

# **Enhancing Coastal Resilience:** A Comprehensive Approach to Coastal Protection and Waterfront Development in the Everglades National Park

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Moffatt & Nichol

Croft Associates

National Park Service

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**CROFT**



moffatt & nichol



# Beyond the Beaches: Why Florida's Other Shorelines Matter

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- ✓ Storm Protection
- ✓ Biodiversity Hotspots
- ✓ Erosion Control
- ✓ Water Quality Guardians
- ✓ Economic Value

Case Study: Gulf Coast Visitor Center,  
Everglades National Park





# Agenda

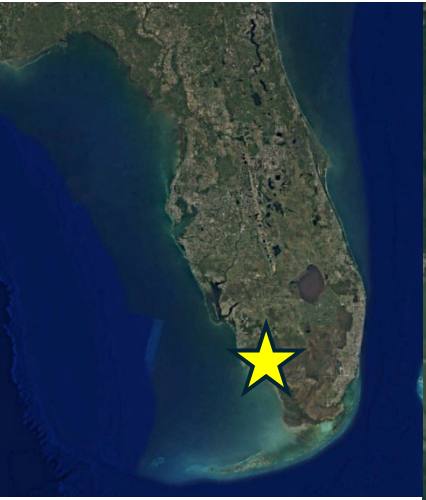
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- Background
- Storm Damages
- Resiliency Planning
- Project Components
- Key Lessons Learned





