CENWS-OD-TS-DM

MEMORANDUM FOR RECORD 11 February 2003

SUBJECT: DETERMINATION ON THE SUITABILITY OF DREDGED MATERIAL TESTED UNDER THE EASTWATERWAY TERMINAL 18 STAGE 1A CHARACTERIZATION (2003-2-00074), EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT (CWA) FOR OPEN-WATER DISPOSAL AT THE ELLIOTT BAY DISPOSAL SITE.

1. The following summary reflects the consensus determination of the Agencies' (U.S. Army Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency) with jurisdiction on dredging and disposal on the suitability for unconfined open-water disposal at the Elliott Bay disposal site of an estimated 28,100 cy of dredged material tested under recency guidelines as part of the Port of Seattle East Waterway Terminal 18 Stage 1A Dredging Project located in Elliott Bay, Seattle, Washington.

2. The material tested within the proposed Terminal 18 Stage 1A footprint under recency guidelines for high ranked projects (2 years), was initially sampled during March 1996 and found suitable for unconfined open-water disposal in 17 March 1997 suitability determination memorandum by the DMMP agencies. The DMMP agencies articulated a proposed recency resampling/testing approach for the Stage 1A material in February 7, 2002 letter to the Port of Seattle (attachment 1). The DMMP agencies are still formulating policy on recency retesting approaches, especially those projects located in high concern areas within or adjacent to MTCA and/or Superfund areas.

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

Table 1. Regulatory Tracking Dates

DMMP Review/Response letter on Recency Memorandum prepared by Anchor Environmental for Port of Seattle on T-18 Stage 1A testing data	February 7, 2002
Round 1:	SAP rec'd 3/12/02
Initial SAP Approval date:	April 1,2002
Round 2:	
DMMP response to July 3, 2003 Anchor memorandum and proposed approach for additional sampling.	July 23, 2002
Bioaccumulation SAP Approval date:	August 21, 2002
Round 1:	
Initial sampling date(s):	April 16-18, and 23, 2002
Round 2:	
Bioaccumulation sampling date(s):	September 3-4, 2002
Round 1:	
Preliminary Analytical Results, A Memorandum presenting an approach for additional sampling: East Waterway Stage 1A (submittal date):	July 3, 2002
Round 2:	
Bioaccumulation Data submittal date:	February 2003
DAIS Tracking Number	EWS1A-1-C-F-181
Recency Determination Date: High (2 years)	September 2004

4. This Recency testing SDM documents sampling collected for a total of 6 dredged material management units (DMMUs) located within the high ranked Stage 1A footprint within the East Waterway (Figure 1) and the 4 DMMU analyzed (see paragraph 5 and 6) in accordance to recommendations in DMMP letter dated February 7, 2002 to the Port of Seattle (attachment 1). The total dredging volume for the Stage 1A material is 28,100 cubic yards. The targeted dredge depth for Stage 1A is –52 ft MLLW including a 1-foot allowable over-dredge depth.

Sampling:

5. Round 1 sampling was initiated between April 16-18, and 23, 2002, and 18 sediment cores were collected by vibracorer within the six DMMUs (see Figure 1 for sample core locations for DMMU's 1-6). Cores collected at DMMUs 2, 4, and 6 were archived pending results of Round 1 testing of DMMUs 1, 3, and 5. Target penetration depths were not achieved at the following stations S1A-1, S1A-4, S1A-6, S1A-7, S1A-9, S1A-12, S1A-13, and S1A-14, and was most likely due to submerged debris (rip-rap). Attempts to collect z-samples during Round-1 underlying DMMUs 1, 2, and 3 were not successful due to the suspected presence of rip-rap as noted above.

6. Round-2 sampling took place between September 3-4, 2002, and consisted of vibracore sampling at 11 sediment core stations within DMMUs 4 and 5 (see Figure 2 for core sample locations for DMMUs 4 and 5) to collect sediment for bioaccumulation testing of both DMMUs and chemical and bioassay testing of DMMU-4. Analysis of archived Round-1 composited sample for DMMU-6 was linked to the Round-2 analysis outcome for adjacent DMMU-5 as approved by DMMP agencies for Round 2 SAP. Because of the problems with riprap presence during Round-1 sampling, no additional attempt was made to collect z-samples at DMMU's 1, 2, and 3 during Round-2 sampling.

7. The Agencies' approved sampling and analysis plan for the Round 1 and Round 2 sampling was followed, and quality assurance/quality control guidelines specified by the Puget Sound Dredged Disposal Analysis Users Manual were generally achieved. The data gathered were deemed sufficient and acceptable for decision-making by the Dredged Material Management Program (DMMP) agencies based on best professional judgment.

Chemical Testing:

8. Appendix 2 summarizes the sediment conventional, chemical, biological testing results and suitability determination outcomes for all six DMMUs evaluated including the four analyzed during the two testing rounds. Chemical analysis of the four DMMUs indicated that TBT was quantitated over the SL/BT in 3 of the 4 DMMUs analyzed, PCBs were quantitated over the SL in 4 of the 4 analyzed, and over the BT in one DMMU, and DDT was detected in 3 of the 4 DMMUs over the SL. Other chemicals detected over the SL in only one DMMU (DMMU-3) were mercury, fluoranthene, and pyrene. Detection limit exceedances were noted for hexachlorobenzene, 2-methylphenol, pentachlorophenol, benzyl alcohol, benzoic acid, hexachlorobutadiene, and n-nitrosodiphenylamine. As noted above Bioaccumulation Triggers were exceeded for TBT (3 DMMUs) and PCB (1 DMMU). The Port elected to conduct bioaccumulation on both DMMU-5 and DMMU-4. The requirement to analyze DMMU-4 was linked to the unsuitable analysis outcome of DMMU-3 and to facilitate the testing of DMMU-4, the Port elected to conduct concurrent bioassay and bioaccumulation testing for TBT before chemical testing had been completed. The TBT quantitated for DMMU-4 was actually below the SL/BT at 0.046 ug/L (tin). All three DMMUs tested during

round 1 underwent concurrent bioassay toxicity testing, and DMMU-4 tested during round 2 underwent concurrent bioassay testing. The results of these analyses are summarized below.

