

3 July 1996

MEMORANDUM FOR RECORD

SUBJECT: DETERMINATION OF THE SUITABILITY OF DREDGED MATERIAL TESTED UNDER PSDDA EVALUATION PROCEDURES FOR PORT OF SEATTLE TERMINAL 5 DREDGING FOR DISPOSAL AT THE PSDDA ELLIOTT BAY OPEN WATER DISPOSAL SITE.

1. The Port of Seattle proposes to dredge approximately 36,000 cubic yards of sediment in the vicinity of Terminal 5. The following summary reflects the PSDDA agencies' (Corps of Engineers, Department of Ecology, Department of Natural Resources and the Environmental Protection Agency) consensus decision on the acceptability of the sampling plan and all relevant test data to make a determination of suitability for the disposal of the material at the Elliott Bay open-water disposal site.
2. Based upon previous data for this area, the project was ranked "low-moderate" by the PSDDA agencies.
3. A sampling and analysis plan was completed for this project and approved by the PSDDA agencies on 18 December 1995. Sampling for this project was initiated on 16 January 1996. Recency for this project will expire during January 2001 to January 2003.

SAP Approval Date	18 December 1995
Sampling dates	16 January -8 February 1996
Data Report submittal date	4 June 1996
Recency determination dates	January 2001 to January 2003

4. Three Dredged Material Management Units were characterized. Samples were taken from three locations and composited for surface unit C-1. Samples were taken from five locations and composited for surface unit C-2. Each DMMU represents up to 18,000 cubic yards of material. One sample location, S-8, was analyzed for the subsurface. These samples and analyses deviate from that proposed in the SAP. During sampling it was discovered that mudline elevations were lower than the existing survey had indicated; hence the total volume to be dredged was reduced from 55,000 cubic yards to approximately 35,000 cubic yards. Most of this sediment is within the 0-4 foot dredge prism. There is insufficient volume to comprise a subsurface unit. However, one single subsurface sample, S-8, was analyzed because some material was below the 4-foot dredge cut.

Port of Seattle, Terminal 5

5. For composite C-1, the chemistry data indicated exceedances of the Dredging Year 1996 PSDDA screening levels for mercury, tributyltin, indeno(1,2,3-cd)pyrene, pyrene, and total HPAHs. In composite C-2, only the screening level for tributyltin was exceeded. There were no screening level exceedances for sample S-8. No bioaccumulation triggers or maximum levels were exceeded. [see attached DAIS Values Table 3b](#)
6. Due to the exceedance of chemical screening levels, biological testing was required for composites C-1 and C-2. Although not required, the Port of Seattle chose to test sample S-8 as well. The amphipod 10-day acute toxicity test, and the bivalve sediment larval combined mortality and abnormality (effective mortality) test, and the *Neanthes* 20-day growth test were conducted. Tests were conducted according to the guidelines specified by PSEP (1995), as modified by the PSDDA program.
7. Reference sediment for use in the bioassays was collected from Sequim Bay. Control sediment was collected from West Beach. The bivalve *Mytilus galloprovincialis* was used in the larval test. Test organisms were field collected by Marinus Incorporated of Long Beach California.
8. Bioassay results are listed in Table 4. DMMUs C-1, C-2 and sample S-8 passed all bioassays.
9. In summary, PSDDA approved protocols and procedures were followed, and quality assurance/quality control guidelines specified in PSDDA were generally complied with. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the PSDDA program. Based on the results of the chemical and biological testing, the PSDDA agencies concluded that all the material tested is suitable for disposal at the Elliott Bay non-dispersive site.
10. This memorandum documents the suitability of proposed dredged sediments for disposal at a PSDDA open-water disposal site. This determination of suitability does not preclude the consideration of this material for an appropriate beneficial use. It does not constitute final agency approval of the project. During the public comment period which follows a public notice, the resource agencies will provide input on the overall project. 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. If a Section 404 permit is issued for this project, a dredging plan must be submitted to the Enforcement Section, Regulatory Branch, Seattle District Corps of Engineers.

Port of Seattle, Terminal 5

Concur:

7/23/96
Date

7/23/96
Date

8-5-96
Date

7/25/96
Date

24 JUL 96
Date

David R. Kendall
David Kendall, Ph.D
Seattle District Corps of Engineers

Stephanie Stirling
Stephanie Stirling
Seattle District Corps of Engineers

Justine Barton
Justine Barton
Environmental Protection Agency, Region 10

Tom Gries
Tom Gries
Washington Department of Ecology

Ted Benson
Ted Benson
Washington Department of Natural Resources

Copies Furnished:

Jack Gossett/CENPS-OP-RG
Doug Hotchkiss/Port of Seattle
Chris Boudreau/EVS
DNR/Ted Benson

