Beneficial Use of Dredged Material

Introduction

The Beneficial Use of Dredged Material (BUDM) has received increased attention nationally in the last 10 to 15 years due to many factors including decreasing capacity in traditional upland containment facilities, increased regulation (and even prohibition) of open water placement, and a growing recognition of the importance of sediment in natural systems.

BUDM is not a new concept and despite having been utilized on many projects all over the country by USACE, Ports, States, Counties, and even private entities, it is still considered an innovative approach. This document provides an overview of the state of the art, the current efforts to increase its use, and ongoing challenges and opportunities.

BUDM is defined as follows: The use or placement of dredged material in such a way as to benefit either the natural or human environment (ERDC 2020).

Beneficial Use of Dredged Material at a Brownfields Site. Source: Encap (Bayonne, NJ)

Dredged material can be used beneficially in a variety of ways, including being used in its raw form to enhance habitat or recreation in the coastal zone, or it has been blended, amended, or processed for use in construction, remediation, or as a feedstock in industrial manufacturing.

Types of Beneficial Use

Beach Nourishment

Coarse-grained dredged material has been placed on a natural or bathing beach for either the explicit purpose of nourishment of an eroded beach, or as a management alternative for material removed during navigation dredging. These additional quantities may prevent erosion and when large quantities are used, they may enhance coastal resiliency.

Construction Aggregate

Both coarse and fine-grained dredged material, dewatered or raw, has been used in the construction of upland or marine facilities or in the manufacture of engineered products (i.e., processed dredged material, PDM). This includes material excavated from existing upland confined placement areas.

Structural Fill

Dredged material that meets specific engineering properties can be used to support the construction for a structure or other facility. Material can be used raw, blended, processed, or placed in a specific manner so as to achieve the particular properties necessary. Sampling and bench scale testing of the target sediments is recommended to ensure that the desired engineering properties can and will be achieved across the entire project.

Non-Structural Fill

Dredged material that is either blended, processed, or placed in such a manner as to render it suitable for uses that require it to remain in form and place, but not support a structure or facility. Dredged material used in this manner need not be as extensively tested as is material used for structural applications.

Remedial Cap

The use of dredged material, either raw, dewatered, or processed so as to render it suitable for use, as a capping material isolating contaminated sediment or soils. Permeability of the processed and placed material is the most common target characteristic.

Marsh Enhancement

The use of dredged material as a non-structural fill to restore eroded, degraded or subsided marsh platforms in freshwater and coastal ecosystems. Material can be placed using high- or low-pressure techniques depending on the desired placement location or application thickness.

Beneficial Use of Dredged Material for Island Restoration. Source: MES (Poplar Island, MD)

Shoreline Stabilization

The use of dredged material as a component in the engineered stabilization of coastal or riverine shorelines damaged or threatened by wind, waves, sea level rise, boat wakes or current or any combination of these. Material can be placed with or without engineered containment.

Habitat Creation and Restoration

The use of dredged material as a component in the creation of engineered habitats to support wildlife in coastal ecosystems. Naturalized beaches, elevated nesting habitat, subtidal benthic habitat, mudflats, and islands have all been created or restored using dredged material placed using both hydraulic and mechanical techniques.

Environmental Manufacturing

The use of dredged material, either raw or dewatered, as a feedstock to an industrial manufacturing process that produces a value-added product such as manufactured topsoil, lightweight aggregate, bricks or pavers or pozzolanic additives.

Why Should Dredged Material be Beneficially Used

Historically, dredged material was viewed as a waste product of excavation, and was given the pejorative name “spoils”, which is still in use today. Historically, dredged material was side casted into marshes, dumped in open water, or used for creating “fast land”. During the 1970’s, when wetland protection laws were enacted, dredged material management became highly regulated. It was considered appropriate to remove and contain as much of the sediment as possible in as small an area as possible, far away from valuable habitat. Only dredged material with high fractions of sand content was considered suitable for beneficial use, usually as beach fill. Today, there is a recognition by resource managers and coastal engineers of the value of sediment in the coastal zone, and an integral part of coastal ecosystems. Despite the success of many beneficial use projects nationwide, with more being constructed every year, there remain challenges that need to be overcome to achieve widespread acceptance. These challenges include public perception, higher cost, and regulatory skepticism. A sustainable beneficial use of dredged material program will support marine transportation, maintain habitat, and increase the resiliency of coastal communities.

