Correction in paragraph 10 made 3/23/2016.

22 March 2012

MEMORANDUM FOR RECORD

SUBJECT: DETERMINATION ON THE SUITABILITY OF MATERIAL TESTED FOR THE BIG BEEF CREEK ESTUARY MITIGATION RESTORATION PROJECT, HOOD CANAL, WASHINGTON EVALUATED UNDER SECTION 404 OF THE CLEAN WATER ACT FOR OPEN-WATER DISPOSAL AND/OR BENEFICIAL USES PLACEMENT.

1. The following summary reflects the consensus suitability determination of the Agencies that comprise the regional Dredged Material Management Program (DMMP) for the State of Washington on testing conducted for the evaluation of sediments within the Big Beef Creek Estuary, Hood Canal, Washington (**Figure 1, Vicinity map**). This characterization evaluates approximately 125,00 cy of material within the estuary, for the U.S. Navy Facilities Engineering Command Atlantic (NAVFAC) mitigation planning for the P-990 Explosives Handling Wharf (and other projects that may affect nearshore habitat in Hood Canal, Puget Sound, WA). The sediment quality evaluation effort in Big Beef Creek Estuary is being done in part to investigate mitigation opportunities within this Estuary to determine sediment suitability for either open-water disposal at the Port Gardner non-dispersive site or for in-water beneficial reuse.

2. **Table 1** documents the regulatory tracking information and dates for the DMMP testing conducted.

Table 1. Regulatory Tracking Information and Dates

SAP submittal date	April 28, 2011
SAP approval date:	May 11, 2011
Sampling date:	June 6-9, 2011
Characterization Report submittal:	January 5, 2012
Volume Tested (# DMMUs), Sampling Method:	Up to 160,000 cy (5 DMMUs, 32,000 cy/DMMU) (Vibracore Sampler at 17 core stations)
DAIS Tracking Number:	USNBB-1-A-F-322
Recency Determination Date: **Low-Moderate** = 7 **years**	June 2018 (**Low-Moderate**)

Background:

3. The Naval Base Kitsap Bangor (Bangor) in Kitsap County, Washington, is exploring the feasibility of conducting offsite mitigation for upcoming Explosive Handling Wharf construction planned at Bangor. One potential mitigation project is the hydrologic restoration of Big Beef Creek Estuary, a tidally restricted estuary located along the eastern shoreline of Hood Canal, approximately five miles south of the Bangor waterfront (**Figure 1**). Restoration may

occur by removing the bridge and causeway and replacing them with a single span bridge, and/or by dredging sediments south of the causeway.

4. The mouth of the estuary is restricted by a filled causeway for Seabeck Highway. The causeway restricts tidal flow, which in turn impacts sediment transport, sediment erosion and accretion, tide channel formation and maintenance, detritus import and export, and physical disturbance. Estuary restoration would likely involve removing some or all of the fill and armor associated with the existing Seabeck Highway causeway and bridge, and replacing the bridge with an elevated structure that better spans the embayment mouth. This would help restore tidal exchange and associated nearshore processes. Depending on hydraulic and sediment transport analyses (and the sediment physical characteristics of the estuary mudflat abutting the causeway), it may also be necessary to dredge a portion of the estuary sediments south of the causeway to provide stable condition upon completion of causeway removal.
5. The sediment quality evaluation conducted and summarized in this suitability determination evaluates the potential dredged material which may be removed as part of the estuary restoration effort.

Table 2. Big Beef Creek Estuary DMMP Characterization Sampling Summary.

DMMU ID	Vibracore Station ID	Coordinates		Water Depth, ft	Core depth, ft. (recovery, ft)	DMMU Volume, CY
		Northing	Easting			
C1	1-1	47 39.3275	-122 47.1596	2.2	7 (3.2)	30,000
	1-2A	47 39.3350	-122 47.0666	2.6	7 (3.4)	
	1-3a	47 39.3432	-122 46.9960	2.95	7 (5.5)	
	1-3B	47 39.3376	-122 46.9947	2.55	6.8 (5)	
	1-4	47 39.3731	-122 46.4275	1.65	7 (5)	
C2	2-5A	47 39.3002	-`122 47.0776	2.8	7 (1.8)	30,000
	2-5B	47 39.3002	-122 47.0776	3.4	7 (3.3)	
	2-6	47 39.3080	-122 47.0239	3.2	6.7 (1.7)	
	2-7	47 39.3207	-122 46.9647	3.2	7 (6.2)	
	2-8	47 39.3286	-122 46.9249	2.4	6.5 (3.8)	
C3	3-9	47 39.2641	-122 47.0299	1.8	4.7 (2)	30,000
	3-10B	47 39.2758	-122 46.9752	1.42	4.9 (3.2)	
	3-11A	47 39.2813	-122 46.9374	2.5	7 (5.7)	
	3-12	47 39.2992	-122 46.8921	3.0	6.8 (3.58)	
C4	4-13	47 39.22564	-122 47.0150	2.24	3.2 (1.9)	27,000
	4-14	47 39.2297	-122 46.9516	2.8	3.6 (2.7)	
	4-15	47 39.2392	-122 46.9220	2.58	3.5 (1.3)	
	4-16A	47 39.2484	-122 46.8731	1.8	7.4 (4.5)	
	4-16B	47.39.2482	-122 46.8739	1.83	4.9 (2.3)	
C5	17A	47 39.3981	-122 47.0816	4.4	7.6 (7.1)	8,000
	17B	47 39.3985	-122 47.0795	3.81	7 (6.4)	
	17C	47 39.3983	-122 47.0787	3.6	8 (7.3)	

Datum = MLLW and NAD 83 WA State Plane Coordinates

6. The project was ranked **Low-Moderate** for the DMMP characterization. The SAP was submitted to the DMMP agencies for review/approval on April 28, 2011, and approved by the DMMP agencies on May 11, 2011 with minor revisions (See **Table 1**).