EPA/Justine Barton
DOE/Tom Gries
DMMO file

Table 2. Sediment Conventional Parameters

Conventional Parameters	C-1	C-2	S-8
Volume	18, 000 cubic yards	18,000 cubic yards	NA
Grain-size			
Gravel	2	1	89
Sand	73	68	6
Silt	17	22	1
Clay	6	7	7
Total Solids (%)	72.3	72.4	82.1
Total Volatile Solids(mg/kg)	25,000	29,000	11,000
Total Organic Carbon (%)	1.2	0.84	0.5
Bulk Ammonia (mg/kg)	9.5	6.7	7.7
Total Sulfides (mg/kg)	160	440	1.3

Table 3. Screening Level Exceedances

Parameters	Chemical Guidelines			C-1	C-2
	SL	BT	ML		
mercury (mg/kg)	0.21		2.1	0.27	
tributyltin ($\mu\text{g}/\text{kg}$)	30	228		69	51
indeno(1,2,3-cd)pyrene ($\mu\text{g}/\text{kg}$)	69		5200	140	
pyrene ($\mu\text{g}/\text{kg}$)	430		7300	630	
HPAH ($\mu\text{g}/\text{kg}$)	1800		51000	2526	

Table 3b. DAIS Value Table - Dry Weight Basis

Project: Port of Seattle - Terminal 5 (DY1997): POST51BF114

	units	C1	C2
SEDIMENT CONVENTIONALS			
Total Solids	%	72.3	72.4
Volatile Solids	%	2.5	2.9
Total Organic Carbon	%	1.2	0.84
Ammonia	MG/KG	9.5	6.7
Total Sulfides	MG/KG	160 j	440 j
METALS			
Antimony (1)	MG/KG	0.5	0.3
Arsenic	MG/KG	6.3	5.1
Cadmium	MG/KG	0.22	0.26
Chromium (4)	MG/KG	-	-
Copper	MG/KG	46.9	40
Lead	MG/KG	37	34
Mercury	MG/KG	-	-
Nickel	MG/KG	14	15
Selenium (4)	MG/KG	-	-
Silver	MG/KG	0.19	0.21
Zinc	MG/KG	71.5	66.6
LPAH			
2-Methylnaphthalene (1)	UG/KG	19 u	19 u
Acenaphthene (1)	UG/KG	36	26
Acenaphthylene (1)	UG/KG	19 u	19 u
Anthracene (1)	UG/KG	73	33
Fluorene (1)	UG/KG	36	24
Naphthalene (1)	UG/KG	55	47
Phenanthrene (1)	UG/KG	220	100
Total LPAH (1)	UG/KG	260	268
HPAH			
Benzo(a)anthracene (1)	UG/KG	160	88
Benzo(a)pyrene (1)	UG/KG	290	150
Benzo(g,h,i)perylene (1)	UG/KG	110	64
Benzofluoranthenes (1)	UG/KG	590	360
Chrysene (1)	UG/KG	240	140
Dibenzo(a,h)anthracene (1)	UG/KG	36	19 u
Fluoranthene	UG/KG	330	200
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	140	62
Pyrene	UG/KG	630	340
Total HPAH (1)	UG/KG	2526	1423
CHLORINATED HYDROCARBONS			
1,2,4-Trichlorobenzene (1)	UG/KG	19 u	19 u
1,2-Dichlorobenzene (1)	UG/KG	19 u	19 u
1,3-Dichlorobenzene (3)	UG/KG	19 u	19 u
1,4-Dichlorobenzene (1)	UG/KG	19 u	19 u
Hexachlorobenzene	UG/KG	19 u	19 u
PHTHALATES			

	units	C1	C2
Bis(2-ethylhexyl)phthalate (1)	UG/KG	150	220
Butyl benzyl phthalate (1)	UG/KG	19 u	19 u
Di-n-butyl phthalate (1)	UG/KG	19 u	19 u
Di-n-octyl phthalate (1)	UG/KG	19 u	19 u
Diethyl phthalate (1)	UG/KG	19 u	19 u
Dimethyl phthalate (1)	UG/KG	19 u	19 u

PHENOLS

2 Methylphenol (1)	UG/KG	19 u	19 u
2,4-Dimethylphenol (1)	UG/KG	19 u	19 u
4 Methylphenol (1)	UG/KG	19 u	19 u
Pentachlorophenol	UG/KG	95 u	97 u
Phenol (1)	UG/KG	20 m	19 u

MISCELLANEOUS EXTRACTABLES

Benzoic acid (1)	UG/KG	190 u	190 u
Benzyl alcohol (1)	UG/KG	19 u	19 u
Dibenzofuran (1)	UG/KG	26	23
Hexachlorobutadiene (1)	UG/KG	19 u	19 u
Hexachloroethane (1)	UG/KG	19 u	19 u
N-Nitrosodiphenylamine (1)	UG/KG	19 u	19 u

VOLATILE ORGANICS

Ethylbenzene (1)	UG/KG	1.1 u	1.1 u
Tetrachloroethene (1)	UG/KG	1.1 u	1.1 u
Total Xylene (1)	UG/KG	2.2 u	2.2 u
Trichloroethene (1)	UG/KG	1.1 u	1.1 u

