



## THE TOWN OF OAK ISLAND, NORTH CAROLINA



# LOCKWOOD FOLLY HABITAT RESTORATION PROJECT DREDGING OF EASTERN CHANNEL



# Overall Project



# Project Purpose and Need

## Navigation

- Provide a Safe, Adequate Depth Channel for the Purpose of Both Commercial and Recreational Navigation for Shallow Draft Boats And Users
- Many Areas Had Shoaled to -1 To -3 Ft MLLW

## Habitat Restoration

- Stabilize and Restore the Estuarial Habitat Surrounding the Eastern Channel
- Water Quality Measurements Point to Need for Tidal Flushing

## Beneficial Use of Material for Infrastructure Protection

- Provide Essential Beach Compatible Sand to the Badly Eroded West Beach of Oak Island Which Has Infrastructure and Structures Currently Threatened After Recent Storm Events

# Project Purpose and Need



# Project Purpose and Need



# Permitting

## All Permits for Original Project Received By February 20<sup>th</sup>

- CAMA Major, USACE 291 & Section 408, USFWS BO

## First Permit Modification Approved By March 3<sup>rd</sup>

- Dealt with Additional Material and Altered Placement Design
- Allowed for Dredging of Up to 278,950 cy and Placement of Up to 226,575 cy
- Agencies Desired to Delay Timeline Extension Until Dredge Had Been Operating for a Couple of Weeks – Get Realistic Estimate

## Second Permit Modification Submitted March 20<sup>th</sup>

- Based on Additional Shoaling and 16-in Dredge Production Rates
- Requested a Three Week Extension – Approved Last Week of April
- Cottrell Added Second Dredge (Used as A Booster) and Production Rates Dramatically Increased So That Extension Was Barely Needed

# Construction Timeline

## Construction Began on March 4<sup>th</sup>, 2015

- Original Permit Request

**April 23<sup>rd</sup>, 2015 – Beach fill placement operations cease**

**April 30<sup>th</sup>, 2015 – All equipment removed from beach**

**May 24<sup>th</sup>, 2015 – Non-beach fill placement operations cease**

**May 31<sup>st</sup>, 2015 – All equipment removed from Horse Island**

## ACTUAL

- April 30<sup>th</sup>, 2015

- May 4<sup>th</sup>, 2015

- May 22<sup>nd</sup>, 2015

- May 31<sup>st</sup>, 2015

- Revised Request

**May 15<sup>th</sup>, 2015 – Beach fill placement operations cease**

**May 20<sup>th</sup>, 2015 – All equipment removed from beach**

**June 5<sup>th</sup>, 2015 – Non-beach fill placement operations cease**

**June 10<sup>th</sup>, 2015 – All equipment removed from Horse Island**

# Project Adjustments

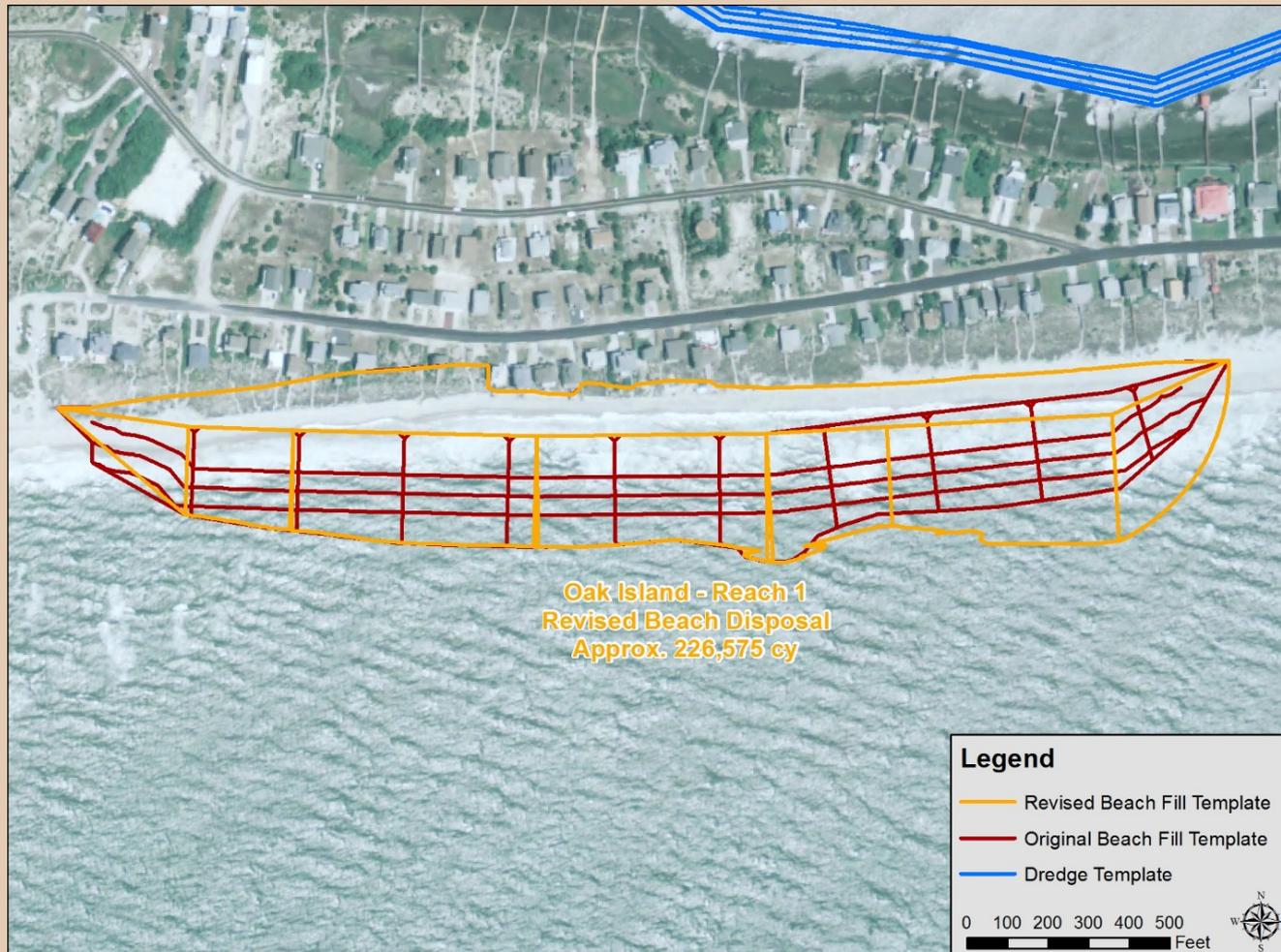
## Project Dredging Template Adjustment

- Had to Shallow Dredging Template Moving Inland Given Additional Material Dredged and Better Than Expected Loss Rates
- Increased Material at Mouth of Eastern Channel Necessitated This
- Various Portions of the Inland Channel Target Elevation Was Raised by 1 – 2 ft with Minimum Target of 6' of Draft at MLLW
- Needed to be Sure That Channel Dredging and Beach Placement Would Stay Within Permit Limits and End at the Same Time for Beach Compatible Portion

# Project Adjustments

## Project Placement Template Adjustment

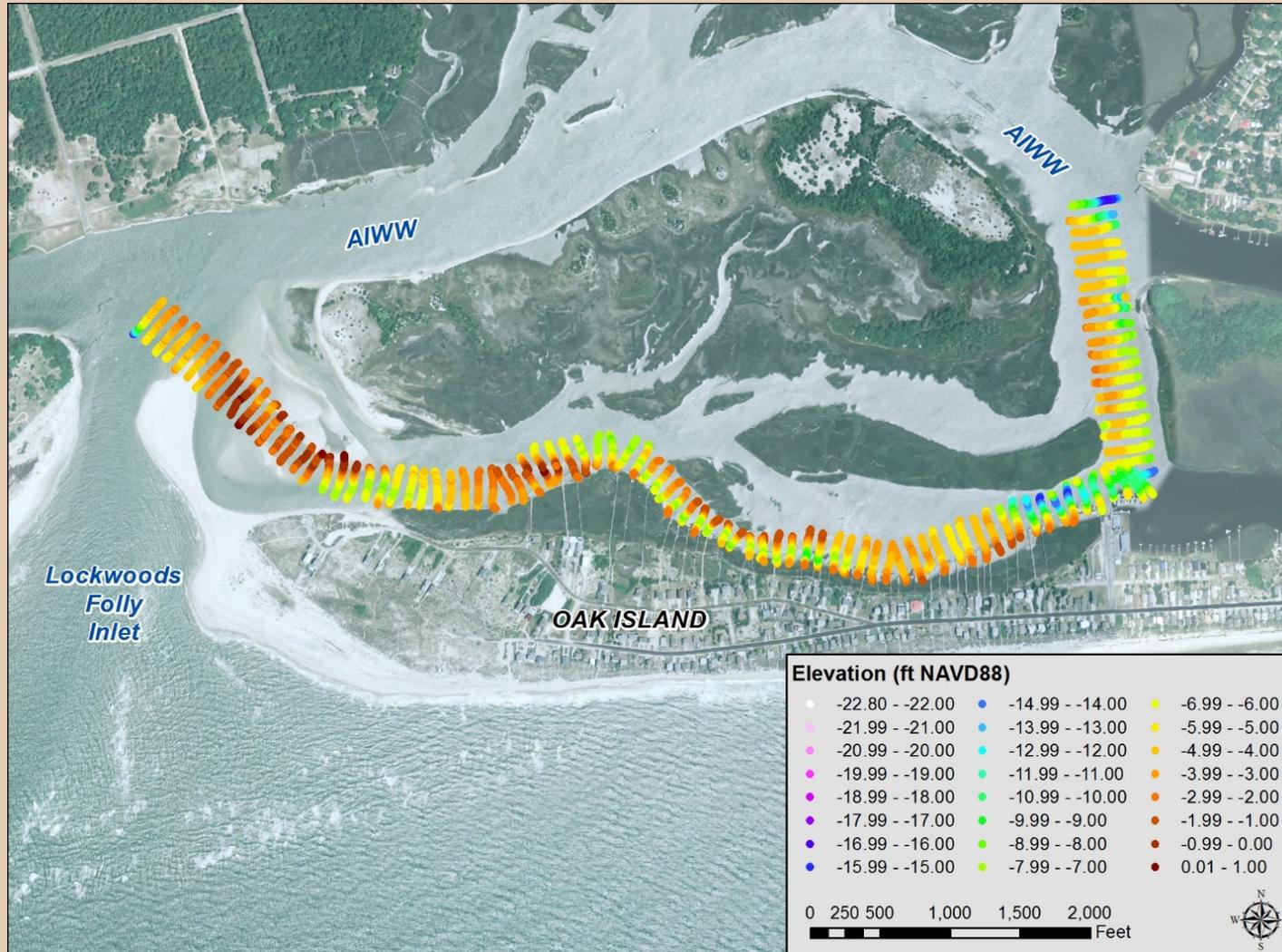
- Placed More Material East Given Volume Change Behavior During Winter



