Sponsored by Jamestown Conservation Commission

Sea Grant
RHODE ISLAND

Spring 2025

Photo by Hongbing Tang

Community Engagement Workshop

Reimaging Mackerel Cove Beach & Sheffield Cove Waterfront

LAR445 Integrated Capstone Class
OCE 496/CVE 498 Senior Capstone class

February 20, 2025

College of the Environment & Life Sciences
College of Engineering

Community Engagement Workshop Agenda:

- **Pizza & social time: 6:00-6:30pm**
- **Presentation at 6:30pm**
- **Group activities starting around 7:00pm**
- **Workshop end time: 8:00pm**


Sheffield Cove
Beavertail Rd
Town Beach
Mackerel Cove
0'
60'
120'
240'

Mackerel Cove Dune Reconstruction

Logan Bukowski and Eva Davet

OCE 496/CVE 498 Senior Capstone Design Project

02/20/2025

Josette Audi, Chris Ferretti, Israel Karubaba, Amanda Missing & Jonah Mroz-Roakes

Professor Amini, Professor Baxter, Professor Spaulding, & Dr. Swanson

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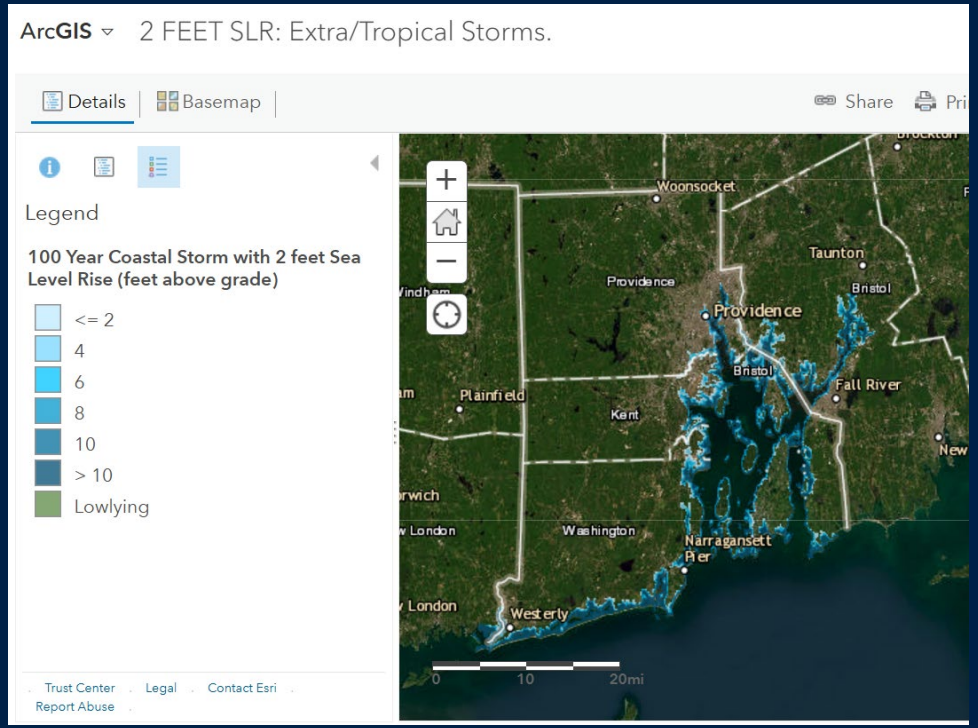
About STORMTOOLS

- Maps Storm Inundation for Coastal Rhode Island
  - With multiple Sea Level Rise (SLR) scenarios

Tools:

- STORMTOOLS for Beginners
- Advanced STORMTOOLS
- STORMTOOLS Design Elevation
- Coastal Environmental Risk Index

Developed in 2016 in RI, with research done by URI professors



STORMTOOLS For Beginners

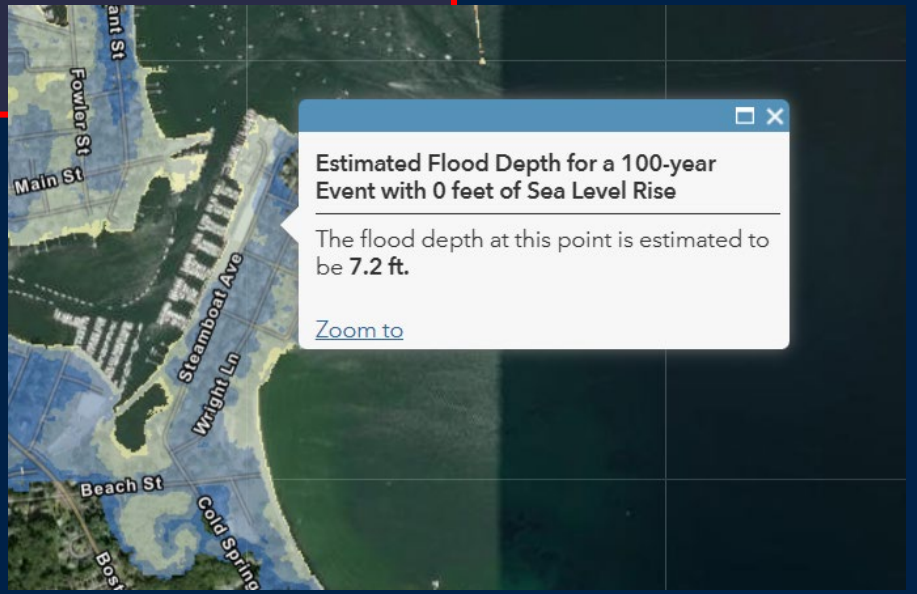
STORMTOOLS for Beginners | Advanced STORMTOOLS | RI CRMC Coastal Hazard Application | STORMTOOLS Design Elevation (SDE) | Inland STORMTOOLS | More

1. Is my property vulnerable to STORM SURGE?
2. How DEEP will the water be on my property during a 100-year (1% chance) coastal storm?
3. Will projected SEA LEVEL RISE affect my property?