Sampling:

7. **Figure 2** and **Table 2** depicts the seventeen Vibracore stations sampled. Four core stations were sampled and composited within DMMUs (C1 through C4). In some cases as noted in Table 2, more than one core sample was collected to provide sufficient sample volume for analyses. The remaining DMMU (C5) was sampled by one core station (3 separate core samples). The samples were collected between June 6-9, 2011 (**Table 2**), and submitted to the testing laboratory for analyses. The Data Characterization Report was submitted to the DMMP agencies for review on January 5, 2012. The DMMP agencies concluded, after reviewing the data validation report, that the data was acceptable for decision-making using best professional judgment.

Chemical Testing Results:

8. The conventional and DMMP chemical analyses results are summarized in **Table 3,** and the comparative SMS evaluation summary is provided in **Table 3**. Dioxin/furans were not evaluated, after DMMP agencies determined there was no-reason-to-believe dioxin was a chemical of concern in the project evaluation area. The data provided demonstrated that for all chemicals of concern, there were no chemicals exceeding DMMP screening level guidelines, or bioaccumulation triggers, or maximum levels. Evaluation of these data relative to SMS guidelines, indicate that there were no Sediment Quality Standard (SQS) exceedances within the Big Beef Creek Estuary, and all chemicals were below SMS dry weight values or carbon-normalized values for SQS.

9. A single Z-sample (C2-Z) was analyzed and all chemicals (**Table 3**) were below SQS, and were either similar to or less than the overlying DMMU (C2). The results for this Z-sample are in compliance with the antidegradation standard.

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Suitability Determination:

10. The results of the DMMP characterization for the five DMMUs, after comparison to SMS guidelines, indicate that all 125,000 cubic yards of material characterized is suitable for either open-water at either at DMMP non-dispersive ~~or dispersive~~ site, or disposal at appropriate beneficial use locations based on these testing results using best professional judgment (BPJ).

11. This memorandum documents the suitability of material proposed for dredging from the Big Beef Creek Estuary Mitigation Restoration Project, Washington, for open-water disposal or at an appropriate beneficial use 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.

3/23/2016: Material not tested for dispersive disposal, and is suitable only for non-dispersive or BU. This wording was included erroneously.

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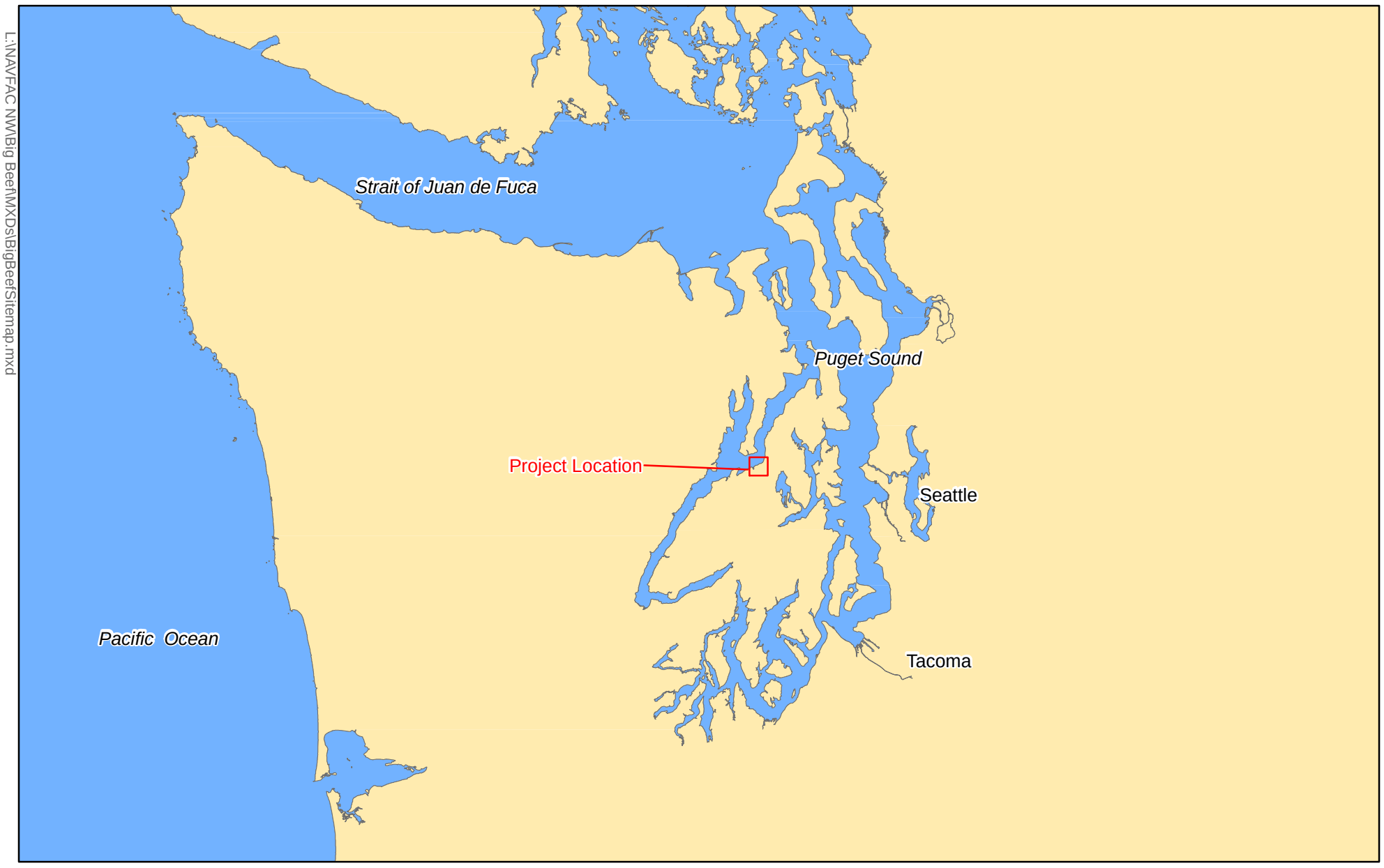
Concur: Signed SDM on file in DMMO Project File

