



PERFORMANCE OF COASTAL STRUCTURES: A MANAGED SYSTEM APPROACH

Presented by:

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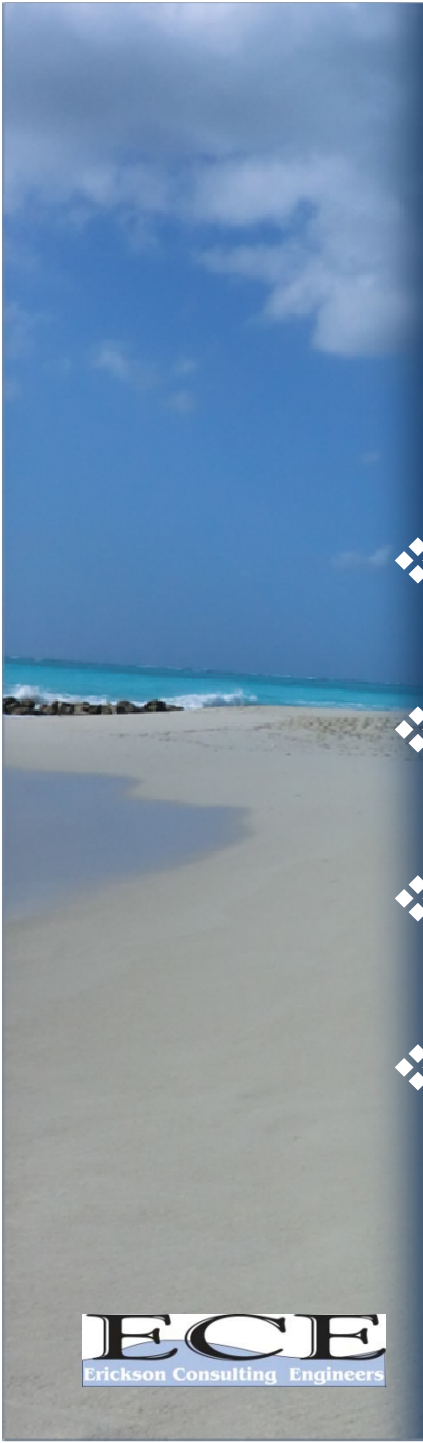
PRESENTATION OVERVIEW

- ❖ What is a Managed System Approach ?
- ❖ Structures to Address Significant Problems
 - Limited Sand Resources (economics)
 - Remedy Erosion Hotspots (protect upland property)
 - Respond to Changes in Structures(s) Permeability
 - Surge & Wave Climate Variability
- ❖ Project Locations with Adjustable Structures
 - Bloody Point, Daufuskie Island, SC
 - Grace Bay and Emerald Bch, TCI
 - Town of Palm Beach, FL

A vertical photograph of a tropical beach. The foreground is a wide expanse of white sand. In the middle ground, the turquoise ocean meets the shore with gentle waves. The sky is a deep blue with scattered white clouds. The overall scene is bright and serene.

EROSION AND SITE CONDITIONS AT BLOODY POINT (1994 TO 2003)





SITE CONDITIONS

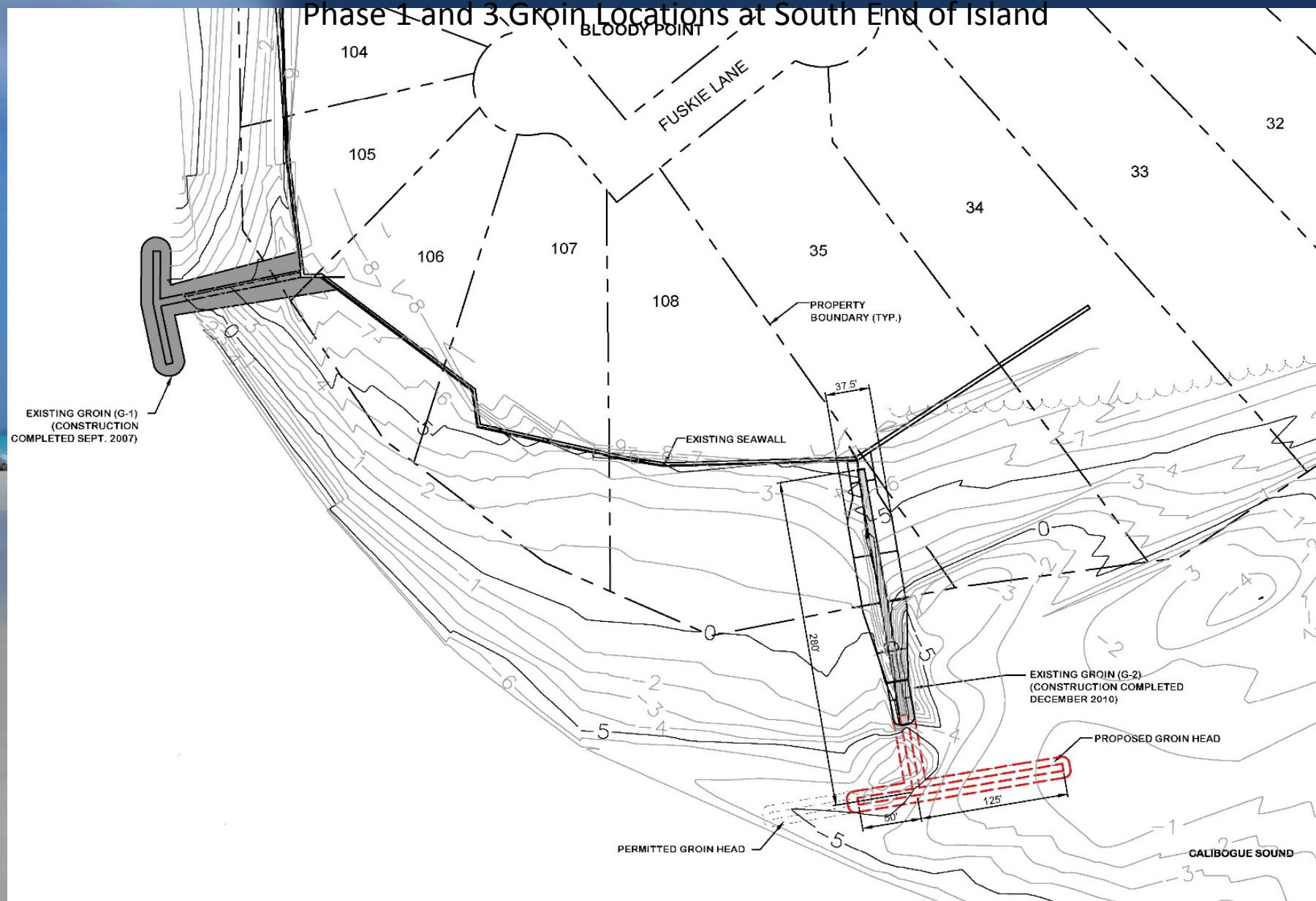
EROSIVE FORCES

- ❖ LARGE TIDAL INLET ADJACENT (-38 to -18 ft)
- ❖ MIGRATING PRIMARY CHANNEL (50-100 FT/YR)
- ❖ MIGRATING FLOOD CHANNEL ALONG BEACH
- ❖ HIGH SPRING TIDES (6 FT)

