CENPS-OP-DMMO

MEMORANDUM FOR RECORD 13 January 1992

SUBJECT: DECISION ON THE SUITABILITY OF DREDGED MATERIAL TESTED UNDER PSDDA CRITERIA FOR THE CORPS OF ENGINEERS DUWAMISH O&M 1991/92 DREDGING PROJECT FOR DISPOSAL AT THE ELLIOTT BAY OPEN-WATER DISPOSAL SITE.

1. 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 all relevant test data to make a determination of suitability for the 196,089 cubic yards (cy) of material proposed for dredging from the Duwamish Waterway for disposal at the PSDDA Elliott Bay open-water disposal site.

2. Chemical and biological testing took place in two separate phases. Phase 1 took place during the summer of 1990 and phase 2 during the summer and fall of 1991.

3. Phase 1 consisted of eight dredged material management units (DMMU) which characterized 31,672 cy. Four DMMUs had bioaccumulation trigger (BT) exceedances. Bioaccumulation testing was not conducted due to the high cost involved. In the absence of bioaccumulation data these DMMUs are considered unacceptable for open-water disposal. The remaining DMMUs had screening level (SL) exceedances, but passed biological testing. The pesticides for these DMMUs, however, were not quantitated by the chemical testing subcontractor. These DMMUs were resampled and the pesticides and PCBs quantitated during phase 2. Complete details relative to phase 1 testing can be found in attachment 3.

4. Phase 2 consisted of sixteen DMMUs which characterized 164,417 cy. In addition, pesticide and PCB quantitation was conducted for the four DMMUs from phase 1 mentioned in paragraph 3.

5. Chemical testing for phase 2 resulted in SL exceedances for twelve DMMUs (see attachment 1). The other four DMMUs had no SL exceedances. There were no BT or maximum level (ML) exceedances for any of the sixteen DMMUs. In addition, for the four DMMUs from phase 1, the pesticides and PCBs were quantitated below BTs and MLs. Based on the chemical testing results, twelve DMMUs from phase 2 were subjected to biological testing. The phase 1 sediments were found to be acceptable for open-water disposal per the decision found in attachment 3.

6. The amphipod 10-day acute toxicity test, echinoderm sediment larval combined mortality and abnormality (effective mortality) test, the Neanthes 10-day acute toxicity test, and the Microtox bacterial luminescence test were conducted for phase 2. PSDDA interpretation guidelines specified in the Phase II Management Plan Report (Sept 1989), modified by changes made at the second annual review meeting, were used to evaluate the bioassay data. The control sediment for the amphipod and Neanthes bioassays was from West Beach (Whidbey Island). The reference sediment was from Carr Inlet. Biological testing for phase 2 was conducted in two rounds due to QA/QC problems encountered in the amphipod, sediment larval and Neanthes bioassays.

Round 1:

a. In the amphipod bioassay, S1 and S13 exhibited hits under the two-hit rule. S3 had variability ranging from 0-100 percent mortality and was rerun in round 2. No other DMMU suffered any hits.

b. In the sediment larval bioassay, extremely high variability was encountered for initial counts, final seawater control counts and some final test sediment counts. As a result, the PSDDA agencies required a retest which was conducted during round 2.

c. In the Neanthes bioassay, C3 exhibited variability ranging from 0-90 percent. This test sediment was rerun during round 2. No other DMMU suffered any hits.

d. In the microtox bioassay all test and reference sediments exhibited light enhancement except for S3. Light enhancement currently is considered a nontoxic response. S3 did not exhibit significant light diminution. There were, therefore, no microtox hits.

Round 2:

a. Because C3 represented a large volume of sediment in the turning basin, some of which is scheduled to be used for capping material at the Port of Seattle's Pier 53, it was decided to split C3 into two smaller units, C3/A and C3/B, for round 2 testing.

b. S3 was subjected to the amphipod bioassay. It exhibited normal variability during this round of testing and did not experience a hit.

c. In the sediment larval bioassay, the test sediments C2, C3/A, C3/B, S1, S3 and S6 experienced hits under the two-hit rule. Ammonia concentrations during the test exceeded 1 mg/l for several of the test sediments. This level has been associated with high mortality rates in the sediment larval test in recent projects. A regression analysis of effective mortality against final ammonia concentrations resulted in a statistically significant correlation. See Attachment 2.

d. In the Neanthes bioassay, C3/A and C3/B suffered no hits. Variability was normal.

7. The bioassay results from round 1 and 2, when taken together, indicate that only S1 experienced two hits under the two-hit rule (for the amphipod and sediment larval bioassays). Under PSDDA interpretation guidelines, this would normally result in a determination of unacceptability of S1 for open-water disposal. In this case, the ammonia concentration for S1 during the sediment larval test was 1.58 mg/l, the highest concentration exhibited for any sediment. It was decided by the PSDDA agencies that the mortality seen in S1 was probably due to ammonia toxicity. The sediment larval results for S1 were set aside as a result. There were, therefore, no DMMU failures during phase 2.

8. In summary, quality assurance/quality control guidelines specified by PSDDA were generally complied with. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the PSDDA program. Based on the combined phase 1 and phase 2 results of chemical and biological testing, the following consensus decision was made by the PSDDA agencies concerning the suitability of the characterized material for disposal at the Elliott Bay open-water disposal site:

The 15,672 cy represented by S2, S6, S7 and S8 from phase 1 are unacceptable for open-water disposal in the absence of bioaccumulation testing. The remaining 180,417 cy, represented by S1, S3, S4 and S5 from phase 1 and S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S12, S13, S14, C1, C2 and C3 from phase 2, are acceptable for unconfined open-water disposal at PSDDA Elliott Bay site.

