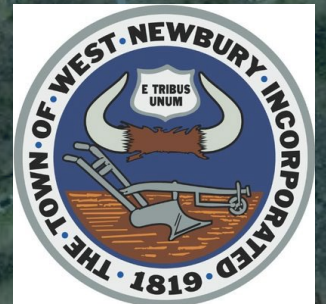




GEI
Consultants



Gulf of Maine
Research Institute



River Road Flood Vulnerability and Adaptation Study Town of West Newbury, Massachusetts

Town Projects Fair and Forum, November 9th, 2023
Leila Pike, P.E. (GEI) and Gayle Bowness (GMRI)

Presentation Outline

1. MVP Program
2. Project Goals and Methods
3. Community Engagement Events
4. Next Steps

Municipal Vulnerability Preparedness (MVP) Program



- Provides funding and support for cities and towns to identify climate hazards, assess vulnerabilities, and develop action plans to improve resilience to climate change
- Emphasizes community participation and feedback
- \$150,000 to the Town of West Newbury in latest grant funding



Project Goals and Methods

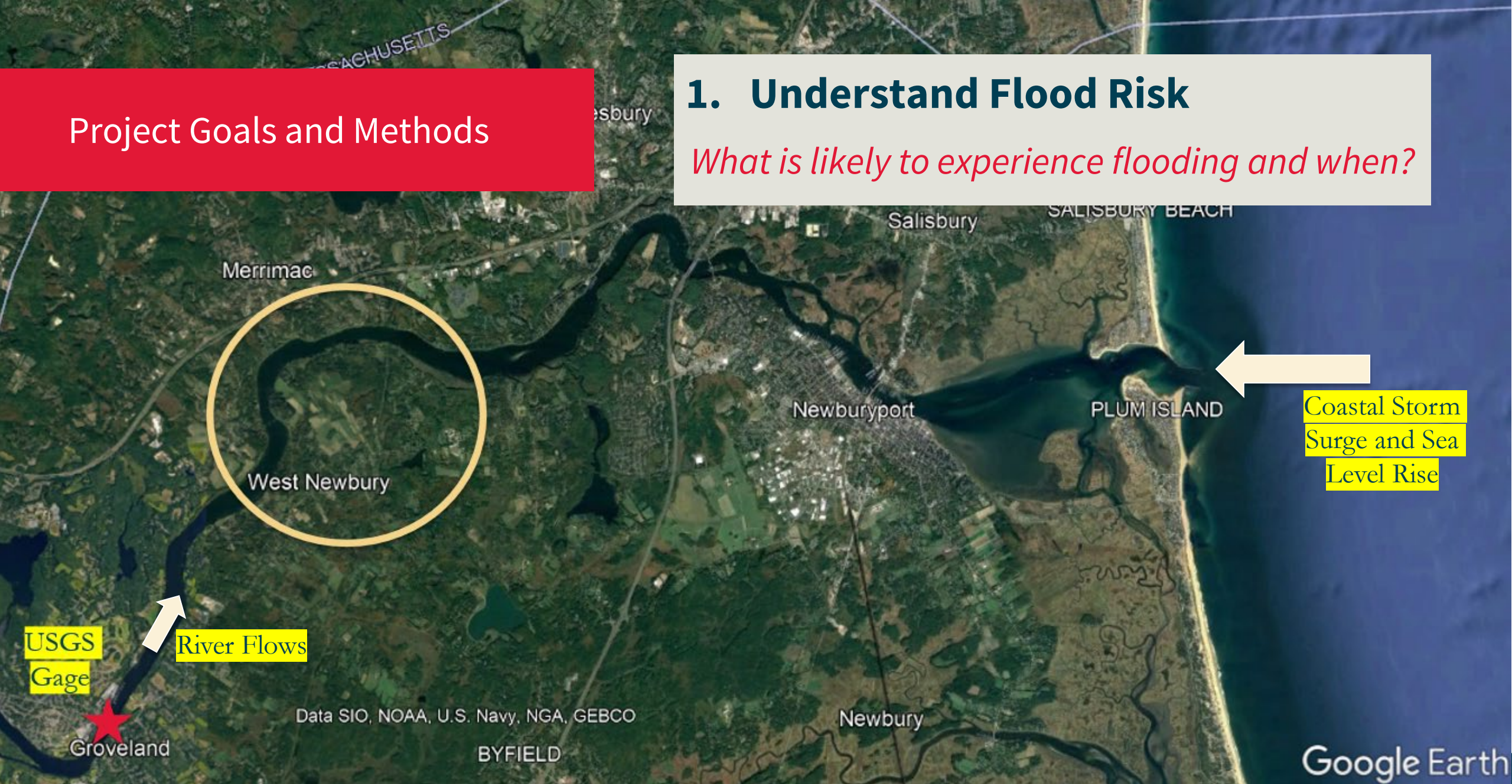
1. Understand flood risk near River Road
2. Identify areas of bank erosion
3. Evaluate culvert conditions and capacity
4. Introduce flood adaptation and bank stabilization options

Emphasis on Community Engagement

Project Goals and Methods

1. Understand Flood Risk

What is likely to experience flooding and when?



