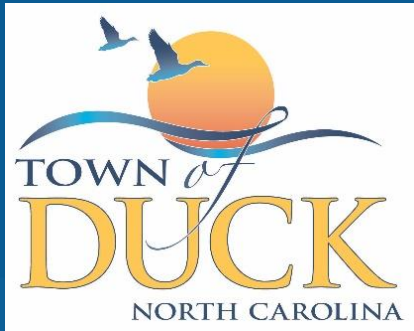


# GETTING TOGETHER TO GET IT DONE: HOW COMMUNITIES IN DARE COUNTY ARE WORKING TOGETHER TO SUSTAIN THEIR BEACHES

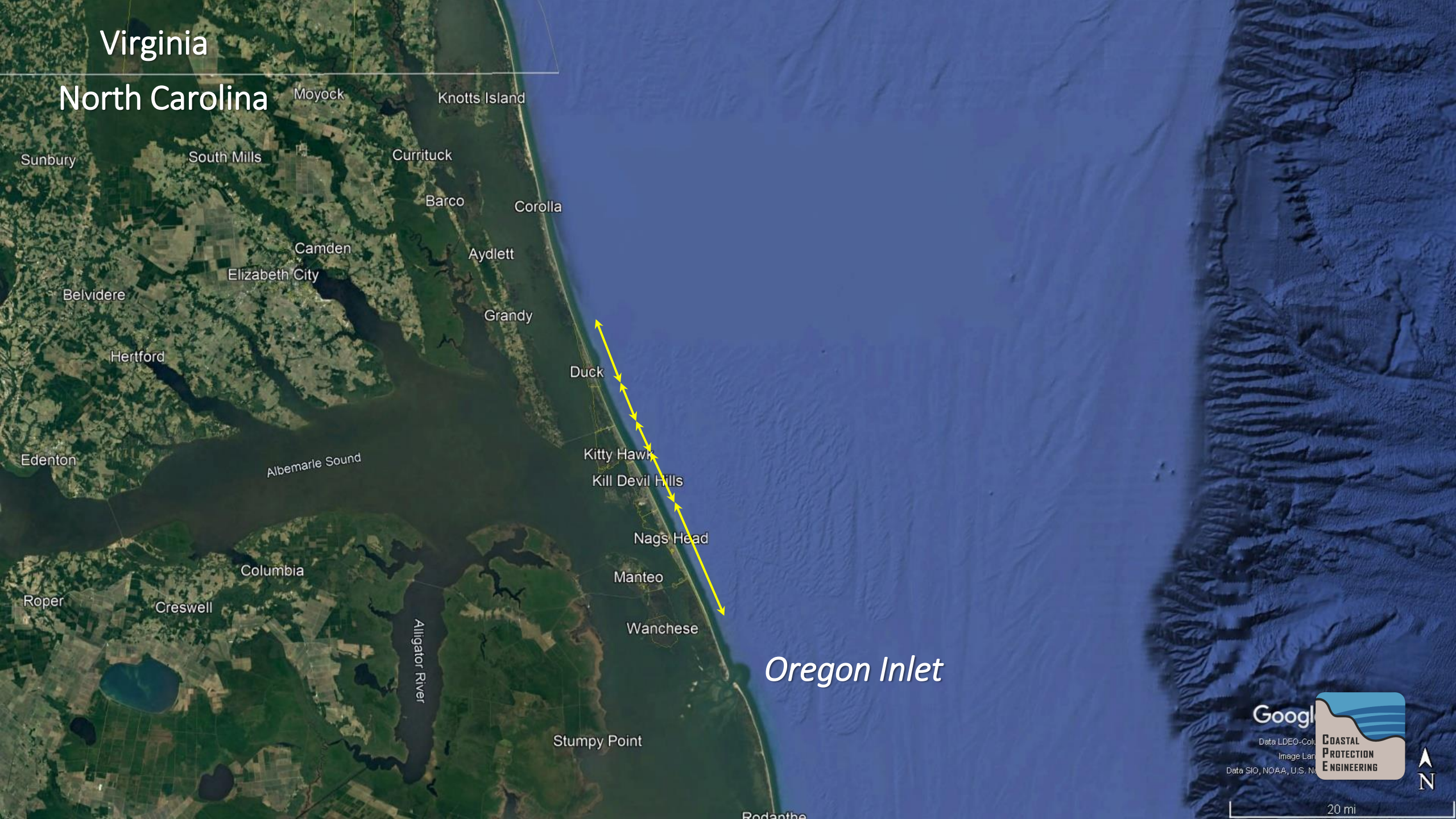


2023 NCBIWA Fall Conference  
Ken Willson  
[Kwillson@CoastalProtectionEng.com](mailto:Kwillson@CoastalProtectionEng.com)

COASTAL  
PROTECTION  
ENGINEERING



# Virginia North Carolina



*Oregon Inlet*



20 mi



Large  
Structures  
Threatened



Ocean Overwash Flooding



Homes Threatened



Houses On Recreational Beach

Exposed Piles  
and Sand Bags



# DARE COUNTY MULTI-TOWN BEACH NOURISHMENT PROJECT

- 2000 – Congress Authorizes a Dare County Beaches Federal project Authorized
- 2005 – Nags Head begins feasibility analysis
- 2011 – Nags Head constructs it's first project with assistance from Dare County
- 2012 – Duck and Kill Devil Hills begin feasibility analysis
- February 2013 – First Joint Meeting Kill Devil Hills / Kitty Hawk
- June 2013 – Kitty Hawk Feasibility / Inter-Agency Meeting (3-Towns and County)
- Initial Estimates – 14% - 17% Cost Savings by Combining Projects
- Fall 2013 – County Formulates 1st Cost Sharing Model
- Equitable Cost Sharing (Towns)
- January 2014 – June 2016 – Design and Permitting

# 2017 INITIAL CONSTRUCTION OF MULTI-TOWN PROJECT



- 4-Towns collaborative effort
- No Federal / No State Funding
- Addressed Town-specific project goals & collaborate to achieve cost savings
- Initial construction May through October 2017
- 8 miles of beach / 4 Million CY
- \$40 Million

