

Wharf District Council Conceptual District Protection & Resiliency Plan

FINAL REPORT

May 30th, 2023





May 30, 2023

Members of the Wharf District Council, recognizing the importance of their role in protecting Boston from sea level rise, in 2019 formed a public/private partnership called the WDC Climate Resilience Task Force. Its charter is to create a conceptual district-scale protection and resiliency plan. In concert with the city, state, and federal agencies and the property owners from Christopher Columbus Park to the Congress Street Bridge, the goal is to provide for the safety of residents and visitors and to protect the billions of dollars in public and private assets both along the waterfront and inland from current and future coastal flood events and sea level rise.

The objective of this planning effort is to produce an equitable and inclusive conceptual plan that:

- i. defines an engineering approach that provides effective flood protection at 2070 sea levels, leveraging previous studies by both public and private entities
- ii. thoughtfully addresses connection points between properties to produce a connected barrier along the harbor's edge
- iii. identifies the costs, process and priority of actions and strategies for achieving those solutions.

This report is the result of the past three years' discussions that have led to a **consensus resilience solution for the Wharf District**, allowing property owners to plan with confidence that their individual improvements are consistent with the district-wide approach. The next phase is to coordinate with governmental agencies on the larger-scale design and implementation, and to work with neighboring districts to link each of our plans.

What this plan is not (yet):

- A design for the public realm atop the identified resilient engineering solutions; much public discussion remains as to what the newly configured waterfront should look and feel like
- A clear pathway for permitting; regulations and legislation likely need to be clarified for Boston to create a resilient waterfront
- Specificity as to ownership, maintenance or regulation of use of newly created open space
- A full investigation of water transportation infrastructure; all existing docks and water-transit access remain unimpeded by the current plan, but a future study may result in a better configuration than the current one

Many thanks to the host of government leaders, the many volunteers, the generous funders, and the dedicated consultants who have helped us take this major step forward. There is a long way to go, but we are on the right path to a waterfront better suited to address the social and environmental challenges of the future.



Marc Margulies, FAIA
President, Wharf District Council
Rowes Wharf Residences Resident

Project Team

Wharf District Council Climate Resilience Taskforce and Management Team members have volunteered many hours of their time and a wealth of invaluable knowledge to this effort.

Wharf District Council Climate Resilience Taskforce

Aaron Michlewitz – MA House of Representatives

Alice Brown – Boston Harbor Now

Andy Coville – Brodeur

Andrew Dankwerth – Pembroke

Ann Lagasse – Ocean Havens

Anne Rogan – Capital Properties

Bill Zielinski – SKW Partners , Hook Wharf Project

BJ Moriarty – Moriarty Partners, Hook Wharf Project

Bob Gordon – Harbor Towers Resident

Bob Gowdy – Harbor Towers Board

Brian Abramson, Servidyne – for Rowes Wharf

Brian Koop – Boston Properties

Bud Ris – Green Ribbon Commission

Carole Charnow – Boston Childrens Museum

Cathy Baker-Eclipse – Boston Park's & Recreation

Charlayne Murrell-Smith – Boston Childrens Museum

Cheryl Delgreco – North End Waterfront Residents Association

Chris Bush – BPDA

Chris Cook – Greenway Conservancy

Chris Fincham

Chris Osgood – Boston Mayor's Office

Doug Gribbel – Folio Condominium, WDC Executive Committee

Fernando Bent- Mulling - Rasta Rootz

Heidi Wolf – InterContinental Residences

Joe Christo – Stone Living Lab

Jack Clark – Pembroke

John Rogers – MA House of Representative

Kara Dominguez, Cushman Wakefield – for 400 and 470 Atlantic Ave

Kate England – Director of Green Infrastructure – City of Boston

Kathy Abbott – Boston Harbor Now

Kelly Roche – Broadluxe Condominium

Jack Clarke – Pembroke

Joanne Hayes Rines – Friends of Christopher Columbus Park & Harbor Tower Board

John Cleveland – Green Ribbon Commission

John Larivee – Rowes Wharf Residences

John Moriarty III

Larry Coe – InterContinental Residences

Marc Grossman – Harbor Towers I resident

Martha Laposata – Harbor Towers

Michael Travis – Boston Children's Museum.

Ray Green – InterContinental Residences

Rich McGuinness – Boston Planning and Development Agency

Sanjay Seth – Environmental Protection Agency

Shelia Willard – InterContinental Residences, WDC Executive Committee

Stephen Johnston – Boston Harbor Hotel, WDC Executive Committee

Project Team

Wharf District Council Climate Resilience Taskforce Management Team

Don Chiofaro Jr. – Chiofaro Company

Kate Dineen – A Better City

Kristan McLaughlin – Pembroke

Luz Arregoces - New England Aquarium, Director of Community Relations

Marc Margulies – Wharf District Council President, Rowes Wharf Residences

Matthew Murphy – Boston Harbor City Cruises

Matt Rubins – Harbor Towers Board

Norman Meisner – Harbor Towers Board

Rick Musiol – New England Aquarium, WDC Executive Committee

Susanne Lavoie – WDC Executive Director

Steve Mitchell – Chiofaro Company

Wesley Stimpson – Harbor Towers Board

Consultant Team

ARUP

Resilience Engineering,
Civil Engineering, Coastal Structures
Engineering, Stakeholder Engagement
& Outreach, Cost Estimating

**HALEY
ALDRICH**

Geotechnical Engineering

HALVORSON
Tighe&Bond STUDIO

Landscape Architecture and
Urban Design

vhb.

Permitting Consulting

**WOODS HOLE
GROUP** FOR EARTH,
FROM SPACE
A CLS COMPANY

Coastal Flood Modeling



Acknowledgements

The Wharf District Council wishes to acknowledge and thank the many individuals and organizations who have contributed their support and time to help develop this plan.

The Wharf District Council would also like to thank the Commonwealth of Massachusetts for their generous support.



AARON MICHLEWITZ
STATE REPRESENTATIVE
3RD SUFFOLK DISTRICT

Commonwealth of Massachusetts

HOUSE OF REPRESENTATIVES
STATE HOUSE, BOSTON, MA 02133-1054

Chair
Ways and Means
ROOM 243, STATE HOUSE
TEL: (617) 722-2990

February 6, 2023

To Marc Margulies, Wharf District Council President:

It is a pleasure to recognize the work that you and the members of the Wharf District Council Climate Resilience Task Force are doing in the creation and development of a "Conceptual Resiliency Masterplan" for the protection of the Wharf District Boston neighborhood. It is encouraging to see residents, businesses, institutions, the City of Boston, and the Commonwealth of Massachusetts, all working together toward this common goal. This is why in 2021 and 2022 the State awarded earmarks of \$250,000 each year to supplement your private fundraising of this important public/private partnership project.

We share your vision, that this process for creating a consensus-based resiliency solution will become a model for other Massachusetts communities. Utilizing a public/private partnership, will enable communities to play an active role in determining the necessary climate change planning and solutions, as well as participating in key process steps from development to funding for further design and construction of those solutions.

Everyone recognizes that this is a long-term challenge, but because the funding, permitting, and construction will also take a long time, we must maintain our sense of urgency to plan now.

Thank you and the WDC Task Force members for undertaking the effort of coordinating the many stakeholders along your neighborhood's waterfront. The development of the Wharf District Conceptual Resiliency Masterplan is a good example of coming together to deal with a challenge and to come up with recommended solutions. This is an important initiative; you continue to have my support.

Sincerely,


AARON MICHLEWITZ
State Representative
Third Suffolk District



February 16, 2023

Mr. Marc Margulies, FAIA, LEED AP
Wharf District Council
85 East India Row, #16
Boston, MA 02110

Dear Mr. Margulies:

The Boston Planning & Development Agency (BPDA) supports the Wharf District Council's efforts to advance the climate preparedness work conducted to date through the City's Climate Ready Boston program. Since the issuance of the Climate Ready Boston report in 2016 there has been significant work conducted to understand current and future coastal flood vulnerability through flood modeling and assessment of district-wide flood protection measures for all of Boston's waterfront communities. These plans were developed in cooperation with residents, businesses, waterfront stakeholders and neighborhood organizations, such as the Wharf District Council, to provide protection against coastal storm events while also supporting improved and equitable public access and enhanced coastal habitat. The Coastal Resilient Solutions Report for Downtown and North End notes that collective action from property owners along the waterfront is needed in order to provide complete flood protection and allow for the successful implementation of this long range plan. Property owners must work with the agreed upon design flood elevation, align their construction activities and cost contributions, and define and coordinate operations and maintenance responsibilities.

Also, for near term flood vulnerability, the flood risk and potential damage is anticipated to have a short duration and remain restricted to the wharf areas. The impacts of these flood events on private property will result in recurrent losses due to the inundation of basements, mechanical systems, and parked cars, as well as limiting ground floor access, business disruption, and the structural stability of the wharves. Therefore, property-level actions are critical regardless of the district-level design strategy. These actions create redundancy in the system and allow property owners to protect critical assets in advance of implementation of district-wide protections.

Below are answers to questions raised by the Council regarding flood modeling developed with the Boston Harbor Flood Risk Model, and related design flood elevations.

Question 1: In order to protect district-wide infrastructure, what is the recommended 2050 design flood elevation (City of Boston and NAVD numbers).

- The [Coastal Resilient Solutions Report for Downtown and North End](#) did not develop design flood elevations for the 21-inches of sea level rise scenario which we expect by 2050. The Wharf District Council's consultant - ARUP may be able to access the data from Woods Hole Group from the flood risk model to develop base flood elevations for 2050.

Question 2: What is the district-wide recommended 2070 design flood elevation (City of Boston and NAVD numbers)

- The Coastal Resilient Solutions Report establishes a Target Design Flood Elevation of 15' (NAVD88); 21.46' (Boston City Base) for the Wharf District to protect to the 1% storm event with 40-inches of sea level rise (2070), and a Modular Design Flood Elevation of 16.5' (NAVD88); 22.96' (Boston City Base). The Target DFE is considered the minimum protective elevation and the modular provides for a higher level of protection with sea levels anticipated to rise beyond 2070. We generally expect coastal protection to be designed to accommodate the modular level in the future. The DFE's also include 1-foot of freeboard, or margin of safety as recommended by FEMA.

Question 3: Separately, we understand that there are required elevations for new construction

- The Coastal Flood Resilience Zoning Overlay (Zoning Article 25A) establishes separate design flood elevations for buildings which are different from the design flood elevations in the Coastal Resilient Solutions Reports, which are specific to district scale shoreline protection measures. The property specific base flood elevations can be referenced through the BPDA's [Zoning Viewer](#).

The BPDA looks forward to the results of the Council's current coastal resilience planning effort and future work to implement the Climate Ready Boston recommendations for district-scale coastal flood protection. Please feel free to reach out with any additional questions.

Sincerely,

Richard McGuinness
Deputy Director for Climate Change
And Environmental Planning

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1. Introduction

Context

Purpose

Process

What's Next?



Introduction

Context

The Wharf District

As a home, a workplace, and a destination to people of varied backgrounds, ages, incomes, and abilities, the Wharf District hosts a wonderful wealth of culture and experiences. From ground floor restaurants and shops to high rise businesses and hotels, from parks to waterfront activities and transportation, from residences to world-famous historic sites – the Wharf District truly is one of the most historically significant and active waterfronts in New England.

The Wharf District Council (WDC) is a 501(C)3 non-profit neighborhood organization, recognized by the Mayor's Office and the City of Boston as representing the community on matters relating to planning, development, construction, programming events and transportation in the District. The Wharf District Council membership is made up of residents, hotels, non-profit institutions, small businesses and A Better City, representing the major businesses in the District. It serves as the neighborhood's voice in matters that require a community opinion and/or action. Its purpose is to help the decision makers make the right decisions on our community related issues.

The Wharf District



Flood Hazards

On January 4, 2018, Winter Storm Grayson pushed the waters of Boston Harbor up to elevation 9.6 feet NAVD88 (16.1 feet Boston City Base), impacting the Wharf District community with flood waters lapping hundreds of feet inland up State Street and along Atlantic Avenue. Inundating the MBTA Blue Line at Aquarium Station, the storm surge caused millions of dollars in damages and resulted in an extended reduction of accessibility along this critical transportation route for the residents of Boston.

While this flood caused significant damage, it did not even rise to the elevation of FEMA's present-day 100-year (1% annual chance) base flood level. Grayson provided a visual baseline of today's flood hazard, and also a stark reminder of our vulnerability to the rising tides expected in the near future.

Aquarium Station, Winter Storm Grayson



Flood Projections

With sea levels projected to rise up to 51.5-inches by 2070, storms such as Winter Storm Grayson are likely to cause more widespread flooding throughout the Wharf District in the coming years, resulting in significantly greater impacts to the community's homes, businesses, and critical infrastructure. The following maps illustrate the flood extents and depths expected to impact the Wharf District during a 1% storm surge flood event (aka a '100-year storm') in 2030, 2050, and 2070 if the proposed district-wide flood protection system is not constructed.

Why Protect Against a 100-Year Flood?

A 100-Year Flood is an event that has a 1-in-100 chance of occurring in any single year. The likelihood of one of these floods occurring over the period of a decade or more is significantly greater.

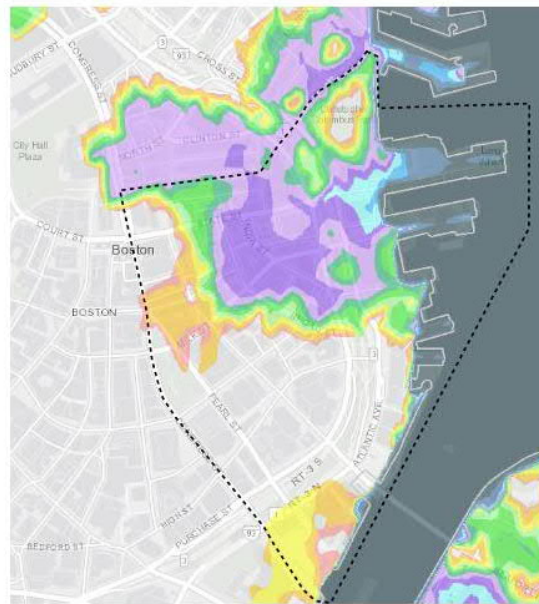
There is a 10% chance the Wharf District will experience a 100-Year Flood in the next 10 years, and a 40% chance such a flood event will occur over the next 50 years.

