CENPS-OP-DMMO

MEMORANDUM FOR RECORD 4 June 1992

SUBJECT: DECISION ON THE SUITABILITY OF DREDGED MATERIAL TESTED FOR THE PORT OF EVERETT 12TH STREET MARINA PROJECT, EVERETT, WASHINGTON (OYB-2-014894 BE DISPOSED OF AT THE PORT GARDNER OPEN WATER DISPOSAL SITES.

1. The following summary reflects the consensus decision of the Agencies' (Corps, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency) with jurisdiction on the acceptability of the sampling plan and all relevant test data (i.e., contained in Chemical Data Report from North Creek Analytical dated March 10, 1992 and bioassay test report from Parametrix dated April 22, 1992) to make a determination of suitability of the 80,400 cubic yards of material proposed for dredging from the 12th Street Marina Project at Everett, Washington for disposal at the Port Gardner open-water disposal site.

2. The Agencies' approved sampling and testing plan was generally followed except as noted in paragraph 4 below for dioxin analyses. The quality assurance/quality control guidelines specified by PSEP and the PSDDA program were generally complied with. The data gathered were deemed sufficient and acceptable for decision making by the Agencies based on best professional judgement.

3. Chemistry data from eight composited samples indicated that six of the eight dredged material management units (DMMU) had either detected or minor detection limit exceedances of chemicals of concern PSDDA screening level (SL) guideline values for Lead, 1,2,4-Trichlorobenze, and Hexachlorobenze (Table 1). Biological testing was subsequently performed on six DMMU (C-1, C-2, C-4, C-5, C-6, C-7), and the outcome of these analyses are summarized in paragraph 7 below. Composited samples C-3 and C-8 had no detected or detection limit exceedances of SL.

Table 1. Chemicals detected over PSDDA screening level.

see Attachment 1 for full COC testing summary without dioxin/furan

CHEMICAL	PSDDA SL	Sample C-1	Sample C-2	Sample C-4	Sample C-5	Sample C-6	Sample C-7
Lead (ppm)	66	85	81	75	79	78	82
1,2,4-Trichlorobenzene (ppb)	13	(18u)	(18u)	(18u)	(18u)	(18u)	(18u)
Hexachlorobutadiene (ppb)	29	(37u)	(37u)	(37u)	(37u)	(37u)	(37u)

4. The PSDDA agencies asked for four composited sediment analyses for dioxins utilizing EPA method 8290. The contractor mistakenly sent all eight composited samples to Alta Analytical Laboratory for dioxin analysis. These data are summarized in Table 2. Results indicated that 2,3,7,8 TCDD (Tetrachloro-Dibenzo-p-Dioxin) was only detected in two of the eight samples at low concentrations of 0.26 and 0.18 pptr (parts per trillion), in DMMU C-5 and C-8, respectively. This congener is regarded by the EPA as the most toxic form of dioxin. A few other less toxic dioxin congeners were detected at low parts per trillion concentrations. In the following table, the toxicity equivalence in terms of 2,3,7,8-TCDD is shown for the nine most toxic congeners of furan and dioxin (u expresses the detection limit for congeners that could not be quantified).

Table 2. Native congeners of Dioxin quantitated in 12th Street Marina sediments.

