Muskingum Watershed Conservancy District

Long-term Maintenance Dredging Program

WEDA Conference

Friday, March 13, 2015

Milwaukee, WI

MUSKINGUM WATERSHED CONSERVANCY DISTRICT

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Presentation Focus

- ✓ **The Muskingum Watershed Conservancy District- An Overview**

- ✓ **The MWCD Long-term Maintenance Dredging Program**
  - Why Dredging is Needed
  - Program Goal and Objectives
  - Program Elements and Accomplishments

- ✓ **Program Priorities in 2015 and Beyond**
  - Dredging Operations Underway: Tappan Lake
  - Preparations for Dredging Operations: Seneca Lake
  - Continued Refinement of Long-term Dredging Program

- ✓ **Lessons Learned for Application Elsewhere**
  - Prioritizing Dredging Locations
  - Selecting and Constructing Dredged Material Relocation Areas (DMRAs)
  - Permitting Requirements- DMRA Construction and Dredging Operations
  - Selecting a Dredging Contractor

- ✓ **Questions**

MUSKINGUM WATERSHED CONSERVANCY DISTRICT

Responsible stewards dedicated to providing the benefits of flood reduction, conservation, and recreation in the Muskingum River Watershed

MWCD Origin: the Great Flood of 1913

- State's greatest weather disaster: flooding in every stream, creek and river in the state
- Resulted in 467 deaths (11 in MWCD region) and more than 40,000 homes flooded
- Infrastructure damage in current dollars: $3 billion in Ohio; $4 - $6 billion in 12 affected states
- In Ohio, the flood spurred development of conservancy districts, including MWCD
- Sixteen dams and reservoirs subsequently constructed: dams owned / operated by USACE-Huntington, reservoirs by MWCD
- January 2005 flooding event- Dams and reservoirs avoided over $400M in property damage reported, and no loss of life

The Great Flood of 1913

Downtown Massillon, OH

The Great Flood of 1913

Downtown Zanesville, OH

The Great Flood of 1913

Downtown Marietta, OH

Facts About MWCD

- Created in 1933, in accordance with ORC, Chapter 6101
- State's largest conservancy district: all/portions of 18 counties
- Manages 16,000 acres of water (10 lakes) and 38,000 acres of land
- U.S. Army Corps of Engineers (USACE) Partnership: USACE owns and operates dams; MWCD manages reservoirs behind dams
- Partnerships on virtually every level of government for short and long-term projects and programs
- System has prevented *an estimated $10.7 billion* in property damage, saved countless lives, and provided a water resource for public uses
- Flood reduction, conservation and recreation are central to the MWCD mission

MWCD covers about 20% of the state

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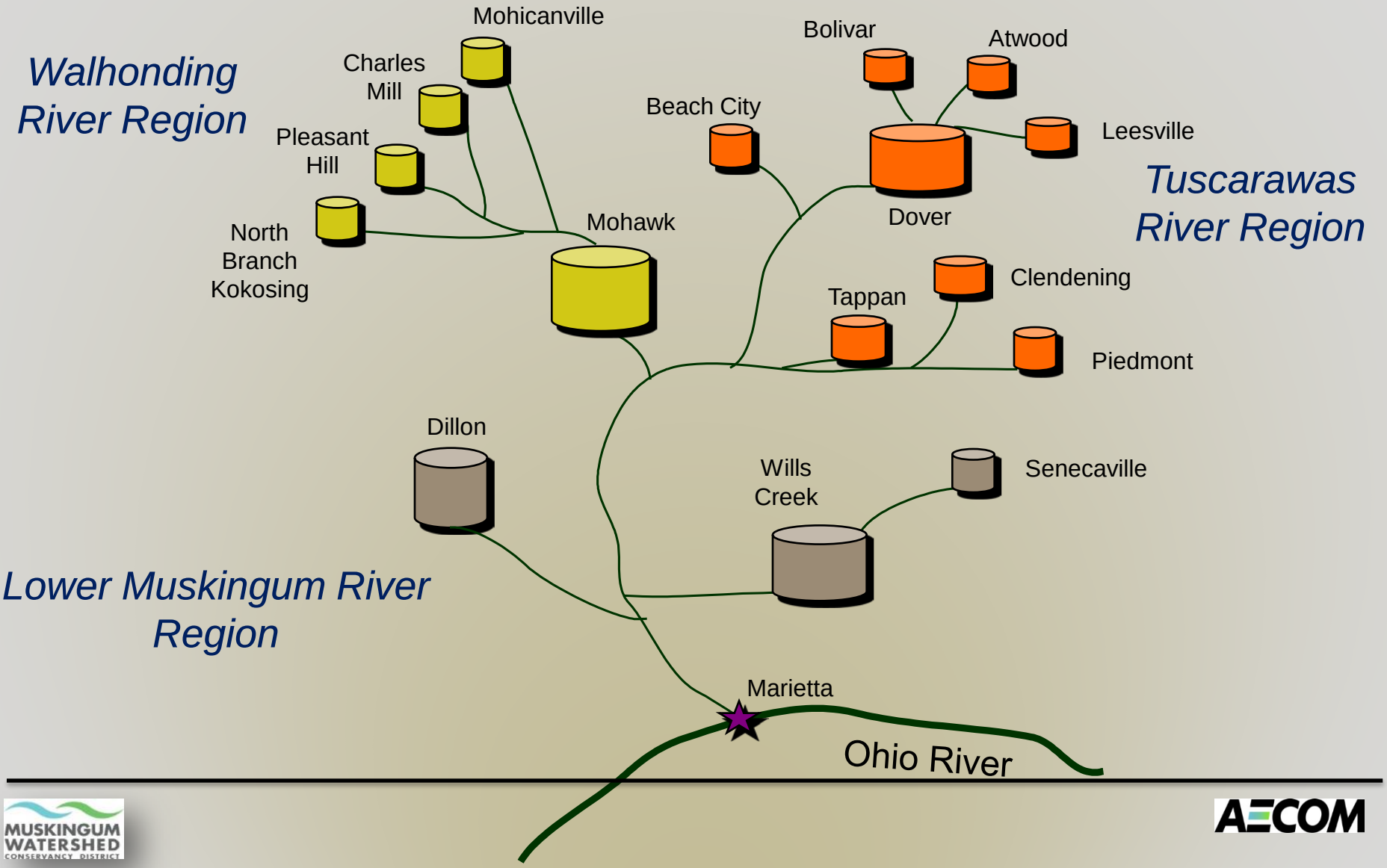
The Muskingum River Basin Reservoir System