Current climate change projections also indicate these types of extreme storms are likely to occur more frequently in the future.

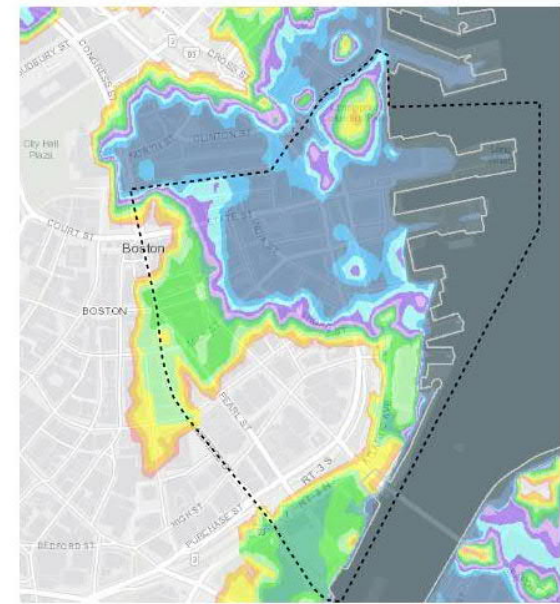
Wharf District Flood Projections



2030 1% Flood



2050 1% Flood

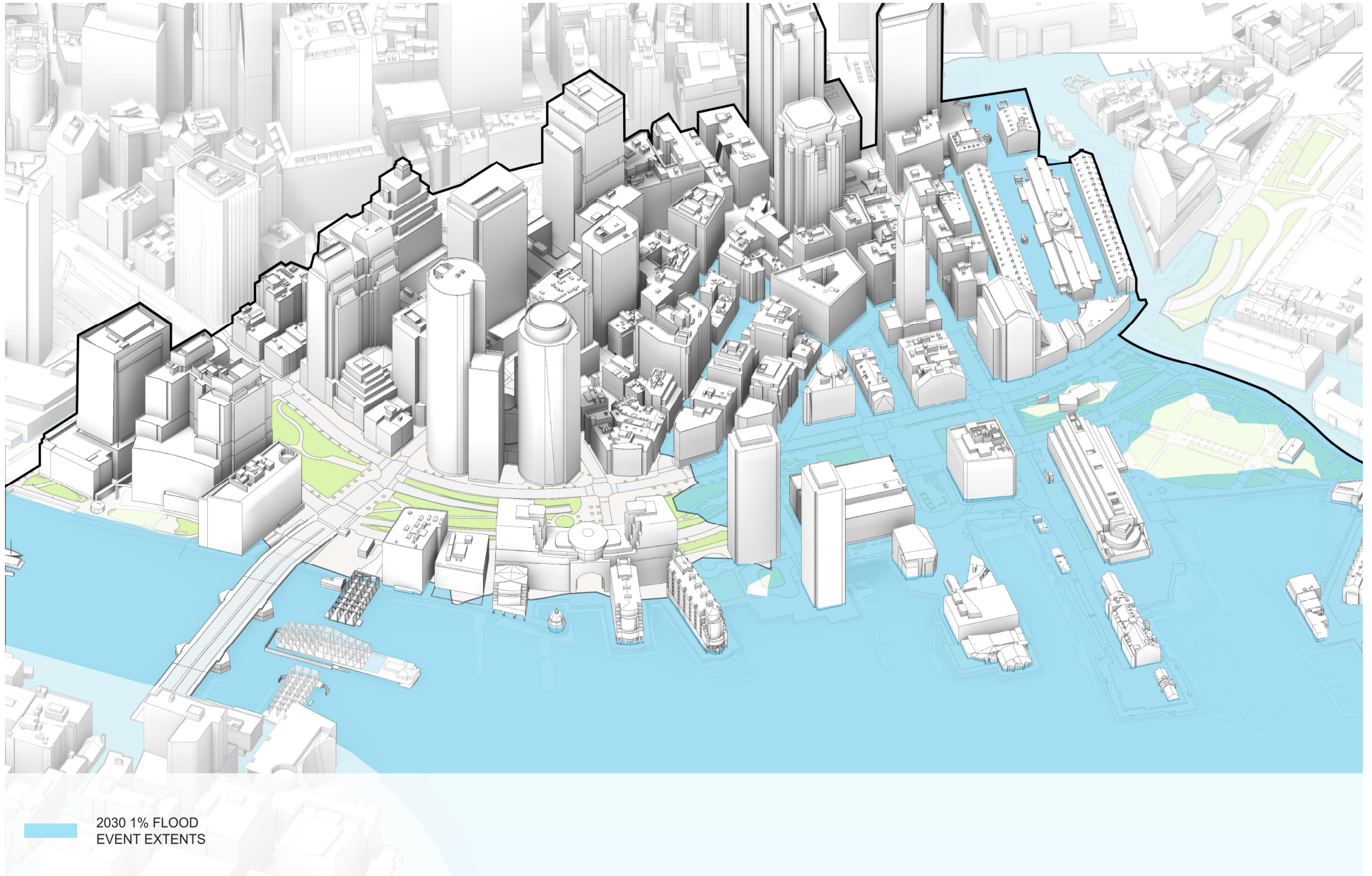


2070 1% Flood

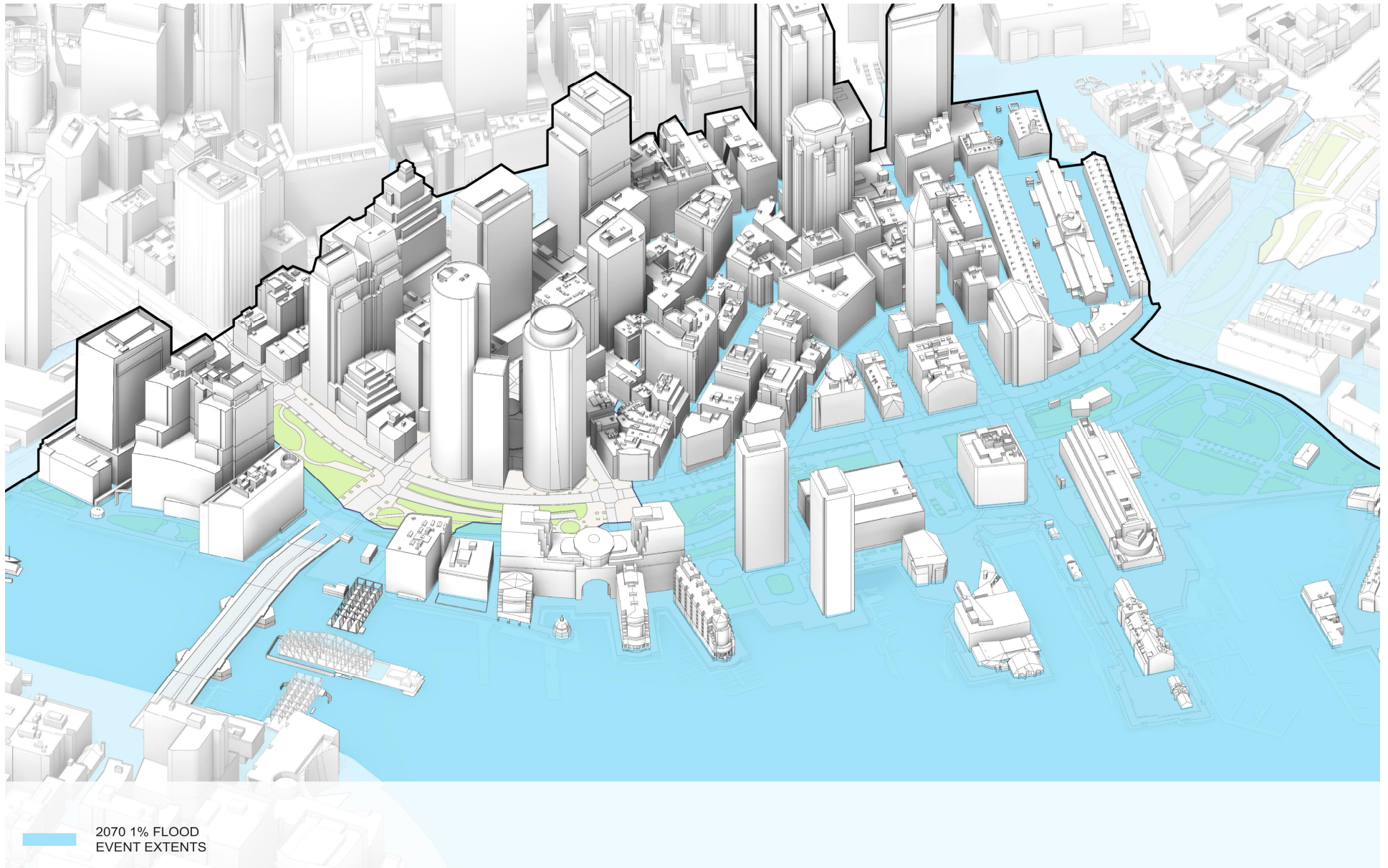
Flood Depths:



Flood Extents – 2030 1% Storm Surge Flood Event



Flood Extents – 2070 1% Storm Surge Flood Event



Additionally, projected sea level rise is anticipated to increase 'sunny-day' flooding throughout the district during high tides events, even when no storms are present. While Boston saw 7 high-tide flood days in 2021, the National Oceanic and Atmospheric Administration (NOAA) projects 11 to 18 high-tide flood days to impact Boston this year, and 50 to 70 high-tide flood days by 2050. Sunny-day tidal flooding is projected to impact critical infrastructure including the Central Artery Tunnel and the MBTA's Blue Line by the 2040s.

Sunny-Day Tidal Flood Projections

- By the 2040s: Critical Infrastructure including the **Central Artery Tunnel and MBTA Blue and Orange Lines** will be exposed to flooding during sunny-day tides.
- By the 2060s: Widespread flooding throughout the Wharf District will expose **dozens of buildings located inland of Atlantic Avenue** to flooding during sunny-day tides.

Sunny-Day Tidal Flooding

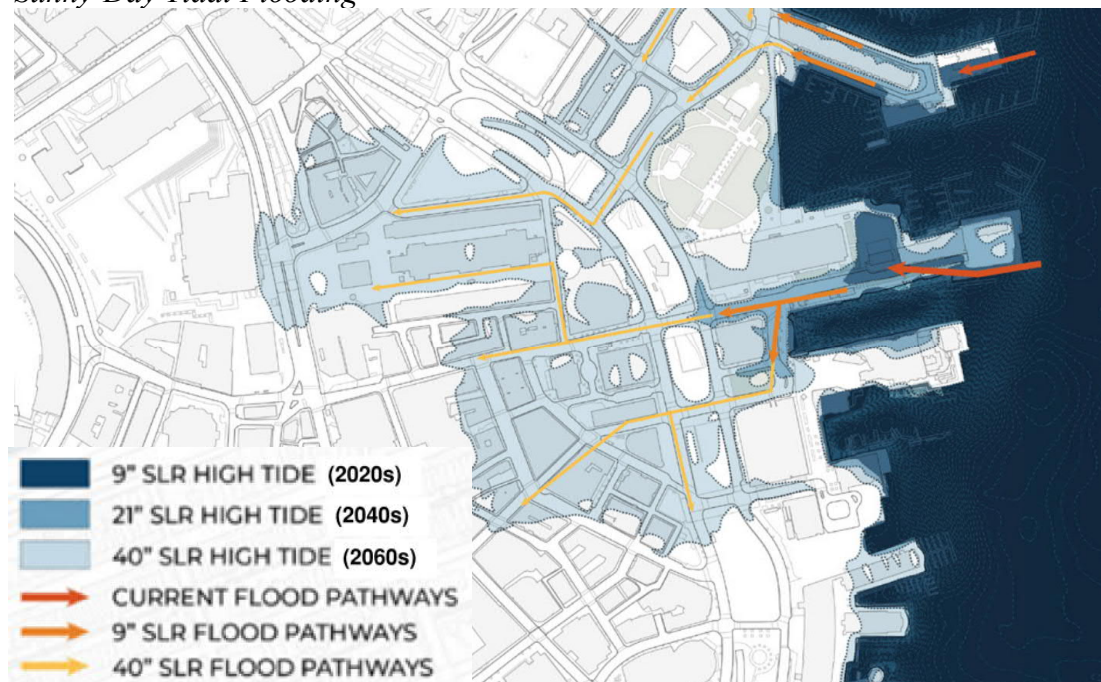


Image Source: Coastal Resilience Solutions for Downtown Boston and North End, with revised time horizons to reflect current sea level rise projections.