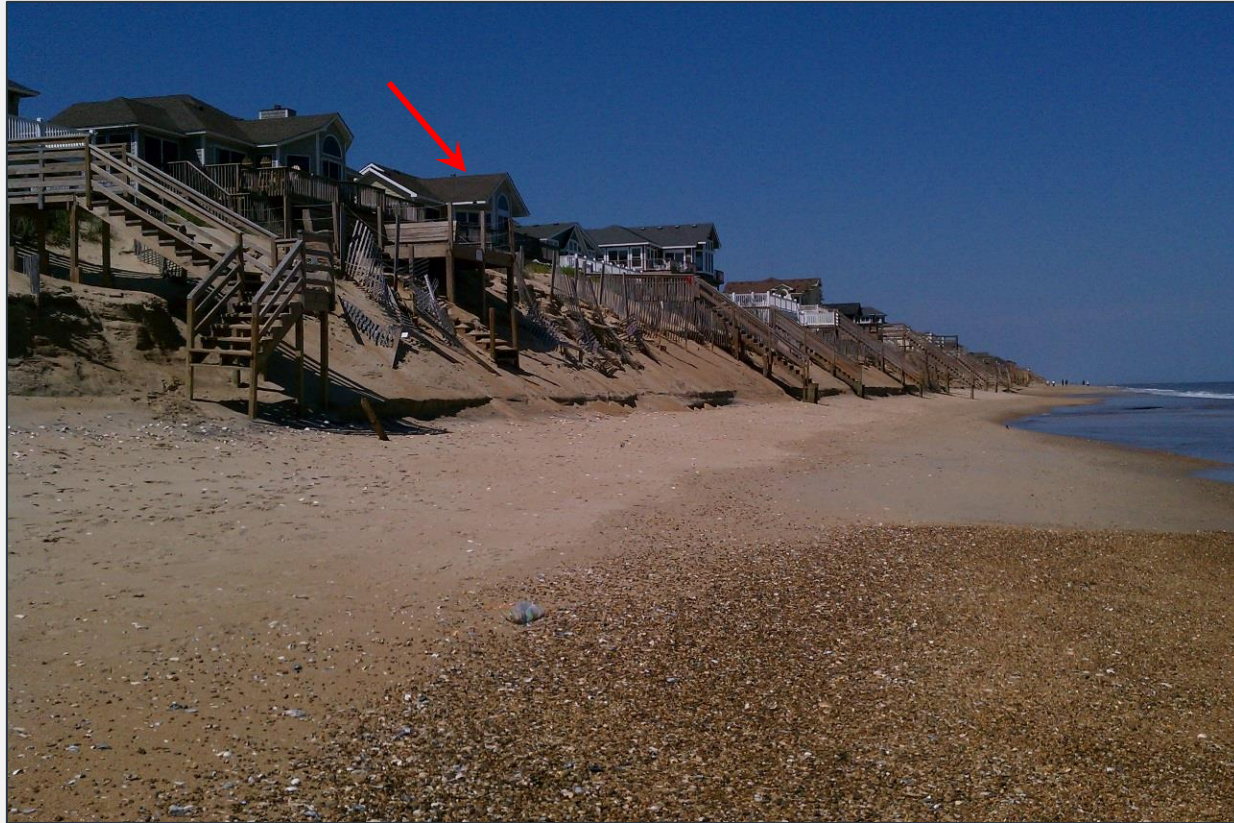


# 2017 INITIAL CONSTRUCTION OF MULTI-TOWN PROJECT





# BEFORE & AFTER: TOWN OF DUCK



March 28, 2012



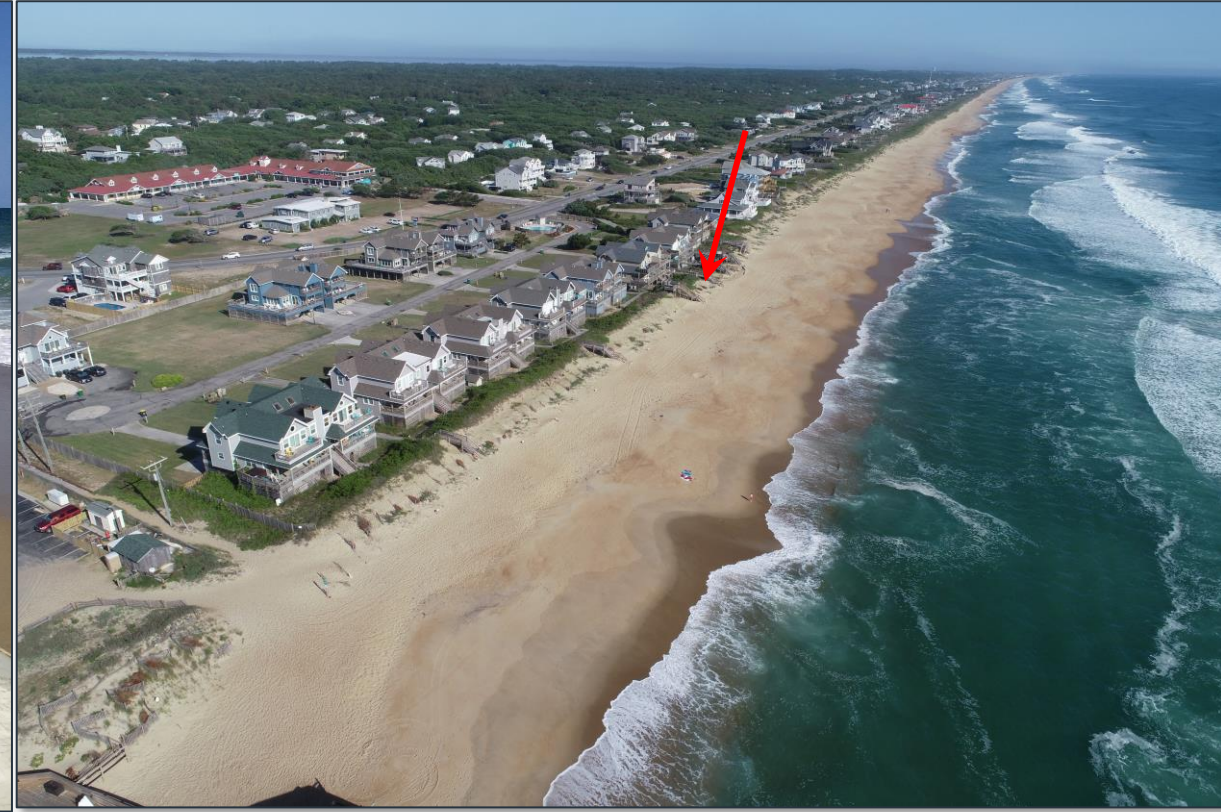
February 18, 2020



# BEFORE & AFTER: TOWN OF SOUTHERN SHORES



July 26, 2017



May 19, 2021



# BEFORE & AFTER: TOWN OF KITTY HAWK



November 21, 2006



April 2018



# BEFORE & AFTER: TOWN OF KITTY HAWK



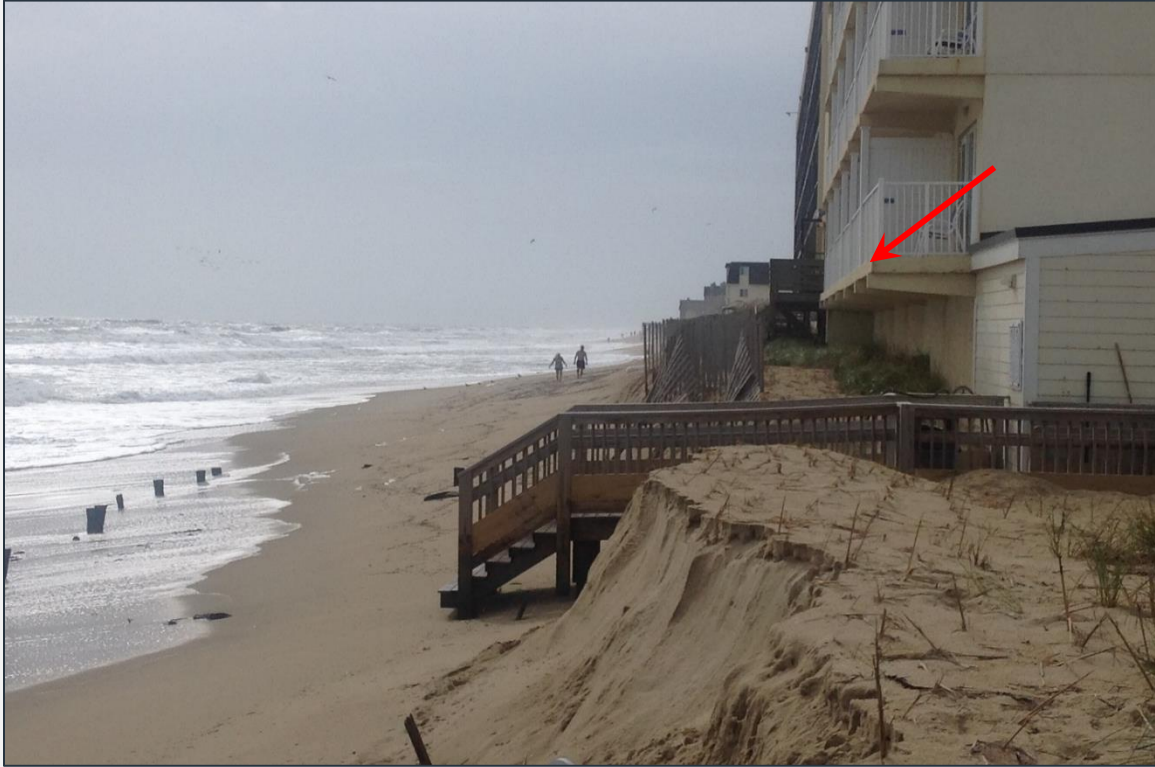
October 22, 2015



December 16, 2019



# BEFORE & AFTER: TOWN OF KILL DEVIL HILLS



September 28, 2015



January 6, 2020