Date	David Kendall, Ph.D., Seattle District Corps of Engineers
Date	Laura Inouye, Ph.D., Washington Department of Ecology
Date	Erika Hoffman, Environmental Protection Agency, Region 10
Date	Celia Barton, Washington Department of Natural Resources

Catherine Blackwell, Corps Regulatory Project Manager
Laura Inouye, Ph.D., Ecology
Erika Hoffman, EPA
Celia Barton, DNR
DMMO File



Bangor EHW #2 Mitigation Restoration Project
Big Beef Estuary

0 600 1,200 Feet
1 inch = 1,000 feet
N

Figure 1. Project Location Map

AECOM

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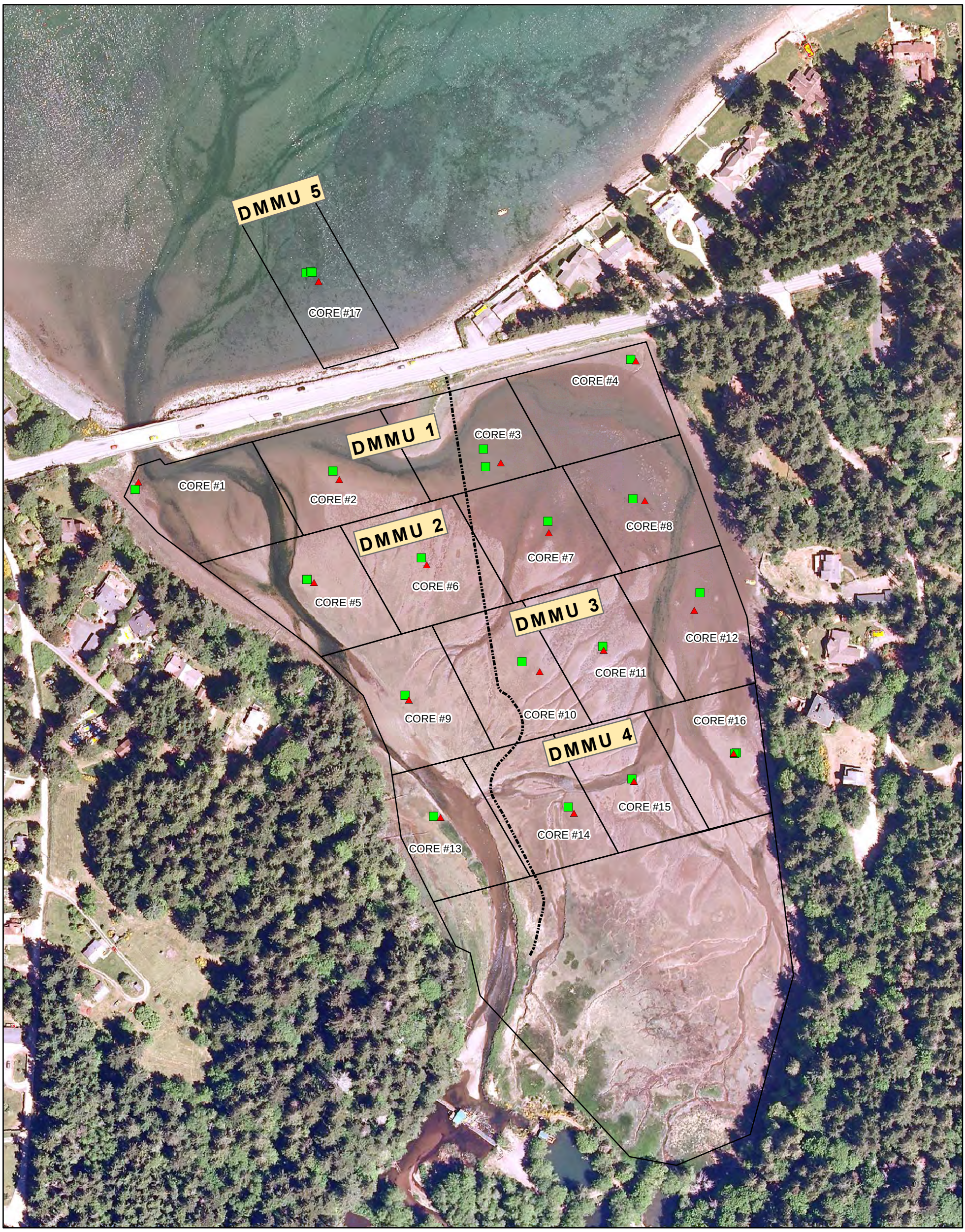
Print Date: 07/28/11