Concur:

1-14-92
Date

David Kendall, Ph.D
Seattle District Corps of Engineers

1/14/92
Date

David Fox
Seattle District Corps of Engineers

1-14-92
Date

John Malek/Justine Smith
Environmental Protection Agency, Region X

1-14-92
Date

Rick Vining
Washington Department of Ecology

1-14-92
Date

Gene Revelas
Washington Department of Natural Resources

1/14/92
Date

Linda Cox
Seattle District Corps of Engineers

3 Attachments
Copies Furnished:
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EPA/John Malek/Justine Smith
DOE/Rick Vining
DNR/Gene Revelas
DMMO file

DUWAMISH O&M - DY 1992 PHASE 2 TESTING
CHEMICALS-OF-CONCERN EXCEEDING PSDDA GUIDELINE VALUES, BIOASSAY DATA AND INTERPRETATION

CHEMICAL	Guideline Values													
METALS (ppm dry wgt):	SL	BT	ML	S1	S3	S4	S5	S6	S7	S8	S10	S11#	S13	S14
Mercury	0.21	1.5	2.1							22				
ORGANIC CHEMICALS (ppb dry wgt):														
4-methylphenol	120		1,200		400	250								
Indeno(1,2,3-cd)pyrene	69		5,200	73					77					
Total PCBs	130		2,500							300			263	159
Total PCBs (ppm carbon-normalized)		38								15.8			15.5	11.4
Total DDT	6.9	50	69	10.6			8.6	9.7		7	7.1	20.6	7.2	
GRAIN SIZE:														
Percent Fines:				67	56	55.0	56.0	58.0	49.0	62.0	50.0	(1)	75	64
BIOASSAYS:														
Microtox (% light diminution)				-2.5	12.2	-5.6	-12.6	-20.7	-35.0	-11.0	-15.7	(1)	-25.6	-46.9
Amphipod (% mortality)				40.0	20(2)	22.0	21.0	23.0	25.0	15.0	17.0	(1)	32	16
Sediment Larval (% effective mortality)(2)				38.8	21.3	21.9	16.7	20.6	19.5	13.6	3.8	(1)	17.8	26.6
Neanthes (% mortality)				2.0	20.0	8.0	12.0	24.0	12.0	10.0	10.0	(1)	26	12
SEDIMENT LARVAL AMMONIA:														
Ammonia, t=final (mg/l)(2)				1.58	1.24	1.26	1.31	1.12	0.64	0.73	0.56	(1)	0.69	0.43
VOLUME AND INTERPRETATION:														
Volume (cubic yards):				4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Pass/Fail:				Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

(1) Performed during Phase 1 testing
(2) Data from Round 2 of Phase 2 testing
x/y format for amphipod & Neanthes bioassays: x=Round 1, y=Round 2

NA = Not Applicable ND = No Data
# This test sediment was labelled S1 during Phase 1 testing, which occurred during the summer of 1990.

DUWAMISH O&M - DY 1992 PHASE 2 TESTING
CHEMICALS-OF-CONCERN EXCEEDING PSDDA G

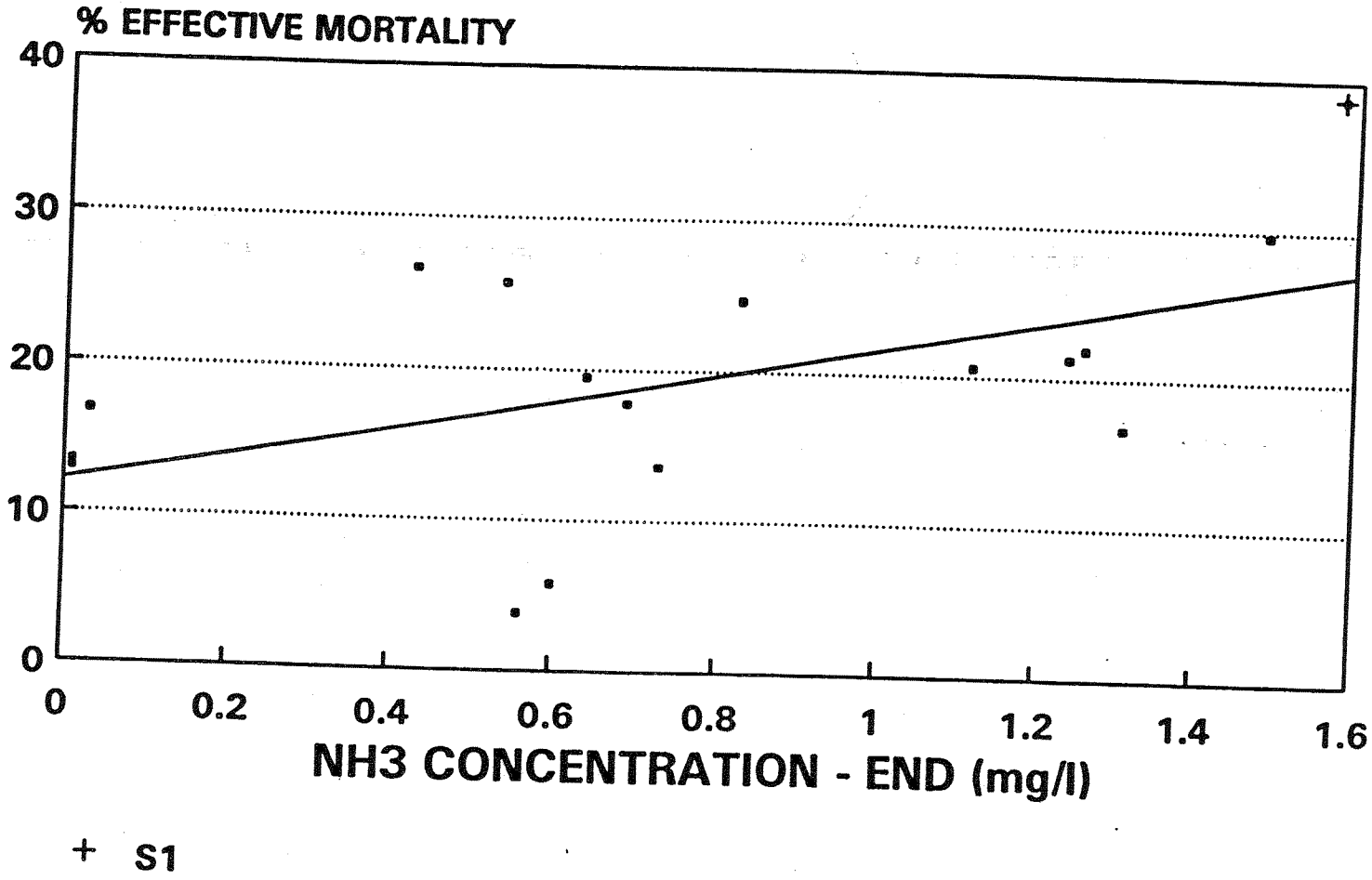
CHEMICAL	Guideline Values												
METALS (ppm dry wgt):	SL	BT	ML	S15#	S16#	S17#	C2	C3/A	C3/B	CARR 21	CARR 22	CARR 24	CONTROL
Mercury	0.21	1.5	2.1										
ORGANIC CHEMICALS (ppb dry wgt):													
4-methylphenol	120		1,200				580	140					
Indeno(1,2,3-cd)pyrene	69		5,200										
Total PCBs	130		2,500										
Total PCBs (ppm carbon-normalized)		38											
Total DDT	6.9	50	69	15.6		21.8							
GRAIN SIZE:													
Percent Fines:				(1)	(1)	(1)	34	22		36	30	55	
BIOASSAYS:													
Microtox (% light diminution)				(1)	(1)	(1)	-55.9	-38.8	NA	ND	-44.5	-30	NA
Amphipod (% mortality)				(1)	(1)	(1)	14	14	NA	5/ND	6/5	12/11	11/5
Sediment Larval (% effective mortality)(2)				(1)	(1)	(1)	24.7	29.7	25.7	16.8	13.4	12.9	7.9
Neanthes (% mortality)				(1)	(1)	(1)	16	4(2)	16(2)	0/ND	6/0	4/4	6/10
SEDIMENT LARVAL AMMONIA:													
Ammonia, t=final (mg/l)(2)				(1)	(1)	(1)	0.83	1.49	0.54	0.03	0.01	0.01	0.01
VOLUME AND INTERPRETATION:													
Volume (cubic yards):				4,000	4,000	4,000	28,815	*	*				
Pass/Fail:				Pass	Pass	Pass	Pass	Pass	Pass				