Project Goals and Methods

Tidally-Influenced River

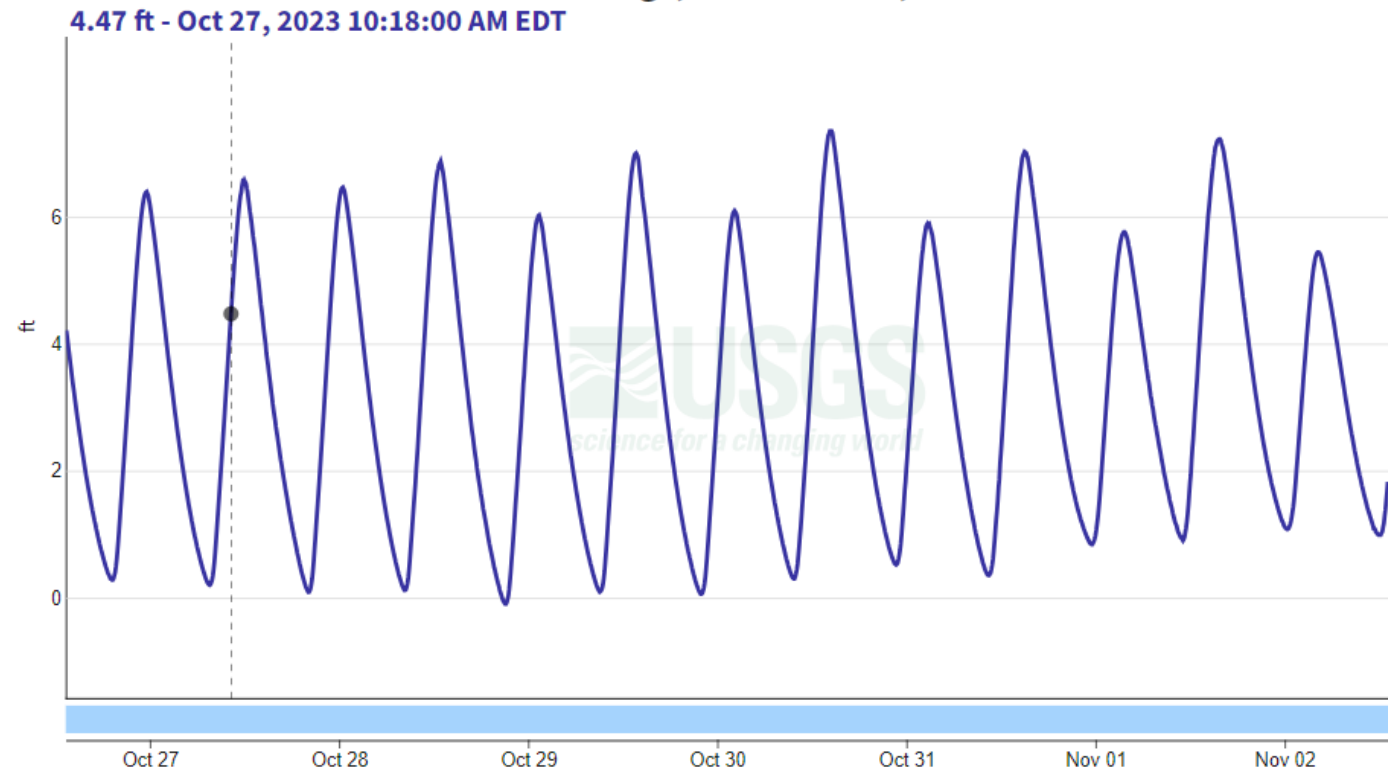
Flooding due to:

- Coastal Storm Surge
- Sea Level Rise
- Extreme Riverine Events
(not included in this study)