Bangor EHW #2 Mitigation Restoration Project
Big Beef Estuary

0 100 200 Feet
1 inch = 183.33 feet
N

Figure 2. Core Sample Locations - Actual and Proposed

AECOM

Legend

- Proposed Core Locations
- Actual Core Locations
- Surveyed Power Line
- DMMU Footprint

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Print Date: 07/28/11

Table 3. Big Beef Creek Estuary Characterization, Hood Canal,Washington.

Chemical Name	DMMP Guidelines				SMS Guidelines																	
	Unit	SL	ML	BT	Unit	SQS	CSL	DMMU-C1		VQ	DMMU-C2		VQ	DMMU-C2-Z		VQ	DMMU-C3		VQ	DMMU-C4		VQ
								0 - 4 feet			0 - 4 feet			4 - 6 feet			0 - 4 feet			0 - 4 feet		
								DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS		DMMP	SMS	
METALS								dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm		dry wgt	mg-oc-norm	
Antimony	mg/kg dw	150	200	-		--	--	**0.3**		U	0.2		U	0.2		U	0.2		U	0.3		U
Arsenic	mg/kg dw	57	700	507.1	mg/kg	57	93	**2.7**			**2.6**			**1.6**			1.7			2.4		
Cadmium	mg/kg dw	5.1	14	11.3	mg/kg	5.1	6.7	0.1		U	0.1		U	0.1		U	0.1		U	0.1		U
Chromium	mg/kg dw	260	-	260	mg/kg	260	270	**27**			**26.9**			**25**			**28.7**			24.8		
Copper	mg/kg dw	390	1300	1027	mg/kg	390	390	**18.6**			**19.6**			**20.6**			**18.5**			14.3		
Lead	mg/kg dw	450	1200	975	mg/kg	450	530	**5.2**			**15.4**			**1.5**			2.3			3.1		
Mercury	mg/kg dw	0.41	2.3	1.5	mg/kg	0.41	0.59	**0.03**			**0.03**		U	0.02		U	**0.03**		U	0.03		U
Selenium	mg/kg dw	-	-	3	mg/kg	--	--	0.7		U	0.6		U	0.6		U	0.6		U	0.7		U
Silver	mg/kg dw	6.1	8.4	6.1	mg/kg	6.1	6.1	0.3		U	0.2		U	0.2		U	0.2		U	0.3		
Zinc	mg/kg dw	410	3800	2783	mg/kg	410	960	**39**			**42**			**30**			**31**			31		
PAHs																						
2-Methylnaphthalene	µg/kg dw	670	1900	-	mg/kg-OC	38	64	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Acenaphthene	µg/kg dw	500	2000	-	mg/kg-OC	16	57	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Acenaphthylene	µg/kg dw	560	1300	-	mg/kg-OC	66	66	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Anthracene	µg/kg dw	960	13000	-	mg/kg-OC	220	1,200	18	0.92	U	11	0.64	J	18	5.52	U	19	0.84	U	19	0.99	U
Fluorene	µg/kg dw	540	3600	-	mg/kg-OC	23	79	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Naphthalene	µg/kg dw	2100	2400	-	mg/kg-OC	99	170	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Phenanthrene	µg/kg dw	1500	21000	-	mg/kg-OC	100	480	18	0.92	U	**71**	4.15		18	5.52	U	19	0.84	U	19	0.99	U
Total LPAHs (summed)	µg/kg dw	5200	29000	-	mg/kg-OC	370	780	18	0.92	U	**82**	4.80		18	5.52	U	19	0.84	U	19	0.99	U
Benzo(a)anthracene	µg/kg dw	1300	5100	-	mg/kg-OC	110	270	18	0.92	U	**30**	1.75		18	5.52	U	19	0.84	U	19	0.99	U
Benzo(a)pyrene	µg/kg dw	1600	3600	-	mg/kg-OC	99	210	18	0.92	U	**27**	1.58		18	5.52	U	19	0.84	U	19	0.99	U
Benzo(g,h,i)perylene	µg/kg dw	670	3200	-	mg/kg-OC	31	78	18	0.92	U	**21**	1.23		18	5.52	U	19	0.84	U	19	0.99	U
Chrysene	µg/kg dw	1400	21000	-	mg/kg-OC	110	460	18	0.92	U	**31**	1.81		18	5.52	U	19	0.84	U	19	0.99	U
