TIME- AND COST-EFFICIENT POST-HURRICANE EMERGENCY SAND SEARCH FOR MEXICO BEACH

Beau Suthard, PG
Client Program Manager
APTIM

Patrick Bryce, PG
Marine Geologist
APTIM

Jeff Andrews, PSM, CH
Director of Operations
APTIM

Tara Brenner, PG, PE
Senior Coastal Engineer
Coastal Protection Engineering
SCOPE OF WORK

► Identify potential offshore sand sources for use in nourishment of Mexico Beach.
► Critically eroded beach area R-132 and R-138
  > 77,000 cy net sediment transport
  > Hurricane Michael (October 2018)
    - Expedite offshore sand search
    - Full scale beach restoration
► 2 Phase Sand Search Approach
  > Refine study area/resources
    - Phase 1: Desktop study and Jet Probes
    - Phase 2: Geophysical and Geotechnical Survey
PHASE 1: DESKTOP STUDY

- Dewberry and MRD Associates, Inc. Feasibility Study (April 1, 2017)
- FDEP ROSSI Database
  - Vibracores, Grab Samples, Historical Seismic Tracklines, and Paleo-River Channels
- Buffered Avoidance Areas
  - Disposal Sites
  - Coastal Barrier Resources
  - Gulf Sturgeon Critical Habitat
  - Fish Havens
  - Obstructions/Wrecks
- 3 potential sand sources
PHASE 1: JET PROBES

- December 17 and 18, 2018
- Distributed 14 jet probes between the 2 potential sand deposits
  - Sub-surface sediment type
    - Surface (0ft)
    - Mid depth (10ft)
    - Bottom of hole (20ft)
  - General grain size (target ≤0.20 mm/2.3 phi to ≥0.30 mm/1.7 phi)
  - Sand layer thickness (volume)
  - Sampled Paleo-Shoreface and Paleo-Washover areas
  - Visual description of sub-surface material and seafloor
### PHASE 1: JET PROBES

**Jet Probe Designation:** MBJP-18-10

<table>
<thead>
<tr>
<th>PROJEC T</th>
<th>MEXICO BEACH SAND</th>
<th>BAY COUNTY, FLORIDA</th>
</tr>
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</table>

**Phase 1: Jet Probes**

#### Jet Probe Log

<table>
<thead>
<tr>
<th>Jet Probe Designation</th>
<th>MBJP-18-10</th>
</tr>
</thead>
</table>

#### Installation Details

<table>
<thead>
<tr>
<th>Div</th>
<th>Project</th>
<th>JET PROBE DESIGNATION</th>
<th>LOCATION COORDINATES (F)</th>
<th>MANUFACTURER'S DESIGNATION OF JET PROBE</th>
</tr>
</thead>
</table>

#### Drilling Agency

<table>
<thead>
<tr>
<th>Agency</th>
<th>CONTRACTOR FILE NO.</th>
<th>ACTED</th>
</tr>
</thead>
</table>

#### Total Samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>SHOTED</th>
<th>UNSHOTED</th>
</tr>
</thead>
</table>

### Geotechnical Samples

- **Soil Type:**
  - Sandy Shell, trace of clay, and wood fragments within clay from 3.0 to 11.0 ft dark gray (5Y-4/1), (5Y-5C).
  - Sandy Shell

- **Elevation (NAVD 88, ft):**
  - +0.00

- **Depth (ft):**
  - +0.00

- **Remarks:**
  - End of Jet Probe
  - Sample A3, Depth = +20.0 ft
  - Mean (min): 1.00, Phi Sorting: 1.00
  - Mean (max): 4.00, Phi Sorting: 2.59

**Sample A2:** Depth = +10.0 ft
Mean (min): 1.00, Phi Sorting: 1.11
Mean (max): 4.00, Phi Sorting: 2.59

**Sample A1:** Depth = +15.0 ft
Mean (min): 1.00, Phi Sorting: 1.47
Mean (max): 2.59, Phi Sorting: 2.59

**Sample A:** Depth = +20.0 ft
Mean (min): 1.00, Phi Sorting: 1.47
Mean (max): 2.59, Phi Sorting: 2.59

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### Additional Information

- Total Number Bores: Family Standard
- Total Recovery for Jet Probe: 10 ft
- Signature and Title of Inspector: Family Standard
- Site Name: Mexico Beach Sand
- Date of Report: March 12, 2020
- Project Name: Mexico Beach Sand
- Contractor: MBJP-18-10
- Location Coordinates: X = 7603.09, Y = 5176.40
- Jet Probe Designation: MBJP-18-10
- Null Parameter: 1.0 ft
- Total Number Bores: 14
- Total Recovery for Jet Probe: 10 ft
- Signature and Title of Inspector: Family Standard
PHASE 1: JET PROBES

Jet Probe Designation: MBJP-18-03

Legend:
- Arrowed Jet Probes
- Fresh Water
- Obstructions
- Disposal Sites
- Gulf Stream Critical Habitat
- Coastal Barrier Resources

Geotechnical Samples:
- GS-0.3, sand 1.7% (G)
- GS 0.3-0.25mm 1-2 (G)
- GS 0.25-0.02mm 2-0.5 (G)
- GS >0.02mm (G)

Elevation (NAD 88, ft):
- 0 - 15
- 15 - 30
- 30 - 45
- 45 - 60
- 60 - 75
- 75 - 90
- 90 - 105
- 105 - 120

Classification of Materials:
- SAND, fine grained, light gray (5Y-7/1), (SP)
- Shelly SAND
- SAND, fine grained, light gray (5Y-7/1), (SP)

Sample 1:
- Depth: 0.0 ft
- Methyl (methyl) 0.75, Ph (pH) 7.3
- Find (C) 1.12% (SP)

