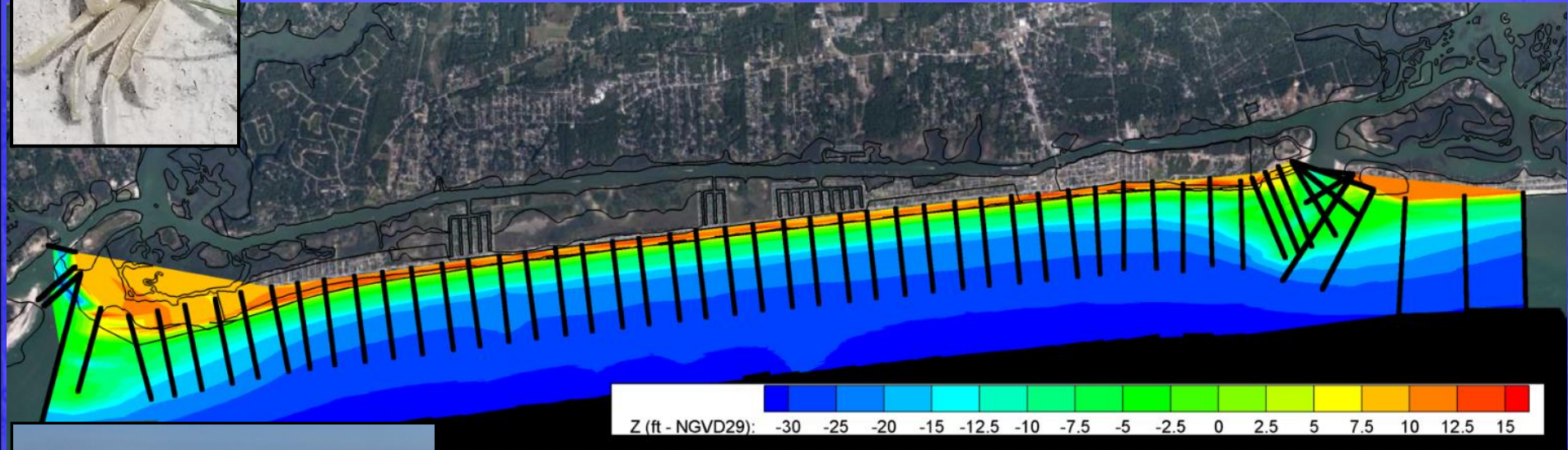


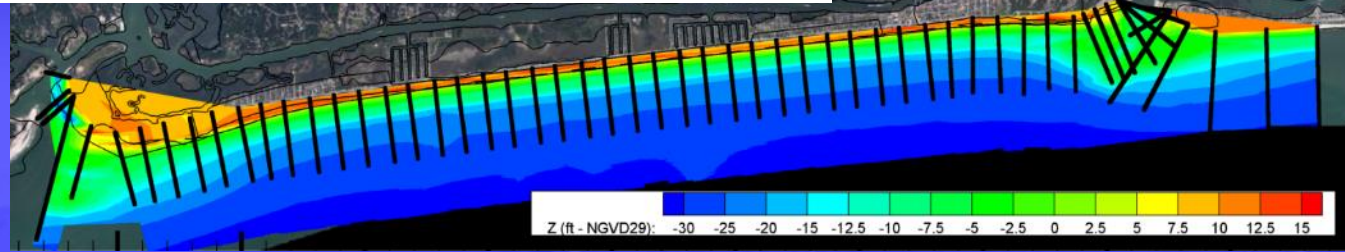
HOLDEN BEACH ANNUAL MONITORING

October 17, 2023



*Marina, Coastal, Environmental
& Water Resources Engineers*

Annual Monitoring Analysis



- Volume Change
- Shoreline Change
- Has occurred annually since 2001
- Nourishment Planning & FEMA Eligibility



