

**SUBJECT: EVALUATION OF PROPOSED POST-DREDGE MATERIAL TO EVALUATE COMPLIANCE WITH THE WASHINGTON STATE ANTIDegradation POLICY, FOR THE CITY OF ENTIAT MARINA (NWS-2013-1049), ENTIAT, WASHINGTON (COLUMBIA RIVER).**

1. **Introduction.** This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Department of Ecology, Washington State Department of Natural Resources, and the Environmental Protection Agency) regarding the suitability of the exposed sediment surface after removal of up to 32,000 cubic yards (cy) of accumulated sediment and native gravel and cobbles from the proposed marina area.
2. **Project.** The City of Entiat proposes to construct a 65-slip public marina along the west bank of the Columbia River. The work includes excavation and dredging of a basin for the marina. In addition to the in-water dredging of up to 32,000 cy, an additional 77,300 cy of uplands adjacent to the dredging is proposed. Proposed disposal is upland, within the project site boundaries but above OHW and with no return flow to the river.

**Table 1. City of Entiat Marina – Project Characterization Summary**

|                                  |                                    |
|----------------------------------|------------------------------------|
| Project ranking                  | Low-moderate                       |
| Proposed dredging volume         | 32,000 cy                          |
| Proposed dredging depth          | 693 ft (NGVD29)<br>697 ft (NAVD88) |
| Proposed disposal location       | upland                             |
| Tier 1 Evaluation received       | February 18, 2015                  |
| Draft SAPs received              | 5/8/15, 1/22/16, 3/22/16           |
| Final SAP received               | April 26, 2016                     |
| SAP approved                     | May 13, 2016                       |
| Sampling date                    | June 16, 2016                      |
| Final Report received            | September 26, 2016                 |
| DMMP tracking ID                 | ENTIA-1-A-F-375                    |
| EIM Study ID                     | ENTIA16                            |
| Public Notice                    | NWS-2013-1049                      |
| Recency Determination Expiration | June 2022 (LM rank – 6 years)      |

3. **Background.** The city of Entiat was originally founded on the banks of the Columbia River, upstream of its confluence with the Entiat River. When the Rocky Reach Dam was built in the 1960s, the resulting upstream reservoir flooded the original town site; the entire town was moved uphill in anticipation of the flooding. Prior to the construction of the dam, the property was part of the uplands but unused by the town. The flooded material consisted of cobbles, sands and gravels. Since flooding, a layer of finer sediment has accumulated in the proposed project area. Pre-project probes indicated up to two feet of fine material overlaying native

cobbles. Since the dredging will remove the entire fine layer, as well as some of the coarse material beneath, no Z-samples of post-dredge native material were required. Sampling of the dredged material was carried out to inform upland disposal options.

4. **Tier 1: Project Ranking and Sampling Requirements.** The Tier 1 evaluation submitted in February 2015 provided the DMMP with adequate information to determine rank and sampling requirements. Because the material is being disposed upland, with no return water, the only DMMP interest is insuring that the post-dredge surface meets State of Washington antidegradation policy. To evaluate the material for upland disposal options, the material was ranked low-moderate, consistent with few local sources for potential contamination but without previous data to rank the area lower. Chemicals of concern were those promulgated in WAC 173-204-563 (SMS Freshwater Sediment Chemical Criteria). Testing for dioxins and furans was not recommended due to the lack of sources in the area. The final Sampling and Analysis Plan (SAP) was approved on May 13, 2016 and a pre-sampling conference call was held with the sampling team on June 10, 2016.
5. **Sampling.** Sampling took place on June 16, 2016. Four grab samples were collected with a hand-held van Veen sampler and composited into one sample for analysis (Erlandsen 2016). Sample elevations were originally reported in NGVD29 but are converted here to NAD88 and for upload to Ecology’s EIM database. Samples were obtained and transported to the laboratory per the approved SAP.