# Project Location















# Hurricane Irma Damages



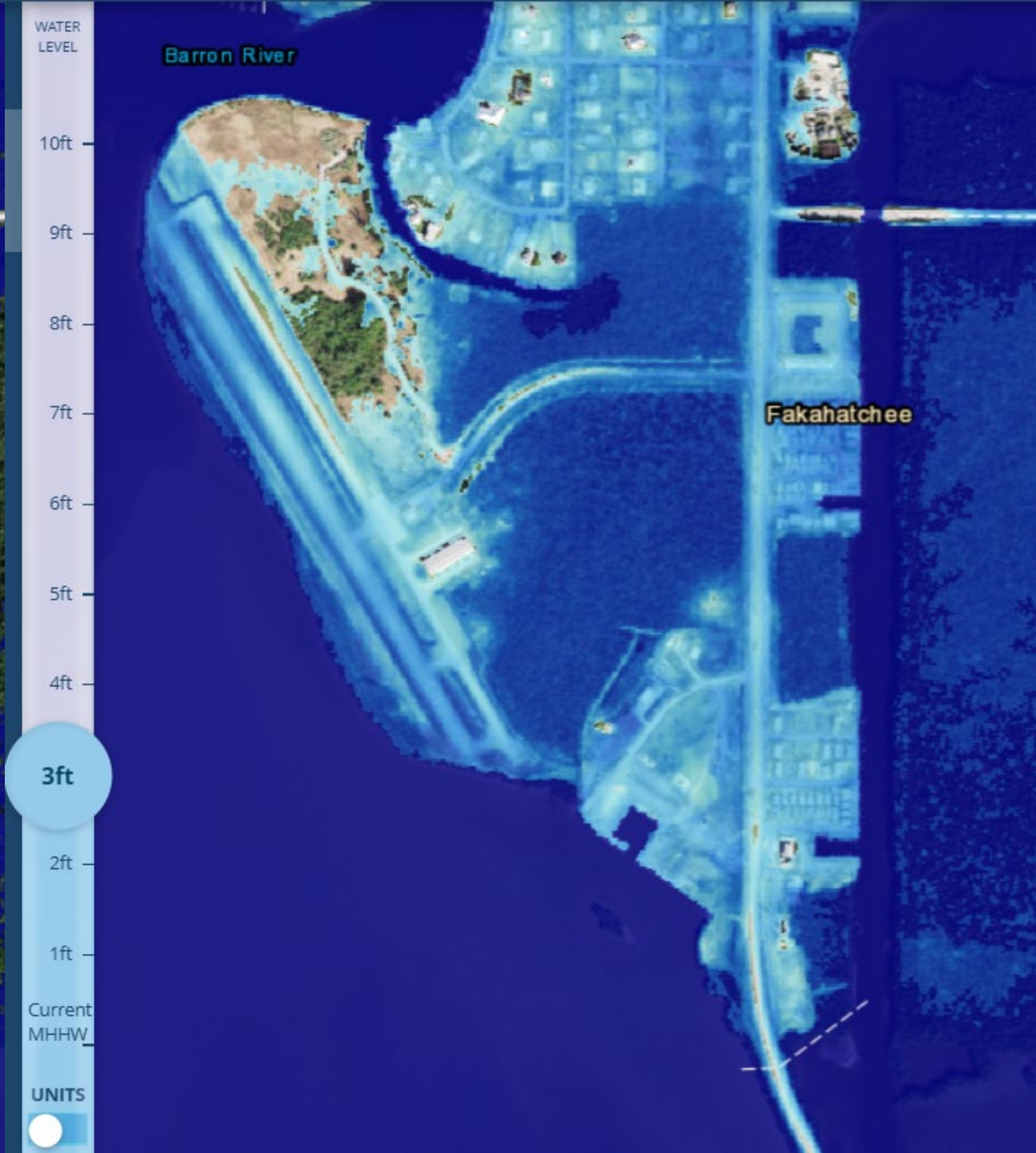


# Resiliency Planning How we invest along the water

## Goals:

- Understand NPS intent, priorities, planning horizons, operations & design limitations
- Balance: existing infrastructure, environmental, permitting, timelines, costs & function