Merrimack River at Bates Bridge Near Haverhill, MA - 011006988

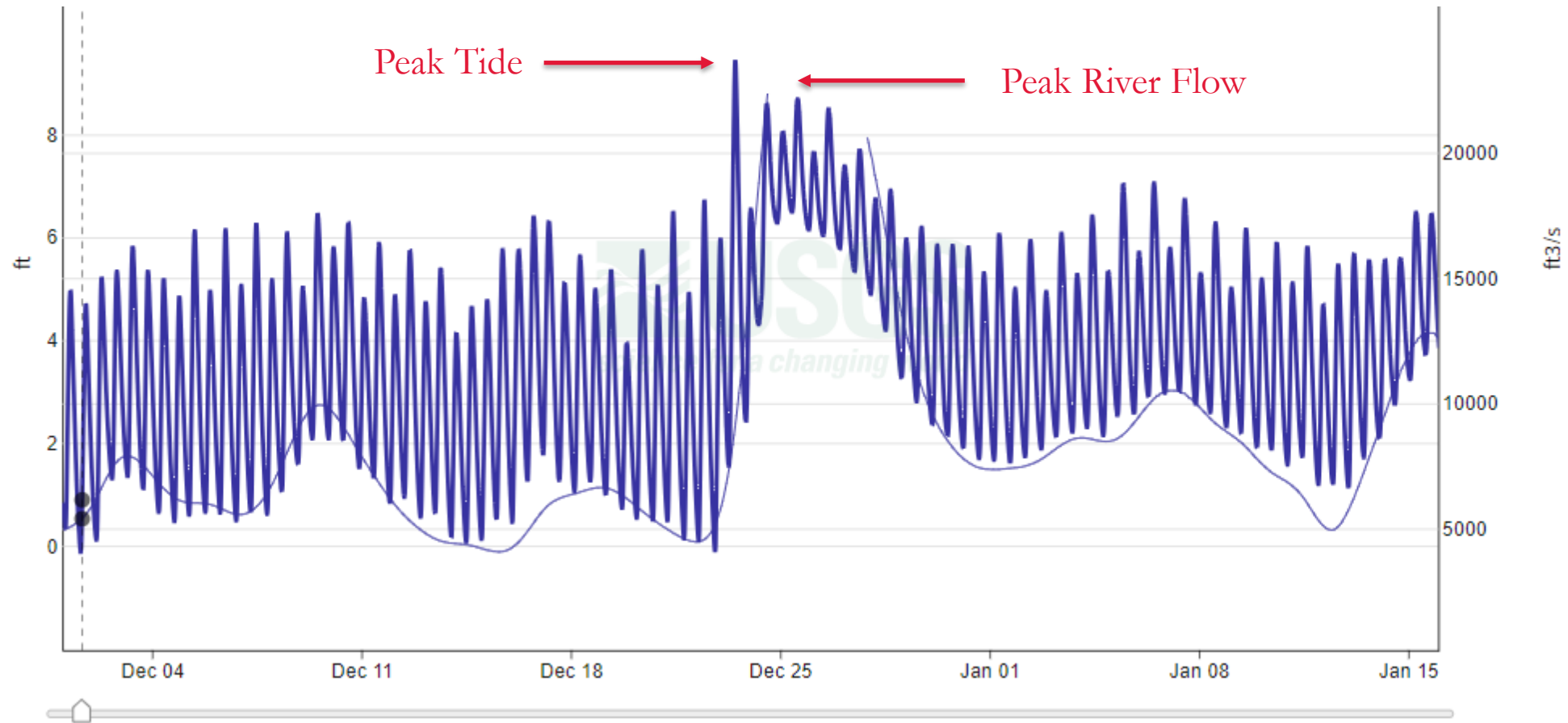
October 26, 2023 - November 2, 2023

Tide stage, above datum, feet



Project Goals and Methods

December 23, 2022 - Storm Event USGS Gage Measurements, Haverhill



Project Goals and Methods

1. Understand Flood Risk

- Coastal Storm Surge
- Sea Level Rise

Three Timeframes:

- Near-Term
- Medium-Term
- Long-Term



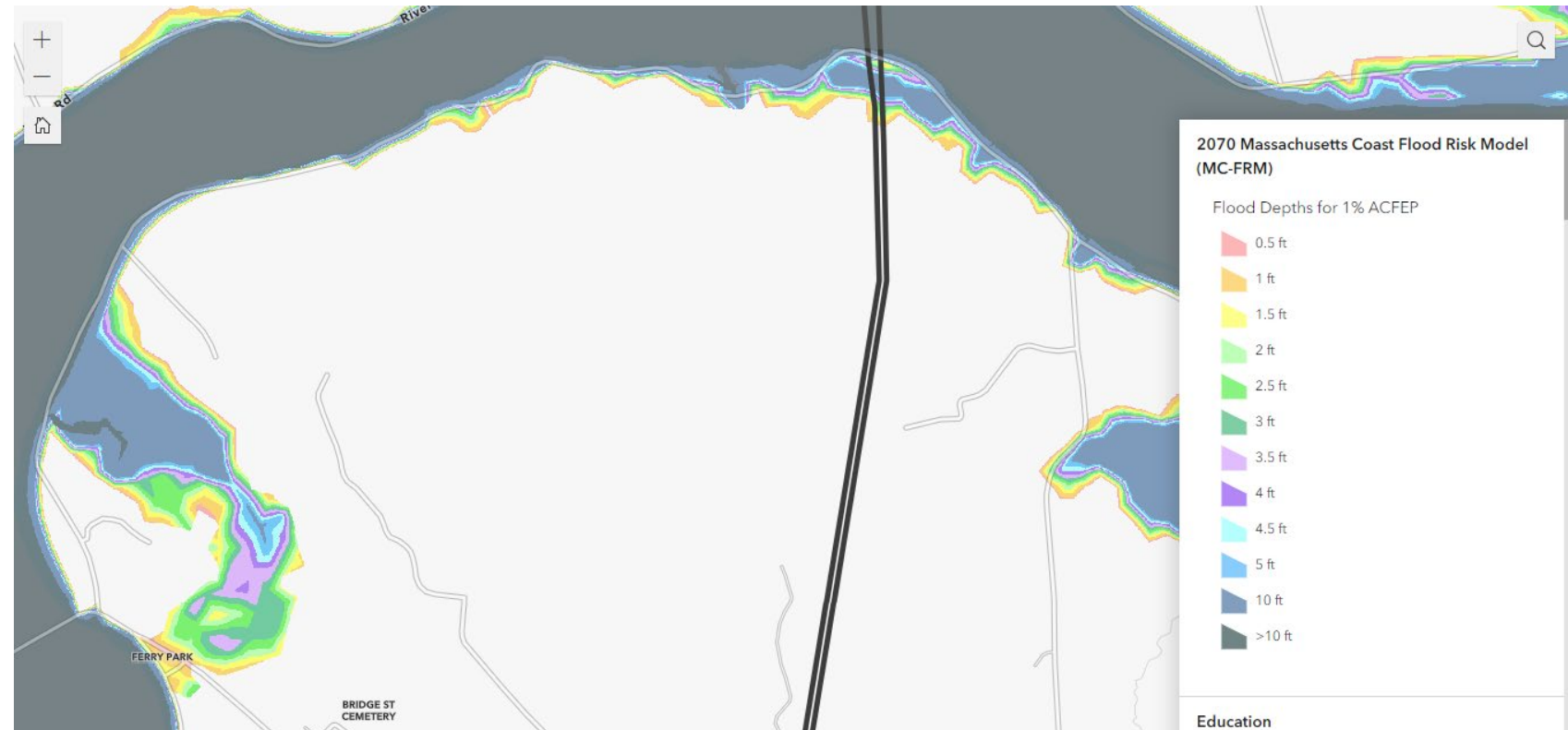
*Coastal Storm Surge Flooding along River Road
December 23, 2022*

Project Goals and Methods

Massachusetts Coastal Flood Risk Model (MC-FRM)

