

# COLUMBIA RIVER AT THE MOUTH

## Project Description

The authorized project provides for a 2640-foot wide channel across the Columbia River Bar. The northerly 2,000 feet of the channel is authorized to 55 feet deep and the southerly 640 feet to 48 feet deep. Hopper dredges maintain the channel.

Two rubble-mound jetties and a spur jetty help secure the channel. The North Jetty, completed in 1917, is about 2.5 miles long. The south jetty, completed in 1914, is about 6.6 miles long. Spur jetty "A" on the north shore is 0.3 miles long. Intended to help stabilize the channel, it was built in conjunction with the first rehabilitation of the North Jetty in 1939.

## Maintenance

The project has two main shoaling areas. The outer shoal extends from approximately river mile (RM) -1.6 to RM -1.0. The inner shoal, Clatsop Shoal, extends from approximately RM 0.0 to RM 2.6, beginning on the south side and crossing the channel near RM 1.0. To maintain the channel's southerly 48-foot depth in the winters between dredging operations, the depth is taken to 53 or 55 feet. To maintain the channel's northerly 55-foot depth between dredging operations, dredging is taken to 60 feet during the summer. Material dredged from the project is placed in one-of-two EPA Section 102 ODMDSs the Deep Water Site (DWS) and the Shallow Water Site (SWS) or a CWA Section 404 North Jetty Site (NJS).

## Sediment

The sediment from the project is sand with an average density of 1,960 grams/liter. The project was most recently sampled in 1990 and 2000. Sediment testing in 2000 included both physical and chemical analyses. Results indicate that the material is clean and suitable for unconfined in-water disposal.



## Sediment Evaluations

**1952-1957.** Sediment samples were collected yearly before and after dredging from dredge bins and subjected to physical analysis between July 1952 and September 1957 (form Table 3, DMRP Tech Rpt. D-77-30, Appx. A).

**1974-1975.** The Dredged Material Research Program conducted an intensive aquatic survey off the mouth of the Columbia River including sampling of dredging and disposal sites. They found that river sediments sampled in the dredging site prior to dredging showed only background levels of nutrients, metals, and other contaminate parameters. Extensive sampling was also conducted at the ODMDSs and offshore in general.

**1977.** A total of 217 sediment grab samples were collected from various locations in the project and offshore at the disposal sites as part of a geological investigation of the sedimentary environments of the mouth of the Columbia River. The study was conducted by the Dept. of Oceanography, University of Washington under contract to the USACE, Portland District. The report concluded that the natural river channel acts as an entrance way for continental shelf water and sediments to enter the estuary. This resulted in a tongue of shelf sediments existing in this portion of the river mouth.

**1982 August.** Two sediment samples were collected from the main navigation channel at RM 1.8 and RM 3.2 and subjected to elutriate and bulk chemical as well as physical analysis. The highest elutriate test release was 35 percent for manganese; 5 percent for cadmium; and less than 1 percent of the bulk concentration for all other metals. This work was preformed by the USGS under contract with the USACE, Portland District. Data is provided in USGS Open File Report 84-133.

**1983 July.** One sediment sample was collected from the main navigation channel at approximately RM 2.8 and subjected to elutriate and bulk chemical as well as physical analysis. Cadmium was found to be associated with the 1 percent material finer than 100 microns (very fine sand) at a concentration of 2.2 ppm. As the concentration of organic carbon and iron (both of which would hinder biological uptake) was small it was speculated that the cadmium may be in a form potentially available to benthic organisms. However, bulk concentrations of cadmium in undifferentiated dredged material would be 0.022 ppm (2.2 ppm/100) well below established concern levels. This work was preformed by the USGS under contract with the USACE, Portland District. Data is provided in USGS Open File Report 86-4088.

**1986 September.** Three 30-foot vibracores were collected from the main navigation channel as part of the October 1987 Columbia River Coal Export Channel technical study. The cores were subdivided by depth and various subsamples were subjected to bulk and elutriate chemical as well as physical analyses.

**1990 June.** Three sediment samples were collected from the Clatsop Spit shoal for physical analysis. The physical nature of the sediments has not changed from previous studies. They were comprised of 98.6 % sand and 1.4 % fines with a mean grain size of 0.26 mm. The material was considered suitable for unconfined in-water disposal without further testing.

**2000 September.** Ten (10) surface grab sediment samples were selected from sites collected as part of the Sediment Trend Analysis study at the Mouth of the Columbia River, September 1-3, 2000. All samples were sent to Sound Analytical Services, Inc. laboratory of Tacoma, WA, for physical analysis and chemical analyses, to include: inorganic metals (9), total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables and polynuclear aromatic hydrocarbons (PAHs). Three (3) samples were submitted for Dioxin/Furan analyses.

