

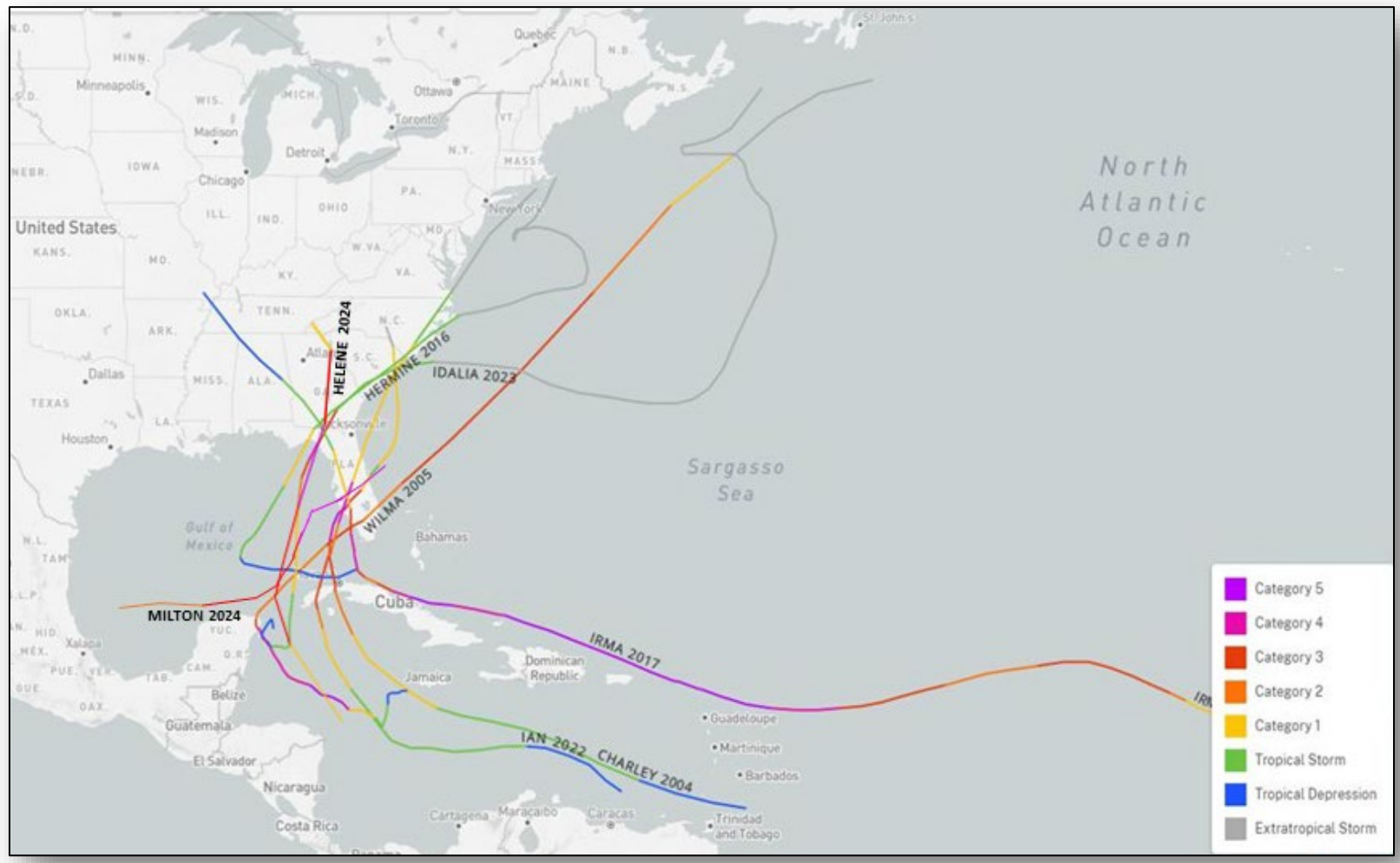
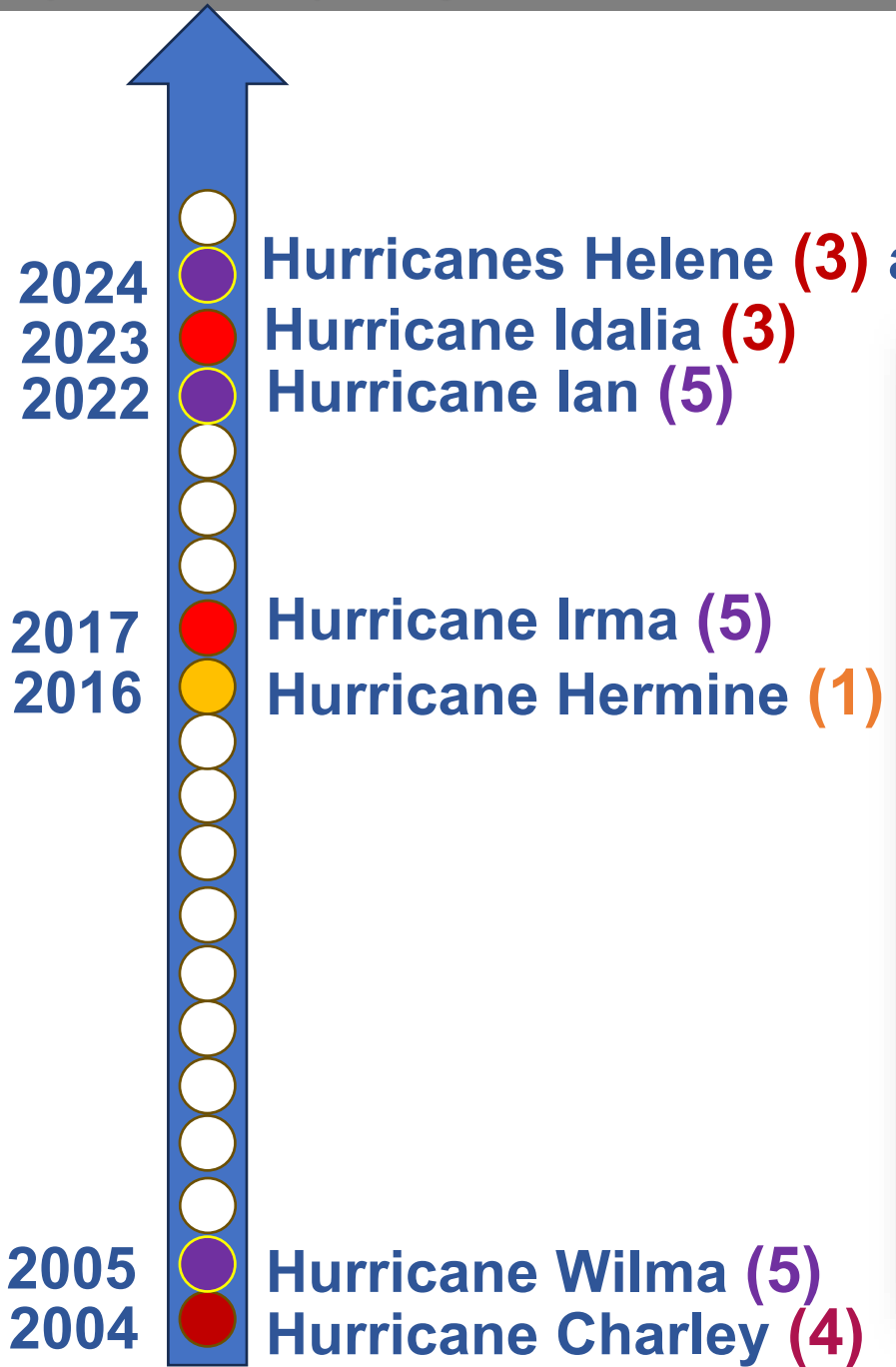