Biological Testing:

9. Standard bioassay testing was conducted on 3 round 1 DMMUs and 1 round 2 DMMUs within the 56 day biological holding time. Table 2 summarizes the solid phase bioassay Quality Control (QC) performance guidelines and also summarizes the solid phase bioassay interpretative guidelines for nondispersive sites, which were used to evaluate the bioassay data presented below. Table 3 summarizes the batch specific bioassay toxicity testing outcomes for the 3 DMMUs tested during Round 1 and 1 tested during Round 2. Two reference samples were collected from Carr Inlet to block for grain size effects. In general, all negative control and reference sediments met the DMMP performance limits for each of the three bioassay tests to assess toxicity. Results for each bioassay test are summarized in Table 2 for the Stage 1A East Waterway dredging area compared to the DMMP nondispersive interpretive guidelines. These bioassay results are discussed below for each of the bioassay tests.

Table 2. Bioassay testing interpretation summary.

Amphipod Bioassay: (*Eohaustorius estuarius*) (% mortality)	**DMMU-1**	**DMMU-3**	**DMMU-4**	**DMMU-5**	**Control**	**Reference** CR-23, CR-23/CR-24
Round 1	34 (**2H**)	68 (**1H**)		24 (**2H**)	3	8 (CR23) 7 (CR23/24)
Round 2			11		1	6 (CR23/23W)
Bivalve Larval Bioassay: (*Mytilus galloprovincialis*) (Mean normal survival)						
Round 1	0.98	0.99		0.98	NA	0.97 (CR23) 0.98 (CR24/23)
Round 2			0.64		NA	0.68 (CR23/23W)
Neanthes Growth Bioassay: (*Neanthes arenaceodentata*) % mortality, MIG						
Round 1	0, 0.65	0, 0.66		0, 0.70	4, 0.74	4, 0.75 (CR23) 0, 0.72 (CR24/23)
Round 2			0, 0.75		0, 0.58	0, 0.59 (CR23/23W)

Legend: MIG = mean individual growth

a) **Amphipod Bioassay (*Eohaustorius estuarius*).** All three Round 1 amphipod bioassay results showed toxicity hits, with DMMU-3 expressing a 1-hit response and both DMMU-1 and DMMU-3 expressing a 2-hit response. Round 2 testing of DMMU-4 showed no toxicity.

b) **Bivalve Larval Bioassay (*Mytilus galloprovincialis*).** The results of the larval bivalve test showed high normal survival relative to the seawater control and all Round 1 sediments tested showed equivalent or higher normal survivorship relative to the reference sediment comparison. Round 2 testing of DMMU-4 also showed no toxicity relative to the reference sediment.

c) ***Neanthes* 20-day Growth Bioassay (*Neanthes arenaceodentata*).** The results of the *Neanthes* growth bioassay (Table 3) showed generally low mortality in tested sediments, and no toxicity relative to the DMMP interpretive guidelines for mean individual growth for both Round 1 and 2 tests.

d) **DMMP Bioassay Summary Determination.** Overall interpretation of the Round 1 and 2 bioassay responses indicates that 1 of 4 (e.g., DMMU-3) East Waterway Stage 1A DMMUs failed the DMMP unconfined-open-water disposal bioassay guidelines, while the remaining 3 DMMUs passed the bioassay interpretative guidelines.

e) **Bioaccumulation Trigger Exceedances**. DMMU-1 had BT exceedances for both TBT and PCBs, and DMMU's 3 and 5 had BT exceedances for TBT. DMMU-3 failed the bioassay interpretive guidelines and was not tested further. The Port of Seattle elected not to pursue bioaccumulation for DMMU-1, and also not to test archived DMMU-2 as required based on DMMP recommendations (attachment 1). Therefore, DMMU-1 and DMMU-2 without the required testing are considered unsuitable using best-professional judgement. The Port elected to conduct bioaccumulation testing on DMMU-5. Results of DMMU-3 testing triggered the requirement to test archived sample DMMU-4. Because of testing timeline considerations the Port also elected to conduct concurrent bioassay testing and bioaccumulation testing for TBT on DMMU-4 before the chemistry analyses had been conducted. Subsequent chemical testing indicated DMMU-4 had no BT exceedances, and TBT was quantitated at 0.046 ug/L.

Bioaccumulation Testing:

11. As noted in paragraph 7e above, two DMMUs (4 and 5) were subjected to bioaccumulation testing for TBT.

12. Bioaccumulation testing was performed with *Macoma nasuta*, a facultative deposit feeding/suspension feeding bivalve and *Nephtys caecoides*, a burrowing facultative deposit feeding/carnivorous polychaete. The two species were tested together in the same 8-gallon aquaria. To provide a better approximation of steady-state tissue concentrations for the tested chemical, TBT the exposure period for the bioaccumulation test has been extended to 45 days by the DMMP program (http://www.nws.usace.army.mil/publicmenu/DOCUMENTS/bioac_00.pdf).

