Strategic Placement of Dredged Sediment to Support Surrounding Resources

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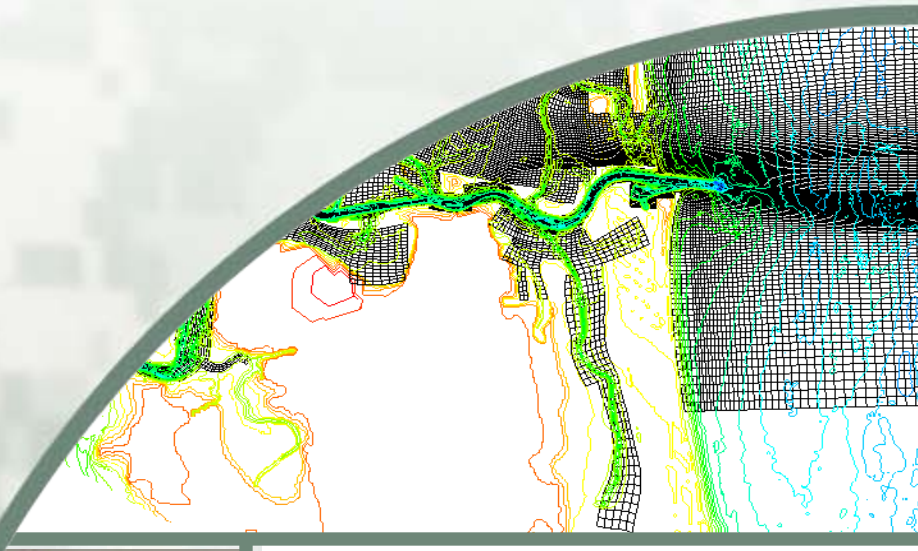

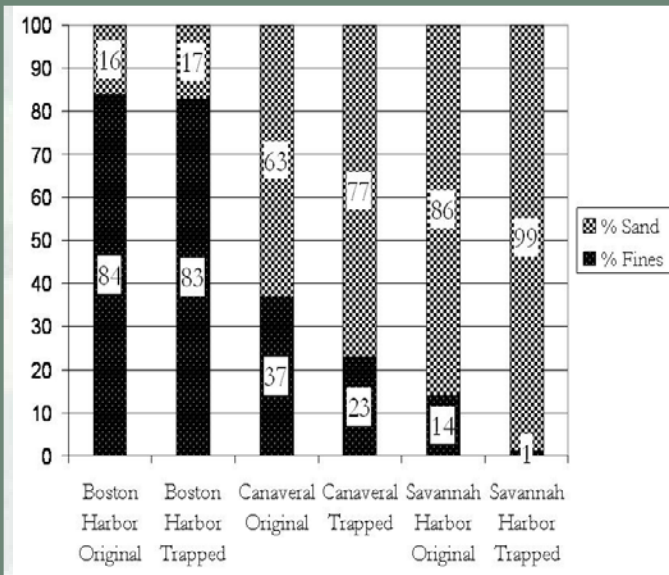

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Krakow, Poland

U.S. ARMY

US Army Corps of Engineers

ERDC
Engineer Research and Development Center

Definitions

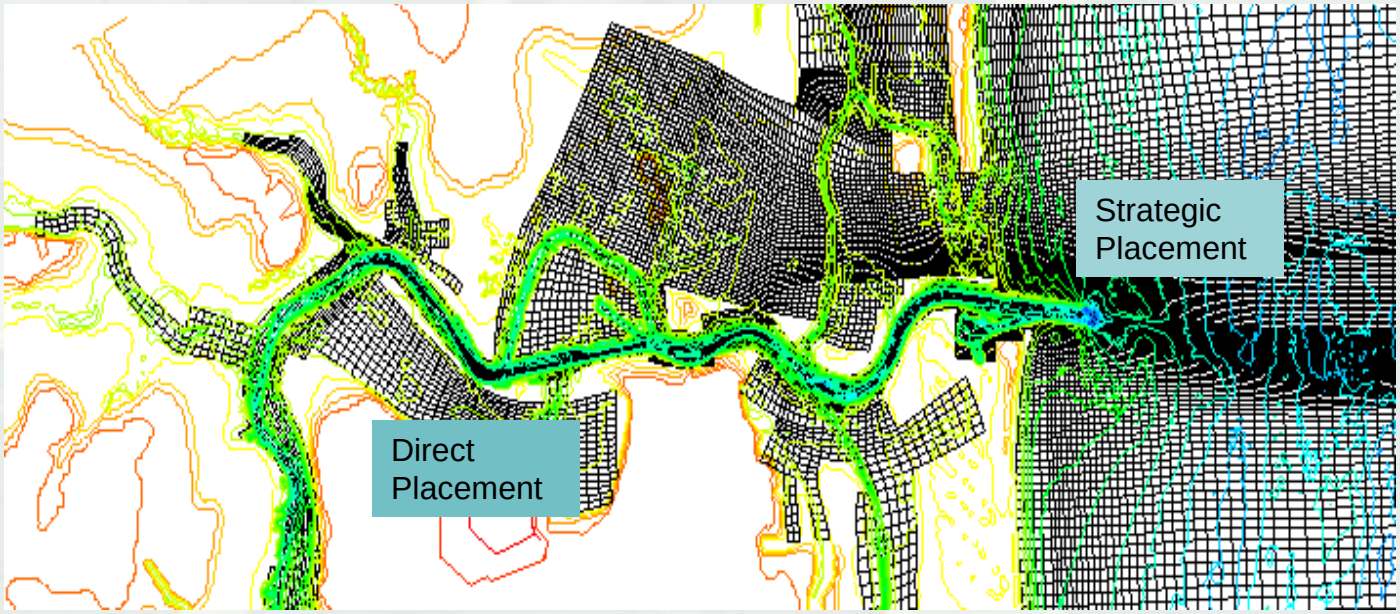
- **Engineering with Nature: The intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes**

- **Strategic Placement: DM placement in a manner and at locations that permits natural forces to disperse the DM toward other locations where it can deliver benefits**
  - **Maximize benefits (FRM, Environmental, etc)**
  - **Minimize rehandling**
  - **Minimize negative environmental impacts**
  - **Reduced cost (meet Federal Standard?)**
  - **Increase beneficial use applications**
  - **Less intrusive (vs. direct placement)**