# Project Summary

## Project Completed Within Permit Conditions

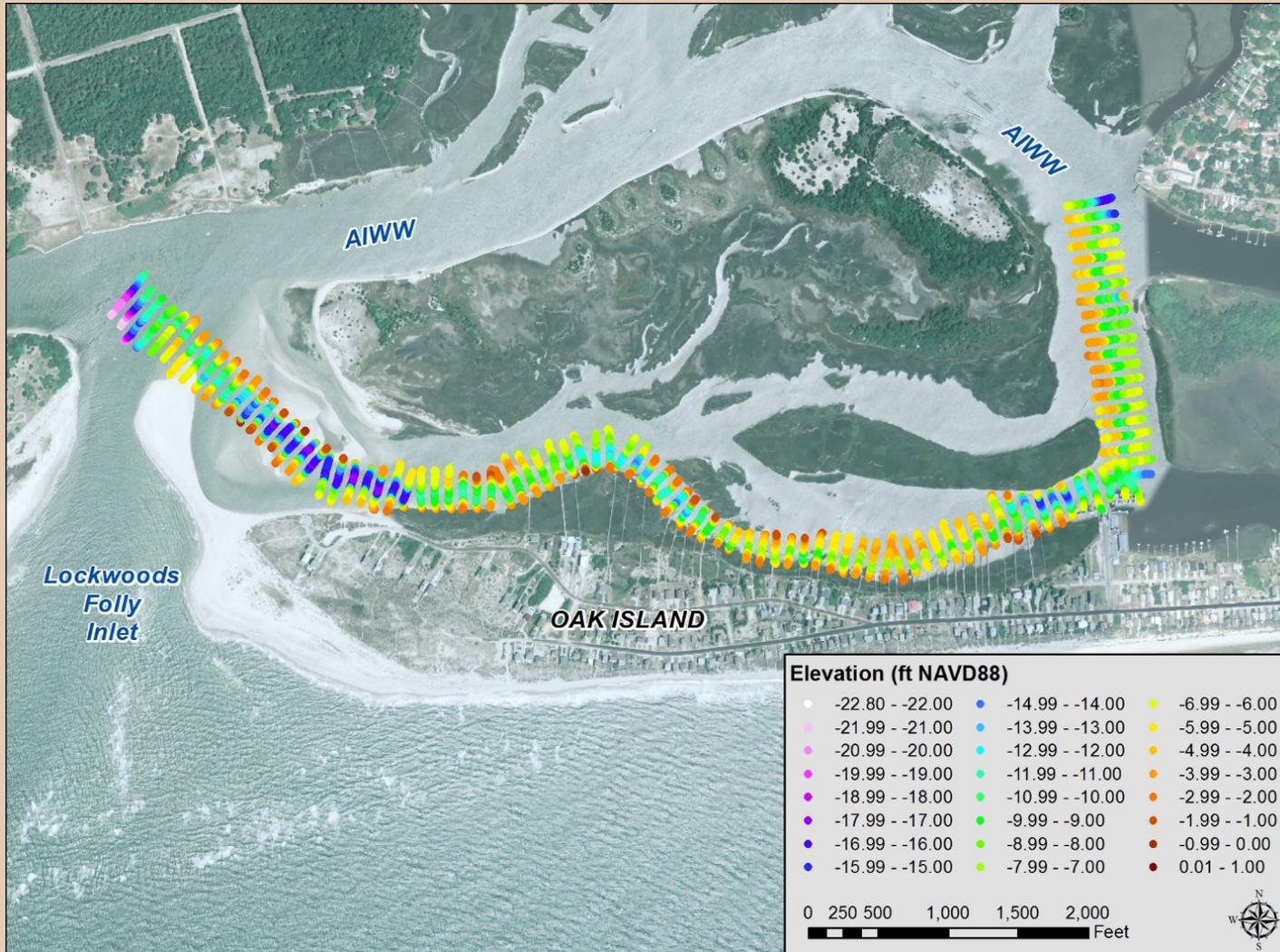
- Pre-Construction Channel Survey – February 2015



# Project Summary

## Project Completed Within Permit Conditions

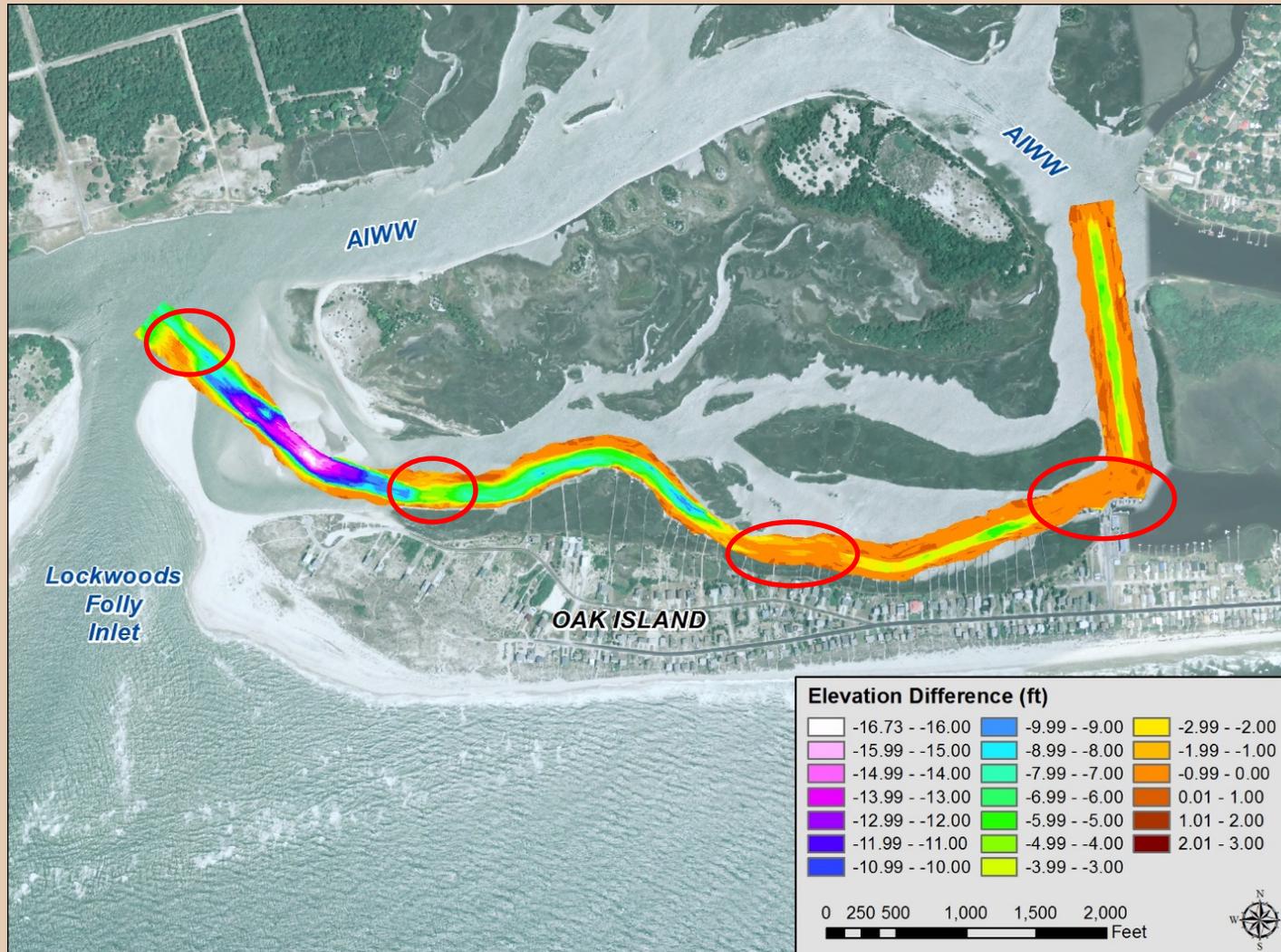
- Post-Construction Channel Survey – May 2015