13. Five replicate 8-gallon aquaria were run for the negative control (*Nephtys*: Tomales Bay, California; *Macoma*: Sequim Bay, Washington), the reference sediment (Carr Inlet: CR-23), and for the two tested DMMUs. In addition to the routine water quality metrics (temperature, salinity, dissolved oxygen, pH) that were monitored during the exposure period, an additional metric, wet-weight growth was collected during the exposure period to further assess the general health and well-being of the test animals. To accomplish this, ten animals of each species were randomly selected from each replicate and weighed at the beginning and end of the test. Animals were depurated for 24 hours before homogenization and freezing for tissue analysis. The results of weight measurements and survival measurements taken for each species during the exposure period suggested that for *Macoma nasuta* there was no apparent relationship between mean wet weight and survival during the 45 exposure period, and only the control sample showed a positive weight gain at the end of the exposure period (Figure 3). There was insufficient biomass to conduct the wet weight measurements for *Nephtys caecoides,* except for the control sediment which showed a negative weight loss compared to the starting weight.

Tissue Chemistry:

14. Table 4 depicts the observed tissue TBT (as tin) concentrations for the two species over the 45 day exposure period. The undetected tissue concentrations for the reference sediment measurements were adjusted to ½ the detection limit observed. Tissue concentrations of chemicals-of-concern from the 45-day exposures were compared statistically to the appropriate reference sediment, based on grain size similarity comparisons. For DMMU-5 the initial to retested sediment porewater TBT concentration ratio is 2.86 (attachment 2), which was used to adjust the tissue concentrations for DMMU-5 for a worst case analysis. Statistical comparisons of test DMMUs and reference tissue concentrations for the final interpretation "worst case" analyses were based on the adjusted tissue concentrations. The summary tissue chemistry interpretation for TBT is provided in attachment 3 for the 2 DMMUs tested.

Bioaccumulation Interpretation:

15. The DMMP agencies agreed that comparing statistical differences from reference is necessary, but not sufficient to determine a DMMU unsuitable for open-water disposal. For those DMMUs that were statistically greater than reference, a more in depth evaluation was required to determine the significance of the bioaccumulation that had occurred. This evaluation focused on **a)** Food and Drug Administration (FDA) Action Levels for Poisonous and Deleterious Substances in Fish and Shellfish for Human Food; **b)** PSDDA target tissue concentration values for chemicals of concern to human health, and **c)** ecological residue-effects data from the literature.

    a) There is no FDA guideline for TBT

16. A recent effort by the Port of Seattle (May 1999)[1] involved compilation of the residue-effect literature for TBT. It was prepared for the Port of Seattle by EVS Solutions for submittal to the U.S. Environmental Protection Agency for the Harbor Island Superfund Site, Waterway Sediment Operable Unit. Using residue-effects data from this and other studies, EPA Superfund developed a tissue trigger level of **3 ppm dry weight of TBT** in tissue (**0.6 ppm wet weight**) that was used to evaluate bioaccumulation data from the West Waterway OU (for more information see Appendix D of the May 1999 EVS report). This tissue concentration is protective for growth and reproduction endpoints in polychaetes, crustaceans, bivalves, and most gastropods. However, it might not protect the most sensitive species of meso- and neogastropods against imposex-related sterility. Considering that meso- and neogastropods are rare in Elliott Bay (Appendix D in EVS, 1999), the DMMP agencies have decided to use the West Waterway **TBT trigger level (3 ppm dry weight, or 0.6 ppm wet weight)** on an interim basis to interpret bioaccumulation relative to disposal at the Elliott Bay site.

17. To summarize, the DMMP agencies will use the following TTLs to interpret the bioaccumulation test data for the East Waterway Terminal 18 Stage 1A:

TBT:	3.0 ppm dry weight (dw) as TBT, or 0.6 ppm (wet weight) as TBT

[1] For TBT, the DMMP agencies relied upon Appendix D of a May 1999 report entitled: "Review of Tissue Residue Effects Data for Tributyltin, Mercury, and Polychlorinated Biphenyls". Prepared by EVS Solutions for the Port of Seattle.

Table 4. 45 Day Bioaccumulation Tissue Test Results for TBT.

Sample ID	Species	replicate #	TBT (ug/kg)	TBT (ug/kg) (adj. 1/2 DL)	Lipids, %	Solids, %
CR23	Macoma	1	0.99U	0.495	0.7	19.7
CR23	Macoma	2	0.95U	0.475	0.68	19.5
CR23	Macoma	3	0.98	0.98	0.58	19.5
CR23	Macoma	4	0.98U	0.49	0.68	19
CR23	Macoma	5	0.96U	0.48	0.62	18.6
AVERAGE:				0.584	0.652	19.26
STANDARD DEVIATION:				0.222	0.050	0.451
DMMU-5	Macoma	1	36		0.61	18
DMMU-5	Macoma	2	41		0.62	19
DMMU-5	Macoma	3	44		0.65	17.8
DMMU-5	Macoma	4	35		0.66	18
DMMU-5	Macoma	5	19		0.68	18.1
AVERAGE:			35		0.644	18.18
STANDARD DEVIATION:			9.67		0.029	0.471
DMMU-4	Macoma	1	59		0.73	19.1
DMMU-4	Macoma	2	46		0.75	19.1
DMMU-4	Macoma	3	92		0.68	19.9
DMMU-4	Macoma	4	67		0.75	18.4
DMMU-4	Macoma	5	72		0.69	19.4
AVERAGE:			67.2		0.72	19.18
STANDARD DEVIATION:			16.99		0.033	0.545