Dredged Material Management programs are used by many Ports, States, Counties and Private entities to establish predictable, cost-effective processes for the removal, transportation, dewatering, and placement of dredged material from navigation projects. The value of beneficially using dredged material to these stakeholders include:

- Potential to identify increased options/opportunity for managing dredged material
- Increased capacity and site life of existing Dredged Material Placement Areas (DMPA)
- Improved public & stakeholder communication (win/win/win)
- Sustainability (recycle/reuse/reduce)
- Improve resiliency of coastal and riverine environments

While the short-term cost for beneficial use can often be higher than the cost of traditional placement options, the benefits to wildlife and coastal communities can be considerably higher. These benefits can be difficult to quantify but should not be ignored.

Challenges to Implementation

Dredged material physical and chemical characteristics vary considerably from project to project and region to region and this can have a large effect on potential BU opportunities. All dredged material is potentially suitable for some type of beneficial use. Challenges associated with the beneficial use of dredged sediments include:

- Cost (market demand, material costs, products, etc.)
- Schedule constraints
- Public perception (resource vs spoil)
- Regulatory restrictions (regulations/policy impediments)
- Permit conditions (fish windows, containment, monitoring, etc.)
- Lack of awareness (availability/benefit)
- Lack of engineering experience
- Lack of contractor experience
- Liability associated with contaminated materials
- Availability of conventional materials (competition)

Beneficial Use Programs

Millions of cubic yards of dredged material have been beneficially used across the country over the past 20 years. The success of the beneficial use of dredged material has one thing in common, the successful multi-party coordination and strong regulatory buy-in. The USACE has created a website that includes multiple BU program case studies (https://budm.el.erdc.dren.mil/). Included below are summaries of some significant beneficial use programs and projects.

NY/NJ Harbor Estuary Program

In 1992, the USACE and USEPA were sued over the open water placement of dredged material from the NY/NJ Harbor in the ocean off Sandy Hook, NJ. With an ongoing annual maintenance need of millions of cubic yards of capacity and pending harbor-wide deepening projects predicting a need for tens of millions of additional capacity, a dredged material management crisis ensued. Considerable time and effort were spent to identify, test, and implement a number of beneficial use options including structural and non-structural fill, environmental manufacturing, capping

of contaminated sediments, and habitat enhancement. When the deepening project was complete nearly all the 60 plus million cubic yards of dredged material of all types and levels of contamination was beneficially used either as non-structural fill, habitat enhancement or capping material. The current beneficial use program is overseen by a Regional Dredging Team chaired by the USACE and USEPA and includes representatives from New York, New Jersey, New York City and the Port Authority of NY and NJ. Both the States of New York and New Jersey champion the beneficial use of dredged material over disposal as a matter of state policy.

NJ Marsh Enhancement

Since Superstorm Sandy made landfall in October of 2012, the State of New Jersey has embarked on an aggressive program of beneficial use in the Atlantic coastal region where historically dredged material was placed in upland confined disposal facilities (CDFs). There is nearly universal recognition that this historical practice is detrimental to the health and sustainability of coastal wetlands, and over time will reduce the resiliency of coastal communities. There has been a concerted effort to permit pilot and demonstration programs to utilize clean dredged material from coastal navigation channels to enhance coastal marshes, stabilize shorelines, replace lost wetlands and islands, and to fill aquatic borrow pits. These projects keep sediment in the coastal system. A Regional Sediment Management Plan is currently being developed for the NJ Atlantic Coastal Zone that will highlight acceptable beneficial uses and identify what should be done to ensure the sustainability of the program.

Rhode Island BU Policy

The Rhode Island Department of Environmental Management (RI DEM) Office of Waste Management has developed this policy to establish guidelines for evaluating whether specific source segregated solid waste materials which are not already defined as “recyclable material” may be recycled. The beneficial reuse and recycling of source segregated solid wastes, where appropriate, prevents the unnecessary waste and depletion of the natural resources of the State and preserves the limited and finite capacity of the State’s solid waste landfills.

