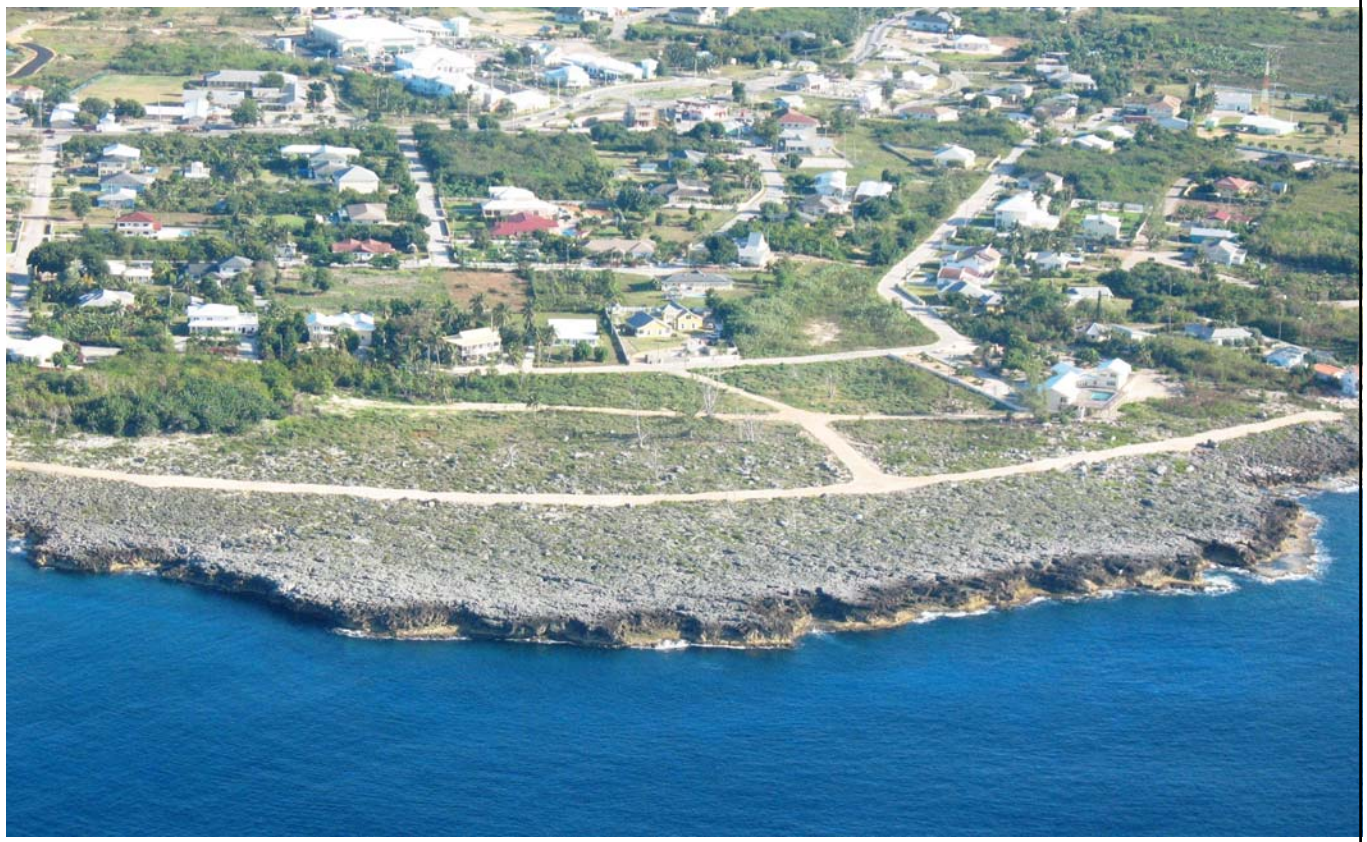
SAVANNAH GULLY
FLOOD MITIGATION PROJECT

Public Meeting
No. 3

Savannah
Primary School

1 November 2007
8:00 PM



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OR&A
Orth-Rodgers & Associates, Inc.
TRANSPORTATION ENGINEERS AND PLANNERS

Presentation Overview

- Project History
- Current Status
- Coastal Engineering Analysis
- Analysis of Potential Solutions
- Flood Wall Details
- Next Steps

Project History

- Project Purpose
- Measures of Effectiveness
- Public Visioning Meetings
- Solutions Public Meeting
- Topographic Survey
- Geotechnical Investigations
- Initial Recommendation

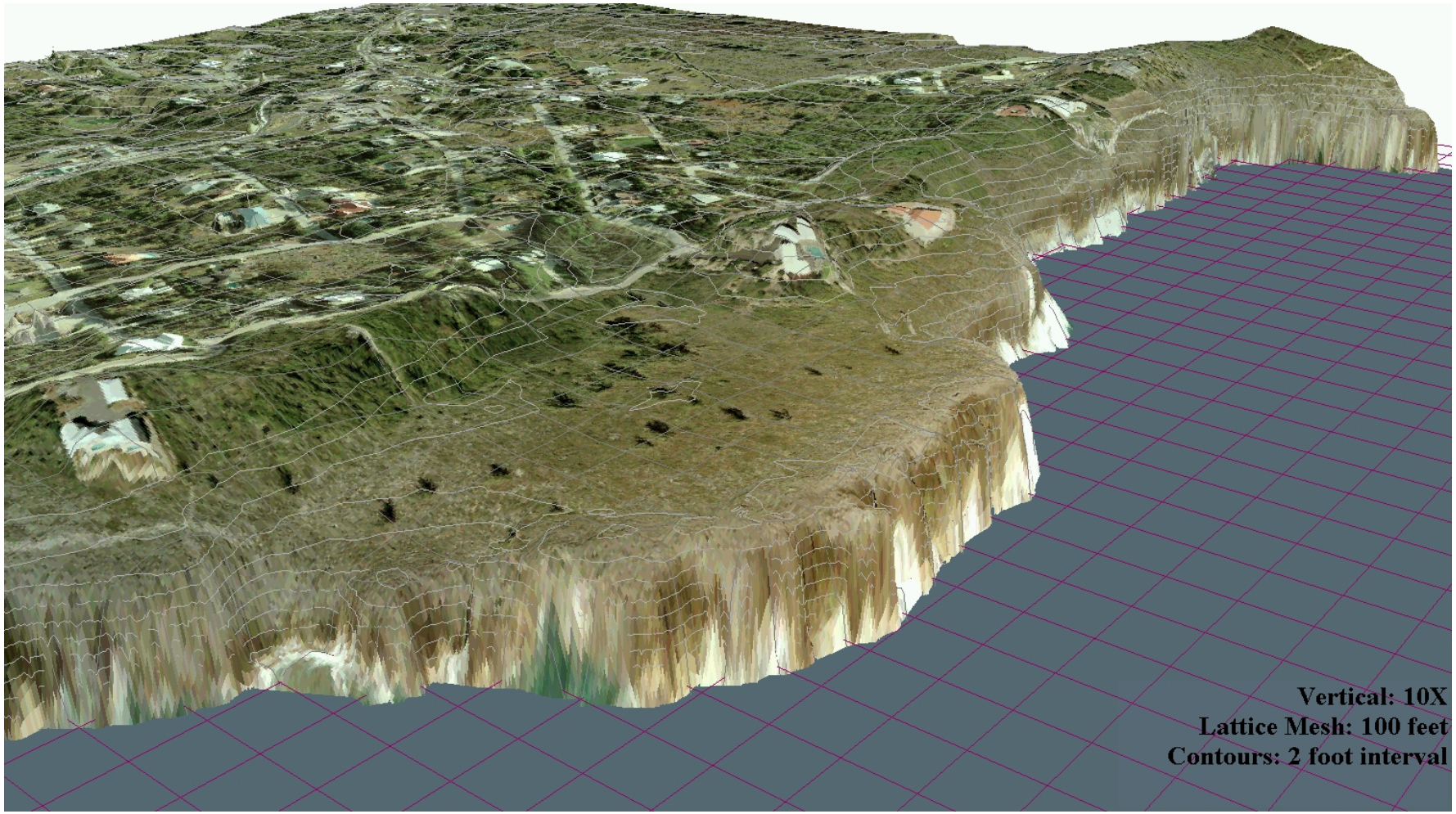
Coastal Engineering Analyses

- Site Characteristics
- Hurricane Frequency
- Components of Hurricane Flooding
- Analysis Tools
- General Design Approach

