

MEMORANDUM FOR: RECORD

July 28, 2011

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM KEYSTONE HARBOR NAVIGATION PROJECT (CENWS-OD-TS-NS-24) WHIDBEY ISLAND, WASHINGTON, FOR UNCONFINED OPEN-WATER DISPOSAL AT A DMMP DISPOSAL SITE OR BENEFICIAL RE-USE.

1. **Introduction.** This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the suitability of up to 60,000 cubic yards (cy) of dredged material from Keystone Harbor for disposal at a DMMP open-water site or for beneficial re-use.
2. **Background.** The Corps proposes to maintenance dredge approximately 60,000 cubic yards of littoral drift sand and gravel from the Lake Crockett Navigation Channel in Keystone Harbor. The Corps proposes to bypass the material as a beneficial use down drift on the east-side of the breakwater (Figure 1). The navigation channel has disrupted the littoral drift to the east side, and beach nourishment is necessary. This project was previously dredged in 1987, 1993, 1999, and 2005 and the material was placed on the beach.
3. **Project Summary.** Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Low
Proposed dredging volume	60,000 cubic yards
Proposed dredging depth	-25 feet MLLW plus 1 foot overdepth
Previous Testing	1975, 1976, 1982, 1988
SAP received	April 20, 2011
SAP approved	May 5, 2011
Sampling date	May 12, 2011
Final data report received	July 28, 2011
DAIS Tracking number	KEYST-1-A-F-309
Navigation Section Public Notice	CENWS-OD-TS-NS-24
Recency Determination (Low Rank = 7 years)	May 2018

4. **Project Ranking and Sampling Requirements.** In a low-ranked area the number of samples and analyses are calculated using the following guidelines (DMMP, 2008a):
 - Maximum volume of sediment represented by each field sample = 8,000 cubic yards
 - Maximum volume of sediment represented by each analysis + 60,000
 The material also meets exclusionary criteria under CWA 40 CFR 230.60 (subparagraphs a, b, and

- c). The exclusionary criteria state that material meets the criteria and can be excluded from further testing if it is (1) predominantly sand from a high current/wave energy area; and (2) dredging area is sufficiently removed from contaminant source and (3) where the disposal site is adjacent to the dredging site. The dredging/disposal area is in a highly dynamic littoral drift current/tidal area, and is free from any know sources of contamination.
5. **Sampling.** Sampling took place on May 12, 2011. Based on previous studies, the DMMP agencies determined that the project area is homogenous, so surface grab samples were considered adequate for sediment characterization. Samples were collected using a Van Veen surface grab sampler. Two Dredged Material Management Units were characterized, with 4 grab samples taken for each DMMU. (Figure 2) Rocky substrate prevented sampling at the precise locations proposed in the approved SAP. All sample locations were shifted after multiple attempts at the original location but all samples were taken within the dredge prism. The sampling and compositing scheme is presented in Table 2.
6. **Chemical Analysis.** The approved sampling and analysis plan (Hart Crowser 2011) was followed (with the exception noted above) and quality control guidelines specified by the PSEP and DMMP programs were generally met. The sediment conventional results can be found in Table 3. The grain-size data show that the proposed dredged material is predominantly sand and gravel. The total organic carbon concentration (TOC) was 1.38 percent for DMMU 1 and 0.455 percent for DMMU 2. .

Both samples were analyzed for DMMP chemicals of concern, and for TBT and dioxin. The chemical results (see Table 4) indicated that there were no exceedances of DMMP screening levels (SL), so bioassays were not required. Total TEQ for DMMU 1 was 0.91 ppt and 0.33 ppt for DMMU 2 (ND = ½ MDL). (See Table 5). The data were also compared to the Sediment Management Standards. 1, 2, 4-trichlorobenzene was undetected above the SQS (OC-normalized) in DMMU 2. However, DMMU 2 was not normalized due to low organic carbon, and the analyte value was compared to DMMP SLs for purposes of SQS evaluation. The agencies determined that this chemical was not likely to be present above the SQS, and no further action was required (see Table 6).

7. **Sediment Exposed by Dredging (SED).** The DMMP antidegradation guidelines (DMMP, 2008b) state that chemical analysis of the z-sample is required if the testing results for the overlying sediment are a) found to be unsuitable for unconfined aquatic disposal, or b) if any other project in the same waterbody has shown evidence of subsurface sediments with greater contamination than surface sediments, or c) if there is any other site-specific reason to believe that the SED may fail to meet the antidegradation policy. The agencies determined that z-sample analysis was not required for this project.