Legend

Is my property vulnerable to a 100-year return period (1% annual chance) COASTAL STORM, and how DEEP will the water be?

- <= 4
- 8
- 12
- 16
- 20
- 24
- > 24



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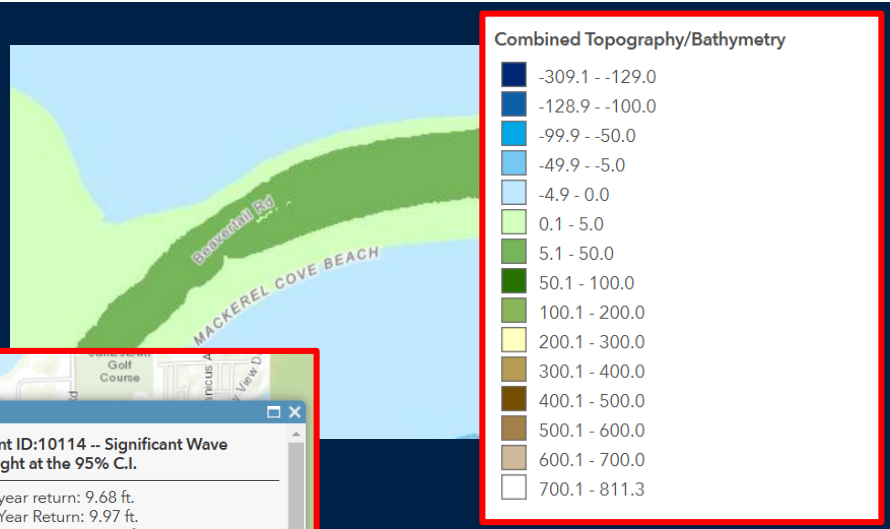
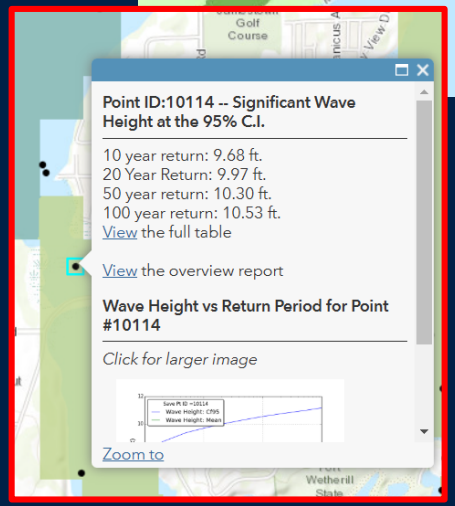
[2] STORMTOOLS Hub