Strategic Placement

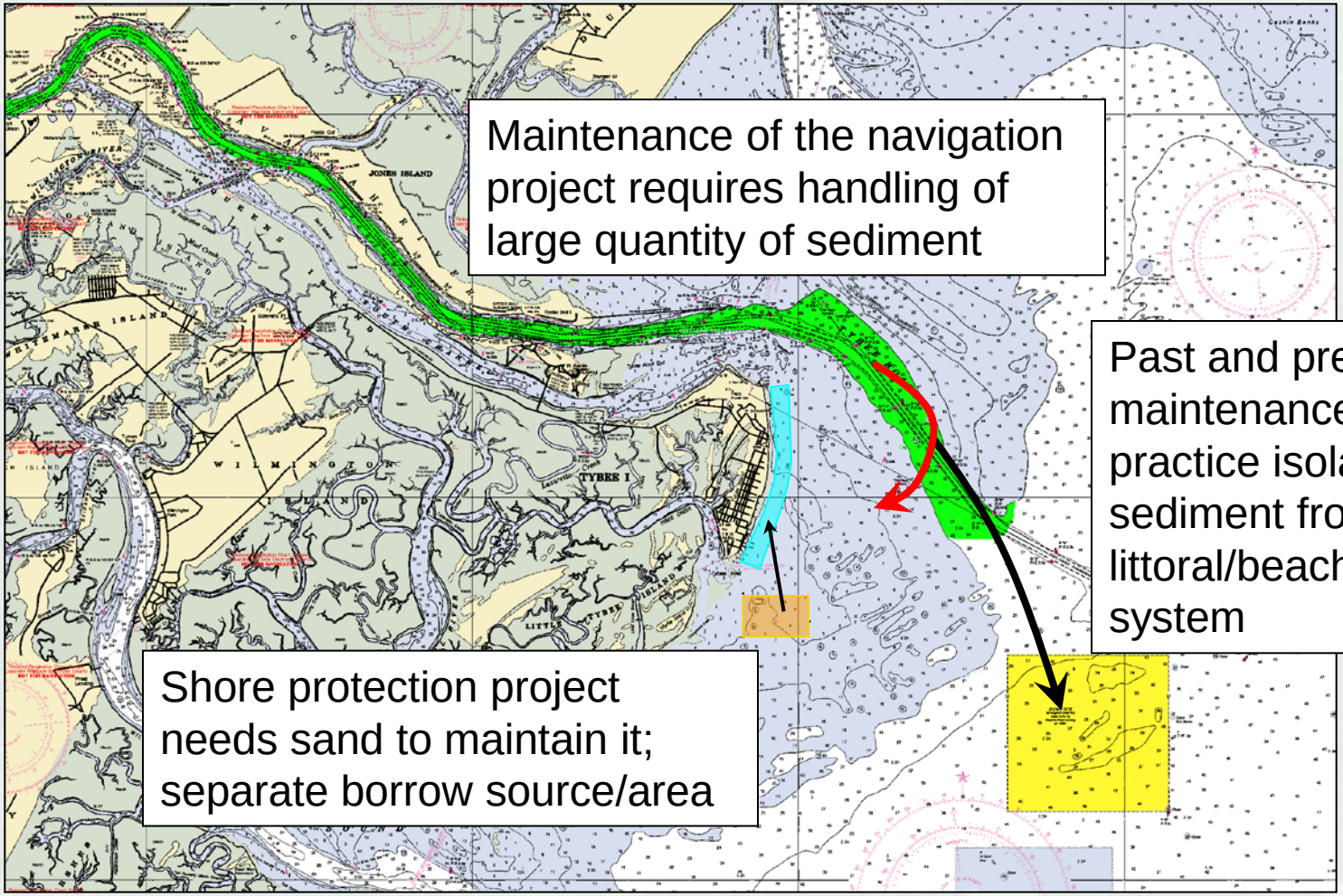
- Optimally, strategic placement is a sustainable solution to DM management
  - Sufficiently dispersive placement site
  - Receptors that require a continuing supply of sediment
  - Within budget constraints
- Strategic placement (vs. direct placement) provides opportunity to control dosing and sediment types
- Use engineering tools to support solution development

Example EWN Solution for DMM

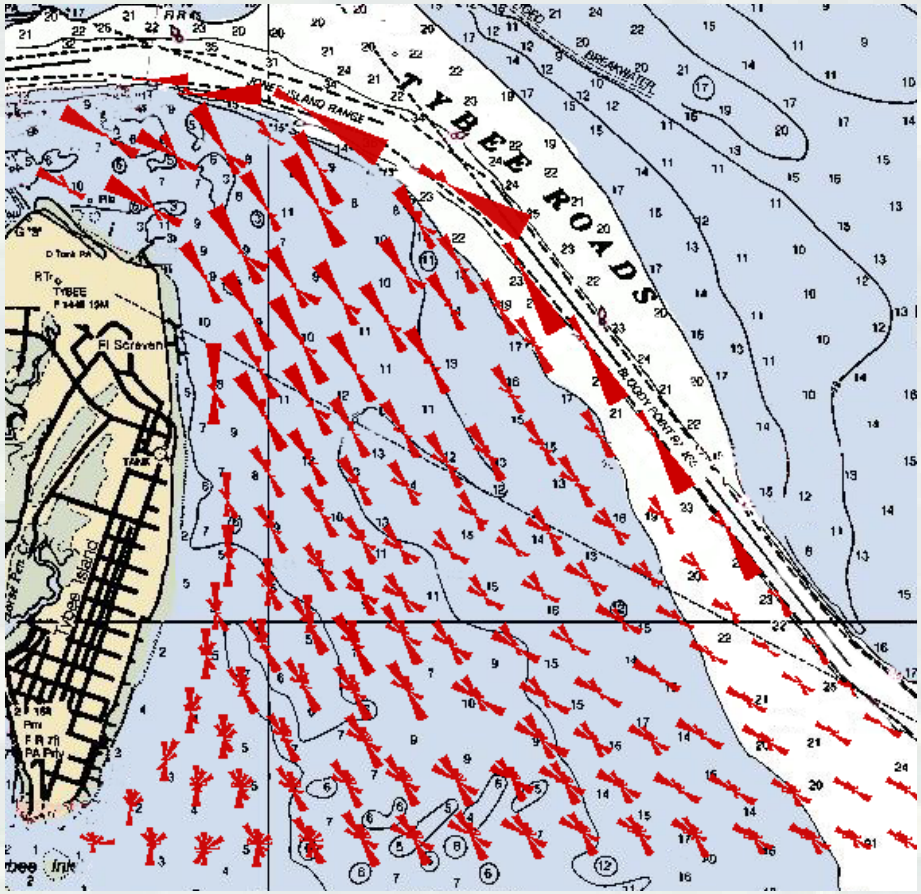


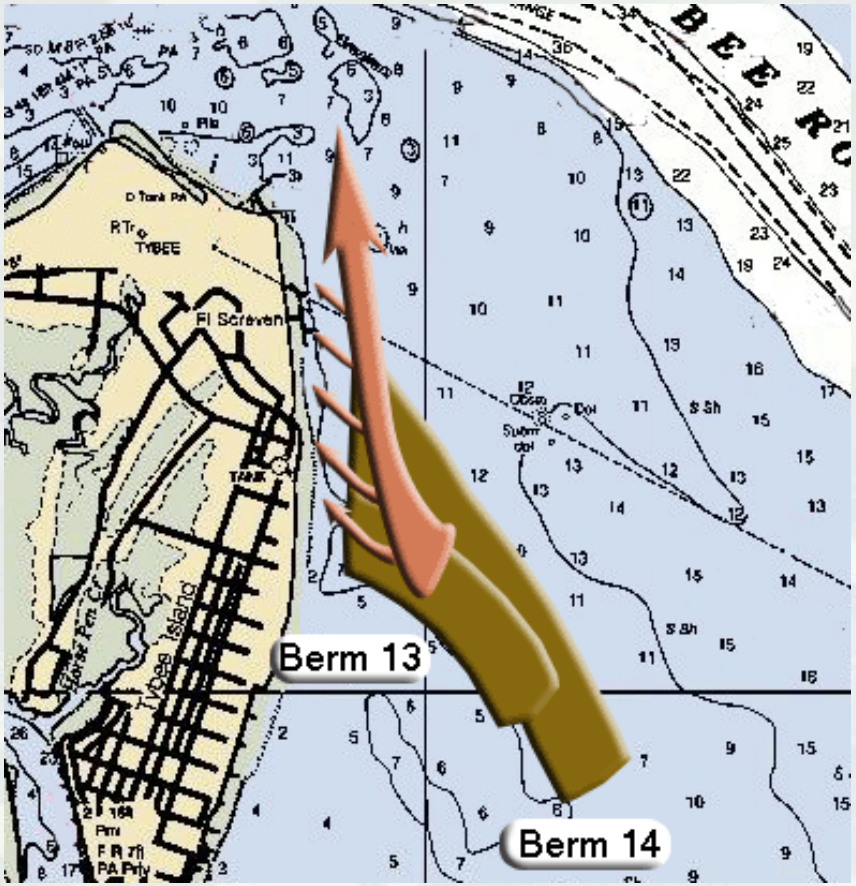
- Must have a solid understanding of the system hydrodynamics
  - Numerical model predictions
  - Monitoring

