CENWS-OD-TS-DMMO

MEMORANDUM FOR: RECORD March 26, 2010

SUBJECT: DETERMINATION REGARDING THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM THE WEYERHAEUSER CARGO DOCK, TURNING BASIN AND SALT DOCK, LONGVIEW, WASHINGTON, FOR FLOW-LANE DISPOSAL IN THE COLUMBIA RIVER.

1. Introduction. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Environmental Protection Agency, and Washington Departments of Ecology and Natural Resources) regarding the suitability of up to 115,300 cubic yards (cy) of dredged material from the Weyerhaeuser property in Longview for flow-lane disposal in the Columbia River.

2. Background. In 2008, Weyerhaeuser submitted a sampling and analysis plan (SAP) for characterization of dredged material from the Mount Coffin ship access channel, salt dock, export dock, chip barge slip, cargo dock and turning basin (Integral, 2008). However, during field sampling it was determined that little or no sediment accumulation had occurred above the maintenance depth for the salt dock, cargo dock, turning basin or export dock. Only the chip barge slip and Mount Coffin access channel required dredging. Sediment from these two areas was characterized and a DMMP suitability determination was issued in January 2009 (DMMP, 2009). In December 2009, Weyerhaeuser notified the Corps of Engineers that the salt dock, cargo dock and turning basin required dredging. Because of the short time available before the end of the in-water work window, the DMMP agencies allowed the 2008 SAP to be used, with minor revisions to reflect current shoaling patterns (Integral, 2010a). The SAP addendum allocated dredged material management units (DMMUs) and field samples to each of the proposed dredging areas (see Figure 1).

3. Project Summary. Table 1 includes project summary and tracking information.

Table 1. Project Summary

Project ranking	Low-moderate
Characterized volume	Total: 115,300 cy Salt Dock: 19,600 cy Cargo Dock: 46,400 cy Turning Basin: 49,300 cy
Maintenance depth	-38 ft. CRD
SAP addendum received	January 13, 2010
SAP addendum approved	January 13, 2010
Sampling dates	January 13-14, 2010
Final data report received	March 25, 2010
DAIS Tracking number	WEYLO-1-A-F-287
USACE Permit Application Number	1999-2-00191
Recency Determination (low-moderate rank = 6 years)	January 2016

4. Project Ranking and Sampling Requirements. The Weyerhaeuser property in Longview is ranked "low-moderate" (Integral, 2008). In low-moderate-ranked areas with homogeneous sediment, the minimum numbers of field samples and dredged material management units (DMMUs) are calculated using the following guidelines (DMMP, 2008b):
   - Maximum volume of sediment represented by each field sample = 8,000 cubic yards
   - Maximum volume of sediment represented by each DMMU = 40,000 cubic yards.

   Based on these guidelines, the proposed dredging volume of 115,300 cy would require a minimum of 15 field samples and 3 DMMUs. The SAP addendum called for 18 field samples and 5 DMMUs – well above the minimum requirement.

5. Sampling. Sampling took place January 13-14, 2010 using a van Veen sampler (in areas with homogeneous sediment, surface grab samples are deemed adequate to represent the sediment – DMMP, 2008b). Only minor problems were encountered during sampling. The target locations for G3-4, G4-1 and G5-1 did not have sediment accumulated above the maintenance dredging depth. Therefore, the sampling stations were moved to locations with adequate sediment depth.

   In addition to grab samples, core samples were required for collection of z-samples to represent the sediment surface to be exposed by dredging. Integral Consulting planned to collect z-samples in two layers: 0-1' and 1-2' below the overdepth. However, the sampling team mistakenly collected the z-samples below the design depth rather than the overdepth. A vibracore was used to collect these samples.

   See Figure 1 for target and actual grab and core sampling locations. Table 3 presents this information in tabular form.

6. Chemical Analysis. The approved sampling and analysis plan was followed and quality control guidelines specified by the PSEP and DMMP programs were met, with only minor quality control deviations (Integral, 2010b). The data were considered sufficient and acceptable for regulatory decision-making under the DMMP program.

