CENWS-ODS-ND

Updated March 15, 2018 to correct recency dates

MEMORANDUM FOR: RECORD February 18, 2014

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM LOWER SNAKE/CLEARWATER RIVER MAINTENANCE DREDGING FOR OPEN WATER DISPOSAL IN THE SNAKE RIVER OR AT AN APPROVED BENEFICIAL USE OR UPLAND SITE.

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 approximately 489,212 cubic yards (cy) (Table 1) of dredged material from the lower Snake/Clearwater federal navigation channel and from locations at the Ports of Clarkston, Washington and Lewiston, Idaho, for open water disposal. The Corps of Engineers currently proposes unconfined open water disposal for all material in the Snake River near Knoxway Canyon at river mile (RM) 116, Garfield County, Washington. The proposal is to build a shallow water habitat bench for juvenile salmonids.

2. Project. The area proposed for dredging includes the federal navigation channel and associated port facilities at the confluence of two rivers in two states. Permitting procedures for Corps and Port dredging projects are different, so project notification occurred under two separate notices. For federal dredging see CENWW-PM-PD-EC 13-01; for port dredging see joint notice: NWS-2013-519 and NWS-2013-916. Though permitting procedures are different for these entities, the projects will be dredged as a whole and were thus—for the most part—characterized together. This Suitability Determination covers the entire project area except for the Port of Clarkston Crane Dock, which was characterized under a separate effort but will be dredged under the referenced Port of Clarkston permit. The project actions, as described in the referenced Public Notices and as shown in Figure 1, are:

   a. The Corps of Engineers, Walla Walla district, proposes dredging the federal navigation channel in four locations in the Lower Granite and McNary Reservoirs on the lower Snake and Clearwater Rivers in Washington and Idaho for a total of approximately 469,212 cy. This maintenance dredging is proposed to provide a 14-foot deep navigation channel, plus two foot over-depth, as measured at minimum operating pool (MOP). MOP at the confluence of the Snake and Clearwater Rivers is identified as an elevation of 733 ft National Geodetic Vertical Datum of 1929 (NGVD29).

   b. The Port of Clarkston proposes to dredge approximately 14,000 cy in four berthing areas: Crane Dock, Grain Elevator, Recreation Dock and Cruise Dock. The Crane Dock, Grain Elevator and Cruise Dock will be dredged to 16 ft MOP (14 ft plus two foot over-depth). The Recreation Dock will be dredged to a depth of 7.5 ft MOP (including over-depth).

   c. The Port of Lewiston proposes to dredge approximately 6,000 cy in one berthing area, to a depth of 16 ft MOP (14 ft plus two foot over-depth).

   Proposed disposal of all material suitable for open water disposal is a location in the Lower Granite reservoir, Snake RM 116 just upstream of Knoxway Canyon. The proponents propose to use the dredged material to create a shallow water habitat bench for juvenile salmonids.

   Dredging at the confluence of the Snake and Clearwater Rivers last took place in the winter of 2005 - 2006.

Table 1. Snake/Clearwater project summary

Project ranking		Low/Low-moderate
Proposed dredging volumes (from Public Notices)		Port of Lewiston: ~ 6,000 cy Port of Clarkston: ~ 14,000 cy Federal Navigation Channel: 469,212 cy
Proposed dredging depth		16 ft MOP/7.5 MOP (min. operating pool)
Tier 2 (chemistry)	SAP received	May 20, 2013
	SAP approved	May 23, 2013
	Sampling dates	August 2-6, 2013
Tier 3 (bioassays)	SAP received	October 28, 2013
	SAP approved	November 5, 2013
	Sampling dates	November 11-13, 2013
Final Report received		January 17, 2014
EIM Study ID		SNCLW13
Public Notices: • Port of Lewiston • Port of Clarkston • Federal Navigation Channel		• NWS-2013-519 • NWS-2013-916 • CENWW-PM-PD-EC 13-01
Recency Determination (Low ranked areas = 7 years; LM ranked areas 6 years)		August 2019/2020 (corrected 3/15/18)

Table 2. Volume comparisons for Snake/Clearwater proposed dredging. Volumes used for Suitability Determination are shaded in blue.

Area to be Dredged	DMMU	Approximate volumes (cy)			
		SAP	Final report	Corps PN	Ports PN
FNC Clarkston West	1	57,079	57,818		
	2	58,365	60,167		
	3	58,165	55,453		
FNC Clarkston East	4	59,635	57,849		
	5	55,749	52,221		
	6	22,032	20,948		
FNC Clearwater	7	6,674	6,187		
	8	11,261	11,261		
FNC Lewiston	9	55,591	55,591		
	10	58,284	58,284		
	11	26,367	26,367		
All Federal Dredging	--	469,199	462,146	469,212	--
Port of Clarkston Grain Elevator	POC-GE	3,218	3,218		
Port of Clarkston Rec. Dock	POC-RD	1,036	1,036		
Port of Clarkston Cruise Dock	POC-CD	9,041	9,041		
All Port of Clarkston	--	13,295	13,295	14,143	~14,000
Port of Lewiston	POL	3,276	4,485	4,485	~ 6,000
All Port of Lewiston	--	3,276	4,485	4,485	~ 6,000
TOTALS	--	485,770	479,926	487,840	--

3. Background. The project area drains over 32,000 square miles of watershed (USACE 2012). As a part of its Congressional authorization, the Corps operates and maintains the navigation system on the lower Snake River. Sediment accumulation in the lower Snake River can interfere with authorized project purposes and the Corps has historically dredged accumulated sediment that impeded navigation. Dredged sediments were placed in areas where they would no longer interfere with the authorized purposes, either in-water within the reservoirs or on upland sites. Several previous characterizations have been performed in the dredging area since 1985, though none under the auspices of the DMMP. Previous chemical analyses have shown that the proposed dredged material did not contain compounds over regulatory criteria consulted at the time.

   Sampling and testing of sediments in the region was accomplished in 2011 in support of the draft Programmatic Sediment Management Plan EIS (USACE 2013). This report was reviewed as part of a Tier 1 analysis of the proposed dredging. A Tier 1 review is done on every project to determine whether further testing is necessary for the DMMP to make a decision on the suitability of project material for in-water disposal. Though the 2011 testing wasn't sufficient to support a suitability determination without further characterization, it provided enough information to focus this DMMP characterization on project specific questions.

4. Tier 1 - Project Ranking and Sampling Requirements. The Tier 1 evaluation provided the DMMP with enough information to determine rank and homogeneity/heterogeneity of the sediments, the two factors that influence sampling and testing frequency and sample type. Previous descriptions and data were used to distinguish five general reaches of the proposed dredging prism that could be considered separately for Tier 2 (chemical analysis) sampling and characterization purposes. These areas were identified based on apparent shoaling patterns and sediment characteristics. These five areas were:

   1. Ice Harbor Lock (sufficient data available for Tier 1 evaluation, no further testing needed)
   2. Clarkston West (including both the Federal Navigation Channel (FNC) and the Port of Clarkston Grain Elevator)
   3. Clarkston East (including the Federal Navigation Channel)
   4. Port of Clarkston (Recreation Dock and Cruise Dock)
   5. Clearwater River (including the Federal Navigation Channel and the Port of Lewiston)

   Clarkston West, Clarkston East and Lewiston reaches were all considered homogenous and ranked of low concern. Core logs from Clarkston West showed some indications of heterogeneity, but the DMMP agencies determined that grab samples would represent the mixture of fines and sand that were observed in previous core samples. Area 4 (Port of Clarkston) showed the greatest amount of core variability and fines content. This area was considered heterogeneous and was sampled with core samples. It was given a low-moderate rank. The Clearwater River portion of the project (Area 5) was considered homogenous and given a low rank.

   Table 2 shows how volume estimates have changed slightly over the course of this project. Since volume calculations are estimates that can vary with changing river conditions and method of measurement, these differences are noted here but are not considered by the DMMP to affect suitability as described in this memorandum. Given the ranks and character of the proposed dredging areas, the DMMP guidelines for sampling density (Table 3) were applied to estimated project volumes available at the time of SAP preparation (Table 4).

Table 3. Maximum sediment volume requirements for DMMP sampling

Project Rank	Homogeneous Material		Heterogeneous Material			
	# of samples required	# of analyses (DMMUs) required	# of samples required		# of analyses (DMMUs) required	
			Surface	Subsurface	Surface	Subsurface
L	8,000 cy	60,000 cy	8,000 cy	48,000 cy	72,000 cy	60,000 cy
LM	8,000 cy	40,000 cy	8,000 cy	32,000 cy	48,000 cy	40,000 cy
M	4,000 cy	20,000 cy	4,000 cy	16,000 cy	24,000 cy	20,000 cy
H	4,000 cy	8,000 cy	4,000 cy	4,000 cy	12,000 cy	8,000 cy

Table 4. Volume and DMMUs in the Snake/Clearwater characterization

Area to be Dredged	Rank	# grab samples	# core samples	# analyses	DMMU name	SAP Volume (cy)
FNC Clarkston West	L	7	--	1	1	57,818
		7	--	1	2	60,167
		7	--	1	3	55,453
FNC Clarkston East	L	8	--	1	4	57,849
		7	--	1	5	52,221
		3	--	1	6	20,948
FNC Clearwater	L	2	--	1	7	6,187
		2	--	1	8	11,261
FNC Lewiston	L	7	--	1	9	55,591
		7	--	1	10	58,284
		3	--	1	11	26,367
All Federal Dredging		60	0	11	11 DMMUs	462,146
POC Grain Elevator	L	2	--	1	POC-GE	3,218
POC Rec. Dock	LM	--	2	1	POC-RD	1,036
POC Cruise Dock	LM	--	2	1	POC-CD	9,041
All Port of Clarkston		2	4	3	3 DMMUs	13,295
Port of Lewiston	LM	2	--	1	POL	4,485
All Port of Lewiston		2	0	1	1 DMMU	4,485
TOTALS		64	4	15	15 DMMUs	479,926

Notes:

- All sampling and analysis requirements are based on estimated volumes. At least two samples are required for one DMMU, regardless of volume.
- All volumes based on removal to 16 feet below MOP, except for Port of Clarkston Recreation Dock, which has volume based on removal to 7.5 ft below MOP.
- Because each Port area constitutes one DMMU, the names of the DMMU and the Port facility are the same.

