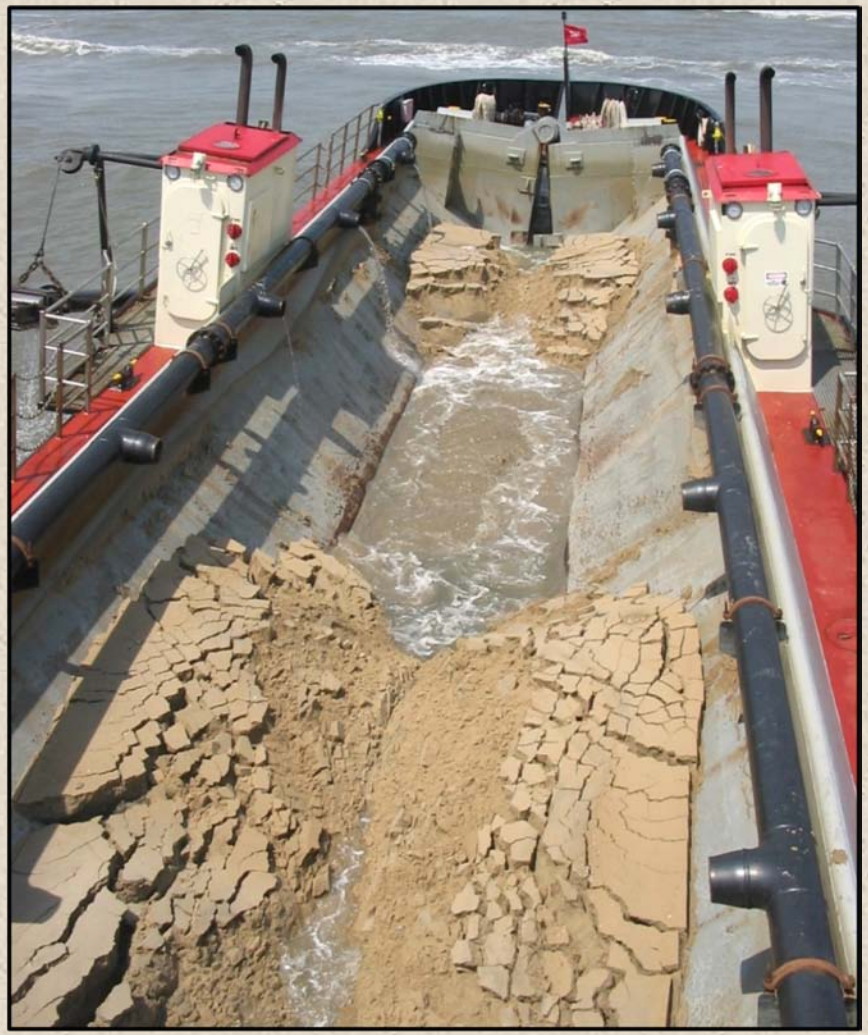
Ocean Placement of Dredged Material



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Regulatory Framework and Guidance

Ocean Placement regulated under Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA)

Testing protocols described in the Ocean Testing Manual ("*The Green Book*") and the Region 6 RIA

- Tier I – Review of Existing Information
- Tier II – Sediment and Elutriate Chemical Testing
- Tier III – Water Column Bioassays, Whole Sediment Bioassays, Bioaccumulation Testing
- Tier IV – Case-Specific Risk Assessment or other studies

Results of Tier II and Tier III testing must comply with the Limiting Permissible Concentration (LPC) and EPA must provide concurrence

Limiting Permissible Concentration (LPC)

Dredged material must comply with the LPC - no adverse impacts related to ocean placement of dredged material