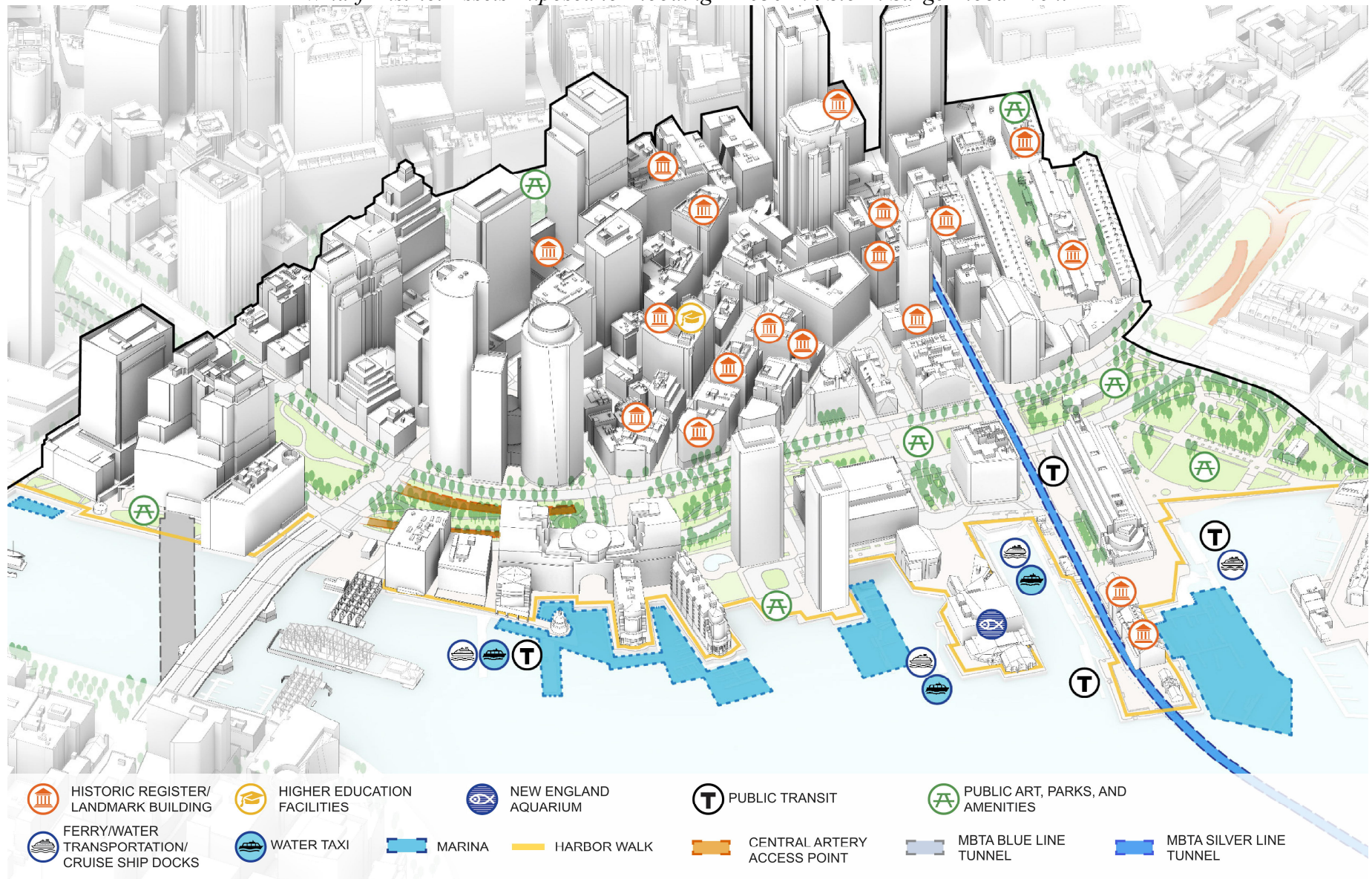
Building-Level Flood Resiliency Guidelines

To protect people and property in the Wharf District, **flood protection strategies are necessary at all buildings in flood prone areas – including those located inland of Atlantic Avenue.** These building-level protections are needed to provide a second line of defense to reduce the risks to the community associated with single points of failure in the district-scale flood protection system proposed along the waterfront.

Strategies for protecting individual buildings from flooding are provided in **Appendix C.**

These sunny-day tidal floods and storm surge events will expose much of the Wharf District community and its important community assets to flood risks. **Without a district-wide flood protection system, all assets indicated on the map below will be exposed to flooding during a 1% Storm Surge Event in 2030.**

Wharf District Assets Exposed to Flooding – 2030 1% Storm Surge Flood Event



Prior Flood Resiliency Planning Initiatives

After Superstorm Sandy caused widespread damage in New York City on October 29, 2012 and spared Boston with a near-miss, Boston undertook numerous flood resilience planning studies aimed at developing a comprehensive approach to protecting its communities.

Two of these studies – Climate Ready Boston (2016) and Coastal Resilience Solutions for Downtown Boston and North End (2020) – developed the following key considerations for designing coastal flood resiliency projects for the Wharf District Community, including:

- **Design Flood Elevations:** A “Target” Design Flood Elevation (DFE) is established as the minimum elevation district-wide flood protection systems are required to meet. A “Modular” DFE is also defined as a higher elevation that flood protection systems may need to be raised to in the future as sea levels rise.
- **Alignments:** Several flood protection options were identified indicating locations, or ‘alignments’ where a district flood protection system may be located.
- **Evaluation Criteria:** A set of evaluation criteria, developed through extensive community engagement efforts, were created to help guide and rank proposed climate resilience strategies.
- **Strategies:** A resilience toolkit summarizing possible design approaches that may be applied along the alignments is provided for guidance.

Refer to **Appendix A** for a full list of definitions and abbreviations used in this report.

In 2019, the Wharf District Council engaged with Wharf District stakeholders in the Wharf District Public Realm Visioning Study to define community preferences associated with resiliency, planning for change, connections and access, and enhancing quality of life.

Since this time, numerous property owners have also undertaken planning, design, and installation of flood resiliency measures to reduce flood hazards on their property.

Timeline of Wharf District Resiliency Planning Initiatives

2016	• Climate Ready Boston
2017	• Imagine Boston 2030
2017	• Resilient Boston
2018	• Resilient Boston Harbor Vision
2018	• Climate Resilient Design Standards & Guidelines for Protection of Public Rights-of-Way
2019	• Coastal Flood Resilience Design Guidelines
2019	• City of Boston Climate Action Plan Update
2019	• Wharf District Public Realm Visioning Study
2020	• Coastal Resilience Solutions for Downtown and North End
2021	• Coastal Flood Resilience Overlay District

Design Flood Elevations (DFEs)

Boston's prior flood resiliency studies were based on the Boston Harbor Flood Risk Model (BH-FRM) developed by Woods Hole Group for MassDOT in 2015. Woods Hole Group recently developed an updated flood model with the latest sea level rise projections for MassDOT: the Massachusetts Coast Flood Risk Model (MC-FRM). MC-FRM outputs underpin the Design Flood Elevations used for the Wharf District Council project. For more details regarding the DFE, refer to **Appendix B**.

Why use MC-FRM Sea Level Rise & Flood Projections?

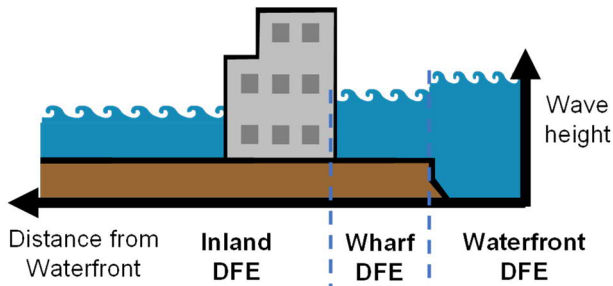
Flood projections from MC-FRM are integrated with Massachusetts' ResilientMA Climate Resilience Design Standards Tool – the state's standard tool for assessing vulnerabilities and informing resilient design for future coastal flood hazards. State agency projects and projects undergoing review under the Massachusetts Environmental Policy Act are required to use ResilientMA tool. Municipal resilience grant recipients are also encouraged to use the ResilientMA tool. **This project uses the sea level rise and flood projections from the MC-FRM to align with regulatory requirements and maximize opportunities for funding.**

Conceptual District Protection & Resiliency Plan – Design Flood Elevations

Target DFE – Consistent with the City of Boston's Target DFE, this is the minimum elevation that district-wide flood protection systems are recommended to meet.

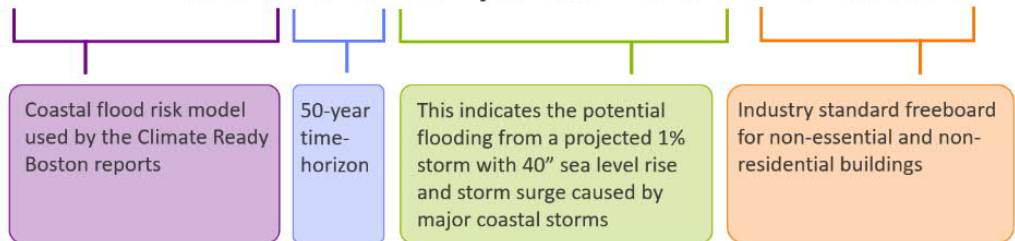
Strategic DFE – We recommend flood protection systems be designed to be incrementally raised over time from the Target DFE to the Strategic DFEs.

The Strategic DFEs vary based on location, with higher DFEs at the waterfront due to wave impacts near the water's edge, and lower DFEs for inland areas, as indicated in the image below:



Target DFE Assumptions:

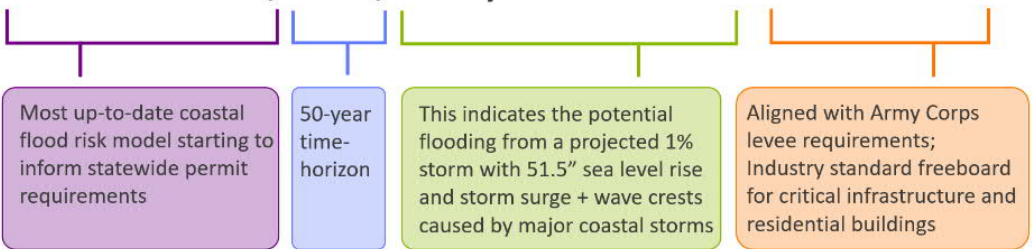
BH-FRM Model*, 2070, 100 –year storm event + 1-ft Freeboard



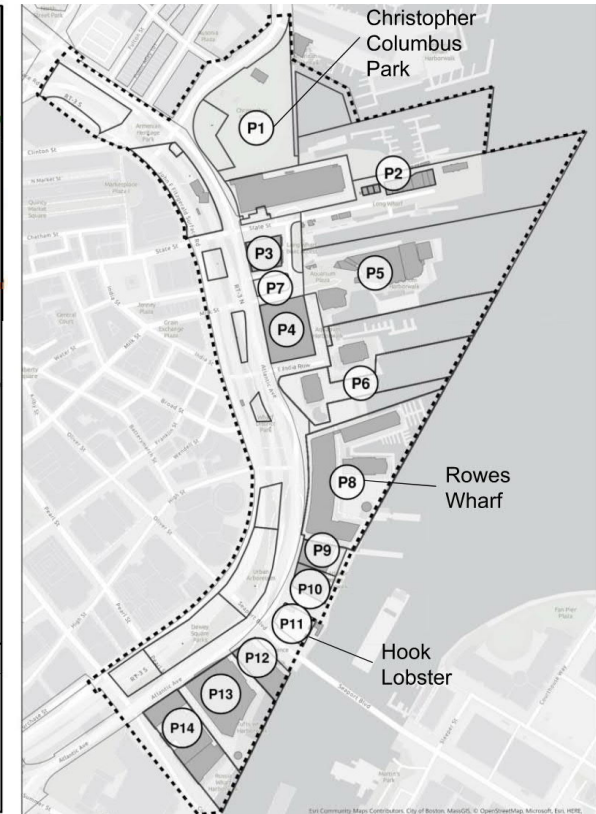
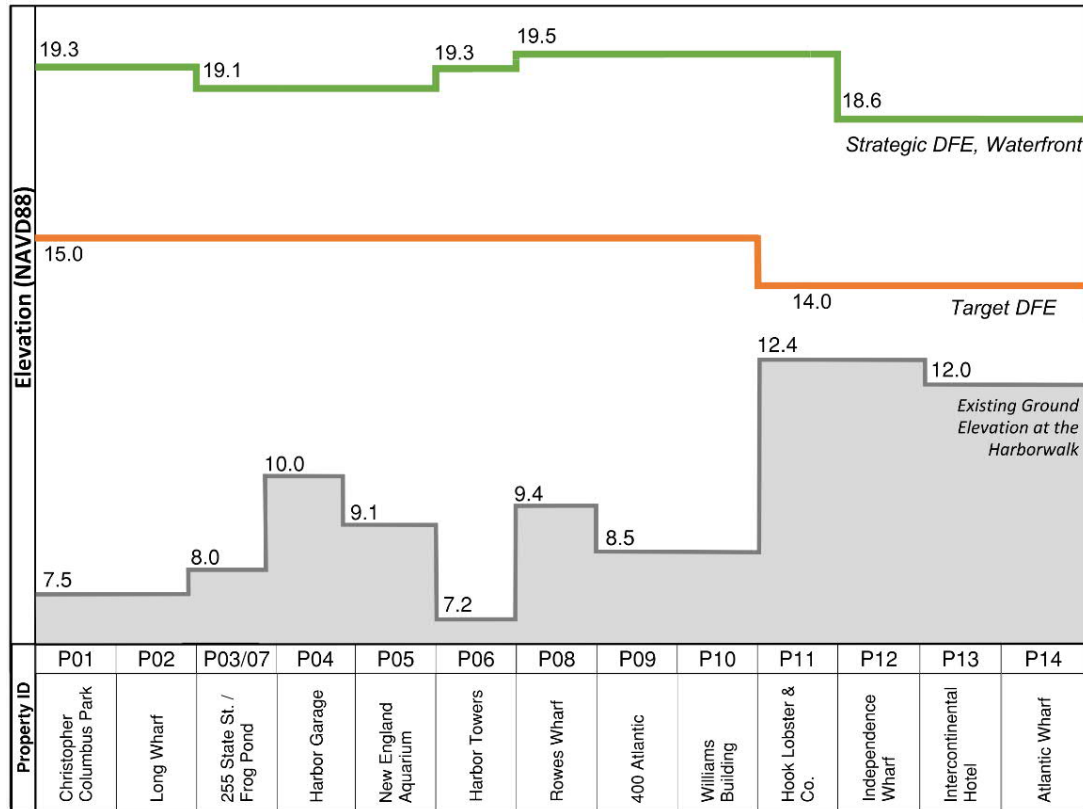
*Boston Harbor Flood Risk Model

