Mobile Bay

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Location: Mobile Bay

Type: Sediment budgeting/Dredged material disposal

Area: Mobile Bay encompasses approximately 1070 km^2 (413 m^2) of open water

City: Mobile

County: Mobile

Agencies: USACE Mobile District, USACE-ERDC, USEPA, USFWS, DCNR, DEP, NMFS, AL State Port Authority, AL Geological Survey, Mobile Bay NEP, Dauphin Island Sea Lab, The Nature Conservancy, Mobile County Environmental Department, Federal Aviation Authority

State/Province: Alabama

Country: United States

Taken from Byrnes et al 2013

Background

Mobile Bay is the 2nd largest estuary in the United State and is located on the southern tip of Alabama, along the Gulf Coast of the United States. Water and sediment feed to Mobile Bay from the Mobile-Tensaw River system, the 6th largest in the United States, and the drainage areas surrounding the bay. Combined total fluvial sediment contribution to the Bay is estimated to be approximately 3.62 mt/yr. The Bay itself is relatively shallow, with an average natural depth of approximately 3 m (9.7 ft) at high water. The geometry of the bay, relatively low velocity discharges from the river, and low wave energy (under normal conditions) contributes to the deposition of as much as 70% of the sediment discharged to the Bay. There are two outlets from Mobile Bay, Mobile Pass (85% of the outflow) and Pass aux Herons (15% of the outflow), with proportional amounts of sediment discharged with these outflows.

Beginning in the early 1800's, a series of appropriations were made for the improvement of the navigation channel in Mobile Bay. The navigation channels and dredged material placement areas located in Mobile Bay are illustrated in the figure on the left. Thin layer placement was planned for six of these placement areas which are shaded in blue in the figure, which are historical open-water disposal areas used prior 1986. Thin layer placement not only benefits channel dredging operations and keeps sediment in the system but also provides faster recovery for bay-bottom benthic communities and has a smaller impact on benthic ecology.

Project Description

Thin layer placement was approved for management of dredged material for emergencies in 2012 (Lillycrop n.d.). The Mobile Harbor Interagency Working Group (IWG) had concerns regarding material behavior upon placement. In September of 2012, the USACE utilized a large pipeline dredge to clear the upper Bay channel (USACE 2014). Approximately 9 MCY of material were dredged with a hydraulic cutterhead and placed in the historic open water placement areas in a

layer not greater than 12 in. A monitoring and modeling program were established to evaluate short and long term dispersion and fate of in-bay thin layer placement (USACE 2014, Parson et al. 2015). The monitoring and modeling efforts were conducted by the US Army Engineer Development Center and leveraged by the Engineering with Nature and Regional Sediment Management Programs. Upon the results of the monitoring and modeling efforts long-term in-bay thin layer placement was approved for the site in 2014. The material will be placed using a spill barge outfitted with continuous GPS tracking system and a diffuser or baffle plate to spread the material. The spill barge utilizes a system of winches, which constantly move the barge in a sweeping pattern to prevent material from exceeding the thin-layer tolerance (USACE 2014). In 2014, 1MCY of dredged material was placed in a thin layer in-bay.

Findings

During the 2012 and 2014 thin layer placement efforts significant savings in dredging costs were realized. For the 2014 thin layer placement effort cost savings resulted in $4/yd^3, which is approximated to a total project cost reduction of $4M (Lillycrop n.d.). Results of the monitoring and modeling efforts concluded that the placed dredged material is less erodible than the native bay bottom sediment due to its fine grained cohesive properties (Rees n.d.). Additionally, material placed in thin-layer fashion is not transported along the bottom as a slug of sediment, rather it is remobilized into the water column by waves and currents and returned into the Bay's natural sediment transport system such that it will not impact other natural resources within the Bay (Gailani et al. 2014). Monitoring results from 2012 indicate that the placed material consolidated, and that the benthic community recovered quickly (Ferraro 2014).

References

Byrnes, M.R.; Berlinghoff, J.L.; and Griffee, S.F. (2013) Sediment Dynamics in Mobile Bay, Alabama: Development of an Operational Sediment Budget. Applied Coastal Research and Engineering, Inc., Mashpee, MS.

Ferraro C. (2014) Strategies for Implementing Regional Sediment Management:Using a Collaborative Approach to Implementing RSM Principles in Alabama. Presentation, CEER 2014, New Orleans, LA.

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Parson, L.; Lovelace, N.; Godsey, E.; Reine, K.; and Gailani, J. (2015) Regional Sediment Management (RSM) Strategy for Mobile Bay, AL. ERDC/CHL CHETN-XIV-41. Vicksburg, MS. US Army Engineer Research and Development Center.

Rees, S. I. (n.d.) Beneficial Use of Dredged Material to Create Emergent Tidal Marsh in Upper Mobile Bay. Department of the Army, Mobile District. Mobile, AL.

USACE (2014) Letter from Coastal Environmental Team, Planning and Environmental Division to the Alabama Department of Environmental Management.

Points of Contact

Information on thin layer placement (TLP) case studies has been compiled as part of a DOTS/EWN project to provide a source of information, knowledge, and experience on TLP of sediment or dredged material in aquatic environments. The Thin Layer Placement Website and Map-Portal are funded by the US Army Engineer Research and Development Center (ERDC). POCs for the Thin Layer Placement Website and Map-Portal are:

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