Rhode Island Marsh Enhancement

The RI Coastal Resources Management Council and its partners have designed a project that will use sediment dredged from the breachway channel to build up adjacent marsh. An example project is one that will use sediment dredged from the Charlestown breachway channel in Ninigret Pond to build up the elevation of the adjacent marsh. The goals of the project are to restore and enhance the functions of the existing salt marsh making it more resilient to future sea level rise, to slow the entry of sediment into the pond and to improve navigation by creating a deeper breachway channel.

Maryland BU Policy

Innovative reuse and beneficial use of Harbor channel dredged material is a key component of the Maryland Dredged Material Management Program (DMMP). In 2014, the DMMP Executive Committee Innovative and Beneficial Use Strategy guided Maryland Department of Transportation Maryland Port Administration (MDOT MPA) in planning for sustainable dredged material management solutions. Maryland’s goal is to make long-term, sustainable innovative reuse and beneficial use programs and projects to address capacity recovery an implemented component of the Dredged Material Management Program in Maryland, to promote the long-term viability of the Port of Baltimore.

Maryland’s Poplar Island Ecosystem Restoration Project

Poplar Island is the site of an environmental restoration project in the mid-Chesapeake Bay using dredged material. The USACE and MDOT MPA began the project in the 1990s to achieve two goals: to restore the severely eroded island to its historic footprint and provide much-needed placement capacity for sediment dredged from shipping channels. The completed project will contain about 68 million cubic yards of dredged material and will consist of approximately 776 acres of tidal wetlands, including low marsh and high marsh habitat, bird nesting island, and ponds; as well as approximately 829 acres of upland habitat. The USACE and MDOT MPA, completed construction

of the Poplar Island Ecosystem Restoration Project lateral expansion Jan. 20, 2021, providing 575 additional acres, including four new wetland cells and one large upland cell. The project is now able to accept dredged material associated with the approach channels to the Port of Baltimore until around 2032.

Mississippi BU Law

The Mississippi Beneficial Use of Dredged Material Law defines beneficial use of dredged material as the intentional placement of dredged sediment to provide environmental, economic, and societal benefits. The goal of the Mississippi BU Program, working with federal, state, and local officials, is to restore and create tidal marsh and associated habitats through the utilization of dredged sediments. In order to offset ongoing coastal losses of tidal marsh, which is valuable fish and wildlife habitat, the BU program permits and manages designated marsh and habitat restoration sites where the dredged sediments can be placed. In 2010, the Mississippi BU Law (MS § 49-27-61) was passed which required all permitted dredging activities greater than 2,500 cubic yards to participate in the BU program if the material is suitable and a site is available. The BU law helps eliminate the loss of valuable sediment resources to open water or upland disposal sites. Four significant sites have been constructed to date, with more than 1,000 acres scheduled to be constructed in the next decade.

Houston-Galveston, Texas Maintenance Dredging Program

Beach nourishment, Source: USACE Galveston District

The beneficial uses of dredged material from the Houston-Galveston Navigation Channel (HGNC) to create large-scale wetlands represents a blueprint for other large U.S. ports. The port authority's interagency coordination team, the Beneficial Uses Group (BUG), successfully developed an innovative 50-year plan to managed dredged material generated from the channel widening and maintenance project. The creation of intertidal wetlands will initiate the restoration of the United States' second most productive estuary, in concert with the Galveston Bay National Estuary Plan, while capturing increasingly scarce government financing for port maintenance and improvement operations. An overview of the various beneficial uses of dredged material in the HGNC enlarging project is presented with a detailed investigation of the Bayport Demonstration Marsh Project. The HGNC project is analyzed as a prototype for successful extensive wetland creation ventures, and several key design criteria for similar large-scale marsh creation projects are given. The current BU plan for the 50-ft project will add to the 45-ft project goals of 4,000 acres of intertidal marshes and bird islands in Galveston Bay.