# Sea Level Rise Viewer

Enter an address or city



Sea Level Rise



Local Scenarios



Mapping Confidence



Marsh Migration



Vulnerability



High Tide Flooding

MHHW



WATER LEVEL

10ft

9ft

8ft

7ft

6ft

5ft

4ft

3ft

2ft

1ft

Gulf of Mexico

Ten Thousand  
Is Nat'l  
Wildlife Ref

Fakahatchee  
Bay

Everglades  
National  
Park

Chokoloskee  
Bay

Everglades  
City

Copeland

Ocho pee

Chokoloskee

Collier

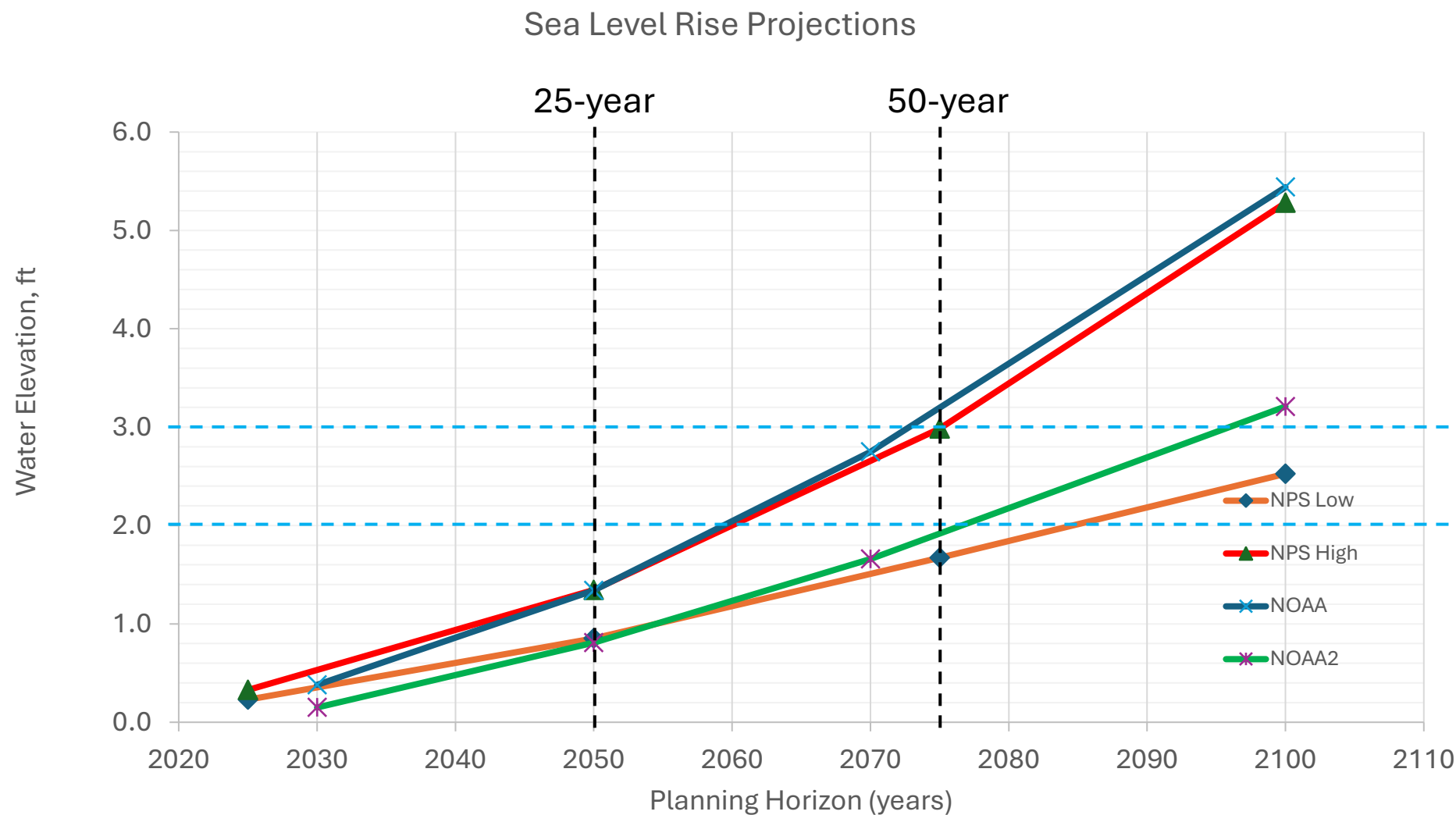
Indian Key Pass