Strategic DFE Assumptions:

MC-FRM Model*, 2070, 100 –year storm event + 2-ft Freeboard



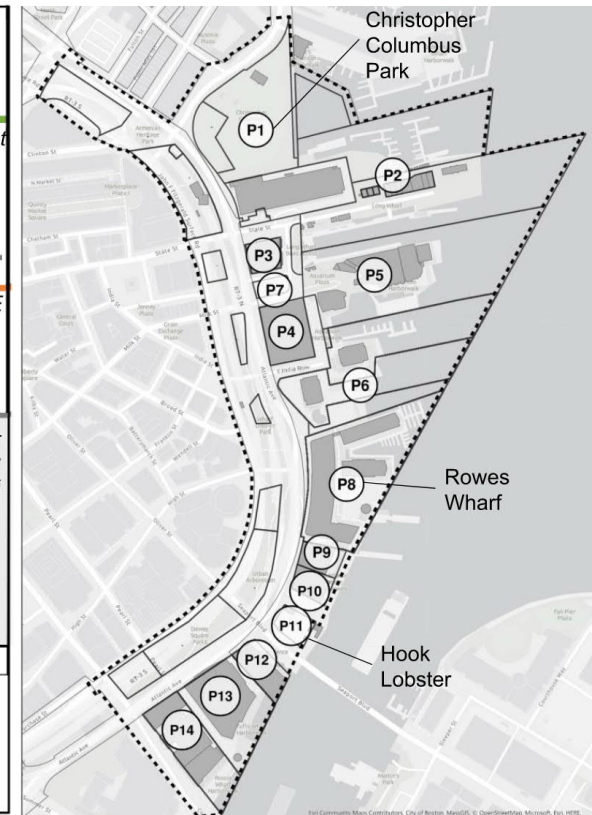
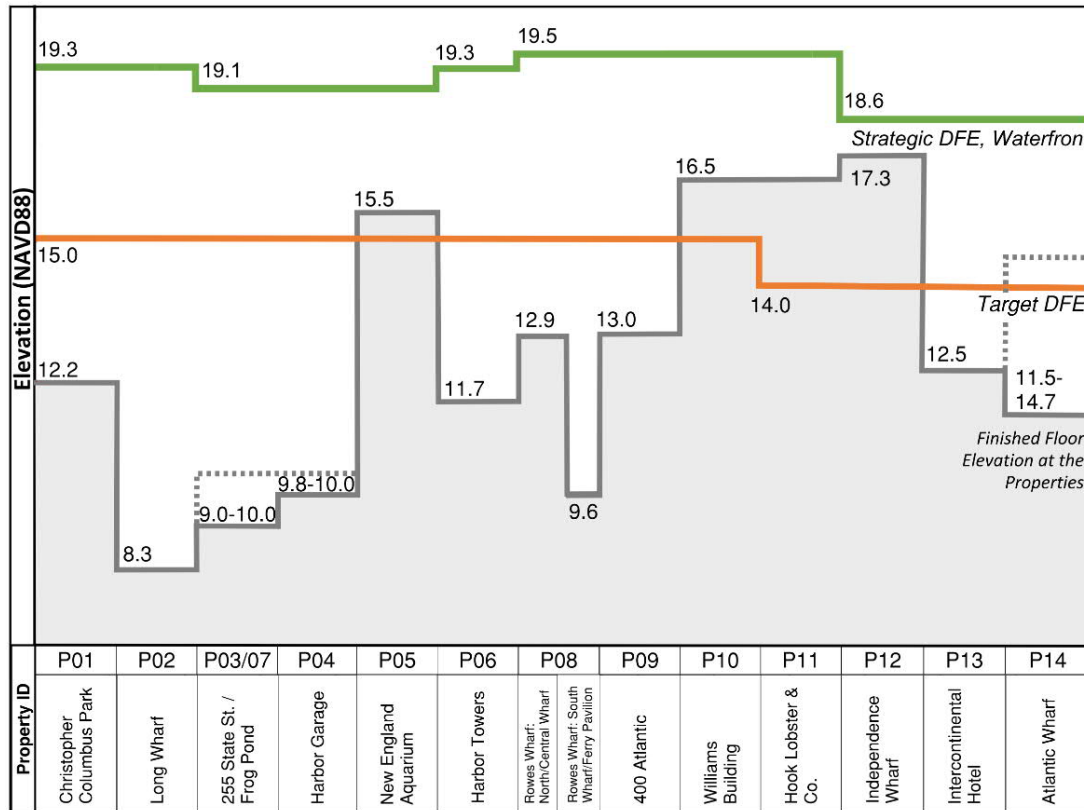
Design Flood Elevations | Ground Elevation at the Harborwalk



Ground Elevation at the Harborwalk

This graphic compares the **existing ground elevations along the Harborwalk** (shown in grey) to the proposed Design Flood Elevations (Target DFE shown in orange, Strategic DFE in green) at each property from Christopher Columbus Park (left) to Atlantic Wharf in the Fort Point Channel (right). Flood protections located along the Harborwalk would need to close the gap in elevation between the existing ground elevation and the Target DFE at a minimum.

Design Flood Elevations | Building First Floor Elevations



Building First Floor Elevations

This graphic compares the **First Floor Elevations of the waterfront buildings** (shown in grey) to the proposed Design Flood Elevations (Target DFE shown in orange, Strategic DFE in green) at each property from Christopher Columbus Park (left) to Atlantic Wharf in the Fort Point Channel (right). Flood protections located at the waterfront buildings would need to close the gap in elevation between the existing ground elevation and the Target DFE at a minimum.

Purpose

With funding from the waterfront property owners and the Commonwealth of Massachusetts, the Wharf District Council collaborated with the City of Boston and Wharf District Stakeholders to provide this engineering assessment to **integrate and advance the prior flood resiliency planning initiatives** by the City of Boston, the Wharf District Council, and individual property owners.

The Conceptual District Protection & Resiliency Plan (the Plan) aims to **define a preferred flood resiliency system along the Wharf District's waterfront that has broad support from the Wharf District community.**

This plan goes beyond protecting individual buildings – protecting all the Wharf District from current and future flooding while providing an integral component of a larger contiguous flood protection system extending beyond the borders of the Wharf District.

The Plan is intended to be compatible with the Wharf District's unique character as an active and functioning waterfront, providing opportunities to preserve and enhance:

- The Harborwalk
- Public spaces
- Inclusive access to the waterfront, water and public transportation and recreation, and buildings
- The functionality of docks and water transportation
- Environmental and historic resources

This plan is not intended to prescribe the public and private land improvements of areas impacted by the proposed flood resiliency system. Instead, it aims to support meaningful conversations about what waterfront access, equity, diversity, and inclusion look like in subsequent resiliency and land improvement planning efforts.

Long Wharf



Process

The Project was conceived in 2019 and Arup was engaged in April 2022. The project team consisted of the Wharf District Council Climate Resilience Task Force Management Team and an interdisciplinary consultant team led by Arup, with support from Halvorson, Haley & Aldrich, VHB, and Woods Hole Group.

The Conceptual District Protection & Resiliency project approach **centers the direct involvement of Wharf District Stakeholders as well as Equity, Diversity, and Inclusion Partners (EDI Partners) in the planning and design process**, with a goal of developing a resiliency plan that would be broadly supported by the Wharf District Community. A summary of the project's approach to designing for social equity and access is provided on the following page.

A detailed summary of the overall project approach is provided in **Appendix B**. This process included:

- *Stakeholder and EDI Partner Engagement*
Wharf District Stakeholders and EDI Partners were engaged to: share knowledge of flood hazards, site-specific considerations, and prior resiliency initiatives; develop a set of Evaluation Criteria for ranking and prioritizing resiliency strategies; assess the impacts of the flood resiliency strategies; and identify a set of preferred resiliency strategies for the waterfront properties.

- *Building on Prior Planning Initiatives*
A Due Diligence assessment was performed to collect, catalogue, and review relevant prior planning, technical and regulatory information, and access considerations. Design Flood Elevations, alignments, strategies, and evaluation criteria from the City's prior planning initiatives were updated to incorporate findings of the Due Diligence assessment, recent flood predictions, and Stakeholder and EDI Partner feedback.
- *Resiliency System Design*
A preferred district-scale flood resiliency system design was developed, along with a flood resiliency guidelines for individual buildings, permitting considerations, cost estimates, a Cost Benefit Analysis, an implementation timeline, and a list of potential funding sources.

June 21, 2022 Due Diligence Site Visit



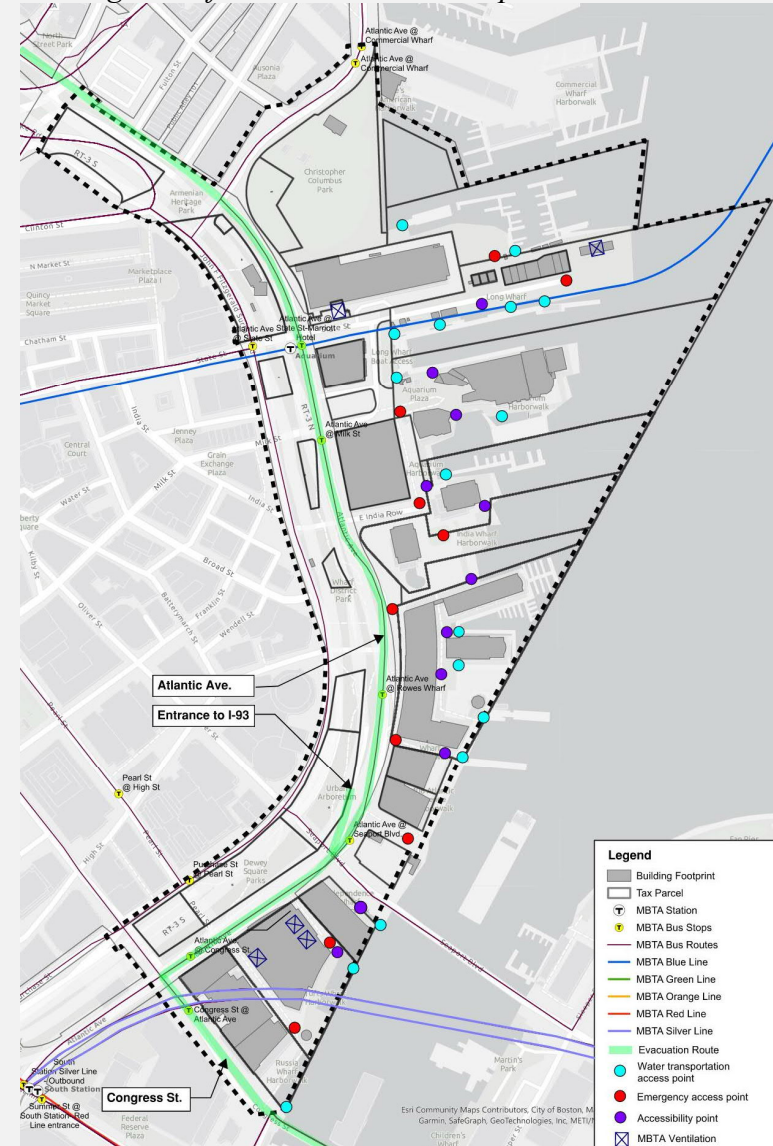
Design for Social Equity & Access

The flood protection system design aims to provide equitable access to the waterfront, safe transportation into, out of, and around the waterfront, and create opportunities for new public recreational and cultural amenities. To achieve these goals, the Plan:

- Identifies opportunities for new accessible routes to the Harborwalk
- Maintains or increases the width of the existing Harborwalk at all locations
- Results in an overall increase in existing Harborwalk and public open space areas, including identifying opportunities for new public open space areas to compensate for potential impacts to existing open space programming by the proposed resiliency strategies
- Maintains emergency access routes to all buildings and Harborwalk locations
- Minimizes impacts on views of the Harbor, and identifies new opportunities for public viewing of the water
- Identifies new opportunities for direct access for the public to 'touch' the water

EDI Partners and Wharf District Stakeholders were also provided opportunities to inform the Plan through review and comment periods on the Project deliverables.

Existing Waterfront Access Route Map



What's Next?

Building off prior planning and guidance from the City of Boston, and developed in close coordination with Boston Planning and Development Agency (BPDA) staff, this Plan is based on resiliency approaches endorsed by the City of Boston. Incorporating the Wharf District Stakeholders and EDI Partners directly in the process, the Plan leverages the local community's deep personal knowledge of the specific hopes and needs of the district's people, organizations, and infrastructure to define a vision that enables the Wharf District not just to survive, but to thrive in the years to come.

In creating a district-wide resiliency plan that is **supported by the Wharf District Community**, this concept plan takes an important step in the Wharf District's journey towards a thriving and resilient future. The success of this plan will ultimately depend on continued engagement and support from the Wharf District Community, the City of Boston, and public and private stakeholders.

Next steps in the Wharf District's resiliency journey:

- Directly **engage with Water Transportation Providers and Marina Operators** to identify additional opportunities to improve water transportation infrastructure in the District.
- **Coordinate with governmental agencies** on the larger-scale design and implementation.
- **Work with neighboring districts** to link each of our plans.
- **Expand our engineering analyses** to further investigate opportunities to manage inland flooding associated rain falling on the 'dry-side' of the proposed flood protection systems.
- Develop a **Funding and Financing Strategy** that will identify potential sources of public and private funding necessary to fully fund the district's flood resiliency plan, and assess the viability of various procurement and operating models that may be employed to advance the plan through final design, construction, and long-term operation.