   For this project, the DMMP agencies agreed to use the SEF freshwater guidelines (RSET, 2006), supplemented by the DMMP marine guidelines (DMMP, 2008b) for those chemicals of concern for which freshwater guidelines do not exist. The preliminary chemical results included a single exceedance of a SEF freshwater screening level. Bis(2-ethylhexyl)phthalate (BEHP) was detected in DMMU 1 at a concentration of 270 ug/kg (the SL1 is 220 ug/kg). There were no exceedances of DMMP marine screening levels. See Table 2.

   Because BEHP was the only chemical exceeding the screening level and because phthalates are common laboratory contaminants, ARI proactively re-extracted all DMMUs on their own, including DMMUs 1 and 5 in duplicate. The results were highly variable (see Table 2). The DMMP agencies then requested that ARI analyze the archived sample for DMMU 1 in duplicate, along with the z-samples associated with DMMU 1. BEHP was detected at low concentrations in DMMU 1 and was also found at a low level in the method blank. The results for the 0-1 ft z-sample were highly variable. The DMMP agencies discussed the results at length vis-à-vis the need to do bioassays. After much discussion the DMMP agencies agreed that the risk in not doing bioassays for this DMMU was small while the navigational impacts of requiring bioassays were very real (Weyerhaeuser would have missed the work window entirely).

Based on the overall evaluation of the chemical data and application of best professional judgment, bioassay testing was not required for the dredged material. All five DMMUs met suitability guidelines, based on chemistry alone, for flow-lane disposal in the Columbia River.

7. Sediment Exposed by Dredging. Sediment to be exposed by dredging must be evaluated in accordance with the DMMP antidegradation guidelines (DMMP 2008a). Vibracore samples were taken from 0-1 feet and 1-2 feet below the project design depth. Based on the results from analysis of the dredged material, and as indicated in the previous section of this memorandum, the z-samples associated with DMMU 1 were tested for BEHP. The results were highly variable, but the highest concentration detected did not exceed the SL1. While the z-samples should have been taken below the overdepth rather than the design depth, it is highly probable that some of the material in the 1-2 foot stratum below the design depth would be left in place after dredging. The DMMP agencies agreed there was little risk in exposing this sediment to the environment or, should the entire 2-foot overdepth be removed, of exposing sediment beyond the overdepth. The sediment to be exposed by dredging was deemed to have met the DMMP antidegradation guidelines.

8. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the Weyerhaeuser property in Longview for flow-lane disposal. The approved sampling and analysis plan was followed (with the exceptions noted previously) and the data gathered were deemed sufficient and acceptable for regulatory decision-making under the DMMP program.

   Based on the results of the previously described testing, the DMMP agencies conclude that all 115,300 cubic yards are suitable for flow-lane disposal in the Columbia River.

9. References.

DMMP, 2008a. 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.

DMMP, 2008b. *Dredged Material Evaluation and Disposal Procedures (Users Manual)*. Dredged Material Management Program, July 2008.

DMMP, 2009. *Determination Regarding the Suitability of Proposed Dredged Material from the Weyerhaeuser Property, Longview, Washington, for Flow-Lane Disposal in the Columbia River or for Beneficial Use*. Dredged Material Management Program, January 2009.

Integral, 2008. *Sampling and Analysis Plan, Sediment Characterization, Weyerhaeuser Property, Longview, Washington.* Prepared by Integral Consulting Inc. for Weyerhaeuser Company. September 2008.

Integral, 2010a. *Sampling and Analysis Plan Addendum, Sediment Characterization, Weyerhaeuser Property, Longview, WA*. Prepared by Integral Consulting Inc. for Weyerhaeuser Company. January 2010.

Integral, 2010b. *Turning Basin Dredged Material Characterization – Field Sediment Sampling Technical Memorandum Summary.* Prepared by Integral Consulting Inc. for Weyerhaeuser NR Company. March 2010.

RSET, 2006. *Northwest Regional Sediment Evaluation Framework, Interim Final.* Northwest Regional Sediment Evaluation Team, September 2006.

