Nags Head 2019 Beach Renourishment Planning, Design, and Implementation
Presentation Outline

1 – 2011 Nourishment Performance
   • 4.6 million cubic yards along 10-mile Nags Head beach
     US largest locally funded nourishment
   • Withstood major hurricanes and storms
   • Lost 30% nourishment volume due to Hurricane Matthew (Oct 2016) – Qualified for FEMA community assistance funds

2 – 2019 Renourishment Needs, Purpose, and Goals
   • Replenish volume lost due to: (1) Chronic erosion
     (2) Hurricane Matthew

3 – 2019 Renourishment Planning, Design, and Implementation
   • 4 million cubic yards along the same 10-mile NH beach
   • 2 Offshore borrow areas
   • 110 Days of Pumping – 1 May to 18 August 2019
2011 Nourishment

- Permitted Volume = 4.6 million cy
- **Contract Volume = 4.6 million cy**
- Project length = 10 miles
- Fill density varies from north to south from 55 cy/ft to 165 cy/ft (Average fill density = 86 cy/ft)
- No dune construction
- 3 hopper dredges and 1 cutterhead dredge
- 2 Offshore borrow areas with state waters
- **156 Days** of Construction from 24 May to 27 October 2011
- Cost = ~$30.2 Million (~$6.56/cy)
2011 Project Performance – Before Hurricane Matthew

Actual annual erosion rates for the first 5 years have varied. Average erosion rate at 100,000 cy/yr (Nov 2011 to June 2016)
Hurricanes *Matthew* – 9 October 2016

- Maximum wind speed over 70 mph
- Significant wave height over 17 ft
1,431,653 cy of sand was lost due to Hurricane Matthew. Average erosion rate at ~360,000 cy/yr (Nov 2011 to Oct 2016)
Goals of the 2019 Renourishment

- Provide higher level of storm protection
- Provide wider recreational beach
- Address Nags Head’s south end erosion issue
- Integrate dune management plan into the renourishment design
- Replenish sand deficit in the “sand box”
- Maintain Nags Head’s eligibility for future FEMA community assistance funds
2019 Renourishment

- Permitted Volume = 4 million cy
- **Contract Volume = 4 million cy**
- Project length = 10 miles
- Fill density varies from north to south from 60 cy/ft to 155 cy/ft (Average fill density = 75 cy/ft)
- Initial dune construction along the south 2 miles
- Two borrow areas located 1.0-2.5 miles offshore within state waters
- 4 Bids received
- Two construction window (summer 2018 vs. summer 2019)
- Successful Bidder – GLDD
- Cost = ~$36.6 Million ($9.16/cy)
Key Dates of the Nags Head 2019 Renourishment

- June 2016 – Retained CSE to plan and design the renourishment project
- July 2016 to January 2017 – Meetings with the Town’s Shoreline Committee
- October 2016 – Hurricane *Matthew*
- By September 2017 – Geotechnical and Engineering Studies
- March & August 2017 – Interagency meetings
- September 2017 – Submitted permit application
- December 2017 – Received USFWS Biological Opinion
- February 2018 – Issued bid documents and received NCDCM CAMA permit
- March 2018 – Bid opening and received USACE permit
- July 2018 – The Town and GLDD executed the Agreement
- 1 May 2019 – First load was delivered by the dredge *Ellis Island*
- 18 August 2019 – Last load was completed by the dredge *Liberty Island*
- 30 August 2019 – Completion of demobilization
Hopper Dredge Used in the Project – *Ellis Island*

- America’s largest hopper dredge
- On site for 47 days from 1 May to 16 June 2019
- Delivered 1,765,360 cy (44% of project volume)
- Daily production rate at ~37,560 cy/day
Hopper Dredge Used in the Project – Liberty Island

- On site for 83 days from 28 May to 18 August 2019
- Delivered 2,234,640 cy (56% of project volume)
- Daily production rate at ~26,920 cy/day
Landing Points and Construction Sequence

- Eight Landing Points
  - Curlew Street (LI)
  - Epstein Street (LI)
  - Harvest Street (LI)
  - Islington Street (EI)
  - Dixie Street (LI)
  - Gull Street (LI)
  - Sea Bird Street (LI)
  - Limulus Street (EI)
Environmental Protection Measures

Protection of Endangered Species at Sea (by Contractor)

- Non-capture trawling sweeping
- Deflectors and specific equipment modification
- Endangered species monitor onboard dredges
- Dredging Quality Management (Silent Inspector)

Protection of Endangered Species on the Beach (By Town)

- Day time monitors (by Town)
- Night time monitors (by Town)
- Lighting, storage of equipment, escarpment, etc (by Contractor)
Typical Fill Sections by Reach

- **Average Fill Density**
  - R1 = 60 cy/ft
  - R2 = 65 cy/ft
  - R3N = 113 cy/ft
  - R3S = 155 cy/ft
  - R4 = 155 cy/ft

- **Dune Construction**
  - R3N, R3S & R4
## Design Volume, Placed Volume, and CSE Confirmed Volume

<table>
<thead>
<tr>
<th>Reach</th>
<th>Design Volume (cy)</th>
<th>Placed Volume (cy)</th>
<th>Difference (%)</th>
<th>CSE Confirmed Volume (cy)</th>
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After Nourishment
“Tidal Pool”
After Nourishment – Escarpments

16 June 2019
(Photo by Town Engineer David Ryan)

16 August 2019
(Photo by Town Manager Cliff Ogburn)
Sediment Quality

- Sand samples were collected every 500 ft along nourished sections

- Mean grain size
  - Native beach = 0.402 mm
  - BA 3A = 0.362 mm
  - BA 4 = 0.376 mm
  - Nourished beach = 0.373 mm

- Shell Content
  - Native beach = ~2%
  - Nourished beach = ~2%
Selected Construction Photos and Videos