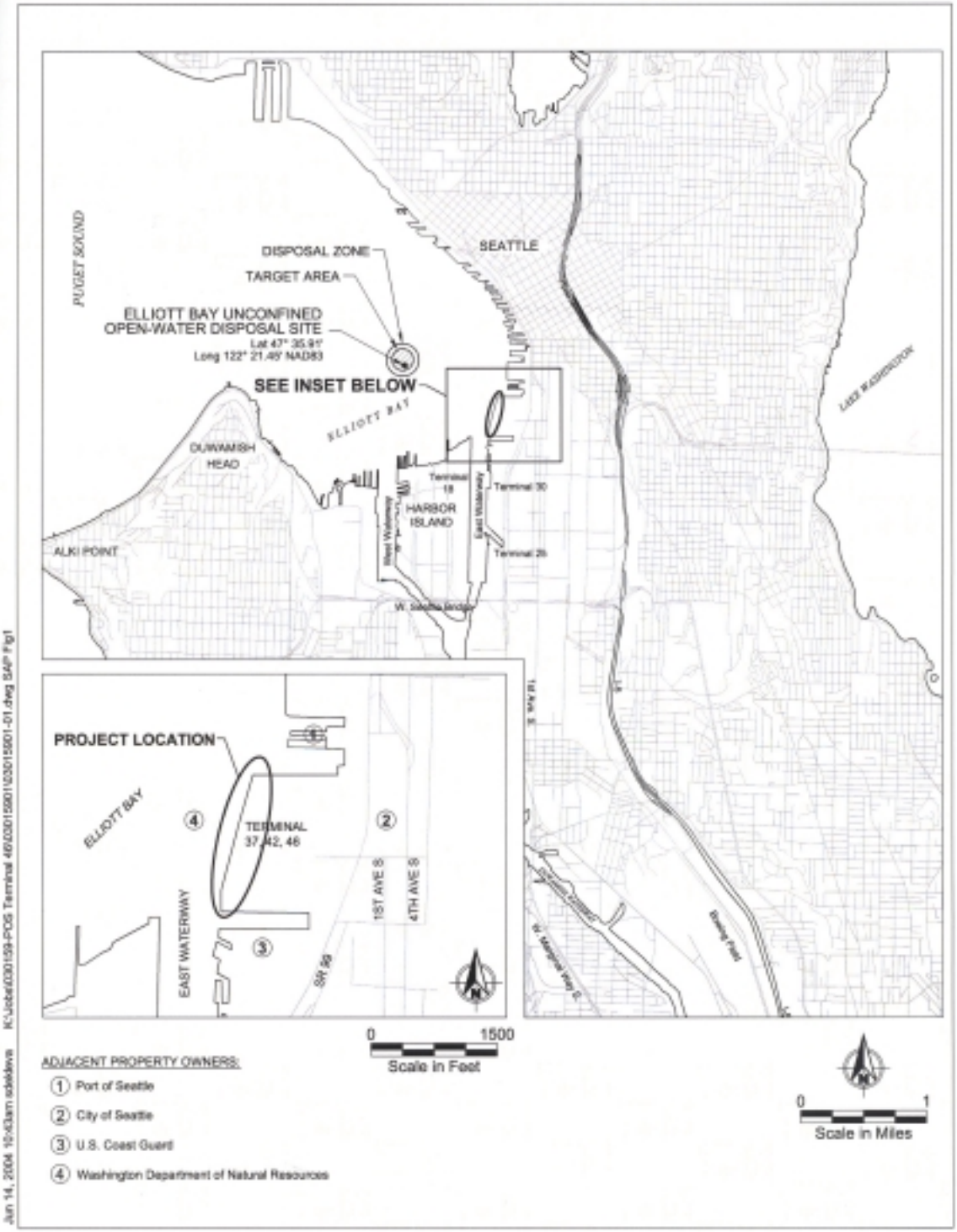

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Figure 1
Vicinity Map
Terminal 46 Sediment Characterization