AMELIORATIVE FACTORS

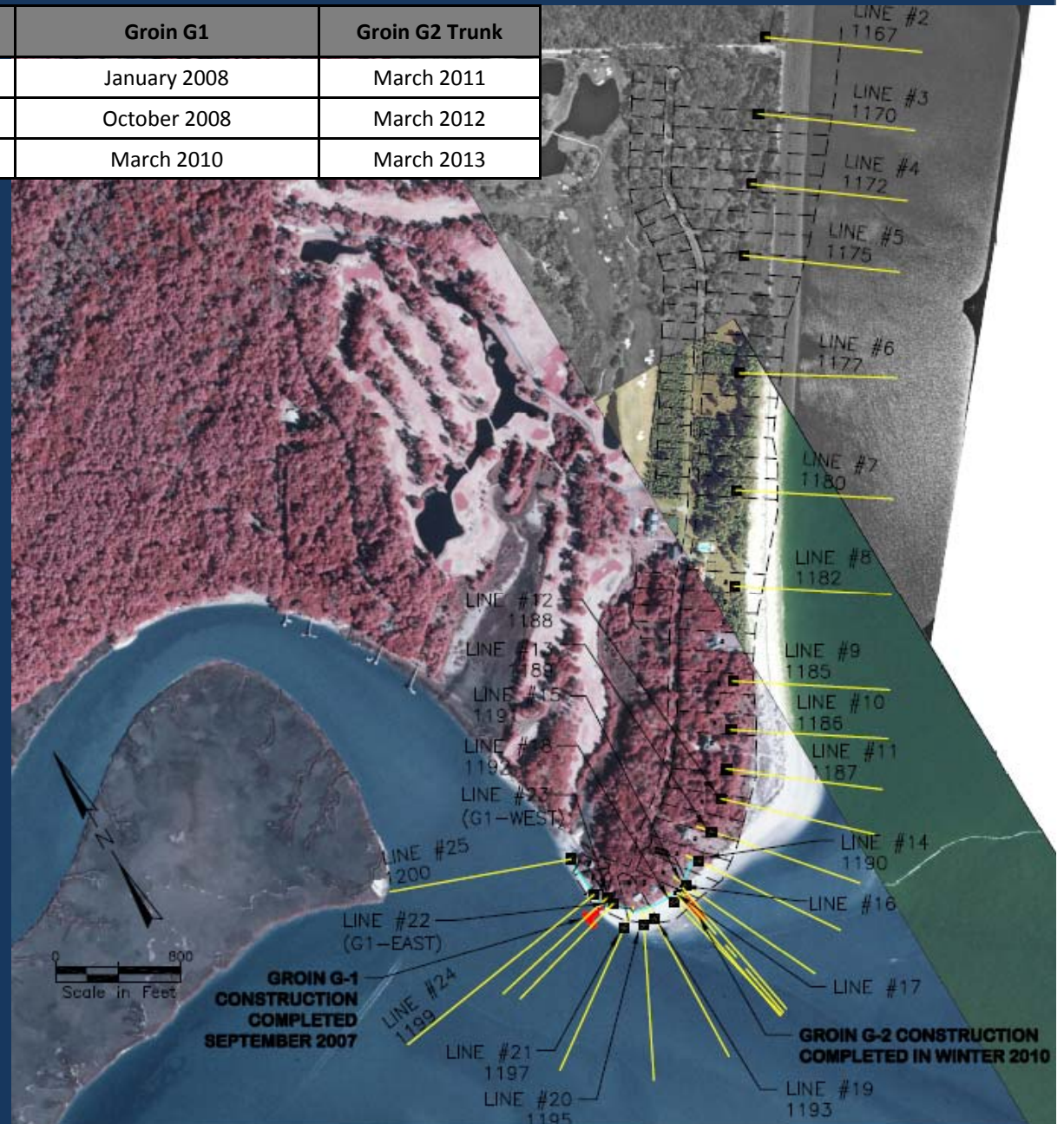
- ❖ SEDIMENT RICH SYSTEM
- ❖ SITE IS ADJACENT TO DOWNDRIFT END OF ISLAND
- ❖ ADJACENT SO. ISLAND IS UNINHABITED SEA ISLAND PARK WITH MANY LARGE SHOALS

Phase 1 and 3 Groin Locations at South End of Island



LOCATION OF BEACH PROFILES FOR MONITORING & ENGINEERING EVALUATION

Monitoring Event	Groin G1	Groin G2 Trunk
Post-Construction	January 2008	March 2011
One Year Post-Construction	October 2008	March 2012
Two Year Post-Construction	March 2010	March 2013





