



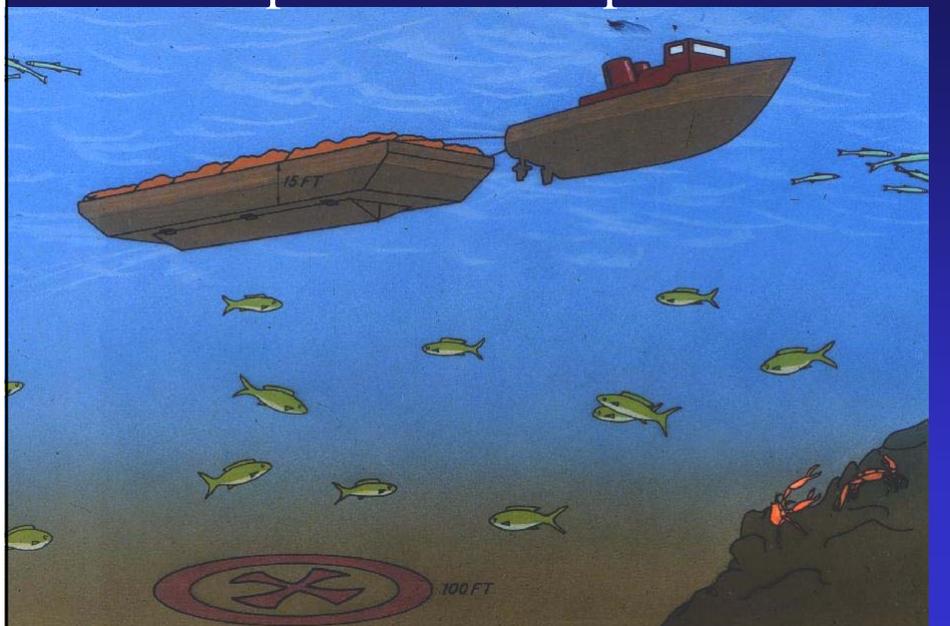
OPEN WATER SITE MANAGEMENT AND CONTROLS

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Keywords: Dredged Material, Open Water,
Capping, Submerged Discharge

Open Water Disposal



Open Water Placement

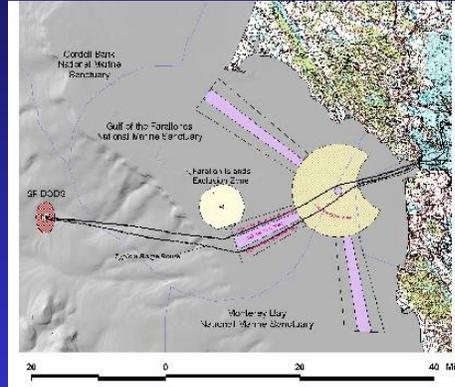
- Site Characterization
- Site Designation/ Selection
- Material Suitability
- Design Evaluations
- Operational Considerations
- Control Measures/ Management Actions
- Monitoring
- Site Management Plan

Site Characterization

- Bathymetry
- Water depth/ stratification
- Current/ wave conditions
- On-site biological resources
- Proximity to sensitive resources

Site Designation/ Selection

- Ocean Site Designation (MPRSA)
 - Formal Designation Process
 - EPA Designated General Use (Section 102)
 - USACE Designated Specific Projects (Section 103)
 - Final and Interim Designations
- Site Selection in US Waters (CWA)