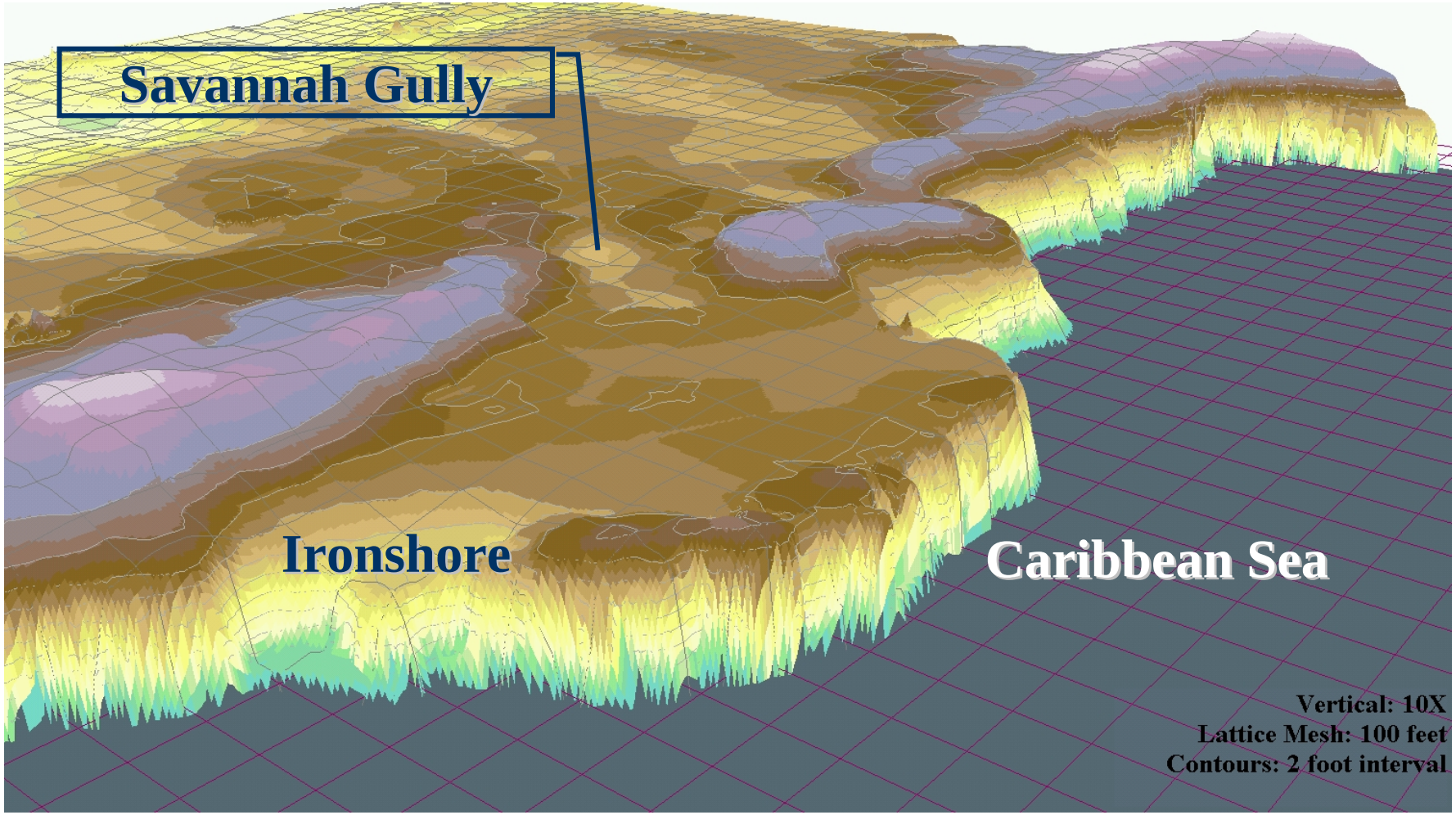
Site Characteristics

- Coastal bluff
- Elevations of +14 to 18 feet on top
- Water depths of 40 to 50 feet in front
- Coastal shelf that extends seaward to depths greater than 150 feet

