Evaluating the Suitability of Dredged Material for Placement and Beneficial Use Alternatives – Testing Manual for Beneficial Use Determination

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Great Lakes Dredging Team
Annual Meeting
Oregon, OH
May 21-22, 2014
3.5M yd³ / yr

Critical – Dredged Material Management issues could severely restrict channel availability within 5 years.
Pressing – Dredged Material Management issues could severely restrict channel availability within 10 years.
No pressing issues within next 10 years; continue to work on long range planning such as DMMPs.

ANNUAL DREDGING REQUIREMENT (CY)
- 800K
- 100K – 250K
- 50K – 95K
- <50K
No Single Alternative Environmentally or Economically

Open Water Placement  Beneficial Use  Confined Placement
1. Purpose. This manual provides guidance for planning, designing, developing, and managing dredged material for beneficial uses, incorporating ecological concepts and engineering designs with biological, economical, and social feasibility.

2. Applicability. This manual applies to all HQUSACE/OCE elements and all field operating activities (FOA) having civil works design responsibilities.

3. General. Beneficial uses of dredged material have been proven on numerous sites in United States waterways. This manual will be helpful to Corps of Engineers scientists and engineers responsible for dredging and dredged material disposal using environmentally, economically, and socially sound techniques and beneficial use management strategies.
**List of Beneficial Use Projects from EM 110-2-5026, USACE 1987**

<table>
<thead>
<tr>
<th>State</th>
<th>Project Name</th>
<th>Location</th>
<th>Beneficial Use</th>
<th>Size</th>
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<tbody>
<tr>
<td>Illinois</td>
<td>Calumet River Harbor</td>
<td>Chicago</td>
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<tr>
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<td>Detroit</td>
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<td>Size</td>
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List - Concluded

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<thead>
<tr>
<th>State</th>
<th>Project Name</th>
<th>Location</th>
<th>Beneficial Use</th>
<th>Size</th>
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<tr>
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<td>Sebewaing Harbor</td>
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<tr>
<td>OH, MI, MN, IL, WI</td>
<td>50 Colony Islands and Lake Sites</td>
<td>OH, MI, MN, IL, WI</td>
<td>Waterbird Nesting</td>
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</table>
The Science

- 40+ years of research and development for evaluating DM Mgt alternatives to meet requirements of the CWA and NEPA.

  - No single disposal alternative is most suited for a region or a type of project.
  - Long-range regional planning is required for effective disposal of dredged material.

  - Development of equipment, instrumentation, software, and operational monitoring and management procedures to significantly enhance the Corps' dredging activities.

- USACE/USEPA Field Verification Program : 1983-1989
  - Techniques for predicting effluent/surface water quality, toxicity and bioaccumulation in plants/animals, aquatic toxicity, bioaccumulation and growth determined a conservative approach for predisposal evaluations.

- Long-Term effects of Dredging Operations: 1985 - 2002
  - Provide proven technologies for identifying, quantifying, and managing contaminated sediments in support of cost-effective, environmentally responsible navigation.

- Dredging Operations and Environment Research Program: 1998- Present
  - Operations Tech, DM Mgt, Risk, Env Resource Protection
EPA/CE Evaluation Framework

- Open Water Disposal
- Confined Disposal
- Beneficial Use
  - Physical suitability
  - Environmental suitability
    - Physical impacts
    - Contaminant impacts
  - Logistics & Mgt needs

Retention of Environmentally Acceptable Alternatives
Evaluation of Socioeconomic, Technical and other Applicable Environmental Considerations
Testing Manuals and Other Guidance

- Environmentally Acceptable


  - Great Lakes Dredged Material Testing & Evaluation Manual (Regional ITM)

  - Evaluation of Dredged Material Proposed for Placement in Island, Nearshore, or Upland CDFs - Testing Manual (Upland testing Manual)

  - Methods from technical notes and project reports
USEPA/USACE Planning/Authorities

Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material
Beneficial Use Planning Manual

Beneficial Uses of Dredged Materials
Other Regional/State Guidance

- Great Lakes Beneficial Use Task Force, 2001
  - Lack of adequate regulatory guidance

