Innovating Shoreline Resilience:
Adaptation Solutions for Florida's Coastal Communities

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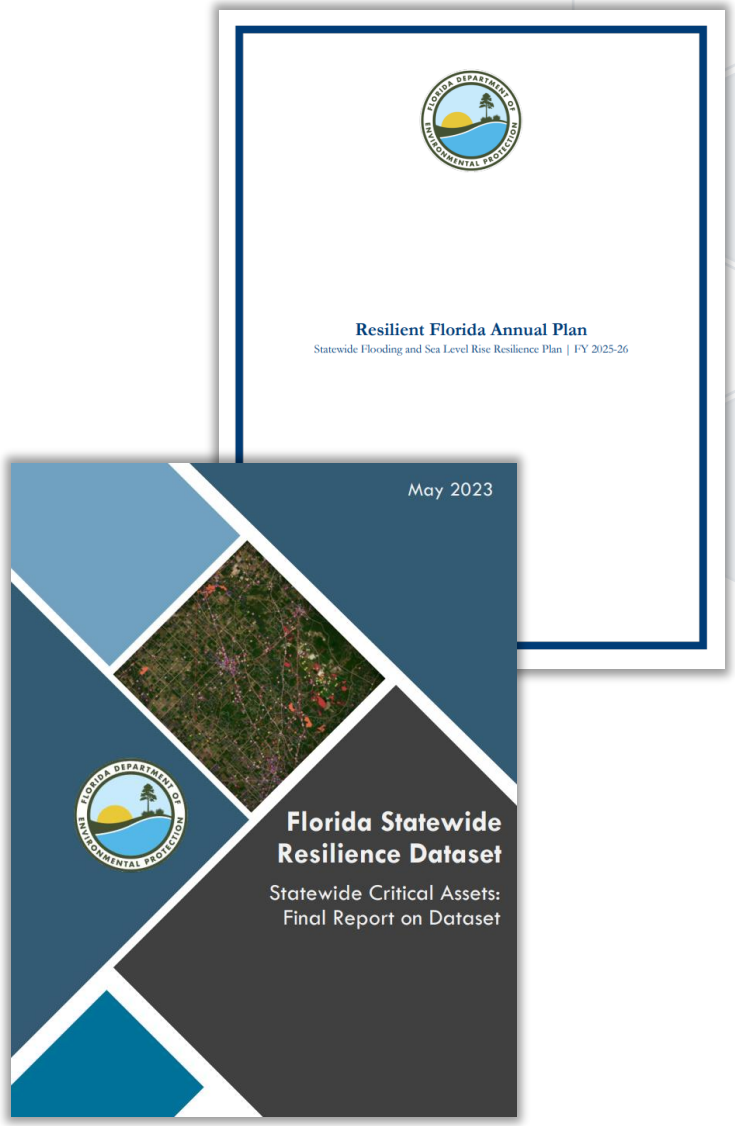
Coastal & Marine Engineering

2025 Florida Stormwater Association

Jenna N. Phillips, MSc.
Senior Director

Resilient Florida Program

- May 12, 2021, Gov. DeSantis signed SB1954 into law
- Comprehensive legislation ensures a coordinated approach to Florida's coastal and inland resilience
- Established Resilient FL Program and S.380.093 F.S., which defines:
  - Flood vulnerability parameters associated with high tides, SLR, storm surge, rainfall, and compound flooding
  - Publicly owned/maintained critical & regionally significant assets



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Resilient Florida Program | Florida Department of Environmental Protection

Critical Asset Classes & Types

1. Transportation and Evacuation Routes

- Airports
- Bridges
- Bus Terminals
- Ports
- Major Roadways
- Marinas
- Rail Facilities
- Railroad Bridges

2. Critical Infrastructure

- Wastewater Treatment Facilities and Lift Stations
- Stormwater Treatment Facilities and Pump Stations
- Drinking Water Facilities
- Water Utilities Conveyance Systems
- Electric Production and Supply Facilities
- Solid and Hazardous Waste Facilities
- Military Installations
- Communications Facilities
- Disaster Debris Management Sites

3. Critical Community and Emergency Facilities

- Schools, Colleges, Universities
- Community Centers
- Correctional Facilities
- Disaster Recovery Centers
- Emergency Medical Service Facilities
- Emergency Operation Centers
- Fire Stations
- Health Care Facilities, Hospitals
- Law Enforcement Facilities
- Local Government Facilities
- Logistical Staging Areas
- Affordable Public Housing
- Risk Shelter Inventory
- State Government Facilities

4. Natural, Cultural, Historical Resources

- Conservation Lands
- Parks
- **Shorelines**
- Surface Waters
- Wetlands
- Historical and Cultural Assets

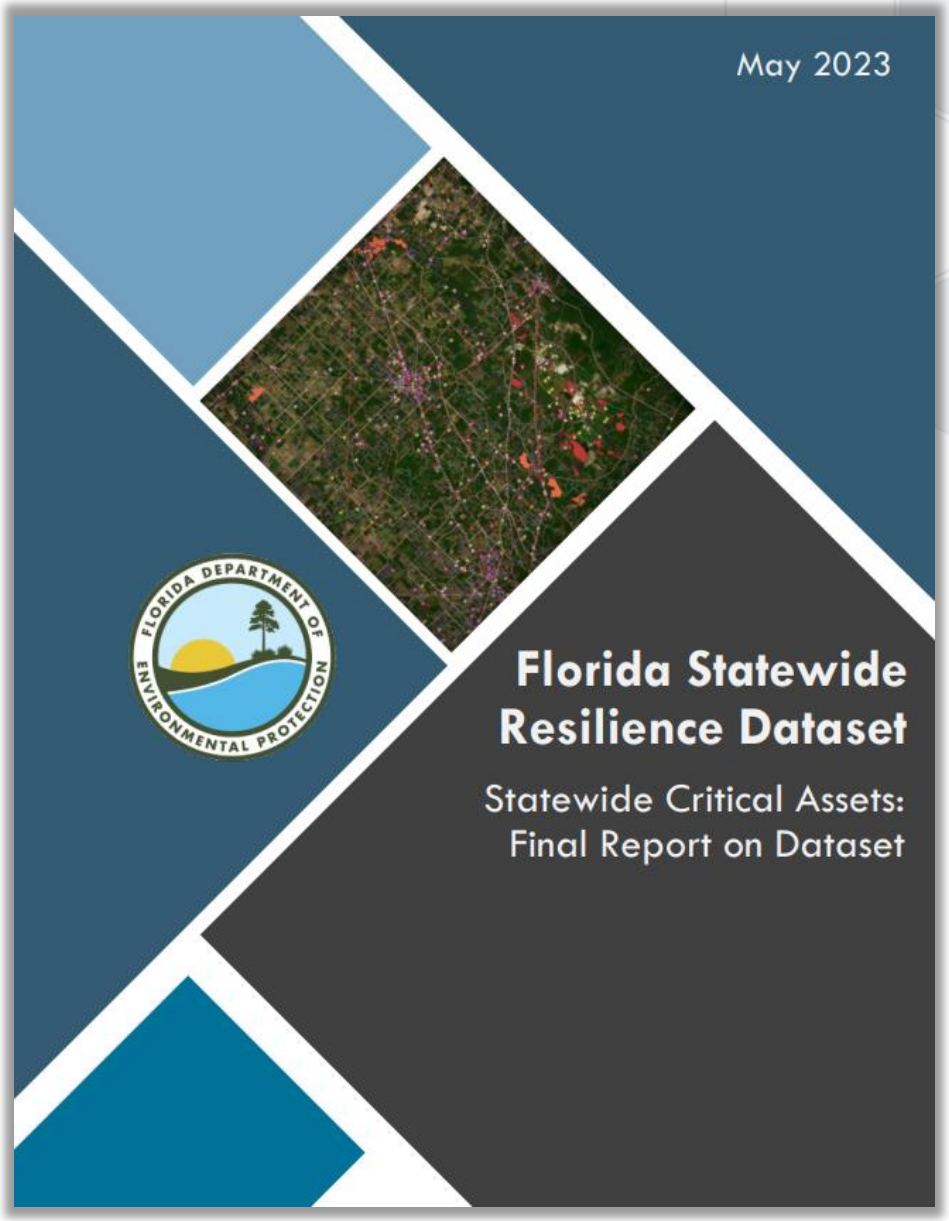
Shorelines are the first line of defense!

Statewide Resilience Dataset

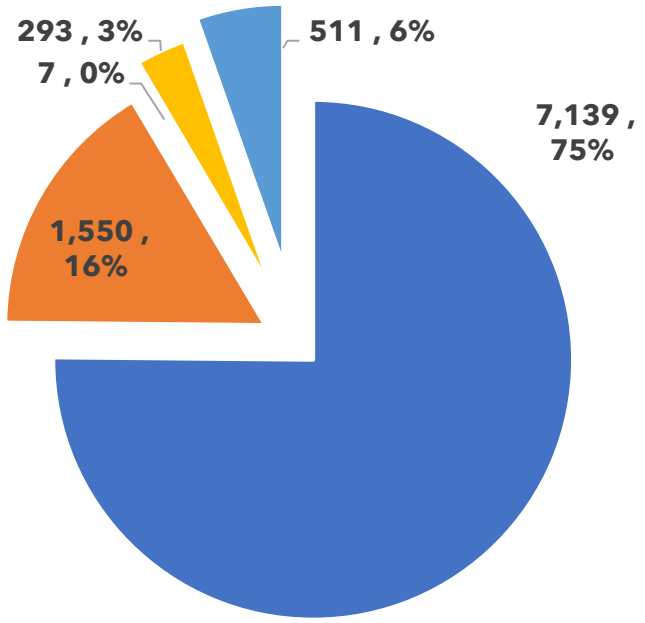
- Natural, Cultural, and Historic Resources
  - 1,301,958 counts
    - **Shorelines** = 59,204 Counts

*"Shoreline locations and classification of shoreline type were sourced from **Florida Fish and Wildlife Conservation Commission** (FWC) Florida Shoreline dataset."*

- FWC Environmental Sensitivity Index (ESI)
  - ID's shorelines sensitivity to oil spills
  - Florida ESI data updated 2010-2013
  - ESI Shoreline Classification Lines are a compilation of most recent ESI mapping