Example EWN Solution for DMM



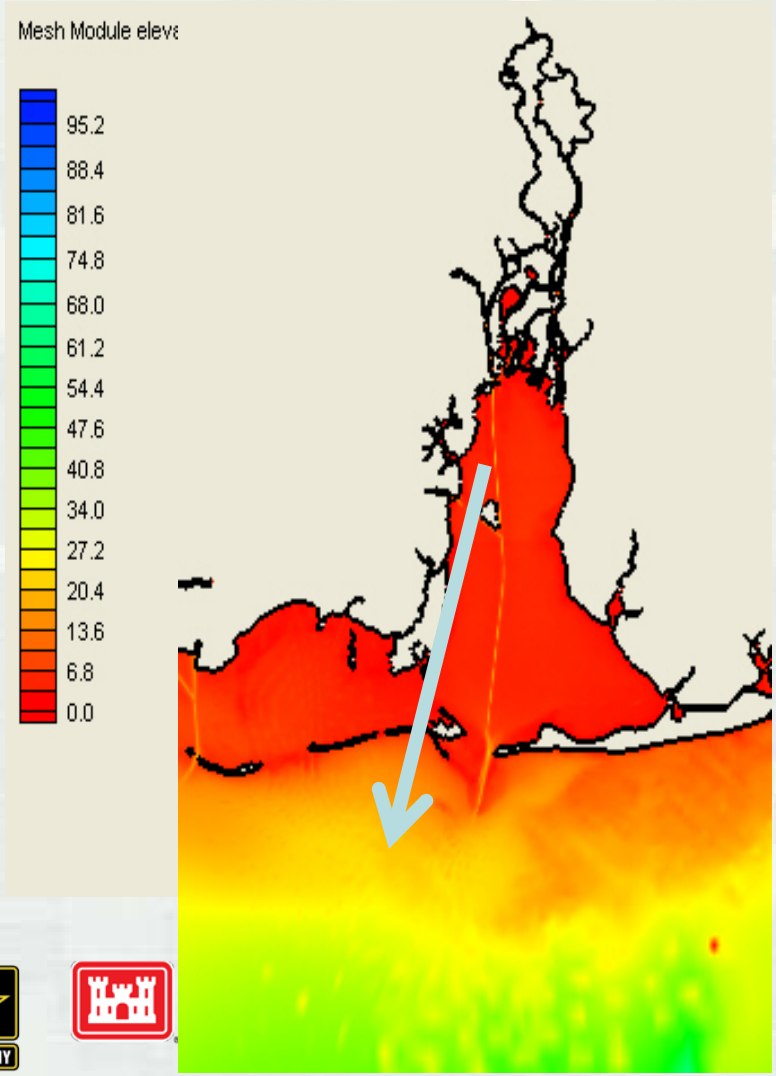
GTRAN Model Application





Optimize Nearshore Placement Location to maximize benefit to Tybee Island and minimize rehandling