(1) Performed during Phase 1 testing
(2) Data from Round 2 of Phase 2 testing
x/y format for amphipod & Neanthes bioassays: x=Round 1, y=Round 2

NA = Not Applicable ND = No Data

* total volume for C3 = 56,011
# These test sediments were labelled S3, S4 and S5 respectively during Phase 1 testing, which occurred during the summer of ~~1991.~~ 1990

DUWAMISH O&M 1992 ROUND 2
ECHINODERM MORTALITY VS NH3



r = .553, r-crit (p = .05) = .482, significant

attachment 2

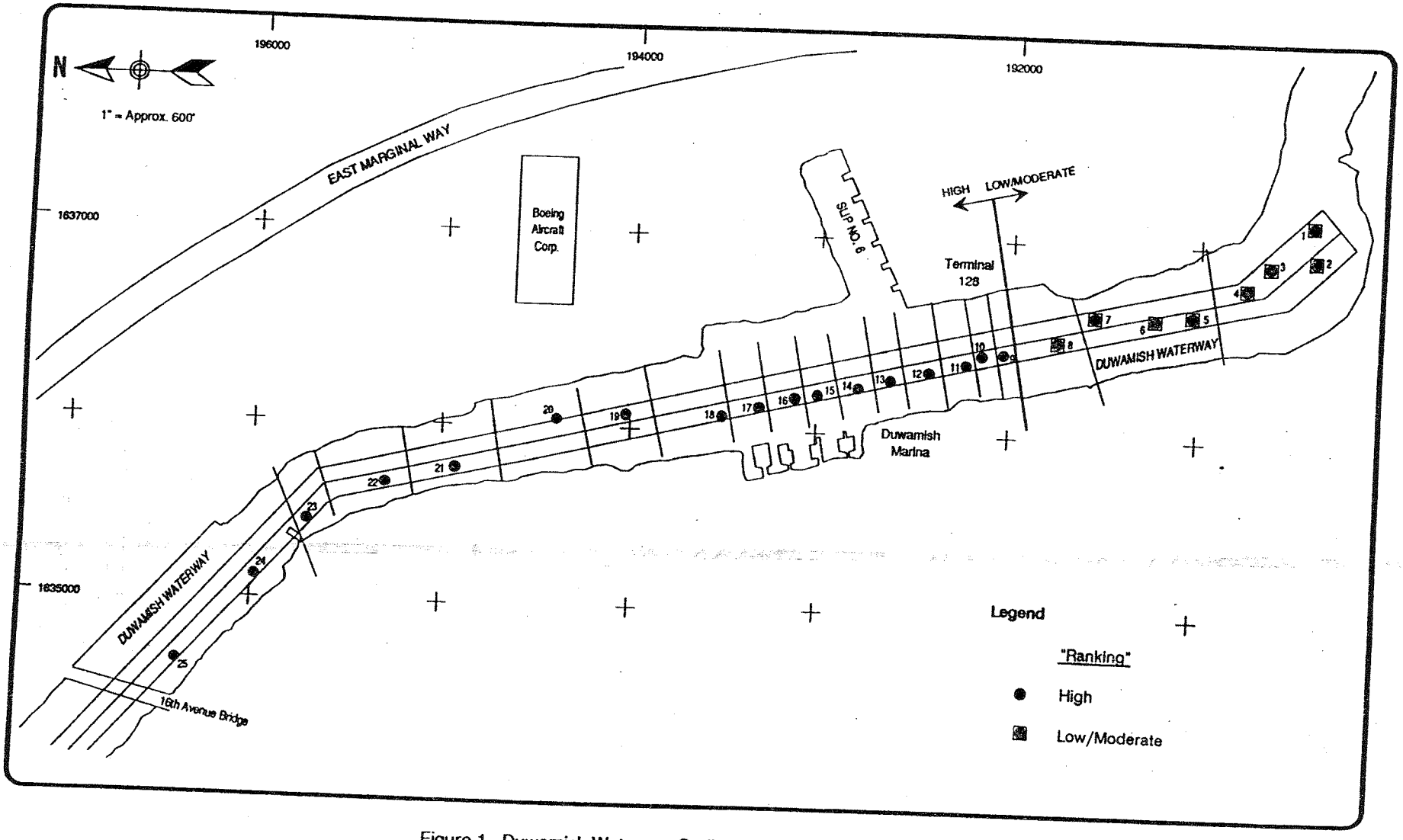
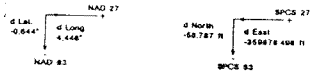


