
EXHIBIT N
PHYSICAL AND BIOLOGICAL STUDIES
OF THE DEEP WATER AND SHALLOW
WATER SITES

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**Physical and Biological Studies
of the
Deep Water and Shallow Water Sites**

The attached information provide results of baseline and special studies undertaken to characterize the proposed Deep Water and Shallow Water ocean dredge material disposal sites off the mouth of the Columbia River. The 1999 Final IFR/EIS, Appendix H, Exhibit H, identified the need for additional baseline and special studies of the proposed ocean dredged material disposal sites. Identified study needs in Exhibit H, included Side Scan Sonar, Sediment Characterization, Crab Distribution and Abundance Studies, and Benthic Sampling. These studies were jointly funded and conducted by EPA, Region 10 and the USACE, Portland District to meet various requirements of the Marine Protection, Research and Sanctuaries Act with regard to required baseline designation studies.

Attachment A

The objective of the Sediment Trend Analysis (STA) and Acoustic Bottom Classification study was to develop an understanding of the mechanisms of sediment transport and inter-relationships among sediment sources and sinks associated with the mouth of the Columbia River. Over 1,200 sediment samples were collected and subjected to size analysis. Five principle Transport Environments were identified and described. In the area of the Deep Water Site sediment transport trends were dominantly landward. Material placed in the Shallow Water Site is very likely to help maintain beaches to the north.

Attachment B

The purpose of the Physical and Chemical Sediment Characterization Baseline Study was to provide sediment physical and chemical baseline information of the Deep Water Site. Samples were collected in conjunction with the STA study. Ten sediment samples were analyzed for physical and chemical properties using protocols proscribed in the Dredged Material Evaluation Framework. Grain size varied between 0.106 mm and 0.126 mm with a mean of 0.120 mm. Chemical results are provided in 8 different tables and compared to previous studies in the area.

Attachment C

Baseline physical information for the Deep Water Site was further accomplished through an acoustic seafloor mapping survey that incorporated the results of the baseline physical grain size analysis. Hydrographic surveys using side scan sonar and bathymetric systems were conducted to continuously map the seafloor in the vicinity of the proposed Deep Water Site. Side scan sonar was used to identify surface material types and boundaries, geomorphic shipwrecks or debris. Accurate depth data was collected. Sediment

classification was accomplished using the RoxAnn™ operating in conjunction with the vessel's echo sounder. The sediment within the Deep Water Site can be generally characterized as a homogeneous distribution of fine sand. Acoustic reflectance presents a nearly featureless geomorphic configuration of the seabed with only a band of apparent low relief seafloor undulations in the eastern portion of the site.

Attachment D

Biological baseline studies were conducted in 2002 with a final report due in March 2003. Preliminary results have been presented and are here included in power point slides. The Deep Water Site biological baseline survey included Sediment Profiling Imagery, sediment physical analyses, benthic infauna analysis, and crab/fish analysis. Crab abundance were analyses through pot deployment and trawls. The latter were also used for fish population analysis. To assess crab and fish populations at the Shallow Water Site pots and trawls were also used.