Mobile Bay Dredging Practices

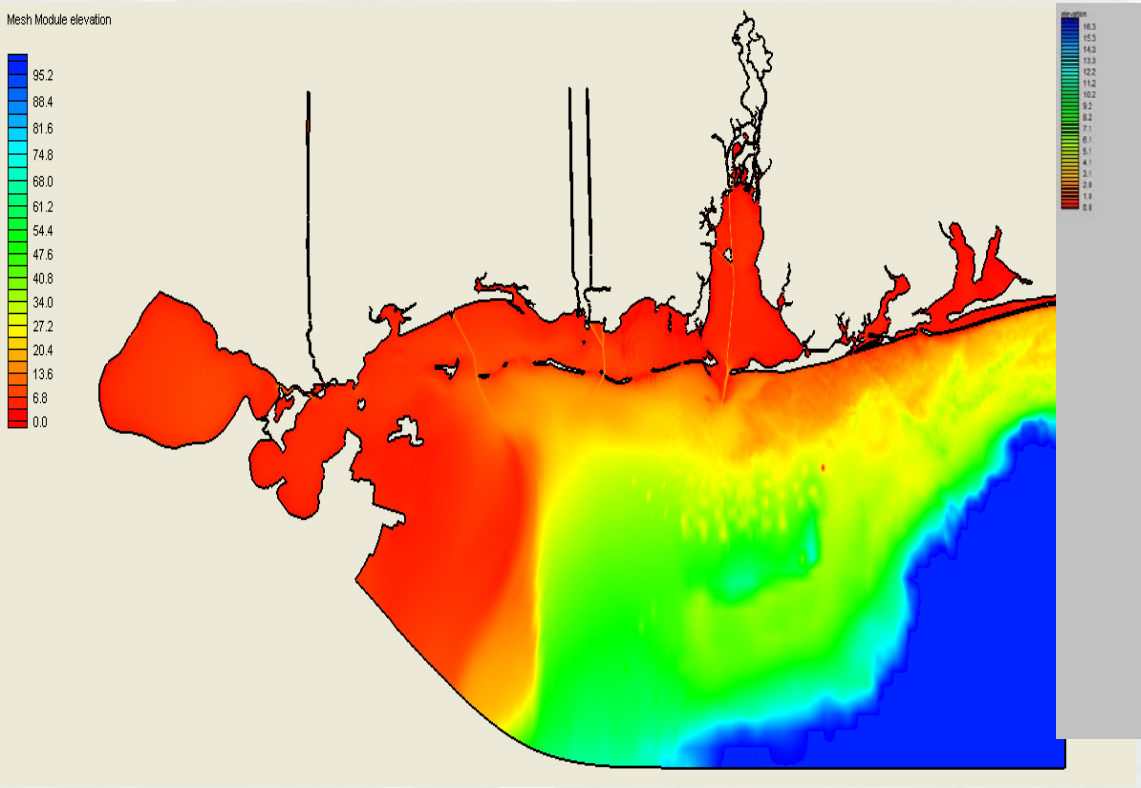


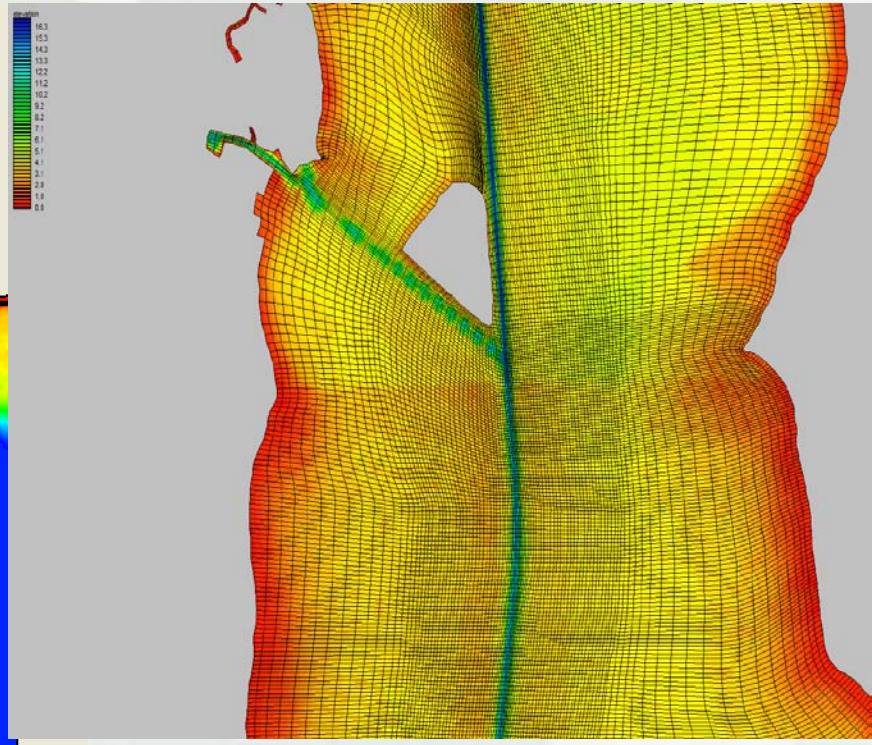
- Present dredging practice: remove sediment from bay to ODMDS
- This removes sediment from sediment-starved regional system (the Bay)
- Proposed practice: TLP within Mobile Bay to feed resources
- Issues: environmental impacts, rehandling, cost


N
Disposal Areas
Navigation Channels
Chickasaw Creek
Mobile River Channel
Mobile Upper Bay Channel
Arlington Ship Channel
Garrows Bend
Dog River
Fly Creek Channel
Theodore Ship Channel
Theodore Barge Channel
Mobile Lower Bay Channel
Fowl River
AL Gulf Intracoastal Waterway
Mobile Bar Channel
Mobile
Spanish River
Mobile Bay
Gaillard Island
1
2
3
4
5
6
7
8
10
11
12
13
14
15
16
17
ODMDS Cells
Gulf of Mexico
0 2.5 5 10
Miles