Bloody Point Groin Phase #1

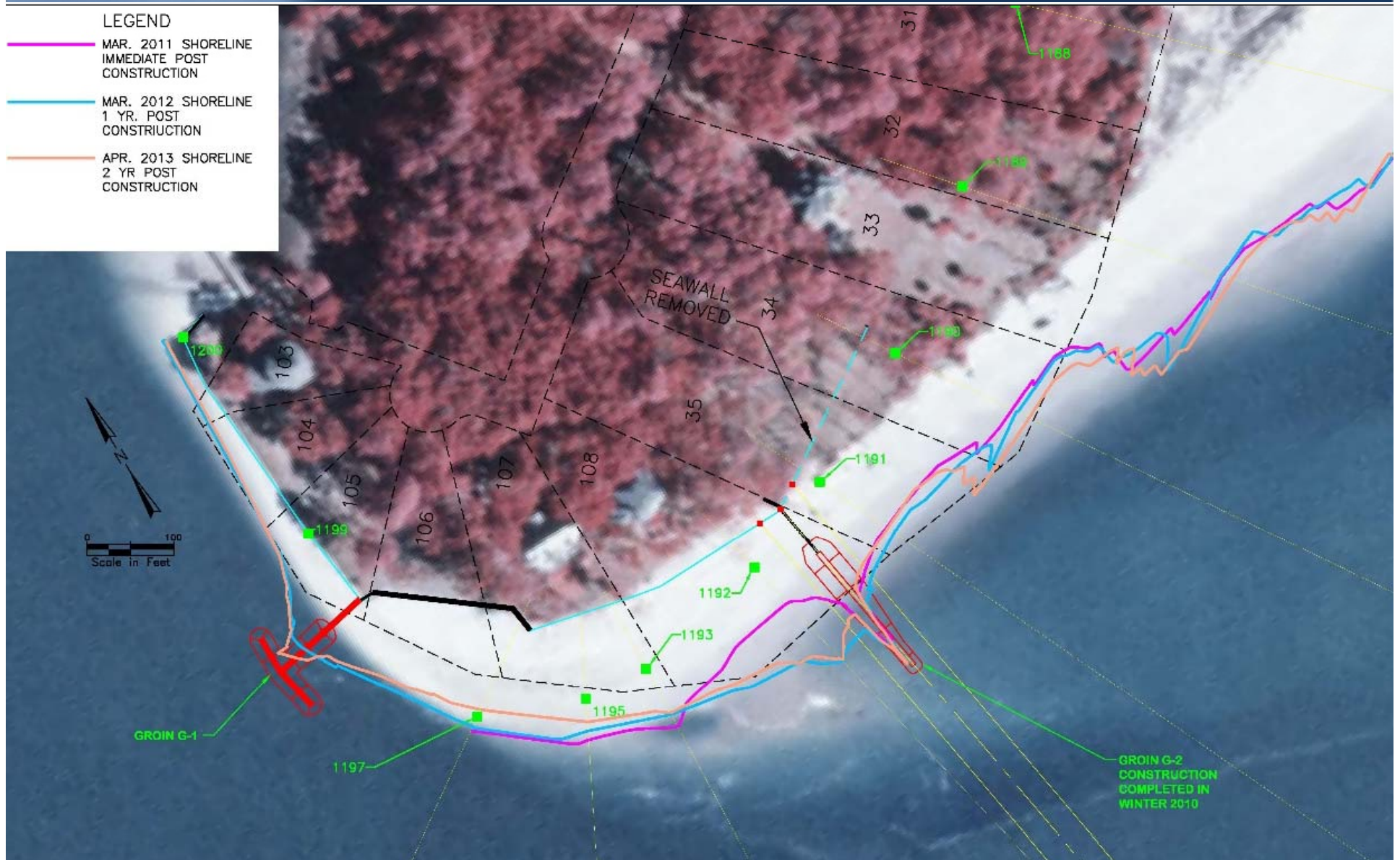
Type	T-Head with Weir
Length	120 ft Trunk : 100 ft Breakwater
Crest Width	2 ft to 6 ft
Material	Sheet Pile with Rock
Foundation	12 inch Marine Mattress
Sand Volume Placed	NONE
Construction Completion Date	2007 (Phase 1)

Bloody Point Groin Phase #2

Type	T-Head with Weir
Length	243 ft Trunk : 175 ft Breakwater
Crest Width and Elevation	6 ft, with variable crest elevations
Material	Rock
Foundation	12 inch Marine Mattress
Sand Volume Placed	NONE
Construction Completion Date	2010 (Phase 2 Partial)

LEGEND

- MAR. 2011 SHORELINE
IMMEDIATE POST
CONSTRUCTION
- MAR. 2012 SHORELINE
1 YR. POST
CONSTRUCTION
- APR. 2013 SHORELINE
2 YR POST
CONSTRUCTION



Phase 1 – T Head Sheet Pile Groin (2007)

Pre-Construction (highly dynamic)



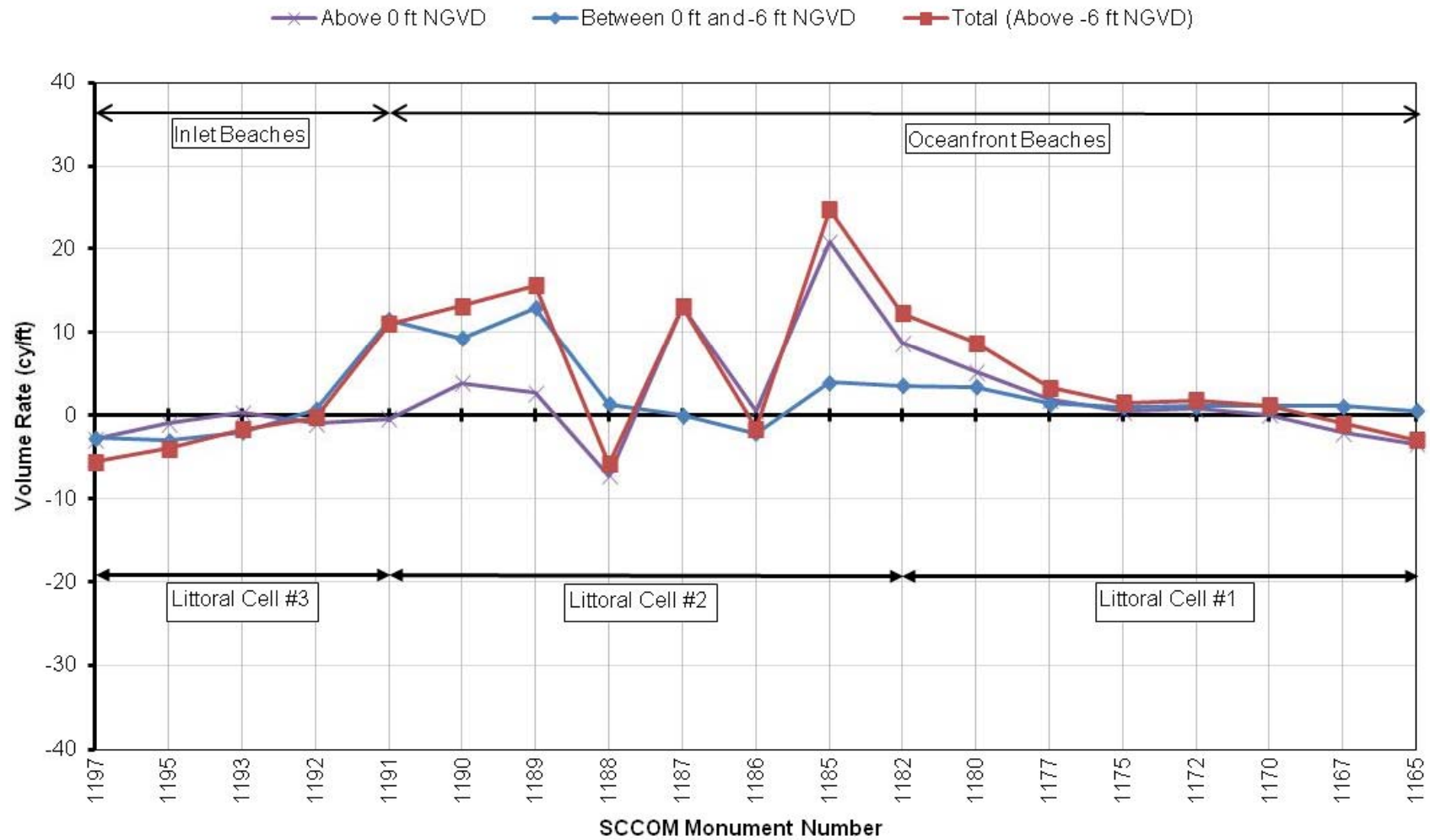
6 Mth Post-Construction (stable)