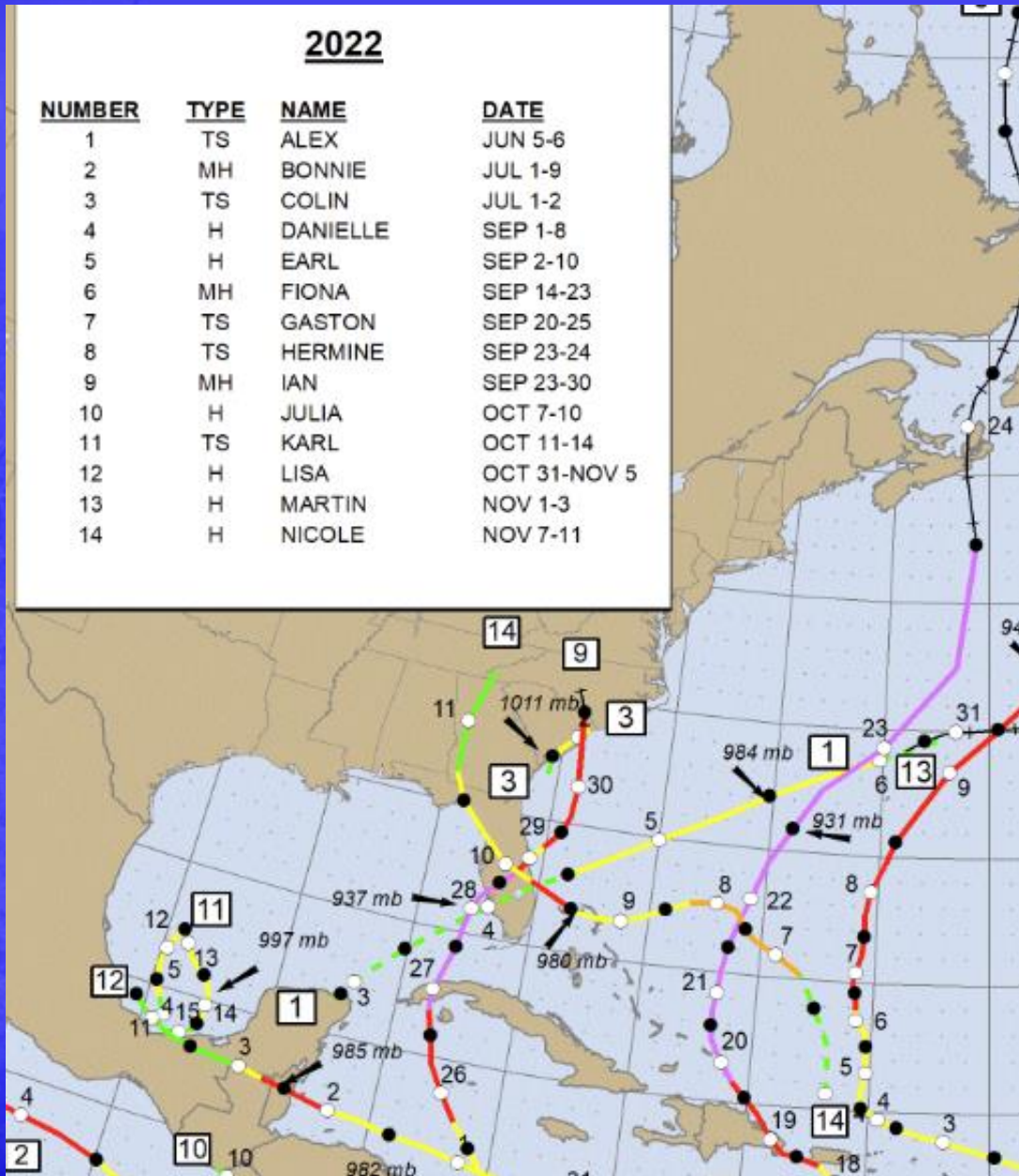
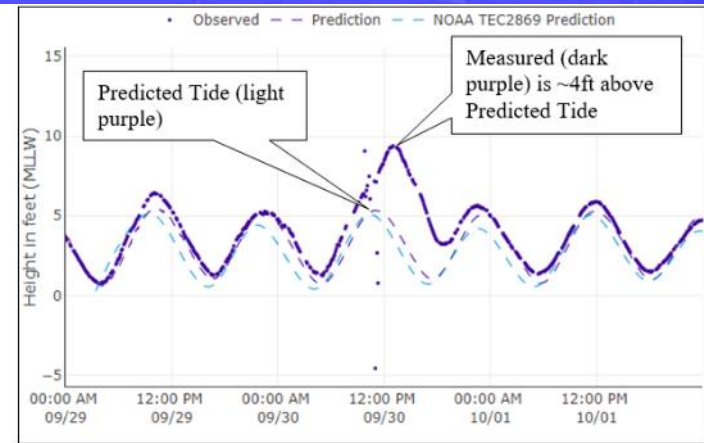
Figure 39. Photographs of the eastern portion of Holden Beach. **A.** West view (3/86) of eroding shoreline and houses stranded on recreational beach. Note bulkheads, timber groins and vestiges of seawalls that litter the beach. The eastern portion of Holden Beach shoreline near the inlet has been a chronic erosion zone since the late 1970s. **B.** West view (11/7/97) of same area in "A" retreat of the shoreline, removal of all but one home and a refurbished dune/dike composed of truck hauled sand. **C.** Aerial photograph of house on beach and peat exposure. Insert depict dike along road. **D.** Aerial photograph depicting shoreline and chronic erosion zone. Note the homes fronted by bulkheads and remnants of those destroyed.