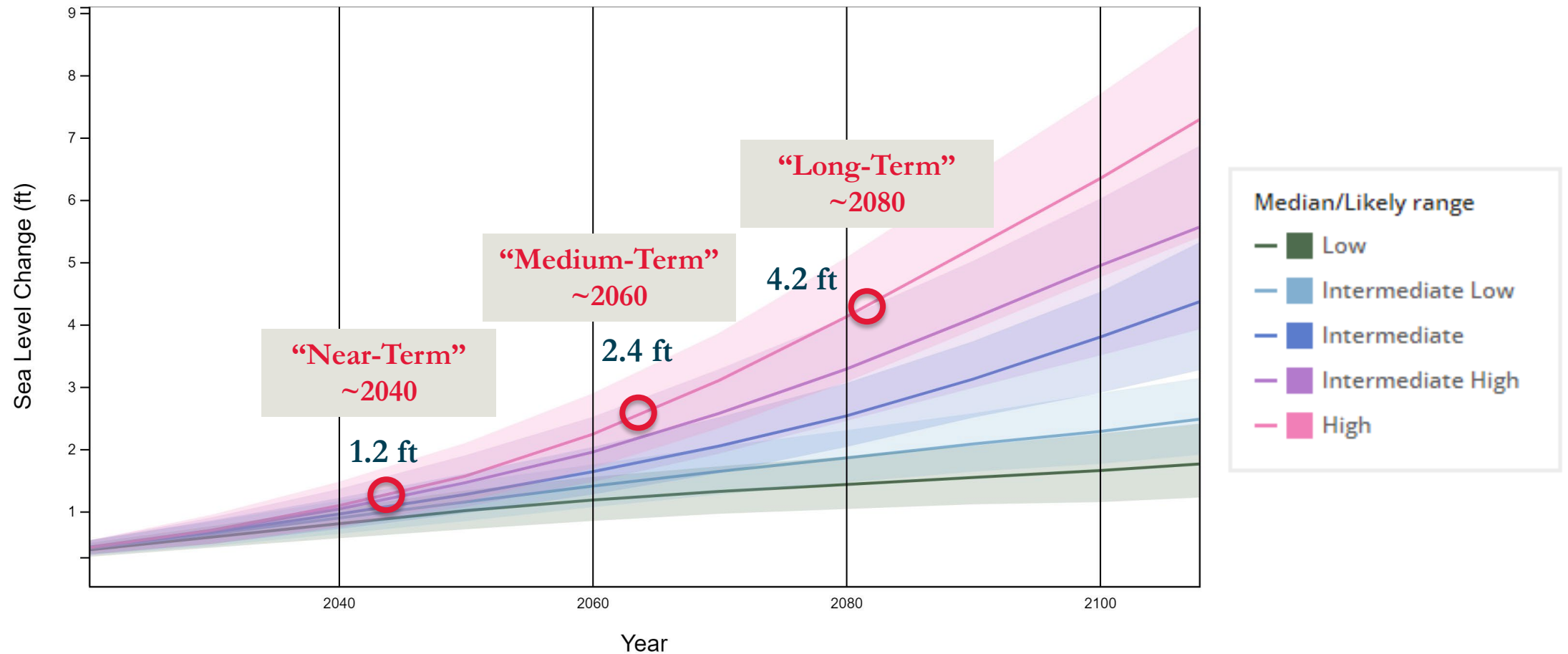
MC-FRM will provide flood depths and extents for:

- 1% annual chance coastal events, i.e., “100-year storms”
- Sea Level Rise
- 3 Timeframes



Project Goals and Methods

NOAA 2022 Sea Level Rise Projections *Boston*



Project Goals and Methods

2. Identify Areas of Bank Erosion

- Historical Imagery
- Drone Survey – *Stay Tuned!*



*Erosion along River Road after
March 15, 2023 Storm Event*

Project Goals and Methods

3. Evaluate Culverts

- **Field survey** to locate, document, survey, and measure existing infrastructure
- **Hydraulic model** to understand capacity limitations that may contribute to overland flooding