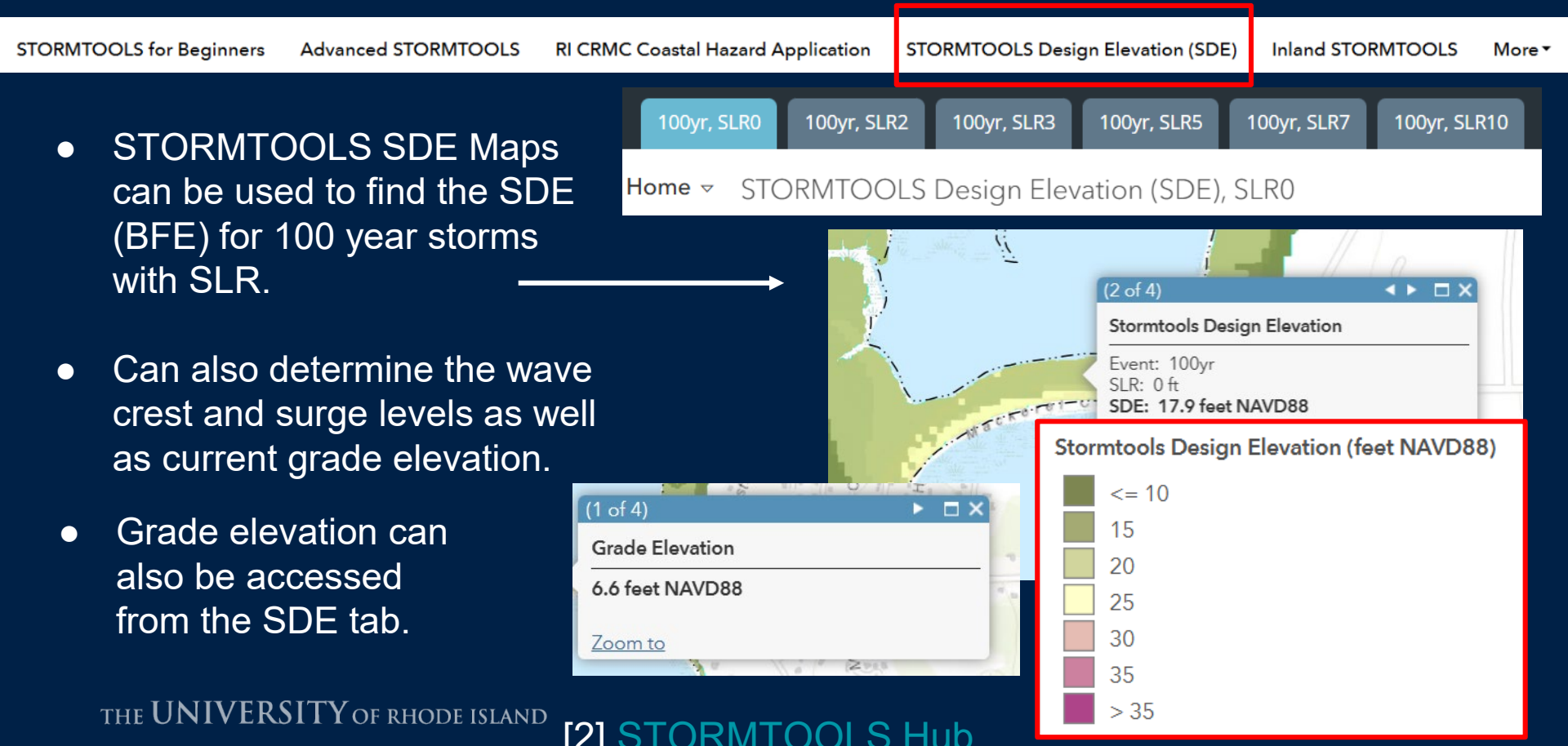
Advanced STORMTOOLS

- STORMTOOLS Advanced can be used for Topography and Bathymetry.
- NACCS Save Points are available here with wave heights and water levels.
- Storm return period with varying levels of SLR can also be visualized.





STORMTOOLS Design Elevation (SDE)



- STORMTOOLS SDE Maps can be used to find the SDE (BFE) for 100 year storms with SLR.
- Can also determine the wave crest and surge levels as well as current grade elevation.
- Grade elevation can also be accessed from the SDE tab.

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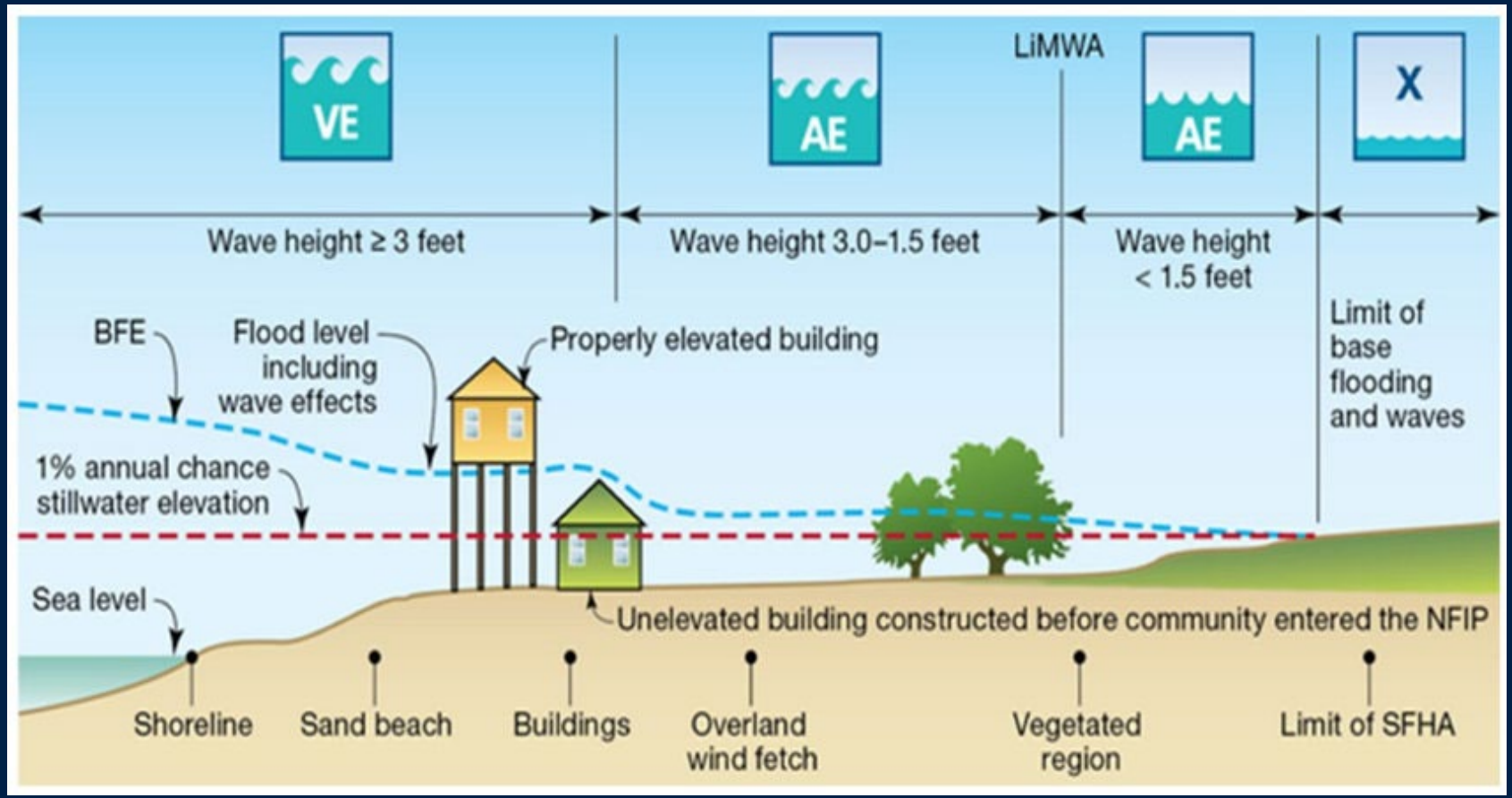
[2] STORMTOOLS Hub

