

A nighttime photograph of the Boston waterfront. In the foreground, a dark wooden building with a sign that reads "BOSTON TEA PARTY SHIPS & MUSEUM" is visible. The building has several windows with white frames. In the middle ground, a large, multi-decked boat is docked at a pier. The water is dark and reflects the lights from the buildings and the boat. In the background, several tall skyscrapers are lit up, and a bridge is visible in the distance. The sky is a deep blue.

Coastal Flood Resilience in Boston

From Planning to Implementation

Agenda

- Coastal Flooding Overview
- Planning
- Implementation
- Bigger Picture & Summary

Boston's Historic Coastline

- About one-sixth of Boston sits on landfill
- The filled land, often the lowest-lying, sees the highest coastal flooding risks



Flooding beneath the Evelyn Moakley Bridge in South Boston's Fort Point Channel (Source: Alison Brizius, December 2022)



Types of Coastal Flooding

What types of flooding do we plan and design for?



SEA LEVEL RISE

Permanent rise in ocean level relative to land



STORM SURGE

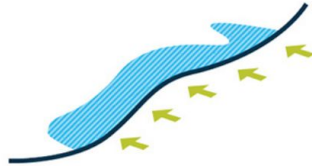
Temporary rise in ocean level during a storm event



WAVE ACTION & EROSION

Gradual reduction in the coastline as waves carry away sediment

How does flooding enter a community?



FRINGE FLOODING

Impacts low-lying areas along the waterfront as water levels rise above the ground elevation



FLOOD PATHWAY

Impacts inland areas when water enters through a low-lying area on the waterfront

Coastal Flooding in Boston in 2018 and 2022



Flooding from during Winter Storm Riley in Boston's North End
(Source: Matt Conti, Winter, 2018)



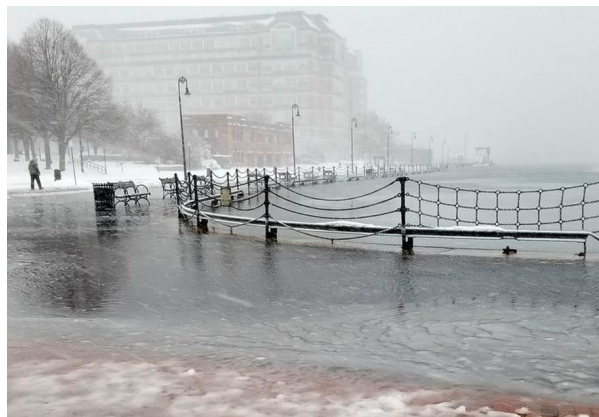
Flooding along the Mary Ellen Welch Greenway in East Boston
(Source: Lisa A. DiFrisco, Winter 2018)



Flooding beneath the Evelyn Moakley Bridge in South Boston's Fort Point Channel
(Source: Alison Brizius, December 2022)



Man kayaks along surface streets near Lewis Mall in East Boston
(Source: Steve Holt, Winter 2018)



Flooding along the Harborwalk in the Charlestown Navy Yard
(Source: Gerry Angoff, Winter 2018)



Flooding along the Harborwalk in Downtown Boston
(Source: Alison Brizius, December 2022)

Sea Level Rise Projection

Projected Sea Level Rise and 1% Annual Chance Flood Elevations

Flood elevations vary across the district and across the City. The example here shows how elevations change over time as a result of sea level rise in South Boston at one location along Fort Point Channel.

Data sources: Climate Ready Boston projections and Boston Harbor Flood Risk Model (BH-FRM). Elevations are reported with respect to the North American Vertical Datum of 1998 (NAVD88). NAVD88 elevations are 6.46 feet lower than Boston City Base.

RELATIVE SEA LEVEL RISE

1 % ANNUAL CHANCE FLOOD ELEVATION AT EXAMPLE LOCATION

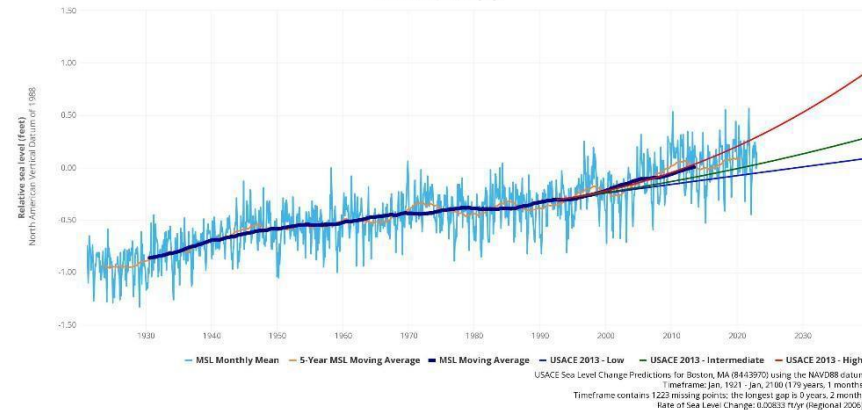
1 % ANNUAL CHANCE FLOOD DEPTH ABOVE GROUND AT EXAMPLE LOCATION

	2030s	2050s	2070s
RELATIVE SEA LEVEL RISE	9 inches	21 inches	40 inches
1 % ANNUAL CHANCE FLOOD ELEVATION AT EXAMPLE LOCATION	10.2 feet	11.3 feet	12.8 feet
1 % ANNUAL CHANCE FLOOD DEPTH ABOVE GROUND AT EXAMPLE LOCATION	2.2 feet	3.3 feet	4.8 feet

Coastal Resilience Solutions for South Boston (2018)

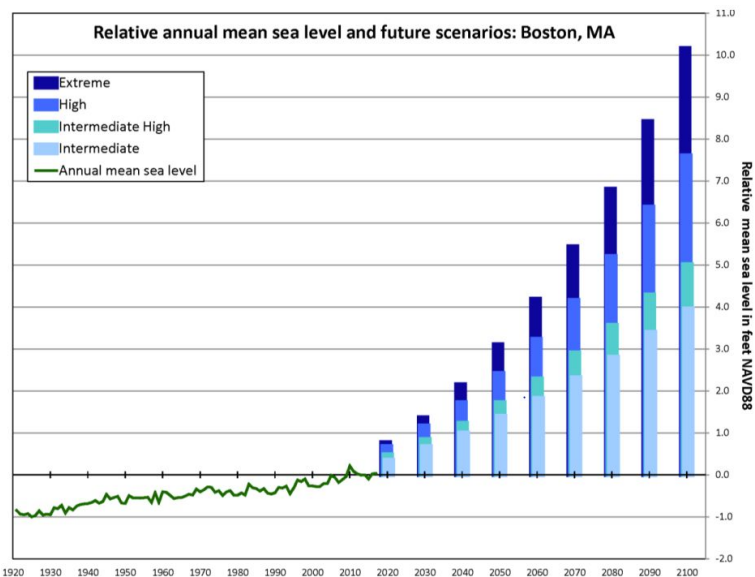
- Research confirms the risks that residents have experienced

Sea Level Data and Projections for Boston, MA (8443970)
Active and compliant tide gauge

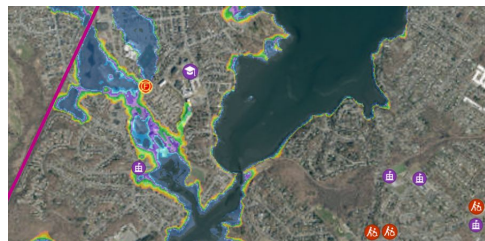


Flooding in different scenarios

- The City has utilized the Massachusetts Coast Flood Risk Model (MCFRM)



2030

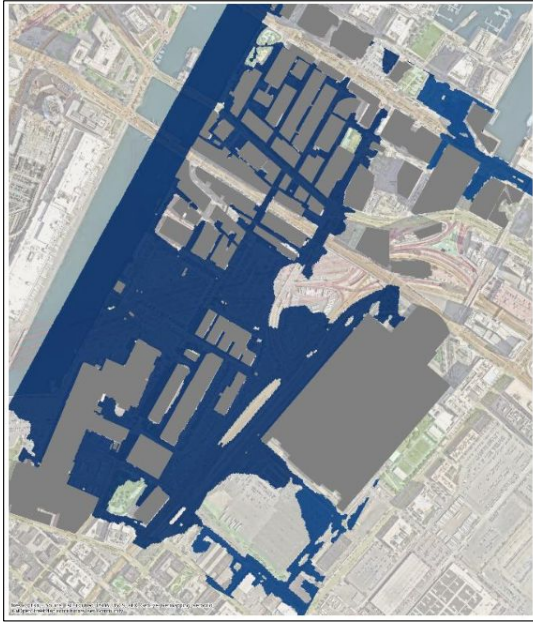


2070

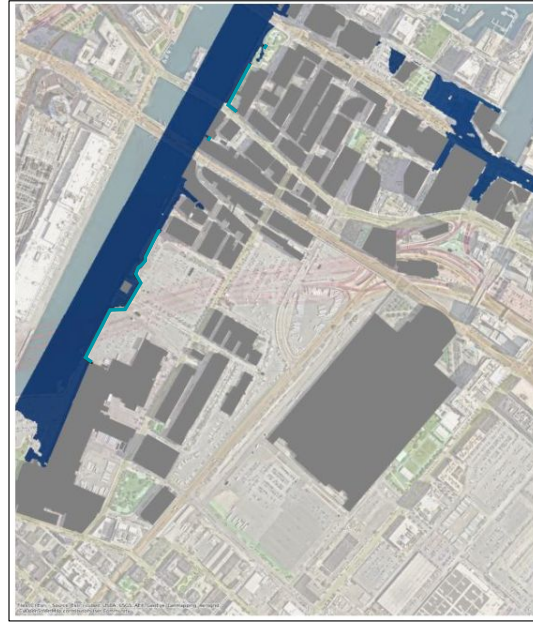
Flood Depths for 1% ACDFP



Flooding in different scenarios



Existing flooding during 2030
100-year storm conditions



Flood extent during a 2030
100-year storm with the
proposed flood barriers in place