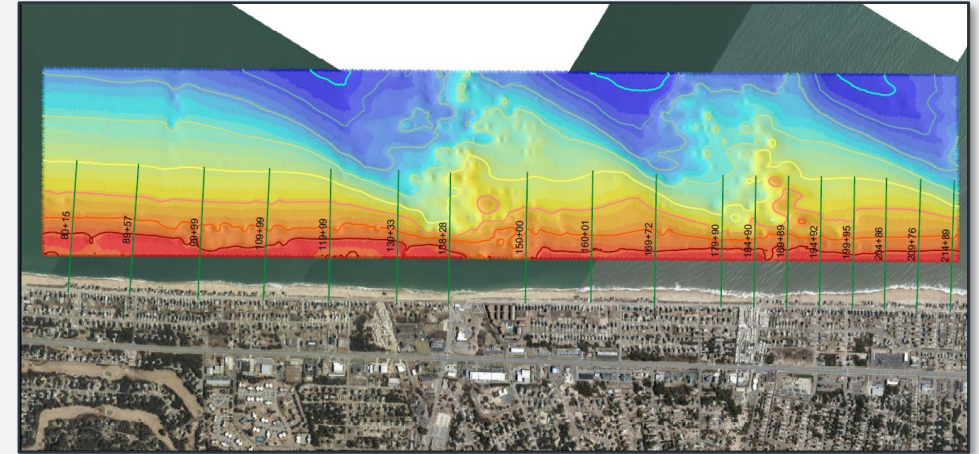
## 2018 Best Restored Beach Outer Banks, North Carolina



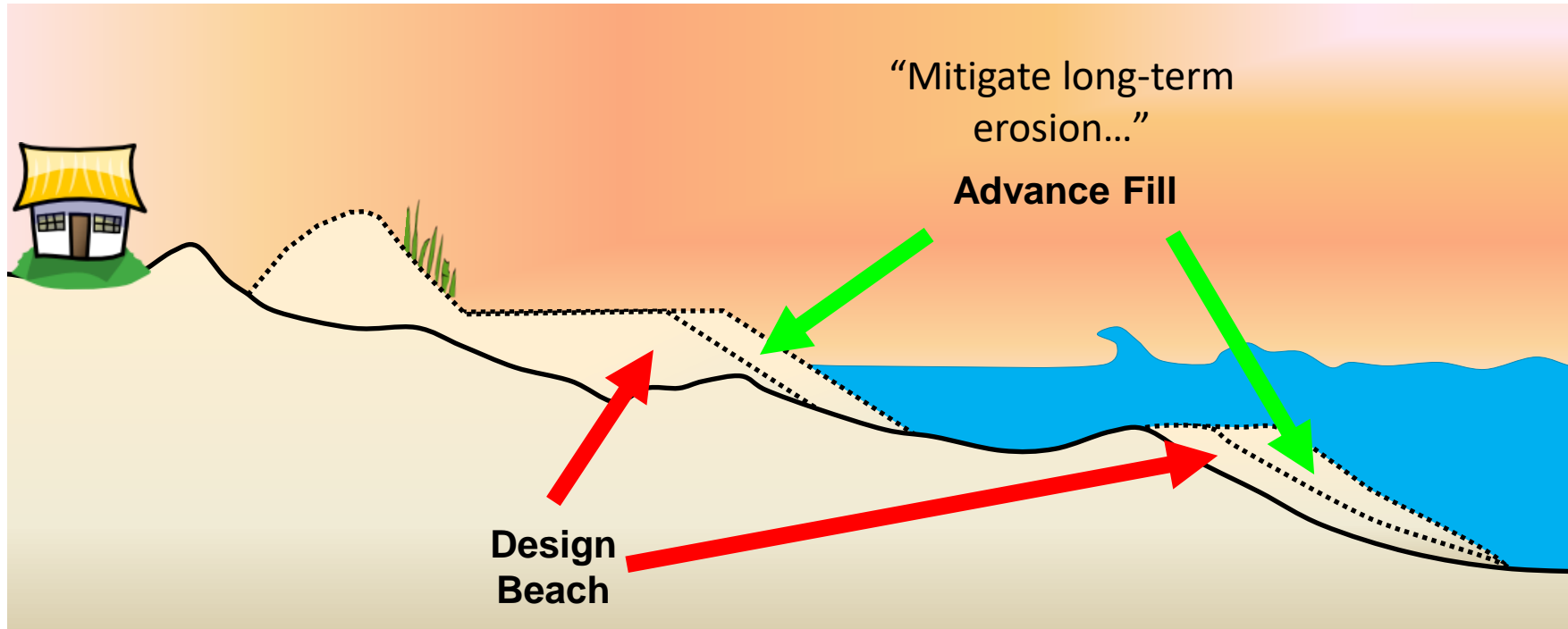


# BEGIN ADAPTIVE MANAGEMENT

- Annual beach monitoring
- Monitoring of profiles with anomalous offshore bathymetry
- Town of Duck and Kitty Hawk eroded at a rate higher than anticipated
- Kill Devil Hills held up better than anticipated
- Hot-Spot erosion in locations in Kitty Hawk and Kill Devil Hills
- Feasibility analysis for Town of Southern Shores
- Hurricane Dorian Impacted Duck and Kill Devil Hills Projects