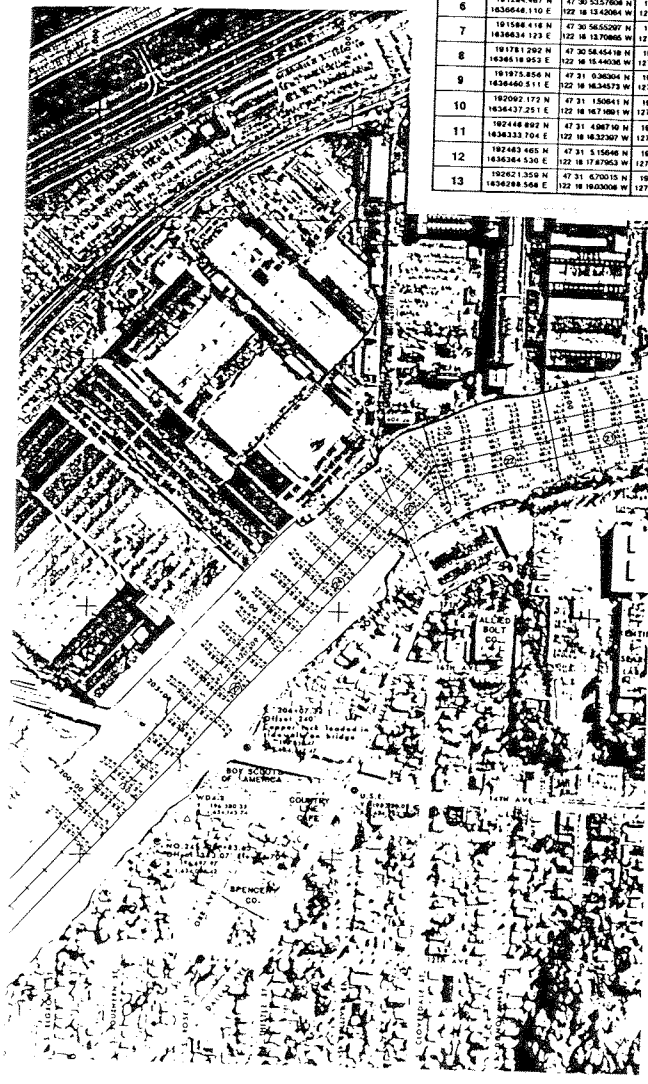
Figure 1. Duwamish Waterway Sediment Characterization Plan

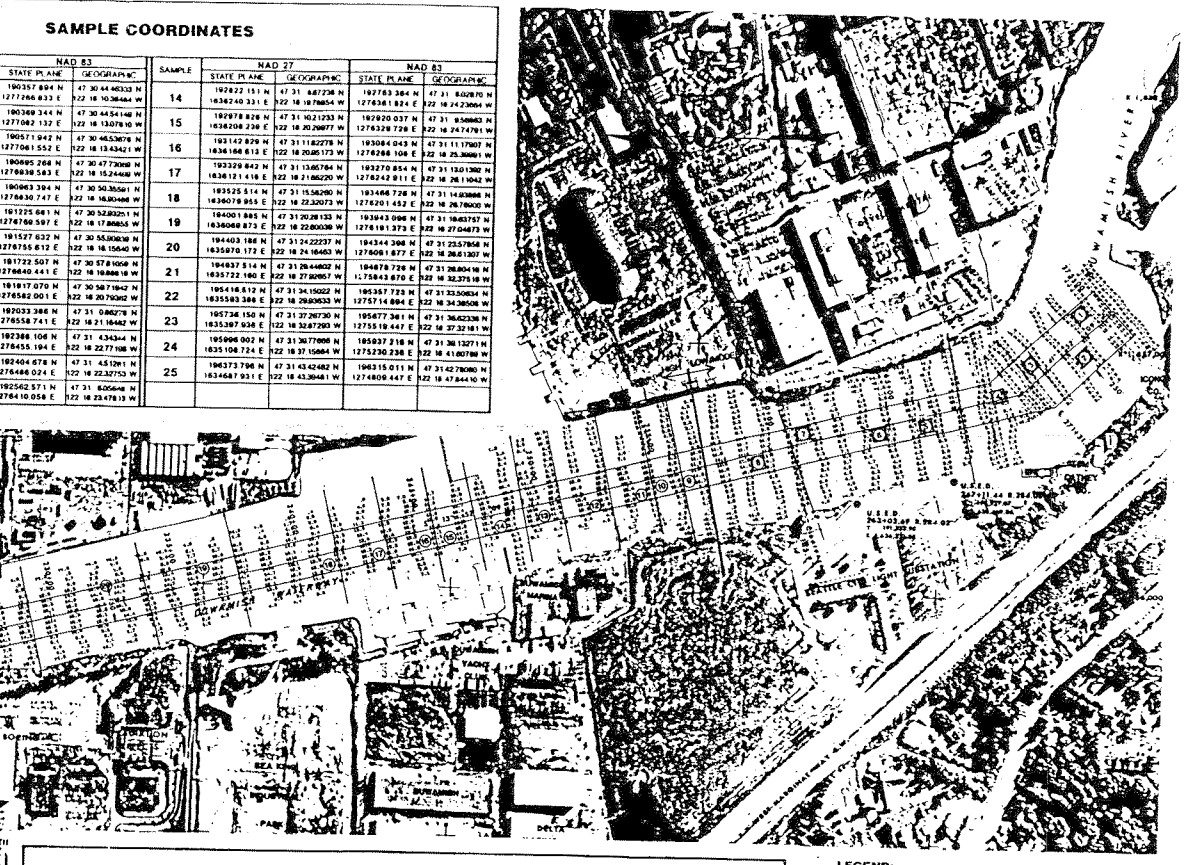
The coordinates shown are referenced to NAD 27 and are in feet based on the SPCS 27 WA 4601. Differences between NAD 27 and NAD 83 and between SPCS 27 and SPCS 83 at the center of the sheet are shown on the diagram below. Datum conversion was performed using the computer program "CORPSCON". Metric conversions were based on US Survey Foot = 1200/3937 Meter.