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The Long-term Maintenance Dredging Program

Why Dredging is Needed

- Fundamental to the MWCD mission: flood control, sediment build-up, shoreline/ water quality degradation, and water conservation needs
- Dredging requirements have increased over the last 80 years
- Build on past efforts- dams/ reservoirs have avoided >$6B damages to date
- Flood capacity volume of selected lakes has been reduced up to 25% to date, and will be reduced by up to 37% by 2025 if no action is taken
- Address threats of localized flooding; threats to human health, safety, and welfare; property damage; and road obstructions
- Improve water quality, fish and wildlife habitat, and water-based recreation

The consequences of inaction increase risks to watershed residents, livelihoods, property and quality of life, as well the watershed's ecological health and viability

Program Goal and Objectives

Goal: Restore and maintain flood capacity of lakes within MWCD jurisdiction

Objectives:

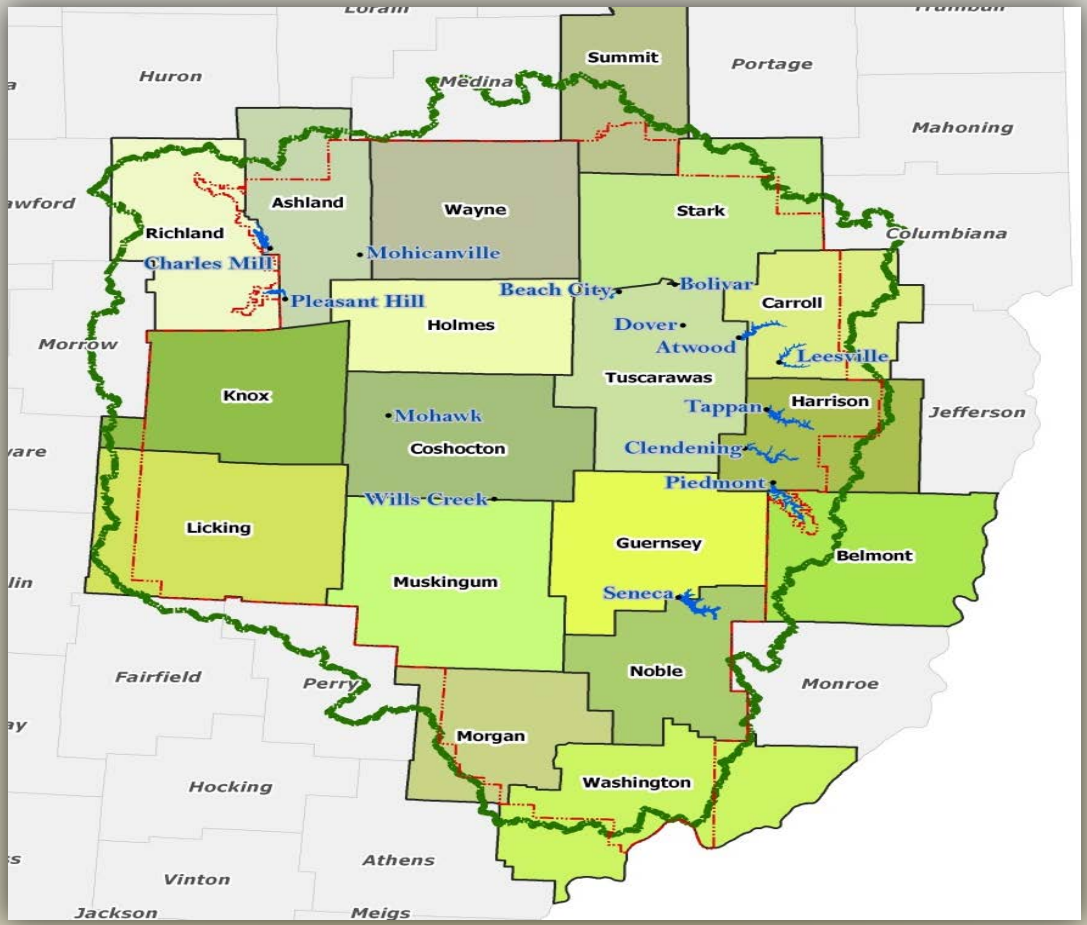
- Assess sediment accumulation in each lake and identify those at risk (i.e., reduced capacity)

- Determine environmentally responsible and economically efficient dredging and sediment placement techniques

- Develop and implement a Long-term Maintenance Dredging Program

Long-term Maintenance Dredging Program

Ohio counties within MWCD jurisdiction (red outline) and the Muskingum River Watershed (green outline).