Dibenzo(a,h)anthracene	µg/kg dw	230	1900	-	mg/kg-OC	12	33	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Fluoranthene	µg/kg dw	1700	30000	4600	mg/kg-OC	160	1,200	**13**	0.66	J	**90**	5.26		18	5.52	U	19	0.84	U	**14**	0.73	J
Indeno(1,2,3-cd)pyrene	µg/kg dw	600	4400	-	mg/kg-OC	34	88	18	0.92	U	**17**	0.99		18	5.52	U	19	0.84	U	19	0.99	U
Pyrene	µg/kg dw	2600	16000	11980	mg/kg-OC	1,000	1,400	**11**	0.56	J	**72**	4.21		18	5.52	U	19	0.84	U	**10**	0.52	J
Total Benzofluoranthene	µg/kg dw	3200	9900	-	mg/kg/OC	230	450	**11**	0.56	J	**50**	2.92		18	5.52	U	19	0.84	U	**11**	0.58	J
Total HPAHs (summed)	µg/kg dw	12000	69000	-	mg/kg-OC	960	5,300	**35**	1.79		**338**	19.77		18	5.52	U	19	0.84	U	**35**	1.83	J
CHLORINATED HYDROCARBONS																						
1,2,4-Trichlorobenzene	µg/kg dw	31	64	-	mg/kg-OC	0.81	1.8	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19		U
1,2-Dichlorobenzene	µg/kg dw	35	110	-	mg/kg-OC	2.3	2.3	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
1,4-Dichlorobenzene	µg/kg dw	110	120	-	mg/kg-OC	3.1	9.0	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
1,3-Dichlorobenzene	µg/kg dw	170	-	-	mg/kg-OC	--	--		0.00			0.00			0.00			0.00			0.00	
Hexachlorobenzene	µg/kg dw	22	230	168	mg/kg-OC	0.38	2.3	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
PHTHALATES																						
Bis(2-ethylhexyl) phthalate	µg/kg dw	1300	8300	-	mg/kg-OC	47	78	18		J	23		U	23		U	24		U	**12**		J
Butyl benzyl phthalate	µg/kg dw	63	970	-	mg/kg-OC	4.9	64	18		U	19		U	18		U	19		U	19		U
Diethyl phthalate	µg/kg dw	200	1200	-	mg/kg-OC	61	110	46	2.35	U	47	2.75	U	45	13.80	U	47	2.09	U	19	0.99	U
Dimethyl phthalate	µg/kg dw	71	1400	-	mg/kg-OC	53.0	53.0	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Di-n-butyl phthalate	µg/kg dw	-	-	-	mg/kg-OC	220	1,700	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
Di-n-octyl phthalate	µg/kg dw	6200	6200	-	mg/kg-OC	58	4,500	18	0.92	U	19	1.11	U	18	5.52	U	19	0.84	U	19	0.99	U
PHENOLS																						
2,4-Dimethylphenol	µg/kg dw	29	210	-	ug/kg	29	29	18		UJ	19		UJ	18		UJ	19		UJ	19		UJ
2-Methylphenol	µg/kg dw	63	77	-	ug/kg	63	63	18		U	19		U	18		U	19		U	19		U
4-Methylphenol	µg/kg dw	670	3600	-	ug/kg	670	670	36		U	37		U	36		U	38		U	19		U
Pentachlorophenol	µg/kg dw	400	690	504	ug/kg	360	690	180		U	190		U	180		U	190		U	94		U
Phenol	µg/kg dw	420	1200		ug/kg	420	1,200	**13**		J	**47**			18		U	**19**			**16**		J
Other SVOCs																						
Benzoic Acid	µg/kg dw	650	760	-	ug/kg	650	650	360		U	370		U	360		U	380		U	**50**		J
Benzyl Alcohol	µg/kg dw	57	870	-	ug/kg	57	73	18		U	19		U	19		U	19		U	19		U
Dibenzofuran	µg/kg dw	540	1700	-	mg/kg-OC	15	58	18	0.92	U	19	1.11	U	19	5.83	U	19	0.84	U	19	0.99	U
Hexachlorobutadiene	µg/kg dw	29	270	-	mg/kg-OC	3.9	6.2	0.96	0.05	U	0.95	0.06	U	0.97	0.30	U	0.98	0.04	U	0.98	0.05	U
Hexachloroethane	µg/kg dw	1400	14000	-	mg/kg-OC	--	--	18	0.92	U	19	1.11	U	19	5.83	U	19	0.84	U	19	0.99	U
N-Nitrosodiphenylamine	µg/kg dw	28	130	-	mg/kg-OC	11	11	18	0.92	U	19	1.11	U	19	5.83	U	19	0.84	U	19	0.99	U

