New Jersey Department of Transportation
Office of Maritime Resources

Experiences with Beneficial Use of Dredged Material in Sensitive Habitats in Coastal New Jersey, USA

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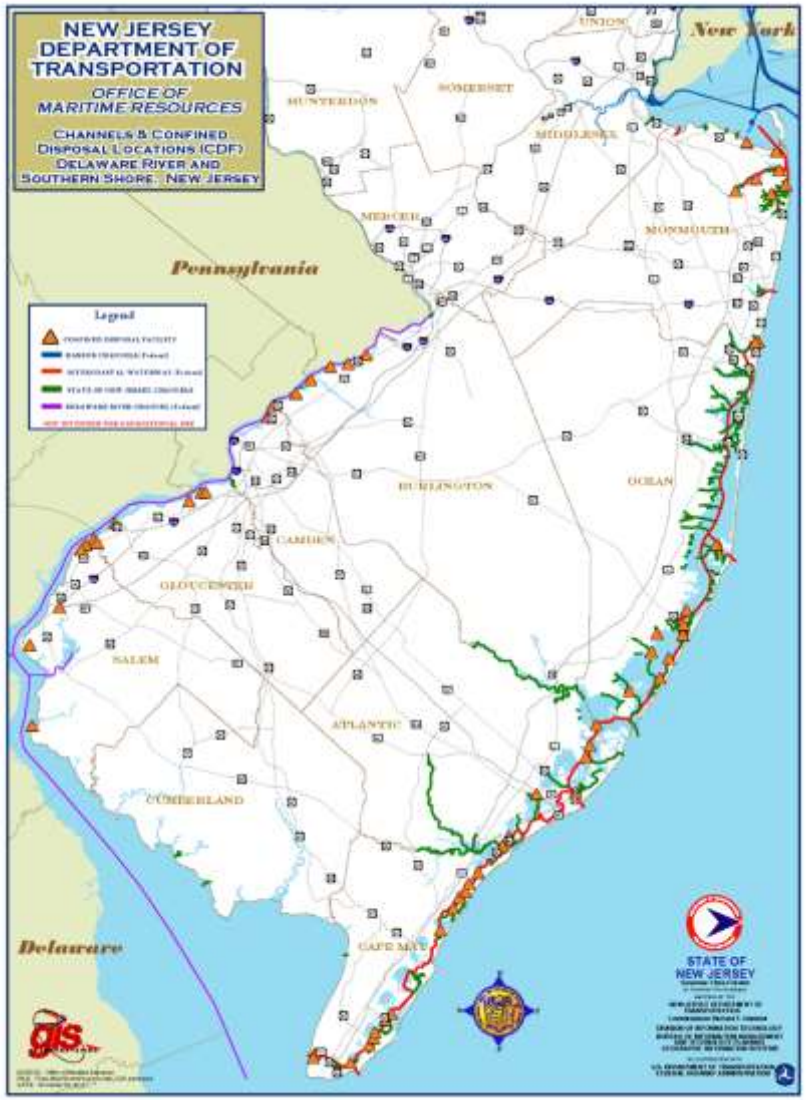
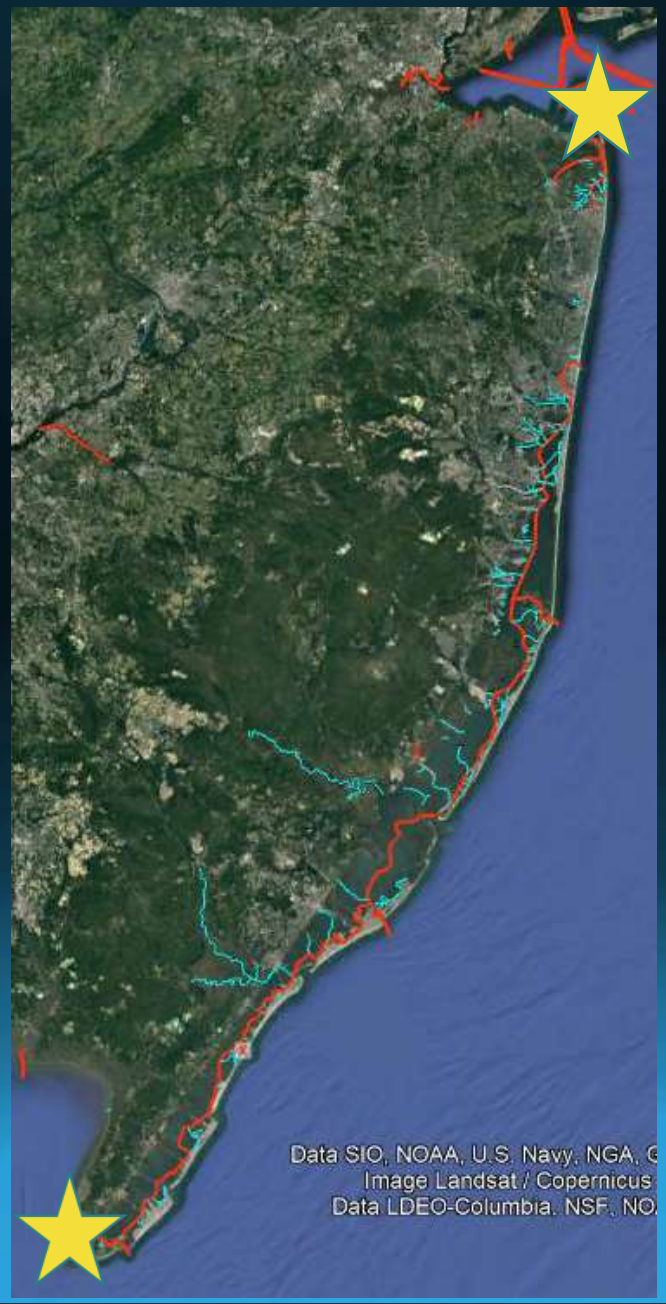
Navigational Need in New Jersey

