

## MEMORANDUM FOR RECORD

2 January 2008

**SUBJECT:** DETERMINATION ON THE RECENCY EXTENSION SUITABILITY OF DREDGED MATERIAL CHARACTERIZED AT THE CAP SANTE BOAT HAVEN – WEST BASIN REDEVELOPMENT PROJECT (2002-00422) UNDER SECTION 404 OF THE CLEAN WATER ACT FOR THE PURPOSE OF DETERMINING THE SUITABILITY OF THE DREDGED MATERIAL FOR OPEN-WATER DISPOSAL AT A DMMP DISPERSIVE DISPOSAL SITE.

1. This Memorandum documents the Dredged Material Management Program (DMMP) recency characterization of 40,900 cubic yards to restore navigational access within berthing areas at the Cap Sante Boat Haven – West Basin Redevelopment Project. It reflects the consensus determination of the Dredged Material Management Program (DMMP) which consists of the principal agencies having jurisdiction for dredge/disposal projects in Washington State (i.e., the Corps of Engineers, Department of Ecology, Department of Natural Resources, and the Environmental Protection Agency).
2. This determination evaluates the recency suitability of an estimated 40,900 cy of maintenance dredged material tested within the Cap Sante Marina for unconfined open-water disposal at the Rosario Strait Dispersive disposal site. The dredging proposed is to restore the minimum maintenance required to provide navigational access to the marina berthing areas.
3. Relevant dates for regulatory tracking purposes are included in **Table 1**.

**Table 1. Regulatory Tracking Dates**

<b>Application Number:</b>	<b>2002-00422</b>
Initial DMMP Characterization/Suitability Determination:	April 12, 2001
Recency Extension Request:	June 12, 2007
DMMP Response to Recency Extension Request:	June 22, 2007
SAP Submittal date:	August 18, 2007
SAP Approval date(s): Revised SAP:	September 14, 2007 September 24, 2007
Sampling date:	September 27, 2007
Characterization Report submittal date:	November 19, 2007
<b>DAIS Tracking #:</b>	<b>CAPSM-1-A-O-276</b>
<b>Recency Determination Date:</b> Moderate = 5 years	February 2006 (Initial) September 2012

4. The initial DMMP characterization was conducted in 1999/2000 and documented in 12 April 2001 Suitability Determination (<http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/Cap-Sante-Marina-sdm.pdf>). The recency expired for the initial characterization in February 2006, and the applicant subsequently requested a recency extension. In response to this request, the DMMP agencies reviewed the previous testing conducted and responded that additional characterization of the 40,900 cy of material remaining to be dredged (Total volume of dredging project = 99,000 cy, of which approximately 58,100 cy was previously dredged) was necessary to evaluate and update the existing sediment quality (**Attachment 1**). The DMMP agencies authorized the use of a grab sampler to evaluate the surface sediment quality within the 4 DMMUs remaining. Based on a review of previous testing results the DMMP agencies determined that the recency evaluation should focus on the analysis of Semi-volatile organic compounds (SVOCs, including polycyclic-aromatic hydrocarbons [PAHs]), Tributyltin, and an analysis of dioxin/furans within the project area. For this project evaluation, the DMMP agencies stipulated that dioxin/furan data would be compared directly with Samish Bay Reference data to evaluate suitability for unconfined-open-water disposal at the Rosario Strait dispersive disposal site.
5. The applicant submitted a SAP for DMMP review and approval on August 18, 2007, and the DMMP agencies approved the SAP on September 14, 2007. The applicant subsequently revised the SAP on 24 September 2007 addressing DMMP comments and requested revisions. Sampling with Van Veen Grab was initiated/completed on September 27, 2007, with 16 stations (e.g., 4 stations within each DMMU) sampled and composited into 4 DMMUs within proposed dredging area, and at 2 stations in Samish Bay (**Figure 1** = Vicinity Map; **Figure 2** = Plan View of Station locations and DMMU boundaries; **Figure 3** = Samish Bay sampling stations).
6. The characterization report was submitted to the DMMP agencies for review on November 19, 2007. The quality assurance/quality control guidelines specified by the 2007 DMMP Users Manual were generally complied with, and the data gathered were deemed sufficient and acceptable for decision-making by the DMMP agencies based on best professional judgment.
7. **Table 2** provides a complete summary of sediment testing results for the 4 characterized DMMUs. Analysis results for the 4 DMMUs tested, indicated that Tributyltin and SVOCs analyzed were quantitated below both DMMP SLs and SMS SQS guidelines. Analysis of dioxin/furans within the 4 DMMUs indicated that the total TEQ's ranged from a low of **3.51 pptr-TEQ** (DMMU-C2) to a high of **52.6 pptr-TEQ** (DMMU-C8) (see **Table 3** for full analysis results for the four DMMUs and Samish Bay Reference Sample for all 17 congeners of dioxin/furan). The Samish Bay Reference sample was quantitated at **2.44 pptr-TEQ**, which was lower than all 4 DMMUs.
8. The agencies concluded that all four DMMUs tested representing a total of 40,900 cy are **unsuitable** for unconfined open-water disposal at the Rosario Strait dispersive disposal site, based on a comparison with the Samish Bay reference. Using the interim dioxin policy established following an Interagency Directors Meeting in February 2007 (<http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/dioxin.pdf>), only sediments quantitated at or below the Samish Bay reference station (**Total TEQ = 2.44 pptr**) would be suitable for dispersive site disposal at Rosario Strait. However, DMMU-C2 quantified at **3.51 pptr-TEQ** meets the interim non-dispersive site dioxin/furan guidelines for 4 of the non-dispersive sites, as this DMMU

is quantitated under the off-site mean concentration for the Bellingham Bay, Port Gardner, Elliott Bay, and Anderson/Ketron Island sites, but is above the Commencement Bay off-site mean. **Table 4** provides the current non-dispersive site off-site averages and maximum concentrations for dioxin/furans at all five non-dispersive sites.

9. Dredging of these four DMMUs will require post dredge analysis of the exposed post-dredge surface for dioxin/furans to evaluate the dioxin/furan concentrations relative to the Washington State antidegradation policy.
10. This memorandum affirms that all 40,900 cy of the sediments proposed for dredging at the Cap Sante Boat Haven – West Basin Redevelopment Project are **unsuitable** for disposal at the Rosario Strait **Dispersive** site. Evaluating these data for Non-dispersive site disposal indicates that DMMU-C1 representing 15,200 cy is **suitable** for unconfined open-water disposal at either the Bellingham Bay, Port Gardner, Elliott Bay, or Anderson/Ketron Island sites, but would not be suitable for disposal at the Commencement Bay Site using the interim dioxin decision-making process. The remaining 25,700 cy is unsuitable for non-dispersive site disposal.
11. 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.

