

Town of North Topsail Beach

Beach and Inlet Management Program:

SHORELINE WORKSHOP

Coastal Planning & Engineering of North Carolina

July 26, 2016

Ken Willson - (kenneth.willson@cbi.com)

Outline:

- Interlocal Agreement / Hard Structure
 - EIS Process
 - Terminal Groin Feasibility Study Preliminary Results
- Ocean Bar Project
 - Results of the Alternative Analysis
 - Permit Status Update
 - Next Steps
- FEMA Maintenance Plan
- Monitoring of Existing Projects:
 - Phase 1
 - Phase 5

INTER-LOCAL AGREEMENT / HARDENED STRUCTURE:

Steps to Design and Permit a Major Coastal Project:

- Feasibility Analysis
- Develop an EIS
 - Establish Purpose and Needs of the Project
 - Establish and Develop Alternatives
 - Conduct Alternative Analysis: (Functional/Environmental/Economic)
 - Draft EIS
 - Public Comment
 - Incorporate Comments into EIS
 - Final EIS
 - Public Comments
- State Permit Application Review
- Biological Assessment
- Essential Fish Habitat Assessment
- Cumulative Effects Assessment

Terminal Groin Feasibility Study – Preliminary Results:

Scope of Work:

- Simulate multiple structural design alternatives
- Evaluate Results in terms of:
 - Beach fill performance
 - Erosional impacts to adjacent beaches and New River Inlet
 - Ability of the structure to retain material on the beach
 - Use model results to determine comparative costs and benefits of channel and terminal groin alternatives

Terminal Groin Feasibility Study – Preliminary Results:

Approximate Shore
Anchorage Start
Point



Terminal Groin Feasibility Study – Preliminary Results:



Terminal Groin Feasibility Study – Preliminary Results:

**Option 1 -
North
Groin:**

**Total
Length:
1,640 ft.**



Terminal Groin Feasibility Study – Preliminary Results:

**Option 2
North
Groin
Extended
250':**

**Total
Length:
1,890**



Terminal Groin Feasibility Study – Preliminary Results:

**Option 3
North
Groin
Extended
500':**

**Total
Length:
2,140 ft.**



Terminal Groin Feasibility Study – Preliminary Results:

**Option 4
South
Groin:**

**Total
Length:
1,650**



Terminal Groin Feasibility Study – Preliminary Results:

**Option 5
South
Groin
Extended
250':**

**Total
Length:
1,900 ft.**



Terminal Groin Feasibility Study – Preliminary Results:

**Option 6
South
Groin
Extended
500':**

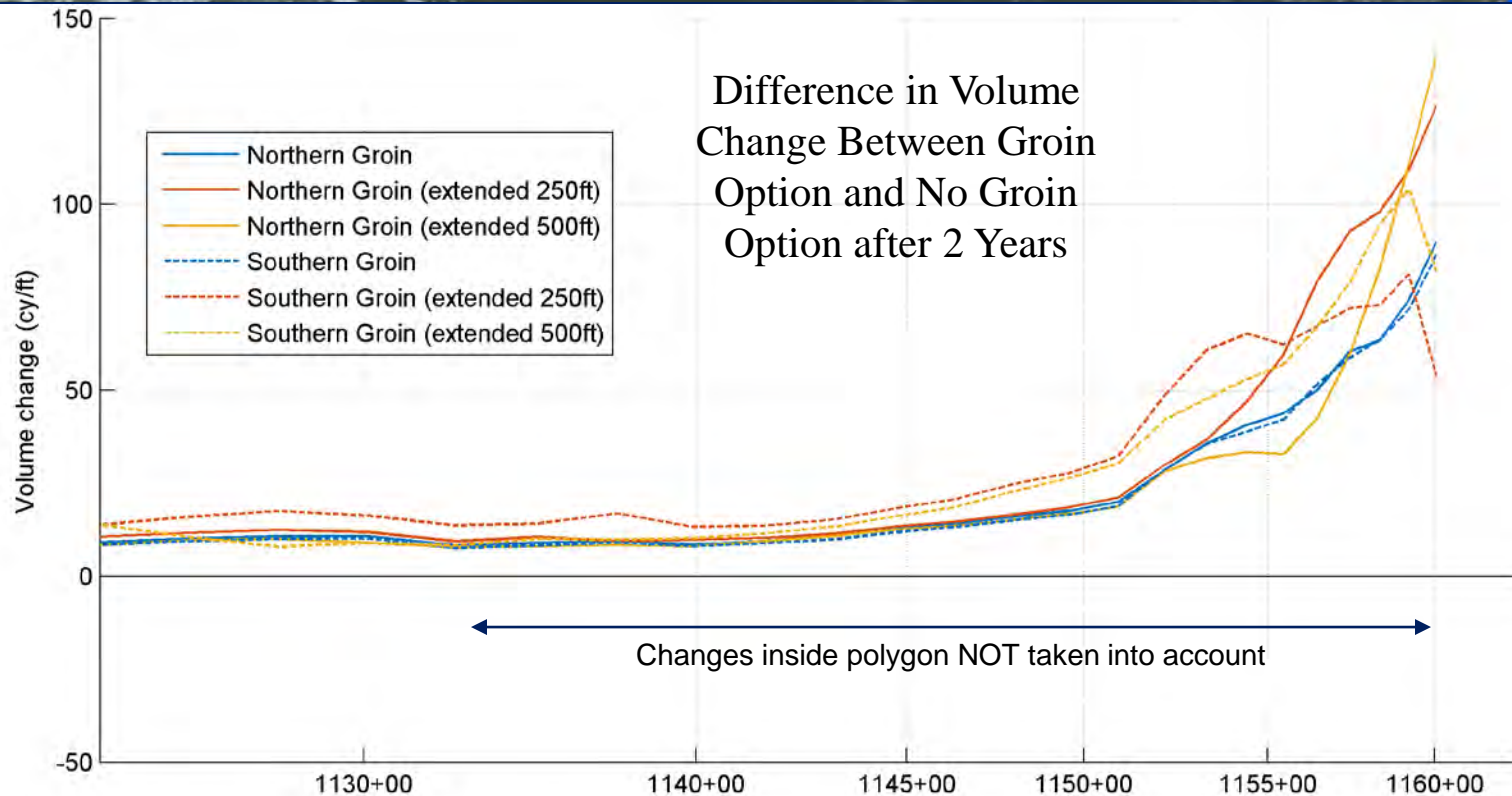
**Total
Length:
2,150 ft.**



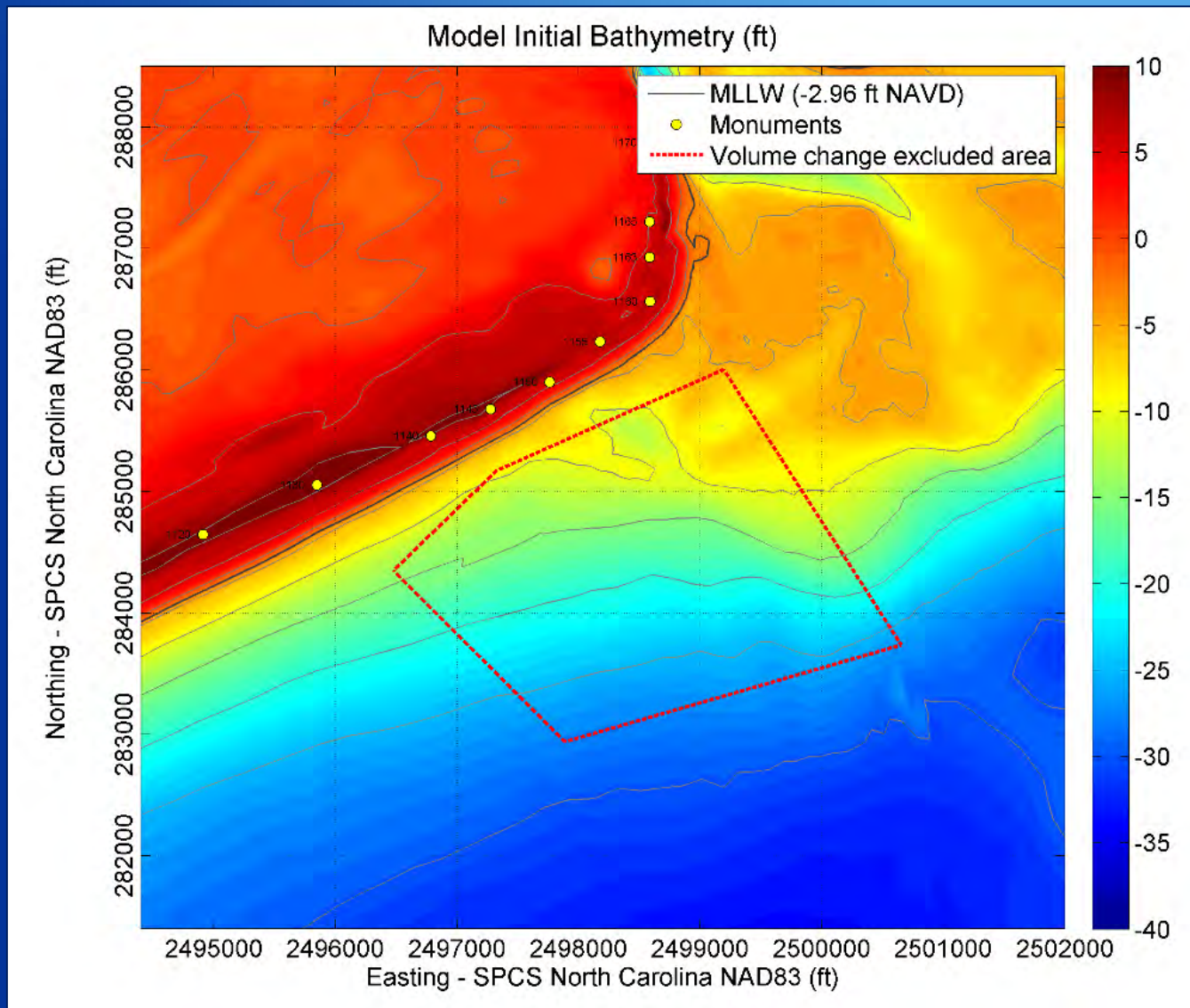
Terminal Groin Feasibility Study – Preliminary Results:

- Model Indicated Volume Change Along the North Topsail Beach Shoreline
- Impacts to the Ocean Bar Channel
- Ebb Shoal Reconfiguration
- Sediment Transport Patterns

Terminal Groin Feasibility Study – Preliminary Results:

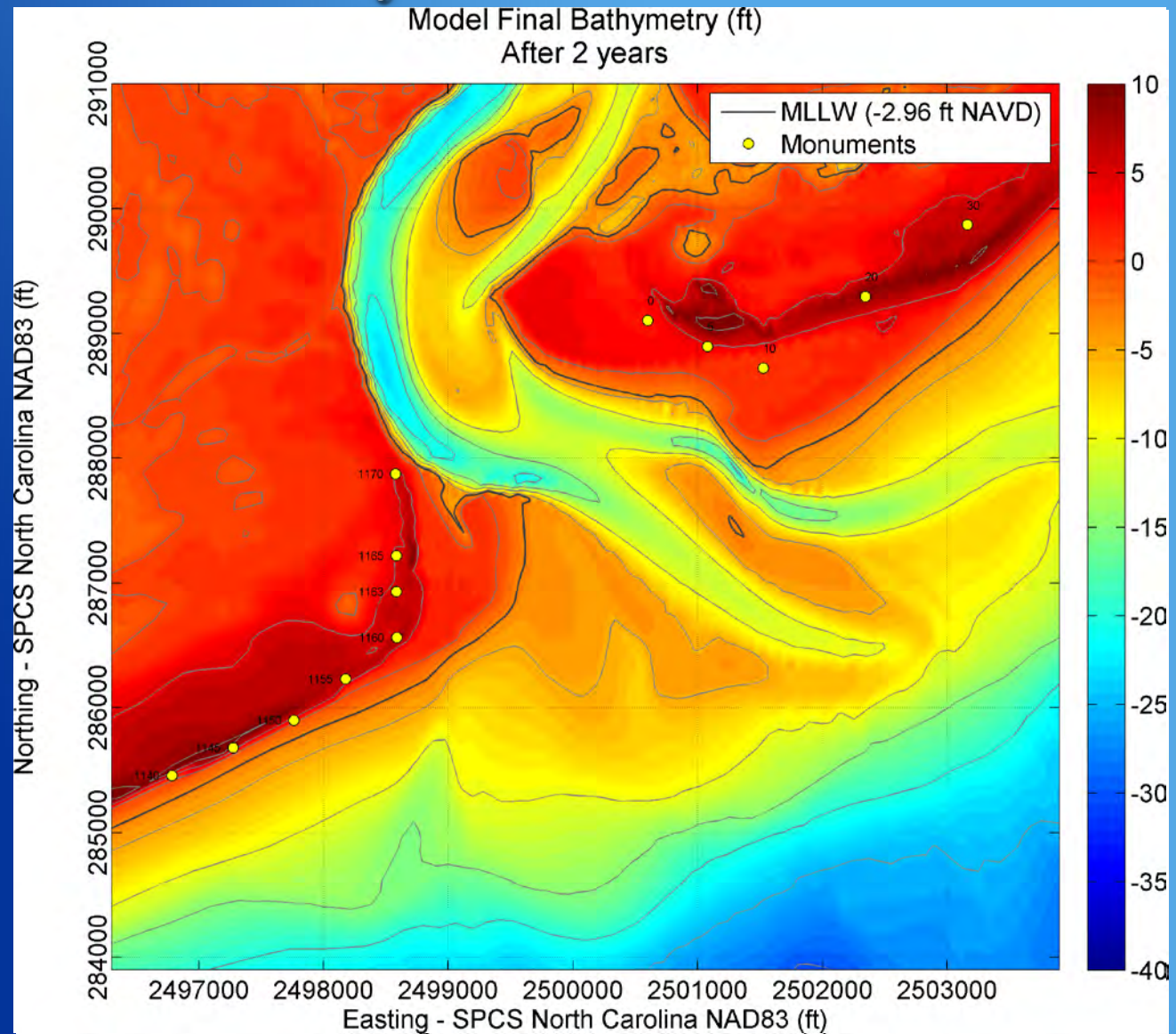


Terminal Groin Feasibility Study – Preliminary Results:



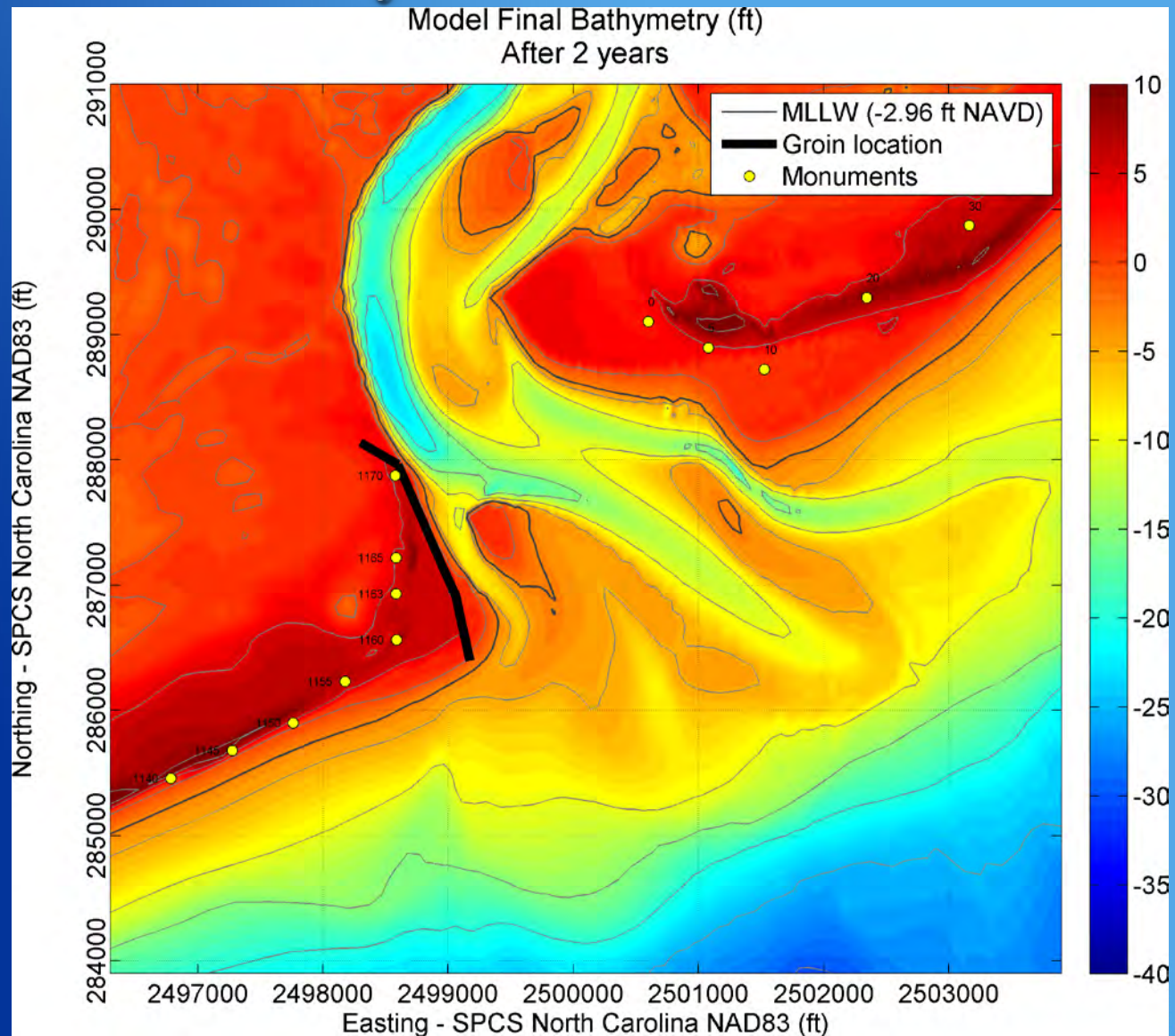
Terminal Groin Feasibility Study – Preliminary Results:

No Groin
Option:



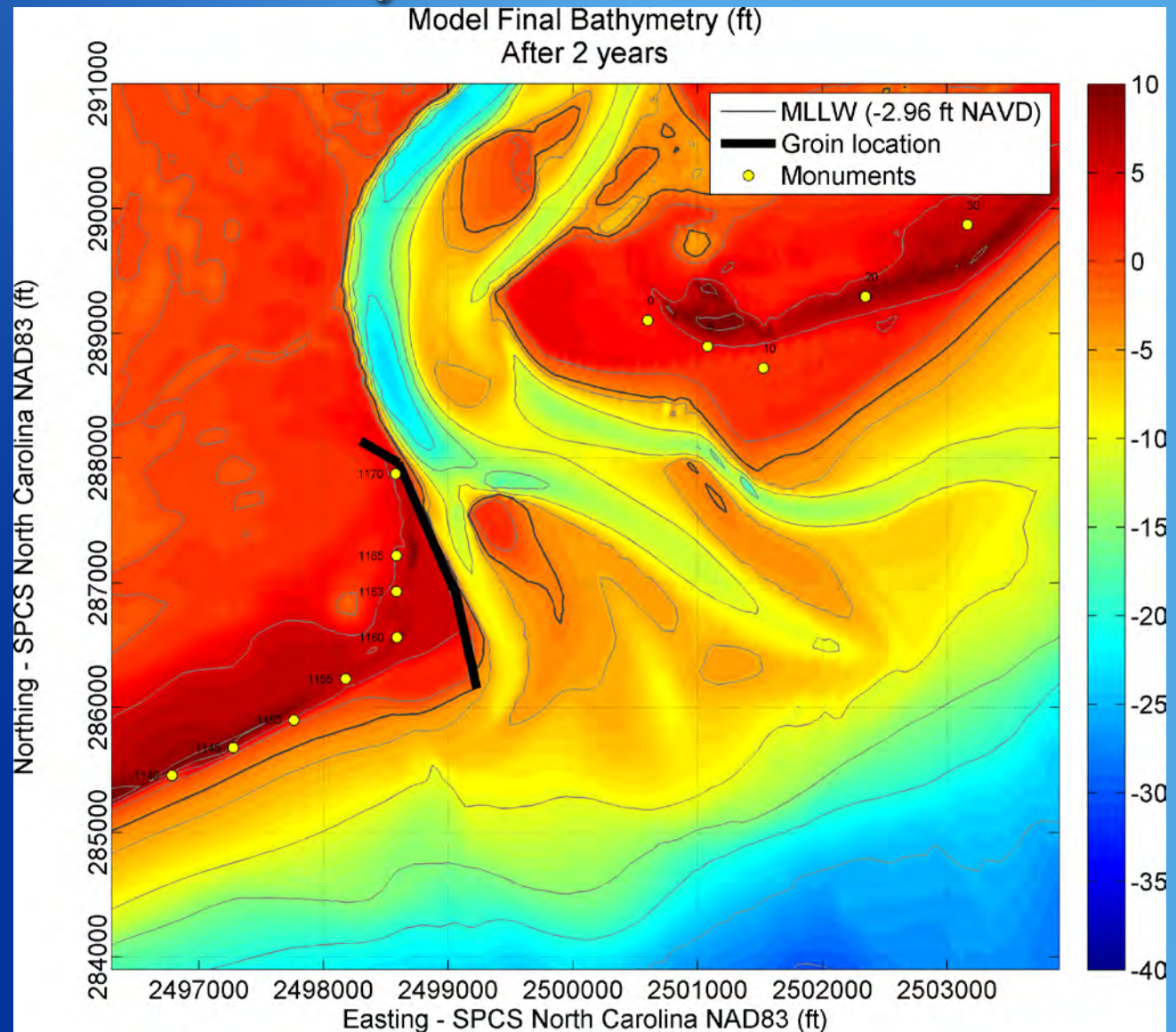
Terminal Groin Feasibility Study – Preliminary Results:

Option 1 - Northern Groin:



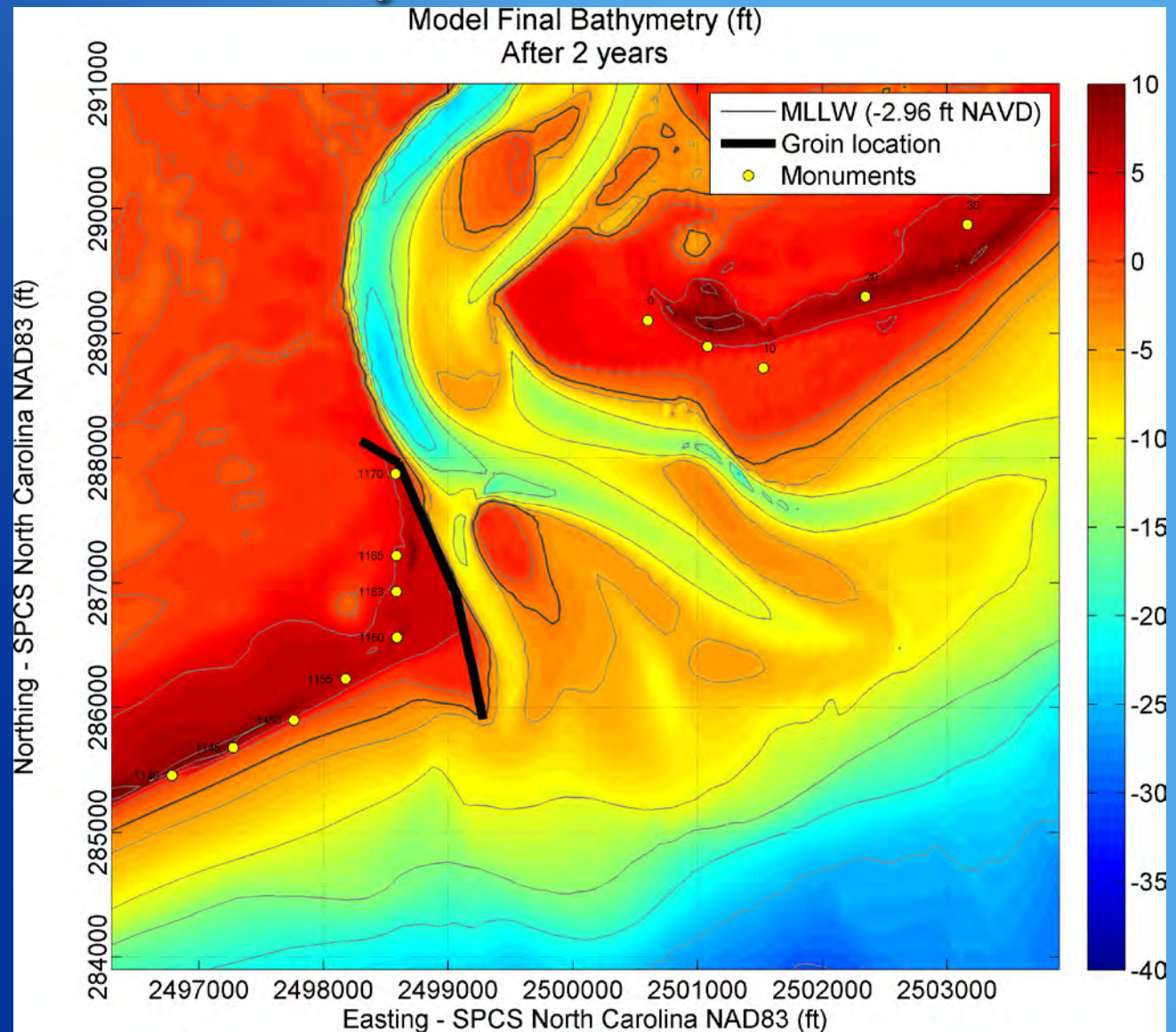
Terminal Groin Feasibility Study – Preliminary Results:

**Option 2 -
Northern
Groin Extended
250 ft:**



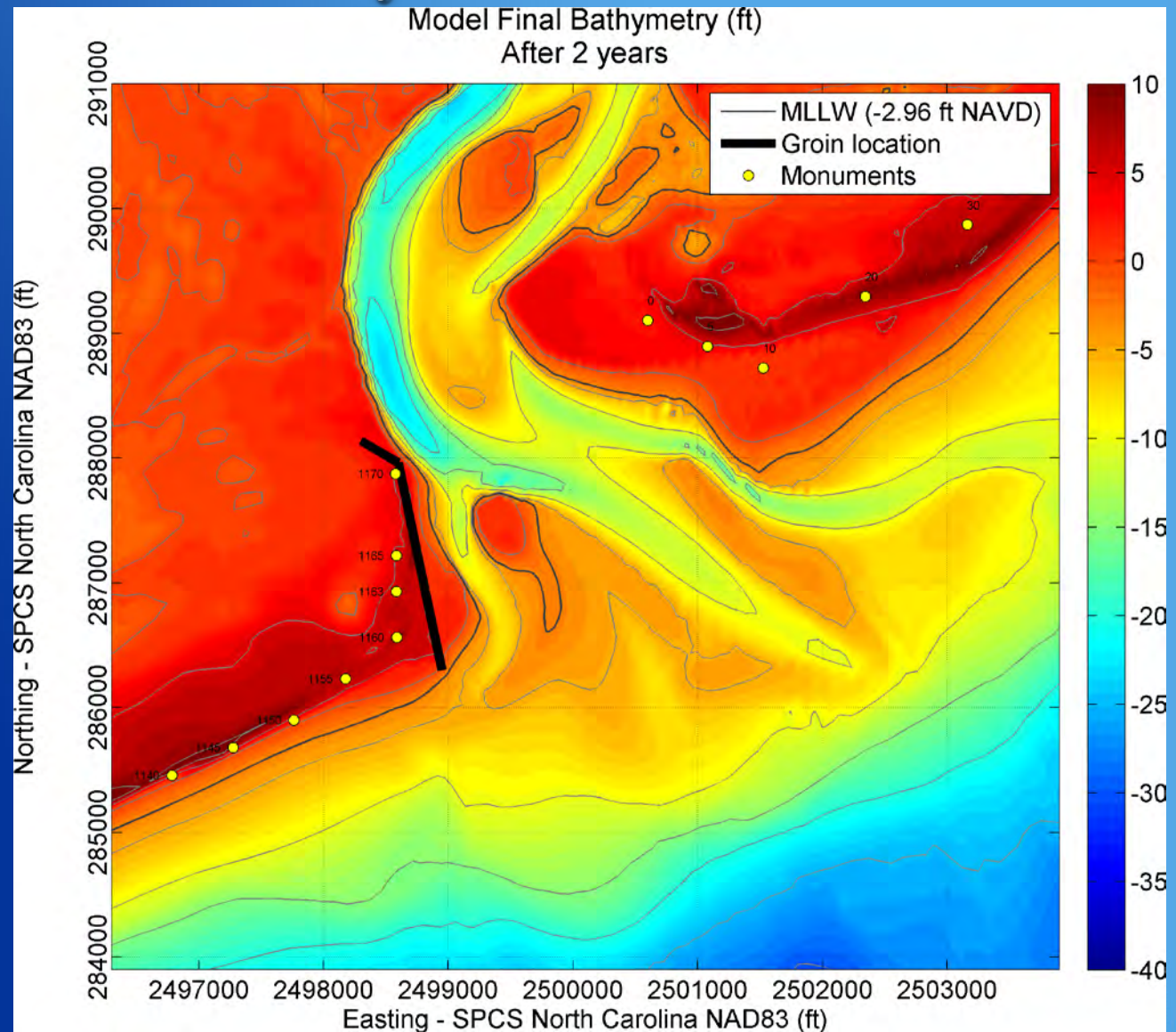
Terminal Groin Feasibility Study – Preliminary Results:

**Option 3 -
Northern
Groin Extended
500 ft:**



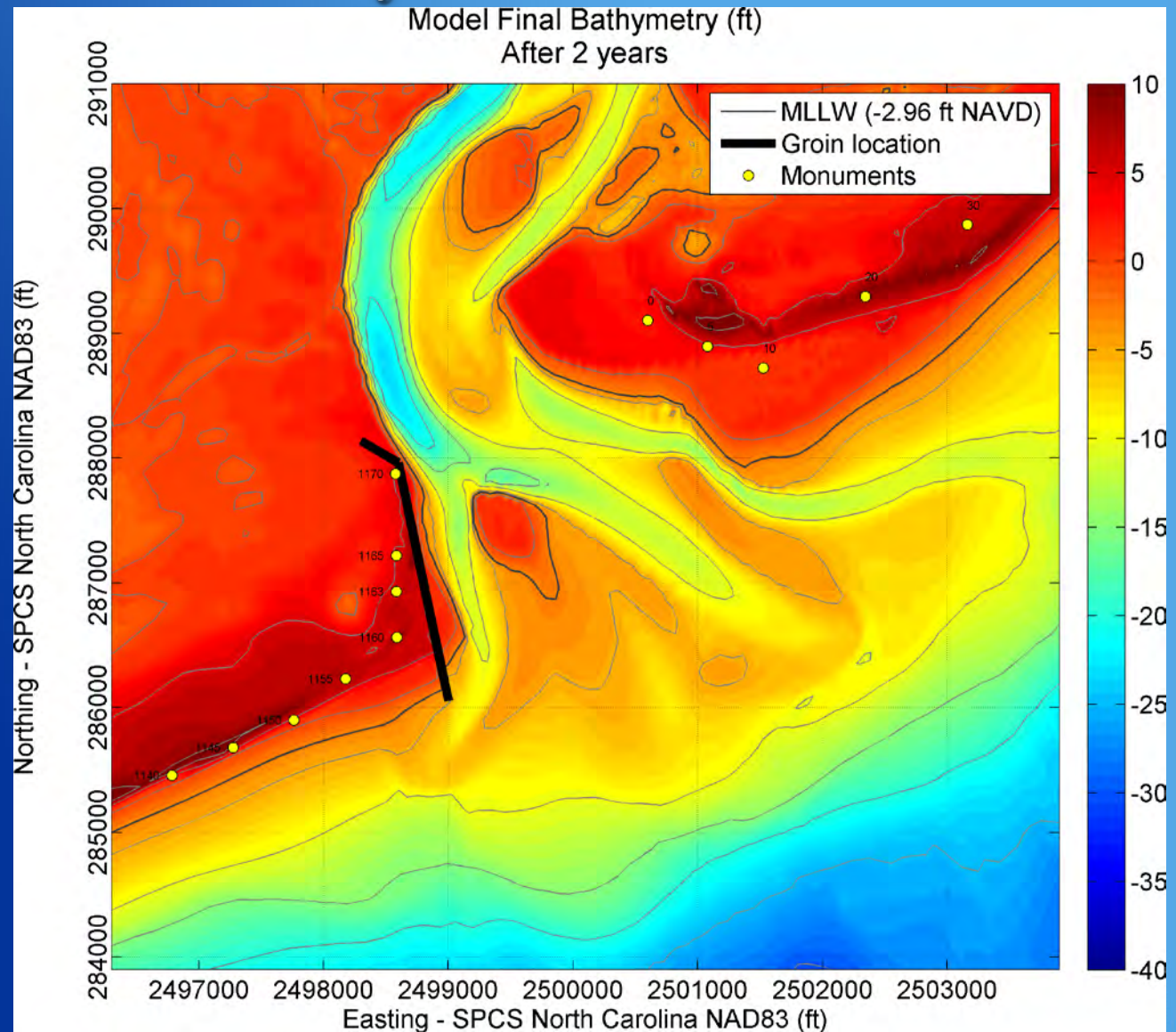
Terminal Groin Feasibility Study – Preliminary Results:

Option 4 - Southern Groin:



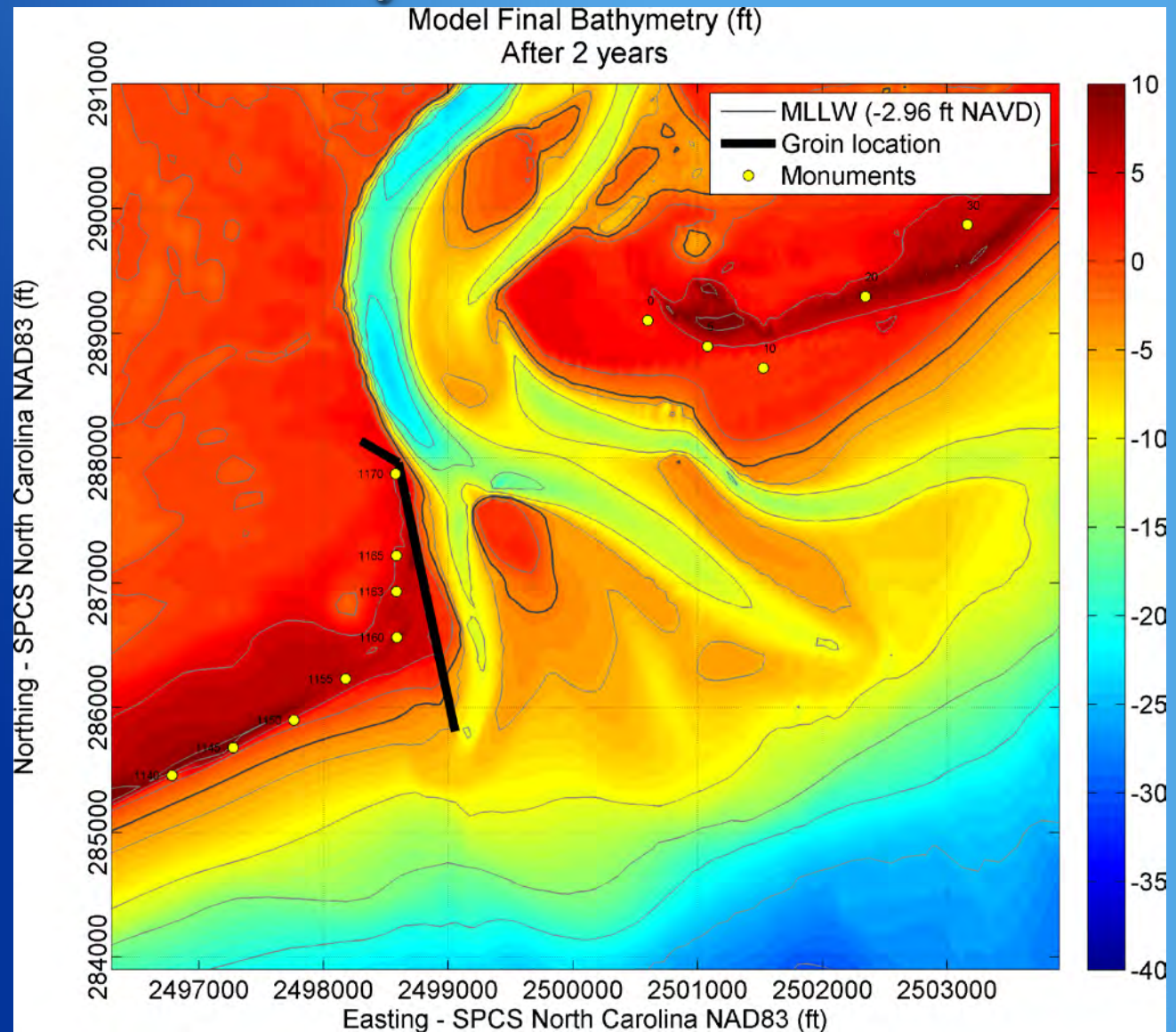
Terminal Groin Feasibility Study – Preliminary Results:

Option 5 - Southern Groin Extended 250 ft:



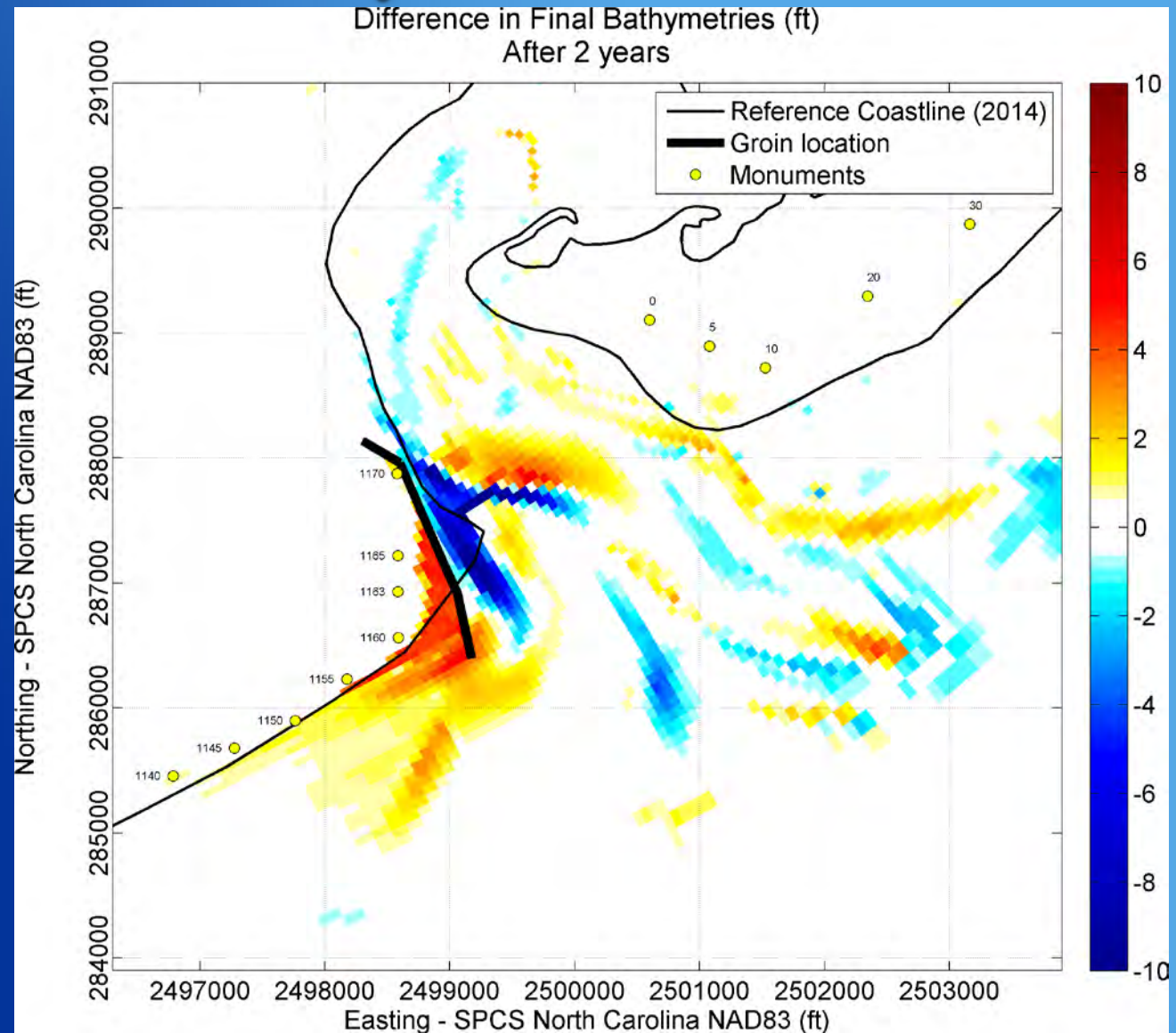
Terminal Groin Feasibility Study – Preliminary Results:

**Option 6 -
Southern
Groin Extended
500 ft:**



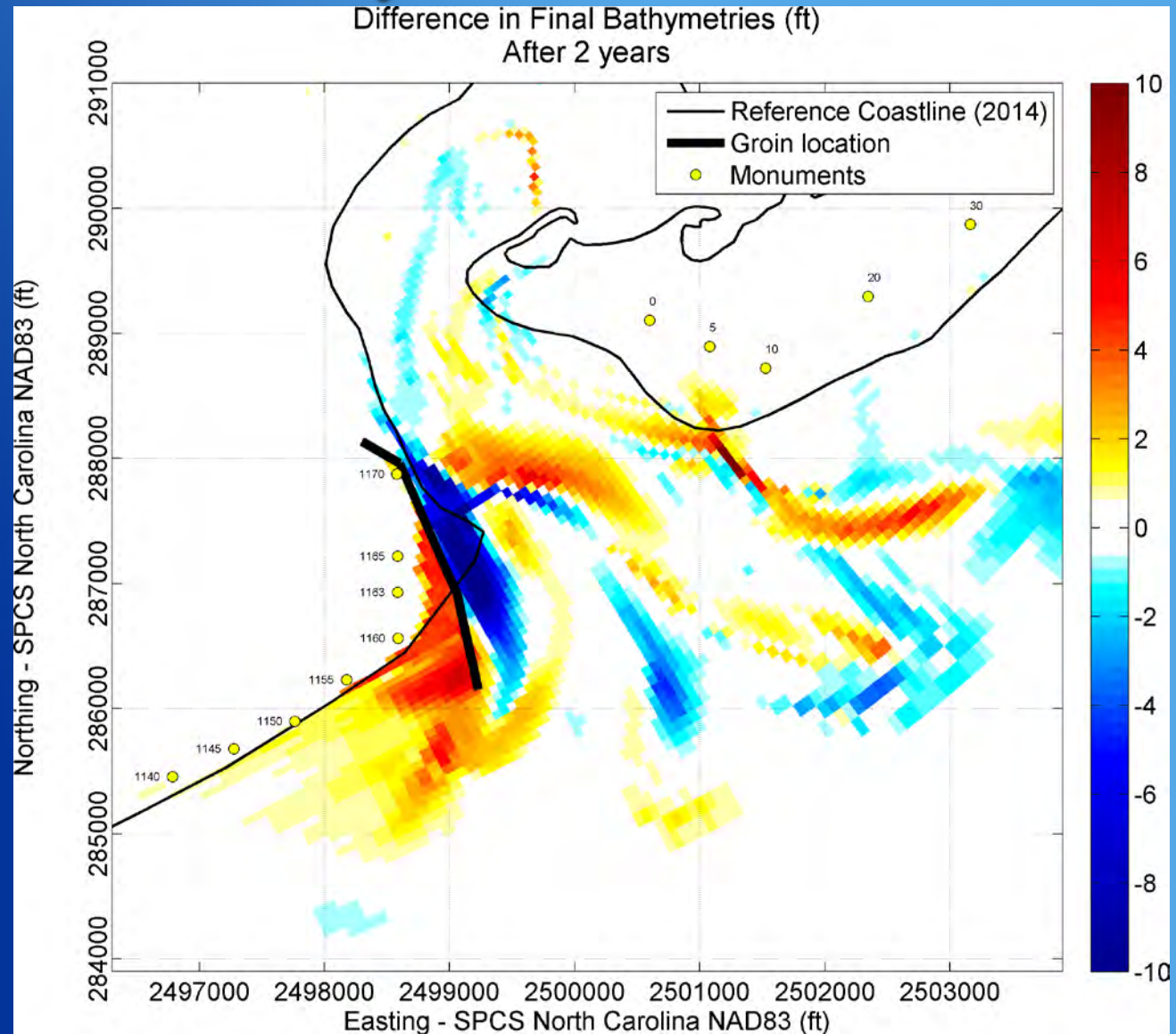
Terminal Groin Feasibility Study – Preliminary Results:

Option 1 - Northern Groin:



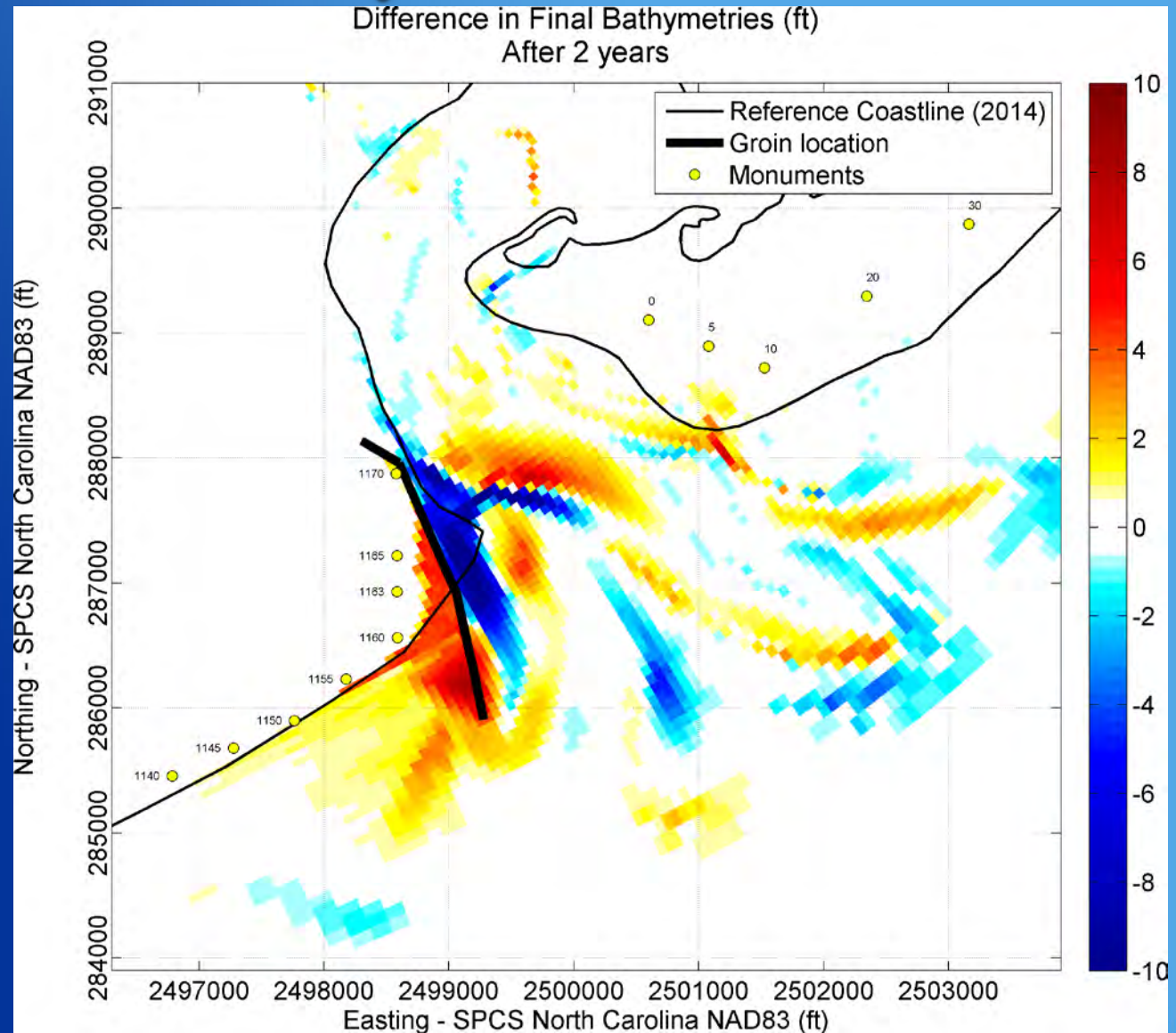
Terminal Groin Feasibility Study – Preliminary Results:

**Option 2 -
Northern
Groin Extended
250 ft:**



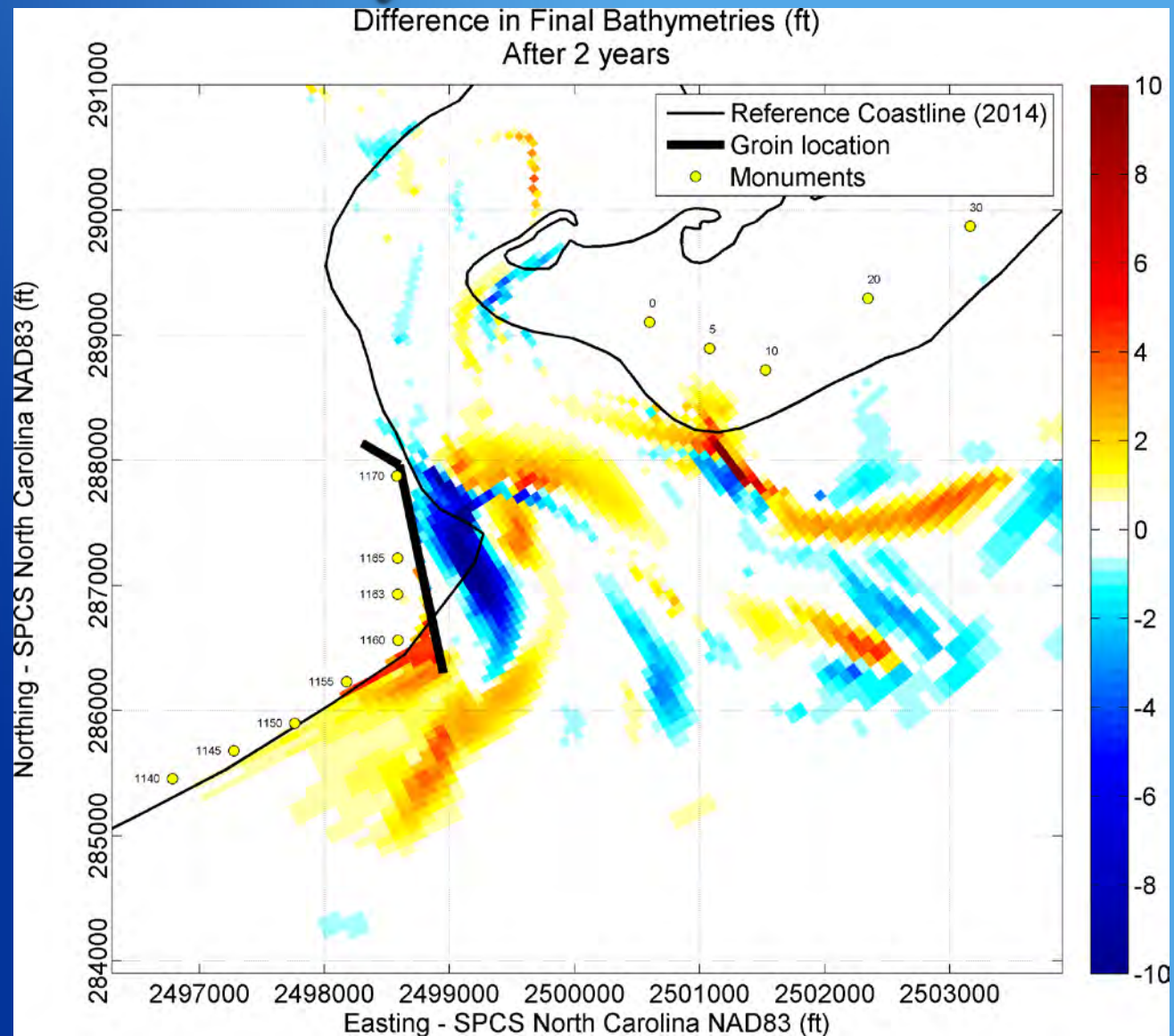
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Northern
Groin Extended
500 ft:**



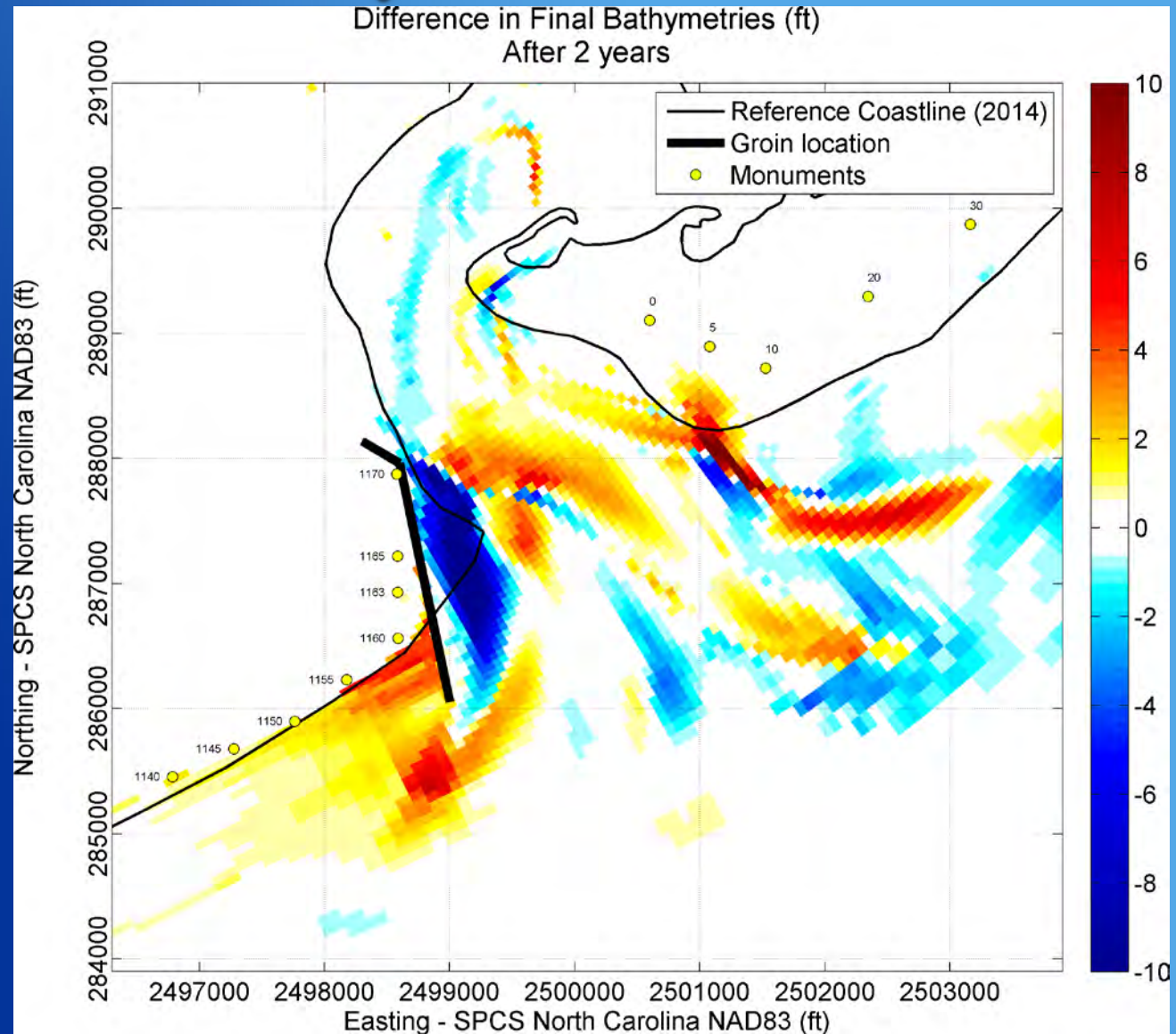
Terminal Groin Feasibility Study – Preliminary Results:

Option 4 - Southern Groin:



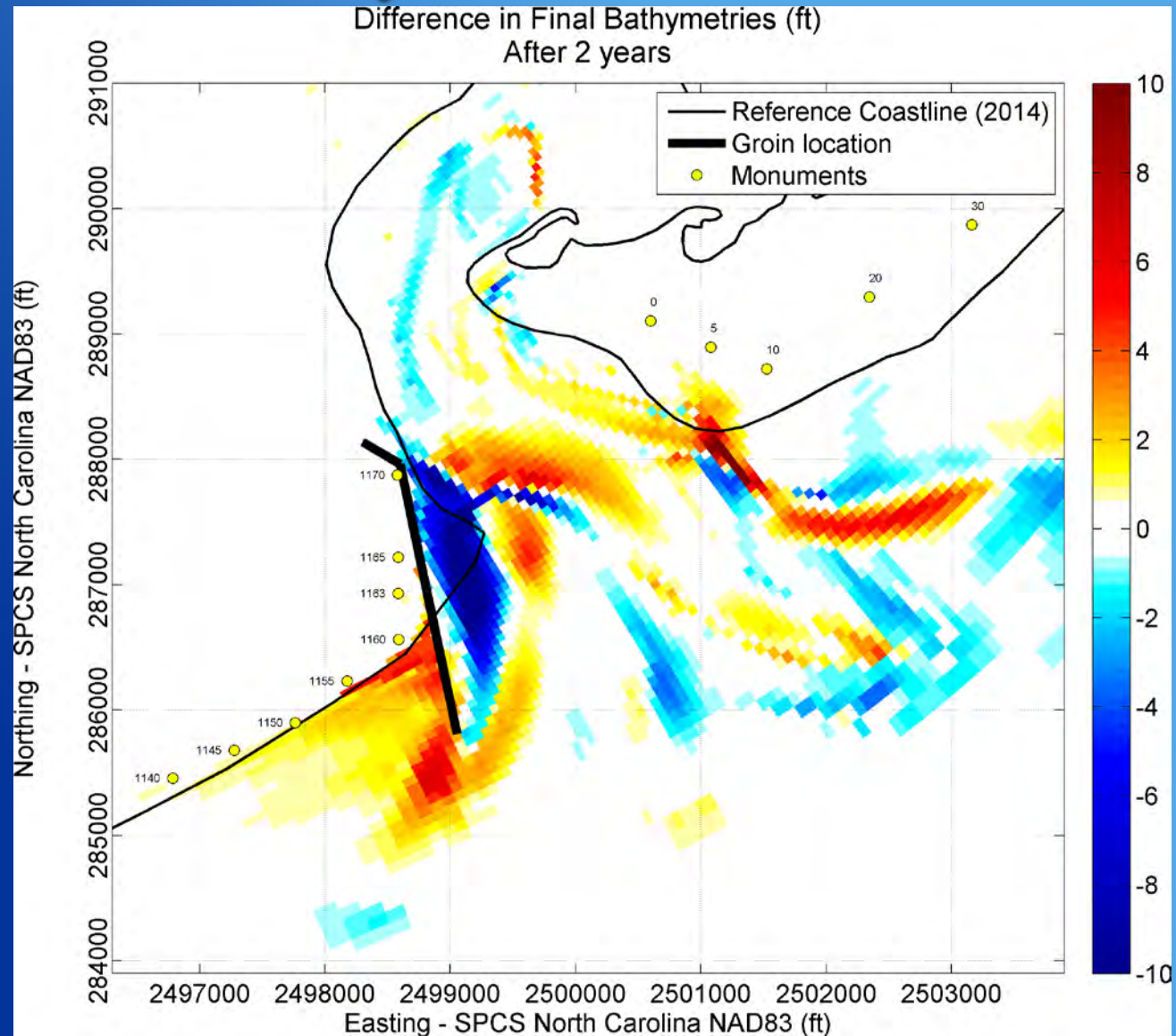
Terminal Groin Feasibility Study – Preliminary Results:

**Option 5 -
Southern
Groin Extended
250 ft:**



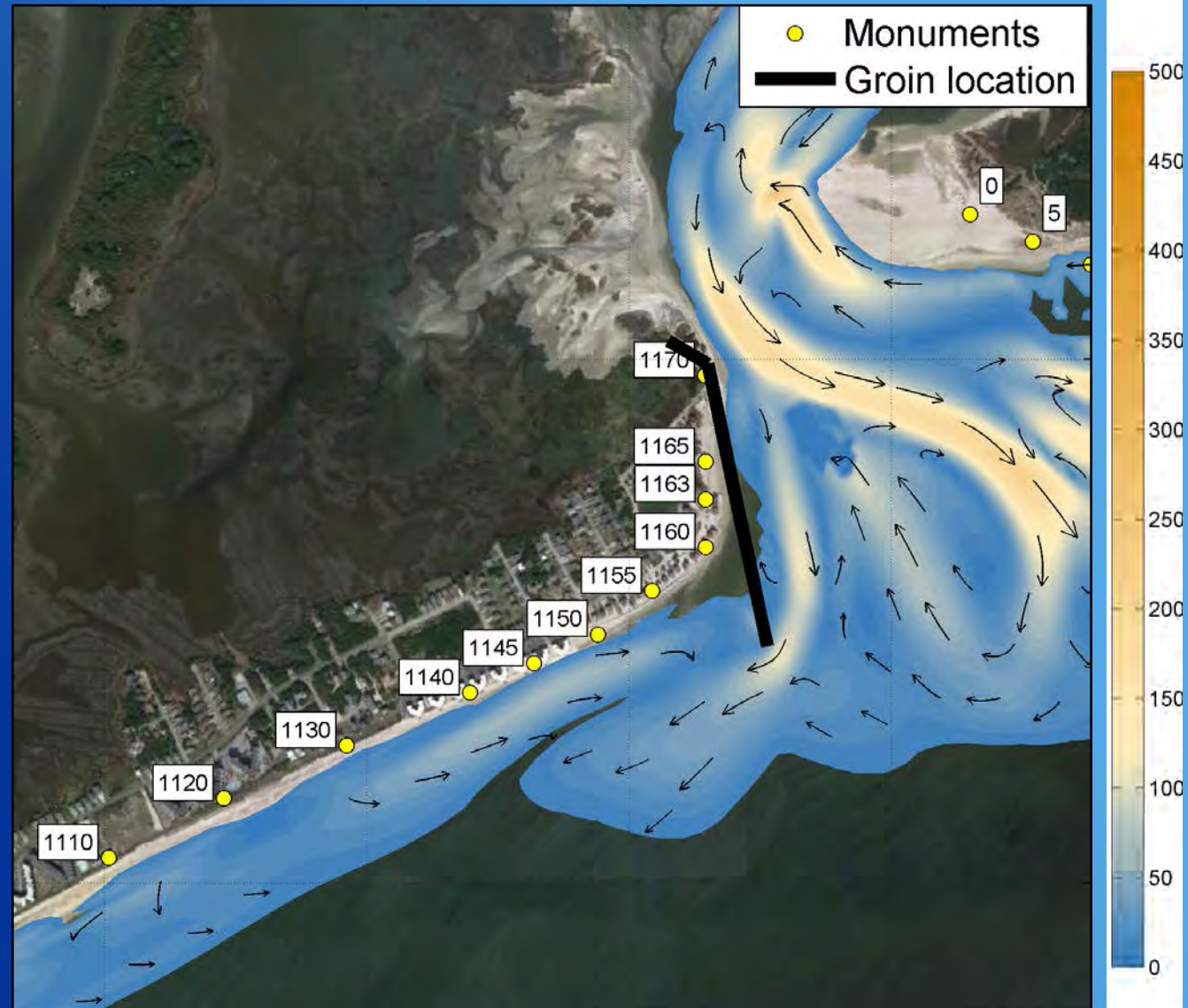
Terminal Groin Feasibility Study – Preliminary Results:

**Option 6 -
Southern
Groin Extended
500 ft:**



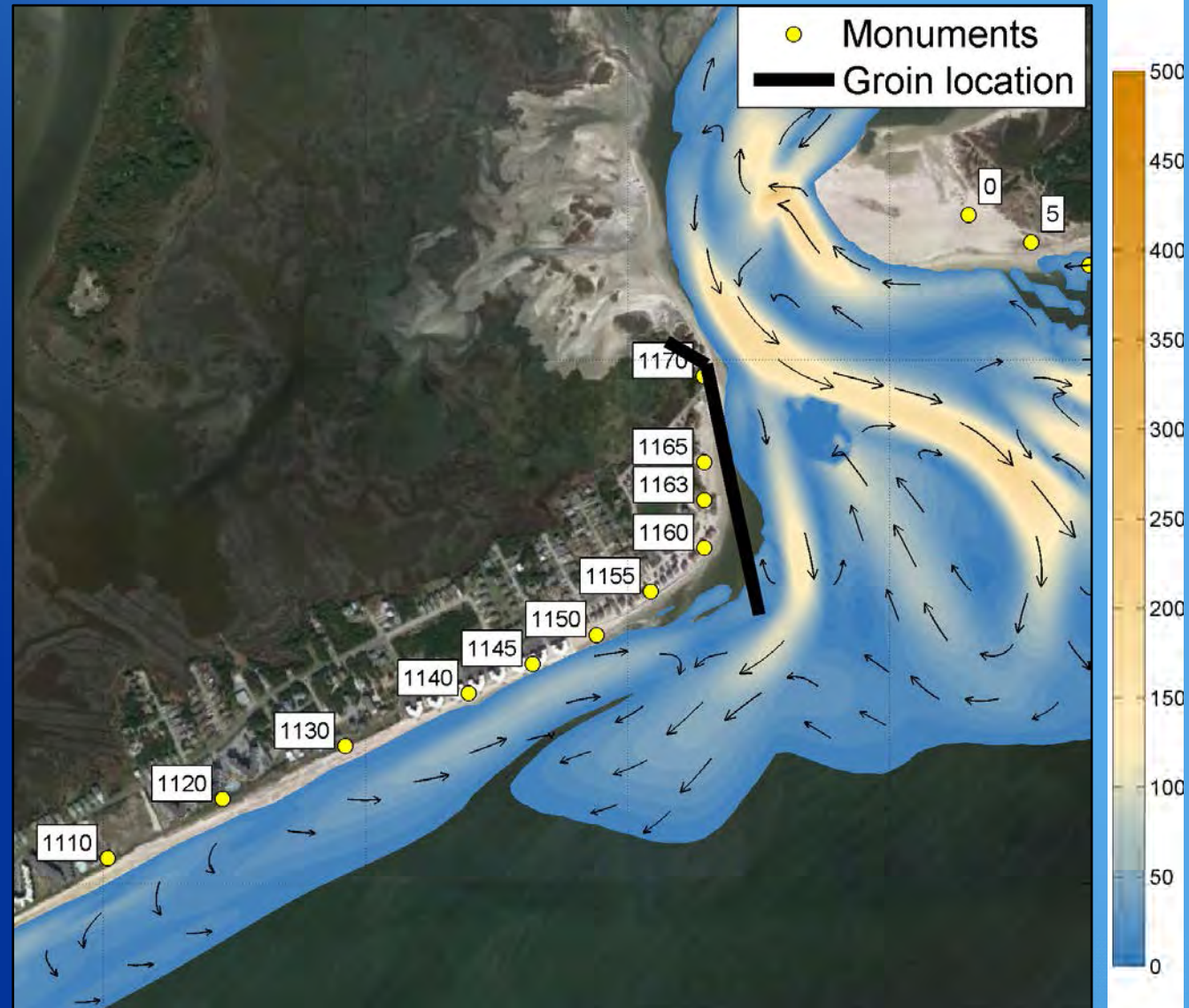
Terminal Groin Feasibility Study – Preliminary Results:

**Option 6 -
Southern
Groin Extended
500 ft:**



Terminal Groin Feasibility Study – Preliminary Results:

**Option 5 -
Southern
Groin Extended
250 ft:**



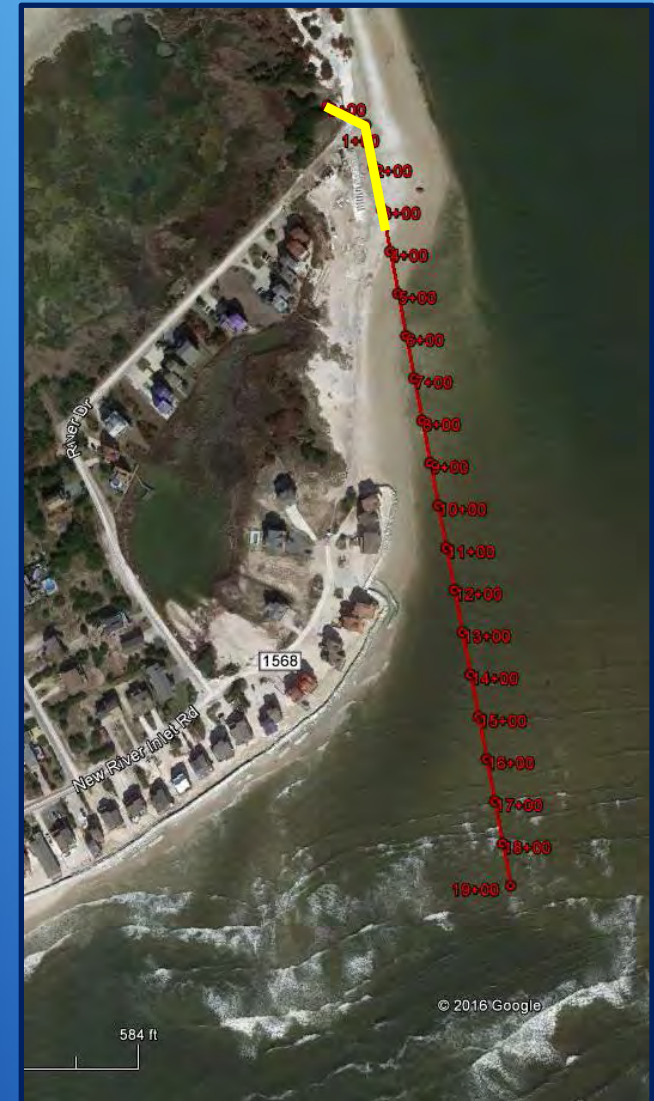
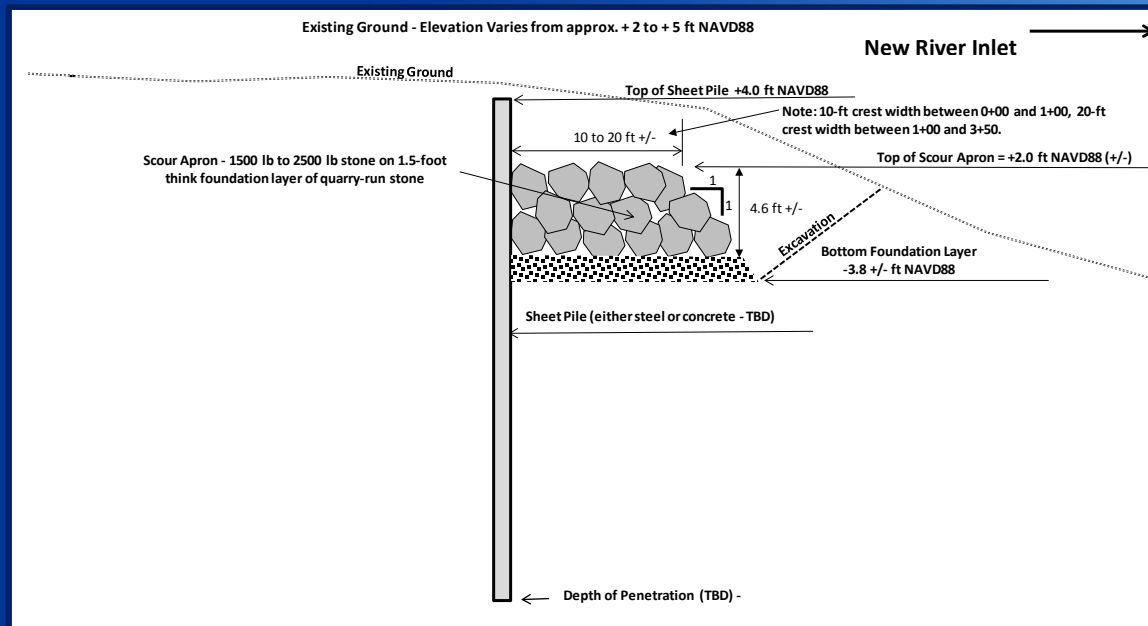
Terminal Groin Feasibility Study – Preliminary Conclusions:

- Recommend Option 5:
 - Southern Alignment
 - Approximately 1,900 ft. long
 - Divided into 3 Sections based on existing conditions



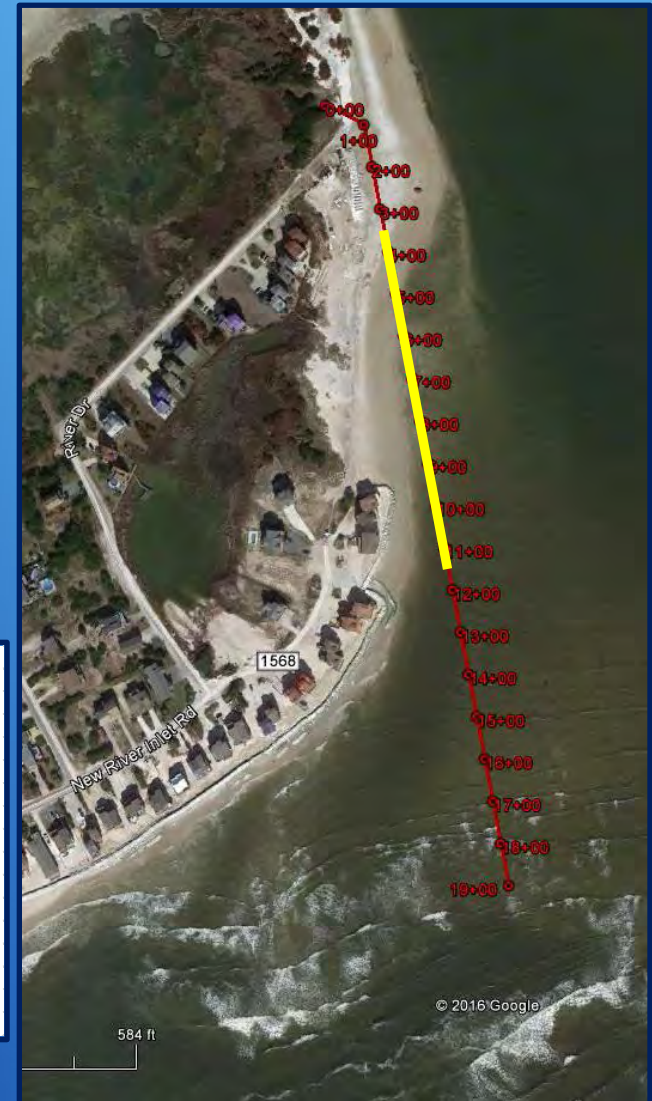
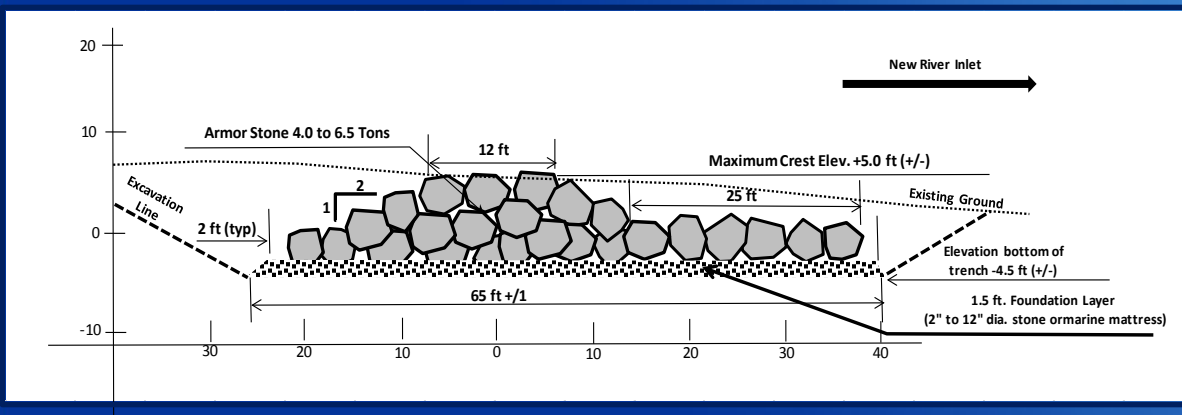
Terminal Groin Feasibility Study – Preliminary Conclusions:

- Station 0+00 to 3+50
 - Sheet pile wall protected on the inlet side by a rubble scour protection apron.
 - Top of sheet pile at ~ +4.0 ft. NAVD88
 - Top of scour apron at ~ +2.0 ft. NAVD88



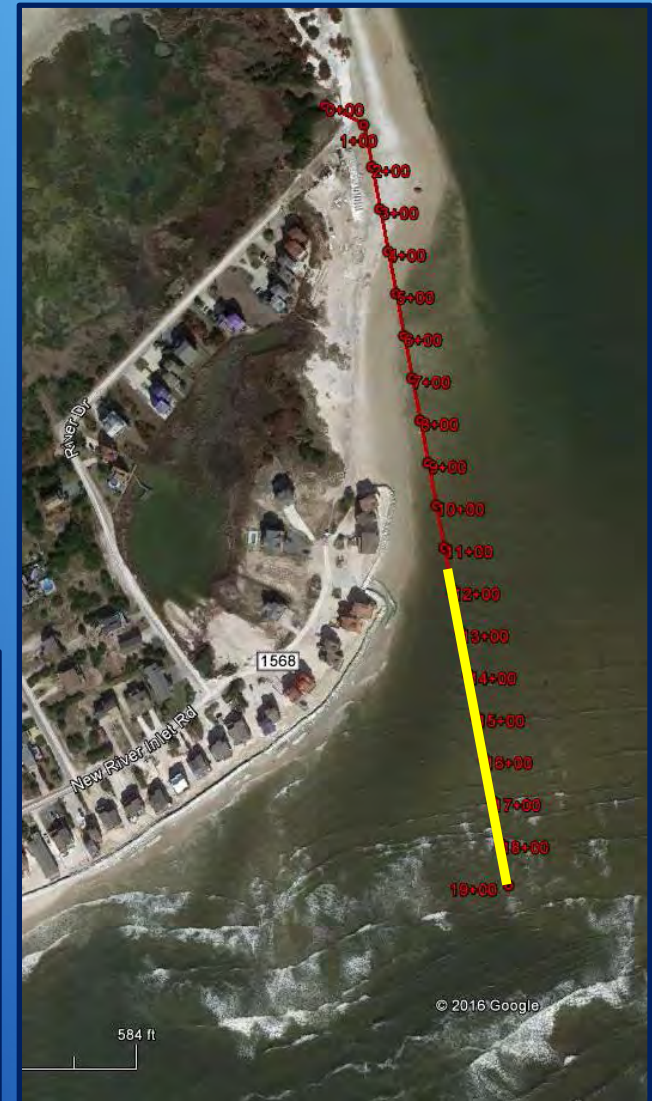
Terminal Groin Feasibility Study – Preliminary Conclusions:

- Station 3+50 to 11+50
 - Rubble Mound Structure – Granite Armor Stone (4.0 and 6.5 tons).
 - Top of rubble mound ~ +5.0 ft. NAVD88
 - ~12 ft. crest width
 - ~1.5' thick bedding layer to protect against settling



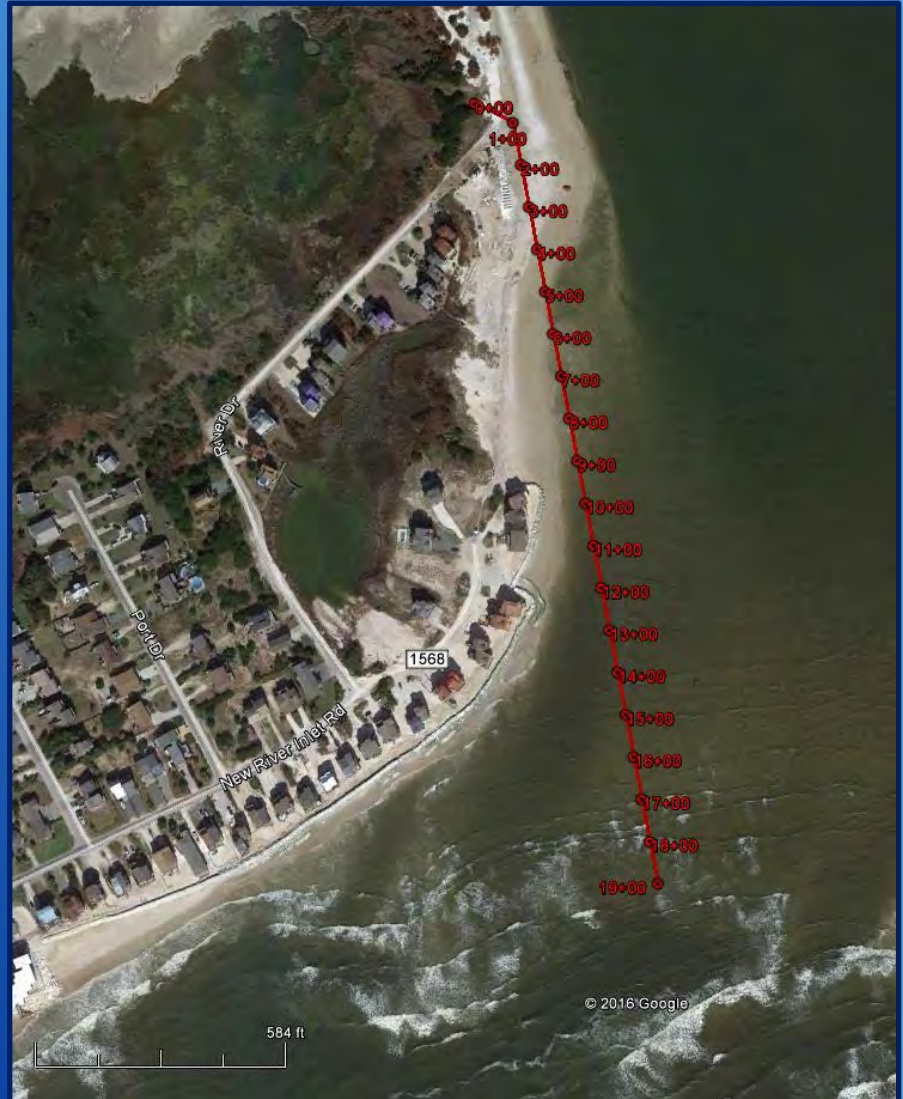
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Terminal Groin Feasibility Study – Preliminary Conclusions:

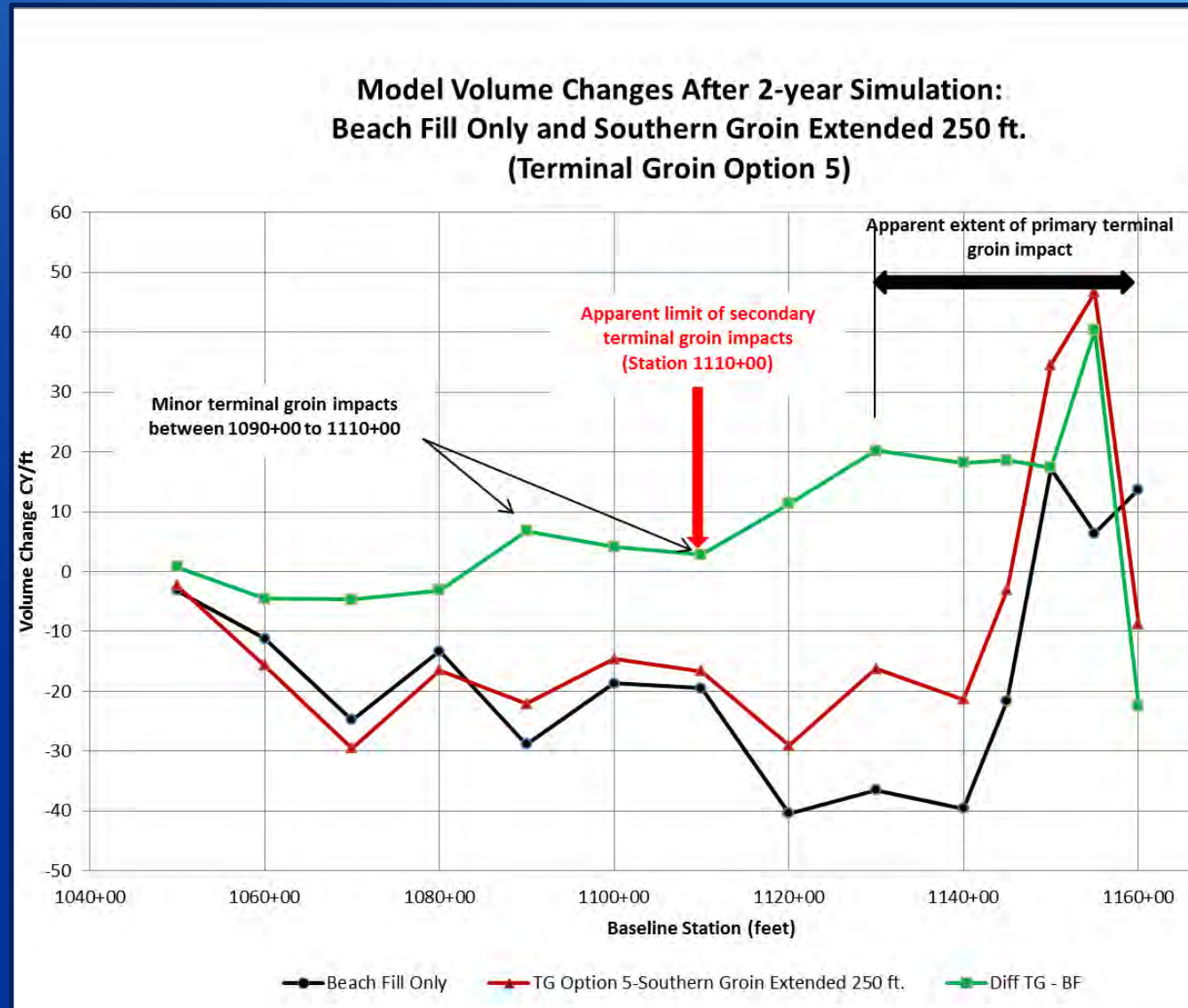
- Cost:
 - Initial Terminal Groin Construction Costs: \$7 Million to \$10 Million
 - Future maintenance costs would be required to repair the structure following severe storms
 - Cost of accompanying beach fill dependent on other projects and sand source.



Terminal Groin Feasibility Study – Preliminary Conclusions:

Extent of Groin Impacts:

- Primary impacts may extend south to Sta. 1130+00 (Bottlenose Blvd.)
- Secondary impacts may extend south to Sta. 1110+00 (Ship Watch)



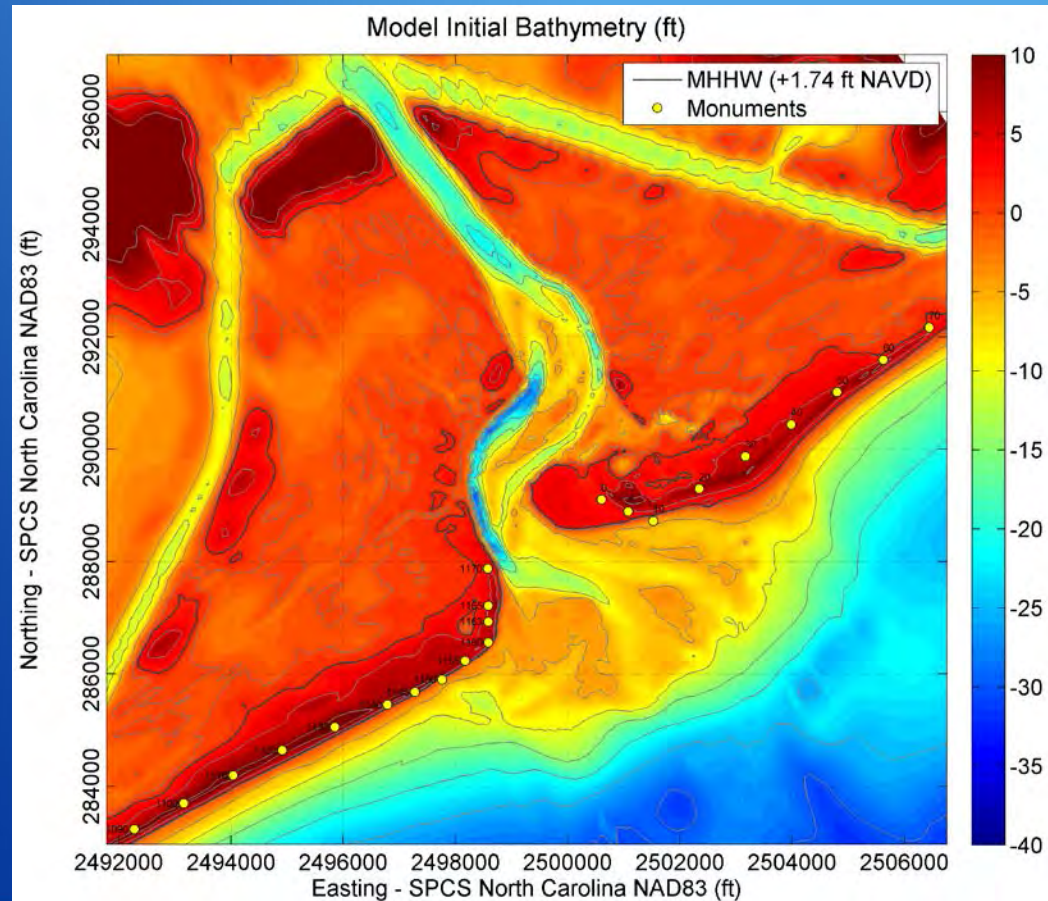
OCEAN BAR PROJECT:

Ocean Bar Project:

- Calibrated the model based on May 2013 to July 2014 Morphological Changes
- Verified the model through April 2015 bathymetry
- Model Simulations ran from April 2015 for 1 and 2 years.
- Evaluated:
 - Ebb Shoal Direct Impacts
 - Ebb Shoal Build Up
 - Channel Depths and Width
 - Volume Change Along the North End
 - Sediment Transport Patterns
 - Wave Energy Sheltering Effects

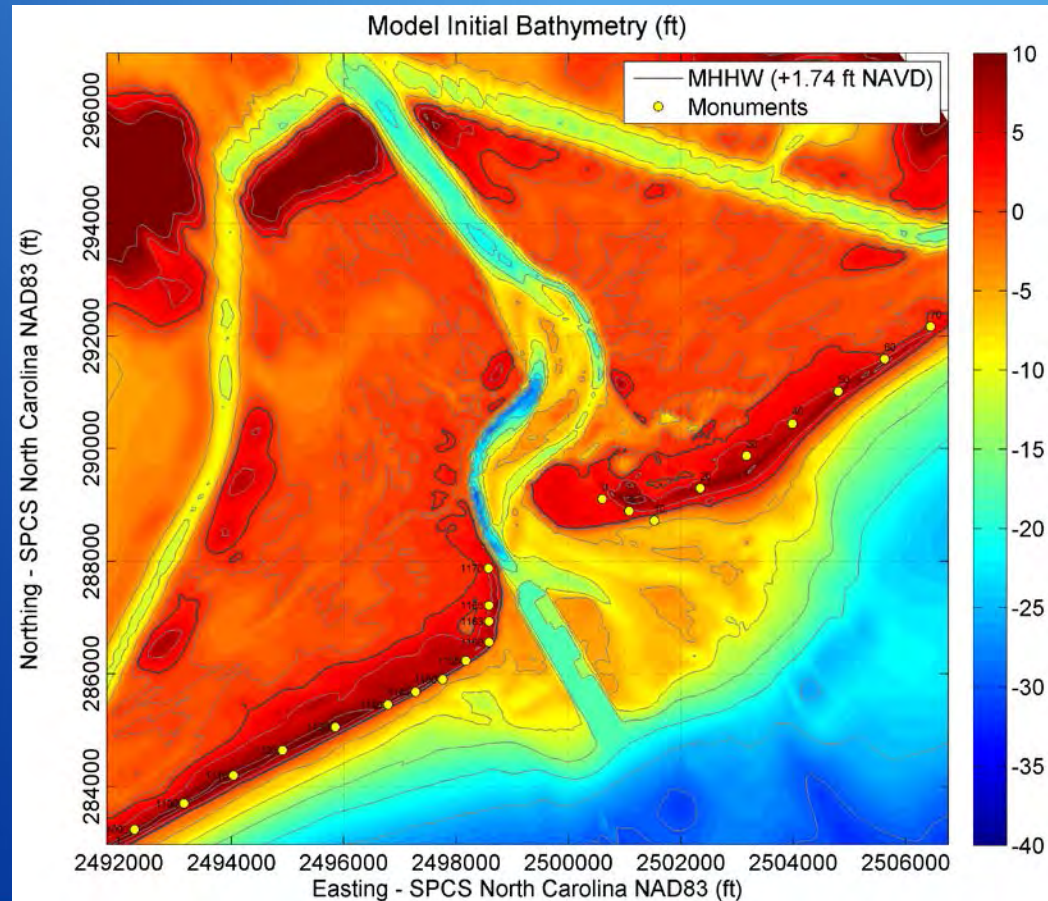
Ocean Bar Project: Alternatives

- No Action Alternative



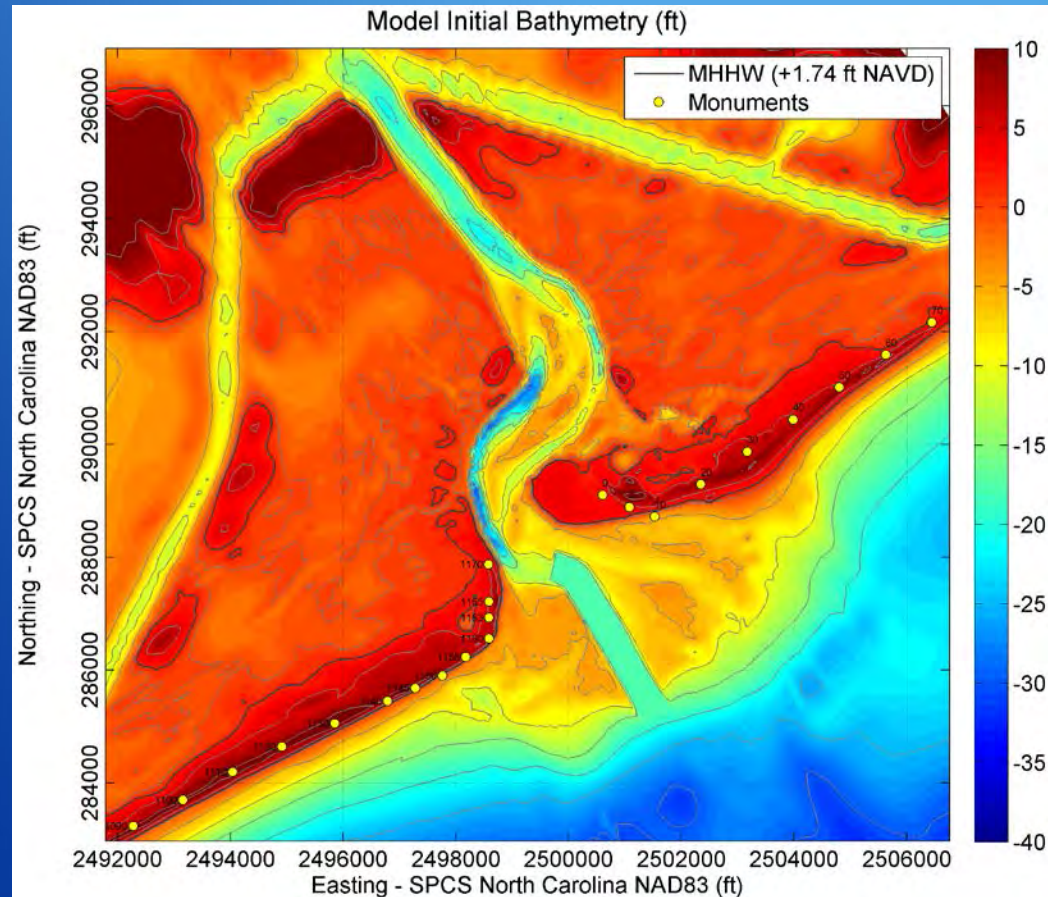
Ocean Bar Project: Alternatives

- No Action Alternative
- 2013 Channel Configuration:
 - Without beach fill
 - With beach fill



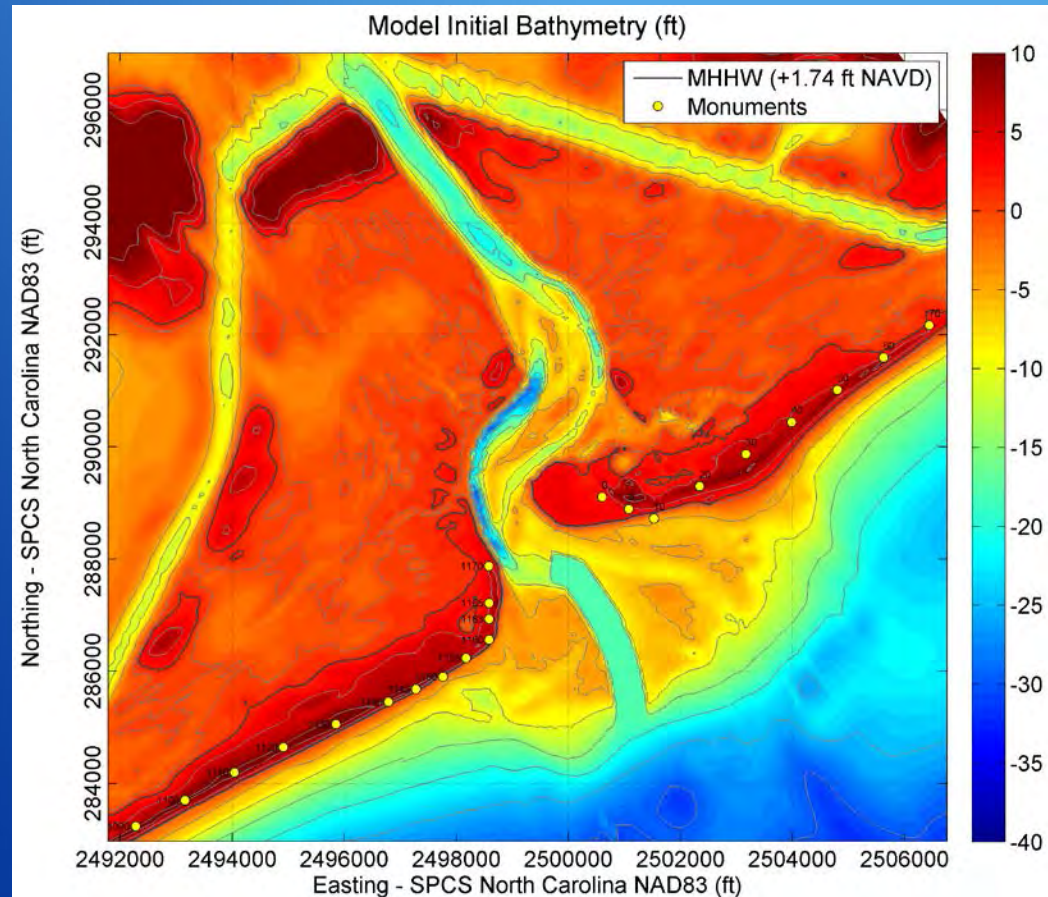
Ocean Bar Project: Alternatives

- No Action Alternative
- 2013 Channel Configuration:
 - Without beach fill
 - With beach fill
- Alternative 1 – Parallel Channel