## The Cumulative Impacts of Hurricanes Debby, Helene and Milton on Southwest and Central Florida Barrier Islands

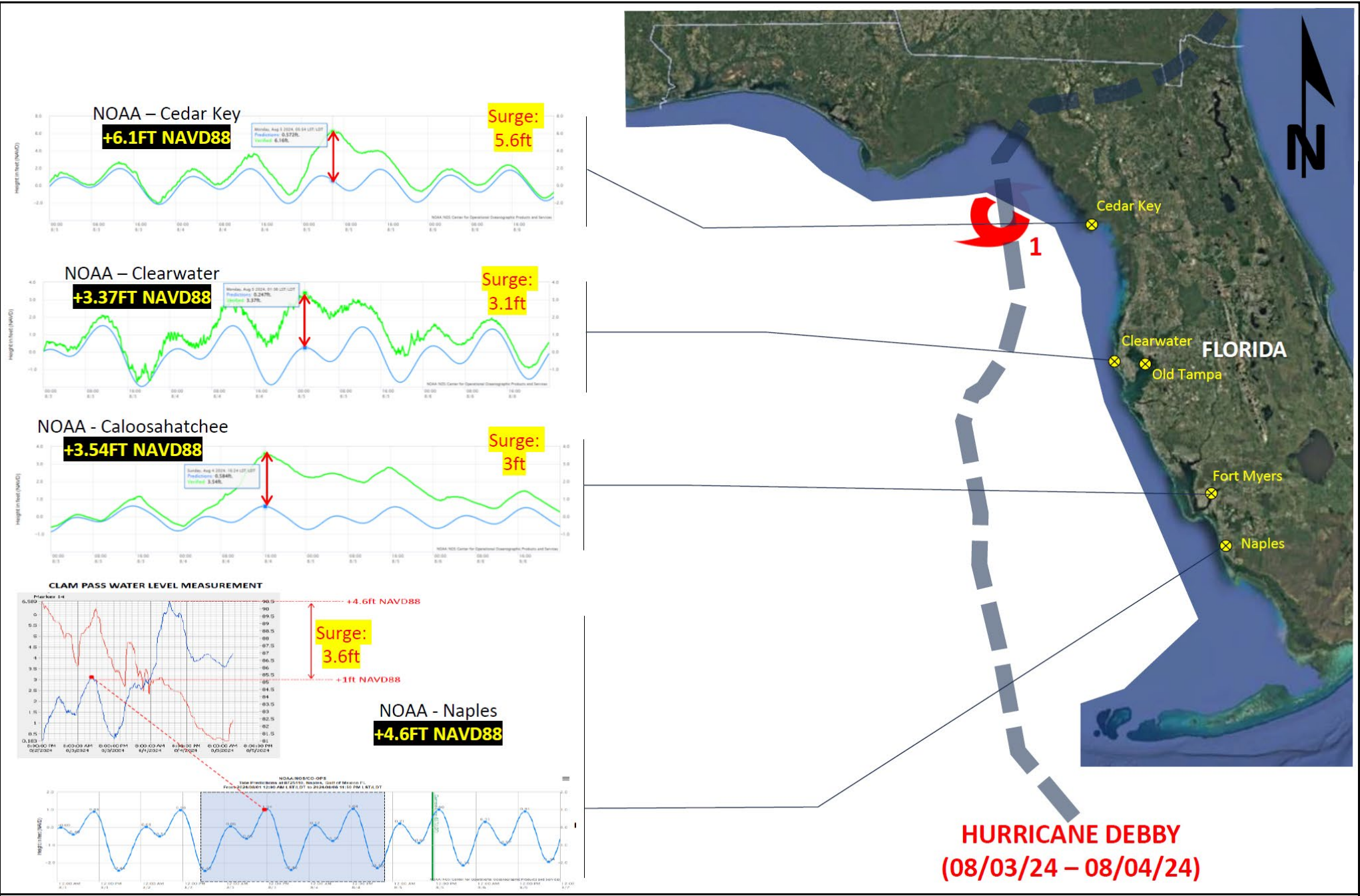
[Mohamed A. Dabees, Ph.D. PE. D. CE.](#)

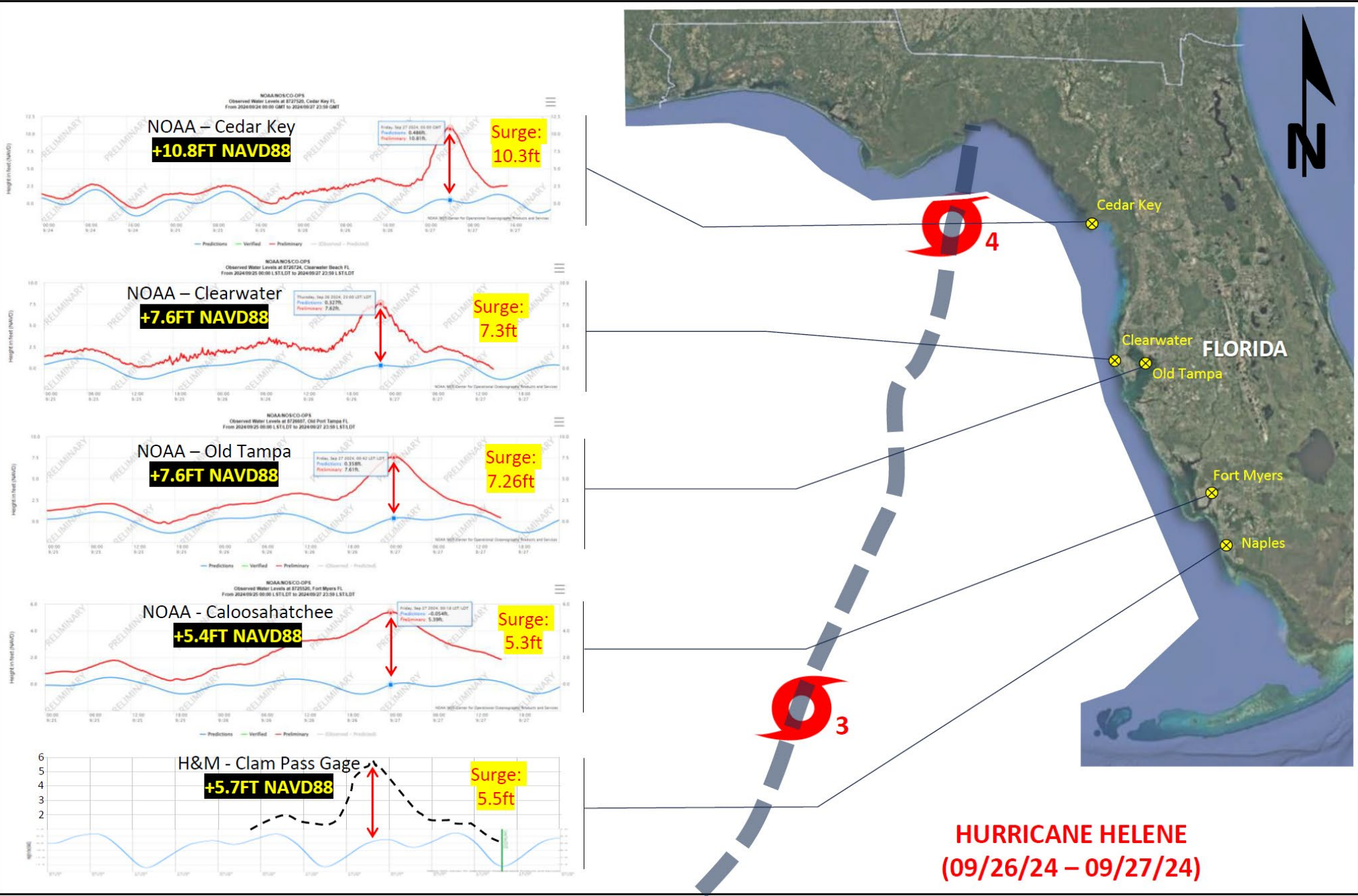
Humiston & Moore Engineers, Naples, USA

[md@humistonandmoore.com](mailto:md@humistonandmoore.com)