Sample ID	Species	replicate #	TBT (ug/kg)	TBT (ug/kg) (adj. 1/2 DL)	Lipids, %	Solids, %
CR23	Nephtys	1	0.99U	0.495	0.63	NA
CR23	Nephtys	2	1.0U	0.5	0.71	NA
CR23	Nephtys	3	1.0U	0.5	0.78	NA
CR23	Nephtys	4	0.99U	0.495	0.72	NA
CR23	Nephtys	5	1.0U	0.5	0.57	NA
AVERAGE:				0.50	0.68	
STANDARD DEVIATION:				0.003	0.082	
DMMU-5	Nephtys	1	16	16	0.66	NA
DMMU-5	Nephtys	2	17	17	0.8	NA
DMMU-5	Nephtys	3	14	14	0.59	NA
DMMU-5	Nephtys	4	1.1U	0.55	0.62	NA
DMMU-5	Nephtys	5	18	18	0.73	NA
AVERAGE:				13.1	0.68	
STANDARD DEVIATION:						
DMMU-4	Nephtys	1	32	32	0.86	NA
DMMU-4	Nephtys	2				NA
DMMU-4	Nephtys	3	1.0U	0.5	0.97	NA
DMMU-4	Nephtys	4	33	33	0.85	NA
DMMU-4	Nephtys	5	33	33	0.76	NA
AVERAGE:				24.6	0.86	
STANDARD DEVIATION:				16.09	0.086	

NA = insufficient sample volume to conduct % solids analysis

18. The agencies used best professional judgement in developing this interpretation guideline to meet PSDDA disposal site management objectives; achievement of other sediment management objectives will require additional evaluation. These guidelines are subject to change for future PSDDA/DMMP projects as additional bioaccumulation data become available.

19. Both DMMUs were compared to these interpretation guidelines using a one-tailed one-sample t-test (see Attachment 3). An alpha level (the probability of making a Type I error, rejecting the null hypothesis of no difference between test and reference responses when, in fact, they are not different) of 0.1 was selected for these statistical comparisons by the DMMP agencies to reflect the higher within sample variability, and to increase the power of the test to discriminate between reference and test responses. Neither DMMU statistically exceeded the bioaccumulation interpretation guidelines. In summary, both DMMUs tested passed the bioaccumulation test.

Suitability Determination

20. The DMMP agencies accepted the data as sufficient to make a suitability determination for open-water unconfined-disposal. Attachment 2 summarizes the final suitability determination for each of the 6 DMMUs and summarizes the essential chemical and biological testing information forming the basis for these determinations.

21. A total of 17,800 cubic yards Stage 1A East Waterway material in 3 DMMUs passed DMMP evaluation guidelines and are suitable for open-water disposal at the Elliott Bay non-dispersive site. Three DMMUs, representing 10,300 cubic yards for the Stage 1A East Waterway Project failed either bioassay, or did not complete necessary testing requirements and are unsuitable for open-water unconfined disposal based on best-professional judgement.

22. This memorandum documents the suitability of the material tested during the Terminal 18 Stage 1A East Waterway Recency characterization for dredging and 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.

Concur:

3/5/03
Date — David Kendall, Ph.D., Seattle District Corps of Engineers

2/27/03
Date — Erika Hoffman, Environmental Protection Agency

02/27/03
Date — Tom Gries, Washington Department of Ecology

3/3/03
Date — Peter Leon, Washington Department of Natural Resources

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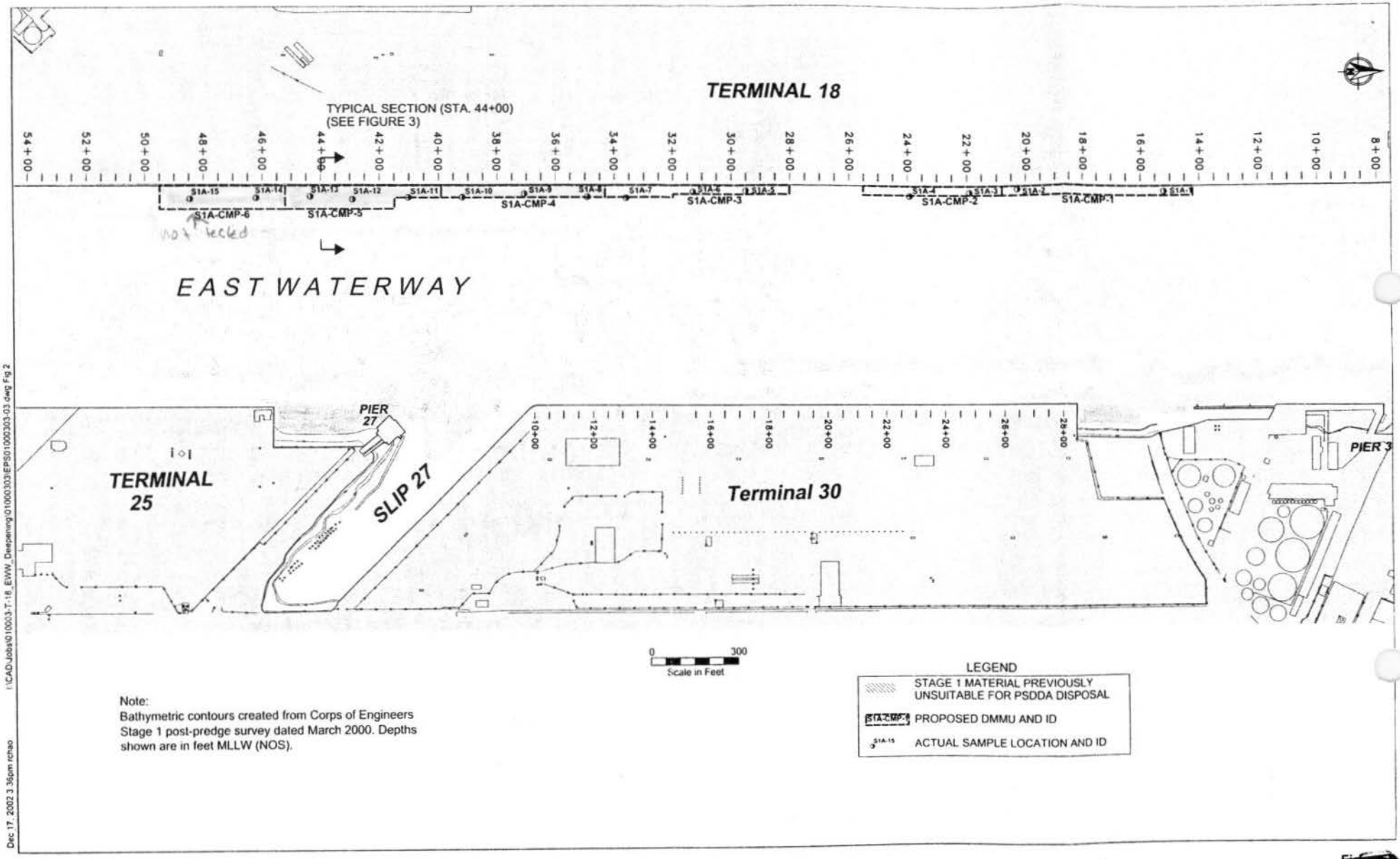
Erika Hoffman, EPA
Kevin Rochlin, EPA Superfund Project Manager

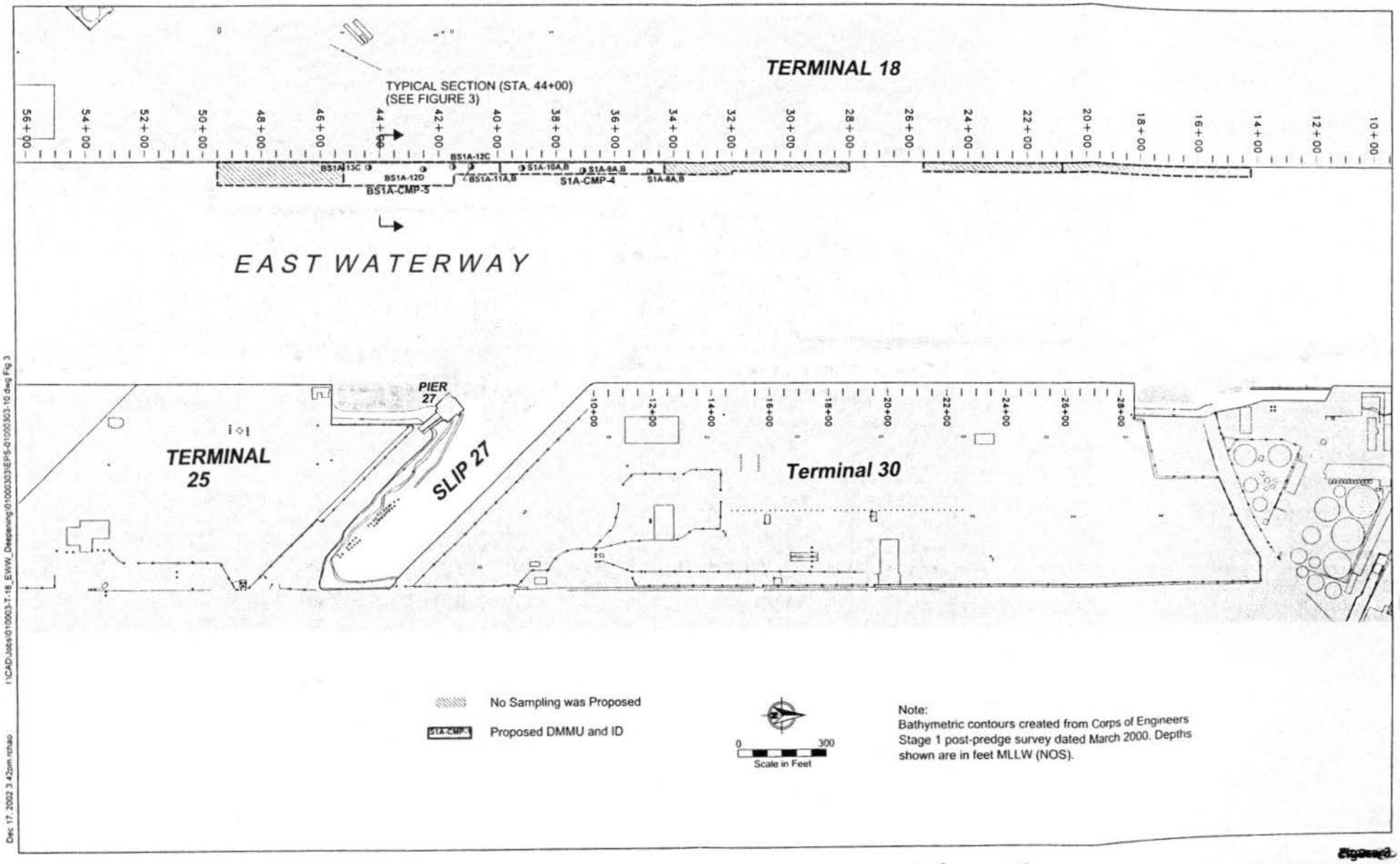
Tom Gries, Ecology
Peter Leon, DNR
Doug Hotchkiss, Port of Seattle
DMMO File



ANCHOR

Figure 1.