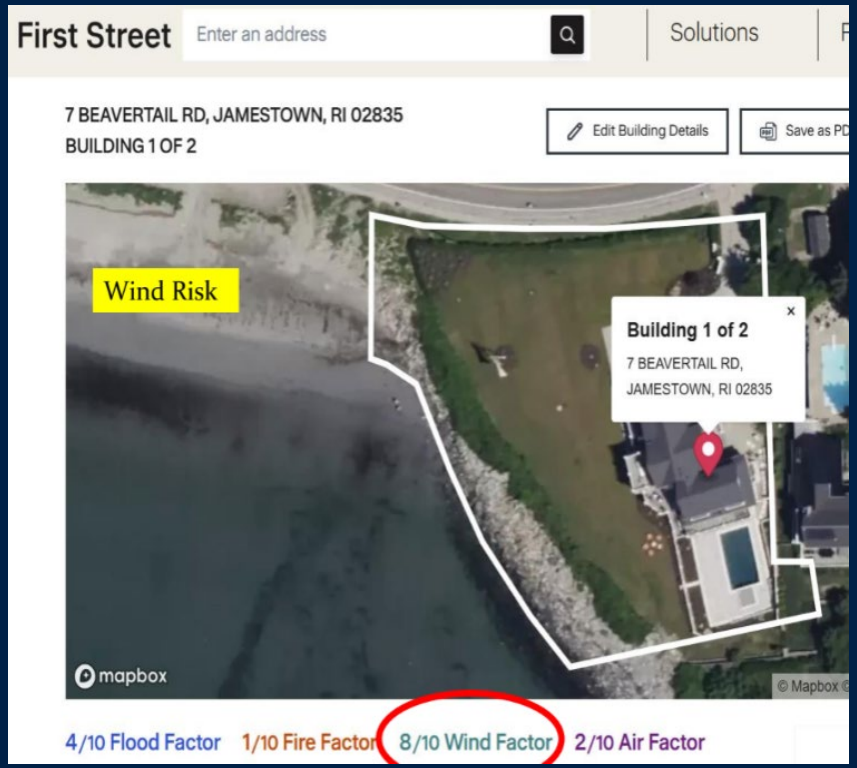
Base Flood Elevation (BFE)



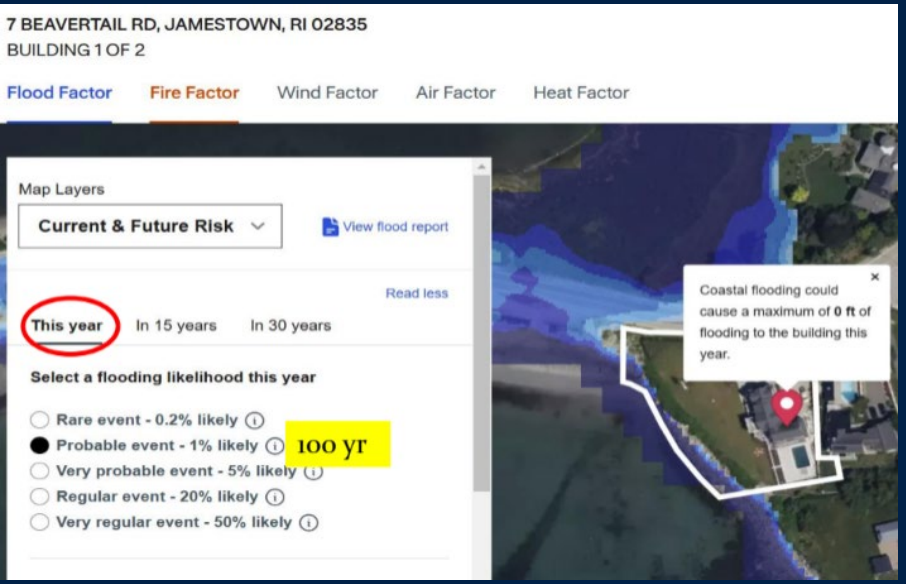
[1]