- Further modeling done by Woods Hole Group and others at specific sites

BOSTON TEA PARTY SHIPS & MUSEUM

Planning

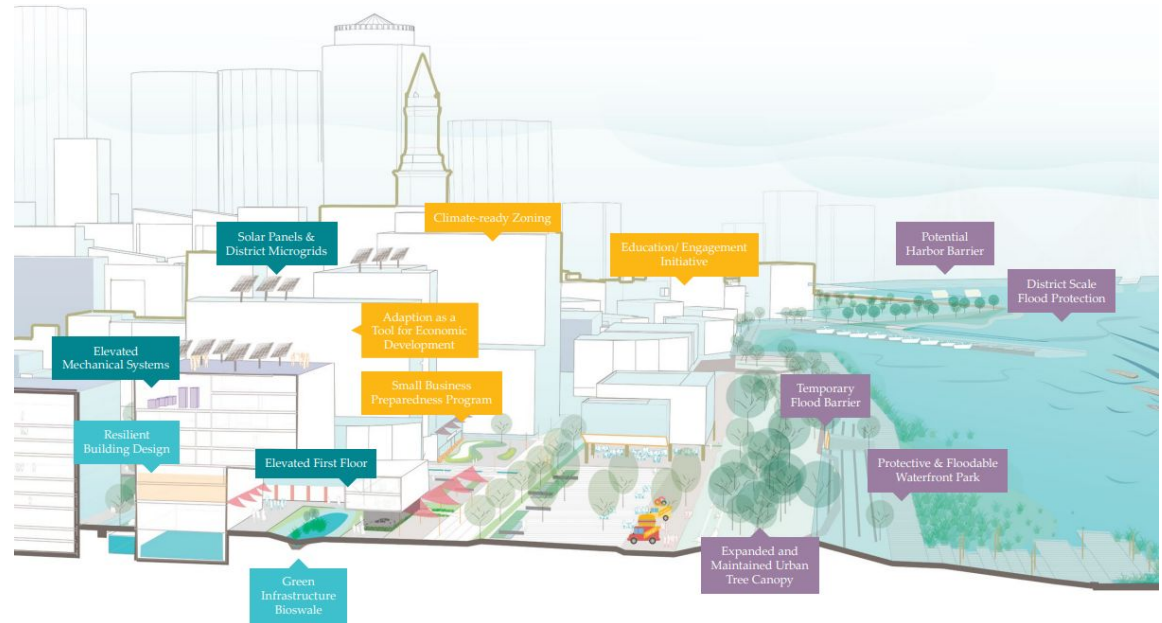


Coastal Resilience Planning Progression in Boston



2016

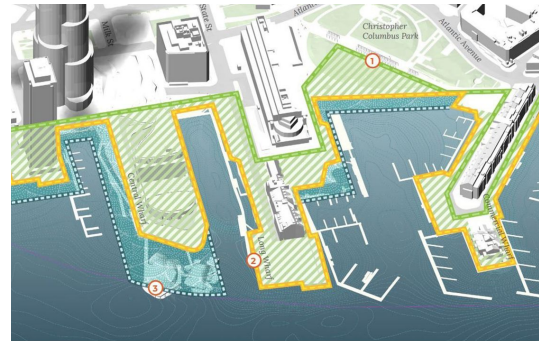
“Climate Ready Boston’s proposals are diverse in scope and scale. They are short term and long term, citywide and neighborhood specific, municipal and regional, regulatory and financial.”



Coastal Resilience Planning Progression in Boston



2016



2020

Planning Progression - Neighborhood Reports



Coastal Resilience Solutions for East Boston & Charlestown Phase I

The Phase I plan was completed in 2017 and studied the waterfront from Sullivan Square to the Boston Autoport in Charlestown, and the waterfront from Logan Airport to Chelsea Creek in East Boston.



Coastal Resilience Solutions for East Boston & Charlestown Phase II

The Phase II plan was completed in 2022 and studied the waterfront from the Boston Autoport to the Charles River Dam in Charlestown, and the waterfront from Chelsea Creek to Wood Island Marsh in East Boston.



Coastal Resilience Solutions for Downtown and North End

The Downtown and North End plan was completed in 2020 and studied the waterfront from the Charles River Dam to the Fort Point Channel.



Coastal Resilience Solutions for South Boston

The South Boston plan was completed in 2018 and studied the waterfront from the Fort Point Channel to Moakley Park.



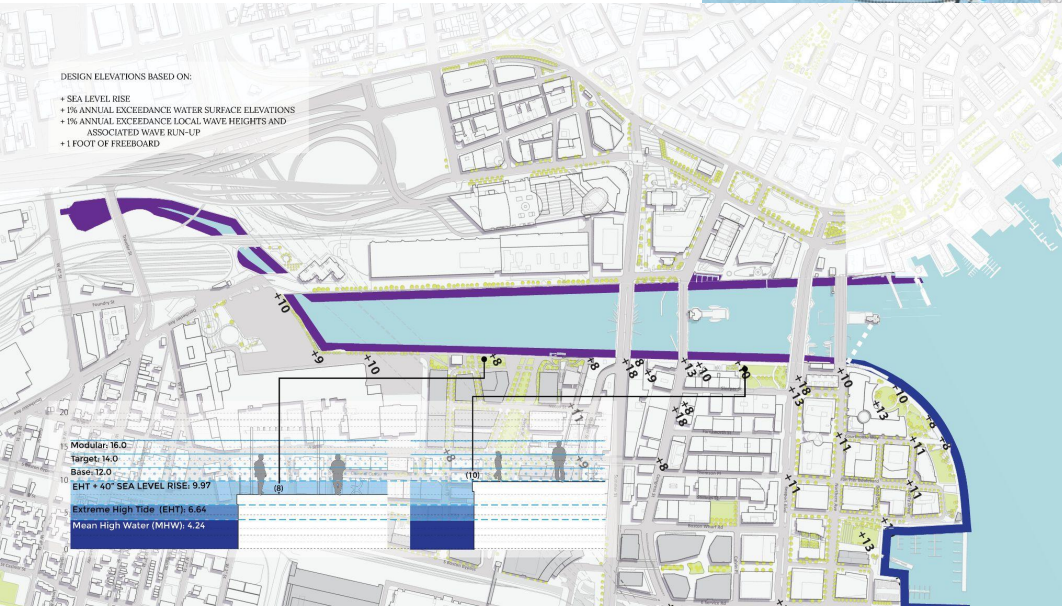
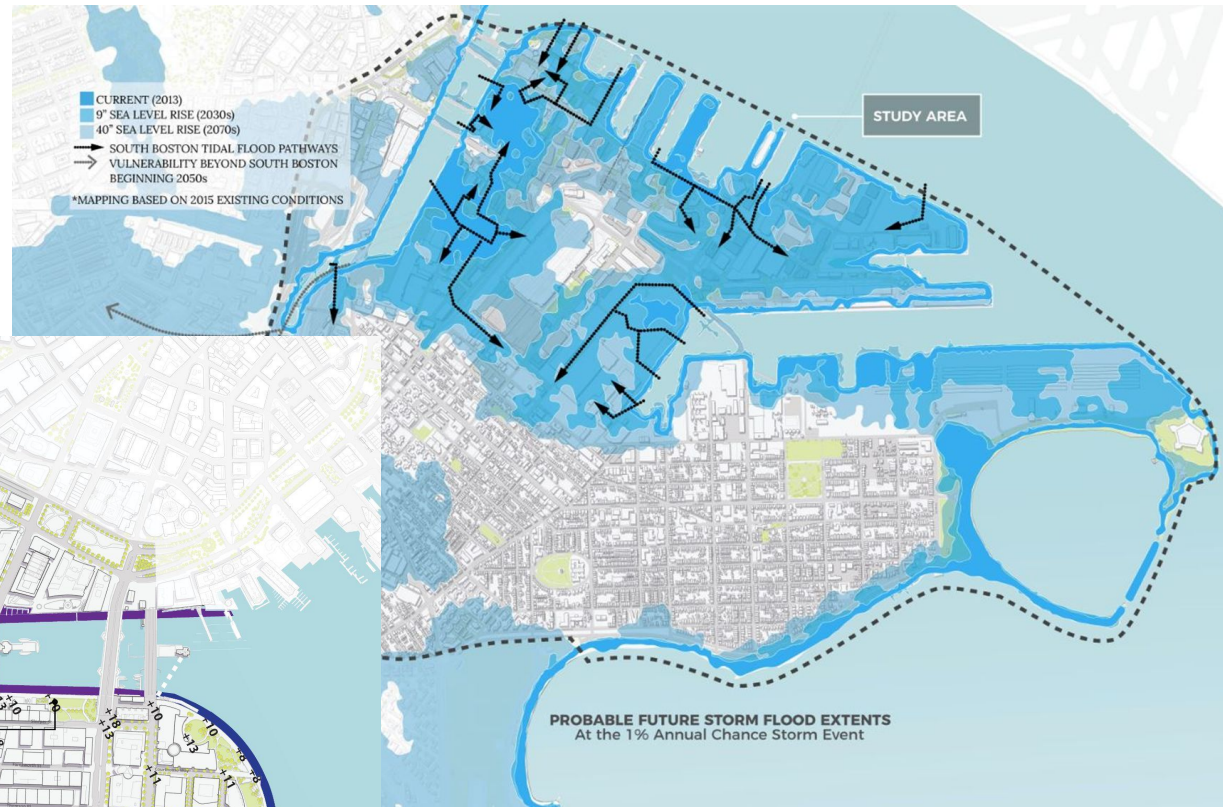
Coastal Resilience Solutions for Dorchester

The Dorchester plan was completed in 2020 and studied the waterfront from Dorchester Bay to the Neponset River.

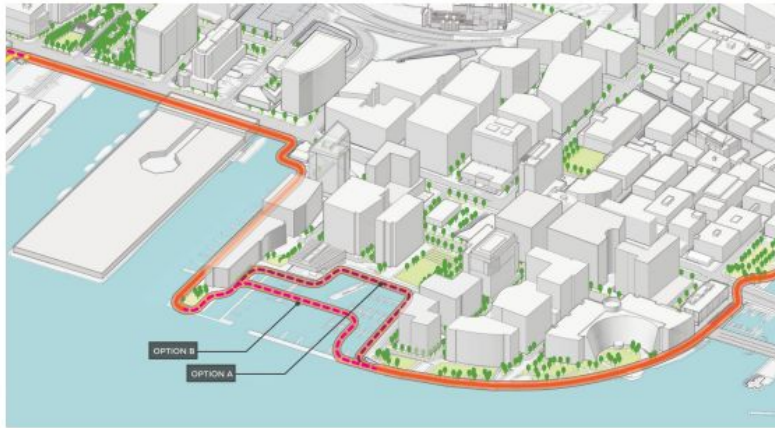
- Describes risks and solutions
- Reflects extensive community engagement
- Similar to other consensus building for municipal projects

Planning Progression - Neighborhood Reports

- Highlighted flood paths
- Identified vulnerabilities
- Elevations are in NAVD88



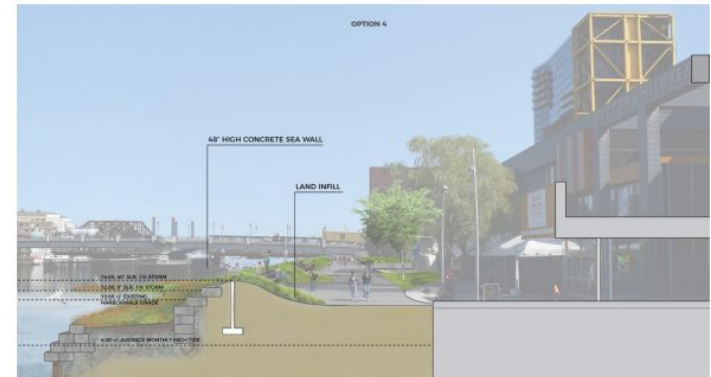
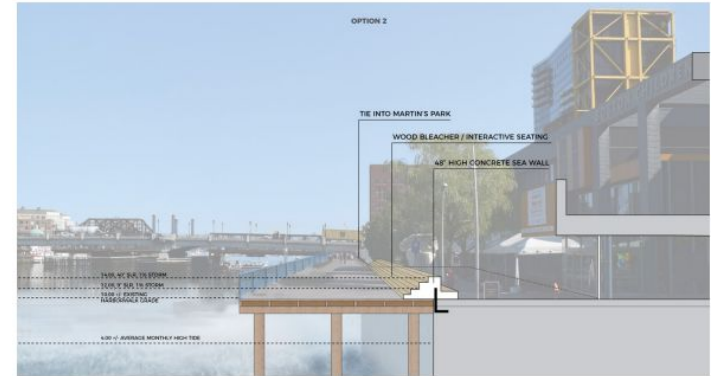
Planning Progression - Neighborhood Reports



Costs of Recommended Mid-term Coastal Resilience Options in the South Boston Waterfront

	OPTION A	OPTION B
ESTIMATED CAPITAL COST	\$53 - \$61 million	\$91 - \$106 million
ESTIMATED MAINTENANCE COST*	\$800,000 - \$900,000 per year	\$1.4 - \$1.6 million per year

*Maintenance costs are expected to be 1.5 percent of the implementation cost.