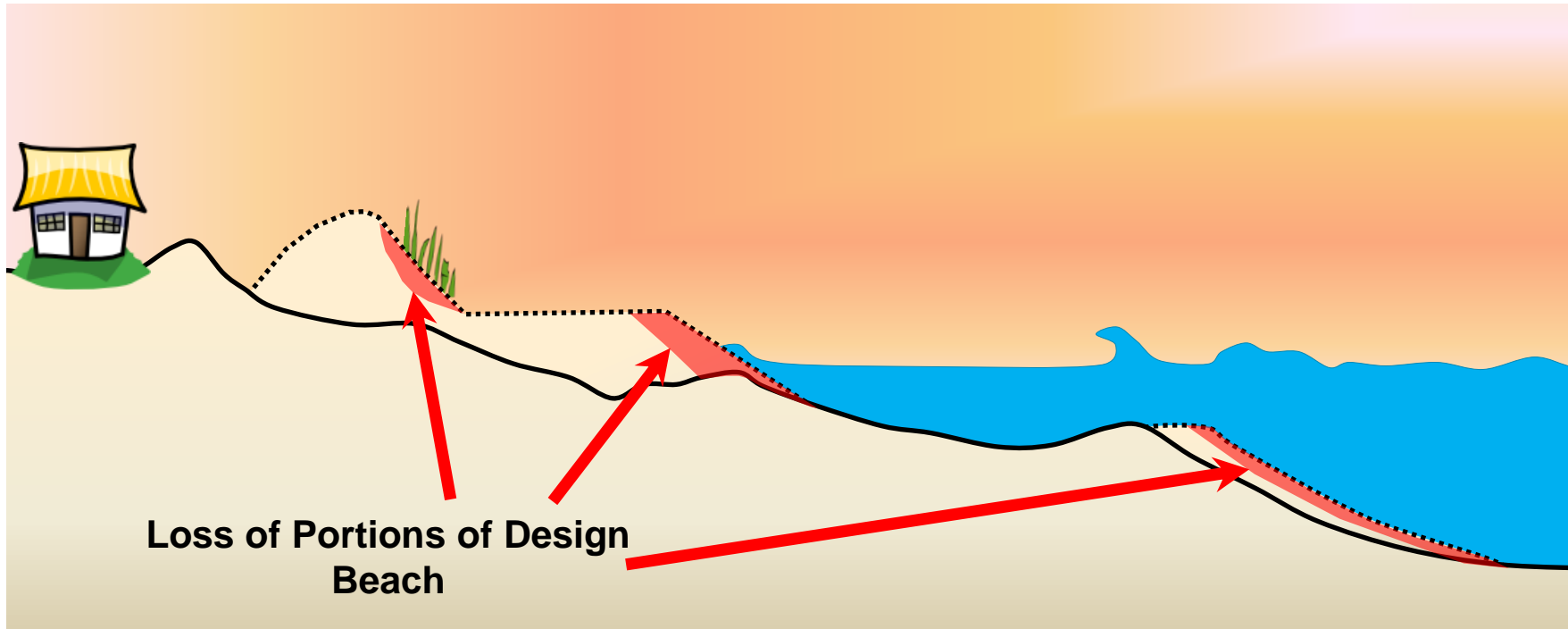


# Town of Duck Project Design:



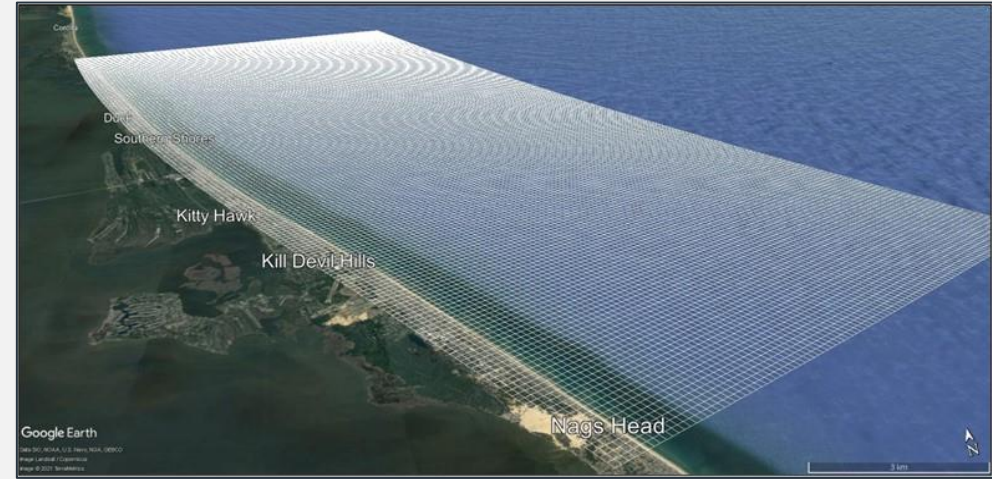


# Town of Duck Project Design:

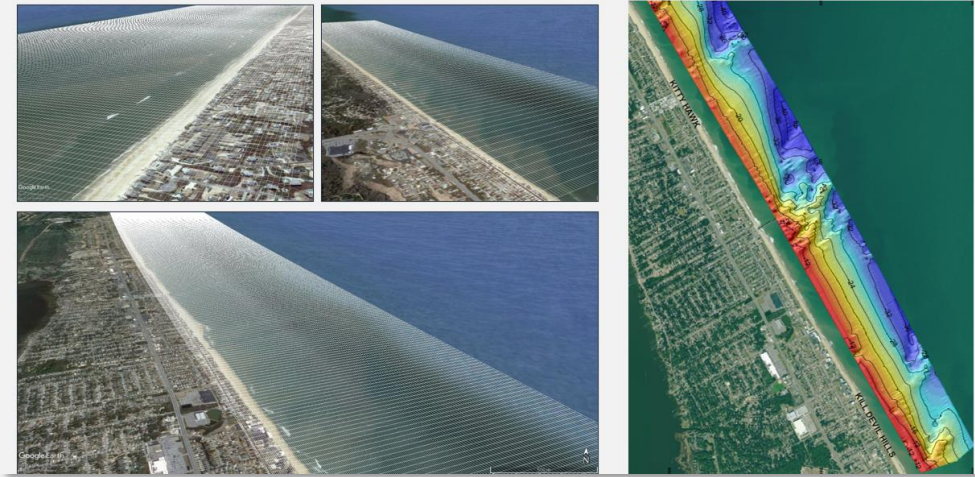


# DELFT3D MORPHOLOGY OVERVIEW

- Fully integrated waves-flow-sediment transport and morphology developed by TU Delft/Deltares
- Constantly being upgraded: *i.e.* new model features and formulations, flexible mesh version, H&H processes
- Future developments are leaning towards coupling it with wind transport for dune growth and vegetation growth and decay for living shorelines/marsh simulations