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1/3/08

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DMMO File

**Table 2. Cap Sante Boat Haven-West Basin Redevelopment Project, Recency Extension DMMP/SMS Characterization Summary**

CHEMICAL NAME	DMMP				SMS			DMMU ID:		DMMU-C1 (4 Grab Stations)			DMMU-C2 (4 Grab Stations)				
	Units	SL	BT	ML	Units	SQS	CSL	DMMP	SMS	mg/kg-dry wgt	mg/kg-OC	VQ	DMMP	SMS	mg/kg-dry wgt	mg/kg-OC	VQ
Antimony		150		200				NA					NA				
Arsenic	mg/kg	57	507.1	700	mg/kg	57	93	NA					NA				
Cadmium	mg/kg	5.1	11.3	14	mg/kg	5.1	6.7	NA					NA				
Chromium	mg/kg	(2)	267	(2)	mg/kg	260	270	NA					NA				
Copper	mg/kg	390	1,027	1,300	mg/kg	390	390	NA					NA				
Lead	mg/kg	450	975	1,200	mg/kg	450	530	NA					NA				
Mercury	mg/kg	0.41	1.5	2.3	mg/kg	0.41	0.59	NA					NA				
Nickel	mg/kg	140	370	370	mg/kg	--	--	NA					NA				
Selenium	mg/kg	(2)	3	(2)	mg/kg	--	--	NA					NA				
Silver	mg/kg	6.1	6.1	8.4	mg/kg	6.1	6.1	NA					NA				
Zinc	mg/kg	410	2,783	3,800	mg/kg	410	960	NA					NA				
TBT ion (porewater)	ug/L	0.15	0.15		ug/L	0.05	0.35	0.052					0.034				
Naphthalene	ug/kg	2,100		2,400	mg/kg-OC	99	170	34.0	1.13				43.0		2.69		
Acenaphthylene	ug/kg	560		2,000	mg/kg-OC	66	66	30.0	1.00				27.0		1.69		
Acenaphthene	ug/kg	500		2,000	mg/kg-OC	16	57	20.0	0.67	U			21.0		1.31		
Fluorene	ug/kg	540		3,600	mg/kg-OC	23	79	23.0	0.77				32.0		2.00		
Phenanthrone	ug/kg	1,500		2,100	mg/kg-OC	100	480	180	6.00				200		12.50		
Anthracene	ug/kg	560		13,000	mg/kg-OC	220	1,200	78.0	2.60				52.0		3.25		
2-Methylnaphthalene	ug/kg	670		1,900	mg/kg-OC	38	64	22.0	0.73				20.0		1.25	U	
<b>Total LPAH</b>	ug/kg	5,200		29,000	mg/kg-OC	370	780	377	12.6				385		24.1		
Fluoranthene	ug/kg	1,700	4,600	30,000	mg/kg-OC	160	1,200	660	22.0				410		25.6		
Pyrene	ug/kg	2,600	11,980	16,000	mg/kg-OC	1,000	1,400	460	15.3				330		20.6		
Benz(a)anthracene	ug/kg	1,300		5,100	mg/kg-OC	110	270	140	4.67				110		6.88		
Chrysene	ug/kg	1,400		21,000	mg/kg-OC	110	460	300	10.0				210		13.1		
<b>Total Benzo(b+k)fluoranthenes</b>	ug/kg	3,200		9,900	mg/kg/OC	230	450	370	12.3				310		19.4		
Benz(a)pyrene	ug/kg	1,600		3,600	mg/kg-OC	99	210	120	4.00				110		6.88		
Indeno(1,2,3-cd)pyrene	ug/kg	600		4,400	mg/kg-OC	34	88	50	1.67				77		4.81		
Dibenzo(a,h)anthracene	ug/kg	230		1,900	mg/kg-OC	12	33	20.0	0.67	U			25.0		1.56		
Benz(g,h,i)perylene	ug/kg	670		3,200	mg/kg-OC	31	78	31.0	1.03				62.0		3.88		
<b>Total HPAH</b>	ug/kg	12,000		69,000	mg/kg-OC	960	5,300	2,140	71.3				1,644		102.8		
1,3-Dichlorobenzene	ug/kg	170			mg/kg-OC	2.3	2.3	20.0	0.67	U			20.0		1.25	U	
1,4-Dichlorobenzene	ug/kg	110		120	mg/kg-OC	3.1	9	20.0	0.67	U			20.0		1.25	U	
1,2-Dichlorobenzene	ug/kg	35		110	mg/kg-OC	2.3	2.3	20.0	0.67	U			20.0		1.25	U	
1,2,4-Trichlorobenzene	ug/kg	31		64	mg/kg-OC	0.81	1.8	20.0	0.67	U			20.0		1.25	U	
Hexachlorobenzene (HCB)	ug/kg	22	168	230	mg/kg-OC	0.38	2.3	20.0	0.67	U			20.0		1.25	U	
Dimethylphthalate	ug/kg	71		1,400	mg/kg-OC	53	53	20.0	0.67	U			20.0		1.25	U	
Diethylphthalate	ug/kg	200		1,200	mg/kg-OC	61	110	20.0	0.67	U			20.0		1.25	U	
Di-n-butylphthalate	ug/kg	1,400		5,100	mg/kg-OC	220	1,700	20.0	0.67	U			20.0		1.25	U	
Butylbenzylphthalate	ug/kg	63		970	mg/kg-OC	4.9	64	20.0	0.67	U			20.0		1.25	U	
Bis(2-ethylhexyl)phthalate	ug/kg	1,300		8,300	mg/kg-OC	47	78	240	8.00				140		8.75		
Di-n-octylphthalate	ug/kg	6,200		6,200	mg/kg-OC	58	4,500	20.0	0.67	U			20.0		1.25	U	
Phenol	ug/kg	420		1,200	ug/kg	420	1,200	20.0	0.67	U			20.0		1.25	U	
2-Methylphenol	ug/kg	63		77	ug/kg	63	63	20.0	0.67	U			20.0		1.25	U	
4-Methylphenol	ug/kg	670		3,600	ug/kg	670	670	33.0	1.10				26.0		1.63		
2,4-Dimethylphenol	ug/kg	29		210	ug/kg	29	29	12.0	0.40	U			20.0		1.25	U	
Pentachlorophenol	ug/kg	400		690	ug/kg	360	690	100	3.33	U			99.0		6.19	U	
Benzyl alcohol	ug/kg	57		87	ug/kg	57	73	20.0	0.67	U			20.0		1.25	U	
Benzoic acid	ug/kg	650		760	ug/kg	650	650	200	6.67	U			200		12.50	U	
Dibenzofuran	ug/kg	540		1,700	mg/kg-OC	15	58	26.0	0.87				25.0		1.56		
Hexachloroethane	ug/kg	600		1,600	mg/kg-OC			20.0	0.67	U			20.0		1.25	U	
Hexachlorobutadiene	ug/kg	29		270	mg/kg-OC	3.9	6.2	20.0	0.67	U			20.0		1.25	U	
N-Nitrosodiphenylamine	ug/kg	280		130	mg/kg-OC	11	11	20.0	0.67	U			20.0		1.25	U	
Trichloroethene	ug/kg	160		1,600	ug/kg	--	--	NA					NA				
Tetrachloroethene	ug/kg	57		210	ug/kg	--	--	NA					NA				
Ethylbenzene	ug/kg	10		50	ug/kg	--	--	NA					NA				
Total Zylene (sum of o-,m-,p-)	ug/kg	40		160	ug/kg	--	--	NA					NA				
Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)	ug/kg	6.9	50	69		--	--	NA					NA				
Aldrin	ug/kg	10				--	--	NA					NA				
Chlordane	ug/kg	10		37		--	--	NA					NA				
Dieldrin	ug/kg	10				--	--	NA					NA				
Heptachlor	ug/kg	10				--	--	NA					NA				
Alpha-BHC	ug/kg		10			--	--	NA					NA				
Gamma-BHC (Lindane)	ug/kg	10				--	--	NA					NA				
Total PCBs	ug/kg	130	38***	3,100.0	mg/kg-OC	12	65	NA					NA				
PCDD/F TEQ (2005 WHO TEFs)(see Table 3):	ng/kg							34.3					3.51				

**Table 2. Cap Sante Boat Haven-West Basin Redevelopment Project, Recency Extension DMMP/SMS Characterization Summary**

CHEMICAL NAME	DMMP				SMS			DMMU ID:		DMMU-C1 (4 Grab Stations)			DMMU-C2 (4 Grab Stations)			
	Units	SL	BT	ML	Units	SQS	CSL	DMMP	SMS	VQ	mg/kg-dry wgt	mg/kg-OC	NA	mg/kg-dry wgt	mg/kg-OC	NA
Total Solids	%										38.6				54.7	
Total Volatile Solids	%										8.3				5.4	
Total Organic Carbon	%										3.0				1.6	
Total Ammonia	mg/kg										NA				NA	
Total Sulfides	mg/kg										1,580				836	
Gravel	%										NA				NA	
Sand	%										NA				NA	
Silt	%										NA				NA	
Clay	%										NA				NA	
Fines (percent silt + clay)	%										NA				NA	
Amphipod ( <i>Eohaustorius estuariorius</i> ):	NH, 2H, 1H															
Juvenile <i>Neanthes</i> 20-day Growth:	NH, 2H, 1H															
Echinoderm Sediment Larval ( <i>Dendraster excentricus</i> )	NH, 2H, 1H															
Bioassay Determination: (P/F)											NA				NA	
BTs exceeded:											NO				NO	
Bioaccumulation conducted:											NO				NO	
ML Rule exceeded:											NO				NO	
PSDDA Determination(Dispersive Site Disposal):											Unsuitable (D)				Unsuitable (D)	
PSDDA Determination (Non-Dispersive Site Disposal):											Unsuitable (ND)				Suitable ND	
DMMU Volume:	cy										3,000				15,200	
Rank											M				M	
Mean Grab sampling depth	cm										10.0				10.0	
Maximum sampling depth (mudline)	cm										10.0				10.0	
DMMU ID:												DMMU-C1			DMMU-C2	

**Legend:**

SL = Screening Level exceedance

BT = Bioaccumulation Trigger exceedance

**Suitable = Non-Dispersive Site Disposal: BB, PG, EB, AK**

**Unsuitable = Dispersive Site (DS) &/or Non-dispersive (ND) Disposal**

SQS = Sediment Quality Standards exceedance (SMS)

CSL = Cleanup Screening Level exceedance (SMS)