10. Agency Signatures.

Concur:

4/1/10

Date | David Fox, P.E. - Seattle District Corps of Engineers

4/1/10

Date | Erika Hoffman - Environmental Protection Agency

04/01/2010

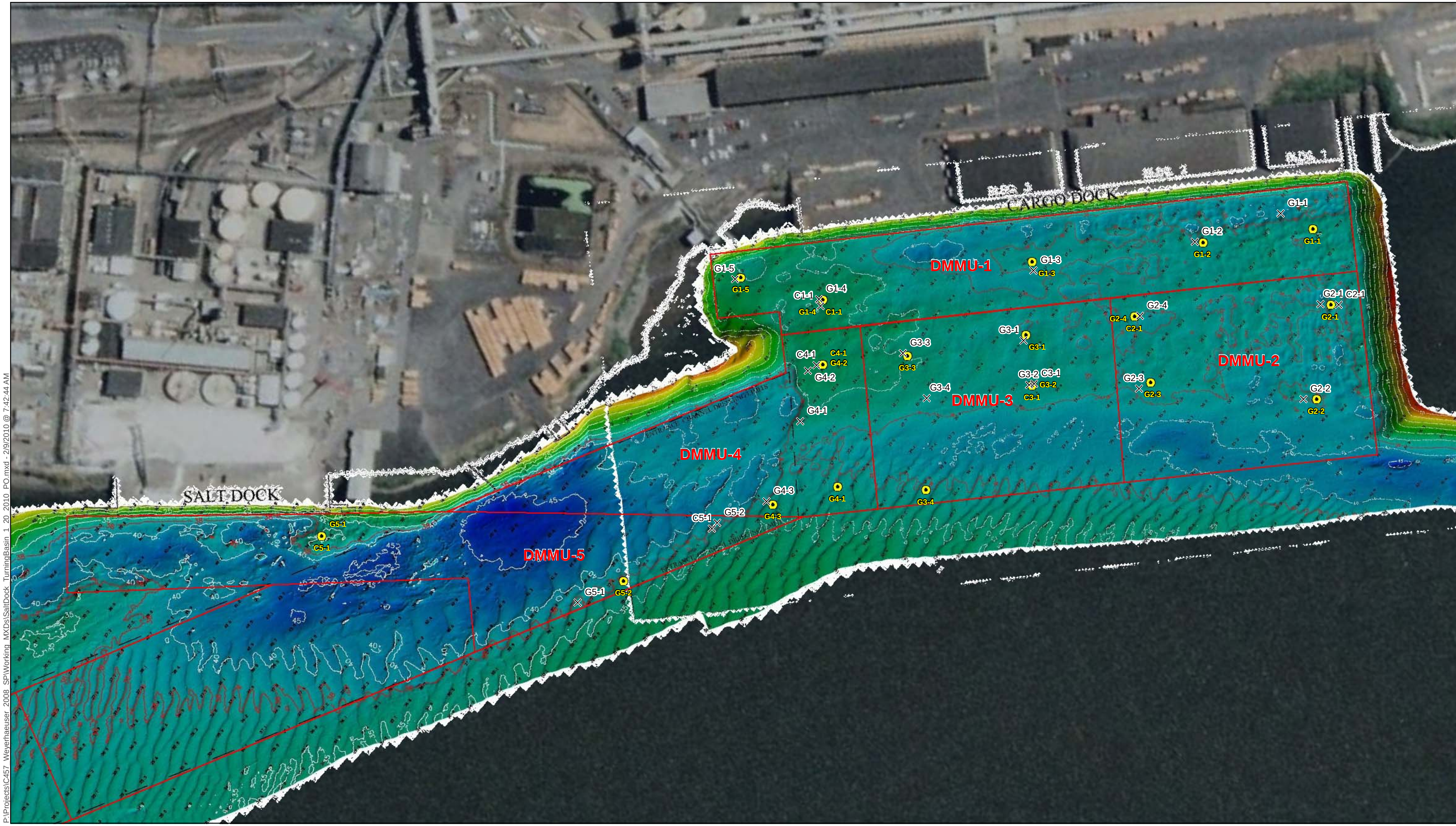
Date | Laura Inouye, Ph.D. - Washington Department of Ecology

04/01/2010

Date | Dave Vagt - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Danette Guy, Corps Regulatory
Sandy Browning, Integral Consulting
Brian Wood, Weyerhaeuser



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integral consulting inc.

0 70 140 280
Feet

Background imagery is for reference purposes only, is courtesy of ESRI and i-cubed online services. Bathymetry provided by Northwest Hydro Inc. (2009) and no longer represents current conditions.