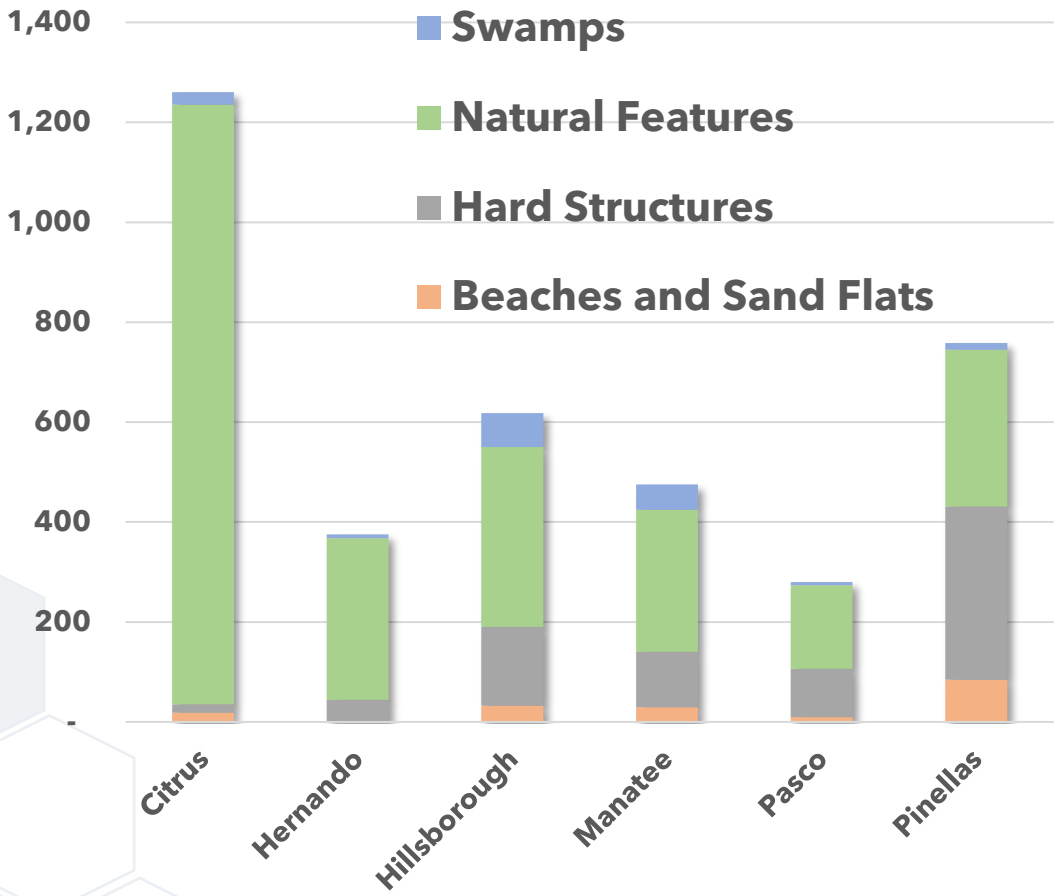


FWC Shoreline Statewide Dataset



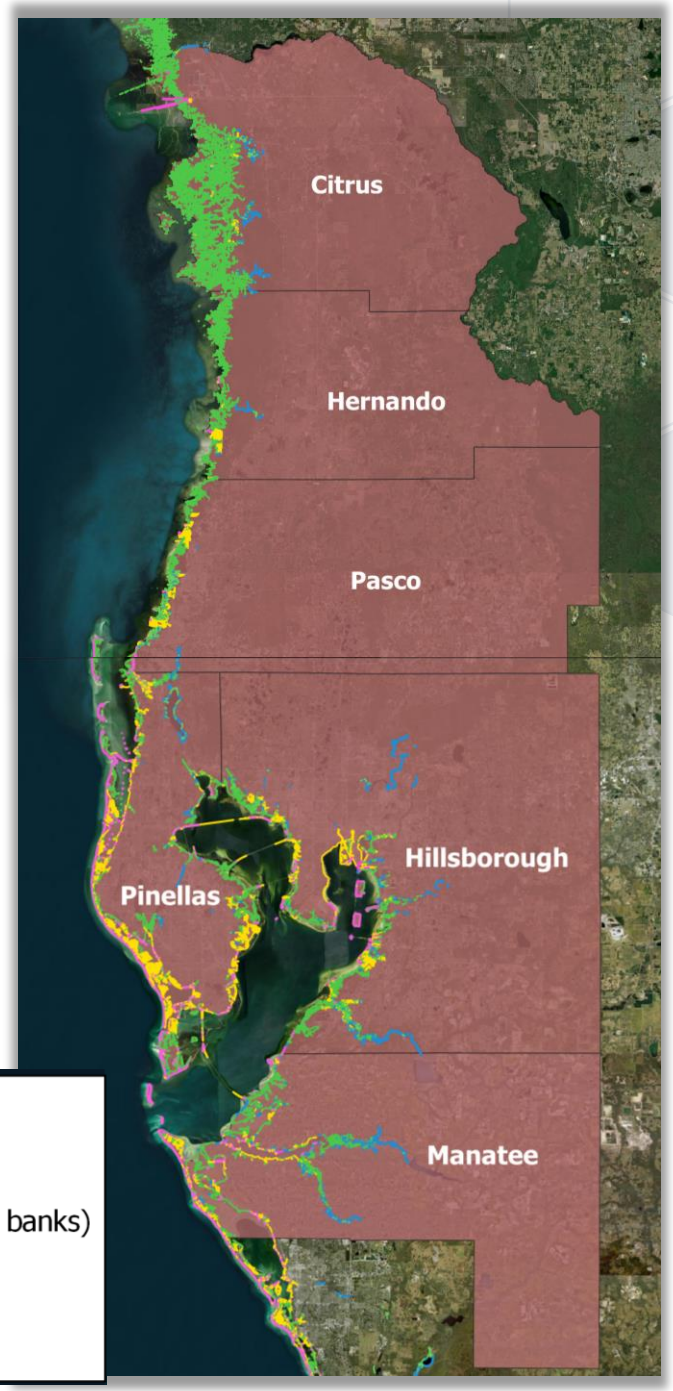
FWC Shoreline Classification	Sum of Shape Length	Miles
10A/10D: Salt- and brackish- water marsh/Scrub-shrub wetlands	728,682	138.01
10A: Salt- and brackish- water marsh	15,170,964	2,873.29
10B: Freshwater marsh	1,202,036	227.66
10C: Swamps	4,803,475	909.75
10D: Scrub-shrub wetlands	15,788,079	2,990.17
1A: Exposed rocky shores; Exposed rocky banks	939	0.18
1B: Exposed, solid man-made structures	536,602	101.63
2A: Exposed wave-cut platforms in bedrock, mud, or clay	6,302	1.19
2B: Exposed scarps and steep slopes in clay	35	0.01
3A: Fine- to medium- grained sand beaches	1,514,572	286.85
3B: Scarps and steep slopes in sand	1,560	0.30
4: Coarse-grained sand beaches	591,544	112.03
5: Mixed sand and gravel beaches	589,441	111.64
6A: Gravel beaches	1,453	0.28
6B: Exposed riprap	467,727	88.58
7: Exposed tidal flats; Sand flats	508,290	96.27
8A: Sheltered rocky shores and sheltered scarps in bedrock, mud, or clay	28,717	5.44
8B: Sheltered solid man-made structures	6,919,631	1,310.54
8C: Sheltered riprap	259,431	49.13
9A: Sheltered tidal flats; Mud flats	23,172	4.39
9B: Vegetated low banks	1,016,315	192.48
9C: Hypersaline tidal flats	1,215	0.23
Grand Total	**50,160,181**	**9,500**

FWC Shoreline Inventory



FWC-ESI Shoreline Linear Miles by County

Tampa Bay Region



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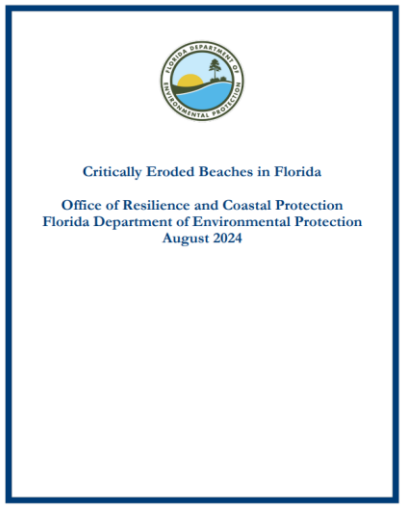
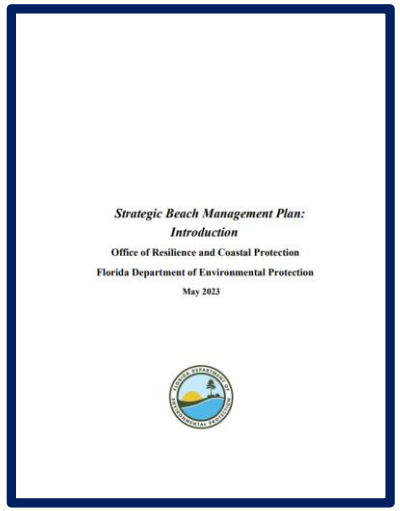
Sandy Beach Shorelines

Shoreline Stats

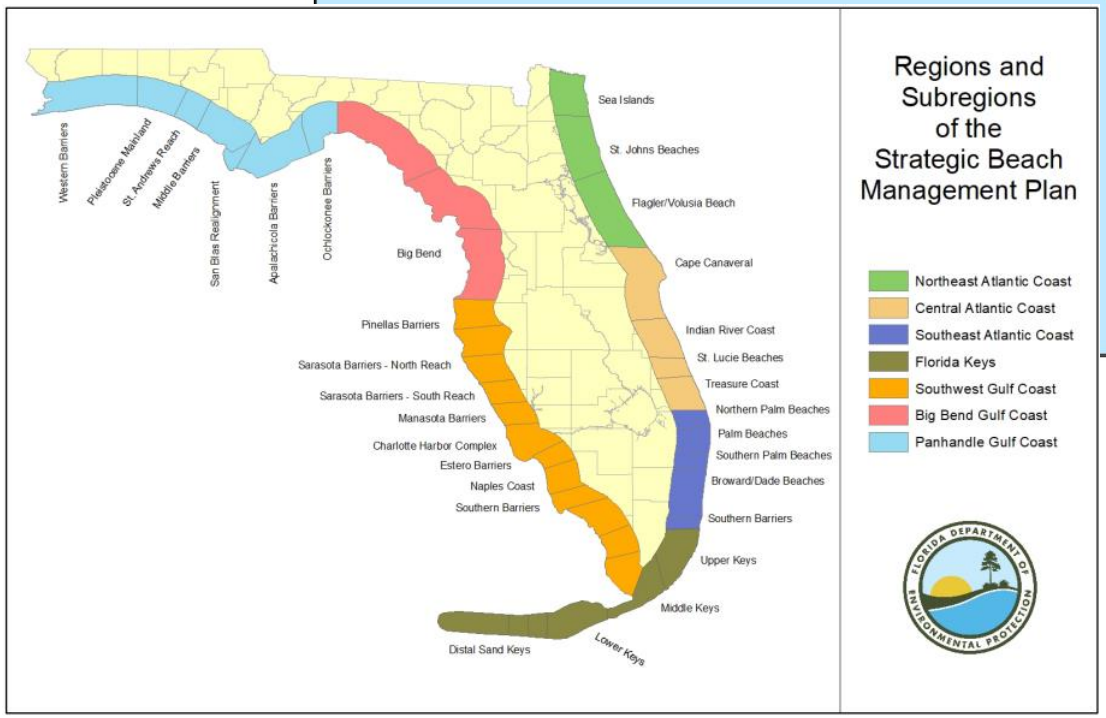
- 8,426 Mi of detailed tidal shoreline
- 2,276 Mi of general tidal shoreline
- 1,350 Mi of general coastline
- 825 Mi of sandy beaches
- 426 Mi critically eroded beaches
- 253 Mi of restored/managed beaches
- 85 Projects (35 Federal)


Critically Eroded Beaches in Florida

Office of Resilience and Coastal Protection
Florida Department of Environmental Protection
August 2024


Strategic Beach Management Plan: Introduction

Office of Resilience and Coastal Protection
Florida Department of Environmental Protection
May 2023



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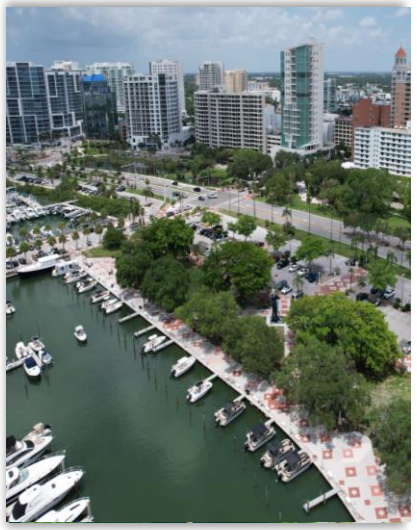
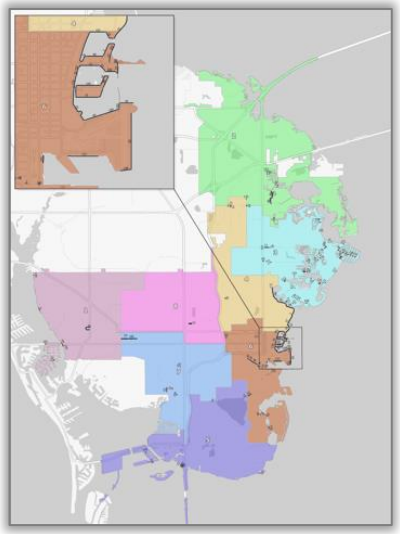
Resilient Shoreline Adaptation Case Studies