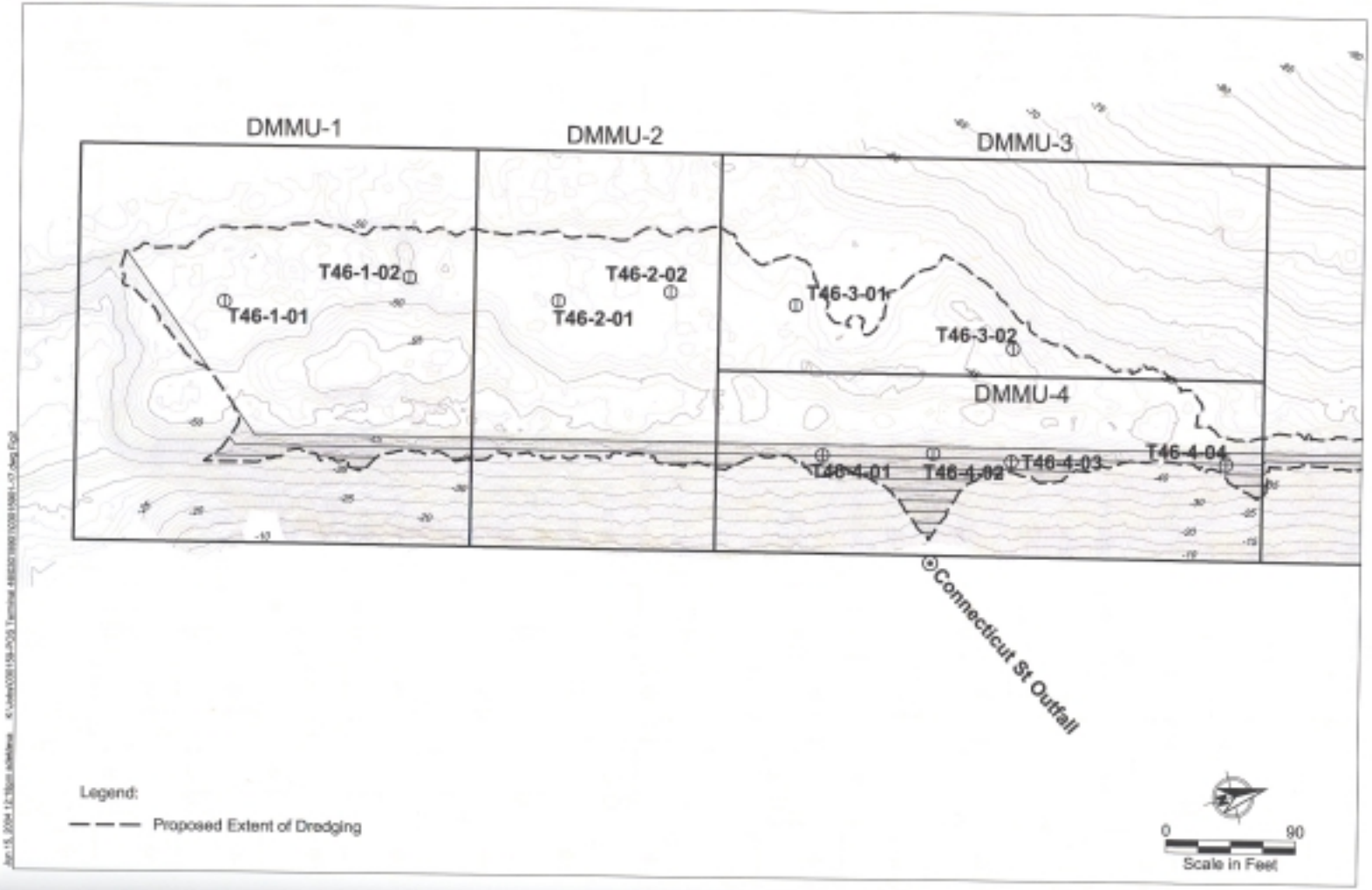

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Figure 2
Delineation of DMMUs and Actual Sampling Locations at the Southern Portion of T37-46
Terminal 46 Sediment Characterization