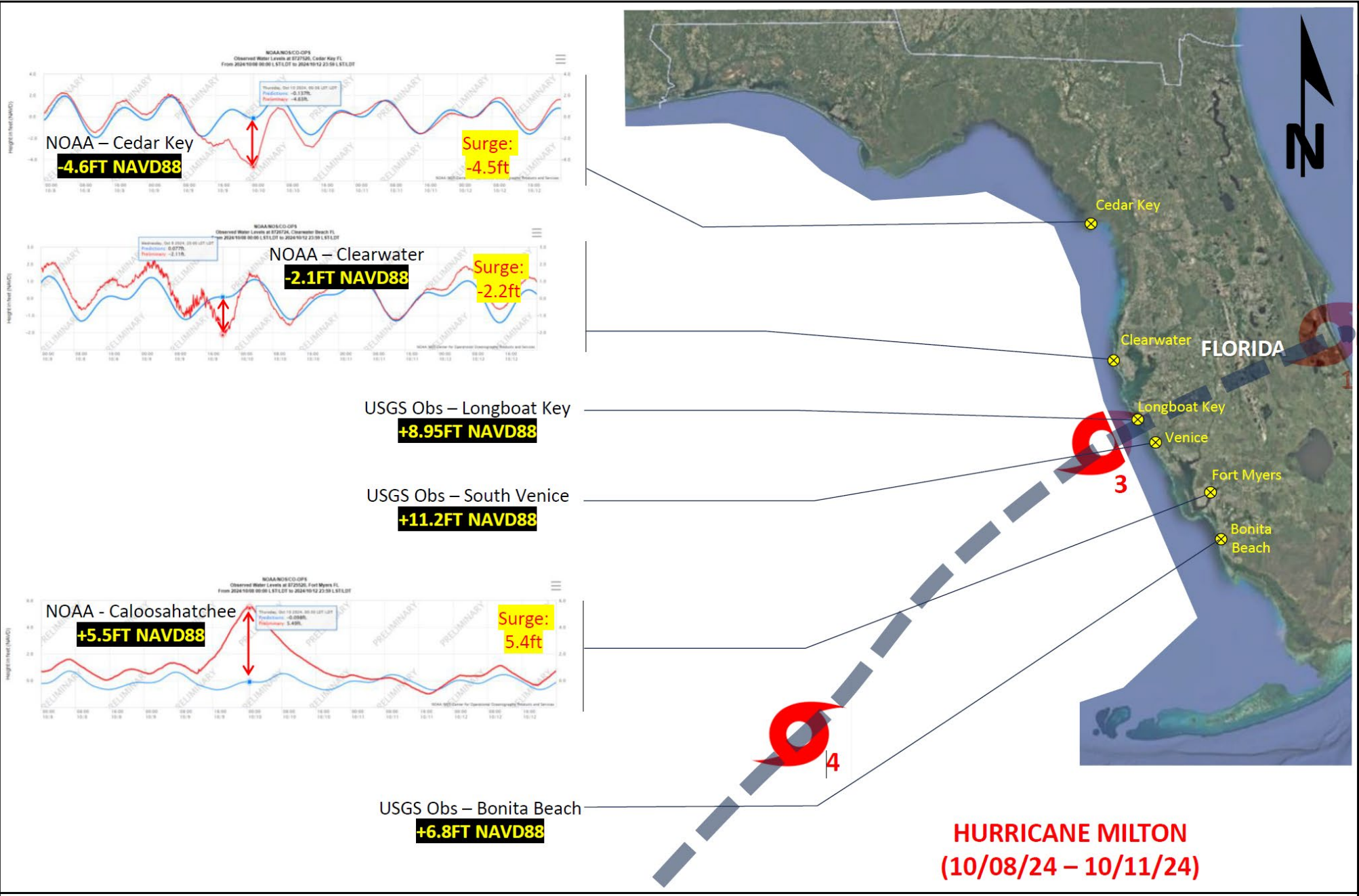














## □ Breaching

- *Multiple breaching at several barrier islands*



Honeymoon Island

Midnight Pass

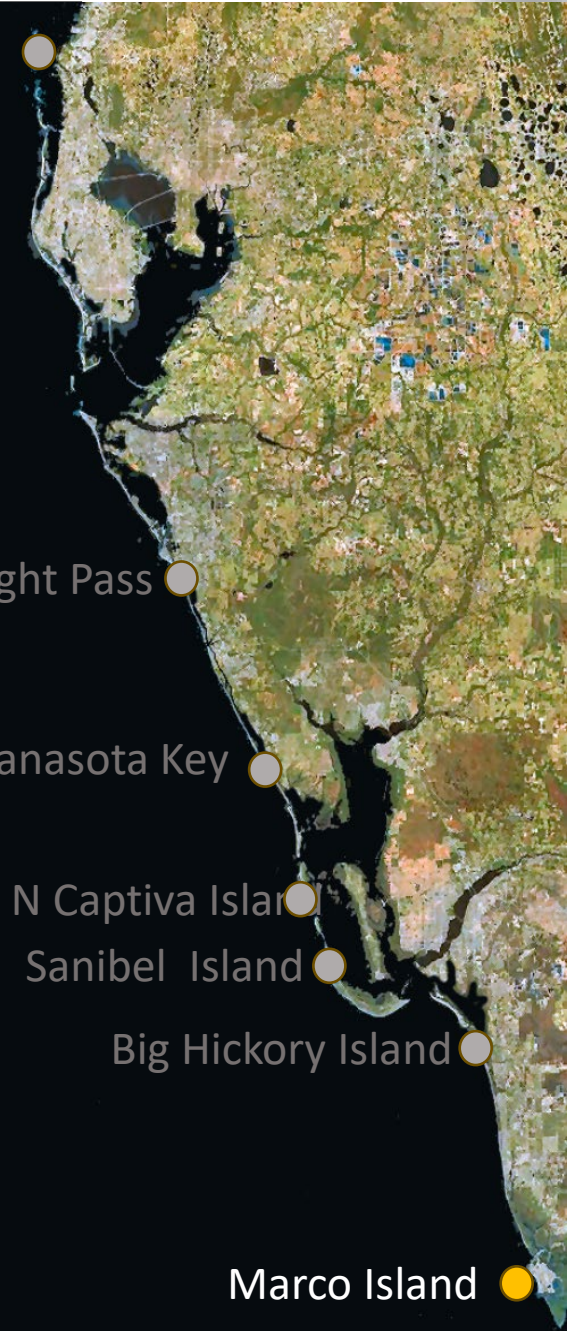
Manasota Key

N Captiva Island

Sanibel Island

Big Hickory Island

Marco Island





## □ Breaching

- *Multiple breaching at several barrier islands*



Honeymoon Island

Midnight Pass

Manasota Key

N Captiva Island

Sanibel Island

Big Hickory Island

Marco Island



## □ Breaching

- *Multiple breaching at several barrier islands*



Honeymoon Island

Midnight Pass

Manasota Key

N Captiva Island

Sanibel Island

Big Hickory Island

Marco Island





## □ Breaching

- *Multiple breaching at several barrier islands*



Courtesy of Guy Weeks- DEP

Honeymoon Island

Midnight Pass