2022 Hurricane Season

2022

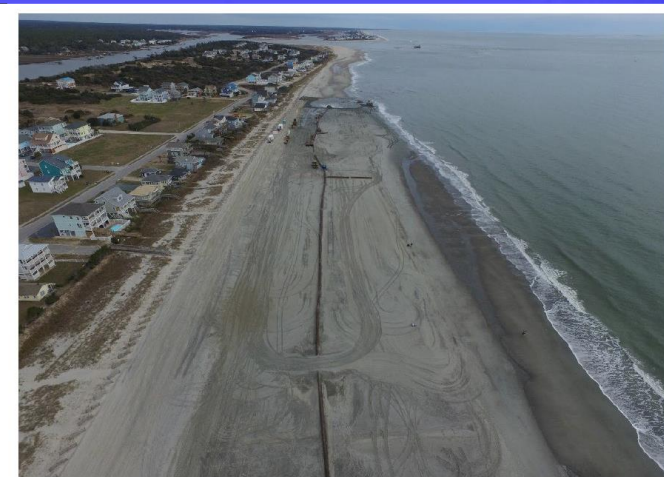
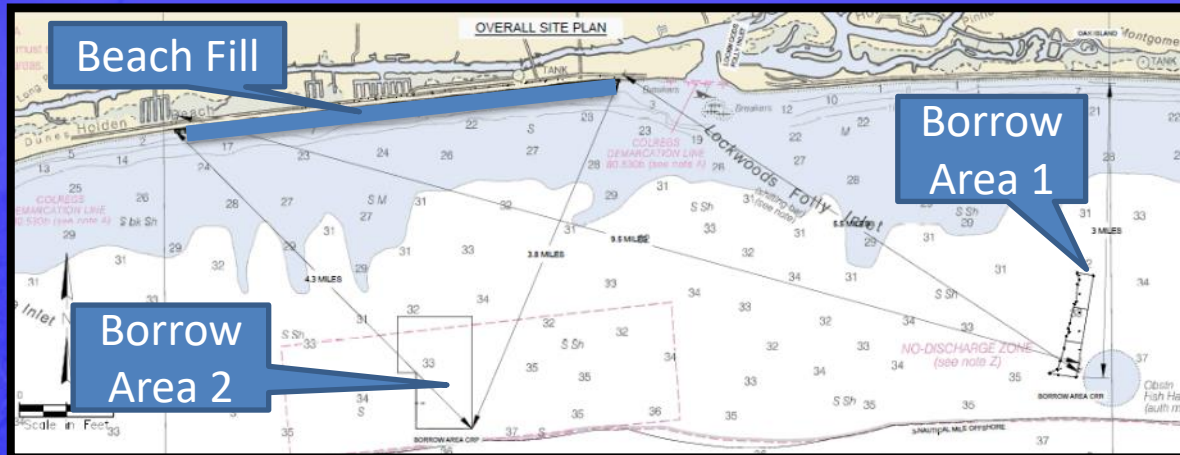
NUMBER	TYPE	NAME	DATE
1	TS	ALEX	JUN 5-6
2	MH	BONNIE	JUL 1-9
3	TS	COLIN	JUL 1-2
4	H	DANIELLE	SEP 1-8
5	H	EARL	SEP 2-10
6	MH	FIONA	SEP 14-23
7	TS	GASTON	SEP 20-25
8	TS	HERMINE	SEP 23-24
9	MH	IAN	SEP 23-30
10	H	JULIA	OCT 7-10
11	TS	KARL	OCT 11-14
12	H	LISA	OCT 31-NOV 5
13	H	MARTIN	NOV 1-3
14	H	NICOLE	NOV 7-11

2022: Ian



- Major Hurricane
 - Hurricane
 - Tropical Storm
 - Tropical Depression
 - Subtropical Storm
 - Subtropical Depression
 - +++ Extratropical
 - Wave/Low/Disturbance
 - Position at 0000 UTC*
 - ^{dd} Position/date at 1200 UTC
 - # Storm Number
 - ppp Minimum Pressure (mb)
- For readability, not all 00Z points are shown for all storms.

