

7 August 2001

SUBJECT: SUPPLEMENTAL DETERMINATION ON THE SUITABILITY OF DREDGED MATERIAL TESTED FOR THE PUGET SOUND NAVAL SHIPYARD DREDGING PROJECT (1998-01967) EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT (CWA) FOR BENEFICIAL REUSE AS INITIAL¹ CAPPING MATERIAL AT THE CERCLA PIT-CAD SITE IN SINCLAIR INLET.

1. The following summary provides a supplemental Dredged Material Management Program (DMMP) Agencies' (U.S. Army Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency) suitability determination evaluation of 160,120 cy of proposed dredged material from the Turning Basin for a potential beneficial reuse as capping material at the CERCLA Pit-CAD site in Sinclair Inlet. This supplemental suitability determination augments the final 21 March 2000 SDM and addresses alternative beneficial reuse disposal alternatives for 160,120 cy of the turning basin material, which was previously found suitable for unconfined open-water disposal at the Elliott Bay disposal site.
2. All sampling and testing conducted within the Turning Basin, including the forty dredged material management units (DMMUs) identified for potential use as initial capping material at the Pit-CAD disposal site in Sinclair Inlet, were previously discussed and summarized in 21 March 2000 SDM, and will not be re-summarized here. See Appendix 1 for a summary review of the sampling/testing results for the forty of fifty-three total DMMUs identified from the Turning Basin for beneficial reuse. The remaining thirteen DMMUs from the Turning basin either have been or will be dredged and disposed as previously discussed in the 21 March 2000 suitability determination.
3. Relevant dates for regulatory tracking purposes are included in Table 1.

Table 1. Regulatory Tracking Dates

Phase I SAP submittal:	September 14, 1998
Phase I SAP Approval date:	October 6, 1998
Phase I Sampling date(s):	January 11-February 4, 1999
Phase I Data Report submittal date:	July 6, 1999
Phase I Interim Suitability Determination Date:	August 24, 1999
Phase II Retesting SAP Submittal date:	October 11, 1999
Phase II Retesting SAP Approval date:	October 12, 1999
Phase II Retesting Sampling date(s):	October 12-28, 1999
Recency Determination Date: High (2 years)	October 2001

¹ The sequence of capping of the contaminated sediments at the Pit-CAD disposal site from bottom to top is as follows: The first one foot of capping material will be commercial sand, followed by the next two feet of capping material, which will come from the Turning Basin/Inner Channel area. The final two feet of capping material will come from the stock piled material excavated from the Pit-CAD site (Peter Havens, August 7, 2001, personal communication).

Chemical Testing Summary

4. Appendix 3 provides a summary of the sediment conventional parameters including grain size and total organic carbon contents for the 40 DMMUs selected from the Turning Basin/Inner Channel. Table 2 summarizes the percent fines, clay content, and grain size averages within the turning basin and inner channel sediments.

Table 2. Comparative conventional sediment characteristics from the Turning Basin/Inner Channel.

Parameter	Surface: Turning Basin and Inner Channel
Volume (cubic yards)	160,120 cy
Number of DMMUs	40 + 2 field duplicates out of 53 + 3 field duplicates (total)
Total Sand + Gravel Content	Average = 10.6 % Range: 6.7 – 17.1
Total Fines Content (% silt + clay)	Average = 89.4 % Range: 75.7 – 93.9 %
Total Clay Content	Average = 35.9 % Range: 27.4 – 41.3 %
Total Organic Content (% TOC)	Average = 2.5 % Range: 1.9 – 6.0 %

5. The chemical testing results for the forty DMMUs identified for potential beneficial reuse as capping material are briefly summarized as follows: Thirty-two of forty DMMUs had no chemical SL exceedances, whereas seven DMMUs (S4, S8, S10, S22, S26, S44, S45) had detected exceedances of the mercury SL and SQS. Two DMMUs (S22, S23) had undetected exceedances of the hexachlorobenzene, Benzyl alcohol, Hexachlorobutadiene, and N-Nitrosodiphenylamine SL, whereas a single DMMU (S22) exceeded the 2,4-Dimethylphenol SL. Comparisons to SQS indicated that all chemicals were below SQS except as noted above for mercury at 7 of the 40 DMMUs, and two DMMU undetected SQS exceedances of Hexachlorobenzene (S22, S23). All forty DMMUs were subject to bioassay testing and those results are summarized below.