Manasota Key

N Captiva Island

Sanibel Island

Big Hickory Island

Marco Island



## □ Breaching

- *Multiple breaching at several barrier islands*



Honeymoon Island

Midnight Pass

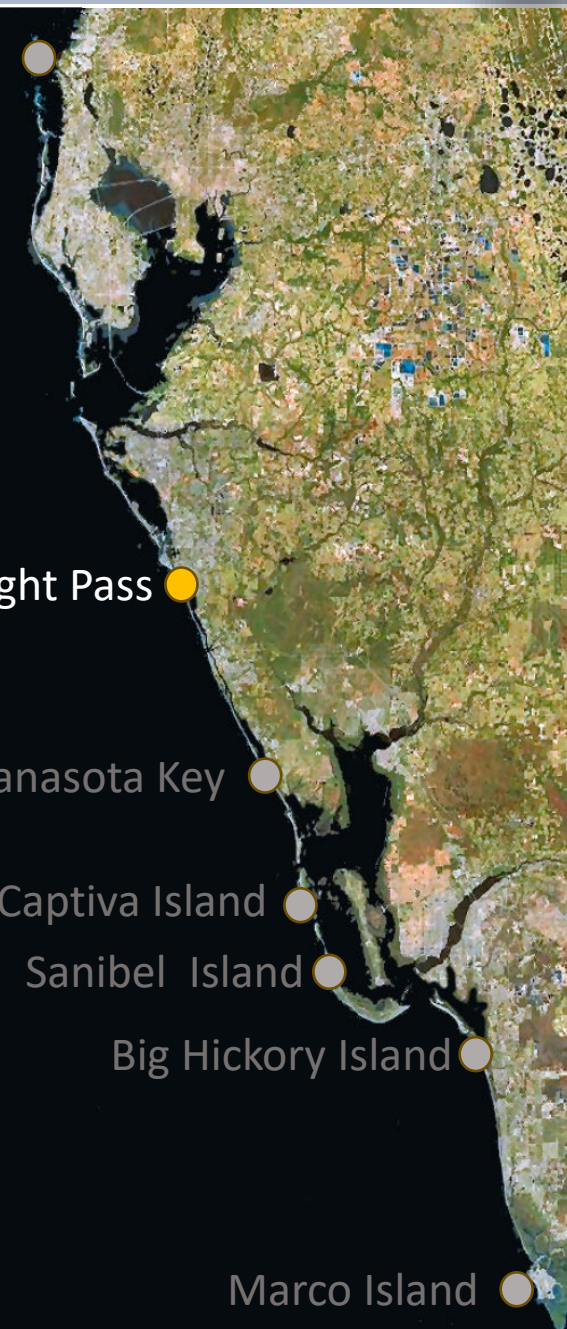
Manasota Key

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## □ Breaching

- *Multiple breaching at several barrier islands*



Honeymoon Island

Midnight Pass

Manasota Key

N Captiva Island

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Marco Island



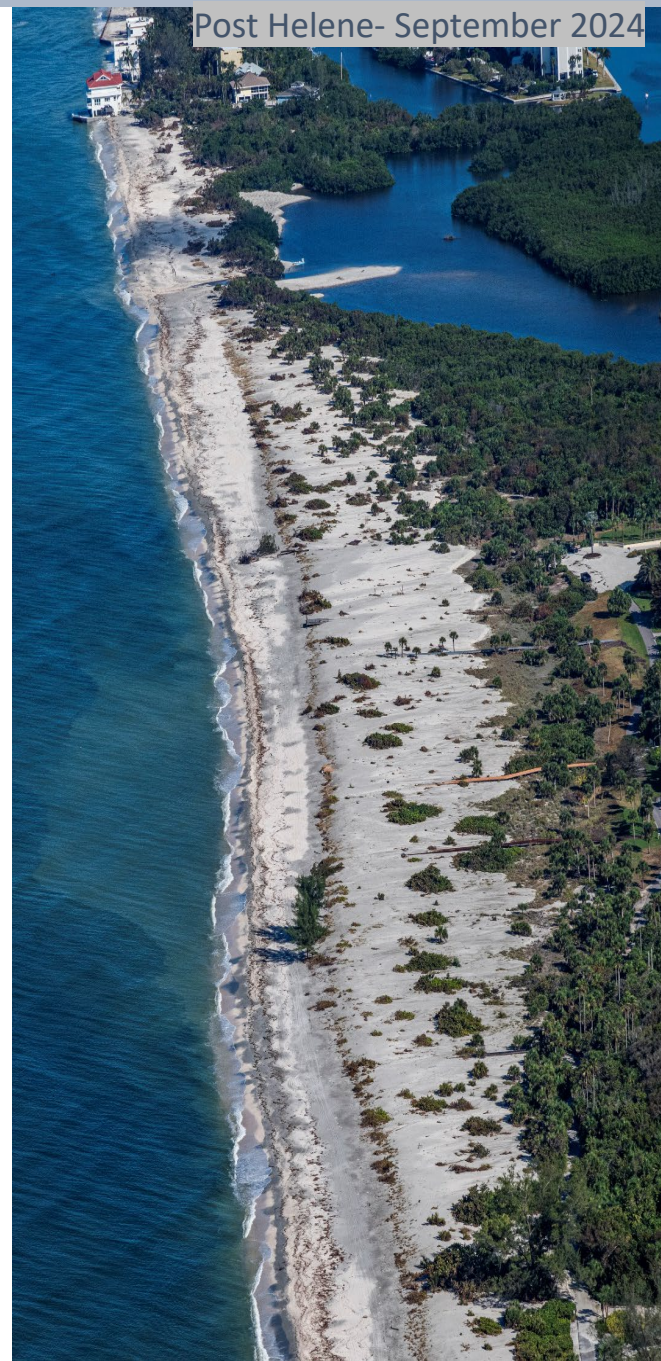
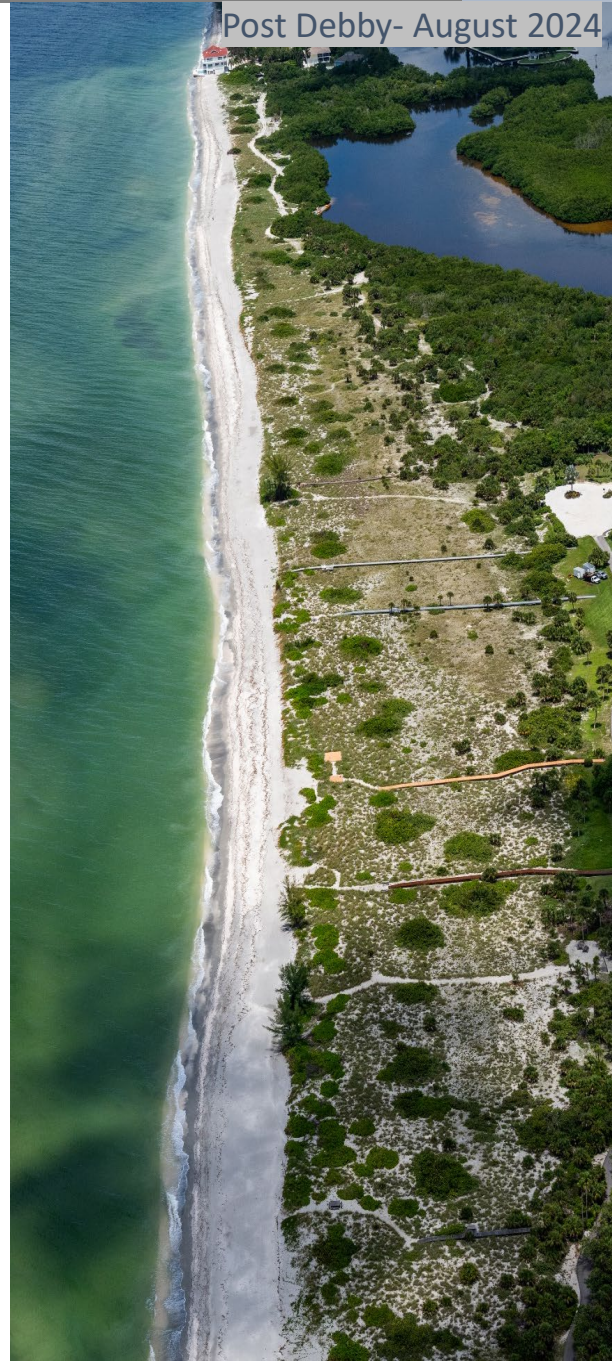


## □ Sand Over Wash

- *Nearshore erosion*
- *Dune loss or landward migration*
- *Loss or degradation of Coastal vegetation*
- *Damage to infrastructure*
- *Impacts to habitable structures*