**Table 2. Sample Locations and Details (June 16, 2016)**

| Sample            | Datum | Unit      | S1          | S2          | S3          | S4          |
|-------------------|-------|-----------|-------------|-------------|-------------|-------------|
| Latitude          | NAD83 |           | 47.679044   | 47.678581   | 47.67815    | 47.678092   |
| Longitude         | NAD83 |           | -120.204036 | -120.204225 | -120.204322 | -120.204356 |
| Water Elevation   | NAD88 | <i>ft</i> | 709.85      | 709.83      | 709.87      | 709.78      |
| Water Depth       |       | <i>ft</i> | 7.22        | 5.88        | 3.82        | 3.85        |
| Top of Sediment   | NAD88 | <i>ft</i> | 702.63      | 703.95      | 706.05      | 705.92      |
| Refusal Elevation | NAD88 | <i>ft</i> | 701.20      | 703.13      | 705.23      | 705.48      |
| Sample Thickness  |       | <i>ft</i> | 1.43        | 0.82        | 0.82        | 0.44        |

6. **Tier 2 Conventional & Chemical Analyses.** The tested sediment was representative only of the portion of the dredge prism that has accumulated since inundation in 1961. That portion consisted of very fine sediments (Table 3). Chemical analyses were conducted by TestAmerica Laboratories, Inc. in Tacoma, Washington. The approved sampling and analysis plan was followed and quality control guidelines specified by the DMMP program were generally met. The sample was diluted by the laboratory due to the high sulfide levels in the sample matrix, so reporting limits were elevated—in some cases over either the SL1 (the Sediment Cleanup Objective) or the SL2 (Cleanup Screening Level). Only one chemical of concern (cadmium) was actually detected at levels above the SL1; no chemicals were detected at levels over the SL2. Chemicals of concern with undetected levels above the SL1 were bis(2-ethylhexyl) phthalate, 4-methylphenol and dibenzofuran. Chemicals of concern with undetected levels above the SL2 were di-n-butyl phthalate, di-n-octyl phthalate, phenol and benzoic acid (Table 4). If proposed disposal had been in waters of the US, the DMMP would have required bioassay testing to further evaluate this material before it was found suitable for

open water disposal. But for upland disposal options, the applicant considered the data sufficient for decision-making.

Table 3. City of Entiat Marina - Sediment Conventional

|                            |                           | DMMU 1 |
|----------------------------|---------------------------|--------|
| Preserved Total Solids     |                           | 40     |
| Total Organic Carbon (%)   |                           | 2.0    |
| Total Solids (%)           |                           | 42.2   |
| Total Volatile Solids (%)  |                           | 2.2    |
| Ammonia (NH3) as N (mg/kg) |                           | 71     |
| Sulfide (mg/kg)            |                           | 610    |
| Grain Size                 | Gravel (> 2000 mm)        | 0.10   |
|                            | Sand (63-2000 mm)         | 38     |
|                            | Silt                      | 60     |
|                            | Clay                      | 1.9    |
|                            | Total Fines (Silt + Clay) | 61.9   |

7. **Sediment Exposed by Dredging.** All of the fine-grained material within the project footprint will be removed from the water and placed in an upland location in a manner consistent with local requirements. The post-dredge surface will consist entirely of native cobbles. Since contaminants in general don't bind with coarse-grained sediments and are usually associated with the fine-grained fraction of material (DMMP/SMS 2006), no testing of the post-dredge surface was required. The sediment to be exposed by dredging is not considered to be degraded relative to the currently exposed sediment surface. The DMMP agencies concluded that this project, as described, is in compliance with the Washington State anti-degradation policy.

*This 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.*

8. **References.**

DMMP 2008. *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 2015. *Dredged Material Evaluation and Disposal Procedures (User Manual)*. Prepared by the Seattle District Dredged Material Management Office for the Dredged Material Management Program, November 2015.

DMMP/SMS 2006. *Reporting Of Sediment-Bound Contaminants: Standardization of Sieving and Analytical Procedures*. A Clarification Paper prepared by David Sternberg (WA State Department of Ecology) for the Dredged Material Management Program (DMMP) agencies and Ecology's Sediment Management Standards (SMS) Program, October 2006.