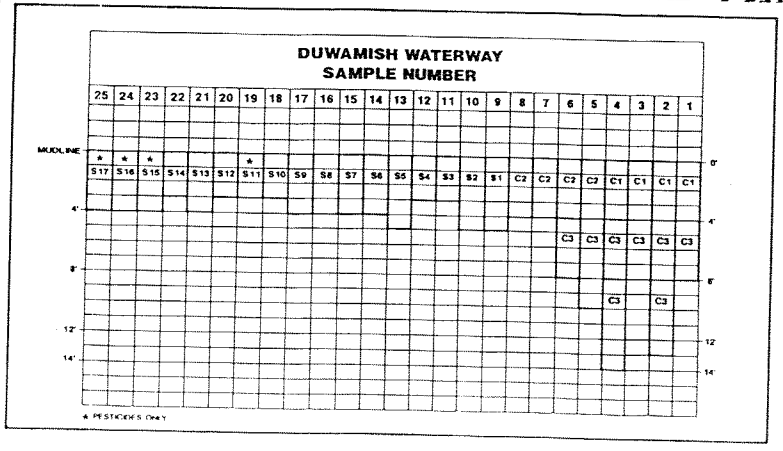
SAMPLE COORDINATES

SAMPLE	NAD 27 STATE PLANE	NAD 27 GEOGRAPHIC	NAD 83 STATE PLANE	NAD 83 GEOGRAPHIC
1	190416.681 N 1637145.353 E	47 30 45.10660 N 122 18 5.93748 W	190357.894 N 1277266.833 E	47 30 44.46333 N 122 18 10.36464 W
2	190428.129 N 1636960.653 E	47 30 45.18498 N 122 18 8.63066 W	190369.344 N 1277082.132 E	47 30 44.54148 N 122 18 13.07810 W
3	190630.727 N 1636940.079 E	47 30 47.18026 N 122 18 8.89672 W	190571.942 N 1277061.552 E	47 30 46.53676 N 122 18 13.43421 W
4	190754.053 N 1636618.109 E	47 30 48.37421 N 122 18 10.79743 W	190695.268 N 1276839.583 E	47 30 47.73098 N 122 18 15.24469 W
5	191022.180 N 1634708.264 E	47 30 50.99846 N 122 18 12.45722 W	190963.394 N 1276830.747 E	47 30 50.35591 N 122 18 16.80466 W
6	191284.467 N 1636646.110 E	47 30 53.57838 N 122 18 13.42064 W	191225.681 N 1276766.597 E	47 30 52.93251 N 122 18 17.88855 W
7	191586.416 N 1636634.123 E	47 30 56.55297 N 122 18 13.70865 W	191527.632 N 1276755.612 E	47 30 55.90838 N 122 18 18.15640 W
8	191781.292 N 1636518.953 E	47 30 58.45418 N 122 18 15.44036 W	191722.507 N 1276640.441 E	47 30 57.81059 N 122 18 19.88618 W
9	191975.854 N 1636460.511 E	47 31 0.36304 N 122 18 16.34573 W	191917.070 N 1276582.001 E	47 30 59.71942 N 122 18 20.79302 W
10	192092.172 N 1636437.251 E	47 31 1.50641 N 122 18 16.7 4981 W	192033.386 N 1276558.741 E	47 31 0.86279 N 122 18 21.16442 W
11	192448.892 N 1636333.704 E	47 31 4.98710 N 122 18 16.32307 W	192388.106 N 1276455.194 E	47 31 4.34344 N 122 18 22.77198 W
12	192483.465 N 1636384.530 E	47 31 5.15646 N 122 18 17.67953 W	192404.678 N 1276486.024 E	47 31 4.51261 N 122 18 22.32753 W
13	192621.359 N 1636288.568 E	47 31 6.70015 N 122 18 19.03008 W	192562.571 N 1276410.056 E	47 31 6.05646 N 122 18 23.47813 W
14	192622.151 N 1636240.331 E	47 31 6.87238 N 122 18 19.78854 W	192763.364 N 1276361.824 E	47 31 8.02870 N 122 18 24.23064 W
15	192978.828 N 1636208.238 E	47 31 10.21233 N 122 18 20.26877 W	192920.037 N 1276329.728 E	47 31 8.58863 N 122 18 24.74791 W
16	193142.829 N 1636166.613 E	47 31 11.82278 N 122 18 20.85173 W	193084.043 N 1276288.104 E	47 31 11.17807 N 122 18 25.36891 W
17	193329.842 N 1636121.416 E	47 31 13.66784 N 122 18 21.65220 W	193270.854 N 1276242.911 E	47 31 13.01392 N 122 18 26.11042 W
18	193525.514 N 1636078.955 E	47 31 15.58280 N 122 18 22.32073 W	193466.726 N 1276201.452 E	47 31 14.93886 N 122 18 26.78000 W
19	194001.885 N 1636069.873 E	47 31 20.28133 N 122 18 22.80039 W	193943.096 N 1276191.373 E	47 31 18.63757 N 122 18 27.04673 W
20	194403.186 N 1635970.172 E	47 31 24.22237 N 122 18 24.16463 W	194344.398 N 1276091.677 E	47 31 23.57858 N 122 18 28.61307 W
21	194637.514 N 1635722.160 E	47 31 26.44602 N 122 18 27.80857 W	194578.726 N 1 75843.670 E	47 31 26.80416 N 122 18 32.375 18 W
22	195416.512 N 1635583.386 E	47 31 34.15022 N 122 18 29.80533 W	195357.723 N 1275714.894 E	47 31 33.50634 N 122 18 34.38508 W
23	195736.150 N 1635397.938 E	47 31 37.26730 N 122 18 32.87293 W	195677.361 N 1275518.447 E	47 31 36.62336 N 122 18 37.32181 W
24	195996.002 N 1635108.724 E	47 31 39.77808 N 122 18 37.15684 W	195937.218 N 1275230.238 E	47 31 38.13271 N 122 18 41.80788 W
25	196373.796 N 1634687.931 E	47 31 43.42482 N 122 18 43.36481 W	196315.011 N 1274809.447 E	47 31 42.78080 N 122 18 47.84410 W