2022 Nourishment (Jan 7 to April 12)



R.N. Weeks



B.E. Lindholm

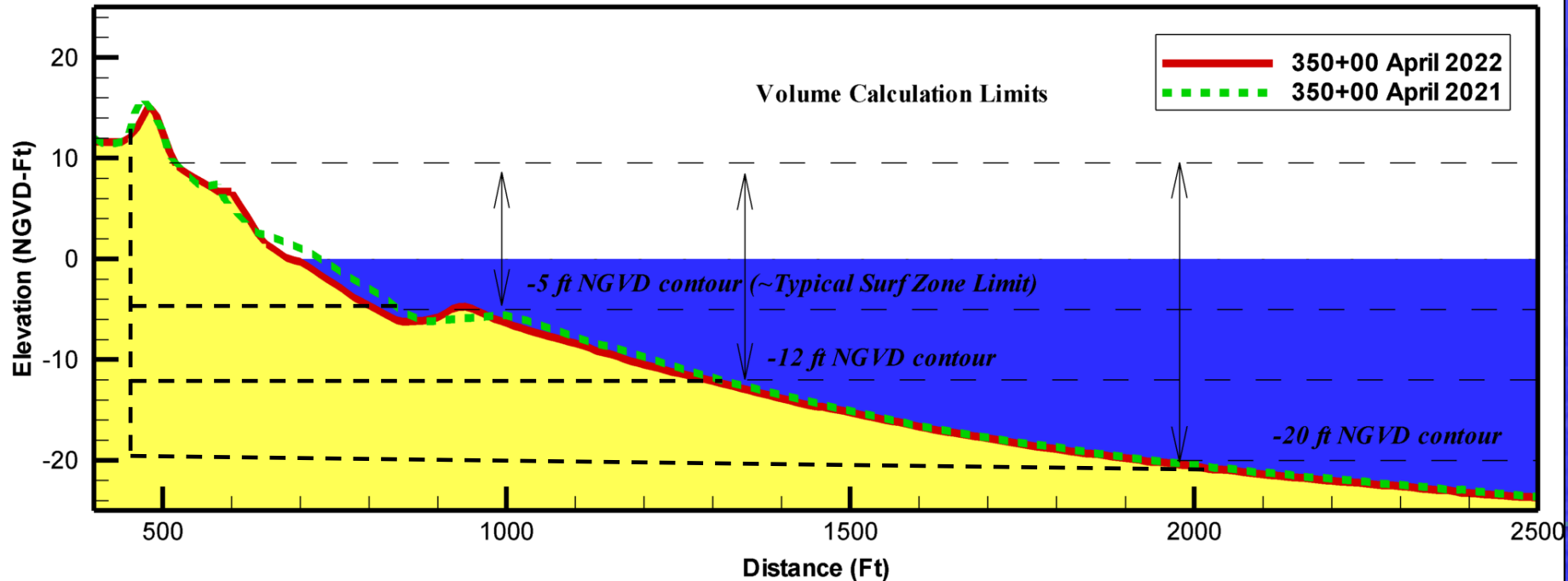


~1.5 Years Post-Project

September 2023 – Beach Looks Great

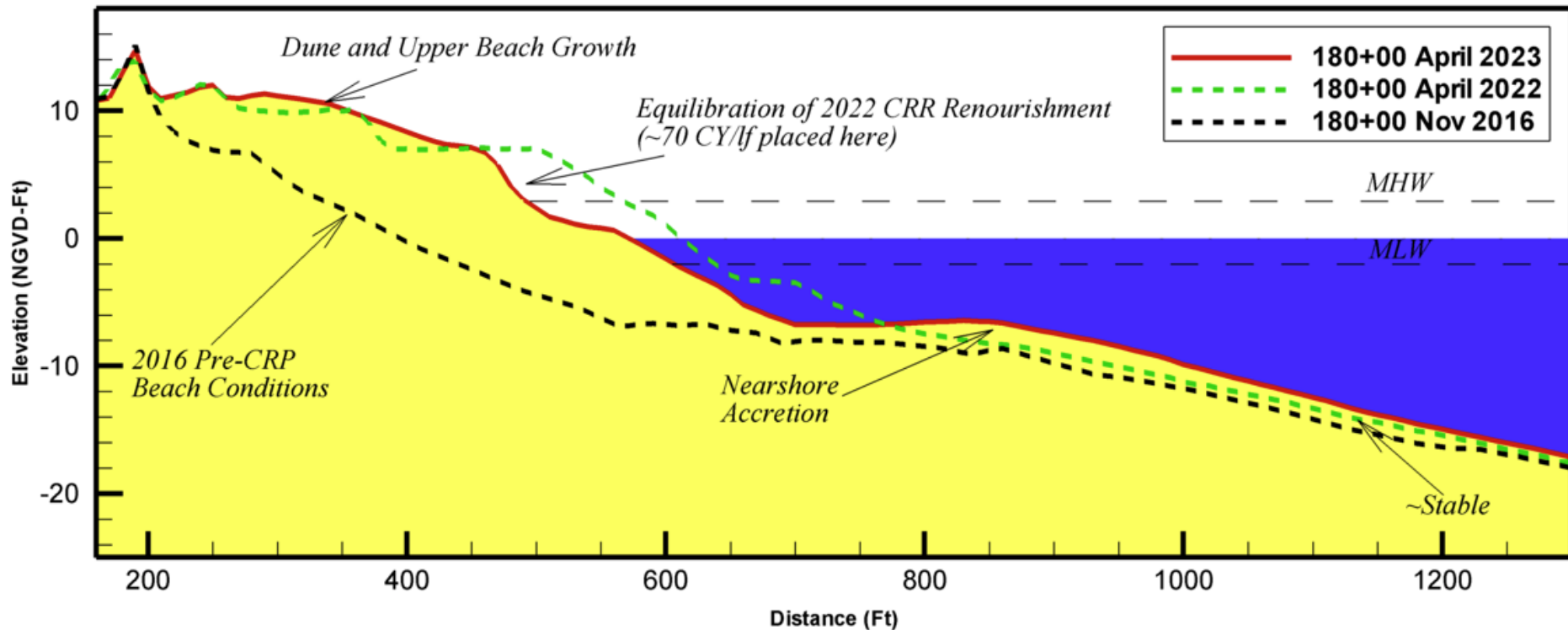