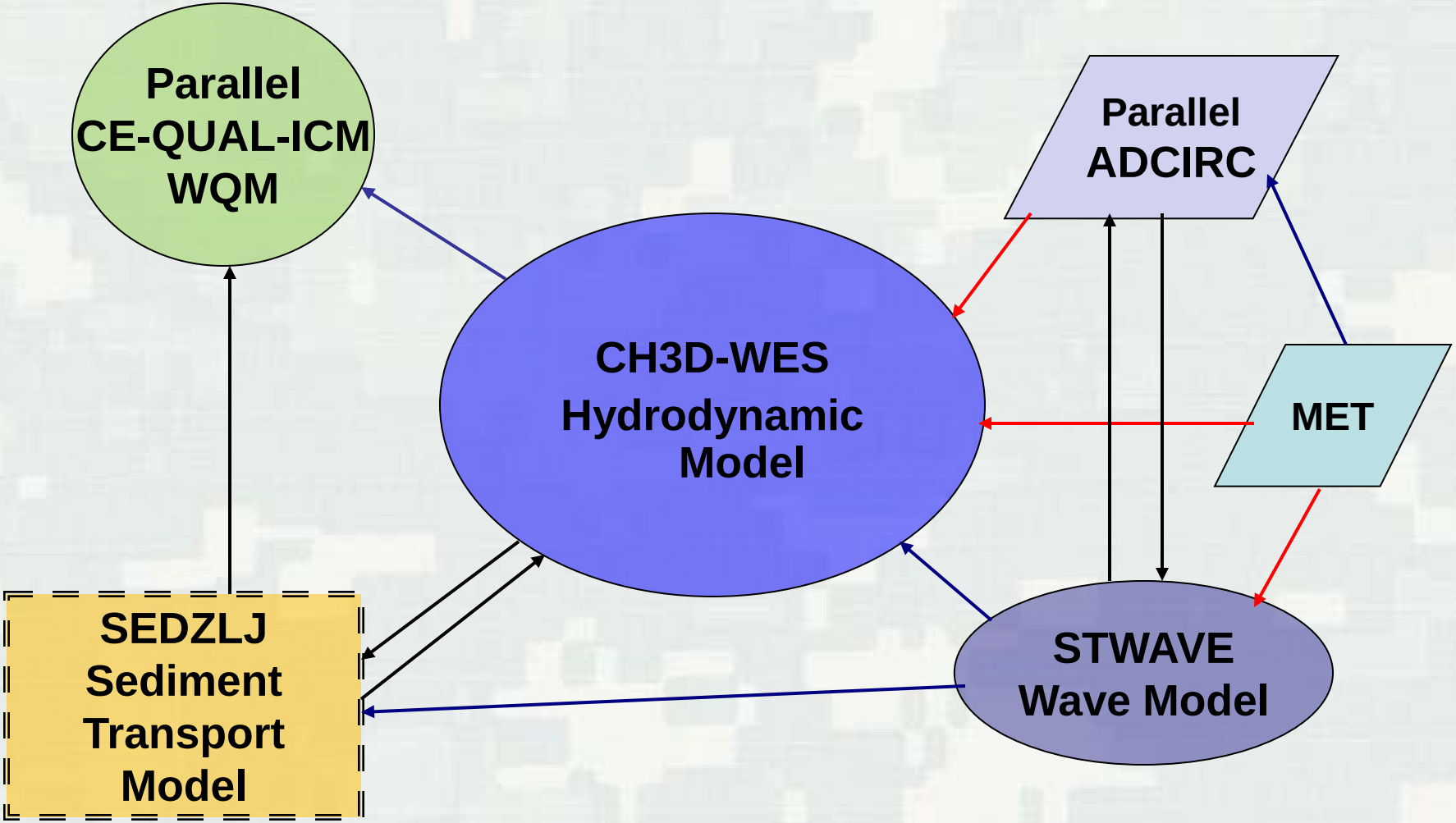
Mobile Bay Model Domain and Grid

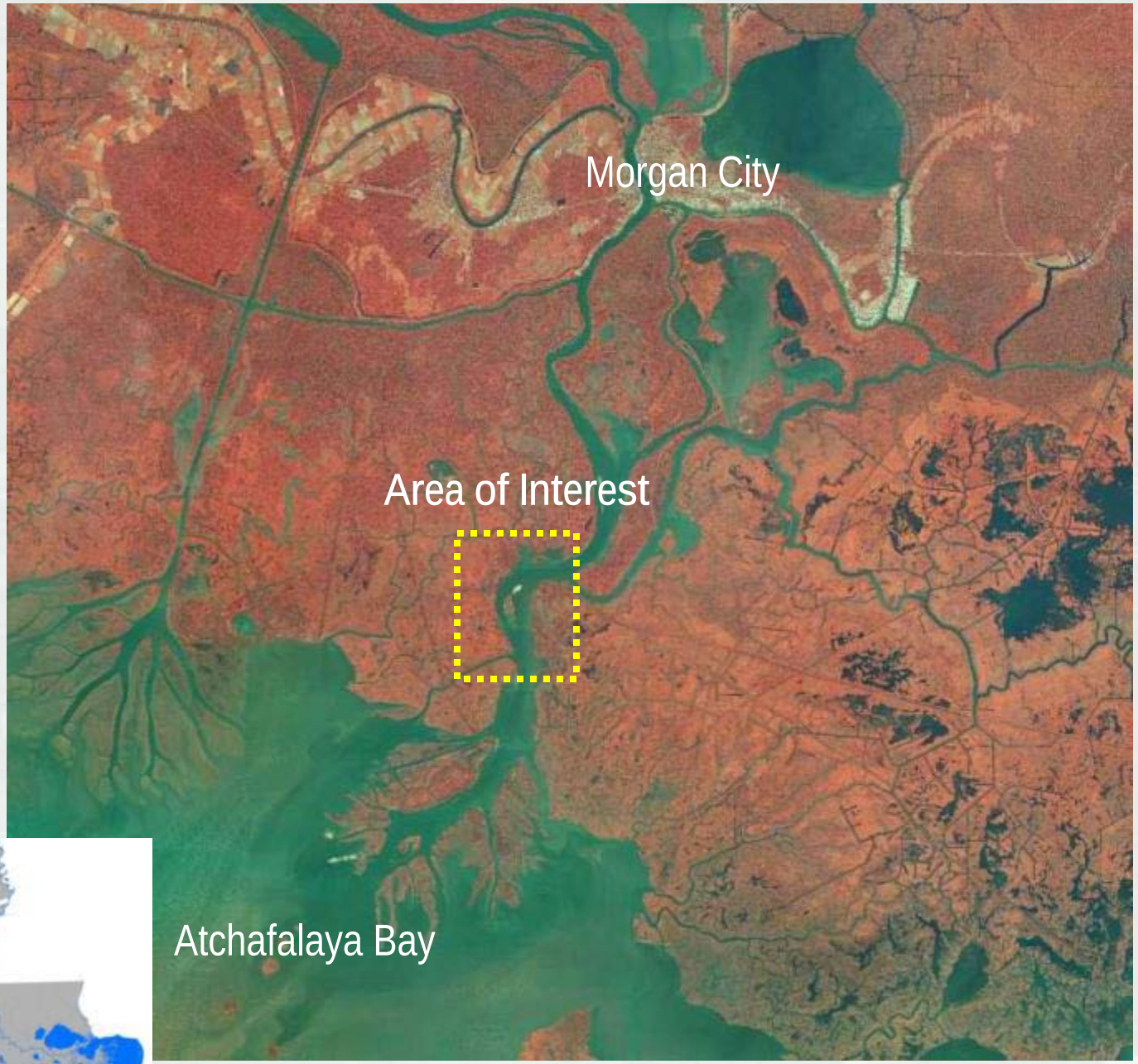
- To address rehandling and environmental impact issues, a complex 3-D modeling exercise of sediment transport in the Bay was applied

