GETTING THE MOST OUT OF MONITORING AND MODELING DATA: DESIGNING FOR THE 1ST RE-NOURISHMENT OF THE MULTI-TOWN PROJECT IN DARE COUNTY, NC

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FSBPA 35th Annual National Conference on Beach Preservation Technology
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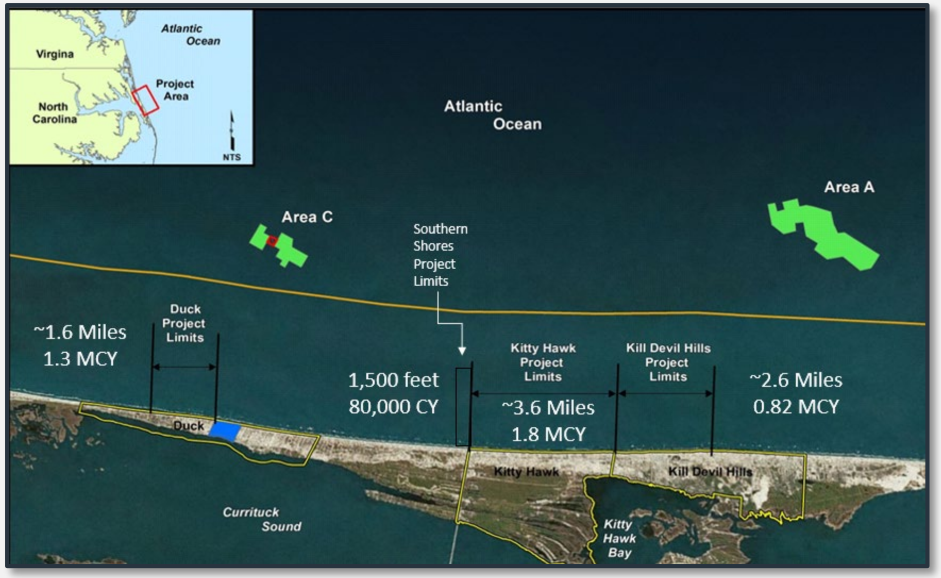
St Augustine, FL

BACKGROUND



- 4-Towns collaborative effort
- Non-federal / minimal state funding
- Address Town-specific project goals & collaborate to achieve cost savings
- Initial construction 2017
- 8 miles of beach / 4 Million CY
- $40 Million

BACKGROUND

- 2017 - Post-con monitoring began
- 2019 - Hurricane Dorian impacts
- 2020 - Town of Southern Shores added
- 2020 - 2021 – Design and permitting
- May 2022 - Anticipated construction start

APPLICATION OF MONITORING AND MODELING TECHNIQUES – ENHANCE PERFORMANCE

- Unique offshore geomorphology - modified monitoring techniques
- Numerical modeling - conducted jointly with the 4 Towns
- Modeling and monitoring results incorporated into unique designs
- Novel approach to post-storm assessments - drones

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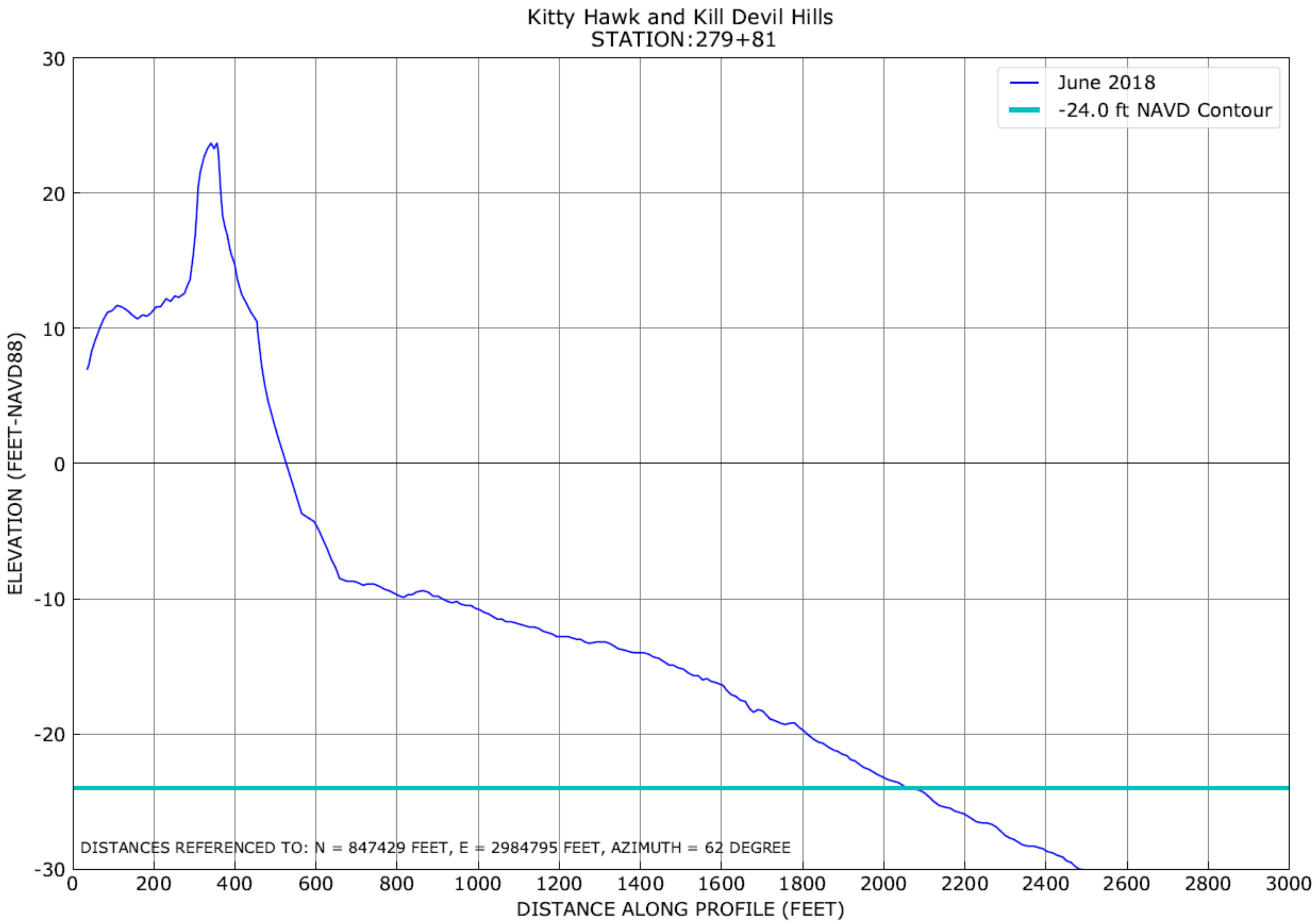

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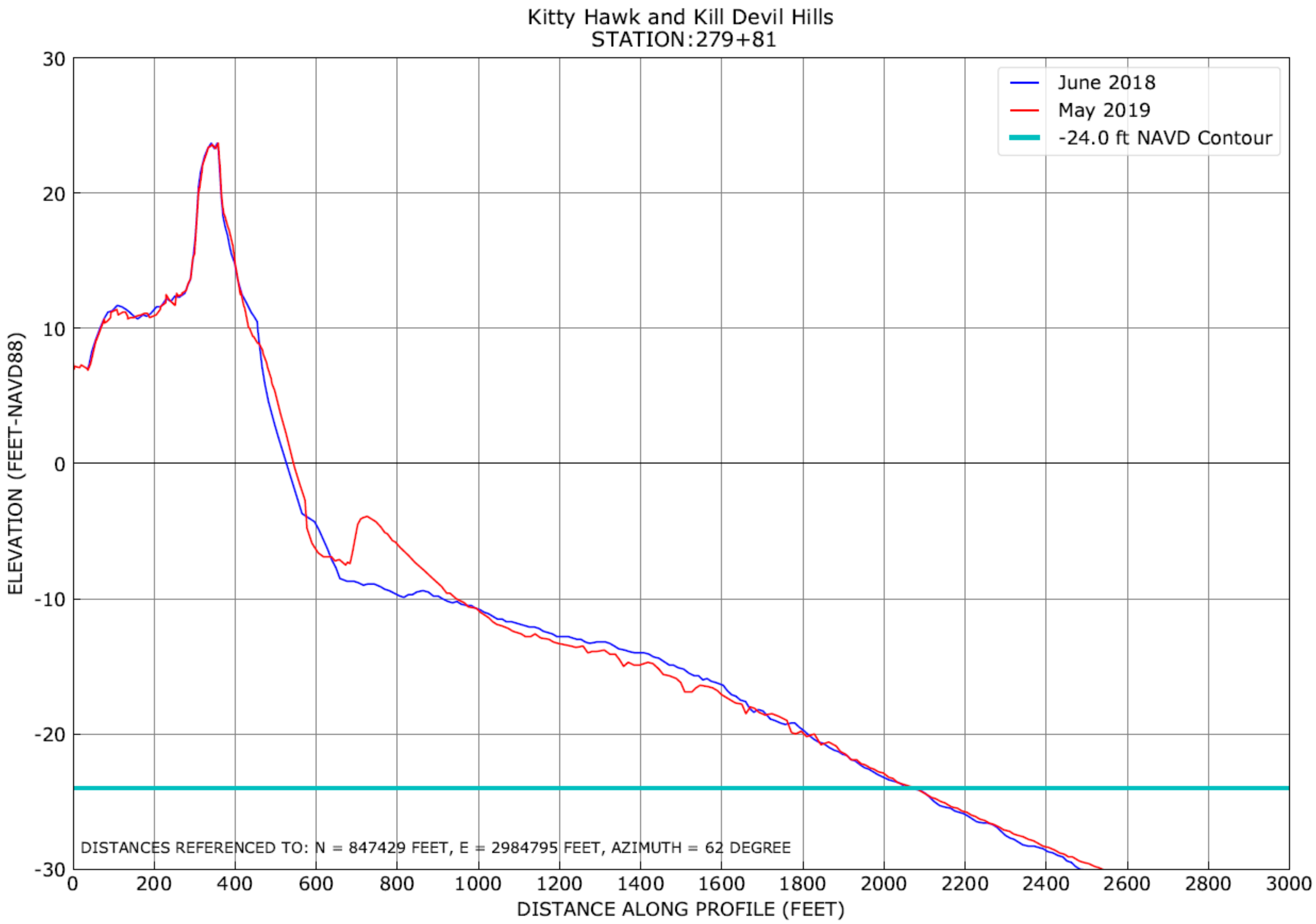

