CENWS-OD-TS-DM

MEMORANDUM FOR RECORD 6 November 2006

SUBJECT: DETERMINATION ON THE SUITABILITY OF DREDGED MATERIAL CHARACTERIZED AT THE PORT OF SEATTLE'S T-30 BERTHING AREA (200601091) UNDER SECTION 404 OF THE CLEAN WATER ACT FOR THE PURPOSE OF DETERMINING THE SUITABILITY OF THE DREDGED MATERIAL FOR OPEN-WATER DISPOSAL AT THE ELLIOTT BAY DISPOSAL SITE.

1. This Memorandum documents the Dredged Material Management Program (DMMP) characterization of 59,000 cubic yards to create navigational access and berthing areas at Terminal 30. It reflects the consensus determination of the Dredged Material Management Program (DMMP) which consists of the principal agencies having jurisdiction for dredge/disposal projects in Washington State (i.e., the Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency). This determination evaluates the suitability of an estimated 59,000 cy of dredged material tested in the Terminal-30 berthing area for unconfined open-water disposal at the Elliott Bay disposal site. The dredging proposed is the minimum required to provide navigational access to berthing areas at T-30.

2. The project is generally located in a High Concern area within a CERCLA cleanup designated site, and portions of this project were previously characterized in 1999 during the Eastwaterway Stage II DMMP project evaluation (2 November 1999 SDM) and were found to be suitable for unconfined-open-water disposal (See **Figures 1-3**). The 1999 characterization indicate that a Moderate Concern rank would be supported by these testing results. A portion of the project area was also subject to a 2001 recency supplemental suitability determination (10 July 2001 SSDM).

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

Table 1a. Regulatory Tracking Dates

Application Number:	20060191
SAP Submital date:	May 1, 2006
SAP Approval date(s):	June 5, 2006
Sampling date(s):	July 12-13, 2006
Characterization Report submittal date:	November 2, 2006
Recency Determination Date: Moderate/High (5+2)/2 =(3.5 years)	January 2010

4. The area proposed for dredging, including navigational access, is approximately 180 feet wide and 1,800 feet long. Dredging will establish the design depth of -51 feet MLLW plus 1 foot allowable overdredge depth. **Figure 1** shows the general vicinity map of project area, whereas **Figures 3-5** depict the bathymetry, cross sections and DMMU sampling locations. See **Table 1b** for Station coordinates and mudline elevations for each coring location. Approximately one-quarter of the

southern portion of the proposed dredged material footprint was not dredged in 2002, while the remaining area to the north was dredged to -44 feet MLLW plus 2 feet of allowable overdredge. The dredged material footprint includes approximately 9,500 cy of subsurface material in the undredged southern portion of the footprint, which was previously tested in 1999 and found to be suitable for open water disposal (**Figure 2b**). This material isolated from the surface was deemed still suitable by the DMMP agencies during SAP review/approval without additional testing. The overlying 11,100 cy of surface material also previously tested as suitable in 1999 (**Figure 2a**), and is re-evaluated during the present characterization with 3 samples and one DMMU (**Figure 5**). The 38,400 cy of material in the northern portion of footprint was characterized as four DMMUs, each comprised of 3 samples, collected by vibracorer (**Figure 5**).

5. A sampling and analysis plan for the testing of five surface DMMUs was submitted to the DMMP agencies for review on May 1, 2006, and approved by the DMMP on June 5, 2006. The approved testing plan called for sampling the five DMMUS at a Moderate-High rank, with one analysis for approximately 9,600 cy, in the northern portion of the footprint, and one analysis for the 11,100 cy of material within the southern portion of the footprint. Sampling was initiated on July 12-13, 2006, and sampling report submitted to the DMMP for review on November 2, 2006. The 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.

6. This memorandum focuses on the sampling/testing results for the five surface Dredged Material Management Units (DMMUs) within the T-30 footprint. **Table 2** summarizes the sediment conventional, chemical, and biological testing results for the five composited subsurface DMMUs analyzed. The analysis results indicated that all chemicals of concern were detected or detection limits were below the screening level guidelines of the Dredged Material Management Program, except Total DDT in DMMU-C1, which was undetected at 18 ppb. The sample was subjected to further cleanup and reanalysis after purging for PCB, and exceeded the DDT SL at 7.9 ppb. Based on these testing results, bioassay testing was required for this DMMU. The bioassay toxicity testing was conducted by Weston Inc. on DMMU-C1 and these results are summarized below.

7. **Tables 3-6** depicts the specific biological toxicity testing outcome summary for DMMU-C1. Negative control and reference sediments met the performance limits for each of the three bioassays species used to assess toxicity. The results indicated that nondispersive interpretation guidelines were met for the amphipod (*Eohaustorius estuarius)* bioassay, the 20-day *Neanthes* growth bioassay, and the Echinoderm (*Dendraster excentnricus*) larval bioassay for DMMU-C1 and no hits (e.g., 2-hit and/or 1-hit) were recorded.

8. The agencies concluded that all five DMMUs tested representing a total of 49,500 cy, and the 9,500 cy of previously tested and suitable subsurface material underlying DMMU-C1 are also suitable for unconfined open-water disposal ate the Elliott Bay site for a total volume of 59,000 cy.

9. This memorandum affirms the suitability of the sediment proposed for dredging at Terminal 30 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.

