

primarily of marine sands transported into the entrance. The material is clean, contains no contaminants of concern in excess levels, is far removed from known sources of contaminants, and is suitable for open-water disposal. In the 1999 IFR/EIS, a smaller volume of material was anticipated to be dredged from the Columbia River navigation channel (RMs 3 to 29) for operation and maintenance purposes and the then-proposed channel improvements project and disposed in the ocean. That material was also evaluated and found suitable for unconfined open-water disposal. These sediments consist of sands with low percent of silts and clays or organic material. Modifications to the channel improvements project (identified and assessed in the SEIS, 2003) propose to beneficially use those sediments for Ecosystem Restoration projects within the estuary for approximately the first 20 years following construction of the improved channel. Should the Ecosystem Restoration projects identified not be built, those sediments would be proposed for ocean disposal. In addition, some fine-grained material from side channels or backwater areas may be placed offshore in the future which will require testing and evaluation and perhaps regulatory permitting.

Material to be disposed at the Shallow Water site is expected to be placed to promote dispersion and subsequent erosion back into the littoral system without generating mounds or other features which could interfere with navigation or reduce navigation safety. Site monitoring and management will be focused on that objective.

Material to be disposed of at the Deep Water site is expected to be point-dumped within Drop Zones so as to concentrate material (individually and cumulatively) from each dump. This placement is expected to help minimize bottom impacts to benthic organisms. However, placement at the Deep Water site is expected to result in the formation of an underwater mound that is different from the flat, gently-sloping bottom that presently exists. When the placement zone of the site is filled to capacity, it is expected to resemble an approximately trapezoidal mound about 40 feet high. Some material is expected to slump into the buffer zone from the created mound.

Current hopper dredges or ocean-going, bottom-dump barges available for use along the west coast dredging have capacities ranging from 800 to 6,000 cubic yards (cy). This would be the likely volume range of dredged material deposited in any one dredging-and-

placement cycle. Clamshell dredges placing material into bottom-dump barges for transport to the ocean can work within the estuary and river, but not at the MCR project. Hopper dredges can and do work sections of the existing river navigation channel. The approximately 4.5 million cubic yards (mcy) estimated to be removed annually from the MCR, and 0.6 mcy of the improved Columbia River channel maintenance should channel materials be proposed for ocean disposal, can be placed at the sites in one dredging season by any combination of private and government dredges. The dredges or barges would be under power and moving during disposal, allowing the maintenance of steerage. The slurried dredged material is expected to exit from the hoppers within several minutes and rapidly descend to the seafloor where it will impact with the bottom and spread radially. Dredged material released at the Shallow Water site should reach the bottom within 10 minutes. Material released at the Deep Water site should reach the bottom in about 35 minutes.

5. Feasibility of Surveillance and Monitoring

Monitoring and surveillance are expected to be feasible at both proposed sites. The proposed Shallow Water site, in the nearshore zone, is readily accessible for bathymetric surveys. The proposed Deep Water site, 4.5 miles offshore and between 200 and 300 feet deep, has undergone monitoring, including side-scan sonar. If actual field monitoring of the disposal activities is required because of a future concern for habitat changes or limited resources, several research groups are available in the area to perform any required work. Most monitoring work for the proposed Shallow Water site can be performed from small, surface research vessels at a reasonable cost. Monitoring at the Deep Water site may be more complex than monitoring at the proposed Shallow Water site and is likely to require a medium or large vessel at greater cost.

Once the proposed sites are designated, monitoring shall be in accordance with the then-current SMMP. Revisions to the SMMP are expected; revisions will be circulated for public review, coordinated specifically with the affected States, and become final when approved by EPA Region 10. At a minimum, annual bathymetric surveys will be conducted in areas that receive dredged material. More frequent compliance surveys will be conducted during placement at the Shallow Water site to assure uniform placement is occurring. It is expected

that off-site monitoring will be necessary at the proposed Shallow Water site, at least in the initial years of use. Routine monitoring for management purposes at the proposed Deep Water site are expected and will likely focus on determining how to concentrate single year disposals in the site and on verification that material is not placed in the buffer zone or escaping outside of the overall site. No routine off-site monitoring is anticipated for the Deep Water site.

6. Dispersal, Horizontal Transport and Vertical Mixing Characteristics of the Area, Including Prevailing Current Direction and Velocity

The ocean entrance at MCR (including Peacock Spit to the north) is characterized by large waves and strong currents and is considered one of the world's most hazardous coastal inlets. The interactions of bathymetry, wind-generated waves, and ocean and river currents, are complex and the transition from coastal regime to oceanic is abrupt. The sea state at the river entrance during storm conditions is characterized by high swell incident from the northwest to southwest combined with locally-generated wind-waves from the south to southwest. During October-April, average wind-wave height is 9 feet and wave period is 12 seconds. During intense winter storms, however, waves can exceed 30 feet. During May-September, average wind-wave height is 5 feet and wave period is 9 seconds. Tides at MCR are mixed semi-diurnal, with a diurnal range of 8.5 feet. Currents, especially during ebb tidal flow cycles, can significantly worsen the hazardous wave climate even during low to moderate wind-wave conditions. At given locations, the velocity of the current has the greatest effect on wave height and wave steepness. This naturally dynamic condition enhances dispersal, horizontal transport and vertical mixing of the sediments as well as the water. This makes the area ideal for a dispersive disposal site, but extremely challenging to dredge and maintain navigation structures and for navigation of all sized vessels and craft.

The Columbia River estuary (from MCR to the Astoria Bridge) is a sink for marine (ocean) sediments, which enter through the mouth of the Columbia River. The estuary also effectively traps virtually all of the coarser fluvial (river) sediments. Finer fluvial sediments held in suspension are passed through the estuary to the ocean. ODMDSs for the MCR dredged material must be located to prevent the dredged material placed at the sites from returning directly into the entrance channel. This requires