- Driving Force
  - Removal of DM from CDFs
  - Mostly evaluated using solid waste or soil cleanup criteria
  - Not always technically defensible
  - Physical exclusions generally apply – sand 90-95% sand
- Risk-based evaluation needed to determine suitability for beneficial use and assist in effective determination of dredged material management alternatives consistent with the *Federal Standard*
- Single, all inclusive web-based manual with up-to-date linkage to appropriate federal and state resources
Goals

- One-Stop, Web-based Guidance
- Standardized risk-based testing methods
- Consistency in interpretation
- Updated regulatory guidance applicable to Great Lakes States
- Regional, cost-effective approach to unique sediment management needs of the Great Lakes
Management Alternatives and Environmental Suitability

- **Aquatic**
  - Open water disposal – CWA, NEPA, CZMA
  - Open water beneficial use – CWA, NEPA, CZMA
  - Near shore beneficial use – CWA, NEPA, CZMA

- **Upland**
  - Confined (with return flow) – CWA, NEPA, CZMA, CAA
  - Confined (no return flow) – CWA? RCRA? NEPA, CAA
  - Unconfined – CWA, RCRA, NEPA, other?

**Suitable for Open Water Disposal**
**Not Suitable for Open Water Disposal**
Suitability Quality Defined

- **Sand Quality** – Physical standard – unless certain COCs present
- **Sediment Quality** – Exposure = Acceptable Risk
  - Suitable for aquatic placement – aquatic habitat, aquatic fill, beach/littoral nourishment, or disposal
- **Soil Quality** – Exposure = Acceptable Risk
  - Suitable for confined or unconfined upland use – habitat, green space, landscaping, crop production
- **Unrestricted Fill** – Exposure = Acceptable Risk
  - Suitable for unrestricted fill, material use
- **Restricted Fill** – Exposure = Unacceptable Risk
  - Suitable for restricted industrial fill, landfill cover, material
- **Impaired** – Unacceptable Exposure Risk without Treatment
  - Requires treatment or processing to render suitable
    - confined disposal
## Physical Suitability

<table>
<thead>
<tr>
<th>Beneficial Use Options</th>
<th>Rock</th>
<th>Gravel &amp; Sand</th>
<th>Consolidated Clay</th>
<th>Silt/Soft Clay</th>
<th>Mixture</th>
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<td>Beach nourishment</td>
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Environmental/Human Health Suitability

[Images of plants, a diagram showing route of biomagnification of contaminants from dredged material, a freshwater amphipod, bottles with different concentrations of toxic organic compounds, a person with a shovel, and a crow.]
Evaluation of DM Suitability for BU

- No reason to believe contaminated
  - Evaluate suitability based on physical characteristics.
  - Meets Federal exclusions for aquatic use
    - Retain aquatic beneficial use or disposal
- Reason to believe contaminated
  - Evaluate suitability based on chemical/biological exposure testing
  - Meets Federal Standard for aquatic use
    - Retain aquatic beneficial use or disposal
- Aquatic use not suitable or available
  - Evaluate physical suitability for upland BU
    - Retain BU options
  - Chemical characteristics meets criteria for retained upland BU options
    - Retain selected upland BU options
- Upland BU not suitable or available
  - Permitted confined disposal available
    - Retain confined disposal

Baseline Chemistry Analyte Groups
1. Metals - 23 per TAL (EPA 6000/7000)
2. Pesticides (EPA 8081A)
3. PCBs (Aroclors/Congeners EPA 8082)
4. Volatile Organics - TCL (EPA 8260B)
5. B/N/A (Semi-volatile organics) - TCL (EPA 8270)
6. Total Organic Carbon (EPA 9060)
7. Ammonia Nitrogen (EPA 350)
8. Total Phosphorus (EPA 6000/7000)
9. Total Kjeldahl nitrogen (TKN - EPA 351)
10. Others – Pharma, Nano, etc

Baseline physical tests
1. Grain Size (ASTM D421, D422; Includes Sieve and Hydrometer)
2. Atterberg Limits (ASTM 4318)
3. Proctor (ASTM d698-00a or ASTM d1557-00)
4. Permeability (ASTM D5084-00E1)
5. Percent Moisture (ASTM D2216)
6. Percent Organic Matter (ASTM D 2974-00)
7. Pathogens
8. Agronomic – CEC, salinity, pH, nutrients
Contaminants - Define the Risk