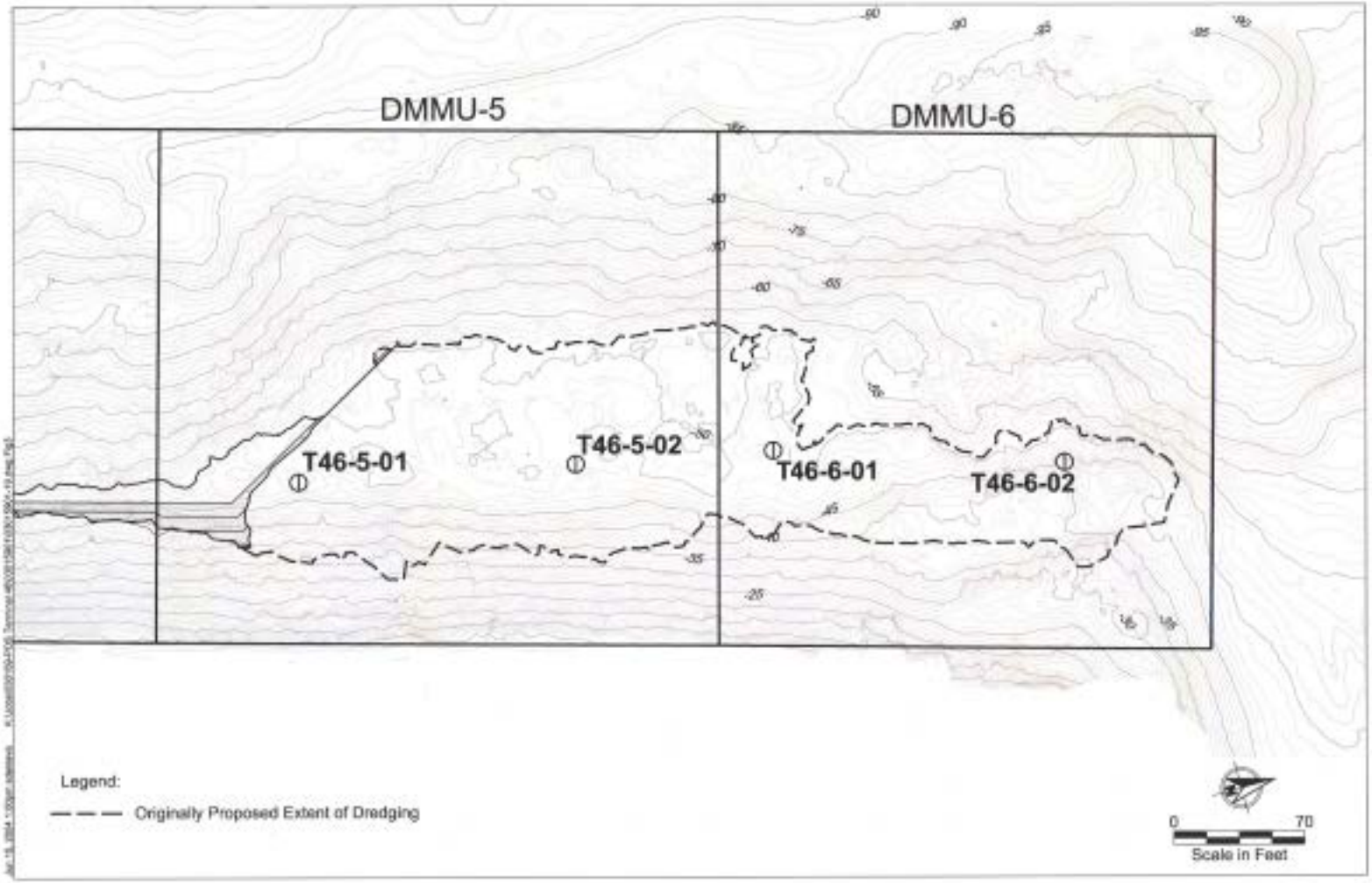

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Figure 3
Delineation of DMMUs and Actual Sampling Locations at the Northern Portion of T37-46
Terminal 46 Sediment Characterization