PESTICIDES AND PCBs

Aldrin (3)	UG/KG	1.4 u	0.97 u
Chlordane (2)	UG/KG	0.95 u	0.97 u
Dieldrin (3)	UG/KG	4.6 u	1.9 u
Heptachlor (3)	UG/KG	0.95 u	0.97 u
Lindane (3)	UG/KG	0.95 u	2.3 u
Total DDT	UG/KG	7.6	5.9
Total PCBs	UG/KG	139	115

ORGANOMETALLICS

Tributyltin (porewater) (2)	UG/L	-	-
-----------------------------	------	---	---

A dash indicates that no data exists for this analyte in DAIS

(1) = No BT exists (2) = No ML exists (3) = No BT or ML exists (4) = No SL or ML exists

END OF REPORT

Table 4. Bioassay Results

DMMU	Amphipod Mortality (<i>Rhepoxinius abronius</i>) (%)	Sediment Larval Test (<i>Mytilus galloprovincialis</i>) (Effective mortality %)	20 Day Neanthes Growth (mg)	Suitability for Non-Dispersive Disposal
Control	3	22.0	12.9	NA
Sequim Bay CG	9	24.4	11.5	NA
C-1	13	38.8	12.9	Pass
C-2	19	29.8	12.2	Pass
S-8	2	28.2	11.9	Pass
Positive Control EC50/LC50)	Cd (mg/L) 0.30	Cu (μ L) 20.2	Cd (mg/L) 7.5	NA
Lab Performance		11.7 \pm 4.75 μ L	6.18 \pm 1.95 mg/L	
DAIS (mean \pm SD)	0.79 \pm 0.48 mg/L		12.5 \pm 5.4 mg/L	