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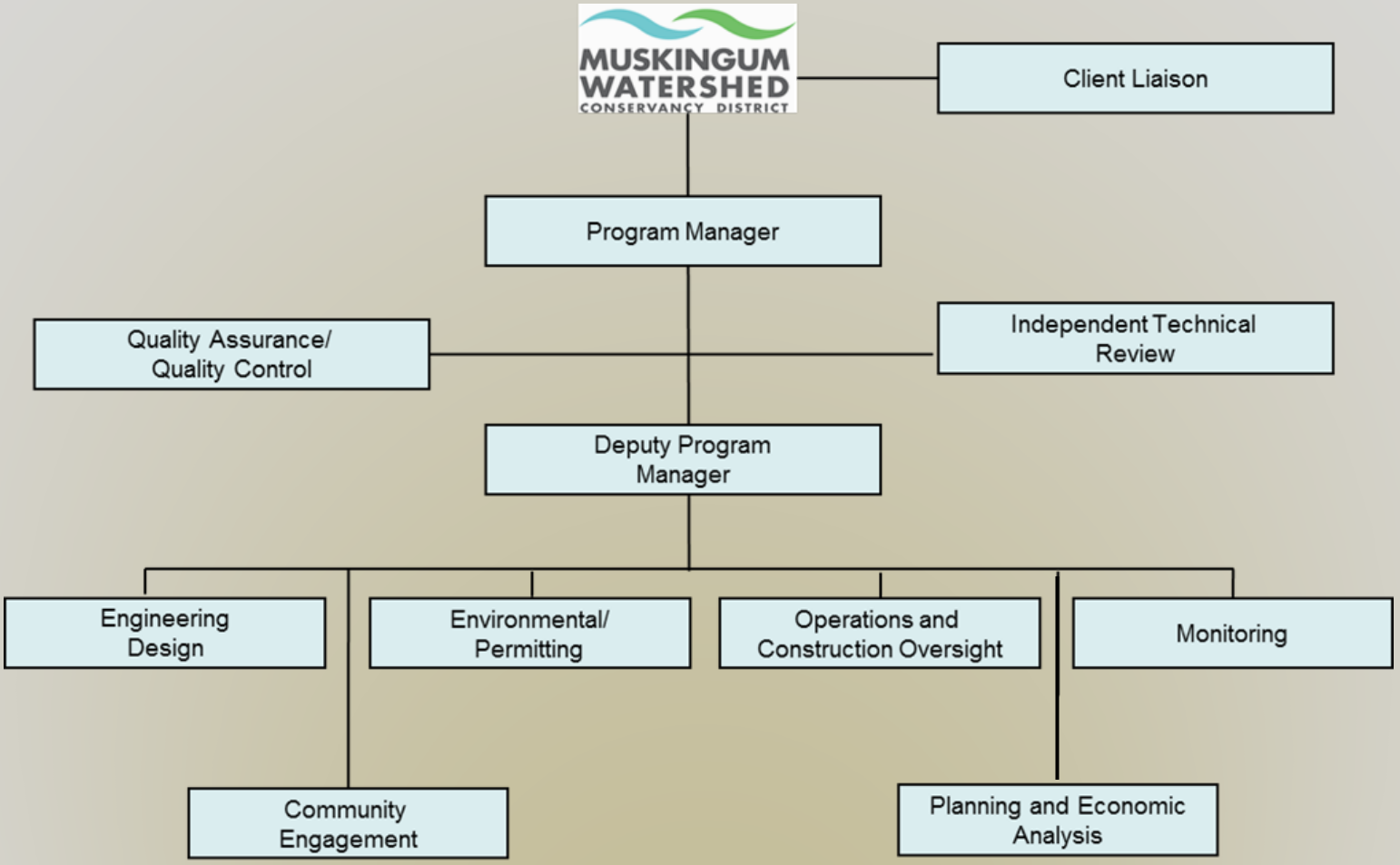
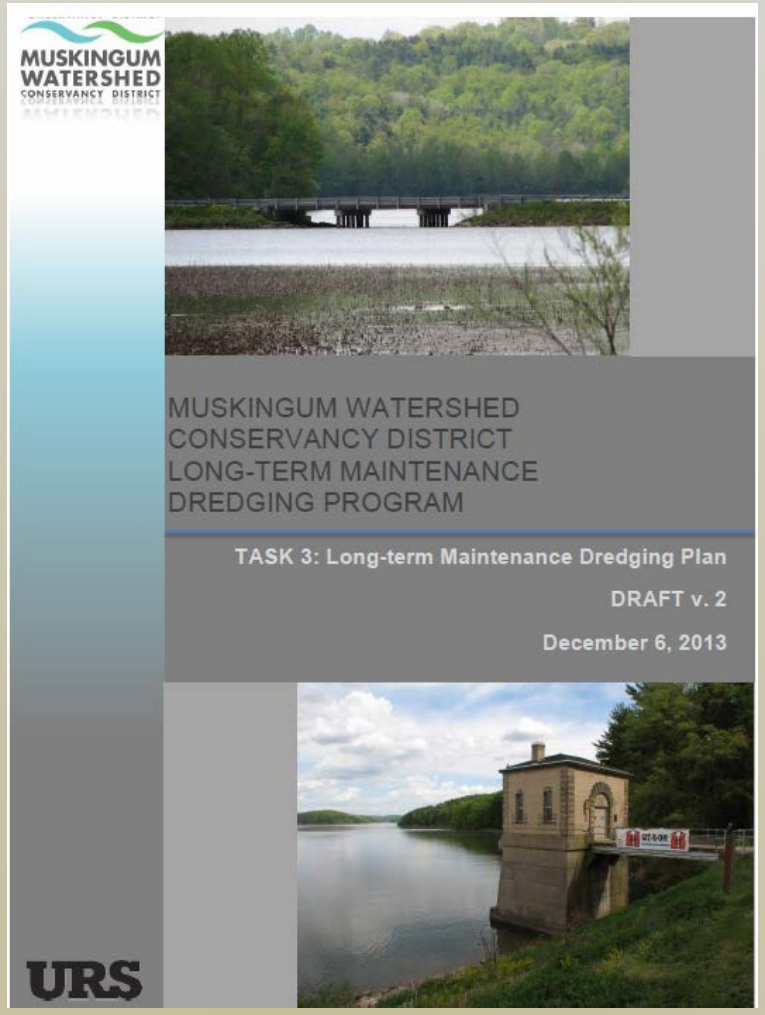
How We are Organized