Table 3. Big Beef Creek Estuary Characterization, Hood Canal,Washington.

Chemical Name	DMMP Guidelines				SMS Guidelines																
	Unit	SL	ML	BT	Unit	SQS	CSL	DMMU-C1		VQ	DMMU-C2		VQ	DMMU-C2-Z		VQ	DMMU-C3		VQ	DMMU-C4		VQ
								0 - 4 feet			0 - 4 feet			4 - 6 feet			0 - 4 feet			0 - 4 feet		
PESTICIDES																						
Aldrin	µg/kg dw	9.5	-	-		--	--	0.96		U	0.95		U	0.97		U	0.98		U	0.98		U
Dieldrin	µg/kg dw	1.9	-	-		--	--	1.9		U	1.9		U	2		U	2		U	2		U
gamma-BHC (Lindane)	µg/kg dw	-	-	-		--	--	0.96		U	0.95		U	0.97		U	0.98		U	0.98		U
Heptachlor	µg/kg dw	1.5	-	-		--	--	0.96		U	0.95		U	0.97		U	0.98		U	0.98		U
4,4'-DDD	µg/kg dw	16	-	-		--	--	1.9		U	1.9		U	2		U	2		U	2		U
4,4'-DDE	µg/kg dw	9	-	-		--	--	1.9		U	1.9		U	2		U	2		U	2		U
4,4'-DDT	µg/kg dw	12	-	-		--	--	1.9		U	1.9		U	2		U	2		U	2		U
Total DDTs	µg/kg dw	-	69	50		--	--	1.9		U	1.9		U	2		U	2		U	2		U
cis-Chlordane	µg/kg dw	-	-	-		--	--	0.96		U	0.95		U	0.97		U	0.98		U	0.98		U
cis-Nonachlor	µg/kg dw	-	-	-		--	--	1.9		U	1.9		U	2		U	2		U	2		U
oxy-Chlordane								1.9		U	1.9		U	2		U	2		U	2		U
trans-Chlordane	µg/kg dw	-	-	-		--	--	0.96		U	0.95		U	0.97		U	0.98		U	0.98		U
trans-Nonachlor	µg/kg dw	-	-	-		--	--	1.9		U	1.9		U	2		U	2		U	2		U
Total chlordane (summed)	µg/kg dw	2.8	-	-		--	--	1.9		U	1.9		U	2		U	2		U	2		U
PCB Aroclors																						
Aroclor 1016	µg/kg dw	-	-	-		--	--	3.9		U	3.8		U	3.9		U	3.9		U	4		U
Aroclor 1221	µg/kg dw	-	-	-		--	--	3.9		U	3.8		U	3.9		U	3.9		U	4		U
Aroclor 1232	µg/kg dw	-	-	-		--	--	3.9		U	3.8		U	3.9		U	3.9		U	4		U
Aroclor 1242	µg/kg dw	-	-	-		--	--	3.9		U	3.8		U	3.9		U	3.9		U	4		U
Aroclor 1248	µg/kg dw	-	-	-		--	--	3.9		U	3.8		U	3.9		U	3.9		U	4		U
Aroclor 1254	µg/kg dw	-	-	-		--	--	3.9		U	3.8		U	3.9		U	3.9		U	4		U
Aroclor 1260	µg/kg dw	-	-	-		--	--	3.9		U	3.8		U	3.9		U	3.9		U	4		U
Total PCBs (summed)	µg/kg dw	130	3100	-	mg/kg/OC	**12.0**	**65.0**	3.9	0.20	U	3.8	0.22	U	3.9	1.20	U	3.9	0.17	U	4	0.21	U
SEDIMENT CONVENTIONALS																						
Total Solids	ng/kg						%	74			78.3			89.2			71.1			65.8		
Total Volatile Solids	%						%	3.22			2.07			1.4			2.69			3.58		
Total Organic Carbon	%						%	1.96			1.71			0.326			2.25			1.91		
Total Ammonia	mg/kg						mg/kg	2.02			0.96			0.11			0.86			0.8		
Total Sulfides	mg/kg						mg/kg	1.17		U	17.6			85			31			19.9		
Gravel	%						%	27.6		U	30.5			54.5			55.2			37.6		
Sand	%						%	52.9			57.0			41.6			35.7			46.0		
Silt	%						%	12.9			7.5			2.5			6.5			18.3		
Clay	%						%	6.7			4.8			1.6			2.6			8		
Fines (percent silt + clay)	%						%	**19.6**			**12.3**			**4.1**			**11.1**			**26.3**		
Bioassay Determination: **(P/F)**								NA			NA			NA			NA			NA		
BTs exceeded: **Y/N**								N			N			N			N			N		
Bioaccumulation conducted: **Y/N**								N			N			N			N			N		
Bioaccumulation Determination: **(P/F)**																						
ML Rule exceeded: **Y/N**								N			N			N			N			N		
PSDDA Determination: (Suitable/Unsuitable)								**Suitable**	**Suitable BU**		**Suitable**	**Suitable BU**			**SuitableAD**		**Suitable**	**Suitable BU**		**Suitable**	**Suitable BU**	
DMMU Volume: (cy)								30,000			30,000						30,000			27,000		
Rank (Low = L, Moderate = M, Low-Moderate =LM, High = H)								LM			LM						LM			LM		
Maximum core depth (ft)	ft						ft	5.5			6.2						5.7			4.5		
Mean core sampling depth (ft)	ft						ft	4.4			3.4						3.6			2.5		
DMMU ID:								**DMMU-C1**		**VQ**	**DMMU-C2**		**VQ**	**DMMU-C2-Z**			**DMMU-C3**		**VQ**	**DMMU-C4**		**VQ**

Legend:

Bold = detected results

U = Compound not detected above detection limit

UJ = Estimated detection limit

J = Estimated value

NA = Not analyzed

Suitable (Open-Water Disposal)

Suitable BU/AD (Suitable Beneficial Uses, Antidegradation)

Table 3. Big Beef Creek Estuary Characterization, Hood Canal,Washington.