5. Chemicals of Concern. The timing of this project characterization straddled implementation of the Department of Ecology changes to Chapter 173-204 WAC Sediment Management

Standards, which became effective on September 1, 2013 (Ecology 2013). As part of the SMS rule changes, Ecology promulgated new numeric chemical and biological cleanup objectives for freshwater sediment to protect the benthic community—essentially an update to the 2006 interim guidelines used by the DMMP from the Sediment Evaluation Framework for the Pacific Northwest (USACE *et al* 2009). Though the DMMP in general uses only guidelines which have been adopted through a public notification and comment process, it also strives to use the most current relevant technical and project-specific information for sediment evaluation. This is also consistent with Ecology's implementation of WAC 173-204-340, which allows use of the best available methods and guidelines.

In making these project-specific decisions, the DMMP strove to do two things: allow comparison to past data collection efforts and existing guideline values, while creating a bridge to future characterization for this project that will likely include the most up-to-date COCs and values for comparison (i.e. the 2013 SMS FW guidelines.) All decisions about analytes and regulatory guidelines were made prior to sampling and testing. The DMMP used the new SMS guidelines—then in draft form—as the basic list of COCs and regulatory guidelines to use in this project. The new SMS rule was considered to have the most current and supportable list of potential COCs and regulatory guidelines, at least for protection of benthic resources. This list was amended as appropriate on a site-specific basis based on previous testing and requests from other agencies. A summary of decisions and rationale behind the project-specific COCs are as follows (DMMP 2013a; DMMP 2014):

a. No dioxin/furan analysis required. Very low TEQs were found in most samples analyzed in 2011, and in all the samples in areas proposed for dredging. They indicated a low "reason-to-believe" that dioxins are of concern in the proposed dredge prism. Due to the presence of an upstream paper plant and associated outfall, however, this decision should be revisited for future characterizations.

b. No analysis for PAHs required. Levels of PAHs, when occasionally detected, have been found at orders of magnitude below levels of concern in either marine or freshwater guidelines. There are few sources in the area for this class of chemicals.

c. No analysis for other organics required (chlorinated hydrocarbons and some miscellaneous extractables). Again, lack of sources and previous data show low reason-to-believe for presence of omitted chemicals at levels of concern.

d. Analysis for the full suite of DMMP COCs for the Port of Clarkston Recreation Dock DMMU and for reference sediments is required. Since no samples from previous characterizations had been taken at the recreation dock, the DMMP requested that chemical analysis be performed for all DMMP COCs, rather than the abbreviated list required for all other DMMUs. Reference sediments used during the bioassay round were also tested for the full list of COCs.

e. Add toxaphene to the list of COCs for all DMMUs. This request was made by fish biologists at the Washington Department of Ecology (Ecology), due to previous detections of toxaphene in some parts of Eastern Washington. However, there are no regulatory sediment guidelines set for toxaphene in Washington State, including the existing DMMP marine guidelines, the Regional Sediment Evaluation Team (RSET) Sediment Evaluation Framework (SEF) guidelines and Ecology's 2013 Sediment Management Standards freshwater guidelines. A rough estimate was calculated based on the water quality

standard for toxaphene in water (EPA 1986) and using a K_{oc} value of 5 (ASTDR Toxaphene Fact Sheet) per the SEF (2009, p. 10-4). The result of this calculation was a theoretical screening level of 0.2 ppb in sediments. The analytical method requested by Ecology, however, cannot reach a detection limit that low. Typical toxaphene sediment quantitation limits (SQL) using Method 8081 are generally around 100 ppb. The chosen laboratory was requested and able to reduce the toxaphene SQL to the lowest possible value. Ecology accepted this approach.

f. Use the DMMP marine BT for selenium as the regulatory guideline, rather than the higher guideline found in the 2013 SMS freshwater guidelines. Selenium was the only element for which a marine guideline was used when a more current freshwater guideline was available. Selenium has been identified at concentrations above the DMMP screening limits in some areas of the watershed, most likely due to mining activities in the watershed. The DMMP marine screening level guideline for selenium is 3 mg/kg dry wt.; the 2013 SMS guidelines use 11 mg/kg as the screening level. It should be noted that the freshwater guidelines use data from freshwater to calculate effects levels, so there is no technical reason to apply the marine rather than the freshwater guidance. The marine value was simply used as a conservative option in a watershed that has some history of selenium detections.

6. Sampling. Two separate sampling and analysis events occurred: the first from August 2 - 6, 2013, and the second from November 10 - 13, 2013. Sediments collected during August were analyzed only for project-specific chemicals of concern (Tier 2). When results from the August sampling became available, it was clear that, for DMMUs 1, 2, 3, 5, 6 and POC-GE, additional information in the form of a Tier 3 biological evaluation would be necessary to make a determination of suitability for open water disposal (Figure 4). Sediments collected during the second sampling event were from those DMMUs with screening level exceedances of project COCs. These sediments underwent additional chemical and biological analyses, as described below.

   a. Tier 2 (August sampling). During the Tier 2 sampling event, 64 grab samples were taken using a 0.1 m^2 hydraulic power grab that were then composited for 13 DMMUs. Four core samples were taken with a vibracore system using 4-inch inner-diameter decontaminated aluminum core tubes that were then composited into two DMMUs (Table 3).

      Some Tier 2 sampling locations were modified based on field situations which included obstructions such as vessels, or when the depth at the target coordinate was deeper than the authorized channel depth.

      Of the fifteen DMMUs characterized in Tier 2, six DMMUs (DMMUs 1, 2, 3, 5, 6 and POC-GE) had screening level exceedances that necessitated further characterization, i.e. Tier 3.

   b. Tier 3 (November sampling). Sediment volumes remaining from the Tier 2 sampling event were insufficient to run bioassays, so additional sampling was required. Tier 3 grab sample locations targeted the sampling locations occupied during Tier 2, and were composited into the six needed DMMUs. During the November sampling event, in addition to the test sediments, two potential reference sediments were collected from the Snake River: one at RM 144 (upstream of Clarkston, WA) and one from a ponded area at RM 128.5, downstream of the Snake/Clearwater confluence. Control sediment for Tier 3 bioassays was collected by Northwestern Aquatic Sciences on November 18, 2013 from

an area approximately one mile east of the Highway 101 Bridge at Beaver Creek, near Newport, Oregon. Table 5 shows all sampling locations for the Tier 3 sampling event.

7. Tier 2 Conventional & Chemical Analyses. The approved sampling and analysis plans (USACE 2013a and 2013b) were followed, with the exceptions noted below. Chemical analyses were conducted by Analytical Resources, Inc. (ARI) of Tukwila, Washington. The resulting analytical data were validated by Mr. Mingta Lin of Pyron Environmental (Pyron). All data were considered to be of known quality and acceptable for use as qualified, with the exception of heptachlor. Heptachlor results were rejected in all samples because none was recovered in the Standard Reference Material.

   The sediment conventional results for Tier 2 are in Table 8. In general, the grain size was slightly coarser and total solids were higher in the Clearwater River DMMUs than in those DMMUs below the Clearwater confluence with the Snake River. Total organic carbon also was higher in the Snake River DMMUs as opposed to the Clearwater DMMUs, especially in DMMU 6 and POC-GE. Total sulfides were elevated over the SMS screening levels in some DMMUs in Tier 2. Sulfide exceedances by themselves are not considered problematic, due to aeration of the sediments during open water disposal. However, most DMMUs with sulfide exceedances underwent bioassays during Tier 3 due to other exceedances.

   Chemical results are compared to the project-specific COC list and regulatory guidelines in Table 11 and Table 12. All chemicals were either detected or undetected at levels below the regulatory guidelines except for 4-methylphenol SL exceedances in DMMUs 1, 2, 3, 5, 6 & POC-GE. DMMU 6 also had an ML exceedance for 4-Methylphenol and an SL exceedance of phenol. 4-Methylphenol results were confirmed by re-processing data with the SIM channel on the GC/MS. These analytes have never been detected above screening levels in previous characterizations of the area. Toxaphene was undetected in all DMMU at levels between 24 and 48 ppb.

8. Tier 3 Conventional and Chemical Analyses. All Tier 3 test sediments underwent both conventional and chemical analyses of the phenols, benzoic acid, and pentachlorophenol. The sediment conventional results for Tier 3 are in Table 9. Total sulfides were elevated over the SMS screening level in all six re-tested DMMUs, as well as both the reference sediments. Reference sediments were analyzed for the same suite of COCs used for the Port of Clarkston Recreation dock during Tier 2 (Table 11). Tier 3 chemistry results are in Table 14. Sample analysis still showed presence of 4-methylphenol at levels above the SL for DMMUs 1, 3, 5 and 6, but for DMMUs 2 and POC-GE the reported levels were below the SL. For DMMU 6, the phenol level in the August sample was reported above the SL; for the November sample phenol was below the SL.

9. Tier 3 - Bioassay Analyses. Due to the regulatory guideline exceedances described above, six DMMUs were required to undergo appropriate biological tests to determine whether these DMMUs are suitable for open water disposal. Consistent with Tier 2 chemical analyses, for Tier 3 the DMMP looked to Ecology's 2013 SMS FW guidelines for required tests and interpretive criteria. As approved in the addendum SAP, three bioassay tests--using two species and including one chronic test--were performed:

   - 10-day *Hyalella azteca* (amphipod) survival test
   - 20-day *Chironomus dilutus* (midge) survival test
   - 20-day *Chironomus dilutus* (midge) growth test

Six test sediments—one composite sample each from DMMUs 1, 2, 3, 5, 6 and POC-GE-- as well as two reference sediments and one control sediment were subjected to the bioassay tests listed above. Tests were run at Northwestern Aquatic Sciences (NWAS) of Newport, Oregon. The control sediment was from Beaver Creek, near Newport, Oregon. Reference and control sediments for all tests met acceptability criteria as defined by the Sediment Management Standards, Chapter 173-204 WAC (Ecology 2013) (Table 15). For test interpretation, test sediments were compared to the control or reference with the closest match to total fines content. As shown in Table 16, Table 17, and Table 18, DMMUs 1, 2, 3 and POC-GE were paired with SR 144 for test interpretation. Reference sediment collected at SR 128.5 proved too fine-grained to use for comparison to any of the test sediments. Because relative grain size of the Beaver Creek sediments was closest to grain sizes for DMMUs 5 and 6, those DMMUs were compared to the control sediment.

All data were considered valid and suitable for decision-making. Survival and growth in test sediments were statistically indistinguishable from control and reference sediments. All test sediments passed the relative interpretive guidelines and are thus suitable for open water disposal.

10. Suitability Determination. This memorandum documents the evaluation of the suitability of sediment proposed for dredging from the Lower Snake and Clearwater Rivers for open water disposal in the Snake River or at an approved beneficial use or upland site. The approved sampling and analysis plan was adequately followed 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 concluded that:

    - all 6,000 of proposed dredged material from the Port of Lewiston are suitable for open water disposal in the Snake River as described in NWS-2013-519.
    - all 14,000 of proposed dredged material from the Port of Clarkston are suitable for open water disposal as described in NWS-2013-916.
    - all 469,212 of proposed dredged material from the Federal Navigation Channel are suitable for open water disposal as described in CENWW-PM-PD-EC 13-01.