8. **Suitability Determination.** This memorandum documents the evaluation of the suitability of sediment proposed for dredging from USACE Keystone Harbor for open-water disposal. The approved sampling and analysis plan was followed. The data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

There were no SL exceedances for DMMP chemicals of concern. In summary, based on the results of the previously described testing, the DMMP agencies conclude that **all 60,000 cubic yards are suitable** for open-water disposal at a dispersive or non-dispersive disposal site, or for beneficial use.

9. **References.**

Hart Crowser, 2011. *Final Sampling and Analysis Plan, Keystone Harbor, Whidbey Island, Washington.* Prepared for US Army Corps of Engineers, May 3, 2011.

Hart Crowser, 2011. *Draft Dredged Material Characterization, Keystone Harbor, Whidbey Island, Oak Harbor WA: Prepared for US Army Corps of Engineers, July 2011.*

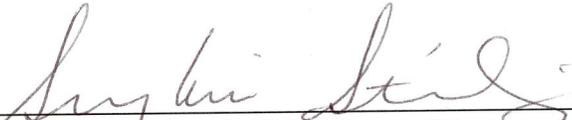
DMMP, 2008a. *Dredged Material Evaluation and Disposal Procedures (Users Manual).* Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, July 2008.

DMMP, 2008b. *Quality of Post-Dredge Sediment Surfaces (Updated).* A Clarification Paper Prepared by David Fox (USACE), Erika Hoffman (EPA) and Tom Gries (Ecology) for the Dredged Material Management Program, June 2008.

10. Agency Signatures.

Concur:

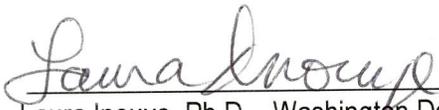
8/9/11
Date


Stephanie Stirling - Seattle District Corps of Engineers

8/4/11
Date


Justine Barton - Environmental Protection Agency

8/4/2011
Date


Laura Inouye, Ph.D. - Washington Department of Ecology

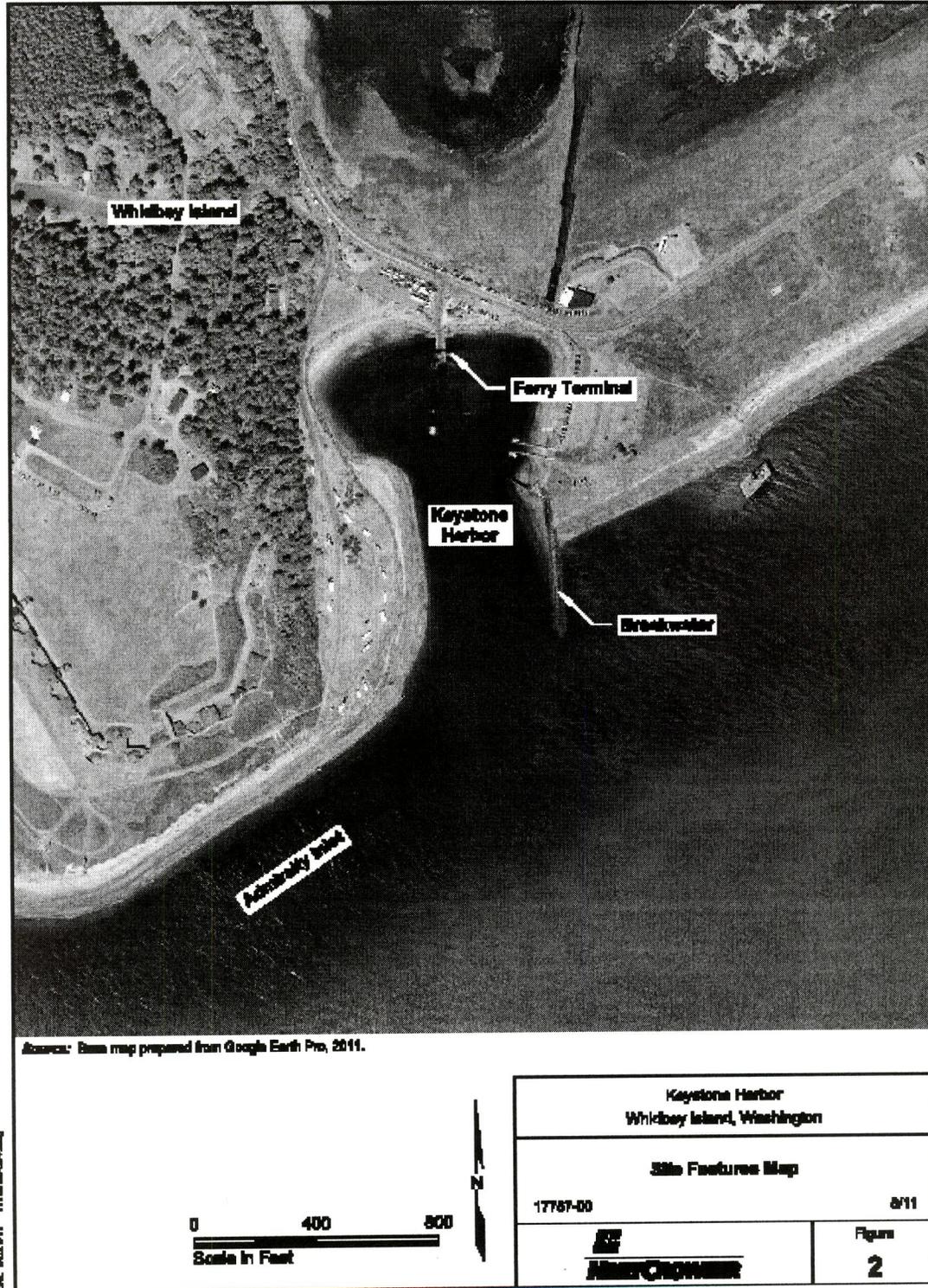
8-4-2011
Date


Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
John Pell, OD-TS-NS
Roger McGinnis, Hart Crowser