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Concur:

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11/9/06 Date	Erika Hoffman, Environmental Protection Agency
11/9/06 Date	Loree Randall, Washington Department of Ecology
11/9/06 Date	Helen Pressley, Washington Department of Ecology
Nov 9th 2006 Date	Sarah Dzinbal, Washington Department of Natural Resources

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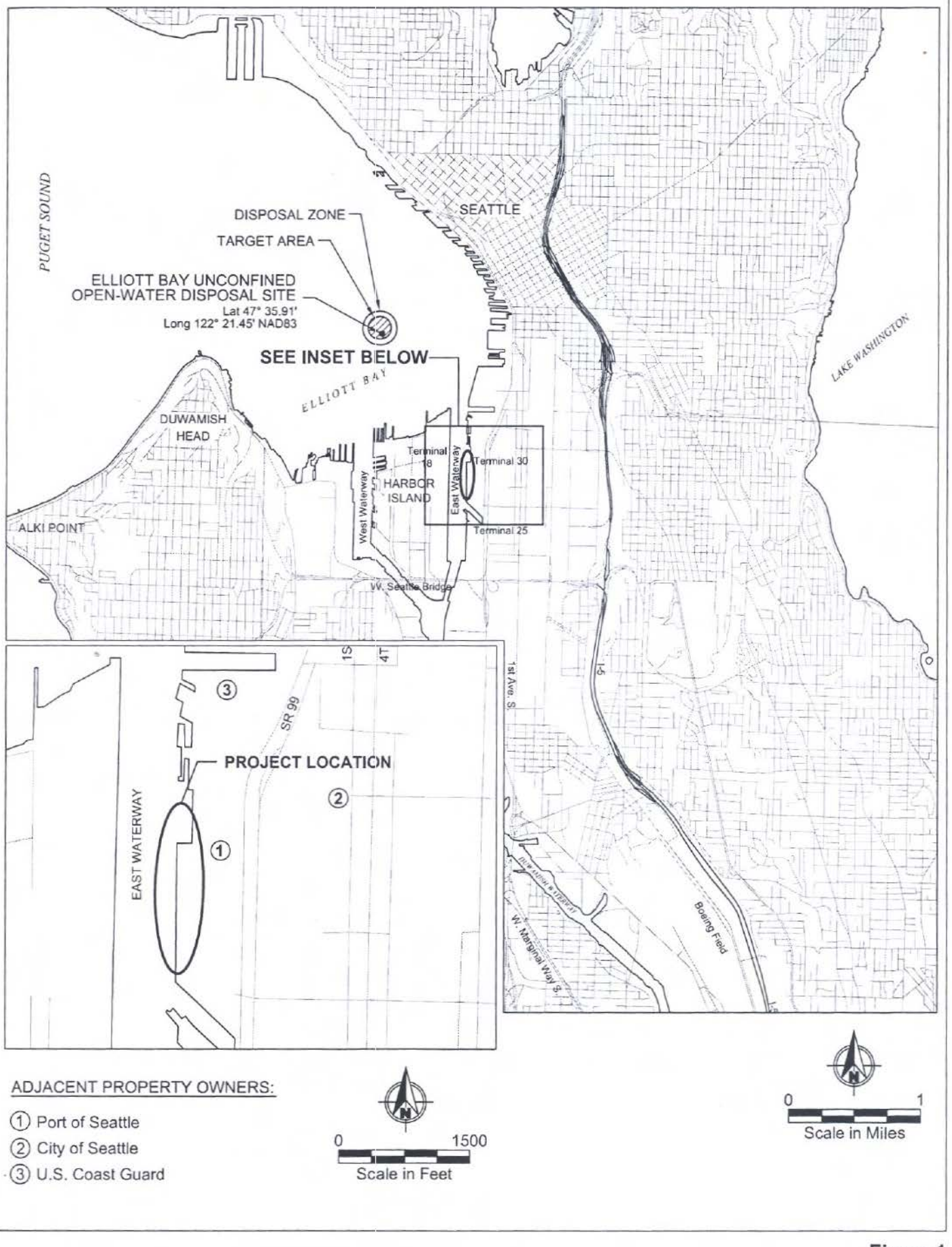
DMMO File



Mar 02, 2006 1:44pm cdavidson K:\Jobs\050003-PORT-OF-SEATTLE\05000302\05000302-01.dwg FIG1

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Vicinity Map
Terminal 30
Port of Seattle