DUWAMISH WATERWAY SAMPLE NUMBER



LEGEND:

SAMPLE LOCATION ①

COMPOSITED SAMPLE ⓒ

SURFACE DUMMY ——

SUBSURFACE DUMMY - - -

200 0 200 400

SCALE IN FEET

NOTES:

THE INFORMATION DEPICTED ON THIS MAP REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.

SOUNDINGS TAKEN ABOVE THE DATUM PLANE ARE PREFIXED WITH (+) SIGN.

HORIZONTAL CONTROL BASED ON LAMBERT GRID PROJECTION FOR WASHINGTON NORTH ZONE.

SOUNDINGS AND ELEVATIONS ARE IN FEET AND ARE REFERRED TO PLANE OF MEAN LOWER LOW WATER.

PHOTO-MAP PREPARED BY SURVEY BRANCH, ENGINEERING DIVISION C OF E.

PHOTOGRAPHY FLOWN: 1 JULY 1980.

PROJECT DIMENSIONS

CONTROLLING DIMENSIONS

PREPARED
PROJECT MANAGER

REVIEWED
DREDGE MATERIAL MGMT OFFICE

APPROVED
NAVIGATION & PLANT BRANCH

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

DUWAMISH WATERWAY

SEDIMENT CHARACTERIZATION PLAN

AUGUST 1991

SEATTLE HARBOR, WASHINGTON

DESIGN
CHK
DATE 1 AUG 1991
FILE NO. E-12-2.1-109
SCALE 1" = 100'
SHEET 1 OF 1
SIZE F

CENPS-OP-DMMO

MEMORANDUM FOR FILE 19 July 1991

SUBJECT: SUMMARY OF DATA BEARING ON THE SUITABILITY OF DREDGED MATERIAL TESTED UNDER PSDDA GUIDELINES FOR THE CORPS OF ENGINEERS' DUWAMISH O&M 1990/91 DREDGING PROJECT FOR DISPOSAL AT THE ELLIOTT BAY OPEN-WATER DISPOSAL SITE.

1. The following summary reflects the PSDDA agencies (Corps of Engineers, Department of Ecology, Department of Natural Resources and the Environmental Protection Agency) coordinated decision on the acceptability of the sampling plan and all relevant test data collected to-date to make a determination of suitability for the 31,672 cubic yards of material proposed for dredging from the federal navigation channel of the Duwamish River for disposal at the PSDDA Elliott Bay open-water disposal site. The suitability decision will be finalized when additional necessary pesticide data is collected during the O&M sampling and testing scheduled for the summer of 1991.

2. The sediments from the portion of the federal navigation characterized were ranked high. Field samples were taken from eight locations on 28 August 1990 (see Attachment ~~1~~ A) and analyzed individually to characterize eight dredged material management units (DMMUs), labelled S1 through S8.

3. Chemistry data indicated that one or more exceedances of the PSDDA screening levels (SL) occurred for all eight test samples (see attachment ~~2~~ B). These included both detected concentrations and limits of detection above the SL. Four DMMUs (S2, S6, S7 and S8) exceeded the carbon-normalized bioaccumulation trigger for PCBs and S8 exceeded the maximum level for PCBs. Due to the relatively high PCB concentrations in all test sediments, Analytical Technologies Incorporated, the chemical testing subcontractor, was unable to quantify the pesticides. There was no additional archived sediment upon which a retest for pesticides could be performed.

4. The SL exceedances (both actual and detection limit) for the test samples, triggers the requirement for biological testing under the tiered testing approach. The Corps opted not to conduct bioassays on the four DMMUs with BT exceedances due to the high cost of bioaccumulation testing. Only S1, S3, S4 and S5 were subjected to bioassays. The amphipod 10-day acute toxicity test, oyster larvae sediment larval combined mortality and abnormality (effective mortality) test, the Neanthes 10-day acute toxicity test, and the Microtox bacterial luminescence test were conducted. PSDDA interpretation guidelines specified in the Phase II Management Plan Report (Sept 1989), modified by changes made at the second annual review meeting, were used to evaluate the bioassay data. The control sediment for the amphipod and Neanthes bioassays was taken from West Beach (Whidbey Island). The reference sediment was from Samish Bay.