Bioassay Testing Summary

6. The DMMP interpretation outcome summary of bioassay testing conducted on the 40 DMMUs is briefly summarized below. During initial sediment testing with the amphipod *Eohaustorius estuarius* there was unexplained toxicity in a large number of DMMUs, which appeared to be at least partially attributable to high clay contents. A reference area study conducted by The U.S. Navy at the request of the DMMP agencies documented that high clay content sediments may contribute to *Eohaustorius* mortalities. See the final 21 March 2000 SDM for a comprehensive discussion of the bioassay testing anomalies observed during the initial testing for this project and DMMP deliberations on these issues relative to amphipod bioassay retesting and other potential causes of the observed toxicity.
7. In summary, the DMMP agencies using weight of evidence and best-professional judgement (PBJ) concluded that the amphipod testing results indicated that three DMMUs (S24, S29, S50) had two-hit

responses from *Eohaustorius estuarius*, whereas the remaining 37 DMMUs had no-hit responses from the amphipod, *Ampelisca abdita* bioassay. Twenty-seven DMMUs exhibited bivalve larval bioassay two-hit responses, whereas thirteen DMMUs had no-hit responses. All forty DMMUs exhibited no-hit responses for the *Neanthes* 20-day growth bioassay. In conclusion, all forty DMMUs passed the nondispersive disposal site interpretation guidelines for bioassays (see Appendix 1 summary).

8. Interpretation of the bioassay testing results relative to SMS guidelines results in the following outcomes. All forty DMMUs were below the *Neanthes* SQS guidelines, and thirty-seven out of forty were below the Amphipod (*Ampelisca abdita*) SQS guidelines, whereas three DMMUs (S24, S29, S50) exceeded the SQS interpretation guidelines (*Eohaustorius estuarius*), but did not exceed the CSL interpretation guidelines. Twenty-seven of forty DMMUs were below the Bivalve larval SQS guidelines, whereas the remaining thirteen DMMUs (S4, S5, S8, S22, S30, S33, S35, S37, S38, S40, S41, S42, S44) exceeded the Bivalve larval bioassay SQS guidelines, but did not exceed the CSL guidelines.

Suitability Determination

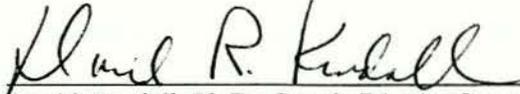
9. The DMMP agencies accepted all the data discussed herein as sufficient using best-professional judgement (BPJ) to make a suitability determination regarding the potential reuse of this material as initial capping material at the Pit-CAD disposal site. As noted in footnote 1, this material will be used as part of an initial cap and will be subsequently capped by an additional two feet of stockpiled material previously excavated from the Pit-CAD disposal site. Appendix 1 summarizes the final suitability determination outcome for each of the 40 DMMUs representing a total volume of 160,120 cubic yards, and summarizes the essential chemical and biological testing information forming the basis for these determinations. Most of the material is below SQS guidelines (24 of 40 DMMUs), and all the remaining material is below CSL guidelines.
 10. A total of 160,120 cubic yards of potential dredged material in 40 DMMUs passed DMMP evaluation guidelines and are suitable for beneficial reuse as capping material at the Pit-CAD disposal site in Sinclair Inlet based on BPJ.
 11. This memorandum documents the suitability of the dredged material dredged within the Turning basin/inner channel within the U.S. Navy Shipyard dredging project in Sinclair Inlet for beneficial reuse as part of an initial cap at the Pit-CAD disposal site in Sinclair Inlet. However, this suitability determination does not constitute final agency approval of the project. A dredging plan for this beneficial reuse must be completed as part of the final project approval process.
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Concur:

8/7/2001

Date



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

8/9/01

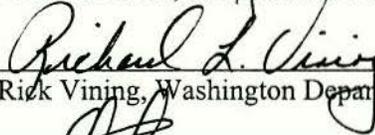
Date



Erika Hoffman, Environmental Protection Agency

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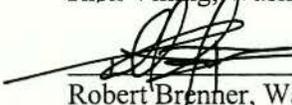
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Date



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DMMO File

Appendix 1. U.S. Navy Puget Sound Naval Shipyard, Bremerton, WA.
DMMP Supplemental SDM on SUITABILITY OF Turning Basin MATERIAL AS CAPPING MATERIAL FOR PITCAD