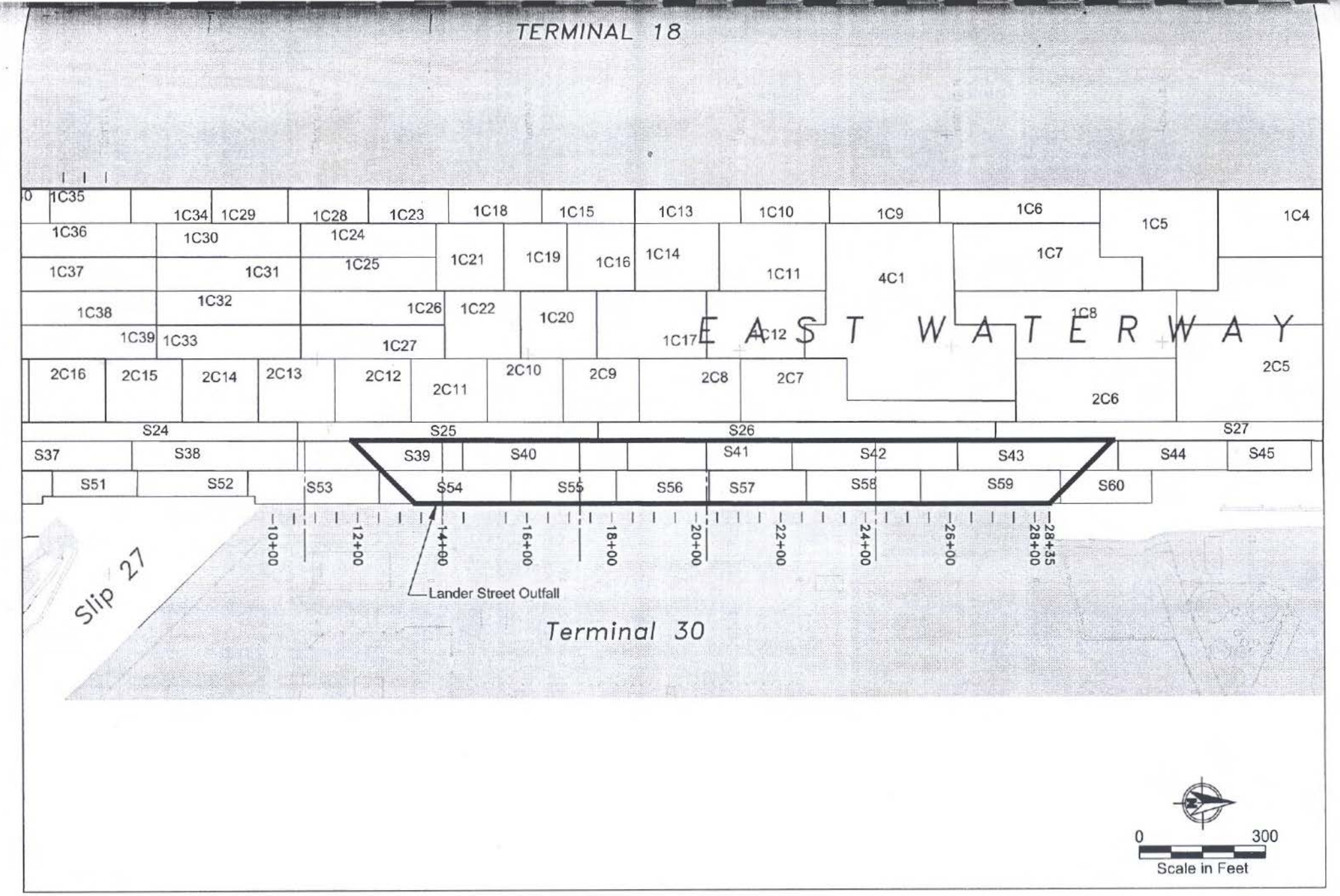


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Figure 2a
Proposed Dredge Area and Previously Characterized Surface DMMUs
Terminal 30
Port of Seattle