× Actual Sample Location

⊙ January 2010 Proposed Sampling Location

▭ DMMU

Figure 1
Weyerhauser, Longview, WA
Cargo/Salt Docks, Turning Basin, and Ship Access Channel
Actual and Proposed Sampling Locations

Table 2. Weyerhaeuser 2010 Sediment Chemistry Results Compared with SEF Guidelines.[a]

	SEF - Freshwater		DMMP - Marine			C1	C1	C1	C1	C1-Z	C1-Z	C1-Z	C1-Z	
Parameter	SL1	SL2	SL	ML	C1	Re-extract	Re-extract Dup.	Archive	Archive Dup.	(0-1)	(0-1) Dup.	(1-2)	(1-2) Dup.	C2
Conventionals														
N-Ammonia (mg-N/kg)	---	---	---	---	12.5	---	---	---	---	---	---	---	---	8.24
Percent Fines (%)	---	---	---	---	52.6	---	---	---	---	36.9	---	40.7	---	21.7
Total organic carbon (%)	---	---	---	---	0.359	---	---	---	---	0.282	---	0.306	---	0.570
Total solids (%)	---	---	---	---	65.6	---	---	---	---	70.9	---	70.3	---	63.3
Total volatile solids (%)	---	---	---	---	1.67	---	---	---	---	---	---	---	---	1.85
Total sulfides (mg/kg)	---	---	---	---	14.3	---	---	---	---	---	---	---	---	19.9
Metals (mg/kg dw)														
Antimony	---	---	150	200	0.3 *UJ*	---	---	---	---	---	---	---	---	0.3 *U*
Arsenic	20	51	NA	NA	1.6	---	---	---	---	---	---	---	---	1.8
Cadmium	1.1	1.5	NA	NA	0.4	---	---	---	---	---	---	---	---	0.3 *U*
Chromium	95	100	---	---	7.7	---	---	---	---	---	---	---	---	8
Copper	80	830	NA	NA	27.3	---	---	---	---	---	---	---	---	26.2
Lead	340	430	NA	NA	2	---	---	---	---	---	---	---	---	3
Mercury	0.28	0.75	NA	NA	0.04 *U*	---	---	---	---	---	---	---	---	0.04 *U*
Nickel	60	70	NA	NA	8.9	---	---	---	---	---	---	---	---	9.2
Selenium[b]	---	---	---	---	0.3 *U*	---	---	---	---	---	---	---	---	0.3 *U*
Silver	2.0	2.5	NA	NA	0.3 *U*	---	---	---	---	---	---	---	---	0.3 *U*
Zinc	130	400	NA	NA	36	---	---	---	---	---	---	---	---	39
SVOCs (µg/kg dw)														
LPAHs														
2-Methylnaphthalene	470	560	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Acenaphthene	1,100	1,300	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Acenaphthylene	470	640	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Anthracene	1,200	1,600	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Fluorene	1,000	3,000	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Naphthalene	500	1,300	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Phenanthrene	6,100	7,600	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Total LPAH	6,600	9,200	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
HPAH														
Fluoranthene	11,000	15,000	NA	NA	13 *J*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	22
Pyrene	8,800	16,000	NA	NA	12 *J*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	24
Benz(a)anthracene	4,300	5,800	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	11 *J*
Chrysene	5,900	6,400	NA	NA	11 *J*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	17 *J*
Benzofluoranthenes (b+k)	600	4,000	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	24 *J*
Benzo(j)fluoranthene	NA	NA	3,200	9,900	--	--	--	---	---	--	--	--	--	--
Benzo(a)pyrene	3,300	4,800	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	16 *J*
Indeno(1,2,3-c,d)pyrene	4,100	5,300	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Dibenz(a,h)anthracene	800	840	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Benzo(g,h,i)perylene	4,000	5,200	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	11 *J*
Total HPAH	31,000	55,000	NA	NA	36 *J*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	125 *J*
Chlorinated hydrocarbons (µg/kg dw)														
1,3-Dichlorobenzene	NA	NA	170	---	1.2 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	1.2 *U*
1,4-Dichlorobenzene	NA	NA	110	120	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
1,2-Dichlorobenzene	NA	NA	35	110	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
1,2,4-Trichlorobenzene	NA	NA	31	64	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Hexachlorobenzene (HCB)	NA	NA	168	230	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*