Sample 2:
- Depth: 10.0 ft
- Methyl (methyl) 0.75, Ph (pH) 6.7
- Find (C) 1.12% (SP)

Sample 3:
- Depth: 20.0 ft
- Methyl (methyl) 0.75, Ph (pH) 7.3
- Find (C) 1.12% (SP)

End of Jet Probe
PHASE 2: GEOPHYSICAL SURVEY

► Geophysical Survey (May 6 - 9, 2019)
  > 93.7 nm of data
    - 13.5 nm Reconnaissance Geophysical Survey
    - 80.2 nm Design/Cultural Resource Geophysical Survey (30 m (98 ft) line spacing)
  > Delineate the base of the paleo-shoreline feature

► Data review and archeological cultural resource review
  > Buffer magnetic anomalies
  > Vibracore survey plan development
PHASE 2: GEOPHYSICAL SURVEY

► Seismic Sub-bottom
  > Digitization of sand shoals, paleochannels, geohazards
  > Sand thickness (isopach)

► Sidescan sonar
  > Delineation of surface features, types, characteristics and surface hazards/debris

► Magnetometer
  > Identify magnetic anomalies

► Single Beam
  > Bathymetric surface
PHASE 2: GEOPHYSICAL SURVEY

- June 18th and June 23rd, 2019,
  - 20 vibracores (up to 1,000 ft spacing over potential borrow area)
  - Athena Technologies Inc.

- Native beach sampling R-130, R-134, R-138, and R-142
  - Top of Dune, Toe of Dune, Mid-berm, Mean High Water (MHW), Mean Low Water (MLW), -4, -8, -12, -16 and -20 ft NAVD.
PHASE 2: GEOTECHNICAL SURVEY

- Vibracores were split, photographed, logged and sampled
  - Layer thickness, color, texture, composition and grain size (clay, silt, sand, gravel, shells)
- Entered into gINT
  - Mean, median grain size, sorting, silt/clay content (moment method)
- Vibracores color coded based on grain size (Facies)
  - Plotted on seismic sub-bottom data
    - Red – >5% fines, high clay, silt, shell
    - Yellow – fine grained sand, <5% silt, >10% shell fragments
    - Green – sand, <5% silt; trace shell hash, fragments, whole shells.
LINE 254 – MBVC-2019-VC14
MBVC-2019-VC14

**Rocky Designation:** MBVC-19-14

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### Drilling Log

<table>
<thead>
<tr>
<th>Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 12, 2020</td>
<td></td>
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</table>

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### Classification of Materials

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
</tr>
<tr>
<td>2.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
</tr>
<tr>
<td>4.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
</tr>
<tr>
<td>6.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
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<tr>
<td>8.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
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<tr>
<td>10.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
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<tr>
<td>12.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
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<tr>
<td>14.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
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<td>16.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
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<tr>
<td>18.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
</tr>
<tr>
<td>20.0</td>
<td>Sandy fine-grained, quartz, fine sand fragments, trace shell hash, trace diatomite, shell fragments up to 0.5&quot;, light grey (5Y 4/1-2)</td>
</tr>
</tbody>
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### Summary of Results

- **Sample 1:** Depth: 0.5 ft, Grey (5Y 4/1-2), 1.5 ft, Light grey (5Y 4/1-2)
- **Sample 2:** Depth: 0.5 ft, Grey (5Y 4/1-2), 1.5 ft, Light grey (5Y 4/1-2)
- **Sample 3:** Depth: 0.5 ft, Grey (5Y 4/1-2), 1.5 ft, Light grey (5Y 4/1-2)
- **Sample 4:** Depth: 0.5 ft, Grey (5Y 4/1-2), 1.5 ft, Light grey (5Y 4/1-2)
- **Sample 5:** Depth: 0.5 ft, Grey (5Y 4/1-2), 1.5 ft, Light grey (5Y 4/1-2)

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**End of boring**
LINE 254 – MBVC-2019-VC14
BORROW AREA DESIGN

- 12,500 ft. southwest of FDEP monument R-129.
- Buffered for potential cultural resource
- 6 cut elevations (-24.5 ft. to -28.0 ft.)
- Volume: 4,270,000 cy
- Modeling of dredging on waves/flows
  (Morjana Signorin, Session F at 2:55 pm)

<table>
<thead>
<tr>
<th>Borrow Area</th>
<th>Carbonate Content (%)</th>
<th>Mean Grain Size (mm)</th>
<th>Sorting (phi)</th>
<th>Fines (phi)</th>
<th>Average Wet Munsell Color Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico Beach Borrow Area</td>
<td>2.00</td>
<td>0.25</td>
<td>1.99</td>
<td>0.84</td>
<td>0.89</td>
</tr>
<tr>
<td>Mexico Beach (R-130 to R-142)</td>
<td>1.53</td>
<td>0.25</td>
<td>2.02</td>
<td>0.69</td>
<td>9.68</td>
</tr>
</tbody>
</table>
PROJECT TIMELINE

PHASE 1 – NOTICE TO PROCEED

- Field – Jet Probes (1 Day)
- Desktop Study (4 Days)

PHASE 2 – NOTICE TO PROCEED

- Field – Native Beach Sampling (2 Days)
- Field – Geophys Survey (6 Days)
- Field – Vibrocoring Sampling (5 Days)
PROJECT CONCLUSION

- Two phase project approach
- Cost and time efficiency
  - Select potential areas from Desktop study
  - Jet probes to quickly narrow down project area
    - Sediment deposits/properties
  - Geophysical/geotechnical data collection
    - Combined operations where able
    - Delineate sand deposit
  - Borrow area design
    - Composite statistics
QUESTIONS

Beau Suthard, PG
beau.suthard@aptim.com
727 374 2150
Expect the Extraordinary.