3D Aerial View of Project Area

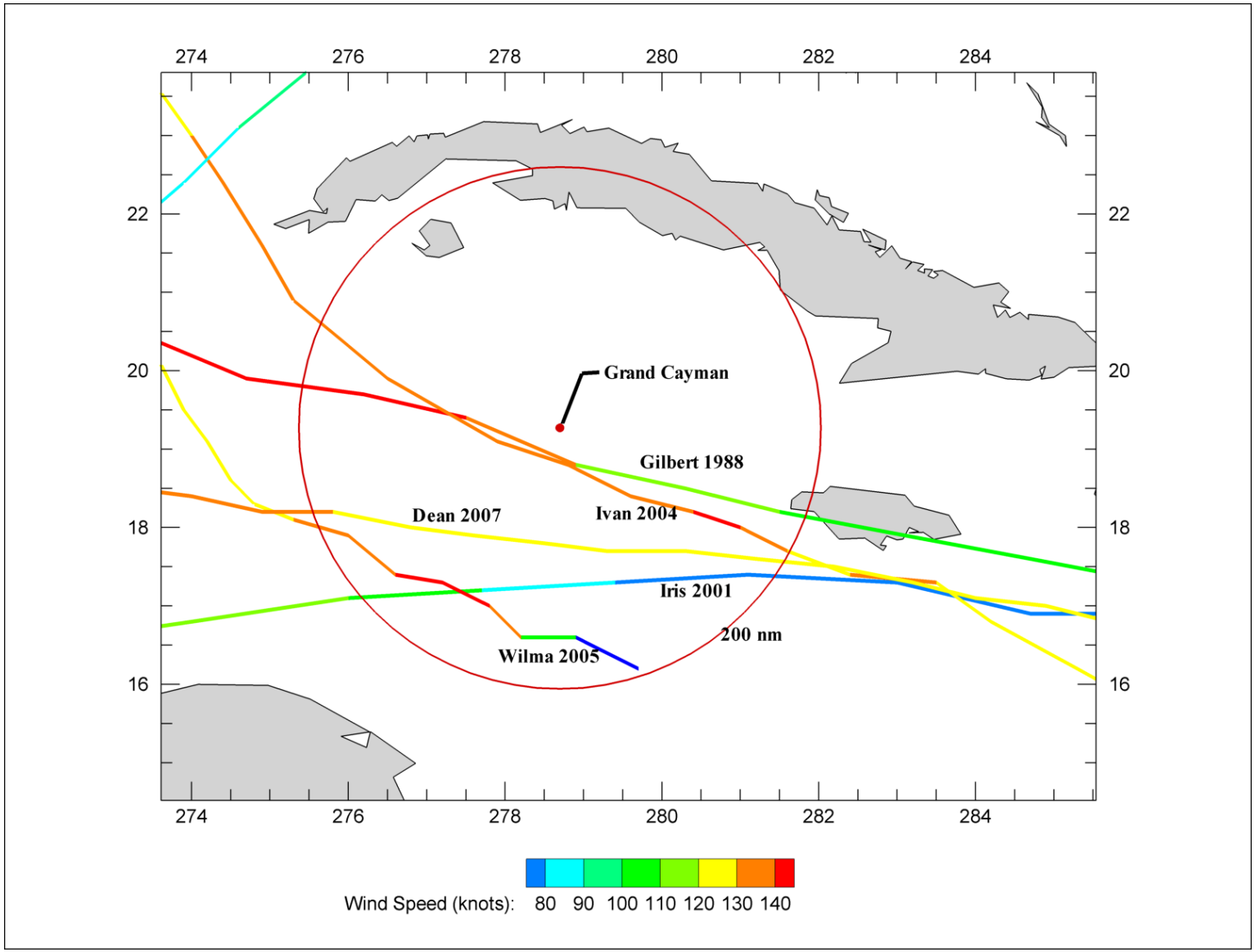


3D Topographic View of Project Area



Site Drainage Patterns

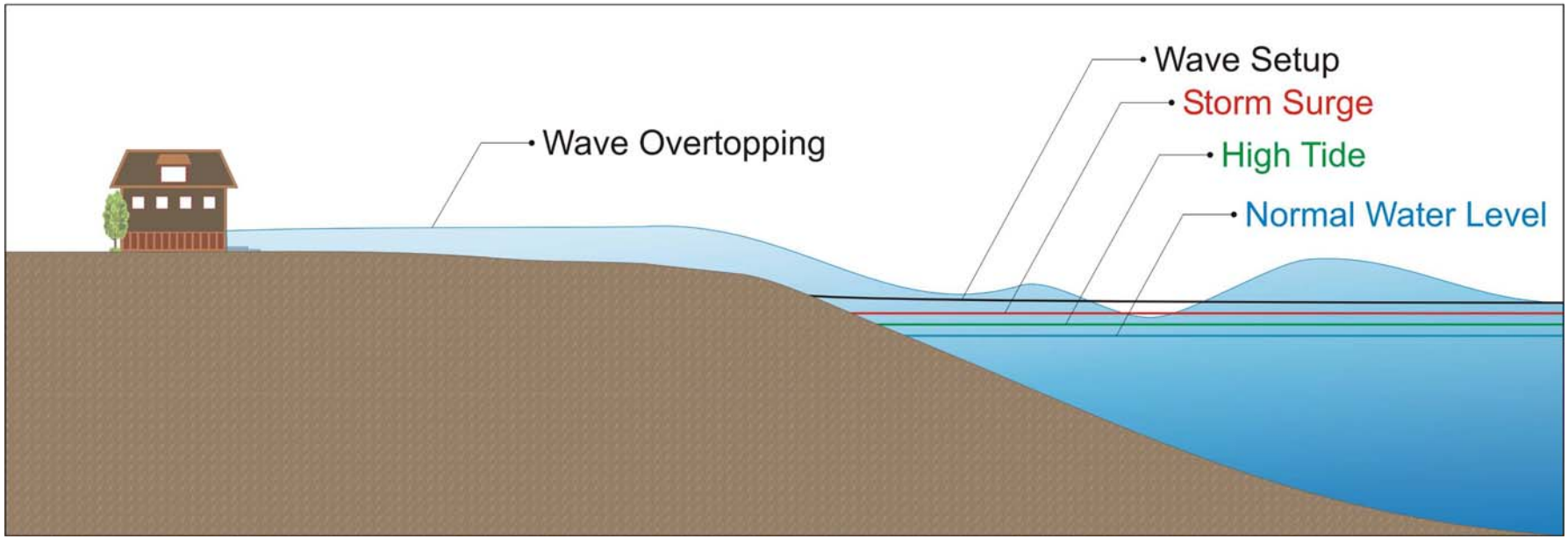
Recent Hurricanes of Concern



How often do hurricanes pass within 200 nm south of Savannah Gully?

	Return Period (years)
Category 1 or greater	3
Category 2 or greater	4
Category 3 or greater	7
Category 4 or greater	11
Category 5	15

Components of Hurricane Flooding



Tools for Evaluating Hurricane Flooding Impacts

- Develop design storms
- Storm surge models
- Wave models
- Wave setup models
- Wave overtopping desktop analyses
- Physical models (not used in this study)

Storm Surge Computer Modeling

- Used to estimate water level change due to wind and atmospheric pressure effects caused by a hurricane
- Not large at this site due to deep water located below the bluff
- Largest storm surge (4.4 feet) would result if a Category 5 hurricane passed directly over the site

Wave Modeling

- Two different computer models used to estimate wave conditions created by hurricanes
- Offshore wave heights ranged from 20 feet to 43 feet, depending on the hurricane