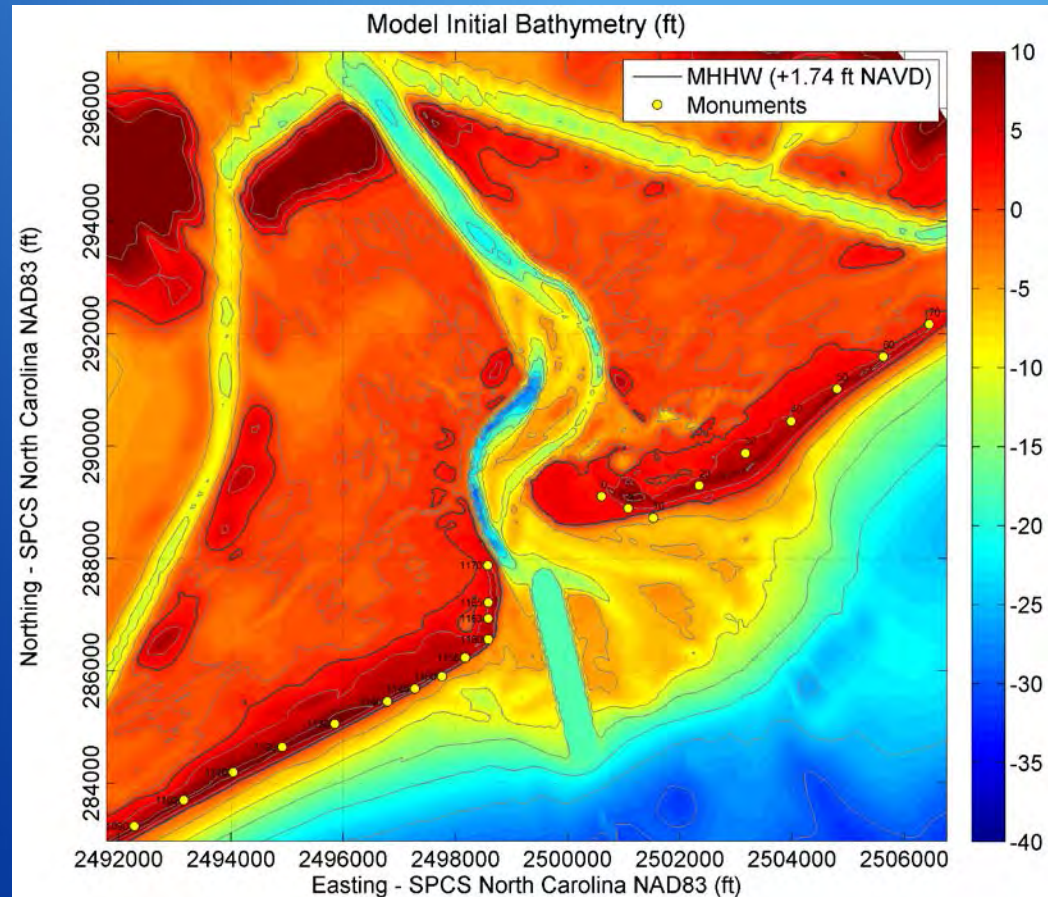
Ocean Bar Project: Alternatives

- No Action Alternative
- 2013 Channel Configuration:
 - Without beach fill
 - With beach fill
- Alternative 1 – Parallel Channel
- Alternative 2 – Curved Channel
 - -18 ft. depth/500 ft. width
 - Shallower channel (-15 ft.)
 - Narrower channel (400 ft.)
 - Shallower & narrower channel



Ocean Bar Project: Alternatives

- No Action Alternative
- 2013 Channel Configuration:
 - Without beach fill
 - With beach fill
- Alternative 1 – Parallel Channel
- Alternative 2 – Curved Channel
 - -18 ft. depth/500 ft. width
 - Shallower channel (-15 ft.)
 - Narrower channel (400 ft.)
 - Shallower & narrower channel
- Alternative 3 – Pivot Channel
 - 17 degree pivot
 - Shifted 250 ft. toward NTB
 - Shifted 500 ft. toward NTB



Ocean Bar Project: Conclusions

- Although Alternative 1 and 2 have less of an impact on the dredging off the established southwest lobe of the ebb shoal, Alternative 3, the 250 ft. and 500 ft. shifted versions of Alternative 3, and the 2013 channel configurations result in a greater buildup of sand on the southwest lobe of the ebb shoal fronting North Topsail Beach
- Model simulations show similar channel widths and depths after 2 years for Alternatives 1, 2, and 3. The secondary alternatives resulted in greater shoaling of the simulated channels after 2 years.
- Alternative 3 and Alternative 3-shifted 250 ft. simulations resulted in the most favorable beach performance along the north end of North Topsail Beach between stations 1140+00 and 1160+00.
- High rates of erosion of the sand placed as part of the Phase 1 project along the north end of North Topsail Beach are due to the creation of a shoreline alignment out of equilibrium with existing conditions.

Ocean Bar Project: Conclusions

- All simulated channel alternatives show similar transport patterns through the channel and along the southeast lobe of the ebb shoal (Onslow Beach side). Simulated results of Alternative 3 and Alternative 3-shifted 250 ft. direct the transport in a more preferable location on the ebb shoal to promote the preferred reconfiguration. Simulated results of Alternative 3 and Alternative 3-shifted 250 ft. also show a reduced sediment transport gradient on the north end of North Topsail Beach which may result in a slowing of the sand transport to the spit area.
- Simulated sediment transport patterns and erosion/sedimentation patterns suggest material filling in the channel is not coming from the beach, but rather the adjacent shoals and the interior inlet system.
- The 2013 channel and Alternative 3 had the greatest reduction in H_s north of Oyster Lane for wave case #8.
- None of the channel alternatives had a significant impact on the tidal prism of New River Inlet.
- Alternative 3 is the recommended channel

Ocean Bar Project: Proposed Schedule - Provided April 13, 2016

<u>State Permit</u>			
Start Date	Completion Date	Milestone	Number of Days
4/18/2016	5/18/2016	Prepare CAMA Permit Mod Applicatiton	30
5/18/2016	10/15/2016	CAMA permit application review period	150
10/8/2016	11/17/2016	Bid Advertisement	40
11/17/2016	12/1/2016	Contract Negotiations	14
12/1/2016	12/31/2016	Mobilization	30
12/31/2016	4/30/2017	Construction	120

Ocean Bar Project: Updated Schedule - July 26, 2016

<u>State Permit</u>			
Start Date	Completion Date	Milestone	Number of Days
4/14/2016	6/29/2016	Prepare CAMA Permit Mod Applicatiton	76
6/29/2016	8/11/2016	DCM Waiting Period for Inter-Agency Meeting	43
8/12/2016	1/9/2017	CAMA permit application review period	150
12/1/2016	1/10/2017	Bid Advertisement	40
11/17/2016	1/24/2016	Contract Negotiations	14
1/24/2017	2/7/2017	Mobilization	14
2/7/2017	4/30/2017	Construction	82

Ocean Bar Project: Next Steps

- Determine Town Priorities:
 - Hold the north end until hardened structure can be installed
 - Continue the program to re-nourish the remaining portions of the beach
 - Maintain projects already constructed
- Determine Shore Protection Budget (minimum 5 year plan)
- Potential Options For Consideration:
 - 2nd Channel Realignment Project – Likely 17/18
 - New River / AIWW / Cedar Bush Cut Maintenance – Beach Disposal
 - Coordination with USACE on ocean bar maintenance
 - Sand bag maintenance
 - Utilize SEIS – DA-143 / Extended Dredge Windows

FEMA MAINTENANCE PLAN:

FEMA Maintenance Plan:

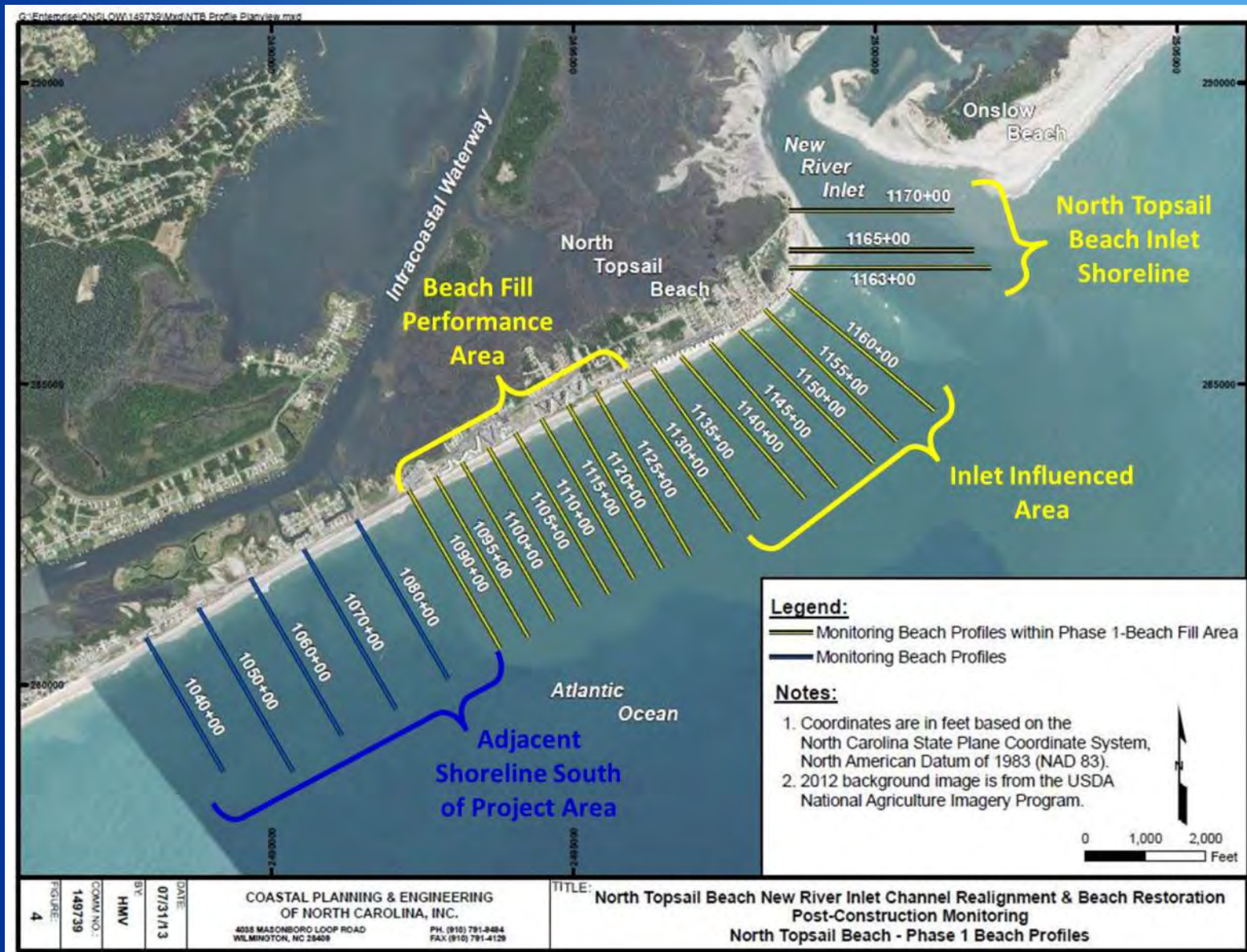
- Satisfies the requirement in 44 CFR 206.226(j)(2) for the implementation of a maintenance program
- Outlines the Town's 11.1 Shoreline Protection Program
- Describes construction activities to date
- Describes the monitoring of the projects constructed
- Describes maintenance plan for the constructed projects
- Describes a 4th construction event (remaining unconstructed sections): Volume and Cost Estimate
- The plan is amended as required to reflect changes in the project scheduling or fiscal projections.

**MONITORING OF EXISTING
PROJECTS:
PHASE 1
&
PHASE 5**

Monitoring of Phase 1:

- Project Completed February 2013
- April 2016 Surveys represent project performance ~ 3.2 years following construction
- Monitoring takes into account sand placed along north end from AIWW/New River Navigation Project
- Monitoring Includes:
 - Phase 1 Project Area – Volume and Shoreline Change (Beach Fill Performance Area / Inlet Influenced Area)
 - Outside Phase 1 Project Area – Volume and Shoreline Change (Southern adjacent shoreline)
 - Onslow Beach Shoreline – Volume and Shoreline Change
 - Channel Shoaling – Volume Change
 - Ebb Shoal Reconfiguration – Qualitative Ebb Shoal and Beach Profile Survey Comparison

Monitoring of Phase 1:



Monitoring of Phase 1:



Shoreline and Volume Changes

PHASE 1 BEACH FILL PERFORMANCE AREA

- **Shoreline Change**
 - MHW (April 2015 to April 2016) = -3 ft./yr
 - MHW (May 2013 to April 2016) = -20 ft./yr
 - Foreshore (April 2015 to April 2016) = -32 ft./yr
 - Foreshore (May 2013 to April 2016) = -21 ft./yr
- **Volume Change (Above -12 ft. NAVD88)**
 - 4/2015 to 4/2016 = -22 cy/lf/yr.
 - 5/2013 to 4/2016 = -16 cy/lf/yr.
 - 5/2013 to 4/2016 = -181,200 cy

PHASE 1 INLET INFLUENCED AREA

- **Shoreline Change**
 - MHW (April 2015 to April 2016) = +46 ft./yr
 - MHW (May 2013 to April 2016) = -66 ft./yr
 - Foreshore (April 2015 to April 2016) = +107 ft./yr
 - Foreshore (May 2013 to April 2016) = -48 ft./yr
- **Volume Change (Above -12 ft. NAVD88)**
 - 4/2015 to 4/2016 = +44 cy/lf/yr.
 - 5/2013 to 4/2016 = -30 cy/lf/yr.
 - 5/2013 to 4/2016 = -304,900 cy

ADJACENT SHORELINE SOUTH OF PHASE 1

- **Shoreline Change**
 - MHW (April 2015 to April 2016) = +9 ft./yr
 - MHW (May 2013 to April 2016) = +4 ft./yr
 - Foreshore (April 2015 to April 2016) = +1 ft./yr
 - Foreshore (May 2013 to April 2016) = +7 ft./yr
- **Volume Change (Above -12 ft. NAVD88)**
 - 4/2015 to 4/2016 = -2 cy/lf/yr.
 - 5/2013 to 4/2016 = -2 cy/lf/yr.
 - 5/2013 to 4/2016 = +20,500 cy

Shoreline and Volume Changes

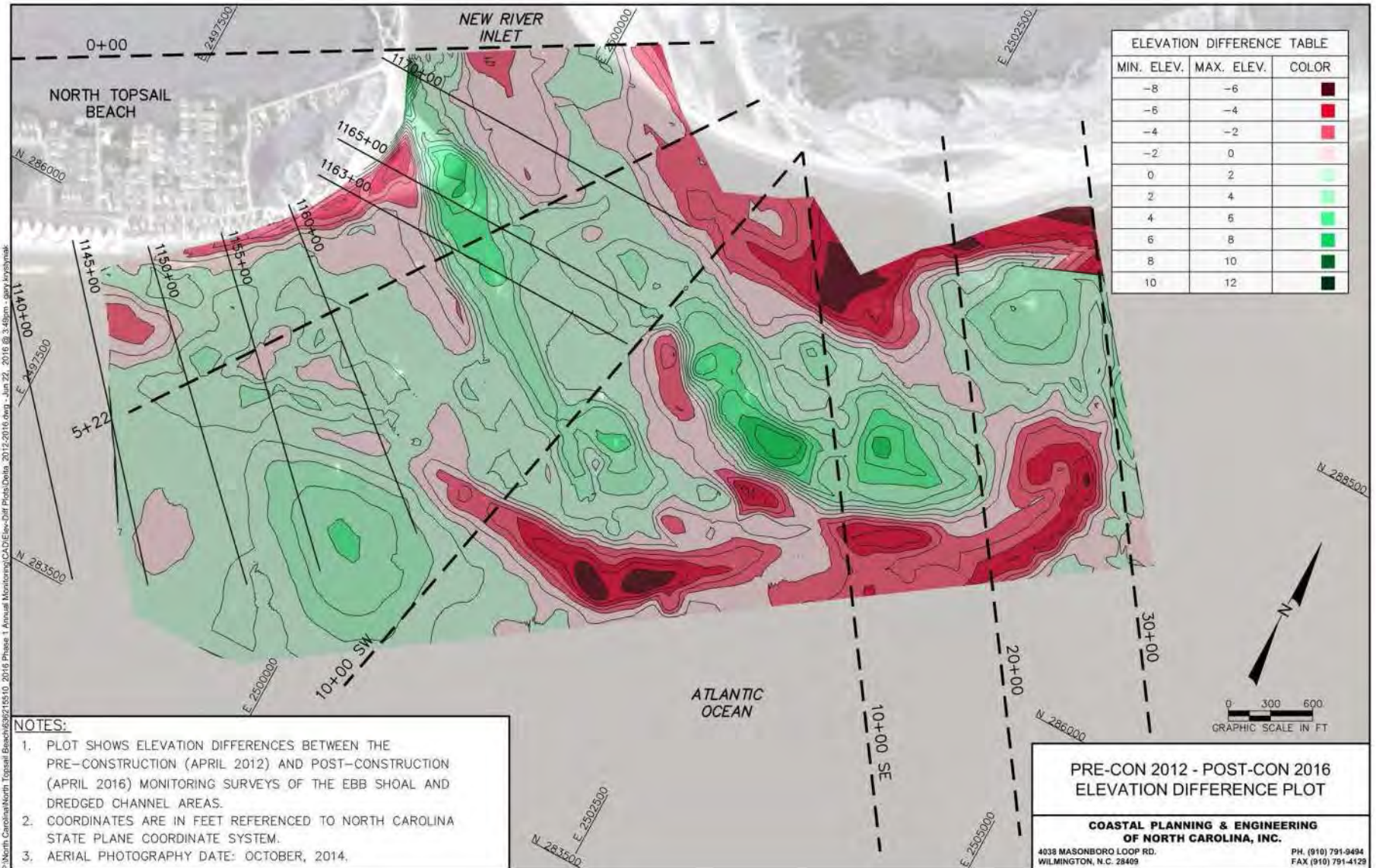
ONSLOW BEACH AREA

- *Shoreline Change*
 - Pre-Con MHW (8/2005 to 10/2012) = -12 ft./yr
 - Post-Con MHW (5/2013 to 4/2016) = +5 ft./yr
 - MHW (4/2015 to 4/2016) = +29 ft./yr
 - Pre-Con Foreshore (8/2005 to 10/2012) = -10 ft./yr.
 - Post-Con Foreshore (5/2013 to 4/2016) = -3 ft./yr.
 - Foreshore (4/2015 to 4/2016) = -10 ft./yr.
- *Volume Change (Above -12 ft. NAVD88)*
 - Pre-Con Volume Change (8/2005 to 10/2012) = -4 cy/lf/yr.
 - Post-Con Volume Change (5/2013 to 4/2016) = +1 cy/lf/yr.
 - Volume Change (4/2015 to 4/2016) = +1 cy/lf/ft.