CHEMICAL NAME	Units	SL	BT	Rank ML	S2	S3	S4	S5	S6	S7	S8	S10	S12	S13	S14	S20	S21	S22	S22-R	S23	S23-R	S24
					Conc	VG	Conc	VG	Conc	VG	Conc	VG										
Arsenic	mg/kg	57	507.1	760																		
Copper	mg/kg	580		1,300																		
Lead	mg/kg	458		1,300																		
Mercury	mg/kg	0.41	1.5	2.3																		
Silver	mg/kg	8.1	6.1	8.4								0.872	0.915						0.537			
Zinc	mg/kg	410		3,800																		
Tributyltin ion (seawater)	ug/l	0.15	0.15	-																		
Aceaphthene	ug/kg	500		2,000																		
Fluorene	ug/kg	540		3,600																		
Phenanthrene	ug/kg	1,500		21,000																		
Anthracene	ug/kg	860		13,000																		
Fluoranthene	ug/kg	1,700	4,600	30,000																		
Pyrene	ug/kg	2,600		16,000																		
Benzo(a)anthracene	ug/kg	1,300		5,100																		
Chrysene	ug/kg	1,400		21,000																		
Indeno(1,2,3-cd)perylene	ug/kg	800		4,400																		
Total HPAHs	ug/kg	12,000		69,000																		
1,4-Dichlorobenzene	ug/kg	31		64																		
Polychlorinated Biphenyls (PCBs)	ug/kg	22	188	230																		
2,2,4,4-Tetrachlorobiphenyls	ug/kg	8,300	13,870	-																		
2-Methylphenol	ug/kg	63		77																		
2,4-Dinitrophenol	ug/kg	29		210																		
Pentachlorophenol	ug/kg	400	504	690																		
Benzoic Acid	ug/kg	850		760																		
Benzyl alcohol	ug/kg	57		870																		
Hexachlorobutadiene	ug/kg	29	212	270																		
N-Nitrosodiphenylamine	ug/kg	28	130	130																		
Alpha-Chloroethane	ug/kg	10		37																		
Dieldrin	ug/kg	10		37																		
Total DDT	ug/kg	6.9	50	69																		
Total PCBs	ug/kg	130		3,100																		
Total PCBs (TOC-normalized)	mg/kg		38																			
Total Solids	%				40.0	40.8	43.0	44.6	50.7	40.5	37.8	39.6	38.0	37.5	38.6	39.7	39.2	37.6	36.5	37.1	36.0	35.5
Total Volatile Solids	%				6.4	8.1	5.9	5.9	4.9	7.6	5.4	7.2	8.1	8.0	7.4	8.9	7.0	6.6	8.8	7.1	6.9	8.6
Total Organic Carbon	%				2.5	2.4	2.3	2.2	2.2	2.5	2.2	2.1	2.4	2.3	2.4	2.3	2.1	3.2	2.5	2.8	2.3	2.5
Total Ammonia	mg/kg				46.0	49.0	61.0	49.0	40.0	34.0	34.0	27.6	49.0	41.0	41.0	29.0	27.0	51.0	35.0	55.0	54.0	52.0
Total Sulfides	mg/kg				69	180	45	71	170	130	110	98	96	370	120	66	100	28	120	26	71	29
Gravel (percent)	%				-	-	-	0.4	-	2.9	1.6	-	-	1.3	-	0.3	8.6	0.6	3.6	-	-	-
Sand (percent)	%				11.6	12.4	9.7	15.8	17.1	11.2	7.8	14.9	8.3	8.6	10.9	9.2	8.6	9.1	6.1	10.5	10.7	7.1
Silt (percent)	%				50.3	49.5	52.3	47.8	42.0	56.4	54.2	51.7	54.1	50.7	53.2	54.7	45.0	49.0	56.5	49.1	55.6	55.1
Clay (percent)	%				38.2	37.9	37.9	36.7	40.7	30.1	36.6	33.4	37.9	39.2	36.9	36.8	36.8	42.3	29.8	40.4	33.9	37.7
Fines (percent silt + clay)	%				88.5	87.4	90.2	63.5	82.7	85.5	80.8	85.1	81.9	89.9	89.1	90.5	81.8	80.3	88.3	89.5	89.5	92.8
Referenced reference match					78.7	79.7	78.7	78.7	78.7	79.7	78.7	78.7	78.7	78.7	78.7	78.7	78.7	82.7	78.7	82.7	78.7	82.7
<i>Robaustronius estuarius</i> DMMP Hts					1-H	1-H	2-H	1-H	2-H	1-H	1-H	2-H	1-H	1-H	1-H	1-H	1-H	1-H	1-H	1-H	1-H	2-H
<i>Ampelisca abdita</i> DMMP Hts					NH	NH	NH	NH	NH	NH												
<i>Mytilus galloprovincialis</i> DMMP Hts					2-H	2-H	2-H	2-H	2-H	NH												
<i>Neanthes amaccedenifera</i> DMMP Hts					NH	NH	NH	NH	NH	NH												
Bioassay Pass/Fail					Pass	Pass	Pass	Pass	Pass	Pass												
<i>Robaustronius estuarius</i> SMS Hts																						
<i>Ampelisca abdita</i> SMS Hts																						SQS
<i>Mytilus galloprovincialis</i> SMS Hts																						
<i>Neanthes amaccedenifera</i> SMS Hts																						
BTs exceeded																						
Accumulation conducted																						
Accumulation Pass/Fail																						
ML Rule exceeded																						
PSDDA Determination					Pass	Pass	Pass	Pass	Pass	Pass												
DMMU Volume	cy				3,980	4,000	3,980	4,100	4,080	3,950	3,950	4,050	3,870	3,940	4,020	4,030	4,000		3,980		3,980	3,920
DMMU D					S2	S3	S4	S5	S6	S7	S8	S10	S12	S13	S14	S20	S21	S22	S22-R	S23	S23-R	S24
Failed:																						
Passed:					3,980	4,000	3,980	4,100	4,080	3,950	3,950	4,050	3,870	3,940	4,020	4,030	4,000		3,980		3,980	3,920
Exhaustion retest																						
Amphipod (Ampelisca) retest					3,980	4,000	3,980	4,100	4,080	3,950	3,950	4,050	3,870	3,940	4,020	4,030	4,000	yes		yes		