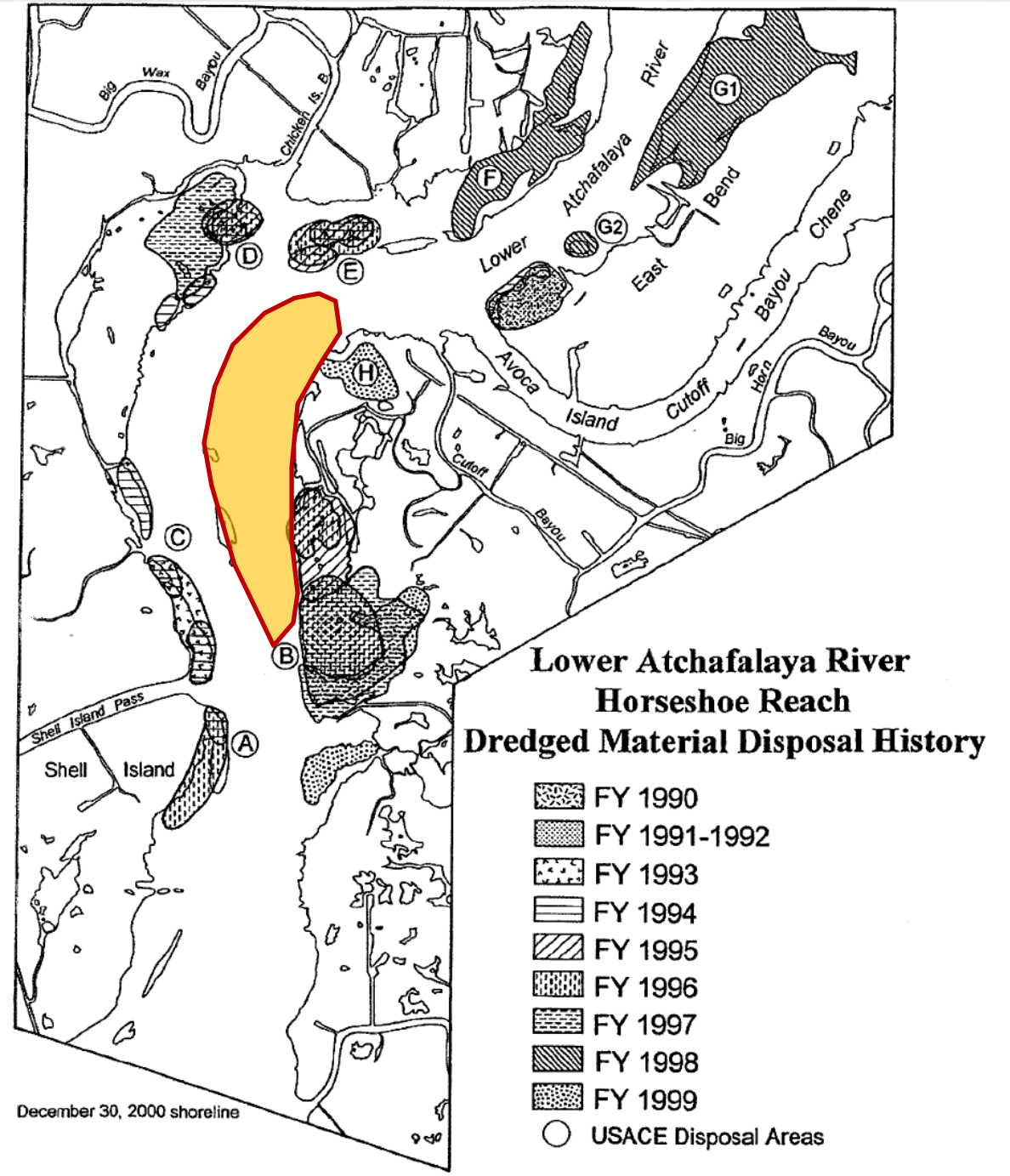




LTFATE Modeling Framework




Morgan City
Area of Interest
Atchafalaya Bay



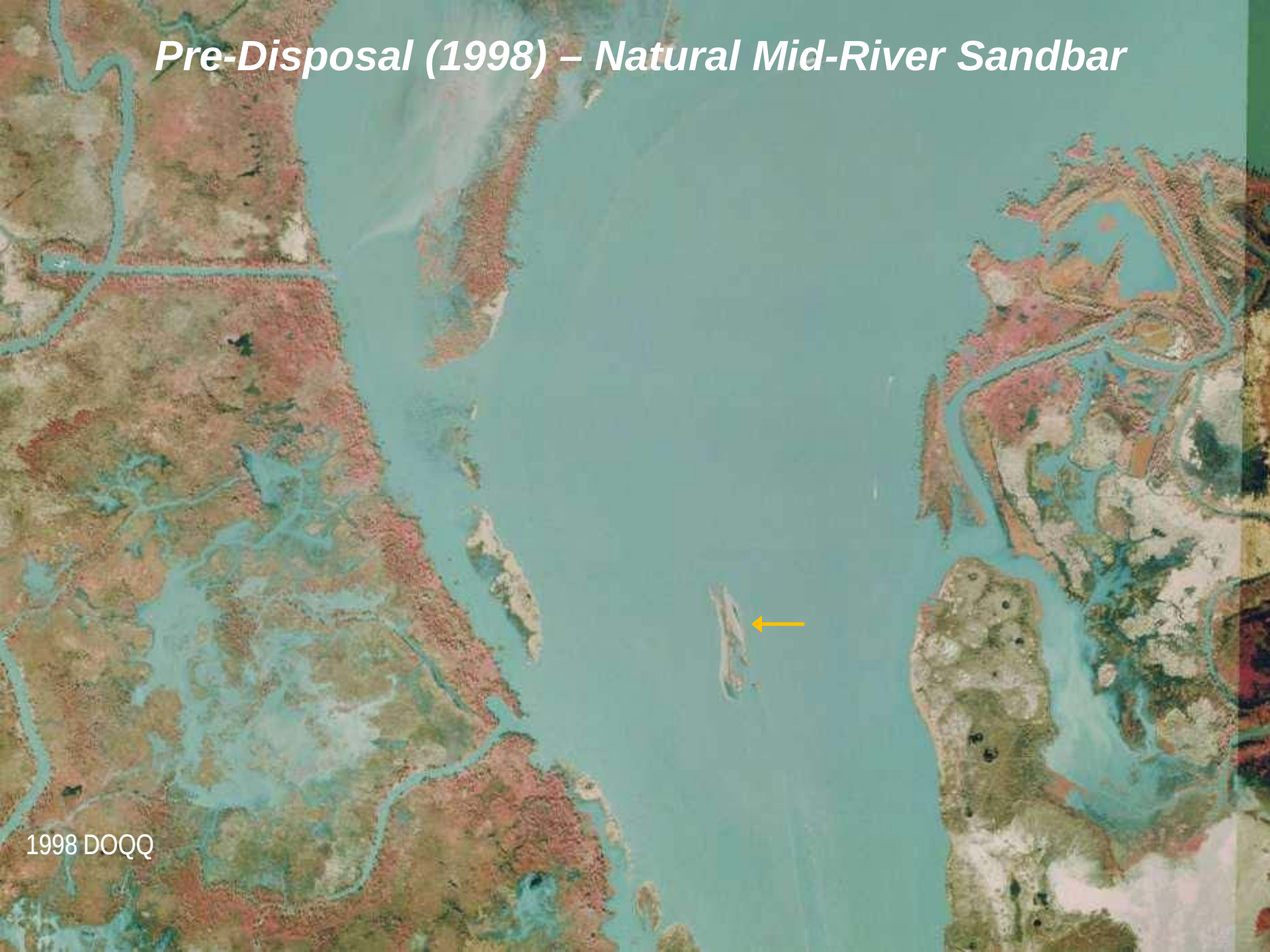
Problem

Capacity of shoreline Disposal Areas Exhausted

Alternatives

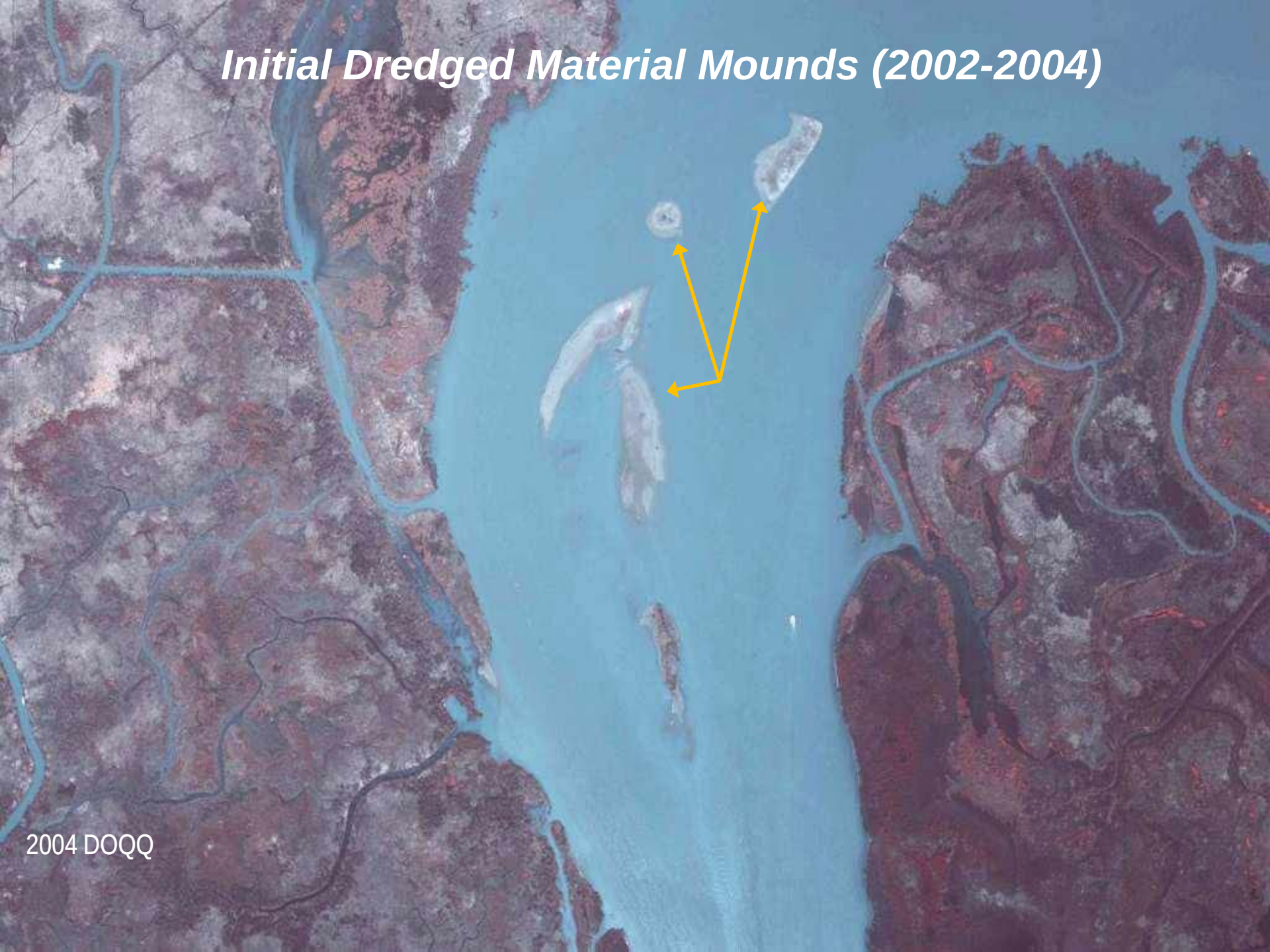
1. ~~Conversion of Wetland Disposal Areas into Upland~~
2. ~~Open Water Disposal in Atchafalaya Bay~~
3. Mid-River Mounding of Dredged Material