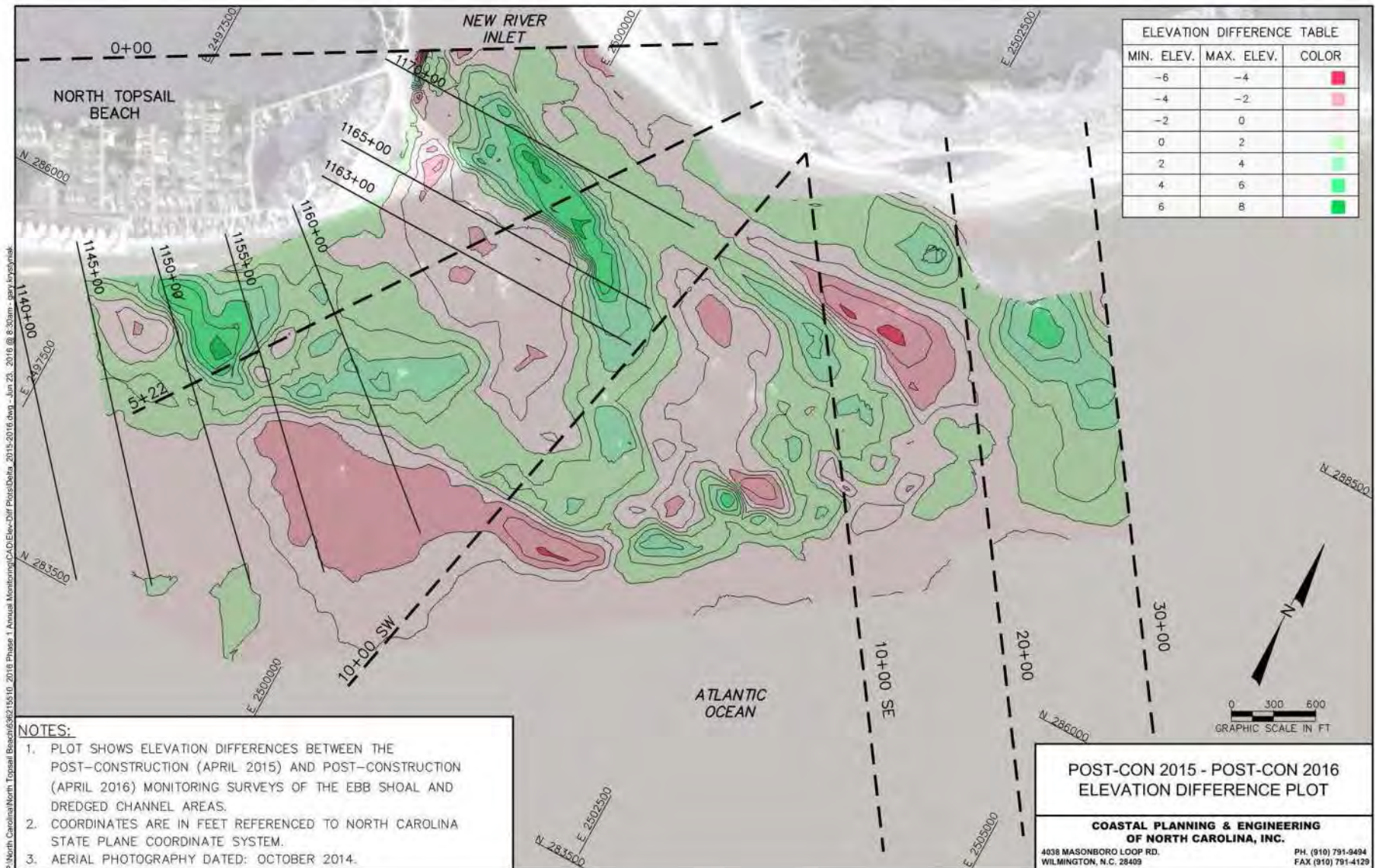
Ebb Shoal Reconfiguration



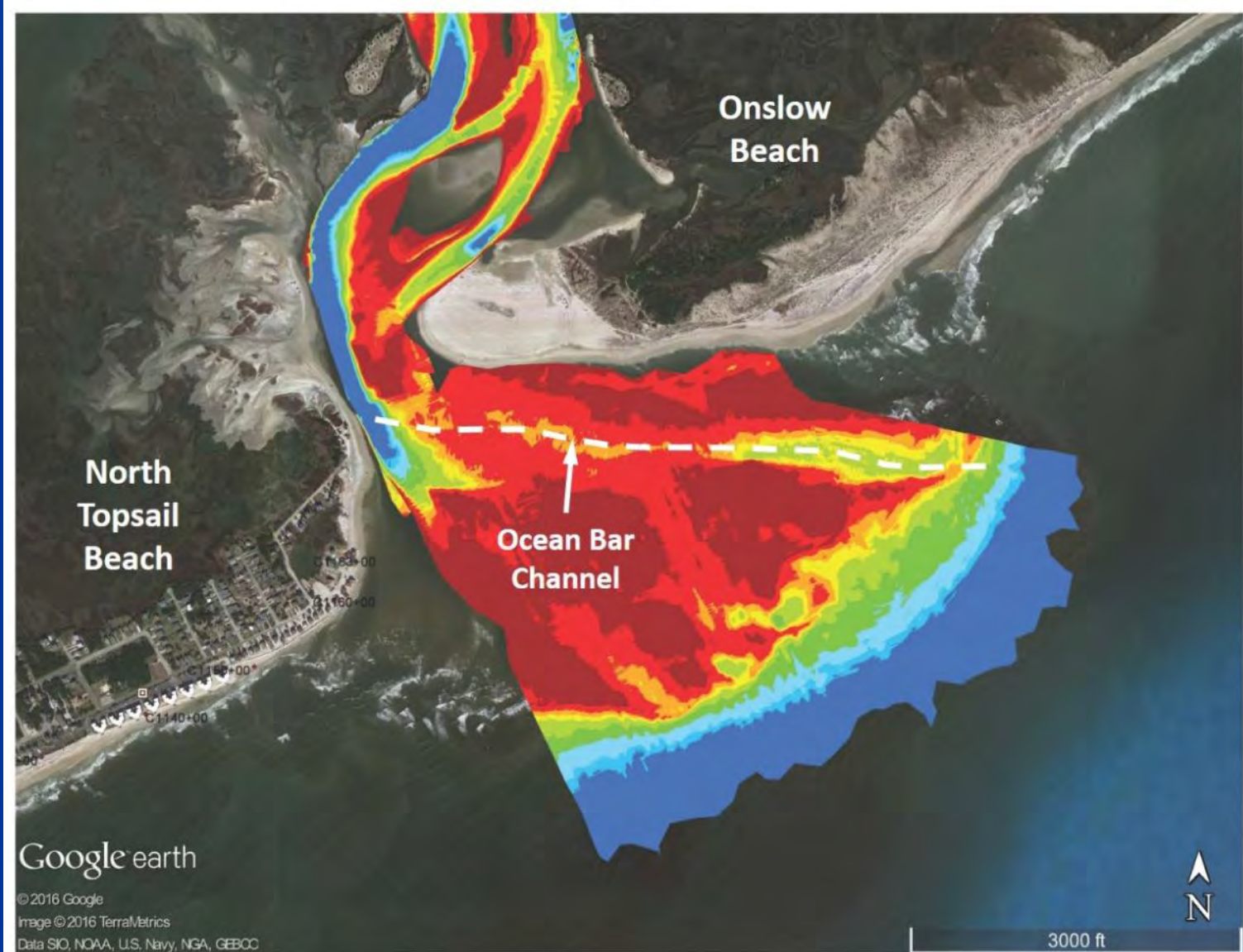
Ebb Shoal Reconfiguration: June 2012 to April 2016



Ebb Shoal Reconfiguration: April 2015 to April 2016



Orientation of Ocean Bar Channel



Monitoring of Phase 1: Conclusions

- Inlet Shoreline remains highly variable due to natural and man-induced changes in the inlet and spit.
- Inlet Influenced Area showed gains in volume due to AIWW/New River Navigation Project. Sand will move south toward reefs and north toward spit.
- Inlet Influenced MHW Surveys pre-AIWW/New River Navigation Project showed stable MHW shoreline position at 1160+00 (+3 ft./yr) and 1155+00 (-1 ft./yr) from April 2016 to March 2016. (May 2013 to April 2015 rate was over -120 ft./yr)
- Beach Fill Performance Area show higher rates of erosion than previously recorded. Highest rates of loss at Station 130+00. Believed to be a response to a deficit of sand moving from north to south due to revetment.

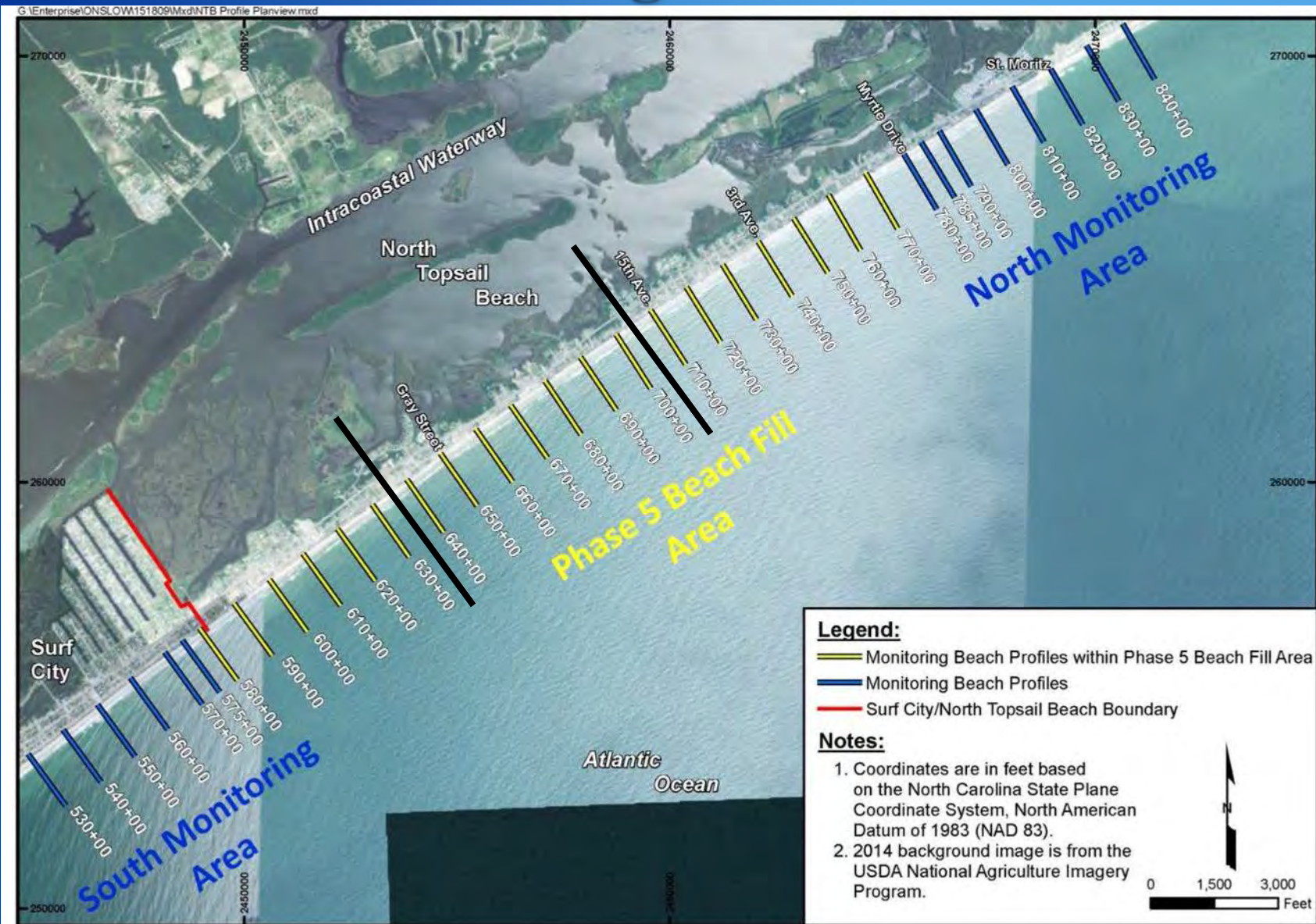
Monitoring of Phase 1: Conclusions

- South Adjacent Area continues to remain stable and show a net advance in the shoreline and net gain in volume above the -12.0 ft. NAVD88 contour since construction.
- Onslow Beach monitoring shows no adverse impacts in response to the project.
- Monitoring of the ebb shoal continues to confirm the design concept that ocean bar alignment dictates the configuration of the ebb shoal. The current ocean bar channel is oriented toward Onslow Beach causing a deflation in the North Topsail Beach portion of the shoal and buildup of the Onslow Beach portion of the shoal over the past 12 months.
- Future channel realignment efforts should ensure that sufficient funding is available for the USACE to maintain the position of the realigned channel

Monitoring of Phase 5:

- Originally permitted to supplement until Federal Project could be constructed (Fill Density = 25 cy/lf)
- May 2013 - NTB BOA Modified Project
 - Fill Density increased to 50 cy/lf
 - 25 ft. wide dune at +14 ft. NAVD88
 - 50 ft. wide berm at +6 ft. NAVD88
 - Advanced Fill (4 years) 20% Additional Volume
- Fall 2014 - Fill Density increased to 73 cy/lf (1.5 MIL CY)
- During Contract Negotiations Fill Density reduced to 62 cy/lf
- Project Completed June 2015
 - Total Volume = 1,273,100 CY (Pre-Con to Post-Con)
 - Project Length = 18,520 ft. (Approx. 3.5 miles)

Monitoring of Phase 5:



Shoreline and Volume Changes

Post-Con (July 2015) to April 2016

PHASE 5 PROJECT AREA

- *Shoreline Change*
 - MHW = -15 ft. (-20 ft./yr)
- *Volume Change (Above DOC) = +2,000 CY*
 - Annualized Avg. = +0.9 cy/lf/yr

NORTH MONITORING AREA

- *Shoreline Change*
 - MHW = +6 ft. (+8 ft./yr)
- *Volume Change (Above DOC) = +23,000 CY*
 - Annualized Avg. = +6.0 cy/lf/yr

SOUTH MONITORING AREA

- *Shoreline Change*
 - MHW = +21 ft. (+28 ft./yr)
- *Volume Change (Above DOC) = +50,400 CY*
 - Annualized Avg. = +9.8 cy/lf/yr

Shoreline and Volume Changes

Post-Con (July 2015) to April 2016

PHASE 5 – NORTHERN REGION

- *Shoreline Change*
 - MHW = +4 ft. (+5 ft./yr)
- *Volume Change (Above DOC) = -34,000 CY*
 - Annualized Avg. = -7.9 cy/lf/yr

PHASE 5 – CENTRAL REGION

- *Shoreline Change*
 - MHW = +3 ft. (+4 ft./yr)
- *Volume Change (Above DOC) = +2,700 CY*
 - Annualized Avg. = +1.7 cy/lf/yr

PHASE 5 – SOUTHERN REGION

- *Shoreline Change*
 - MHW = -51 ft. (-68 ft./yr)
- *Volume Change (Above DOC) = +33,400 CY*
 - Annualized Avg. = +7.7 cy/lf/yr

Monitoring of Phase 5: Conclusions

- Phase 5 Project Area: +2,000 cy of material; +87 ft. Shoreline Remain (MHW)
- Northern Monitoring Area – Generally Stable. Minimal shoreline and volume changes between July 2015 and April 2016
- Southern Monitoring Area – Generally Stable. Increase in MHW shoreline and volume to Depth of Closure between July 2015 and April 2016