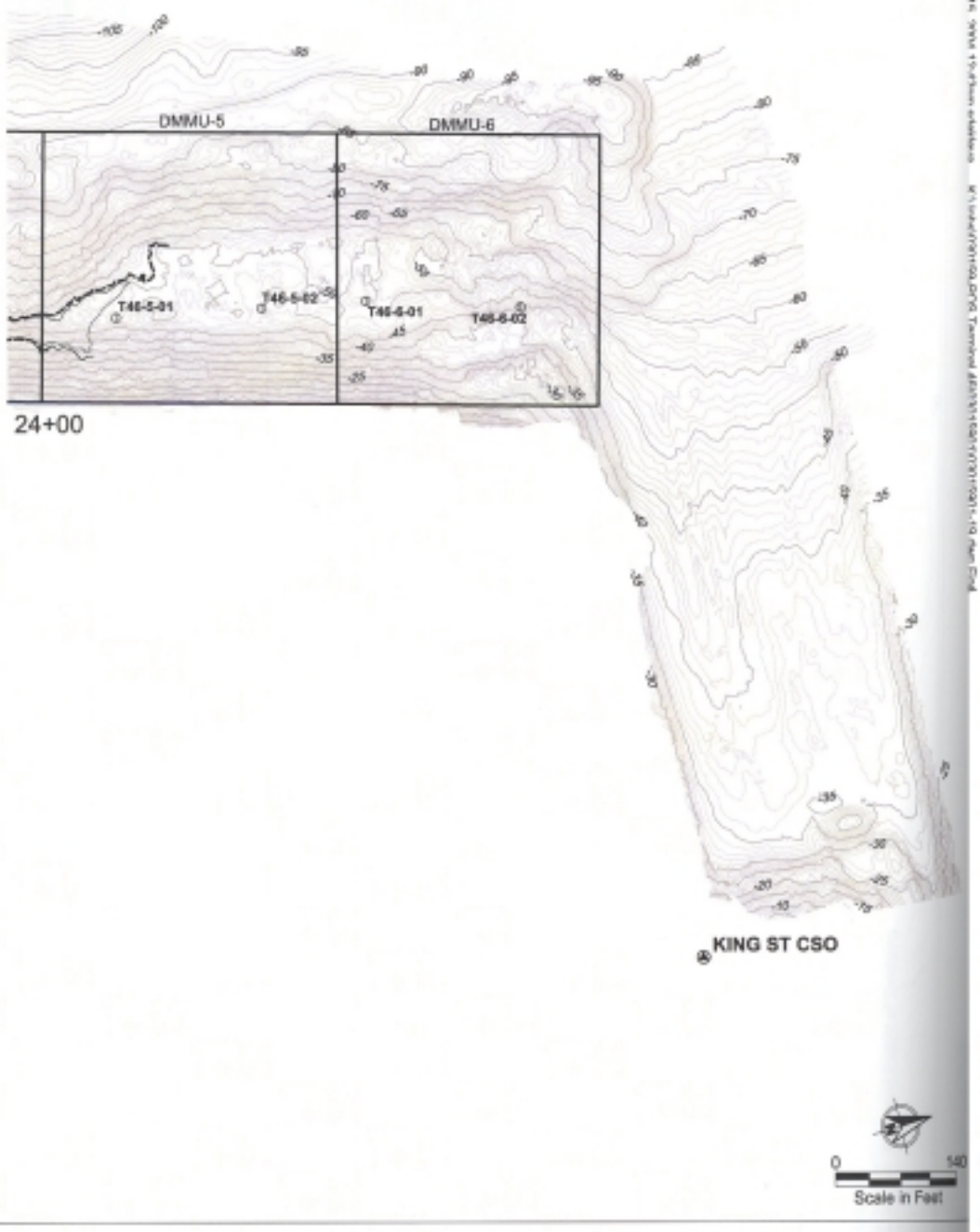

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Figure
Location of the King Street CSO Outfa
Terminal 46 Sediment Characterizatio

Table 2. DMMP Sediment Testing Summary and Evaluation for Port of Seattle T-46 Dredging Footprint.