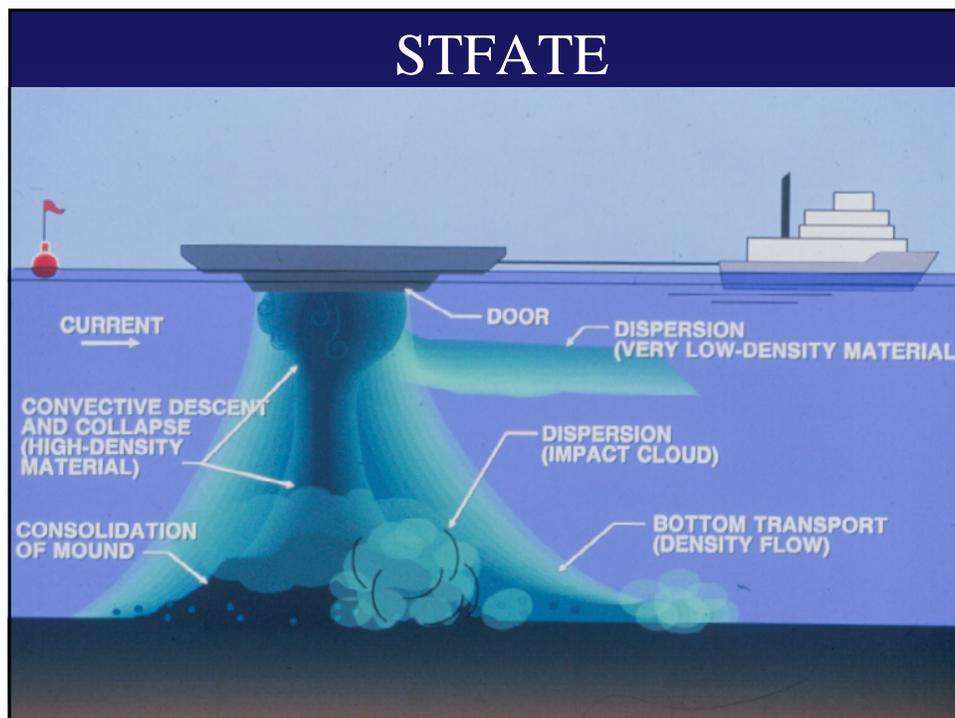
Material Suitability

- Is proposed dredged material suitable for open water placement at the site without special management or controls?
 - Physical impacts
 - MPRSA sites via site designation
 - CWA sites project specific
 - Contaminant impacts
 - MPRSA via OTM procedures
 - CWA via ITM procedures

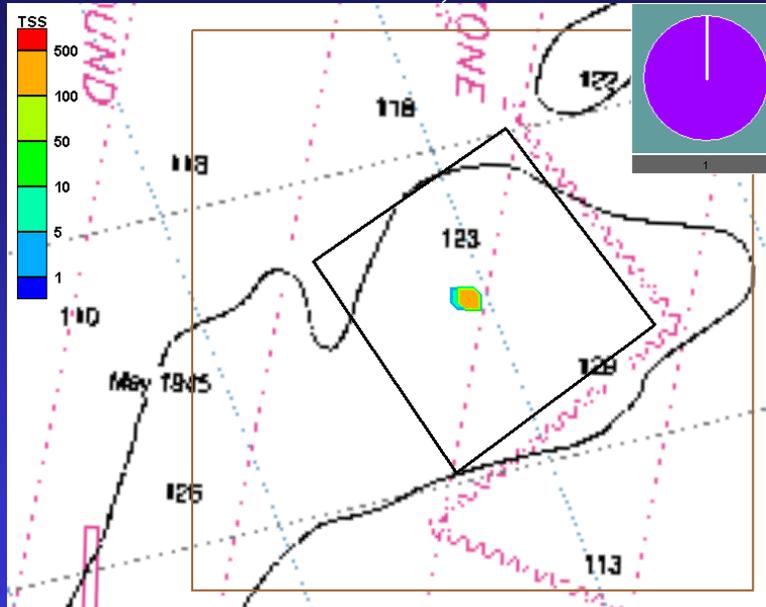


“Design” Evaluations

- Water Column Dispersion
 - STFATE or CDFATE or others
- Placement technique, location, and rate
 - Mound Development ~ MDFATE
- Long-Term Stability and Site Capacity
 - Consolidation ~ PSDDF
 - Erosion/ Consolidation ~ LTFATE
- Far Field Transport ~ TABS, ICM, SSFATE