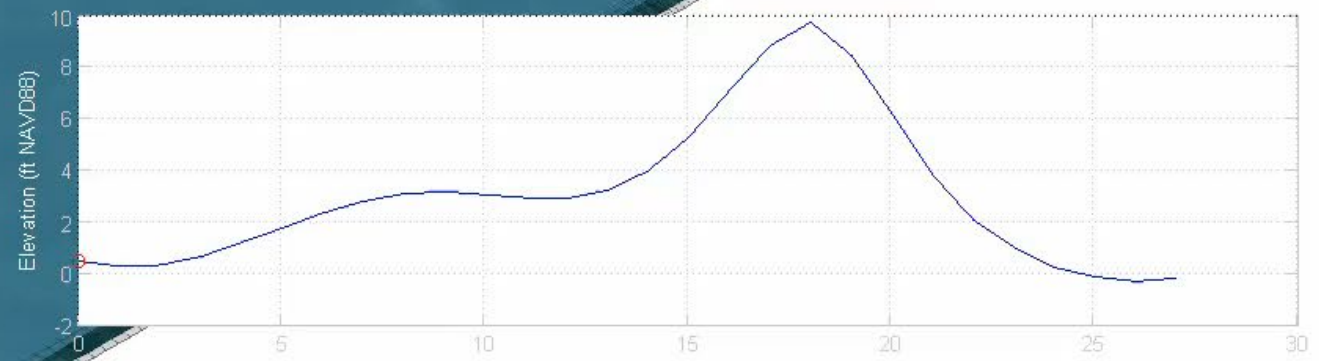
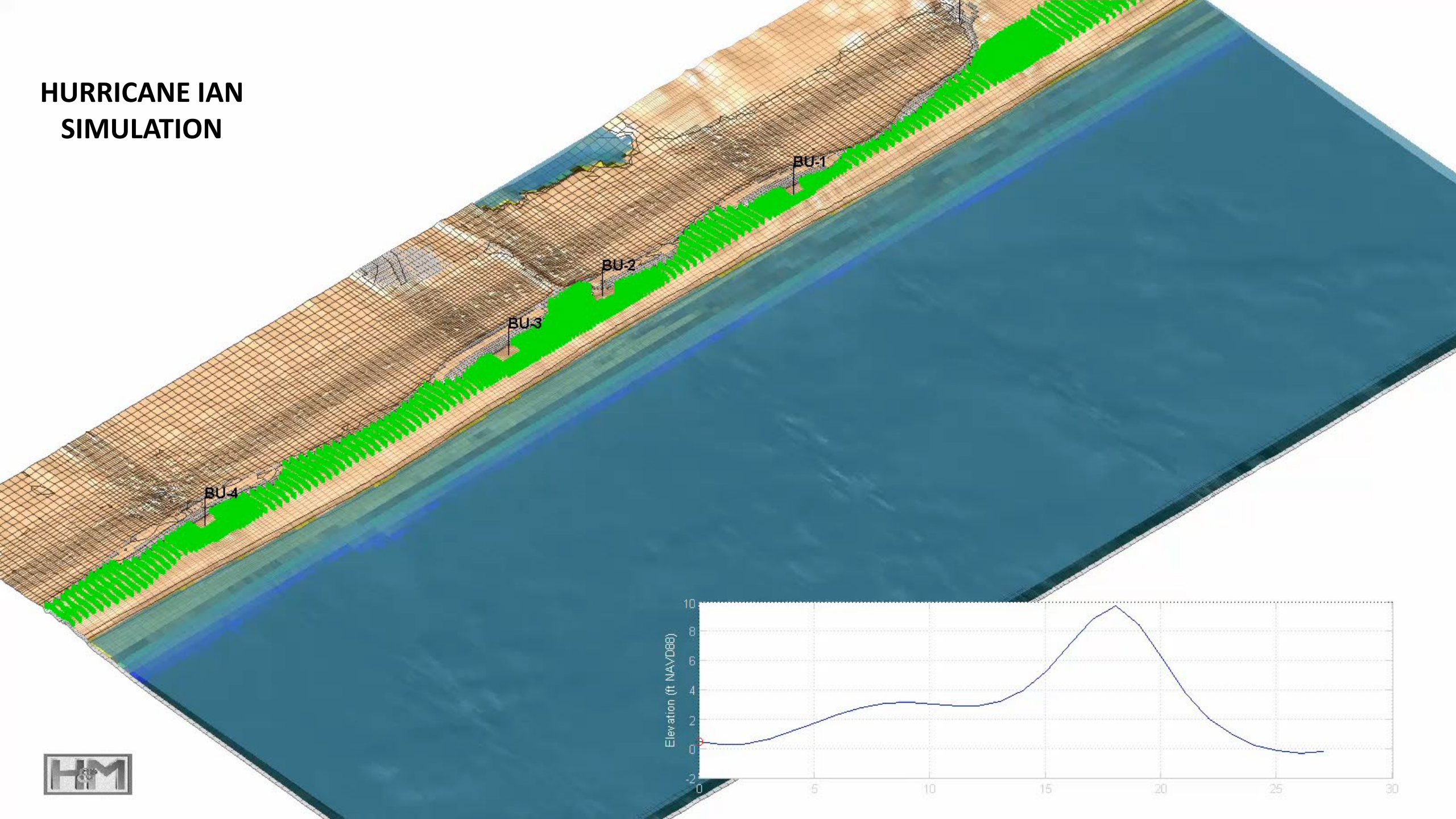








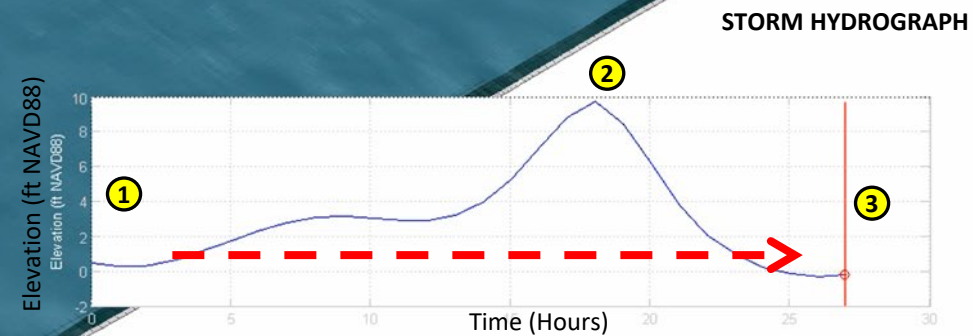
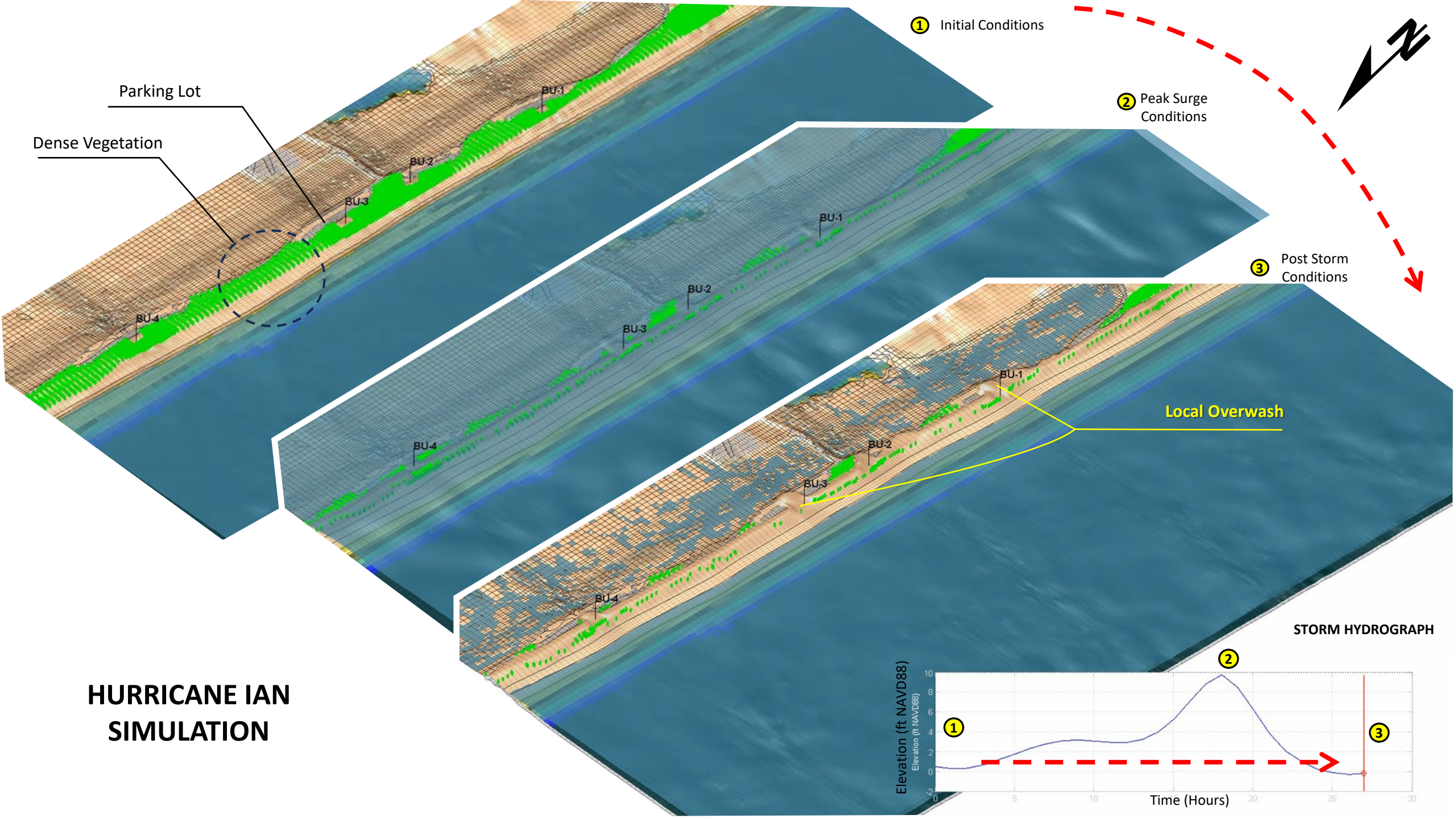
HURRICANE IAN  
SIMULATION





