THE REALITIES OF FUTURE SAND SOURCES FOR SOUTHEAST FLORIDA BEACHES

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Overview

• Future Sand Requirements

• Remaining, Accessible Offshore Sand Sources

• Possible Alternative Sources and Cost
  • Upland
  • Domestic Offshore (beyond Broward County)
  • Non-Domestic Offshore (Bahamas and beyond)
Historical Broward County Beach Projects

- Initial restoration in 1970
- More than a dozen projects
- 12+ million cubic yards of sand placed from offshore borrow areas
- 300,000 cy/yr
Future Sand Requirements

USACE ... ~25 million cubic yards over the next 50 years

Based primarily on...

- Authorized project specifications (pre-1970 shoreline conditions)
- Past sand placement experience (initial restoration and maintenance)

Past Criteria are not Expected to Represent Future Conditions
Enhanced Protection to Nearshore Hardbottom
Observed Annual Sand Demand (1980 – present)

- Segment I
  - Deerfield Beach
  - Hillsboro Beach
  - Pompano Beach
  - Fort Lauderdale
  - Hillsboro Inlet
    - 100,000 cy/yr (existing)
  - -48,000 cy/yr

- Segment II
  - Hallandale Beach
  - Hollywood
  - Port Everglades Inlet
    - 50,000 cy/yr (planned)
  - -42,000 cy/yr

- Segment III
  - -110,000 cy/yr

-200,000 cy/yr
**Future Sand Requirement**

*Realistic ... ~8-10 million cubic yards over the next 50 years*

Influenced by...

- Environmental Resource Protection
  - No significant future widening of beaches
  - Maintain established conditions only

- Improved Management at Boca Raton and Hillsboro Inlets

- Sand Bypassing at Port Everglades Inlet
Future Sand Availability

Remaining accessible sources offshore of Broward County are limited…

Due to…

• Past use

• Increased protection to adjacent hardbottom resources
Historical Offshore Sand Sources
Historical Offshore Sand Sources – Northern County

Historical Offshore Borrow Area (typ.)
Remaining, Accessible Offshore Sand Sources
### Remaining, Accessible Offshore Sand Sources

<table>
<thead>
<tr>
<th>Broward County Offshore Borrow Area</th>
<th>Potentially Accessible Sand Volume (400-ft Buffers) (cy)</th>
<th>Potentially Accessible Sand Volume (600-ft Buffers) (cy)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Most Desirable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/11</td>
<td>829,000</td>
<td>622,000</td>
</tr>
<tr>
<td>12</td>
<td>560,000</td>
<td>224,000</td>
</tr>
<tr>
<td><strong>subtotal</strong></td>
<td><strong>1,389,000</strong></td>
<td><strong>846,000</strong></td>
</tr>
<tr>
<td><strong>Less Desirable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>407,000</td>
<td>220,000</td>
</tr>
<tr>
<td>9</td>
<td>395,000</td>
<td>178,000</td>
</tr>
<tr>
<td>13</td>
<td>83,000</td>
<td>-</td>
</tr>
<tr>
<td><strong>subtotal</strong></td>
<td><strong>885,000</strong></td>
<td><strong>398,000</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,274,000</strong></td>
<td><strong>1,244,000</strong></td>
</tr>
</tbody>
</table>

5-7 yrs
Future Sand Sources – Options and Cost

- Remaining Offshore ($24/cy assumed)
- Upland
- Domestic Offshore (OCS) (beyond Broward County)
- Bahamian
- Distant Non-Domestic
• Numerous sources within 125 miles of Broward County

• Recent experience with these upland sources in Broward County suggests the unit cost for sand would be about $35-37/cy
Domestic Offshore (OCS) Sources

- Several developed sources on the central and southern Florida OCS (Outer Continental Shelf)
- Total volume of sand available on OCS is unknown
- Amount expected to be orders of magnitude higher than anticipated demand
Presently…

- There are two lease holders with permission to export sand for use and beach nourishment.

- Only one of the leases is developed as a commercial source capable of providing large quantities of sand.
Distant Non-Domestic Sources
Cost Assessment Parameters

- **Source Location**

- **Sand Loading**
  - Self-loading Equipment
  - Assisted loading (mechanical/hydraulic)

- **Sand Hauling**
  - Hopper Dredge (typical for short distances)
  - Tug and Scow (typical for long distances)

- **Sand Delivery and Placement**
  - Direct from Offshore
  - Port Everglades Rehandling and Truck-Haul Delivery
• Remaining Offshore of Broward County (14 nm)
• West Bank, Bahamas (48 nm)
• Ocean Cay, Bahamas (62 nm) - Commercial
• East Central Florida (OCS) (80 nm)
• Cay Sal Bank, Bahamas (120 nm)
• East Central Florida (OCS) (140 nm)
• Southwest Florida (OCS) (280 nm)
• Turks and Caicos Islands (520 nm)
• Dominican Republic (700 nm)
Sand Loading