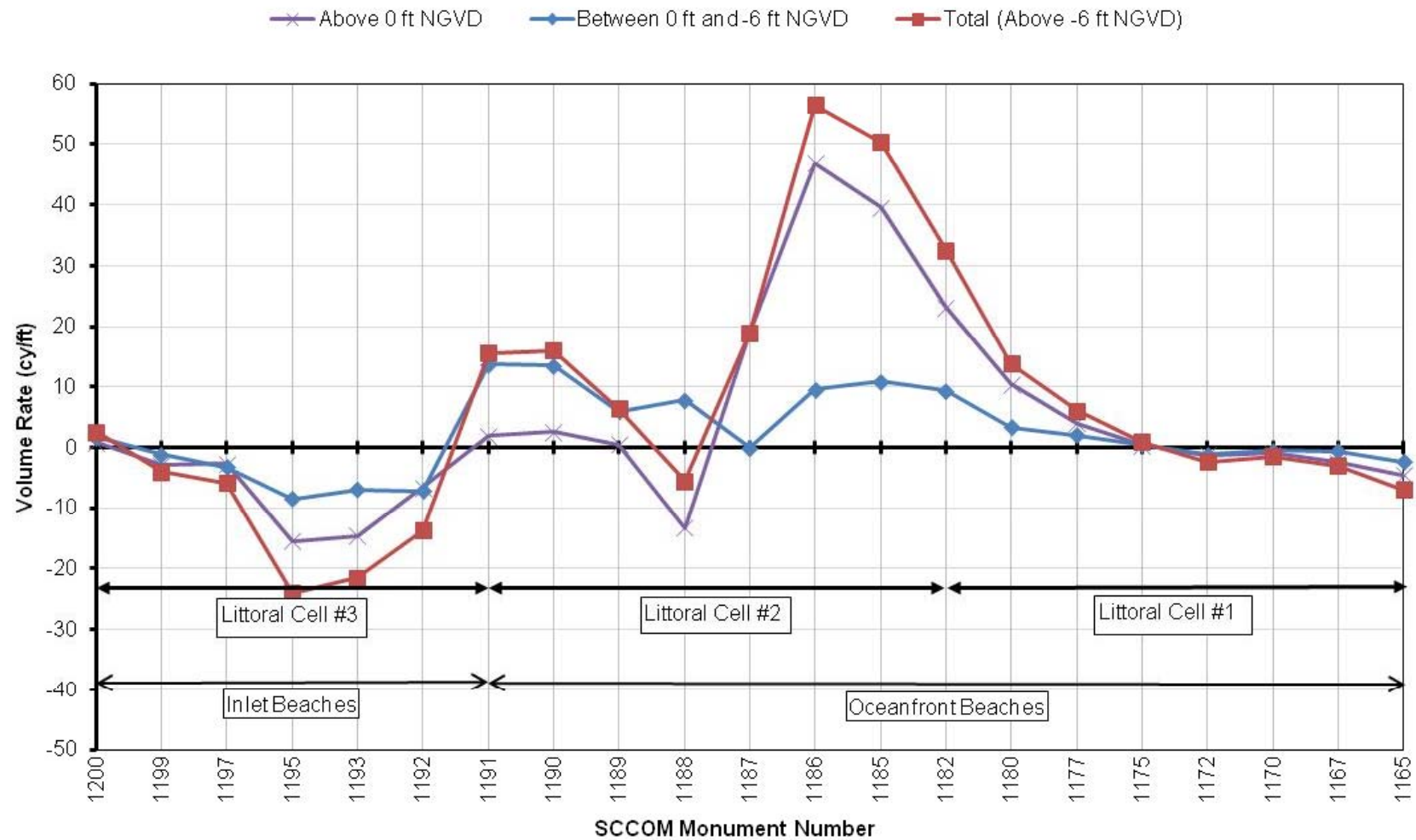
Phase 2 – T Head Rock and Sheet Pile Groin (2010)