VQ = Validation Qualifier

U = undetected at the reported concentration

NA = Not Analyzed

BB = Bellingham bay; PG = Port Gardner; EB = Elliott Bay; AK = Anderson-Ketron Island

**Table 2. Cap Sante Boat Haven-West Basin Redevelopment Project, Recency Extension DMMP/SMS Characterization Summary**

CHEMICAL NAME	DMMU ID:				DMMU-C8 (4 Grab Stations)			DMMU-C9 (4 Grab Stations)						
	Units	SL	BT	ML	Units	SQS	CSL	DMMP	SMS	VQ	DMMP	SMS	VQ	
Antimony		150		200				NA			NA			
Arsenic	mg/kg	57	507.1	700	mg/kg	57	93	NA			NA			
Cadmium	mg/kg	5.1	11.3	14	mg/kg	5.1	6.7	NA			NA			
Chromium	mg/kg	(2)	267	(2)	mg/kg	260	270	NA			NA			
Copper	mg/kg	390	1,027	1,300	mg/kg	390	390	NA			NA			
Lead	mg/kg	450	975	1,200	mg/kg	450	530	NA			NA			
Mercury	mg/kg	0.41	1.5	2.3	mg/kg	0.41	0.59	NA			NA			
Nickel	mg/kg	140	370	370	mg/kg	--	--	NA			NA			
Selenium	mg/kg	(2)	3	(2)	mg/kg	--	--	NA			NA			
Silver	mg/kg	6.1	6.1	8.4	mg/kg	6.1	6.1	NA			NA			
Zinc	mg/kg	410	2,783	3,800	mg/kg	410	960	NA			NA			
TBT ion (porewater)	ug/L	0.15	0.15		ug/L	0.05	0.35	<b>0.040</b>			<b>0.057</b>			
Naphthalene	ug/kg	2,100		2,400	mg/kg-OC	99	170	<b>29.0</b>	<b>1.21</b>		<b>25.0</b>	<b>0.71</b>		
Acenaphthylene	ug/kg	560		2,000	mg/kg-OC	66	66	<b>28.0</b>	<b>1.17</b>		20.0	0.57	U	
Acenaphthene	ug/kg	500		2,000	mg/kg-OC	16	57	20.0	0.83	U	20.0	0.57	U	
Fluorene	ug/kg	540		3,600	mg/kg-OC	23	79	<b>22.0</b>	<b>0.92</b>		<b>20.0</b>	<b>0.57</b>	U	
Phenanthrone	ug/kg	1,500		2,100	mg/kg-OC	100	480	<b>260</b>	<b>10.8</b>		<b>130</b>	<b>3.71</b>		
Anthracene	ug/kg	560		13,000	mg/kg-OC	220	1,200	<b>52.0</b>	<b>2.17</b>		<b>54.0</b>	<b>1.54</b>		
2-Methylnaphthalene	ug/kg	670		1,900	mg/kg-OC	38	64	20.0	0.83	U	20.0	0.57	U	
<b>Total LPAH</b>	ug/kg	5,200		29,000	mg/kg-OC	370	780	<b>411</b>	<b>17.1</b>		<b>249</b>	<b>7.11</b>		
Fluoranthene	ug/kg	1,700		4,600	30,000	mg/kg-OC	160	1,200	<b>650</b>	<b>27.1</b>		<b>510</b>	<b>14.6</b>	
Pyrene	ug/kg	2,600		11,980	16,000	mg/kg-OC	1,000	1,400	<b>470</b>	<b>19.6</b>		<b>410</b>	<b>11.7</b>	
Benz(a)anthracene	ug/kg	1,300		5,100	mg/kg-OC	110	270	<b>120</b>	<b>5.00</b>		<b>110</b>	<b>3.14</b>		
Chrysene	ug/kg	1,400		21,000	mg/kg-OC	110	460	<b>290</b>	<b>12.1</b>		<b>220</b>	<b>6.29</b>		
<b>Total Benzo(b+k)fluoranthenes</b>	ug/kg	3,200		9,900	mg/kg-OC	230	450	<b>350</b>	<b>14.6</b>		<b>290</b>	<b>8.29</b>		
Benz(a)pyrene	ug/kg	1,600		3,600	mg/kg-OC	99	210	<b>94</b>	<b>3.92</b>		<b>89</b>	<b>2.54</b>		
Indeno(1,2,3-cd)pyrene	ug/kg	600		4,400	mg/kg-OC	34	88	<b>37</b>	<b>1.54</b>		<b>34</b>	<b>0.97</b>		
Dibenzo(a,h)anthracene	ug/kg	230		1,900	mg/kg-OC	12	33	20.0	0.83	U	20.0	0.57	U	
Benz(o,h,i)perylene	ug/kg	670		3,200	mg/kg-OC	31	78	20.0	0.83	U	20.0	0.57	U	
<b>Total HPAH</b>	ug/kg	12,000		69,000	mg/kg-OC	960	5,300	<b>2,031</b>	<b>84.6</b>		<b>1,683</b>	<b>48.1</b>		
1,3-Dichlorobenzene	ug/kg	170			mg/kg-OC	2.3	2.3	20.0	0.83	U	20.0	0.57	U	
1,4-Dichlorobenzene	ug/kg	110		120	mg/kg-OC	3.1	9	20.0	0.83	U	20.0	0.57	U	
1,2-Dichlorobenzene	ug/kg	35		110	mg/kg-OC	2.3	2.3	20.0	0.83	U	20.0	0.57	U	
1,2,4-Trichlorobenzene	ug/kg	31		64	mg/kg-OC	0.81	1.8	20.0	0.83	U	20.0	0.57	U	
Hexachlorobenzene (HCB)	ug/kg	22	168	230	mg/kg-OC	0.38	2.3	20.0	0.83	U	20.0	0.57	U	
Dimethylphthalate	ug/kg	71		1,400	mg/kg-OC	53	53	20.0	0.83	U	20.0	0.57	U	
Diethylphthalate	ug/kg	200		1,200	mg/kg-OC	61	110	20.0	0.83	U	20.0	0.57	U	
Di-n-butylphthalate	ug/kg	1,400		5,100	mg/kg-OC	220	1,700	20.0	0.83	U	20.0	0.57	U	
Butylbenzylphthalate	ug/kg	63		970	mg/kg-OC	4.9	64	20.0	0.83	U	20.0	0.57	U	
Bis(2-ethylhexyl)phthalate	ug/kg	1,300		8,300	mg/kg-OC	47	78	<b>120</b>	<b>5.00</b>		<b>110</b>	<b>3.14</b>		
Di-n-octylphthalate	ug/kg	6,200		6,200	mg/kg-OC	58	4,500	20.0	0.83	U	20.0	0.57	U	
Phenol	ug/kg	420		1,200	ug/kg	420	1,200	20.0	0.83	U	20.0	0.57	U	
2-Methylphenol	ug/kg	63		77	ug/kg	63	63	20.0	0.83	U	20.0	0.57	U	
4-Methylphenol	ug/kg	670		3,600	ug/kg	670	670	20.0	0.83	U	<b>25.0</b>	<b>0.71</b>		
2,4-Dimethylphenol	ug/kg	29		210	ug/kg	29	29	20.0	0.83	U	20.0	0.57	U	
Pentachlorophenol	ug/kg	400		690	ug/kg	360	690	<b>98.0</b>	<b>4.08</b>	U	<b>99.0</b>	<b>2.83</b>	U	
Benzyl alcohol	ug/kg	57		87	ug/kg	57	73	20.0	0.83	U	20.0	0.57	U	
Benzoic acid	ug/kg	650		760	ug/kg	650	650	200	8.33	U	200	5.71	U	
Dibenzofuran	ug/kg	540		1,700	mg/kg-OC	15	58	<b>25.0</b>	<b>1.04</b>		20.0	0.57	U	
Hexachloroethane	ug/kg	600		1,600	mg/kg-OC			20.0	0.83	U	20.0	0.57	U	
Hexachlorobutadiene	ug/kg	29		270	mg/kg-OC	3.9	6.2	20.0	0.83	U	20.0	0.57	U	
N-Nitrosodiphenylamine	ug/kg	280		130	mg/kg-OC	11	11	20.0	0.83	U	20.0	0.57	U	
Trichloroethene	ug/kg	160		1,600	ug/kg	--	--	NA			NA			
Tetrachloroethene	ug/kg	57		210	ug/kg	--	--	NA			NA			
Ethylbenzene	ug/kg	10		50	ug/kg	--	--	NA			NA			
Total Zylene (sum of o-,m-,p-)	ug/kg	40		160	ug/kg	--	--	NA			NA			
Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)	ug/kg	6.9	50	69		--	--	NA			NA			
Aldrin	ug/kg	10				--	--	NA			NA			
Chlordane	ug/kg	10		37		--	--	NA			NA			
Dieldrin	ug/kg	10				--	--	NA			NA			
Heptachlor	ug/kg	10				--	--	NA			NA			
Alpha-BHC	ug/kg		10			--	--	NA			NA			
Gamma-BHC (Lindane)	ug/kg		10			--	--	NA			NA			
Total PCBs	ug/kg	130	38***	3,100.0	mg/kg-OC	12	65	NA			NA			
PCDD/F TEQ (2005 WHO TEFs)(see Table 3):	ng/kg							<b>52.6</b>			<b>44.4</b>			