				DMMU ID:	DMMU-1		DMMU-2		DMMU-3		DMMU-4		DMMU-5		DMMU-6	
				Rank:	H		H		H		H		H		H	
CHEMICAL NAME	Units	SL	BT	ML	Conc.	VQ	Conc	VQ	Conc	VQ	Conc	VQ	Conc.	VQ	Conc.	VQ
Mercury	mg/kg	0.41	1.5	2.3	0.06	U	0.05	U	2.22		0.79		0.13		0.23	
Chromium	mg/kg				12.5		24.7		23.4		27.3		23.8		34.5	
TBT ion (porewater)	ug/L	0.15	0.15		0.02	U	NPW		0.02	U	1.9		2.2		0.3	
1,4-Dichlorobenzene	ug/kg	110		120	1.0	U	0.9	U	1.0	U	180.0	J	1.1	U	1.4	U
2,4-Dimethylphenol	ug/kg	29		210	19.0	U	19.0	U	48.0		18.0	U	20.0	U	28.0	U
Benzyl Alcohol	ug/kg	57		870	19	U	19	U	20	U	720		110			
Total Solids	%				74.1		77.8		73.8		68.6		65.2		51.3	
Total Volatile Solids	%				2.3		1.5		3.0		4.1		3.2		5.0	
Total Organic Carbon	%				0.77		0.39		4.6		2.7		1.3		1.9	
Total Ammonia	mg/kg				23.0		16.0		32.0		7.4		4.4		3.8	
Total Sulfides	mg/kg				190		140		1,200		820		540		550	
Gravel	%				0.01		0.6		0.1		26.6		32.2		27.5	
Sand	%				57.6		77.8		69.8		59.3		50.7		44.5	
Silt	%				33.1		15.3		19.4		8.3		8.1		14.1	
Clay	%				9.3		6.3		10.7		5.9		9.1		13.7	
Fines (percent silt + clay)	%				42.4		21.6		30.1		14.2		17.2		27.8	
Eohaustorius estuarius hits:									Not Tested		Not Tested		Not Tested			
Mytilus galloprovincialis hits:																
Neanthes arenaceodentata hits:																
Bioassay Determination: (P/F)																
BTs eyesceeded:					no		no		yes		yes		yes		no	
Bioaccumulation conducted:					no		no		no		no		no		no	
Bioaccumulation Determination:									Not Tested		Not Tested		Not Tested			
ML Rule exceeded:					no		NO		no		no		no		no	
PSDDA Determination:					PASS		PASS		FAIL(B)		FAIL(B)		FAIL(B)		PASS	
DMMU Volume:	cy				4,000		4,200		3,800		4,900		3,400		3,100	
Mean Core sampling depth	ft				8.5		6		9		1		0.125		0.125	
Maximum sampling depth (mudline)					9		7		9		1.5		0.125		0.125	
DMMU ID:					DMMU-1		DMMU-2		DMMU-3		DMMU-4		DMMU-5		DMMU-6	
Failed:									3,800		4,900		3,400			
Passed:					4,000		4,200								3,100	

Legend:

- **SL = Screening Level exceedance**
- **BT = Bioaccumulation Trigger exceedance**
- **P = Pass (Suitable for UCOWD)**
- **F(B) = Failure (UCOWD Unsuitable wo biological testing)**
- VQ = Validation Qualifier
- UCOWD = Unconfined open-water disposal

Total Volume:	23,400	+	2 feet overdepth and 10% contingency	=	27,000
Vol. Failed .	12,100	+	1,861.5	=	13,961.5
Vol. Pass	11,300	+	1,738.5	=	13,038.5