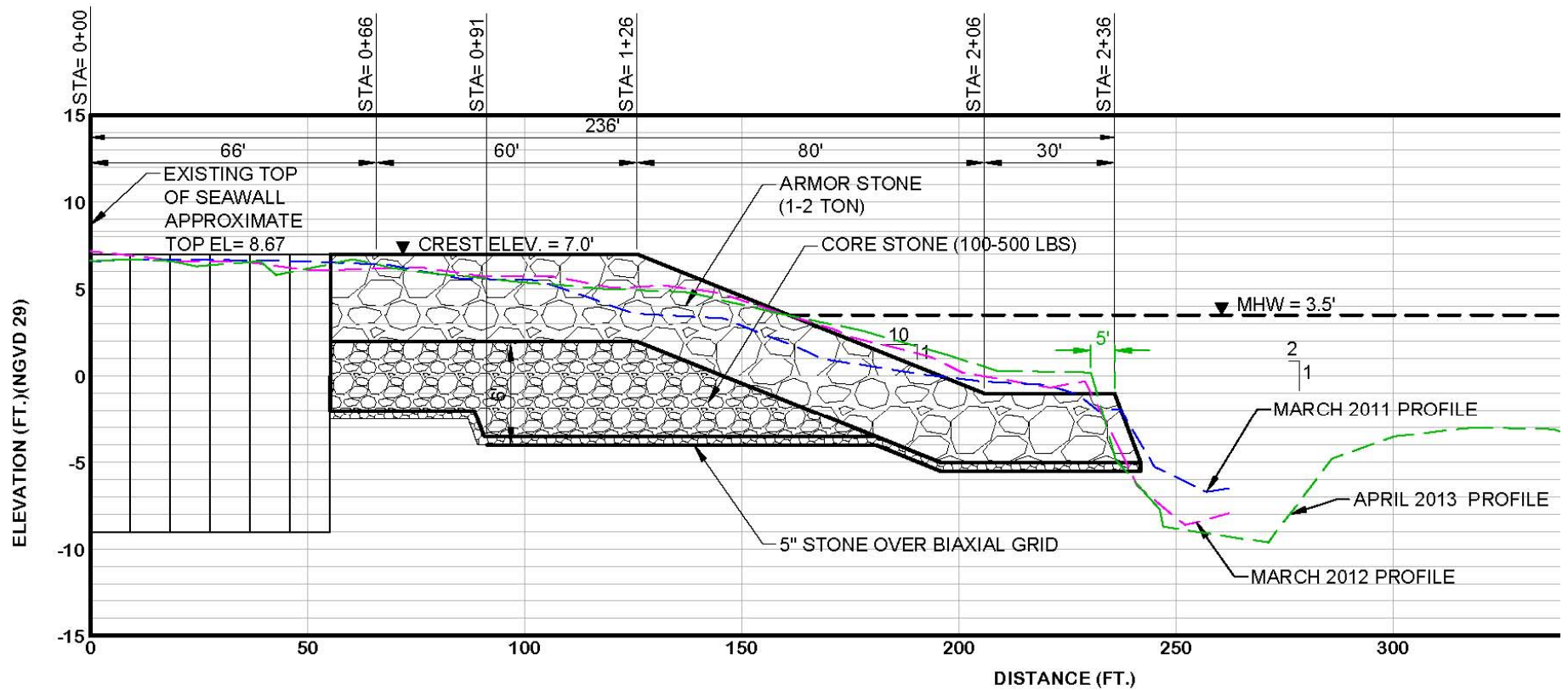


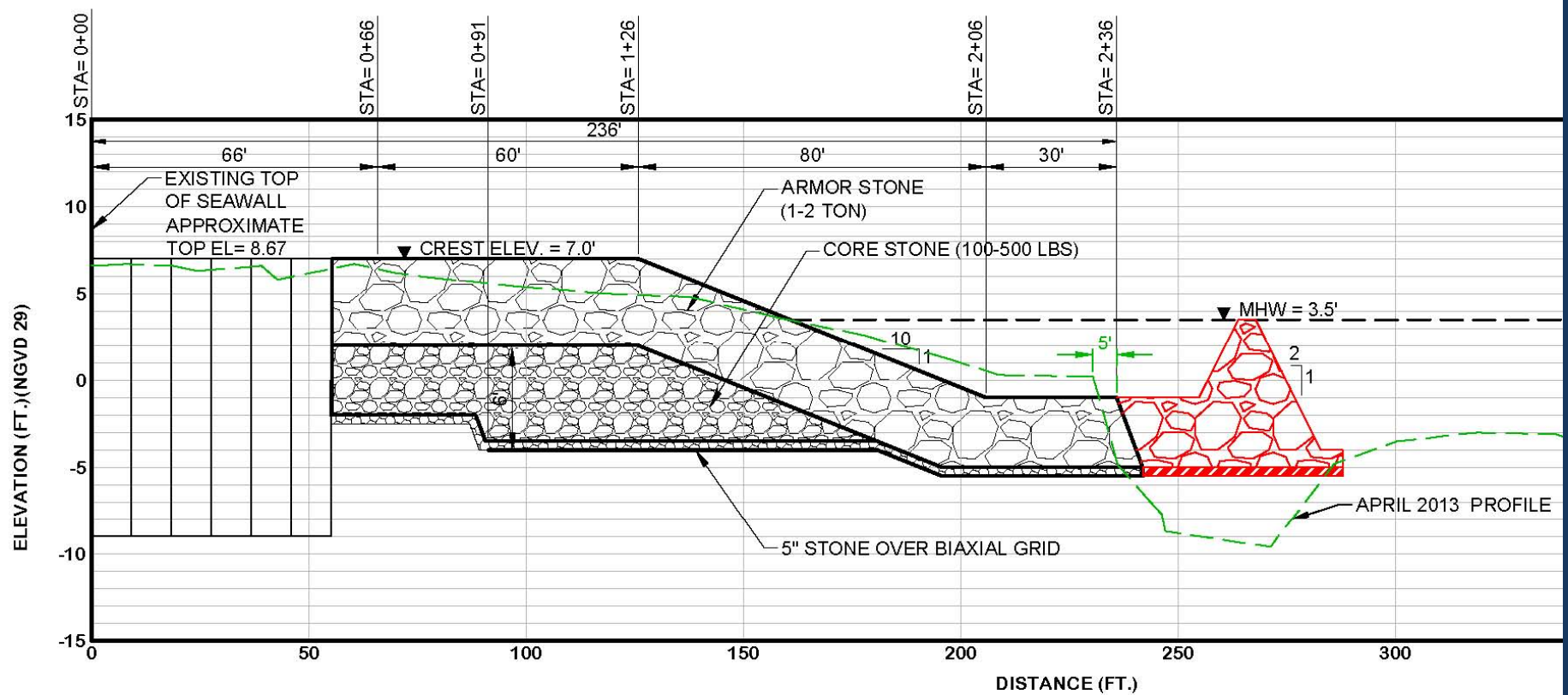
Net Alongshore Unit Volume Change (CY/FT) (March 2012 to March 2013)



Net Alongshore Unit Volume Change (CY/FT) (March 2010 to March 2013)