Contaminant pathways

► Soil
  • Direct contact, dermal, ingestion
► Surface Water
  • Water quality criteria (water column, effluent, surface runoff), drinking water
► Ground Water
  • Drinking water standards
► Plant
  • Wetland and upland toxicity and bioaccumulation
  • Foodchains
► Animal
  • Water column toxicity / Benthic bioaccumulation
  • Soil invertebrate toxicity and bioaccumulation
  • Higher foodchains
► Air
  • Volatile emissions
  • Dust
Tiered Testing Approach

- **Tier I** – Existing info, material determined inert
- **Tier II** – Compare DM chemistry to screening level
  - Pass: no further contaminant evaluation needed
  - Fail: Further evaluation
- **Tier III** - Physical and biological tests for bioavailability
  - Biological exposure for bioavailability or site specific use
- **Tier IV** - Risk assessment
Analysis of Dredged Material Suitability

- **Aquatic**
  - Physical exclusion
  - Standard elutriate toxicity
  - Whole sediment aquatic toxicity
  - Benthic Bioaccumulation
  - Submerged Aquatic Plant Bioaccumulation
  - Ecological risk analysis
Analysis of Dredged Material Suitability

- **Upland**
  - Screening level criteria
    - State criteria for upland beneficial use in residential/industrial
  - Surface runoff/ground WQ
  - Upland plant toxicity and bioaccumulation
  - Wetland plant toxicity and bioaccumulation
  - Soil invertebrate toxicity and bioaccumulation
  - Ecological risk analysis
Application

Evaluation of Beneficial Use Suitability for Cleveland Harbor Dredged Material: Interim Capacity Management and Long-Term Planning

Joseph P. Kreitinger, Richard A. Price, Thomas D. Borrowman, Alan J. Kennedy, Dennis L. Brandon, and Michelle Bourne

August 2011

FINDING OF NO SIGNIFICANT IMPACT AND ENVIRONMENTAL ASSESSMENT

OPERATIONS AND MAINTENANCE

OPEN-LAKE PLACEMENT OF MATERIAL DREDGED FROM CLEVELAND HARBOR FEDERAL NAVIGATION CHANNELS IN THE UPPER CUYAHOGA RIVER

CLEVELAND HARBOR
CUYAHOGA COUNTY, OHIO

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Buffalo District
1778 Niagara Street
Buffalo, NY 14207-3199

February 2014

PUBLIC REVIEW PERIOD ENDS: March 26, 2014
New Manual – Current Status

- Currently in preparation
  - Internal review of Chap 1 complete
  - Executive Summary
  - Introduction
    - Background
    - Purpose and Scope
    - Dredged Material Quality for Beneficial Use
      - Dredged Material Quality and the Federal Standard
      - Sediment Quality
      - Soil Quality
      - Fill Quality
      - Impaired
    - Applicability
      - This Manual is Intended to Address
      - This Manual is not Intended to Address
      - Relationship to Other Dredged Material Testing Manuals
    - Framework and Approach in Determining Suitability for Beneficial Use
      - General Approach
      - Framework for Aquatic Beneficial Use and Disposal
      - Framework for Upland Beneficial Use and Disposal
      - Framework for Managing Impaired Sediments
    - Statutory and Regulatory Overview
      - Regulatory Considerations for Aquatic Placement
      - Regulatory Considerations for Upland Placement
      - Other Regulatory or Legal Issues

- Needs
  - Assistance from states incorporating up-to-date guidance for upland beneficial uses
    - Responsible agency
    - POC
    - Process
    - Applicability
    - Criteria
    - Long-term web links
  - Clarification of some regulatory issues
  - Clarification of legal issues
What is in a Name?

The name of an endeavor can deliver a return to the long term goal so let's have a short conversation on that name…

Ideas so far:

- BUTM - Beneficial Use Testing Manual
- GLTM - Great Lakes Testing Manual
- Sediment Resource Guidance Manual
Questions??