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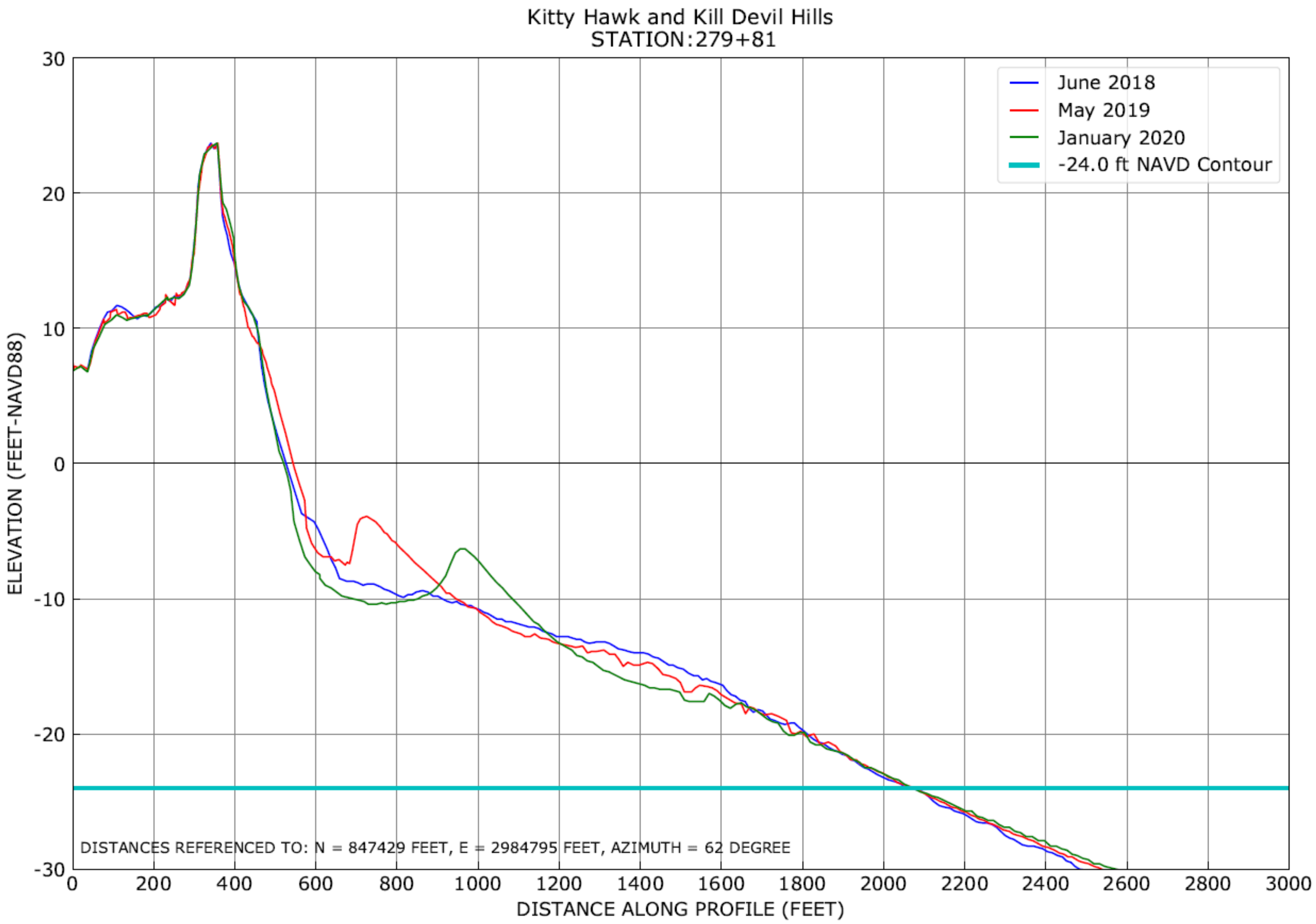

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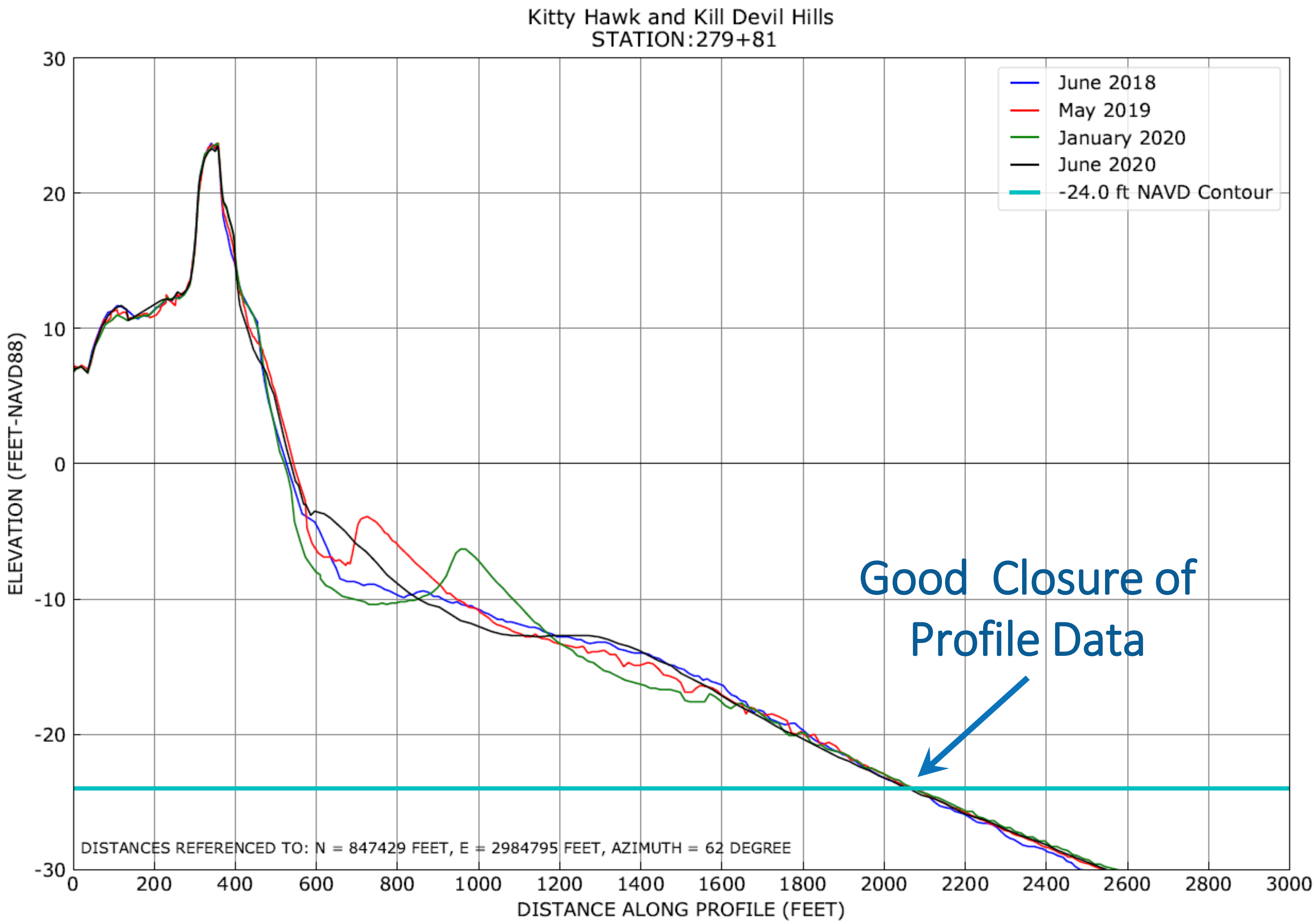
Kitty Hawk and Kill Devil Hills
STATION:279+81
June 2018
May 2019
January 2020
June 2020
-24.0 ft NAVD Contour
ELEVATION (FEET-NAVD88)
DISTANCE ALONG PROFILE (FEET)
DISTANCES REFERENCED TO: N = 847429 FEET, E = 2984795 FEET, AZIMUTH = 62 DEGREE
30
20
10
0
-10
-20
-30
0
200
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1400
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1800
2000
2200
2400
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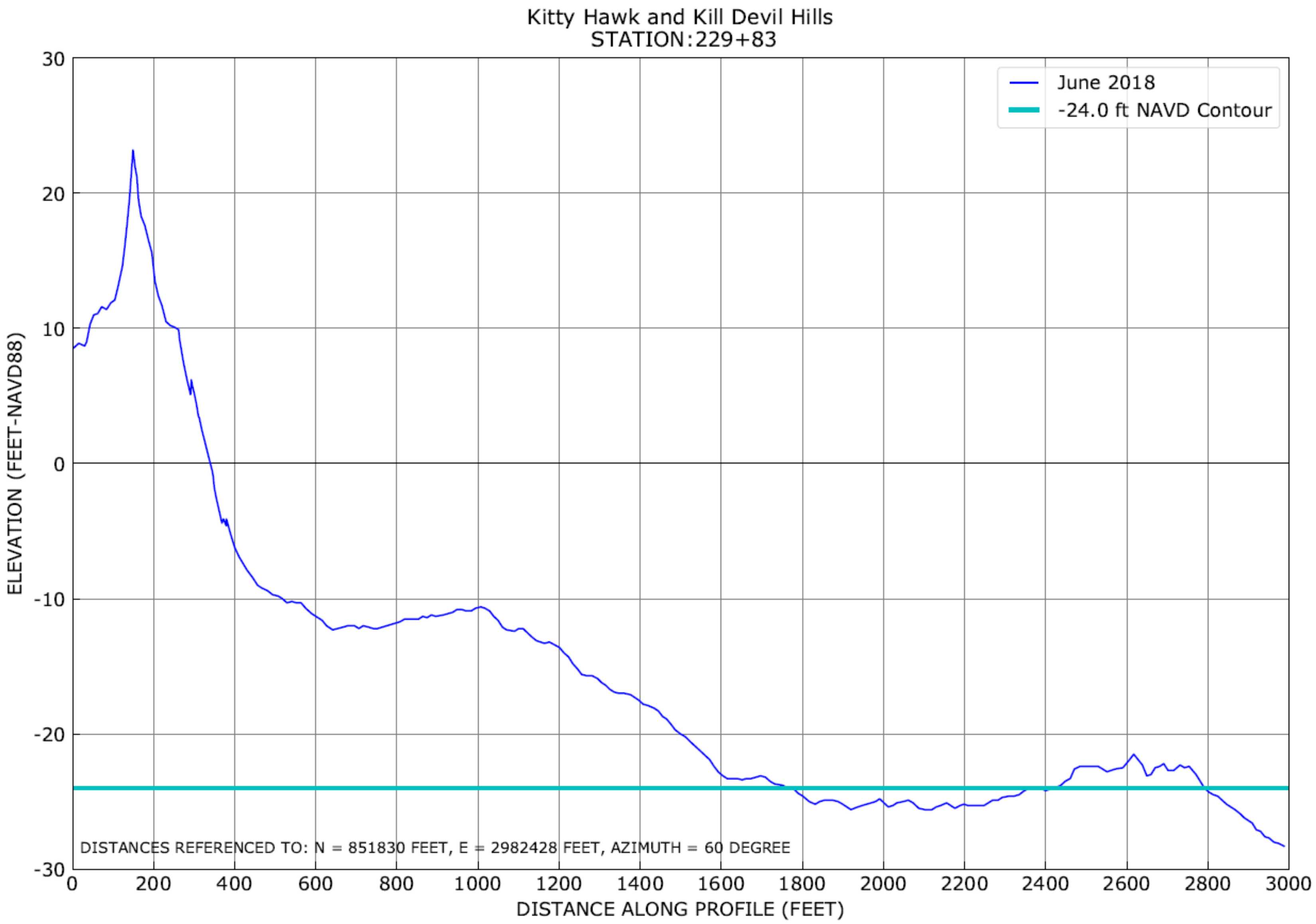
3000
Good Closure of
Profile Data