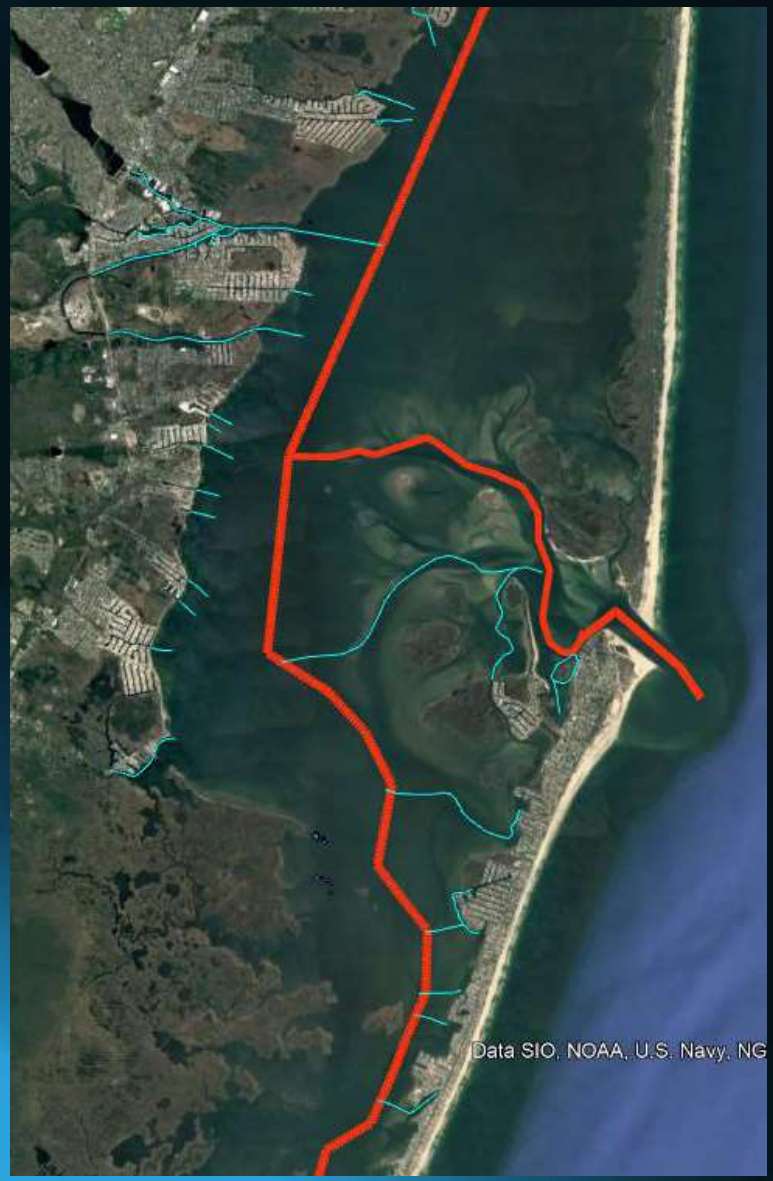
- **Federal Channels** in NY/NJ Harbor, Delaware River, and NJ Intracoastal Waterway; over 400 nm of engineered waterways
- **State Channel Network** – 215 Marked and Identified Channels; over 200 nm of engineered waterways
- **Local Channel Network** – Berths, marinas and local access channels; extent and condition is largely unknown
- **Two International Ports,** (PONYNJ and South Jersey Port Corp.), a world class fishery, and internationally recognized tourism/recreation
- **Supports >$50 billion annually to NJ economy**
- **Requires 5-7 million CY of dredging annually to maintain a "state of good repair"**