Table 3
Summary of Chemical and Conventional Results

Location ID Sample ID Sample Date	Screening Level	Bio Trigger	Max Level	T46-1 T46-1-SD 04/05/2004 core	T46-2 T46-2-SD 03/22/2004 core	T46-3 T46-3-SD 04/05/2004 core	T46-4 T46-4-SD 4/13/2004 core/scoop	T46-5 T46-5-SD 04/02/2004 scoop	T46-6 T46-6-SD 04/02/2004 scoop
Fluorene	540	--	3600	19 U	19 U	**94**	38 U	**62**	59 U
Phenanthrene	1500	--	21000	19 U	19 U	**460**	**410**	**430**	**490**
Anthracene	960	--	13000	19 U	19 U	**240**	**160**	**140**	**170**
2-Methylnaphthalene	670	--	1900	19 U	19 U	**88**	38 U	**30**	59 U
Total LPAH	5200	--	29000	19 U	19 U	**1334**	**570**	**783**	**660**
HPAHs									
Fluoranthene	1700	4600	30000	19 U	19 U	**470**	**1100**	**970**	**1600**
Pyrene	2600	11980	16000	19 U	19 U	**580**	**1400**	**1200**	**1400**
Benzo(a)anthracene	1300	--	5100	19 U	19 U	**190**	**500**	**390**	**460**
Chrysene	1400	--	21000	19 U	19 U	**220**	**690**	**760**	**880**
Benzo(b)fluoranthene	3200	--	9900	19 U	19 U	**230**	**820**	**680**	**680**
Benzo(k)fluoranthene	3200	--	9900	19 U	19 U	**200**	**630**	**480**	**510**
Benzo(a)pyrene	1600	--	3600	19 U	19 U	**230**	**630**	**430**	**450**
Indeno(1,2,3-cd)pyrene	600	--	4400	19 U	19 U	**78**	**250**	**140**	**250**
Dibenzo(a,h)anthracene	230	--	1900	19 U	19 U	**21**	**70**	**39**	**72**
Benzo(g,h,i)perylene	670	--	3200	19 U	19 U	**70**	**200**	**110**	**210**
Total HPAH	12000	--	69000	19 U	19 U	**2289**	**6290**	**5199**	**6512**
Chlorinated benzenes									
1,3-Dichlorobenzene	**170**	--		1.0 U	0.9 U	1.0 U	1.1 U	1.1 U	1.4 U
1,4-Dichlorobenzene	**110**	--	120	1.0 U	0.9 U	1.0 U	**180 J * ****	1.1 U	1.4 U
1,2-Dichlorobenzene	35	--	110	1.0 U	0.9 U	1.0 U	1.1 U	1.1 U	1.4 U
1,2,4-Trichlorobenzene	31	--	64	5.2 U	4.7 U	5.1 U	5.4 U	5.6 U	6.8 U
Hexachlorobenzene	22	168	230	0.96 U	0.97 U	0.97 U	0.95 U	0.98 U	0.98 U
Phthalates									
Dimethylphthalate	1400	--	--	19 U	19 U	20 U	38 U	20 U	59 U
Diethylphthalate	1200	--	--	19 U	19 U	20 U	38 U	20 U	59 U
Di-n-butylphthalate	5100	--	--	19 U	19 U	20 U	**69**	20 U	59 U
Butylbenzylphthalate	970	--	--	19 U	19 U	20 U	38 U	**200**	59 U
bis(2-Ethylhexyl)phthalate	8300	--	--	19 U	19 U	**31**	**1600**	**660**	**330**
Di-n-octylphthalate	6200	--	--	19 U	19 U	20 U	38 U	20 U	59 U
Phenols									
Phenol	**420**	--	1200	19 U	19 U	**32**	38 U	**35**	59 U
2-Methylphenol	63	--	77	19 U	19 U	**35**	38 U	20 U	59 U
4-Methylphenol	670	--	3600	19 U	19 U	**660**	38 U	20 U	59 U
2,4-Dimethylphenol	29	--	210	19 U	19 U	**48 ***	18 U	20 U	28 U
Pentachlorophenol	**400**	504	690	97 U	97 U	99 U	190 U	98 U	300 U
Miscellaneous									
Benzyl alcohol	57	--	870	19 U	19 U	20 U	**720 ***	**110 ***	59 U
Benzoic acid	650	--	760	190 U	190 U	200 U	380 U	200 U	590 U
Dibenzofuran	540	--	1700	19 U	19 U	**62**	38 U	**36**	59 U
Hexachloroethane	1400	--	14000	19 U	19 U	20 U	38 U	20 U	59 U
Hexachlorobutadiene	29	--	270	0.96 U	0.97 U	0.97 U	0.95 U	0.98 U	0.98 U
n-Nitrosodiphenylamine	28	--	1300	19 U	19 U	20 U	13 U	20 U	21 U
VOCs (µg/kg)									
Ethylbenzene	10	--	50	1.0 U	0.9 U	1.0 U	1.1 U	1.1 U	1.4 U
Tetrachloroethene	57	--	210	1.0 U	0.9 U	1.0 U	1.1 U	1.1 U	1.4 U
Trichloroethene	160	--	1600	1.0 U	0.9 U	1.0 U	1.1 U	1.1 U	1.4 U
o-Xylene	40	--	160	1.0 U	0.9 U	1.0 U	1.1 U	1.1 U	1.4 U
m,p-Xylene	40	--	160	1.0 U	0.9 U	1.0 U	1.1 U	1.1 U	1.4 U
Xylene (total)	40	--	160	1 U	0.9 U	1 U	1.1 U	1.1 U	1.4 U

