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# Overview of the San Francisco Proving Ground District Strategic Sediment Placement Pilot Project and EWN engineering tools

SEPTEMBER 13, 2022 Arye M. Janoff, Ph.D. Lead Planner USACE SF District

## Objectives

- Problem
  - Marsh drowning and edge erosion
  - Limited sediment supply
  - Funding incremental cost above the federal standard
- Solution
  - Beneficial Use of Dredged Material (BUDM or BU)
    - Direct Placement
    - Novel EWN Methods (e.g., Strategic Placement)
- Strategic Placement planning process and design
- How to leverage EWN in SF Bay
  - Regional Dredged Material Management Plan





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#### SCIENCE

Got Mud? For Coastal Cities, Humble Dirt Has Become A Hot Commodity

May 1, 2021 · 7:28 AM ET Heard on Weekend Edition Saturday



The simple local solution to sea level rise? Mud from the bottom of San Francisco Bay

#### Problems

- A change in sediment regime, sea level rise, and localized erosion will lead to a long-term loss of mudflats and marshes in the San Francisco Bay.
- Dredged sediment is critical for adaptation/restoration of marshes and mudflats that protect us from rising seas and storms.
- Incremental cost above federal standard must be covered by nonfederal partners

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#### **Opportunities**

- EWN approaches may offer possible solutions to the problem of losing mudflats and marshes.
- Potential to lower the cost of beneficial reuse of dredge material by using natural processes to bring the material onshore.

# Marsh Drowning





Fig. 9 *R. longirostris obsoletus* habitat availability at MHHW. Projected marsh area (%) where elevation plus maximum vegetation height exceeds MHHW by at least 20 cm

From Karen Thorne, USGS

Swanson et al. 2013

Figure G-9. Corte Madera WARMER results in terms of vegetation category: mudflat, low, mid, or high marsh, or upland transition.

#### **Marsh Erosion**



New life for eroding shorelines (SFEI and Baye 2020)

## **Mudflats and Marshes**

- Part of a "complete marsh" ecosystem
- Mudflat width and elevation
- Sediment storage and subsidies
- Wave attenuation and shoaling





#### **Beneficial Use Projects in SF Bay**





#### Shoreline Phase I



Ocean Beach, SF











# Strategic Placement Pilot Project

- Using natural transport processes to move material onshore
- Creates resilience for mudflats and marshes
- Innovative, cost-effective, moves towards regional goals
- Monitoring impacts and effectiveness





# WRDA 2016 Section 1122 Beneficial Use of Dredged Material Pilot Program

- Section 1122 of WRDA 2016 requires USACE to establish a pilot program to carry out 10 projects for the beneficial use of dredged material
- \$50 mil Proposal by State Coastal Conservancy with BCDC requested funds for both direct and strategic placement
- Working group drafted a framework to recommend ways to assess impacts, site suitability, logistics, monitoring (SFEI)
- SF District was funded to do **strategic shallow water placement pilot project** to test new innovative method





# **Screening of Sites**

- Site selection criteria 🖈
  - Eroding or drowning marsh, lack of natural sediment supply
  - Sufficient wind-wave action to resuspend sediment placed
  - Proximity to a Federal Channel
  - Open to tidal exchange, existing marsh
  - Water shallow enough to get scow close to shore
  - Protection for disadvantaged communities
  - Lower populations of critical species
  - Avoiding large eelgrass beds/nearshore reef projects



## Alternatives

- Model simulated numerous scenarios at two placement sites
- Comparisons
  - Volume
  - Placement locations
  - Placement area
  - Tidal timing
  - Source of sediment
  - Seasonal differences



#### Scenario Results: Emeryville and Eden Landing



### **Final Scenario Selection**



Dispersed South of Dumbarton Bridge **Dispersed North of Bay Bridge** 









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## **Deposition on Mudflat/Marsh**

- Deposition thickness at placement area is  $\sim 1/3 - 1$  ft
- Deposition thicknesses on mudflat and in marsh channels is  $\sim 1 \text{ mm to } 1 \text{ cm}$ .
- On natural depositional scale and mimics natural processes.