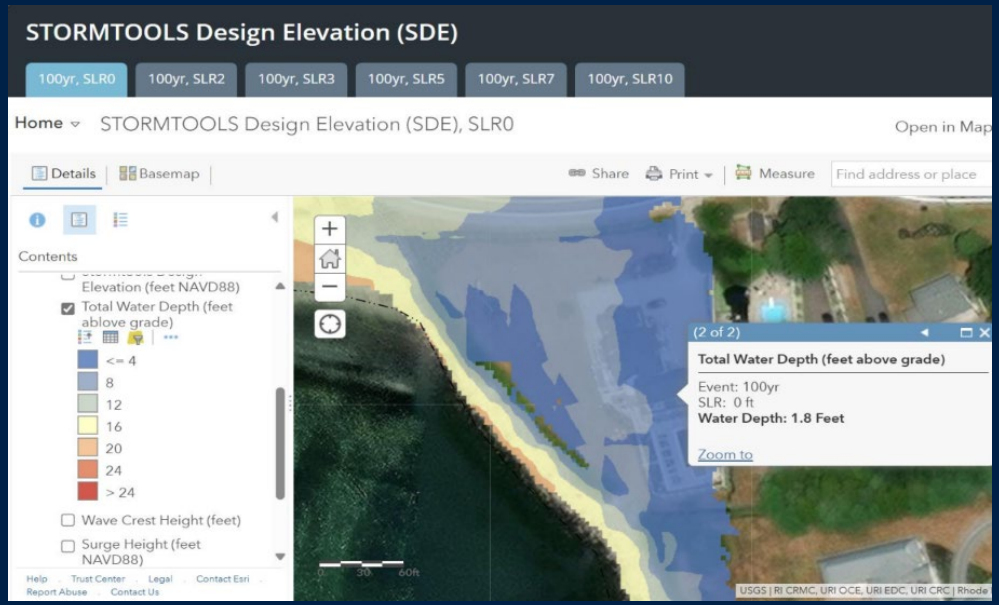
About First Street Foundation

- Aims to connect climate change and financial risk at scale for financial institutions, companies, and governments
  - With multiple SLR scenarios
- Provides comprehensive set of climate hazards including:
  - Flooding
  - Winds
  - Wildfire
  - Extreme heat
  - Air quality
- Conducts scenario analysis to determine the financial risks from extreme climates
- The macroeconomic module quantifies how climate risks will impact insurance prices, population migration, HPI (House Price Index), and property values.



First Street Foundation vs STORMTOOLS





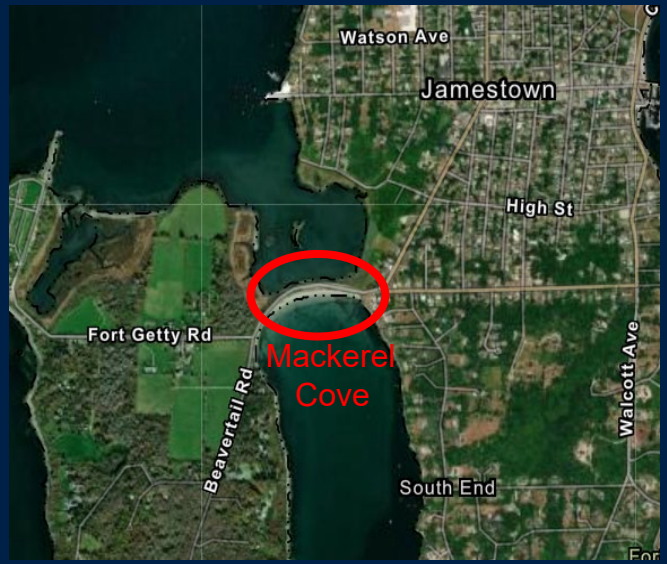
Federal Emergency Management Agency Cost Benefit Analysis

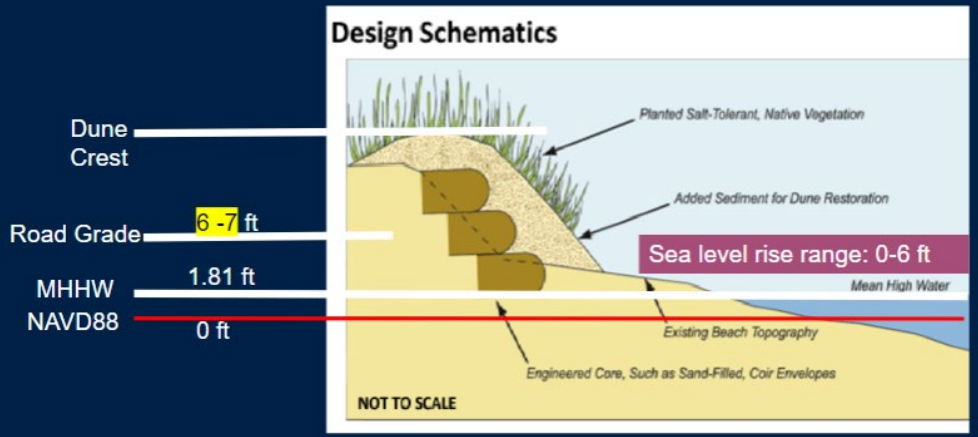
- Cost benefit analysis (CBA) can be an important tool to determine if elevating one's house is a worthwhile investment
- FEMA has developed a CBA toolkit
- The toolkit requires the following information, all of which can be found using STORMTOOLS or accessed using public tax assessment data:

FEMA CBA Toolkit

Introduction to Completed Work

Evaluate the feasibility of using reinforced dunes to mitigate flooding and erosion at Mackerel Cove Beach in Jamestown, Rhode Island.