More Resources for Your Community





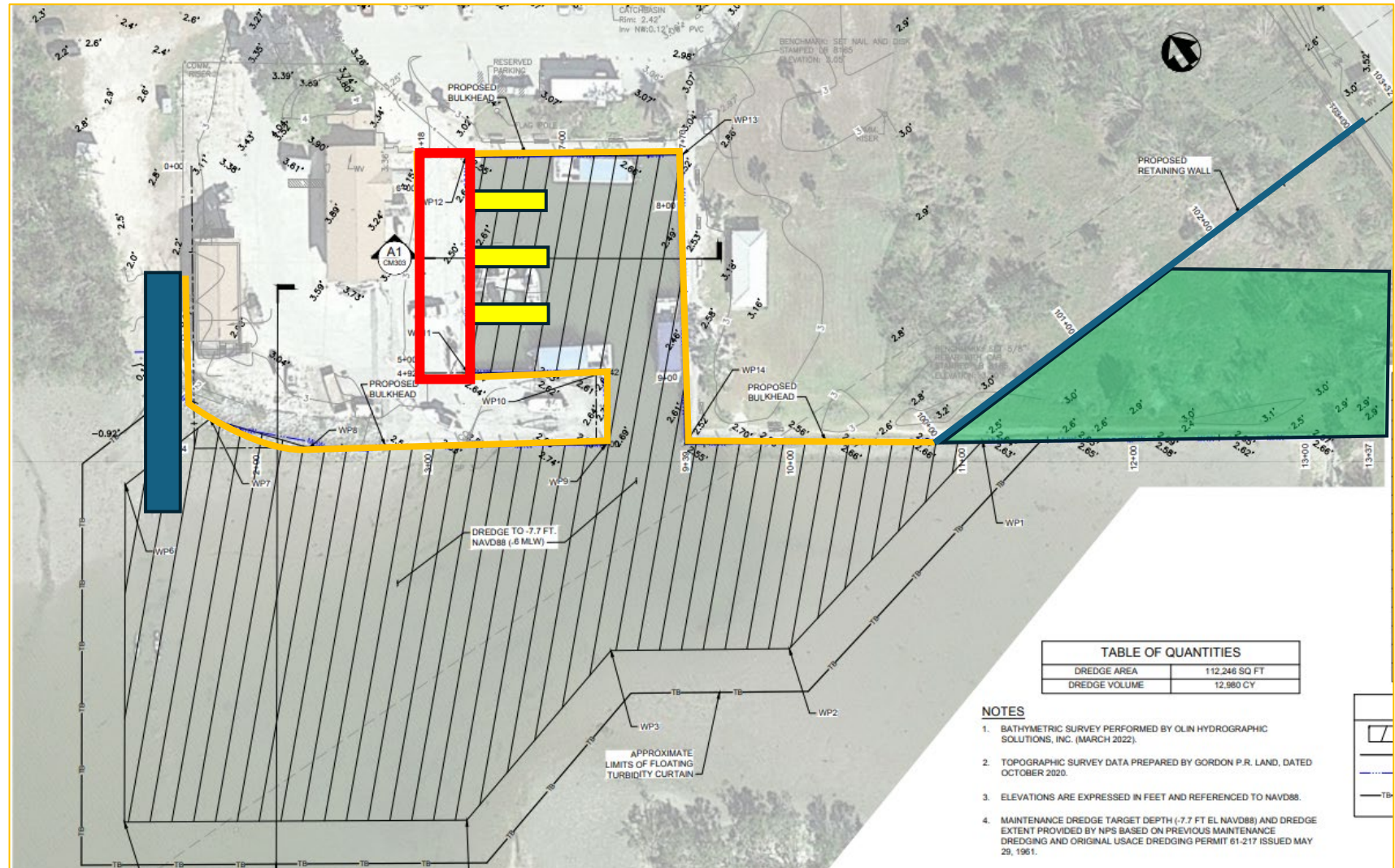
# Sea Level Rise & Planning Horizons





# What should the project look like?

- What
  - ☐ Coastal Resiliency
  - ☐ Managed retreat
  - ☐ Marina expansion
  - ☐ New bulkhead
  - ☐ Dredging
  - ☐ Boat ramp
  - ☐ Utilities & Fuel
  - ☐ Floating docks
  - ☐ Living shoreline
  - ☐ Stormwater Management
  - ☐ Building & Upland Civil
- Why – All the elements + giving up land for living shoreline, surprise wetlands, JAXBO in <10 months