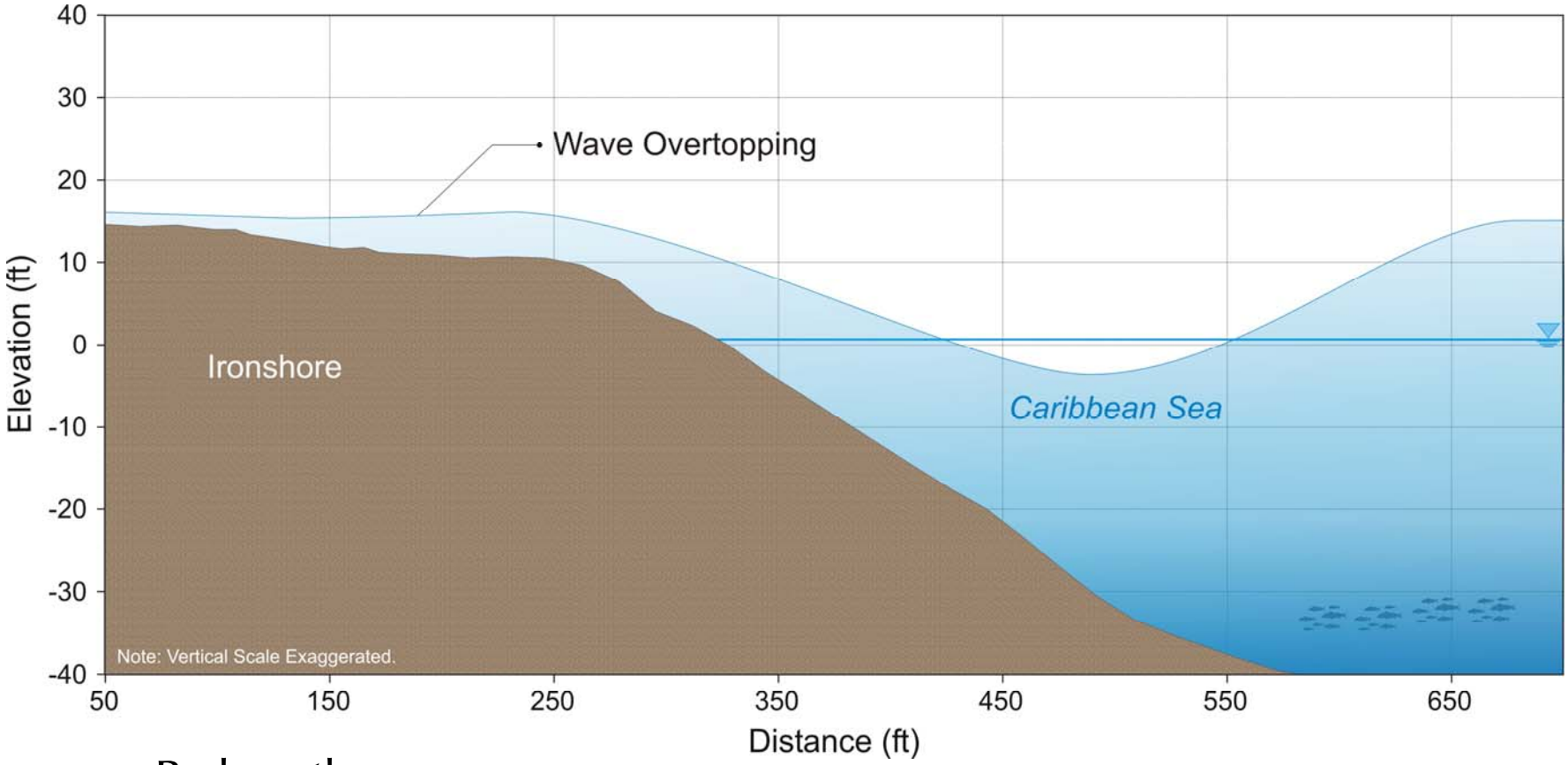
Wave Overtopping

- Used work developed in Holland and England to evaluate wave overtopping
- Very large rates of overtopping predicted
- Total volume of overtopping water predicted for Wilma 2005 compared well to measured data

Overall Findings:

- Storm surge and wave setup is limited in height due to deep water in front of the Savannah Gully site.
- Flooding is the result of wave overtopping of the bluff

Design Approaches



- Reduce the waves
- Raise the bluff
- Deal with the water

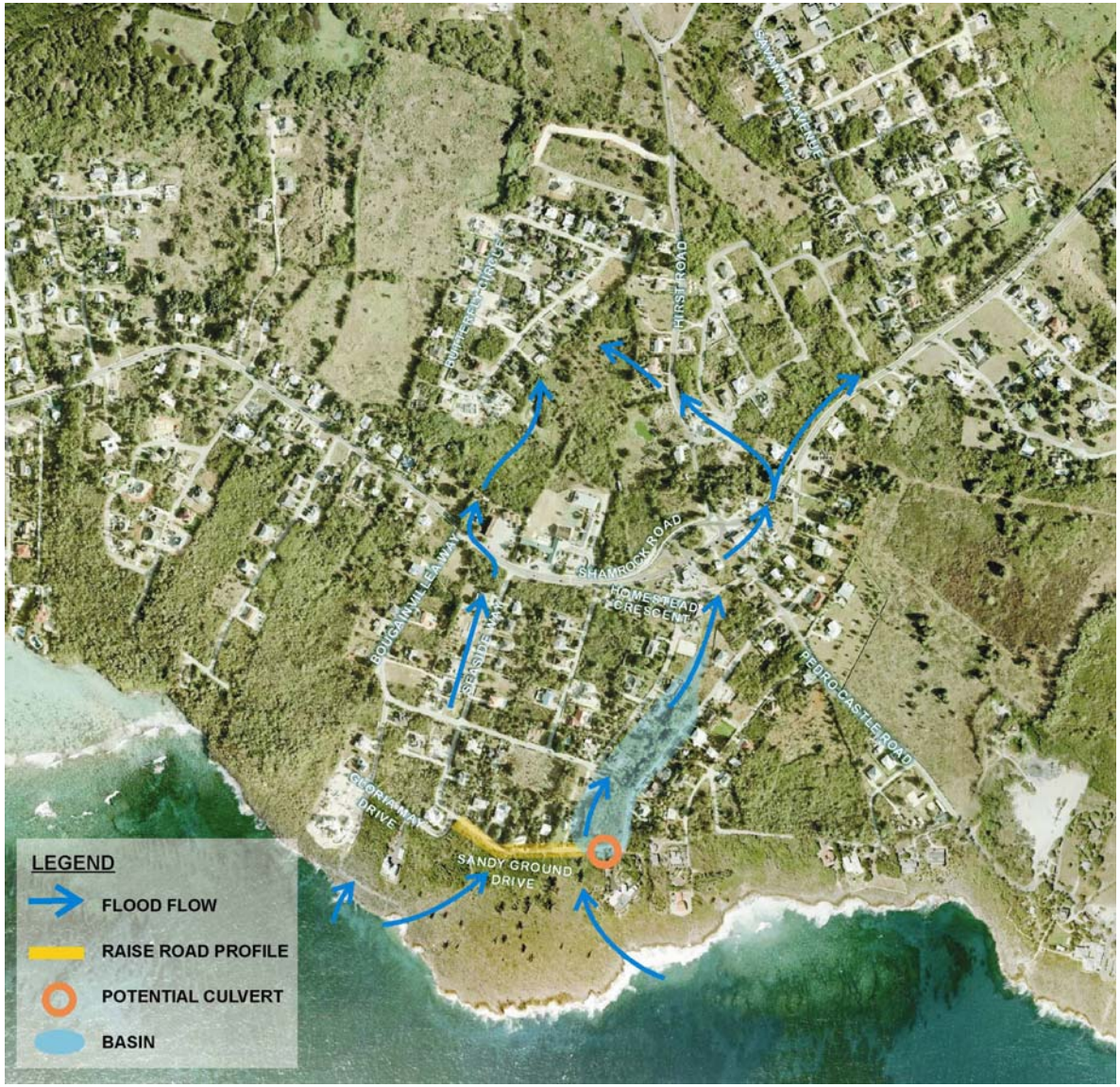
Evaluation of Solutions

- Evaluated each potential solution identified in October 2006
- Examined design requirements, effectiveness, costs, and other concerns
- Evaluated the following:
  - Coastal armoring
  - Create a basin in gully
  - Create a basin in quarry
  - Raise Shamrock and Homestead and install culverts
  - Pump water out to North Sound along Hirst Road
  - Coastal floodwall