    This suitability determination does *not* constitute final agency approval of the project. 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.

Table 5. Summary of proposed dredging locations, with basis for suitability

Location	DMMUs	Determination	Reference
FNC - Ice Harbor Lock	NA	suitable	Tier 1
FNC - Clarkston West	1, 2, 3	suitable	Tier 3
FNC - Clarkston East	4, 5, 6	suitable	Tiers 2 & 3
POC - Grain Elevator	POC - GE	suitable	Tier 3
POC - Recreation Dock	POC - RD	suitable	Tier 2
POC - Cruise Dock	POC - CD	suitable	Tier 2
POC - Crane Dock	NA	suitable	Port of Clarkston Crane Dock, Snake River
FNC - Clearwater	7, 8	suitable	Tier 2
FNC - Lewiston	9, 10, 11	suitable	Tier 2
Port of Lewiston	POL	suitable	Tier 2

Tier 1 - sufficient information available
Tier 2 - chemical evaluation
Tier 3 - biological evaluation

11. References.

DMMP 2014. Memorandum for Record, dated January 29, 2014.

DMMP 2013a. Memorandum for NWW, dated April 23, 2013.

DMMP 2013b. Dredged Material Evaluation and Disposal Procedures (User Manual). Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, July 2013.

DMMP (Seattle District; EPA Region 10; Washington Department of Ecology; Washington Department of Natural Resources). 2009. Dredged Material Evaluation and Disposal Procedures. Dredged Material Management Office, US Army Corps of Engineers, Seattle, Washington. http://www.nws.usace.army.mil/Missions/CivilWorks/Dredging/UsersManual.aspx

Ecology 2013. Sediment Management Standards – Chapter 173-204 WAC. Washington State Department of Ecology, adopted February 2013.

EPA 1986. Toxaphene Ambient Water Quality Criteria. Criteria and Standards Division, Office of Water Planning and Standards, US EPA. National Recommended Water Quality Criteria.

RSET (USACE, Portland District, Seattle District, Walla Walla District, and Northwestern Division; EPA Region 10; WDOE; Washington Department of Natural Resources; Oregon Department of Environmental Quality; Idaho Department of Environmental Quality; National Marine Fisheries Service; and U.S. Fish and Wildlife Service). 2009. Sediment Evaluation Framework for the Pacific Northwest [SEF]. Final. Portland, OR: USACE, Northwestern Division. www.nwp.usace.army.mil/regulatory/docs/SEF/2009-Final_SEF.pdf.

SEE 2014. Data Report: 2013 Lower Snake/Clearwater River Sediment Sampling and Analysis. Prepared by Science and Engineering for the Environment, LLC for USACE, Walla Walla District, January 2014.

USACE 2013a. Supplemental 2013 Sediment Collection and Laboratory Analyses of the Lower Snake and Clearwater Rivers. Addendum to the Approved July 2013 Sample Analysis Plan, November 2013.

USACE 2013b. Lower Snake and Clearwater Rivers Sediment Evaluation Report for Proposed 2013/2014 Channel Maintenance Dredging, USACE, Walla Walla District. May 2013.

USACE 2013c. Sampling and Analysis Plan for Lower Snake and Clearwater Rivers Proposed 2013/2014 Channel Maintenance Dredging

USACE 2012. Lower Snake River Draft Programmatic Sediment Management Plan Environmental Impact Statement, Lower Snake and Clearwater Rivers, Washington and Idaho. Walla Walla: USACE, Walla Walla District. December 2012.

USACE 2005. Lower Snake River Navigation Maintenance Environmental Impact Statement (EIS). Lower Snake and Clearwater Rivers, Washington and Idaho. Walla Walla: USACE, Walla Walla District.

Signed copy on file in Dredged Material Management office, Corps of Engineers, Seattle.

12. Agency Signatures

SUBJECT: DETERMINATION ON THE SUITABILITY OF PROPOSED DREDGED MATERIAL FROM LOWER SNAKE/CLEARWATER RIVER MAINTENANCE DREDGING FOR OPEN-WATER DISPOSAL IN THE SNAKE RIVER OR AT AN APPROVED BENEFICIAL USE OR UPLAND SITE.

Concur:

_____ _____
Date Lauran Cole Warner - Seattle District Corps of Engineers

_____ _____
Date Justine Barton - Environmental Protection Agency

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

_____ _____
Date Celia Barton - Washington Department of Natural Resources

Copies furnished:

DMMP signatories
Steve Juul, NWW
Bob Ries, NOAA
Sally Fisher, BergerABAM

Table 6. Snake/Clearwater sampling locations for Tier 2 (August) sampling

DMMU	Sample Key	Sample Date	Latitude (NAD83)	Longitude (NAD83)	Measured Mudline (ft)	LWSI Elevation (NGVD 29)	Mudline Elevation (NGVD 29)	Depth to Top of z-Layer (ft) (717 ft NGVD29)	Sample Type
FNC Clarkston West									
1	1	08/02/13	46 25.69455	-117 03.27004	-18.2	735.8	717.6	-0.6	Grab
	2	08/02/13	46 25.66394	-117 03.27024	-15	735.8	720.8	-3.8	Grab
	5	08/02/13	46 25.67310	-117 03.38158	-18	735.8	717.8	-0.8	Grab
	6	08/02/13	46 25.65193	-117 03.38262	-17.7	735.8	718.1	-1.1	Grab
	7	08/02/13	46 25.70497	-117 03.17991	-18.1	735.8	717.7	-0.7	Grab
	8	08/02/13	46 25.68226	-117 03.17977	-15.3	735.8	720.5	-3.5	Grab
	9	08/02/13	46 25.64825	-117 03.18119	-11.2	735.8	724.6	-7.6	Grab
2	10	08/02/13	46 25.70337	-117 03.12526	-18.2	735.9	717.7	-0.6	Grab
	11	08/02/13	46 25.6804	-117 03.1251	-13.5	735.9	722.4	-5.4	Grab
	12	08/02/13	46 25.64583	-117 03.12679	-10.4	735.9	725.5	-8.5	Grab
	13	08/02/13	46 25.70047	-117 03.06436	-16.8	735.9	719.1	-2.1	Grab
	14	08/02/13	46 25.69015	-117 03.06382	-14.8	735.9	721.1	-4.1	Grab
	15	08/02/13	46 25.67219	-117 03.06631	-13.3	735.9	722.6	-5.6	Grab
	16	08/02/13	46 25.63869	-117 03.06520	-10.3	735.9	725.6	-8.6	Grab
3	17	08/02/13	46 25.71100	-117 03.01280	-18.1	735.8	717.7	-0.7	Grab
	18	08/02/13	46 25.68802	-117 03.01252	-15.2	735.8	720.6	-3.6	Grab
	19	08/02/13	46 25.67138	-117 03.01453	-13.5	735.8	722.3	-5.3	Grab
	20	08/02/13	46 25.63815	-117 03.01543	-10.7	735.8	725.1	-8.1	Grab
	21	08/02/13	46 25.69680	-117 02.93750	-16.8	735.8	719	-2	Grab
	22	08/02/13	46 25.64123	-117 02.95315	-13.4	735.8	722.4	-5.4	Grab
	3	08/02/13	46 25.68523	-117 02.93810	-14.7	735.8	721.1	-4.1	Grab
FNC Clarkston East									
4	23	08/03/13	46 25.70190	-117 02.89425	-18.3	735.7	717.4	-0.4	Grab
	24	08/03/13	46 25.67186	-117 02.89512	-13.8	735.7	721.9	-4.9	Grab
	25	08/03/13	46 25.63918	-117 02.89506	-11.9	735.7	723.8	-6.8	Grab
	26	08/03/13	46 25.68083	-117 02.82305	-16.5	735.7	719.2	-2.2	Grab
	27	08/03/13	46 25.66595	-117 02.82836	-13.7	735.7	722	-5	Grab
	28	08/03/13	46 25.63801	-117 02.83616	-13.3	735.7	722.4	-5.4	Grab
	29	08/03/13	46 25.66574	-117 02.76873	-16.3	735.7	719.4	-2.4	Grab
	30	08/03/13	46 25.63579	-117 02.78207	-13.5	735.7	722.2	-5.2	Grab

Table 6. Snake/Clearwater sampling locations for Tier 2 (August) sampling

DMMU	Sample Key	Sample Date	Latitude (NAD83)	Longitude (NAD83)	Measured Mudline (ft)	LWSI Elevation (NGVD 29)	Mudline Elevation (NGVD 29)	Depth to Top of z-Layer (ft) (717 ft NGVD29)	Sample Type
5	31	08/03/13	46 25.64979	-117 02.72121	-16.3	735.8	719.5	-2.5	Grab
	32	08/03/13	46 25.63780	-117 02.72684	-14.2	735.8	721.6	-4.6	Grab
	35	08/03/13	46 25.62026	-117 02.73595	-13.4	735.8	722.4	-5.4	Grab
	36	08/03/13	46 25.62729	-117 02.65398	-16.6	735.8	719.2	-2.2	Grab
	37	08/03/13	46 25.59718	-117 02.67107	-12.9	735.8	722.9	-5.9	Grab
	38	08/03/13	46 25.60119	-117 02.59998	-16.2	735.8	719.6	-2.6	Grab
	39	08/03/13	46 25.58528	-117 02.60914	-13.9	735.8	721.9	-4.9	Grab
6	41	08/03/13	46 25.57305	-117 02.54624	-15.6	735.8	720.2	-3.2	Grab
	42	08/03/13	46 25.54852	-117 02.49284	-16.3	735.8	719.5	-2.5	Grab
	72	08/03/13	46 25.52202	-117 02.44118	-17.3	735.8	718.5	-1.5	Grab
FNC Clearwater									
7	43	08/03/13	46 25.56085	-117 02.10144	-17.6	735.7	718.1	-1.1	Grab
	44	08/03/13	46 25.54994	-117 01.96369	-17	735.7	718.7	-1.7	Grab
8	45	08/03/13	46 25.52161	-117 01.59620	-17.8	735.7	717.9	-0.9	Grab
	46	08/03/13	46 25.51716	-117 01.50833	-15.9	735.7	719.8	-2.8	Grab
FNC Lewiston									
9	73	08/04/13	46 25.41100	-117 01.02259	-16.2	735.5	719.3	-2.3	Grab
	47	08/04/13	46 25.40938	-117 00.93063	-18	735.5	717.5	-0.5	Grab
	48	08/04/13	46 25.38205	-117 00.95121	-16.4	735.5	719.1	-2.1	Grab
	49	08/04/13	46 25.38732	-117 00.86200	-16.3	735.5	719.2	-2.2	Grab
	50	08/04/13	46 25.35906	-117 00.88025	-14.2	735.5	721.3	-4.3	Grab
	51	08/04/13	46 25.36294	-117 00.80782	-15	735.5	720.5	-3.5	Grab
	52	08/04/13	46 25.34316	-117 00.82860	-14.2	735.5	721.3	-4.3	Grab
10	53	08/04/13	46 25.33680	-117 00.77380	-14.5	735.5	721	-4	Grab
	54	08/04/13	46 25.36910	-117 00.74646	-17.8	735.5	717.7	-0.7	Grab
	56	08/04/13	46 25.34296	-117 00.66073	-17.6	735.5	717.9	-0.9	Grab
	57	08/04/13	46 25.31921	-117 00.68108	-14.1	735.5	721.4	-4.4	Grab
	58	08/04/13	46 25.29224	-117 00.69795	-16.1	735.5	719.4	-2.4	Grab
	59	08/04/13	46 25.31923	-117 00.59241	-14.6	735.6	721	-4	Grab
	60	08/04/13	46 25.29570	-117 00.60594	-15.5	735.6	720.1	-3.1	Grab