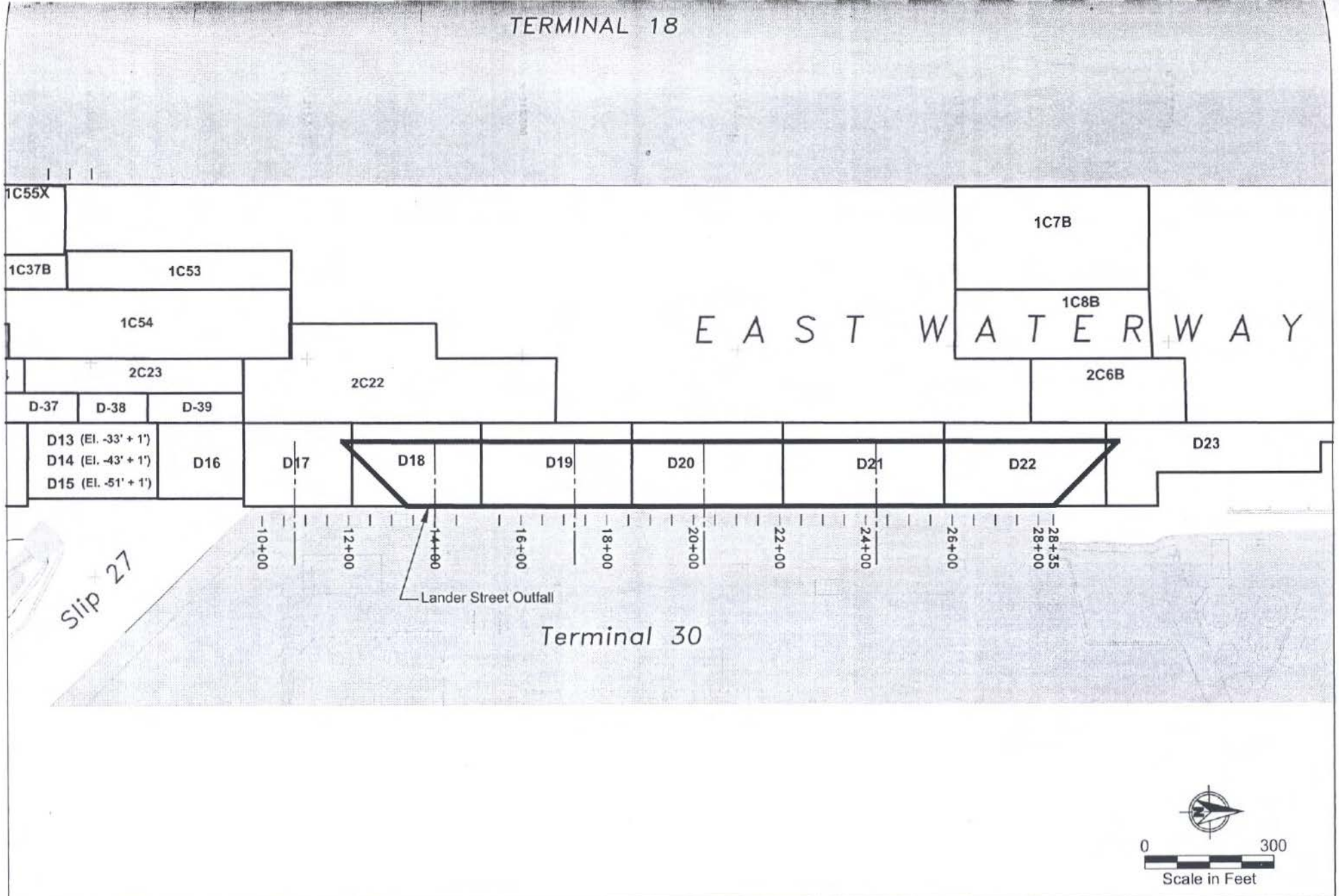

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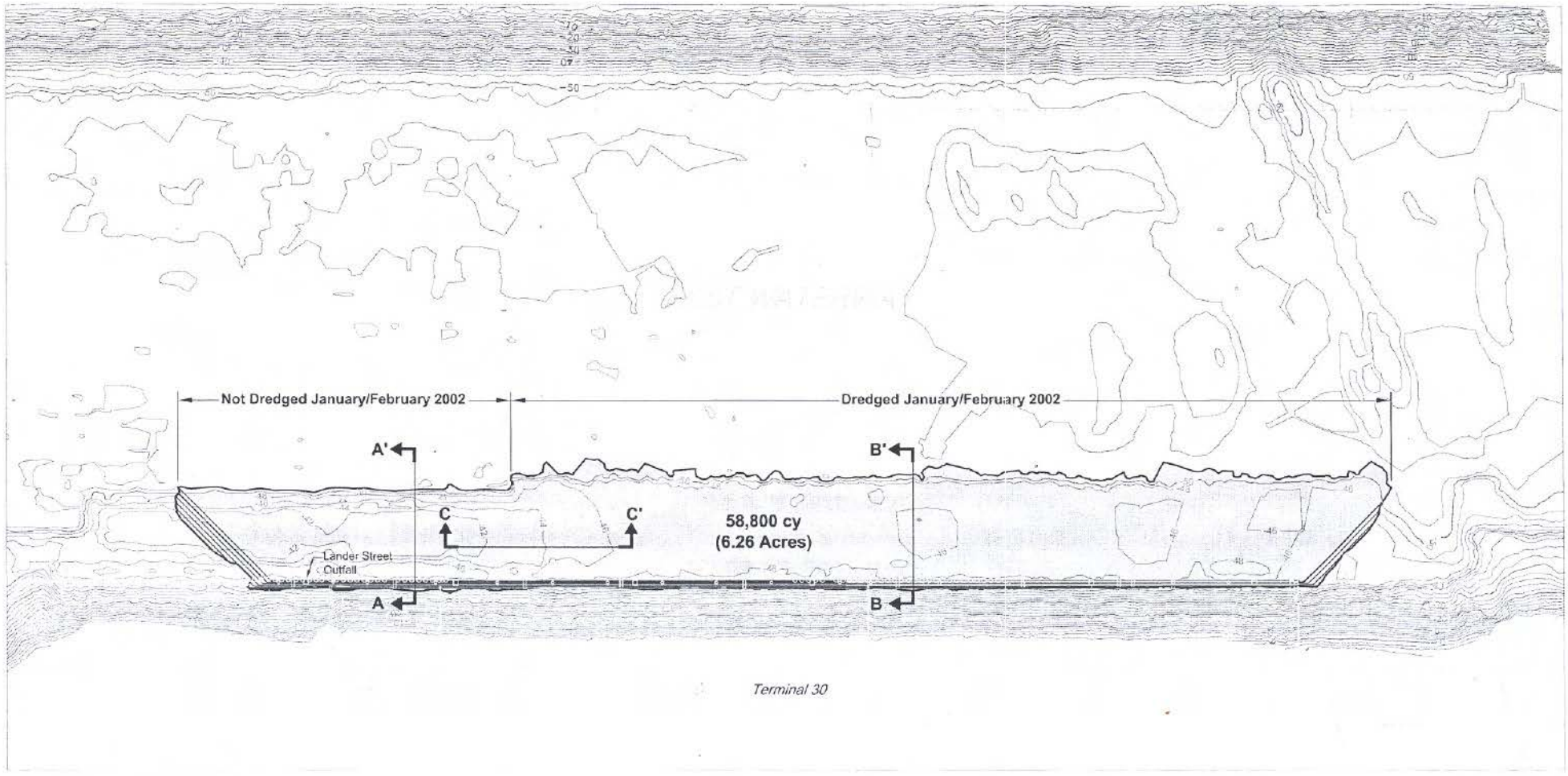
Figure 2b
Proposed Dredge Area and Previously Characterized Subsurface DMMUs
Terminal 30
Port of Seattle



Proposed Dredge Footprint

B B' Cross Section Location and Designation

0 150
Scale in Feet

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Figure 3
General Project Area and Bathymetry for T30
Terminal 30
Port of Seattle