**Dredged Sediment Deposition Thickness** 2 mi





# Alternatives Analysis

- Proposed Action:
  - Eden Landing (shallow, 100,000 yd<sup>3</sup>)
- Alternative B:
  - Emeryville Crescent (shallow, 100,000 yd<sup>3</sup>)
- No Action Alternative





# **Draft Monitoring Plan**

- Pre-project
  - Water depth and elevation
  - Suspended sediment, wave conditions
  - Eelgrass surveys
  - Sediment transport rates
  - Background marsh/mudflat gain or loss
- Post-project
  - Placement site
  - Bay bottom, eelgrass
  - Sediment transport rates
  - Marsh/mudflat gain or loss
  - Community science





Marsh deposition

Magnets

15

Kilometers



### **Project Success**

- What will make this effort successful?
  - Delivery to mudflats, and eventually marshes, and restoration ponds
  - Permitting and implementation of novel placement method
  - Completion of a successful contract with available existing equipment to give a basis for cost comparison
  - Placement without significant impact to ecological function of shallows
  - Material not going to disposal site; keeping dredged material in the system
  - Community engagement
  - Testing a tool useful in maximizing BU for Regional Dredged Material Management Plan



## **EWN at Regional Scale**

- Regional Dredge Material Management Plan
  - Broad Stakeholder Engagement
  - Science Gap Analysis and studies
  - Associated 2025-2034 revised Environmental Compliance
  - Maximize BU
  - Leverage EWN tools for BU
- Engineering with Nature / Comprehensive Benefits Planning / Environmental Justice
  - Beneficial Reuse via EWN
  - Beneficial Reuse with and for EJ communities
- Pursue Pilots & Innovative Applications
  - Nearshore Strategic Placement Pilot Projects
  - Establish Humboldt Nearshore Demonstration sites
  - Aquatic Transfer Site
- Re-envision Regional Goals
  - Regional sediment management through Comprehensive Study or Integrated Water Resource Management authorities



## Thank You!

#### Project Team

#### • USACE

- Peter Mull Project Manager
- John Dingler- Planning Mentor
- Arye Janoff Planner
- Julie Beagle- Environmental Planner
- Eric Joliffe- Environmental Planner
- Ellie Covington- Environmental Planner
- Tiffany Cheng- Coastal Engineer
- Fanny Chan- Civil Engineer
- Kelly Boyd Real Estate
- Non-Federal Sponsor (CA Coastal Conservancy)
  - Evyan Sloane (SCC)-Sponsor Program Manager
    - Brenda Goeden (BCDC)-Sponsor Technical Support



- Contractor (Modeling)
  - AnchorQEA (Michael MacWilliams, Aaron Bever)
- SF Bay Regional Water Quality Control Board (CEQA Lead)
  - Xavier Fernandez
  - Kevin Lunde
  - Jazzy Graham-Davis

#### **Contact**

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#### **BONUS SLIDES**



#### **MUD MOTOR, THE NETHERLANDS**

#### The dredged sludge is usually thought to be useless and it is spread in the Wadden Sea.



#### 2. Sediment transport to salt marsh

In the Mud Motor project, the dredged material from the port of Harlingen is spread in a tidal channel in front of the salt marshes near Koehoal. If that material is deposited at the right time and in the right place, it moves onto and in front of the salt marshes.

Koehoa

Mud Motor, Ecoshape

#### 3. Tidal flow and wind

The tidal flow and the wind then transport the material naturally to the salt marsh and the mudflats in front of it. Adequate sediment flows allow salt marshes to grow with sea level rise as long as the sediment can be retained.



Sediment arrives at the salt marsh. The mudflats and salt marshes are flooded at high tide. The sediment can then settle to the bed. The salt marsh grows. This process is repeated again and again. In natural conditions, salt marshes are formed by sediment and the vegetation in place slows down the flow of water, allowing sediment to settle.

#### 1. Dredging work in Harlingen

Sediment settles in harbours because harbours are sheltered from currents and waves. To keep the port of Harlingen open to shipping, 1.3 million cubic metres has to be dredged annually.

#### SHORELINE RESILIENCE FOR VULNERABLE COMMUNITIES





#### **COMMUNITY SCIENCE: COASTSNAP AND SANDSNAP**







**EWN** 









### **Outreach Coordination**

- Stakeholder meeting 10 March 2021
- Resource agency meeting 26 March 2021
- Stakeholder meeting 15 May 2022
- Resource agency meeting 23 May 2022
- Tribal consultation underway
- Consultation with the Confederated Villages of Lisjan Nation on 1 June 2022.
- Public meeting 15 July 2022
- Landowners: working with CDFW and South Bay Salt Ponds.
- Working with City of Hayward and Hayward Rec and Park to plan outreach



#### **SFEI Adaptation Atlas**

<u>https://storymaps.sfei.org/journal/src/?appid=9b55646b</u>
<u>becd40ff97cf41fe674edc93</u>