Site 69b, TSS



Operational Considerations

- Equipment and placement techniques
- Time, rate, location, and methods of placement
- Quantity and frequency of materials placed
- Navigation and positioning
- Site controls, e.g. Buoys
- Coordinating site use among permittees

Open Water Site Monitoring

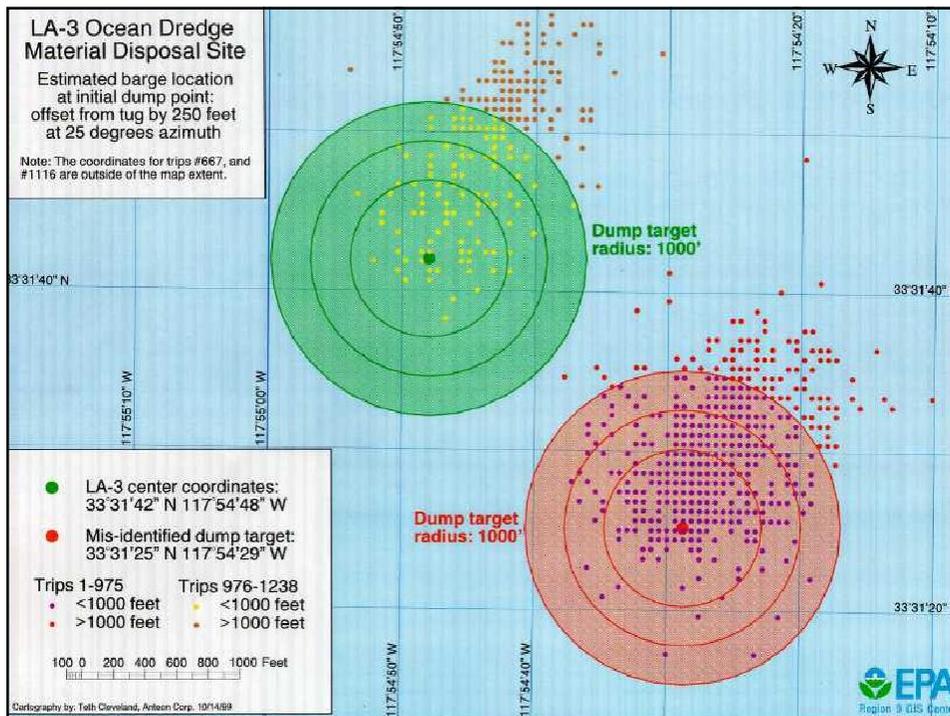
- Need for Monitoring
 - Evaluate effectiveness of management
 - Evaluate environmental impacts
 - Recommend modifications
- Monitoring Plan
 - Clear objectives
 - Testable hypotheses
 - Methods and equipment
- Management Actions
- Silent Inspector
 - Location
 - Volume

Open Water Monitoring Tools



Site Management Plans

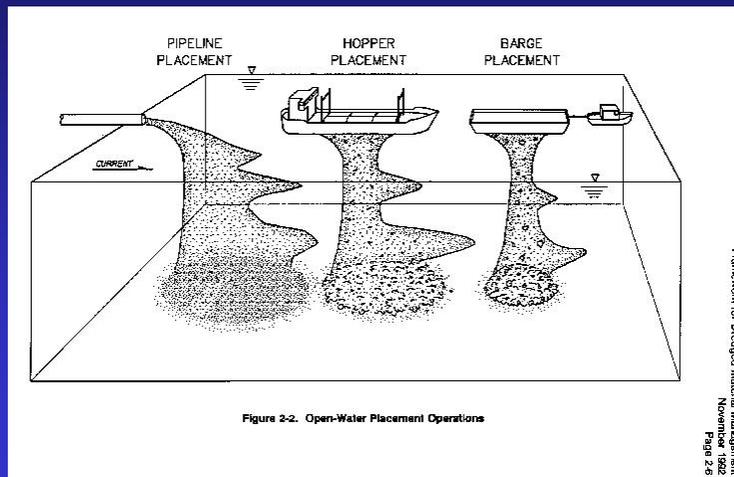
- Roles and responsibilities
- Management objectives
- Specifics on operations and management
- Inspection and enforcement
- Monitoring requirements