Kitty Hawk and Kill Devil Hills
STATION:229+83
June 2018
-24.0 ft NAVD Contour
ELEVATION (FEET-NAVD88)
30
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-10
-20
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2200
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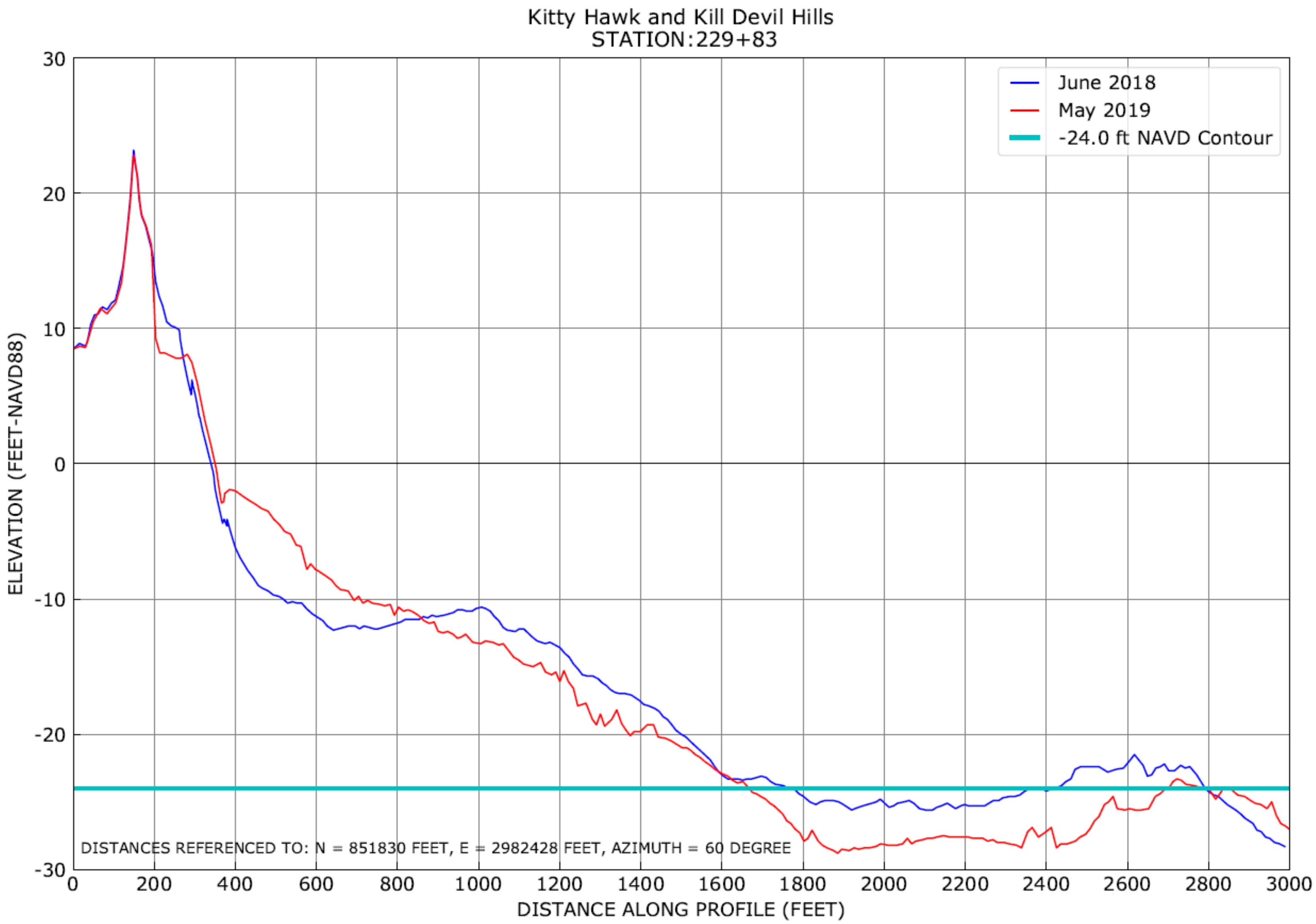
DISTANCE ALONG PROFILE (FEET)
DISTANCES REFERENCED TO: N = 851830 FEET, E = 2982428 FEET, AZIMUTH = 60 DEGREE



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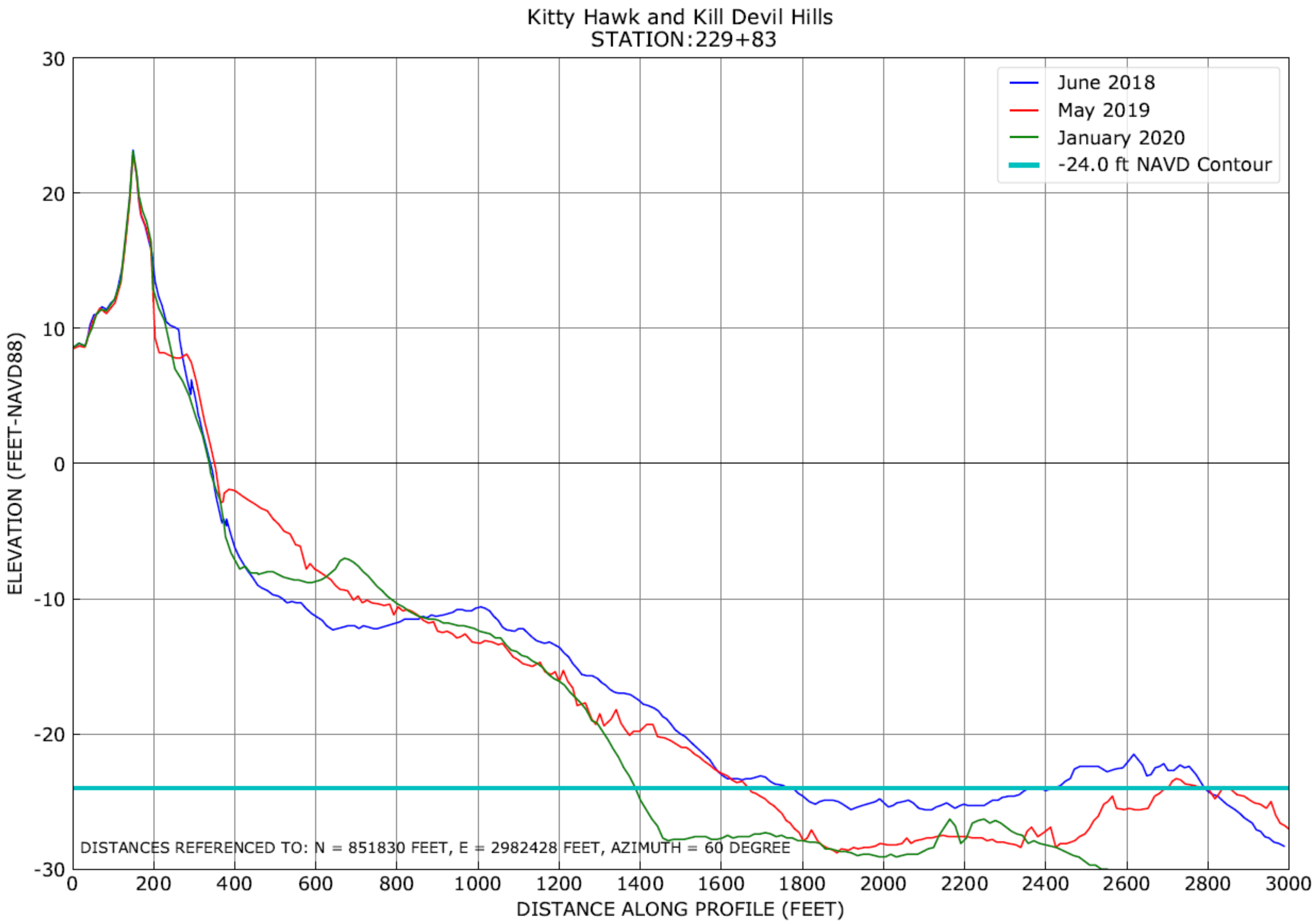