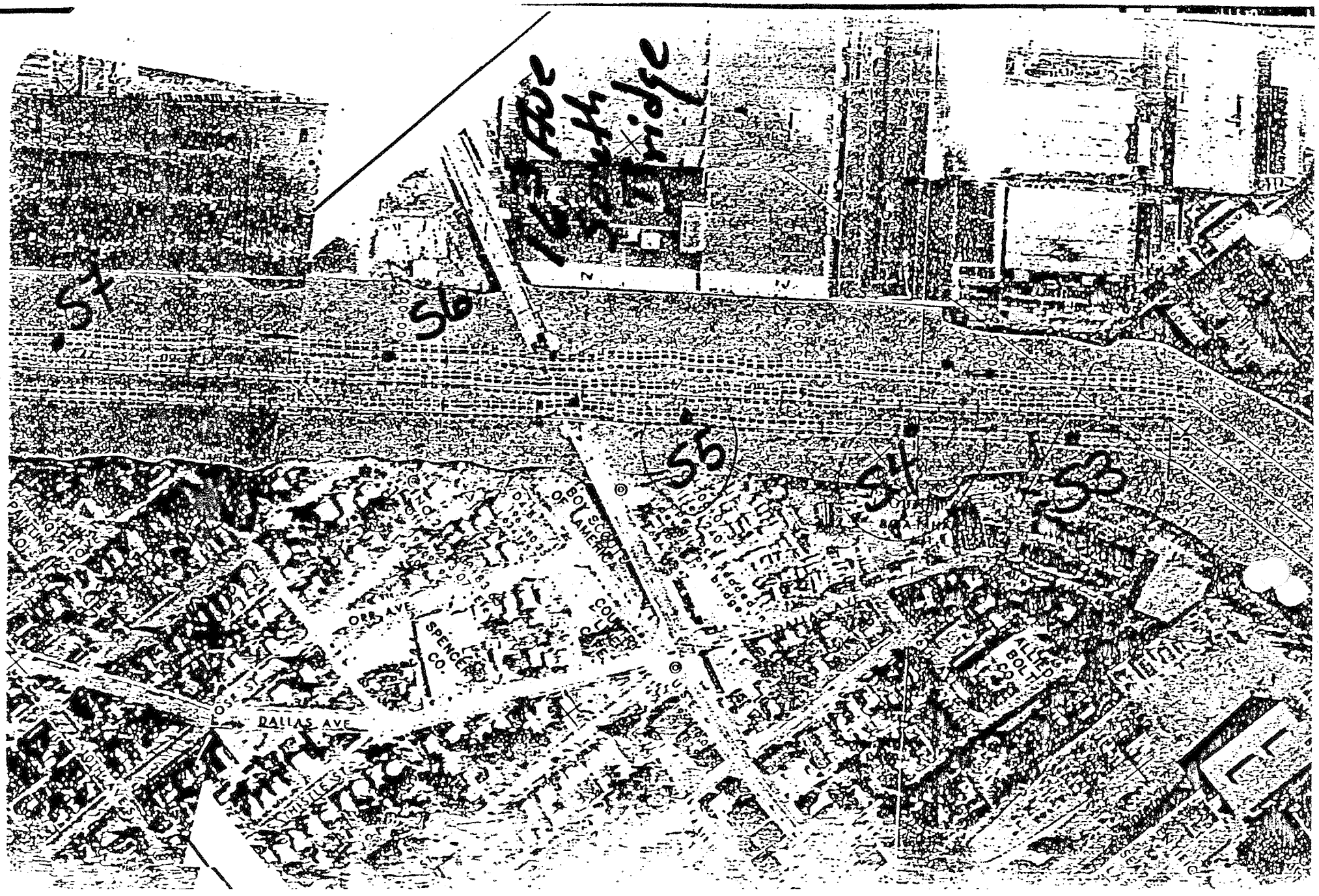
Attachment 3

PSDDA Agency Coordination:

EPA (Justine Smith, 15 July 1991) - concurs with decision

DNR (Betsy Striplin, 16 July 1991) - concurs with decision but would like to see any recent hydrographic data on the Duwamish reach dredged in 89/90.

DOE (Rick Vining, 17 July 1991) - concurs with decision but add language about need for additional sampling and testing if additional accumulated material exceeds 2 feet (language added as paragraph 7).


S7
S6
S5
S4
S3
BOY SCOUTS OF AMERICA
ORR AVE
SPENCER CO.
DALLAS AVE
ALLIED BOLT CO.

DUWAMISH O&M - 1991
CHEMICALS-OF-CONCERN EXCEEDING PSDDA GUIDELINE VALUES, BIOASSAY DATA AND INTERPRETATION

CHEMICAL	Guideline Values			Test Sediments									
METALS (ppm dry wgt):	SL	BT	ML	S1	S2	S3	S4	S5	S6	S7	S8	Samish Ref #5	Control
Mercury	0.21	1.5	2.1		0.26					0.35	0.24	N/A	N/A
ORGANIC CHEMICALS (ppb dry wgt):													
1,2,4-Trichlorobenzene	6.4		64	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	N/A	N/A
Pentachlorophenol	100	504	690	419	115	399						N/A	N/A
Total PCBs	130		2,500	149	1083	720	262	289	1848	1992	3306	N/A	N/A
Total PCBs (ppm carbon-normalized)		38			40.4				82.5	94.4	131.2	N/A	N/A
Pesticides				NQ	NQ	NQ	NQ	NQ	NQ	NQ	NQ	N/A	N/A