Table 2. Weyerhaeuser 2010 Sediment Chemistry Results Compared with SEF Guidelines.[a]

Parameter	SEF - Freshwater SL1	SEF - Freshwater SL2	DMMP - Marine SL	DMMP - Marine ML	C1	C1 Re-extract	C1 Re-extract Dup.	C1 Archive	C1 Archive Dup.	C1-Z (0-1)	C1-Z (0-1) Dup.	C1-Z (1-2)	C1-Z (1-2) Dup.	C2
Phthalate esters (µg/kg dw)														
Dimethyl phthalate	46	440	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Diethyl phthalate	NA	NA	200	1,200	20 *U*	140 *B*	78 *B*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Di-n-butyl phthalate	NA	NA	1,400	5,100	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Butyl benzyl phthalate	260	370	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Bis(2-ethylhexyl)phthalate	220	320	NA	NA	270	260 *J*	64 *UJ*	18 JB	21 B	160 *JB*	20 *JB*	25 *B*	22 *JB*	140
Di-n-octyl phthalate	26	45	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Phenols (µg/kg dw)														
Phenol	---	---	420	1,200	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
2-Methylphenol	---	---	63	77	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
4-Methylphenol	---	---	670	3,600	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
2,4-Dimethylphenol	---	---	29	210	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Pentachlorophenol	---	---	400	690	98 *U*	320 *U*	320 *U*	---	---	100 *U*	99 *U*	98 *U*	100 *U*	98 *U*
Miscellaneous extractables (µg/kg dw)														
Benzyl alcohol	---	---	57	870	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Benzoic acid	NA	NA	650	760	200 *U*	640 *U*	640 *U*	---	---	200 *U*	200 *U*	200 *U*	200 *U*	200 *U*
Dibenzofuran	400	440	NA	NA	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Hexachloroethane	---	---	1,400	14,000	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Hexachlorobutadiene	---	---	29	270	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
N-Nitrosodiphenylamine	---	---	28	130	20 *U*	64 *U*	64 *U*	---	---	20 *U*	20 *U*	20 *U*	20 *U*	20 *U*
Pesticides (µg/kg dw)														
Total DDT	NA	NA	6.9	69	1.9 *U*	---	---	---	---	---	---	---	---	2 *U*
p,p'-DDE	NA	NA	---	---	1.9 *U*	---	---	---	---	---	---	---	---	2 *U*
p,p'-DDD	NA	NA	---	---	1.9 *U*	---	---	---	---	---	---	---	---	2 *U*
p,p'-DDT	NA	NA	---	---	1.9 *U*	---	---	---	---	---	---	---	---	2 *U*
Aldrin	NA	NA	10	---	0.97 *U*	---	---	---	---	---	---	---	---	0.99 *U*
Total Chlordane	NA	NA	10	---	1.9 *U*	---	---	---	---	---	---	---	---	2 *U*
Dieldrin	NA	NA	10	---	1.9 *U*	---	---	---	---	---	---	---	---	2 *U*
Heptachlor	NA	NA	10	---	1.2 *UJ*	---	---	---	---	---	---	---	---	0.99 *U*
Lindane	NA	NA	10	---	0.97 *U*	---	---	---	---	---	---	---	---	0.99 *U*
PCB Aroclors (µg/kg dw)														
Total PCB Aroclors	60	120	NA	NA	9.8 *U*	---	---	---	---	---	---	---	---	10 *U*

Table 2. Weyerhaeuser 2010 Sediment Chemistry Results Compared with SEF Guidelines.[a]