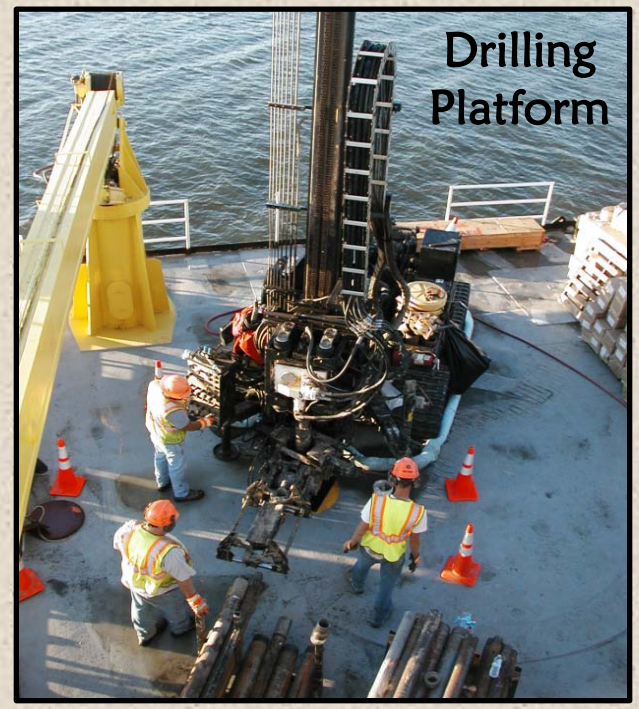
- Tier II – water quality criteria compliance*
- Tier III – water column toxicity compliance*
- Tier III – benthic toxicity compliance
- Tier III – benthic bioaccumulation

**Water column impacts can usually be minimized/alleviated by placement strategy (i.e., placement location and volume within the designated site)*

***No decisions based strictly on sediment chemistry – used only for determination of analytes for tissue testing*

Sediment Collection

- Sampling method (vibracoring/drilling) determined by requirements of project
- Testing is a list of approx 120 analytes, plus toxicological testing
- Sediment volume required determined by amount/type of testing – often need approx 30 gallons of sediment per sample

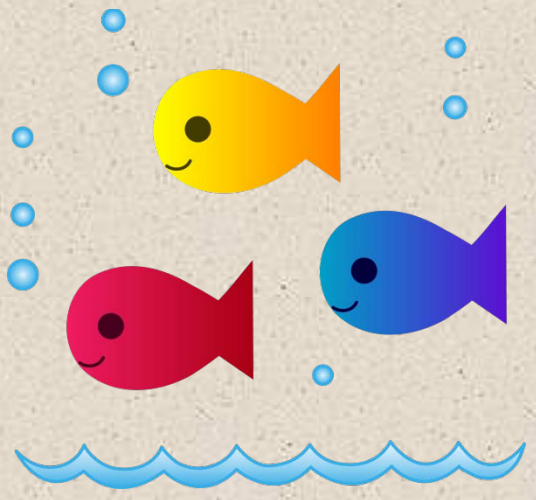


Reference Site and Receiving Water Sampling

- Reference sites located offshore, in areas away from influence of land activity
- Grab sampling used to collect surface sediments
- Receiving water collected from placement site (ODMDS) to determine background concentrations for STFATE modeling

Water Quality Criteria - Standard Elutriates

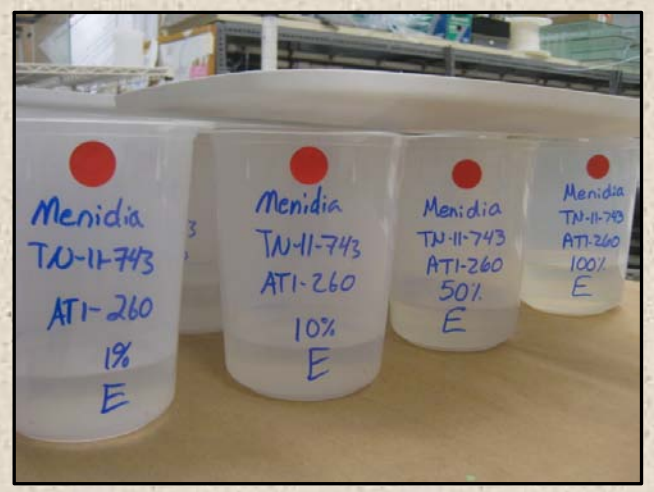
- LPC compliance = No exceedance of WQC outside the placement site boundary within the first 4 hours following placement and no WQC exceedance anywhere in marine environment after 4 hours
- If none of the constituents exceed WQC, the material meets LPC
- If have WQC exceedances, STFATE model is used to predict the concentration during and after a 4-hour initial mixing period of the constituent requiring the greatest dilution to achieve WQC