NATIVE CONGENERS[1] (TEC)	TOXICITY EQUIVALENCE FACTOR	Sample C-1 (pptr)	Sample C-2 (pptr)	Sample C-3 (pptr)	Sample C-4 (pptr)	Sample C-6 (pptr)	Sample C-5 (pptr)	Sample C-7 (pptr)	Sample C-8 (pptr)
2,3,7,8-TCDD	1	1.0u (0.5)	0.2u (0.1)	0.22u (0.11)	0.9u (0.45)	0.54u (0.27)	0.26 (0.26)	0.2u (0.1)	0.18 (0.18)
2,3,7,8-PeCDD	0.5	1.7u (0.425)	0.35u (0.09)	0.31u (0.08)	2.5u (0.63)	1.3u (0.325)	0.28u (0.07)	0.22u (0.06)	0.33u (0.085)
2,3,7,8-HxCDD	0.1	14.7 (1.47)	0.46u (0.06)	0.76u (0.08)	2.5u (0.37)	11.2 (1.12)	1.86 (0.186)	1.8 (0.18)	2.6 (0.26)
2,3,7,8-HpCDD	0.01	15.0 (0.15)	16.0 (0.16)	16.0 (0.16)	36.0 0.36)	180 (1.8)	40 (0.4)	50.0 (0.5)	52 (0.52)
OCDD	0.001	1200 (1.2)	130 (0.13)	130 (0.13)	230 (0.23)	1400 (1.4)	320 (0.32)	390 (0.39)	420 (0.42)
2,3,7,8-TCDF	0.1	5.4 (0.54)	0.86 (0.09)	0.92 (0.09)	3.1 (.31)	4.9 (0.49)	1.5 (0.15)	1.8 (0.18)	1.4 (0.14)
1,2,3,7,8-PeCDF	0.05	1.2u (0.03)	0.26u (0.01)	0.24u (0.01)	1.3u (0.1)	0.67 (0.34)	0.28 (0.014)	1.3u (0.03)	0.3 (0.015)
2,3,4.7.8-PeCDF	0.5	0.4u (0.1)	0.22u (0.06)	0.2u (0.05)	1.2u (0.3)	0.84 (0.42)	0.35 (0.175)	0.82u (0.21)	0.78 (0.39)
2,3,7,8-HxCDF	0.1	6.4 (0.64)	0.66u (0.1)	1.2u (0.15)	1.2u (0.14)	9.1 (0.91)	1.25 (0.125)	0.52u (0.07)	0.72 (0.108)
2,3,7,8-HpCDF	0.01	22.0 (0.22)	0.48u (0.003)	5.6 0.06)	7.0 (0.07)	37.0 (0.37)	8.42 (0.084)	19.4 (0.19)	8.7 (0.87)
OCDF	0.001	54 (0.54)	2.6 (0.003)	2.0 (0.002)	15.0 (0.02)	120 (0.12)	20.0 (0.02)	25.0 (0.03)	15 (0.015)
TOTAL TEC		5.8	0.8	0.9	3.0	7.3	1.9	1.9	2.2

see Attachment 2 for updated TEC = TEQ using 2005 WHO TEFs

5. One way to summarize potential toxicity for mammals is to calculate the toxicity equivalent concentrations (TEC) measured in tissue. This is usually used for food ingestion, and has limited applicability to sediment because it **does not** consider the relative bioavailability of the congeners. Accordingly, TEC overstates toxicity to mammals when applied to sediments. TEC as a toxicity measure does not apply to fish, shellfish or birds. For comparison purposes only, the TEC's ranged from a low of 0.8 to a high of 7.3 pptr.

6. Based on the Agencies' present best professional judgment, these low concentrations of dioxin are unlikely to be environmentally harmful for this project. The Agencies' consensus is that the material is suitable for unconfined open-water disposal relative to these dioxin test results.

7. Bioassay testing was accomplished on six of the eight DMMU and these data are summarized in Table 3 below. The results demonstrated an echinoderm double hit for DMMU C-2 and an amphipod

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[1] TCDD = Tetrachlorodibenzodioxin TCDF = Tetrachlorodibenzofuran
PeCDD = Pentachlorodibenzodioxin PeCDF = Pentachlorodibenzofuran
HxCDD = Hexachlorodibenzodioxin HxCDF = Hexachlorodibenzofuran
HpCDD = Heptachlorodibenzodioxin HpCDF = Heptachlorodibenzofuran
OCDD = Octochlorodibenzodioxin OCDF = Octochlorodibenzofuran

double hit for DMMU C-6. There were no other corresponding hits among the other bioassays for these DMMU; therefore both DMMU pass nondispersive disposal guidelines. Within replicate mortality for DMMU C-5 for the Neanthes 10-day acute test was high, ranging from 0 to 80 percent mortality. Due to the intrareplicate variability displayed for this bioassay this DMMU was not statistically significant from reference.

Table 3. Bioassay testing summary relative to PSDDA interpretation guidelines.