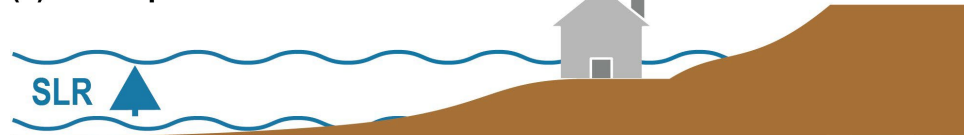


April 2007 Flooding

Project Goals and Methods

4. Introduce Adaptation and Stabilization Options

(a) No response



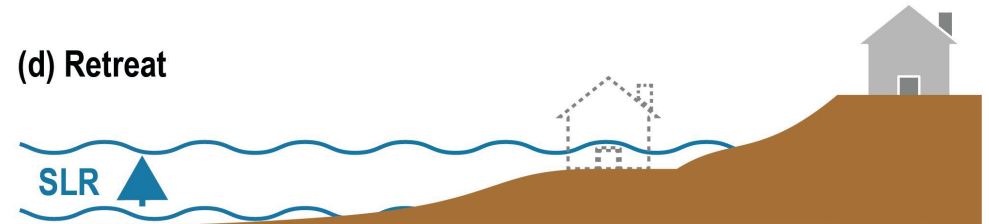
(b) Advance



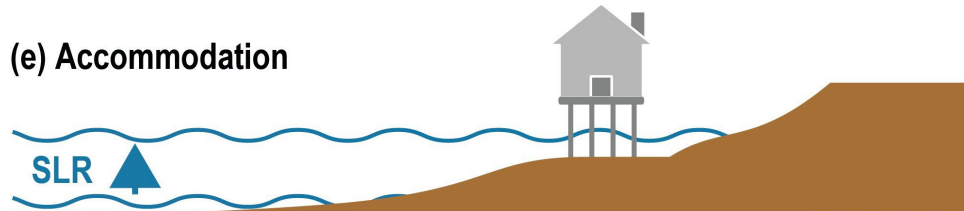
(c) Protection



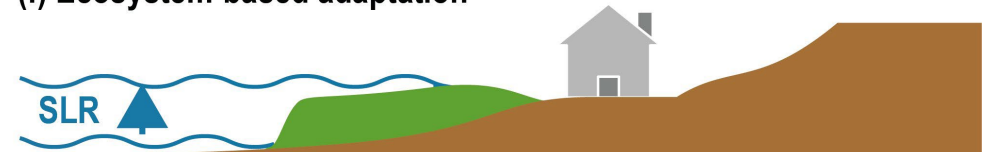
(d) Retreat



(e) Accommodation



(f) Ecosystem-based adaptation



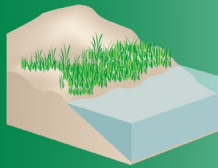
From IPCC (2019) Chapter 4, Box 4.3, Fig. 1

4. Introduce Adaptation and Stabilization Options

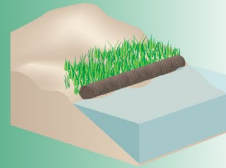
GREEN - SOFTER TECHNIQUES

GRAY - HARDER TECHNIQUES

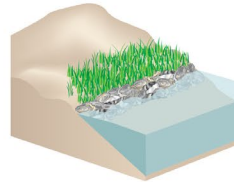
Living Shorelines



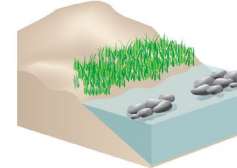
VEGETATION ONLY -
Provides a buffer to upland areas and breaks small waves. Suitable for low wave energy environments.



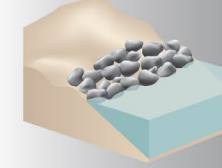
EDGING -
Added structure holds the toe of existing or vegetated slope in place. Suitable for most areas except high wave energy environments.



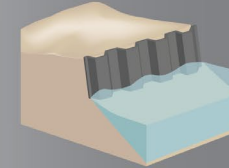
SILLS -
Parallel to vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.



BREAKWATER -
(vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.



REVETMENT -
Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with existing hardened shoreline structures.



BULKHEAD -
Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for high energy settings and sites with existing hard shoreline structures.

NOAA, Habitat Blueprint (2016)

Upcoming Community Events

- Drone survey, meet with GEI Engineers - *Week of Nov. 27th, Day TBD*
- Community Presentation on Sea Level Rise - *Dec. 7th, 6-7:30 pm (virtual)*
- Contribute data through Community Science - *Jan. – Apr. 2024 (ongoing)*
- Interactive Community Maps - *May 2024 (online)*
- Community Site Visits, Community Meeting, Final Report - *June 2024*

Example Projects/Products



Example Projects/Products

FAQ Partners

Welcome to the Ecosystem Investigation Network

[View Projects](#)