Open Water Control Measures

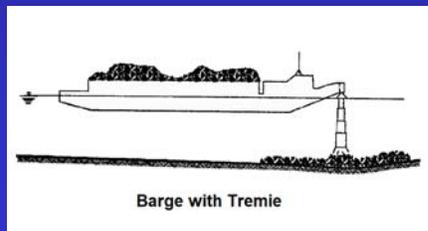
- Water Column Impacts
 - Submerged discharge
 - Geocontainers
 - Silt Curtains
 - Treatment (polymer addition)
 - Reduce discharge rate
 - Promote mixing (dump while under tow)
- Benthic Impacts
 - Treatment (oxygen injection, activated carbon)
 - Capping or entombing with cleaner dredged material
- Sediment Stability
 - Lateral confinement
 - Capping (armoring) or CAD
 - Geocontainers

Open Water Placement Operations



Submerged Discharge

- Can reduce water column dispersion
- Can improve accuracy of placement
- Pipeline configurations
- Diffuser design available
- Tremie technology

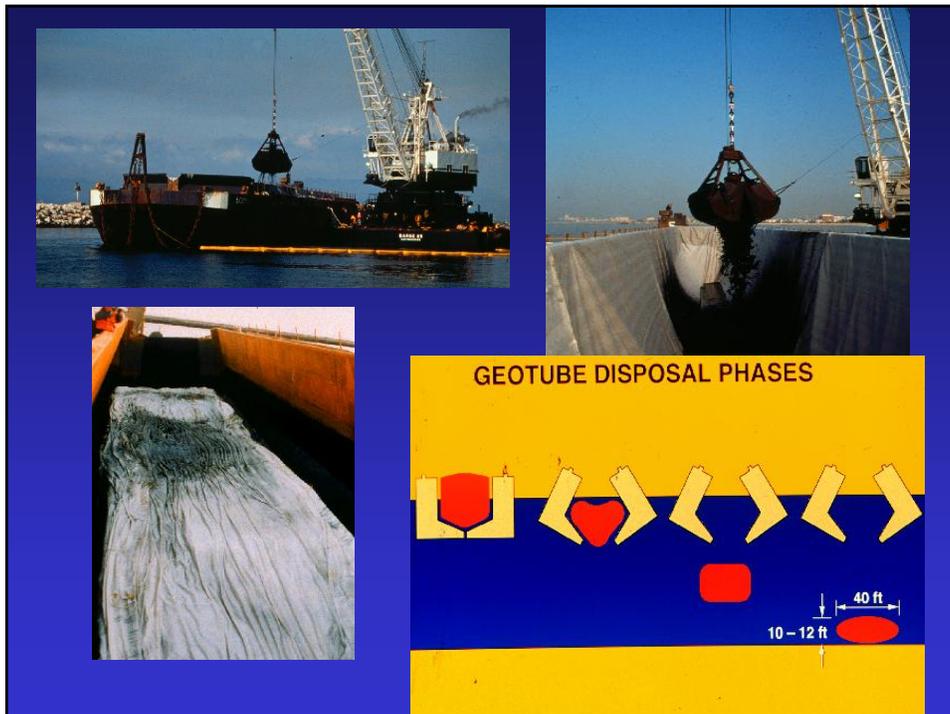


Submerged Diffuser



Geo-containers

- Geotextiles used for solids containment
- Can reduce water column dispersion
- Can reduce capping requirements
- Engineering design approaches available
- Operational aspects need refinement



Silt Curtains

- Used mostly at dredging site rather than disposal end; could be deployed around critical environmental resources
- Curtain materials and construction
- Deployment options
- Can be effective in low-energy conditions (< 1 fps)
- Difficult to maintain in current
- Frequently requested by resource agencies