NQ = Not Quantitated
U = Undetected

GRAIN SIZE:										
Percent Fines:	81.8	66.9	61.0	71.3	65.1	37.0	72.1	82.2	ND	N/A
BIOASSAYS:										
Microtox (% light diminution)	-7.2	ND	-10.0	-14.0	-19.0	ND	ND	ND	-30.0	N/A
Amphipod (% mortality)	26.0	ND	14.0	31.0	13.0	ND	ND	ND	28.0	8.0
Sediment Larval (% effective mortality)(1)	53.9	ND	65.0	62.9	98.2	ND	ND	ND	28.6	0.0
Neanthes (% mortality)	4.0	ND	8.0	6.0	9.0	ND	ND	ND	2.0	6.0

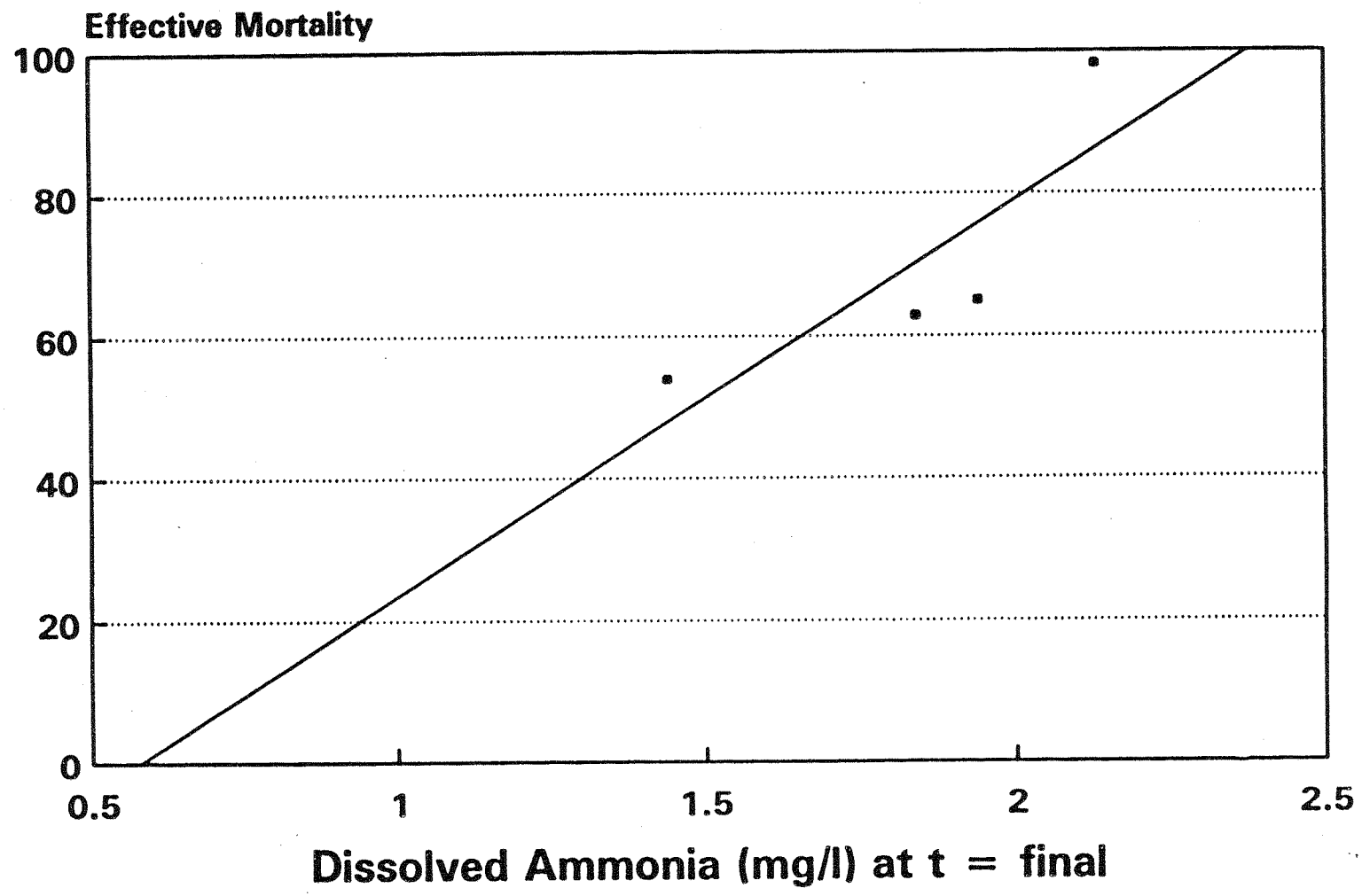
ND = Not Done

SEDIMENT LARVAL AMMONIA AND SULFIDES:										
Ammonia, t=initial (mg/l)	1.50	N/A	2.00	1.78	2.26	N/A	N/A	N/A	0.10	0.02
Ammonia, t=final (mg/l)	1.44	N/A	1.94	1.84	2.13	N/A	N/A	N/A	0.14	0.02
Sulfides, t=initial (mg/l)	0.12	N/A	0.09	0.14	0.09	N/A	N/A	N/A	0.17	<.02
Sulfides, t=final (mg/l)	<.02	N/A	<.02	<.02	<.02	N/A	N/A	N/A	<.02	<.02
VOLUME AND INTERPRETATION:										
Volume (cubic yards):	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	N/A	N/A
Pass/Fail:	PASS(2)	FAIL(3)	PASS(2)	PASS(2)	PASS(2)	FAIL(3)	FAIL(3)	FAIL(3)	N/A	N/A

(1) The sediment larval results were set aside due to the reference sediment performance failure and the high concentrations of dissolved ammonia measured during the test.
(2) This interpretation was based on the Microtox, amphipod and Neanthes bioassays only and will be considered preliminary until the pesticides can be quantitated.
(3) Due to quantitated PCBs above the bioaccumulation trigger, these sediments are unacceptable for open-water disposal in the absence of bioaccumulation testing data.

Attachment B

DUWAMISH O&M - 90/91
SEDIMENT LARVAL BIOASSAY



Attachment D