# Project Summary

## Project Completed Within Permit Conditions

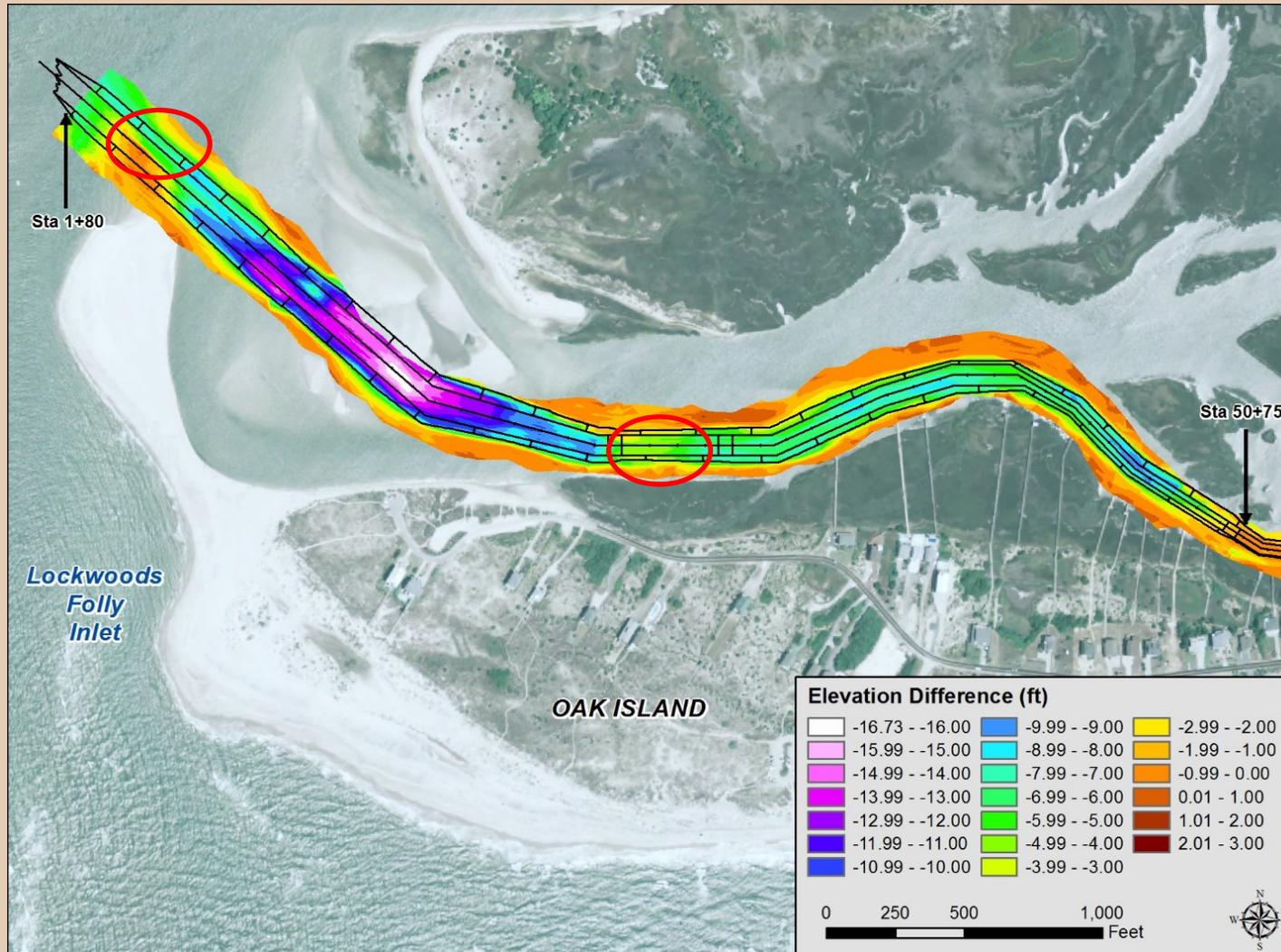
- Difference Between Pre- & Post-Construction Channel Survey



# Project Summary

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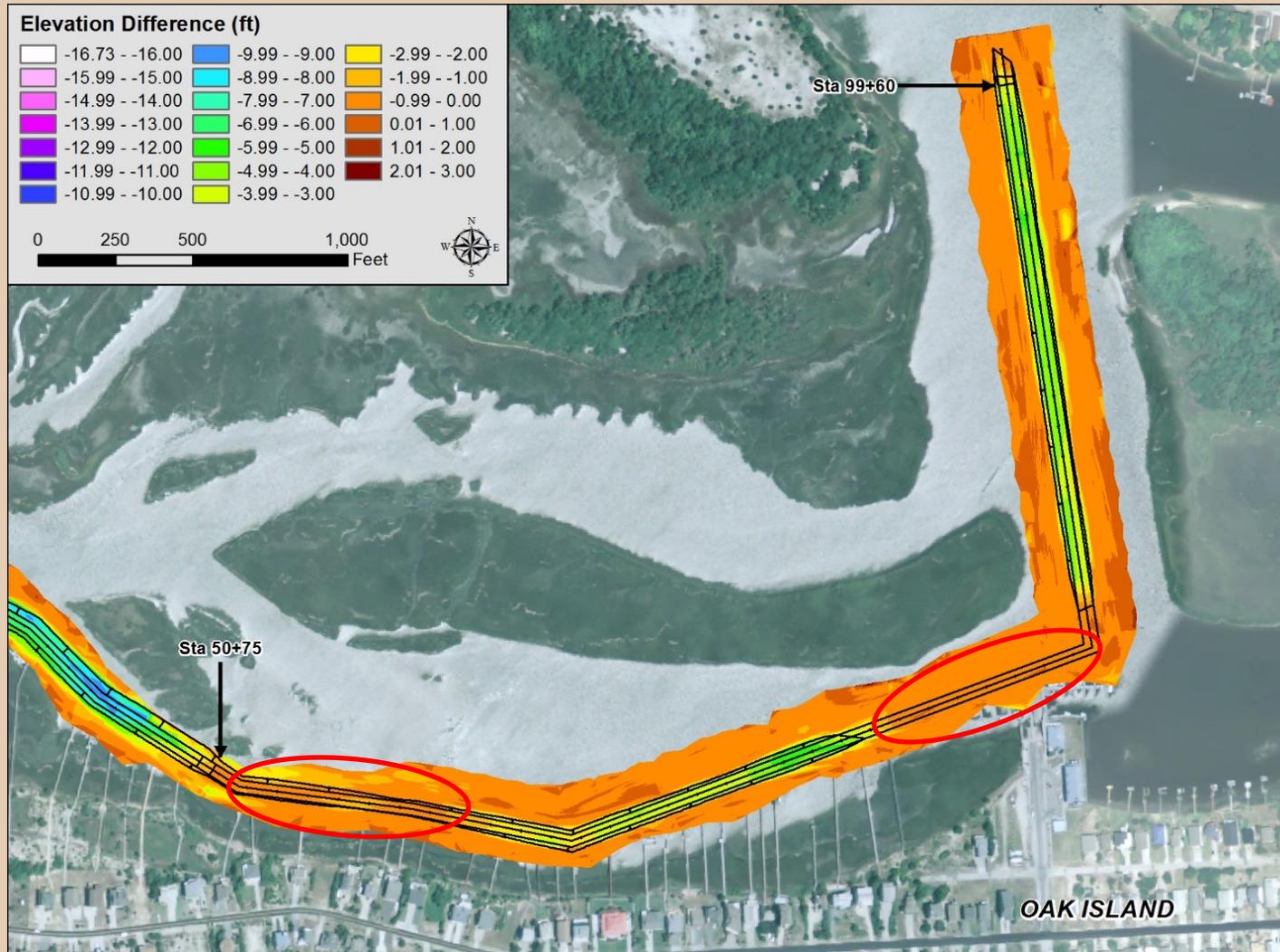
- Difference Between Pre- & Post-Construction Channel Survey