STATION	AMPHIPOD MORTALITY (%)	ECHINODERM MORTALITY (%)	NEANTHES MORTALITY (%)	MICROTOX TEST (% LIGHT CHANGE)	PSDDA DISPOSAL GUIDELINES (PASS/FAIL)
CONTROL	8.5	N/A	3.0	N/A	
REFERENCE (CARR 4)	26.3	19.2	8.0	-16.96	
C-1	35.0	13.1	8.0	-28.85	PASS
C-2	20.0	41.1*	10.0	-15.50	PASS
C-4	25.0	10.8	10.0	-9.27	PASS
C-5	27.0	8.8	24.0	-14.55	PASS
C-6	42.0*	19.0	14.0	-5.31	PASS
C-7	25.0	21.3	20.0	-11.47	PASS

* double hit under PSDDA nondispersive guidelines

8. Based on the above discussion and summary of chemical and biological testing results for the proposed 12th Street Marina dredging area, the Agencies' concluded that all the dredged material tested (80,400 cubic yards) is suitable for disposal at the Port Gardner nondispersive disposal site.

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Attachment 1. DAIS Value Table - Dry Weight Basis (all COC except Dioxin/Furans)

Project: Port of Everett - 12th Street Boat Ramp **POE121BF051**

	units	C1	C2	C3	C4	C5	C6	C7	C8
SEDIMENT CONVENTIONALS									
Total Solids	%	54	54	55	64	65	59	60	67
Volatile Solids	%	4.3	4.6	4.4	2.6	1.9	4.3	3.8	2.2
Total Organic Carbon	%	2	2	1.9	0.93	1.1	1.8	1.7	1.2
Ammonia	MG/KG	82	53	41	24	30	70	68	49
Total Sulfides	MG/KG	15	14	14	11	10	13	15	9
METALS									
Antimony (1)	MG/KG	0.46 u	0.46 u	0.46 u	0.46 u	0.46 u	0.84	0.46 u	0.46 u
Arsenic	MG/KG	12	14	14	8.4	9.6	12	12	9.3
Cadmium	MG/KG	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u
Chromium (4)	MG/KG	-	-	-	-	-	-	-	-
Copper	MG/KG	65	64	60	39	37	56	54	39
Lead	MG/KG	85	81	63	75	79	78	82	54
Mercury	MG/KG	0.11	0.1	0.1	0.15	0.07	0.09	0.07	0.07
Nickel	MG/KG	41	42	40	34	34	44	40	32
Selenium (4)	MG/KG	-	-	-	-	-	-	-	-
Silver	MG/KG	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u	0.92 u
Zinc	MG/KG	110	100	100	69	65	91	86	66
LPAH									
2-Methylnaphthalene (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
Acenaphthene (1)	UG/KG	18 u	18 u	18 u	18 u	17	19	18 u	15
Acenaphthylene (1)	UG/KG	20	18 u	18	17	22	19	20	20
Anthracene (1)	UG/KG	54	37	43	30	56	46	35	30
Fluorene (1)	UG/KG	18 u	18 u	18 u	18 u	23	17	18 u	18
Naphthalene (1)	UG/KG	18 u	18 u	18 u	23	32	18 u	18 u	32
Phenanthrene (1)	UG/KG	52	44	49	56	77	62	52	63
Total LPAH (1)	UG/KG	126	81	110	126	227	163	107	178
HPAH									
Benzo(a)anthracene (1)	UG/KG	83	70	76	56	116	73	79	71
Benzo(a)pyrene (1)	UG/KG	61	61	56	37	73	52	57	47
Benzo(g,h,i)perylene (1)	UG/KG	35	28	27	18 u	22	29	27	15
Benzofluoranthenes (1)	UG/KG	153	154	145	83	170	121	139	110
Chrysene (1)	UG/KG	129	108	111	64	170	113	124	105
Dibenzo(a,h)anthracene (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
Fluoranthene	UG/KG	137	97	138	154	154	113	133	114
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	33	29	29	18 u	25	27	27	20
Pyrene	UG/KG	203	182	199	139	324	121	129	144
Total HPAH (1)	UG/KG	834	729	781	533	1054	649	715	626
CHLORINATED HYDROCARBONS									
1,2,4-Trichlorobenzene (1)	UG/KG	18 u	18 u	13 u	18 u	18 u	18 u	18 u	13 u
1,2-Dichlorobenzene (1)	UG/KG	4 u	4 u	4 u	4 u	4 u	4 u	4 u	4 u
1,3-Dichlorobenzene (3)	UG/KG	4 u	4 u	4 u	4 u	4 u	4 u	4 u	4 u