Table 6. Snake/Clearwater sampling locations for Tier 2 (August) sampling

DMMU	Sample Key	Sample Date	Latitude (NAD83)	Longitude (NAD83)	Measured Mudline (ft)	LWSI Elevation (NGVD 29)	Mudline Elevation (NGVD 29)	Depth to Top of z-Layer (ft) (717 ft NGVD29)	Sample Type
11	55	08/04/13	46 25.28813	-117 00.52123	-16	735.6	719.6	-2.6	Grab
	61	08/04/13	46 25.24317	-117 00.37379	-17.4	735.6	718.2	-1.2	Grab
	62	08/04/13	46 25.20398	-117 00.21044	-17.7	735.6	717.9	-0.9	Grab
Port of Clarkston Grain Elevator									
POC GE	68	08/03/13	46 25.63010	-117 03.2784	-15.4	735.6	720.2	-3.2	Grab
	69	08/03/13	46 25.63600	-117 03.2118	-11.1	735.6	724.5	-7.5	Grab
Port of Clarkston Recreation Dock									
POC Rec Dock	63	08/05/13	46 25.61961	-117 03.10163	-7.4	735.5	728.1	-2.6	Core
	63	08/06/13	46 25.61990	-117 03.10000	-5.6	735.5	729.9	-4.4	Core
	64	08/05/13	46 25.61896	-117 03.06731	-6.7	735.5	728.8	-3.3	Core
Port of Clarkston Cruise Dock									
POC Cruise Dock	65	08/05/13	46 25.5895	-117 02.6988	-12.5	735.5	723	-6	Core
	66	08/05/13	46 25.5758	-117 02.6435	-11.9	735.5	723.6	-6.6	Core
	66	08/06/13	46 25.5753	-117 02.6440	-12.6	735.5	722.9	-5.9	Core
Port of Lewiston									
POL	70	08/04/13	46 25.45081	-117 00.92356	-15.8	735.5	719.7	-2.7	Grab
	71	08/04/13	46 25.40506	-117 00.79649	-10.8	735.5	724.7	-7.7	Grab

Table 7. Snake/Clearwater sampling locations for Tier 3 (November) sampling

DMMU	Sample Key	Sample Date	Sample Time	Latitude (NAD83)	Longitude (NAD83)	Measured Mudline (ft)	LWSI Elevation (NGVD 29)	Mudline Elevation (NGVD 29)	Depth to Top of z-Layer (ft) (717 ft NGVD29)	Sample Type
FNC Clarkston West										
1	5	11/11/13	8:44	46 25.66653 N	-117 03.38313	-19.3	737.3	718	-1	Grab
	6	11/11/13	9:02	46 25.65040 N	-117 03.38274	-18.9	737.3	718.4	-1.4	Grab
	1	11/11/13	9:20	46 25.69435 N	-117 03.27038	-18.7	737.3	718.6	-1.6	Grab
	2	11/11/13	9:33	46 25.66344 N	-117 03.27030	-15.8	737.1	721.3	-4.3	Grab
	7	11/11/13	9:52	46 25.70464 N	-117 03.18045	-19	737.1	718.1	-1.1	Grab
	8	11/11/13	10:07	46 25.68205 N	-117 03.17995	-15.7	737	721.3	-4.3	Grab
	9	11/11/13	10:20	46 25.64841 N	-117 03.18110	-11.9	737	725.1	-8.1	Grab
2	10	11/11/13	11:28	46 25.70346 N	-117 03.12553	-17.9	737	719.1	-2.1	Grab
	13	11/11/13	12:31	46 25.70081 N	-117 03.06462	-16.5	736.8	720.3	-3.3	Grab
	11	11/11/13	11:57	46 25.68085 N	-117 03.12505	-15.2	736.9	721.7	-4.7	Grab
	14	11/11/13	12:46	46 25.69010 N	-117 03.06405	-15.5	736.8	721.3	-4.3	Grab
	15	11/11/13	13:00	46 25.67219 N	-117 03.06644	-14	736.8	722.8	-5.8	Grab
	12	11/11/13	12:15	46 25.64600 N	-117 03.12727	-11.4	736.9	725.5	-8.5	Grab
	16	11/11/13	13:14	46 25.63855 N	-117 03.06530	-11.1	736.8	725.7	-8.7	Grab
3	17	11/11/13	14:24	46 25.71151 N	-117 03.01295	-18.9	736.7	717.8	-0.8	Grab
	18	11/11/13	14:38	46 25.68810 N	-117 03.01258	-15.9	736.7	720.8	-3.8	Grab
	19	11/11/13	14:52	46 25.67174 N	-117 03.01455	-14.8	736.7	721.9	-4.9	Grab
	20	11/11/13	15:07	46 25.63811 N	-117 03.01509	-10.8	736.7	725.9	-8.9	Grab
	21	11/11/13	15:24	46 25.69651 N	-117 02.93810	-17.1	736.6	719.5	-2.5	Grab
	3	11/11/13	15:56	46 25.68545 N	-117 02.93833	-15.7	736.6	720.9	-3.9	Grab
	22	11/11/13	15:41	46 25.64147 N	-117 02.95305	-14.3	736.6	722.3	-5.3	Grab
FNC Clarkston East										
5	31	11/12/13	11:18	46 25.65019 N	-117 02.72151	-16.9	736.9	720	-3	Grab
	32	11/12/13	11:30	46 25.63814 N	-117 02.72725	-15.3	736.9	721.6	-4.6	Grab
	35	11/12/13	11:46	46 25.62056 N	-117 02.73644	-14.3	736.9	722.6	-5.6	Grab
	38	11/12/13	12:23	46 25.60119 N	-117 02.60027	-16.9	736.9	720	-3	Grab
	39	11/12/13	12:35	46 25.58514 N	-117 02.60975	-14.7	736.8	722.1	-5.1	Grab
	36	11/12/13	11:58	46 25.62744 N	-117 02.65408	-17.5	736.9	719.4	-2.4	Grab
	37	11/12/13	12:11	46 25.59747 N	-117 02.67121	-13.9	736.9	723	-6	Grab

Table 7. Snake/Clearwater sampling locations for Tier 3 (November) sampling

DMMU	Sample Key	Sample Date	Sample Time	Latitude (NAD83)	Longitude (NAD83)	Measured Mudline (ft)	LWSI Elevation (NGVD 29)	Mudline Elevation (NGVD 29)	Depth to Top of z-Layer (ft) (717 ft NGVD29)	Sample Type
6	41	11/12/13	9:06	46 25.57321 N	-117 02.54631	-16.7	736.8	720.1	-3.1	Grab
	42	11/12/13	8:54	46 25.54882 N	-117 02.49284	-17.3	736.9	719.6	-2.6	Grab
	72	11/12/13	8:37	46 25.52215 N	-117 02.44100	-18.3	736.9	718.6	-1.6	Grab
Port of Clarkston Grain Elevator										
POC-GE	68	11/12/13	10:21	46 25.63025 N	-117 03.27859	-17.5	736.8	719.3	-2.3	Grab
	69	11/12/13	10:38	46 25.63606 N	-117 03.2 -1174	-12.9	736.8	723.9	-6.9	Grab
Bioassay Reference Sediments										
River Mile 144		11/12/13	15:04	46 21.24158 N	-117 03.6430	---	---	---	---	Grab
River Mile 128		11/13/13	12:30	46 27.16417	-117 12.26467	---	---	---	---	Hand

Table 8. Conventional results from Tier 2 - Chemistry Round

	GRAB SAMPLES													CORE SAMPLES	
	DMMU 1	DMMU 2	DMMU 3	DMMU 4	DMMU 5	DMMU 6	POC-GE	DMMU 7	DMMU 8	DMMU 9	DMMU 10	DMMU 11	POL	POC-CD	POC-RD
Total solids (%)	56.58	67.55	68.03	70.46	68.41	43.72	48.26	74.53	67.59	74.2	77.71	75.69	68.15	73.58	53.78
Total organic carbon (%)	1.53	1.47	0.84	0.67	1.03	6.84	4.14	0.419	0.721	0.231	0.672	0.265	0.235	3.63	2.02
Total Sulfides (mg/kg)	89.3	74.2	125	7.98	1.7	*30*	66	1.53	1.7	1.34 U	1.52	2.77	3.36	21.5	5,640
Ammonia (mg/kg)	41.2	29	25	17	25.8	69.5	69.8	2.86	6.18	0.32	13.6	0.5	6.56	38.5	330
Sand (%)	85.2	87	88.7	92.5	86.9	69.4	76.6	94.3	96.3	98.2	92.4	98.4	95.1	94	44.8
Silt (%)	8.3	6.7	4.5	2.7	8.4	16.5	15.6	3.9	1.5	0.8	4.3	1.2	2	3.1	40.8
Clay (%)	6.6	6.4	6.7	4.8	4.7	14.2	7.9	1.6	2.2	0.8	3.1	0.4	2.5	2.9	14.5
Total Fines % (silt + clay)	14.9	13.1	11.2	7.5	13.1	30.7	23.5	5.5	3.7	1.6	7.4	1.6	1.2	4.5	55.3

Table 9. Conventional results from Tier 3 – Bioassay Round

	DMMUs undergoing bioassays												References				Control	
	DMMU-1		DMMU-2		DMMU-3		DMMU-5		DMMU-6		POC-GE		SR128.5		SR144		Beaver Creek	
Total Solids (%)	56.4		61.2		58.1		41.4		37.0		60.9		53.54		56.19		---	
Total Organic Carbon (%)	2.0	J	4.2	J	5.5	J	5.6	J	8.7	J	3.8	J	2.18	J	2.24	J	---	
Sulfide (mg/kg)	179.0	J	106.0	J	130.0	J	243.0	J	185.0	J	142.0	J	*44.7*	J	332	J	---	
Ammonia (mg/kg)	29.6		23.6		37.6		60.2		101.0		52.1		2.88		30.1		---	
Gravel (%)	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.3		0.1	U	0	
Sand (%)	80.7		85.8		78.9		61.3		51.6		85.8		35.2		70.3		51.6	
Silt (%)	11.8		8.4		12.0		22.5		29.5		8.6		50.6		22.2		34.4	
Clay (%)	7.5		5.8		8.9		16.2		18.9		5.5		13.9		7.5		5.0	
Total Fines % (silt + clay)	19.3		14.2		20.9		38.7		48.4		14.1		64.5		29.7		39.4	

Note for Tables 8 & 9: *Bold, italicized, yellow-shaded* values indicate exceeds the SL; Bold, orange-shaded values exceed the CL.
For Total Sulfides, SL = 39; CL = 61. For Ammonia, SL = 230 and CL = 300.