Water Column Toxicity LPC – Bioassays

Acute, larval tests (48-96 hrs) for 3 species

- *Menidia sp.* (silverside)
- *Americamysis bahia* (mysid / opposum shrimp)
- *Cyprinodon variegatus* (sheepshead minnow)
- *Mytilus galloprovincialis or Mytilus edulis* (blue mussel) – 48-hour larval development test

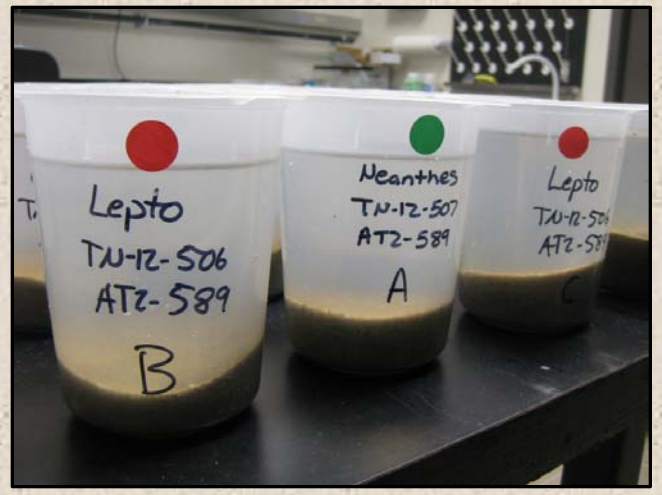


- <u>Endpoint</u>: survival
- Standard Elutriate (100%, 50%, 10%, and 1% dilution), laboratory control, and elutriate prep water – 5 replicates
- Results reported as LC50 values
- Statistically compare to site water
- If statistically different, run the STFATE model to determine LPC compliance

Benthic Toxicity LPC - Whole Sediment Bioassays

10-day tests for 2 species

- *Leptocheirus plumulosus* (estuarine amphipod)
- *Ampelisca abdita* (estuarine amphipod)
- *Americamysis bahia* (mysid / opposum shrimp)



- <u>Endpoint</u>: survival
- Test sediment, reference sediment, and control sediment – 5 replicates
- Statistically compare results to reference site survival

Does not meet the benthic toxicity LPC if:

1) mortality in the test sediment is significantly greater than mortality in the reference sediment, <u>AND</u>
2) exceeds mortality in the reference sediment by at least 10% (or 20% for amphipods)

Benthic Bioaccumulation Testing

28-Day testing for 2 species

- *Nereis virens* (sand worm)
- *Macoma balthica* (blunt-nose clam)

- Endpoint: survival (sufficient tissue for tissue testing)
- Test sediment, reference sediment, and control sediment – 5 replicates

Tissue Testing

Consultation with EPA after sediment analysis is completed to determine which samples and analytes should be tested in tissue samples

Tissue Results Evaluation:

- Statistically compare to FDA action levels
- Statistically compare to reference sediment
- Statistically compare to background concentrations

Benthic Bioaccumulation LPC

If tissue concentrations statistically exceed reference tissue concentrations, then additional evaluation of the tissue concentration is required to determine LPC compliance

1. Number of species in which concentration exceeds reference
2. Number of contaminants that exceed reference
3. Magnitude by which concentration(s) exceeds reference
4. Toxicological importance
5. Phylogenetic diversity of the affected species
6. Propensity of contaminant(s) to biomagnify
7. Magnitude of toxicity, number, and phylogenetic diversity of species with mortality greater than reference
8. Magnitude by which concentrations in test tissue exceed concentrations in species living at disposal site

Timeframe

Task	*Task*	*Project*
Sampling and Analysis Plan Development	4 weeks	1 month
Field Sampling – Sediment and Water	3 weeks	2 months
Analytical Testing – Sediment and Standard Elutriates	4 weeks	3 months
Ecotoxicological Testing	8 weeks	5 months
Water Column Bioassays		
Whole Sediment Bioassays		
Bioaccumulation Testing		
STFATE Modeling	2 weeks	5 months
Consultation with EPA	4 weeks	6 months
Analytical Testing – Tissue	6 weeks	8 months
Data Analysis, Statistical Comparisons, Reports	8 weeks	10 months
EPA Concurrence	4 weeks+	11+ months

PROCESS TAKES APPROXIMATELY *12 MONTHS* TO RECEIVE CONCURRENCE

QUESTIONS?