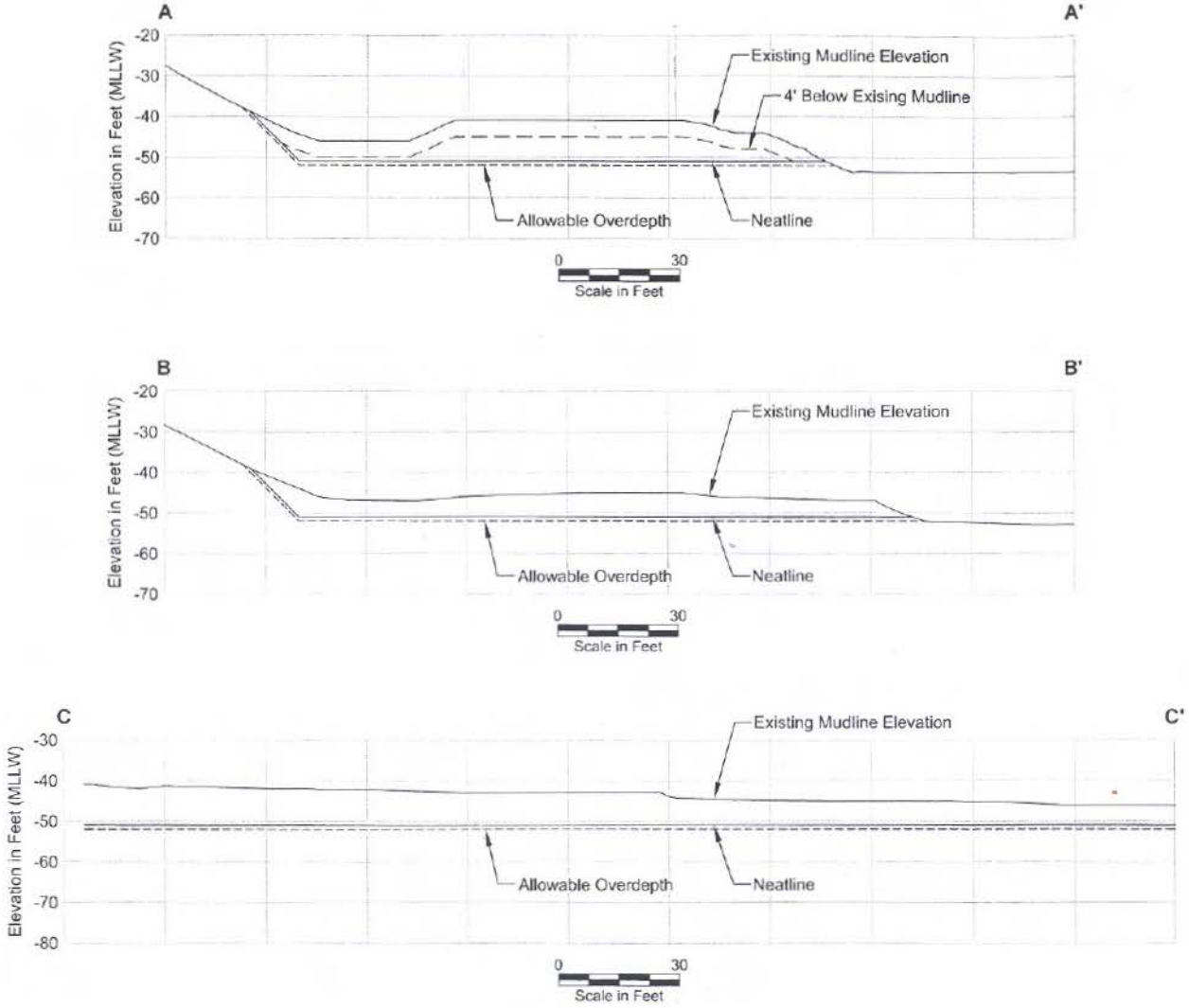

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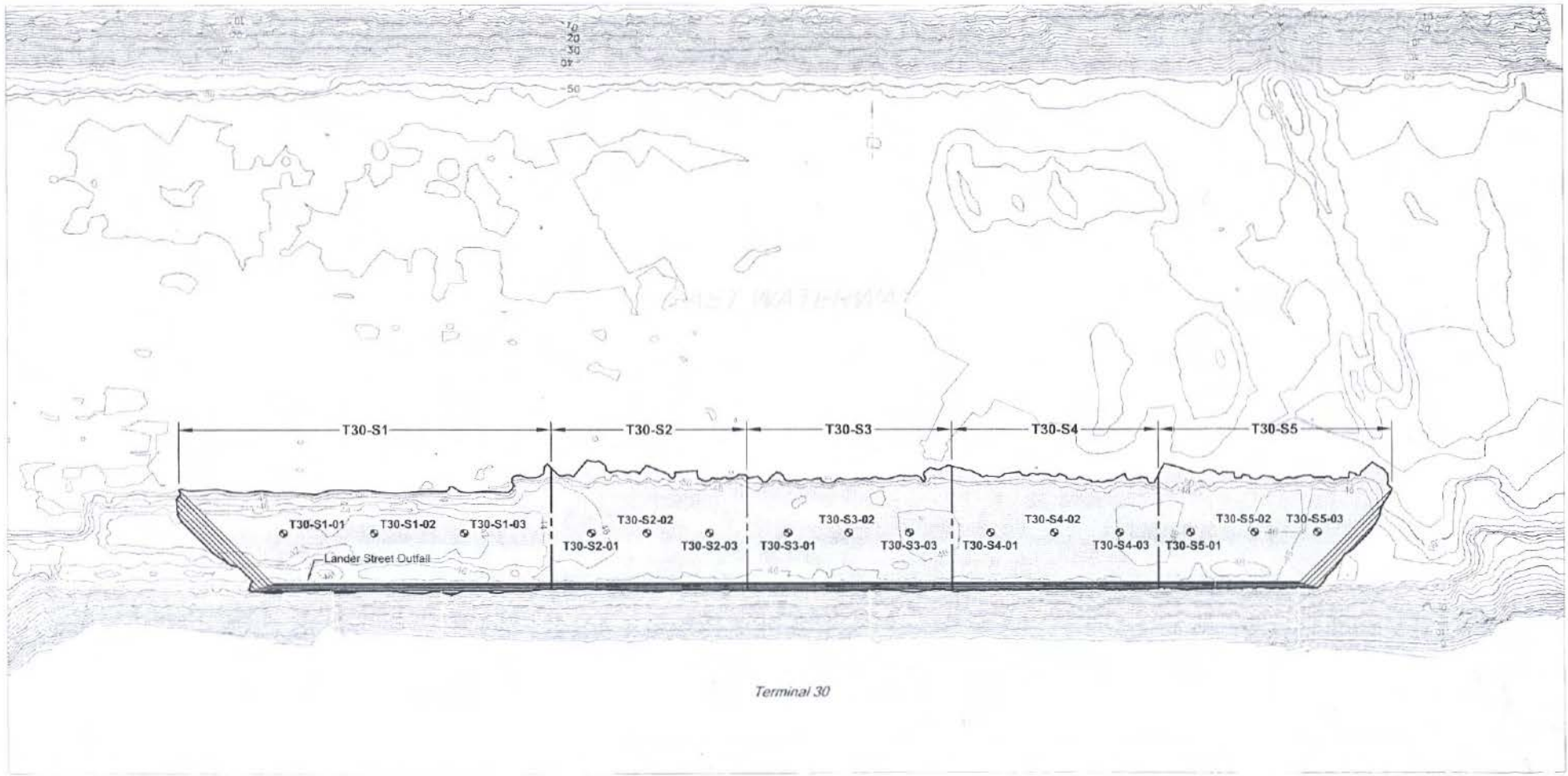
Figure 4
Cross Sections in the Proposed T30 Dredge Area
Terminal 30
Port of Seattle



T30-S4 DMMU Location, Designation, and Dredge Depth (Allowable Overdepth)

T30-S1-01 Sample Location and Designation

Note:
Subsurface DMMU T30-D1 lies beneath T30-S1.

