THE PHYSICS OF DREDGED MATERIAL PLACEMENT WITHIN NEARSHORE WATERS: AS OBSERVED BY CRAB

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PROJECT: Dredged sand is being placed within a nearshore location adjacent to the Mouth of the Columbia River (MCR), USA to address a chronic coastal sediment deficit while minimizing impacts to the site’s benthic ecology.

MOTIVATION FOR PLACEMENT OF DREDGED MATERIAL IN NEARSHORE ZONE: The nearshore morphology along the south side of the MCR inlet has been receding for many decades compromising the stability of the MCR inlet, jetties, and navigation channel. Progressive loss of shoreface morphology (sand) at the MCR also degrades the benthic substrate for nearshore ecology.

Regional Sediment Management (RSM) sustains water resource projects, that interact with natural sediment processes, by implementing balanced approaches for managing affected sediment. An objective of RSM is to emulate the natural system of sediment transport pathways that may be affected by a project. To Work with Nature, Not Against.

THIS POSTER: Summarizes in-situ observations of dredged material deposition on the seabed, when placed in nearshore waters of the PAC-NW, USA. Predictions for the physics affecting bottom deposition (of placed dredged material) are consistent with observations. Initial observations indicate that bottom dwellers like Dungeness crab (Metacarcinus magister) may not be adversely affected by dredged material placement.

Deployable “deposition meter”, designed for simplified deployment and retrieval similar to crab pots. A camcorder, was attached to the deposition meter mount, and recorded in-situ deposition and bottom-encounter physics resulting from dredged material placement. A staff gauge was attached to the center support element of the deposition meter. Three deposition meters were fabricated and deployed, each 13 inch high and 40 inch base dia. Photo, concept, and fabrication by CURTIS ROEGNER-NOAA.

The below video images were obtained from NOAA’s "deposition meter" positioned below a hopper dredge during placement of dredged material (fine-medium sand) on 28 SEP 2012. The “deposition” meter was deployed on the seabed in water depth of 50 ft, 1 mile south of the Mouth of the Columbia River. The hopper dredge Effyuons transited over the “deposition meter” as it placed 5,500 cubic yards (4200 cubic meters) of sand in 50 ft water depth for load 1397. Dredged material was released uniformly from the hopper dredge along the 5,100 ft long placement transect, as verified by integrated KDGPS vessel tracking and vessel displacement measurements. The amount of dredged material released into the water column (per unit length along the 5,100 ft placement transect) was 1.1 cubic yard/sec (or 1.3 tons/sec). The rate of dredged material release during the 17-minute placement event was 5.4 cubic yards/sec (or 6.8 tons/sec). The “deposition meter” was located within an offset distance of 100 ft from the Essayons as she passed overhead. The amount of dredged material released into the water column (per unit length along the 5,100 ft placement transect) was 1.1 cubic yard/sec (or 1.3 tons/sec). The rate of dredged material release during the 17-minute placement event was 5.4 cubic yards/sec (or 6.8 tons/sec). The “deposition meter” was located within an offset distance of 100 ft from the Essayons as she passed overhead.. The hopper dredge Essayons utilizes a series of 12 doors located on the hull bottom to sequentially release each load of dredged material. Resulting in a gradual release of dredged material from the vessel.

DREDGED MATERIAL DEPOSITION, ft

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