Trailing-Suction Hopper Dredge (self-loading)

Hydraulic cutter-suction dredge loading a scow

Mechanical loading from upland stockpile

Spider barge
Hopper Dredge

Tug and Scow(s)

Sand Hauling
Delivery and Placement - Hopper Dredge from Offshore
Delivery and Placement - Port Everglades to Truck-Haul
Not Considered Feasible for Broward County

-- Limited by Offshore Wave Climate --

Delivery and Placement – Hydraulic Unloader Offshore
• The presence of hardbottom resources in and around potential rehandling areas

• Sedimentation and turbidity concerns during disposal of material and transfer from storage area to beach

Not Considered Feasible for Broward County

Delivery and Placement – Nearshore Rehandling
Project Methods

- **Trailing-Suction Hopper Dredge (Distant Offshore)**
  - Self-load, Self-transport, Direct Self-unload
  - Ocean Cay not included (self-load not an option at this site)

- **Trailing-Suction Hopper Dredge (Ocean Cay)**
  - Mechanical Load, Self-transport, Direct Self-unload

- **Tug and Scow (Distant Offshore)**
  - Hydraulic load, Self-transport, Mechanical Unload to Port, Truck-Haul

- **Tug and Scow (Ocean Cay)**
  - Mechanical load, Self-transport, Mechanical Unload to Port, Truck-Haul
Cost Analysis Assumptions

• **Hopper Dredges (Self-loading and Unloading)**
  • 2,000 cy : 4,000 cy : 7,200 cy

• **Tug and Scows (Mechanical/Hydraulic Load and Unload)**
  • 3-3,900 cy : 3-6,300 cy

• **Consistent Unit Costs for Equipment**
  • Emphasis on the effect of haul capacity, haul time (distance), and unloading method to cost

• **Cost for Bahamian and other Non-Domestic Sand will include Government Royalty and Lease Holder Expenses**
Effect of Capacity, Distance and Unloading Method to Cost
Effect of Capacity, Distance and Unloading Method to Cost
### Comparison of Costs for Sand Sources and Handling Methods

<table>
<thead>
<tr>
<th>Sand Source</th>
<th>One-way Distance to Sand Source (nm)</th>
<th>Probable Unit Price for Sand In-Place on Beach (with Mob/Demob) ($/cy)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hopper Dredge 2,000 cy</td>
<td>Hopper Dredge 4,000 cy</td>
</tr>
<tr>
<td>West Bank, Bahamas</td>
<td>48</td>
<td>$71.69</td>
<td>$29.45</td>
</tr>
<tr>
<td>Ocean Cay, Bahamas</td>
<td>62</td>
<td>$103.27</td>
<td>$46.95</td>
</tr>
<tr>
<td>St. Lucie County</td>
<td>80</td>
<td>$99.86</td>
<td>$36.57</td>
</tr>
<tr>
<td>Cay Sal Bank, Bahamas</td>
<td>120</td>
<td>$140.41</td>
<td>$50.92</td>
</tr>
<tr>
<td>Canaveral Shoals, Brevard County</td>
<td>140</td>
<td>$156.11</td>
<td>$53.53</td>
</tr>
<tr>
<td>Tom's Hill, Lee County</td>
<td>280</td>
<td>$289.44</td>
<td>$95.19</td>
</tr>
<tr>
<td>Turks and Caicos Islands (TCI)</td>
<td>520</td>
<td>$521.36</td>
<td>$169.97</td>
</tr>
<tr>
<td>Dominican Republic (DR)</td>
<td>700</td>
<td>$692.79</td>
<td>$223.54</td>
</tr>
</tbody>
</table>

*** Northern Segment III Only
Location of Potentially Feasible Future Sources
Realities…

- Future sand source needs in Broward County are expected to be ~8 to 10 Mcy over the next 50 years 
  \[ (2.5 \text{ to } 3 \text{ time less than prevailing estimated quantities}) \]

- Remaining sand resources offshore of Broward County may only be between 0.8 and 1.5 Mcy

- Broward County will be faced with using distance sand sources in the near future to maintain their beaches (5-7 yrs)
Realities…

• Sand sources on the Florida east coast Outer Continental Shelf (OCS) with 140 miles of Broward County may be cost-effective future alternatives.

• The cost-effectiveness of currently available Bahamian sand (compared to upland truck haul) is limited due to delivery restrictions, government and lease holder expenses, and the reliability of availability.

• Project size, equipment type, haul distance, and unloading conditions will influence cost-effectiveness of distant sources.
Considerations…

• Pursue an expanded evaluation of potentially available sand resources on the OCS

• Relate potentially available OCS sources to realistic future expected sand requirements for all SE Florida communities
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