Sarasota Bayfront Park



St. Pete Seawall CIP Study



Portosueno Park Living Shoreline

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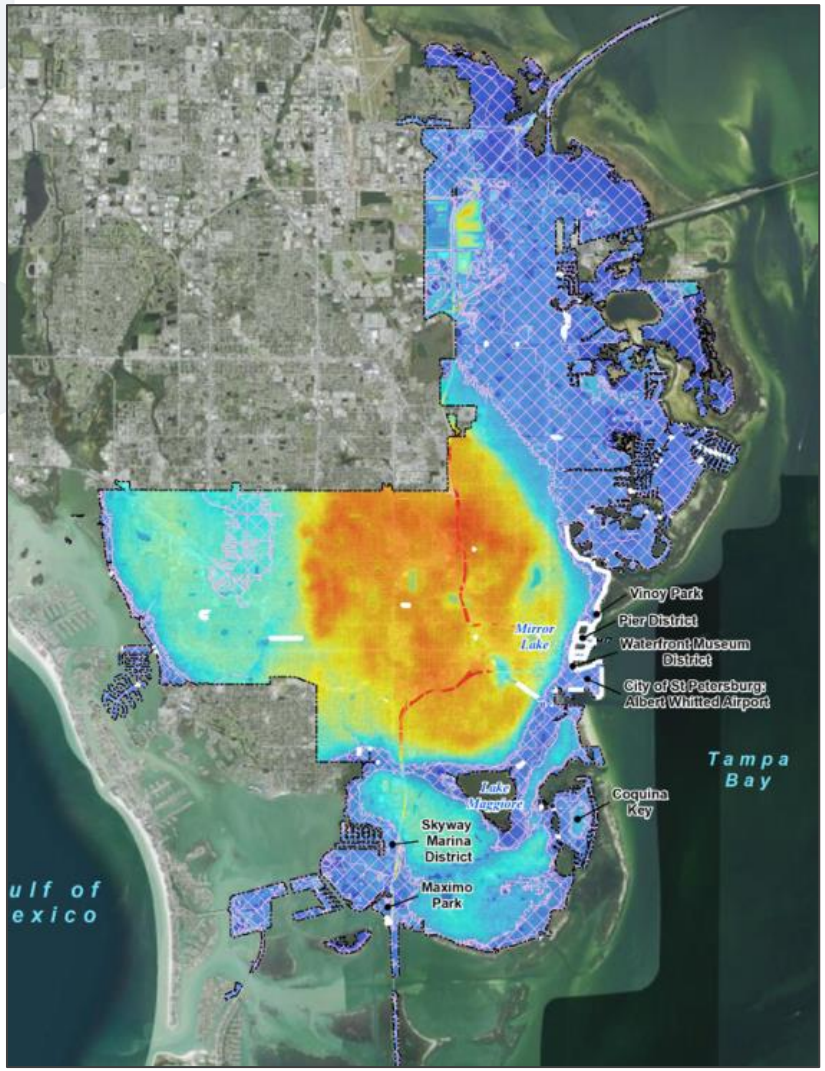
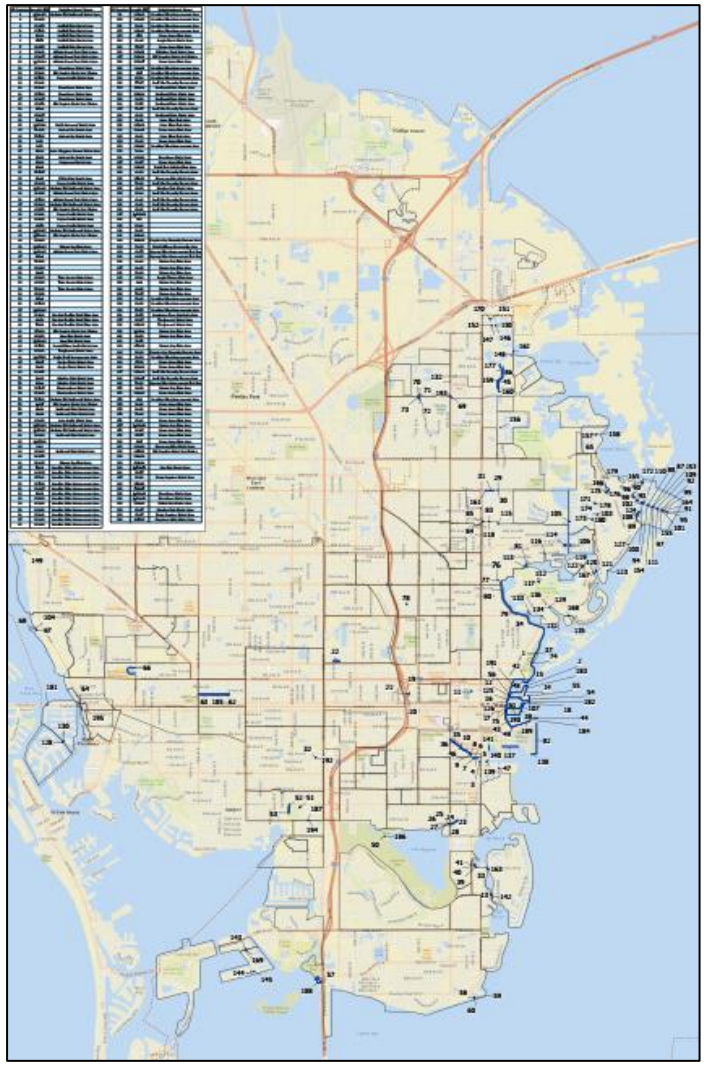
City of St. Pete Strategic Seawall CIP Plan

- FDEO CDBG-MIT Grant = ~$900K
- ~73,000 LF of Seawall
- Perform conditions inspections
- Develop seawall inventory & geodatabase
- Evaluate flood vulnerability associated with storm surge, tides, SLR and rainfall
- Develop recommendations to improve resilience
- Emphasize NBS



Existing DEM



City-owned Wall Segments

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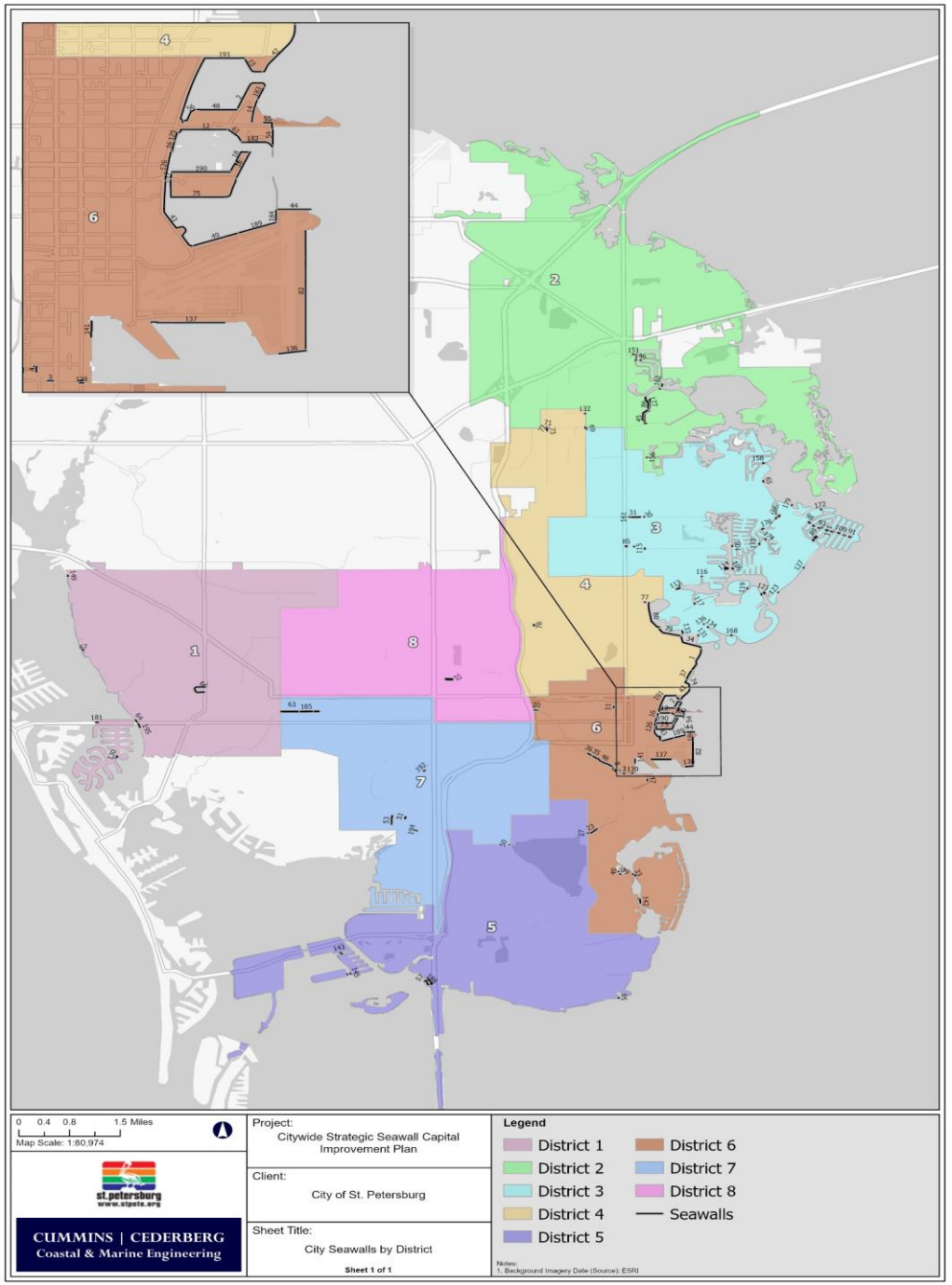
Field Region Map Overview

District	Linear Feet of Seawall	Quantity of Wall Segments	Quantity of Report Card Subsections
1	3,210	10	12
2	5,213	14	21
3	9,030	72	81
4	12,492	16	42
5	2,296	13	16
6	31,281	58	102
7	7,236	11	25
8	1,107	1	2
Total	71,865	195	301



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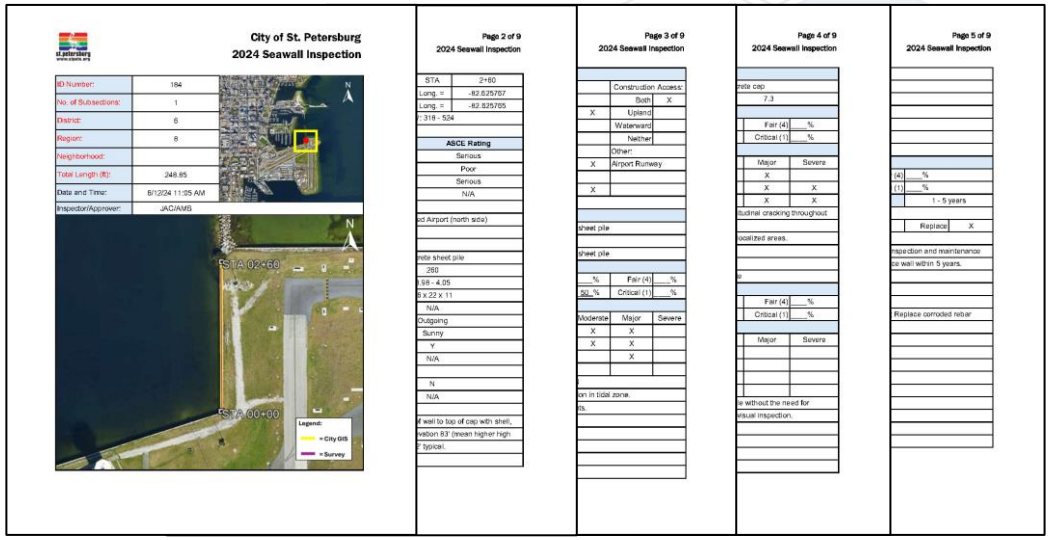
Field Data Collection


City of St. Petersburg
2024 Seawall Inspection

ID Number:	184
No. of Subsections:	1
District:	8
Region:	8
Neighborhood:	
Total Length (ft):	248.85
Date and Time:	6/12/24 11:05 AM
Inspector/Approver:	JAC/AWB

Page 2 of 9 — 2024 Seawall Inspection

STA	2+60
Long. =	-82.625767
Long. =	-82.625765
: 318 - 524	

ASCE Rating
Serious
Poor
Serious
N/A

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Construction Access:		
	Both	X
X	Upland	
	Waterward	
	Neither	
Other:		
X	Airport Runway	
X		

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	Major	Severe
	X	
	X	X
	X	X

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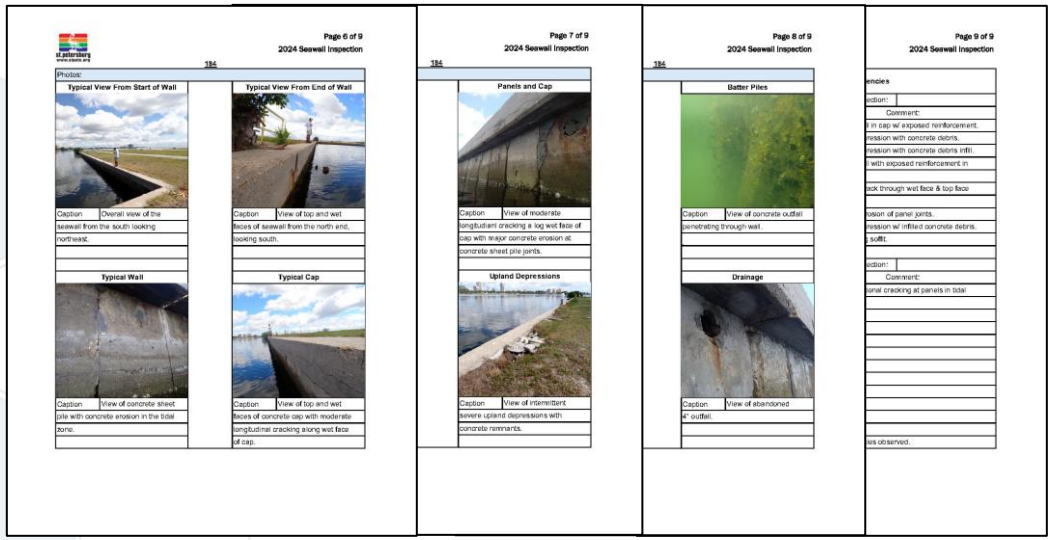
	1 - 5 years
Replace	X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Photos:

Typical View From Start of Wall

Caption	Overall view of the seawall from the south looking northeast.