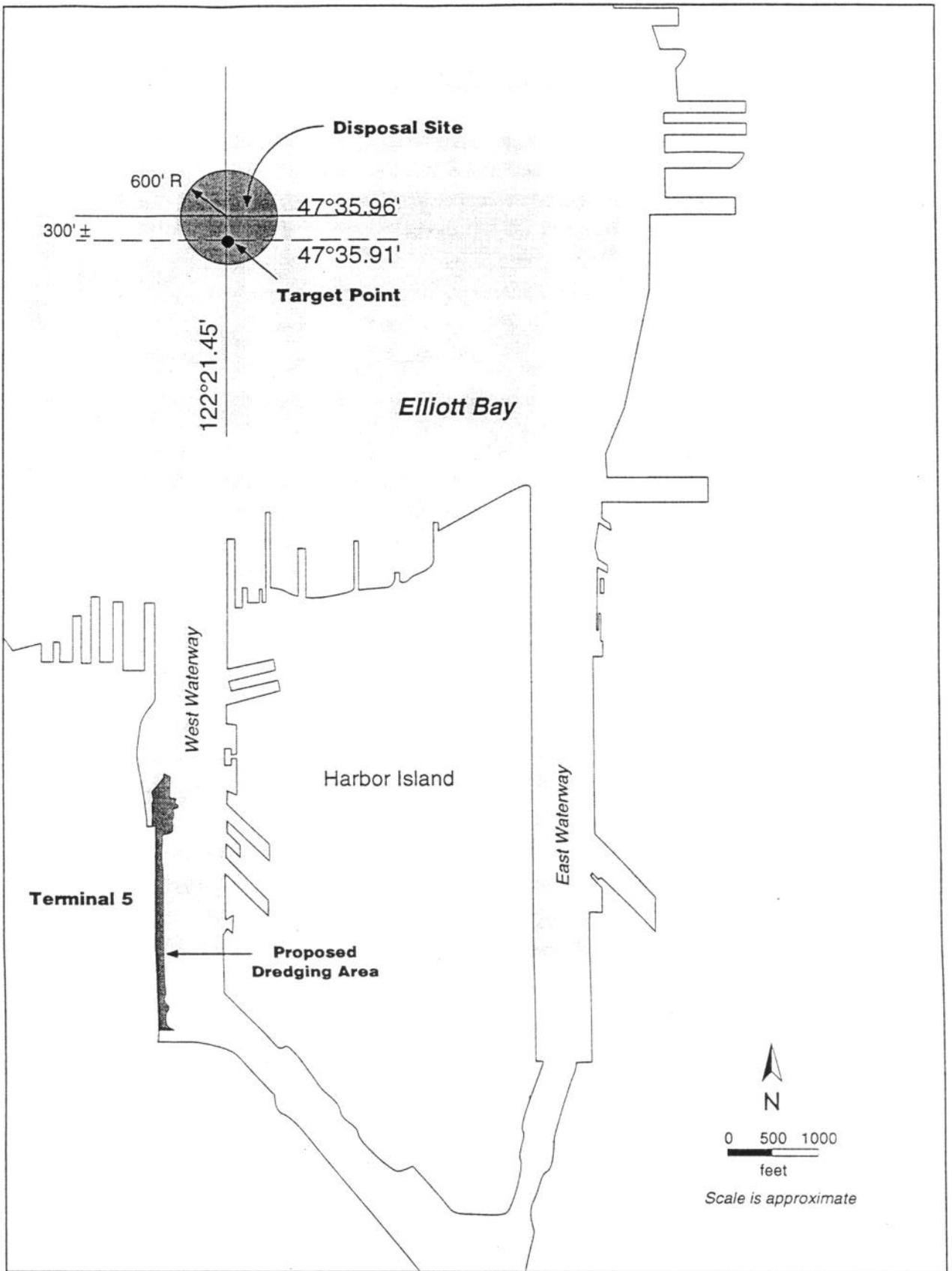


Figure 1-1. Proposed dredging area at Port of Seattle Terminal 5

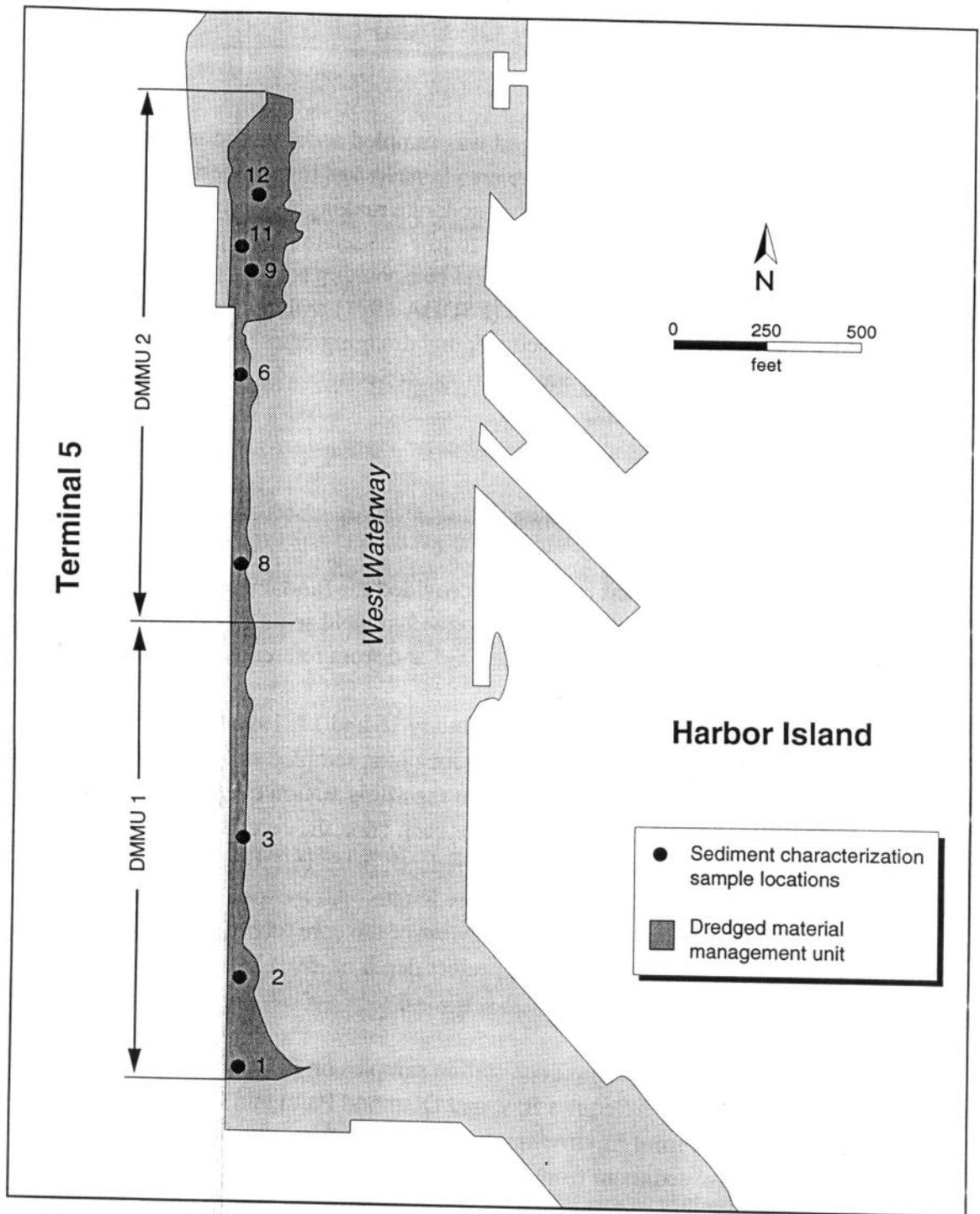


Figure 2-1. Locations of sediment core stations and delineation of DMMU1 and DMMU2 for T-5 dredge sediment characterization

Table 2-1. Summary of core sample locations, mudline elevations, and core depths and lengths for T-5 dredged material characterization