Table 10. Final Chemicals of Concern and Regulatory Guidelines used for the Snake/Clearwater River characterization.

CHEMICAL	CAS[1] NUMBER	DMMP Marine 2013			Interim FW 2006 (SEF)		SMS FW 2013		Used for Snake/Clearwater River Source is shaded	
		SL	BT	ML	SL1	SL2	SL1 (SCO)	SL2 (CSL)	Screening Level	Cleanup Level
CONVENTIONALS (mg/kg dry weight)										
Ammonia							230	300	230	300
Total sulfides							39	61	39	61
METALS (mg/kg dry weight)										
Antimony	7440-36-0	150	---	200	---	---	---	---	150	200
Arsenic	7440-38-2	57	507.1	700	20	51	14	120	14	120
Cadmium	7440-43-9	5.1	11.3	14	1.1	1.5	2.1	5.4	2.1	5.4
Chromium	7440-47-3	260	260	---	95	100	72	88	72	88
Copper	7440-50-8	390	1,027	1,300	80	830	400	1,200	400	1,200
Lead	7439-92-1	450	975	1,200	340	430	360	> 1,300	360	> 1,300
Mercury	7439-97-6	0.41	1.5	2.3	0.28	0.75	0.66	0.8	0.66	0.8
Nickel	7440-02-0	---	---	---	60	70	26	110	26	110
Selenium	7782-49-2	---	3	---	---	---	11	>20	3	---
Silver	7440-22-4	6.1	6.1	8.4	2	2.5	0.57	1.7	0.57	1.7
Zinc	7440-66-6	410	2,783	3,800	130	400	3,200	> 4,200	3,200	> 4,200
PHTHALATES (µg/kg dry weight)								`		
Dimethyl phthalate	131-11-3	71	---	1,400	46	440	---	---	46	440
Diethyl phthalate	84-66-2	200	---	1,200	---	---	---	---	200	1,200
Di-n-butyl phthalate	84-74-2	1,400	---	5,100	---	---	380	1,000	380	1,000
Butyl benzyl phthalate	85-68-7	63	---	970	260	370	---	---	260	370
Bis(2-ethylhexyl) phthalate	117-81-7	1,300	---	8,300	220	320	500	22,000	500	22,000
Di-n-octyl phthalate	117-84-0	6,200	---	6,200	26	45	39	> 1,100	39	> 1,100
PHENOLS (µg/kg dry weight)										
Phenol	108-95-2	420	---	1,200	---	---	120	210	120	210
2-Methylphenol	95-48-7	63	---	77	---	---	---	---	63	77
4-Methylphenol	106-44-5	670	---	3,600	---	---	260	2,000	260	2,000
2,4-Dimethylphenol	105-67-9	29	---	210	---	---	---	---	29	210
Pentachlorophenol	87-86-5	400	504	690	---	---	1,200	> 1,200	1,200	> 1,200

Table 10. Final Chemicals of Concern and Regulatory Guidelines used for the Snake/Clearwater River characterization.

CHEMICAL	CAS[1] NUMBER	DMMP Marine 2013			Interim FW 2006 (SEF)		SMS FW 2013		Used for Snake/Clearwater River Source is shaded	
		SL	BT	ML	SL1	SL2	SL1 (SCO)	SL2 (CSL)	Screening Level	Cleanup Level
MISCELLANEOUS EXTRACTABLES (µg/kg dry weight)										
Benzoic acid	65-85-0	650	---	760	---	---	2,900	3,800	2,900	3,800
Dibenzofuran	132-64-9	540	---	1,700	400	440	200	680	200	680
beta-Hexachlorocyclohexane	319-85-7	---	---	---	---	---	7.2	11	7.2	11
PESTICIDES & PCBs (µg/kg dry weight)										
4,4'-DDD	72-54-8	16	---	---			310	860	310	860
4,4'-DDE	72-55-9	9	---	---			21	33	21	33
4,4'-DDT	50-29-3	12	---	---	---	---	100	8100	100	8100
sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT		---	50	69			---	---	---	---
Total Chlordane	5103-71-9	2.8	37	---	---	---	---	---	2.8	37
Dieldrin	60-57-1	1.9	---	1,700	---	---	4.9	9.3	4.9	9.3
Heptachlor	76-44-8	1.5	---	270	---	---	---	---	1.5	270
Endrin ketone	53494-70-5						8.5	> 8.5	8.5	> 8.5
Carbazole	86-74-8						900	1100	900	1100
Total PCBs (Aroclors)	---	130	38 [2]	3,100	60	120	110	2500	110	2500
SPECIAL CHEMICALS OF CONCERN[4]										
Toxaphene	8001-35-2	---	---	---	---	---	---	---	0.2[4]	---

[1] Chemical Abstract Service Registry Number

[2] This value is normalized to total organic carbon, and is expressed in mg/kg carbon.

[3] Analyses required only when there is sufficient reason-to-believe for presence in given project or location.

[4] This is not a required or reviewed screening level; simply a target detection limit for laboratory analyses

Table 11. Additional Chemicals of Concern and Regulatory Guidelines required for POC Recreational Dock & Bioassay Samples

CHEMICAL	CAS[1] NUMBER	DMMP Marine 2013			Interim FW 2006 (SEF)		SMS FW 2013		Used for Snake River Source is shaded	
		SL	BT	ML	SL1	SL2	SL1 (SCO)	SL2 (CSL)	Screening Level	Cleanup Level
PAHs (µg/kg dry weight)										
Naphthalene	91-20-3	2,100	---	2,400	500	1,300	---	---	500	1,300
Acenaphthylene	208-96-8	560	---	1,300	470	640	---	---	470	640
Acenaphthene	83-32-9	500	---	2,000	1,100	1,300	---	---	1,100	1,300
Fluorene	86-73-7	540	---	3,600	1,000	3,000	---	---	1,000	3,000
Phenanthrene	85-01-8	1,500	---	21,000	6,100	7,600	---	---	6,100	7,600
Anthracene	120-12-7	960	---	13,000	1,200	1,200	---	---	1,200	1,200
2-Methylnaphthalene	91-57-6	670	---	1,900	470	560	---	---	470	560
Total LPAH	---	5,200	---	29,000	6,600	9,200	---	---	6,600	9,200
Fluoranthene	206-44-0	1,700	4,600	30,000	11,000	15,000	---	---	11,000	15,000
Pyrene	129-00-0	2,600	11,980	16,000	8,800	16,000	---	---	8,800	16,000
Benz(a)anthracene	56-55-3	1,300	---	5,100	4,300	5,800	---	---	4,300	5,800
Chrysene	218-01-9	1,400	---	21,000	5,900	6,400	---	---	5,900	6,400
Benzofluoranthenes (b, j ,k)	205-99-2	3,200	---	9,900	600	4000	---	---	600	4,000
	205-82-3						---	---		
	207-08-9						---	---		
Benzo(a)pyrene	50-32-8	1,600	---	3,600	3,300	4,800	---	---	3,300	4,800
Indeno(1,2,3-c,d)pyrene	193-39-5	600	---	4,400	4,100	5,300	---	---	4,100	5,300
Dibenz(a,h)anthracene	53-70-3	230	---	1,900	800	840	---	---	800	840
Benzo(g,h,i)perylene	191-24-2	670	---	3,200	4,000	5,200	---	---	4,000	5,200
Total HPAH	---	12,000	---	69,000	31,000	55,000	---	---	31,000	55,000
CHLORINATED HYDROCARBONS (µg/kg dry weight)										
1,4-Dichlorobenzene	106-46-7	110	---	120	---	---	---	---	110	120
1,2-Dichlorobenzene	95-50-1	35	---	110	---	---	---	---	35	110
1,2,4-Trichlorobenzene	120-82-1	31	---	64	---	---	---	---	31	64
Hexachlorobenzene (HCB)	118-74-1	22	168	230	---	---	---	---	22	230

Table 11. Additional Chemicals of Concern and Regulatory Guidelines required for POC Recreational Dock & Bioassay Samples

CHEMICAL	CAS[1] NUMBER	DMMP Marine 2013			Interim FW 2006 (SEF)		SMS FW 2013		Used for Snake River Source is shaded	
		SL	BT	ML	SL1	SL2	SL1 (SCO)	SL2 (CSL)	Screening Level	Cleanup Level
Benzyl alcohol	100-51-6	57	---	870	---	---	---	---	57	870
Hexachlorobutadiene	87-68-3	11	---	270	---	---	---	---	11	270
N-Nitrosodiphenylamine	86-30-6	28	---	130	---	---	---	---	28	130
BULK PETROLEUM HYDROCARBONS										
Total Petroleum Hydrocarbon (TPH) - Diesel		---	---	---	---	---	340	510	340	510
Total Petroleum Hydrocarbon (TPH) - Residual		---	---	---	---	---	3600	4400	3600	4400

[1] Chemical Abstract Service Registry Number

Table 12. Results of Chemical Analysis for Grab-sampled DMMUs, Tier 2 (August 2013)