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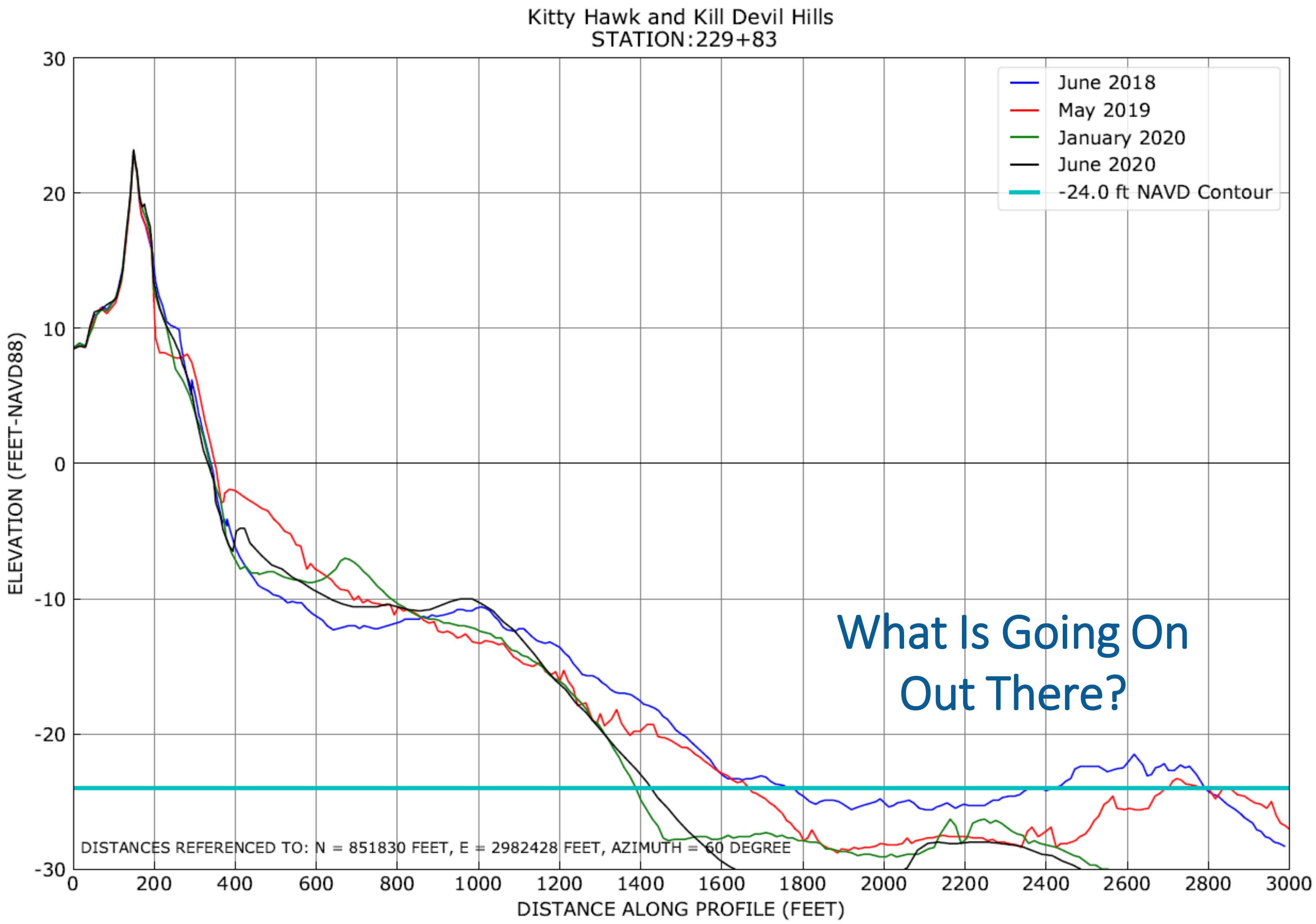
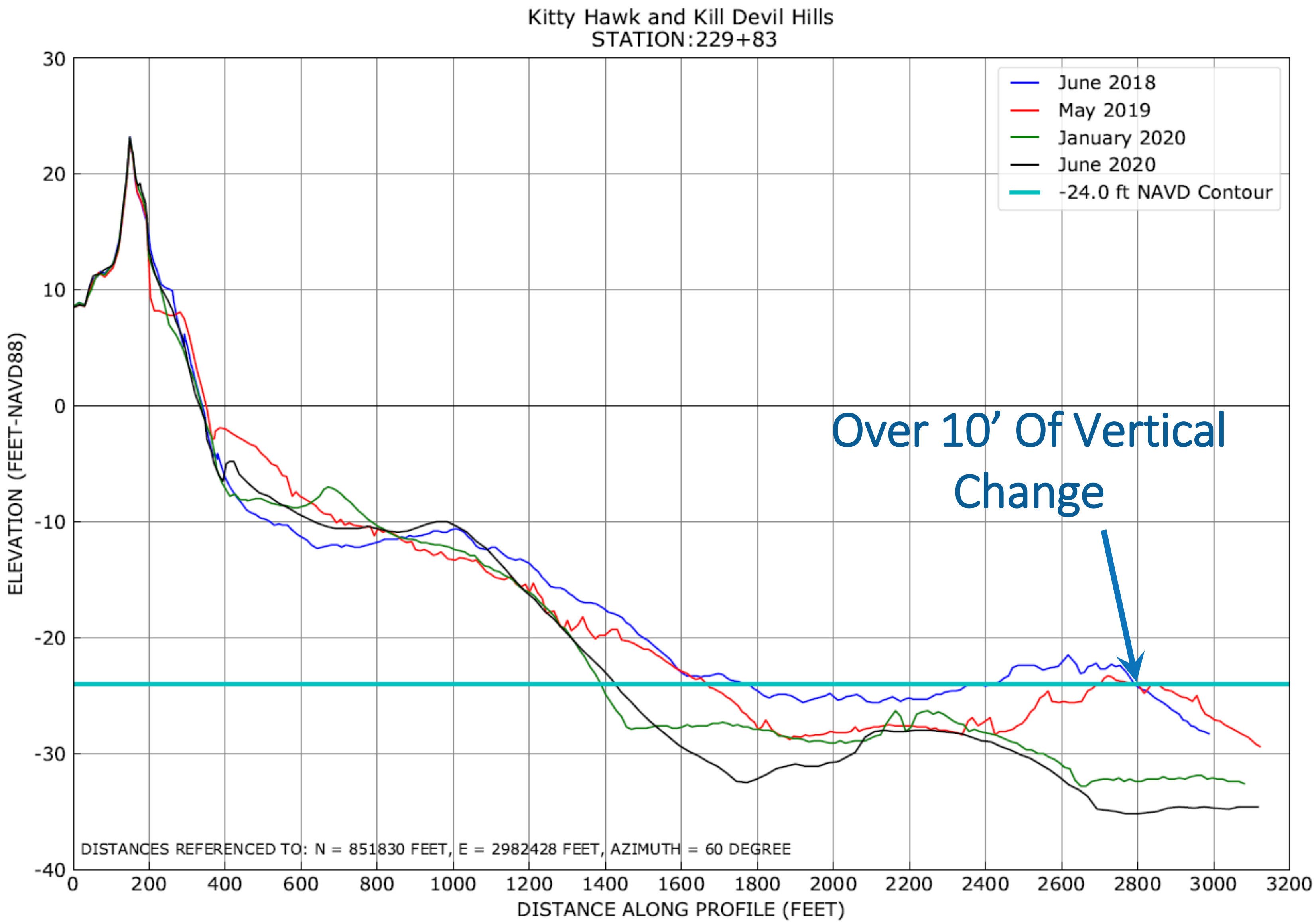


What Is Going On Out There?



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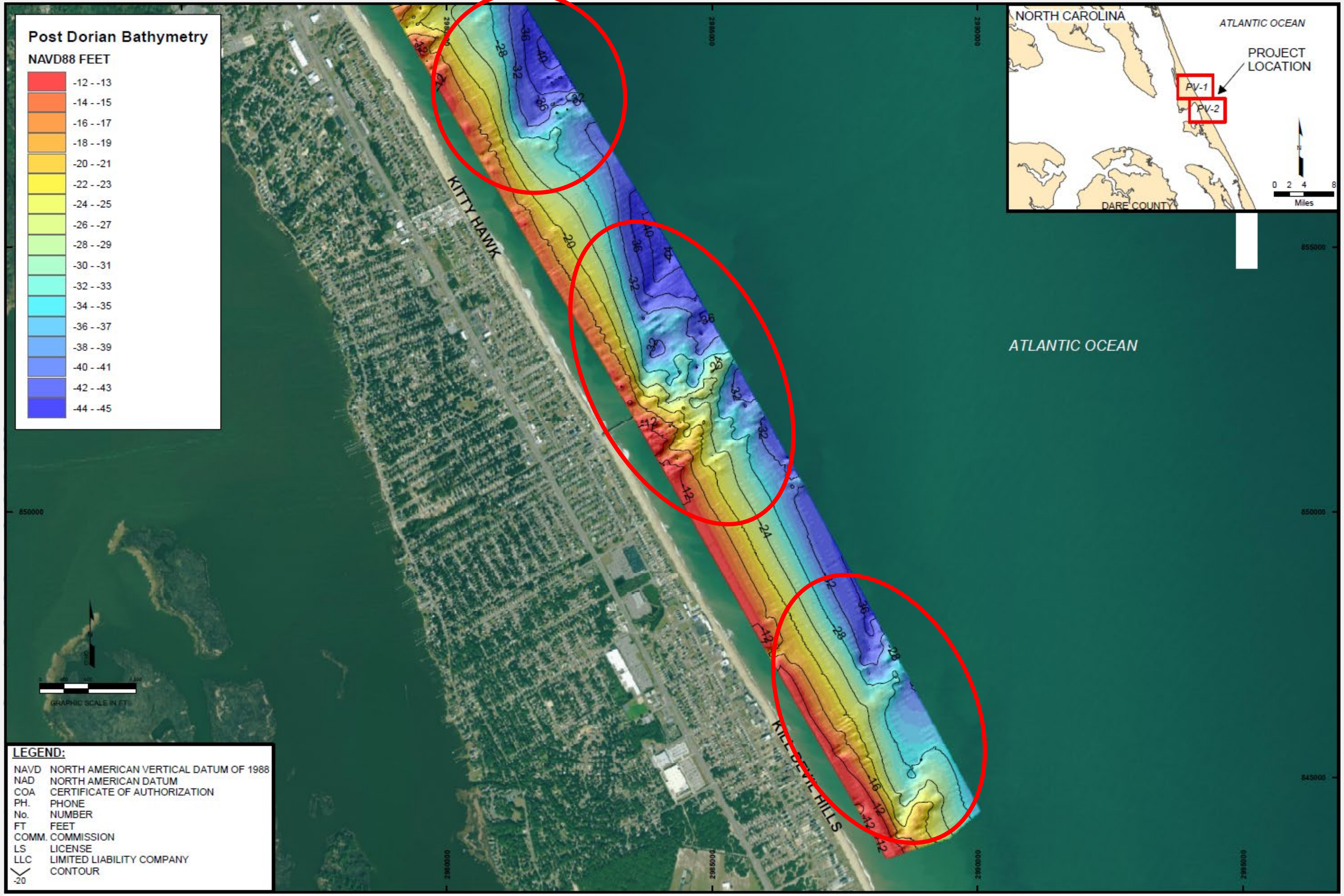