0 150
Scale in Feet

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Figure 5
Delineation of Surface DMMUs and Proposed Sampling Locations at T30
Terminal 30
Port of Seattle

Table 1b
Coordinates and Mudline Elevations for Core Sampling Locations

DMMU and Volume (cy)	Core Station ID	Latitude[a] (°N)	Longitude[a] (°W)	Northing[a] (feet)	Easting[a] (feet)	Mudline Elevation (feet MLLW)	Target Depth (feet MLLW)[b]
T30-S1 11,100	T30-S1-01-A	47 34 53.24	122 20 35.87	215753	1267775	-41.7	-52
	T30-S1-01-B	47 34 53.11	122 20 35.80	215739	1267780	-40.4	-52
	T30-S1-02	47 34 54.36	122 20 35.90	215867	1267776	-40.3	-52
	T30-S1-03	47 34 55.78	122 20 35.86	216010	1267782	-41.3	-52
T30-S2 9,600	T30-S2-01-A	47 34 57.56	122 20 35.81	216191	1267788	-45.6	-52
	T30-S2-01-B	47 34 57.59	122 20 35.86	216193	1267785	-45.4	-52
	T30-S2-02	47 34 58.32	122 20 35.85	216267	1267788	-45.9	-52
	T30-S2-03	47 34 59.24	122 20 35.80	216361	1267793	-46.1	-52
T30-S3 9,600	T30-S3-01-A	47 35 00.37	122 20 35.89	216476	1267789	-47.1	-52
	T30-S3-01-B	47 35 00.41	122 20 35.88	216479	1267789	-47.8	-52
	T30-S3-02	47 35 01.24	122 20 35.88	216563	1267791	-47.1	-52
	T30-S3-03	47 35 02.15	122 20 35.83	216656	1267797	-46.4	-52
T30-S4 9,600	T30-S4-01	47 35 03.29	122 20 35.83	216771	1267799	-46.8	-52
	T30-S4-02	47 35 04.19	122 20 35.82	216863	1267801	-47.1	-52
	T30-S4-03-A	47 35 05.18	122 20 35.90	216963	1267798	-45.6	-52
	T30-S4-03-B	47 35 05.16	122 20 35.77	216961	1267806	-46.5	-52
T30-S5 9,600	T30-S5-01-A	47 35 06.24	122 20 35.83	217070	1267805	-45.5	-52
	T30-S5-01-B	47 35 06.14	122 20 35.87	217061	1267801	-46.0	-52
	T30-S5-02	47 35 07.11	122 20 35.89	217158	1267802	-46.0	-52
	T30-S5-03	47 35 08.04	122 20 35.95	217253	1267799	-46.0	-52
T30-D1 9,500	Testing Not Required						
Reference	AS-BIO-R1	48 04 48.39	123 01 46.77	401652	1103620	-50.8	N/Ap
Control	N/Ap	44 37 14.82	124 02 29.52	368053	7280275	ND	N/Ap

Notes:
a – Washington North Zone, NAD 83 geographic and state plane coordinates – US survey feet
b – The target depth for sediment cores comprises the project depth of -50 feet MLLW, 1 foot of overdredge, and 1 foot Z-layer
ND – No Data
N/Ap – Not applicable

Table 2
Summary of Sediment Chemistry Results Compared to DMMP Evaluation Criteria

Location ID Sample ID Sample Date Depth Interval	DMMP SL	BT	ML	T30-S1 T30-S1-CS 7/12/2006 0-4 ft	T30-S1-CS re-analysis after PCB Purging	T30-S2 T30-S2-CS 7/13/2006 0-4 ft	T30-S3 T30-S3-CS 7/13/2006 0-4 ft	T30-S4 T30-S4-CS 7/13/2006 0-4 ft	T30-S5 T30-S5-CS 7/13/2006 0-4 ft
Conventionals									
Ammonia (mg/kg)	--	--	--	**1.21**		**51.7**	**41.6**	**25.0**	**44.3**
Sulfide (mg/kg)	--	--	--	**97.5**		**247**	**278 J**	**23.3**	**12.1**
Total organic carbon (%)	--	--	--	**1.05**		**0.633**	**0.706**	**0.746**	**0.669**
Total solids (%)	--	--	--	**71.10**		**70.70**	**73.40**	**76.90**	**75.80**
Preserved total solids (%)	--	--	--	**73.50**		**71.80**	**72.50**	**75.80**	**75.10**
Total volatile solids (%)	--	--	--	**3.03**		**2.30**	**2.66**	**1.69**	**1.94**
Grain Size (%)									
Gravel	--	--	--	**1.7**		0	**0.1**	**0.8**	**0.6**
Sand	--	--	--	**61.8**		**58.2**	**61.1**	**78.5**	**73.4**
Silt	--	--	--	**26.3**		**33.9**	**30.8**	**15.8**	**20.3**
Clay	--	--	--	**10.2**		**7.8**	**7.9**	**4.8**	**5.7**
Fines	--	--	--	**36.5**		**41.7**	**38.7**	**20.6**	**26**
Metals (mg/kg)									
Antimony	150	--	200	7 U		6 U	7 U	6 U	7 U
Arsenic	57	507.1	700	7 U		6 U	7 U	6 U	7 U
Cadmium	5.1	11.3	14	**1.8**		0.3 U	0.3 U	0.3 U	0.3 U
Chromium	--	267	--	**34.5**		**15.5**	**16.1**	**14.1**	**13.8**
Copper	390	1027	1300	**47.7**		**20.3**	**27.6**	**16.5**	**15.8**
Lead	450	975	1200	**41**		**5**	**7**	**6**	**3**
Mercury	0.41	1.5	2.3	**0.18**		0.06 U	**0.08**	0.05 U	0.05 U
Nickel	140	370	370	**19**		**11**	**11**	**10**	**9**
Selenium	--	3	--	0.3 U		0.3 U	0.3 U	0.3 U	0.3 U
Silver	6.1	6.1	8.4	**0.5**		0.4 U	0.4 U	0.4 U	0.4 U
Zinc	410	2783	3800	**104**		**35.2**	**40.1**	**32.7**	**28.8**
Organometalics (µg/L)									
Tributyltin (ion)	0.15	0.15	--	**0.042 J**		0.019 U	0.019 U	0.019 U	0.019 U
PCBs (µg/kg)									
Aroclor 1016	--	--	--	40 U[2]	40 U[2]	7.7 U	9.8 U	10 U	9.6 U
Aroclor 1221	--	--	--	20 U		7.7 U	9.8 U	10 U	9.6 U
Aroclor 1232	--	--	--	60 U	60 U[2]	7.7 U	9.8 U	10 U	9.6 U
Aroclor 1242	--	--	--	60 U	60 U[2]	7.7 U	9.8 U	10 U	9.6 U
Aroclor 1248	--	--	--	60 U	60 U[2]	7.7 U	9.8 U	10 U	9.6 U
Aroclor 1254	--	--	--	120 U	120 U[2]	**7.1 J**	**14**	**14**	9.6 U
Aroclor 1260	--	--	--	**130**		**10**	**18**	**22**	**5.4 J**
Total PCBs	130	--	3100	**130**		**17.1**	**32**	**36**	**5.4**