Volume Analysis



Three Volume Calcs. From Dune to
-5 ft, -12 ft and -20 ft

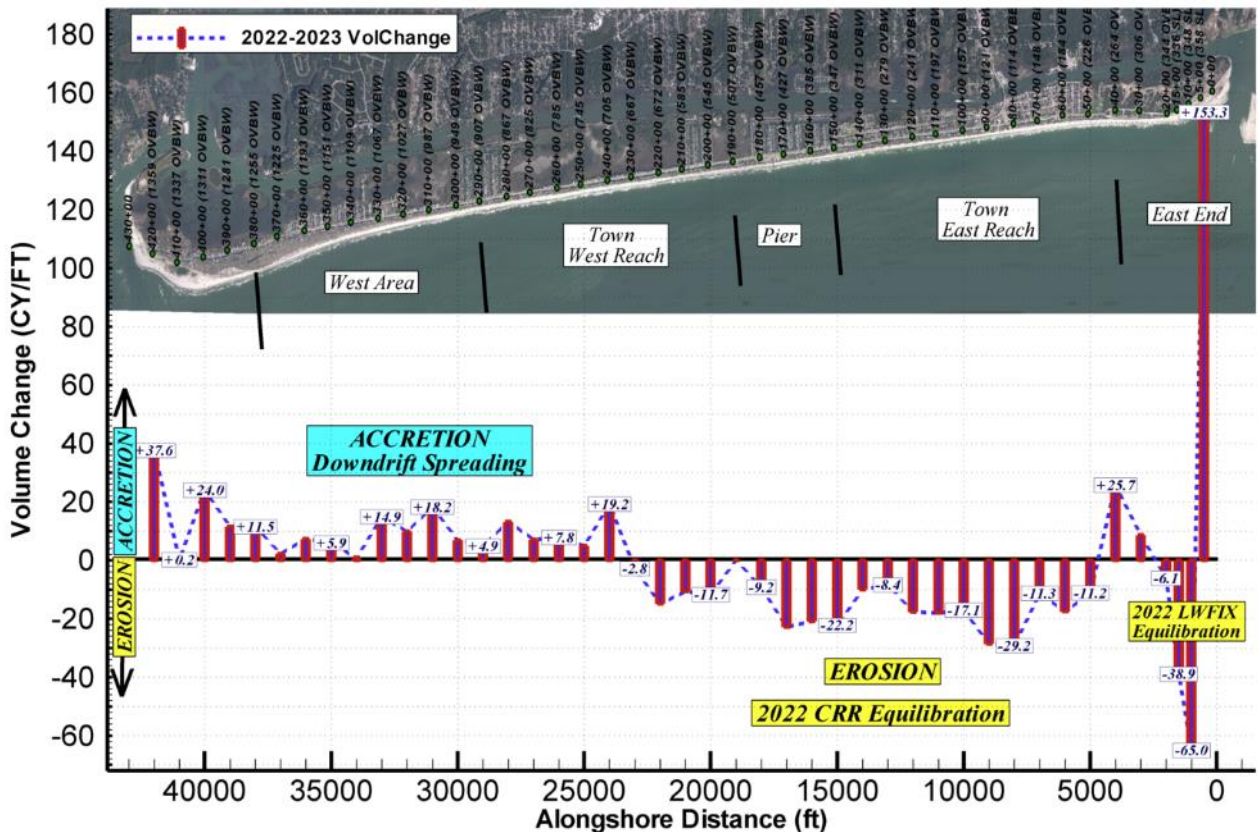
Cumulative Effect of 2017 and 2022 Nourishments



BEACH FILL EQUILIBRATION THIS YEAR

Volume Change (to -12 ft)