**Table 2. Cap Sante Boat Haven-West Basin Redevelopment Project, Recency Extension DMMP/SMS Characterization Summary**

CHEMICAL NAME	DMMP				SMS			DMMU ID:	DMMU-C8 (4 Grab Stations)			DMMU-C9 (4 Grab Stations)				
	Units	SL	BT	ML	Units	SQS	CSL	DMMP	SMS	VQ	mg/kg-dry wgt	mg/kg-OC	VQ	mg/kg-dry wgt	mg/kg-OC	VQ
Total Solids	%										36.7				36.8	
Total Volatile Solids	%										8.9				9.5	
Total Organic Carbon	%										2.4				3.5	
Total Ammonia	mg/kg										NA				NA	
Total Sulfides	mg/kg										1,580				1,360	
Gravel	%										NA				NA	
Sand	%										NA				NA	
Silt	%										NA				NA	
Clay	%										NA				NA	
Fines (percent silt + clay)	%										NA				NA	
Amphipod ( <i>Eohaustorius estuariorius</i> ):	NH, 2H, 1H															
Juvenile <i>Neanthes</i> 20-day Growth:	NH, 2H, 1H															
Echinoderm Sediment Larval ( <i>Dendraster excentricus</i> )	NH, 2H, 1H															
Bioassay Determination: (P/F)											NA				NA	
BTs exceeded:											NO				NO	
Bioaccumulation conducted:											NO				NO	
ML Rule exceeded:											NO				NO	
PSDDA Determination(Dispersive Site Disposal):											Unsuitable (D)				Unsuitable (D)	
PSDDA Determination (Non-Dispersive Site Disposal):											Unsuitable (ND)				Unsuitable (ND)	
DMMU Volume:	cy										14,500				8,200	
Rank											M				M	
Mean Grab sampling depth	cm										10.0				10.0	
Maximum sampling depth (mudline)	cm										10.0				10.0	
DMMU ID:												DMMU-C8			DMMU-C9	

**Legend:**

SL = Screening Level exceedance

BT = Bioaccumulation Trigger exceedance

**Suitable = Non-Dispersive Site Disposal: BB, PG, EB, AK**

**Unsuitable = Dispersive Site (DS) &/or Non-dispersive (ND) Disposal**

SQS = Sediment Quality Standards exceedance (SMS)

CSL = Cleanup Screening Level exceedance (SMS)

VQ = Validation Qualifier

U = undetected at the report

NA = Not Analyzed

BB = Bellingham bay; PG =

**Table 2. Cap Sante Boat Haven-West Basin Redevelopment Project, Recency Extension DMMP/SMS Characterization Summary**

CHEMICAL NAME					DMMU ID:			Reference (Samish Bay)		
	Units	SL	BT	ML	Units	SQS	CSL	DMMP	mg/kg-dry wgt	mg/kg-OC
DMMP	SMS							SMS		VQ
Antimony		150		200						
Arsenic	mg/kg	57	507.1	700	mg/kg	57	93			
Cadmium	mg/kg	5.1	11.3	14	mg/kg	5.1	6.7			
Chromium	mg/kg	(2)	267	(2)	mg/kg	260	270			
Copper	mg/kg	390	1,027	1,300	mg/kg	390	390			
Lead	mg/kg	450	975	1,200	mg/kg	450	530			
Mercury	mg/kg	0.41	1.5	2.3	mg/kg	0.41	0.59			
Nickel	mg/kg	140	370	370	mg/kg	--	--			
Selenium	mg/kg	(2)	3	(2)	mg/kg	--	--			
Silver	mg/kg	6.1	6.1	8.4	mg/kg	6.1	6.1			
Zinc	mg/kg	410	2,783	3,800	mg/kg	410	960			
TBT ion (porewater)	ug/L	0.15	0.15		ug/L	0.05	0.35			
Naphthalene	ug/kg	2,100		2,400	mg/kg-OC	99	170			
Acenaphthylene	ug/kg	560		2,000	mg/kg-OC	66	66			
Acenaphthene	ug/kg	500		2,000	mg/kg-OC	16	57			
Fluorene	ug/kg	540		3,600	mg/kg-OC	23	79			
Phenanthrene	ug/kg	1,500		2,100	mg/kg-OC	100	480			
Anthracene	ug/kg	560		13,000	mg/kg-OC	220	1,200			
2-Methylnaphthalene	ug/kg	670		1,900	mg/kg-OC	38	64			
<b>Total LPAH</b>	ug/kg	5,200		29,000	mg/kg-OC	370	780			
Fluoranthene	ug/kg	1,700	4,600	30,000	mg/kg-OC	160	1,200			
Pyrene	ug/kg	2,600	11,980	16,000	mg/kg-OC	1,000	1,400			
Benzo(a)anthracene	ug/kg	1,300		5,100	mg/kg-OC	110	270			
Chrysene	ug/kg	1,400		21,000	mg/kg-OC	110	460			
<b>Total Benzo(b+k)fluoranthenes</b>	ug/kg	3,200		9,900	mg/kg/OC	230	450			
Benzo(a)pyrene	ug/kg	1,600		3,600	mg/kg-OC	99	210			
Indeno(1,2,3-cd)pyrene	ug/kg	600		4,400	mg/kg-OC	34	88			
Dibenzo(a,h)anthracene	ug/kg	230		1,900	mg/kg-OC	12	33			
Benzo(g,h,i)perylene	ug/kg	670		3,200	mg/kg-OC	31	78			
<b>Total HPAH</b>	ug/kg	12,000		69,000	mg/kg-OC	960	5,300			
1,3-Dichlorobenzene	ug/kg	170			mg/kg-OC	2.3	2.3			
1,4-Dichlorobenzene	ug/kg	110		120	mg/kg-OC	3.1	9			
1,2-Dichlorobenzene	ug/kg	35		110	mg/kg-OC	2.3	2.3			
1,2,4-Trichlorobenzene	ug/kg	31		64	mg/kg-OC	0.81	1.8			
Hexachlorobenzene (HCB)	ug/kg	22	168	230	mg/kg-OC	0.38	2.3			
Dimethylphthalate	ug/kg	71		1,400	mg/kg-OC	53	53			
Diethylphthalate	ug/kg	200		1,200	mg/kg-OC	61	110			
Di-n-butylphthalate	ug/kg	1,400		5,100	mg/kg-OC	220	1,700			
Butylbenzylphthalate	ug/kg	63		970	mg/kg-OC	4.9	64			
Bis(2-ethylhexyl)phthalate	ug/kg	1,300		8,300	mg/kg-OC	47	78			
Di-n-octylphthalate	ug/kg	6,200		6,200	mg/kg-OC	58	4,500			
Phenol	ug/kg	420		1,200	ug/kg	420	1,200			
2-Methylphenol	ug/kg	63		77	ug/kg	63	63			
4-Methylphenol	ug/kg	670		3,600	ug/kg	670	670			
2,4-Dimethylphenol	ug/kg	29		210	ug/kg	29	29			
Pentachlorophenol	ug/kg	400		690	ug/kg	360	690			
Benzyl alcohol	ug/kg	57		87	ug/kg	57	73			
Benzoic acid	ug/kg	650		760	ug/kg	650	650			
Dibenzofuran	ug/kg	540		1,700	mg/kg-OC	15	58			
Hexachloroethane	ug/kg	600		1,600	mg/kg-OC					
Hexachlorobutadiene	ug/kg	29		270	mg/kg-OC	3.9	6.2			
N-Nitrosodiphenylamine	ug/kg	280		130	mg/kg-OC	11	11			
Trichloroethene	ug/kg	160		1,600	ug/kg	--	--			
Tetrachloroethene	ug/kg	57		210	ug/kg	--	--			
Ethylbenzene	ug/kg	10		50	ug/kg	--	--			
<b>Total Zylene (sum of o-,m-,p-)</b>	ug/kg	40		160	ug/kg	--	--			
<b>Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)</b>	ug/kg	6.9	50	69		--	--			
Aldrin	ug/kg	10				--	--			
Chlordane	ug/kg	10	37			--	--			
Dieldrin	ug/kg	10				--	--			
Heptachlor	ug/kg	10				--	--			
Alpha-BHC	ug/kg		10			--	--			
Gamma-BHC (Lindane)	ug/kg	10				--	--			
<b>Total PCBs</b>	ug/kg	130	38***	3,100.0	mg/kg-OC	12	65			
PCDD/F TEQ (2005 WHO TEFs)(see Table 3):	ng/kg							2.44		

