Feasible Approaches to Beach Nourishment

Presentation Approach

- Characterize history of BUDM / Beach Nourishment in Texas
- What drives the identification of projects?
- Challenges associated with beach nourishment
- Specific challenges on Galveston Island
- Local dredge ownership feasibility
- Approaches to reducing costs of beach nourishment
• Promote and sustain the Gulf facing beaches;
• The beaches are an important coastal asset;
• Beaches have seen variable levels of investment to maintain and extend the line;
• Costs have ranged from between $12/cy to $45/cy for beach nourishment;
• Impacts associated with sea level rise may prompt additional future needs
• Requirement to explore the most sustainable approaches to funding and executing beach nourishment
Factors Affecting Selection of Projects

Project Drivers

• Available Sand Sources
  – Proximity, Sand Quality, Permitting

• Perceived Benefits
  – Fall within coastal erosion framework
  – Addresses economic growth
  – Reduces exposure to damaging tropical events
  – Benefits can be demonstrated

• Available Partnering
  – US Army Corps of Engineers
  – State and Local Government funding
History of Beach Nourishment in Texas

Major Beach Nourishment Projects

• Rollover Pass
  – Caplen and Gilchrist Beaches
  – Periodic Partnering with USACE
• Galveston Island
  – Phase I, II, and II Projects
  – Various procurement strategies
• South Padre Island;
  – Periodic Partnering with USACE
  – Response to maintenance dredging events
• Surfside / Sargent / McGhee / North Padre Beaches
  – Upland sources
Summary of Five Years of Federal Dredging Costs

- Hoppers mainly used for Entrance channel / Inner channel
  - $1.00 to $5.00 / cy
- Pipeline dredging
  - $1.00 and $7.00 / cy, dependent on disposal distance
  - Rarer use in Entrance / Inner channel.
- Disposal distance impacts costs.
- **Observable premium on costs for Beach Nourishment**
  - At approx. 60%
- **Mobilization costs have significant impact in unit rates**
  - Can be as high as between $2 million and $4 million
  - Lower for locally based equipment
Galveston Island Longshore Sediment Transport

**Local Sediment Deficits**

- Cyclical exchange of sand between East Beach and Big Reef
  - No external sources of sand
- Longshore transport diverges near 61st Street
- Net losses at all reaches, except at East Beach
- Annual deficits of between 18,000 cy and 200,000 cy
Permitted Placement Areas
How does Local Dredge Ownership Work?

• Cost effectiveness of owning a dredge is a function of several variables
  – Fixed Cost and Variable Costs
  – Volume of material / Programmatic approach – scale matters
  – Beach nourishment projects are more complex than navigation channel maintenance
  – A single dredge size and type can constrain scope for wider utilization
  – Support at government level is crucial to ownership feasibility, even if the financial feasibility can be demonstrated.

• Feasibility is not just a function of $/ cy

• Efficiencies can be found by optimizing contract work instead
Baseline Cost Analysis

• Optimal Dredge Identification
  – Provided an indication of the potential size of locally owned dredges to price
  – Provided a means to establish the baseline costs for the cost feasibility assessment
  – Provided a method of validation of the cost estimating tool

• Cost Estimating Tools
  – Cost Engineering Dredge Estimate Program
  – Texas A&M Center for Dredging Studies

• Development of Dredge Capital Cost Database
  – CIRIA Cost Standards for Dredging Equipment
  – Consultation with regional shipyards and dredge manufacturers
  – Dredge database built up as function of cutter power
Baseline Cost Analysis

• Baseline Analysis structured as a Private Dredging Contractor would
  – Private Contracting
  – Collaboration with USACE
  – Coincident Bidding

• 24” cutter suction dredge
• 3,600 cy / 14,000 cy hopper dredge optimal
• Not directly comparable to Phase II and III; longer distances; smaller volumes

<table>
<thead>
<tr>
<th>Dredge</th>
<th>Private Contracting ($/cy)</th>
<th>Coincident Bids ($/cy)</th>
<th>Corps’ Collaboration ($/cy)</th>
<th>Phase II (Observed Costs, excludes mobilization)</th>
<th>Phase III (Observed Costs, includes mobilization)</th>
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</thead>
<tbody>
<tr>
<td>24” cutter</td>
<td>20.7</td>
<td>17.7</td>
<td>n/a</td>
<td>n/a</td>
<td>$16.5</td>
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<tr>
<td>3,600 cy hopper</td>
<td>21.8</td>
<td>20.6</td>
<td>20.9</td>
<td>12.0</td>
<td>n/a</td>
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</table>
Local Ownership Costs