~~Figure 2~~
Actual Sample Locations and DMMUs
Stage 1a - Recharacterization; Round 1
East Waterway, Terminal 18



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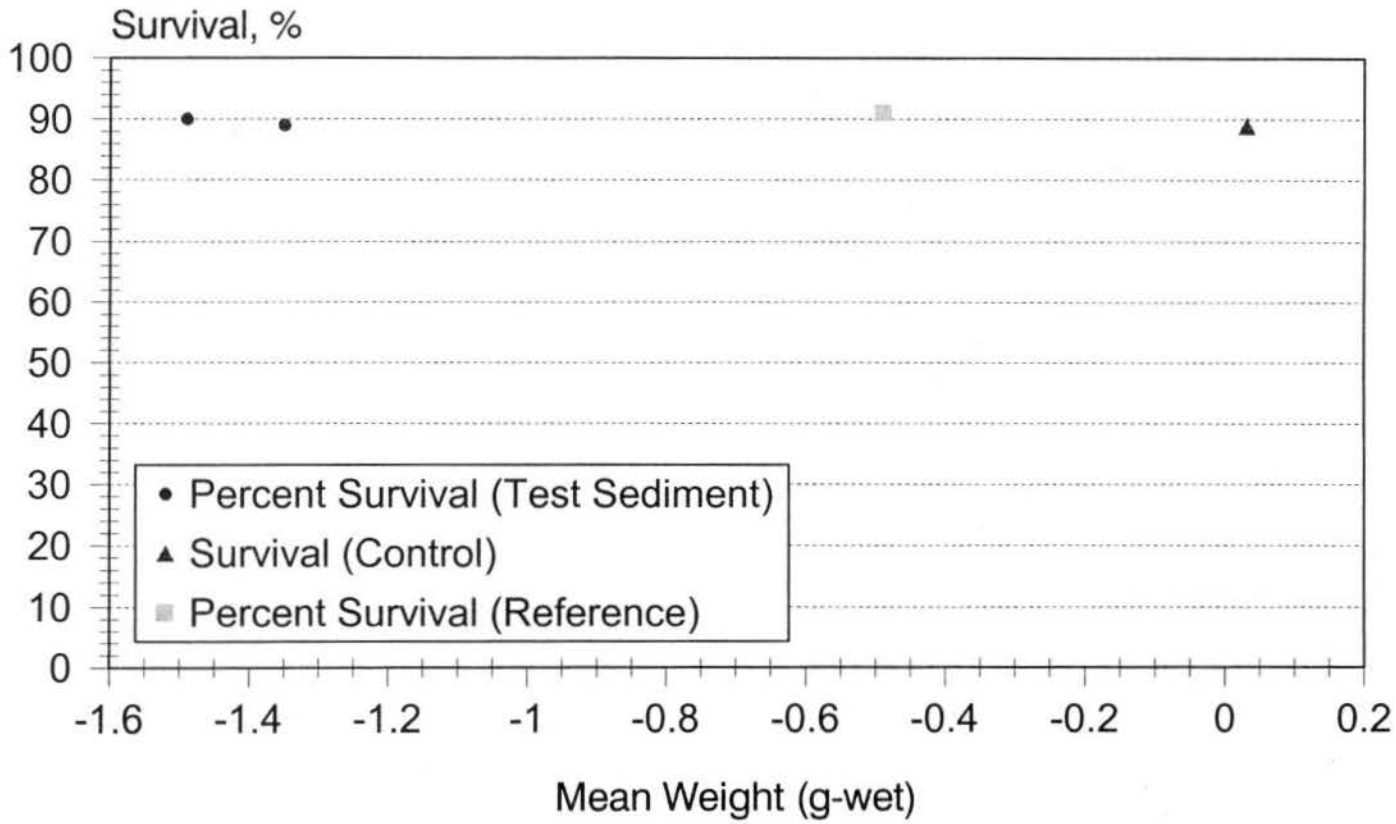
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2.

Actual Sample Locations and DMMUs
Bioaccumulation and Standard Charaterization (Round 2)
East Waterway, Terminal 18

Figure 3. Macoma Weight versus Survival

45 Bioaccumulation Test (Stage 1A)



DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

February 7, 2002

Doug Hotchkiss
Port of Seattle
P.O. Box 1209
Seattle, WA 98111

Subject: Stage 1a Sediment Evaluation, PN # 95-2-02133

Dear Mr. Hotchkiss:

This letter provides the DMMP consensus review response to the December 17, 2001 memorandum prepared by Anchor Environmental, for the Port of Seattle, regarding the recency of East Waterway Stage I data collected in 1997. The DMMP agencies have determined after considering the rationale for no further testing needed, that at least limited retesting at three or four locations will be required before dredging at the Stage 1a area with disposal at the Elliott bay site can commence. The DMMP review comments on the memorandum and rationale for requiring additional testing are discussed below.