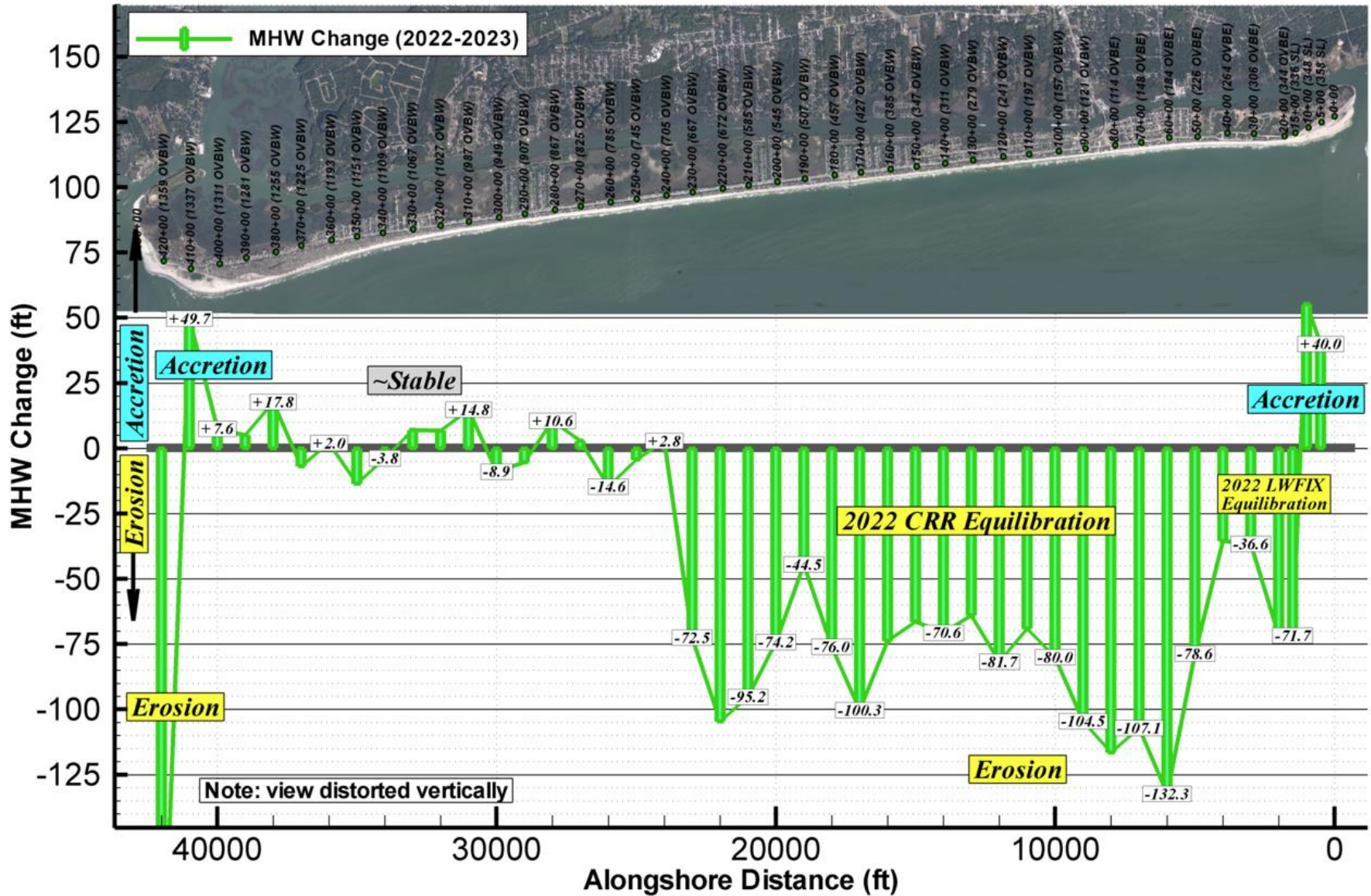
**BEACH FILL
EQUILIBRATION=
NATURAL
REDISTRIBUTION
OF SAND**



Reach Averages	Stations Included	Total Volume Change (cy) (Dune to -12 ft NGVD)	Dry Beach/Surf Zone Volume Change (cy) (Dune to -5 ft)	Surf Zone/Depth-of-Closure Volume Change (cy) (-5 ft to -12 ft NGVD)
LWF Inlet	5 to 15	-4,000	-19,000	+15,000
USACE East	15 to 40	+7,000	-49,000	+56,000
Town East	40 to 150	-167,000	-282,000	+115,000
Pier	150 to 190	-64,000	-97,000	+33,000
Town West	190 to 290	+14,000	-68,000	+82,000
West Area	290 to 380	+74,000	+18,000	+56,000
Shalotte Inlet	380 to 420	+60,000	-19,000	+79,000
	TOTAL	-80,000	-516,000	+436,000
Central Reach	40 to 290	-217,000	-447,000	+230,000

*Positive values represent accretion/gains and negative values indicate erosion/losses