Figure 1. Project Location, Keystone Harbor



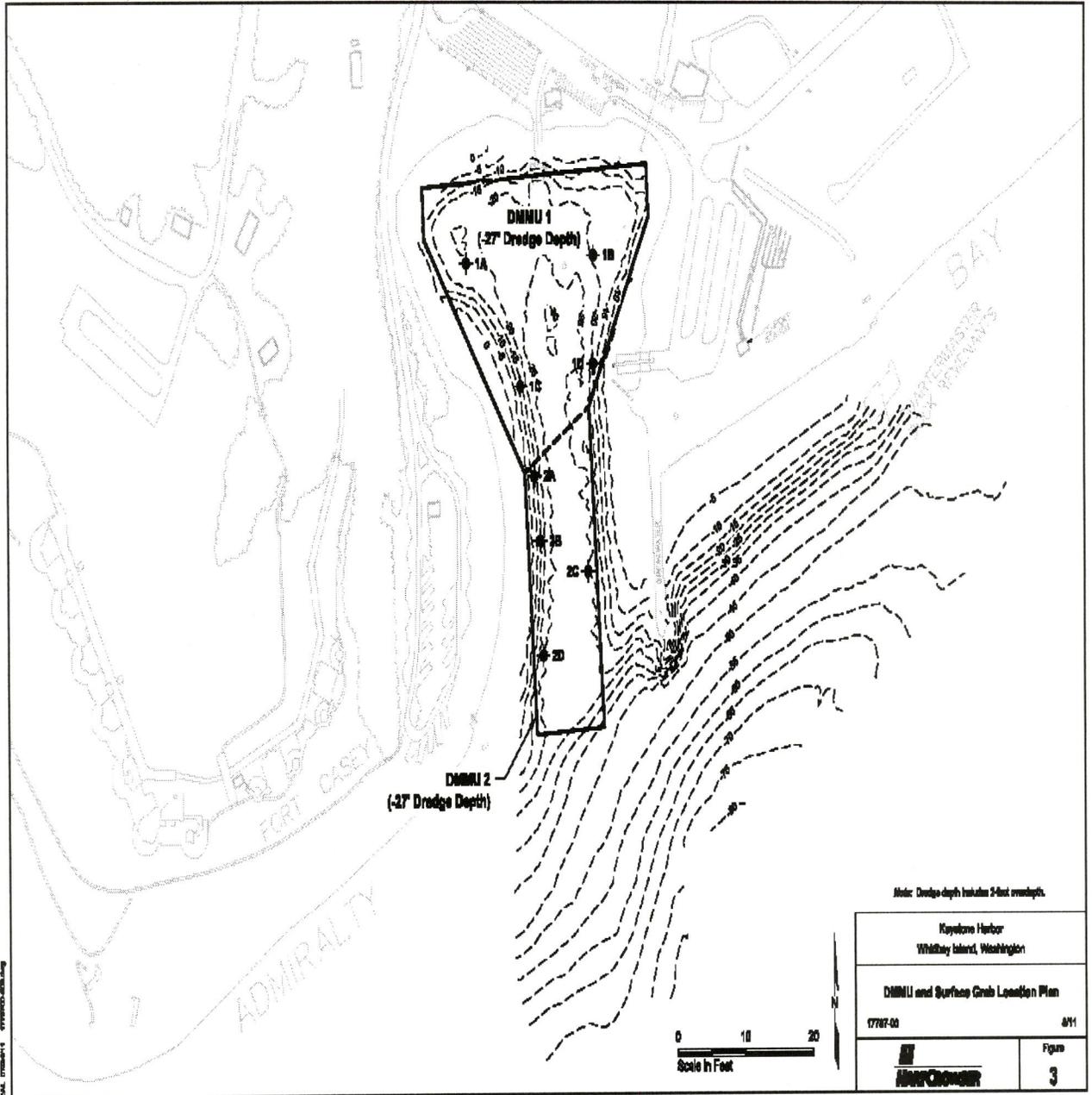


Figure 2 – Sample Locations, Keystone Harbor

Table 2. Sampling and Compositing Scheme

DMMU Number	Composite Surface Grab Sample Identification
DMMU-1	<ul style="list-style-type: none">• 1A• 1B• 1C• 1D
DMMU-2	<ul style="list-style-type: none">• 2A• 2B• 2C• 2D

Table 3. Sediment Conventional Data.

		DMMU 1	DMMU 2
DAIS ID:		S1	S2
GRAIN SIZE	% Gravel:	10.3	30.4
	% Sand:	81.4	67.1
	% Silt:	4.9	1.2
	% Clay:	3.5	1.5
	% Fines (clay+silt):	8.4	2.7
Total Solids (%):		73.2	77.6
Volatile Solids (%):		1.78	0.8
Total Organic Carbon (%):		1.38	0.45
Total Sulfides (mg/kg):		5.27	1.3
Total Ammonia (mg N/kg):		5.71	8.27

Table 4. Chemical results compared to DMMP regulatory guidelines.

CHEMICAL	SL	BT	ML	DMMU 1		DMMU 2	
				conc	QL	conc	QL
METALS (mg/kg dry)							
Antimony	150	---	200	6	uj	6	uj
Arsenic	57	507	700	7.7	u	6.2	u
Cadmium	5.1	11.3	14	0.3	u	0.2	u
Chromium	---	267	---	29.1		21.6	
Copper	390	1,027	1,300	9.1		8.7	
Lead	450	975	1,200	3	u	2	u
Mercury	0.41	1.5	2.3	0.03	u	0.02	u
Nickel	140	370	370	45		36	
Silver	6.1	6.1	8.4	0.4	u	0.4	u
Zinc	410	2,783	3,800	31		25	
Organometallic Compounds							
Tributyltin (ug/kg dry)				0.005	u	0.005	u
LPAH (ug/kg dry)							
2-Methylnaphthalene	670	---	1,900	18	u	18	uj
Acenaphthene	500	---	2,000	18	uj	18	uj
Acenaphthylene	560	---	1,300	11	t	18	uj
Anthracene	960	---	13,000	20		18	uj
Fluorene	540	---	3,600	18	t	18	uj
Naphthalene	2,100	---	2,400	18	uj	18	uj
Phenanthrene	1,500	---	21,000	68		18	uj
Total LPAH	5,200	---	29,000	117		18	u
HPAH (ug/kg dry)							
Benzo(a)anthracene	1,300	---	5,100	77		18	uj
Benzo(a)pyrene	1,600	---	3,600	100		18	uj
Benzo(g,h,i)perylene	670	---	3,200	18		18	uj
Benzo(a)fluoranthene	3,200	---	9,900	100		18	uj
Chrysene	1,400	---	21,000	110		18	uj
Dibenzo(a,h)anthracene	230	---	1,900	18	u	18	uj
Fluoranthene	1,700	4,600	30,000	140		18	uj
Indeno(1,2,3-c,d)pyrene	600	---	4,400	18	t	18	uj
Pyrene	2,600	11,980	16,000	170		18	uj
Total HPAH	12,000	---	69,000	669		18	u
CHLORINATED HYDROCARBONS (ug/kg dry)							
1,2,4-Trichlorobenzene	31	---	64	18	uj	18	uj
1,2-Dichlorobenzene	35	---	110	18	uj	18	uj
1,3-Dichlorobenzene	170	---	---	18	uj	18	uj
1,4-Dichlorobenzene	110	---	120	18	uj	18	uj
Hexachlorobenzene	22	168	230	18	u	18	uj