CHEMICAL	Used for Snake River		DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		POC-GE		DMMU 7		DMMU 8		DMMU 9		DMMU 10		DMMU 11		POL	
	SL	CL	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q
CONVENTIONALS (mg/kg dry weight)																												
Ammonia	230	300	41.2		29		25		17		25.8		69.5		69.8		2.86		6.18		0.32		13.6		0.5		6.56	
Total sulfides	39	61	89.3		74.2		125		7.98		1.7		30		66		1.53		1.7		1.34	U	1.52		2.77		3.36	
METALS (mg/kg dry weight)																												
Antimony	150	200	8	UJ	8	UJ	7	UJ	7	UJ	8	UJ	10	UJ	10	UJ	6	UJ	7	UJ	6	UJ	6	UJ	6	UJ	7	UJ
Arsenic	14	120	8	U	8	U	7	U	7	U	8	U	10	U	10	U	6	U	7	U	6	U	6	U	6	U	7	U
Cadmium	2.1	5.4	0.4		0.3		0.3		0.3		0.3		0.5		0.5		0.3		0.3		0.3		0.3		0.3		0.3	
Chromium	72	88	14.6		13		10.8		11.3		12		21		18		6.3		7		5.9		7.4		5.7		6.4	
Copper	400	1,200	12.5		10.9		10.4		10.2		10.5		17.1		16.9		4.4		5.6		4.5	UJ	6.8		4.3		5.7	
Lead	360	> 1,300	6	J	5	J	4	J	3	J	4	J	8	J	7	J	3	UJ	3	UJ	3	U	3	J	2	UJ	12	J
Mercury	0.66	0.8	0.03	U	0.04	U	0.03	U	0.03	U	0.03	U	0.05	U	0.04	U	0.03	U	0.03	U	0.03	U	0.03	U	0.02	U	0.03	U
Nickel	26	110	11		9		8		8		9		13		11		4		5		4		5		4		5	
Selenium	3	---	0.8	U	0.8	U	0.7	U	0.7	U	0.7	U	1	U	1	U	0.6	U	0.7	U	0.6	U	0.7	U	0.6	U	0.7	U
Silver	0.57	1.7	0.5	U	0.5	U	0.4	U	0.4	U	0.5	U	0.7	U	0.6	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Zinc	3,200	> 4,200	47		40		38		33		35		55		59		25		36		24		28		22		26	
PHTHALATES (µg/kg dry weight)																												
Dimethyl phthalate	46	440	19	U	20	U	19	U	19	U	19	U	19	U	19	U	20	U	18	U	19	U	19	U	19	U	19	U
Diethyl phthalate	200	1,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Di-n-butyl phthalate	380	1,000	19	U	20	U	19	U	19	U	19	U	19	U	19	U	20	U	18	U	19	U	19	U	19	U	19	U
Butyl benzyl phthalate	260	370	19	U	20	U	19	U	19	U	19	U	19	U	19	U	20	U	18	U	19	U	19	U	19	U	19	U
Bis(2-ethylhexyl) phthalate	500	22,000	48	U	49	U	47	U	48	U	48	U	48	U	48	U	49	U	46	U	130	J	48	U	48	U	48	U
Di-n-octyl phthalate	39	> 1,100	19	U	20	U	19	U	48	U	19	U	19	U	19	U	20	U	18	U	19	U	19	U	19	U	19	U
PHENOLS (µg/kg dry weight)																												
Phenol	120	210	28		23		19	U	12	J	46		*170*		67		20	U	18	U	19	U	19	U	13	J	19	U
2-Methylphenol	63	77	19	U	20	U	19	U	19	U	19	U	19	U	19	U	20	U	18	U	19	U	19	U	19	U	19	U
4-Methylphenol	260	2,000	*1,700*		*650*		*340*		190		*1,300*		4,900		*1,400*		15	J	18	U	19	U	19	U	19	U	19	U
2,4-Dimethylphenol	29	210	26	UJ	26	UJ	25	UJ	26	UJ	26	UJ	26	UJ	26	UJ	26	UJ	25	UJ	26	UJ	26	UJ	26	UJ	26	UJ
Pentachlorophenol	1,200	> 1,200	95	UJ	98	UJ	94	UJ	96	UJ	96	UJ	96	UJ	97	U	98	UJ	93	UJ	95	U	95	U	97	U	97	U
MISCELLANEOUS EXTRACTABLES (µg/kg dry weight)																												
Benzoic acid	2,900	3,800	280		140	J	120	J	61	J	130	J	890		570		200	U	180	U	190	U	190	U	190	U	190	U
Dibenzofuran	200	680	19	U	20	U	19	U	19	U	19	U	14	J	19	U	20	U	18	U	19	U	19	U	19	U	19	U

Table 12. Results of Chemical Analysis for Grab-sampled DMMUs, Tier 2 (August 2013)

CHEMICAL	Used for Snake River		DMMU 1		DMMU 2		DMMU 3		DMMU 4		DMMU 5		DMMU 6		POC-GE		DMMU 7		DMMU 8		DMMU 9		DMMU 10		DMMU 11		POL	
	SL	CL	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q
beta-Hexachlorocyclohexane	7.2	11	0.97	U	0.97	U	0.49	U	0.47	U	0.47	U	0.98	U	0.47	U	0.47	U	0.48	U	0.49	U	0.49	U	0.48	U	0.5	U
PESTICIDES & PCBs (µg/kg dry weight)																												
4,4'-DDD	310	860	1.9	U	1.9	U	0.98	U	0.94	U	0.95	U	2	U	1.9	U	0.94	U	0.96	U	0.98	U	0.98	U	0.95	U	0.95	U
4,4'-DDE	21	33	1.9	U	1.9	U	0.98	U	0.94	U	0.95	U	1.5	U	1.9	U	0.94	U	0.96	U	0.98	U	1.6	U	0.95	U	0.95	U
4,4'-DDT	100	8,100	1.9	UJ	1.9	UJ	0.98	U	0.94	U	0.95	UJ	2	UJ	1.9	UJ	0.94	U	0.96	U	0.98	U	0.98	U	0.95	U	0.95	U
Total Chlordane	2.8	37	1.9	U	1.9	U	0.98	U	0.94	U	0.95	U	2	U	1.9	U	0.94	U	0.96	U	0.98	U	0.98	U	0.95	U	0.95	U
Dieldrin	4.9	9.3	1.9	U	1.9	U	0.98	U	0.94	U	0.95	U	2	U	1.9	U	0.94	U	0.96	U	0.98	U	0.98	U	0.95	U	0.95	U
Heptachlor	1.5	270	0.97	R	0.97	R	0.49	R	0.47	R	0.47	R	0.98	R	0.96	R	0.47	R	0.48	R	0.49	R	0.49	R	0.48	R	0.47	R
Endrin ketone	8.5	> 8.5	1.9	UJ	1.9	UJ	0.98	U	0.94	U	0.95	UJ	2	UJ	1.9	UJ	0.94	U	0.96	U	0.98	U	0.98	U	0.95	U	0.95	U
Carbazole	900	1,100	19	U	20	U	19	U	19	U	19	U	19	U	19	UJ	20	U	18	U	19	UJ	19	UJ	19	UJ	13	J
Total PCBs (Aroclors)	110	2,500	39	U	40	U	38	U	18	U	39	U	46	U	39	U	27	U	19	U	27	U	22	U	18	U	28	U
SPECIAL CHEMICALS OF CONCERN																												
Toxaphene	0.2*	---	48	UJ	48	UJ	25	U	24	U	24	UJ	49	UJ	48	UJ	24	U	24	U	24	U	24	U	24	U	24	U

* Toxaphene SL is not a required or reviewed screening level; simply a target detection limit for laboratory analyses
Bold, italicized, yellow-shaded values indicate exceeds the SL; Bold, orange-shaded values exceed the CL
S/C SL1 and S/C CL = Project-specific screening levels from source indicated
mg/kg = milligrams per kilogram; **µg/kg** = micrograms per kilogram

Data Qualifiers
U Indicates that the target analyte was not detected at the reported concentration
UJ - The analyte was analyzed for, and the associated quantitation limit was an estimated value.
J Estimated concentration when the value is less than ARI's established reporting limits
R - The reported result was rejected.

Table 13. Results of Chemical Analysis for Core-sampled DMMUs, Tier 2 (August 2013)

CHEMICAL	Used for Snake River		Project Data			
			POC Cruise Dock		POC Rec Dock	
	Screening Level	Cleanup Level	Value	Q	Value	Q
CONVENTIONALS (mg/kg dry weight)						
Ammonia	230	300	38.5		330	
Total sulfides	39	61	21.5		5,640	
METALS (mg/kg dry weight)						
Antimony	150	200	6	UJ	9	UJ
Arsenic	14	120	6	U	9	U
Cadmium	2.1	5.4	0.3		0.7	
Chromium	72	88	13.4		20	
Copper	400	1,200	11.2		24.5	
Lead	360	> 1,300	4	J	8	J
Mercury	0.66	0.8	0.03	U	0.06	
Nickel	26	110	10		15	
Selenium	3	---	0.7	U	0.9	U
Silver	0.57	1.7	0.4	U	0.5	U
Zinc	3,200	> 4,200	40		70	
PHTHALATES (µg/kg dry weight)						
Dimethyl phthalate	46	440	19	U	19	U
Diethyl phthalate	200	1,200	—	—	19	U
Di-n-butyl phthalate	380	1,000	19	U	19	U
Butyl benzyl phthalate	260	370	19	U	19	U
Bis(2-ethylhexyl) phthalate	500	22,000	47	U	48	U
Di-n-octyl phthalate	39	> 1,100	19	U	19	U
PHENOLS (µg/kg dry weight)						
Phenol	120	210	19	U	36	
2-Methylphenol	63	77	19	U	19	U
4-Methylphenol	260	2,000	28		130	
2,4-Dimethylphenol	29	210	26	UJ	26	UJ
Pentachlorophenol	1,200	> 1,200	95	U	97	U
MISCELLANEOUS EXTRACTABLES (µg/kg dry weight)						
Benzyl alcohol	57	870	—	—	19	U
Benzoic acid	2,900	3,800	110	J	430	
Dibenzofuran	200	680	19	U	19	U
Hexachlorobutadiene	11	270	—	—	1.9	U
N-Nitrosodiphenylamine	28	130	—	—	19	U
beta-Hexachlorocyclohexane	7.2	11	0.49	U	3.9	U
PESTICIDES & PCBs (µg/kg dry weight)						
4,4'-DDD	310	860	0.98	U	1.8	J
4,4'-DDE	21	33	0.98	U	1.9	U
4,4'-DDT	100	8,100	0.98	U	1.9	UJ
Total Chlordane	2.8	37	0.98	U	1.9	U
Dieldrin	4.9	9.3	0.98	U	1.9	U
Heptachlor	1.5	270	0.49	R	0.95	R
Endrin ketone	8.5	> 8.5	0.98	U	1.9	UJ
Carbazole	900	1,100	19	UJ	13	J
Total PCBs (Aroclors)	110	2,500	19	U	20	U