Typical View From End of Wall

Caption	View of top and wet faces of seawall from the north end, looking south.

Typical Wall

Caption	View of concrete sheet pile with concrete erosion in the tidal zone.

Typical Cap

Caption	View of top and wet faces of concrete cap with moderate longitudinal cracking along wet face of cap.

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Panels and Cap

Caption	View of moderate longitudinal cracking a log wet face of cap with major concrete erosion at concrete sheet pile joints.

Upland Depressions

Caption	View of intermittent severe upland depressions with concrete remnants.

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Batter Piles

Caption	View of concrete outfall penetrating through wall.

Drainage

Caption	View of abandoned 4" outfall.

Page 9 of 9 — 2024 Seawall Inspection

ASCE Condition Assessment Ratings

Rating		Description
6	Good	No visible damage, or only minor damage is noted. Structural elements may show very minor deterioration, but no overstressing is observed. No Repairs are required.
5	Satisfactory	Limited minor to moderate defects or deterioration are observed, but no overstressing is observed. No Repairs are required.
4	Fair	All primary structural elements are sound, but minor to moderate defects or deterioration is observed. Localized areas of moderate to advance deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3	Poor	Advanced deterioration or overstressing is observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	Serious	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	Critical	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high priority basis with strong urgency.

[1] Ratings are used to describe the existing structure compared with the structure when newly built. The possibility that the structure may have been designed for loads that are lower than the current standards for design should have no influence on the ratings.

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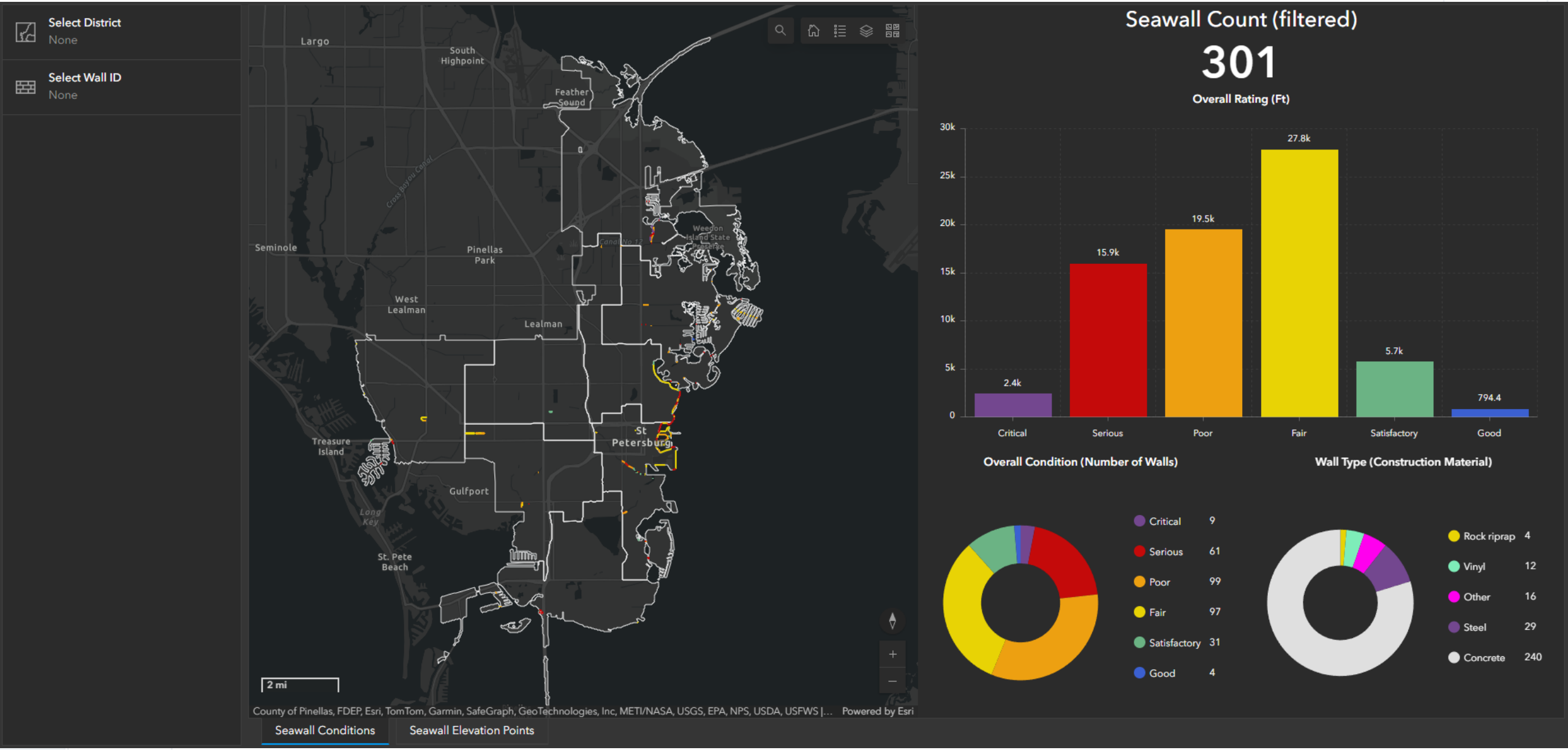

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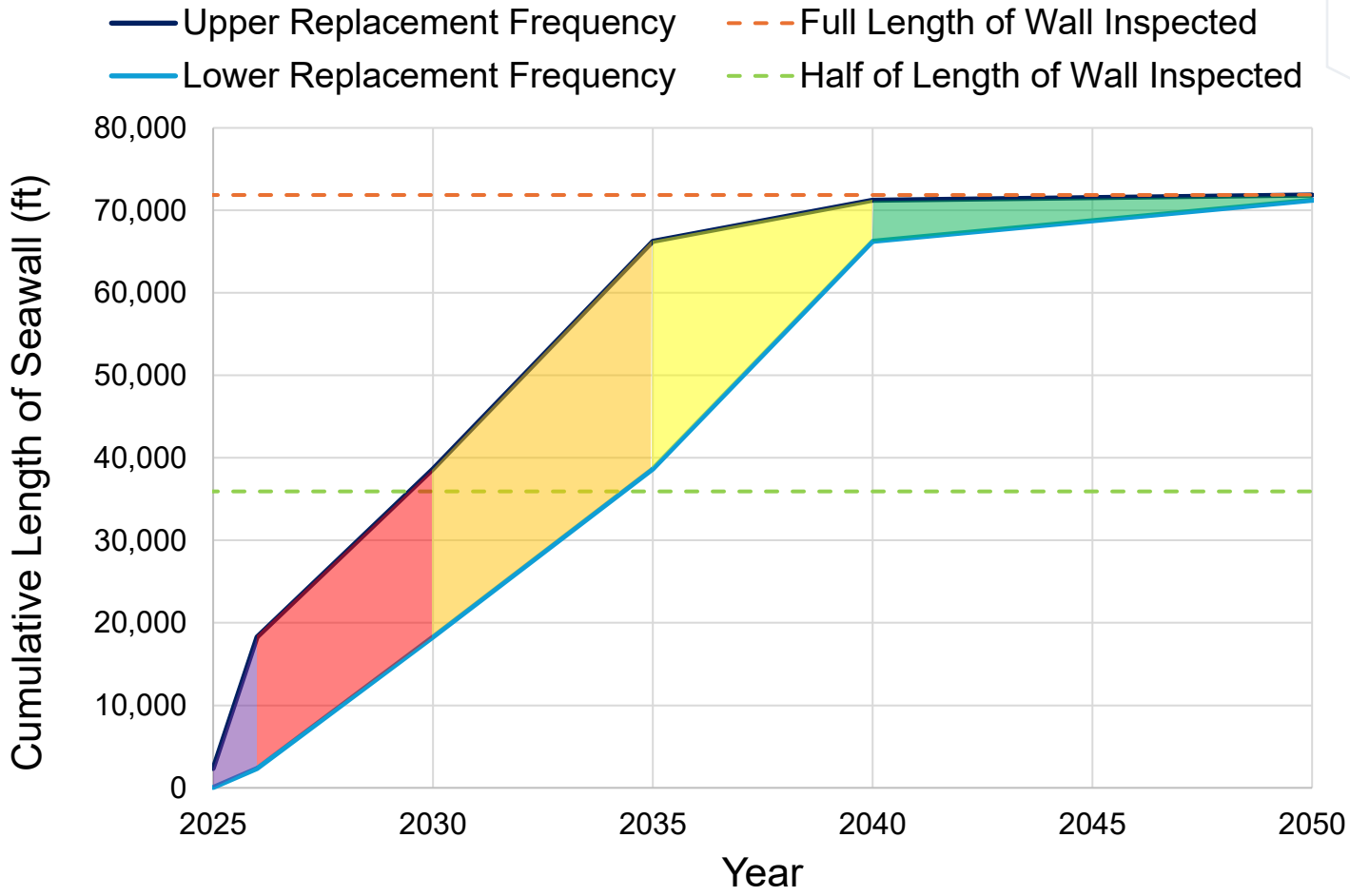
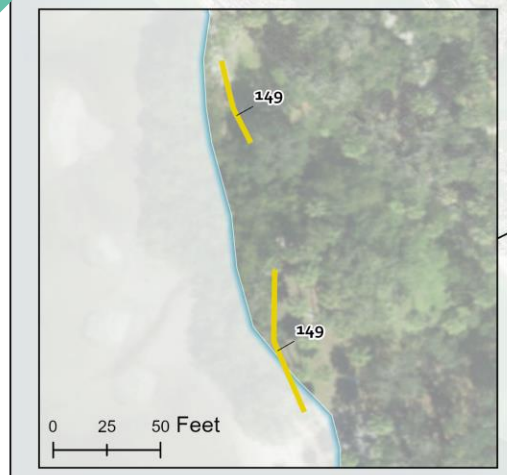
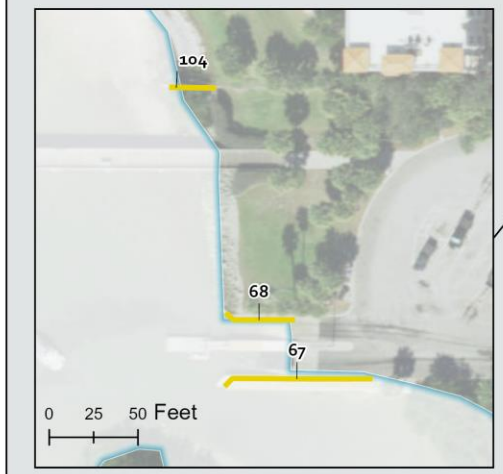
City of St. Petersburg Interactive Dashboard