Silt Curtain being held in place



Silt Curtain



Open Water Treatment

- Largely experimental; such as amendments to control bioavailability
- Oxygen injection
- Addition of flocculants



Open Water Control Measures

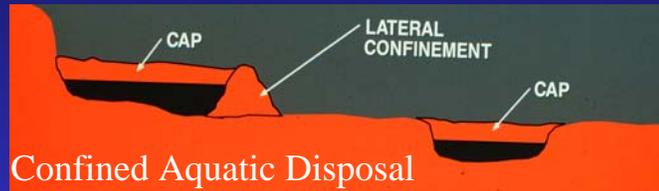
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Contained Aquatic Disposal (CAD)/Capping

- PURPOSE
 - Physical stabilization
 - Physical isolation of contaminants from benthos by capping
 - Reduction of contaminant flux

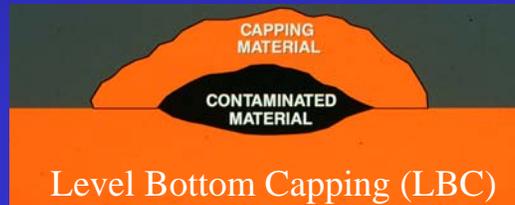
CAD Approaches

- Existing Pits/Fills or Excavated Pits
- Lateral Confinement



Confined Aquatic Disposal

- Mounds



Level Bottom Capping (LBC)

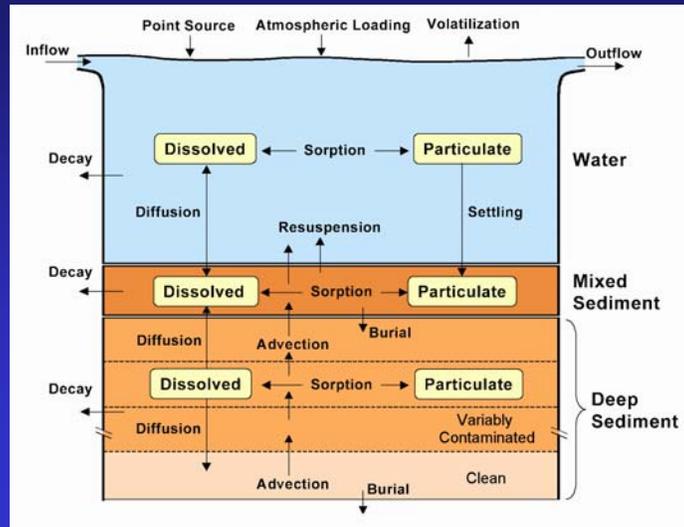
Cap Design/Thickness

Factors:

Mixed Layer
Biodiffusion
Advection/ Diffusion
Advection/ Diffusion

- Erosion
- Bioturbation
- Retardation/Dispersion of Contaminant Flux from Advection/ Diffusion
- Consolidation
- Operational factors

Models are needed for long-term effectiveness evaluations - RECOVERY



Equipment and Placement Methods for Capping

- **Barge**
 - conventional - spreading - pumpout
- **Hopper**
 - conventional - spreading- pumpout
- **Pipeline**
 - diffuser - sand box - baffle plate
- **Direct mechanical placement**
- **Other innovative methods**

Placement Methods



Capping Guidance Documents

- **ARCS In-Situ Capping Guidance**
EPA 905-B96-004 Oct 96
 - <http://www.epa.gov/glnpo/arcs/EPA-905-B94-003/EPA-905-B94-003-toc.html>
- **USACE Guidance for Subaqueous Dredged Material Capping** Jun 98
 - <http://www.wes.army.mil/el/dots/doer/pdf/doer-1.pdf>
- **Equipment and Placement Techniques for Subaqueous Capping** ?? 2005
 - <http://www.wes.army.mil/el/dots/doer>