STATION No.	CORE No.	NORTHING (ft) NAD 83		EASTING (ft) NAD 83		MUDLINE ELEVATION (MLLW) (ft)		PENETRATION DEPTH (MLLW) (ft)		CORE LENGTH (ft)	
		SAP	Actual	SAP	Actual	SAP	Actual	SAP	Actual	<i>in situ</i>	Recovered
1	1	213180	213181	1263305	1263290	-42	-42.4	-52	-50	7.6	7.6
2	3	213180	213178	1263305	1263315	-42	-42.4	-52	-47.4	5.0	4.0
3	1	213480	213457	1263270	1263301	-43	-47.4	-52	-52.6	5.2	5.0
4	4	213480	213450	1263270	1263301	-43	-46.7	-52	-52.6	5.9	5.6
5	2	213880	213884	1263278	1263303	-39	-50.0	-52	-57.2	6.3	4.9
6	3	213880	213888	1263278	1263307	-39	-51.4	-52	-57.8	6.4	5.5
7	2	215280	215291	1263305	1263326	-40	-53.5	-52	-57	3.5	3.0
8	3	215280	215285	1263305	1263326	-40	-46.4	-52	-50.4	4.0	3.2
9	1	214730	214712	1263294	1263303	-39	-42	-52	-52.8	10.8	8.4
10	2	214730	214723	1263294	1263301	-39	-42	-52	-52.8	10.8	8.1
11	1	215470	215446	1263351	1263359	-41	-49.6	-52	-55.2	5.6	4.9
12	2	215470	215443	1263351	1263375	-41	-48.2	-52	-53.8	5.6	4.2
13	1	215534	215544	1263324	1263320	-38	-42.4	-52	-48.8	6.4	5.1
14	4	215534	215535	1263324	1263325	-38	-44.1	-52	-49.6	5.5	4.3
15	1	215688	215688	1263374	1263368	-41	-44	-52	-48.4	4.4	3.6
16	5	215688	215706	1263374	1263379	-41	-46.4	-52	-53.6	7.2	5.2