Notes:

*Result exceeds Screening criteria

**Result exceeds PSDDA Max criteria

Detections are bolded

Exceedances are boxed

1-The sample yielded no porewater

J = The analyte was positvely identified; the associated numerial value is an approximate concentration of the analyte in the sample

U = The compound was analyzed for, but not detected above the reported sample quantitation limit.

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

Table 3
Summary of Chemical and Conventional Results

Location ID Sample ID Sample Date	Screening Level	Bio Trigger	Max Level	T46-1 T46-1-SD 04/05/2004 core	T46-2 T46-2-SD 03/22/2004 core	T46-3 T46-3-SD 04/05/2004 core	T46-4 T46-4-SD 4/13/2004 core/scoop	T46-5 T46-5-SD 04/02/2004 scoop	T46-6 T46-6-SD 04/02/2004 scoop
Conventionals									
Ammonia (mg/kg)	--	--	--	**23**	**16**	**32**	**7.41**	**4.4**	**3.8**
Sulfide (mg/kg)	--	--	--	**190**	**140**	**1200**	**820**	**540**	**550**
Total Organic Carbon (%)	--	--	--	**0.77**	**0.39**	**4.6**	**2.66**	**1.3**	**1.9**
Total solids (%)	--	--	--	**74.1**	**77.8**	**73.8**	**68.60**	**65.2**	**51.3**
Total solids, preserved (%)	--	--	--	**73.2**	**84.1**	**62.8**	**67.60**	**67.9**	**53.3**
Total Volatile Solids (%)	--	--	--	**2.3**	**1.5**	**3.0**	**4.07**	**3.2**	**5.0**
Tributyltin (µg/L)									
Tributyltin chloride	--	--	--	0.025 U	NPW[1]	0.025 U	**2.2**	**2.5**	**0.28**
Tributyltin ion	0.15	0.15	--	0.022 U	NPW[1]	0.022 U	**1.9 ***	**2.2 J ***	**0.25 ***
Grain Size (%)									
Gravel	--	--	--	**0.01**	**0.6**	**0.1**	**26.6**	**32.2**	**27.5**
Sand	--	--	--	**57.6**	**77.8**	**69.8**	**59.3**	**50.7**	**44.5**
Silt	--	--	--	**33.1**	**15.3**	**19.4**	**8.3**	**8.1**	**14.1**
Clay	--	--	--	**9.3**	**6.3**	**10.7**	**5.9**	**9.1**	**13.7**
Fines	--	--	--	**42.4**	**21.6**	**30.1**	**14.2**	**17.2**	**27.8**
Metals (mg/kg)									
Antimony	150	--	200	7 UJ	6 UJ	7 UJ	7 U	8 UJ	9 UJ
Arsenic	57	507.1	700	7 U	6 U	7 U	7 U	8 U	**11**
Cadmium	5.1	11.3	14	0.3 U	0.2 U	**0.5**	**0.7**	0.3 U	0.4 U
Chromium	--	267	--	**12.5**	**24.7**	**23.4**	**27.3**	**23.8**	**34.5**