Note: Highlighted results (Initial and retested DMMUs) with clay contents > 15%, not included in decision matrix for final SDM. See Final SDM for explanation.

Initial Test (i)
Gray Highlighted area denotes retested parameters (R)

Appendix 1. U.S. Navy Puget Sound Naval Shipyard, Bremerton, WA.
 DMMP Supplemental SDM on SUITABILITY OF Turning Basin MATERIAL AS CAPPING MATERIAL FOR PITCAD

CHEMICAL NAME	Units	SL	BT	Rank	S44	S45	S46	S47	S48	FD-S48.1	S48-R	S49	S50	CR-10	CR-21S	CR-24	DMMU	
					H	H	H	H	H	H	H	H	H	H	H	H	REF	REF
Asbestos	mg/kg	57	507.1	700														
Copper	mg/kg	380		1,300														
Lead	mg/kg	450		1,200														
Mercury	mg/kg	0.41	1.5	2.3	0.434	0.454												
Silver	mg/kg	6.1		8.4														
Zinc	mg/kg	470		3,800														
Tributyltin ion (free water)	ug/l	0.15	0.15	-														
Acenaphthene	ug/kg	500		2,000														
Fluorene	ug/kg	540		3,600														
Phenanthrene	ug/kg	1,500		21,000														
Anthracene	ug/kg	860		13,000														
Fluoranthene	ug/kg	1,700	4,800	30,000														
Pyrene	ug/kg	2,600		16,000														
Benzo(a)anthracene	ug/kg	1,300		5,100														
Chrysene	ug/kg	1,400		21,000														
Indeno(1,2,3-c) dipyrene	ug/kg	600		4,400														
Total HPAHs	ug/kg	12,000		69,000														
1,2,4-Trichlorobenzene	ug/kg	31		64														
Hexachlorobenzene (HCB)	ug/kg	22	168	230														
Bis(2-ethylhexyl)phthalate	ug/kg	8,500	13,870	-														
3-Methylphenol	ug/kg	63		77														
2,4-Dimethylphenol	ug/kg	29		210														
Pentachlorophenol	ug/kg	400	504	690														
Benzoic Acid	ug/kg	650		760														
Benzyl alcohol	ug/kg	57		870														
Hexachlorobutadiene	ug/kg	29	212	270														
N,N-Diisopropylamine	ug/kg	28	130	130														
alpha-Chlorane	ug/kg	10	37	-														
Dieldrin	ug/kg	10	37	-														
Total DDT	ug/kg	6.9	50	69														
Total PCBs	ug/kg	130		3,100														
Total PCBs (TOC, normalized)	mg/kg		38															
Total Solids	%				38.8	38.0	35.8	38.9	37.8	37.0	38.0	37.1	35.2	56.2	75.6	63.8		
Total Volatile Solids	%				8.1	8.5	5.6	7.3	8.8	7.4	9.7	8.8	7.9	3.7	1.8	1.9		
Total Organic Carbon	%				2.4	2.5	2.2	2.8	1.9	2.1	2.4	2.5	2.3	1.1	0.4	0.7		
Total Ammonia	mg/kg				65.0	46.0	53.0	46.0	88.0	81.0	61.0	46.0	53.0	7.9	13.0	11.0		
Total Sulfides	mg/kg				120	28	76	290	120	89	77	220	140	93	<10	<10		
Gravel (percent)	%				0.3	1.2	0.9	0.3	0.3	-	0.6	0.3	0.3	0.6	0.2	0.4		
Sand (percent)	%				7.6	8.7	7.9	9.2	7.5	6.2	9.4	8.8	10.0	20.7	90.0	56.0		
Silt (percent)	%				52.6	54.8	56.0	57.8	50.9	53.5	56.4	55.6	57.2	67.0	4.5	37.0		