	units	C1	C2	C3	C4	C5	C6	C7	C8
1,4-Dichlorobenzene (1)	UG/KG	4 u	4 u	4 u	4 u	4 u	4 u	4 u	4 u
Hexachlorobenzene	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
PHTHALATES									
Bis(2-ethylhexyl)phthalate (1)	UG/KG	185 u	185 u	185 u	185 u	185 u	185 u	185 u	185 u
Butyl benzyl phthalate (1)	UG/KG	185 u	185 u	185 u	185 u	185 u	185 u	185 u	185 u
Di-n-butyl phthalate (1)	UG/KG	22	18 u	18 u	18 u	18 u	18 u	18 u	18 u
Di-n-octyl phthalate (1)	UG/KG	185 u	185 u	185 u	185 u	185 u	185 u	185 u	185 u
Diethyl phthalate (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
Dimethyl phthalate (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
PHENOLS									
2 Methylphenol (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
2,4-Dimethylphenol (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
4 Methylphenol (1)	UG/KG	18 u	20	18 u	37	45	18 u	24	68
Pentachlorophenol	UG/KG	74 u	74 u	74 u	74 u	74 u	74 u	74 u	4 u
Phenol (1)	UG/KG	18 u	53	24	18 u	18 u	42	35	23
MISCELLANEOUS EXTRACTABLES									
Benzoic acid (1)	UG/KG	369 u	369 u	369 u	369 u	369 u	369 u	369 u	369 u
Benzyl alcohol (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
Dibenzofuran (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
Hexachlorobutadiene (1)	UG/KG	37 u	37 u	29 u	37 u	37 u	37 u	37 u	27 u
Hexachloroethane (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
N-Nitrosodiphenylamine (1)	UG/KG	18 u	18 u	18 u	18 u	18 u	18 u	18 u	18 u
VOLATILE ORGANICS									
Ethylbenzene (1)	UG/KG	4 u	4 u	4 u	4 u	4 u	4 u	4 u	4 u
Tetrachloroethene (1)	UG/KG	4 u	4 u	4 u	4 u	4 u	4 u	4 u	4 u
Total Xylene (1)	UG/KG	4 u	4 u	4 u	4 u	4 u	4 u	4 u	4 u
Trichloroethene (1)	UG/KG	4 u	4 u	4 u	4 u	4 u	4 u	4 u	4 u
PESTICIDES AND PCBs									
Aldrin (3)	UG/KG	5 u	5 u	5 u	5 u	2 u	5 u	5 u	5 u
Chlordane (2)	UG/KG	5 u	5 u	5 u	5 u	2 u	5 u	5 u	5 u
Dieldrin (3)	UG/KG	2 u	2	2 u	2 u	2 u	2 u	2 u	2 u
Heptachlor (3)	UG/KG	5 u	5 u	5 u	5 u	2 u	5 u	5 u	5 u
Lindane (3)	UG/KG	5 u	5 u	5 u	5 u	2 u	5 u	5 u	5 u
Total DDT	UG/KG	3.3 u	3.3 u	3.3 u	3.3 u	2 u	3.3 u	3.3 u	3.3 u
Total PCBs	UG/KG	10 u	10 u	10 u	10 u	10 u	10 u	10 u	10 u
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