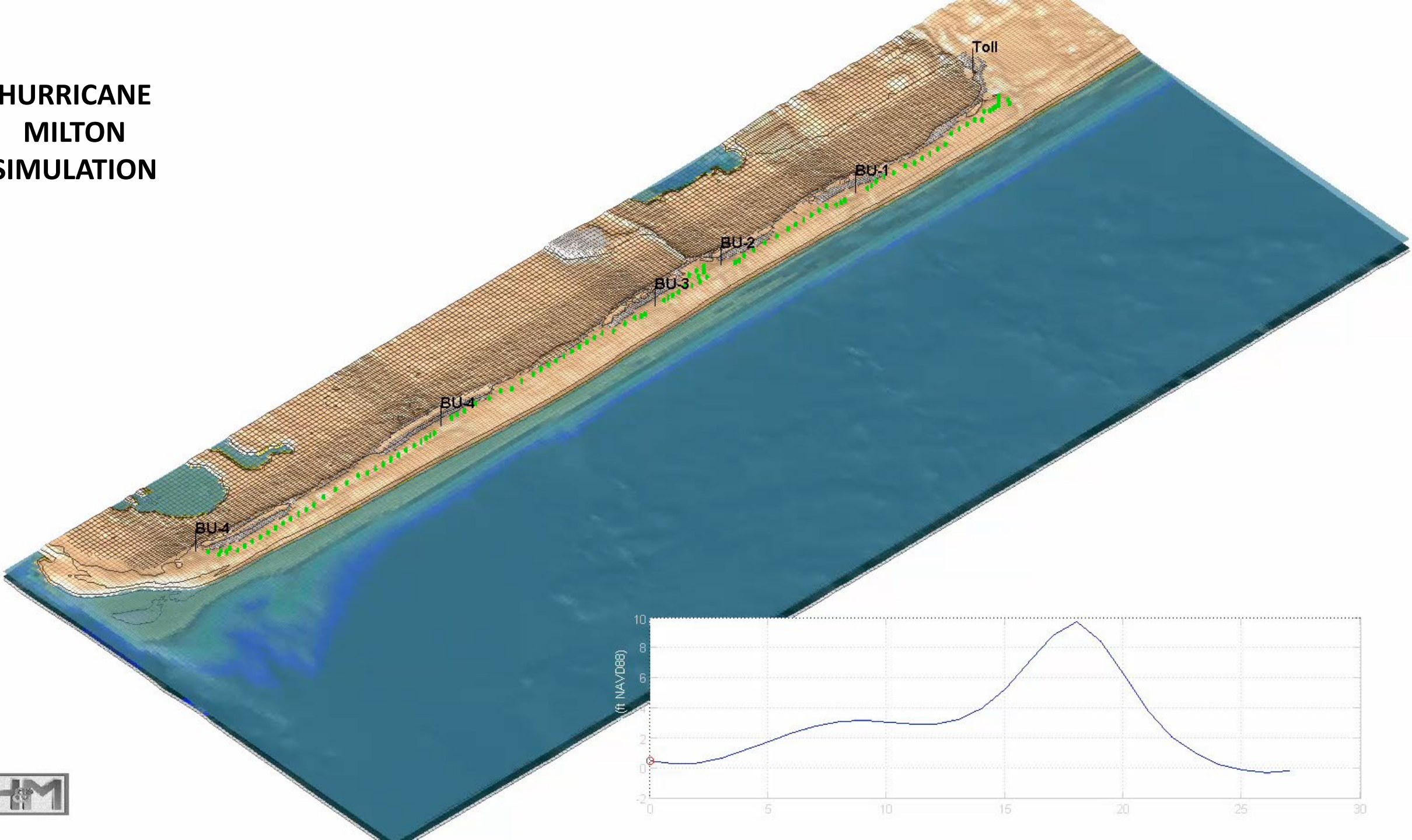
# HURRICANE IAN SIMULATION

Parking Lot  
Dense Vegetation





HURRICANE  
MILTON  
SIMULATION





Parking Lot  
Sparse Vegetation

# HURRICANE MILTON SIMULATION



① Initial Conditions

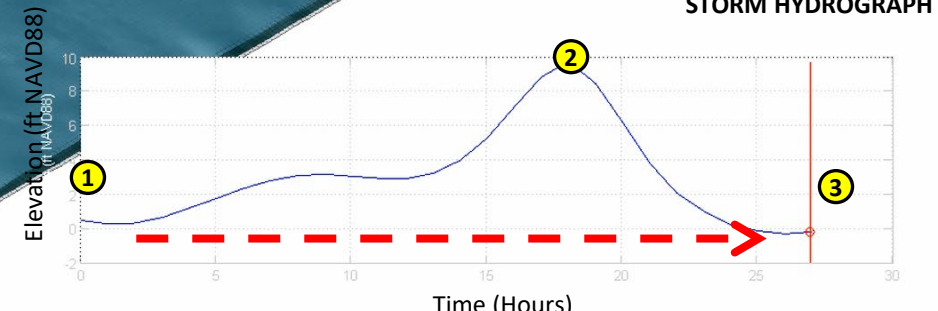
② Peak Surge  
Conditions

③ Post Storm  
Conditions

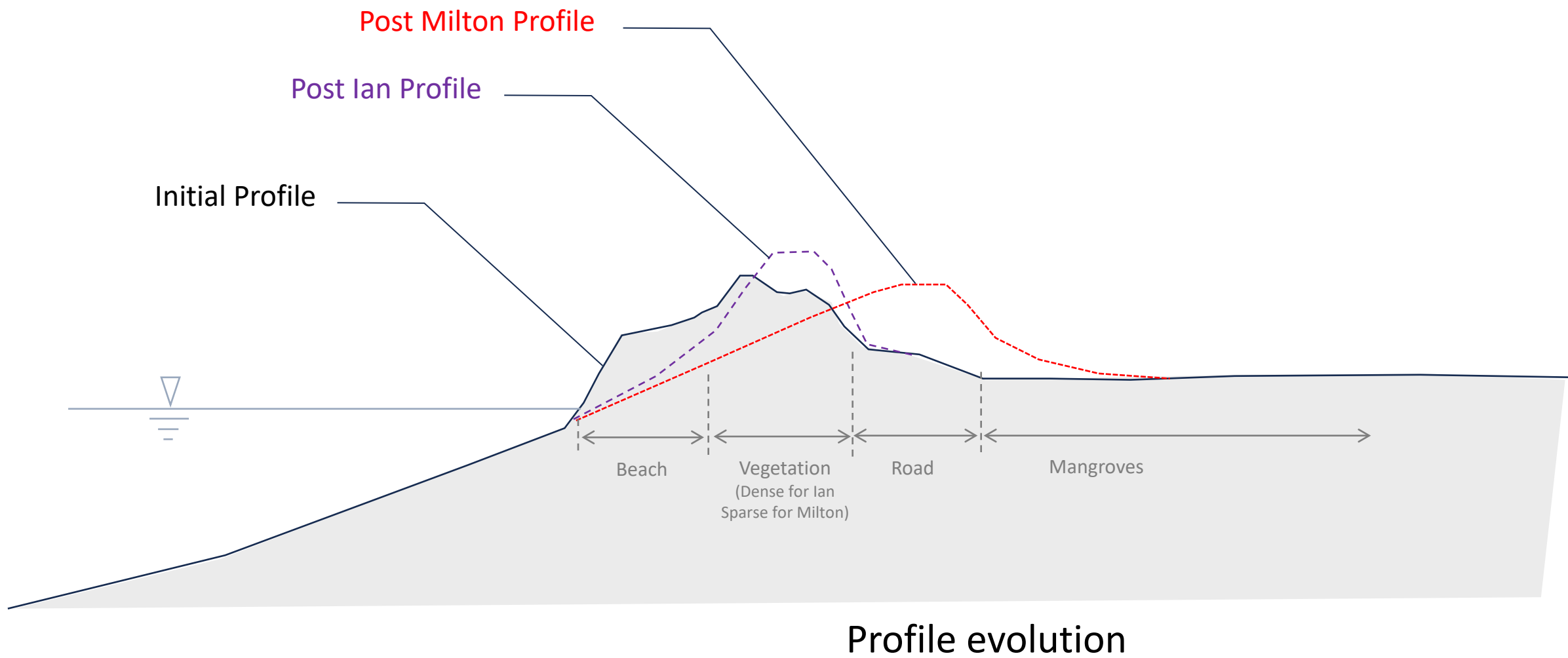


Widespread Overwash

Profile









## □ Barrier island natural evolution (Centuries)

- *Barrier Island landward migration*
- *Inlet evolution processes*
  - *Development*
  - *Migration*
  - *Barrier island breaching*
  - *Inlet closures/ opening*