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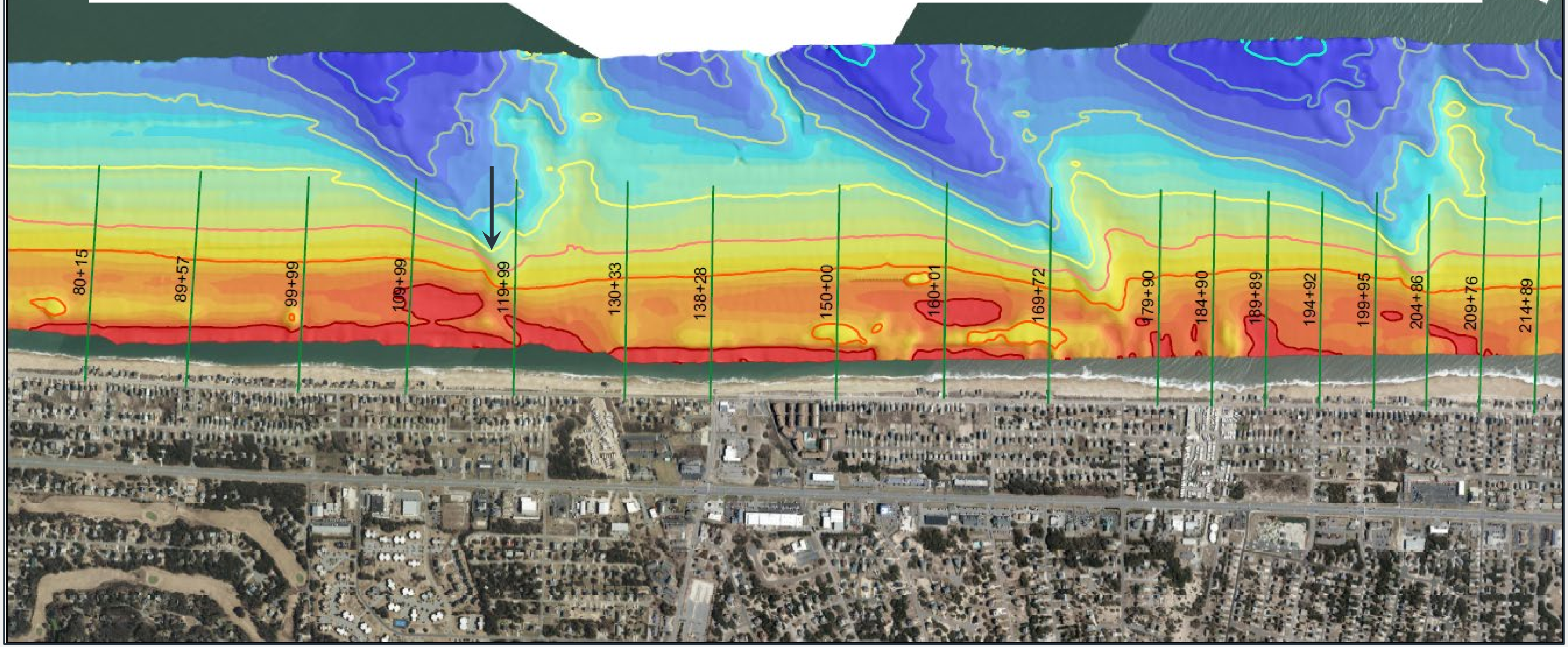
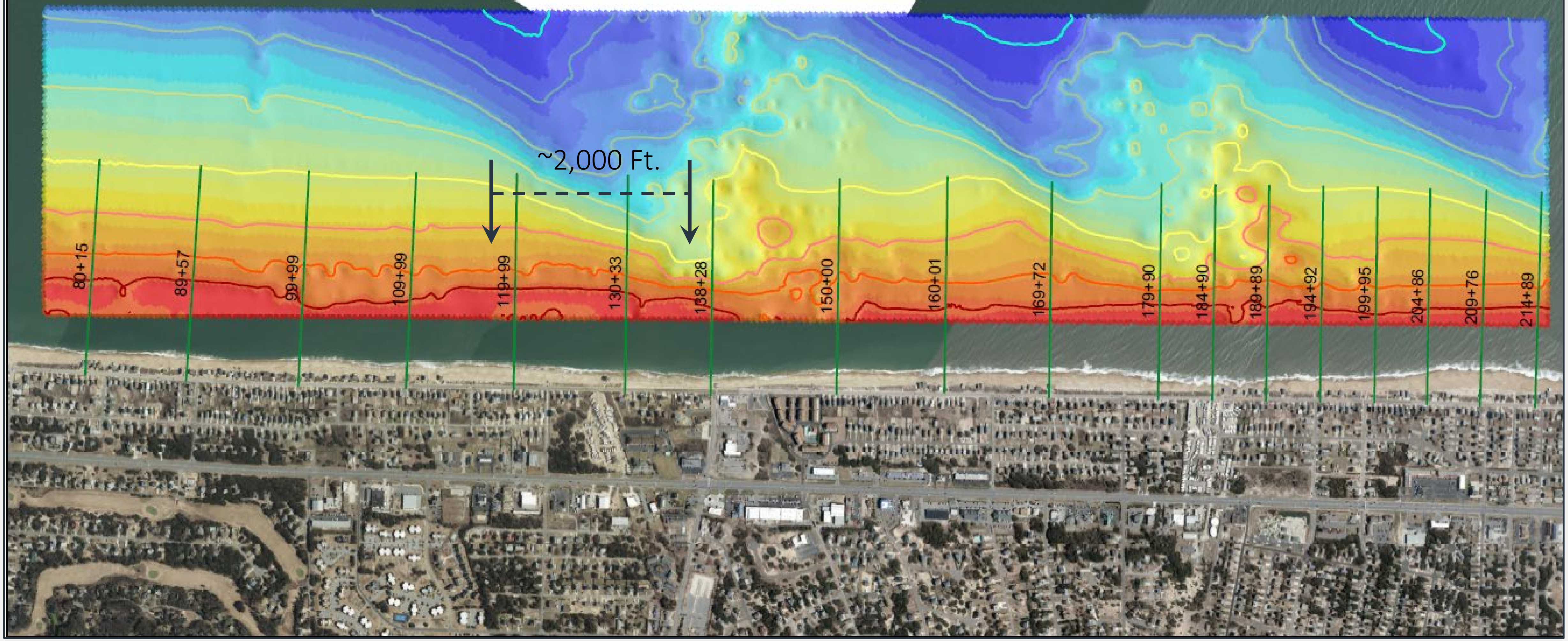
2009 Multibeam Survey (USACE FRF)



Dec. 2017/Feb. 2018 Single Beam Survey



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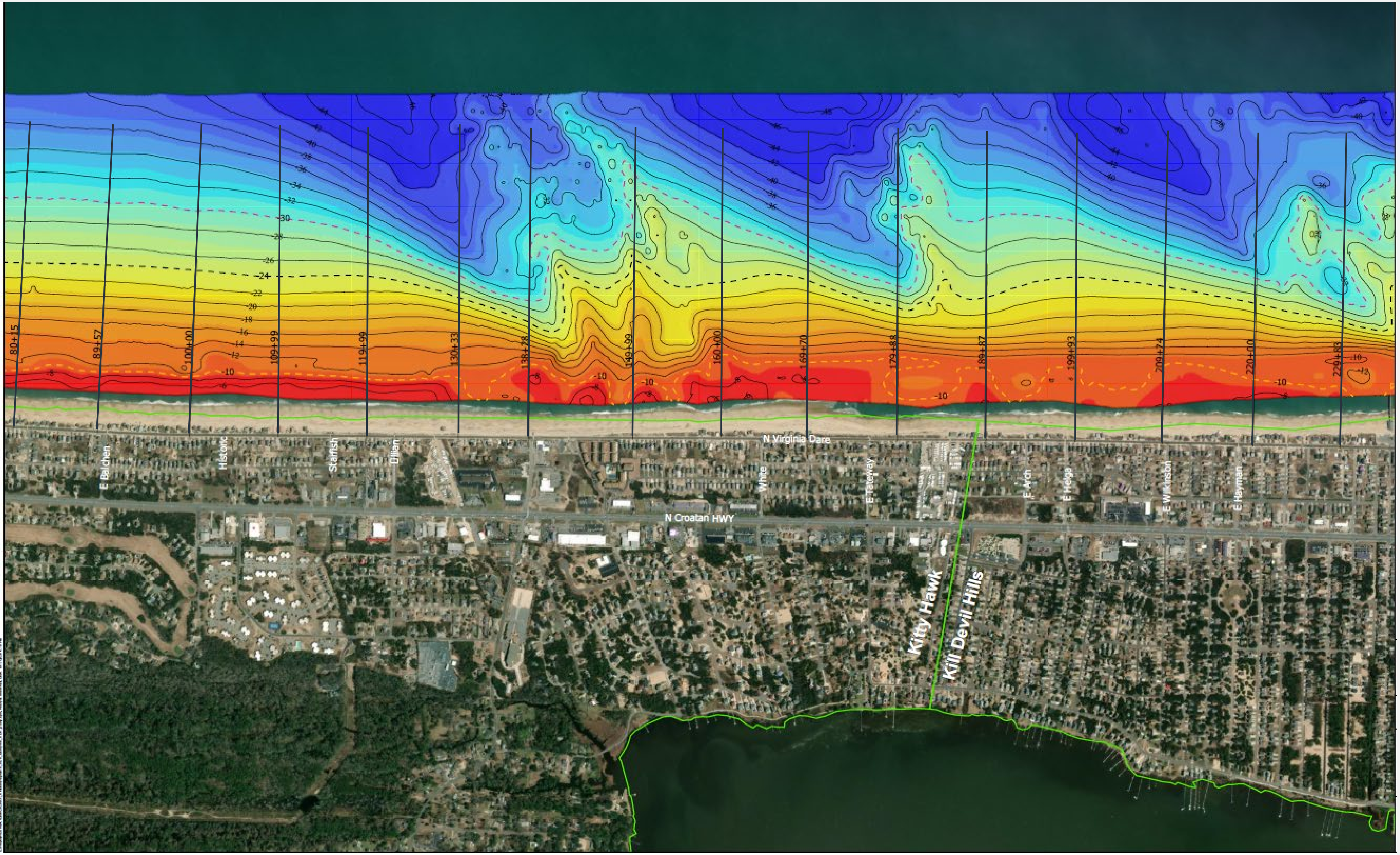