Areas of Opportunities Map

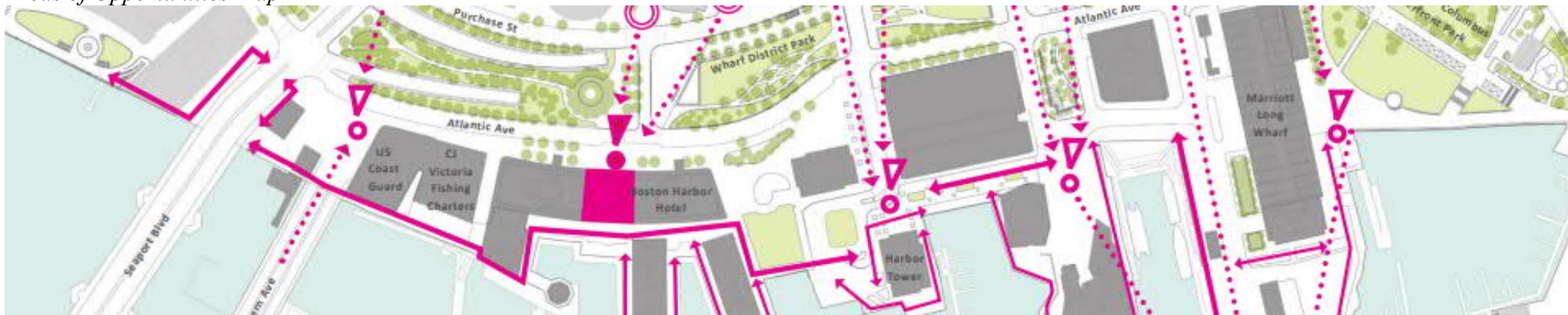


Image Source: 2016 Wharf District Public Realm Vision, Halvorson

The background image shows a scenic view of a waterfront promenade. In the foreground, a wooden boardwalk runs along a body of water, with a metal railing and a thick chain visible. Two people are walking away from the camera on the boardwalk. In the background, a city skyline is visible, featuring several tall buildings, including a prominent clock tower. The sky is clear and blue.

2. Flood Resiliency Solutions for the Wharf District

Wharf District Flood Resiliency Plan

Sub-District Projects

Implementation Timeline

Regulatory Considerations

Cost Estimate, Benefit-Cost Analysis, and Funding Opportunities

Wharf District Flood Resiliency Plan

Designed to optimize the Evaluation Criteria of Effectiveness, Feasibility, Adaptability, Social Equity & Access, and Environmental & Additional Benefits, the proposed flood resiliency plan for the Wharf District provides a contiguous line of protection along the district's entire waterfront. This plan also creates three Resiliency Zones within the district to protect all Wharf District properties from flood pathways originating outside the district while mitigating wide-spread flood risks associated with single points of failure.

The proposed plan integrates multiple resiliency strategies into a cohesive flood protection system informed by the findings of a Multicriteria Assessment, a multi-disciplinary engineering assessment, and an extensive stakeholder engagement process. Importantly, **the proposed resiliency system has the support of each of the district's Waterfront Property owners.**

A detailed summary of the project's approach to each of the Evaluation Criteria is provided in **Appendix B.**

Wharf District Resiliency Project Evaluation Criteria



Effectiveness

- Meets Design Flood Elevations (DFEs)
- Facilitates continuous line of protection / resilience across the entire district
- Minimizes deployment complexity
- Protects critical infrastructure
- Avoids increasing rainfall-based flooding at abutting properties



Feasibility

- Minimizes ground settlement & coastal erosion
- Minimizes impacts to seawalls & structural decks
- Minimizes permitting risks
- Minimizes construction cost
- Minimizes long term operations & maintenance costs



Adaptability

- Compatible with existing property-specific plans and land use
- Compatible with district-wide and abutting-property resiliency strategies
- Provides opportunities for phased implementation



Social Equity & Access

- Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage
- Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage
- Preserves & enhances view of the Harbor
- Preserves & enhances emergency access
- Preserves & enhances non-emergency access to the waterfront, public



Environmental & Additional Benefits

- Preserves & enhances environmental resources
- Preserves & enhances docks & water transportation functionality and access
- Minimizes outdoor private land use impacts
- Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources

Along with the district-scale waterfront strategies, Building-Level Flood Resiliency Guidelines are provided in **Appendix C**. These guidelines summarize flood resiliency recommendations recommended to be implemented by building owners throughout the Wharf District to create a second layer of resiliency for the Wharf District community at each building located within a flood prone area.

The following section provides an overview of the key design elements of the Wharf District Flood Resiliency Plan. For further detail into the due diligence and multi-criteria assessment findings refer to **Appendix D**.

Phased Construction

The flood protection system is designed to be built in phases, constructed to the Target Design Flood Elevation (DFE) in the near-term and mid-term to prioritize protection of the most at-risk areas within the Wharf District, and then incrementally raised to the Strategic DFE in the long-term as sea levels rise.

Refer to the Sub-District Project descriptions and Implementation Timeline for additional construction phasing recommendations.

Multiple Flood Pathways

The proposed flood protection system protects the Wharf District from flooding from the three major potential flood pathways of storm surge, rainfall, and groundwater.



Coastal Storm Surge – A combination of seawalls, elevated landforms, and floodwalls are proposed to protect the district from overland flooding from coastal storm surges up to the Design Flood Elevations (DFEs).



Rainfall – New storm drainage infrastructure is proposed to mitigate the risks of rainfall causing flooding on the ‘dry-side’ of the flood protection system, including:

- New major underground stormwater storage
- New stormwater pump systems
- New storm drainpipes to convey overflows from the City’s existing sewers to the new stormwater storage and pump systems
- New manual gate valves and automatic tide gates on all existing storm and combined sewer outfalls to the Harbor



Below-Ground Flood Pathways – Groundwater cutoff walls are proposed to reduce the influence of tides and storm surges on inland groundwater levels. New groundwater management systems consisting of underdrain systems to collect and convey groundwater to storage and pump systems are also proposed to maintain safe groundwater levels without exposing existing wood piles to rot and degradation by marine borers.

Building Consensus

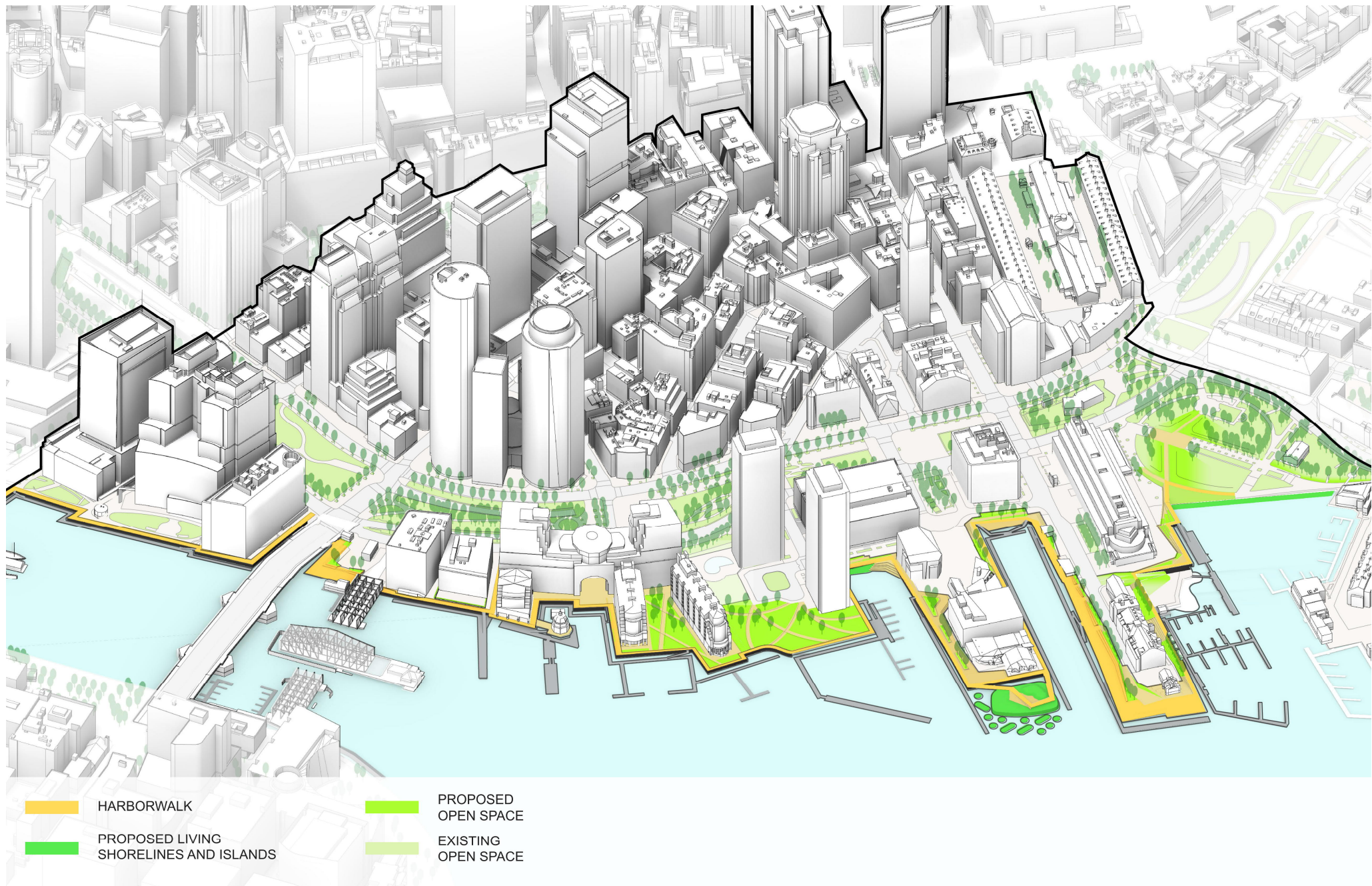
The proposed district-wide flood resiliency system was developed in close coordination with the waterfront property owners – on whose property the flood resiliency systems must be installed. **The resulting proposed flood resiliency plan represents a consensus resilience solution supported by each of the district's Waterfront Property owners.**

The status of the project's engagement with each waterfront property is summarized in the table below.

Waterfront Property Owner Coordination Status | May 26th, 2023

Waterfront Property	All Workshops Complete	Preferred System Identified
Marriott Long Wharf	✓	✓
Boston Harbor City Cruises	✓	✓
255 State / Frog Pond Park	✓	✓
New England Aquarium	✓	✓
Harbor Garage	✓	✓
Harbor Towers	✓	✓
Rowes Wharf	✓	✓
400 Atlantic	✓	✓
Williams Building (US Coast Guard)	✓	✓
James Hook & Company	✓	✓
Independence Wharf	✓	✓
Intercontinental Hotel Condos	✓	✓
Atlantic Wharf	✓	✓
Public Works Department / PIC	✓	✓
Rose Kennedy Greenway	✓	✓
Christopher Columbus Park / Long Wharf	✓	✓

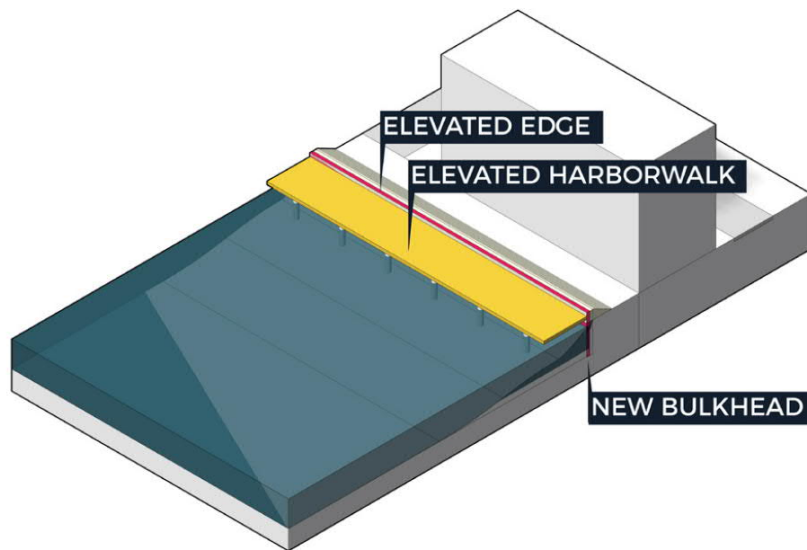
Wharf District Flood Resiliency Plan



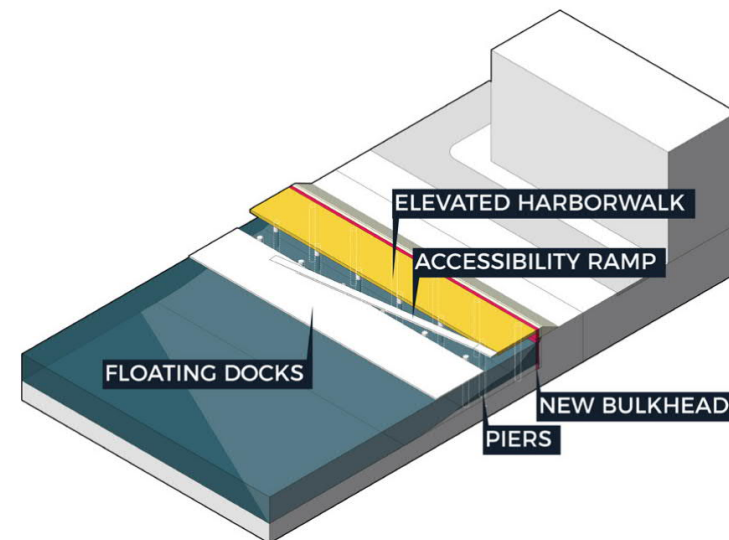
Resiliency Strategies

The proposed resiliency plan is comprised of the five following resiliency strategies, which are integrated into a single cohesive flood protection system to provide a contiguous line of protection along the Waterfront that will protect the entire Wharf District. Before each strategy was run through the multi-criteria assessment, a Coastal Structures Assessment was conducted, and the results can be found in Appendix F.