Long-term Maintenance Dredging Program

Task 1: Program Management
Task 2: Communications Plan
Task 3: Long-term Maintenance Dredging Plan
Task 4: Economic Analysis Model
Task 5: Beneficial Use of Dredge Material Plan
Task 6: Prioritization of Candidate Dredging Sites
Task 7: Funding Guidance for Dredging Initiatives
Task 8: Tappan Lake Dredging Project
Task 9: Seneca Lake Dredging Project

Task 3: Long-term Maintenance Dredging Plan



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Task 3: Long-term Maintenance Dredging Plan

Goal:

- Provide a framework to coordinate all Program activities and secure timely efficient, and cost-effective dredging services

Activities:

- Develop, update, and apply the Plan to address four critical Program components (i.e., Program Management, Operational and Environmental Services, Beneficial Uses of Dredged Material, Economic Analysis)
- Incorporate elements of all identified Program tasks
- Provide guidance for site-specific dredging projects

Outcomes:

- Plan serves as basis for design of initial dredging project at Tappan Lake

Task 3: Plan Implementation Process

Step 1 Select Lake(s) and Initiate Planning

- **(a) Prioritize** dredging needs District-wide and select priority site(s)
- **(b) Initiate** planning with "All Hands" Meeting
- **(c) Compile data** and information needs (including required field studies)
- **(d) Refine** options following data acquisition and stakeholder input

Step 2 Evaluate Potential Dredging Sites

- **(a) Develop** evaluation criteria of dredging sites
- **(b) Apply evaluation criteria** including flood risk reduction, cost, env. impact, beneficial use, stakeholder acceptability
- **(c) Draft** concept-level design options
- **(d) Select** preferred option

Step 3 Finalize Design

- **(a) Develop detailed plan** by defining labor/ equipment needs, preparing time/ cost estimates, and addressing site specific field studies
- **(b) Secure approvals** from landowners, and permits from regulatory agencies
- **(c) Draft plans and specifications** and pre-qualify dredging contractors eligible to bid
- **(d) Disseminate plans/ specifications** via Request for Proposal (RFP) process and select dredging contractor

Step 4 Implement Design

- **(a) Confirm compliance** with requisite permits, certifications, easements, landowner agreements, and Health and Safety Plans (among others)
- **(b) Prepare site** for mobilization
- **(c) Undertake dredging project** and perform construction oversight

Step 5 Monitor and Evaluate Lakes

- **(a) Implement monitoring, evaluation, and reporting** during and following project
- **(b) Apply Adaptive Management** to analyze results and identify "lessons learned" for future application

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Task 4: Economic Analysis Model

Goal:

- Employ rigorous economic analysis to advise on cost-effective and environmentally responsible dredging operations.

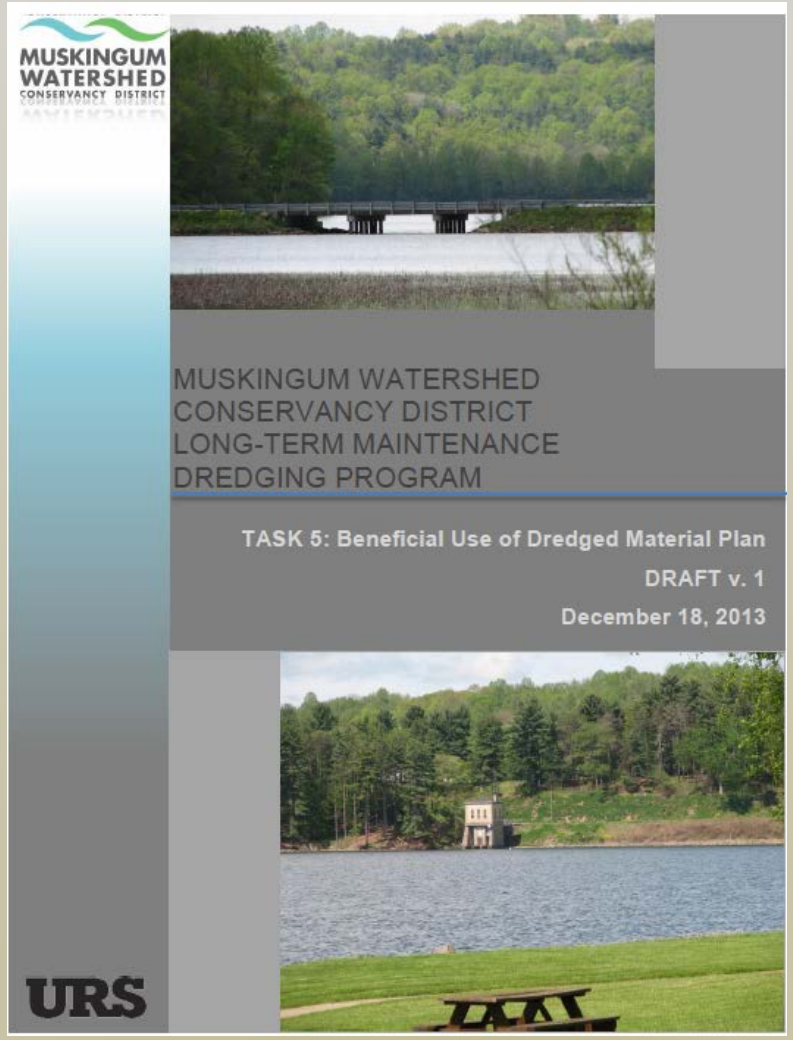
Activities:

- Review site-specific characteristics and dredging requirements to “scope out” prospective alternatives (e.g., “in-house” vs. contracting out)
- Refine and “customize” model for site-specific application, including simultaneous dredging operations
- Apply model to Lake Tappan and monitor associated costs
- Apply the refined model at future dredging sites to be determined

Outcomes:

- Determined that contracting out dredging services for Tappan Lake was preferred approach; will re-evaluate as future priorities are established

Task 5: Beneficial Use of Dredged Material Plan



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Task 5: Beneficial Use of Dredged Material Plan

Goal:

- Incorporate beneficial use technologies to realize environmental and economic benefits, and showcase MWCD commitment to sustainability

Activities:

- Comprehensive analysis of technologies, applications, and relevance to MWCD lakes
- Develop, maintain, and apply beneficial use plan
- Use plan to guide Tappan Lake dredging strategy and approach

Outcomes:

- Plan is guiding beneficial use approach to Tappan Lake dredging and its Dredged Material Relocation Areas (DMRAs)

Task 5: Beneficial Use of Dredged Material Plan

Beneficial Use	Dredged Material Sediment Type						Notes
	Rock	Gravel	Sand	Compact Clay	Silt/ Clay	Mix	
Category 1 Agricultural/Product Use							
Aquaculture/Aquafarm Ponds	2	2	2	1	1	2	Range of sediment types can be used, depending on structure. This is a specialized and seldom-employed use.
Construction Materials	1	1	1	2	2	2	Common, extensive, highly versatile use of dredged materials; clean preferred but contaminated material can sometimes be used.
Manufacture of Aggregates	1	1	1	3	3	3	Variety of uses when clean material is separated and then added to an aggregate mix.
Decorative Landscaping	1	1	1	1	1	1	All sediment types are applicable if clean and separated.
Land Application – Farmland	3	3	3	2	1	2	Excellent (and common) use when large volumes of clean, high-quality material are available. Separation required.
Topsoil/Compost	3	3	3	3	1	1	Also a common use when clean, high-quality material is available, even in limited quantities. Separation/ extensive preparation work required.
Category 2 Engineered Use							
Beach/Littoral Zone Nourishment	3	2	1	2	3	3	Common use of clean, high-quality sand and mixed soil. Cost-effective when hydraulically dredged and locally deposited.
Berm Creation/Maintenance	1	1	1	2	2	1	Multiple applications and sediment mixtures; does not require high-quality material or separation of sediment types.
Capping / Landfill Cover	2	1	2	1	2	2	Best suited for gravel, clay, or a combination thereof; some contamination may be acceptable.

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Task 5: Beneficial Use of Dredged Material Plan

Noise Control Berm

Sediment used for Beach Nourishment

Dredged Sediment at Landfill

Windmill Island, Michigan

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Task 5: Beneficial Use of Dredged Material Plan

Reclaimed Strip Mine

Structural Fill for Parking Lot

Using Dredged Material to Raise Dike

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Task 6: Prioritization of Candidate Dredging Sites

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LONG-TERM MAINTENANCE
DREDGING PROGRAM

TASK 6: PRIORITIZATION OF
CANDIDATE DREDGING SITES

Prepared for

MUSKINGUM WATERSHED CONSERVANCY DISTRICT

October 2013

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564 White Pond Drive
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Project no. 13816492

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Task 6: Prioritization of Candidate Dredging Sites

Goal:

- Determine priority dredging sites, based on multiple criteria, to advise MWCD on sequencing of dredging projects

Activities:

- Develop and refine prioritization protocol on basis of multiple criteria (e.g., conditions, capacity, dredging history, usage, constraints)
- Apply to candidate lakes within MWCD jurisdiction and offer advice
- Refine and apply annually to ensure optimal long-term strategy

Outcomes:

- Tappan Lake selected for initial dredging; Seneca Lake for follow-up
- Protocol refinements are ongoing: annual re-prioritization

Task 6: Prioritization of Candidate Dredging Sites

- **Evaluations:** Eight of 16 reservoirs included in prioritization process (excluded dry dams, others managed by USACE)
- **Criteria:** Flood Damage Reduction (50 points); Value to the Public (40 points); and Dredging Cost (60 points)
- **Outcomes in Priority Order:** Tappan (97); Seneca (95); Pleasant Hill (94); Charles Mill (91); Atwood (90); Piedmont (83); Leesville (80); Clendening (65)
- **Next Steps:** Process will be reapplied annually to accommodate any changes in the relative importance of each potential project, based upon criteria