Atlantic Shore Region

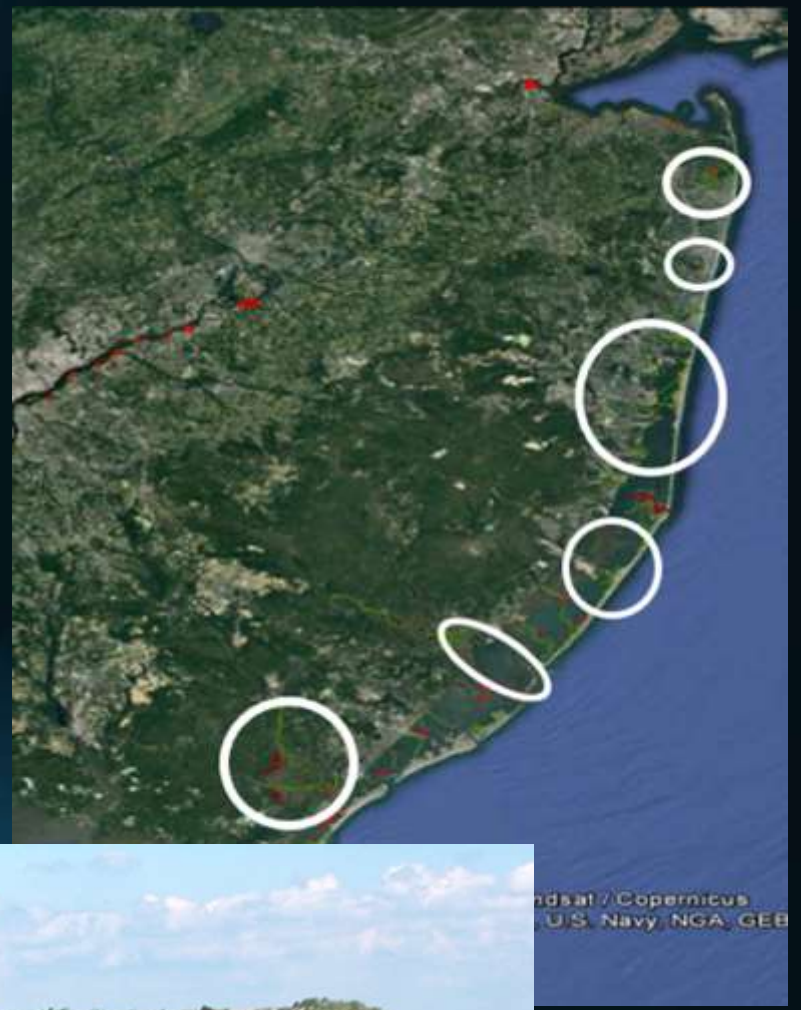
- Sandy Hook to Cape May (125 miles)
- Barrier Island with bathing beaches
- Back Bay surrounded by extensive marshlands
- 105 nm Federal Intracoastal Waterway
- 200 nm of State channels
- Local and municipal waterways and lagoon communities
- Recreation and Commercial Fishing
- 500,000 CY per year of clean sand and silt





Marine Transportation System in Crisis

- Increasing Need to Dredge
- Decreasing Capacity for Traditional Dredged Material Management
- Gaps where there are no viable management options



Coastal Habitat in Crisis

- Marsh Platform Inundation
- Marsh Edge Erosion
- Historical Impacts
- Development Pressure

Coastal Communities in Crisis

- Sea Level Rise
- Storm Surge
- Beach Erosion
- Shoreline Erosion

Maintenance of Maritime Transportation, Improving Resiliency of Coastal Communities and Conservation of Marine Ecosystems all require smart sediment management. Dredged Material can and should be included in all three.