PHTHALATES (ug/kg dry)							
Bis(2-ethylhexyl)phthalate	1,300	---	8,300	32	u	21	u
Butyl benzyl phthalate	63	---	970	18	u	18	uj
Di-n-butyl phthalate	1,400	---	5,100	16	t	18	uj
Di-n-octyl phthalate	6,200	---	6,200	18	u	18	uj
Diethyl phthalate	200	---	1,200	18	u	18	uj
Dimethyl phthalate	71	---	1,400	13	t	18	uj
PHENOLS (ug/kg dry)							
2 Methylphenol	63	---	77	18	u	18	uj
2,4-Dimethylphenol	29	---	210	18	uj	18	uj
4 Methylphenol	670	---	3,600	28		18	uj
Pentachlorophenol	400	504	690	92	uj	90	uj
Phenol	420	---	1,200	18	u	18	uj
MISCELLANEOUS EXTRACTABLES (ug/kg dry)							
Benzoic acid	650	---	760	62	t	180	uj
Benzyl alcohol	57	---	870	18	u	18	uj
Dibenzofuran	540	---	1,700	24	u	18	uj
Hexachlorobutadiene	29	---	270	18	uj	18	uj
Hexachloroethane	1,400	---	14,000	18	uj	18	uj
N-Nitrosodiphenylamine	28	---	130	18	u	19	uj
VOLATILE ORGANICS (ug/kg dry)							
Ethylbenzene	10	---	50	1	u	0.9	u
Tetrachloroethene	57	---	210	1	u	0.9	u
Total Xylene	40	---	160	2	u	1.8	u
Trichloroethene	160	---	1,600	1	u	0.9	u
PESTICIDES AND PCBs (ug/kg dry)							
Aldrin	10	---	---	0.99	u	0.92	u
Chlordane	10	37	---	3.8		0.92	
Dieldrin	10	---	---	2	u	1.8	u
Heptachlor	10	---	---	0.99	u	0.92	u
Lindane	10	---	---	0.99	u	0.92	u
Total DDT	6.9	50	69	2	uj	1.6	u
Total PCBs	130	---	3,100	4	u	3.6	u
Total PCBs (mg/kg OC)	---	38	---	0.29	u	20	u

u = undetected

uj = analyte not detected above reported sample quantitation limit

t = estimate between MDL and MRL

QL = laboratory qualifier

OC = organic carbon

SL = screening level

BT = bioaccumulation trigger

ML = maximum level

Table 6. Chemical results compared to SMS regulatory guidelines.

CHEMICAL	SQS	CSL	DMMU 1		DMMU 2	
			conc	QL	conc	QL
METALS (mg/kg dry)						
Arsenic	57	93	6	u	7	u
Cadmium	5.1	6.7	0.3	u	0.4	
Chromium	260	270	28.1		38.4	
Copper	390	390	9.4	u	13.5	
Lead	450	530	3		3	u
Mercury	0.41	0.59	0.05	u	0.05	u
Silver	6.1	6.1	0.4	u	0.4	u
Zinc	410	960	26		34	
LPAH (mg/kg OC)						
2-Methylnaphthalene	38	64	1.3	u	3.96	uj
Acenaphthene	16	57	0.89	t	3.96	uj
Acenaphthylene	66	66	1.3	uj	3.96	uj
Anthracene	220	1200	1.45	u	3.96	uj
Fluorene	23	79	1.3	t	3.96	uj
Naphthalene	99	170	1.3	uj	3.96	uj
Phenanthrene	100	480	4.93		3.96	uj
Total LPAH	370	780	8.48		3.96	u
HPAH (mg/kg OC)						
Benzo(a)anthracene	110	270	5.58		3.96	uj
Benzo(a)pyrene	99	210	2.61		3.96	uj
Benzo(g,h,i)perylene	34	88	1.3		3.96	uj
Benzofluoranthenes	230	450	7.25		3.96	uj
Chrysene	110	460	7.97		3.96	uj
Dibenzo(a,h)anthracene	12	33	1.3	u	3.96	uj
Fluoranthene	160	1200	10.14		3.96	uj
Indeno(1,2,3-c,d)pyrene	34	88	1.3	t	3.96	uj
Pyrene	1000	1400	12.32		3.96	uj
Total HPAH	960	5300	48.48		3.96	u
CHLORINATED HYDROCARBONS (mg/kg OC)						
1,2,4-Trichlorobenzene	0.81	1.8	1.3	uj	3.96	uj
1,2-Dichlorobenzene	2.3	2.3	1.3	uj	3.96	uj
1,4-Dichlorobenzene	3.1	9	1.3	uj	3.96	uj
Hexachlorobenzene	0.38	2.3	1.3	u	3.96	uj
PHTHALATES (mg/kg OC)						
Bis(2-ethylhexyl)phthalate	47	78	2.32	u	4.62	u
Butyl benzyl phthalate	4.9	64	1.3	u	3.96	uj
Di-n-butyl phthalate	220	1700	1.3	u	3.96	uj
Di-n-octyl phthalate	58	4500	1.16	t	3.96	uj
Diethyl phthalate	61	110	1.3	u	3.96	uj
Dimethyl phthalate	53	53	0.94	t	3.96	uj