Task 6: Prioritization of Candidate Dredging Sites

Factor	Max Pts.	Atwood	Charles Mill	Clendening	Leesville	Piedmont	Pleasant Hill	Seneca	Tappan
Flood Damage Reduction									
Potential to increase flood storage capacity	25	10	15	10	10	15	15	15	15
Opportunity to increase conveyance of flood flows	15	5	0	0	5	0	5	5	5
Percent of reservoir filled with sediment at summer pool elevation	10	5	10	5	4	8	10	8	7
Value to the Public									
Primary uses of reservoir	15	15	10	10	10	10	10	10	15
Opportunities for beneficial use of dredged material	10	0	0	0	0	5	0	5	0
Increase in water quality	10	5	10	5	5	5	5	10	10
Presence of local stakeholder groups	5	5	3	0	3	0	2	5	5
Dredging Cost									
Absence of contaminated sediment	10	10	10	10	10	5	10	5	10
Ease of sediment relocation	10	10	10	5	5	5	10	5	10
Potential for cost-sharing partner	10	5	3	0	3	5	2	7	5
Complexity of dredging operations	10	5	5	5	10	10	10	5	0
Upstream sediment management in place	5	0	0	0	0	0	0	0	0
Depth of material to be dredged	5	5	5	5	5	5	5	5	5
Amount of material to be dredged	10	10	10	10	10	10	10	10	10
Total	**150**	**90**	**91**	**65**	**80**	**83**	**94**	**95**	**97**

Task 8: Tappan Lake Dredging Project

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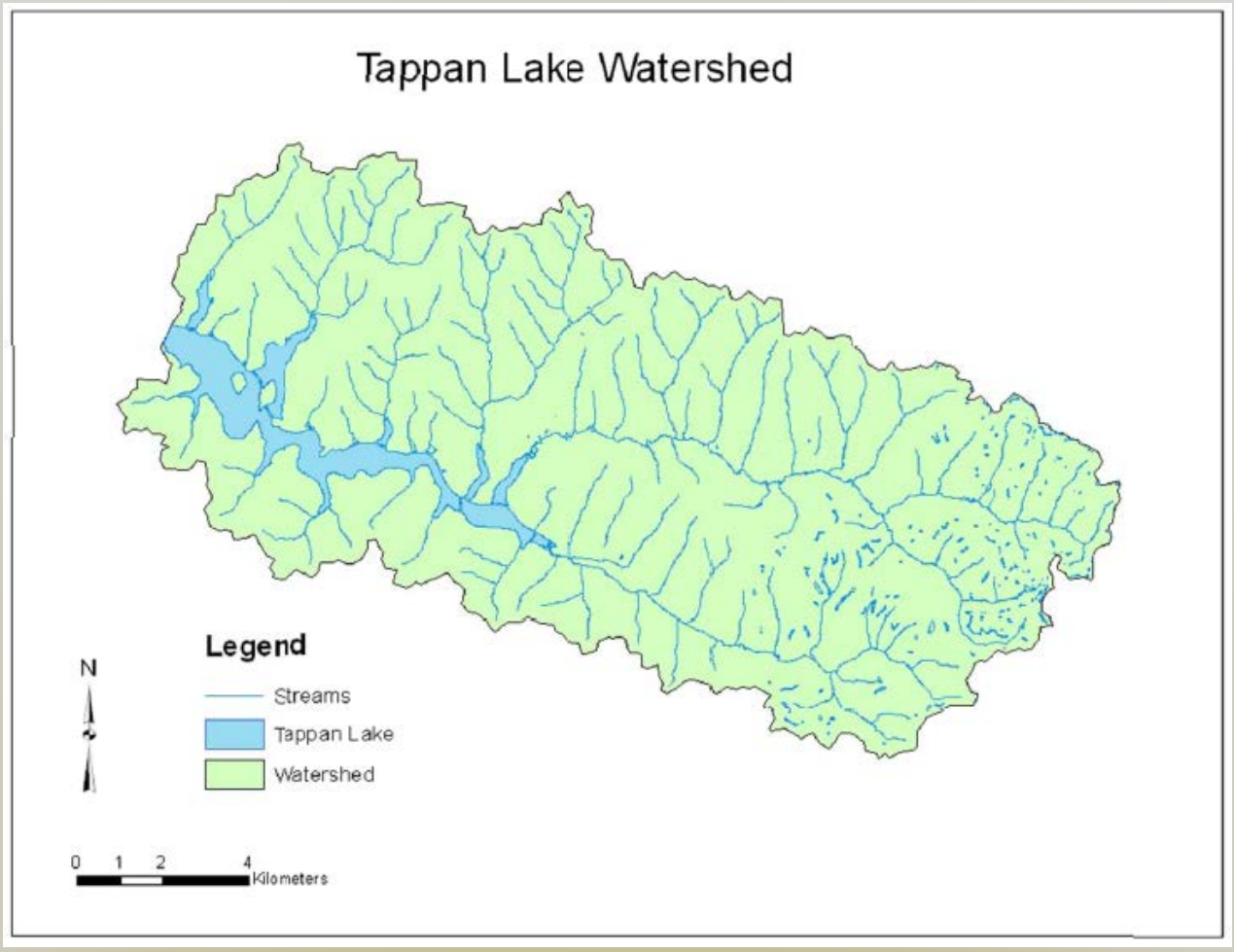
Task 8: Tappan Lake Dredging Project