**Table 2. Cap Sante Boat Haven-West Basin Redevelopment Project, Recency Extension DMMP/SMS Characterization Summary**

CHEMICAL NAME	DMMP				SMS			DMMU ID:	Reference (Samish Bay)		
	Units	SL	BT	ML	Units	SQS	CSL	DMMP	mg/kg-dry wgt	mg/kg-OC	VQ
Total Solids	%								35.5		
Total Volatile Solids	%								6.7		
Total Organic Carbon	%								2.3		
Total Ammonia	mg/kg								NA		
Total Sulfides	mg/kg								437		
Gravel	%								NA		
Sand	%								NA		
Silt	%								NA		
Clay	%								NA		
Fines (percent silt + clay)	%								NA		
Amphipod ( <i>Eohaustorius estuariorius</i> ):	NH, 2H, 1H										
Juvenile <i>Neanthes</i> 20-day Growth:	NH, 2H, 1H										
Echinoderm Sediment Larval ( <i>Dendraster excentricus</i> )	NH, 2H, 1H										
Bioassay Determination: (P/F)											
BTs exceeded:											
Bioaccumulation conducted:											
ML Rule exceeded:											
PSDDA Determination(Dispersive Site Disposal):											
PSDDA Determination (Non-Dispersive Site Disposal):											
DMMU Volume:	cy										
Rank											
Mean Grab sampling depth	cm										
Maximum sampling depth (mudline)	cm										
DMMU ID:									Reference (Samish Bay)		

**Legend:**

**SL = Screening Level exceedance**

**BT = Bioaccumulation Trigger exceedance**

**Suitable = Non-Dispersive Site Disposal: BB, PG, EB, AK**

**Unsuitable = Dispersive Site (DS) &/or Non-dispersive (ND) Disposal**

**SQS = Sediment Quality Standards exceedance (SMS)**

**CSL = Cleanup Screening Level exceedance (SMS)**

**VQ = Validation Qualifier**

**U = undetected at the report**

**NA = Not Analyzed**

**BB = Bellingham bay; PG =**

**Table 3. Cap Sante Boat Haven, dioxin/furans analysis results**

Analyte	WHO (05) TEF	DMMU-C1			DMMU-C2			DMMU-C8			DMMU-C9			Samish Reference		
		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	1.3		1.3	0.088	u	0.044	1.4		1.4	1.2		1.2	0.23	j	0.23
1,2,3,7,8-PeCDD	1	11		11	0.94	j	0.94	13		13	11		11	0.76	j	0.76
1,2,3,4,7,8-HxCDD	0.1	20		2	1.2	i	0.12	21		2.1	17		1.7	0.61	i	0.061
1,2,3,6,7,8-HxCDD	0.1	63		6.3	4.7	j	0.47	73		7.3	60		6	3.7	j	0.37
1,2,3,7,8,9-HxCDD	0.1	46		4.6	3.1	j	0.31	50		5	41		4.1	2.2	j	0.22
1,2,3,4,6,7,8-HpCDD	0.01	1	u	0.005	96		0.96	1400		14	1200		12	25		0.25
OCDD	0.0003	9400		2.82	650		0.195	10000		3	8200		2.46	150		0.045
2,3,4,7,8-PeCDF	0.3	5.6		1.68	0.37	j	0.111	6.3		1.89	5.7		1.71	0.63	j	0.189
2,3,7,8-TCDF	0.1	2.8		0.28	0.33	j	0.033	3.6		0.36	3.2		0.32	0.81	j	0.081
1,2,3,4,7,8-HxCDF	0.1	7.6		0.76	0.7	j	0.07	9		0.9	5.9		0.59	0.55	j	0.055
1,2,3,6,7,8-HxCDF	0.1	7.5	e	0.75	0.47	i	0.047	7.8		0.78	7.2		0.72	0.41	j	0.041
2,3,4,6,7,8-HxCDF	0.1	6		0.6	0.79	j	0.079	6.1		0.61	5.6		0.56	0.53	j	0.053
1,2,3,7,8,9-HxCDF	0.1	2.9	j	0.29	0.26	j	0.026	3.2	j	0.32	2.6	j	0.26	0.18	i	0.018
1,2,3,7,8-PeCDF	0.03	3	j	0.09	0.26	j	0.0078	3.3	j	0.099	3.2	j	0.096	0.39	j	0.012
1,2,3,4,6,7,8-HpCDF	0.01	160		1.6	8.2		0.082	160		1.6	150		1.5	4.8	j	0.048
1,2,3,4,7,8,9-HpCDF	0.01	8.8		0.088	0.45	i	0.0045	8.7		0.087	7.3		0.073	0.32	i	0.0032
OCDF	0.0003	600		0.18	25		0.0075	500		0.15	450		0.135	10	B	0.0030
Total TEQ: (U = 1/2)				34.3			3.51			52.6			44.4			2.44
Total TEQ: (U = 0)				34.3			3.46			52.6			44.4			2.44
Total TOC, %:				3.0			1.6			2.4			3.5			2.3

Legend: U = not detected; B = Detected concentration less than 10X the method blank

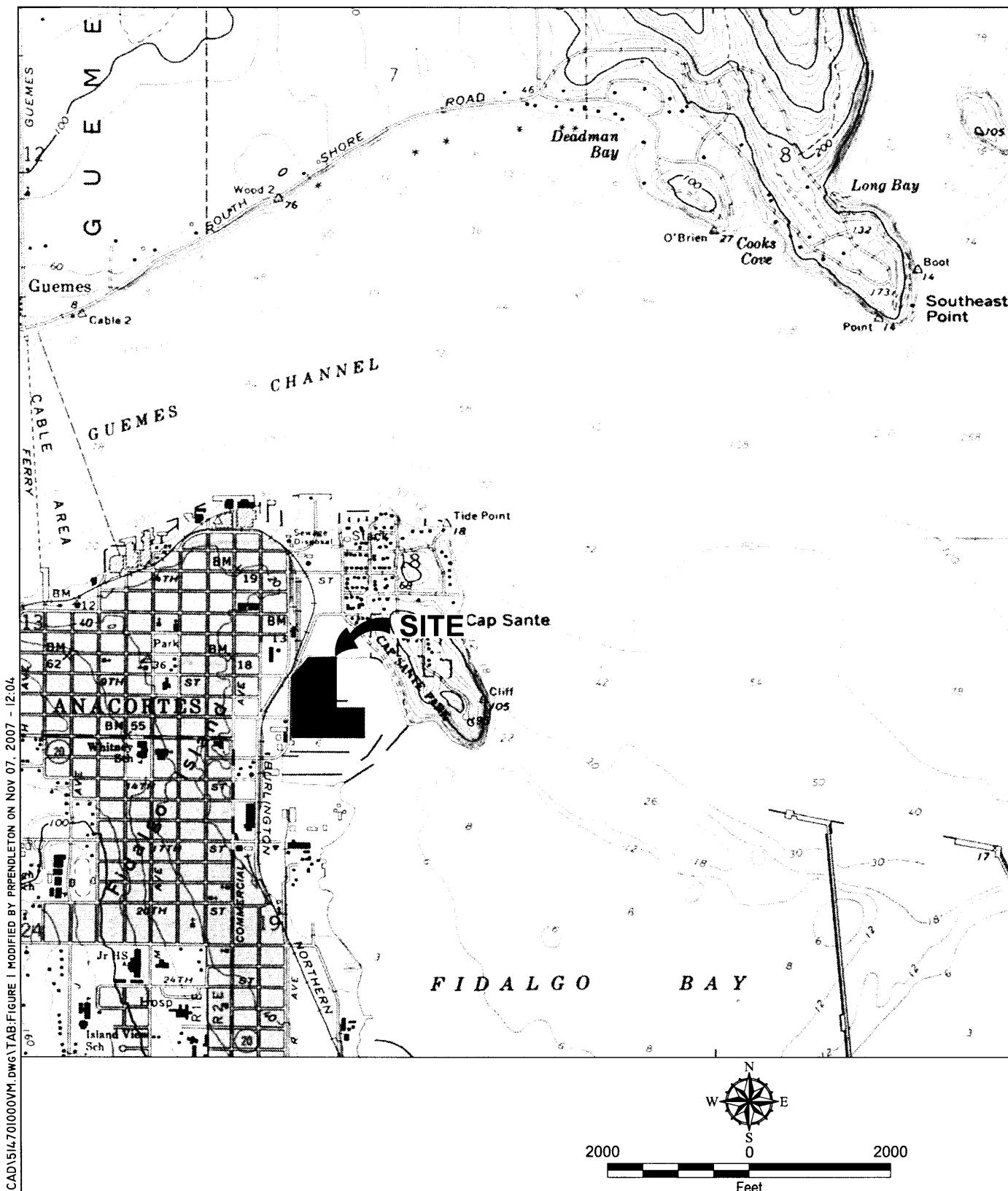
I = Indicating that there is interference present; E = Indicating PC/De interference