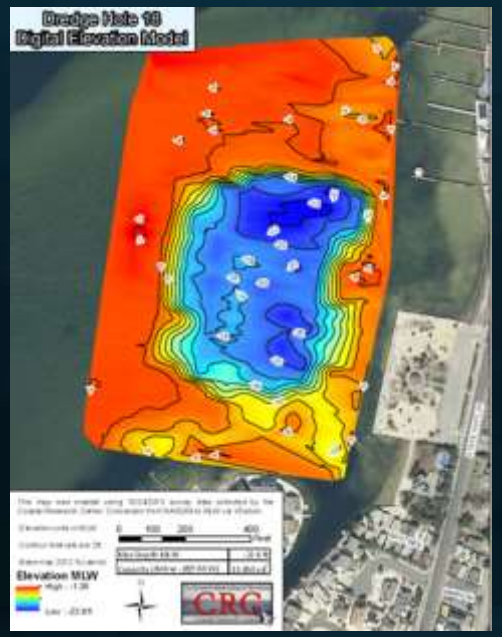
Historical Dredged Material Management

10-18” Cutterhead Pipeline Dredges

Beach Replenishment (≥90% coarse)

Confined Upland Disposal (everything else)

Dune Creation



Benthic Restoration

Shoreline Stabilization

Habitat Creation

Marsh Enhancement

Island Restoration

Case Study 1: Mordecai Island

- Beneficial Use Type: Island restoration
- Placement Technique: Low pressure hydraulic
- Dredged Material Placed: 28,000 CY
- Construction Cost: $981,100
- Cost per cubic yard: $35
- Acres Restored/Enhanced: 4.0
- Cost/acre: 245,275
- Lesson Learned: Beware of unintended consequences