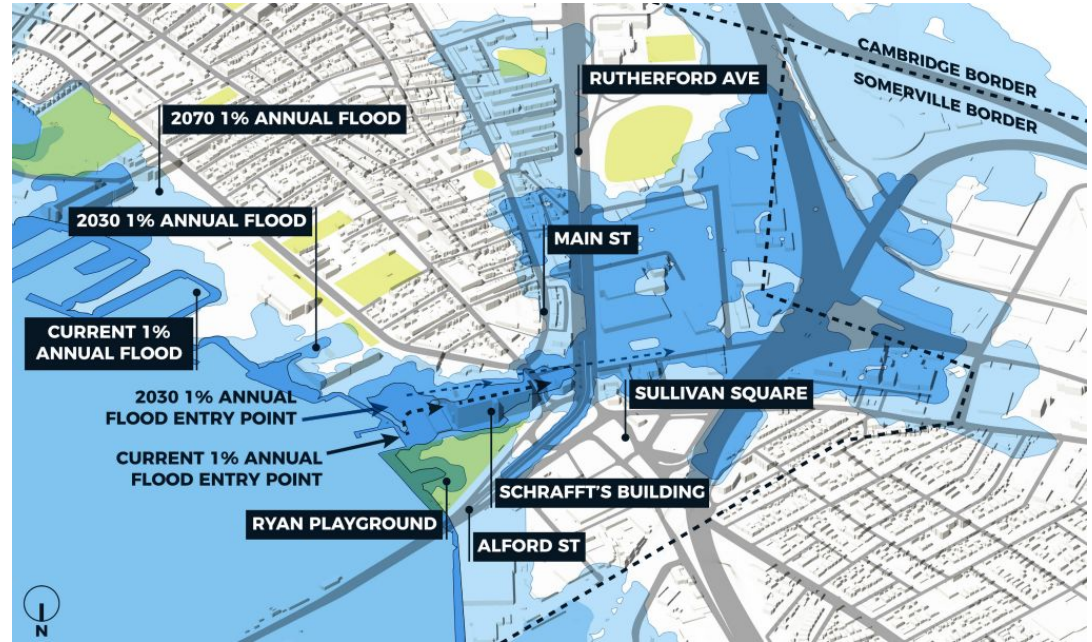


- Described possible solutions and costs

Planning Progression - Neighborhood Reports



Deployable flood walls, such as the type shown in these renderings of the Greenway under Summer Street, are installed only when a flood is anticipated. They are otherwise kept in storage.



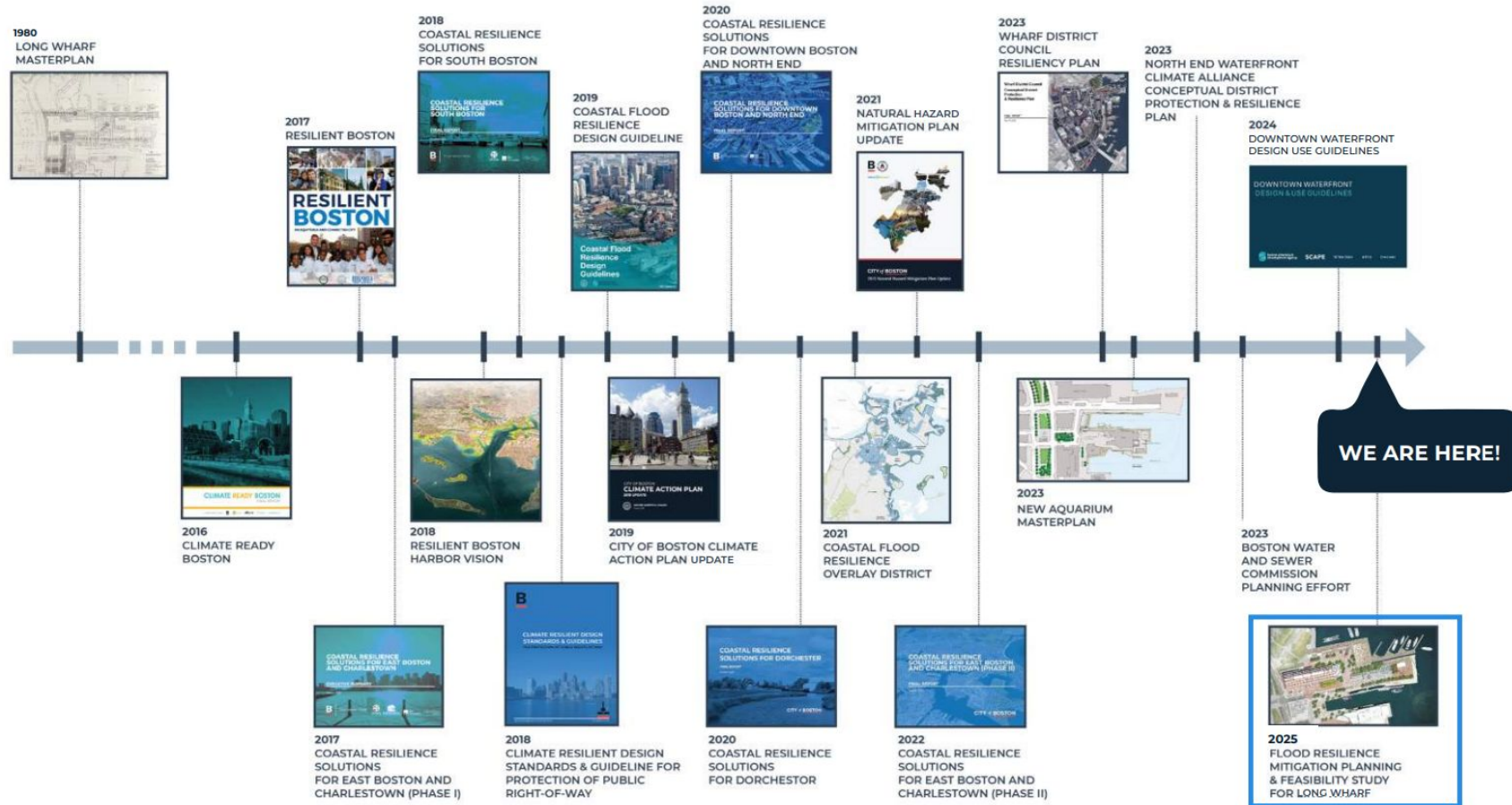
- Included recommendation of the City's first "Deployable"
- Identified priorities

Planning Progression - Neighborhood Reports



Estimated costs for coastal resilience solutions in the East Boston study area.

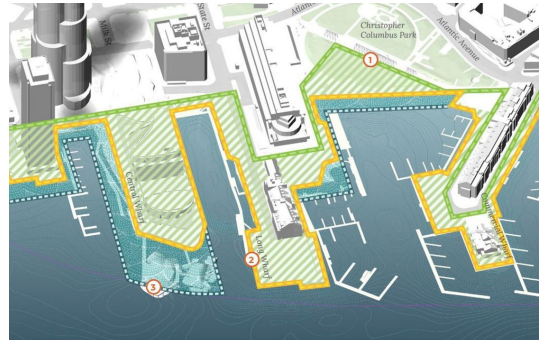
Prior Plans and Studies (Downtown Boston)