Coastal Armoring

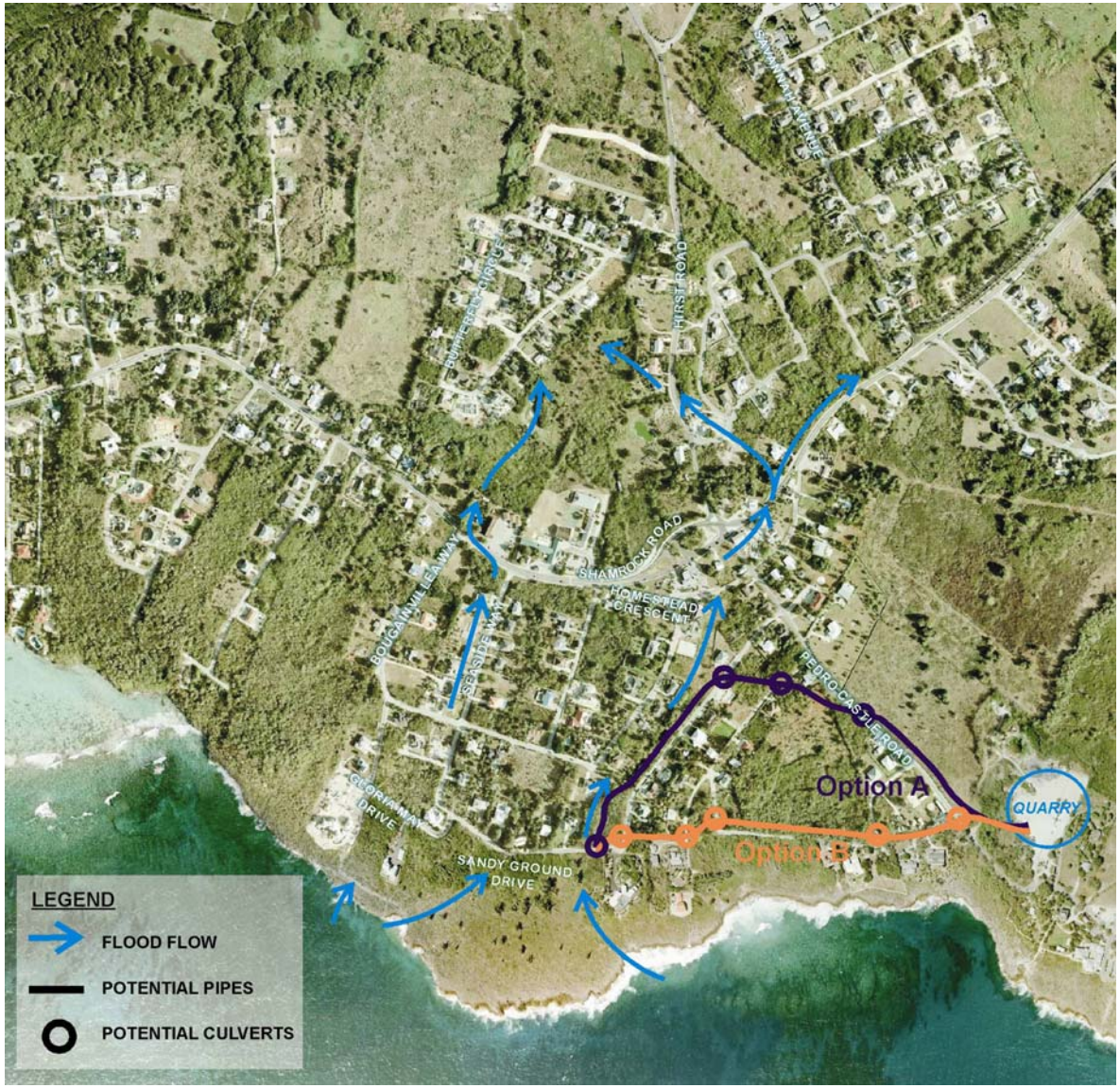
- Initial concept to place armor in water to break wave action
- Will not completely prevent flooding
- A site specific solution for focused low spots
- Cost:$2 million for site specific locations
- Costs outweigh benefits

Retention Basin in Gully



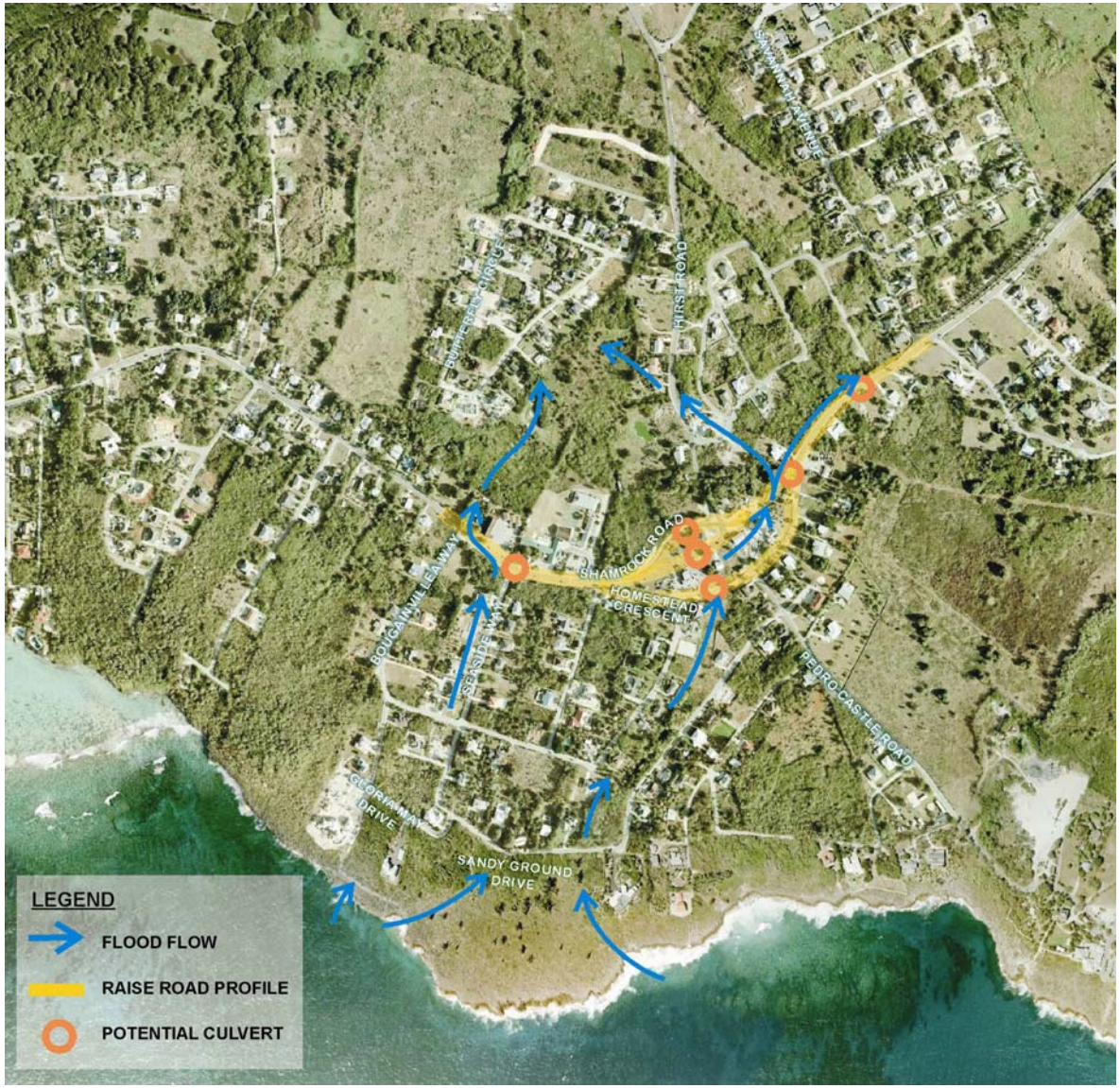
- Requires culvert under Sandy Ground Road
- Required gully depth of 12,000 feet to retain floodwaters
- Will affect 22 properties
- Cost not determined since alternative is not reasonable

Retention Basin in Quarry



- Quarry located approximately one mile from site
- Requires massive culverts and pipes
- Quarry can hold 82 million gallons of floodwater
- Quarry area to be doubled and excavated additional 175 feet in depth
- Cost not determined since alternative is not reasonable

Culverts under Shamrock, Homestead Crescent



- Will keep roads open
- May affect access to 40 properties
- Will not prevent flooding or contain waters
- May increase flood depths on north side of Shamrock
- Water likely to pool in new shopping center and/or Savannah Meadows
- Cost:$2.4 Million