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PCBs (mg/kg-OC)									
Total PCBs	--	38	--	**12.4**		**2.70**	**4.53**	**4.83**	**0.807**
Pesticides (µg/kg)									
4,4'-DDD	--	--	--	2.0 U	3.9 U	2.0 U	2.0 U	2.0 U	1.9 U
4,4'-DDE	--	--	--	6.4 Y	3.9 U	2.0 U	2.0 U	2.0 U	1.9 U
4,4'-DDT	--	--	--	18 Y	7.9 Y	2.0 U	2.0 U	2.0 U	1.9 U
Total DDT	6.9	50	69	18 Y	7.9 Y	2.0 U	2.0 U	2.0 U	1.9 U
Aldrin	10	--	--	0.98 U		0.97 U	0.99 U	0.98 U	0.96 U
Dieldrin	10	--	--	6.2 Y		2.0 U	2.0 U	2.0 U	1.9 U
gamma-BHC (Lindane)	10	--	--	0.98 U		0.97 U	0.99 U	0.98 U	0.96 U
alpha-Chlordane	10	--	--	0.98 U		0.97 U	0.99 U	0.98 U	0.96 U
gamma-Chlordane	--	--	--	0.98 U		0.97 U	0.99 U	0.98 U	0.96 U
cis-Nonachlor	--	--	--	2.0 U		2.0 U	2.0 U	2.0 U	1.9 U
trans-Nonachlor	--	--	--	2.0 U		2.0 U	2.0 U	2.0 U	1.9 U
Heptachlor	10	--	--	0.98 U		0.97 U	0.99 U	0.98 U	0.96 U
Total chlordane	--	37	--	2 U		0.97 U	0.99 U	0.98 U	0.96 U
LPAH (µg/kg)									
Naphthalene	2100	--	2400	**21**		20 U	20 U	**18 J**	20 U
Acenaphthylene	560	--	1300	20 U		20 U	20 U	20 U	20 U
Acenaphthene	500	--	2000	**14 J**		20 U	20 U	**18 J**	20 U
Fluorene	540	--	3600	**12 J**		20 U	20 U	20 U	20 U
Phenanthrene	1500	--	21000	**77**		**10 J**	**20**	**15 J**	20 U
Anthracene	960	--	13000	**45**		20 U	20 U	20 U	20 U
2-Methylnaphthalene	670	--	1900	20 U		20 U	20 U	20 U	20 U
Total LPAH	5200	--	29000	**169**		**10**	**20**	**51**	20 U
HPAH (µg/kg)									
Fluoranthene	1700	4600	30000	**260**		**21**	**35**	**30**	20 U
Pyrene	2600	11980	16000	**380**		**21**	**45**	**42**	**12 J**
Benzo(a)anthracene	1300	--	5100	**94**		20 U	**19 J**	**14 J**	20 U
Chrysene	1400	--	21000	**140**		**12 J**	**33**	**20**	20 U
Benzo(b)fluoranthene	--	--	--	**120**		20 U	**31**	**15 J**	20 U
Benzo(k)fluoranthene	--	--	--	**150**		**12 J**	**19 J**	**22**	20 U
Total Benzofluoranthenes	3200	--	9900	**270**		**12**	**50**	**37**	20 U
Benzo(a)pyrene	1600	--	3600	**130**		20 U	**21**	**13 J**	20 U
Indeno(1,2,3-c,d)pyrene	600	--	4400	**65**		20 U	**13 J**	**10 J**	20 U
Dibenzo(a,h)anthracene	230	--	1900	**13 J**		20 U	20 U	20 U	20 U
Benzo(g,h,i)perylene	670	--	3200	**77**		20 U	**16 J**	**11 J**	20 U