Coastal Resilience Planning Progression in Boston



2016

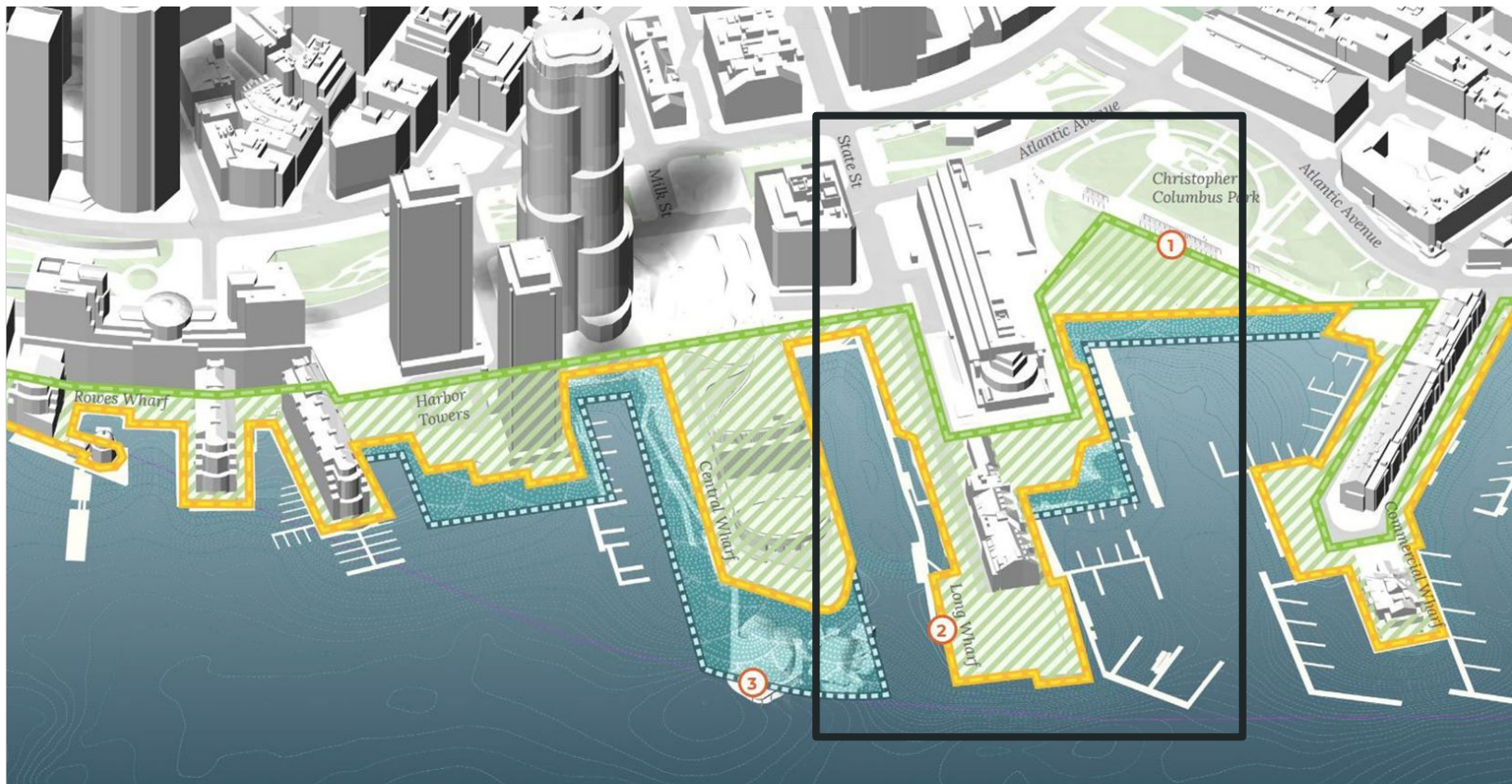


2020



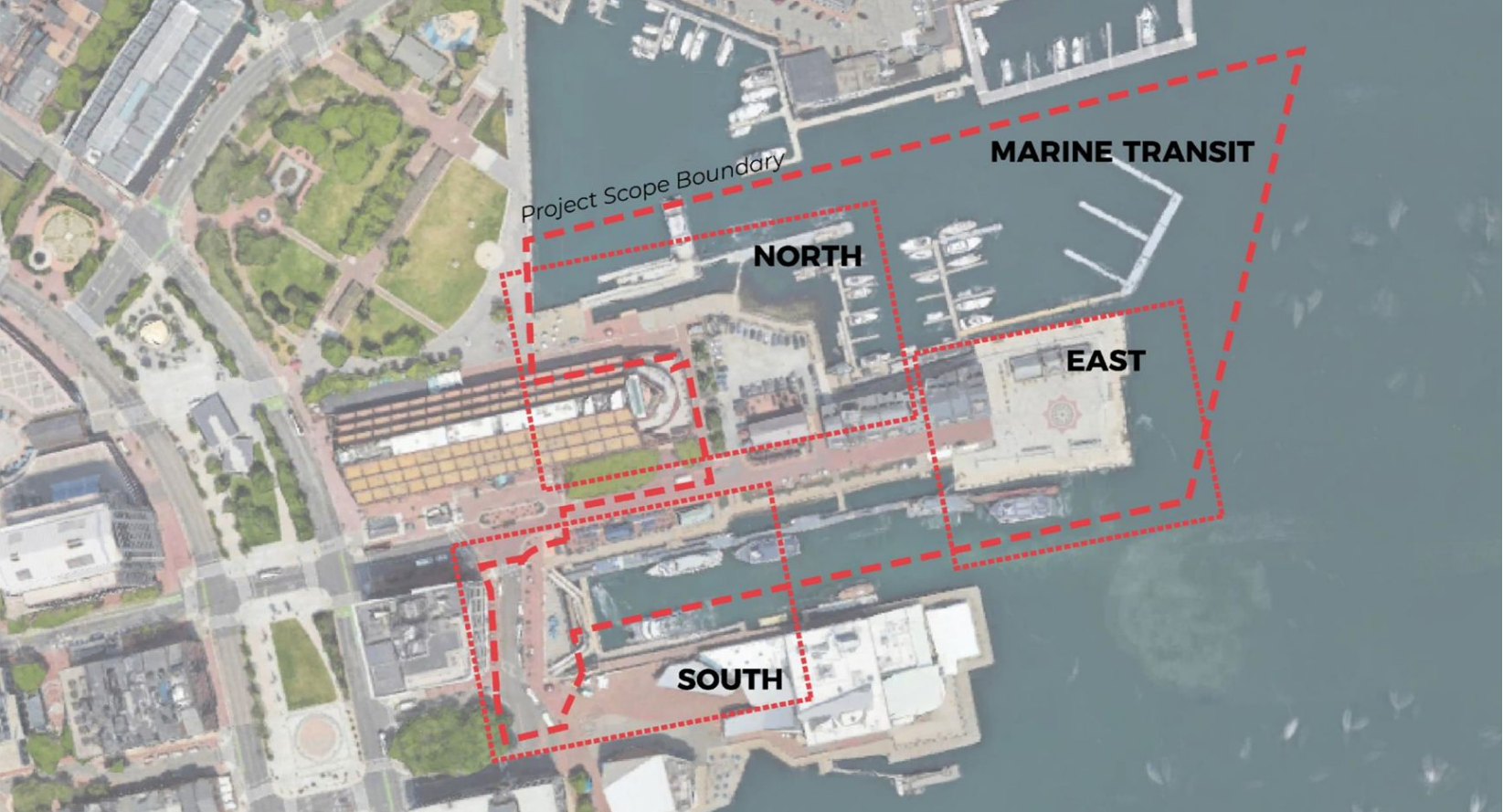
2026

Long Wharf Project Approach



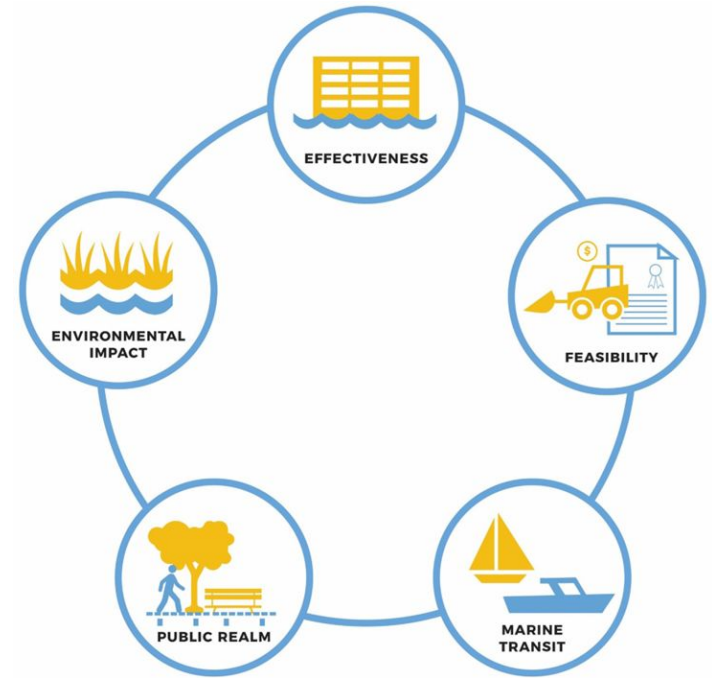
COASTAL RESILIENCE SOLUTIONS FOR DOWNTOWN BOSTON AND NORTH END, 2020

Long Wharf Project Scope Area

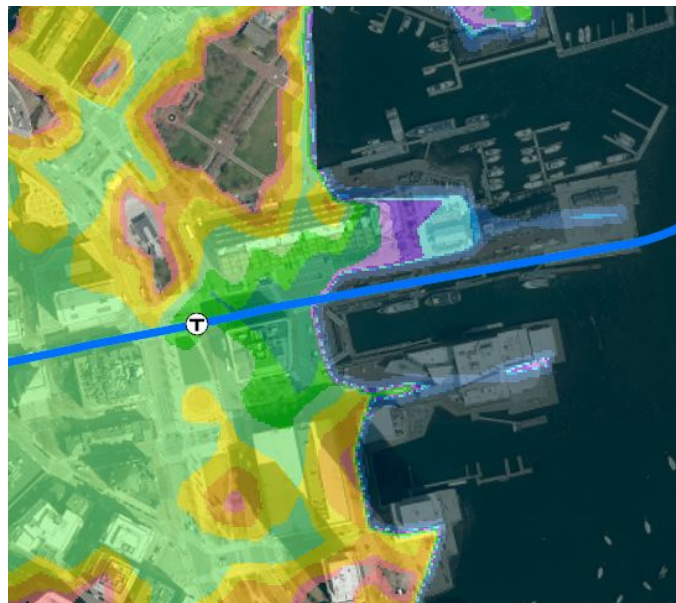


Long Wharf Project Scope

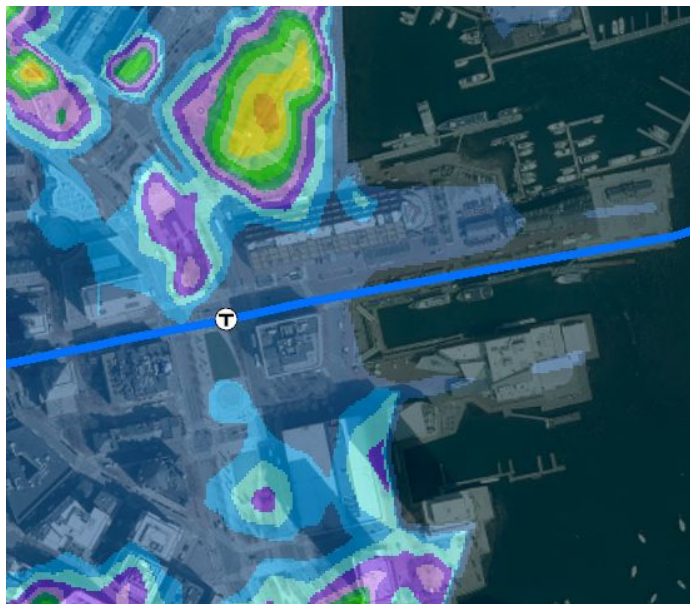
- Develop a set of inclusive, welcoming, & implementable alternative designs for Long Wharf that:
 - Close 2030 and long term flood pathways and protect critical infrastructure
 - Create an accessible & equitable public realm that strengthens the relationship between people & water and respects wharf history
 - Ensure tie-ins & resolve operational, engineering, & other challenges with partner projects & plans
 - Develop design & engineering assessments for funding candidacy



MCFRM Conditions

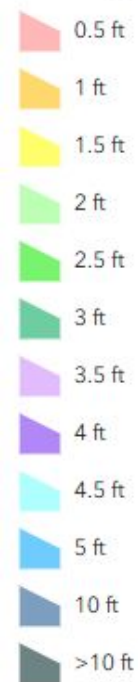


2030



2070

Flood Depths for 1% ACFEP



- Models show relative depth of water above land during a coastal flooding event with a 1% annual coastal flood exceedance probabilities (ACFEP)
- Includes expected impacts of tides, waves, wave run-up and overtopping, storm surge, winds, and currents

Engagement Feedback Examples



OPEN SPACE + ACCESS TO WATER

ENSURE THAT THE PARK'S PROGRAMMING IS RETAINED, AS THE COMMUNITY VALUES THE OPEN, FLEXIBLE SPACE AND DOES NOT WANT TO LOSE IT DUE TO FLOODING OR CHANGES IN THE RELATIONSHIP TO WATER.