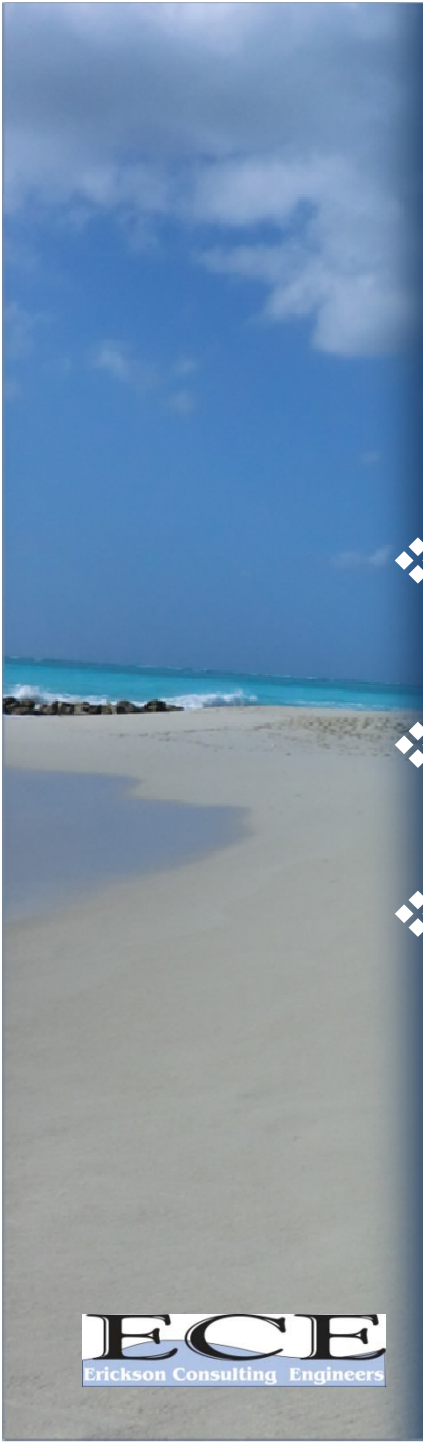






GRACE BAY TURKS AND CAICOS ISLANDS





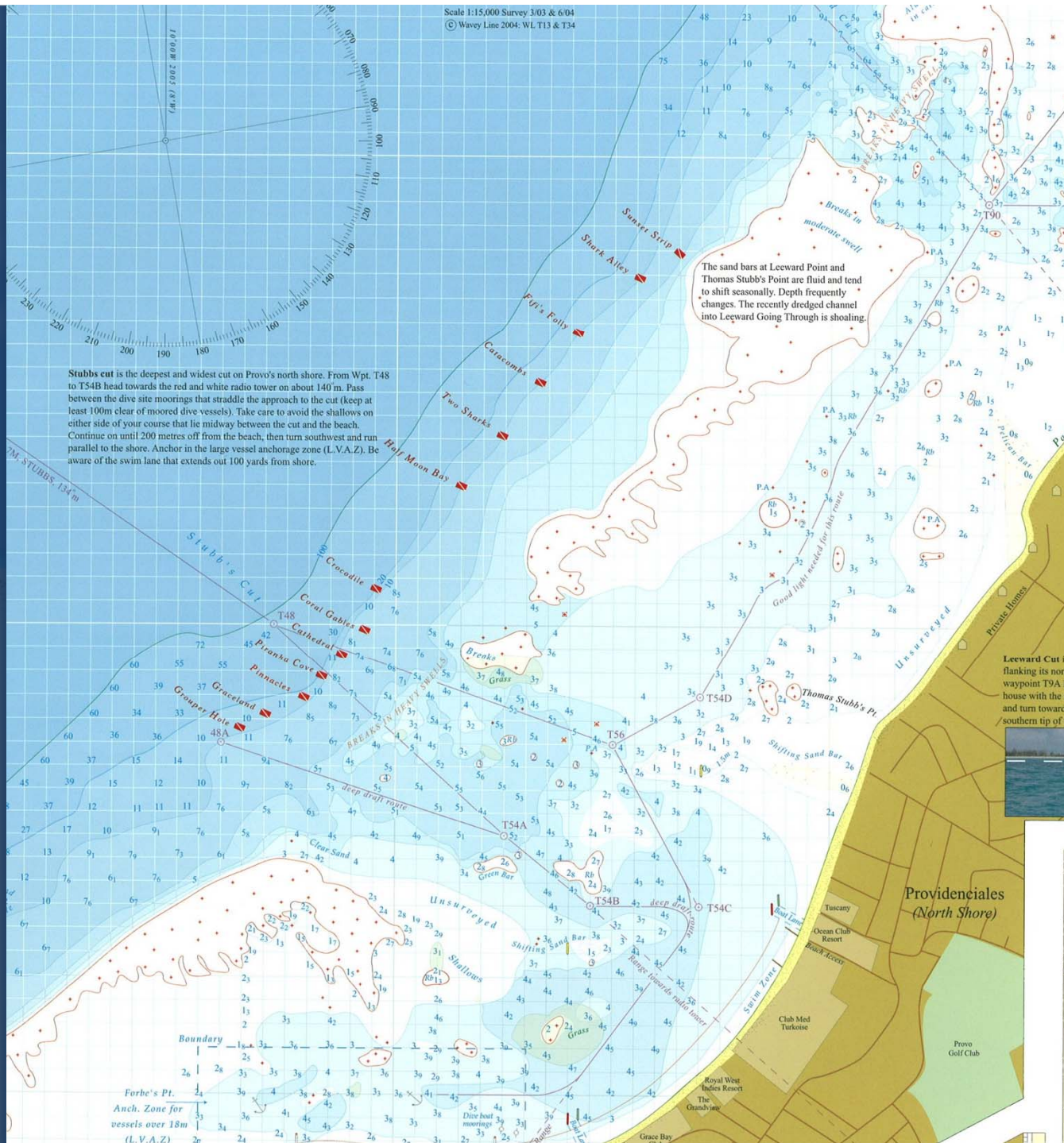
SITE CONDITIONS

EROSIVE FORCES

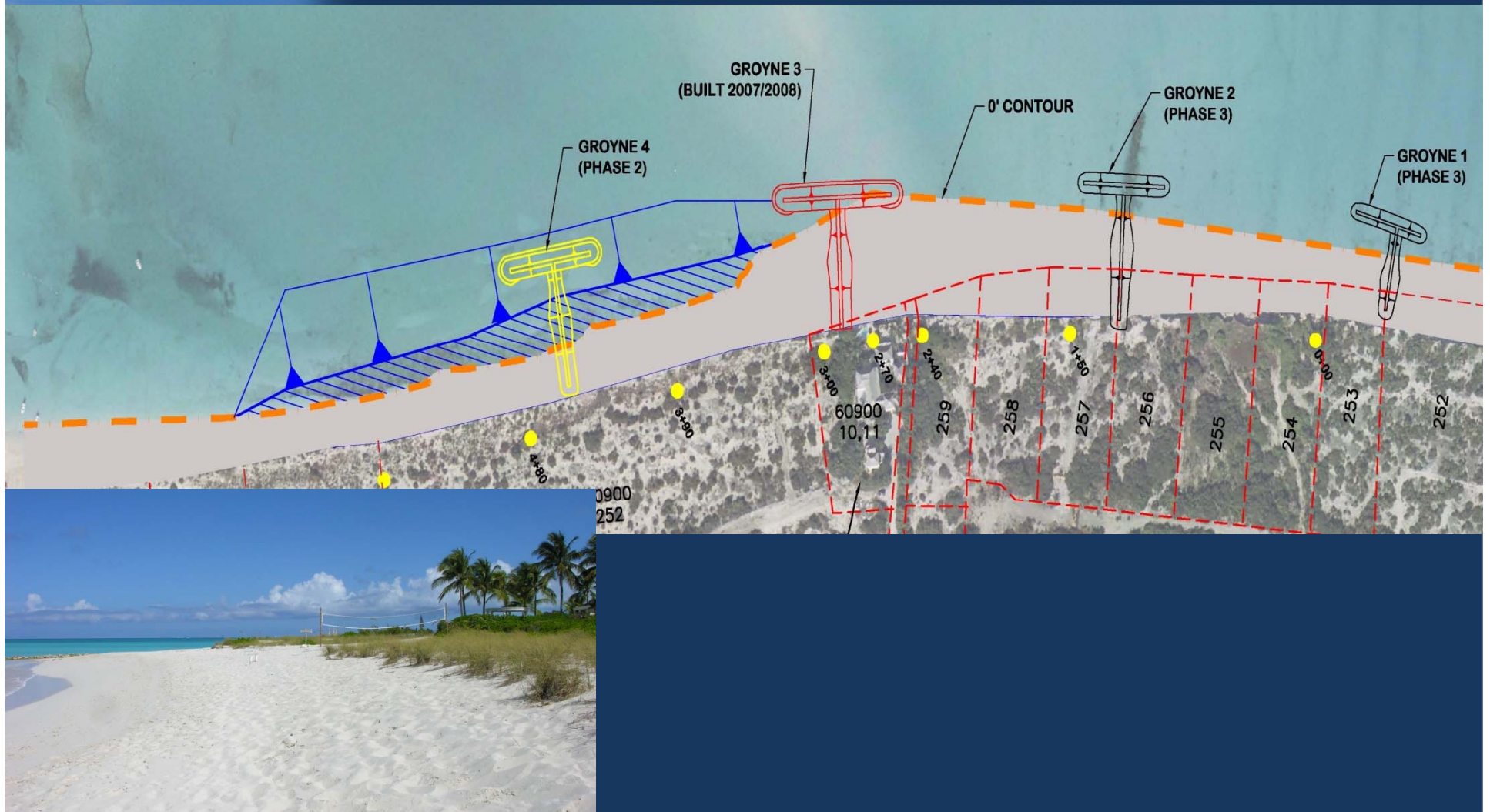
- ❖ HIGH EROSION RATES
(-10 to -15 ft/YR)
- ❖ SEDIMENT DEFICIT
UPDRIFT
- ❖ LIMITED SAND
RESOURCES FOR
FUTURE
NOURISHMENT