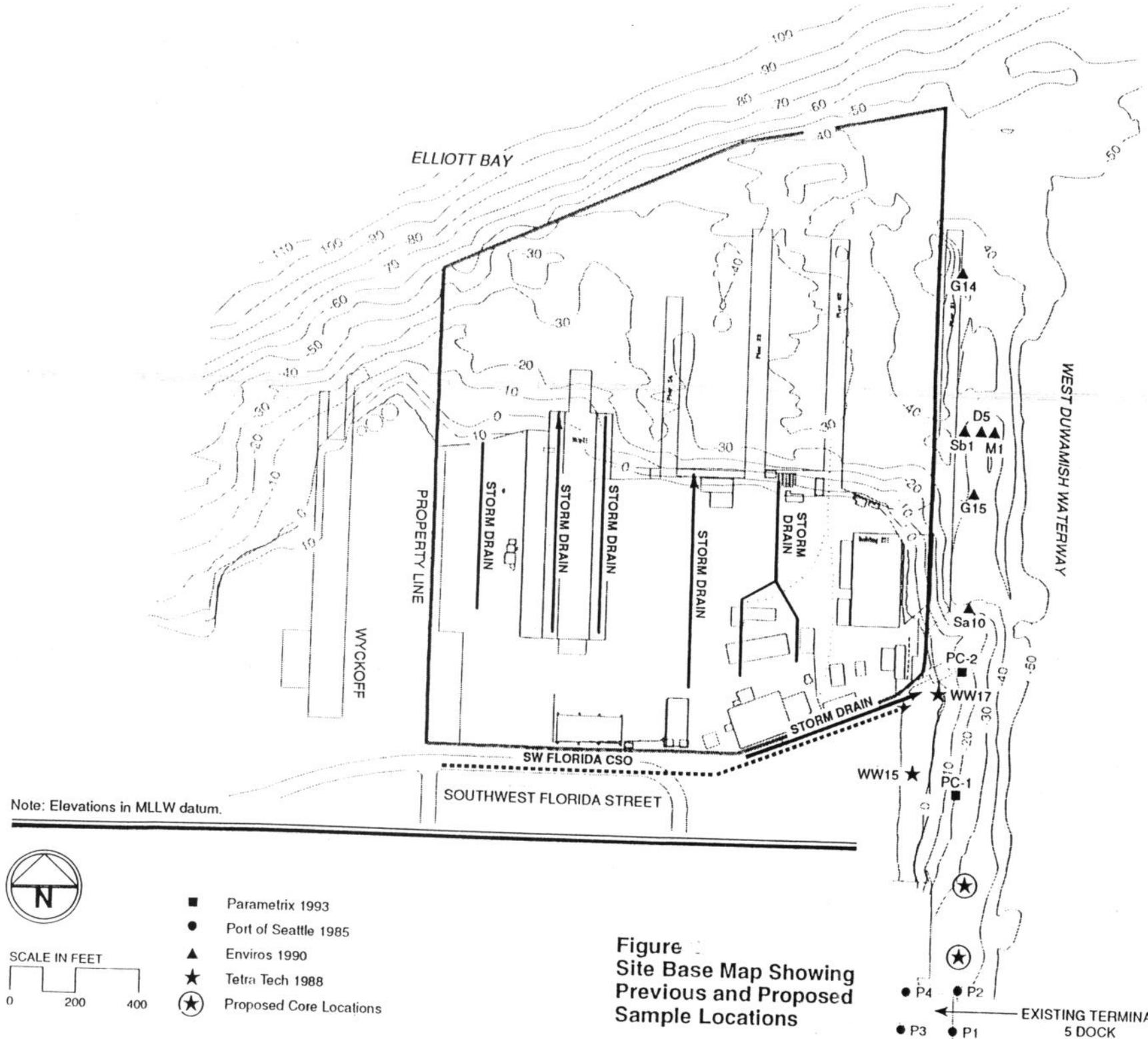
30 April 1997

Memorandum for Record

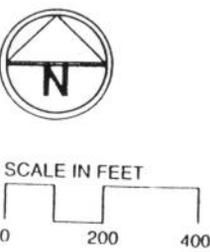
SUBJECT: CLARIFICATION OF AREAS TESTED IN THE VICINITY OF PORT OF SEATTLE, TERMINAL 5, IN THE WEST WATERWAY OF THE DUWAMISH RIVER.

1. The Port of Seattle has recently completed two sediment testing projects in the vicinity of Terminal 5 on the West Waterway. These two events tested sediments in different locations in the vicinity of the terminal.
2. The first sampling event was undertaken in 1994, and documented in a suitability determination dated 31 January 1995. This event characterized material to be dredged during the northern extension of Terminal 5. The sampling characterized 34,000 cubic yards, and all material was found suitable for open-water disposal. The sample locations are shown on Figure 1. The material was characterized to a depth of -40 feet.
3. The second sampling event took place in 1996, and was documented in a suitability determination dated 3 July 1996. This sampling characterized material adjacent to Terminal 5, with the intention of deepening the area to -50 feet. Initial estimates proposed dredging 55,000 cubic yards, but surveys prior to sampling indicated that only 36,000 cubic yards would need to be removed. In reviewing the sampling plan for this project, the PSDDA agencies requested that sampling of the dredge prism from -40 to -50 feet be conducted for that area to the north that had been sampled and approved in 1995. This was done, and all material was found suitable for open-water disposal. The initial area to be sampled is shown in Figure 2, and the expanded area is shown in Figure 3.


Stephanie Stirling
Biologist



Note: Elevations in MLLW datum.



- Parametrix 1993
- Port of Seattle 1985
- ▲ Enviro 1990
- ★ Tetra Tech 1988
- ★ (in circle) Proposed Core Locations

Figure 1
 Site Base Map Showing
 Previous and Proposed
 Sample Locations

EXISTING TERMINAL
 5 DOCK

Figure 1.