# Project Summary

## Project Completed Within Permit Conditions

- Difference Between Pre- & Post-Construction Channel Survey

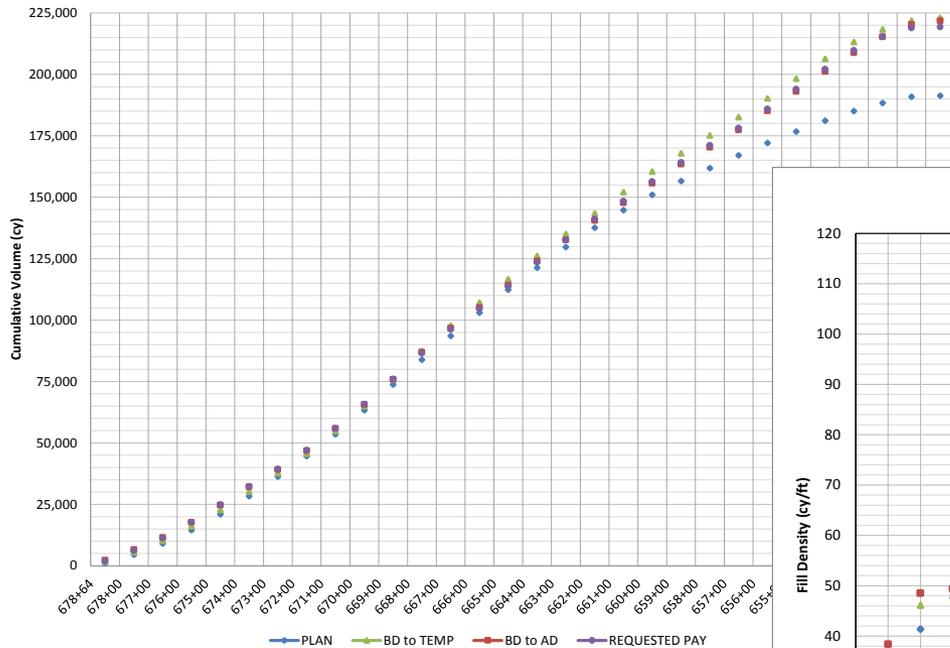


# Project Summary

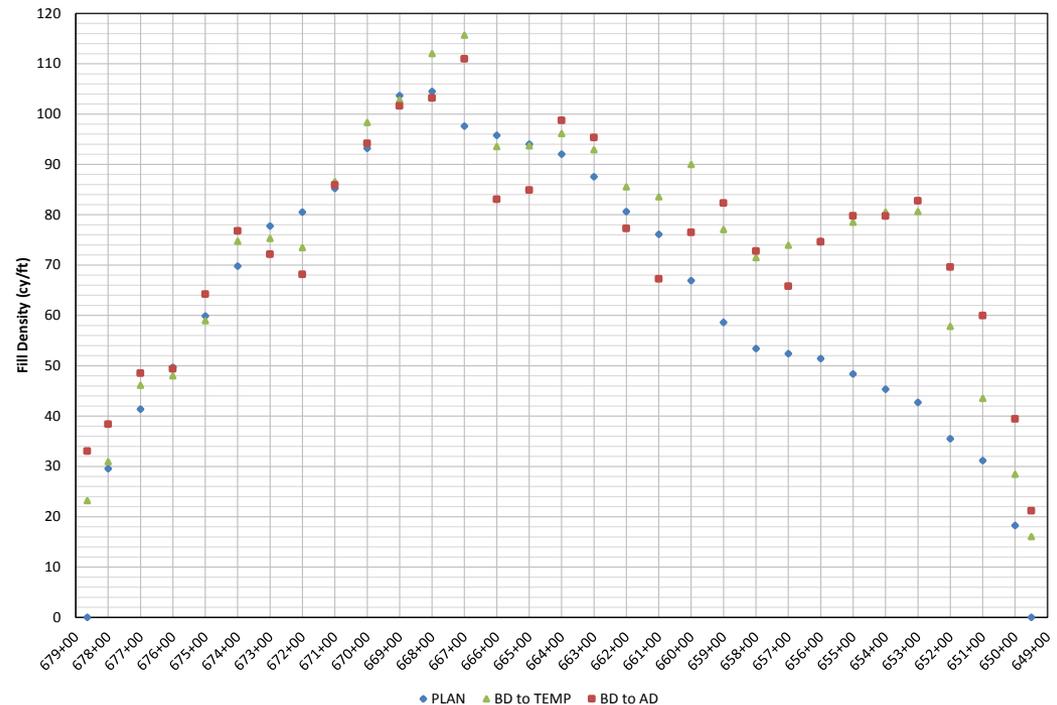
## Project Completed Within Permit Conditions

- Beach Placement – 227,315 cy Placed (Est.) – Pay Volume – 224,617 cy – Permit Volumes – 278,950 cy (Dredged) & 226,575 cy (Placed)

Oak Island - Cumulative Volumes



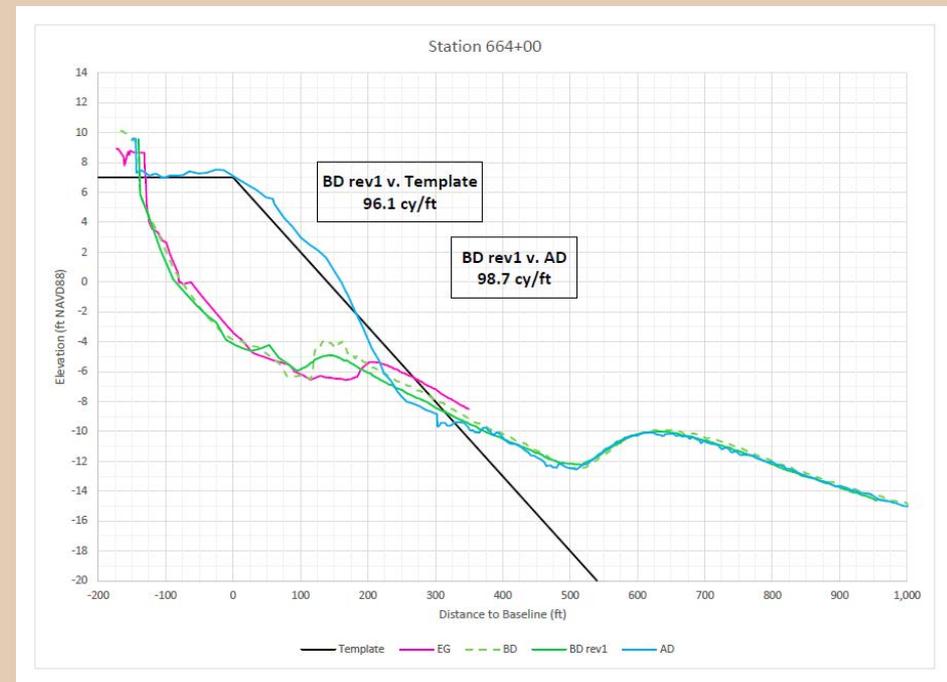
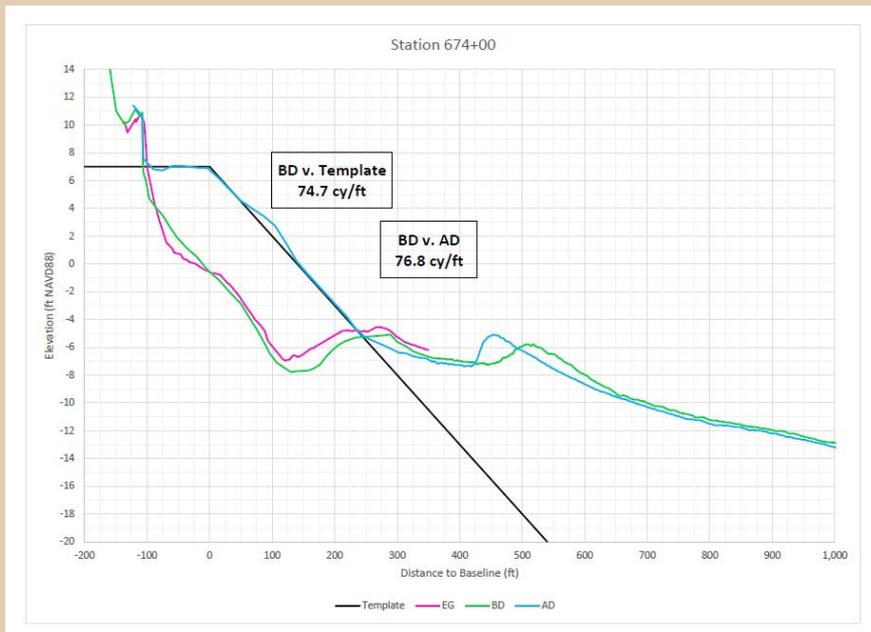
Oak Island - Fill Density



# Project Summary

## Project Completed Within Permit Conditions

- Average Placement Density = 85 cy/ft – Move MHW Seaward ~200 ft (Before Profile Equilibration)



# Project Summary

## Before & After



# Project Summary

## Project Aerials – Please Note Taken After TS Ana



# Project Summary

## Sand Quality Was Excellent

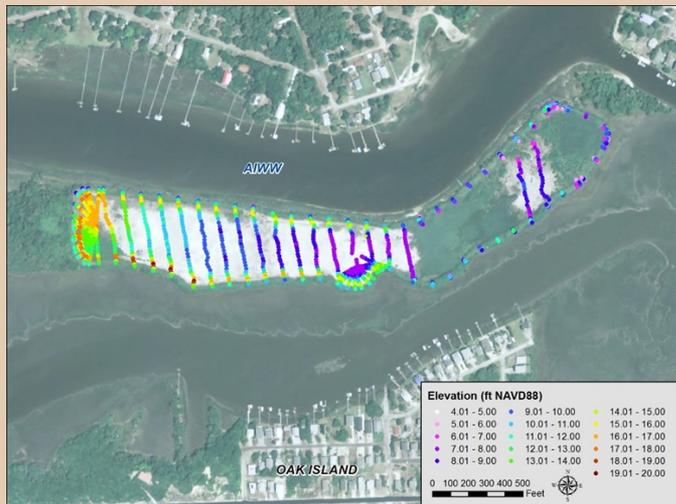
- Compliant with State Standards – Medium Sand  $d_{50} = 0.34\text{mm}$
- 2.5% Gravel, 3.1% Granular, 94.1% Sand, 0.3% Fine, 11.1% Shell – Avg.
- Up to 6% Gravel, 11% Granular, 6% Fine, 24% Shell Allowed
- Multiple Turtle Nests In Project Area Noted After Placement Completed