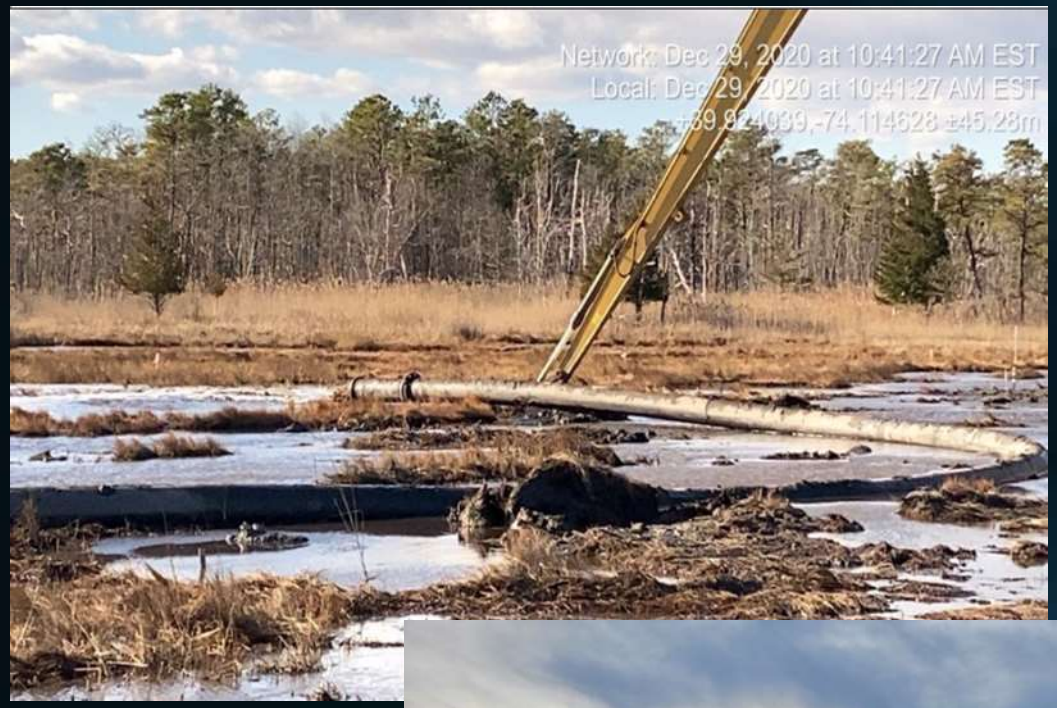
Case Study 2: Ring Island

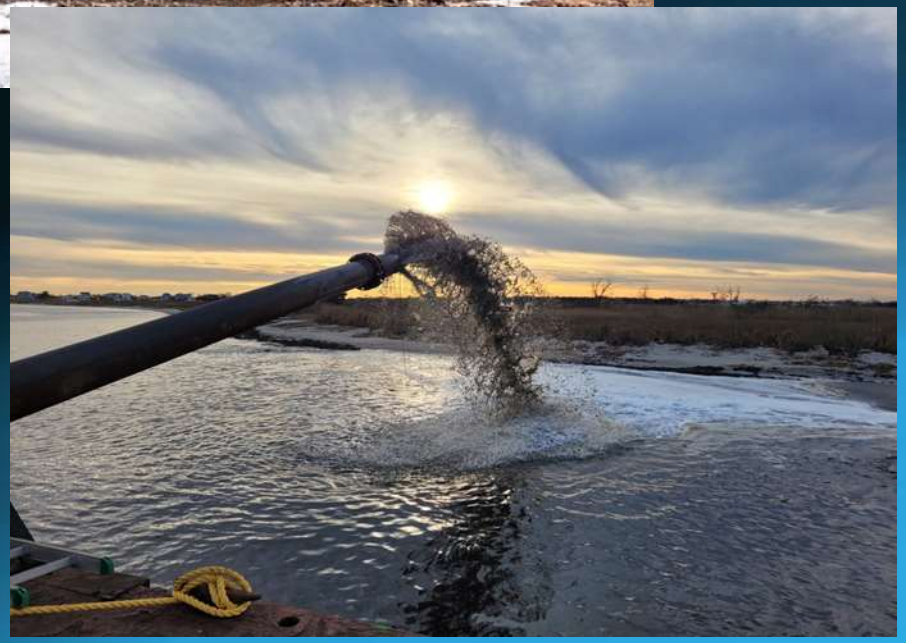
- Beneficial Use Type: Upland habitat creation
- Placement Technique: Low pressure hydraulic
- Dredged Material Placed: 7,000 CY
- Construction Cost: $706,970
- Cost per cubic yard: 101
- Acres Restored/Enhanced: 1
- Cost/acre: $706,970
- Lesson Learned: Multiple applications may be needed to achieve project goals

Case Study 3: Fortescue Marsh

- Beneficial Use Type: marsh enhancement, dune creation, beach replenishment
- Placement Technique: Low pressure hydraulic
- Dredged Material Placed: 37,140 CY
- Construction Cost: $5,200,744
- Cost per cubic yard: $140
- Acres Restored/Enhanced: 8.2
- Cost/acre: $396,597
- Linear Ft Protected: 1100
- Cost/linear ft: $1,772
- Lesson Learned: Do not over-engineer, minimize use of equipment

Case Study 4: Good Luck Point Marsh





- Beneficial Use Type: marsh enhancement, shoreline stabilization
- Placement Technique: Low pressure hydraulic
- Dredged Material Placed: 12,000 CY
- Construction Cost: $2,891,470
- Cost per cubic yard: $240
- Acres Restored/Enhanced: 5.2
- Cost/acre: $279,177
- Linear Ft Protected: 750
- Cost/linear ft: $1,920
- Lesson Learned: time and size matters

Case Study 5: Dredged Hole 18

- Beneficial Use Type: benthic restoration
- Placement Technique: mechanical
- Dredged Material Placed: 244,100 CY
- Project Cost: $19,065,195
- Cost per cubic yard: $78
- Acres Restored/Enhanced: 9 acres
- Cost/acre: $2,118,355
- Lesson Learned: Wind events caused more turbidity than placement technique

Case Study 6: Brigantine Islands

- Beneficial Use Type: benthic enhancement, shoreline protection
- Placement Technique: Low pressure hydraulic
- Dredged Material Placed: 21,823 CY
- Construction Cost: $1,678,307
- Cost per cubic yard: $68
- Acres Restored/Enhanced: 23.6
- Cost/acre: $71,115
- Linear Ft Protected: 500
- Cost/linear ft: $1,320
- Lesson Learned: Work with resource agencies early in the process