# Marina Concepts







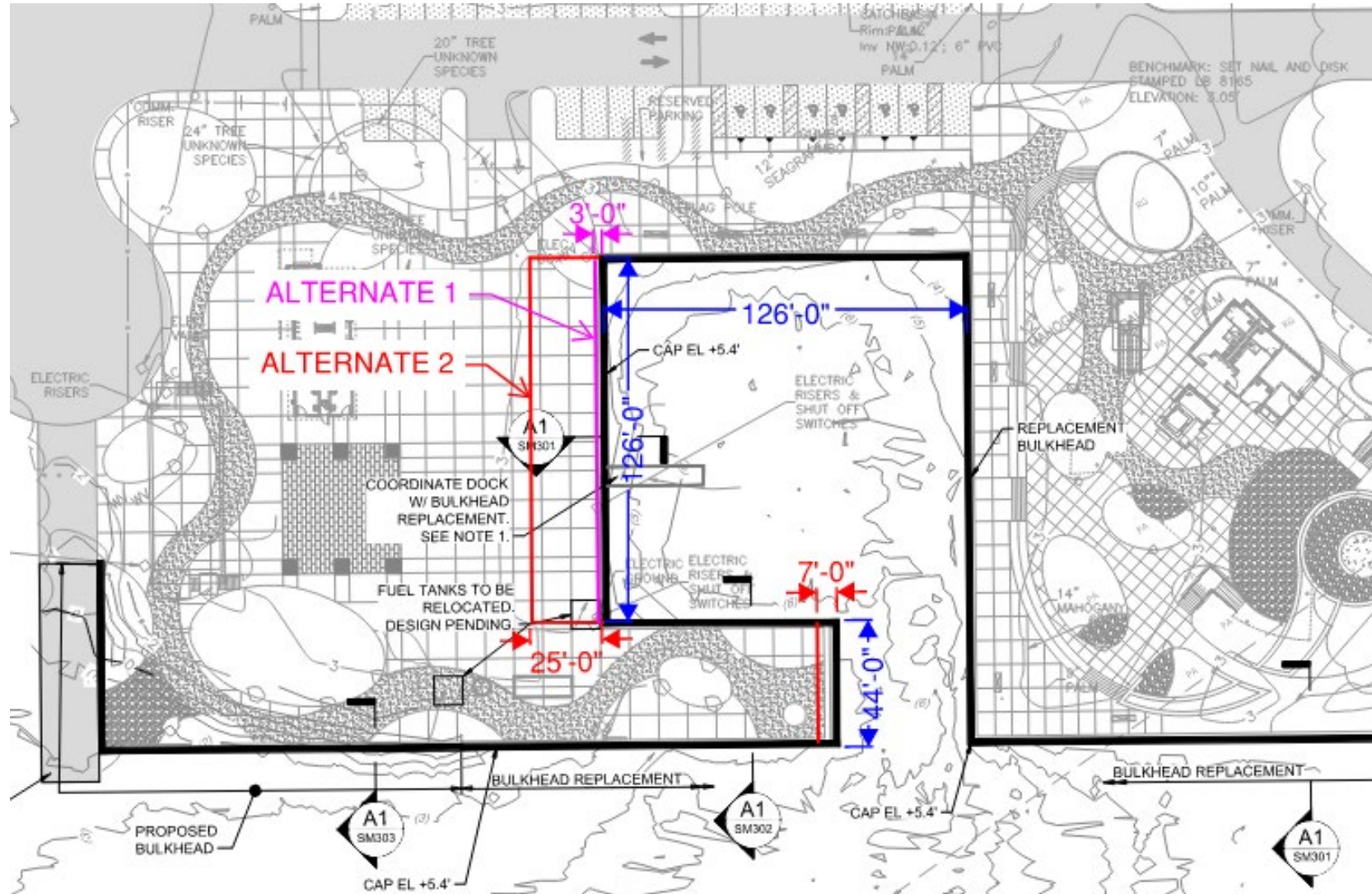
# Marina Concepts

- Considerations
  - Vessel Operations.
  - Upland Developments.
  - Permitting.
  - Cost.
- Assumptions
  - Alternatives along the Basin West wall

Alternative 0 - Current Design  
(Blue)

Alternative 1 - 3ft Widening  
(Magenta)

Alternative 2 - 25ft Widening  
(Red)





# Marina Bulkhead - Current Design

Bulkhead Replacement within 18" of current "wet face".