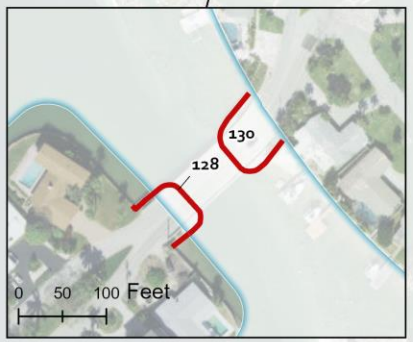
Remaining Service Life

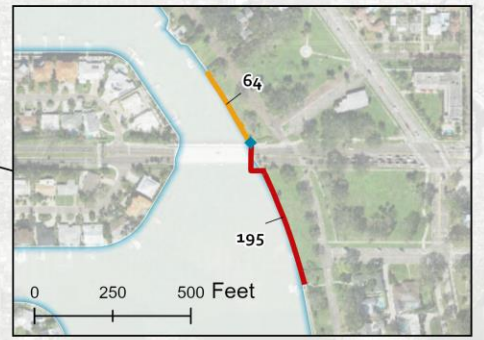
ASCE Rating vs Remaining Service Life	
Good	> 25 years
Satisfactory	15 – 25 years
Fair	10 – 15 years
Poor	5 – 10 years
Serious	1 – 5 years
Critical	< 1 year











Condition Rating	Wall Count	Total Wall Length (ft)
Serious	3	855
Poor	2	745
Fair	6	1,852
Satisfactory	1	168
Totals:	**12**	**3,620**

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Sheet Title:

District 1

Sheet 1 of 1

Legend

- St. Petersburg Districts
- Stormwater Outlets within 50 ft of Seawall

Notes:
1. Background: ESRI World Imagery, MAXAR, No specific date provided

Condition Rating
- Critical
- Serious
- Poor
- Fair
- Satisfactory
- Good

0 0.5 1 Miles

Map Scale: 1:50,000

NAD 1983 HARN StatePlane Florida West FIPS 0902 Feet

Post-Storm Challenges

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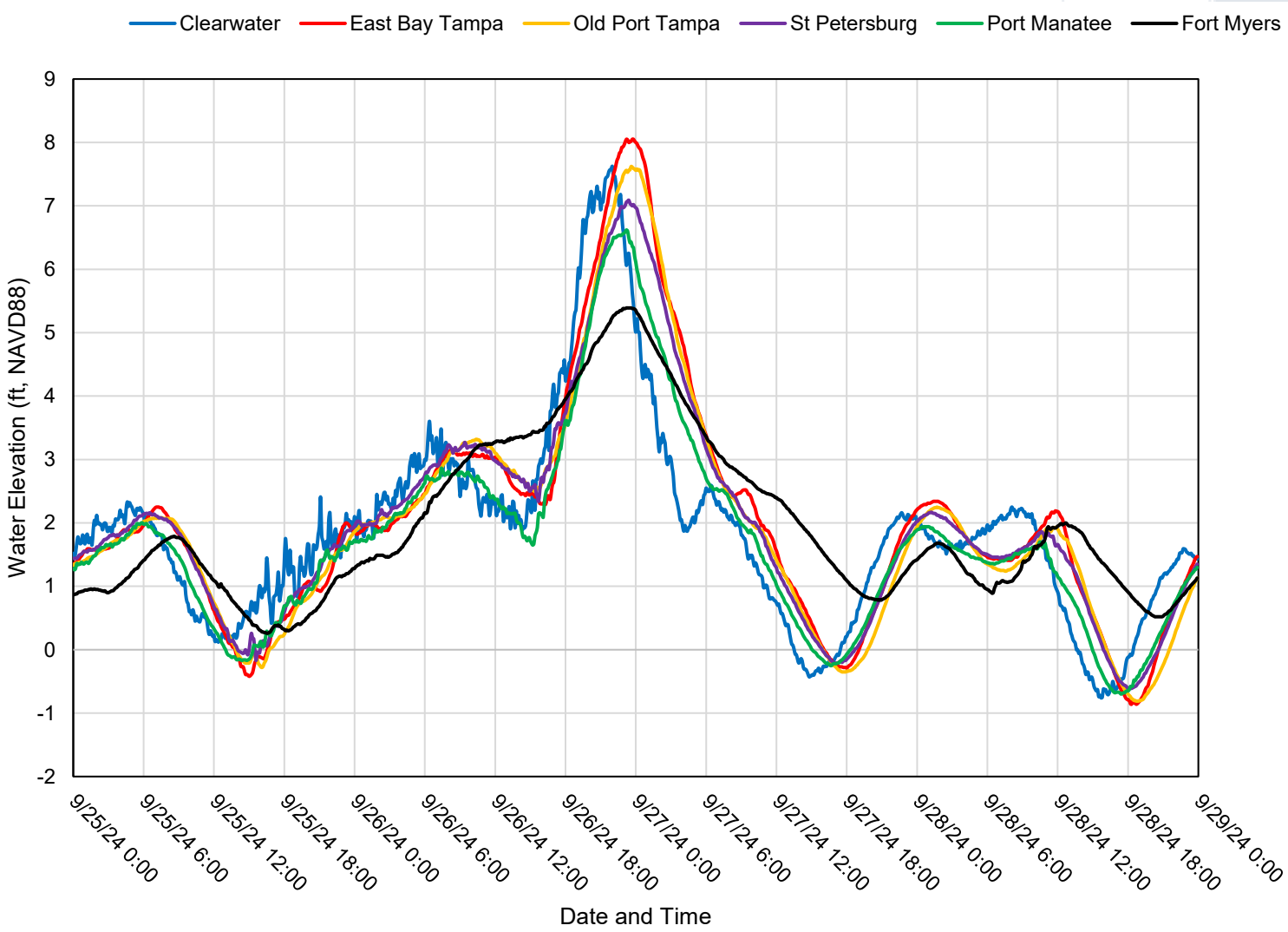
Storm Surge Vulnerability – Helene

- Category 4 hurricane at landfall in Perry, FL
- Helene moved quickly at 23mph
- Eye of the storm approx. 170 miles south-southwest of Tampa
- St. Petersburg NOAA station peak surge = +7.09 feet NAVD (per FEMA FIS is between a 25-year and 50-year return period storm)



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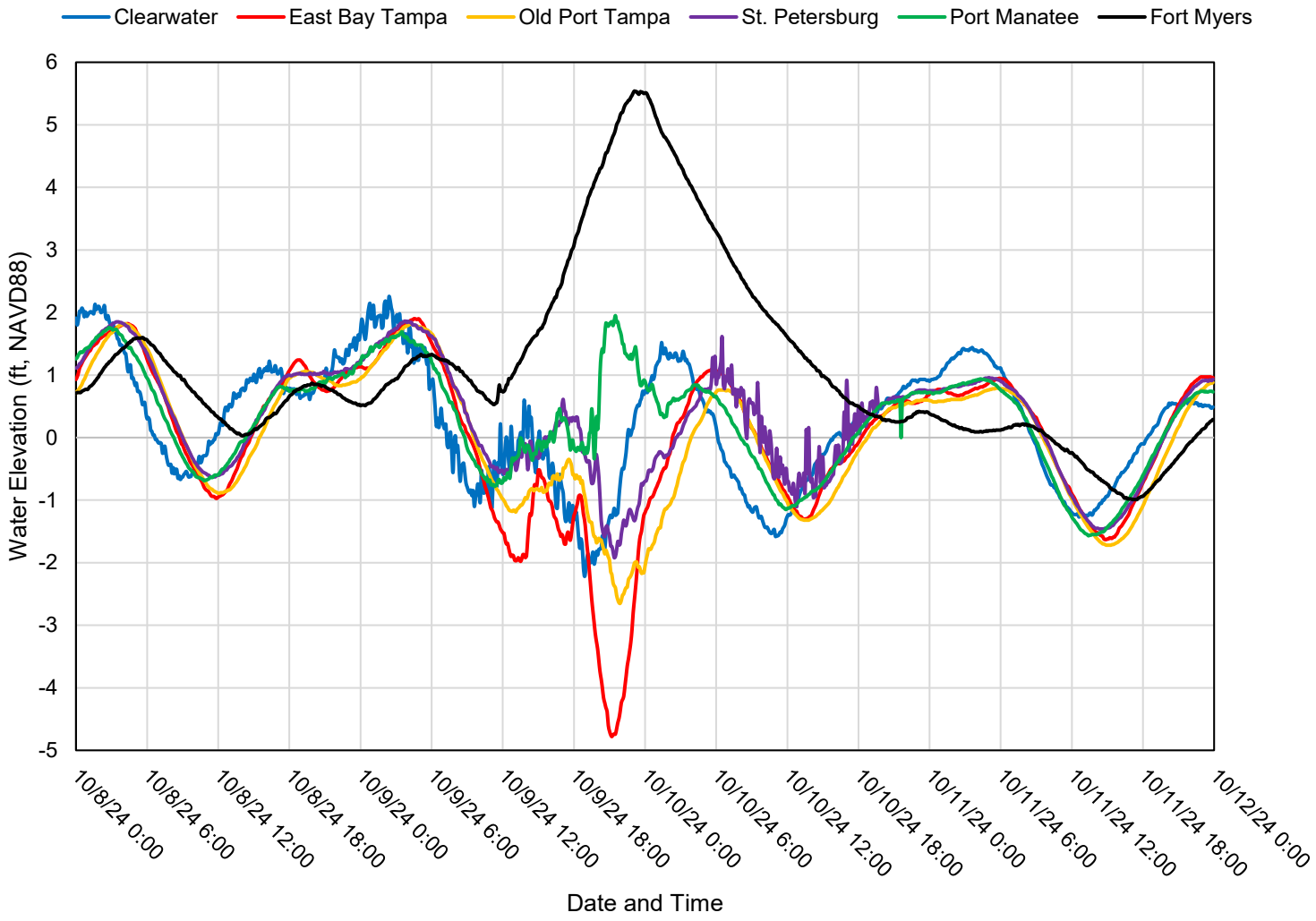
Storm Surge Vulnerability – Milton

- Category 3 hurricane at landfall in Siesta Key, FL on October 9th, 2024
- 24-hr rainfall of 18.54 inches and a peak 3-hour rainfall total of 9.04 inches on October 9th
- St. Petersburg NOAA station peak surge reached +1.86 feet, NAVD88
- Reverse storm surge in the Tampa Bay with recorded water level at East Bay station of -4.78 feet, NAVD88



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Flood Modeling

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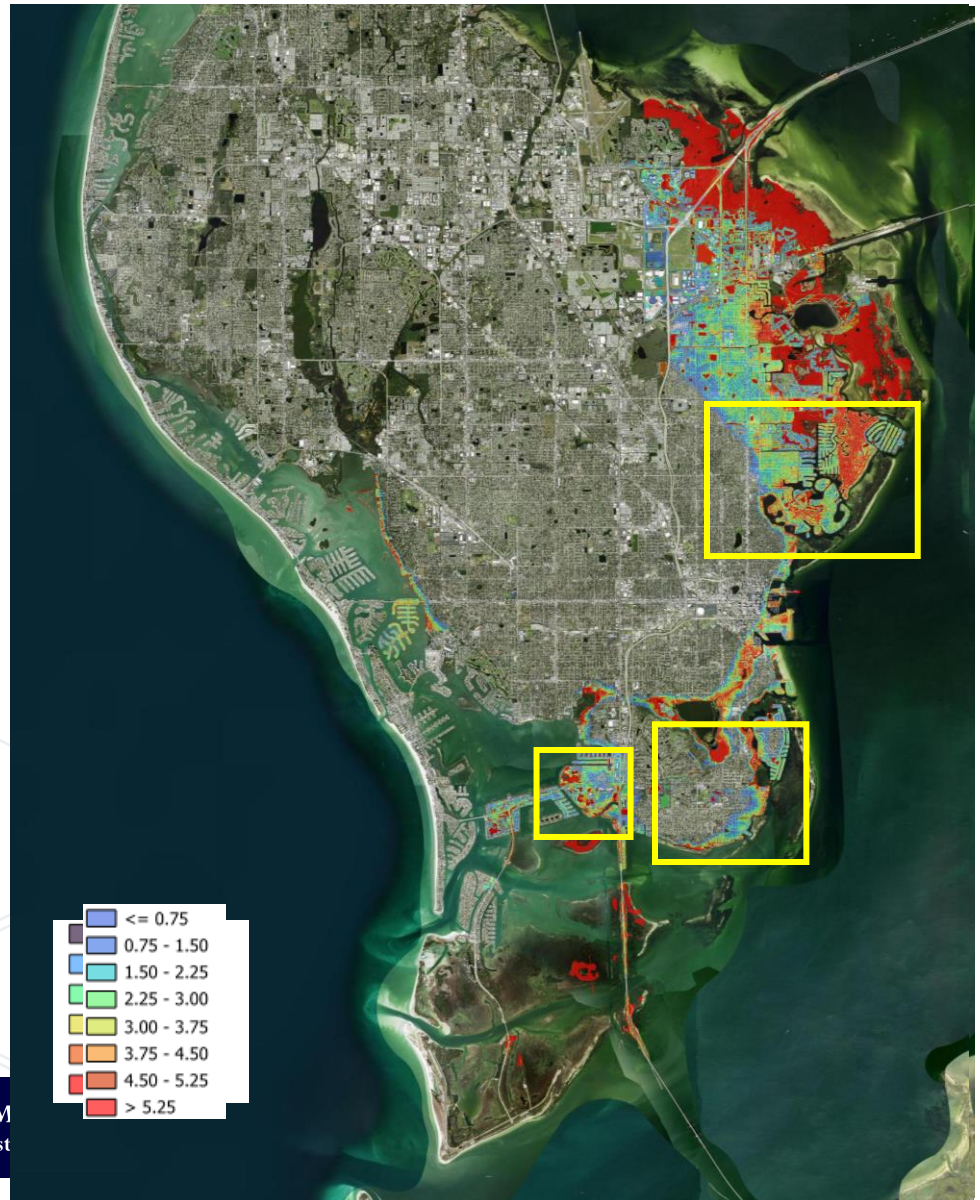