Attachment 2. Updated Dioxin/Furan Results using 2005 WHO TEFs

Summary of DY1992 Port of Everett 12th Street Dioxin Data

	WHO (05)	POE-12th St.(C1)=6750cy			POE-12th St.(C2)=6750cy			POE-12th St.(C3)=6750cy			POE-12th St.(C4)=6750cy			POE 12th St.(C5)=10100cy			POE-12th St.(C6)=7900cy			POE-12th St.(C7)=15800cy			POE-12th St.(C8)=19700cy		
Analyte	**TEF**	**ng/kg-dw**	**LQ**	**TEQ**	**ng/kg-dw**	**LQ**	**TEQ**	**ng/kg-dw**	**LQ**	**TEQ**	**ng/kg-dw**	**LQ**	**TEQ**	**ng/kg-dw**	**LQ**	**TEQ**	**ng/kg-dw**	**LQ**	**TEQ**	**ng/kg-dw**	**LQ**	**TEQ**	**ng/kg-dw**	**LQ**	**TEQ**
2,3,7,8-TCDD	1	1	u	0.5	0.2	u	0.1	0.22	u	0.11	0.9	u	0.45	**0.26**		0.54	**0.54**	u	0.27	0.2	u	0.1	**0.18**		0.18
1,2,3,7,8-PeCDD	1	1.7	u	0.85	0.35	u	0.175	0.31	u	0.155	2.5	u	1.25	0.28	u	0.14	**1.3**	u	0.65	0.22	u	0.11	0.33	u	0.165
1,2,3,4,7,8-HxCDD	0.1	**1.8**		0.18	0.35	u	0.0175	0.42	u	0.021	2.5	u	0.125	52	u	2.6	**1.8**		0.18	0.55	u	0.0275	**2.6**		0.26
1,2,3,6,7,8-HxCDD	0.1	**9.4**		0.94	0.46	u	0.023	0.76	u	0.038	2.3	u	0.115	**1.4**		0.69	**6.9**		0.69	**1.8**		0.18	0.4	u	0.04
1,2,3,7,8,9-HxCDD	0.1	**3.5**		0.35	0.33	u	0.0165	0.36	u	0.018	2.5	u	0.125	0.92	u	0.25	**2.5**		0.25	0.59	u	0.059	**2.6**		0.26
1,2,3,4,6,7,8-HpCDD	0.01	**15**		0.15	**16**		0.08	**16**		0.16	**36**		0.36	**40**		1.8	**180**		1.8	**50**		0.5	0.96	u	0.0096
OCDD	0.0003	**1200**		0.36	**130**		0.0195	**130**		0.039	**230**		0.069	**320**		0.42	**1400**		0.42	**390**		0.117	**420**		0.126
2.3.7.8-TCDF	0.1	**5.4**		0.54	**0.86**		0.043	**0.92**		0.092	**3.1**		0.31	**1.5**		0.49	**4.9**		0.49	**1.8**		0.18	**1.4**		0.14
1,2,3,7,8-PeCDF	0.03	1.2	u	0.018	0.26	u	0.0039	0.24	u	0.0036	1.3	u	0.0195	**0.28**		0.0201	**0.67**		0.0201	1.3	u	0.0195	**0.3**		0.009
2,3,4,7,8-PeCDF	0.3	0.4	u	0.06	0.22	u	0.033	0.2	u	0.03	1.2	u	0.18	**0.35**		0.252	**0.84**		0.252	0.82	u	0.123	**0.78**		0.234
1,2,3,4,7,8-HxCDF	0.1	**1.7**		0.17	0.66	u	0.033	1.2	u	0.06	0.9	u	0.045	0.76	u	0.39	**3.9**		0.39	0.52	u	0.026	0.64	u	0.064
1,2,3,6,7,8-HxCDF	0.1	**1**		0.1	0.61	u	0.0305	1.1	u	0.055	0.72	u	0.036	0.42	u	0.17	**1.7**		0.17	0.49	u	0.0245	0.45	u	0.045
2,3,4,6,7,8-HxCDF	0.1	**3.7**		0.37	0.51	u	0.0255	0.63	u	0.0315	0.9	u	0.045	0.97	u	0.35	**3.5**		0.35	0.18	u	0.009	0.72	u	0.072
1,2,3,7,8,9-HxCDF	0.1	0.57	u	0.0285	0.22	u	0.011	0.11	u	0.0055	1.2	u	0.06	0.34	u	0.18	**1.8**		0.18	0.11	u	0.0055	0.34	u	0.034
1,2,3,4,6,7,8-HpCDF	0.01	**22**		0.22	0.48	u	0.0024	**5.6**		0.056	**7**		0.07	**7.9**		0.37	**37**		0.37	**11**		0.11	**8.2**		0.082
1,2,3,4,7,8,9-HpCDF	0.01	1.2	u	0.006	0.18	u	0.0009	0.25	u	0.00125	0.48	u	0.0024	**0.52**		0.027	**2.7**		0.027	**8.4**		0.084	**0.5**		0.005
OCDF	0.0003	**54**		0.0162	**2.6**		0.00039	**2**		0.0006	**15**		0.0045	**20**		0.036	**120**		0.036	**25**		0.0075	**15**		0.0045
Total TEQ (u = 1/2):				**4.859**			**0.615**			**0.876**			**3.266**			**8.725**			**6.545**			**1.683**			**1.730**
Total TEQ (u=0):				**3.396**			**0.143**			**0.348**			**0.814**			**4.645**			**5.625**			**1.179**			**1.301**
Total TOC, %:																									