	SEF - Freshwater		DMMP - Marine		C2		C3		C4		C5	C5
Parameter	SL1	SL2	SL	ML	Re-extract	C3	Re-extract	C4	Re-extract	C5	Re-extract	Re-extract Dup.
Conventionals												
N-Ammonia (mg-N/kg)	---	---	---	---	---	2.35	---	1.91	---	0.13 *U*	---	---
Percent Fines (%)	---	---	---	---	---	58	---	48.6	---	1	---	---
Total organic carbon (%)	---	---	---	---	---	0.413	---	0.270	---	0.120	---	---
Total solids (%)	---	---	---	---	---	65.8	---	72.3	---	75.5	---	---
Total volatile solids (%)	---	---	---	---	---	1.57	---	0.89	---	0.47	---	---
Total sulfides (mg/kg)	---	---	---	---	---	1.5 *U*	---	1.35 *U*	---	1.28 *U*	---	---
Metals (mg/kg dw)												
Antimony	---	---	150	200	---	0.3 *U*	---	0.3 *U*	---	0.2 *U*	---	---
Arsenic	20	51	NA	NA	---	1.6	---	1.1	---	0.8	---	---
Cadmium	1.1	1.5	NA	NA	---	0.3	---	0.3 *U*	---	0.2 *U*	---	---
Chromium	95	100	---	---	---	6.8	---	5.5	---	4.6	---	---
Copper	80	830	NA	NA	---	24.5	---	16	---	11.8	---	---
Lead	340	430	NA	NA	---	2	---	1	---	1 *U*	---	---
Mercury	0.28	0.75	NA	NA	---	0.03 *U*	---	0.03 *U*	---	0.03 *U*	---	---
Nickel	60	70	NA	NA	---	8.4	---	8.1	---	6.7	---	---
Selenium[b]	---	---	---	---	---	0.3 *U*	---	0.3 *U*	---	0.2 *U*	---	---
Silver	2.0	2.5	NA	NA	---	0.3 *U*	---	0.3 *U*	---	0.2 *U*	---	---
Zinc	130	400	NA	NA	---	32	---	25	---	21	---	---
SVOCs (µg/kg dw)												
LPAHs												
2-Methylnaphthalene	470	560	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Acenaphthene	1,100	1,300	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Acenaphthylene	470	640	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Anthracene	1,200	1,600	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Fluorene	1,000	3,000	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Naphthalene	500	1,300	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Phenanthrene	6,100	7,600	NA	NA	63 *U*	13 *J*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Total LPAH	6,600	9,200	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
HPAH												
Fluoranthene	11,000	15,000	NA	NA	63 *U*	31	61 *U*	11 *J*	66 *U*	19 *U*	64 *U*	64 *U*
Pyrene	8,800	16,000	NA	NA	63 *U*	25	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Benz(a)anthracene	4,300	5,800	NA	NA	63 *U*	20	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Chrysene	5,900	6,400	NA	NA	63 *U*	22	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Benzofluoranthenes (b+k)	600	4,000	NA	NA	63 *U*	81	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Benzo(j)fluoranthene	NA	NA	3,200	9,900	--	--	--	--	--	--	--	--
Benzo(a)pyrene	3,300	4,800	NA	NA	63 *U*	28	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Indeno(1,2,3-c,d)pyrene	4,100	5,300	NA	NA	63 *U*	16 *J*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Dibenz(a,h)anthracene	800	840	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Benzo(g,h,i)perylene	4,000	5,200	NA	NA	63 *U*	19 *J*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	7 *U*
Total HPAH	31,000	55,000	NA	NA	63 *U*	242 *J*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Chlorinated hydrocarbons (µg/kg dw)												
1,3-Dichlorobenzene	NA	NA	170	---	63 *U*	1.2 *U*	61 *U*	1.2 *U*	66 *U*	1.2 *U*	64 *U*	64 *U*
1,4-Dichlorobenzene	NA	NA	110	120	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
1,2-Dichlorobenzene	NA	NA	35	110	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
1,2,4-Trichlorobenzene	NA	NA	31	64	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Hexachlorobenzene (HCB)	NA	NA	168	230	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*

Table 2. Weyerhaeuser 2010 Sediment Chemistry Results Compared with SEF Guidelines.[a]