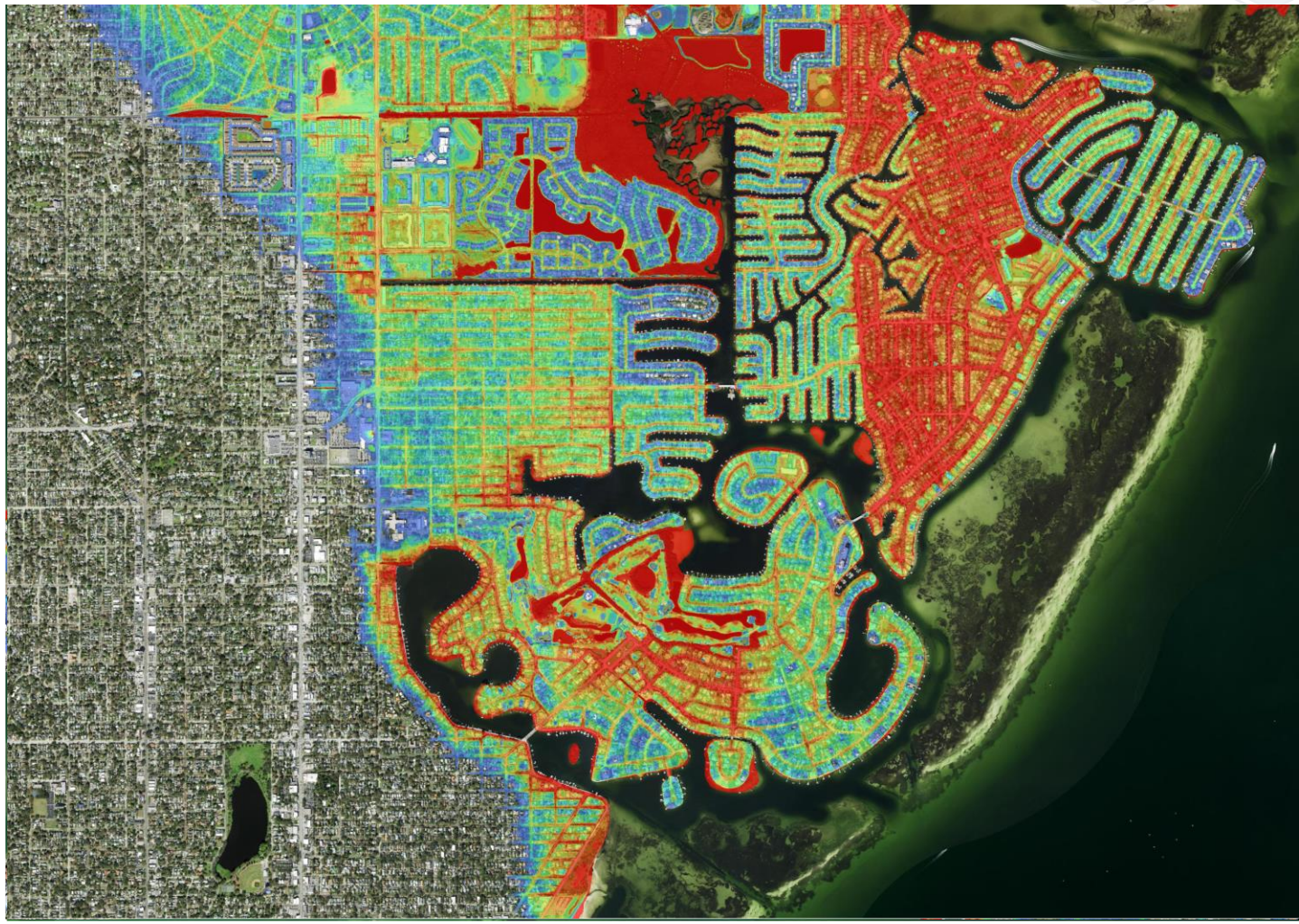

Harbordale, [illegible] Siesta Key

Top of Cap Elevation Summary

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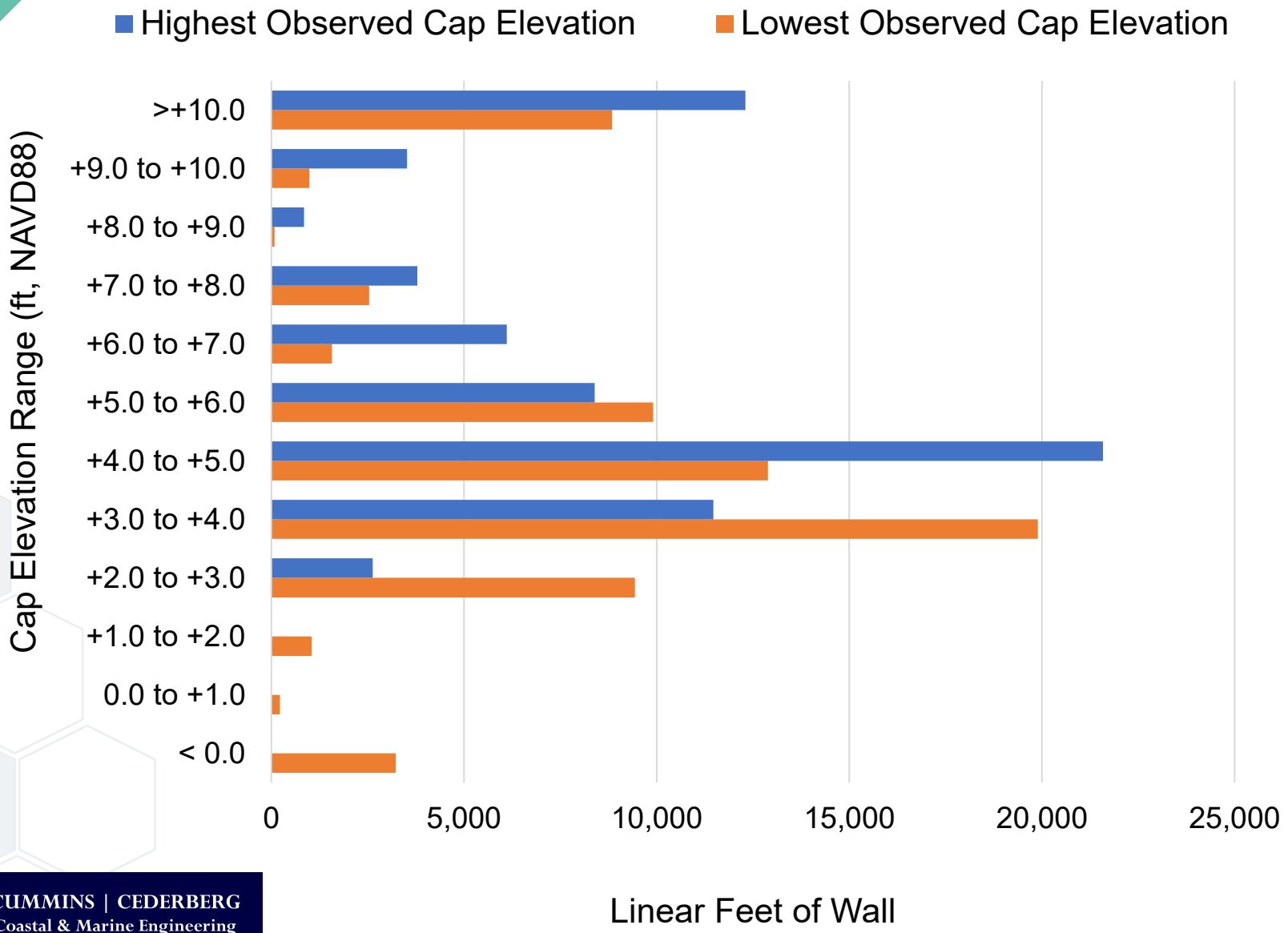