# Project Summary

## Horse Island Placement

- Dike Raised Along Western 2/3 of Island
- While 25,500 cy Estimated to Have Been Placed on Horse Island Only ~3,500 cy of Capacity Lost
- Improvements Have Added 70,000 – 100,000 cy of Additional Capacity and Once Lower 1/3 Island Dike is Raised Even More Capacity Will Be Realized



	BD Volume Comparison (cy)	AD Volume Comparison (cy)	Volume Difference (cy)
Dike Crest Contour*	92,746	192,095	99,349
1' Freeboard to Dike Crest Contour*	65,154	154,342	89,188
2' Freeboard to Dike Crest Contour*	45,974	118,492	72,518
Remaining Fill Below 9 ft NAVD88 (Minimum Dike Elevation)	55,004	54,810	-194
Remaining Fill Below 8 ft NAVD88 (1 ft Below Minimum Dike Elevation)	38,534	35,265	-3,269
Remaining Fill Below 7 ft NAVD88 (2 ft Below Minimum Dike Elevation)	25,379	21,720	-3,659

\*Dike crest contour varies in elevation and location from BD to AD survey due to the dike enhancement performed along the western half of the island

**Note:** Volume dredged for material placed on Horse Island estimated to be ~30kcy

# Tropical Storm Ana – May 10<sup>th</sup>, 2015

## Landfall @ Myrtle Beach – 10 Days After Beach Fill Portion Completed

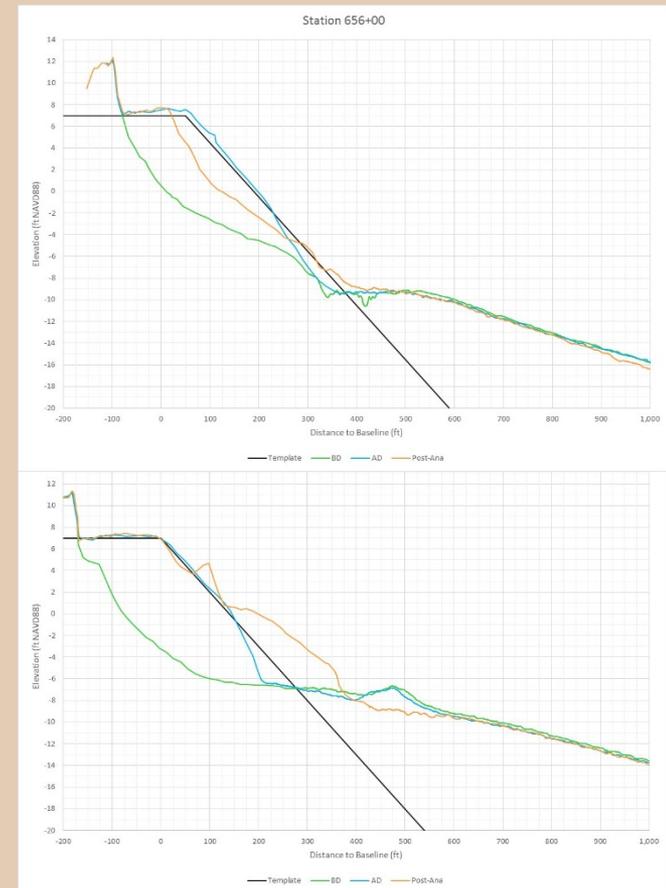
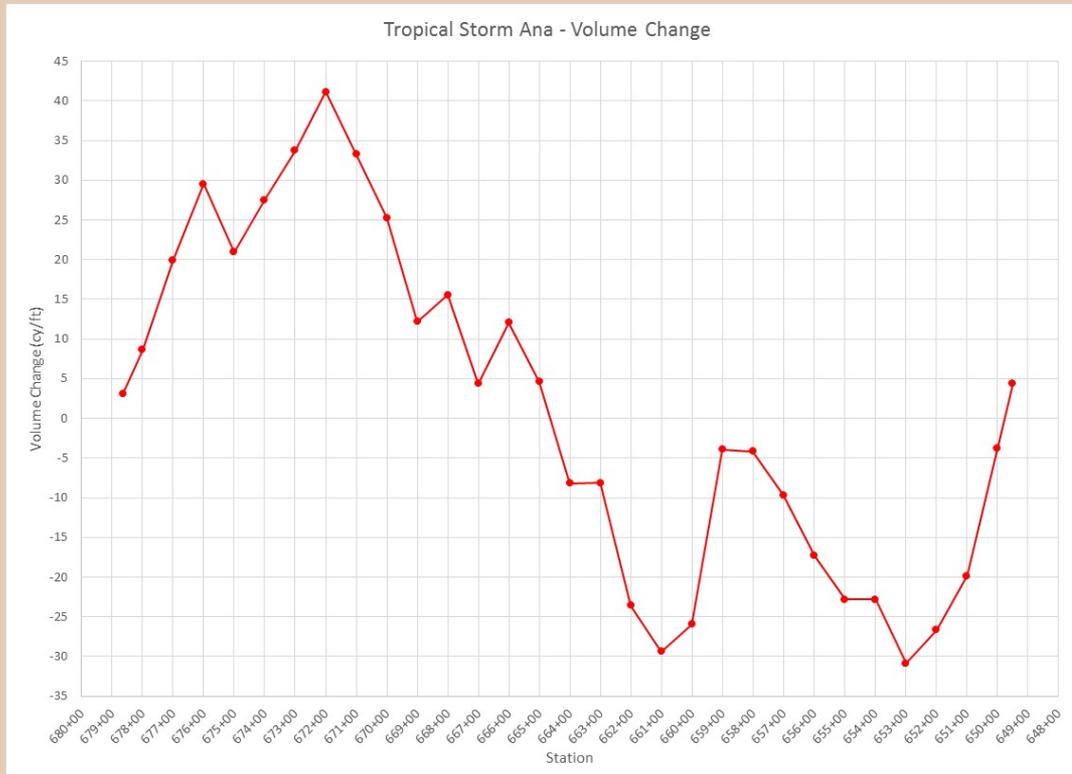
- Elevated Wave Conditions for Approximately 5 Days
- Max Significant Wave Height of 12.8 ft and Period of 6.7 sec
- Post-storm Survey Completed on June 10<sup>th</sup>, 2015



# Tropical Storm Ana – May 10<sup>th</sup>, 2015

## Sand Stayed Within the System But Considerable Movement

- Eastern Half of Project Area Lost 25,500 cy – Visible Beach
- Western Half of Project Area Gained 28,200 cy - Offshore
- Longshore Movement of Material & Grain Size Effects





# Some Lessons Learned

## At This Time, The Project Area is a Very Dynamic Area and Subject to Significant Changes During Storms

- Measurements Show 25,000 - 50,000 cy Changes Over Winter and During Ana

## Future Placements Should Use Transport Patterns to Our Advantage & Plan for Cleanout at Mouth 'On Way Out'

- Place More Material East of the Hotspot to Use as a Feeder Beach
- Plan to Cleanout "Plug" at Mouth While Dredge "On Way Out"

## Meetings Should Be Held With USACE to Look at Options to Tie Dredging of Mouth of Eastern Channel with AIWW Crossing Project – Every 2-3 Years

## Continued (Annual) Profile Monitoring Will Give Us More Knowledge of Sediment Transport Patterns and Assist in Determining Long-term Needs



## THE TOWN OF OAK ISLAND, NORTH CAROLINA



# PLANNING ANALYSIS, ENGINEERING DESIGN AND ENVIRONMENTAL INVESTIGATIONS

in Support of a Comprehensive Shoreline Management Plan



# Goals and Strategies

## Goals

- **Long-term Beach and Shoreline Management Program**
  - Qualify for and Maintain Static-line Exception
  - Qualify for and Maintain FEMA Engineered Beach
- **Lockwoods Folly Inlet Management Plan**
- **Davis Creek Area Enhancement Plan**

## Strategies

- **Develop Cost and Time Efficiencies by:**
  - Collaborate with USACE on Cape Fear Inlet Management – SMP
  - Utilize Available Data from the USACE BCB 50-yr Project
  - Partner with Town of Holden Beach on joint Lockwoods Folly Inlet Management
  - Innovative Permitting Approaches