BOSTON PARKS DEPARTMENT



THERE IS NO EASY PATH TO THE WATERFRONT, AND THERE IS NO HANGOUT SPACE. WE NEED TO CREATE A COMMUNAL OPEN SPACE.

NEW ENGLAND AQUARIUM

WAYFINDING

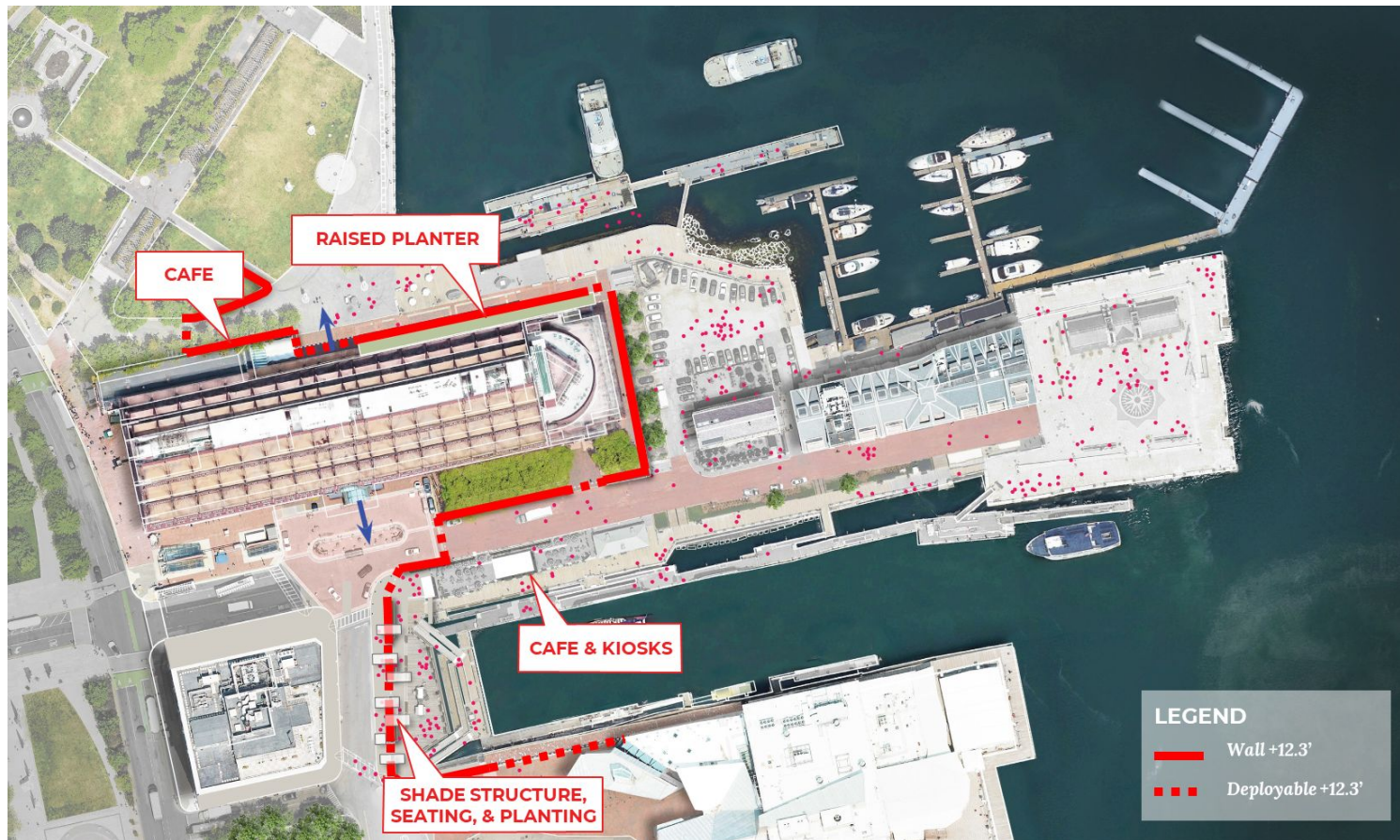


Proposed 2030 Alignment

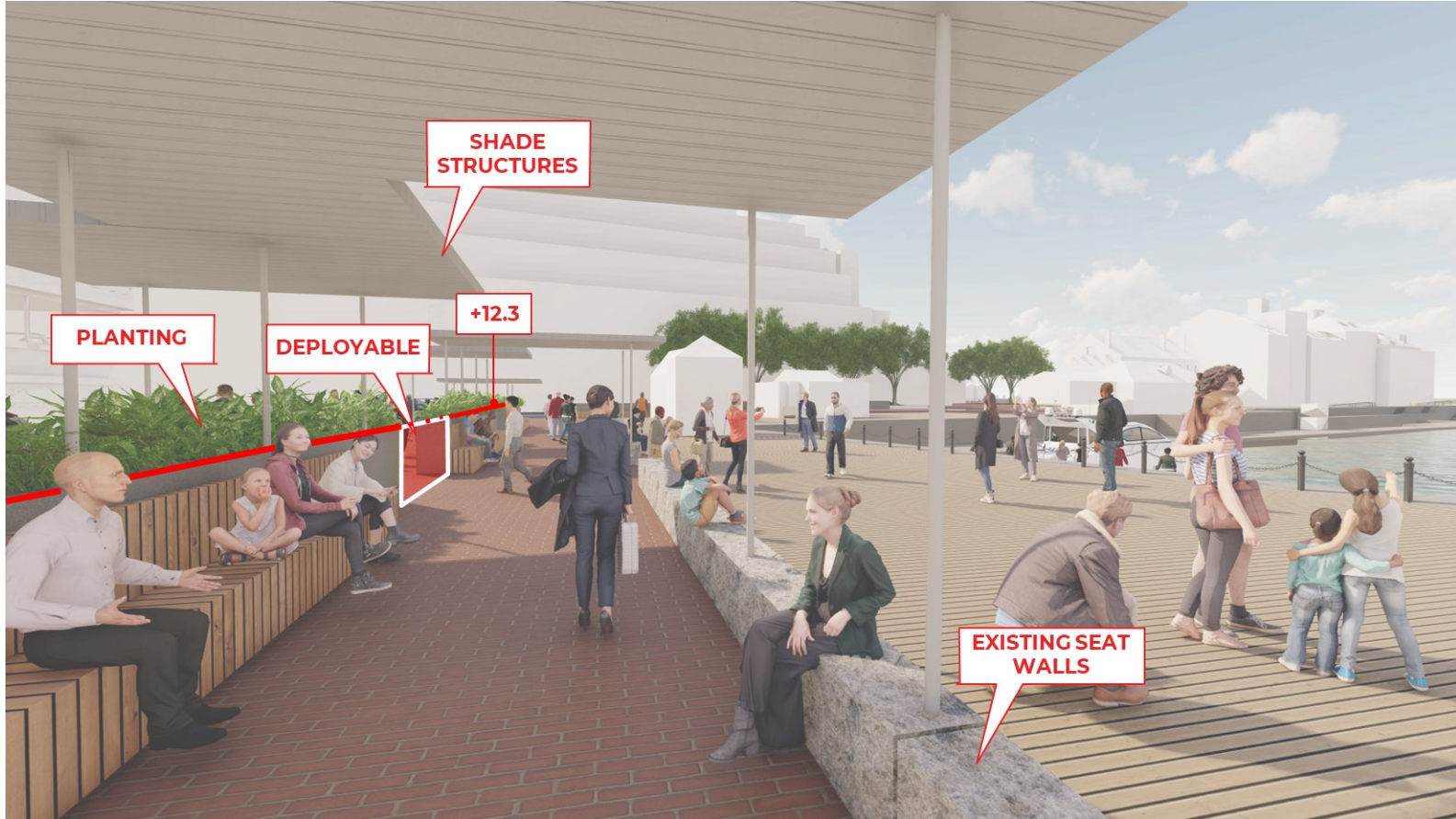


2030

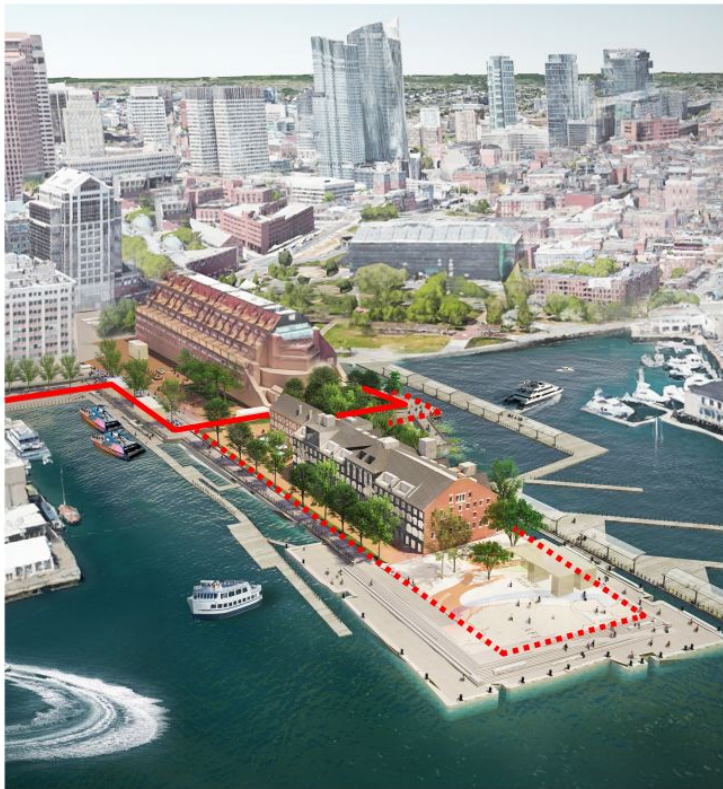
Proposed 2030 Alignment



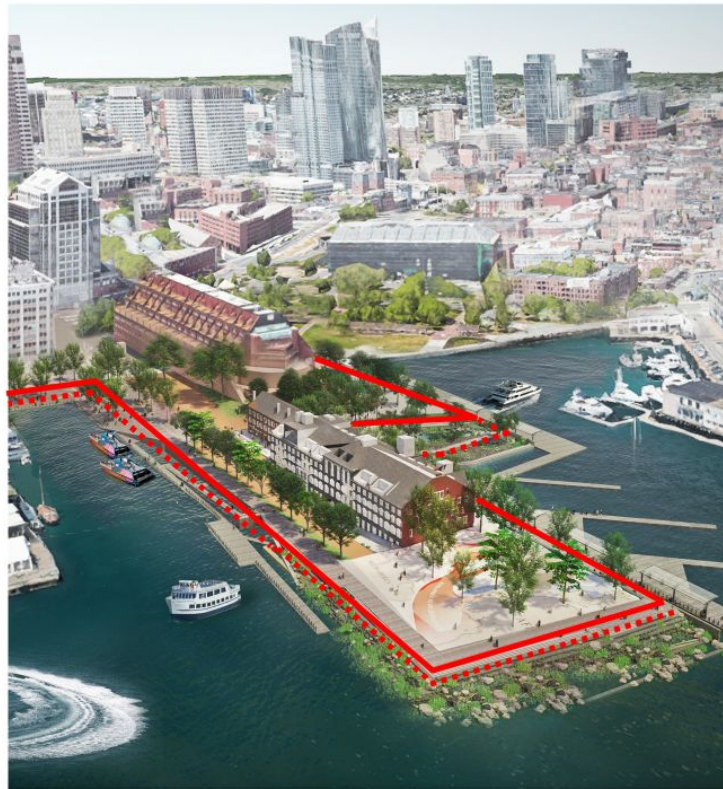
Proposed 2030 Alignment - Old Atlantic Avenue