Beach profiles alone do not effectively resolve volumetric changes

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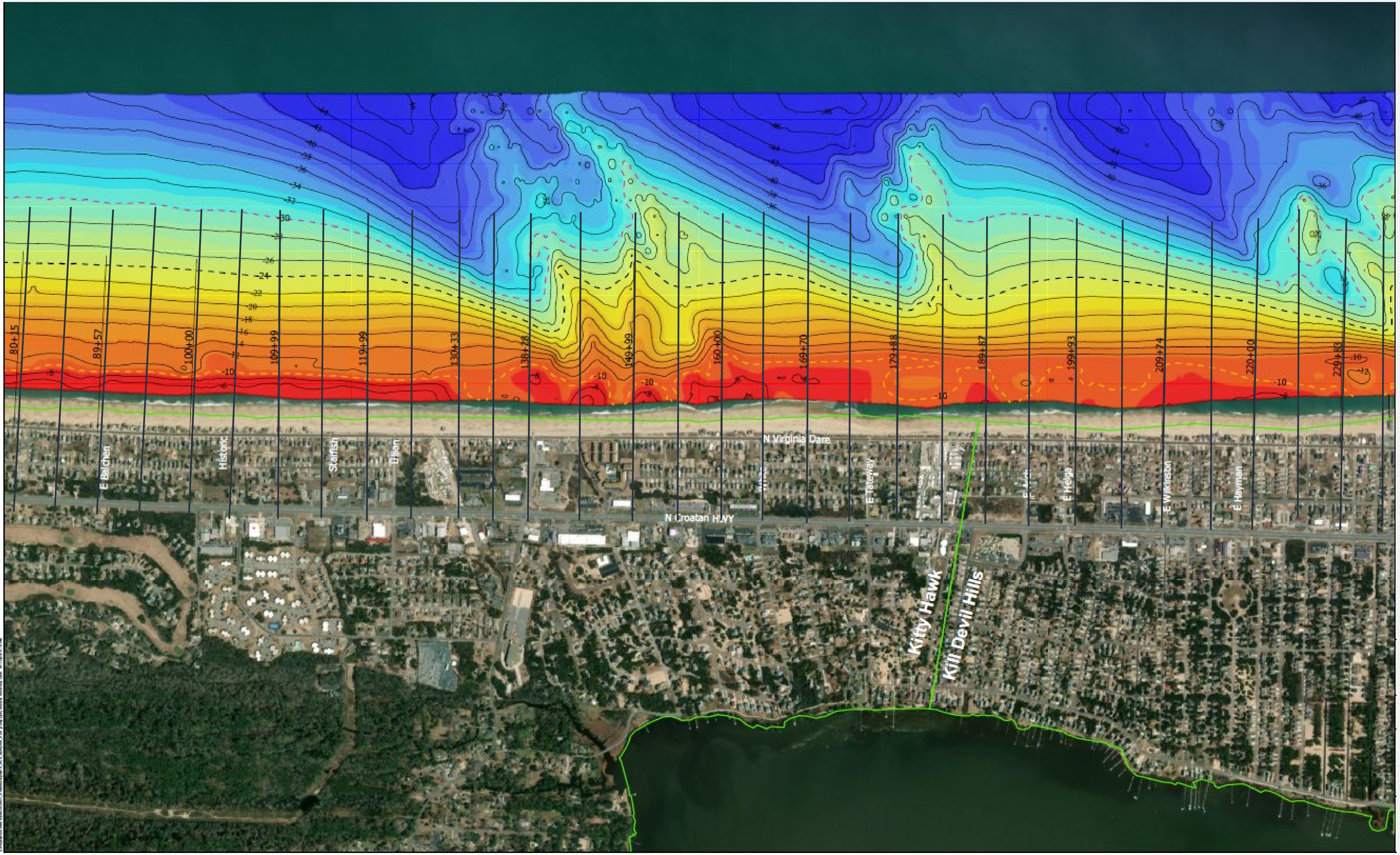

Option: double line spacing of beach profiles

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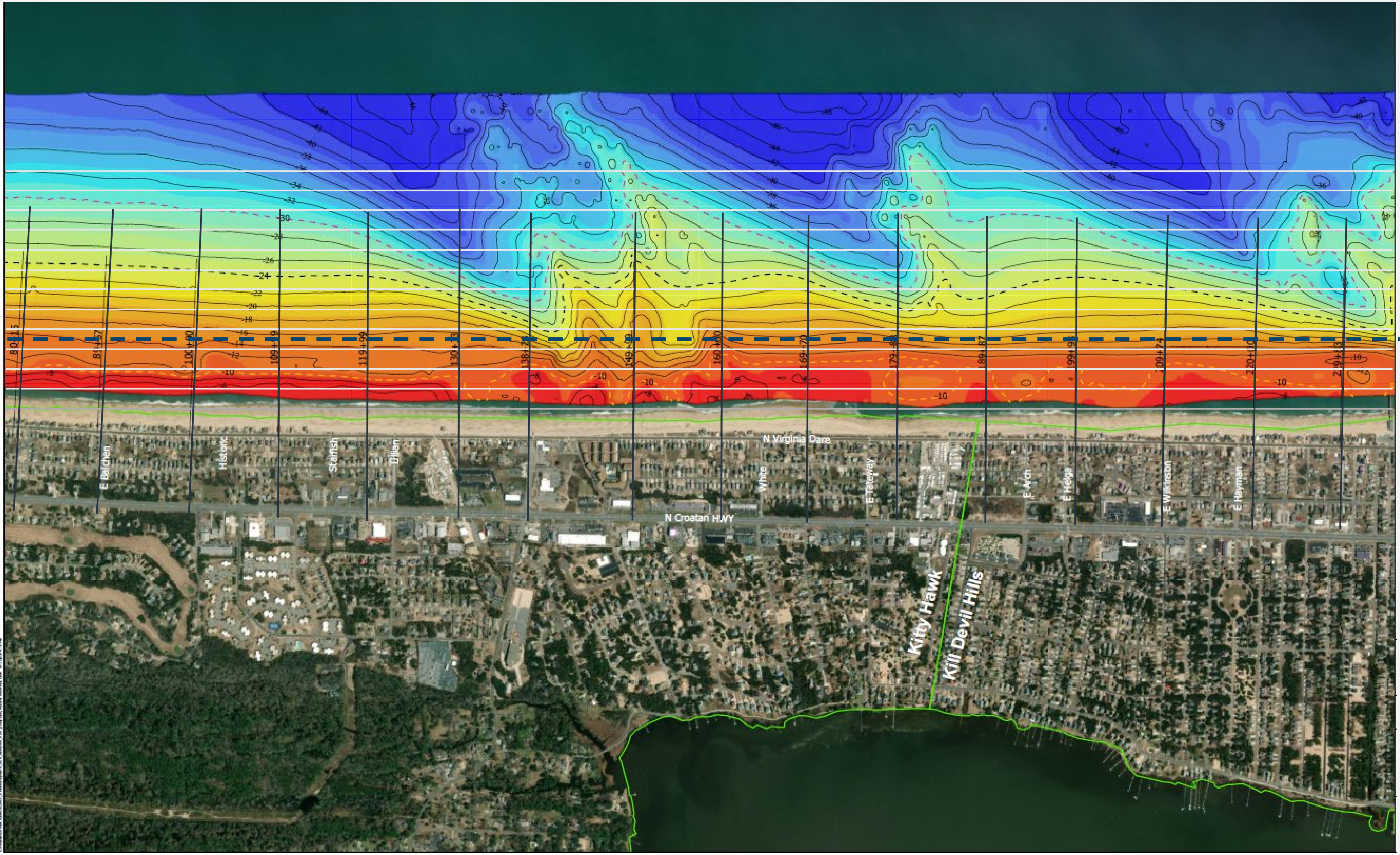


Offshore volumes calculated using surface comparison

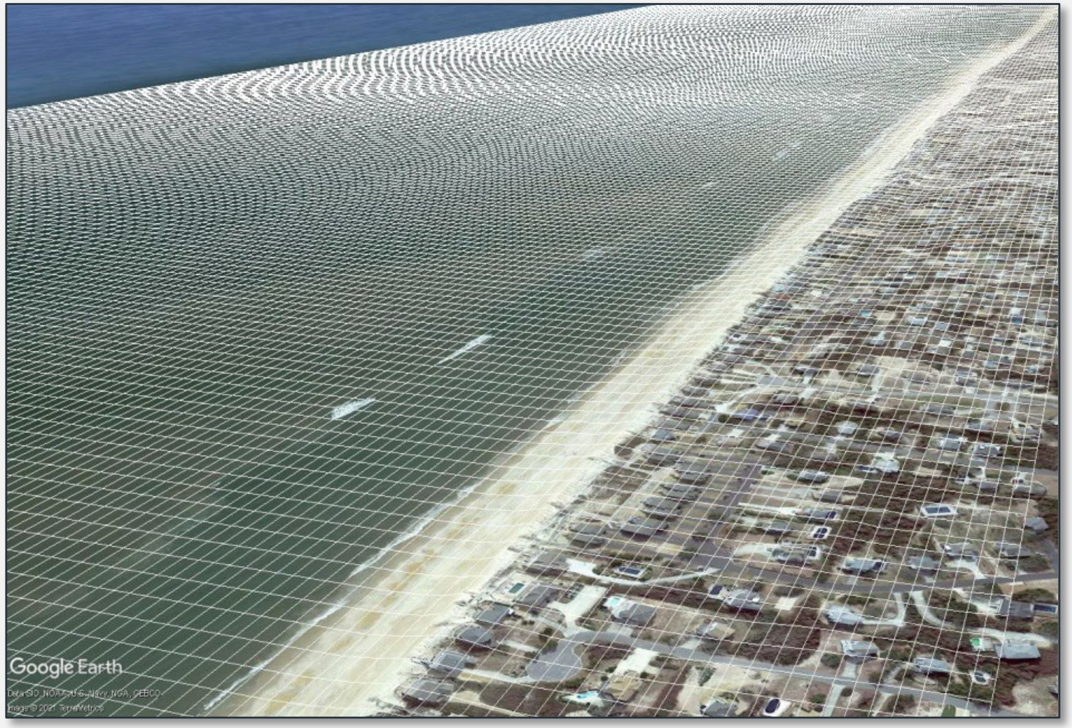
Nearshore & upland volumes calculated using Average End Area Method

WHY MODEL THE BEACH PROJECTS?