Sediment represented by samples collected during this sampling event consisted of 98.11% sand and 1.89% fines, with a median grain size of 0.20 mm. Analyses for this sampling event meet the Tier II guidelines established in the DMEF for open in-water, unconfined placement in an estuarine site under the Clean Water Act (CWA), sec 404 or an ODMDS under the Marine Protection, Research and Sanctuary Act (MPRSA) Sec. 103, without further characterization.

**2005 October,** MCR South Jetty Barge Offloading Zone: Repair to the South Jetty at the Mouth of the Columbia River requires a barge offloading facility to be constructed for the unloading of construction rock. Dredging would be required near the south shore of the Columbia River at approximate river mile (RM) 6. There is a potential to dredge up to 4,000 CY of bottom material, which historical samples in the area indicate is over 99% sand. The dredged material is planned for upland placement; to be used in construction of a temporary road for transporting of rock from the barge to the jetty repair site.

The proposed dredge material from this project is determined to be suitable for both unconfined in-water and upland placement. No significant, adverse ecological impacts are expected from disposal in terms of sediment toxicity. In addition, the proposed project volume of 4,000 CYs meets the "No Test" guidance for small projects as provided in the DMEF Section 6.6.4 and Table 6-2.

The Tier I evaluation was reviewed and approved by the Regional Management Team (EPA, ODEQ and COE), as provided for in the DMEF (1998).

**2008 June.** Using the USEPA's OSV Bold ten (10) Van Veen surface grab samples were collected from sites previously sampled during the September 2000 sediment evaluation study. The ten (10) samples were submitted for physical grain size analyses. Percent sand averaged 98.45% with a range of 99.3% to 97.0%. Percent silt and clay averaged 1.59% ranging from 3.0% to 0.7%. Samples were sent to Columbia Analytical Services (CAS), Kelso, WA, for total organic carbon (TOC) analysis. Analytical Resources, Inc., Tukwila, WA conducted physical analysis on the samples. Per the Project Review Group approved SAP no chemical analyses were conducted.

Physical results for the 2000 and 2008 sampling events were compared. The mean percent sand for all samples in September 2000 was 98.11% for June 2008 it was 98.45%. Even though different seasons were sampled the percent sand is remarkable similar between these two sampling events. Within both data sets, sediment towards the outer portion of the mouth is finer than sediments towards the center of the mouth.

**2008 June (ODMDS)**, This physical sediment evaluation was conducted to meet the Routine Monitoring requirement of the 2005 MCR DWS Site Management and Monitoring Plan (SMMP) developed jointly by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency. Using the USEPA's OSV Bold thirty-four (34) 0.1 m<sup>2</sup> Van Veen surface grab samples were collected, June 2008, from sites within the Deep Water Site (DWS) which have received dredged material. Sediment was also collected from four (4) reference sites located outside the DWS boundaries. All samples were sent to Analytical Resources, Inc. (ARI), Tukwila, WA, for physical analysis.

Sediment physical properties for studies specific to the DWS were compared. These included the 2002 DWS baseline study the 2005 DWS monitoring study and the present 2008 DWS physical sediment monitoring study.

Two rounds of sampling were conducted in July and September 2002. Two rounds were also collected in June and September 2005. Dredged material from the MCR project began being placed in the DWS in 2004. The 2005 surveys collected sediment from areas where dredged material from the MCR project was placed in 2004, in areas where dredged material was actively being placed in 2005, and in areas where no dredged material placement had occurred.

In 2008 a total of 34 sediment samples were collected from the Columbia river Improvement Project (CRCIP) drop zone, the two MCR project drop zones, as well as from various reference stations inside and outside of the DWS. This provided the ability to assess areas where placement had ceased 1.5 years previously, where placement was ongoing, as well as where no placement had taken place.

The presence or absence of dredged material was easy to delineate based upon grain size. Material from the MCR project and CRCIP was consistently coarser than the ambient sediment. In general the percent sand and gravel in ambient sediments collected from within the DWS ranged from the mid 80's to lower 90's while the placed dredged material was consistently above 95% and as high as 99% sand and gravel. Dredged material from the CRCIP placed in 2005-2006 in the SW corner of the DWS appears little altered from samples collected during active placement in 2005. The same is true for MCR project dredged material placed in the shallower eastern portion of the DWS. Material placed in the 2004-2006 placement area is very similar to material placed in the 2007-2008 drop zone in 2007. Samples were collected prior to the 2008 dredging season so all stations had experienced at least one winter season and some areas 2 winters.

Experience from previous monitoring studies in the mid-1970's and 1990's in shallower water has shown that ambient sediments cover dredged material relatively shortly. This has been documented for coarse grained dredged material as well as fine grained material. It appears that if this phenomenon is to occur in the deeper DWS the timeframe for burial by ambient sediments is greater than the interval covered by this study.