Average Construction Cost/CY

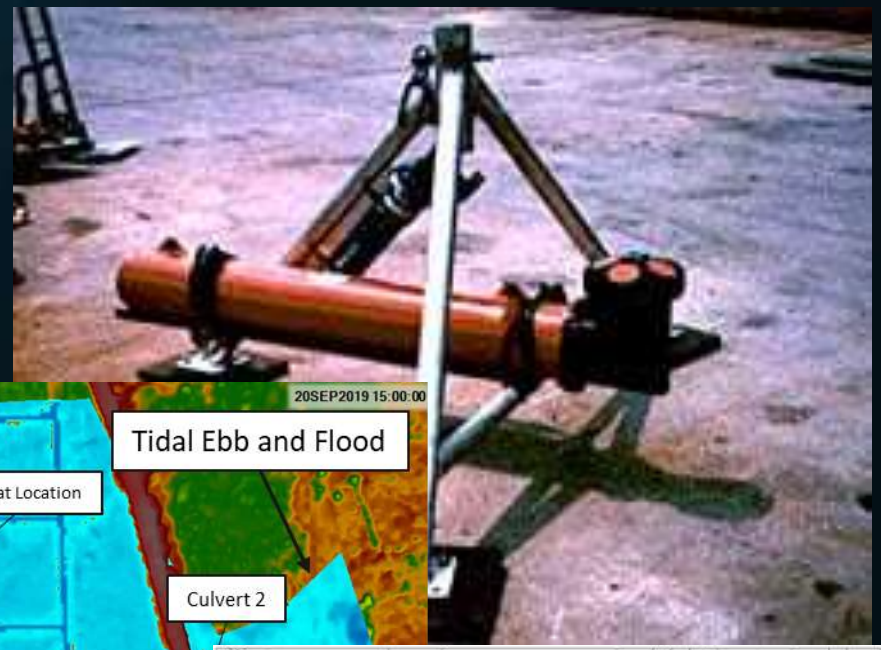
Construction

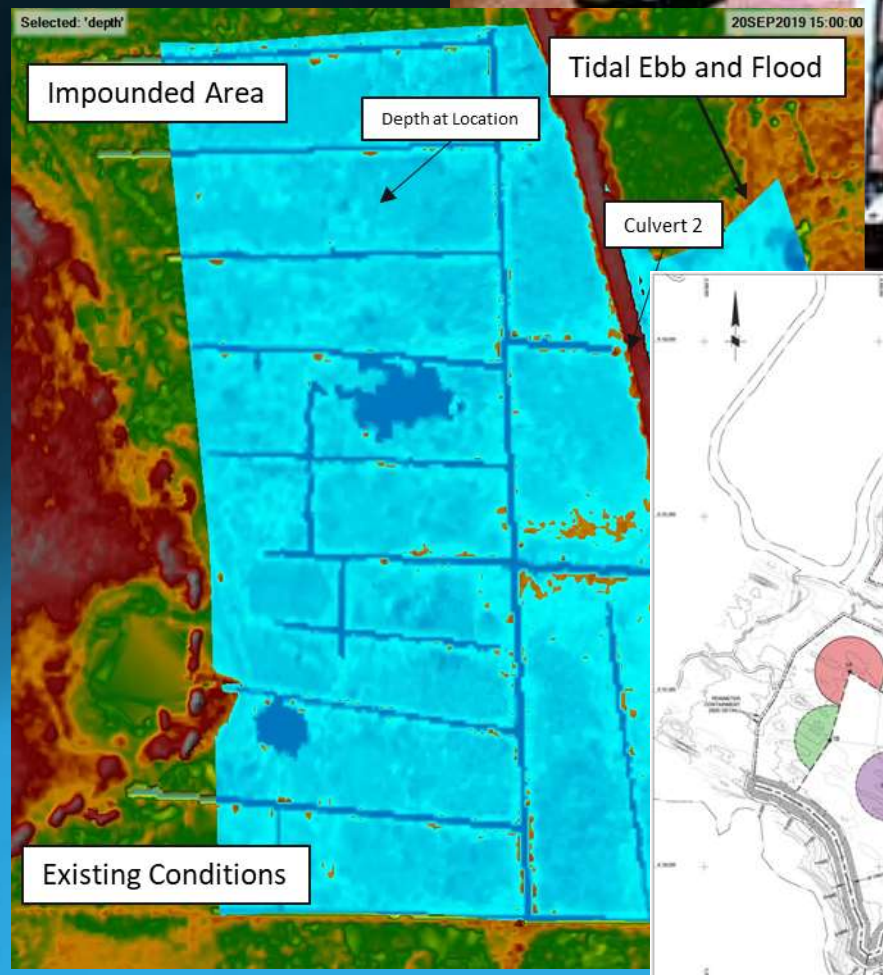
- Multiple locations, extensive site preparation and containment drive up mobilization costs
- Longer pumping distances and complicated placement requirements drive up dredging costs
- Difficult site conditions, specialized equipment and or restrictive permit conditions drive up placement costs
- Construction Monitoring – Elevation and sediment transport
- Adaptive Management – during construction vs. post construction