- Local ownership imposes different cost burden
- All annual fixed costs are borne by the local owner
- Greater requirement for retention of staff
- Ancillary equipment capital costs are greater
- Placement distance are longer
- Limiting scope and increasing volume reduces 24” cutter suction unit rate (~$18 /cy)

<table>
<thead>
<tr>
<th>Dredge Type</th>
<th>Size / Capacity</th>
<th>Total Fixed Cost</th>
<th>Total Annual Cost</th>
<th>Cost Per Cy (600,000 cy)</th>
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</thead>
<tbody>
<tr>
<td>Cutter</td>
<td>24&quot;</td>
<td>$10.16 million</td>
<td>$17.1 million</td>
<td>$28.5</td>
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<tr>
<td>Hopper</td>
<td>3,600 cy</td>
<td>$14.55 million</td>
<td>$20.2 million</td>
<td>$33.7</td>
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</tbody>
</table>
Potential for Regional Collaboration

Overview of potential for collaboration

• Environmental Restoration and Habitat Protection
  – Texas Parks and Wildlife, The Nature Conservancy, Ducks Unlimited
  – Cutter Suction Dredges more versatile
  – Opportunities for collaboration dependent on value to the regional partner
  – Lots of small fill (50,000 cy) opportunities
  – Large fill opportunities more limited; three to five year frequency
  – Suggest limiting to 200,000 cy per of available material

• Beach Nourishment
  – South Padre Island; Sargent Beach; Rollover Pass; Surfside
  – More suitable to hopper dredges
  – Limited access to material beyond Corps navigation channel projects
  – Suggest limiting to 150,000 to 250,000 cy per of available material
Can we make Local Dredge Ownership Work?

Impact on Costs of Regional Collaboration

• Utilization increased by between 9 and 16%
• Fixed Costs unaffected; Variable costs are increased
• 24” cutter suction dredge adjusted rate ~$19 /cy
• 3,600 cy hopper dredge adjusted rate ~$24 /cy

How much material needs to be moved to make it work?

• Maximum utilization estimated at 70%
• Associated variable costs suggests upwards of two million cubic yards of material needs to be moved to be close to Phase II and III projects
How to make Local Dredge Ownership Feasible

- New build market required
  - Recognize that “used” dredge may not meet local owner demands
- Home Port Logistics
  - Limited permanent wharf space availability
- Consider availability of experienced staff
- Factor in heavy overhaul requirements
- Pro-active regional collaboration
  - Risk that projects may not be realized
- Build portfolio of projects around dredge capability
- Annual funding commitment Required
Recommendations for Improving Cost Efficiencies

• Contractual Mechanisms
  – Incentives to reduce dredge unit rates or mobilization lump sum items
  – Marginal reductions in profit rate most likely
    • Volumes too low to identify a firm tipping point
    • Requires long term commitment on volumes / frequency
  – Consider summer placement windows
  – Early Contractor Input; Establish long term partnerships
    • Promotes improved understanding of project risks
    • Allows contractor input in setting the schedule
Recommendations for Improving Cost Efficiencies

• Programmatic Approach
  – Continued investment is needed:
    • Long term coastal hazards continue to exacerbate the need for beneficial use of dredged material
    • Sustainable use of public funds
  – Spread mobilization costs over multiple projects, multiple sponsors
  – Collaborate between agencies to group projects requiring similar dredge equipment
  – Promotes competition amongst dredgers
  – Upwards of two million cubic yards of material needed to make local ownership work
Recommendations for Improving Cost Efficiencies

• Promote Collaboration with the Corps of Engineers
  – Potentially offers best value for dredging from the federal navigation channel
  – Incremental costs burden, limits exposure to mobilization costs.
  – Likely makes use of hopper dredges
    • Limits access to shallow submerged sources (Big Reef)
  – Cutter Suction / Big Reef
    • Consider potential for mobilization cost reduction if projects are bid coincident with Corps mid-bay projects.
Overall Feasibility Recommendation

• Local Ownership not feasible without grouping of projects in programmatic manner
  – Requires cross agency collaboration and funding commitments
  – Additional logistical barriers to be overcome
• Recommend continued collaboration with the Corps or coincident bidding
• The Case for Continued Investment
  – Storm surge protection; FEMA recognition
  – Sea Level Rise Impacts
  – Economic Benefits Observed at South Padre Island
  – Critical to maintaining annual economic growth
  – Sustainable use of Public Funds
Local Dredge Ownership Feasibility Study

Questions....