PHENOLS (ug/kg dry)						
2 Methylphenol	63	63	12	t	18	uj
2,4-Dimethylphenol	29	29	18	uj	18	uj
4 Methylphenol	670	670	28		18	uj
Pentachlorophenol	360	690	92	uj	90	uj
Phenol	420	1200	18	u	18	uj
MISCELLANEOUS EXTRACTABLES (ug/kg dry)						
Benzoic acid	650	650	62	t	180	uj
Benzyl alcohol	57	73	18	u	18	uj
MISCELLANEOUS EXTRACTABLES (mg/kg OC)						
Dibenzofuran	15	58	1.74		3.96	uj
Hexachlorobutadiene	3.9	6.2	1.3	uj	3.96	uj
N-Nitrosodiphenylamine	11	11	1.3	u	3.96	uj
PCBs (mg/kg OC)						
Total PCBs (mg/kg carbon)	12	65	0.29	u	0.79	u

u = undetected

uj = analyte not detected above reported sample quantitation limit

t = estimate between MDL and MRL

QL = laboratory qualifier

OC = organic carbon

SMS = Sediment Management Standards

SQS = sediment quality standard

CSL = cleanup screening level

Table 7. Dioxin Results

Sample ID Sampling Date	DMMP			AETs		DMMU-1 5/12/2011	DMMU-2 5/12/2011	DMMU-3 5/12/2011 Dup of DMMU-1
	SL	BT	ML	LAET	2LAET			
DIOXINS (pg/g)								
2,3,7,8-TCDD						0.0619 UJ	0.0497 UJ	0.0588 UJ
1,2,3,7,8-PeCDD						0.265 T	0.161 T	0.169 U
1,2,3,4,7,8-HxCDD						0.206 T	0.0413 J	0.116 UJ
1,2,3,6,7,8-HxCDD						0.607 T	0.135 T	0.471 T
1,2,3,7,8,9-HxCDD						0.355 UJ	0.135 UJ	0.276 UJ
1,2,3,4,6,7,8-HpCDD						22.4	1.67 T	19
OCDD						272	12.3	247
2,3,7,8-TCDF						0.279 U	0.223 U	0.284 U
1,2,3,7,8-PeCDF						0.387 U	0.245 U	0.357 U
2,3,4,7,8-PeCDF						0.259 T	0.143 T	0.161 U
1,2,3,4,7,8-HxCDF						0.455 T	0.27 T	0.394 T
1,2,3,6,7,8-HxCDF						0.23 T	0.115 T	0.178 T
1,2,3,7,8,9-HxCDF						0.134 T	0.046 UJ	0.035 UJ
2,3,4,6,7,8-HxCDF						0.208 T	0.0372 U	0.11 T
1,2,3,4,6,7,8-HpCDF						1.55 U	0.527 U	1.48 U
1,2,3,4,7,8,9-HpCDF						0.186 U	0.0625 U	0.131 T
OCDF						5.99 T	0.632 T	5.23 T
Total TCDD						0.661	0.262	0.663
Total PeCDD						0.932	0.457	0.559
Total HxCDD						9.53	0.427	6.87
Total HpCDD						127	5.72	112
Total TCDF						1.75	0.519	1.95
Total PeCDF						0.838	0.626	1.56
Total HxCDF						2.66	0.857	2.17
Total HpCDF						4.88	0.899	4.67
TEQ (ND = 0)	---	---	---			0.8341	0.28061	0.38228
TEQ (ND = 1/2 MDL)	4	---	10			0.91123	0.33414	0.56863