	SEF - Freshwater		DMMP - Marine		C2		C3		C4		C5	C5
Parameter	SL1	SL2	SL	ML	Re-extract	C3	Re-extract	C4	Re-extract	C5	Re-extract	Re-extract Dup.
Phthalate esters (µg/kg dw)												
Dimethyl phthalate	46	440	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Diethyl phthalate	NA	NA	200	1,200	33 *JB*	20 *U*	61 *JB*	19 *U*	66 *U*	19 *U*	64 *U*	86 *B*
Di-n-butyl phthalate	NA	NA	1,400	5,100	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Butyl benzyl phthalate	260	370	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Bis(2-ethylhexyl)phthalate	220	320	NA	NA	63 *U*	120	61 *U*	150	66 *U*	120	64 *U*	64 *U*
Di-n-octyl phthalate	26	45	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Phenols (µg/kg dw)												
Phenol	---	---	420	1,200	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
2-Methylphenol	---	---	63	77	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
4-Methylphenol	---	---	670	3,600	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
2,4-Dimethylphenol	---	---	29	210	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Pentachlorophenol	---	---	400	690	310 *U*	98 *U*	310 *U*	97 *U*	330 *U*	96 *U*	320 *U*	320 *U*
Miscellaneous extractables (µg/kg dw)												
Benzyl alcohol	---	---	57	870	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Benzoic acid	NA	NA	650	760	630 *U*	200 *U*	610 *U*	190 *U*	660 *U*	190 *U*	640 *U*	640 *U*
Dibenzofuran	400	440	NA	NA	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Hexachloroethane	---	---	1,400	14,000	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Hexachlorobutadiene	---	---	29	270	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
N-Nitrosodiphenylamine	---	---	28	130	63 *U*	20 *U*	61 *U*	19 *U*	66 *U*	19 *U*	64 *U*	64 *U*
Pesticides (µg/kg dw)												
Total DDT	NA	NA	6.9	69	---	2 *U*	---	1.9 *U*	---	1.9 *U*	---	---
p,p'-DDE	NA	NA	---	---	---	2 *U*	---	1.9 *U*	---	1.9 *U*	---	---
p,p'-DDD	NA	NA	---	---	---	2 *U*	---	1.9 *U*	---	1.9 *U*	---	---
p,p'-DDT	NA	NA	---	---	---	2 *U*	---	1.9 *U*	---	1.9 *U*	---	---
Aldrin	NA	NA	10	---	---	0.98 *U*	---	0.96 *U*	---	0.97 *U*	---	---
Total Chlordane	NA	NA	10	---	---	2 *U*	---	1.9 *U*	---	1.9 *U*	---	---
Dieldrin	NA	NA	10	---	---	2 *U*	---	1.9 *U*	---	1.9 *U*	---	---
Heptachlor	NA	NA	10	---	---	2.1 *UJ*	---	0.96 *U*	---	0.97 *U*	---	---
Lindane	NA	NA	10	---	---	0.98 *U*	---	0.96 *U*	---	0.97 *U*	---	---
PCB Aroclors (µg/kg dw)												
Total PCB Aroclors	60	120	NA	NA	---	10 *U*	---	10 *U*	---	10 *U*	---	---

Notes:

--- = data not available
DMMP = Dredged Material Management Program
HPAH = high molecular weight polycyclic aromatic hydrocarbon
LPAH = low molecular weight polycyclic aromatic hydrocarbon
ML = maximum level
NA = not applicable
PCB = polychlorinated biphenyl
SEF = Sediment Evaluation Framework
SL = screening level
SVOC = semivolatile organic compound

B = analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J = estimated concentration when the value is less than ARI's established reporting limits
U = indicates the target analyte was not detected at the reported concentration

mg-N/kg dw = millegrams-Nitrogen/kilograms dry weight
µg/kg dw = micrograms/kilograms dry weight
Bis(2-ethylhexyl)phthalate exceeded the SL1 in composite sample C1.
Per the SAP (2008), VOCs were not analyzed.
Per the SAP Addendum (2010), resin acids, guaiacols, and dioxin/furans were not analyzed.

[a] The SEF freshwater guidelines are used for those chemicals of concern for which they are available. The DMMP marine guidelines are used for those chemicals of concern for which no freshwater guidelines exist.
[b] The DMMP bioaccumulation trigger for selenium is 3 mg/kg.