## □ Anthropogenic change (Decades)

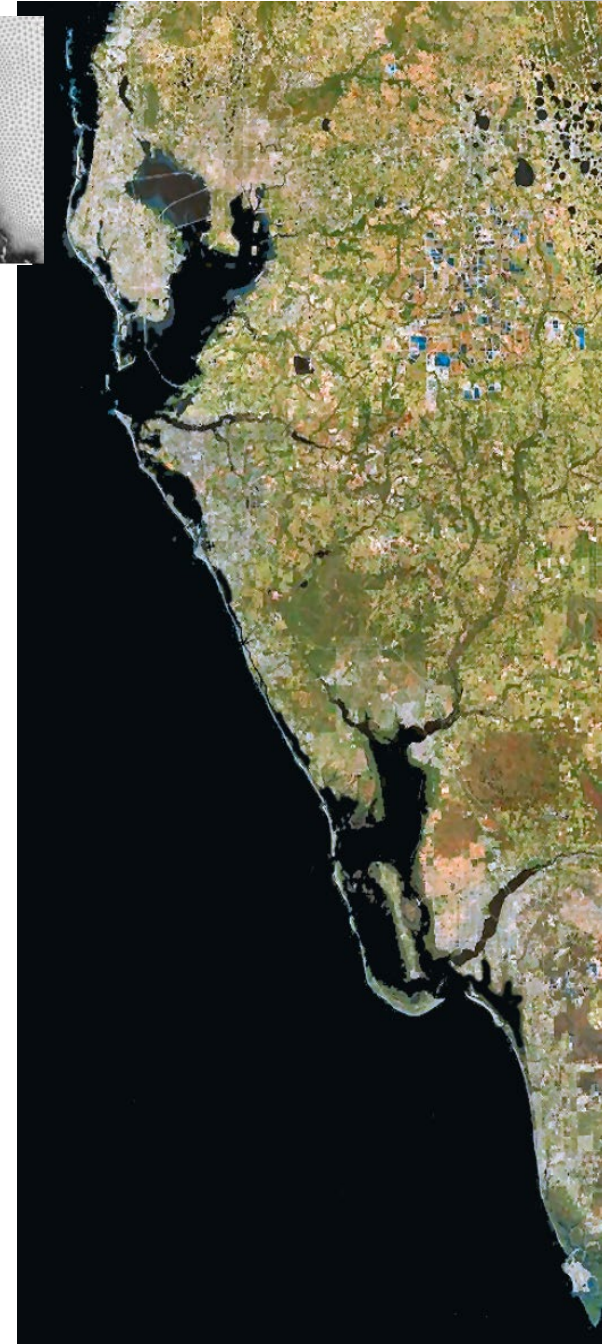
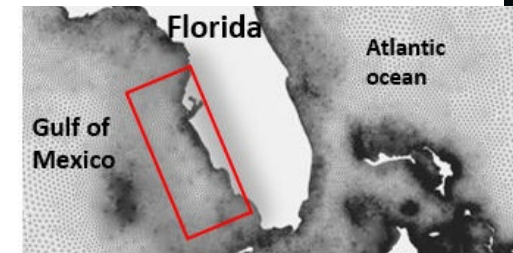
- *Coastal Encroachment*
- *Inlet management*

## □ Project scale (years)

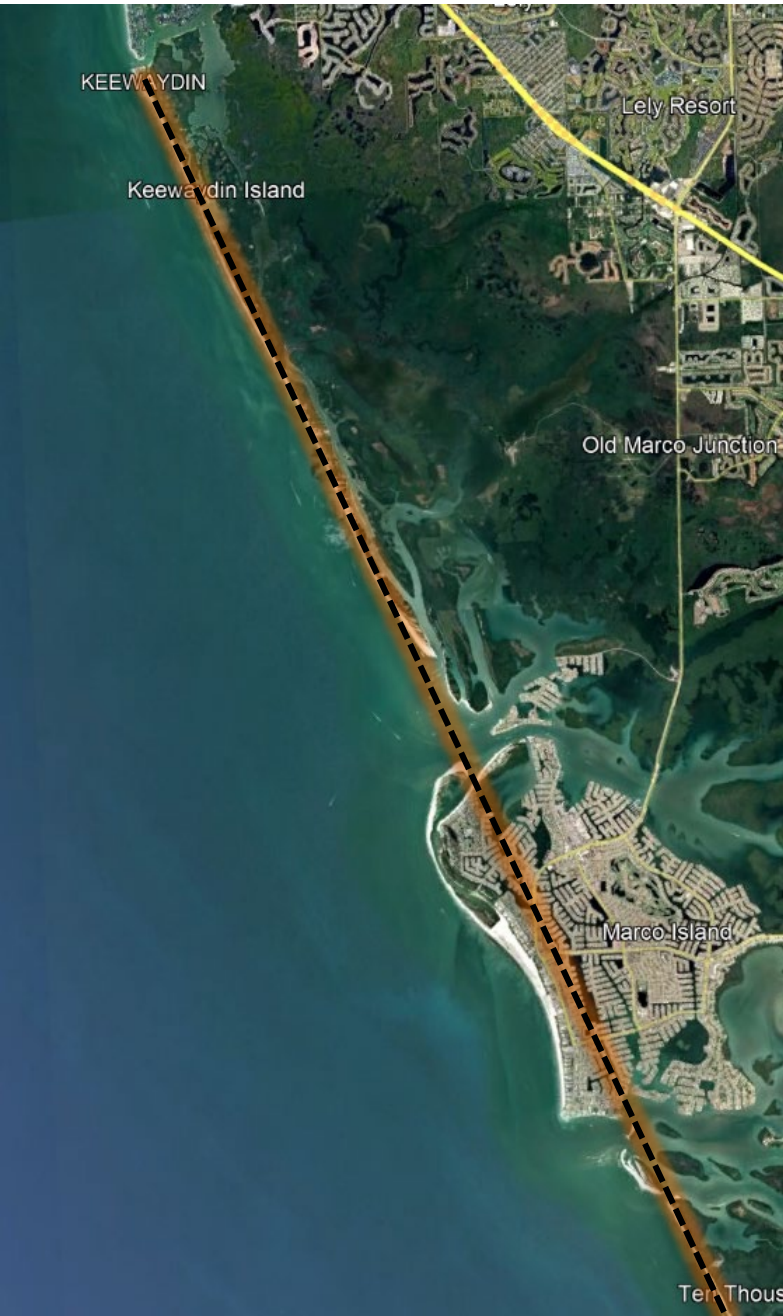
- *Beach and inlet management*

## □ Coastal Resiliency (years-decades)

- *Major storms frequency*
- *Natural and Nature Based Features Vs Structural features*









**Structural Concept**: to use hard structures designed to withstand or absorb the hydrodynamic forcing over short distances

## □ **Types**

- ***Seawalls***
- ***Revetment***
- ***Flood walls***
- ***Coastal structures***

## □ **Function**

- ***Energy dissipation***
- ***Reduce risk of flooding***
- ***Protection of upland development***





**Structural Concept**: to use hard structures designed to withstand or absorb the hydrodynamic forcing over short distances

## □ **Limitations**

- *Beach impacts*
- *Loss of beach habitat*
- *Limited functionality during large storms*





**NNBF Concept**: to utilize natural landscape features instead of hard structures to reduce risk of damage caused by coastal storms

## □ Types

- *Beaches and dunes*
- *Wetlands*
- *Coastal vegetation*
- *Reefs*
- *Barrier islands*

## □ Function

- *Energy dissipation*
- *Reduce risk of flooding*
- *Evolve with changing hydrodynamics*
- *Adaptability*