Table 13. Results of Chemical Analysis for Core-sampled DMMUs, Tier 2 (August 2013)

CHEMICAL	Used for Snake River		Project Data			
			POC Cruise Dock		POC Rec Dock	
	Screening Level	Cleanup Level	Value	Q	Value	Q
SPECIAL CHEMICALS OF CONCERN[4]						
Toxaphene	0.2*	---	25	U	48	UJ
PAHs (µg/kg dry weight)						
Naphthalene	500	1,300	—	—	19	U
Acenaphthylene	470	640	—	—	19	U
Acenaphthene	1,100	1,300	—	—	19	U
Fluorene	1,000	3,000	—	—	19	U
Phenanthrene	6,100	7,600	—	—	19	U
Anthracene	1,200	1,200	—	—	19	U
2-Methylnaphthalene[2]	470	560	—	—	19	U
Total LPAH	6,600	9,200	—	—	19	U
Fluoranthene	11,000	15,000	—	—	19	U
Pyrene	8,800	16,000	—	—	19	U
Benz(a)anthracene	4,300	5,800	—	—	19	U
Chrysene	5,900	6,400	—	—	19	U
Benzofluoranthenes (b, j ,k)	600	4,000	—	—	19	U
Benzo(a)pyrene	3,300	4,800	—	—	19	U
Indeno(1,2,3-c,d)pyrene	4,100	5,300	—	—	19	U
Dibenz(a,h)anthracene	800	840	—	—	19	U
Benzo(g,h,i)perylene	4,000	5,200	—	—	19	U
Total HPAH	31,000	55,000	—	—	19	U
CHLORINATED HYDROCARBONS (µg/kg dry weight)						
1,4-Dichlorobenzene	110	120	—	—	19	U
1,2-Dichlorobenzene	35	110	—	—	19	U
1,2,4-Trichlorobenzene	31	64	—	—	19	U
Hexachlorobenzene (HCB)	22	230	—	—	1.9	U
BULK PETROLEUM HYDROCARBONS						
Total Petroleum Hydrocarbon (TPH) - Diesel	340	510	—	—	41	
Total Petroleum Hydrocarbon (TPH) - Residual	3,600	4,400	—	—	120	

Table 14. Results of Chemical Analysis for DMMUs undergoing bioassays, Tier 3 (November 2013)

CHEMICAL	SL	CL	DMMU-1-G-C1-B		DMMU-2-G-C1-B		DMMU-3-G-C1-B		DMMU-5-G-C1-B		DMMU-6-G-C1-B		POC-GE-G-C1-B		SR144-R-G1		SR128.5-R-G1	
PHENOLS & MISC. EXTRACTABLES (µg/kg dry weight)																		
Phenol	120	210	39		27		33		100		110		25		19	U	20	
2-Methylphenol	---	---	19	U	20	U	19	U	18	J	20	U	20	U	19	U	19	U
4-Methylphenol	260	2,000	*340*		160		*340*		*660*		*1,200*		81		120		19	U
2,4-Dimethylphenol	---	---	26	UJ	27	UJ	26	UJ	26	UJ	27	UJ	26	UJ	26	UJ	26	UJ
Benzoic acid	2,900	3,800	260		220		200		850		960		170	J	90	J	70	J
Pentachlorophenol	1,200	> 1,200	97	U	99	U	95	U	96	U	100	U	32	J	96	U	96	U

Bold, italicized, yellow-shaded values indicate exceeds the SL

Table 15. SMS 2013 Freshwater Bioassay Interpretive Criteria for Tests Used In Snake/Clearwater Characterization

Biological Test/ Endpoint	Performance Standard		Sediment Cleanup Objective for each biological test	Cleanup Screening Level for each biological test
	Control	Reference		
Hyalella azteca				
10-day mortality	$M_C \leq 20\%$	$M_R \leq 25\%$	$M_T - M_C > 15\%$ and M_T vs M_C SD ($p \leq 0.05$)	$M_T - M_C > 25\%$ and M_T vs M_C SD ($p \leq 0.05$)
Chironomus dilutus				
20-day mortality	$M_C \leq 32\%$	$M_R \leq 35\%$	$M_T - M_C > 15\%$ and M_T vs M_C SD ($p \leq 0.05$)	$M_T - M_C > 25\%$ and M_T vs M_C SD ($p \leq 0.05$)
20-day growth	$MIG_C \geq 0.60$ mg/individual	$MIG_R/MIG_C \geq 0.8$	$(MIG_C - MIG_T)/MIG_C > 0.25$ and MIG_T vs MIG_C SD ($p \leq 0.05$)	$(MIG_C - MIG_T)/MIG_C > 0.40$ and MIG_T vs MIG_C SD ($p \leq 0.05$)

M_C = mean control sediment
M_R = mean reference sediment
M_T = mean test sediment
MIG_R = mean individual growth - reference sediment
MIG_T = mean individual growth - test sediment
MIG_C = mean individual growth - control sediment
SD = significant difference
Growth measured via dry wt

Table 16. *Hyallela azteca* 10-day mortality results

Sample	% fines	Mean mortality (%)	Control Performance Standard **C ≤ 20%**	Reference Performance Standard **R ≤ 25%**	Compared with	1-Hit Criteria: T-R >25% and T vs. R SS	2-Hit Criteria: T-R >15% and T vs. R SS	Pass/Fail
Control (Beaver Creek) (C)	39.4	1.3	1.3 < 20;		--			
Reference 1 (SR mile 144) - coarse (R_C)	29.7	1.3		1.3 < 25, accept	--			
Reference 2 (SR mile 128.5) - fine (R_F)	64.5	3.8		3.8 < 25, accept	--			
DMMU 1	19.3	1.3			R_C	T- R_C = 0.0	T-R_C = 0.0	Pass
DMMU 2	14.2	0.0			R_C	T- R_C = -1.3	T- R_C = -1.3	Pass
DMMU 3	20.9	0.0			R_C	T- R_C = -1.3	T- R_C = -1.3	Pass
DMMU 5	38.7	0.0			C	T-C = -1.3	T-C = -1.3	Pass
DMMU 6	48.4	1.3			C	T-C = 0.0	T-C = 0.0	Pass
DMMU GE	14.1	0.0			R_C	T- R_C = -1.3	T- R_C = -1.3	Pass

Table 17. *Chironomus dilutus* 20-day mortality results

Sample	% fines	Mean mortality (%)	Control Performance Standard **C ≤ 32%**	Reference Performance Standard **R ≤ 35%**	Compared with	1-Hit Criteria: T-R >25% and T vs. R SS	2-Hit Criteria: T-R >15% and T vs. R SS	Pass/Fail
Control (Beaver Creek) (C)	39.4	18.8	18.8 < 32; accept		--			
Reference 1 (SR mile 144) - coarse (R_C)	29.7	13.8		13.8 < 35; accept	--			
Reference 2 (SR mile 128.5) - fine (R_F)	64.5	26.3		26.3 < 35; accept	--			
DMMU 1	19.3	13.8			R_C	T-R_C=0.0	T-R_C=0.0	Pass
DMMU 2	14.2	15.0			R_C	T-R_C=1.3	T-R_C=1.3	Pass
DMMU 3	20.9	13.8			R_C	T-R_C=0.0	T-R_C=0.0	Pass
DMMU 5	38.7	12.5			C	T-C=-6.3	T-C=-6.3	Pass
DMMU 6	48.4	12.5			C	T-C=-6.3	T-C=-6.3	Pass
DMMU GE	14.1	17.5			R_C	T-R_C=3.8	T-R_C=3.8	Pass

Table 18. *Chironomus dilutus* 20-day growth results

Sample	% fines	Growth - mean AFDW (mg/ind.)	Control Performance Standard **C ≥ 0.**60 mg/ind.	Reference Performance Standard **R/C ≥ 0.8**	Compared with	1-Hit: $(MIG_R - MIG_T)/MIG_R > 0.25$ and MIG_T vs. MIG_R SS	2-Hit: $(MIG_R - MIG_T)/MIG_R > 0.40$ and MIG_T vs. MIG_R SS	Pass/Fail
Control (Beaver Creek) (C)	39.4	1.73	1.73 > 0.6; accept		--			
Reference 1 (SR mile 144) - coarse (R_C)	29.7	1.56		R/C = 0.9; accept	--			
Reference 2 (SR mile 128.5) - fine (R_F)	64.5	1.70		R/C = 0.99; accept	--			
DMMU 1	19.3	1.42			R_C	0.09	0.09	Pass
DMMU 2	14.2	1.67			R_C	-0.07	-0.07	Pass
DMMU 3	20.9	1.62			R_C	-0.04	-0.04	Pass
DMMU 5	38.7	1.52			C	0.12	0.12	Pass
DMMU 6	48.4	1.65			C	0.05	0.05	Pass
DMMU GE	14.1	1.95			R_C	-0.25	-0.25	Pass