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Total HPAH	12000	--	69000	**1429**		**66**	**232**	**177**	**12**
Chlorinated Hydrocarbons (µg/kg)									
1,3-Dichlorobenzene	170	--	--	20 U		20 U	20 U	20 U	20 U
1,4-Dichlorobenzene	110	--	120	**12 J**		20 U	20 U	20 U	20 U
1,2-Dichlorobenzene	35	--	110	20 U		20 U	20 U	20 U	20 U
1,2,4-Trichlorobenzene	31	--	64	20 U		20 U	20 U	20 U	20 U
Hexachlorobenzene	22	168	230	20 U		20 U	20 U	20 U	20 U
Phthalates (µg/kg)									
Dimethylphthalate	71	--	1400	20 U		20 U	20 U	20 U	20 U
Diethylphthalate	200	--	1200	20 U		20 U	20 U	20 U	20 U
Di-n-butylphthalate	1400	--	5100	20 U		20 U	20 U	20 U	20 U
Butylbenzylphthalate	63	--	970	20 U		20 U	20 U	20 U	20 U
bis(2-Ethylhexyl)phthalate	1300	--	8300	**240 B**		**22 B**	**36 B**	**31 B**	20 U
Di-n-octylphthalate	6200	--	6200	20 U		20 U	20 U	20 U	20 U
Phenols (µg/kg)									
Phenol	420	--	1200	**20**		20 U	**13 J**	20 U	20 U
2-Methylphenol	63	--	77	20 U		20 U	20 U	20 U	20 U
4-Methylphenol	670	--	3600	20 U		20 U	20 U	20 U	20 U
2,4-Dimethylphenol	29	--	210	20 U		20 U	20 U	20 U	20 U
Pentachlorophenol	400	504	690	99 U		99 U	99 U	99 U	99 U
Misc Extractables (µg/kg)									
Benzyl alcohol	57	--	870	20 U		20 U	20 U	20 U	20 U
Benzoic acid	650	--	760	200 U		200 U	200 U	200 U	200 U
Dibenzofuran	540	--	1700	20 U		20 U	20 U	20 U	20 U
Hexachloroethane	1400	--	14000	20 U		20 U	20 U	20 U	20 U
Hexachlorobutadiene	29	--	270	20 U		20 U	20 U	20 U	20 U
n-Nitrosodiphenylamine	28	--	1300	20 U		20 U	20 U	20 U	20 U
VOC (µg/kg)									
Ethylbenzene	10	--	50	1.0 U		1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	57	--	210	1.0 U		1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	160	--	1600	1.0 U		1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	40	--	160	1.0 U		1.0 U	1.0 U	1.0 U	1.0 U
m,p-Xylene	40	--	160	1.0 U		1.0 U	1.0 U	1.0 U	1.0 U
Total xylene	40	--	160	1 U		1.0 U	1.0 U	1.0 U	1.0 U

Notes:

Table 2
Summary of Sediment Chemistry Results Compared to DMMP Evaluation Criteria

Location ID				T30-S1	T30-S1-CS	T30-S2	T30-S3	T30-S4	T30-S5
Sample ID				T30-S1-CS	re-analysis	T30-S2-CS	T30-S3-CS	T30-S4-CS	T30-S5-CS
Sample Date	DMMP			7/12/2006	after PCB	7/13/2006	7/13/2006	7/13/2006	7/13/2006
Depth Interval	SL	BT	ML	0-4 ft	Purging	0-4 ft	0-4 ft	0-4 ft	0-4 ft

1 Total chlordane includes all chlordane isomers including cis-chlordane, trans-chlordane, cis-nonaclor, trans-nonaclor,

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

Y The analyte was analyzed for, but not detected with elevated reporting limit due to chromatograph interference.

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

SL Screening Level

BT Bioaccumulation Trigger

ML Maximum Level

Boxed values indicate those that exceed screening criteria.

Bold values indicate detections.

Table 3
10-Day Acute Amphipod Mortality Test Performance Summary—*Eohaustorius sp.*
Non-Dispersive Criteria

Treatment	Percentage Mortality	M_T-M_C > 20%?	Statistically Less than Reference	M_T-M_R > 30%?	Fails 2-Hit Rule?	Fails 1-Hit Rule?
Control	0.0 ± 0.0	--	--	--	--	--
Reference	13.0 ± 0.9	No (13%)	--	--	--	--
T30-S1-CS	14.0 ± 1.1	No (14%)	No	No (1%)	No	No

Table 4
20-Day Chronic Juvenile Polychaete Growth Test Performance Summary – *Neanthes arenaceodentata*
Non-Dispersive Criteria

Treatment	Mortality (%)	Mean Individual Growth Rate (mg/ind/day)	MIG_T/MIG_C < 0.80?	Statistically MIG Less than Reference?	MIG_T/MIG_R	MIG_T/MIG_R		Fails 2-Hit Rule?	Fails 1-Hit Rule?
						<0.7?	<0.5?		
Control	0	0.74 ± 0.15	--	--	--	--	--	--	--
Reference	0	0.72 ± 0.11	No (0.97)	--	--	--	--	--	--
T30-S1-CS	0	0.61 ± 0.09	No (0.82)	Yes	0.85	No	No	No	No

Table 5
48-Hour Acute Larval Test Performance Summary – *Dendraster excentricus*
Non-Dispersive Criteria

Treatment	Mean Normalized Combined Mortality and Abnormality	N_T/N_C < 0.80?	Statistically Less than Reference?	N_R/N_C - N_T/N_C > 0.30?	Fails 2-Hit Rule?	Fails 1-Hit Rule?
Control	3.7 ± 4.1	--	--	--	--	--
Reference	10.8 ± 8.0	No (0.90)	--	--	--	--
T30-S1-CS	6.8 ± 7.1	No (0.94)	No	No (-0.05)	No	No

Table 6
Summary of Chemical and Bioassay Testing Results for Port of Seattle Terminal 30 and Proposed Suitability Determinations

DMMU	Estimated Volume (cy)	Screening Level Exceedance?	Amphipod Bioassay		Larval Bioassay		Juvenile Polychaete Bioassay		Proposed Suitable for Open Water Disposal?
			2-Hit Rule Failure?	1-Hit Rule Failure?	2-Hit Rule Failure?	1-Hit Rule Failure?	2-Hit Rule Failure?	1-Hit Rule Failure?	
T30-S1	11,100	Yes (total DDT)	No	No	No	No	No	No	Yes
T30-S2	9,600	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes
T30-S3	9,600	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes
T30-S4	9,600	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes
T30-S5	9,600	No	N/A	N/A	N/A	N/A	N/A	N/A	Yes
T30-D1	9,500	Subsurface DMMU directly below the footprint of T30-S1. Testing was not required.							Yes

N/A – not applicable