To understand performance drivers, test alternative designs, fine tune design.

Specific objectives per Town:

- **Duck:** Minimize end losses in the south end
- **Southern Shores:** Better understand fill diffusion rates
- **Kitty Hawk:** Help predict and mitigate erosion hotspots / provide boundary conditions for cross-shore modeling and
- **Kill Devil Hills:** Help predict and mitigate erosion hotspots



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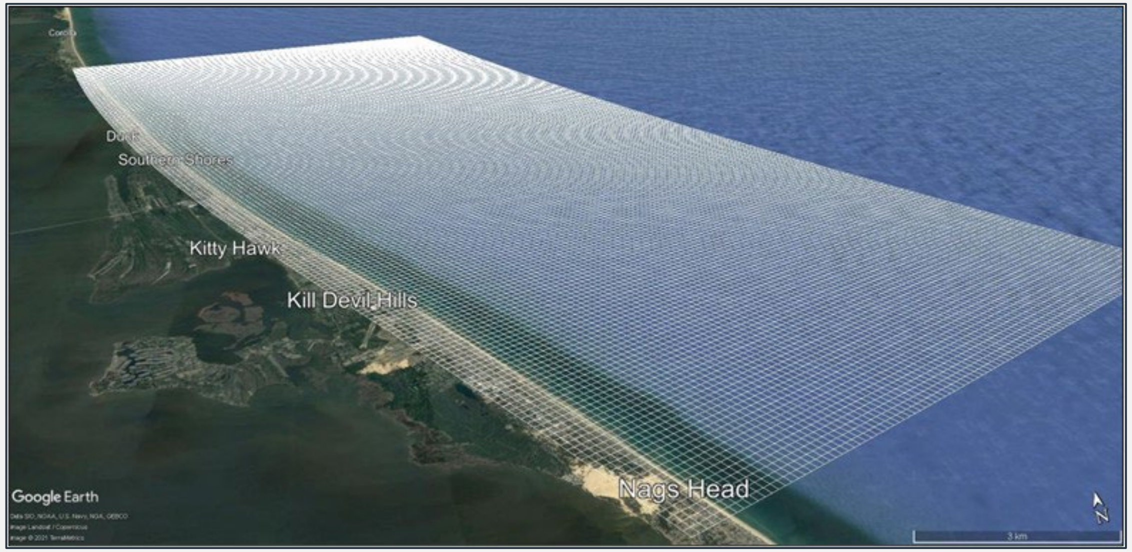
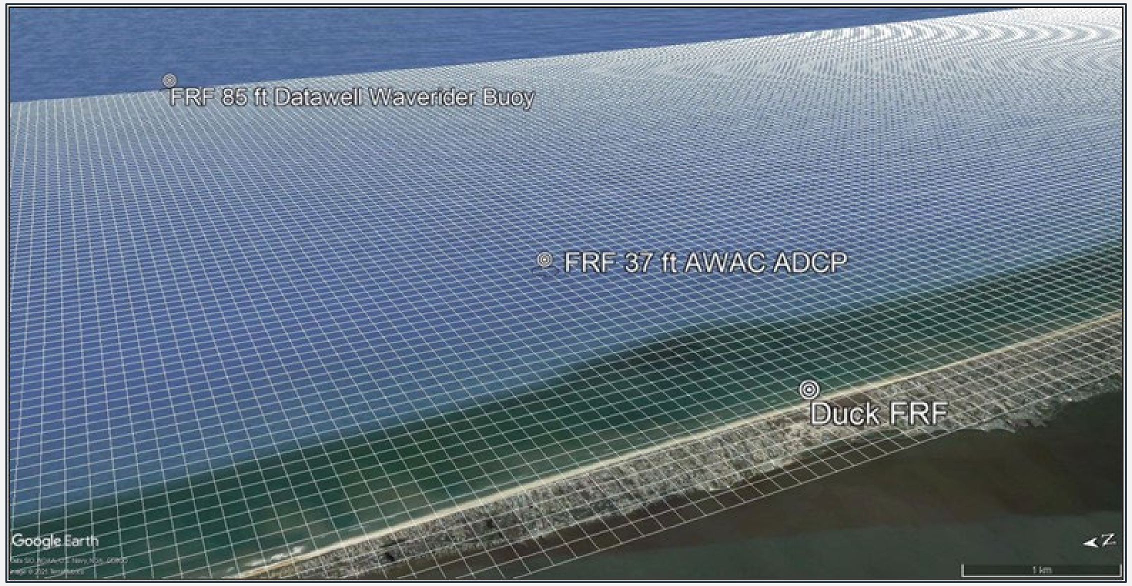
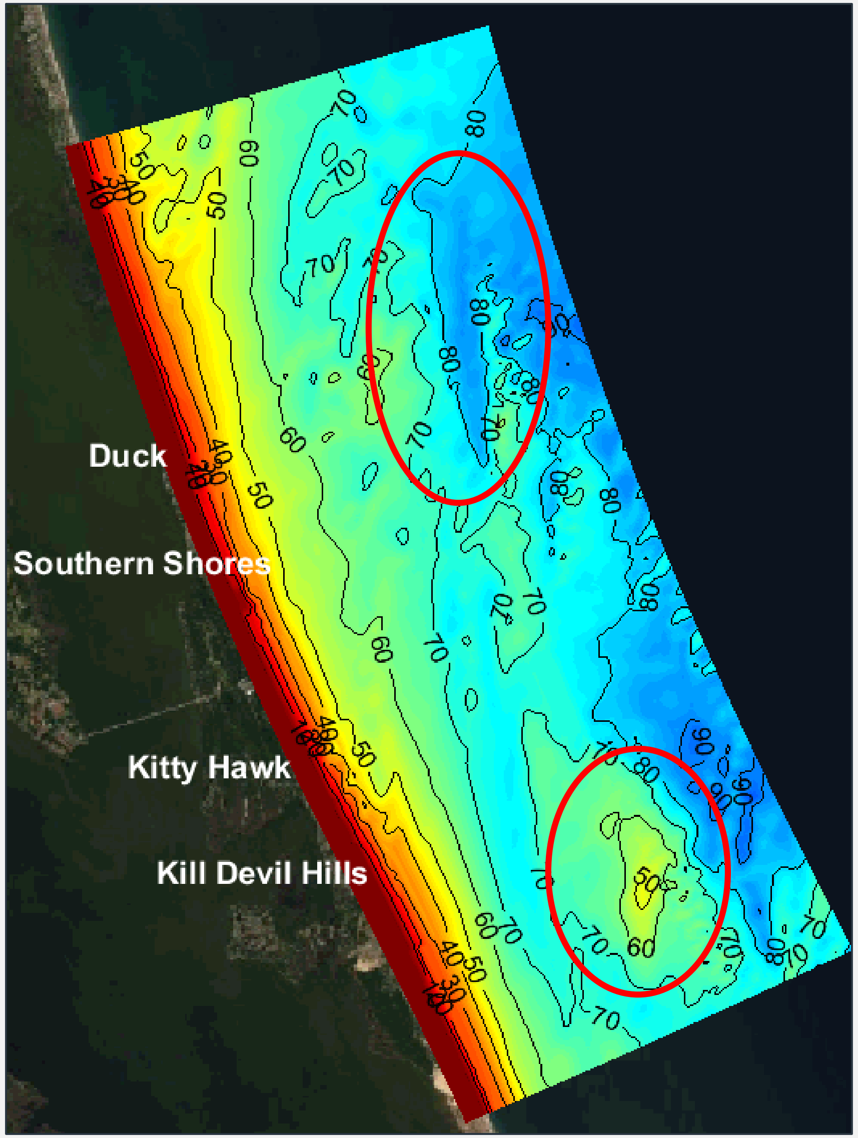
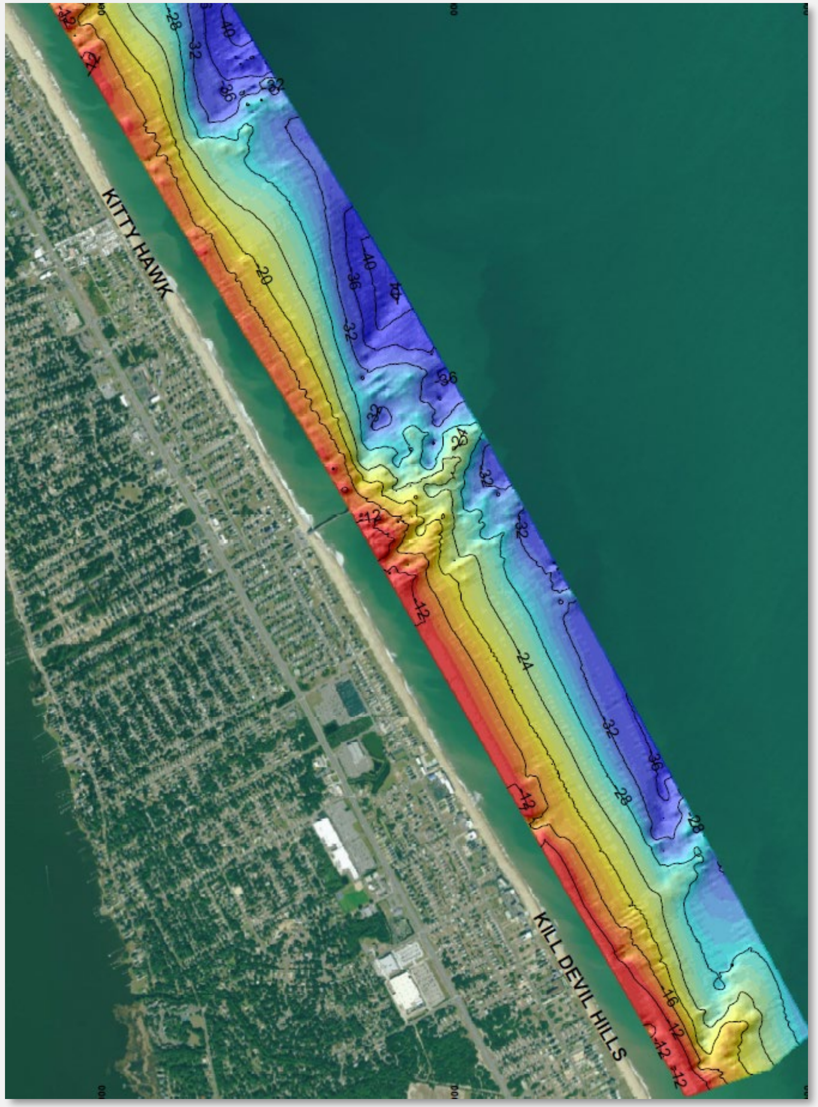
REGIONAL WAVE MODEL