California Montezuma Wetland Restoration Project

Hydraulic Unloader Liberty at Montezuma. Source: Anchor QEA (San Francisco, CA)

The Montezuma Wetlands Restoration Project is a privately owned BU site that accepts sediment from public and private dredging projects in the San Francisco Bay and Delta region with goal of restoring subsided habitat lost from historic agricultural diking. Although the San Francisco Bay-Delta hosts the largest estuary on the west coast, Montezuma is one of only two currently active BU sites that is consistently open to all public and private projects meeting sediment criteria guidelines and is the only site that accepts non-cover (foundation) sediment. A key component of the project's success can be credited to its ease of use by dredgers in that a hydraulic unloader (the Liberty) is available twenty-four hours a day to manage sediment directly from a barge and can be easily accessed from deep water along the San Joaquin River. Another important component of its success is that the local agencies require that approximately 40% of a project's cumulative maintenance dredging volume be placed in beneficial use. Montezuma was implemented by private investors in 2001 who purchased the land and built miles of pipeline, levees, and electrical infrastructure in anticipation of 3-million cubic yards of sediment generated from the Port of Oakland's 50-foot deepening project. Montezuma continues to be funded through tipping fee revenue from the Port of Oakland and Port of San Francisco's sizeable annual O&M dredging programs, as well as numerous smaller private and public navigation projects. When complete, Montezuma will have accepted approximately 20 million cubic yards of sediment and restored 1,800 acres of tidal and seasonal wetlands.

References

There are many references and guidance documents that have been developed recently with the growth of BU of dredged material. Below is a subset of available resources and manuals:

- US Army Corps of Engineers Dredging Operations Technical Support – Beneficial Use of Dredged Sediments (ERDC, 2020) (https://budm.el.erdc.dren.mil/)
- Thin Layer Placement of Dredged Material (ERDC, 2020) (https://tlp.el.erdc.dren.mil/)
- Great Lakes Dredging Team -Beneficial Use Regional Manual (Great Lakes Dredging Team, 2020) (https://www.lre.usace.army.mil/Portals/69/docs/GreatLakesInfo/docs/Great%20Lakes%20Dredging%20Team/Publications/RegionalBeneficialUseManual_Nov2020-draft-final.pdf?ver=5ZrTW3oyUNDHimx-PWwPsg%3D%3D) https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Dredging-Team/).
- Innovative Reuse and Beneficial Use of Dredged Material Guidance Document (Maryland Department of Environment, 2019) (https://mde.maryland.gov/programs/Marylander/Documents/Dredging/FINAL_IBR_GUIDANCE_12.05.2019_MDE.pdf).
- The Processing and Beneficial Use of Fine-Grained Dredged Material (New Jersey Department of Transportation, 2013) (https://www.state.nj.us/transportation/freight/maritime/documents/PDM_FINAL_4.24.13-cs.pdf)
- Beneficial use of Dredged Material: Applications for Natural and Nature Based Features (New Jersey Department of Environmental Protection, 2021) (https://www.nj.gov/dep/opi/nature-based-solutions.html)

- Identify, Planning, and Financing Beneficial Use Projects Using Dredged Material – Beneficial Use Planning Manual (USEPA, 2015) (https://www.epa.gov/sites/production/files/2015-08/documents/identifying_planning_and_financing_beneficial_use_projects.pdf
- USACE Galveston District Texas Coast – Beneficial Use Group (BUG) (https://www.swg.usace.army.mil/Missions/Beneficial-Use/).
- Los Angeles Regional Contaminated Sediments Task Force – Long-Term Management Strategy (CSTF, 2005) (https://coastal.ca.gov/water-quality/la-sediment/)
- Long-Term Management Strategy for the Placement of Dredged material in the San Francisco Bay Region, Management Plan (USACE et al, 2001) https://www.spn.usace.army.mil/Portals/68/docs/Dredging/LMTS/entire%20LMTF.pdf
- Maryland Department of Transportation Maryland Port Administration Innovative & Beneficial Use of Dredged Material Program (https://maryland-dmmp.com/)
- Mississippi Department of Marine Resources Beneficial Use Program (https://dmr.ms.gov/beneficial-use/)
- Poplar Island Environmental Restoration Project (http://www.poplarislandrestoration.com/)
- Rhode Island Marsh Enhancement (http://www.crmc.ri.gov/habitatrestoration/npsaltmarsh.html)
- Central Dredging Association (CEDA 2019) "Sustainable Management of the Beneficial Use of Sediments," http://www.dredging.org/media/ceda/org/documents/ceda/2019-05-BUS-ip.pdf)

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