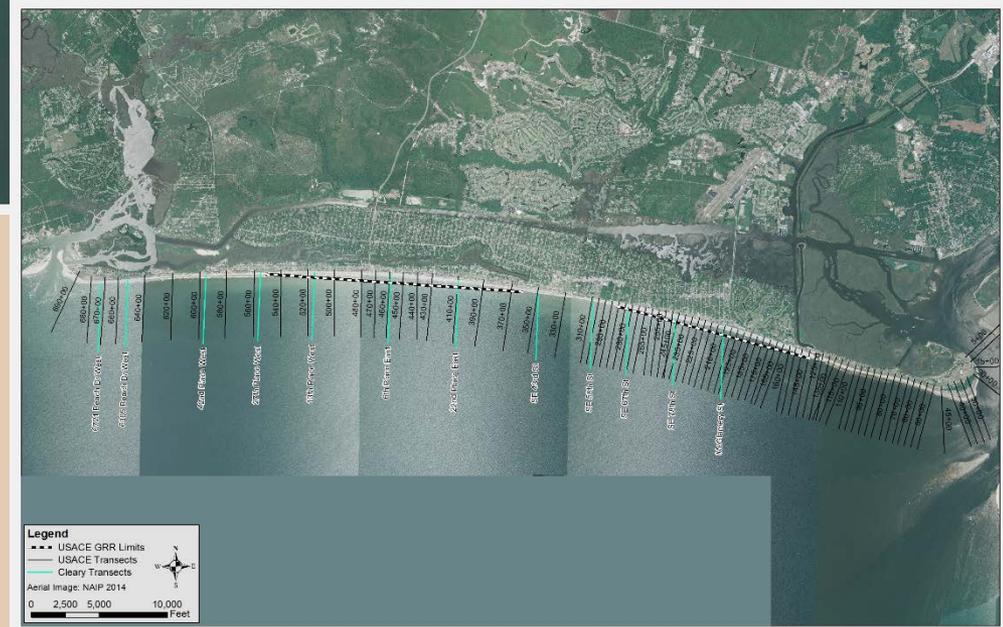
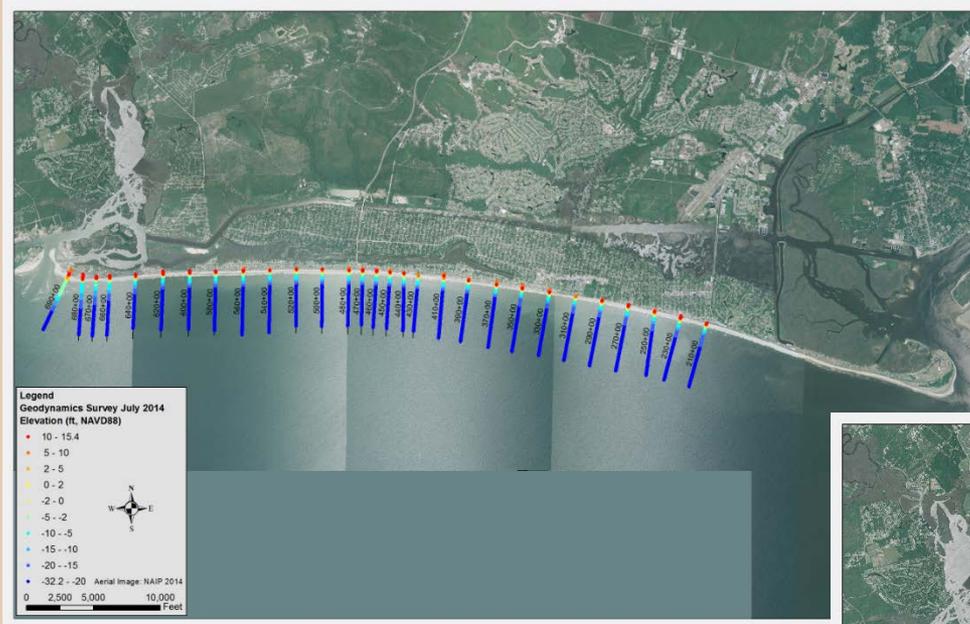
# Project Scope of Work

- **Task 1 - Review Existing Data and Identify Field Data Collection Needs**
  - Use existing USACE and Town data to the extent possible (USACE, Cleary, etc.)
  - Define representative reaches based on available data (subject to change)
  - Identify data gaps for additional field work needed (topo/bathy surveys, geotechnical data) and likely permitting approaches
- **Task 2 – Field Investigations**
  - Topo/bathy surveys of representative profiles needed (~40 profiles)
  - Preliminary sediment sampling of native beach also to be completed
  - Above will provide general morphologic understanding of island, basis for limited modeling and compatibility assessment

# Data Collection and Review

## Profile Surveys

- Geodynamics (2014) and Cleary (Hard Copy Reports- Topo Only)



# Data Collection and Review

## Profile Surveys

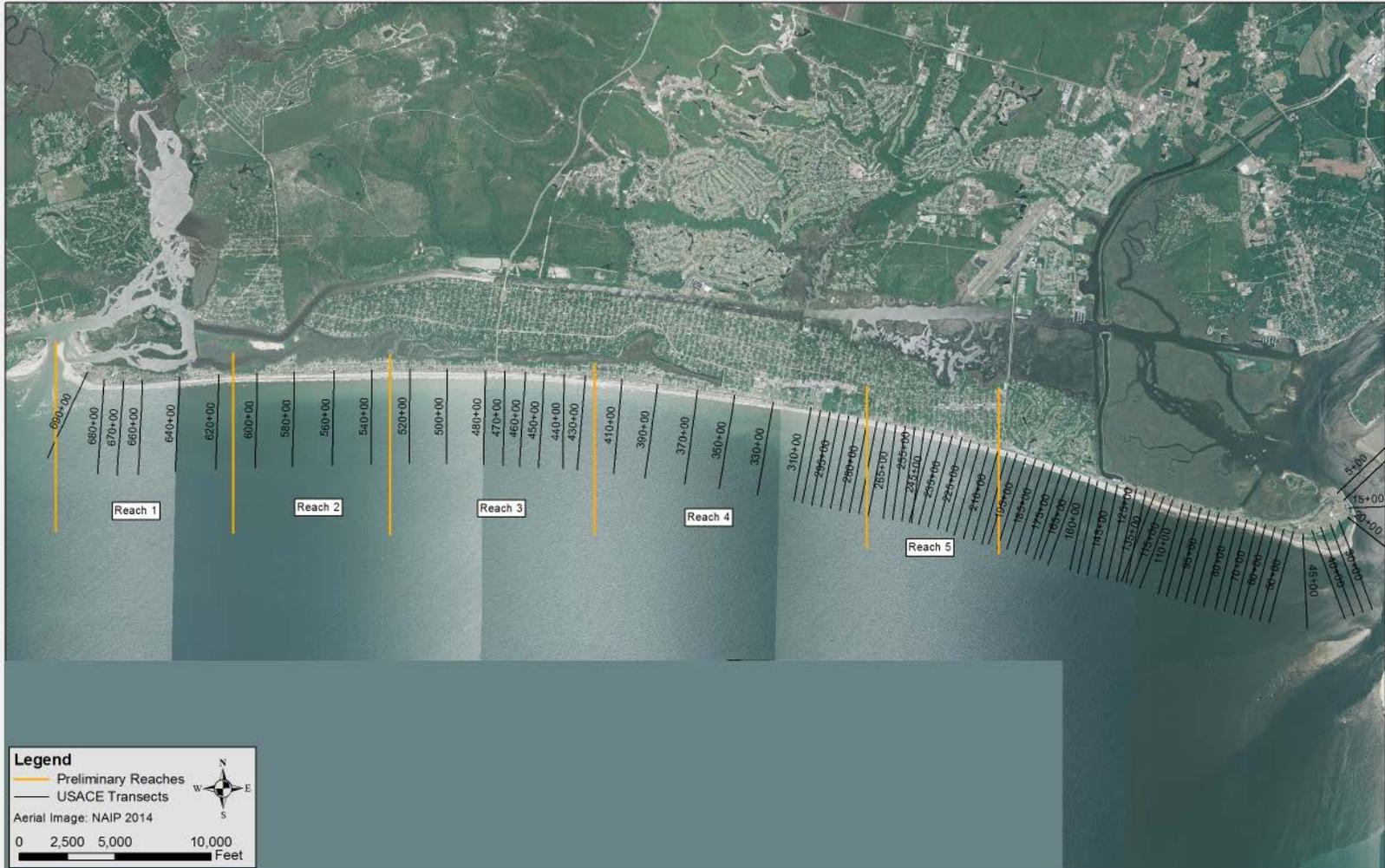
- USACE Surveys Only Cover Eastern Part of Town to 58<sup>th</sup> Street

Beach Surveys				
Location	Date	Source	Format	Extent
Oak Island	Jul-14	Geodynamics	BMAP, xyz	210+00 - 690+00 (10+00 and 20+00 spacing)
Oak Island	Jan-12	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Sep-10	USACE	BMAP (LARC), 3D (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Mar-10	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Mar-09	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Jan-09	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Apr-08	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Jul-07	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Jan-07	USACE	BMAP (LARC), xyz (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Oct-06	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Mar-06	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Aug-05	USACE	BMAP (LARC), 3d (LARC)	5+00 - 310+00 (5+00 spacing)
Oak Island	Feb-05	USACE	BMAP, 3d (topo)	5+00 - 310+00 (5+00 spacing)
Oak Island	Jun-04	McKim & Creed	bmap, xyz (Topo)	5+00 - 310+00 (5+00 spacing)
Oak Island	Jun-03	McKim & Creed	excel, xyz (topo)	5+00 - 310+00 (5+00 spacing)
Oak Island	Feb-03	McKim & Creed	excel, xyz (topo)	5+00 - 310+00 (5+00 spacing), 434+00 - 486+00 (5+00 spacing)
Oak Island	Nov-02	USACE	BMAP, xyz (topo)	5+00 - 310+00 (5+00 spacing)
Oak Island	Dec-01	USACE	BMAP, xyz (topo/LARC)	10+00 - 310+00 (10+00 spacing)
Oak Island	Dec-00	USACE	BMAP, xyz (topo/bathy)	10+00 - 310+00 (10+00 spacing)
Oak Island	Aug-00	USACE	BMAP (LARC), xyz (topo/LARC), 3DF (LARC)	5+00 - 310+00 (5+00 spacing)