Working together to understand change in the Gulf of Maine and its watershed

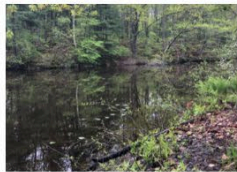
Example Projects/Products



Portland South Portland Belfast Vinalhaven Saint George



Long Creek Trail



Clarks Pond Trail



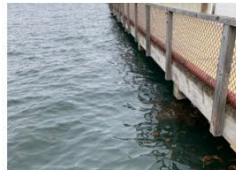
Yerxa Park



Anthoine Creek



Mill Creek Park



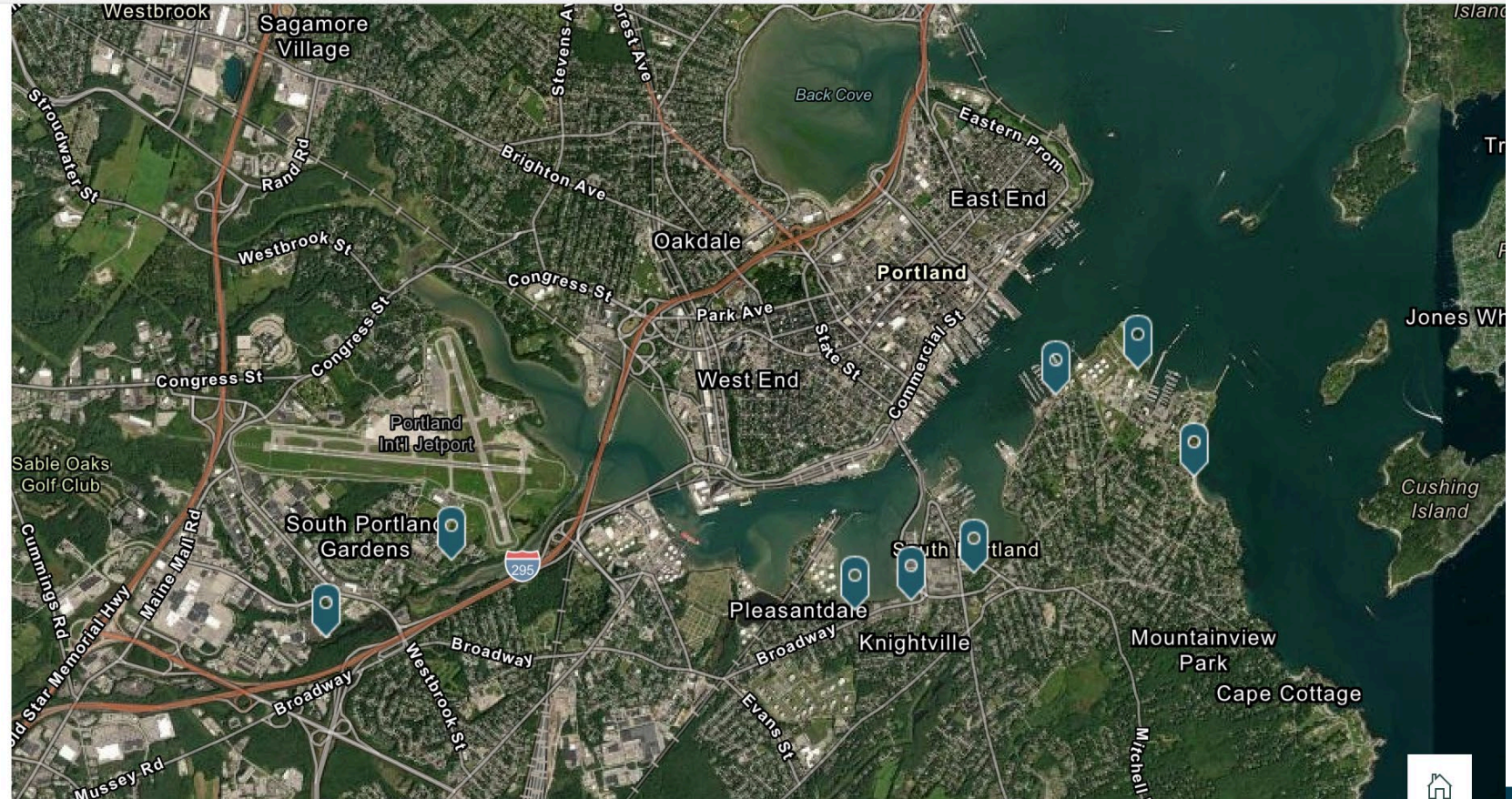
Portland Street Pier



Bug Light State Park














Willard Beach



Example Projects/Products



Example Projects/Products

Date ▼	Time	Site Name	Photo 1	Level of concern
<input type="text" value="mm/dd/yyyy"/> 				
to				
<input type="text" value="mm/dd/yyyy"/> 		<input type="text" value="South Portland - Bug Light Park"/>  		<input type="text" value="Filter..."/> 
11/30/2022	10:00	South Portland - Bug Light Park		 It's not flooding here today
01/17/2022	10:25	South Portland - Bug Light Park		 If it happened frequently, this would be a problem
01/03/2022	11:00	South Portland - Bug Light Park		 Not a problem

