Dredged Material Evaluation and Testing Overview

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Guidance Documents for
Management of Dredged Material

Technical Guidance
• Technical Framework
• Inland Testing Manual
• Ocean Testing Manual
• Upland Testing Manual
• Ocean Site Designation Manual
• Site Management & Monitoring

Found at:
el.erdc.usace.army.mil/dots/guidance.html
Inland Testing Manual

- Addresses CWA
- Interim guidance in 1976, updated in 1998
- Included:
  - Effects-based testing
  - Sequenced > Tiered

DM placement “will not cause “an unacceptable adverse impact””
Ocean Testing Manual

- Addresses MPRSA
- Originally developed in 1977, updated in 1991
- Included:
  - Effects-based testing
  - Bioaccumulation
  - Sequenced > Tiered

DM placement in ocean will not “unreasonably degrade or endanger: human health, welfare, or amenities, marine environment, ecological systems, or economic potentialities”
<table>
<thead>
<tr>
<th>MPRSA</th>
<th>CWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality Criteria</td>
<td>Water Quality Standards</td>
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<tr>
<td>Mixing Specified</td>
<td>Mixing Variable</td>
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<tr>
<td>Exclusions Restricted</td>
<td>Exclusions Broad</td>
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<tr>
<td>Reference Comparison</td>
<td>Disposal Comparison</td>
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<tr>
<td>Bioassays Mandatory</td>
<td>Bioassays Optional</td>
</tr>
<tr>
<td>Trace Contaminants</td>
<td>No Trace Contaminants</td>
</tr>
<tr>
<td>No Physical Isolation</td>
<td>Physical Isolation</td>
</tr>
<tr>
<td>1977 Regulation</td>
<td>1980 Regulation</td>
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</tbody>
</table>
Upland Testing Manual

- Addresses management of DM in confined disposal facilities (CDF)
- Published in 2003
- Included:
  - Tiered approach to assess contaminant releases
  - Focused on contaminant pathways and use of a conceptual model
  - Goal is to determine need/extent of contaminant controls
Dredged Material Testing Manuals

• Tiered testing and evaluation
• Testing procedures (elutriate, benthic, and bioaccumulation)
• Computer models for mixing
• Statistical tools, QA/QC, and data interpretation
• Case-specific evaluations
Southeast RIM

• Completed in 2008
• Region specific guidance
  ➢ Process
  ➢ Sampling (DMMU size)
  ➢ SAP/QAPP
  ➢ Grain size (sand)
  ➢ Acceptable bioassays
  ➢ Screening levels
  ➢ Examples of SAP/QAPPs

www.epa.gov/region4/water/oceans/documents/SERIM_Final_August%202008.pdf
Risk Assessment and Management Process

- Process that evaluates the likelihood that adverse effects may occur or are occurring as a result of exposure to one or more stressors (USEPA 1997).
- Risk management is an approach to consider the outcome and uncertainty of an assessment and mitigate risk through a range of alternatives.
Features of Risk Assessment

• Evaluate risk to different levels of ecological organization (ecosystems, communities, species, populations)

• Important planning components of RA
  ➢ Problem formulation stage
  ➢ Conceptual model

• Evaluate exposure and potential effects
• Result in a characterization of risk
• May determine levels of unacceptable risk/suitability of management options
A stressor is any physical, chemical, or biological entity that can induce an adverse response

Dredging Stressors:

- Chemicals in sediment
- Chemicals released into surface waters from dredging activities
- Resuspension
- Physical activities (e.g., noise) associated with dredging
Conceptual Model: Open Water Placement of DM

Dredged Material Placed in Open Water

Pathways

Sediment

Water (acute)

Direct Contact

Receptors

Aquatic Invertebrates

Fish

Benthic Invertebrates

Birds/Wildlife

Humans
Conceptual Model: Upland (CDF) Placement of DM

Pathways

CDF Placement → Volatilization

Direct Contact

Soil Runoff/ Effleunt → Water Leaching

Water Leaching → Seepage

Receptors

Plants

Soil Invertebrates

Humans

Birds/ Wildlife

Fish

Aquatic Invertebrates
Weight of Evidence

- Relies on multiple lines-of-evidence (LOE)
- Reach conclusions regarding the potential risks to receptors identified within the CM
- Three main lines-of-evidence

Lines of Evidence:
- Water Column
- Direct Contact
- Food Web
Guidance Manuals: 4 Tiered Procedure

Tiered process → follow as far as necessary to make decision

- **TIER 1**: Evaluation of existing data
- **TIER 2**: Chemistry, screening, and models
- **TIER 3**: Toxicity and bioaccumulation bioassays
- **TIER 4**: Site or region specific analysis

Increasing cost, information and resolution
Tier I

• Examine existing information
  ➢ Contaminant sources
    – Pathways of contaminant sources
    – Spill information
  ➢ Physical characteristics of site
    – Bathymetry, currents, deposition, time since last dredging was required
  ➢ Prior physical monitoring
Tier I

• Exclusions from testing
  ➢ MPRSA
    – Primarily sand, gravel, rock and high energy environment (or)
    – Beach nourishment material (or)
    – Same as disposal and “far removed” from sources of contamination
  ➢ CWA
    – Not a carrier of contaminants (e.g. sand)
    – Far removed from sources of contaminants
    – Adjacent to placement site
    – If constraints are available to manage sediments
Tier I

• Identify Contaminants of Concern
  ➢ Presence in sediment
  ➢ Chemical properties
    – Water solubility
    – Persistence
  ➢ Toxicological significance
  ➢ Propensity to bioaccumulate
Other Tiers

• Tier II
  - Water column screen
  - Thermodynamically based bioaccumulation potential (TBP)

• Tier III
  - Elutriate, Sediment Toxicity, and Bioaccumulation Bioassays

• Tier IV
  - Site specific studies
Relation of RA Process and DM Guidance Procedures

- Tier 1: Exclusions and evaluation of existing data
- Tier 2: Chemistry, screening, and models
- Tier 3: Toxicity and bioaccumulation bioassays
- Tier 4: Site specific analysis and study

Data Acquisition, Verification, and Monitoring

- Problem Formulation
- Analysis: Exposure, Effects
- Characterization
- Management
More Details

• Problem Formulation and Conceptual Model Development for Aquatic Placement - Burton Suedel

• Water Column Evaluation - Al Kennedy

• Benthic Toxicity Evaluations - Dan Farrar

• Bioaccumulation Evaluations - Gui Lotufo