AMELIORATIVE FACTORS

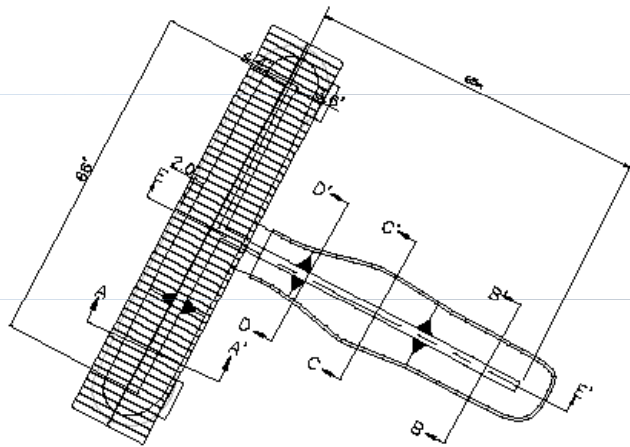
- ❖ BARRIER REEF SYSTEM
- ❖ SITE IS EXPOSED TO NORTH
TO NORTHWEST WAVES
- ❖ LEEWARD SIDE OF ISLAND
FOR NORTH TO NORTHEAST
WAVES



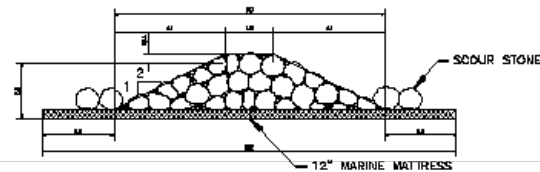
GROYNE PLAN AUTHORIZED IN 2007 WITH CONSTRUCTION PHASED (BASED ON PERFORMANCE)



PLAN VIEW OF T-HEAD GROYNE (2007)

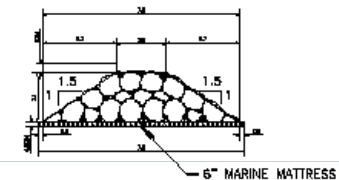


GROIN G3 PLAN
SCALE: 1"=10 METERS



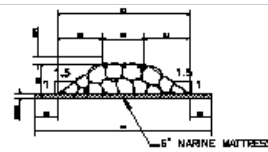
TYPICAL HEAD SECTION A-A'

N.T.S.



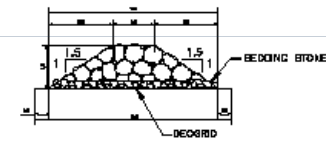
TYPICAL WEIR SECTION D-D'

N.T.S.



TYPICAL SLOPING SECTION C-C'

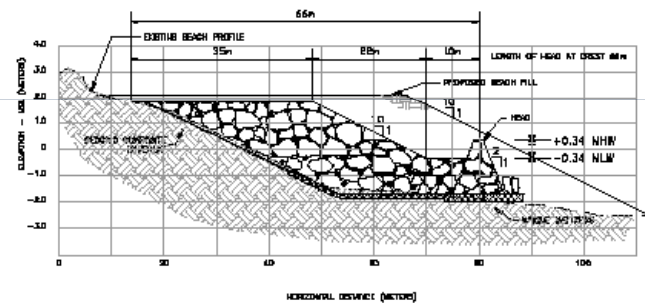
N.T.S.



TYPICAL TRUNK SECTION B-B'

N.T.S.

ITEM	QNTY	UNIT (METRIC)
1. ARMOR STONE	3,392	TONS
2. CHINKING STONE	509	TONS
3. SCOUR STONE	366	TONS
4. BEDDING STONE	250	TONS
5. 12" MARINE MATRESS	1,277	SQ. M
6. 6" MARINE MATRESS	242	SQ. M
7. GEOGRID	340	SQ. M



GROIN G3 LONGITUDINAL SECTION E-E'

SCALE: HORIZ. 1"=10 METERS
VERT. 1"=2 METERS

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East Grace Bay T- HEAD Groin

Type	T-Head with Weir
Length	215 ft Trunk : 200 ft Breakwater
Crest Width	6 ft and Varying Elevation
Material	2-3 Ton Limestone
Foundation	6-12 inch Marine Mattress
Sand Volume Placed	170,000 CY
Construction Completion Date	2007