## Existing.

- Round timber with rubber bearing.
- Width = 14" to 18" (estimated).



## Proposed Alternatives.

- Extruded Rubber
- Horizontal / Vertical / Diagonal .
- Width = 4" to 6" .



## Net Reduction.

- $(14''+6'')-(14'')=6''$  max.
- $(14''+4'')-(18'')=0''$  min.

## Basin Operational width

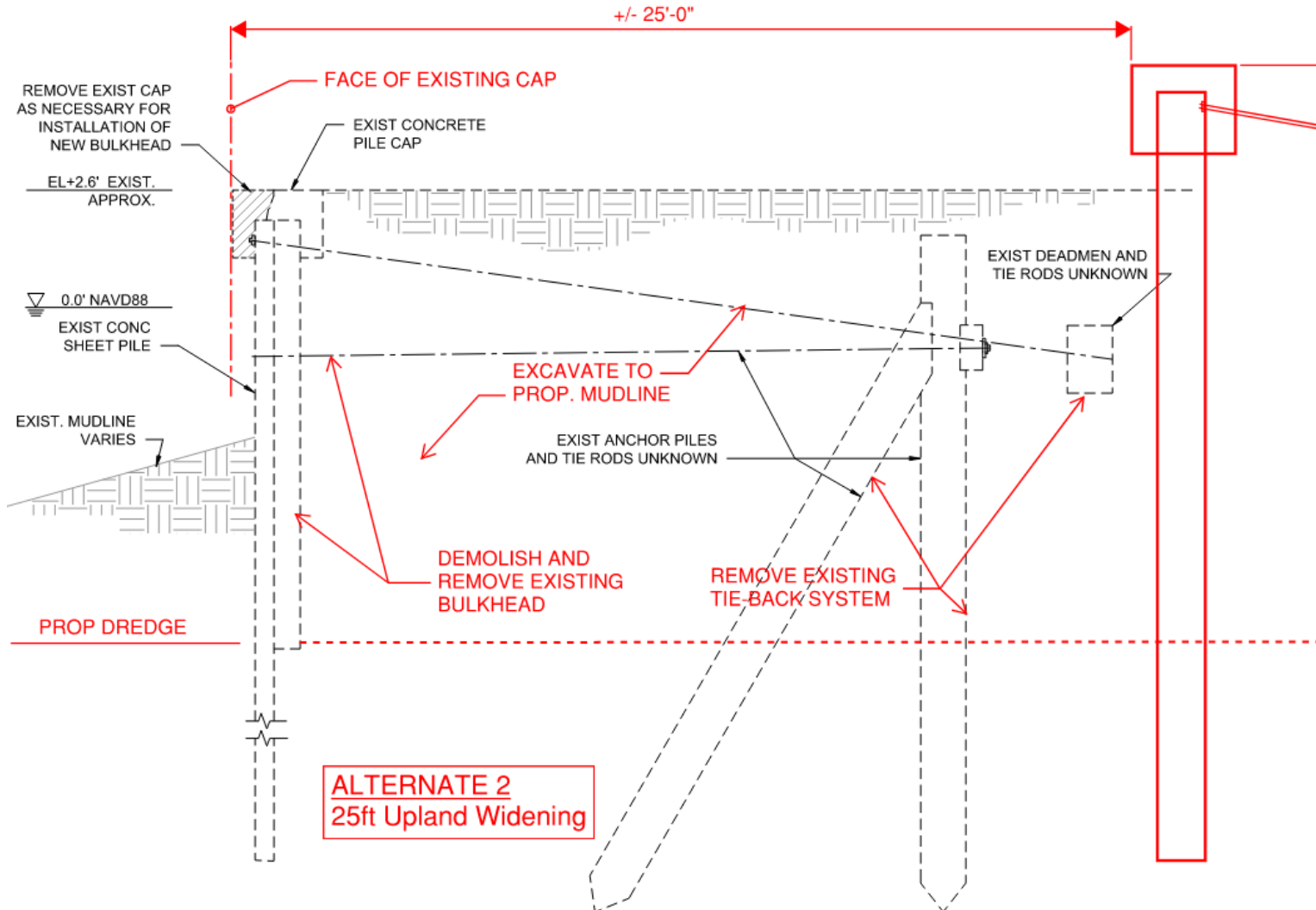
- 0 to 1ft overall.
- Less than 1%.





# Marina Bulkhead - Alternative 2

Bulkhead Replacement 25 feet upland.



## Pros.

1. Basin Size Increase.
2. Waterside operations improvements.
3. Potential Cut / fill quantities benefits to upland grading.
4. Landside Construction.