Regional  
Wave  
Model



Local High-  
Res  
Morphology  
Model



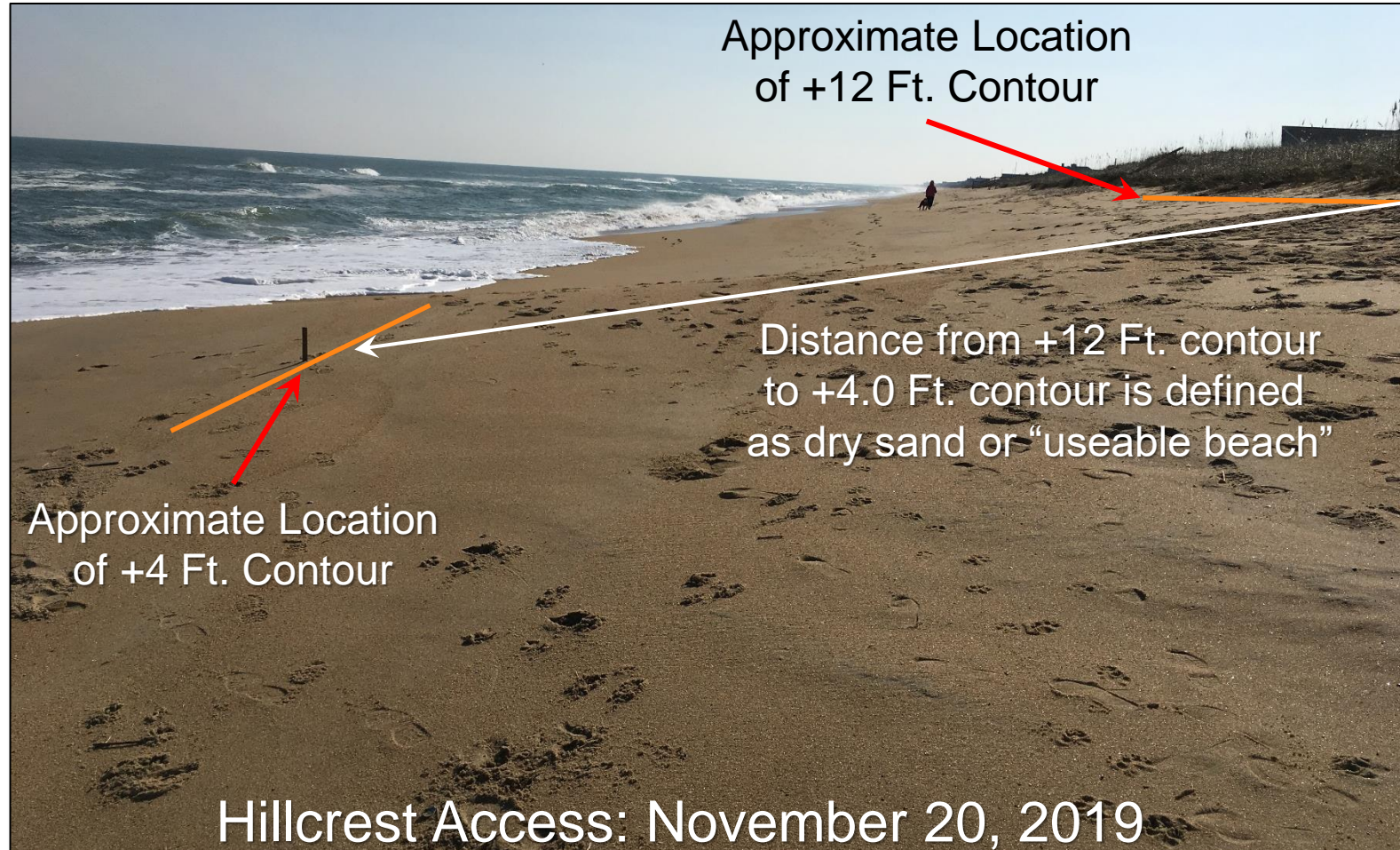


# TOWN OF SOUTHERN SHORES PROJECT DESIGN:

- Design Goals
  1. Reasonable level of storm damage reduction
  2. Mitigate long-term erosion
  3. Maintain a healthy beach that provides sufficient useable beach and support shorebird and sea turtle nesting habitat
- Project Split Into 2 Design Segments
- South of 4<sup>th</sup> Ave. - Classic Advanced Fill and Design Cross Section Concept
- Advanced Fill Based on 5 Year Renourishment Interval
- North of 4<sup>th</sup> Ave. – Fill designed to maintain a beach that achieves Goal 3



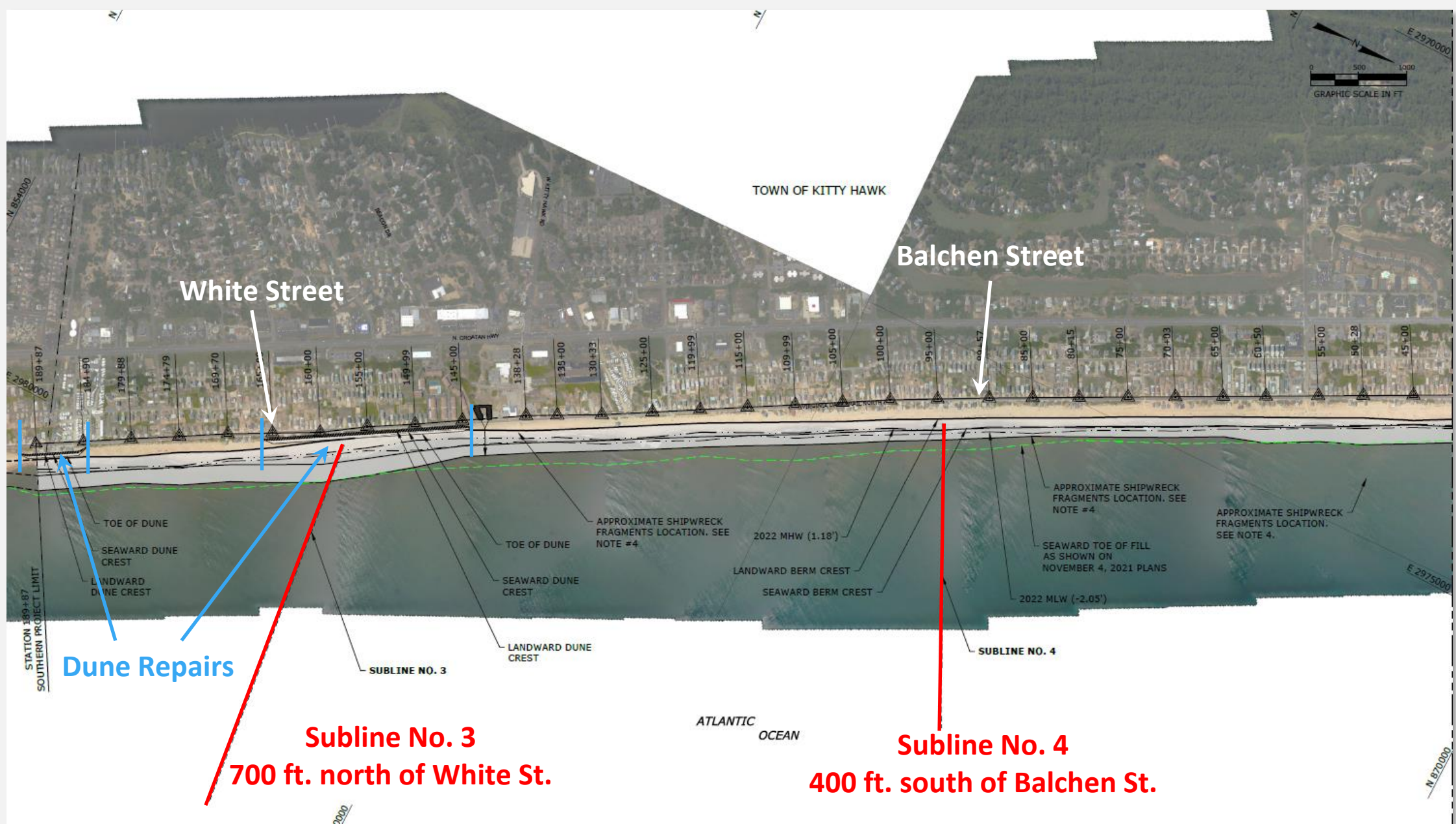
# USEABLE BEACH WIDTH:



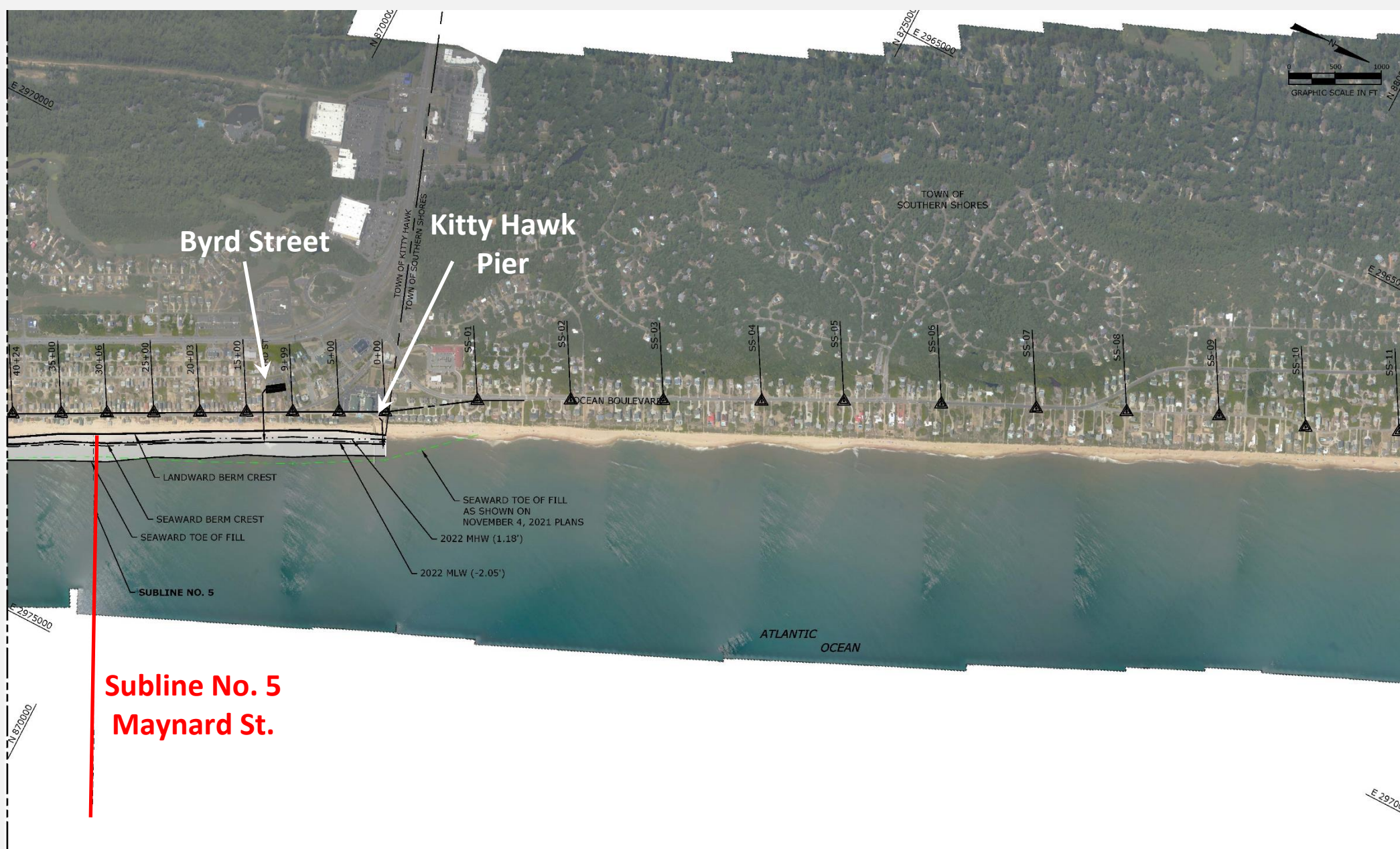
# TOWN OF KITTY HAWK PROJECT DESIGN:

- Kitty Hawk Beach Nourishment Design
  - Re-establish portions of design fill that eroded (276,400 cy)
  - Repair portion of dune at southern boundary and south of Kitty Hawk Road (6,200 cy)
  - Uniform distribution of 19 cy/ft of fill along the project area (360,800 cy)
  - Additional fill to address anticipated hot spot erosion in 2 areas (106,600 cy)
- Advanced Fill Based on 5 Year Renourishment Interval