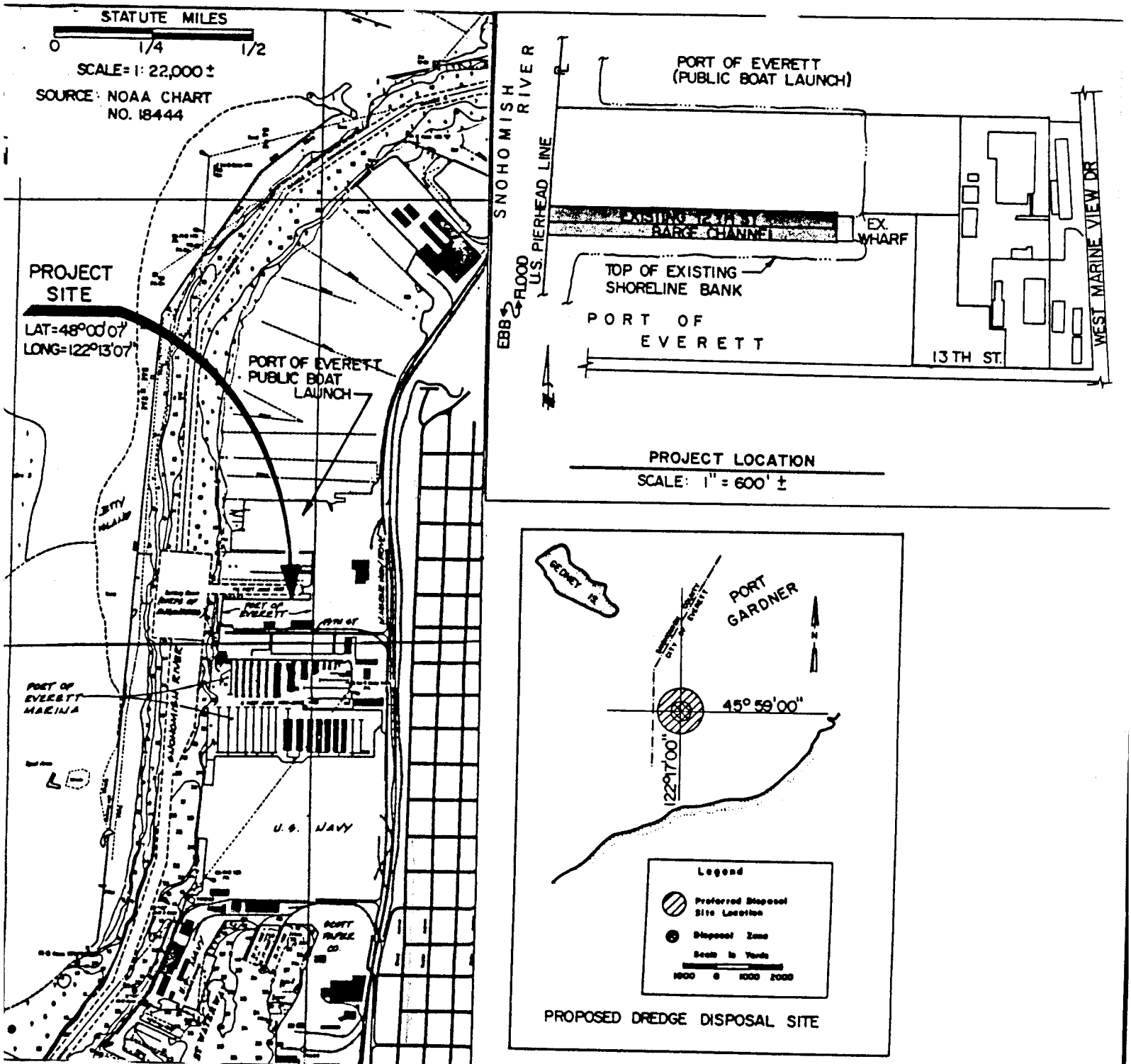
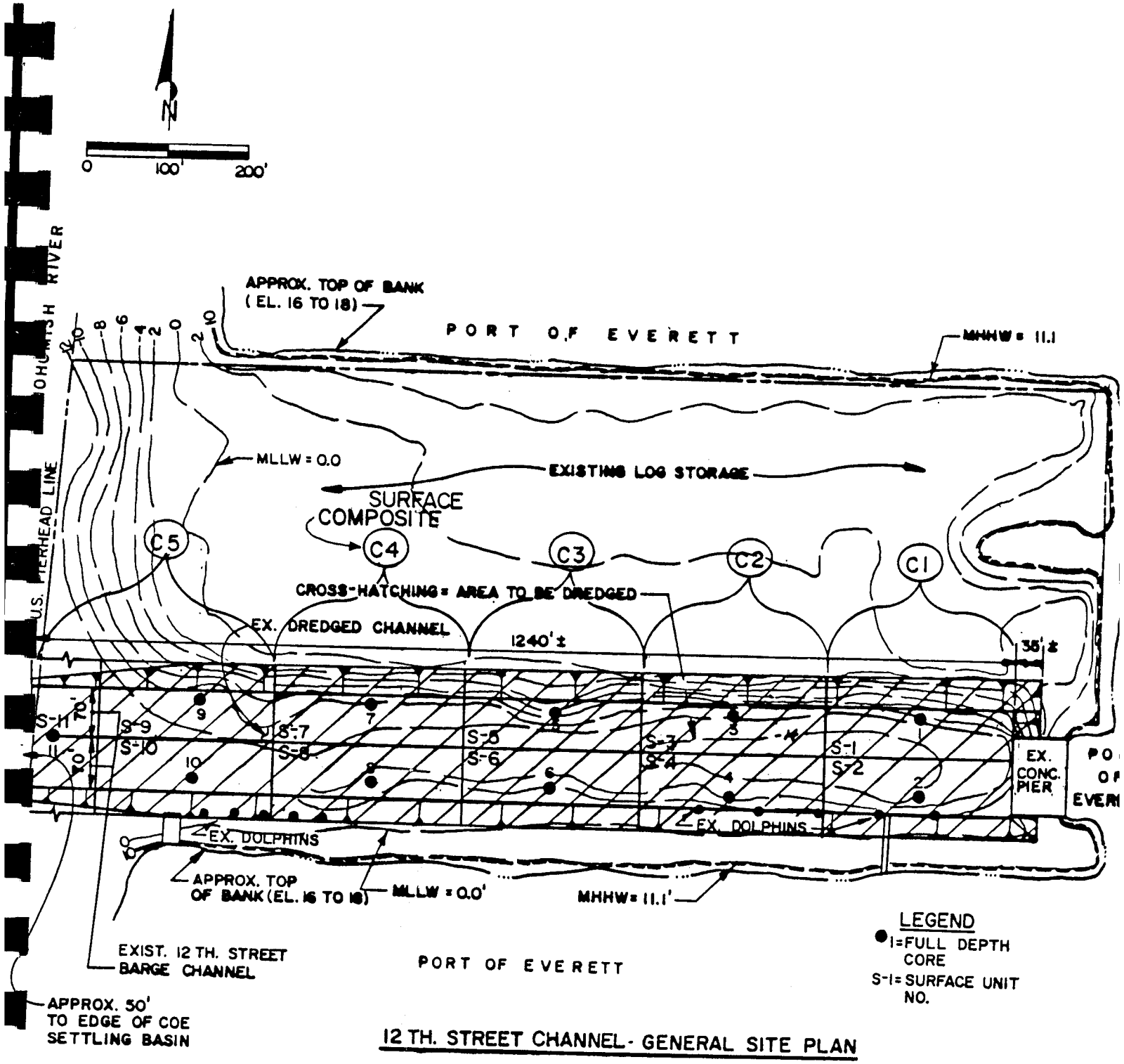
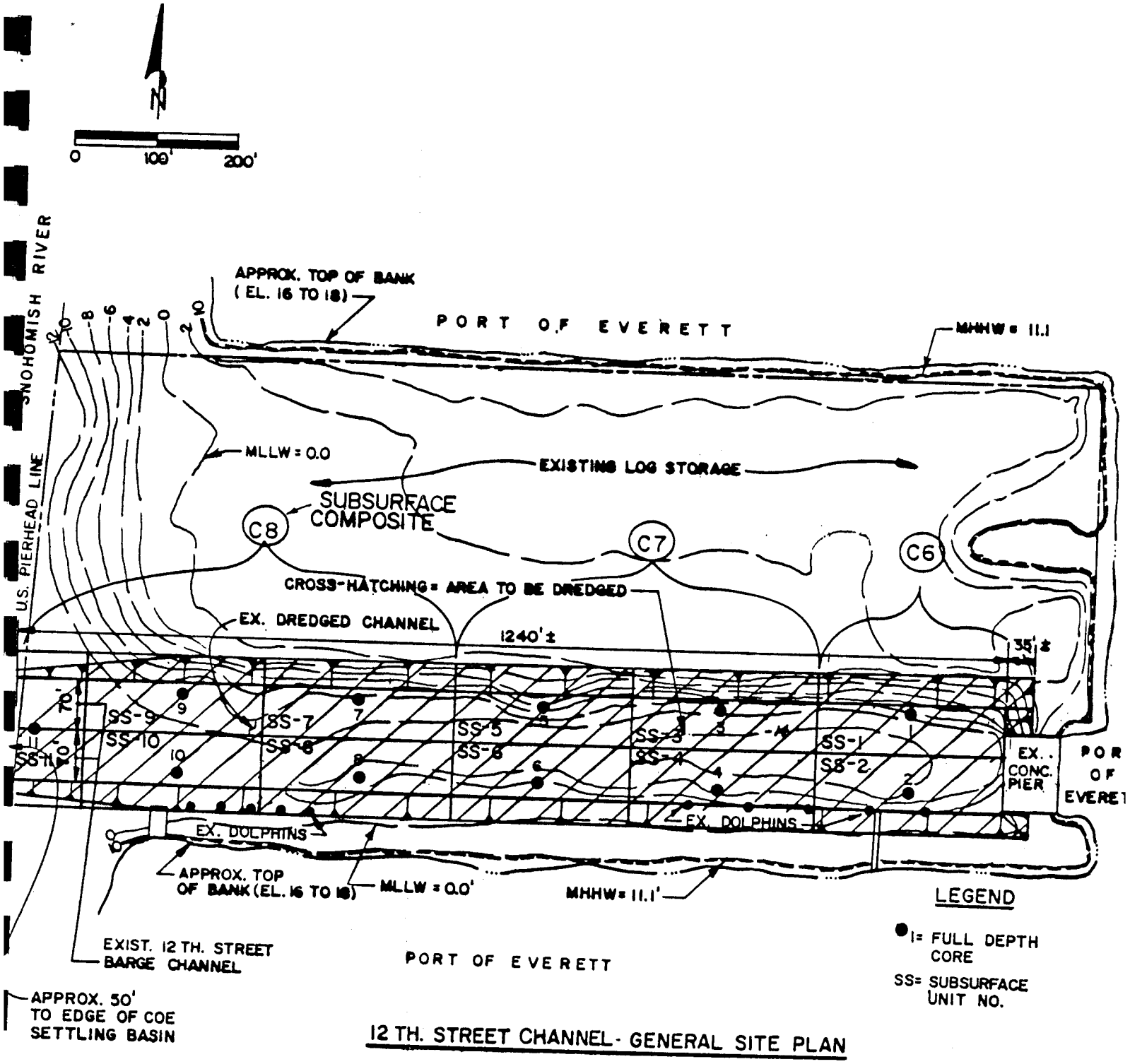


FIGURE 1:
VICINITY & LOCATION MAPS



12 TH. STREET CHANNEL- GENERAL SITE PLAN

FIGURE 2:
SURFACE SEDIMENT UNITS
CORE LOCATIONS AND
COMPOSITE LOCATIONS



12 TH. STREET CHANNEL - GENERAL SITE PLAN

FIGURE 3:
SUBSURFACE SEDIMENT UNITS
CORE LOCATIONS AND
COMPOSITE LOCATIONS

TABLE 1

12TH STREET BARGE CHANNEL DREDGING COMPOSITE SCHEME

Compositing of Top 4 Feet of Dredge Prism:

Corps Reference Code	Samples Composited (Top 4 Feet)			Volume Represented (cubic yards
C1	1A	2A		6,750
C2	3A	4A		6,750
C3	5A	6A		6,750
C4	7A	8A		6,750
C5	9A	10A	11A	10,100

Composite of Subsurface of Dredge Area:

Corps Reference Code	Samples Composited (In Collection Order)							Approx. Volume Represented (cubic yards
C6	1B	1C	2B	2C				7,900
C7	3B	3C	4B	5B	5C	6B	6C	15,800
C8	7B 10C	7C 11B	8B 11C	9B	9C	9D	10B	19,700