Importance of Beavertail Road

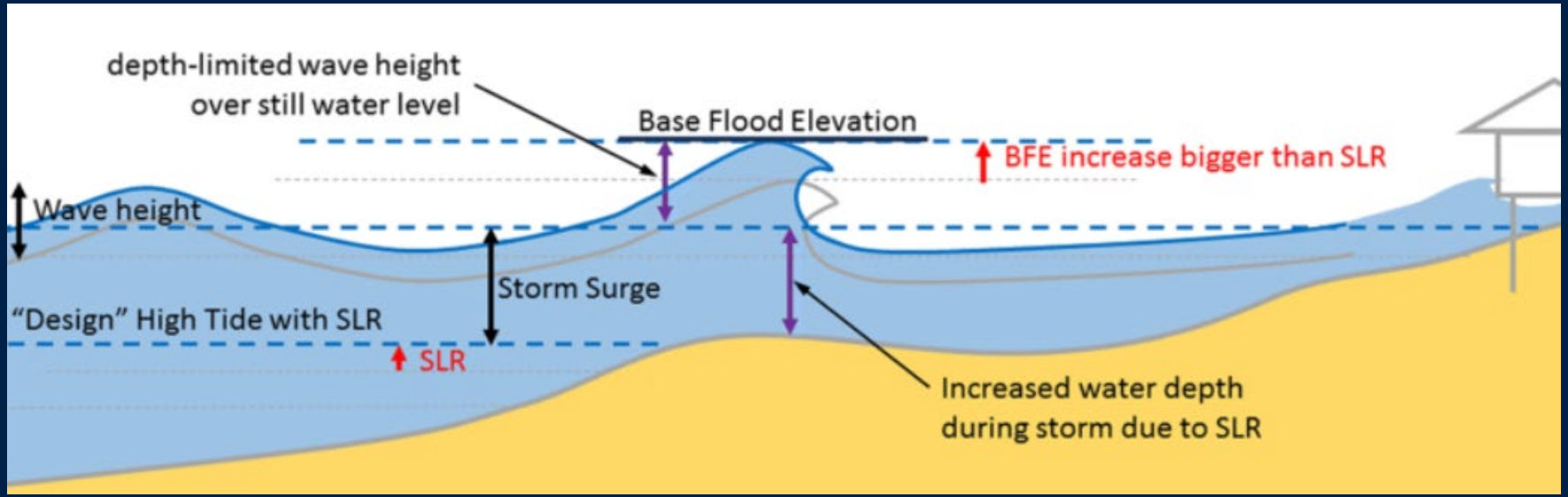
- Beavertail Road is the only roadway connecting the West and East sides of Jamestown
  - Critical evacuation infrastructure
- West of Mackerel Cove there are:
  - 186 structures (93 % residential)
  - This accounts for roughly 6.4 % Jamestown's residential buildings
  - Total parcel estimations: *$455 million*
    - Total land estimation: *$332 million*
    - Total building estimation: *$123 million*

Problem Statement

- December 23, 2022
- High tide 5.1 ft above NAVD88
- 10 yr storm

Quincy, MJ, and 12/23/2022 | 7:55 am. “Beavertail Rd.” *MyCoast*, mycoast.org/reports/99712. Accessed 7 Nov. 2024.

Design Flood Conditions

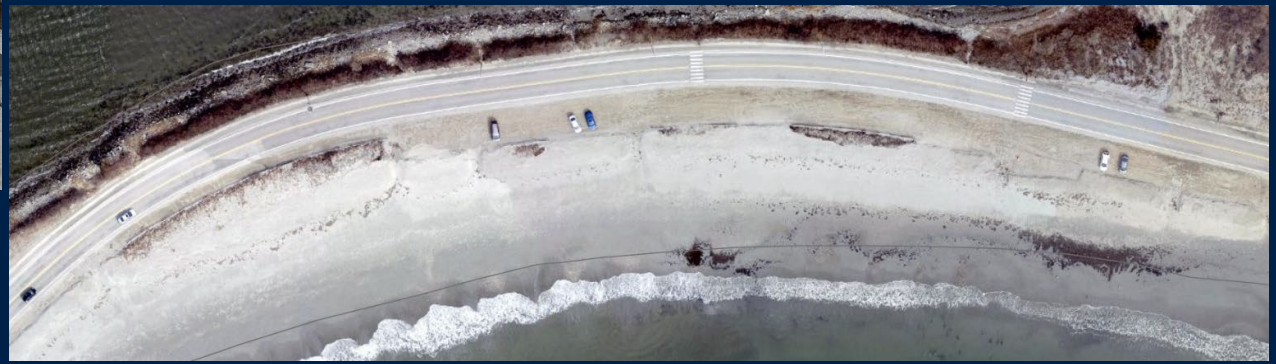


- Design a dune to an elevation of 12 ft in order to prevent flood damage against:
  - 50yr storm surge with tidal influence
  - 20yr base flood elevation

- Road elevation ~ 6.5 feet above NAVD88
- Current dune elevation~ 7 feet above NAVD88

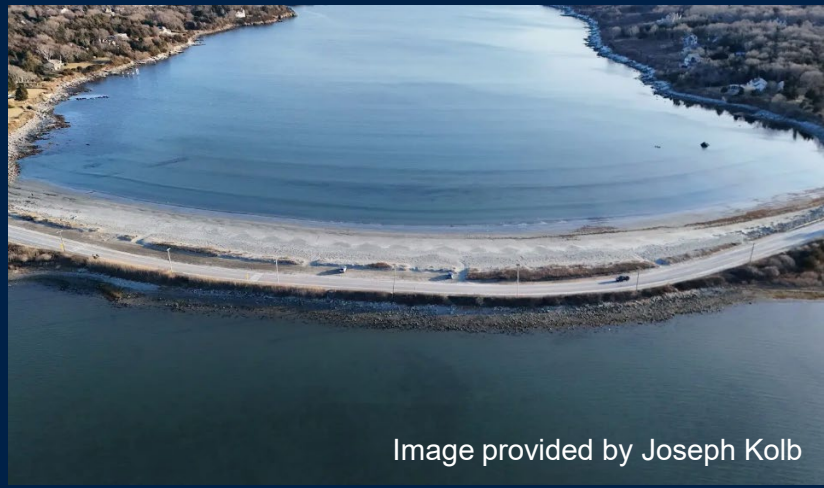
Mackerel Cove Aerial Footage 2022 vs 2024