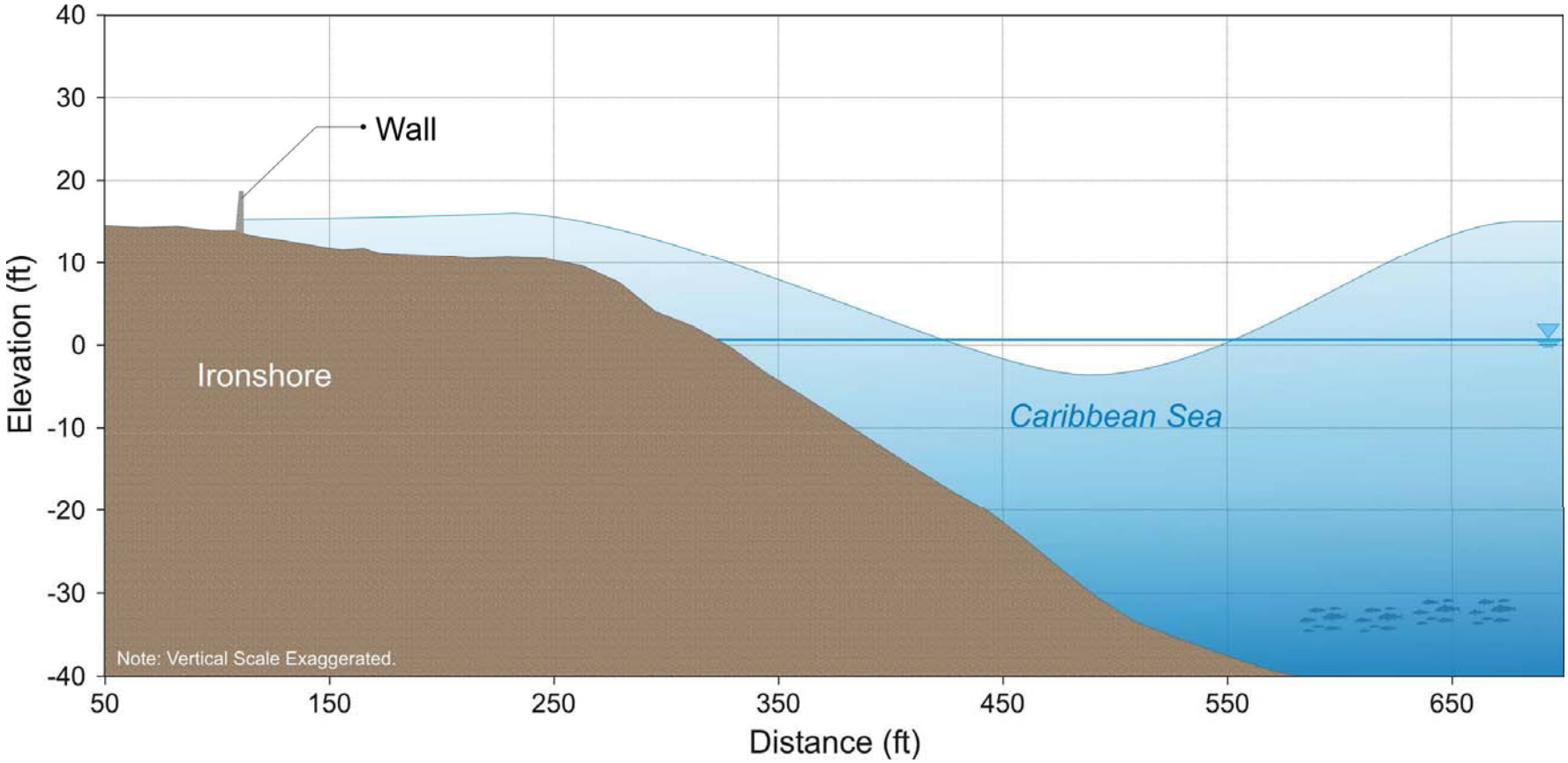
Pump Water to North Sound

- Requires culverts under Sandy Ground, Homestead, and Shamrock Roads
- Requires over 2 miles of pipes and pump stations along Hirst Road
- Will not stop flooding
- Cost not determined as alternative considered not reasonable

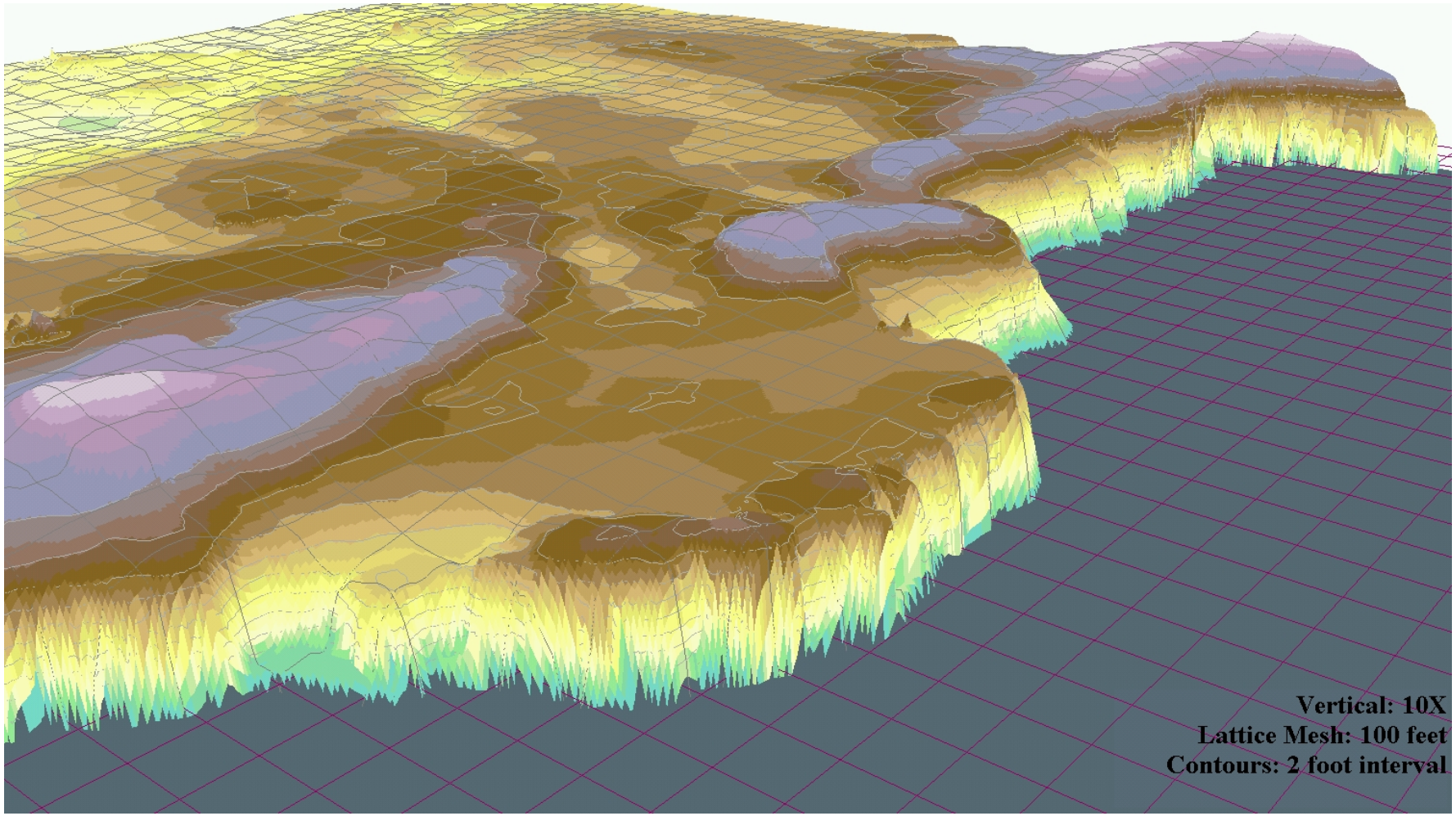
Coastal Floodwall

- Designed for CAT 2 hurricane approaching from the south
- Height set according to highest elevation of ironshore
- Designed to prevent 96% - 99% flood water reaching inland
- May use additional mitigation measures if needed
- Cost: $4-6 Million