Proposed 2070 Alignment



ACUPUNCTURE



BIG SPLASH

LEGEND

-  +15.0'
-  +12.8'

Proposed 2070 Alignment: Acupuncture



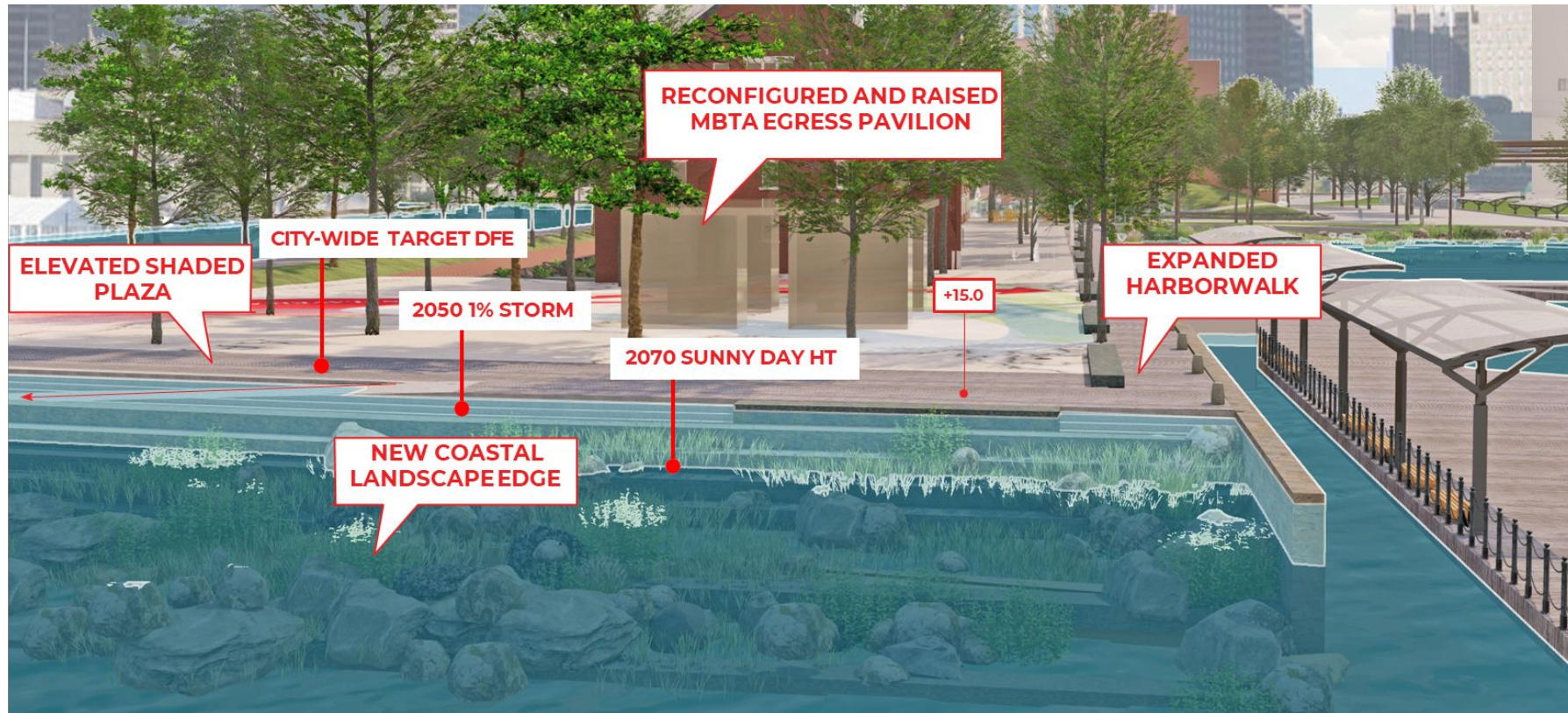
Proposed 2070 Alignment: Acupuncture (North Side)



Proposed 2070 Alignment: Big Splash



Proposed 2070 Alignment: Big Splash



Examples of Coastal Resilience Strategies

RAISED HARBORWALK / RAISED PARK SPACE



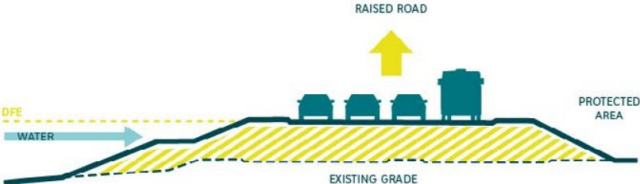
RAISED BERMS AND DUNES



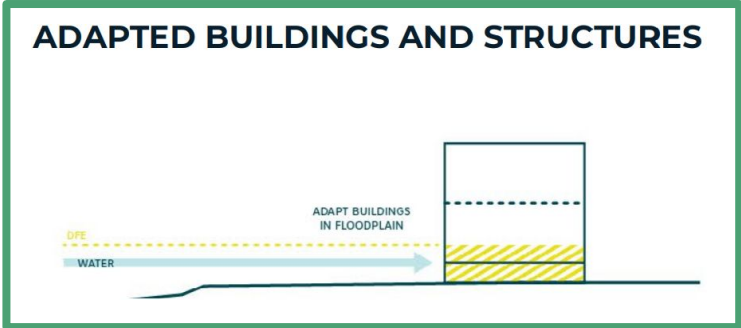
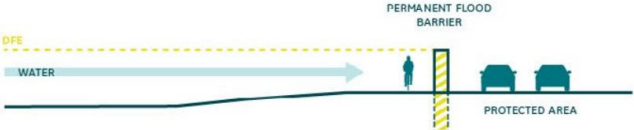
NATURE-BASED SOLUTIONS



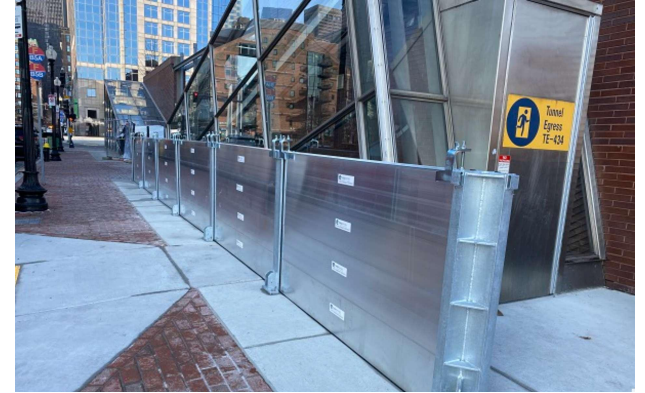
RAISED ROADWAYS / MEDIAN FLOODWALLS



VERTICAL FLOODWALLS

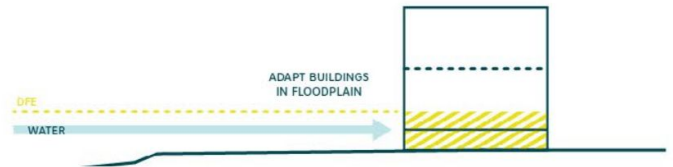


Examples of Adapted Buildings and Structures



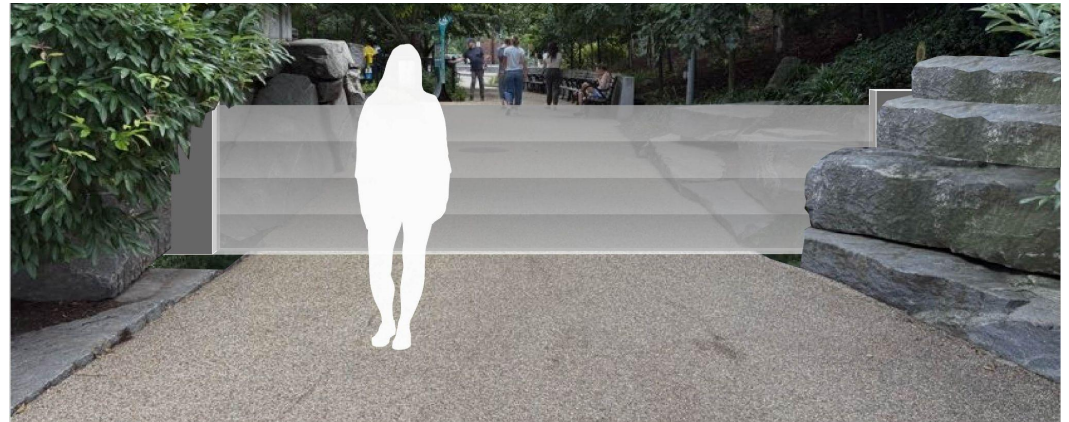
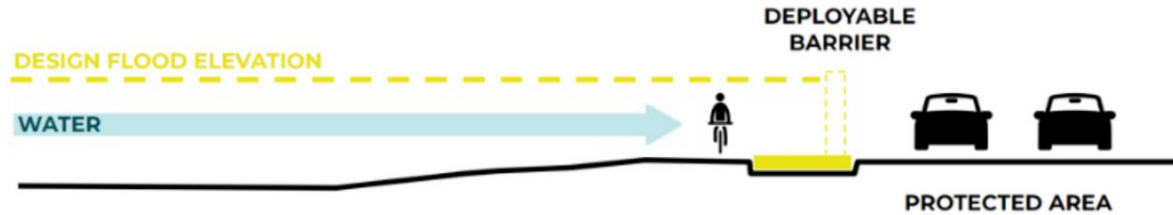
- MBTA installed aluminum stop logs at Aquarium Station
- Boston's "Deployables Day"
- Port Norfolk Home Flood Assessment Pilot Program 2026
- Adaptations in use at many private buildings

ADAPTED BUILDINGS AND STRUCTURES



Examples of Coastal Resilience Strategies - “Deployables”