2022

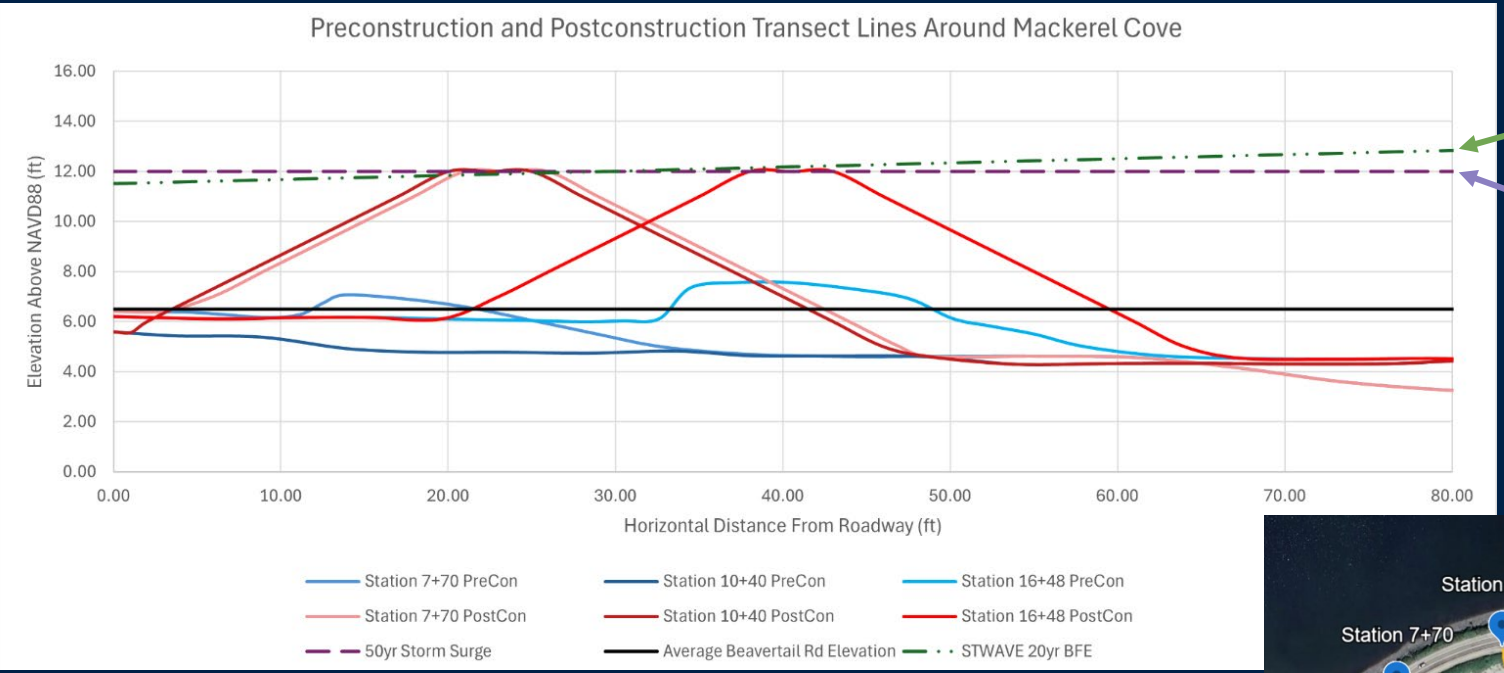


2024

Mackerel Cove Drone Footage: February 2024

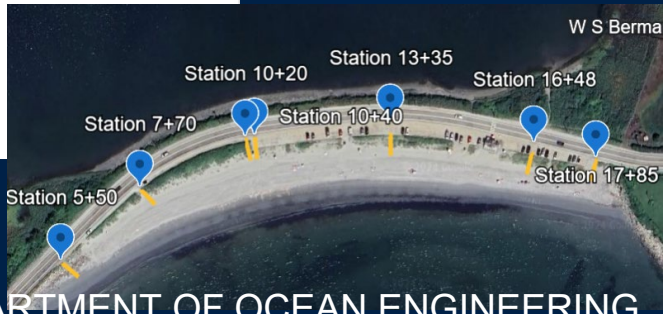


Before and After Transect Lines of Mackerel Cove



20yr STWAVE BFE

50yr NACCS Storm Surge



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DEPARTMENT OF OCEAN ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING

Preliminary Aerial Image of Reinforced Dune

Required Volume:
6,505 CY

Total Linear Ft:
1,214 ft

- Narrowest portion of beachfront ~ 65 ft
- Current design would require restructuring of the parking lot

Engineered Core Options

Geotextiles

- 10-50 year life span
- Will not degrade unless exposed to UV rays
- Synthetic material
  - Will require special exemption form from Coastal Resource Management Council
- No regular maintenance required
- More resilient in extreme environments

Coir

- 2-5 year life span
- Biodegradable, will naturally degrade over time
- Eco-friendly
  - Allowed by Coastal Resource Management Council
- Will require maintenance or replacement
- Less resilient in extreme environments