Chemical Name	DMMP Guidelines				SMS Guidelines								
	Unit	SL	ML	BT	Unit	SQS	CSL	DMMU-C5		VQ	DMMU-C5 (dup)		VQ
								0 - 4 feet			0 - 4 feet		
								DMMP	SMS		DMMP	SMS	
METALS								dry wgt	mg-oc-norm		dry wgt	mg-oc-norm	
Antimony	mg/kg dw	150	200	-		--	--	0.2		U	0.2		U
Arsenic	mg/kg dw	57	700	507.1	mg/kg	57	93	1.6			2		
Cadmium	mg/kg dw	5.1	14	11.3	mg/kg	5.1	6.7	0.1		U	0.1		
Chromium	mg/kg dw	260	-	260	mg/kg	260	270	27.3			37.6		
Copper	mg/kg dw	390	1300	1027	mg/kg	390	390	13			14.3		
Lead	mg/kg dw	450	1200	975	mg/kg	450	530	1.9			2.1		
Mercury	mg/kg dw	0.41	2.3	1.5	mg/kg	0.41	0.59	0.03		U	0.03		U
Selenium	mg/kg dw	-	-	3	mg/kg	--	--	0.6		U	0.6		U
Silver	mg/kg dw	6.1	8.4	6.1	mg/kg	6.1	6.1	0.2		U	0.2		U
Zinc	mg/kg dw	410	3800	2783	mg/kg	410	960	33			33		
PAHs													
2-Methylnaphthalene	µg/kg dw	670	1900	-	mg/kg-OC	38	64	19	3.71	U	19	3.79	U
Acenaphthene	µg/kg dw	500	2000	-	mg/kg-OC	16	57	19	3.71	U	19	3.79	U
Acenaphthylene	µg/kg dw	560	1300	-	mg/kg-OC	66	66	19	3.71	U	19	3.79	U
Anthracene	µg/kg dw	960	13000	-	mg/kg-OC	220	1,200	19	3.71	U	19	3.79	U
Fluorene	µg/kg dw	540	3600	-	mg/kg-OC	23	79	19	3.71	U	19	3.79	U
Naphthalene	µg/kg dw	2100	2400	-	mg/kg-OC	99	170	19	3.71	U	19	3.79	U
Phenanthrene	µg/kg dw	1500	21000	-	mg/kg-OC	100	480	19	3.71	U	**14**	2.79	J
Total LPAHs (summed)	µg/kg dw	5200	29000	-	mg/kg-OC	370	780	19	3.71	U	**14**	2.79	
Benzo(a)anthracene	µg/kg dw	1300	5100	-	mg/kg-OC	110	270	19	3.71	U	19	3.79	U
Benzo(a)pyrene	µg/kg dw	1600	3600	-	mg/kg-OC	99	210	19	3.71	U	19	3.79	U
Benzo(g,h,i)perylene	µg/kg dw	670	3200	-	mg/kg-OC	31	78	19	3.71	U	19	3.79	U
Chrysene	µg/kg dw	1400	21000	-	mg/kg-OC	110	460	19	3.71	U	19	3.79	U
Dibenzo(a,h)anthracene	µg/kg dw	230	1900	-	mg/kg-OC	12	33	19	3.71	U	19	3.79	U
Fluoranthene	µg/kg dw	1700	30000	4600	mg/kg-OC	160	1,200	**10**	1.95	J	**14**	2.79	J
Indeno(1,2,3-cd)pyrene	µg/kg dw	600	4400	-	mg/kg-OC	34	88	19	3.71	U	19	3.79	U
Pyrene	µg/kg dw	2600	16000	11980	mg/kg-OC	1,000	1,400	**11**	2.15	J	**16**	3.19	J
Total Benzofluoranthene	µg/kg dw	3200	9900	-	mg/kg/OC	230	450	19	3.71	U	19	3.79	U
Total HPAHs (summed)	µg/kg dw	12000	69000	-	mg/kg-OC	960	5,300	**21**	4.10	J	**30**	5.99	
CHLORINATED HYDROCARBONS													
1,2,4-Trichlorobenzene	µg/kg dw	31	64	-	mg/kg-OC	0.81	1.8	19		U	19		U
1,2-Dichlorobenzene	µg/kg dw	35	110	-	mg/kg-OC	2.3	2.3	19	3.71	U	19	3.79	U
1,4-Dichlorobenzene	µg/kg dw	110	120	-	mg/kg-OC	3.1	9.0	19	3.71	U	19	3.79	U
1,3-Dichlorobenzene	µg/kg dw	170	-	-	mg/kg-OC	--	--		0.00			0.00	
Hexachlorobenzene	µg/kg dw	22	230	168	mg/kg-OC	0.38	2.3	19	3.71	U	19	3.79	U
PHTHALATES													
Bis(2-ethylhexyl) phthalate	µg/kg dw	1300	8300	-	mg/kg-OC	47	78	24		U	24		U
Butyl benzyl phthalate	µg/kg dw	63	970	-	mg/kg-OC	4.9	64	19		U	19		U
Diethyl phthalate	µg/kg dw	200	1200	-	mg/kg-OC	61	110	47	9.18	U	48	9.58	U
Dimethyl phthalate	µg/kg dw	71	1400	-	mg/kg-OC	53.0	53.0	19	3.71	U	19	3.79	U
Di-n-butyl phthalate	µg/kg dw	-	-	-	mg/kg-OC	220	1,700	19	3.71	U	19	3.79	U
Di-n-octyl phthalate	µg/kg dw	6200	6200	-	mg/kg-OC	58	4,500	19	3.71	U	19	3.79	U
PHENOLS													
2,4-Dimethylphenol	µg/kg dw	29	210	-	ug/kg	29	29	19		UJ	19		UJ
2-Methylphenol	µg/kg dw	63	77	-	ug/kg	63	63	19		U	19		U
4-Methylphenol	µg/kg dw	670	3600	-	ug/kg	670	670	38		U	39		U
Pentachlorophenol	µg/kg dw	400	690	504	ug/kg	360	690	190		U	190		U
Phenol	µg/kg dw	420	1200		ug/kg	420	1,200	19		U	19		U
Other SVOCs													
Benzoic Acid	µg/kg dw	650	760	-	ug/kg	650	650	380		U	390		U
Benzyl Alcohol	µg/kg dw	57	870	-	ug/kg	57	73	19		U	19		U
Dibenzofuran	µg/kg dw	540	1700	-	mg/kg-OC	15	58	19	3.71	U	19	3.79	U
Hexachlorobutadiene	µg/kg dw	29	270	-	mg/kg-OC	3.9	6.2	0.97	0.19	U	0.96	0.19	U
Hexachloroethane	µg/kg dw	1400	14000	-	mg/kg-OC	--	--	19	3.71	U	19	3.79	U
N-Nitrosodiphenylamine	µg/kg dw	28	130	-	mg/kg-OC	11	11	19	3.71	U	19	3.79	U