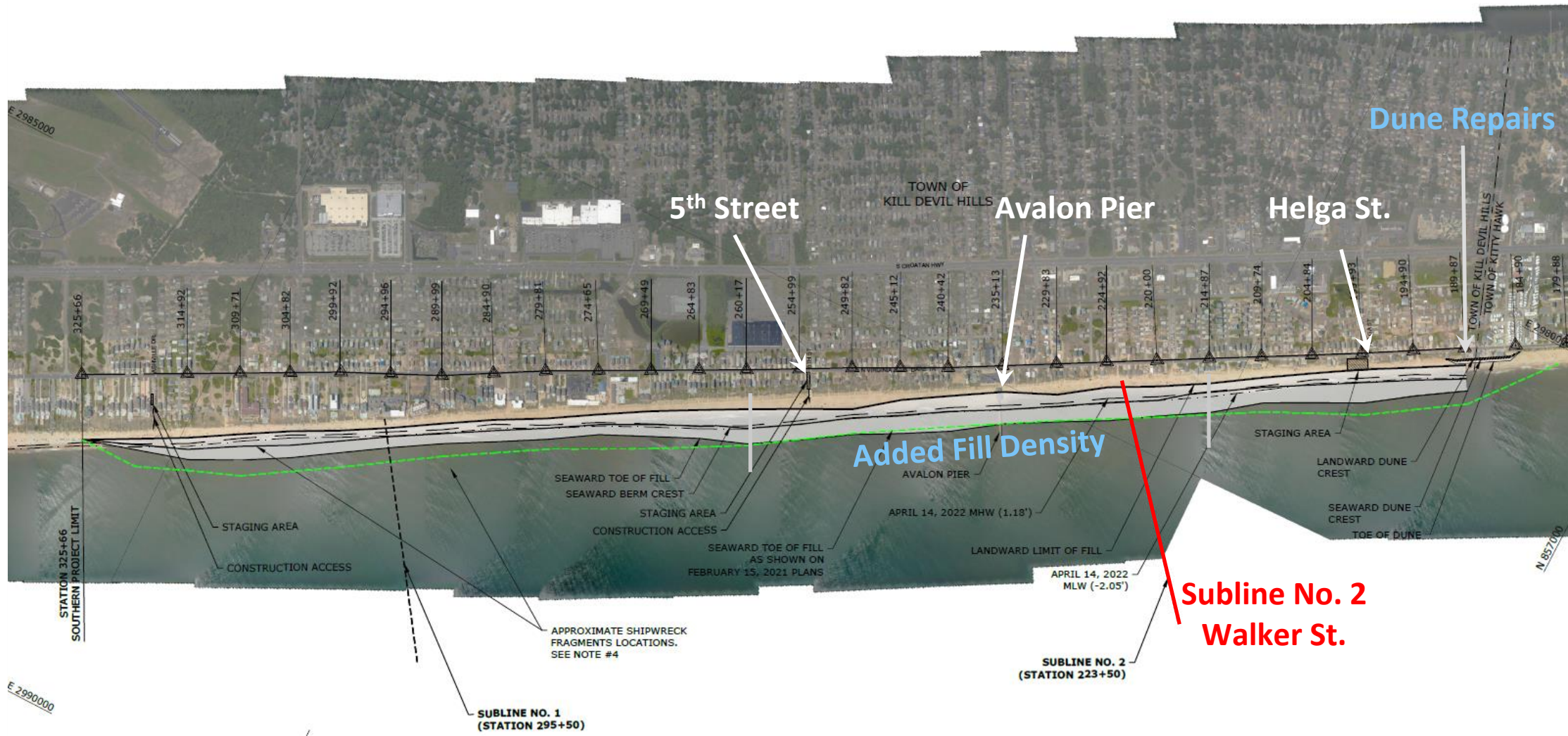
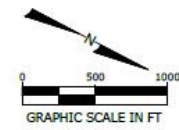


# TOWN OF KILL DEVIL HILLS PROJECT DESIGN:

- Re-establish portions of design fill that eroded (102,000 cy)
- Repair portion of dune at northern portion of project (400 cy)
- Uniform distribution of 24 cy/ft of fill along the project area (300,000 cy)
- Additional fill to address anticipated hot spot erosion between Hayman and 5<sup>th</sup> St. (75,000 cy)
- 1,074 Taper on south end (27,600 cy)
- Advanced Fill Based on 5 Year Renourishment Interval



# TOWN OF KILL DEVIL HILLS PROJECT DESIGN:





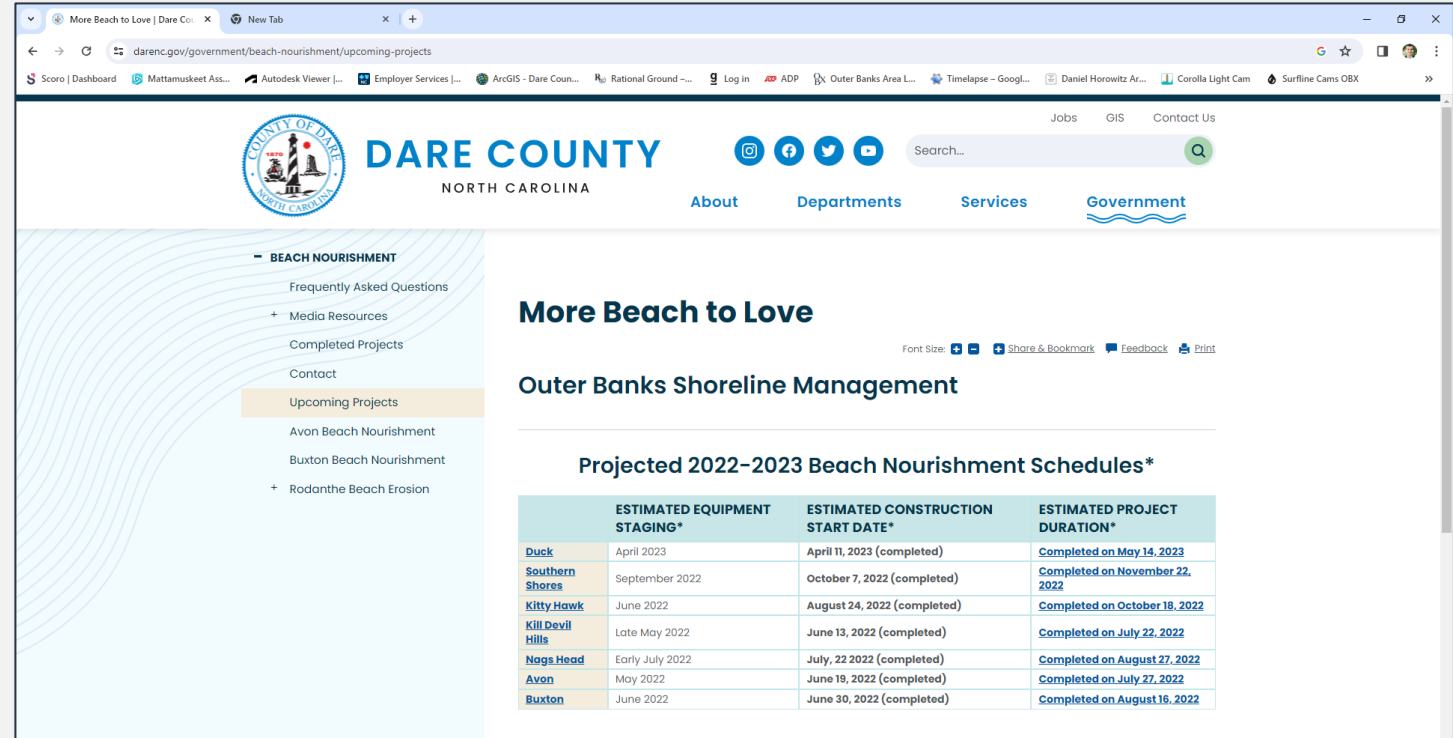
# MULTI-TOWN PERMITTING

- 1 Batched Environmental Assessment (EA)
- 1 Batched Essential Fish Habitat assessment (EFH)  
Duck Harbor  
End – Mid October (~30 days)
- SARBO used for NMFS Consultation
- 4 Separate CAMA Major Permits
- 4 Separate Dept. of Army Permits
- 4 Separate 401 WQ Cert.
- 1 BOEM Lease for Borrow Area



# MULTI-TOWN PLANNING

- Early Bidding
- Formal Notifications of Rental Companies
- Public Outreach Meetings with Contractors, Towns, Realtors, Public
- Website Tracking



The screenshot shows the Dare County website with the following content:

**DARE COUNTY**  
NORTH CAROLINA

Navigation links: About, Departments, Services, Government

**BEACH NOURISHMENT**

- Frequently Asked Questions
- Media Resources
- Completed Projects
- Contact
- Upcoming Projects**
- Avon Beach Nourishment
- Buxton Beach Nourishment
- Rodanthe Beach Erosion

**More Beach to Love**

Outer Banks Shoreline Management

Projected 2022-2023 Beach Nourishment Schedules\*

	ESTIMATED EQUIPMENT STAGING*	ESTIMATED CONSTRUCTION START DATE*	ESTIMATED PROJECT DURATION*
<b>Duck</b>	April 2023	April 11, 2023 (completed)	Completed on May 14, 2023
<b>Southern Shores</b>	September 2022	October 7, 2022 (completed)	Completed on November 22, 2022
<b>Kitty Hawk</b>	June 2022	August 24, 2022 (completed)	Completed on October 18, 2022
<b>Kill Devil Hills</b>	Late May 2022	June 13, 2022 (completed)	Completed on July 22, 2022
<b>Nags Head</b>	Early July 2022	July 22, 2022 (completed)	Completed on August 27, 2022
<b>Avon</b>	May 2022	June 19, 2022 (completed)	Completed on July 27, 2022
<b>Buxton</b>	June 2022	June 30, 2022 (completed)	Completed on August 16, 2022



# BREAK DOWN OF VARIOUS COSTS

Project Funding Source	Town of Duck (494,000 CY)	Town of Southern Shores (894,500 CY)	Town of Kitty Hawk (750,000 CY)	Town of Kill Devil Hills (505,000 CY)	Total
Town Contribution	\$2,375,000	\$5,546,000	\$5,020,000	\$593,000	\$13,534,000
Dare County Contribution	\$797,000	\$4,371,000	\$2,855,000	\$691,000	\$8,714,000
NC CSDR Fund	\$1,451,000	\$1,408,000	\$1,408,000	\$1,451,000	\$5,718,000
FEMA	\$2,426,000	\$0	\$0	\$3,638,000	\$6,064,000
<b>TOTALS:</b>	<b>\$7,049,000</b>	<b>\$11,325,000</b>	<b>\$9,283,000</b>	<b>\$6,373,000</b>	<b>\$34,030,000</b>

# 2022/2023 CONSTRUCTION

- Start June 13, 2022 – Kill Devil Hills (38 days)
- Start July 21, 2022 – No Dredging (34 days)
- Start August 25, 2022 – Kitty Hawk (62 days)
- Start October 7, 2022 – Town of Southern Shores (46 days)
- November 23, 2022 to April 12, 2023 – No Dredging (140 days)
- Start April 13, 2023 – Duck (25 days)
- Start May 9, 2023 – Added Southern Shores Fill (3 days)
- Munitions & Explosives of Concern (MEC)
- Sand Fencing





**DUCK**



**SOUTHERN SHORES**



**KITTY HAWK**

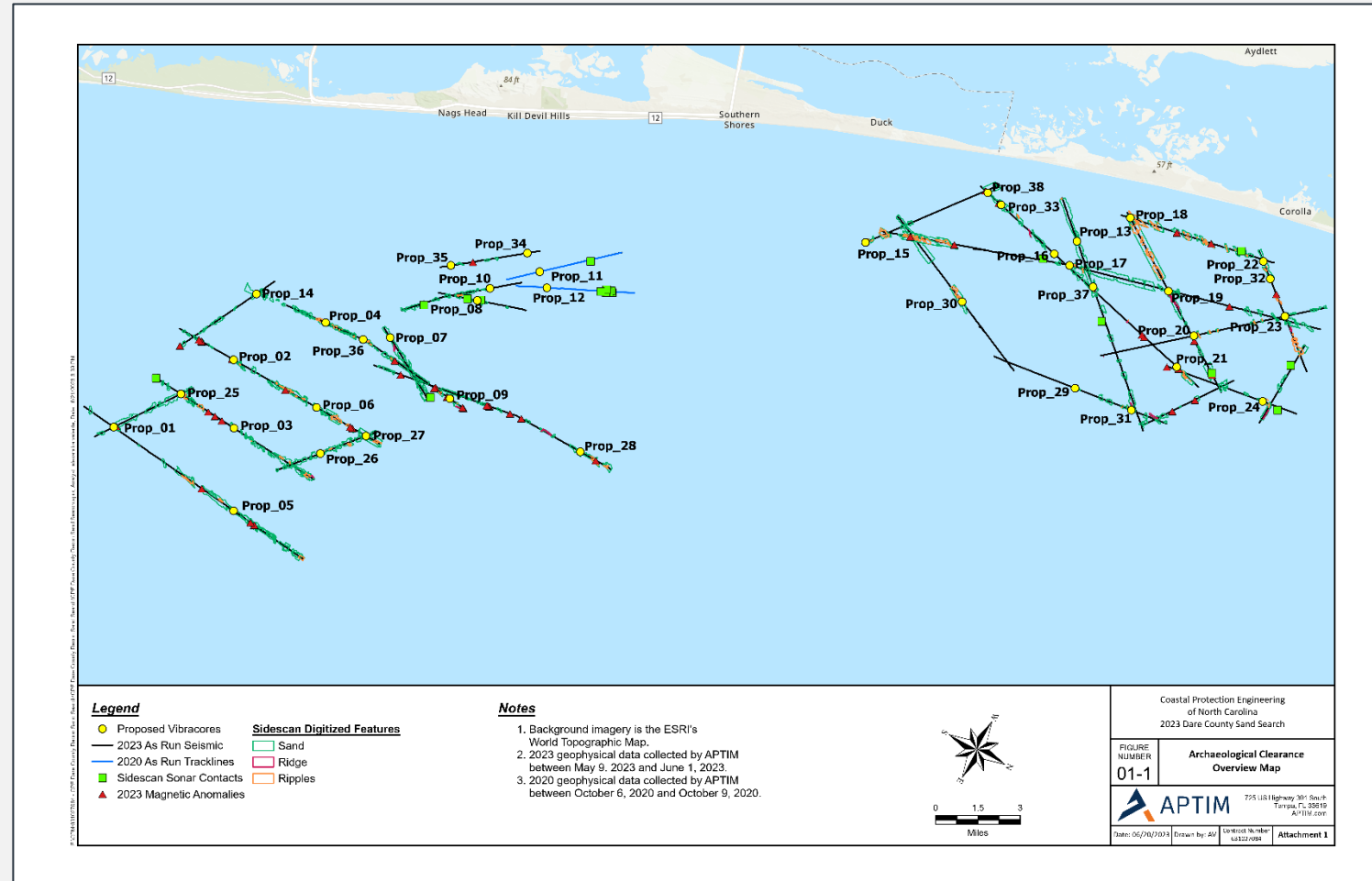


**KILL DEVIL HILLS**



# A LOOK AHEAD...

- Post-Con Baseline Surveys
- Annual Monitoring Surveys
- Optimizing Design
- Consideration of extending maintenance interval
- Beach Maintenance Plans
- Regional Sand Investigations – Long-Term Sand Resources





# THANK YOU



Ken Willson

[Kwillson@CoastalProtectionEng.com](mailto:Kwillson@CoastalProtectionEng.com)