SUSTAINABLE SEDIMENT MANAGEMENT AND DREDGING SEMINAR
28-30 NOVEMBER 2018
GALVESTON, TX

Overview of Sediment Management Strategies
Don Hayes
Dredging Program Goals

- Maintain or improve navigability within time and budget
- Minimize environmental impacts (beyond permit compliance)
- Minimize impact on long-term storage capacity
- Maximize environmental and economic benefits
Traditional Sediment Placement Options

- Upland/Nearshore
  - Unconfined placement
  - Confined placement

- Open Water
  - Side Casting
  - Aquatic Disposal

DIFFICULT TO SUSTAIN
Beneficial Use Options

- Beach nourishment
- Marsh nourishment, restoration, establishment
- EWN features
- Thin-layer placement
- Construction projects
- Off-site uses – fill material, etc.
- Many others

INCREASED SUSTAINABILITY
## Related ADDAMS Models

<table>
<thead>
<tr>
<th>SITE</th>
<th>DREDGING/ PLACEMENT</th>
<th>LONG-TERM MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONFINED</td>
<td>SETTLE/CDF</td>
<td>PSDDDF</td>
</tr>
<tr>
<td>OPEN WATER</td>
<td>STFATE, MDFATE, CDFATE</td>
<td>LTFATE</td>
</tr>
</tbody>
</table>
Sediment Properties

- Sediment properties significantly impact sediment management options
- Coarse materials – sand, gravel, cobble
  - Dewater easily
  - Quickly regain bearing capacity
  - Potential off-site uses
  - Workable
- Fine materials – silts and clays
  - May contain beneficial nutrients
  - Difficult to dewater
  - Very low bearing capacity
  - Off-site uses require dewatering ($) and still limited
  - Undesirable constituents more likely an issue
Sedimentation Patterns - Complicating Factors

- Hydraulically placed sediments segregate by settling velocity (grain size) after discharge
- Coarse materials (sands) deposit near the point of discharge
  - Recover bearing capacity quickly; usually can support equipment
- Fines settle into a nearly homogenous “pie filling” with gradual slope to outlet
  - Very limited bearing capacity; can’t support conventional earthmoving equipment
  - Difficult to dewater
  - Difficult to remove
Sediment Management During Placement

- **Objectives**
  - Meet discharge requirements
  - Minimize the loss of solids from the site
  - Maximize life of placement area

- **General rules of thumb:**
  - Maintain 2 ft of ponding at the weir
  - Retention time ≥ 24 hrs

- **Column settling tests** provide more accurate requirements

- **Actively managing** the location and direction of the dredged material influent can be beneficial
Sand Separation During Dredging

- Sand separation during dredging has proven successful
  - Coarse organic matter and associated contamination may be a concern

- Cost effectiveness depends on
  - Amount of sand available
  - Market for sand
  - Value of space sand would have occupied
Post-dredging Sediment Management

Objective: Expedite and enhance capacity recovery

- Gradually remove ponded water to expose surface immediately post dredging to facilitate drying and consolidation
- Manage site to minimize precipitation/runoff impacts
- Implement active dewatering strategies
- Vegetation control
Dewatering Strategies

- Perimeter trenching
  - Long reach excavator
- Cross trenching
  - Typically 100’-200’ on center
  - Low pressure tracked vehicles
  - Requires crust formation
- Active Drainage Systems
  - Vertical drains
  - Underdrains
- Low permeability of the settled fine material limits porewater movement
Material Recovery

- Sediment is commonly used to raise dikes
- Removing material for other uses seems like an obvious way to recover volume
- Sand can often be recovered and may have some market value
- Fine material removal/reuse challenging
  - Designs seldom facilitate material recovery
  - Limited reach from dikes for excavation equipment
  - Most require additional dewatering prior to use
  - Limited market value
Maximizing Confined Storage Volumes

- Place material in thin lifts (2 ft or less)
- Promptly remove ponded water
- Ditch for surface drainage as soon as bearing capacity allows
- Implement other dewatering methods as possible
- Vegetation can assist with dewatering, but has negatives as well
- Provide sufficient time between disposal actions for complete desiccation
- Craney Island example
Dredging and Sediment Management Plan

- Multi-year, adaptive plan for managing dredging projects and sediment placement areas can help maximize capacity

- Purpose
  - Match project timing with placement area management
  - Rotate placement areas into and out of service to maximize capacity gains
  - Identify areas ripe for beneficial use; initiate data collection, agency coordination, and permitting (to the extent possible)
  - Implement cost-effective dewatering strategies
  - Develop material reuse strategies

- D2M2 may provide useful guidance for complex systems
Increasing Beneficial Use Opportunities

- Beneficial uses offer many benefits
  - New capacity
  - Positive environmental benefits
  - Possible monetary benefits (rare cases!)

- Why is it not more common?
  - Sediment availability mismatches
  - Usually involves additional costs
  - Federal Standard limitations
  - Requires additional permits
  - Motivation
Can we overcome BU obstacles?

- Spatial and temporal sediment availability
  - Proactively identify potential BU sites
  - Aggregate smaller projects into larger projects that have a greater impact
  - Develop designs that do not require single-placement events

- Cost
  - Local sponsors
  - Consider replacement cost of disposal volume
  - Broader view of Federal Standard

- Motivation
  - Must become a priority

- Permits
  - Pursue broad permits for larger sites
  - Increased interagency cooperation
Sustainable Upland Placement Sites?

- Some upland placement will likely always be required
- Can we envision sustainable placement sites that never fill?
- Basic Requirements
  - Multiple cells (not necessarily co-located) to allow “fallow” years
  - Sufficient area for manageable annual placement depths
  - Subsurface drains to accelerate dewatering
  - Firm bottom to support mechanical equipment at all times
  - Reliable market for dewatered sediment
  - Possible combination with dewatered sewage sludge
Placement Area Preliminary Assessment - Concept

- Utilize existing data and feeds
- Dashboard component for visualization (ArcGIS Portal)
- Fully Customizable
- Requirements
  - Initial Surveys (Cross-Section, Airborne LiDAR, Mobile LiDAR and UAS)
  - Interface for dredging quantities
  - Periodic assessments
Visualize Placement Area Data

- Common Dashboard(s)
- Information at-a-glance
- Status
- Capacity
- Filters
- Consolidation Info

Maintenance work this week
3 cu yds.

New Material this week
8,695 cu yds.
External Form for Partners

- ArcGIS (Survey123) interface for Dredging reporting
- Simple form requiring location and volume(s)
- Customizable reporting
Sustainable Sediment Management and Dredging Seminar

28-30 Nov 2018

Galveston, TX