Copper	390	1027	1300	**18.5**	**14.8**	**36.6**	**146**	**100**	**118**
Lead	450	975	1200	3 U	**4**	**49**	**162**	**27**	**40**
Mercury	0.41	1.5	2.3	0.06 U	0.05 U	**2.22 ***	**0.79 ***	**0.13**	**0.23**
Nickel	140	370	370	**16**	**42**	**25**	**27**	**24**	**43**
Selenium	--	3	--	0.3 U	0.2 U	0.3 U	**0.4**	0.3 U	0.4 U
Silver	6.1	6.1	8.4	0.4 U	0.4 U	**1.0**	**6.0**	0.5 U	**0.8**
Zinc	410	2783	3800	**25.6**	**31.0**	**87.2**	**157**	**112**	**139**
PCBs (µg/kg)									
Aroclor 1016	--	--	--	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	4.0 U
Aroclor 1221	--	--	--	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	4.0 U
Aroclor 1232	--	--	--	3.9 U	3.9 U	3.9 U	7.8 U	3.9 U	4.0 U
Aroclor 1242	--	--	--	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	4.0 U
Aroclor 1248	--	--	--	3.9 U	3.9 U	5.8 U	7.8 U	13 U	4.0 U
Aroclor 1254	--	--	--	3.9 U	3.9 U	**11**	**45**	17 U	**14**
Aroclor 1260	--	--	--	3.9 U	3.9 U	**10**	**25**	38 U	**16**
Total PCBs	130		3100	3.9 U	3.9 U	**21**	**70**	38 U	**30**
Total PCBs (mg/kg-OC)	--	38	--	0.5 U	1 U	**0.45**	**2.6**	2.92 U	**1.57**
Pesticides (µg/kg)									
4,4'-DDD	--	--	--	1.9 U	2.0 U	1.9 U	1.9 U	2.0 U	2.0 U
4,4'-DDE	--	--	--	1.9 U	2.0 U	1.9 U	1.9 U	2.0 U	2.0 U
4,4'-DDT	--	--	--	1.9 U	2.0 U	1.9 U	1.9 U	2.0 U	2.0 U
DDT (total)	6.9	50	69	1.9 U	2 U	1.9 U	1.9 U	2 U	2 U
Aldrin	10			0.96 U	0.97 U	0.97 U	0.95 U	0.98 U	0.98 U
alpha-BHC	--	--	--	0.96 U	0.97 U	0.97 U	0.95 U	0.98 U	0.98 U
alpha-BHC (mg/kg-OC)	--	10	--	0.12 U	0.24 U	0.02 U	0.036 U	0.07 U	0.05 U
gamma-BHC (Lindane)	10	--	--	0.96 U	0.97 U	0.97 U	0.95 U	0.98 U	0.98 U
alpha-Chlordane	10	--	--	0.96 U	0.97 U	0.97 U	0.95 U	0.98 U	0.98 U
gamma-Chlordane	--	--	--	0.96 U	0.97 U	**1.8**	0.95 U	0.98 U	**4.0**
Total Chlordane (PSDDA)	--	37	--	1.9 U	2 U	**1.8**	1.9 U	2 U	**4**
Dieldrin	10	--	--	1.9 U	2.0 U	1.9 U	1.9 U	2.0 U	2.0 U
Heptachlor	10	--	--	0.96 U	0.97 U	0.97 U	0.95 U	0.98 U	0.98 U
SVOCs (µg/kg)									
LPAHs									
Naphthalene	2100	--	2400	19 U	19 U	**390**	38 U	**24**	59 U
Acenaphthylene	560	--	1300	19 U	19 U	**65**	38 U	**41**	59 U
Acenaphthene	500	--	2000	19 U	19 U	**85**	38 U	**86**	59 U