1. Page 2, 2nd paragraph. The description provided for the Stage 1a project area dredging (Station 15+00 to 49+50) does not match the boundaries depicted on Figure 1-2, where the northernmost boundary shown is near Station 13+00. Please provide hatching on future figure to show which material is suitable, including discussion on the top of page 6 on buffer cuts. DMMU 1C13 is unsuitable and the figure should be shaded.

2. Page 2, 2nd paragraph. Please provide more information on the additional proposed berth dredging in the south apron area (49+50 to 57+50), which appears to be within the Stage II testing area, and which has a suitability determination dated November 2, 1999. Has the Port of Seattle initiated a Section 10/404 permit action for this area? This material also exceeds the 2-year recency guideline, and may be subject to additional testing after a DMMP agency "reason-to-believe" review.

3. Page 5, 3rd paragraph. This paragraph addresses the sloughing potential of material (presumably subsurface) left *after completion* of the Stage 1a dredging. The DMMP agencies are also concerned about contamination of the Stage 1a area from adjacent unsuitable DMMUs due to unsuitable surface material that may have sloughed into the Stage 1a area *during dredging* in the adjacent contaminated DMMU (especially since it appears that the Stage 1a area was at a lower elevation than the pre-dredged Stage 1 area).

4. Page 6 (Sources of contamination) and Page 12 (Effects of Dredging). These sections omit discussion of contamination from turbidity and displaced material from the

Attachment 1

problematic Phase 1 dredging. The recency determination review memorandum should have acknowledged the problems observed during the Phase 1 dredging. Various accounts of activities occurring during this dredging documented equipment and sediment management problems during the Phase I dredging which led to water quality standard exceedances for turbidity. Therefore, in the opinion of the DMMP, the resuspension factor (R) used in Table 4-1 based on various buckets and associated losses, is not a conservative estimator. The bulleted list of possible sources of sediment suspension associated with dredging (page 12) should also include barge overflow.

5. Page 7, 2nd paragraph. Please define (quantitatively) what is meant by "far field" and "near field". More information should be provided to substantiate the statement that CSO contamination within East Waterway has not "significantly migrated to surrounding areas".

6. Page 8 (Source Control). This section focuses mostly on planned reductions in overflow events. How do these plans translate to a demonstration that no significant contamination has occurred in the Phase 1a area since characterization in 1999?

7. Page 9 (Oil spills). While 200 gallons may constitute a "minor leak" in the world of spill cleanup, it does not appear to be minor in it's potential for contamination of the area near DMMUs 1C18 and 1C23. Have there been any sediment samples taken in this area to confirm that the spill was confined to the riprap and pilings underneath T-18? What are the official boundaries of the "hot zone" where pressure washing has occurred?

8. Page 15, 2nd paragraph. Use of PSEP's guidelines for precision of analytical replicates is not an acceptable means to determine whether differences in the chemical concentrations of field measurements are significant or not. It is appropriate, however, to use these guidelines to evaluate the differences between lab replicates.

9. Page 15, 3rd paragraph. There should be a summary of the recent Windward/Port of Seattle "Nature and Extent" data collection effort in support of Superfund/East Waterway decisions, especially at locations along the T-18 Pier.

10. Page 16 (conclusions). The DMMP agencies disagree with the Port's findings in this memorandum that samples obtained in 1999 representing the Phase 1a sediments continue to be representative of the area. The information provided indicates that there are several factors that may have induced significant changes to the sediment matrix within the Stage 1a area since the last characterization. These include:

    - Influence of Phase 1 dredging, including potential sloughing, spillage, and redistribution of bottom sediments.
    - Contamination of surrounding sediments from the 200 gallon oil spill in the immediate vicinity of 1C18 and 1C23.
    - Ongoing shipping activity at T-18 and in the immediate vicinity of the Phase 1a sediments and an acknowledged hot spot in the vicinity of 9+00.

Given the above issues and the fact that almost five years have elapsed since the T-18 characterization, the DMMP agencies have determined that it is necessary to recharacterize the Stage 1a area, and propose a tiered resampling/retesting approach. After reviewing the data, the DMMP agencies propose reconfiguring the DMMU boundaries for the 27,000 cy of material within the Stage 1a footprint as follows:

- **DMMU-1:** Composite of 1C5 and 1C6, which is near unsuitable 1C4 and the hot spot to the north.
- **DMMU-2:** Composite of 1C9 and 1C10
- **DMMU-3:** Composite of 1C15, 1C18, and 1C23 near the oil spill area located at Station 32+00.
- **DMMU-4:** Composite of 1C28, 1C29, and 1C34.
- **DMMU-5:** Composite of 1C35, 1C40, and 1C41, near the southern end of Stage 1a, where sloughing is a concern.
- **DMMU-6:** Composite of 1C46 and 1C47, or analyzed separately as two individual DMMUs.

DMMU's 1, 3, and 5 will be analyzed initially for chemicals of concern (including TBT), while DMMU's 2, 4, 6 will be archived pending results of the analyses of DMMU 1, 3, and 5. If characterization of the three DMMUs analyzed indicate the areas are no longer chemically and/or biologically suitable for open-water-unconfined disposal, additional analyses of archived DMMUs may be required. The agencies would be required to exercise best professional judgement (BPJ) in making the decision on whether or not to analyze archived samples after reviewing initial testing results.