Table 3. Big Beef Creek Estuary Characterization, Hood Canal,Washington.

Chemical Name	DMMP Guidelines				SMS Guidelines								
	Unit	SL	ML	BT	Unit	SQS	CSL	DMMU-C5		VQ	DMMU-C5 (dup)		VQ
								0 - 4 feet			0 - 4 feet		
PESTICIDES													
Aldrin	µg/kg dw	9.5	-	-		--	--	0.97		U	0.96		U
Dieldrin	µg/kg dw	1.9	-	-		--	--	1.9		U	1.9		U
gamma-BHC (Lindane)	µg/kg dw	-	-	-		--	--	0.97		U	0.96		U
Heptachlor	µg/kg dw	1.5	-	-		--	--	0.97		U	0.96		U
4,4'-DDD	µg/kg dw	16	-	-		--	--	1.9		U	1.9		U
4,4'-DDE	µg/kg dw	9	-	-		--	--	1.9		U	1.9		U
4,4'-DDT	µg/kg dw	12	-	-		--	--	1.9		U	1.9		U
Total DDTs	µg/kg dw	-	69	50		--	--	1.9		U	1.9		U
cis-Chlordane	µg/kg dw	-	-	-		--	--	0.97		U	0.96		U
cis-Nonachlor	µg/kg dw	-	-	-		--	--	1.9		U	1.9		U
oxy-Chlordane								1.9		U	1.9		U
trans-Chlordane	µg/kg dw	-	-	-		--	--	0.97		U	0.96		U
trans-Nonachlor	µg/kg dw	-	-	-		--	--	1.9		U	1.9		U
Total chlordane (summed)	µg/kg dw	2.8	-	-		--	--	1.9		U	1.9		U
PCB Aroclors													
Aroclor 1016	µg/kg dw	-	-	-		--	--	3.9		U	3.9		U
Aroclor 1221	µg/kg dw	-	-	-		--	--	3.9		U	3.9		U
Aroclor 1232	µg/kg dw	-	-	-		--	--	3.9		U	3.9		U
Aroclor 1242	µg/kg dw	-	-	-		--	--	3.9		U	3.9		U
Aroclor 1248	µg/kg dw	-	-	-		--	--	3.9		U	3.9		U
Aroclor 1254	µg/kg dw	-	-	-		--	--	3.9		U	3.9		U
Aroclor 1260	µg/kg dw	-	-	-		--	--	3.9		U	3.9		U
Total PCBs (summed)	µg/kg dw	130	3100	-	mg/kg/OC	**12.0**	**65.0**	3.9	0.76	U	3.9	0.78	U
SEDIMENT CONVENTIONALS													
Total Solids	ng/kg						%	78.1			79.5		
Total Volatile Solids	%						%	1.51			1.4		
Total Organic Carbon	%						%	0.512			0.501		
Total Ammonia	mg/kg						mg/kg	1.1			0.93		
Total Sulfides	mg/kg						mg/kg	1.19		U	1.21		U
Gravel	%						%	28.6					
Sand	%						%	49.0					
Silt	%						%	16.4					
Clay	%						%	5.1					
Fines (percent silt + clay)	%						%	**21.5**					
Bioassay Determination: **(P/F)**								NA			NA		
BTs exceeded: **Y/N**								N					
Bioaccumulation conducted: **Y/N**								N			N		
Bioaccumulation Determination: **(P/F)**													
ML Rule exceeded: **Y/N**								N			N		
PSDDA Determination: (Suitable/Unsuitable)								**Suitable**	**Suitable BU**		**Suitable**	**Suitable BU**	
DMMU Volume: (cy)								8,000					
Rank (Low = L, Moderate = M, Low-Moderate =LM, High = H)								LM					
Maximum core depth (ft)	ft						ft	7.3					
Mean core sampling depth (ft)	ft						ft	6.9					
DMMU ID:								**DMMU-C5**		**VQ**	**DMMU-C5 (dup)**		**VQ**

Legend:

Bold = detected results

U = Compound not detected above detection limit

UJ = Estimated detection limit

J = Estimated value

NA = Not analyzed

Suitable (Open-Water Disposal)

Suitable BU/AD (Suitable Beneficial Uses, Antidegradation)