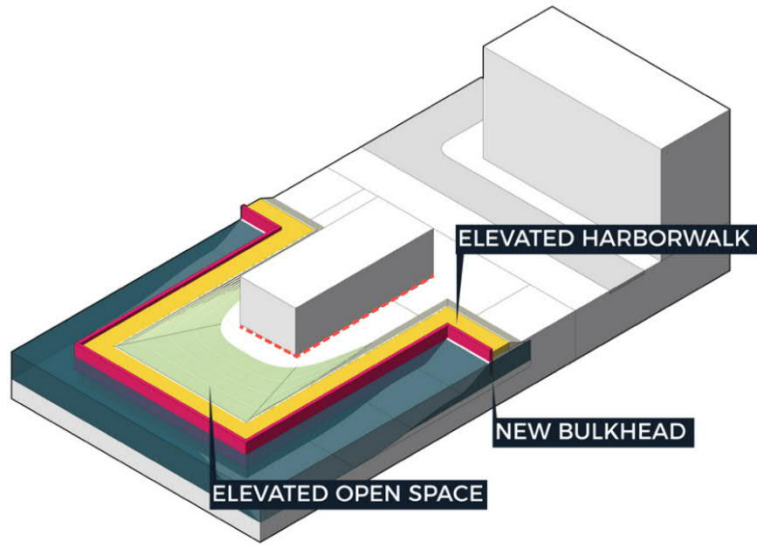
Over Water – This strategy elevates the ground elevation at the existing seawall location and cantilevers a new decking system for the Harborwalk over the water.



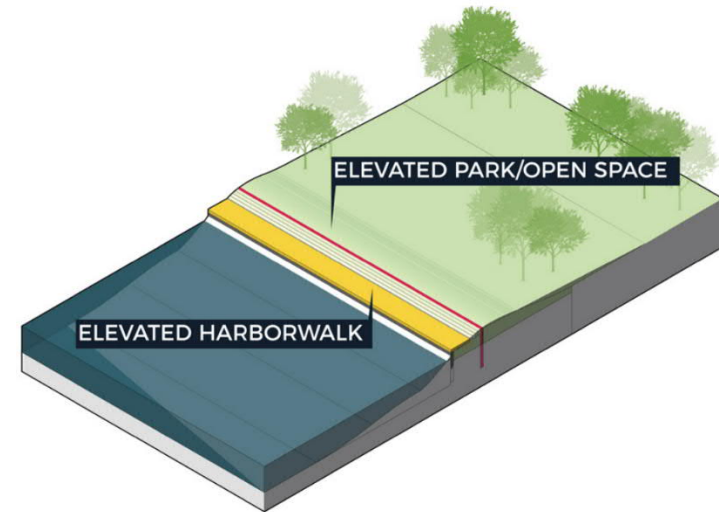
Elevated Dock – This strategy is identical to the Over Water strategy except it incorporates floating docks on the water to facilitate water transportation and access.



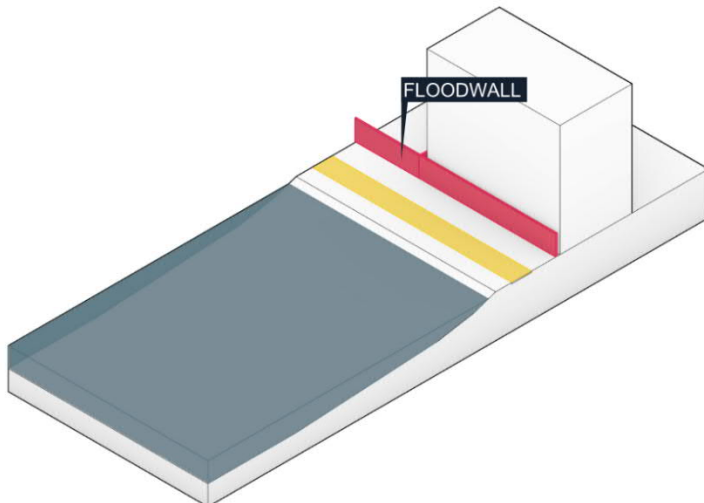
Elevated / Constructed Harbor Walk – This strategy infills the Harbor outboard of the existing seawall and creates new elevated open space and Harborwalks.



Elevated / Constructed Land – This strategy elevates the existing ground to create a flood protection landform. Surface materials vary and include landscaped berms as well as hardscape walkways and Harborwalks.



Floodwall – The use of floodwalls for the district-wide system is limited to roadways and immediately adjacent to existing walls and solid building facades.

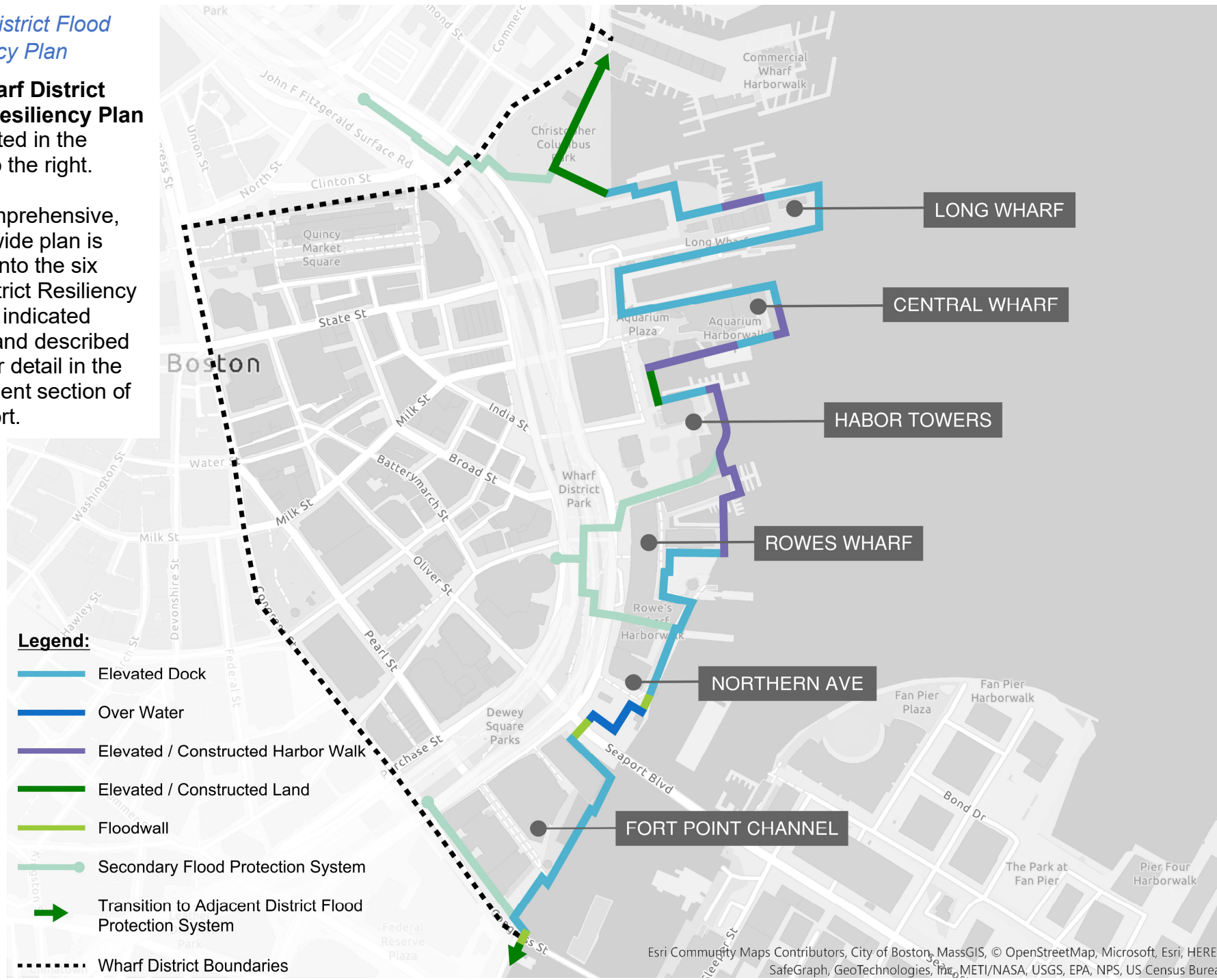


The resiliency strategy images in this section are from the Coastal Resilience Solutions for Downtown and North End Report, except for the Floodwall image which was created by Arup and Halvorson.

Wharf District Flood Resiliency Plan

The **Wharf District Flood Resiliency Plan** is indicated in the image to the right.

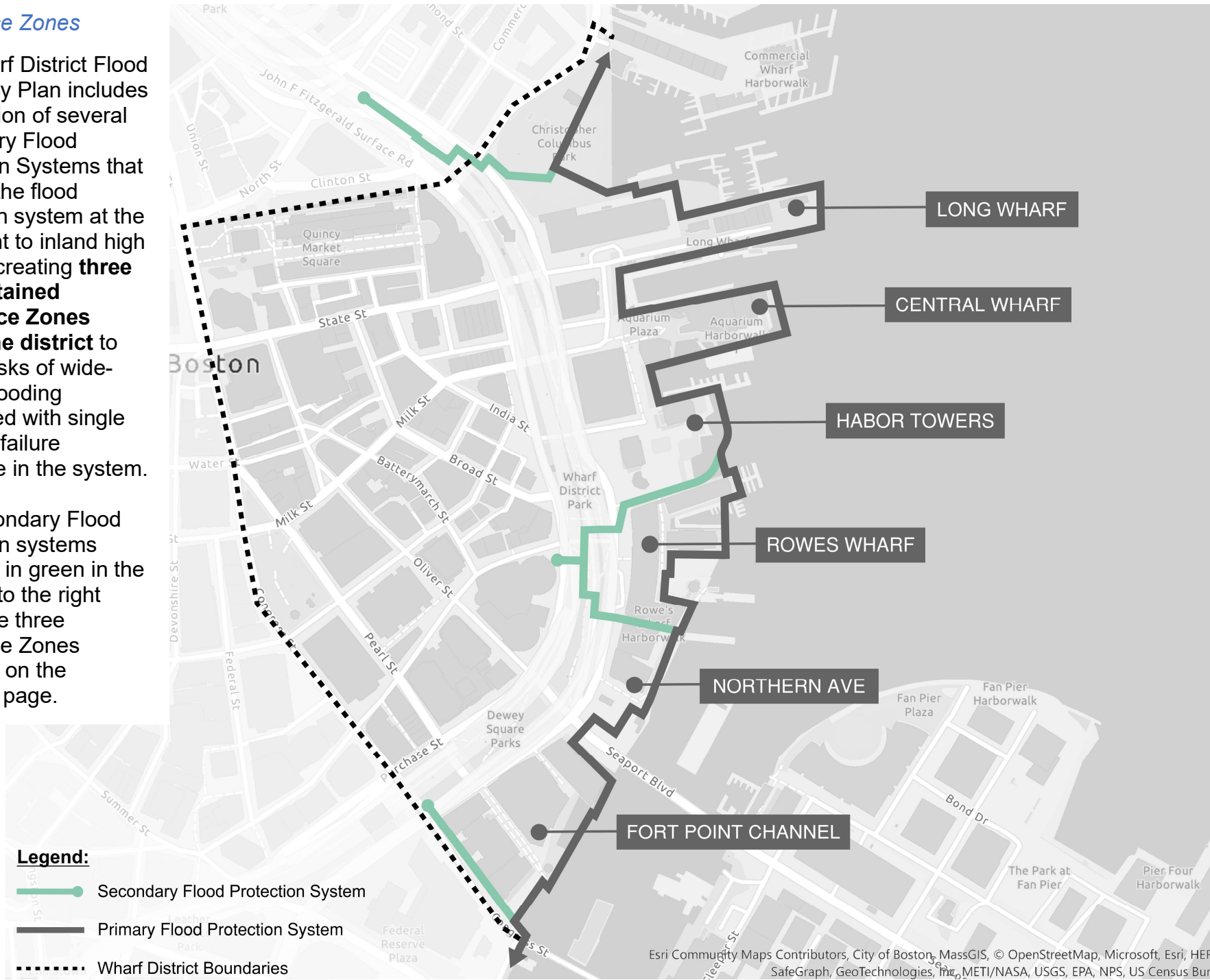
This comprehensive, district-wide plan is divided into the six Sub-District Resiliency Projects indicated hereon and described in further detail in the subsequent section of this report.