- Temporary barriers can also protect against larger scale flooding



BOSTON TEA PARTY SHIPS & MUSEUM

Implementation



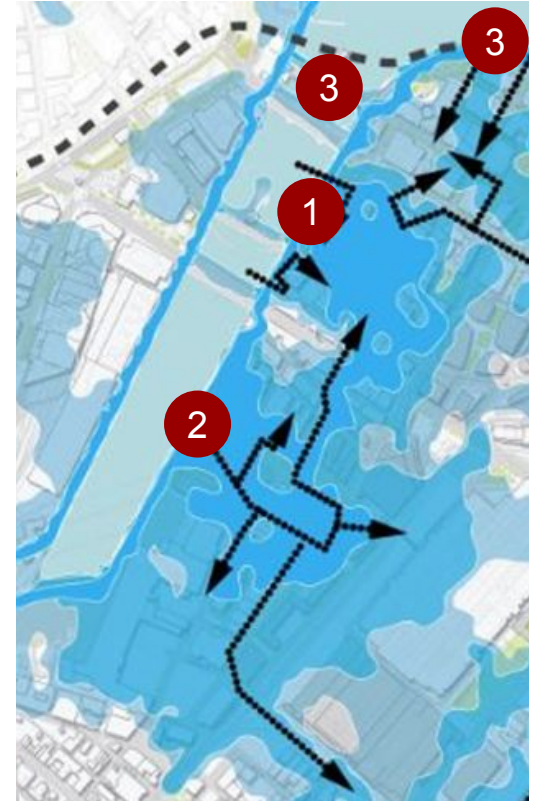
Fort Point Channel

To address the most urgent flood risk:

- 2026 **1** Construction of 3 interim projects at the north end of the channel.
- 2027 **2** Construction of a solution at the south end of the channel
- TBD **2** Article 80-approved resilience (private)

To address longer term flood risk:

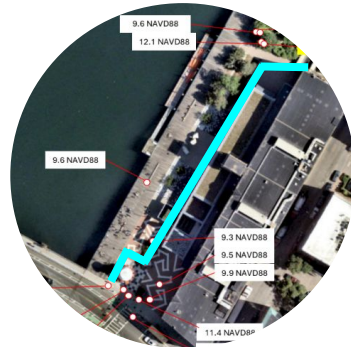
- Longer Term **3** Design and implement longer term flood-risk reduction infrastructure at the mouth of the Fort Point Channel, as well as Seaport Blvd. and Reserved Channel. (Army Corps designs in 2025-2028; Army Corps construction 2030s+).



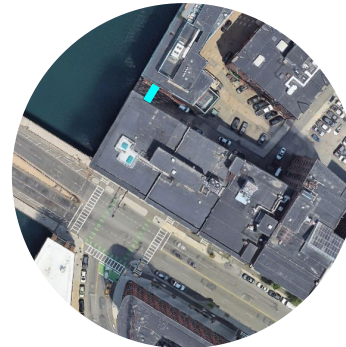
Interim Measures



Martin's Park



**Children's
Museum**



**Sleeper St
Extension
Passageway**

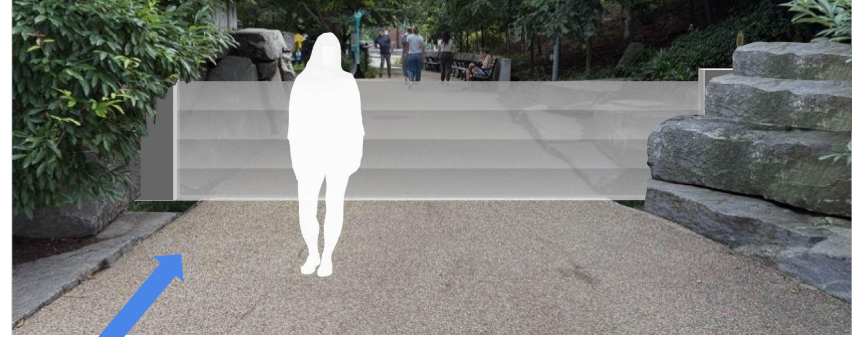


**Resilient Fort
Point Channel**

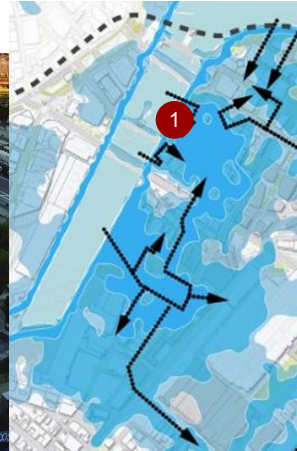
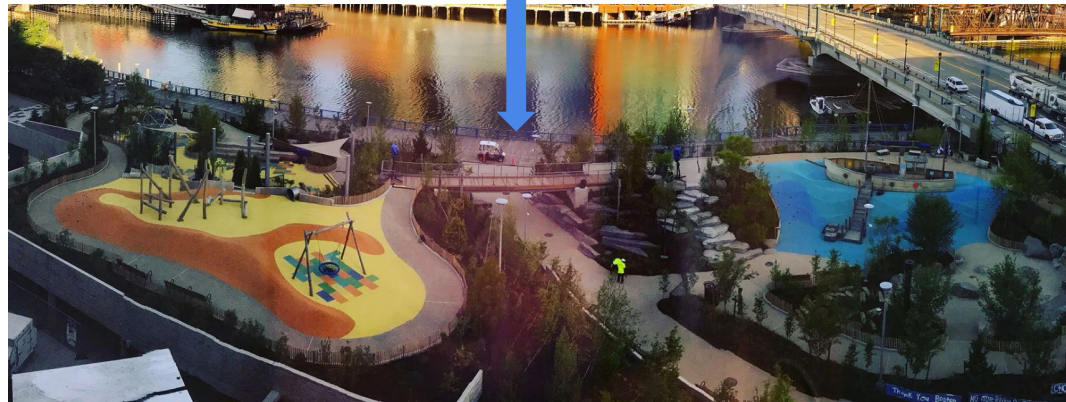
- Provides neighborhood protection until construction of longer term projects (private development, US Army Corps of Engineers)

Martin's Park

- Mid-construction
- Path will be closed but park will remain open
- Detour signs are up
- Estimated completion: **May 2026**



Flood pathway



Boston Children's Museum

- Deployable flood barriers in front of the museum
- Nearing final design
- Will include seating element
- Tie into high ground on both sides of the Museum
- Estimated construction start: Fall 2026



Sleeper St Extension



- City is working on securing property rights
- Estimated construction start: Fall 2026



Fort Point: Near Term Resilience Project - Limit of Work by Property



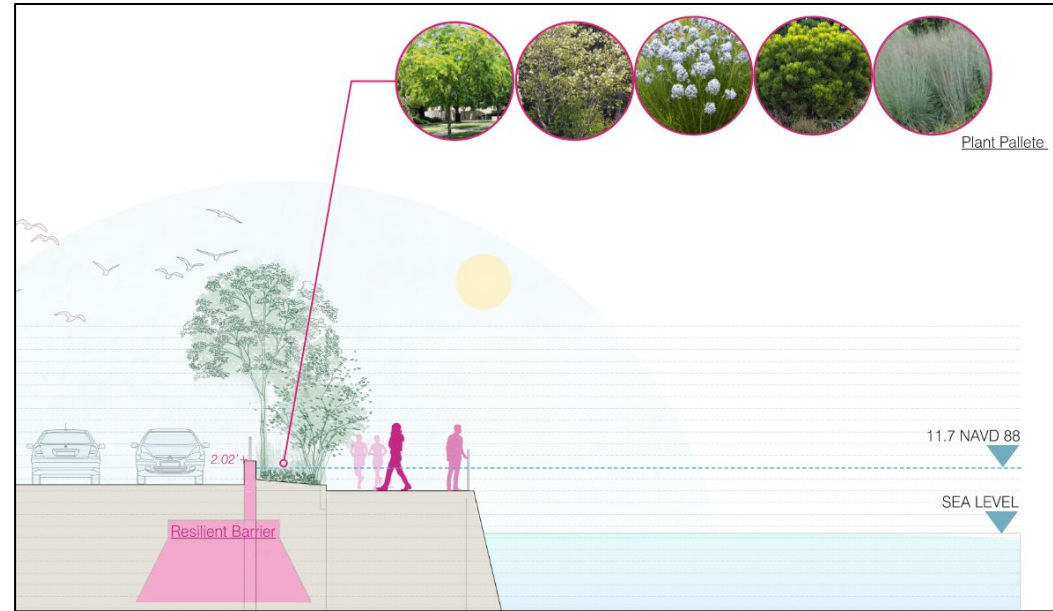
Fort Point Channel: Near Term Resilience Project



- Coastal floodwall system concrete barrier
- Deployable barriers across two travel lanes
- Design elevation is 11.7 ft NAVD88
 - (2030 1% event as modeled by MC-FRM with 12" of freeboard)
- 2'-4' tall depending on ground elevation
- Originally planned with \$10M from FEMA PDM grant, now funded with City dollars

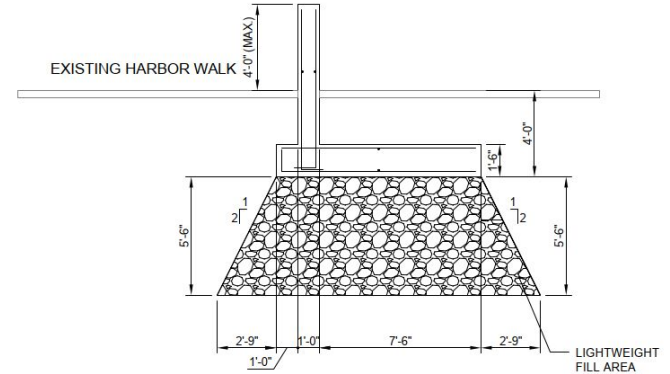
Fort Point Channel: Near Term Resilience Project

- Provide interim flood protection to benefit area
- Minimize disturbance to existing parking lot
- Decommissioning may happen one section/parcel at a time, upon construction of private resilience measures