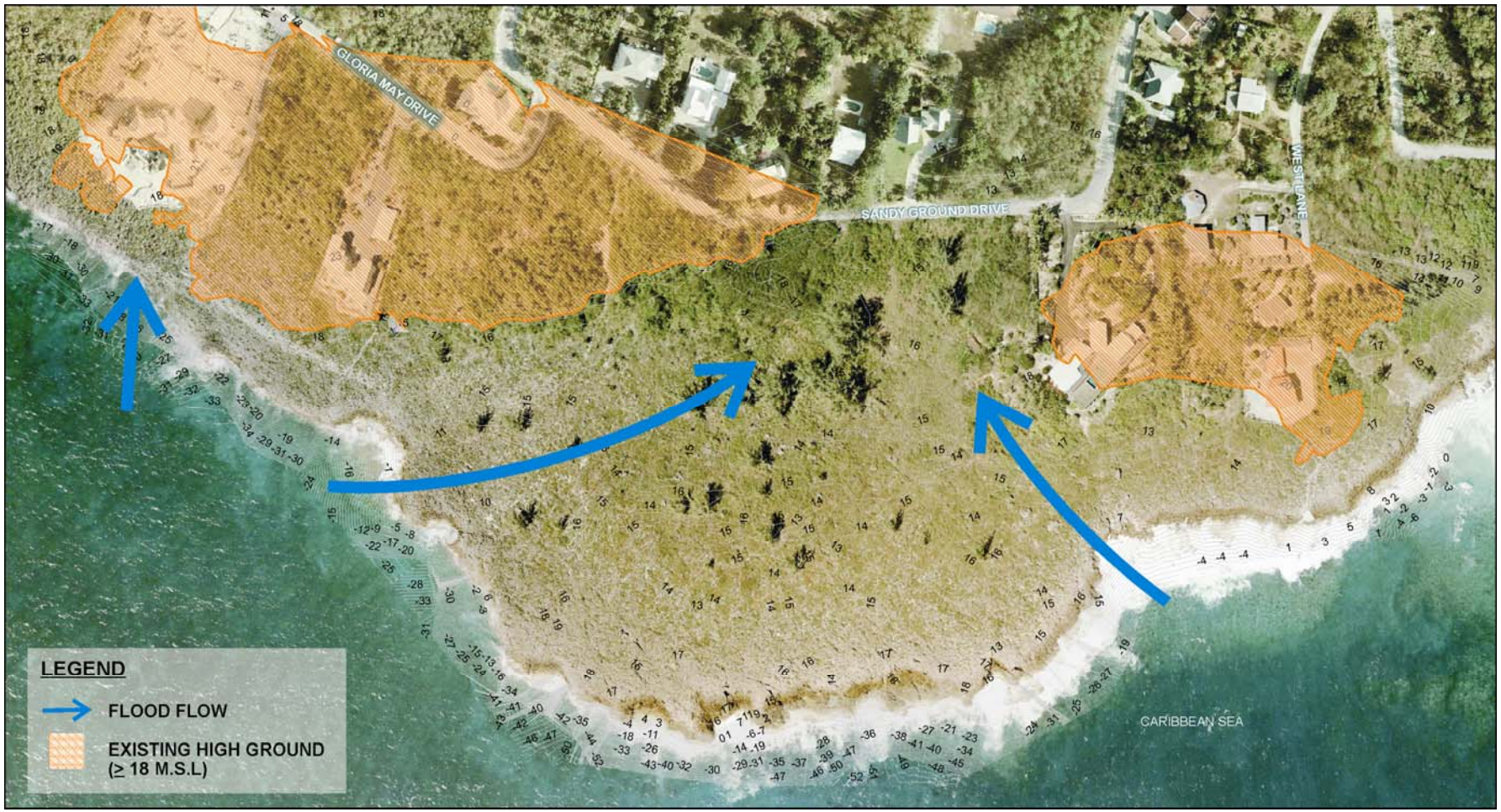
Effect of a Wall



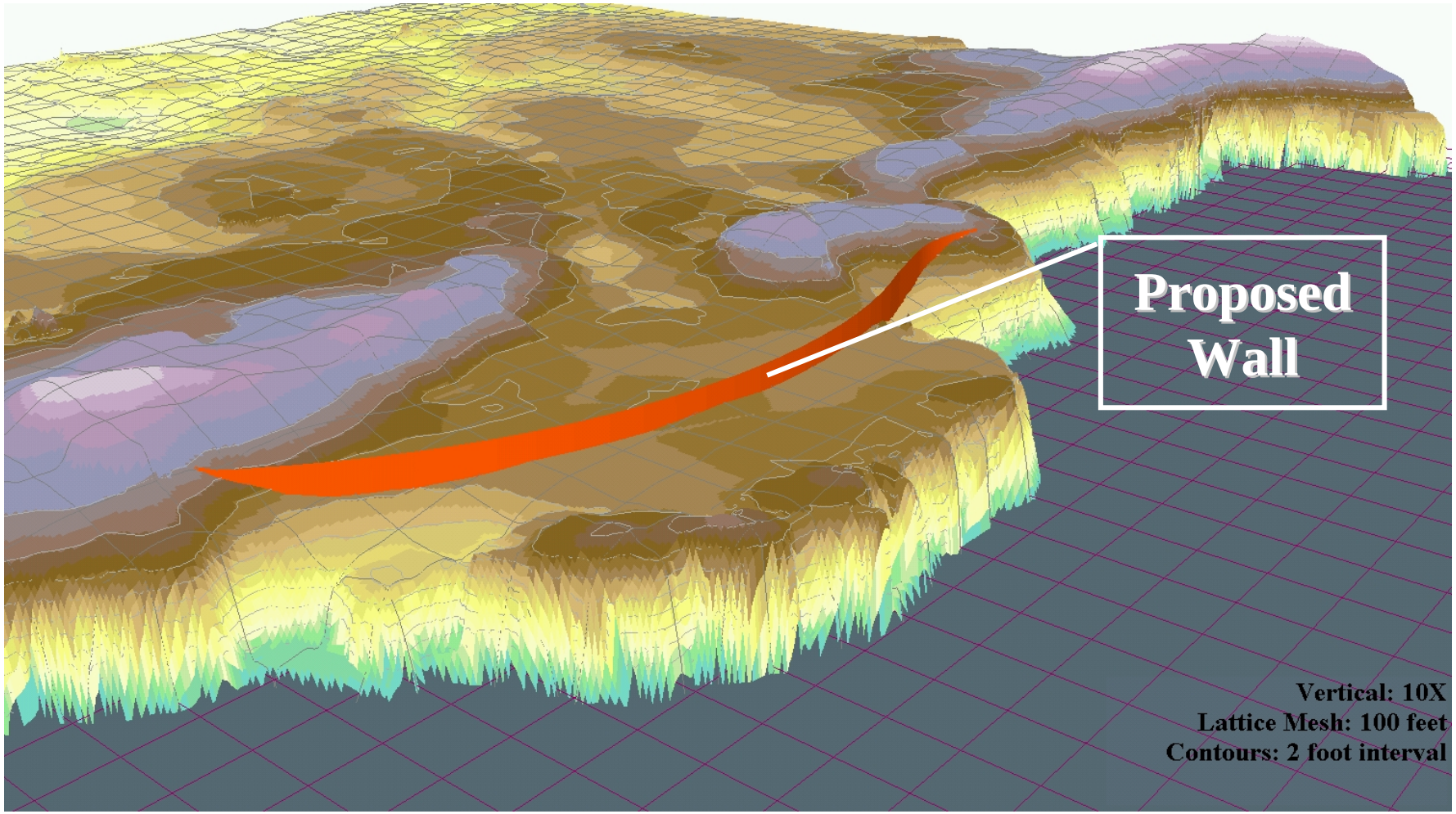
3D Rendering of Existing Conditions



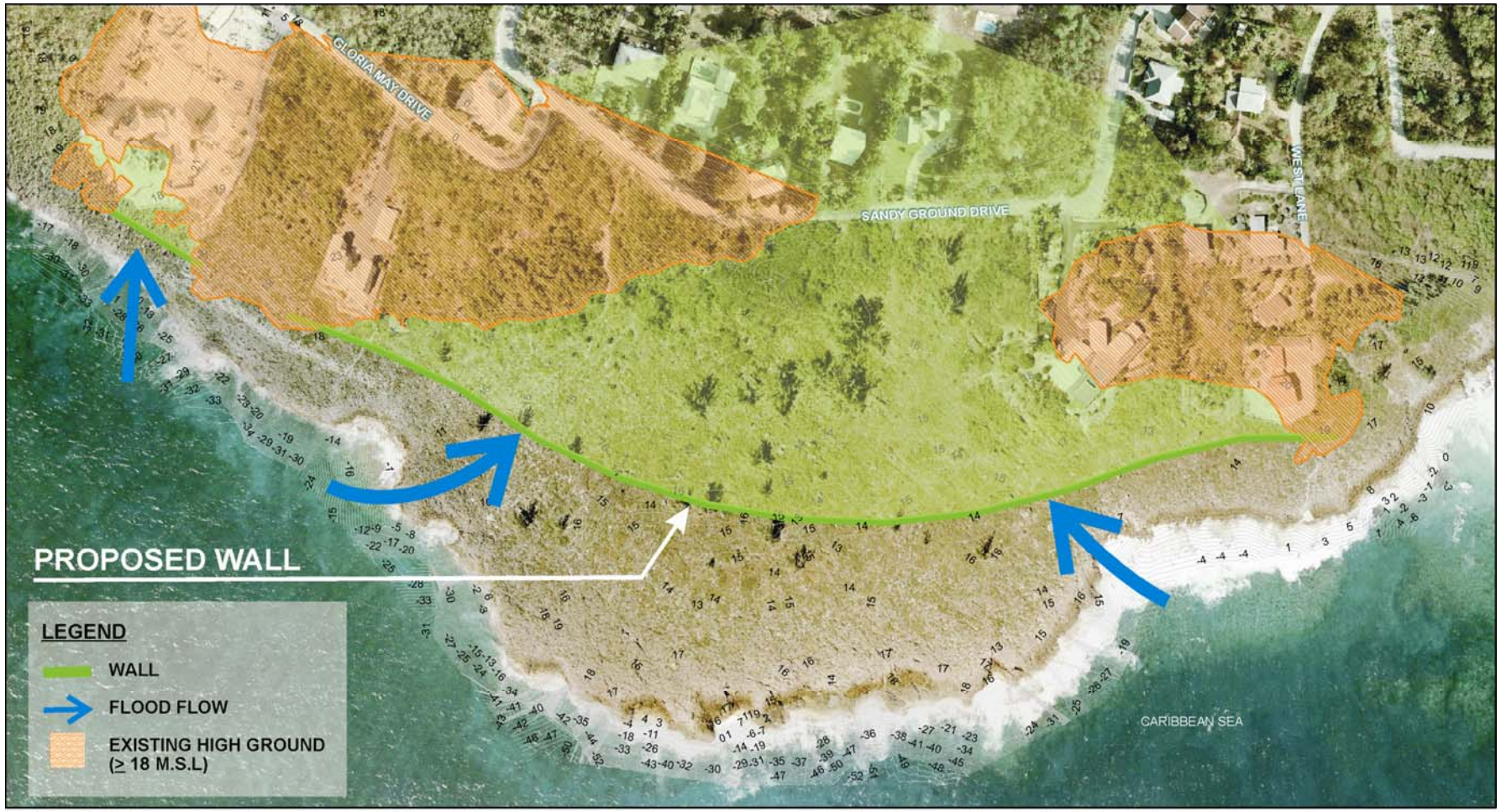
Plan View of Existing Conditions

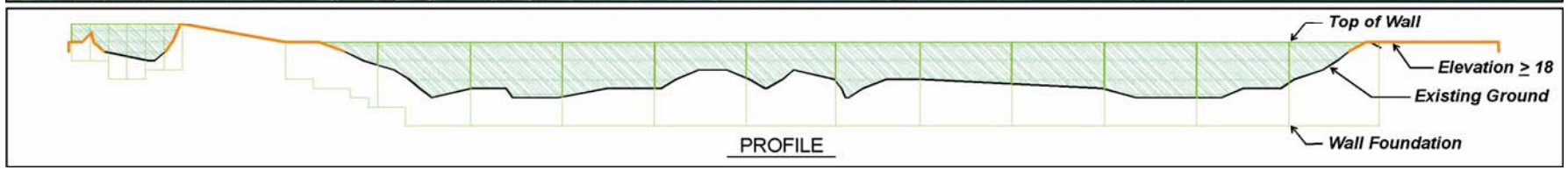


3D Rendering with Proposed Floodwall



Plan View with Proposed Wall





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Savannah Gully Flood Mitigation Project
1 November 2007

Floodwall Facts

- Should prevent 96% - 99% of seawater from reaching inland through the gully
- Designed to protect majority of Savannah residents
- Prevents significant flooding from CAT 2 events
- Designed to withstand CAT 5 events

Floodwall Facts

- Approximately 2000 feet in length
- Set at 19.0 feet msl - ranges from 2 to 7 feet high
- Placed on caissons 2 feet in diameter and 10 feet deep on 15-foot centers
- Comprised of 125 tons of steel, 2500 LF of steel piles and 1200 CY of concrete
- Estimated construction cost $4.0-6.0 M

Additional Mitigation Measures

- Approx. 96% - 99% of floodwaters will not overtop wall
- 1% - 4% (22 - 64 MGal) may overtop wall
  - Do Nothing: floodwaters measured in inches, not feet
  - Use Gully as Basin: will not contain remainder even at a depth of 10 feet
  - Use Quarry as Basin: will require a series of pipes but will contain remainder

Recommendations

- Build physical model to understand details of water movement and drainage
- NRA to put floodwall contract out to tender
- Begin construction as soon as possible
- Run cost benefit analysis on additional mitigation measures