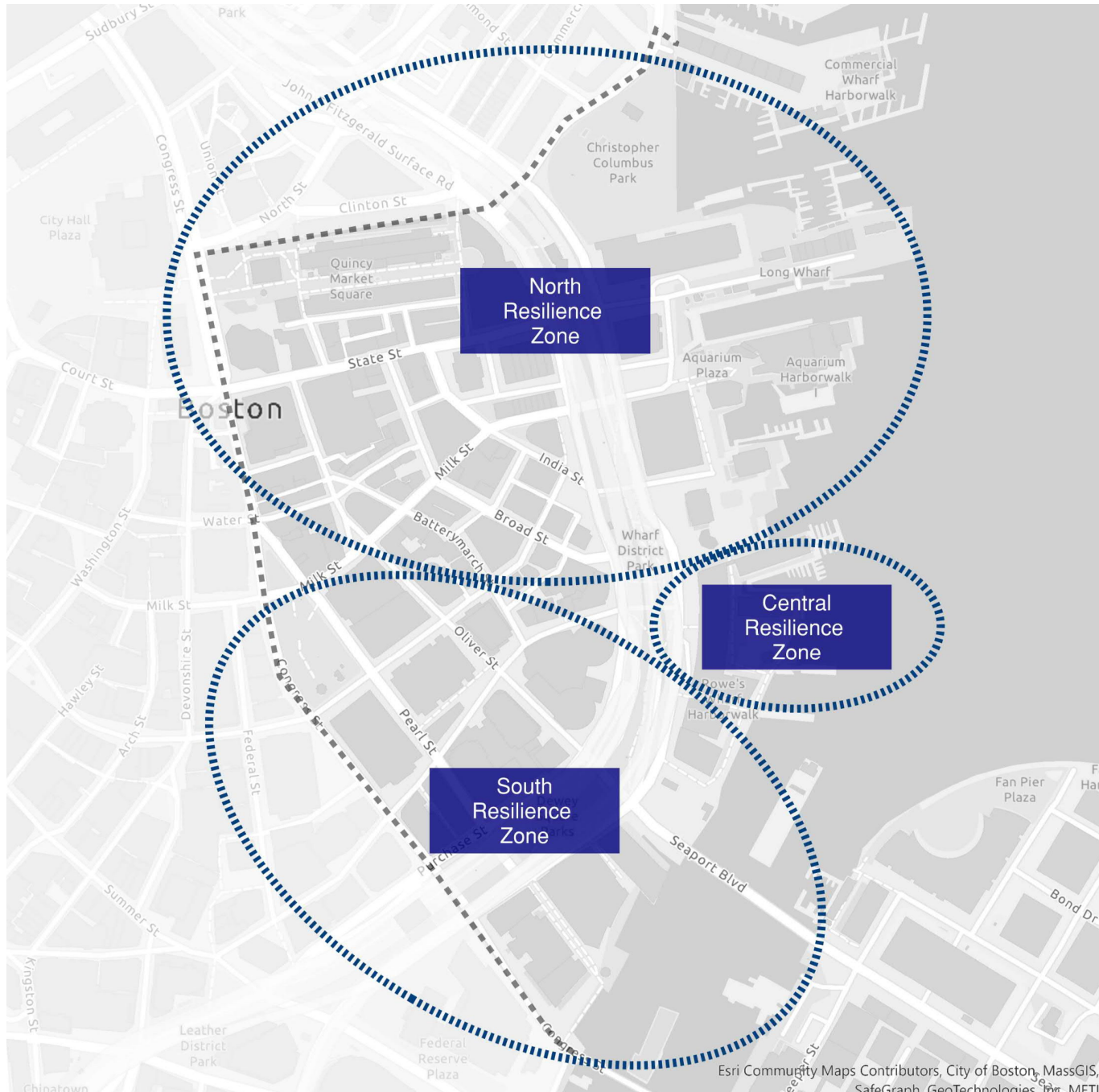
Resilience Zones

The Wharf District Flood Resiliency Plan includes the creation of several Secondary Flood Protection Systems that connect the flood protection system at the waterfront to inland high points – creating **three self-contained Resilience Zones within the district** to reduce risks of widespread flooding associated with single points of failure anywhere in the system.

The Secondary Flood Protection systems indicated in green in the diagram to the right create the three Resilience Zones identified on the following page.



Flood Resilience Zones



Waterfront Access

To provide equitable access to the waterfront, safe transportation into, out of, and around the waterfront, and create opportunities for new public waterfront recreational and cultural amenities, the Plan maintains or increases the width of the existing Harborwalk at all locations and increases existing Harborwalk areas, public open space areas, and dock areas within each Sub-District Project, as shown on the table below.

Across the entire district, **the Plan creates 21,150 square feet of new Harborwalk, 90,890 square feet of new publicly-accessible open space area, and 2,190 linear feet of new docks.**

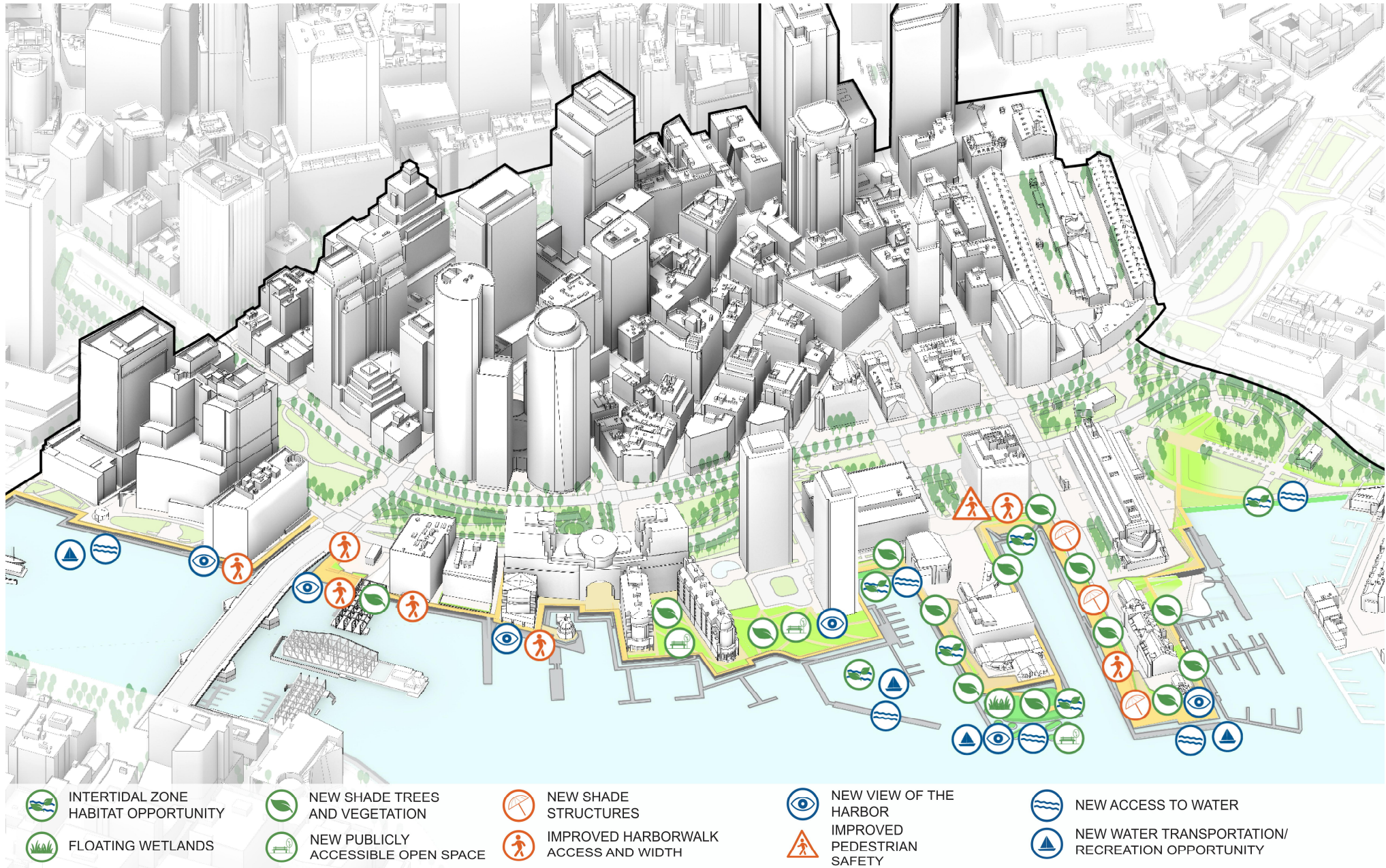
Preserving and Improving Waterfront Access

Sub-District Project	Harborwalk Area			Publicly-Accessible Open Space Area			Dock Length		
	Existing (SFT)	Proposed (SFT)	Difference (%)	Existing (SFT)	Proposed (SFT)	Difference (%)	Existing (LFT)	Proposed (LFT)	Difference (%)
Long Wharf	60,840	78,150	128%	289,610	308,030	106%	2,460	3,360	137%
Central Wharf	26,900	27,070	101%	26,940	44,890	167%	600	1,080	180%
Harbor Towers	11,160	11,190	100%	30,830	56,440	183%	710	800	113%
Rowes Wharf	15,950	16,060	101%	31,810	46,400	146%	2,590	2,620	101%
Northern Ave.	3,250	6,190	190%	3,250	15,790	486%	200	480	240%
Fort Point Channel	17,420	18,010	103%	56,470	58,250	103%	350	760	217%
TOTAL	135,520	156,670	116%	438,910	529,800	121%	6,910	9,100	132%

Multiple Benefits

Many potential opportunities to better connect our community to the Harbor and enhance our environment may be unlocked with the implementation of this Plan, as illustrated on this page. **We anticipate that these opportunities will need to be further discussed, planned, and designed through subsequent community engagement initiatives.**

Opportunities for Multiple Benefits

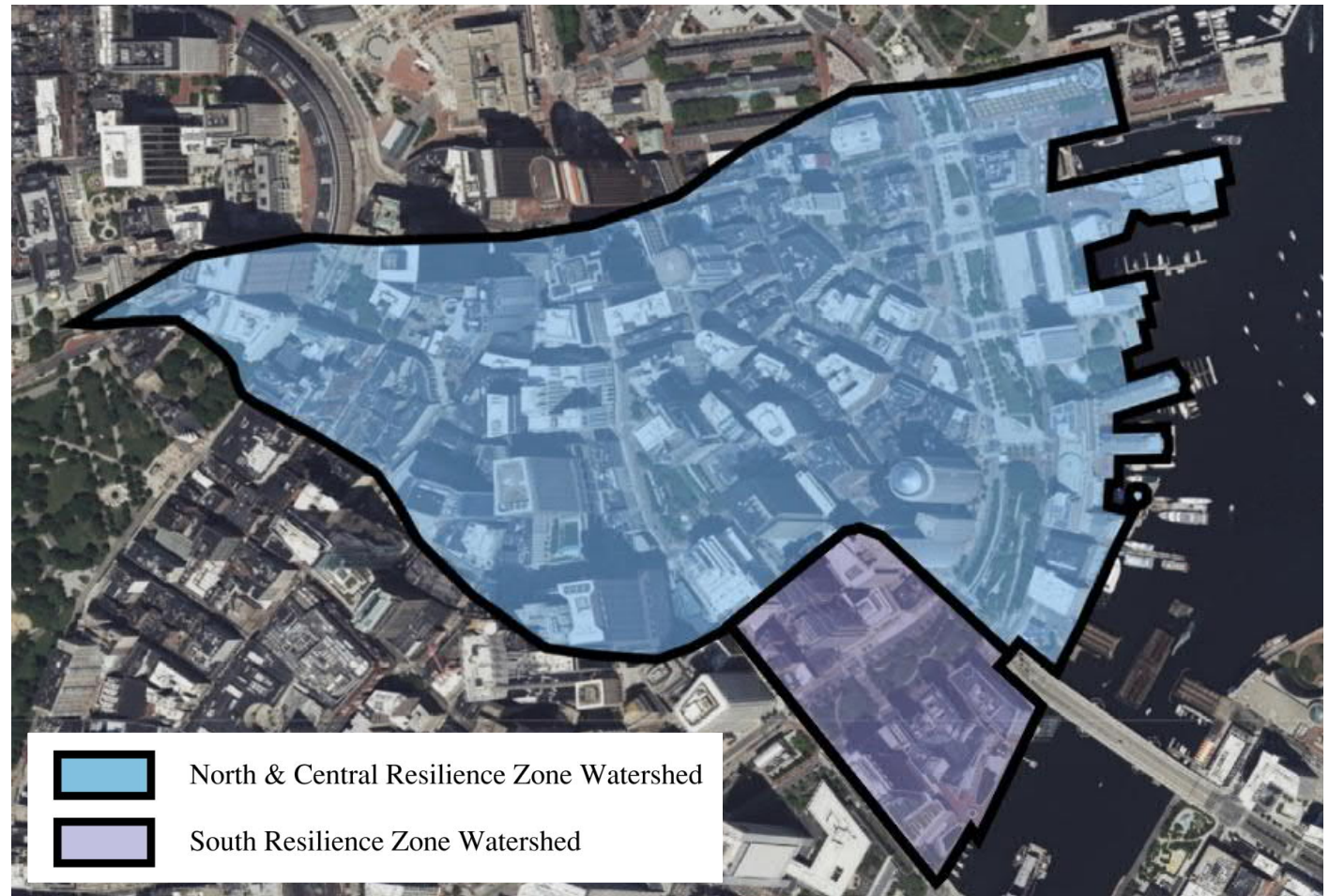


Stormwater Storage

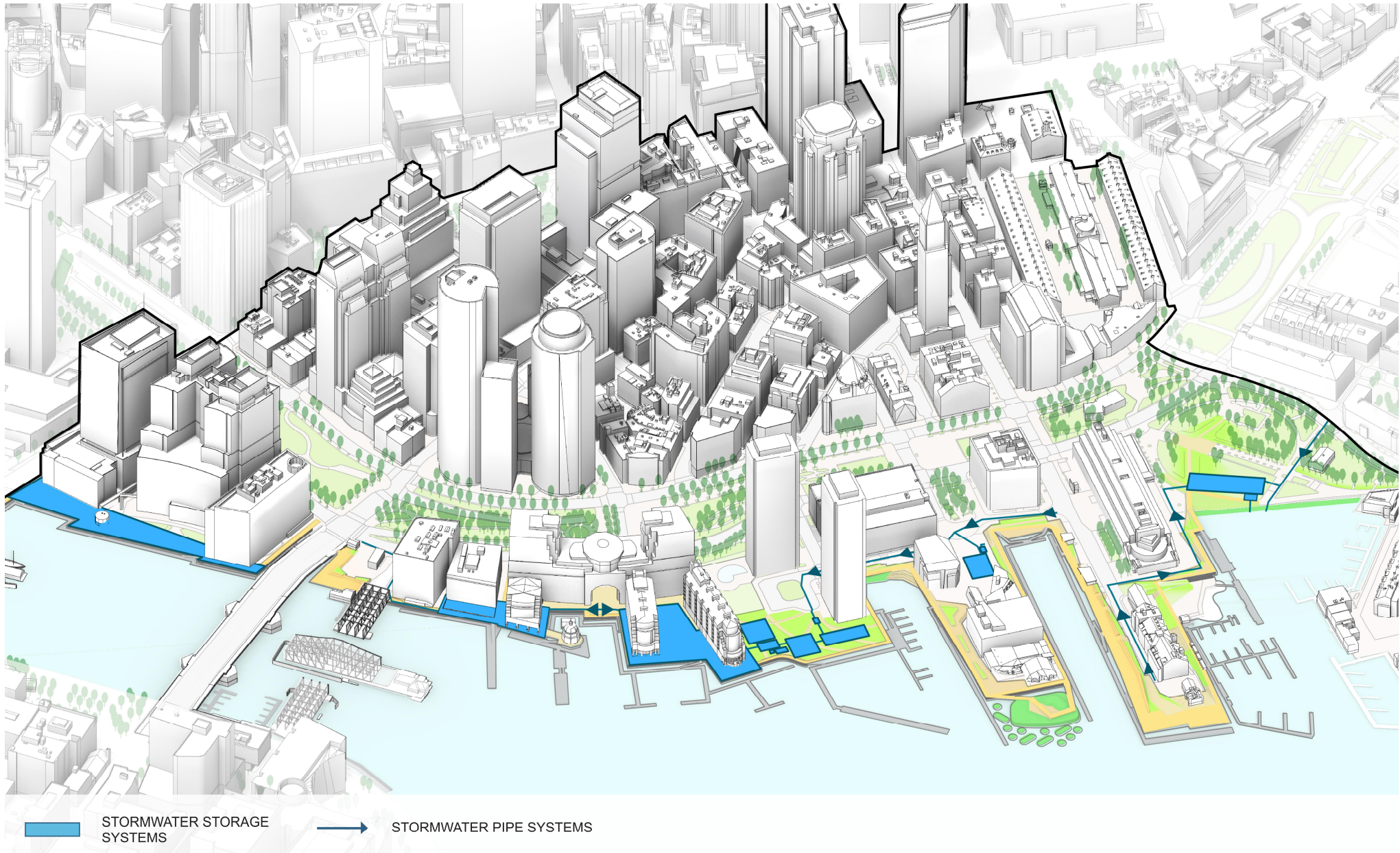
New storm drainage infrastructure – shown on the following page – is proposed to mitigate the risks of rainfall causing flooding on the ‘dry-side’ of the flood protection system. The proposed drainage infrastructure includes extensive new underground stormwater storage and pump systems, drainage pipes, and tide gates on municipal drainage outfall pipes to the Harbor.