Pre-Disposal (1998) – Natural Mid-River Sandbar



1998 DOQQ

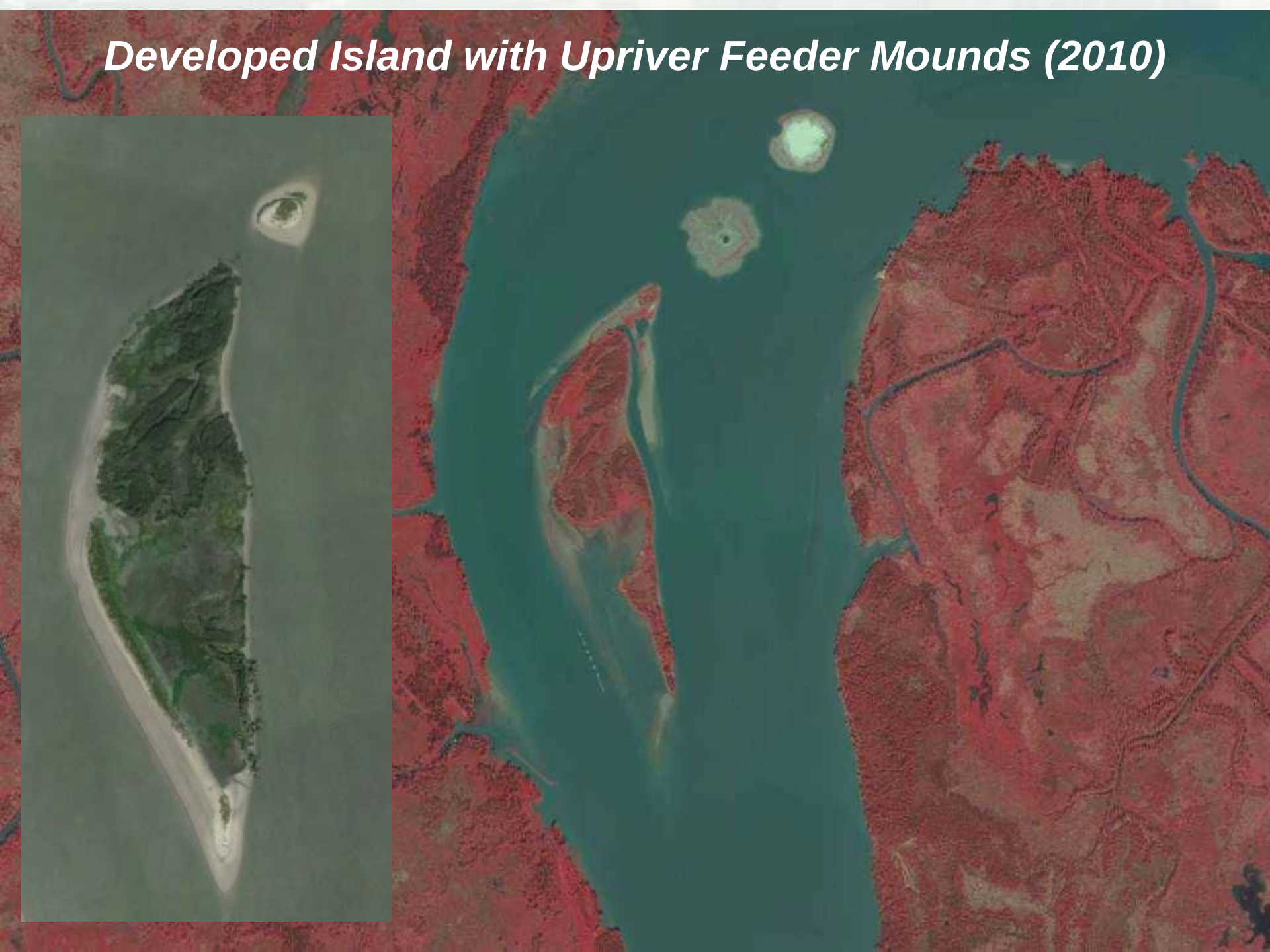
Initial Dredged Material Mounds (2002-2004)



2004 DOQQ

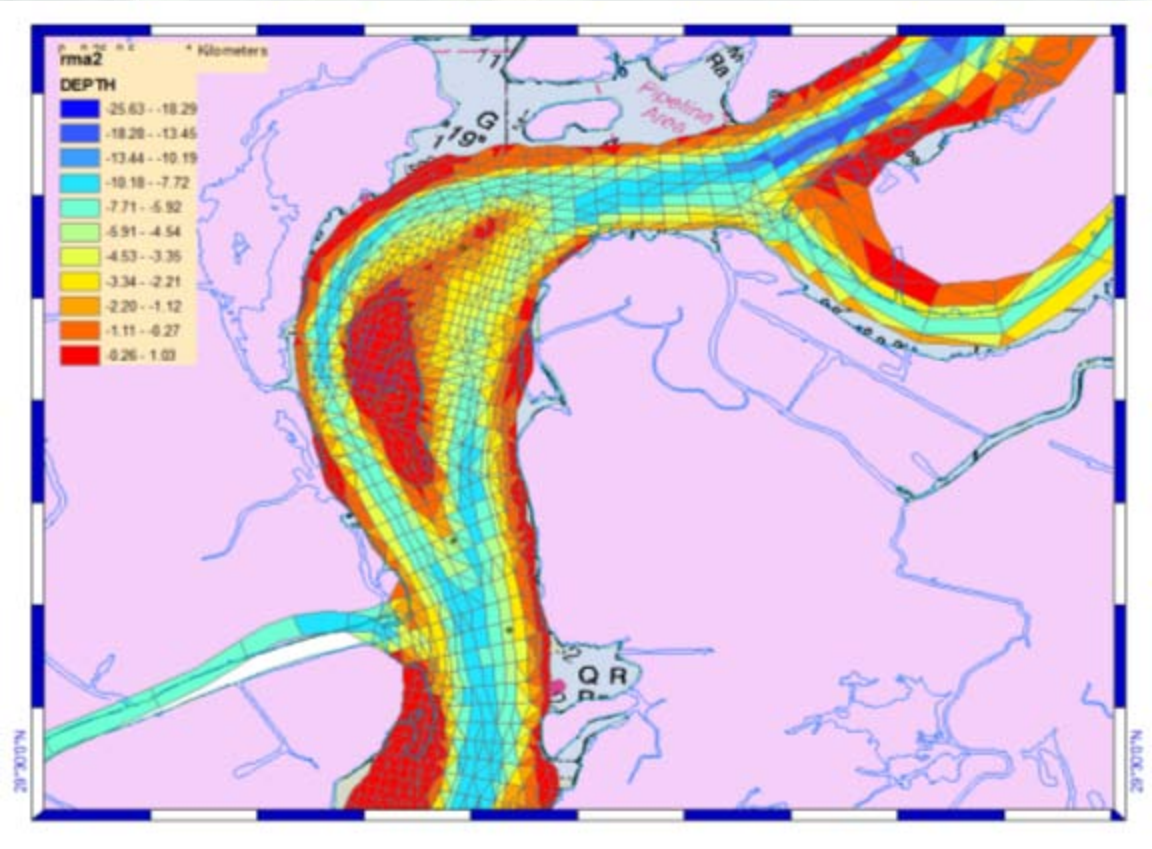
Year	Total (acres)
2008	66.1
2009	60.3
2010	55.9
2011	71.1
2012	70.1
2013	77.0
2014	87.6