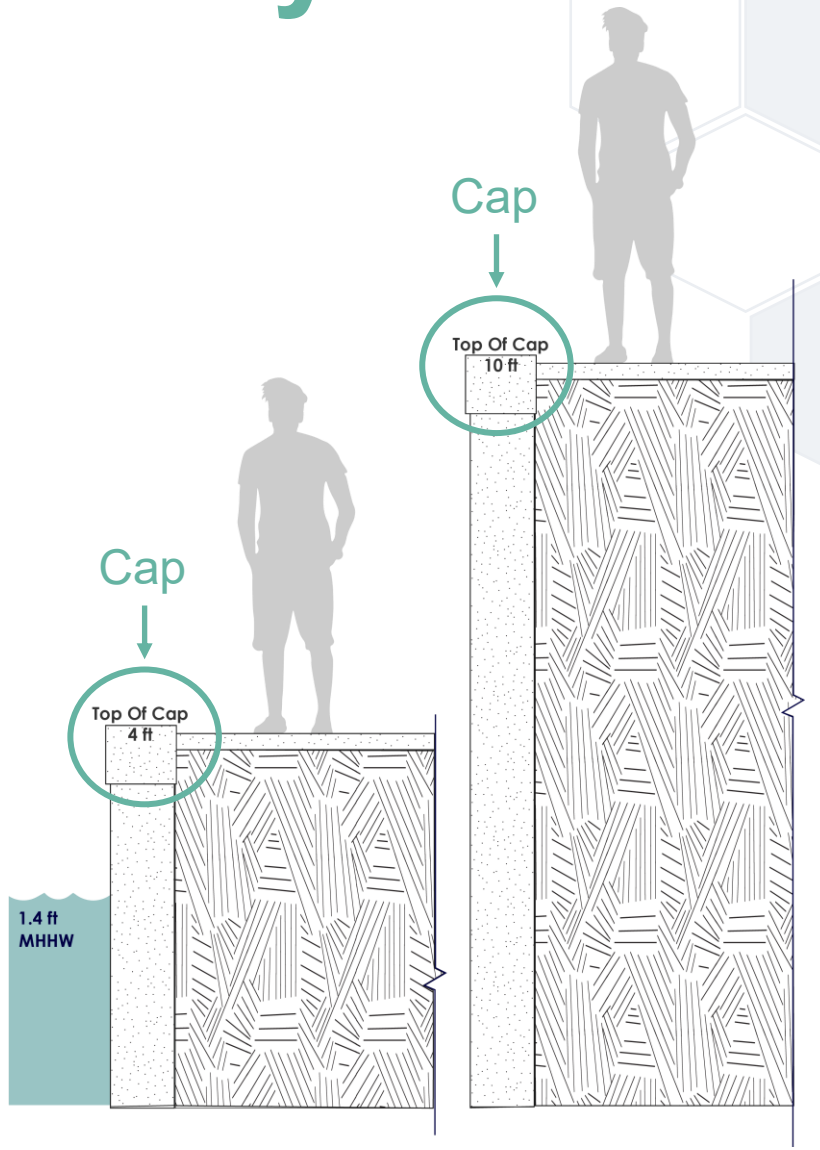

Represents Lowest Point along Wall

Represents Highest Point along Wall

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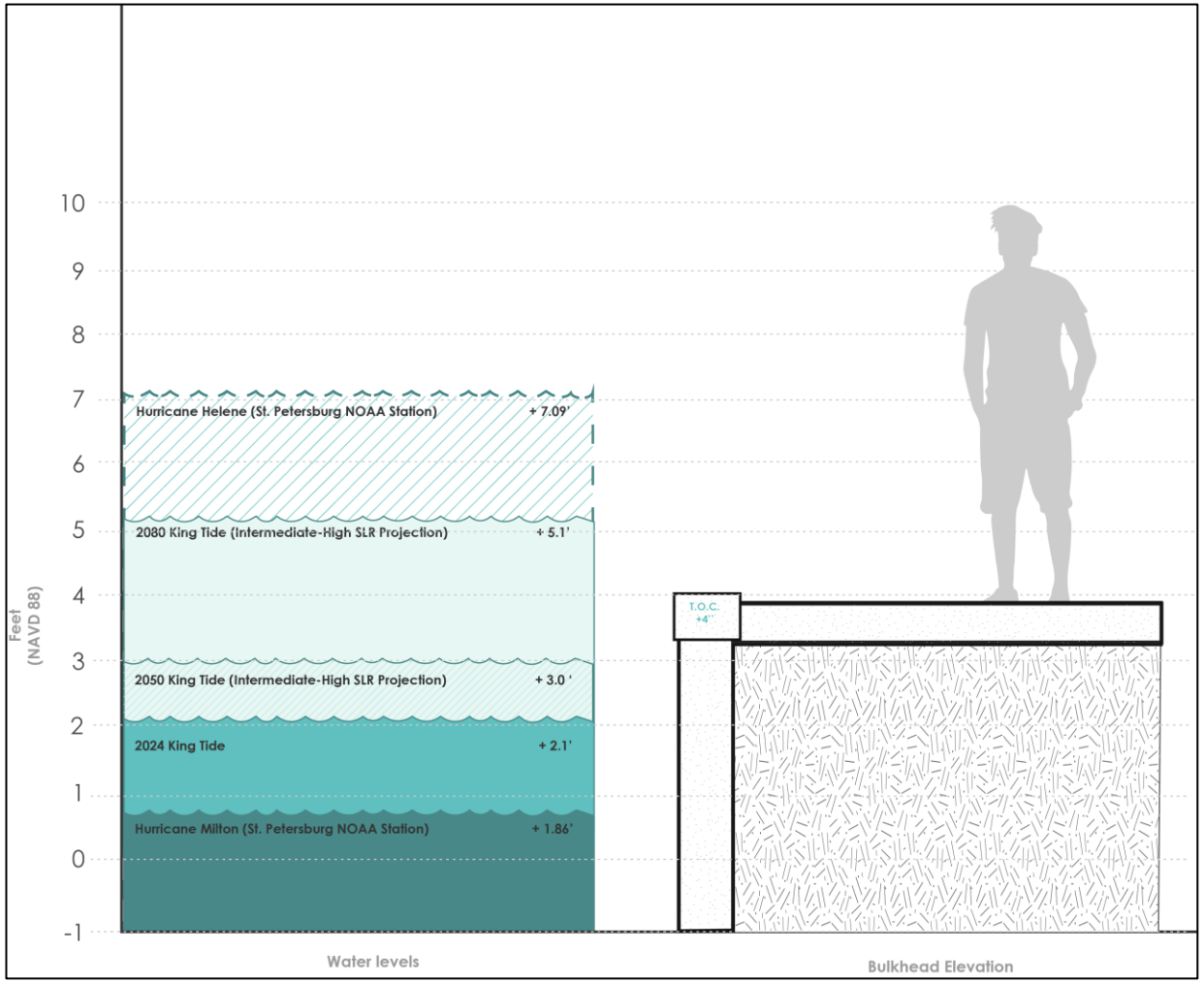
Cap Elevations & Vulnerability

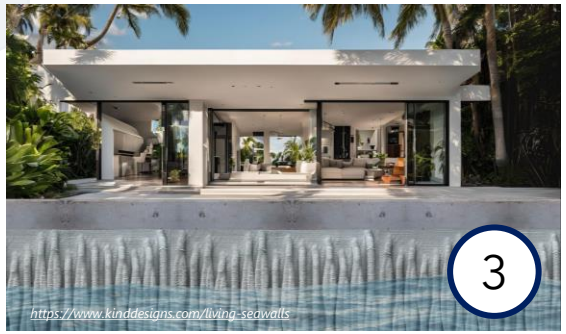
Seawall Elevation Summary

Cap Elevation (ft-NAVD)	Length of Wall (LF)	% of Total Length
< +2.0 ft	1,270	2%
+2.0 to +3.0 ft	9,371	13%
+3.0 to 4.0 ft	19,816	28%
+4.0 to 5.0 ft	12,920	18%
> +5.0 ft	24,156	34%



Coastal Toolbox

Categories		Description
1	Repair only	Wall rating of Fair or better. Adequate remaining service life (10 yrs<)
2	Replace in-kind, raise cap elevation	Where space is a constraint. Wall rating of Poor or less
3	Environmental enhancement	Living panels, oyster domes, toe rock, upland planting/swale
4	Rock revetment/planters	Replacement of vertical walls to include vegetation while maintaining smaller footprint
5	Hybrid shoreline (Alternative 1)	Rock sill/vegetated slope/ planters
6	Hybrid shoreline (Alternative 2)	Rock breakwater/pocket beaches/groins
7	Natural living shoreline	Vegetative plantings



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Portosueno Park Living Shoreline

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- Connects to Palma Sola Bay in Bradenton
- Existing concrete weir
- 1960's era deteriorating bulkhead
- Relatively low energy in basin
- Project goals Combines:
  - Remove existing wall to create more natural shoreline
  - Enhance recreational use of park
  - Boardwalk, pathway
  - Native vegetation, oyster domes
- Stakeholder engagement

Preliminary Plan Concept

Sarasota Bayfront Park Bulkhead

- $3.6M Resilient FL Grant + $500K WCIND Grant + City Match = $6.73M
- Goal to reduce flood risks
- Cap elevation = +2.17'NAVD
- Performed topside & underwater inspection
- Inspection report identified ASCE Rating of Poor to Fair
- Engineering alternatives analysis
- Stakeholder engagement with marina operators
- Design & Permitting

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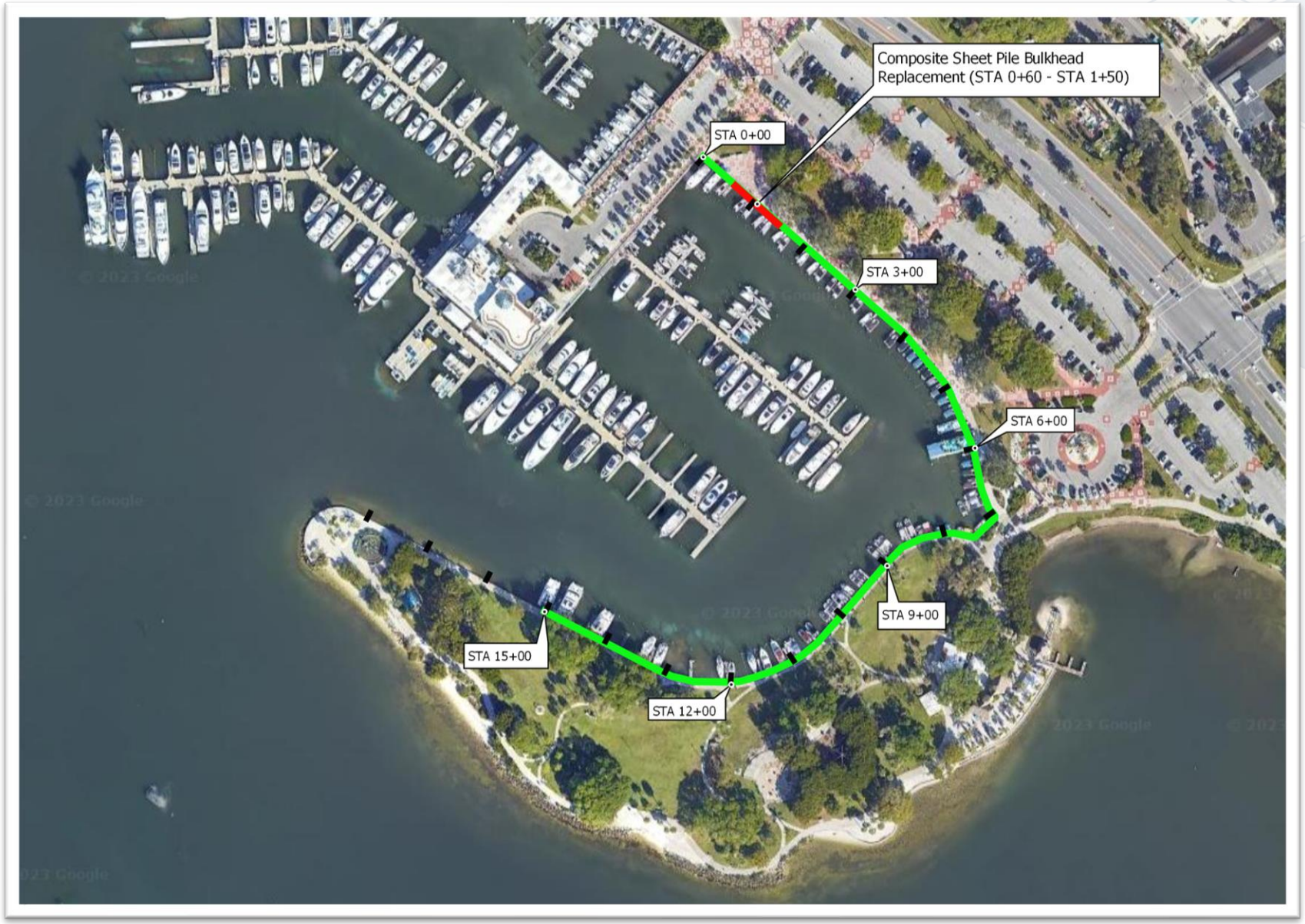
CITY OF SARASOTA

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

WCIND



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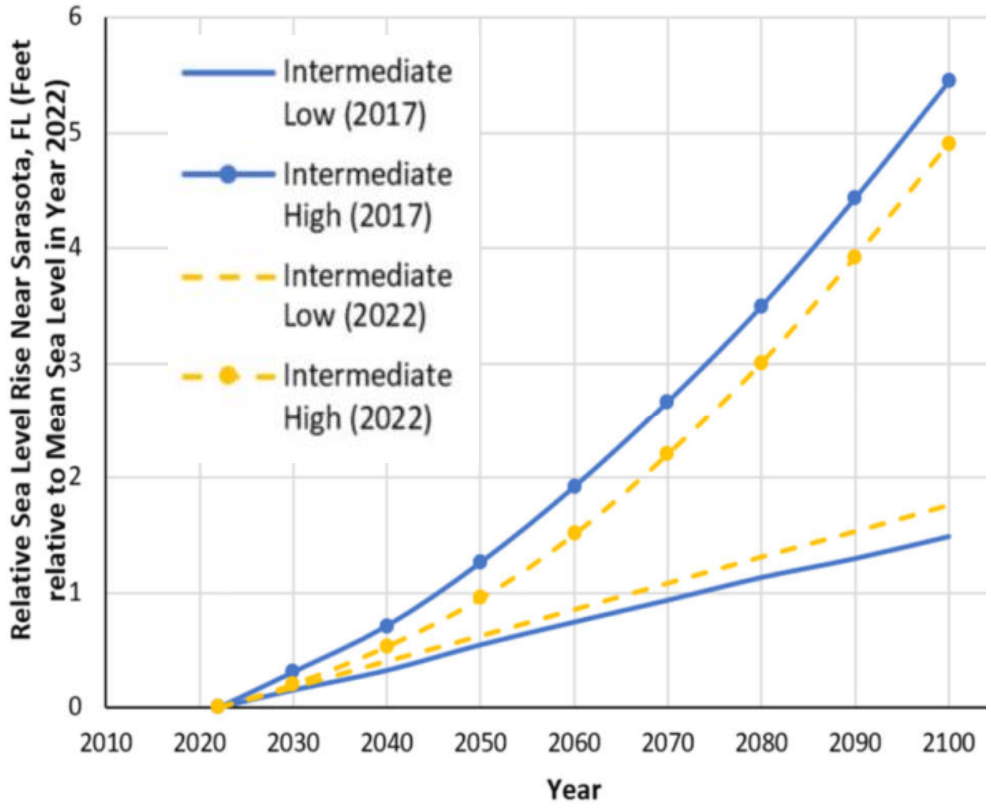