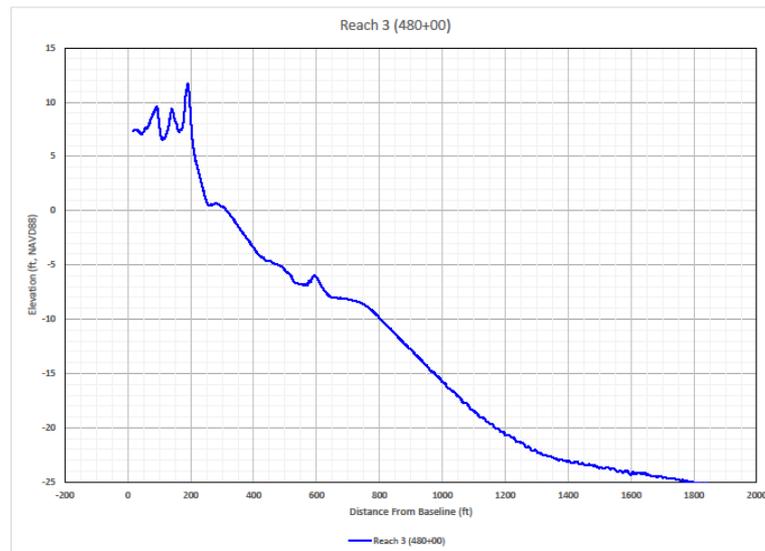
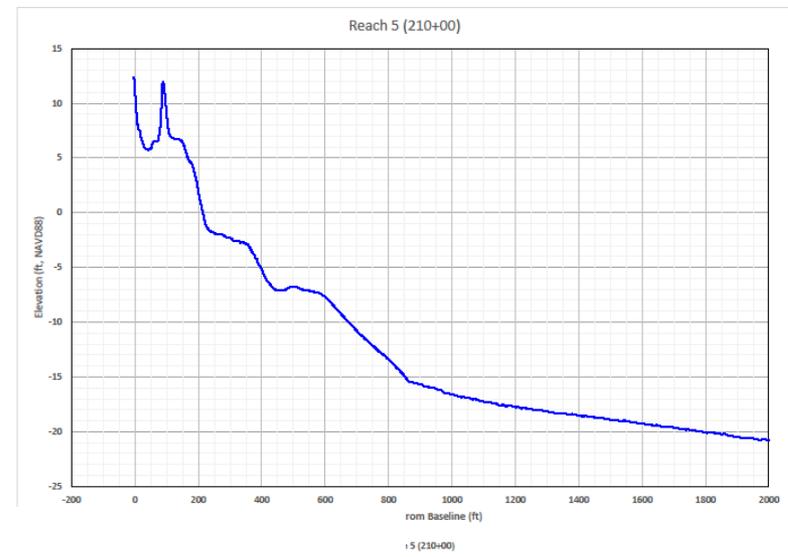
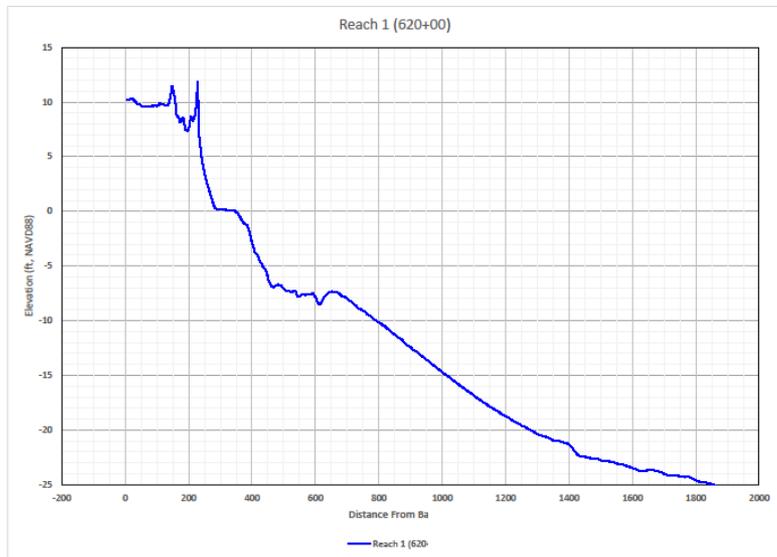
# Data Collection and Review

## Preliminary Reach Development

- Based on Dune/Berm Elevations/Shape & NCDCM Erosion Rates



# Data Collection and Review



# Data Collection and Review

## Preliminary Sediment Resources

- Based on NCBIMP, USACE and NCGS Datasets



# Data Collection and Review

## Preliminary Sediment Resources

- Eastern Channel Project

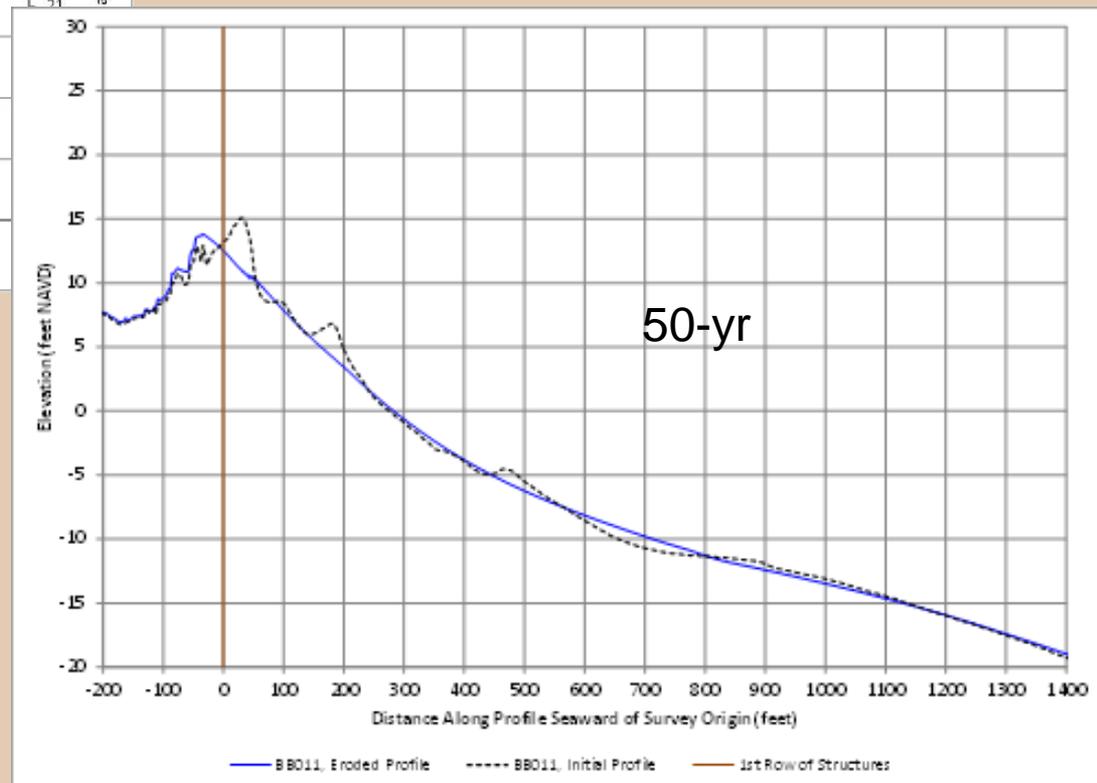
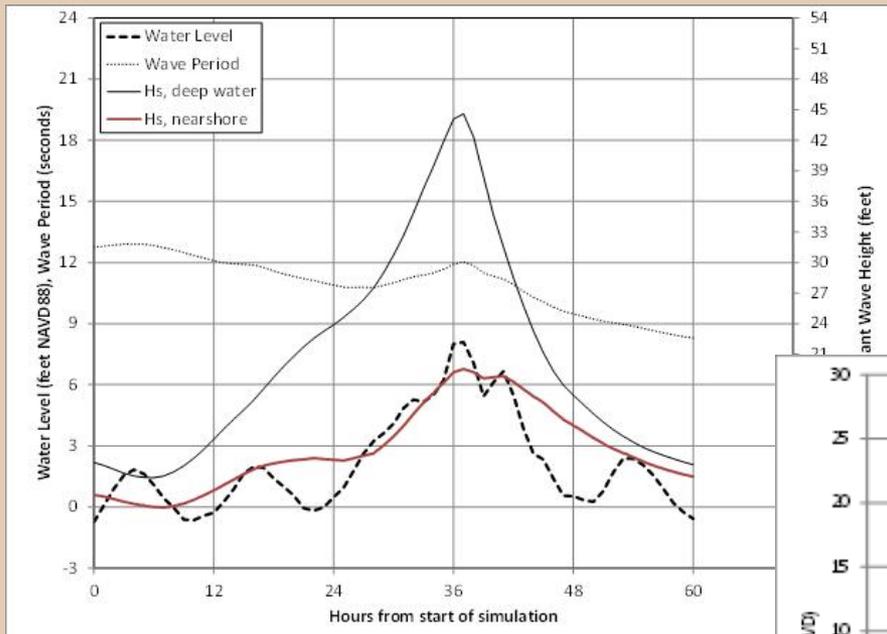