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

Erlandsen 2016. *In-Water Sediment Sampling Summary Report: Entiat Marina, City of Entiat*. Report prepared for the City of Entiat by Eric Smith, PE. September 2016.

signed copy on file in DMMP office

9. Agency Signatures

SUBJECT: EVALUATION OF PROPOSED POST-DREDGE MATERIAL TO EVALUATE COMPLIANCE WITH THE WASHINGTON STATE ANTIDEGRADATION POLICY, FOR THE CITY OF ENTIAT MARINA (NWS-2013-1049), ENTIAT, WASHINGTON (COLUMBIA RIVER).

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
- Debbie Knaub, Corps Regulatory
- Keith Vradenburg, Mayor
- Larry Lehman, Grette Associates, LLC
- Eric Smith, Erlandsen

Table 4. Chemical analysis results compared to SMS FW Guidelines

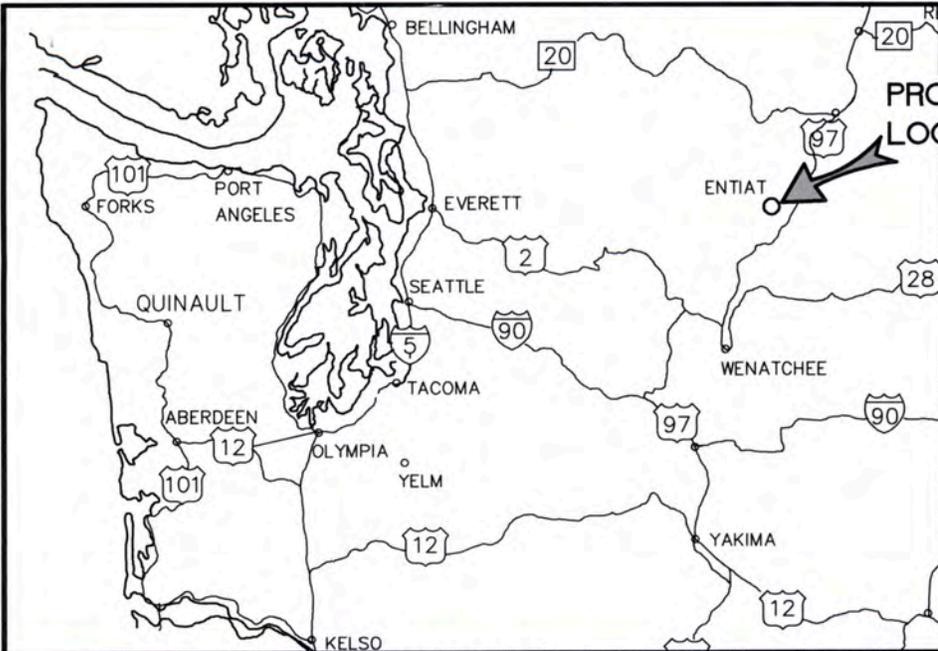
| CHEMICAL                                     | CAS NUMBER | SMS FRESHWATER |         | DMMU 1 |    |
|--|------------|----------------|---------|--------|----|
|  |            | SL1            | SL2     | Result | LQ |
| <b>METALS (mg/kg dry weight)</b>             |            |                |         |        |    |
| Antimony                                     | 7440-36-0  | ---            | ---     |        |    |
| Arsenic                                      | 7440-38-2  | 14             | 120     | 8.4    |    |
| Cadmium                                      | 7440-43-9  | 2.1            | 5.4     | 3.7    |    |
| Chromium (Speciated and Unspeciated)         | 7440-47-3  | 72             | 88      | 25     |    |
| Copper                                       | 7440-50-8  | 400            | 1,200   | 32     |    |
| Lead   | 7439-92-1  | 360            | > 1,300 | 21     | B  |
| Mercury                                      | 7439-97-6  | 0.66           | 0.8     | 0.05   |    |
| Nickel                                       | 7440-02-0  | 38             | 110     | 19     |    |
| Selenium                                     | 7782-49-2  | 11             | >20     | 1.2    | B  |
| Silver                                       | 7440-22-4  | 0.57           | 1.7     | 0.12   | J  |
| Zinc   | 7440-66-6  | 3,200          | >4,200  | 250    |    |
| <b>PAHs (µg/kg dry weight)</b>               |            |                |         |        |    |
| Naphthalene                                  | 91-20-3    | ---            | ---     | 88     | U  |
| Acenaphthylene                               | 208-96-8   | ---            | ---     | 88     | U  |
| Acenaphthene                                 | 83-32-9    | ---            | ---     | 88     | U  |
| Fluorene                                     | 86-73-7    | ---            | ---     | 88     | U  |