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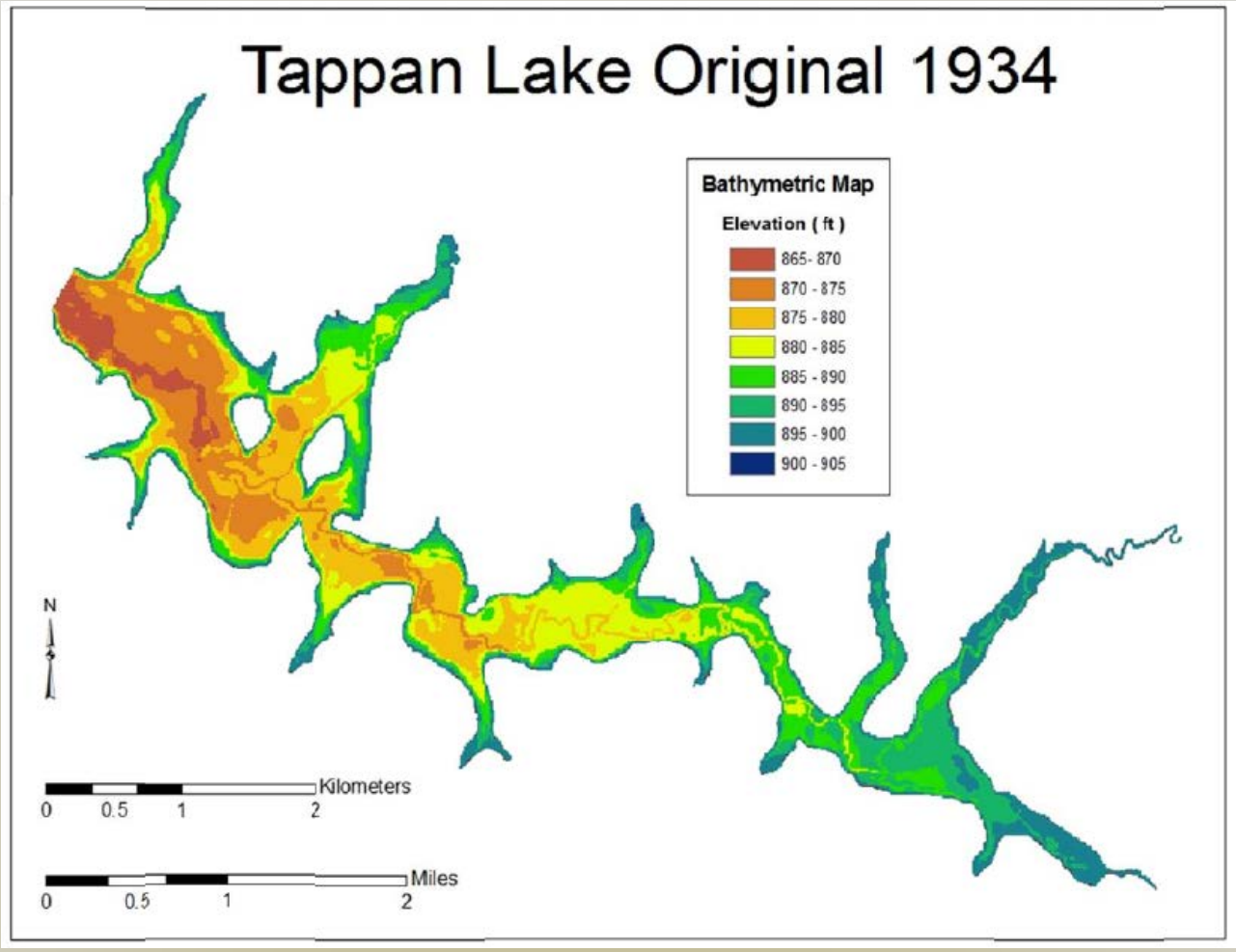
Task 8: Tappan Lake Dredging Project