Clay (percent)	%				39.4	35.4	36.3	32.7	41.5	40.3	33.6	36.4	32.6	11.7	6.3	6.7		
Fines (percent silt + clay)	%				92.0	90.2	91.3	90.5	92.4	93.8	90.0	91.0	89.7	78.7	9.8	43.7		
Preferred reference match					78.7	78.7	78.7	78.7	82.7	82.7	78.7	78.7	82.7	-	-	-		
<i>Eohaustorius estuarius</i> DMMP hits					1-H(0)	1-H(0)	1-H(0)	1-H(0)	1-H(0)	-	2-H(R)	1-H(0)	2-H(0)					
<i>Ampelisca abdita</i> DMMP hits					NH	NH	NH	NH			NH	NH						
<i>Myktilus galloprovincialis</i> DMMP hits					NH	NH	2-H	NH	2-H	-		NH	NH					
<i>Neanthes arenaceodentata</i> DMMP hits					NH	NH	NH	NH	NH	-		NH	NH					
Bioassay Pass/Fail					Pass	Pass	Pass	Pass			Pass	Pass	Pass					
<i>Eohaustorius estuarius</i> SMS hits													SQS					
<i>Ampelisca abdita</i> SMS hits																		
<i>Myktilus galloprovincialis</i> SMS hits																		
<i>Neanthes arenaceodentata</i> SMS hits																		
RTA exceeded																		
Bioaccumulation conducted																		
Bioaccumulation Pass/Fail																		
ML Rule exceeded																		
SPDOA Determination					Pass	Pass	Pass	Pass			Pass	Pass	Pass					
DMMU Volume	cy				4,150	3,980	4,050	4,080			4,120	4,020	4,030					
DMMU D					S44	S45	S46	S47	S48	FD-S48.1	S48-R	S49	S50					

Legend:
 NH = No Hit (nondispersive guidelines)
 2H = two hit failure (nondispersive guidelines)
 1H = one hit failure (nondispersive guidelines)
 P = Pass (Suitable for UCOWD)
 F = Failure (Unsuitable for UCOWD)
 UCOWD = Unconfined open-water disposal
 VQ = Validation Qualifier
 D = Associated compound required a dilution due to matrix or concentration
 E = Estimated Value
 U = Undetected
 J = Positively Identified; approximate concentration of the analyte in sample.
 NQ = Not Quantifiable, but positive identification
 ML = Maximum Level (upper chemical guideline)
 SL = Screening Level (lower chemical guideline)
 BT = Bioaccumulation Trigger
 FD = Field Duplicate (S39, S48, S71, D1, D4, S73, D4c, S101)

Turning Basin (40 DMMUs Identified)	
%Sand+Gravel	10.6
%fines	89.4
%clay	35.9
Volume (cy)	160,120
%TOC	2.5

Total Volume Tested
 160,120 cy
 160,120 cy: Suitable for UCOWD
 148,130 cy: Retested Volume (amphipod bioassay)

Failed:																			
Passed:																			
<i>Eohaustorius</i> retest					4,150	3,980	4,050	4,080			4,120	4,020	4,030						
<i>Ampipod (Ampelisca)</i> retest					4,150	3,980	4,050	4,080	4,120			4,020							

Note: Highlighted results (initial and retested DMMUs) with clay contents > 15%, not included in decision matrix for final SDM. See Final SDM for explanation.

Initial Test (I)
 Gray Highlighted area denotes retested parameters (R)