| Phenanthrene                                 | 85-01-8    | ---            | ---     | 88     | U  |
| Anthracene                                   | 120-12-7   | ---            | ---     | 88     | U  |
| 2-Methylnaphthalene                          | 91-57-6    | ---            | ---     | 88     | U  |
| Fluoranthene                                 | 206-44-0   | ---            | ---     | 88     | U  |
| Pyrene                                       | 129-00-0   | ---            | ---     | 88     | U  |
| Benz(a)anthracene                            | 56-55-3    | ---            | ---     | 88     | U  |
| Chrysene                                     | 218-01-9   | ---            | ---     | 110    | U  |
| Benzo(a)fluoranthenes (b, j, k)              | 205-99-2   |                |         | 240    | U  |
|  | 205-82-3   | ---            | ---     |        |    |
|  | 207-08-9   |                |         |        |    |
| Benzo(a)pyrene                               | 50-32-8    | ---            | ---     | 150    | U  |
| Indeno(1,2,3-c,d)pyrene                      | 193-39-5   | ---            | ---     | 180    | U  |
| Dibenz(a,h)anthracene                        | 53-70-3    | ---            | ---     | 180    | U  |
| Benzo(g,h,i)perylene                         | 191-24-2   | ---            | ---     | 150    | U  |
| Total PAHs                                   |            | 17,000         | 30,000  | 1,890  | U  |
| <b>PHTHALATES (µg/kg dry weight)</b>         |            |                |         |        |    |
| Di-n-butyl phthalate                         | 84-74-2    | 380            | 1,000   | 2,200  | U  |
| Bis(2-ethylhexyl) phthalate                  | 117-81-7   | 500            | 22,000  | 2,600  | U  |
| Di-n-octyl phthalate                         | 117-84-0   | 39             | >1,100  | 2,200  | U  |
| <b>PHENOLS (µg/kg dry weight)</b>            |            |                |         |        |    |
| Phenol                                       | 108-95-2   | 120            | 210     | 440    | U  |
| 4-Methylphenol                               | 106-44-5   | 260            | 2,000   | 880    | U  |
| Pentachlorophenol                            | 87-86-5    | 1,200          | >1,200  | 1,100  | U  |
| <b>MISC. EXTRACTABLES (µg/kg dry weight)</b> |            |                |         |        |    |
| Benzoic acid                                 | 65-85-0    | 2,900          | 3,800   | 11,000 | U  |
| Dibenzofuran                                 | 132-64-9   | 200            | 680     | 440    | U  |