Please call me (206/764-3768) if you have any questions about our response.

Sincerely,

David R. Kendall, Ph.D.
Chief, Dredged Material Management Office

Copies Furnished:
Justine Barton, EPA
Erika Hoffman, EPA
Allison Hiltner, EPA
Rick Vining, Ecology
Robert Brenner, DNR
DMMO File

Attachment 2. DMMP Sediment Testing Summary and Evaluation for Port of Seattle T-18 Stage 1A 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					0.43							
TBT ion (porewater) - Round 1	ug/L	0.15	0.15		2.9				1.3				0.16			
TBT ion (porewater) - Round 2	ug/L	0.15	0.15								0.046	J	0.056	J		
TBT Ratio (Round 1/Round 2):													2.86			
Fluoranthene	ug/kg	1,700	4,600	30,000					1,800							
Pyrene	ug/kg	2,600		16,000					3,000							
Hexaclorobenzene (HCB)	ug/kg	22	168	230	95	U			98	U			95	U		
2-Methylphenol	ug/kg	63		77	95	U			98	U			95	U		
2,4-Dimethylphenol	ug/kg	29		210					98	U			95	U		
Pentachlorophenol	ug/kg	400	504	690	480	U			490	U			480	U		
Benzyl alcohol	ug/kg	57		870	95	U			92	NJ			95	U		
Benzoic acid	ug/kg	650		760	950	U			980	U			950	U		
Hexachlorobutadiene	ug/kg	29	212	270	95	U			98	U			95	U		
N-Nitrosodiphenylamine	ug/kg	28	130	130	95	U			98	U			95	U		
Total DDT	ug/kg	6.9	50	69	19.0	J			21.9	J			15.0	J		
Total PCBs	ug/kg	130		3,100	2,900	J			490	J	164		210	J		
Total PCBs (TOC- normalized)	mg/kg		38		171				29		15		18			
Total Solids	%				64.3				55.5		70.6		71.8, 69.6			
Total Volatile Solids	%				3.5				5.2		2.4		2.8			
Total Organic Carbon	%				1.7				1.7		1.1		1.2, 1.6			
Total Ammonia	mg/kg				16.0				16.0		6.8		7.2			
Total Sulfides	mg/kg				1,600				2,500		470		24			
Gravel	%				2.9				4.3		3.7		2.9, 7.4			
Sand	%				61.8				32.1		64.7		57.8, 57.5			
Silt	%				21.5				38.5		21.5		28.8, 22.3			
Clay	%				13.8				25.2		10.0		10.3, 12.8			
Fines (percent silt + clay)	%				35.3				63.7		31.5		39.1, 35.1			
preferred reference match:	%															
Eohaustorius estuarius hits:					2-H				1-H				2-H			
Mytilus galloprovincialis hits:																
Neanthes arenaceodentata hits:																
Bioassay Determination: (P/F)					PASS				FAIL		PASS		PASS			
BTs eyesceeded:					yes				yes		no		yes			
Bioaccumulation conducted:					no				no		yes		yes			
Bioaccumulation Determination:					Not Tested				Not Tested		PASS		PASS			
ML Rule exceeded:					no				no		no		no			
PSDDA Determination:					FAIL(bpj)		FAIL(bpj)		FAIL		PASS		PASS		PASS(bpj)	
DMMU Volume:	cy				2,800		2,700		4,800		5,200		6,800		5,800	
DMMU ID:					DMMU-1		DMMU-2		DMMU-3		DMMU-4		DMMU-5		DMMU-6	

Legend:

- 1H = one hit response failure (DMMP Guidelines)
- 2H = two hit response failure (DMMP Guidelines)
- P = Pass (Suitable for UCOWD)
- F = Failure (Unsuitable for UCOWD)
- VQ = Validation Qualifier
- UCOWD = Unconfined open-water disposal
- U = Undetected at the reported concentration
- N = Presumptive evidence/tentative identification
- J = analyte positively identified, estimated concentration
- BT = bioaccumulation trigger (sediment chemical value) exceedanc
- SL = screening level (lower chemical guideline)

Total Volume: 28,100

Failed:	2,800		2,700		4,800								Vol. Failed . 10,300
Passed:							5,200		6,800		5,800		Vol. Pass 17,800
Bioaccumulation (DMMU tested)							5,200		6,800				Vol. Bioaccum 12,000

*DMMU's 2 and 6 not tested. DMMU 4 testing during Round 2. See text of SDM for explanation.

Attachment 3. Worst Case Bioaccumulation Interpretation Summary (Adjusted Values)

			DMMU 4									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-ww	600	67.2	67.2	0.58	yes	yes	24.6	24.6	0.68	yes	yes
TBT ion (as TBT)	ug/kg-dw	3,000	350	350	3.0	yes	yes					

			DMMU 5									
			Macoma nasuta					Nephtys caecoides				
CHEMICAL NAME	Units	Guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline	DMMU tissue (Initial)	DMMU tissue (adjusted)	Reference (CR-23 Mod)	Statistically different from reference	statistically below guideline
TBT ion (as TBT)	ug/kg-ww	600	35.0	99	0.58	yes	yes	13.1	37	0.68	yes	yes
TBT ion (as TBT)	ug/kg-dw	3,000	192.5	547	3.0	yes	yes					

Note: Tissue concentrations for Macoma interpreted on wet-weight (ww) and on a dry-weight (dw) basis. Nepthys interpreted on wet weight basis only, as there was insufficient tissue to determine total solids for the conversion to dry weight.