## □ Limitations

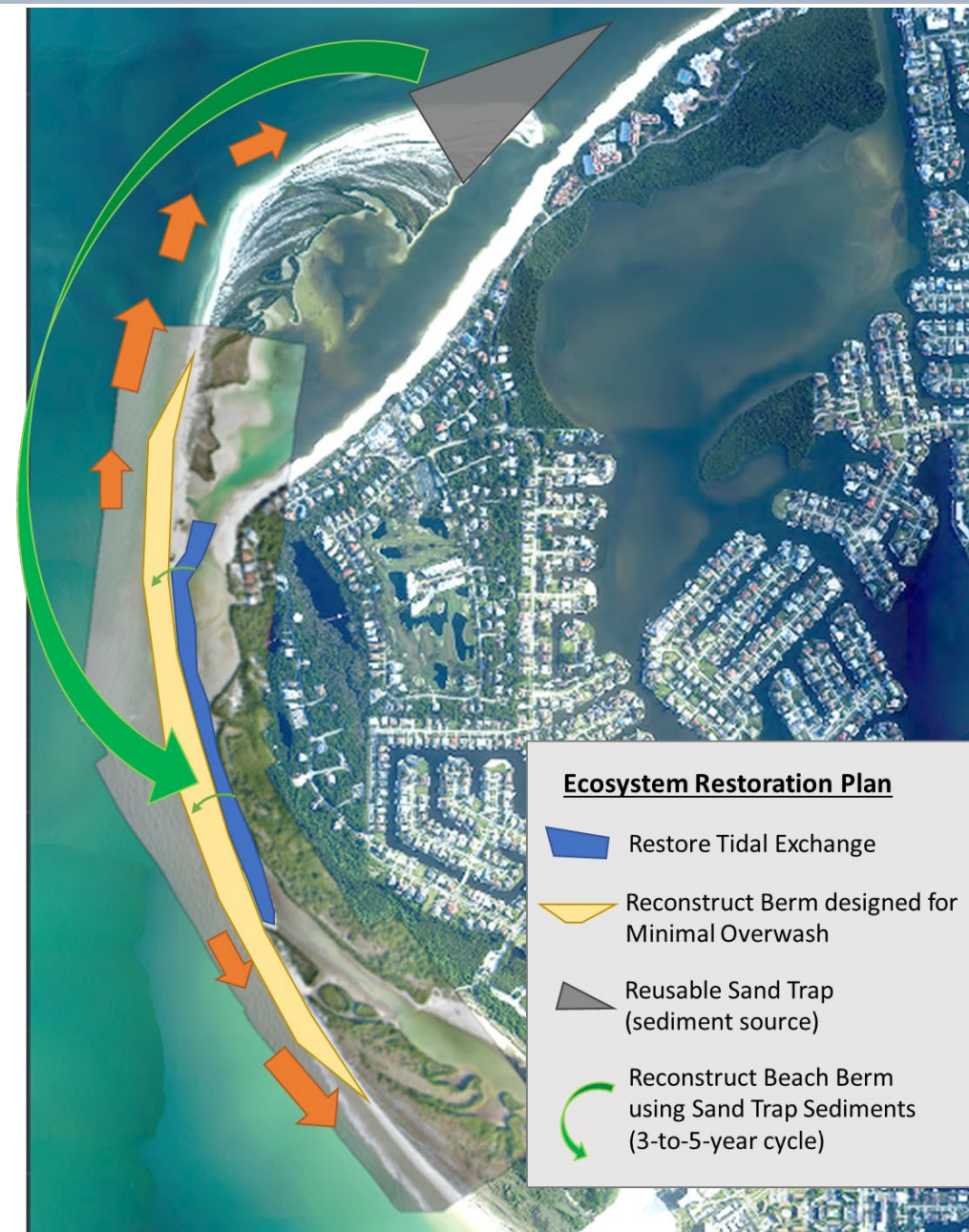
- *Space and availability*





## □ Main Elements

- **Natural/ nature-based resiliency system**
  - **Multitier coastal storm risk management**
    - Sand Spit
    - Tidal Lagoon
    - Mangrove shoreline
- **Lagoon Flow Channel**
  - Restore tidal exchange
  - Improve water quality
  - Maintain and promote SAV
  - Inlet closures/ opening
- **Renewable sand source**
  - Sand trap
  - Maintain inlet open
  - Cyclic use of sand
  - Incremental adaptation







Schematic of nature-based restoration elements







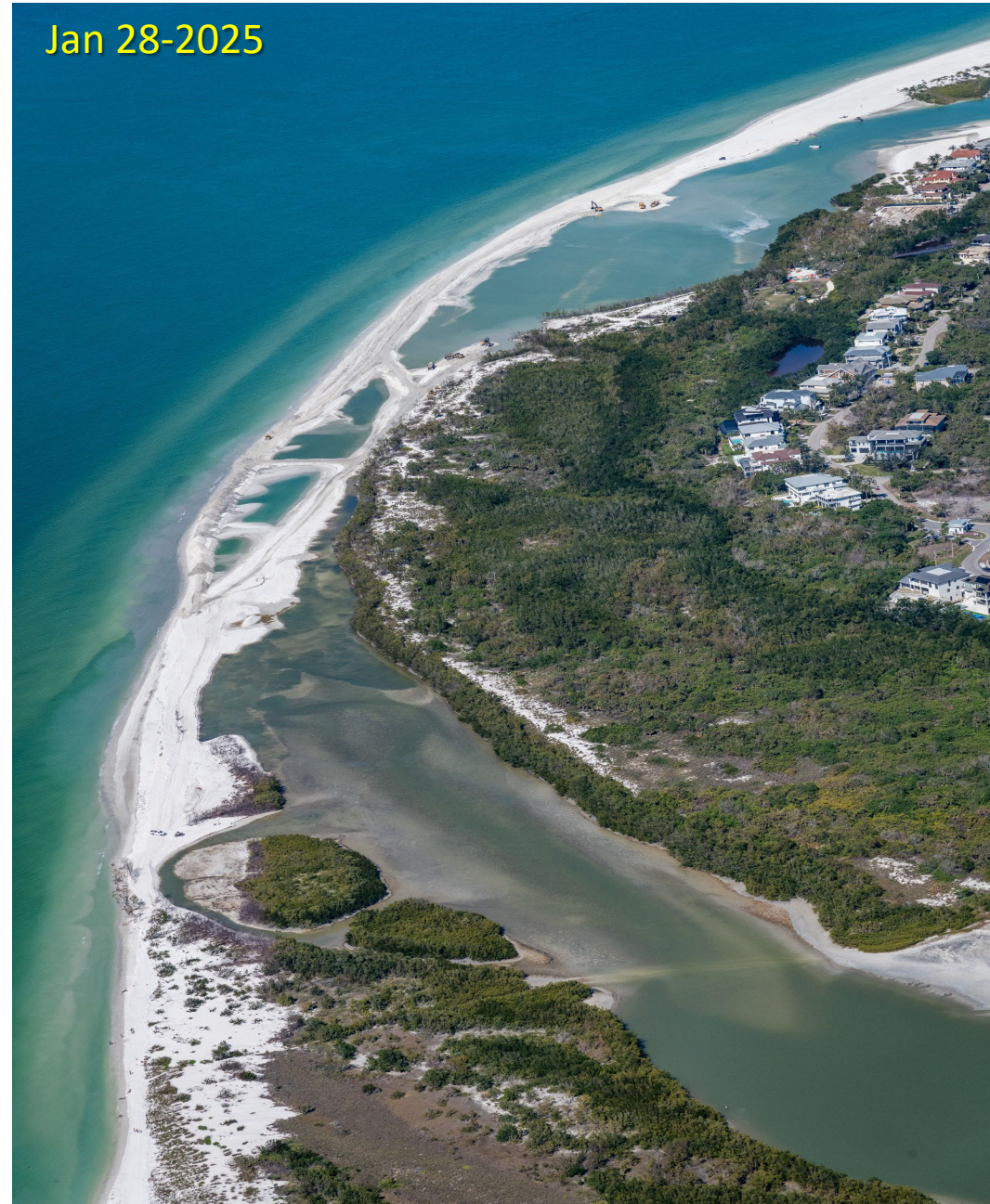


-  Coastal vegetation
-  Flow Channel
-  Protective berm
-  Beach











## Barrier island Systems

### Regional Plan Development

- *Maintain the integrity and function of barrier islands*

### Working with Nature *one project at a time*

- *Incrementally working with nature towards **sustainable** and adaptive management programs*

## Considerations

### □ **Continuity and adaptation**

- *Maintain continuity of morphologic features*
- *Incremental implementation to address immediate needs within **regional concepts***

### □ **NNBFs**

- *Maintain and enhance existing natural features*
- *Design multi tier systems of coastal defense*

### □ **Public Education**

- *Information and communication*