| CHEMICAL  | CAS NUMBER | SMS FRESHWATER |       | DMMU 1 |    |
|---|------------|----------------|-------|--------|----|
|   |            | SL1            | SL2   | Result | LQ |
| Carbazole                                       | 86-74-8    | 900            | 1,100 | 440    | U  |
| <b>PESTICIDES &amp; PCBs (µg/kg dry weight)</b> |            |                |       |        |    |
| beta-Hexachlorocyclohexane                      |            | 7.2            | 11    | 0.57   | J  |
| 2,4'-DDD  | ---        | 310            | 860   | 1.2    | J  |
| 4,4'-DDD  |            |                |       | 6.2    | B  |
| 2,4'-DDE  | ---        | 21             | 33    | 4.5    | U  |
| 4,4'-DDE  |            |                |       | 8.4    | B  |
| 2,4'-DDT  | ---        | 100            | 8,100 | 4.5    | U  |
| 4,4'-DDT  |            |                |       | 0.67   | J  |
| Dieldrin  | 60-57-1    | 4.9            | 9.3   | 4.5    | U  |
| Endrin ketone                                   | 53494-70-5 | 8.5            | >8.5  | 4.5    | U  |
| Total PCBs (Aroclors)                           | ---        | 110            | 2,500 | 16.47  | U  |
| <b>BULK PETROLEUM HYDROCARBONS (mg/kg)</b>      |            |                |       |        |    |
| TPH – Diesel                                    | ---        | 340            | 510   | 55     | U  |
| TPH – Residual                                  | ---        | 3,600          | 4,400 | 28     | J  |

Notes:

- CAS: Chemical Abstract Service Registry Number
- MDL: Method Detection Limit
- MRL: Method Reporting Limit
- SQS: Sediment Quality Standards
- CSL: Cleanup Screening Level
- LQ: Laboratory Data Qualifier
- B: Compound was found in the blank and sample.
- J: Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
- U: Not detected at the reporting limit (or MDL or EDL if shown)
- detected compounds are bolded
- detected exceedance > SL1
- undetected exceedance > SL1
- undetected exceedance > SL2

S09 T25N R21E



**PROJECT LOCATION**

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**WASHINGTON KEY MAP**

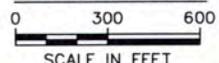


PROJECT SITE  
 LAT: 47° 40' 41.33"N  
 LONG: 120° 12' 16.46"W  
 SECTION 09 T25N, R21E

**COLUMBIA RIVER (LAKE ENTIAT)**

FLOW

**LOCATION MAP**



SCALE IN FEET

**WATER LEVELS (NGVD29)**

|                            |         |
|----------------------------|---------|
| NORMAL HIGH OPERATING POOL | +707.0' |
| ORDINARY HIGH WATER        | +706.5' |
| MIN OPERATING POOL         | +703.0' |

