Appendix H

Ocean Dredging and Offshore Disposal Best Management Practices (BMP)

Appendix H: Dredging and Ocean Disposal Best Management Practices (BMPs)

The following are excerpts from documents produced by the US ARMY Corps of Engineers and the Australian Government Department of the Environment and Heritage (DEH). These documents can be accessed at:
http://www.spn.usace.army.mil/ltms2001/appi.pdf and
http://www.deh.gov.au/coasts/pollution/dumping/guidelines/index.html respectively

Best Management Practices (BMP) are the actual practices--including the forms, procedures, charts, software references, etc.--actually used by dredgers to minimize consequences of dredging and ocean disposal on water quality. These documents provide a general overview of some of the most effective measures to preserve water quality during dredging and ocean disposal operations.

Dredging Best Management Practices

Common BMPs for dredging activities include Silt Curtains, Gunderbooms, and Operational Controls.

Silt Curtains

Silt curtains are intended to allow suspended sediment at a dredging site to settle out of the water column in a controlled area, minimizing the area that is affected by the increased suspended sediment usually present at a dredging site. A silt curtain is an impermeable barrier. They are constructed of a flexible reinforced thermoplastic material. The upper hem has floatation material and the lower hem has ballast material. Silt curtains are most effective when used on a project where they are not opened and closed to allow equipment access to the dredging or disposal area. Silt curtains are also limited to project locations with less than 1-2 knot currents.

Gunderbooms

Gunderbooms are designed to allow water to flow through the curtain while filtering suspended dredged sediment from the flow. Gunderbooms are similar to silt curtains but are constructed of permeable geotextile fabrics. They are also designed to extend from the water surface to the project bottom.

Operational Controls

Mechanical Dredge

There are three fundamental controls possible with mechanical dredges.

- **Increase cycle time.** Longer cycle time reduces the velocity of the ascending loaded bucket through the water column, which reduces potential to wash sediment form the bucket. However, limiting the velocity of the descending bucket reduces the volume of sediment that is picked up and requires more total bites to remove the project material. The majority of the sediment resuspension, for a clamshell dredge, occurs when the bucket hits the bottom.

- **Eliminate multiple bites.** When the clamshell bucket hits the bottom, an impact wave of suspended sediment travels along the bottom away form the dredge bucket. When the clamshell bucket takes multiple bites, the bucket loses sediment as it is reopened for subsequent bites. Sediment is also released higher in the water column, as the bucket is raised, opened, and lowered.
- **Eliminate bottom stockpiling.** Bottom stockpiling of the dredged sediment in silty sediment has a similar effect as multiple bite dredging; an increased volume of sediment is released into the water column from the operation.

Hydraulic Dredge Operational Controls

There are three fundamental controls possible with hydraulic dredges.

- **Reduce cutterhead rotation speed**. Reducing cutterhead rotation speed reduces the potential for side casting the excavated sediment away form the suction entrance and resuspending sediment. This measure is typically effective only on maintenance or relatively loose, fine-grain sediment.
- **Reduce swing speed**. Reducing the swing speed ensures that the dredge head does not move through the cut faster than it can hydraulically pump the sediment. Reducing swing speed reduces the volume of resuspended sediment. The goal is to swing the dredge head at a speed that allows as much of the disturbed sediment as possible to be removed with the hydraulic flow. Typical swing speeds are 5-30 feet/minute.
- **Eliminate bank undercutting**. Dredgers should remove the sediment in maximum lifts equal to 80% or less of the cutterhead diameter.

Hopper Dredges and Barges Operational Controls

There are three controls possible with dredges and barges.

- **Eliminate or reduce hopper overflow**. Eliminating or reducing hopper overflow reduces the volume of fine material that flows from the hopper in the overflow. One caution is that this control may significantly reduce project production for hopper dredges or when hydraulic dredging into a barge.
- **Lower hopper fill level**. Lowering the hopper fill level in rough sea conditions can prevent material loss during transport.
- **Recirculation system**. Water from the hopper overflow can be recirculated to the draghead and is used to transport more material into the hopper.
- **Ocean Conditions**. Avoiding rough sea conditions during sediment transport may reduce material losses and would ensure an efficient operation.

Specialty Equipment

- **Pneuma Pump**. The Pneuma pump is used primarily for removal of fine-grained sediment. The Pneuma pump offers high solids concentration (up to 90%) in the dredge slurry, with minimal turbidity.
- **Closed or environmental bucket**. Specially constructed dredging buckets designed to reduce or eliminate increased turbidity of suspended solids from entering a waterway.

- **Large capacity dredges**. Larger than normal dredges designed to carry larger loads. This allows less traffic and fewer dumps, thereby providing fewer disturbances at a disposal site.
- **Precision Dredging**. Dredging utilizing special tools and techniques to restrict the material dredged to that specifically identified. This may mean thin layers, either surficial or imbedded, or specific boundaries.

Ocean Disposal Best Management Practices

When released from a vessel, most of the dredge spoil will sink directly to the sea bed or form a dense layer of suspended sediment just above the sea bed. Generally this material will settle within a period of hours or days, although if fine and of high water content it is liable to be resuspended and may subsequently be dispersed by currents or waves. Where dispersal in the receiving environment is undesirable, spoil disposal can be managed to reduce dispersal in the water column or across the sea bed. The following practices may be followed to effectively reduce impacts to the water column and sea bottom due to ocean disposal activities:

- Dispersal or spreading of sediments will be reduced if spoil is dredged with a grab dredge rather than a suction dredge (USEPA, 1992). Grab dredges keep sediments nearer their original cohesive state than suction dredges, which create slurry. Slurries of fine sediment are more dispersive and can flow down even a slight gradient on the sea floor. Other controls could include altering the disposal location, or changing the rate and timing of disposal.
- Submerged diffusers may also reduce water column impacts because they release the spoil lower in the water column and reduce the velocity of discharge. This can reduce both the spread and resuspension of fines.
- Lateral containment can physically restrict material both during and after disposal, resulting in smaller areas of sea bed being affected and also reducing the potential for release of contaminants. Such sites can include existing depressions or borrow pits, or constructed depressions.
- Where the major impact of concern is burial of benthic organisms, thin-layer placement may be considered. Deposition of spoil in a layer of less than 30 cm facilitates benthic organisms burrowing up to the surface and improves the rate of recolonization (USEPA, 1992).
- Seasonal restrictions during fish migration periods may be put in effect for areas where this is a significant issue.
- Perform dredging activities only on the incoming tide.
- Perform shunting, which involves pumping of the free water in a barge to the bottom of the water body which reduces turbidity, and
- Employment of an independent, certified, on-board dredging inspector to ensure compliance with permit conditions.