Engineering and Permitting

<u>Site specific Engineering data needs:</u>

- Coastal Processes (tide, waves and currents)
- Marsh hydrology (baseline and proposed condition)
- Placement modeling
- Geotechnical data
  - Marsh platform
  - Source material
- Placement design
- Average increase: about 25% over traditional





Site Selection

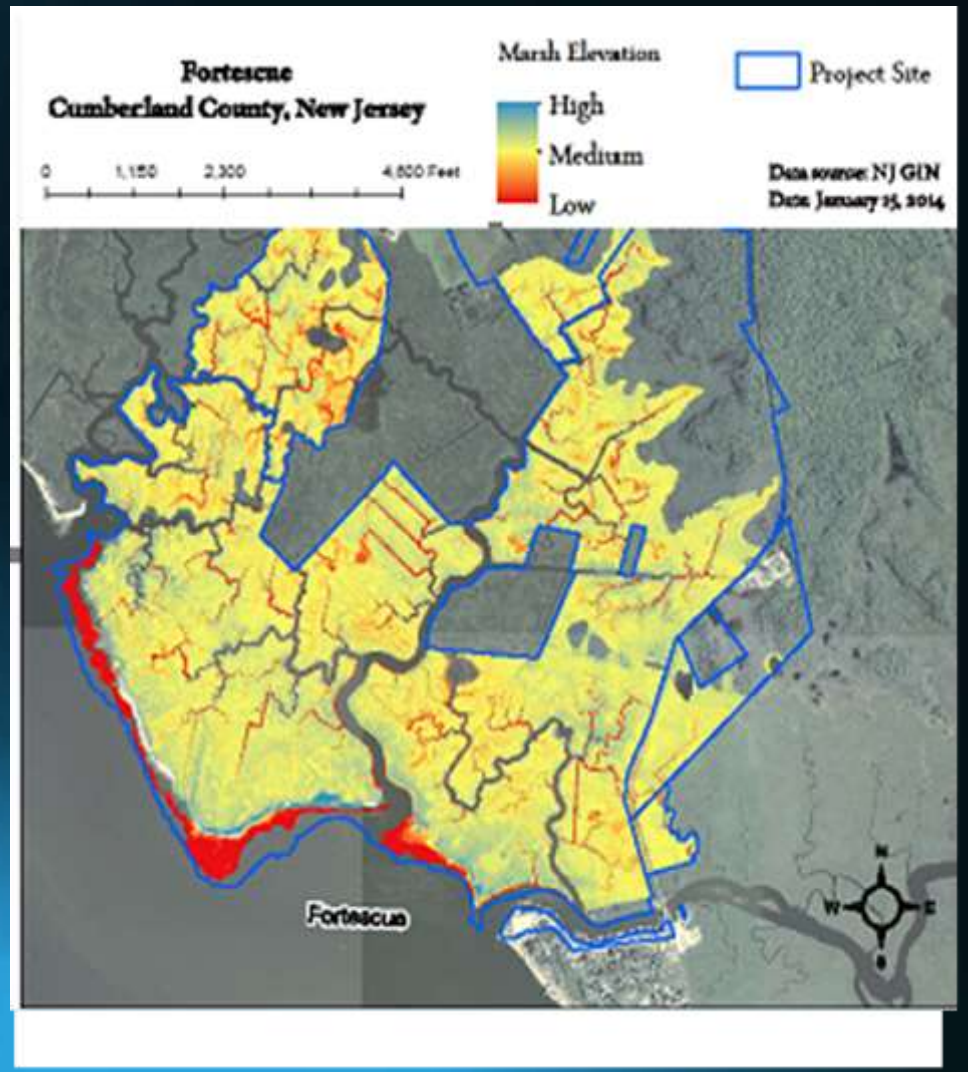
Geographic Risk Analysis:

- Where do we need to protect our built infrastructure?
- Where do we need to enhance/restore habitat?
- Where do we need to dredge?

Site Specific Habitat data needs:

- What resources are using the site now?
- What resources do we need habitat for?
- What conditions need to exist to achieve those goals?