J = Indicating that the value is below the calibration range

**Table 4. Current Disposal Site Dioxin Concentrations<sup>1</sup>**

Disposal Site	Offsite Mean	Offsite Maximum
Bellingham Bay	6.9	10.5
Port Gardner	4.1	5.2
Elliott Bay	8	10.6
Commencement Bay	2.4	5.2
Anderson/Ketron	3.6	6.8

<sup>1</sup>Concentrations expressed as pptr-TEQ @ ND = 1/2 DL



**Vicinity Map**

Cap Sante Boat Haven  
Anacortes, Washington

**GEOENGINEERS**

**Figure 1**

Legend:

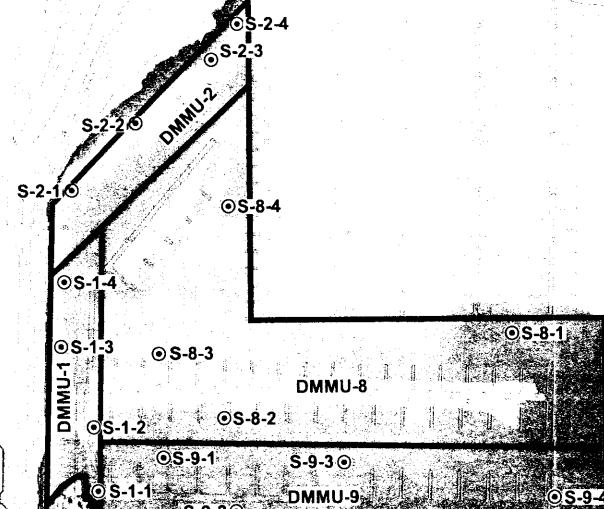
- S-1-1 ● Proposed Sample Location  
— Dredge Boundary  
— DMMU Boundary

DEPTH LEGEND  
(IN FEET, MLLW)

0  
-5  
-10  
-15



200 0 200  
FEET



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Drawing base from David Evans and Associates, entitled Cap Sante Boat Haven, Multibeam Bathymetric Survey, Composite Hill Shade Imagery, Sheet 2 of 2, dated 3/29/06, project number POAN03.

**Site Plan  
Sample Locations**

Cap Sante Boat Haven  
Anacortes, Washington

**GEOENGINEERS** **Figure 2.**

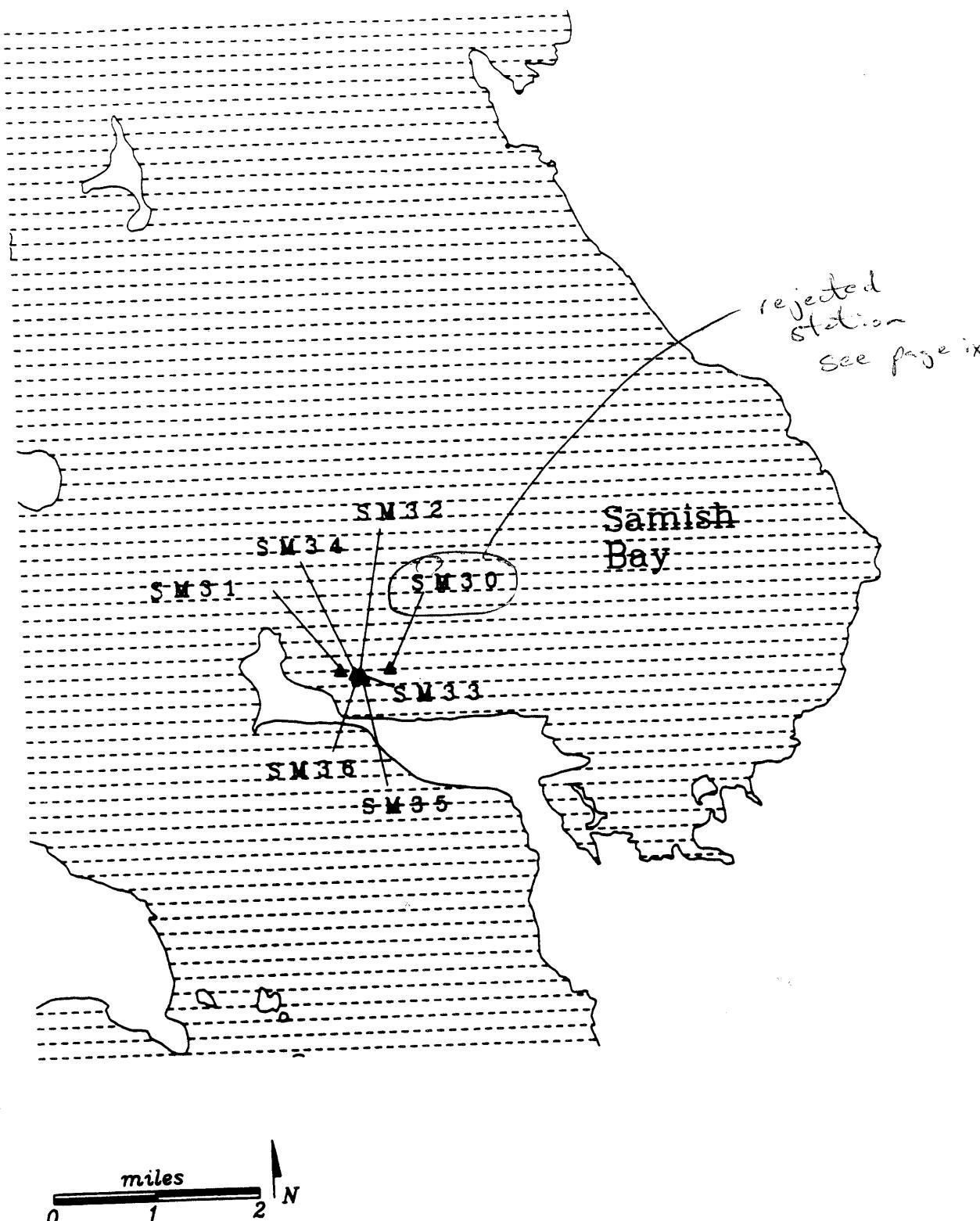


Figure 3. Stations sampled in Samish Bay.



REPLY TO  
ATTENTION OF

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

June 22, 2007

Connie Thoman  
Environmental Administrator  
Port of Anacortes  
First and Commercial Avenue  
P.O. Box 297  
Anacortes, WA 38221

**Re:** Open-Water Disposal Suitability Recency Update for Cap Sante Boat Haven Dredged Material  
(Ref #200200422)

Dear Ms. Thoman:

This letter provides the Dredged Material Management Program (DMMP) response to your June 12, 2007 letter requesting a recency extension for the remaining dredged material proposed for dredging within the Cap Sante Boat Haven Project over the next 3-5 years. The recency for this project expired in 2006. We understand that the Port of Anacortes would like to dredge approximately 23,000 cy of the remaining 40,900 cy within the next 3 to 5 years.

The DMMP agencies reviewed the information provided and re-evaluated the data previously collected for the initial suitability determination pertaining to the remaining dredged material footprint located within portions of Dredged Material Management Unit's (DMMU's) C1, C2, and C9, and for the entire C8 DMMU (see **Figure 1, Table 1**). Our review shows that TBT Screening Level/Bioaccumulation Trigger (SL/BT) was previously exceeded in all 4 DMMUs. Furthermore, C8 also had Polycyclic-Aromatic-Hydrocarbons (PAHs) exceedances of screening levels for Phenanthrene, Chrysene, Fluoranthene, Pyrene, and Total HPAHs. Moreover, Fluoranthene was quantitated at 5,200 ppb in this DMMU, which is above the bioaccumulation trigger (4,600 ppb), but this DMMU was not subjected to bioaccumulation testing during the initial characterization. DMMU-C8 was subjected to bioassay testing and subsequently passed DMMP open-water disposal guidelines. All 4 DMMUs with TBT exceedances underwent and passed bioaccumulation testing in 2 composited analyses. DMMU C2 on reanalysis also had a detection limit SL exceedance for Butyl-benzyl-phthalate, as the current SL was reset in 2004 to 63 ug/kg from 970 ug/kg.