Developed Island with Upriver Feeder Mounds (2010)



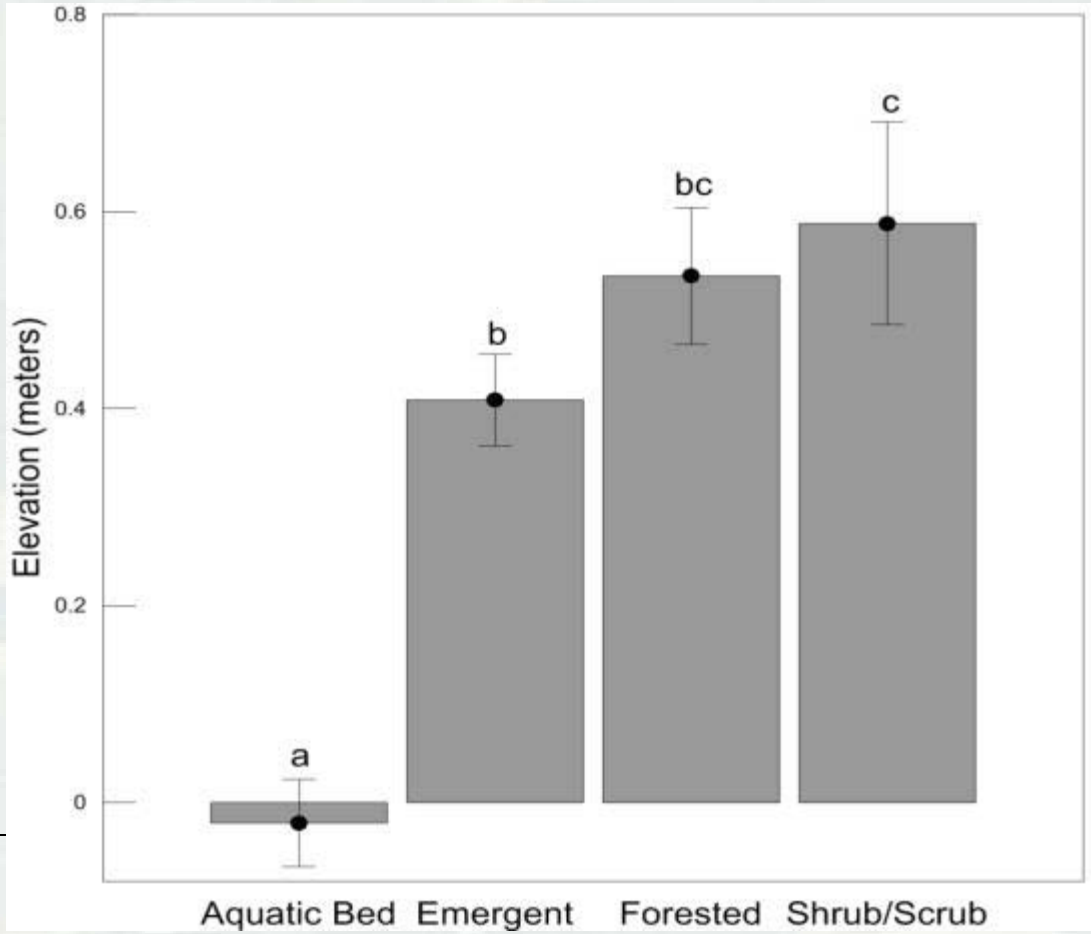
Navigation Benefit

Modeling: Implement CH3D to characterize study area hydrodynamics



Quantification of the Environmental Benefit

1. Habitat classification
   - 4 distinct habitats – driven by elevation gradient
   - Provide diversity for plants and animal habitats
   - Similar distribution to natural wetlands



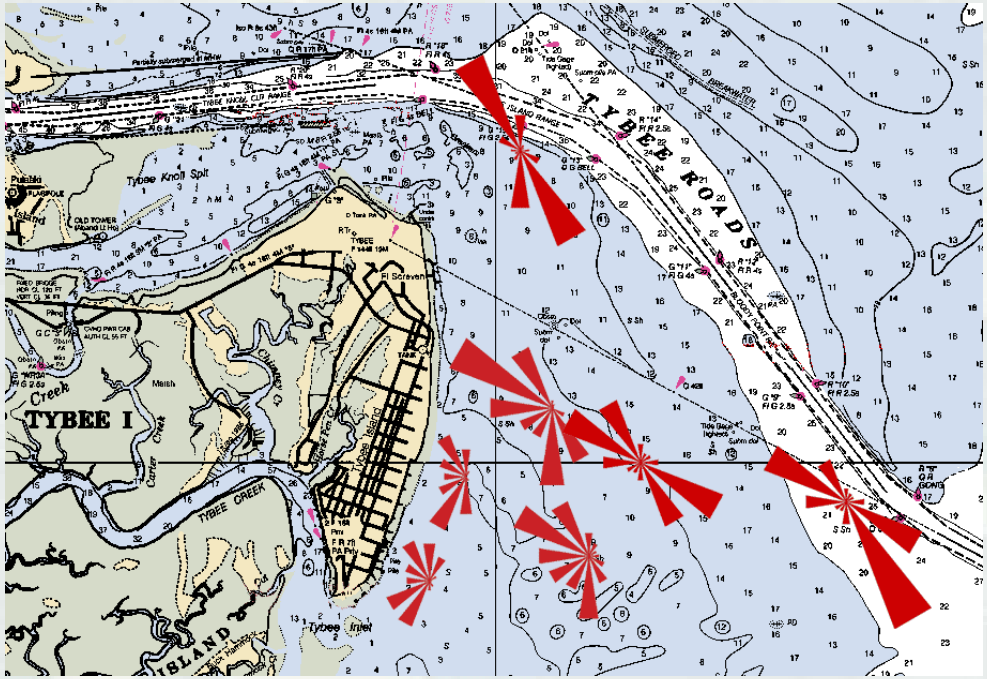
What Happens Next?

- Continue scientific research (hydrology and environment)
- Document positive / negative channel maintenance impacts
- Identify and quantify benefits
- Communicate findings widely
- Seek other applications for this novel placement practice

Questions?

GTRAN
Gridded TRANsport Model

- Screening level tool to assess sand transport:
  - Maximize beneficial use
  - Minimize channel infilling
  - Minimize or maximize transport toward target resources
  - Qualitatively predict transport direction and magnitude
- Sediment transport model not needed, especially in initial phases of placement study
- Interpret model output to define sediment pathways from placement sites



GTRAN calculates transport direction and magnitude at multiple locations over complex domain. Defines transport pathways and dominant transport directions due to currents, waves, and wave asymmetry