Table 3. Weyerhaeuser DMMP Sediment Sampling Summary, Winter 2010

Location	Note	Dredge Volume to 40 ft CRD (cubic yards)	Sample Type	Sample ID	Proposed Location Long_DDM	Proposed Location Lat_DDM	Actual Location Long_DDM	Actual Location Lat_DDM	Design Depth (ft CRD)	Mudline Depth (ft CRD)	Core Depth Below Mudline (ft) Z1	Core Depth Below Mudline (ft) Z2
DMMU 1	Cargo Dock	46,400	Grab	G1-1	122° 58.941' W	46° 7.505' N	-122° 58.946' W	46° 07.517' N	38	35.7	--	--
			Grab	G1-2	122° 58.983' W	46° 7.531' N	-122° 58.986' W	46° 07.533' N		35.9	--	--
			Grab	G1-3	122° 59.049' W	46° 7.572' N	-122° 59.052' W	46° 07.569' N		34.6	--	--
			Grab	G1-4	122° 59.135' W	46° 7.618' N	-122° 59.136' W	46° 07.619 N		33.9	--	--
			Grab	G1-5	122° 59.154' W	46° 7.645' N	-122° 59.157' W	46° 07.646' N		33.9	--	--
			Core	C1-1	122° 59.135' W	46° 7.618' N	-122° 59.138' W	46° 07.617' N		33.4	4.5-5.5	5.5-6.5
DMMU 2	Turning Basin	14,000	Grab	G2-1	122° 58.964' W	46° 7.482' N	-122° 58.967' W	46° 07.485' N	38	34.9*	--	--
			Grab	G2-2	122° 59.005' W	46° 7.464' N	-122° 59.009' W	46° 07.467' N		39.5*	--	--
			Grab	G2-3	122° 59.055' W	46° 7.512' N	-122° 59.061' W	46° 07.513' N		37.9*	--	--
			Grab	G2-4	122° 59.035' W	46° 7.531' N	-122° 59.033' W	46° 07.530' N		39.7*	--	--
			Core	C2-1	122° 59.035' W	46° 7.531' N	-122° 58.961' W	46° 07.480' N		35.6*	2.4-3.4	3.4-4.4
DMMU 3	Turning Basin	18,400	Grab	G3-1	122° 59.079' W	46° 7.556' N	-122° 59.082' W	46° 07.555' N	38	38.9*	--	--
			Grab	G3-2	122° 59.096' W	46° 7.542' N	-122° 59.097' W	46° 07.543' N		37.9*	--	--
			Grab	G3-3	122° 59.127' W	46° 7.582' N	-122° 59.128' W	46° 07.584' N		36.8*	--	--
			Grab	G3-4	122° 59.172' W	46° 7.546' N	-122° 59.137' W	46° 07.567' N		38.3*	--	--
			Core	C3-1	122° 59.096' W	46° 7.542' N	-122° 59.095' W	46° 07.542' N		35.2*	2.8-3.8	3.8-4.8
DMMU 4	Turning Basin	16,900	Grab	G4-1	122° 59.201' W	46° 7.570' N	-122° 59.189' W	46° 07.595' N	38	35.6	--	--
			Grab	G4-2	122° 59.160' W	46° 7.603' N	-122° 59.167' W	46° 07.605' N		34.1	--	--
			Grab	G4-3	122° 59.230' W	46° 7.583' N	-122° 59.231' W	46° 07.585' N		35.6	--	--
			Core	C4-1	122° 59.160' W	46° 7.603' N	-122° 59.162' W	46° 07.604' N		34.2	3.8-4.8	4.8-5.8
DMMU 5	Salt Dock	19,600	Grab	G5-1	122° 59.395' W	46° 7.695' N	-122° 59.334' W	46° 07.611' N	38	37.6	--	--
			Grab	G5-2	122° 59.310' W	46° 7.604' N	-122° 59.256' W	46° 07.593' N		36.6	--	--
			Core	C5-1	122° 59.395' W	46° 7.695' N	-122° 59.260' W	46° 07.593' N		36.8	1.2-2.2	2.2-3.2

Notes:

* = Depths less than shown due to one-hour lag in "real-time" tide gage corrections. Water depths confirmed using November 2009 bathymetric survey of Cargo Dock (Northwest Hydro Inc.) and were generally 1.5-2 ft less than "real-time" reading.

-- = not applicable

CRD = Columbia River Datum

DDM = degrees, decimals, minutes

DMMP = dredge management prism

DMMU = dredge management unit