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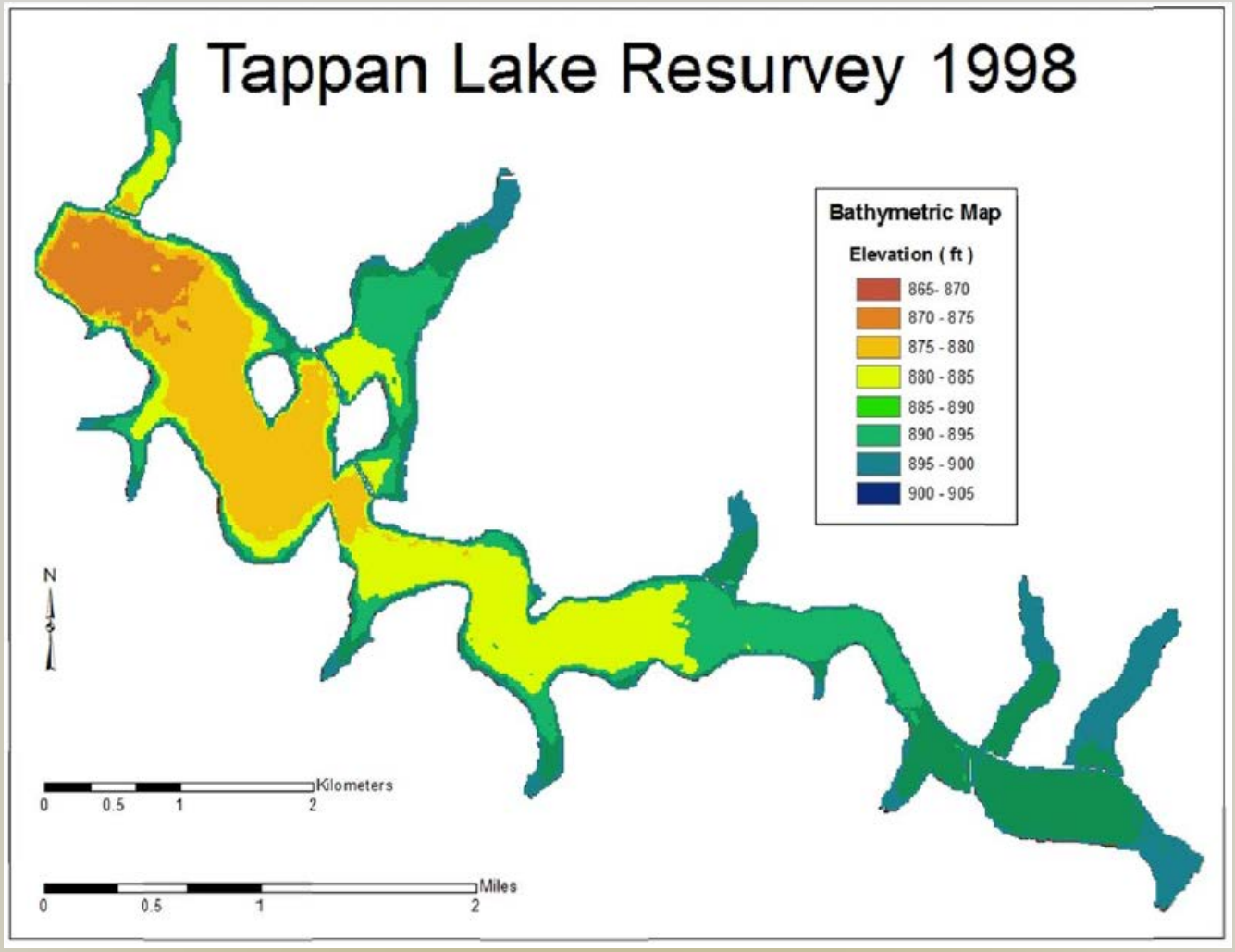
Task 8: Tappan Lake Dredging Project



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Task 8: Tappan Lake Dredging Project

Goal:

- Design and execute dredging operations on Tappan Lake to increase flood storage capacity

Activities:

- Prepare plans and specifications, including studies, field analyses, equipment/ labor assessments, and regulatory (i.e., permitting)
- Pre-qualify dredging contractors through a “Letter of Interest” process
- Prepare/ release bid documents to pre-qualified dredging contractors
- Administer bidding process/ select one or more dredging firms
- Oversee dredging operations, including construction

Outcomes:

- Site visits, conceptual design, sampling/ analysis, public meeting, landowner visits, permitting consultations, permitting applications, detailed design

Prioritizing Dredging Locations

- Two levels of decisions: prioritizing reservoirs within the MWCD system, and prioritizing dredging locations within the selected reservoir
- Use of “Prioritization Tool” (Task 6) expedites decisions: 14 weighted criteria in categories of Flood Damage Reduction, Value to the Public, and Dredging Cost
- Availability of DMRA sites can be a significant limiting factor and shouldn’t be underestimated when prioritizing dredging locations
- Sequencing is also important: need to demonstrate responsiveness to needs of all constituents while addressing most critical needs

Lessons Learned for Application Elsewhere

Selecting and Constructing Dredged Material Relocation Areas (DMRAs)

- Time consuming and complex process: need to evaluate and select sites in the earliest stages of a dredging project
- Privately-owned land is a particular challenge: negotiation is time and labor intensive with uncertain outcomes
- Need to select multiple sites and alternatives (i.e., a “Plan B” and “Plan C”) given uncertainties with site selection process
- Need to anticipate and accommodate costs: DMRA construction can be as expensive/ more expensive than the actual dredging

Lessons Learned for Application Elsewhere

Permitting Requirements- DMRA Construction and Dredging Operations

- An “all hands” meeting (i.e., with all potentially relevant regulatory agencies) at project onset will help define permitting steps and timelines
- Permitting requirements are not typically well-defined; need to engage relevant agencies on an ongoing basis
- Need to “budget in” time requirements/ delays associated with agency permit package reviews and revisions
- Need to anticipate and accommodate “environmental windows” (i.e., permitting restrictions) when clearing sites, constructing DMRAs and operating dredges

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Lessons Learned for Application Elsewhere

Selecting a Dredging Contractor

- A pre-qualification process ensures availability of a “stable” of capable contractors
- CMR (Construction Manager at Risk) is an effective delivery method: contractor supports owner by conducting pre-construction (i.e., engineering and design) work and commits to a Guaranteed Maximum Price (GMP)
- CMR also allows selection on basis of contractor’s experience and ability as well as proposed price
- Keep the “runner-up” contractor regularly updated (and ensure availability) in the event that negotiations with the selected contractor do not progress
- Contract negotiations can be problematic: consider including contract language in RFP and requiring acceptance as a condition for selection

Long-term Maintenance Dredging Program

Questions / Comments?

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