Fort Point Channel: Near Term Resilience Project

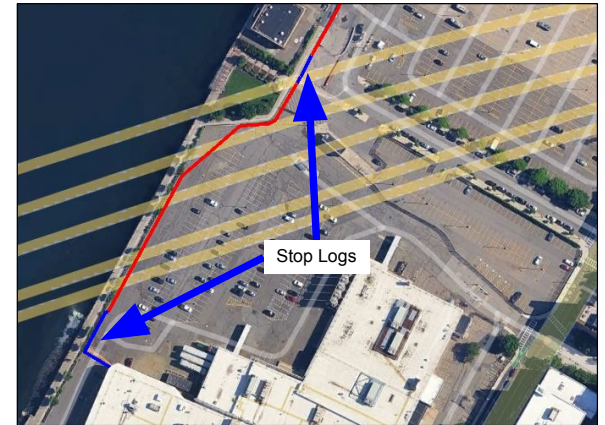
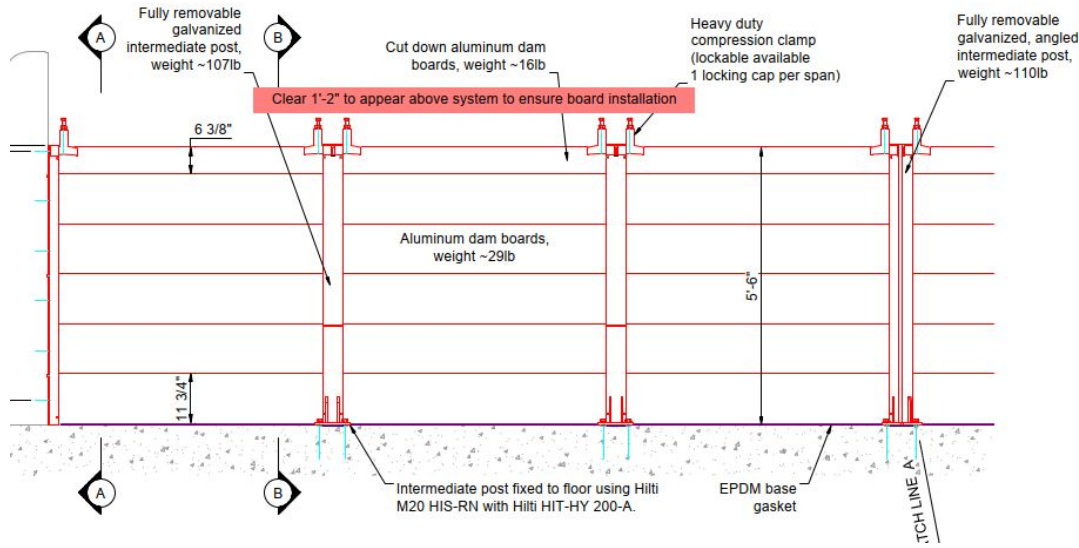
- Flood wall height variable based on existing ground elevation
- Opportunity to add public amenity/seating area



CAST-IN-PLACE CONCRETE
RETAINING WALL - SECTION A
N.T.S.



Fort Point: Near Term Resilience Project - Deployable Stop Logs



Charlestown - Main Street



Weston & Sampson

2030 1% Storm
Depth of Inundation
at Main Street in Charlestown

— Flood Barriers
— Boston Buildings

Depth of Inundation (Feet)

0 - 1
1 - 2
2 - 3



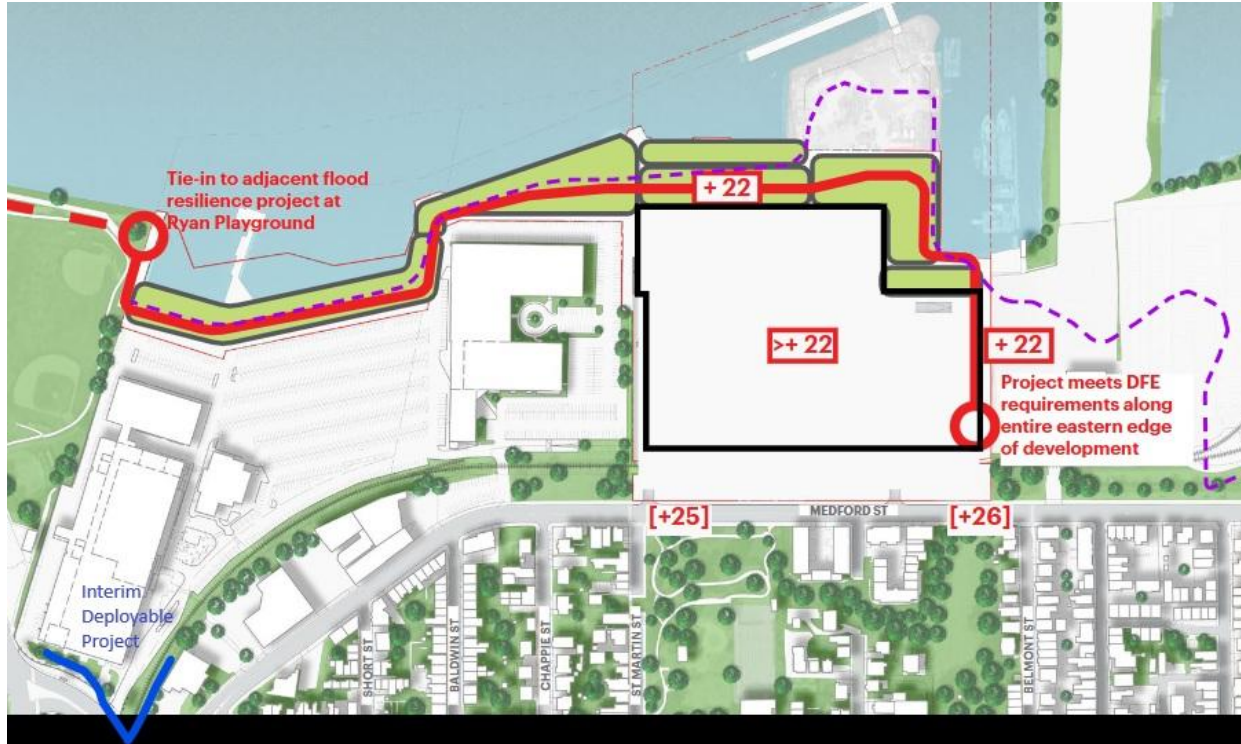
- Mid-construction
- Detour signs are up
- Estimated completion: **August 2026**

Leveraging Private Development for Coastal Resilience



- Coastal Flood Resilience Overlay District (CFROD) ensures protection in new construction and retrofits
- Written into zoning code in 2021

Leveraging Private Development for Coastal Resilience



- Interim only in use until larger-scale long-term project is completed

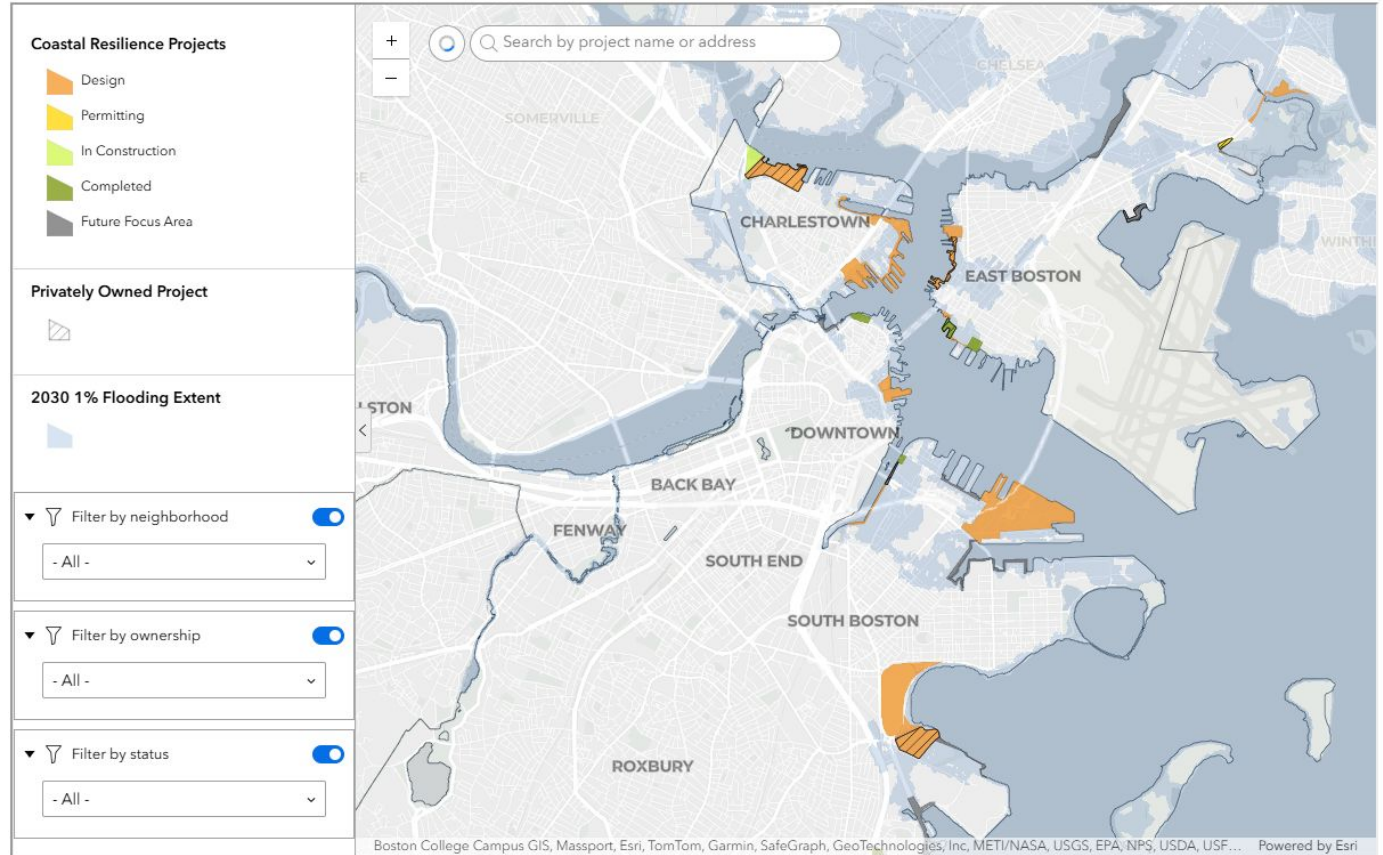
BOSTON TEA PARTY SHIPS & MUSEUM

Summary



Coastal Resilience Project Tracker

- Tracks all City resilience work
- Available for public use



Three-part Approach - Climate Ready Boston

Today's Storms

Strengthen Our Response to Today's Flooding

*Focus for the City's **Emergency Management** Team*

This Decade's Storms

Address Key 2030 Floodpaths

*Focus for the City's **Capital Plan***

2030 & Beyond

Transform Our 47 Miles of Coastline

*Focus for Collaboration with the **Army Corps of Engineers***



Municipal Planning for Coastal Flooding

- Coastal flood resilience:
 - Embedded in various types of projects, often in ways that are not immediately apparent
 - Seldom “in use” and should serve multiple purposes
 - Wide variety in scale
 - On public or private land, or both
- Creativity and early community risk awareness are essential



Langone Park & Puopolo Playground | North End
Construction completed in 2020



Fort Point Channel Resilience project

A nighttime photograph of the Boston Tea Party Ships & Museum. The museum building is on the left, with its name illuminated in white. A large, multi-decked ship is docked at the pier in the center. In the background, several modern skyscrapers are lit up against the dark blue sky. The water in the foreground reflects the lights from the buildings and the ship. The overall scene is a mix of historical and modern architecture.

Thank You!

Contact: benjamin.matusow@boston.gov