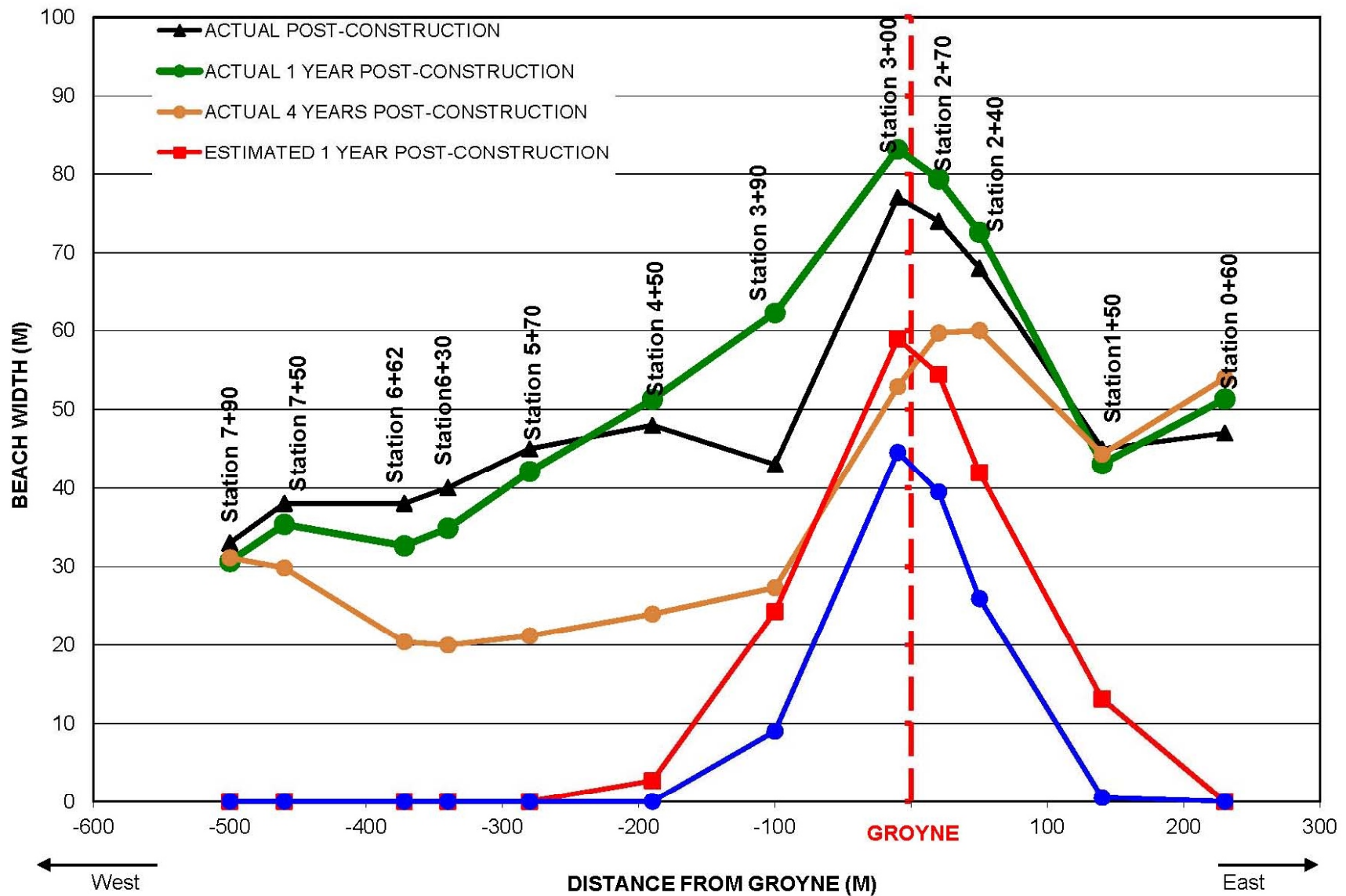
CONSTRUCTION OF LARGEST GROYNE (2007)



POST HURRICANE HANA AND IKE (SEPT 2008)

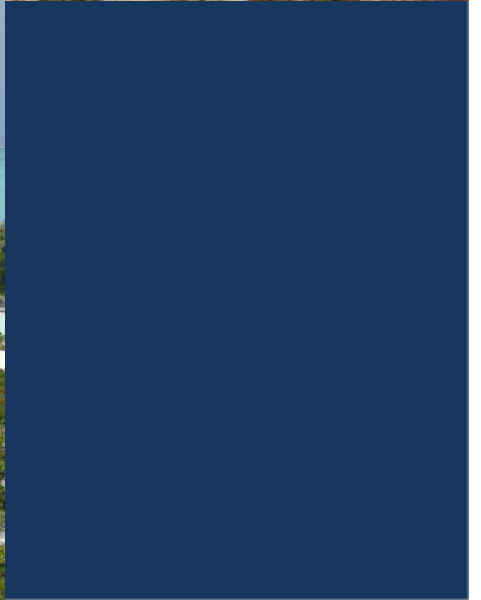
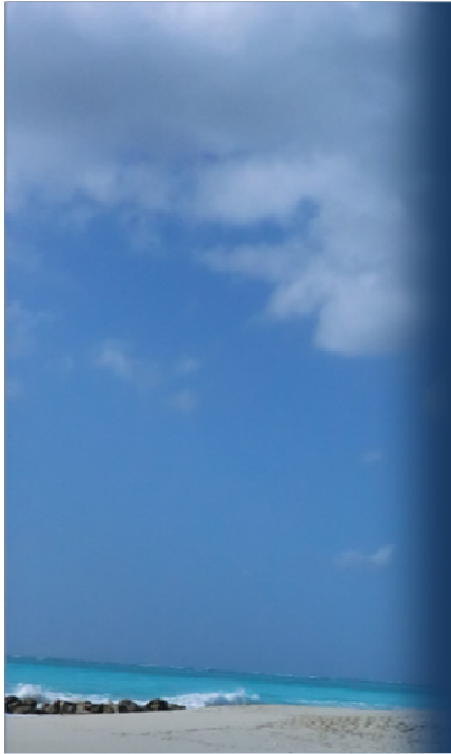


SHORELINE CHANGES 2008 TO 2012 AT GRACE BAY



GRACE BAY T-HEAD GROUYNE WITH WEIR (4 YRS POST CONSTRUCTION)





Grace Bay Groyne Performance

Benefits

- Shoreline Restored to 1960-1980s condition (5100 ft using 170,000 CY)
- Large Recreational Beach
- Beach Width Added 150 to 75 ft (5 Yrs Post Construction)



CONCLUSIONS: BENEFITS AND VALUE TO OWNERS AND REGULATORS

- Identifies Project Performance Metrics to Evaluate Response of Beach to Structure
- Pre- Agreed Modifications to Increase or Decrease Net Sand Flows thru Structure(s)
- Measure Beach Response thru Monitoring Shoreline and Beach Volume Changes
- Understandable to Stakeholders - Identifies Littoral Cells Along Beach and Maintenance