NWS-2013-1049

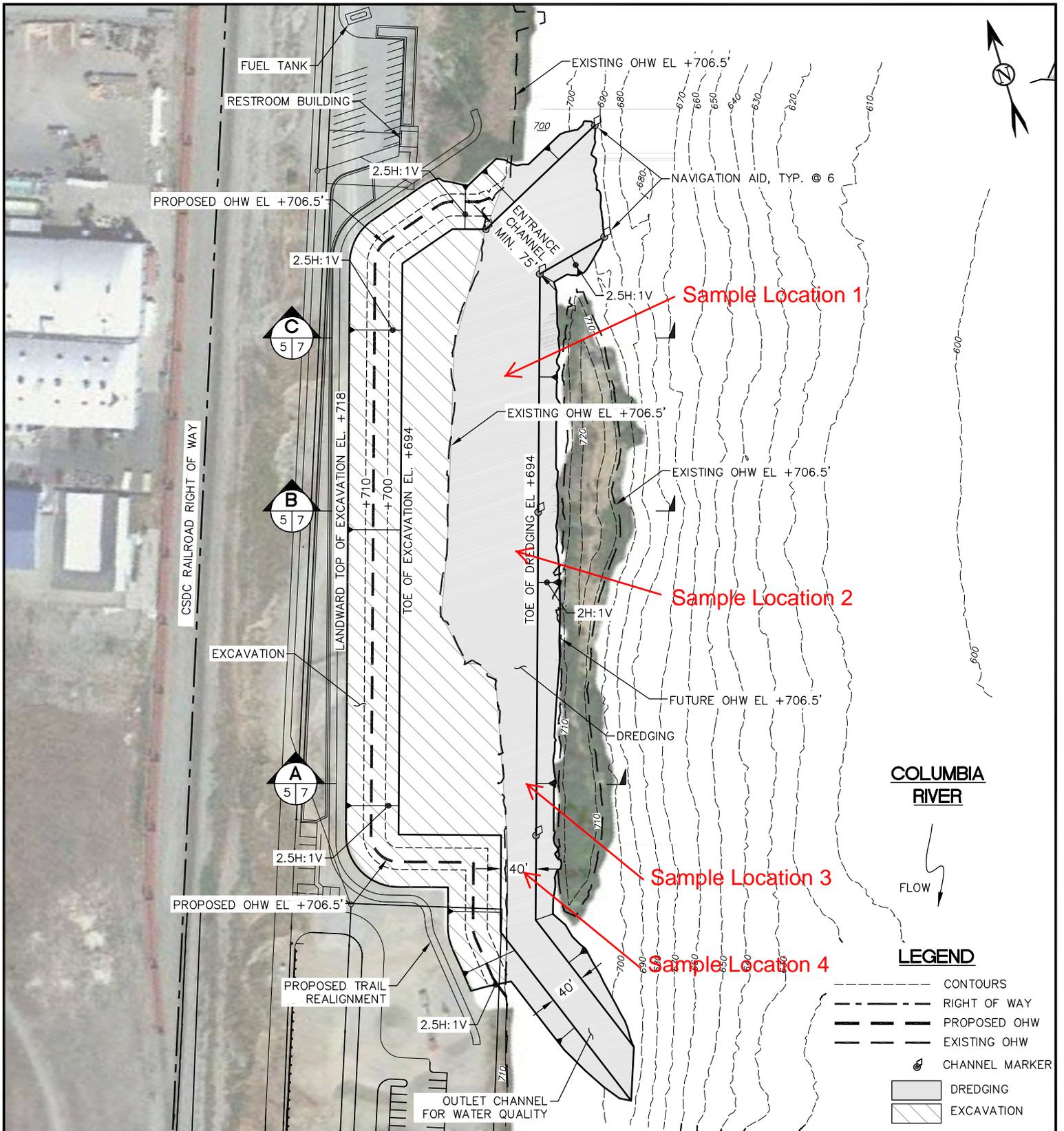
**PURPOSE:** CONSTRUCT PUBLIC MARINA  
**LOCATION:** 47° 40' 41.33"N  
 120° 12' 16.46"W  
**DATUM:** NGVD29  
**ADJACENT PROPERTY OWNERS:**  
 1. CITY OF ENTIAT  
 2. CHELAN COUNTY PUD

**CITY OF ENTIAT  
 ENTIAT TRAIL AND MARINA**

**VICINITY MAP**

APPLICATION BY: CITY OF ENTIAT

**PROPOSED:** ENTIAT MARINA, PARKING AREA  
**IN:** LAKE ENTIAT (COLUMBIA RIVER)  
**AT:** ENTIAT, WA  
**COUNTY:** CHELAN  
 SHEET 1 OF 22      **DATE:** 9/11/13



**NOTES:**

1. UPLAND IMPROVEMENTS SHOWN FOR REFERENCE ONLY.
2. CONTOUR INTERVAL SHOWN AT 10 FT.



| WATER LEVELS (NGVD29)      |         |
|----------------------------|---------|
| NORMAL HIGH OPERATING POOL | +707.0' |
| ORDINARY HIGH WATER        | +706.5' |
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**PURPOSE:** CONSTRUCT PUBLIC MARINA

**LOCATION:** 47° 40' 41.33"N  
120° 12' 16.46"W

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**ADJACENT PROPERTY OWNERS:**

1. CITY OF ENTIAT
2. CHELAN COUNTY PUD

**CITY OF ENTIAT  
ENTIAT TRAIL AND MARINA  
PROPOSED DREDGING AND  
EXCAVATION PLAN**

APPLICATION BY: CITY OF ENTIAT

**PROPOSED:** ENTIAT MARINA, PARKING AREA

**IN:** LAKE ENTIAT (COLUMBIA RIVER)

**AT:** ENTIAT, WA

**COUNTY:** CHELAN

SHEET 5 OF 22

**DATE:** 9/11/13