LOCAL HIGH-RES MODELS

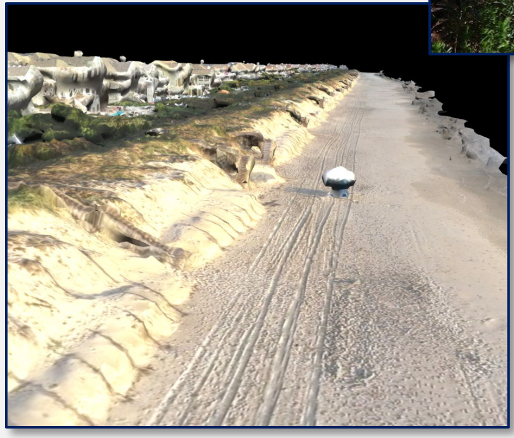


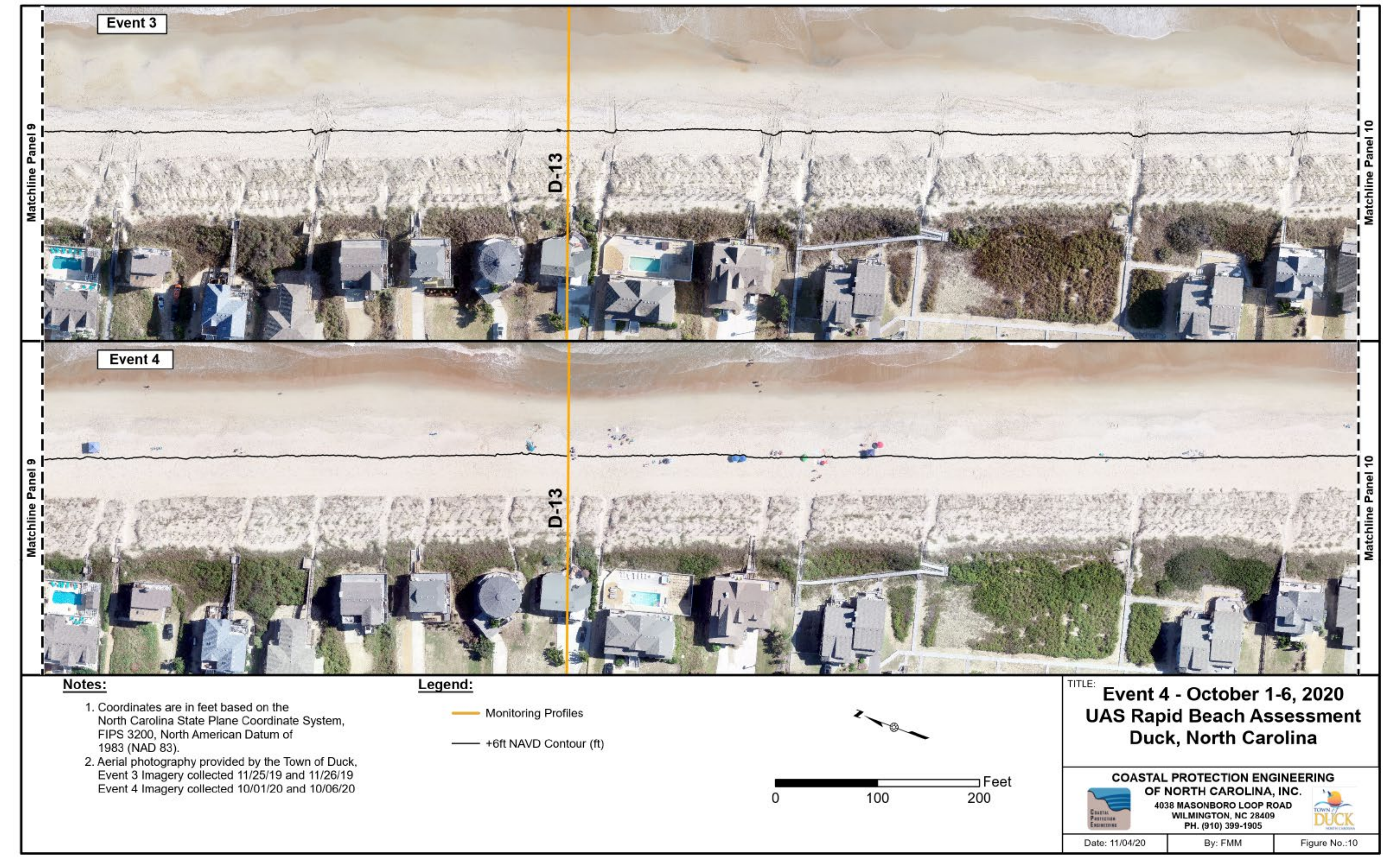
INCORPORATING MONITORING AND MODELING RESULTS INTO DESIGN

- Refining advanced fill volumes for renourishments
- Modifying the beach fill configuration at Duck to allow more fill to stay within the project area
- Refining estimates for diffusion losses along Southern Shores
- Identifying high probability hot spot areas associated with migrating features
- Designing fill configurations to mitigate hot spot erosion

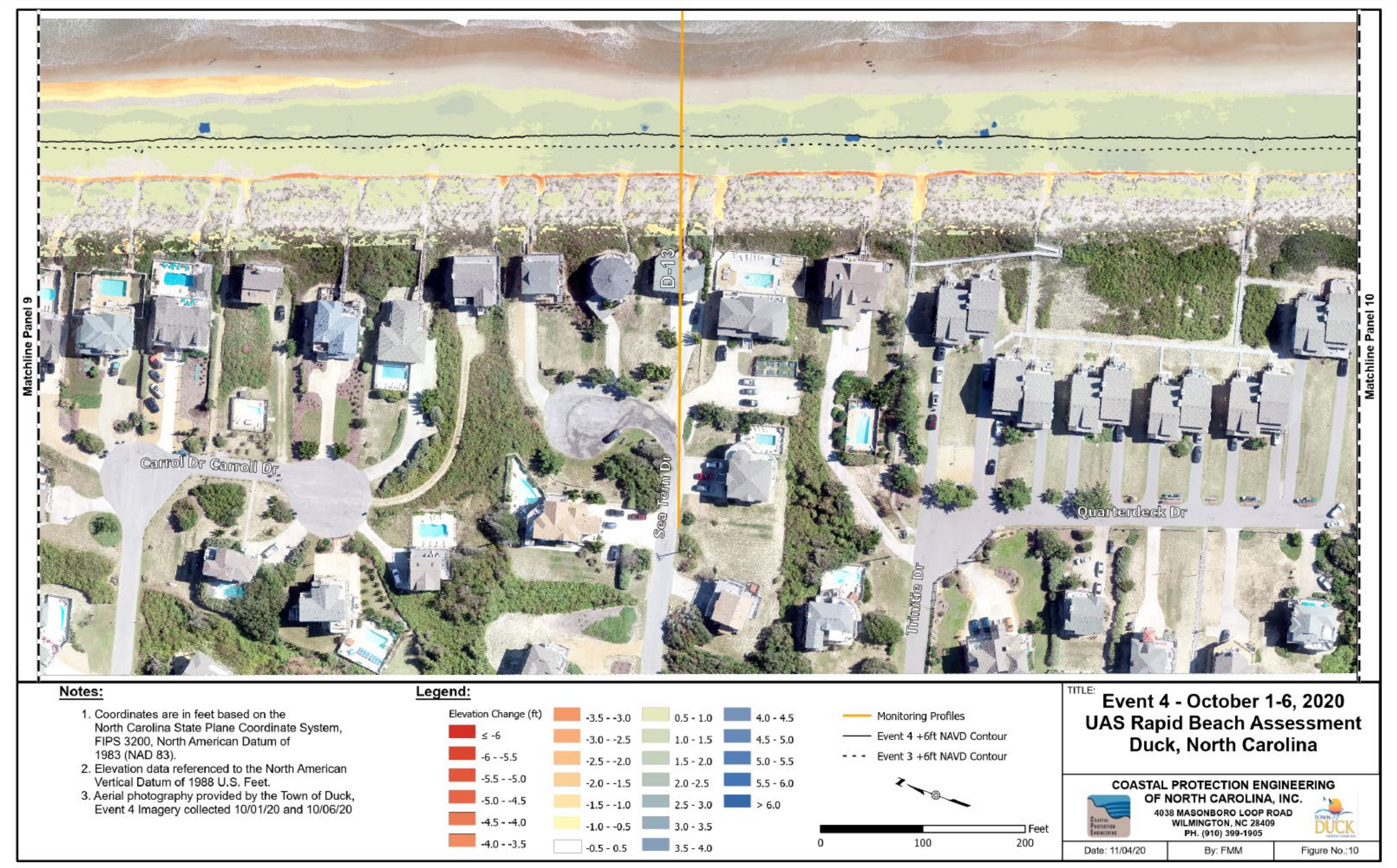
UAS DUNE MONITORING PROGRAM

- Unmanned Aerial Systems (UAS) - rapidly deployed, high-resolution, low-cost, and time efficient
- Used to conduct beach and dune assessment surveys prior to and following storm events.
- Ground Control Points (GCPs) installed within the project area and used to increase the absolute accuracy of a UAS survey.
- Data collected during the flight is processed to produce georeferenced orthomosaics, XYZ point clouds, and 3D surfaces of the project area.
- Allows for observations and 2D & 3D measurement and analysis of shoreline and volume changes.





Comparison view of georeferenced orthomosaics



Elevation Change Plot

Summary:

- Regular beach monitoring is invaluable to the program
- Analyzing and understanding the data can lead to increased project performance and decreased project costs
- Communities can work together on monitoring and modeling efforts to achieve cost savings

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THANK YOU

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