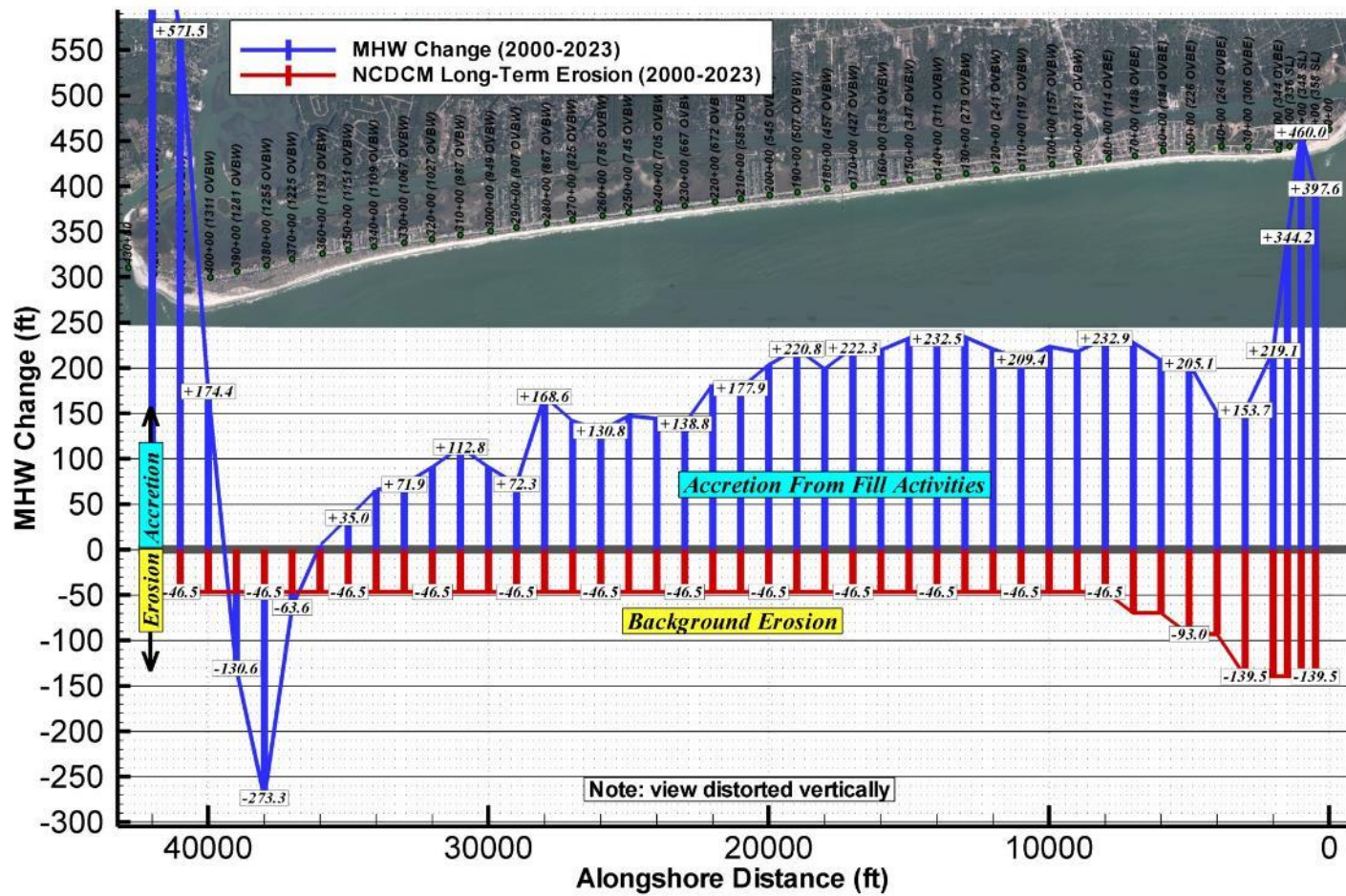
Mean High Water (MHW) Shoreline Change



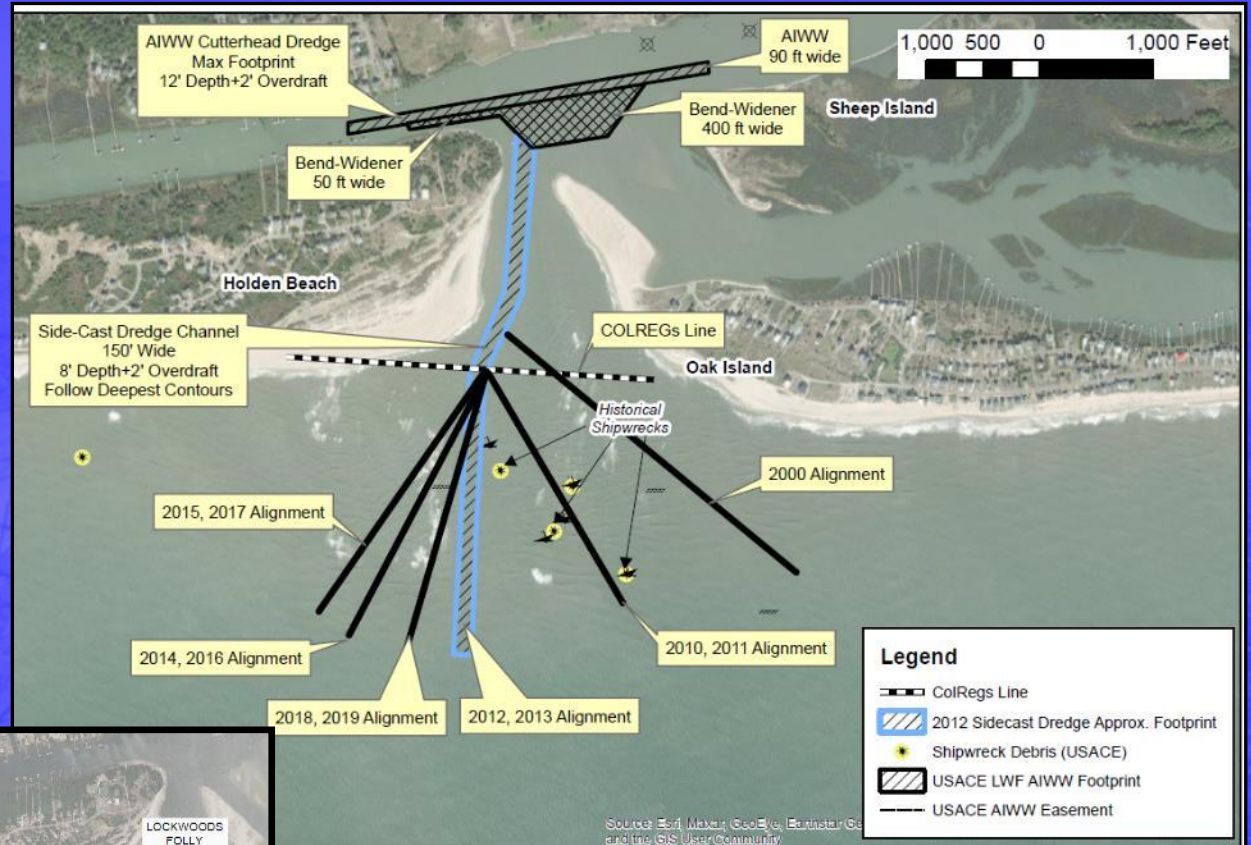
2000 to 2023

Beach much healthier now

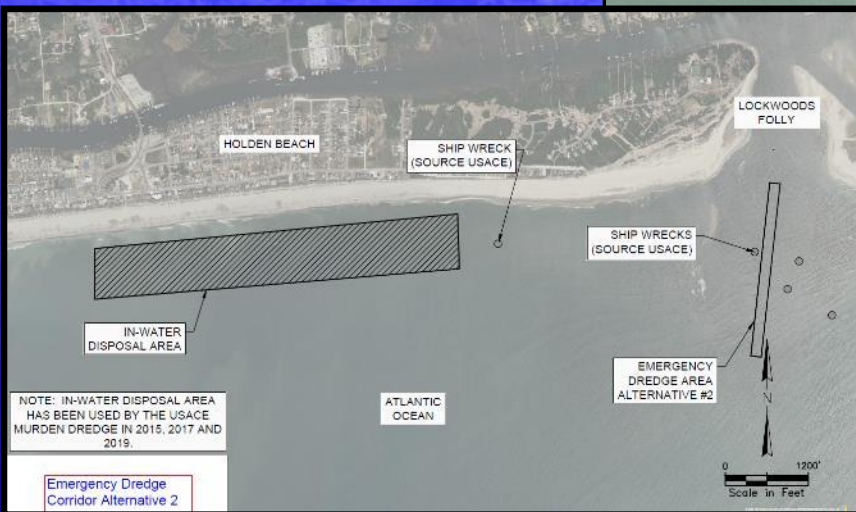
Table 3-4. Historical MHW Shoreline Change by Reach (2000 to 2021)		
Reach Averages	Stations Included	Historical MHW Change (2000 to 2022) (ft)
LWF Inlet	5 to 15	+400.6
USACE East	15 to 40	+174.5
Town East	40 to 150	+216.4
Pier	150 to 190	+218.9
Town West	190 to 290	+157.1
West Area	290 to 380	+20.8