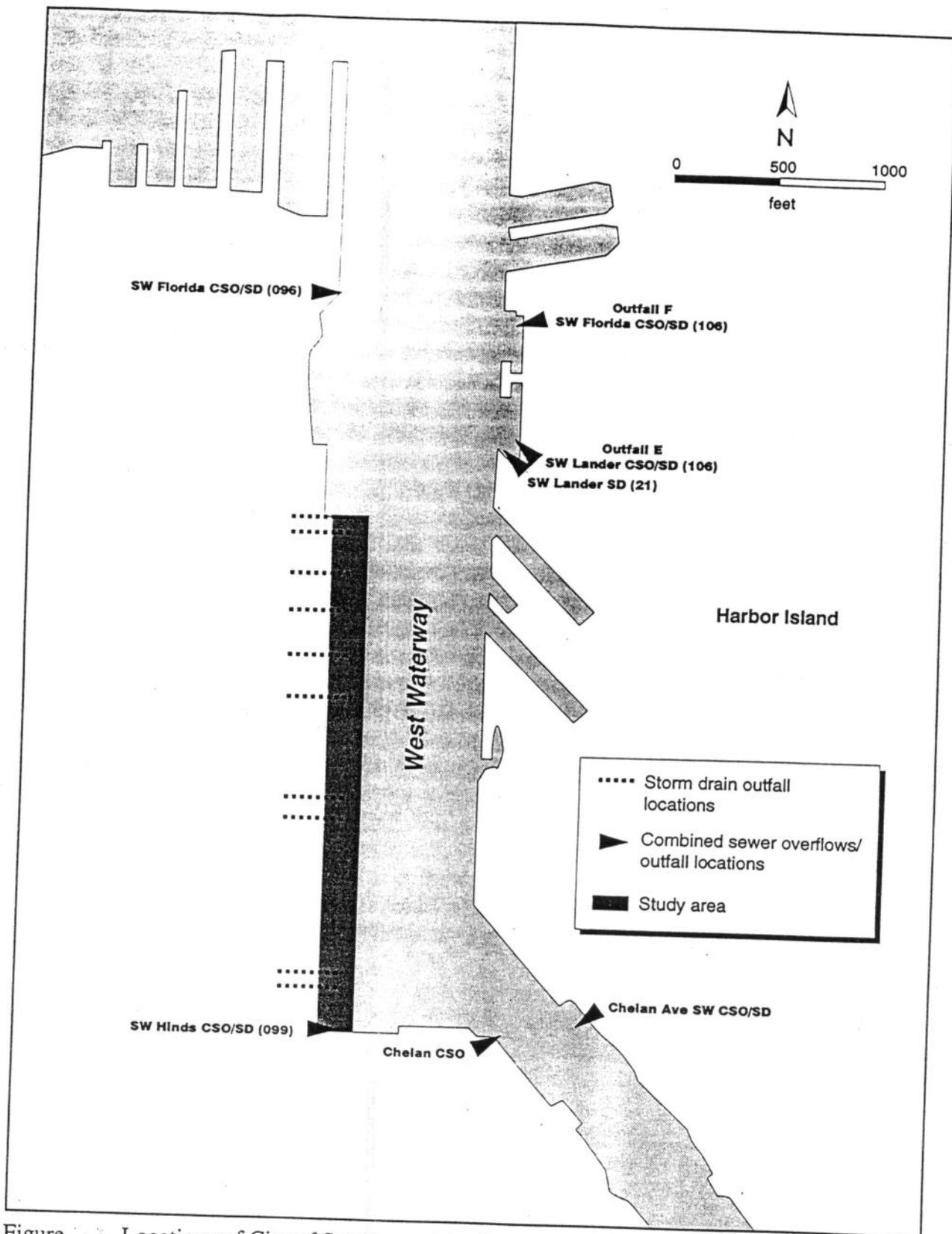


Figure 2

Figure 2. Locations of City of Seattle combined sewer overflows and Port of Seattle Terminal 5 storm drain outfalls.