## Cons

1. Cost.
2. Permitting.
3. Full Removal of Existing seawall.
4. Potential Flushing analysis.

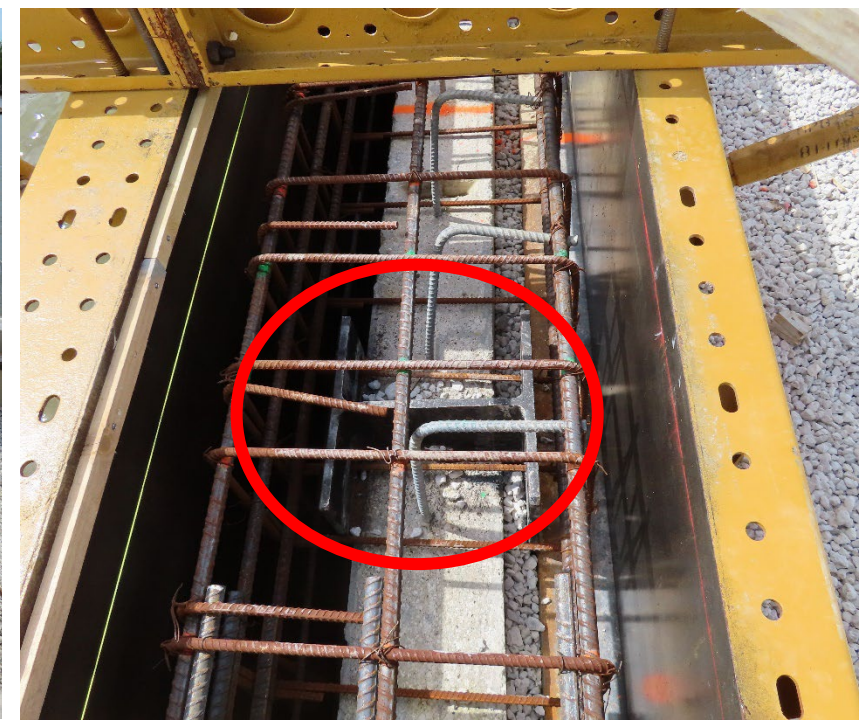
## Costs (ROM)

- \$250K to \$300K net add.

## Environmental Permitting

- 8 to 12 months.







# Living Shoreline Concepts





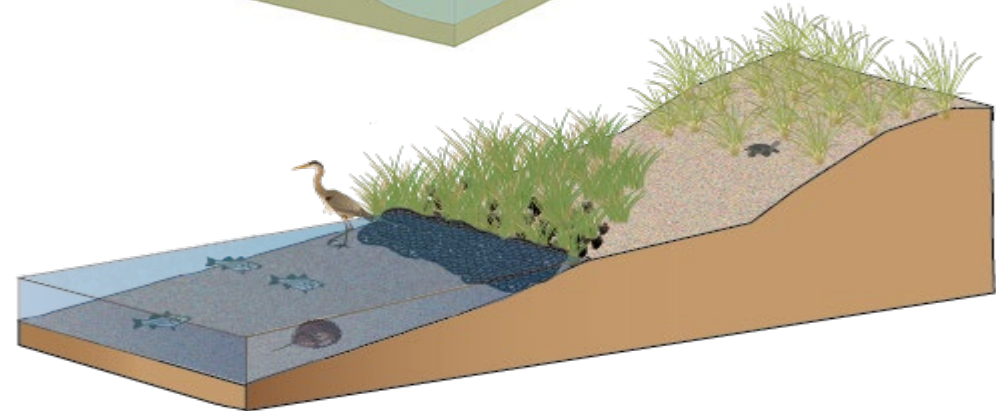
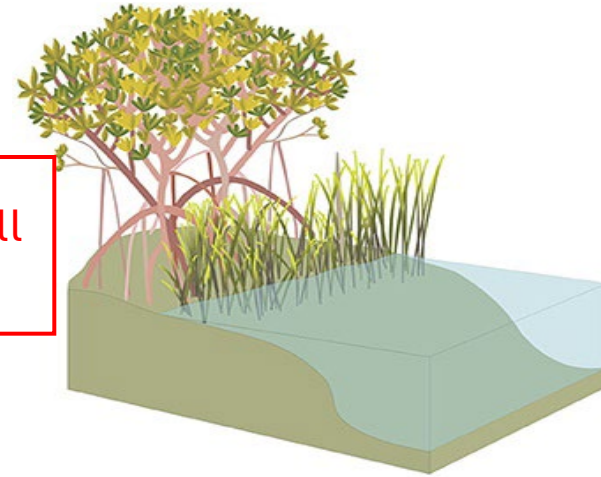
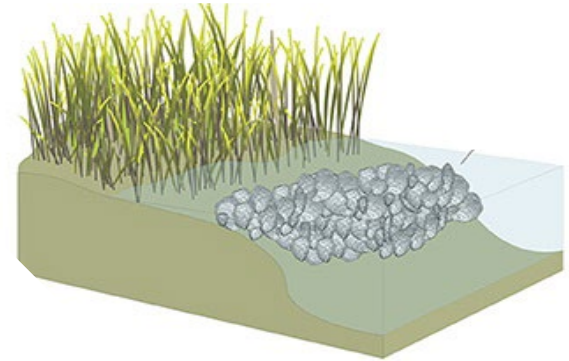
# Living Shoreline Alternatives

