Beneficial Use of Dredged Material:
Draft Definitions for Reporting in the Dredging Information System
November 16, 2009

1. Habitat Development

In habitat development, dredged materials are used to build and maintain productive plant and animal habitat, especially wetlands. Using dredged materials as a substrate in habitat development is one of the most common and important beneficial uses. In considering habitat development, it is necessary to determine what type of habitat is needed (e.g., habitat to enhance fish or bird communities), whether the constructed habitat will be stable at the proposed location, and whether the new habitat will displace existing unique or valuable habitats.

Four general categories of habitats are suitable for establishment on dredged material: wetland, upland, island, and aquatic. These habitats may occur simultaneously within the same project area.

- ***Wetland.*** Wetland habitat is a broad category of periodically inundated or saturated soils and plant communities, characterized by vegetation that survives in wet soils. Wetlands are most commonly freshwater and saltwater marshes, bottomland hardwoods, freshwater swamps, and freshwater riverine and lake habitats. To develop wetland habitat, dredged material is used to fill areas to precise elevations to promote colonization by wetland vegetation.
- ***Upland.*** Upland habitat includes a broad category of terrestrial communities characterized by vegetation not normally subject to inundation, including grasses, shrubs, and trees. Upland habitat projects can be designed to support birds, waterfowl, mammals, and rare or endangered species.
- ***Island.*** Dredged material can be used, where appropriate, to create new islands. Colonial-nesting seabirds are the primary wildlife species using new island habitats, but other wildlife, such as seals, also may benefit.
- ***Aquatic.*** Aquatic habitats are permanently submerged habitats extending from near sea, river, or lake level down several feet. Dredged material is used to affect either the bottom elevation or the condition of the submerged area. Potential aquatic habitats that could be developed using dredged material include seagrass meadows, oyster beds, fishing reefs, stands of freshwater aquatic plants, and stable berms (dredged material (primarily fine grained), placed in a mound that is designed to be stable over time to provide fish habitat.

2. Parks and Recreation

Of all types of beneficial uses, recreation on dredged material containment sites is one of the most prevalent land uses in terms of acreage. It is not surprising to find many examples of such use since there is a demand for waterfront recreational sites in urban areas, where many dredging projects occur.

- Using dredged material for developing park and recreational facilities is often associated with other beneficial uses, such as habitat development for fish and wildlife, or creation of beach and boating amenities (Murden 1987).

- For example, in the construction of the Tennessee-Tombigbee Waterway, a number of the dredged material disposal areas were designed for recreational uses (McClure 1988). Disposal areas were filled, contoured, and planted with vegetation to control erosion and to provide wildlife food and habitat. Activities supported in these areas include swimming and boating, walking and bicycle trails, wildlife viewing, and hunting.

- Another example is the use of dredged material for the Bayonne Golf Course in New Jersey for as grading material in contouring the course.

3. Beach Nourishment and Sediment Management

Beach nourishment and sediment management are areas where there is sometimes less of a clear distinction between beneficial use and disposal. For this category of placement, two subcategories are considered:

- Subcategory 1: Beach Nourishment & Sediment Management
  - Direct placement on beaches
  - Berm creation
  - Riverbank erosion control

- Subcategory 2: Littoral Zone Sediment Management
  - Aquatic Placement in the littoral zone
    - Sand by-passing
    - Thin-layer disposal
    - Deep berm creation

In Subcategory 1, dredged materials are used to supply sediment directly to beaches that are subject to erosion. The purpose of adding this sand can be to reduce flooding damage from storms or increase recreational opportunities. Beach nourishment has been accomplished by dredging sand from inshore or offshore locations and transporting it by truck, split hull hopper dredge, or hydraulic pipeline to the beach needing supply. This subcategory would also include such placement options as placed at the toe of a bank on a river to stabilize and provide erosion protection.

The construction of underwater berms both to decrease erosion by wave action and to supply sand to eroding beaches is a technique for beach nourishment. Underwater berms are mounds built on the ocean bottom, usually parallel to the shoreline and constructed to a specific height, length, and orientation. This approach is significantly less costly and less energy intensive (consequently, more often feasible) than direct beach nourishment.

In Subcategory 2, sediment is kept in the littoral system, but quantification of the amounts that actually reach the intended target (e.g., beach) is less definitive. Numerous placement options are included in this subcategory, including such techniques as sand by-passing, thin-layer disposal, and deep bern creation.