The DMMP agencies also have concerns about potential dioxin concentrations in the Cap Sante dredging area given recent dioxin testing conducted at MJB Properties North Dock dredging area South of Cap Sante Marina, and recent dioxin testing conducted at the Port of Anacortes Dakota Creek and Pier 1 dredging area.

In light of the previous data review, unresolved concerns about potential bioaccumulation of Fluoranthene and elevated PAHs in DMMU C8, and general dioxin concerns, the DMMP agencies determined that the recency for the four DMMUs can **not** be extended without additional testing. The DMMP agencies will require retesting for PAH's and TBT, and testing for dioxin/furans within the four DMMUs. We also recommend collecting a sample at the previously occupied Dakota Creek/Pier 1 reference site in Fidalgo Bay (e.g., AN-REF-1) for dioxin/furan testing (See **Figure 2**). (The DMMP agencies subsequently revised this recommendation to use the Samish Bay Reference). The dioxin/furan testing should follow the latest DMMP guidance implemented following the 2007 Sediment Management Annual Review Meeting ([http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/DMMP\\_DIOXIN\\_CLARIFICATION.pdf](http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/DMMP_DIOXIN_CLARIFICATION.pdf); [http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/dioxin\\_QAPP.pdf](http://www.nws.usace.army.mil/PublicMenu/documents/DMMO/dioxin_QAPP.pdf)). For the dioxin analysis subsamples collected within each of the four DMMUs may be composited for one analysis. However, we recommend archiving subsamples from each DMMU pending DMMP review of the composited analysis results.

**Attachment 1.**

The DMMP agencies look forward to working with the Port of Anacortes to resolve the outstanding sediment quality concerns within the remaining dredged material for the Cap Sante Boat Haven Project area. Please call me at (206-764-3768) if you have any questions or concerns about the DMMP determination regarding recency extension and/or retesting requirements.

Sincerely,



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

Copies furnished:

Randel Perry, Corps Regulatory PM  
John Hertzog, Ph.D., Geoengineers, Inc.  
Ted Benson, Ecology TCP  
Laura Inouye, Ph.D., Ecology  
Helen Pressley, Ecology  
Jonathan Freedman, EPA  
Courtney Wasson, DNR  
DMMO Files

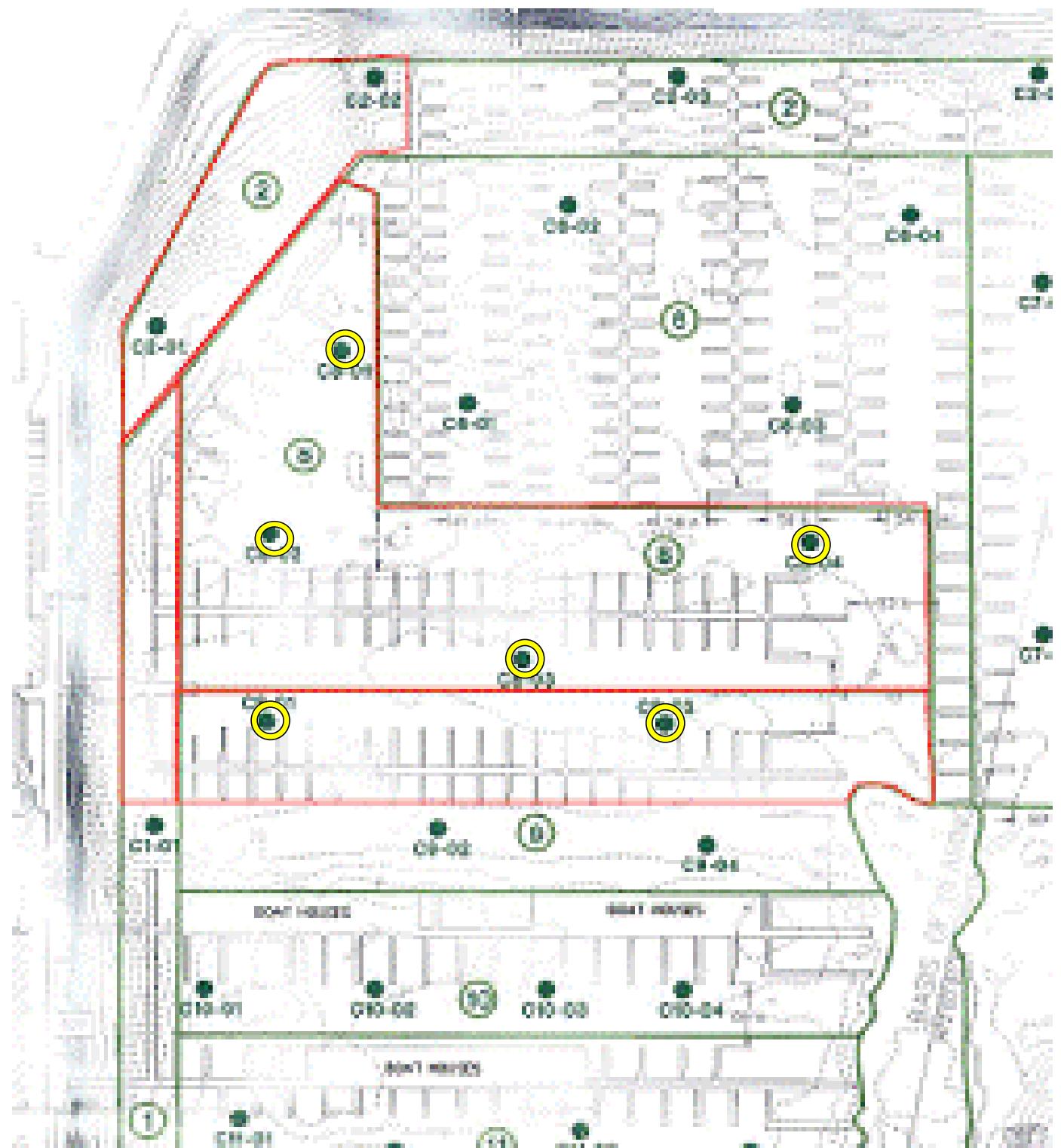


Figure 1. Plan View Schematic depicting DMMU specific dredging areas for the West Basin Redevelopment Phase III dredging footprint (DMMU-1 = 3,000 cy; DMMU-2 = 15,200 cy; DMMU-8 = 14,500 cy; DMMU-9 = 8,200 cy). Total Volume remaining = 40,900 cy; Total Volume anticipated to be dredged in next 3-5 years = 23,000 cy).

**Table 1. Cape Sante Marina Project Recency Extension Evaluation**

DAIS Value Table - Dry Weight Basis

Project:

	units	C1	C2	C8	C9
<b>SEDIMENT CONVENTIONALS</b>					
Total Solids	%	53	53.4	40	59
Volatile Solids	%	9.39	6.94	7.51	9.3
Total Organic Carbon	%	3.6	3.5	3.2	3.9
Ammonia	MG/KG	66	22	58	80
Total Sulfides	MG/KG	270	200	870	930
<b>METALS</b>					
Antimony (1)	MG/KG	5.8 u	5.5 u	5.5 u	6.5 u
Arsenic	MG/KG	6.4	5.2	5.5	6.4
Cadmium	MG/KG	0.58 u	0.55 u	0.55 u	0.65
Chromium	MG/KG	-	-	-	-
Copper	MG/KG	55	43	51	59
Lead (1)	MG/KG	26	12	19	26
Mercury	MG/KG	0.21 u	0.2 u	0.2 u	0.24 u
Nickel	MG/KG	26	28	30	32
Selenium	MG/KG	-	-	-	-
<b>LPAH</b>					
Silver	MG/KG	1.2 u	1.1 u	1.1 u	1.3 u
Zinc	MG/KG	95 j	77 j	90 j	110 j
2-Methylnaphthalene (1)	UG/KG	36	11 j	3 j	4 j
Acenaphthene (1)	UG/KG	50	8 j	30 j	24
Acenaphthylene (1)	UG/KG	23	33	31 j	20
Anthracene (1)	UG/KG	110	72	110	33
Fluorene (1)	UG/KG	45	27	100	30
Naphthalene (1)	UG/KG	110	94	14 j	27
<b>HPAH</b>					
Phenanthrene (1)	UG/KG	220	230	1800	130
Total LPAH (1)	UG/KG	558	464	2085	264
Benzo(a)anthracene (1)	UG/KG	200	260	470	91
Benzo(a)pyrene (1)	UG/KG	130	290	250	87
Benzo(g,h,i)perylene (1)	UG/KG	67	180	130	58
Benzofluoranthenes (1)	UG/KG	330	610	1900	160
Chrysene (1)	UG/KG	290	460	1500	140
Dibenzo(a,h)anthracene (1)	UG/KG	35	27	62 j	27
Fluoranthene	UG/KG	1100	470	5200	250
Indeno(1,2,3-c,d)pyrene (1)	UG/KG	65	160	140	54
<b>CHLORINATED HYDROCARBONS</b>					
Pyrene	UG/KG	440	590	3000	250
Total HPAH (1)	UG/KG	2987	3657	14550	1277
1,2,4-Trichlorobenzene (1)	UG/KG	23 u	31 u	22 u	22 u
1,2-Dichlorobenzene (1)	UG/KG	4 u	4 u	3 u	5 u
1,3-Dichlorobenzene (3)	UG/KG	4 u	4 u	3 u	5 u
<b>PHTHALATES</b>					
1,4-Dichlorobenzene (1)	UG/KG	4 u	4 u	3 u	5 u
Hexachlorobenzene	UG/KG	4 u	3 u	3 u	4 u
Bis(2-ethylhexyl)phthalate (1)	UG/KG	150	180	110	120
Butyl benzyl phthalate (1)	UG/KG	20 j	110 <sup>(4)</sup> u	37 u	38 u
Di-n-butyl phthalate (1)	UG/KG	21 u	36 u	25 u	20 u
Di-n-octyl phthalate (1)	UG/KG	38 u	130	36 u	37 u

	units	C1	C2	C8	C9
<b>PHENOLS</b>					
Diethyl phthalate (1)	UG/KG	28 u	38 u	26 u	27 u
Dimethyl phthalate (1)	UG/KG	25	14 j	14 j	17 j
2 Methylphenol (1)	UG/KG	3.5 j	33 u	1.4 j	2.4 j
2,4-Dimethylphenol (1)	UG/KG	3.4 j	1.3 j	1.3 j	1.4 j
4 Methylphenol (1)	UG/KG	190	74	55	130
<b>MISCELLANEOUS EXTRACTABLES</b>					
Pentachlorophenol	UG/KG	6.5 j	2.7 j	11 j	8 j
Phenol (1)	UG/KG	39 j	15 j	30 j	36 j
Benzoic acid (1)	UG/KG	49 j	50 j	43 j	43 j
Benzyl alcohol (1)	UG/KG	3.2 j	0.77 j	1.9 j	1.9 j
Dibenzofuran (1)	UG/KG	47	9 j	55 j	19
Hexachlorobutadiene (1)	UG/KG	4 u	3 u	3 u	4 u
<b>VOLATILE ORGANICS</b>					
Hexachloroethane (1)	UG/KG	29 u	40 u	28 u	29 u
N-Nitrosodiphenylamine (1)	UG/KG	17 u	23 u	16 u	16 u
Ethylbenzene (1)	UG/KG	4 u	4 u	3 u	5 u
Tetrachloroethene (1)	UG/KG	4 u	4 u	3 u	5 u
<b>PESTICIDES AND PCBs</b>					
Total Xylene (1)	UG/KG	4 u	4 u	3 u	5 u
Trichloroethene (1)	UG/KG	4 u	4 u	3 u	5 u
Aldrin (3)	UG/KG	4 u	3 u	3 u	4 u
Chlordane (2)	UG/KG	4 u	3 u	3 u	4 u
Dieldrin (3)	UG/KG	7 u	7 u	7 u	8 u
Heptachlor (3)	UG/KG	-	-	-	-
Lindane (3)	UG/KG	4 u	3 u	3 u	4 u
<b>ORGANOMETALLICS: TBT</b>	UG/L	0.47	0.20	0.29	0.24
Total DDT	UG/KG	-	-	-	-
Total PCBs	UG/KG	71 u	67 u	68 u	79 u
DMMU Volume (cubic yards)	CY	3,000	15,200	14,500	8,200

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) = Exceeds 2004 SL (63 ug/kg), but below 1998 SL (970 ug/kg)

SL Exceedance (Phenanthrene = 1,500 ug/kg; Chrysene = 1,400 ug/kg; Pyrene = 2,600 ug/kg; Total HPAH = 12,000 ug/kg)

BT Exceedance (TBT = 0.15 ug/L; Fluoranthene = 4,600 ug/kg)

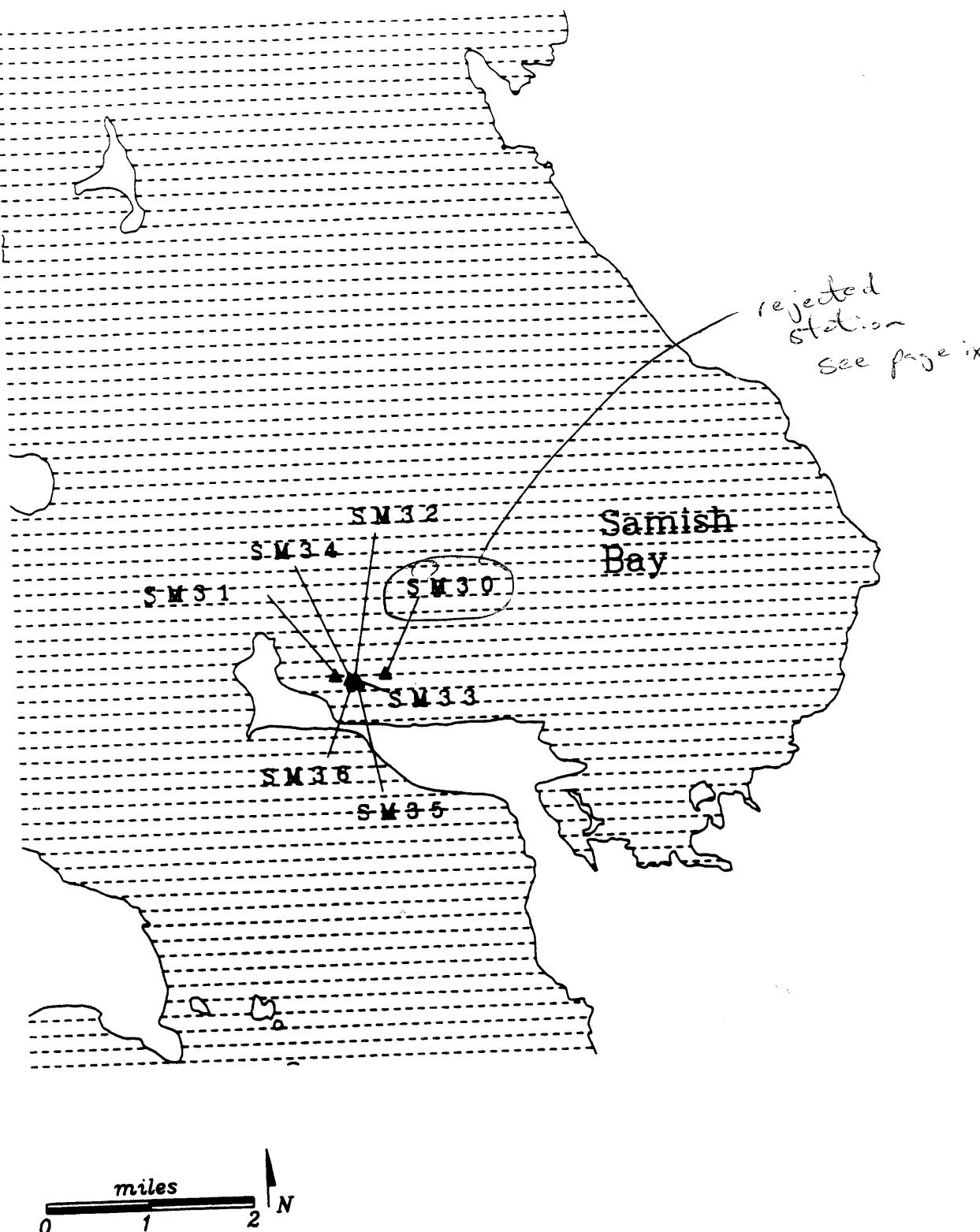


Figure 2.  
(revised per text). Stations sampled in Samish Bay.