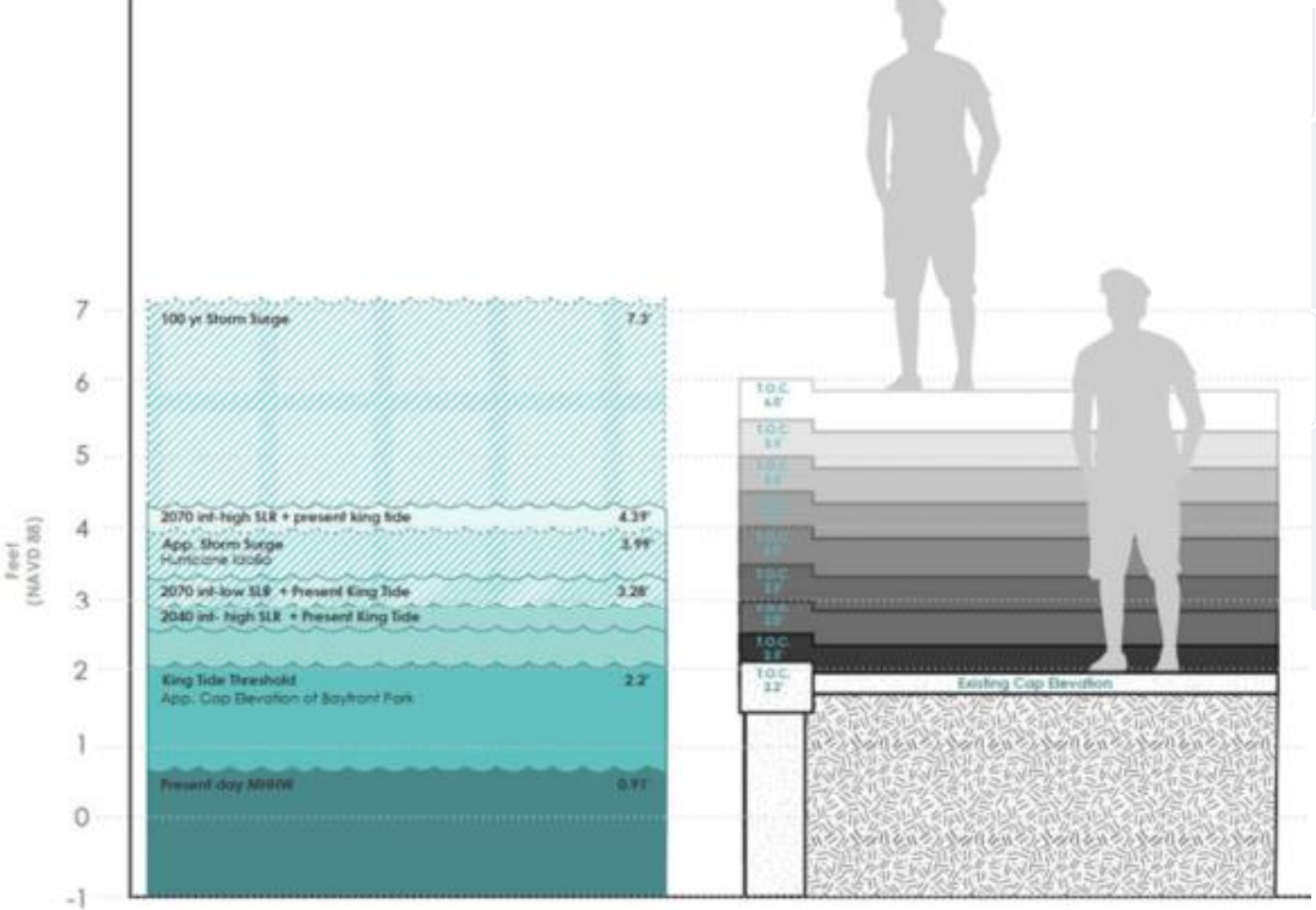

Hurricane's Helene and Milton

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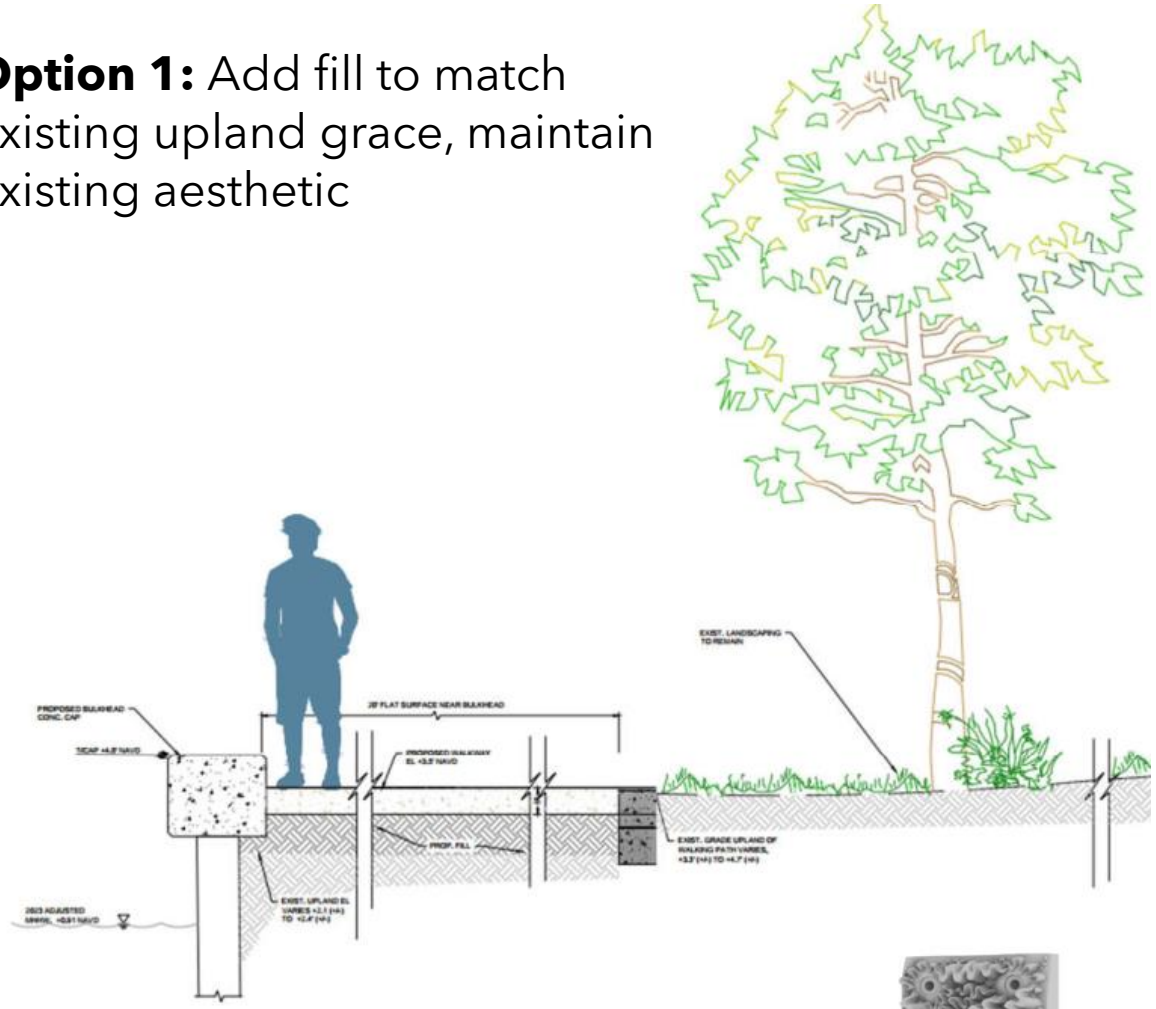
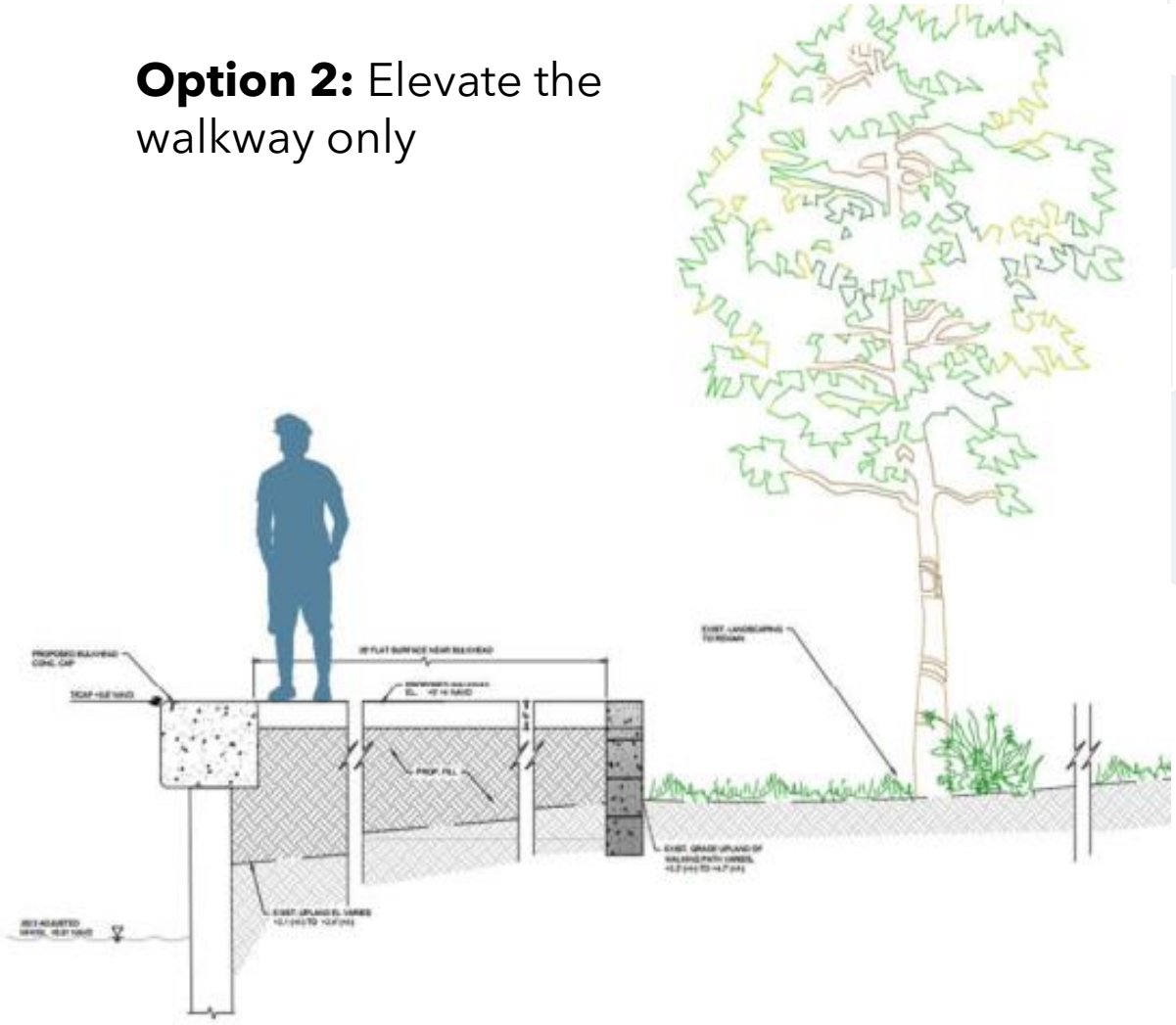
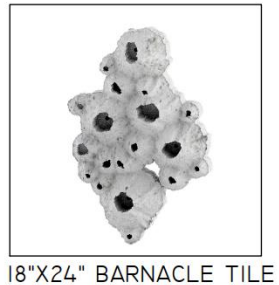
Option 1: Add fill to match existing upland grace, maintain existing aesthetic



Option 2: Elevate the walkway only





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Thank You!

SCAN ME

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Some Takeaways:

- Recognize shorelines as the 'first line of defense'
- Don't forget about the back bay shorelines!
- Consider development of a shoreline inventory – use available resources as a starting point
- Understand infrastructure service life and conditions
- Look for opportunities to add NBS
- Leverage funding opportunities when possible.