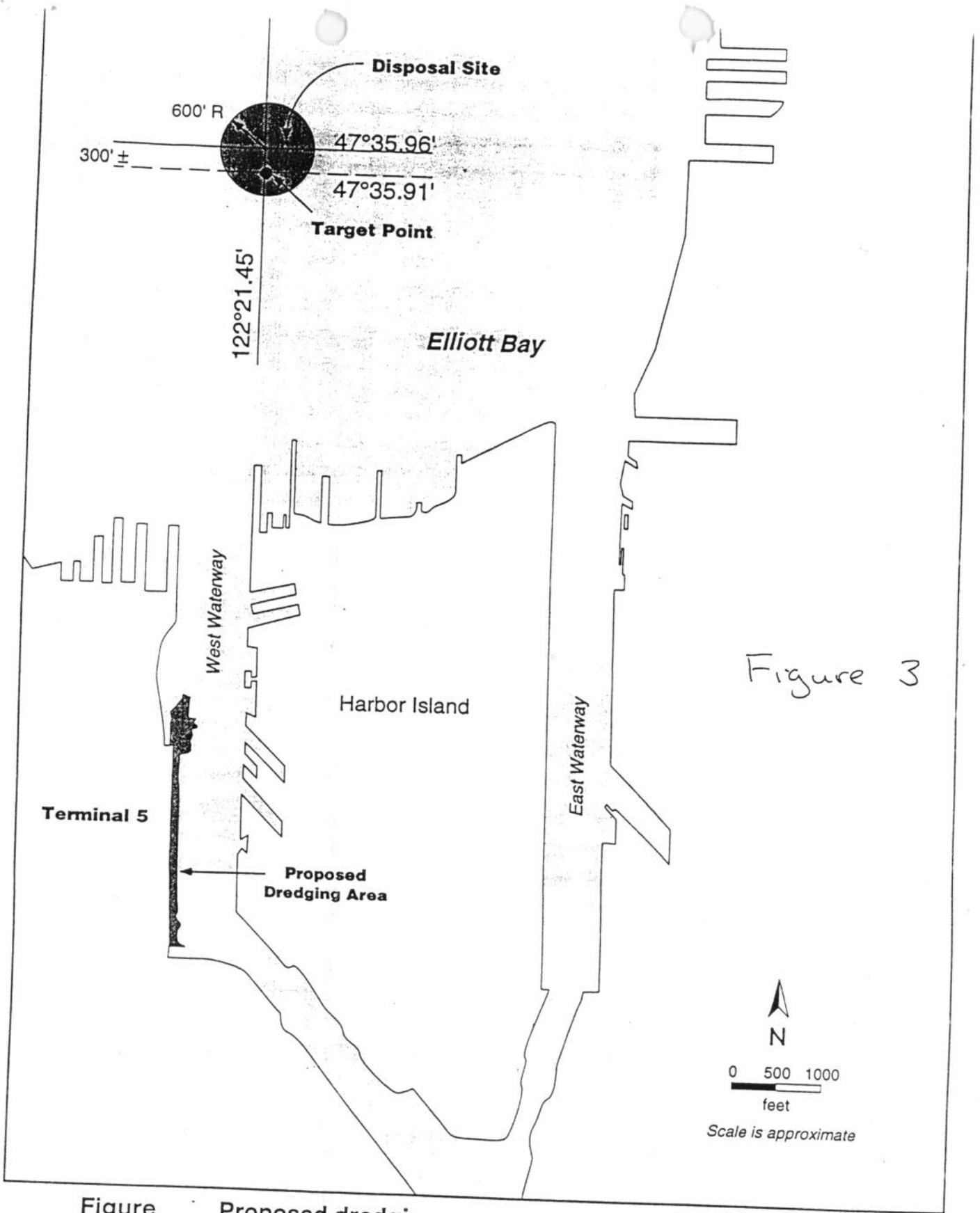


Figure 3

Figure Proposed dredging area at Port of Seattle Terminal 5

DAIS Value Table - Dry Weight Basis

Project: Port of Seattle - Terminal 5 (DY97): POST51BF114

	units	C1	C2
SEDIMENT CONVENTIONALS			
Total Solids	%	72.3	72.4
Volatile Solids	%	2.5	2.9
Total Organic Carbon	%	1.2	0.84
Ammonia	MG/KG	9.5	6.7
Total Sulfides	MG/KG	160 j	440 j
METALS			
Antimony (1)	MG/KG	0.5	0.3
Arsenic	MG/KG	6.3	5.1
Cadmium	MG/KG	0.22	0.26
Chromium (4)	MG/KG	-	-
Copper	MG/KG	46.9	40
Lead	MG/KG	37	34
Mercury	MG/KG	-	-
Nickel	MG/KG	14	15
Selenium (4)	MG/KG	-	-
Silver	MG/KG	0.19	0.21
Zinc	MG/KG	71.5	66.6
LPAH			
2-Methylnaphthalene (1)	UG/KG	19 u	19 u
Acenaphthene (1)	UG/KG	36	26
Acenaphthylene (1)	UG/KG	19 u	19 u
Anthracene (1)	UG/KG	73	33
Fluorene (1)	UG/KG	36	24
Naphthalene (1)	UG/KG	55	47
Phenanthrene (1)	UG/KG	220	100
Total LPAH (1)	UG/KG	260	268
HPAH			
Benzo(a)anthracene (1)	UG/KG	160	88
Benzo(a)pyrene (1)	UG/KG	290	150
Benzo(g,h,i)perylene (1)	UG/KG	110	64
Benzofluoranthenes (1)	UG/KG	590	360
Chrysene (1)	UG/KG	240	140
Dibenzo(a,h)anthracene (1)	UG/KG	36	19 u
Fluoranthene	UG/KG	330	200
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	140	62
Pyrene	UG/KG	630	340
Total HPAH (1)	UG/KG	2526	1423
CHLORINATED HYDROCARBONS			
1,2,4-Trichlorobenzene (1)	UG/KG	19 u	19 u
1,2-Dichlorobenzene (1)	UG/KG	19 u	19 u
1,3-Dichlorobenzene (3)	UG/KG	19 u	19 u
1,4-Dichlorobenzene (1)	UG/KG	19 u	19 u
Hexachlorobenzene	UG/KG	19 u	19 u
PHTHALATES			

	units	C1	C2
Bis(2-ethylhexyl)phthalate (1)	UG/KG	150	220
Butyl benzyl phthalate (1)	UG/KG	19 u	19 u
Di-n-butyl phthalate (1)	UG/KG	19 u	19 u
Di-n-octyl phthalate (1)	UG/KG	19 u	19 u
Diethyl phthalate (1)	UG/KG	19 u	19 u
Dimethyl phthalate (1)	UG/KG	19 u	19 u

PHENOLS

2 Methylphenol (1)	UG/KG	19 u	19 u
2,4-Dimethylphenol (1)	UG/KG	19 u	19 u
4 Methylphenol (1)	UG/KG	19 u	19 u
Pentachlorophenol	UG/KG	95 u	97 u
Phenol (1)	UG/KG	20 m	19 u

MISCELLANEOUS EXTRACTABLES

Benzoic acid (1)	UG/KG	190 u	190 u
Benzyl alcohol (1)	UG/KG	19 u	19 u
Dibenzofuran (1)	UG/KG	26	23
Hexachlorobutadiene (1)	UG/KG	19 u	19 u
Hexachloroethane (1)	UG/KG	19 u	19 u
N-Nitrosodiphenylamine (1)	UG/KG	19 u	19 u

VOLATILE ORGANICS

Ethylbenzene (1)	UG/KG	1.1 u	1.1 u
Tetrachloroethene (1)	UG/KG	1.1 u	1.1 u
Total Xylene (1)	UG/KG	2.2 u	2.2 u
Trichloroethene (1)	UG/KG	1.1 u	1.1 u

PESTICIDES AND PCBs

Aldrin (3)	UG/KG	1.4 u	0.97 u
Chlordane (2)	UG/KG	0.95 u	0.97 u
Dieldrin (3)	UG/KG	4.6 u	1.9 u
Heptachlor (3)	UG/KG	0.95 u	0.97 u
Lindane (3)	UG/KG	0.95 u	2.3 u
Total DDT	UG/KG	7.6	5.9
Total PCBs	UG/KG	139	115

ORGANOMETALLICS

Tributyltin (porewater) (2)	UG/L	-	-
-----------------------------	------	---	---

A dash indicates that no data exists for this analyte in DAIS

(1) = No BT exists (2) = No ML exists (3) = No BT or ML exists (4) = No SL or ML exists

END OF REPORT