# Project Scope of Work

- **Task 3 – Coastal Engineering/Geology and Planning Evaluation**
  - Analytical analysis to develop preliminary estimates of sand need
    - Build on USACE vulnerability analysis in the GRR and use DCM shoreline and USACE profile change data to develop estimates of sand need
  - Sand source assessment
    - Build on USACE GRR work (including Yellow Banks, inlet and offshore locations)
    - Reassess the potential use of multiple sources
    - Leverage beneficial use as possible (Eastern Channel, Lockwoods Folly Inlet) and complete analytical assessments of these options (increased flushing, water quality improvement, improved navigation) with expanded/optimal permitted dimensions
  - Storm protection assessment
    - Complete SBEACH modeling of representative sections to determine level of protection provided and likely templates needed to provide additional storm protection
    - Short-term and long-term strategies will be developed as well as resulting funding needs/potential funding sources
    - Incorporate static line exception and FEMA engineered beach criteria

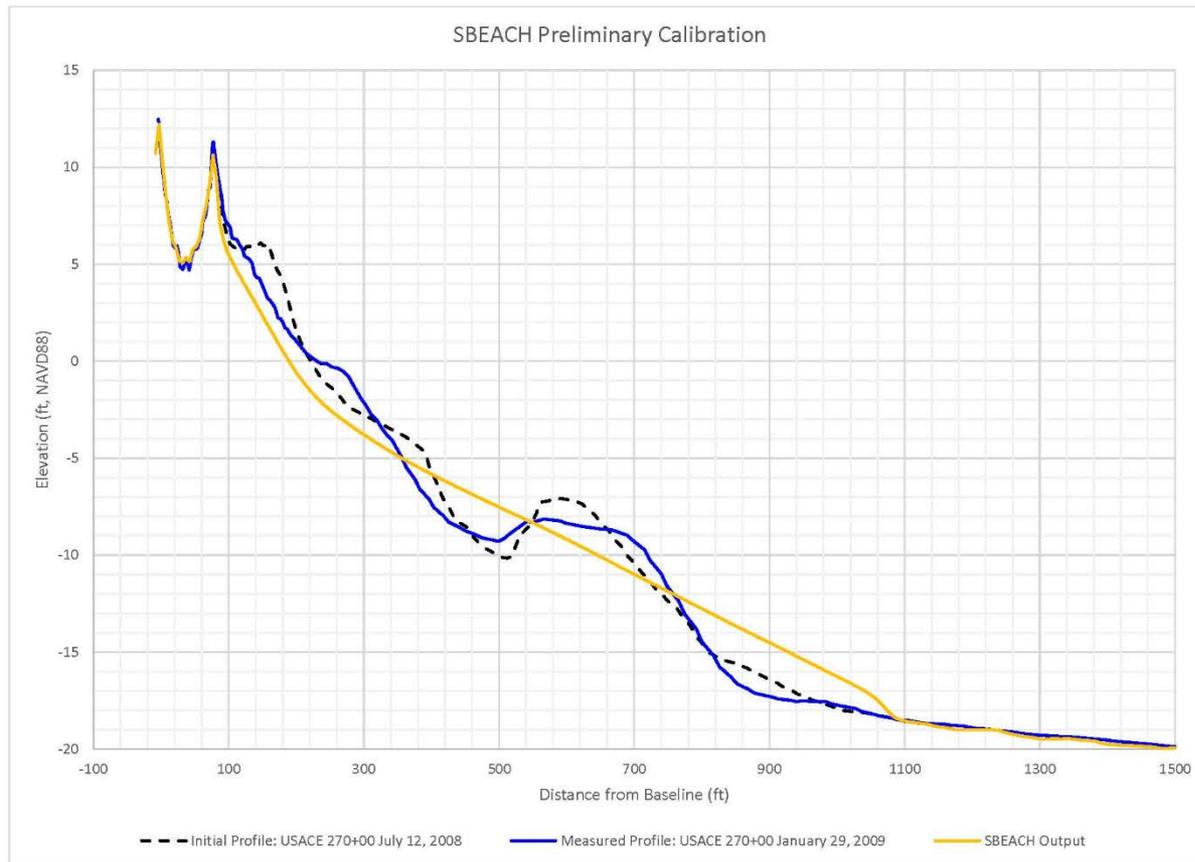
# Project Scope of Work

## • Task 3 – Coastal Engineering/Geology and Planning Evaluation



# Project Scope of Work

- Task 3 – Coastal Engineering/Geology and Planning Evaluation
  - TS Hanna Used for Calibration – Only One Profile Available



# Project Scope of Work

- Task 3 – Coastal Engineering/Geology and Planning Evaluation
  - Environmental planning and permitting evaluation
    - Agency meetings
    - Review of existing data and identify data gaps for future data collection
    - Identify permitting options (USACE GP291, EA, Supplemental EIS to GRR)
    - Assess potential regulatory/mitigation/monitoring requirements
    - Environmental planning and permitting evaluation
  - Draft and final feasibility report



# Project Scope of Work

- **Task 4 – Davis Canal Management**

- Review existing surveys and prior investigations
- Identify additional data collection efforts needed for design and permitting
  - Bathymetric surveys, water quality and other environmental data
- Develop conceptual dredging plan and potential funding options
- Develop permitting path in conjunction with Task 3
  - Review original permit and investigate USACE GP291 option
  - Assess potential variance for dredging in Primary Nursery Area
  - Investigate/Document historical navigation use

- **Task 5 – Project Management**

- Town/Regulatory Coordination, Four (4) Meetings

- **Additional Services Under Separate Authorization**

- Represent Town of Oak Island in USACE SMP, USACE GRR and meetings concerning Lockwoods Folly Inlet Management

# Project Fee

- Task 1 – Review Data/Identify Data Collection Needs - \$12,960
- Task 2 – Field Investigations - \$18,220
- Task 3 – Coastal Engineering/Environmental Evaluation - \$98,230
- Task 4 – Davis Canal Management - \$6,960
- Task 5 – Meetings/Public Involvement - \$12,500
- Incidentals – \$1,030
- Additional Services Under Separate Authorization – TBD
  
- TOTAL PROJECT - \$149,900



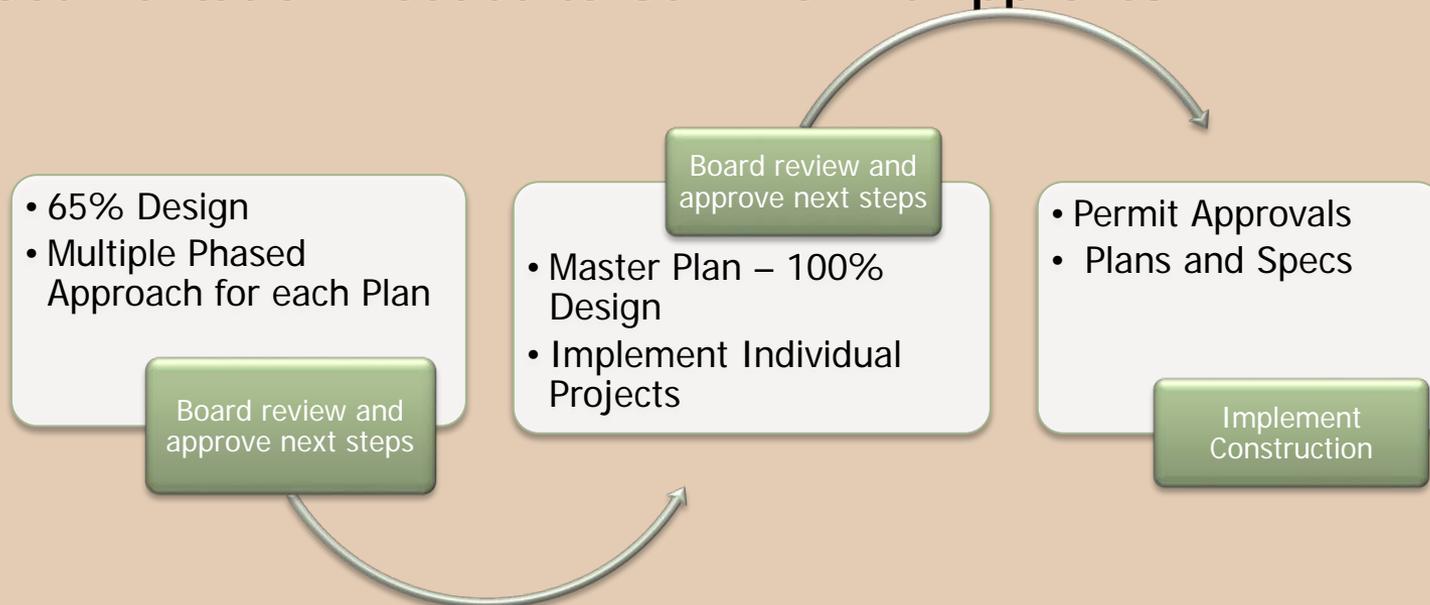
# Current Scope Allows for Tiered Approach

## A. Complete a Feasibility Level Study to Determine Estimates of Project Needs and Costs (“65% Answer”)

- 1) Beach Protection and Shoreline Needs
- 2) Lockwoods Folly Inlet Management
- 3) Davis Creek Enhancement
- 4) Determine if Feasible to Move Forward with a Small Investment



## B. If Town Desires, Move to Next Steps with a Detailed Study and Documentation Needed to Gain Permit Approval



# Discussion

## Thank You!