Placement of sandy dredged material, potentially with higher percentages of fines than can be placed directly on the dry beach, in nearshore waters (typically water depth of 2 to 8 meters), is used to retain or replenish sand in the littoral system. It is generally desired that the sand fraction would at some point move on-shore with finer fraction moving offshore to stable depths. Studies to date have shown shoreward migration, but actual increases in beach width directly attributable to sand placed nearshore moving on shore have not been documented. However, increases in beach width due to a sheltering effect resulting from the increased berm elevation resulting from the dredged material have been documented.

Deep berms are included in this subcategory because wave energy may not be able to reshape the berm material if material is placed in water that is too deep; this could result in sediment loss from the littoral system.

4. Construction and Agricultural

This category is intended to be a bit of a catch-all for projects that are not direct habitat creation/restoration, parks and recreation, or beach nourishment. This category includes:

- Construction and industrial development
- Agricultural uses
- Forestry
- Horticulture
- Aquaculture
- Land reclamation

Construction and industrial development offer a number of opportunities for the beneficial use of dredged material. Many of these applications are likely to occur near shorelines or rivers, thereby minimizing transportation distances between dredged material sources and uses.

- One such beneficial use is bank stabilization. In many lakes and rivers, particularly in the southern United States, placement of dredged material coupled with riprap is used to stabilize banks.
- Dredged material also can be used in levee and dike construction.
- In urban coastal areas, dredged material can be used to expand or enhance port-related facilities. For example, placing dredged material among abandoned piers can increase port-related lands. This option requires placing dredged material behind barriers such as sheet piling erected around and between abandoned piers. The procedure would be similar to construction of confined disposal facilities.
- As a more general construction application, dewatered dredged material may also be used as loose material in construction; formed into construction aggregate and used for building material; or used in the ceramic industry for producing bricks, roof tiles, or ceramic tiles.
- Use of dredged material for restoration of brownfields sites. Brownfields are abandoned, idle, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination. The Jersey Gardens Mall project is an example of a brownfields redevelopment success: an environmental remediation company acquired and developed a former municipal waste landfill, incorporating beneficial use applications of dredged material.

- Aggregate – Construction: Use of dm as primary building materials such as sand and gravel that can be used to make concrete.
- Building Materials and Products: dm that is processed considerably to create building materials as distinguished from use of the material as is for construction aggregate. This would include brick manufacture, low-strength aggregates (pellets fired from fine-grained material), eco-blocks, and flowable fill products.
- General Fill: dm that is used as used as fill material (e.g. for parking lots, roadbed construction) or other general construction activities.
- Manufactured Soil: dredged material that is combined with other products (e.g. biosolids and cellulose) to create soil.

Dredged material has a number of uses for <u>agriculture, forestry, horticulture and aquaculture</u>.

- Each year, considerable amounts of topsoil are lost by erosion to rivers, estuaries, and the oceans. By applying dredged material to farmland, topsoil can be conserved and reclaimed. Uncontaminated dredged material from freshwater sources has actively been incorporated into marginal soils for agriculture (growing of crops and raising livestock), forestry (growing of trees for commercial purposes), and horticulture (growing of vegetables, fruit, nut and ornamental plants for commercial purposes) purposes. Sediments may be placed in containment areas that can be used for aquaculture.
- Dewatered dredged sediment can be applied to farmland to elevate the soil surface, thus improving drainage and reducing flooding; when incorporated into marginal soils, it can enhance the physical and chemical characteristics of the soils, and make water and nutrients available for crop growth.
- Dredged material placement at sites in river systems has provided livestock pastures. Dredged material placed in containment areas to create dikes could serve as potential aquaculture areas.
- There are thousands of acres of land located on dredged material disposal sites that have been filled to capacity and are now used for agriculture.

<u>Land Reclamation</u> is a general category that includes a range of terrestrial placement sites for mitigating damage from various activities that degrade the landscape. The productive use of dredged material in reclamation of strip mines, capping of solid waste landfills, and the use of material to protect levees and dikes are placement options.

- Abandoned strip mines are unsightly, barren areas, and sources of acid leachate runoff and erosion; strip mines can be recontoured and covered with a layer of dewatered dredged material.
- Fine-grained dredged material can be used in solid waste management as daily and interim sanitary landfill cover. To implement this disposal alternative, the dredged material must meet chemical and physical criteria, and must meet landfill cover regulations. Thus, one of the constraints of using this disposal option is that open land must be available for a dewatering and drying area.
- Sub-surface mines: reclaim land used as part of mines (deep mines where the primary form of removal is extraction using tunnels, gravel or rock mining.
- Brownfields: mitigate for landscape destruction in urban areas due to prior construction or industrial activities.
- Solid Waste Applications: landfills, either as a liner or cover.