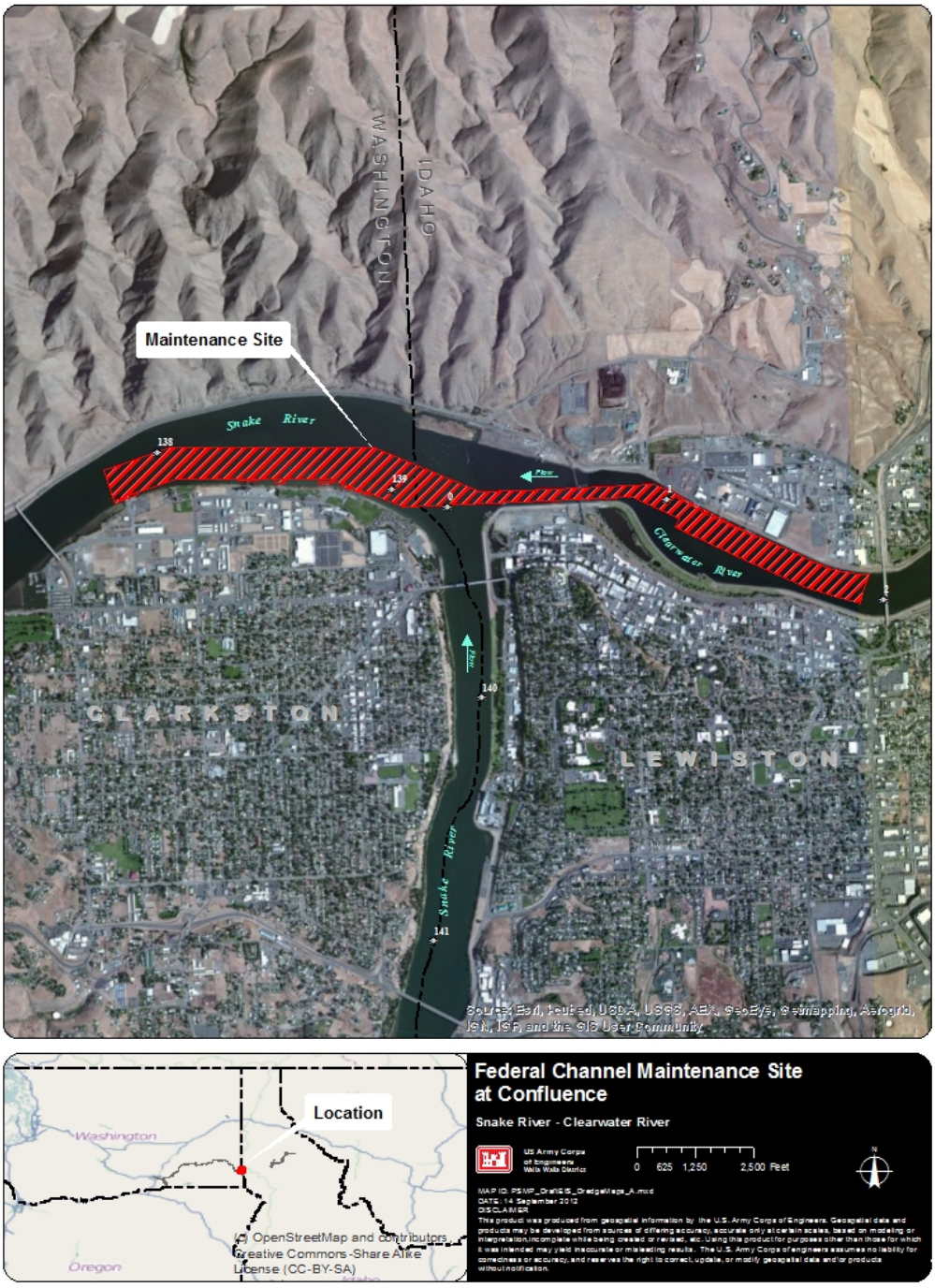

Figure 1. Vicinity Map showing dredging limits of the Federal Channel at the confluence of the Snake and Clearwater Rivers

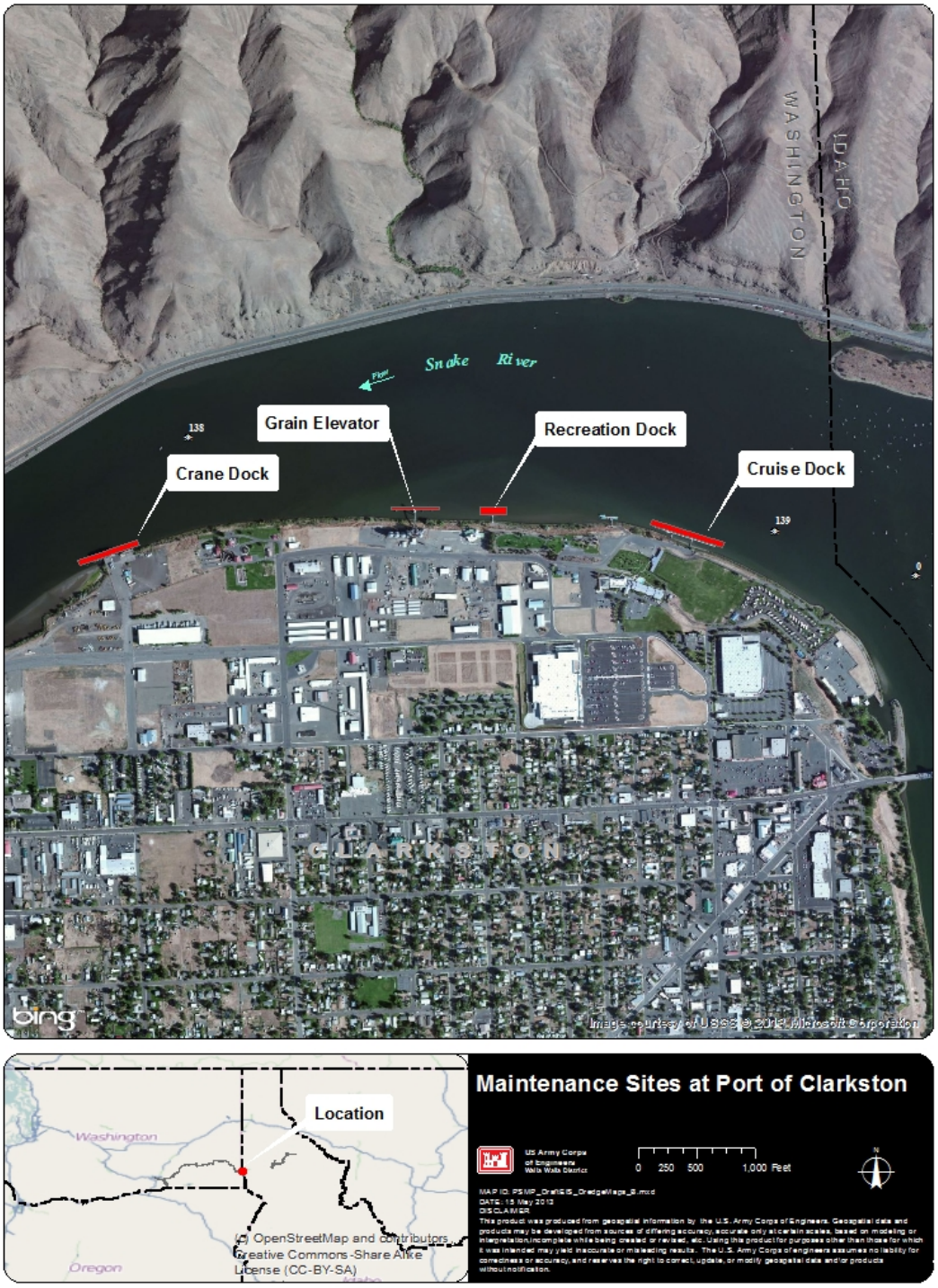

Figure 2. Snake River Vicinity Map showing Port of Clarkston proposed dredge areas. Grain Elevator, Recreation Dock and Cruise Dock are evaluated in this SD; Crane Dock is evaluated separately in Port of Clarkston Crane Dock, Snake River.

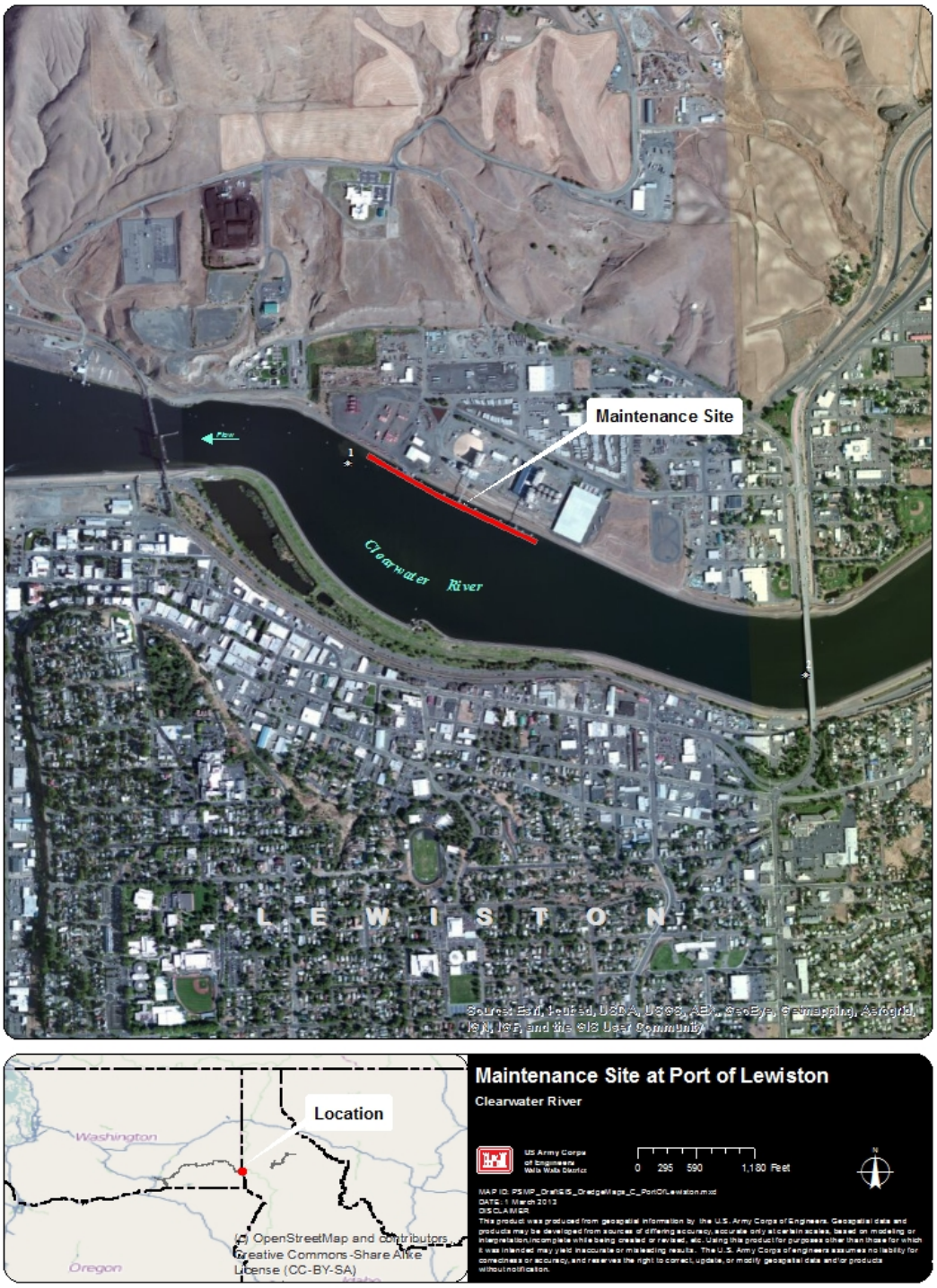

Figure 3. Proposed dredging in Clearwater River at Port of Lewiston.

Figure 4. Approximate DMMU locations with 4-methylphenol exceedances in red. Yellow pins indicate elevated 4-methlyphenol without SL exceedance; green pins indicate low 4-methylphenol detections.