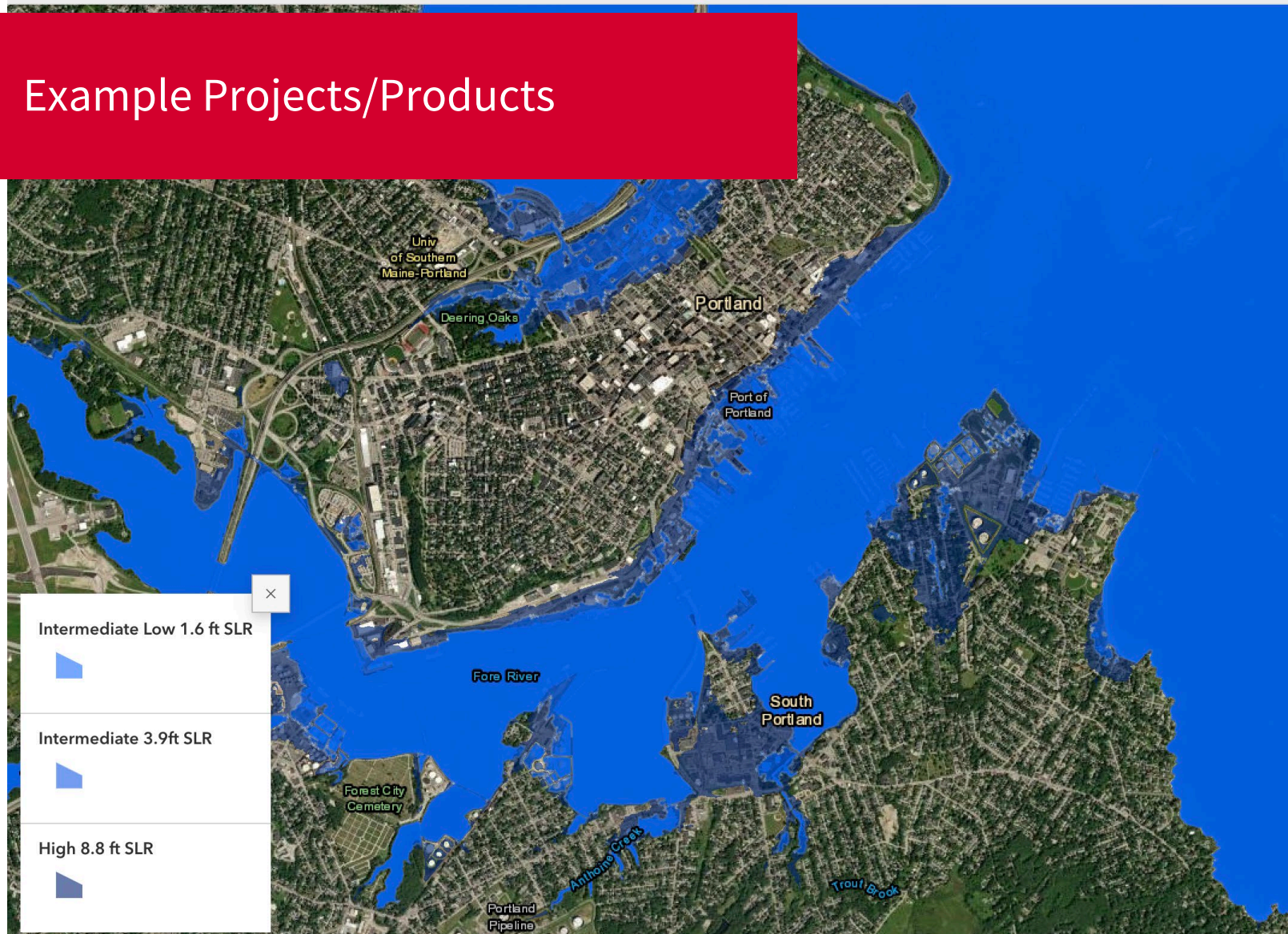
Example Projects/Products

Preparing for Coastal Flooding in South Portland

How can we inspire, prioritize, and invest in equitable actions that strengthen our community?

March 28, 2023

Example Projects/Products



Sea Level Rise

You may have read or heard about an increase in coastal flooding events lately, seen higher than usual tides, or perhaps even experienced flooding on your coastal property or an increase in flood insurance rates. That is because sea levels are rising, and in recent decades, the rate of rise has begun accelerating.

The two major causes of global sea level rise are thermal expansion caused by the warming of the ocean and an increased melting of land-based ice, such as glaciers and ice sheets. Here, in the Gulf of Maine, we are experiencing a rate of rise that is higher than the global average.

Higher sea levels mean more

Example Projects/Products

As seas rise and we experience higher tides, we become more vulnerable to flooding from coastal storms. For example, on December 23rd, 2022 a storm surge of 2.4 feet happened during an 11.3 foot tide. The resulting water level of 13.7 feet came close to Maine's highest recorded water level of 14.1 feet which occurred during the blizzard of 1978.

Swipe side to side on the map below to explore flood models of what the predicted high tide on December 23rd would have looked like on a calm day (LEFT), and the impacts of the resulting storm (RIGHT).



Left: 12 foot tide (Bathtub Model) and Right: 10 foot tide with 1.5 ft SLR with 100-year storm event (Dynamic Flood Model)

Thank you!
Questions?



Consulting
Engineers and
Scientists

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