Shallotte Inlet	380 to 420	+85.5
Central Reach	40 to 290	+191.0



LWF Inlet Ebb Shoal Emergency Dredging

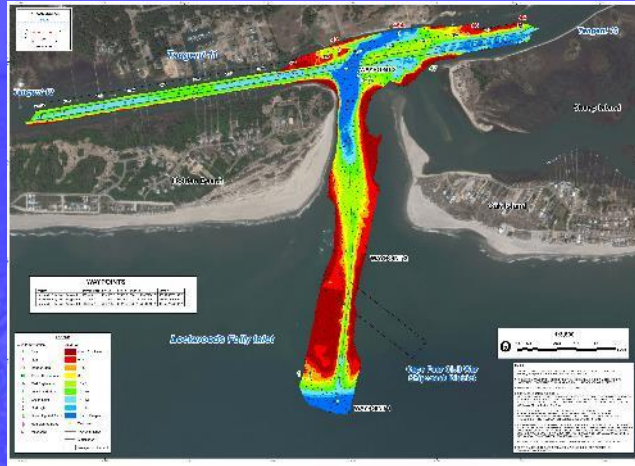


Source: Esri, DeLorme, GeoEye, Earthstar (USA), DigitalGlobe, GeoEye, Earthstar (USA), and the GIS User Community



- ~60,000 cy in Nearshore

ONGOING HB BEACH MANAGEMENT ACTIVITIES



- Corps 50-yr Study
- FEMA Coordination
- LWFIX & Bend-Widener
- LWF Outer Channel Dredging/Navigation
- West End Analysis
- Offshore Borrow Area Finalization