Cost Estimation

Item Number	Item	Unit Price	Quantity	Total Cost	Expected Annual Maintance Cost
Option A					
1	Sand Purchasing	$36/CY	6,505 CY	$233,601	$5,220
2	Engineering Cost	$14/CY	6,505 CY	$100,114	$2,030
3	Vegetation Plantings & Purchasing	$1.03/ft	1,214 ft	$1,350	None
4	Sand Fencing Cost	$9/ft	2,428 ft	$21,852	None
5	Dune Walkover	$150/SF	990 SF	$148,500	None
	Subtotal			$505,417	$7,250
Option B					
	Items 1-5			$505,417	$7,250
6	Geotextile Tube	$750/ ft	1,214 ft	$910,500	None
	Subtotal			$1,415,917	$7,250
Option C					
	Items 1-5			$505,417	$7,250
7	Sand Filled Coir Envelope	$350/ft	1,214 ft	$424,900	$200-$1,000
	Subtotal			$930,317	$7,450-$8,250

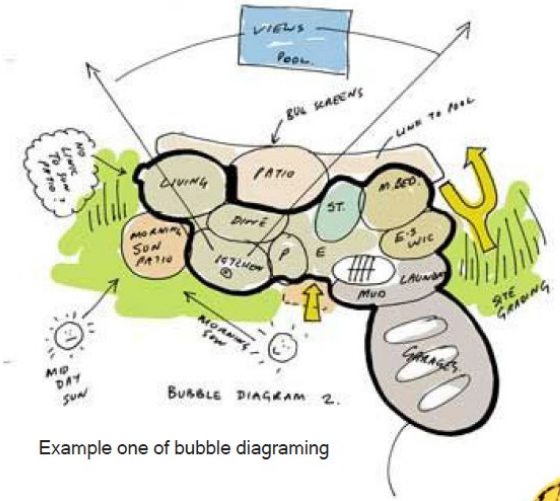
- **Final Cost Estimate of Sand Dune, *Option A*: $506,000**
- **Final Cost Estimate of Geotextile Reinforced Dune, *Option B*: $1,416,000**
- **Final Cost Estimate of Sand Filled Coir Envelope, *Option C*: $930,000**
  - Expected annual cost of sand replenishment: $7,250
  - Based on Field Monitoring of Coir and Jute Reinforced Dunes in Matunuck (pages 3&4)

Works Cited

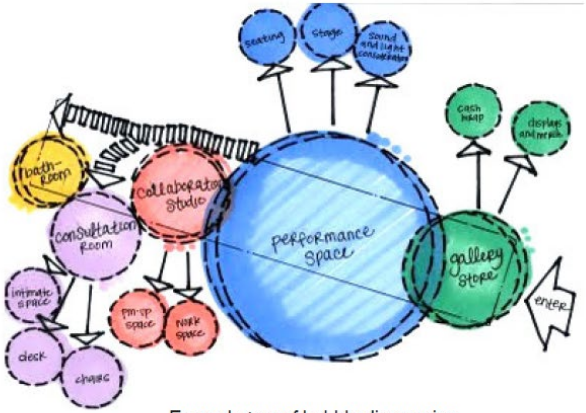
- 1. Spaulding, Malcolm & Grilli, Annette & Damon, Christopher & Hashemi, Reza & Kouhi, Soroush & Fugate, Grover. (2020). Stormtools Design Elevation (SDE) Maps: Including Impact of Sea Level Rise. Journal of Marine Science and Engineering. 8. 292. 10.3390/jmse8040292.
- 2. Spaulding, M. L., T. Isaji, C. Damon, and G. Fugate, 2015. Application of STORMTOOLS's simplified flood inundation model, with and without sea level rise, to RI coastal waters, ASCE Solutions to Coastal Disasters Conference, Boston, MA, September 2015.
- 3. Spaulding ML, Grilli A, Damon C, McKenna B, Christensen M, Vinhateiro N, Boyd J, Fugate G. STORMTOOLS, Coastal Environmental Risk Index (CERI) Risk and Damage Assessment App. Journal of Marine Science and Engineering. 2020; 8(2):129. https://doi.org/10.3390/jmse8020129
- 4. Nantucket MA 2014 Ata. "Reinforcing Dunes and Bluffs with Geosynthetics." Geosynthetics Magazine, 9 June 2019, geosyntheticsmagazine.com/2019/10/01/reinforcing-dunes-and-bluffs-with-geosynthetics/.
- 5. Giannakos, Samuel. Field Monitoring of Coir and Jute Reinforced Dunes in Matunuck, Rhode Island. 2012 Looking East to West along the beach in front of 1117 Succotash Road 2012
- 6. " NACCS Water Levels for 100yr Event." Edc.Maps.Arcgis.Com, NACCS, edc.maps.arcgis.com/home/webmap/viewer.html?webmap=792b5411c93f46a8809611ffb5899832. Accessed 7 Nov. 2024.
- 7. Amini, Mehrshad. FEMA BCA_Amini.
- 8. Northeast Ocean Council. "Dune - Engineered Core Design Schematics Cost ..." Dune - Engineered Core, www.northeastoceancouncil.org/wp-content/uploads/2019/01/Living-Shoreline-Profile_Dune_Engineered-Core-1.pdf. Accessed 7 Nov. 2024.

Community Engagement Workshop Agenda:

- General question boards
- Activity survey
- Visual preference survey
- Mini-design Charrette



Example one of bubble diagraming



Example two of bubble diagraming

Bubble Diagram