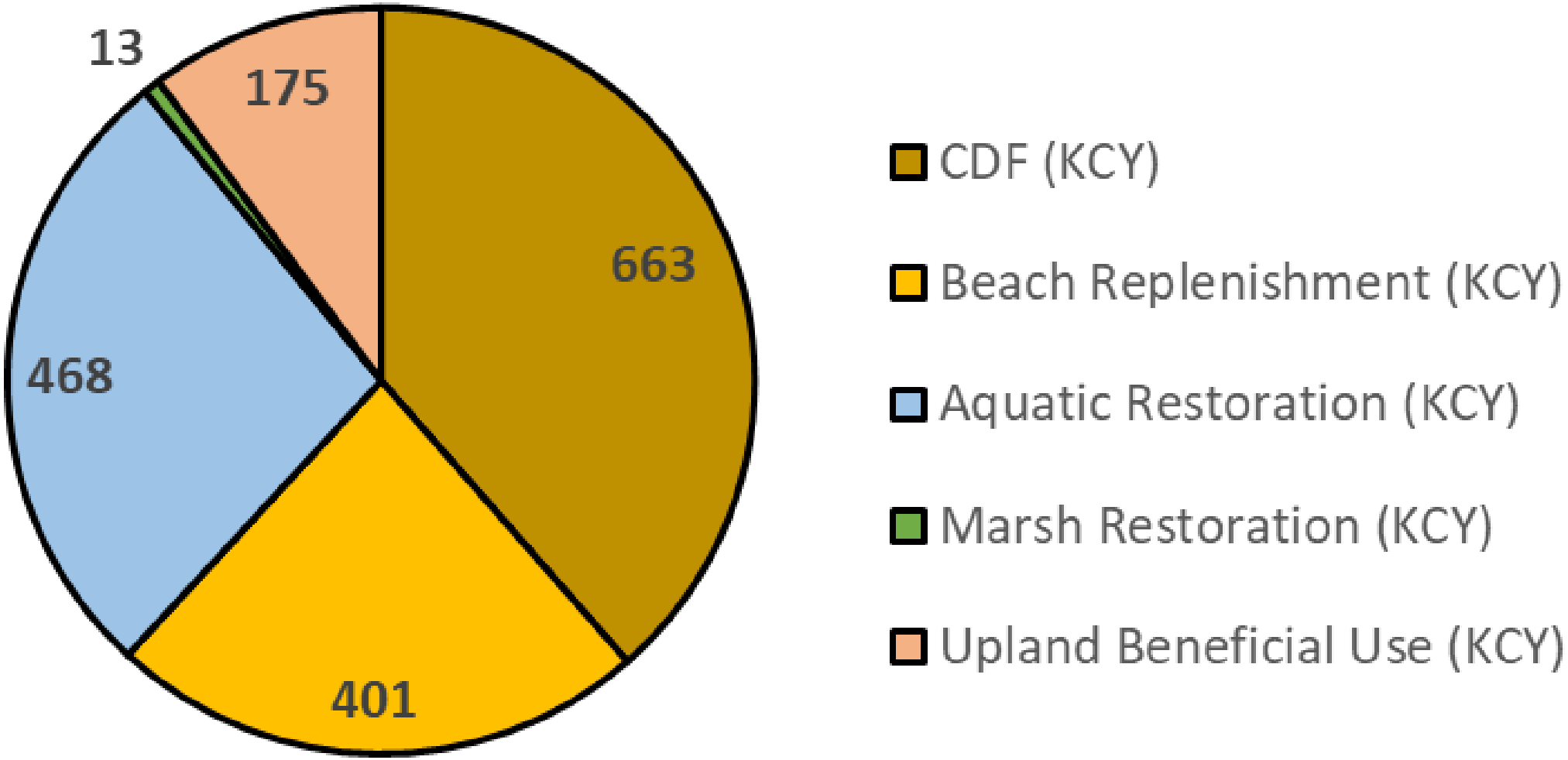
- This analysis has increased project timelines by as much as a year



Monitoring

- Elevation (during and after construction)
- Consolidation
- Movement of sediment
- Hydrology (water level)
- Vegetation
- Wildlife
- Cost is averaging about $250,000 per project

SCDP Management of Dredged Material



Cost/Benefit Considerations

- Shared Assets
- Shared Responsibilities
- Shared Benefits
- Cost per cubic yard placed
  - Traditional: $36-57/CY
  - Natural/Nature Based: $55-146/CY
- Cost per acre habitat created/restored
  - $54,000 –2,000,000 plus
- Cost per ft shoreline stabilized
  - $1300 – 1900
- Will costs come down as
  - Project size/frequency increases?
  - With experience?
  - Do we need better technology/techniques?
  - Do we need to reduce risk?

Patience Pays