- Considerations
  - Avoid critical sawtooth habitat changes (keep living shoreline landward of current old seawall limit).
  - Viewsheds, experience, vegetation type, required maintenance.
- Assumptions
  - Sea Level Rise (SLR) will continue at projected design rates.
  - Scour due to storms likely to occur before vegetation matures.

Alternative 1 - Hard & soft living shoreline **Modify Existing Seawall**  
Living shoreline with native vegetation and ~~buried revetment~~

Alternative 2 - Soft living shoreline  
Living shoreline with mangroves and no wall or revetment










Alternative 3 - Beneficial dredge use living shoreline  
Thin layer placement of dredge spoils from channel and planted with native vegetation

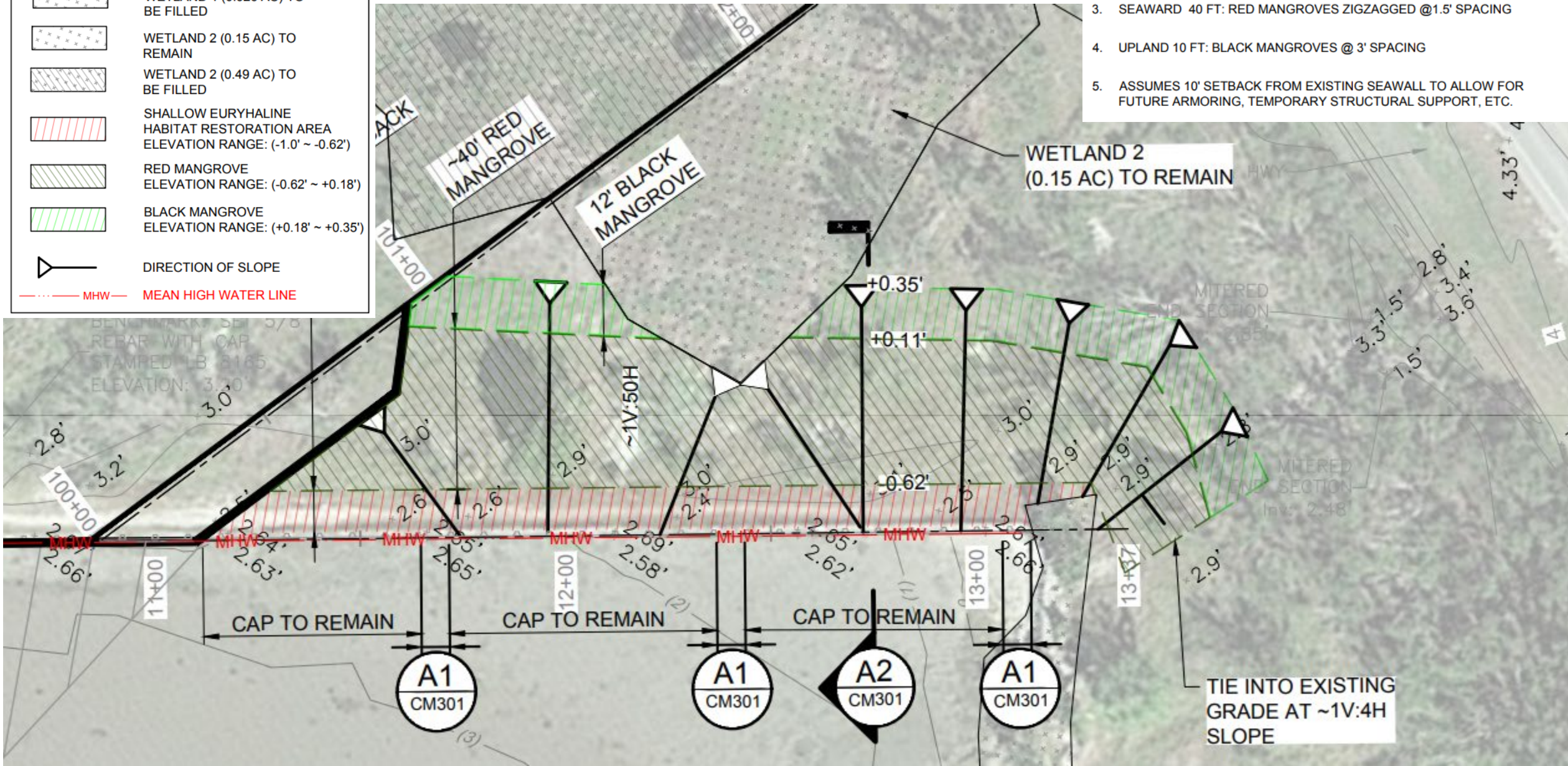




# Living Shoreline

## LEGEND

- 
-  WETLAND 1 (0.026 AC) TO BE FILLED  
 WETLAND 2 (0.15 AC) TO REMAIN  
 WETLAND 2 (0.49 AC) TO BE FILLED  
 SHALLOW EURYHALINE HABITAT RESTORATION AREA  
 ELEVATION RANGE: (-1.0' ~ -0.62')  
 RED MANGROVE  
 ELEVATION RANGE: (-0.62' ~ +0.18')  
 BLACK MANGROVE  
 ELEVATION RANGE: (+0.18' ~ +0.35')  
 DIRECTION OF SLOPE  
 MHW — MEAN HIGH WATER LINE



## NOTES

1. MANGROVE TO GROW BETWEEN ELEVATIONS -0.62(MSL +3' SLR) TO +3.4 (MHW + 3' SLR) FT NAVD88
2. ASSUMES TOTAL MANGROVE WIDTH = 52'
3. SEAWARD 40 FT: RED MANGROVES ZIGZAGGED @1.5' SPACING
4. UPLAND 10 FT: BLACK MANGROVES @ 3' SPACING
5. ASSUMES 10' SETBACK FROM EXISTING SEAWALL TO ALLOW FOR FUTURE ARMORING, TEMPORARY STRUCTURAL SUPPORT, ETC.



# Living Shoreline

- Tidal flushing analysis
  - Lower wall elevation + breaks
- Natural recruitment
- Red & Black mangroves (MANG)



Red Mangroves



Black Mangroves

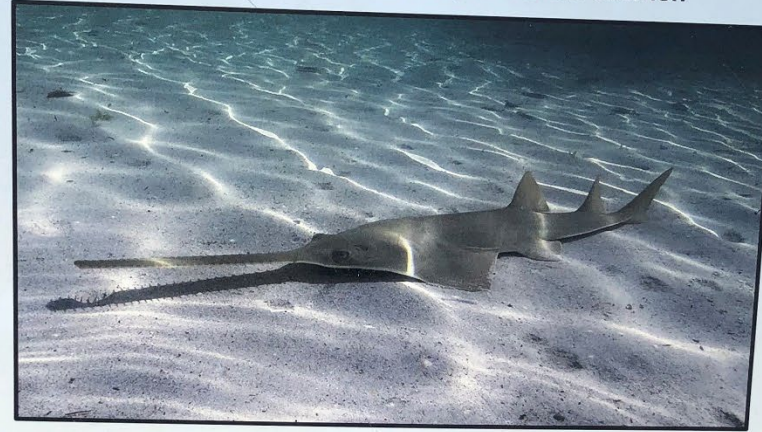


## Key Lessons Learned

- Comprehensive design:
  - Retreat vs Raise
  - Continuous line of defense
  - Resiliency investment
- Permitting:
  - Surprise mangroves
  - JaxBO fast track
  - PDCs: vibratory & auger for pile install
- Let Nature do it's thing:  
Leveraging living shoreline recruitment

### **Sawfish Are Endangered** **Respect • Release • Report**

Sawfish are protected by State and Federal laws:  
It is illegal to harm, harvest, or handle sawfish



#### **You Can Help Save Smalltooth Sawfish**

##### Angler Guidance:

- ▶ Release sawfish immediately
- ▶ Never lift from the water or drag ashore
- ▶ Do not use gaffs or ropes to secure
- ▶ Cut the line as close to the hook as possible

##### Diver Guidance:

- ▶ Keep your distance
- ▶ Avoid disturbing sawfish
- ▶ Do not chase or pursue
- ▶ Never feed or touch

#### **Share Information About Your Encounter**

**1-844-4SAWFISH**

**[www.SawfishRecovery.org](http://www.SawfishRecovery.org)**

*The information you provide helps scientists track sawfish recovery*





# How it started...

## December 2023

Aerial courtesy of Perini





How it's going...  
December 2024

Aerial courtesy of Perini





How it's going...

Aerial courtesy of Perini



# Thank you!

Questions?

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