These new drainage systems are proposed to manage rain falling within the Wharf District’s rainfall catchment areas indicated on the image to the right.

Wharf District Rainfall Catchment Area



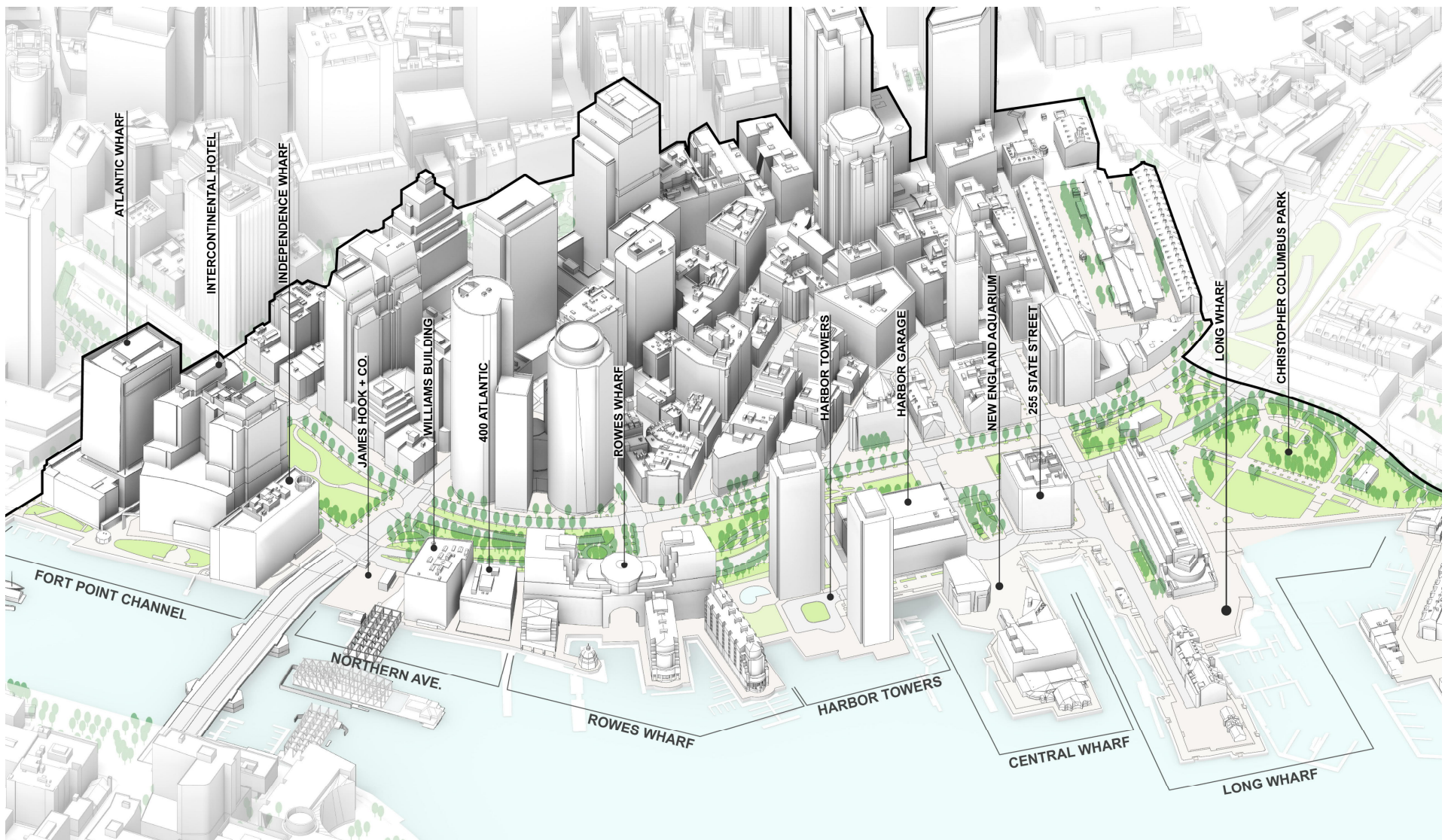
Stormwater Storage Areas



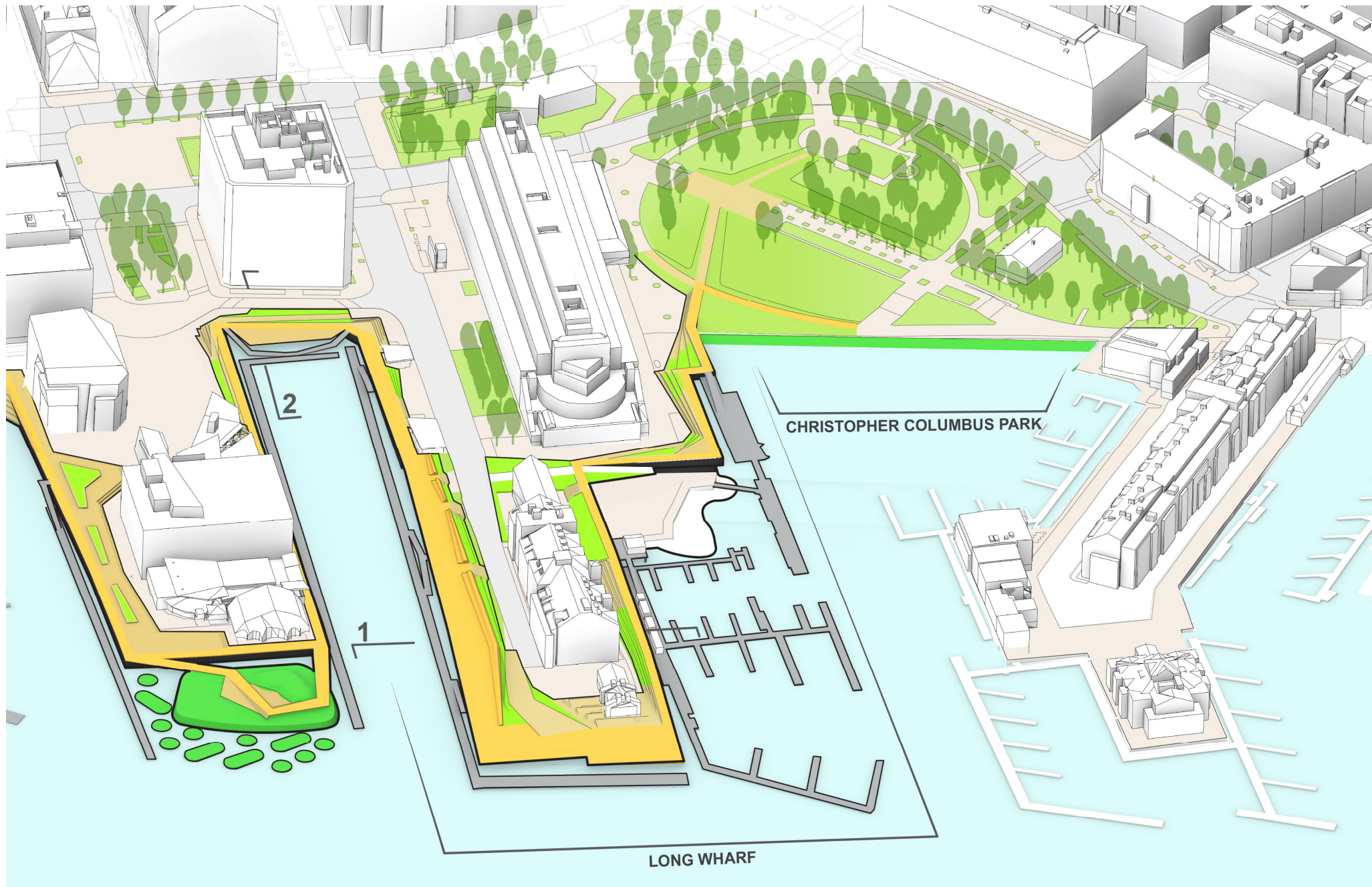
Sub-District Projects

The following pages provide additional details for each of the six Sub-District Flood Resiliency Projects, including rendered plans and sections, a summary of key considerations and multicriteria assessment findings, and conceptual engineering plans specific to each Project.

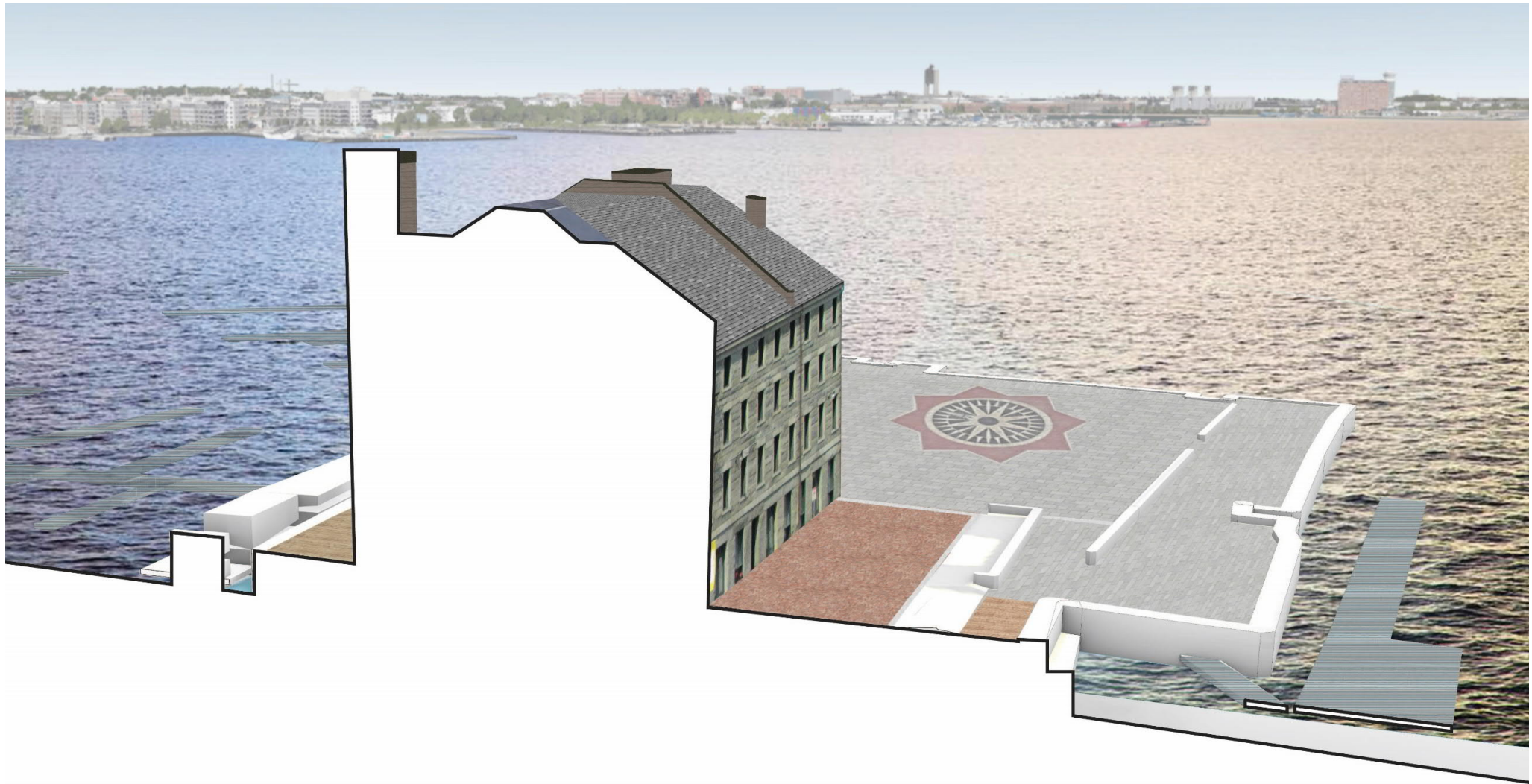
Sub-District Resiliency Projects



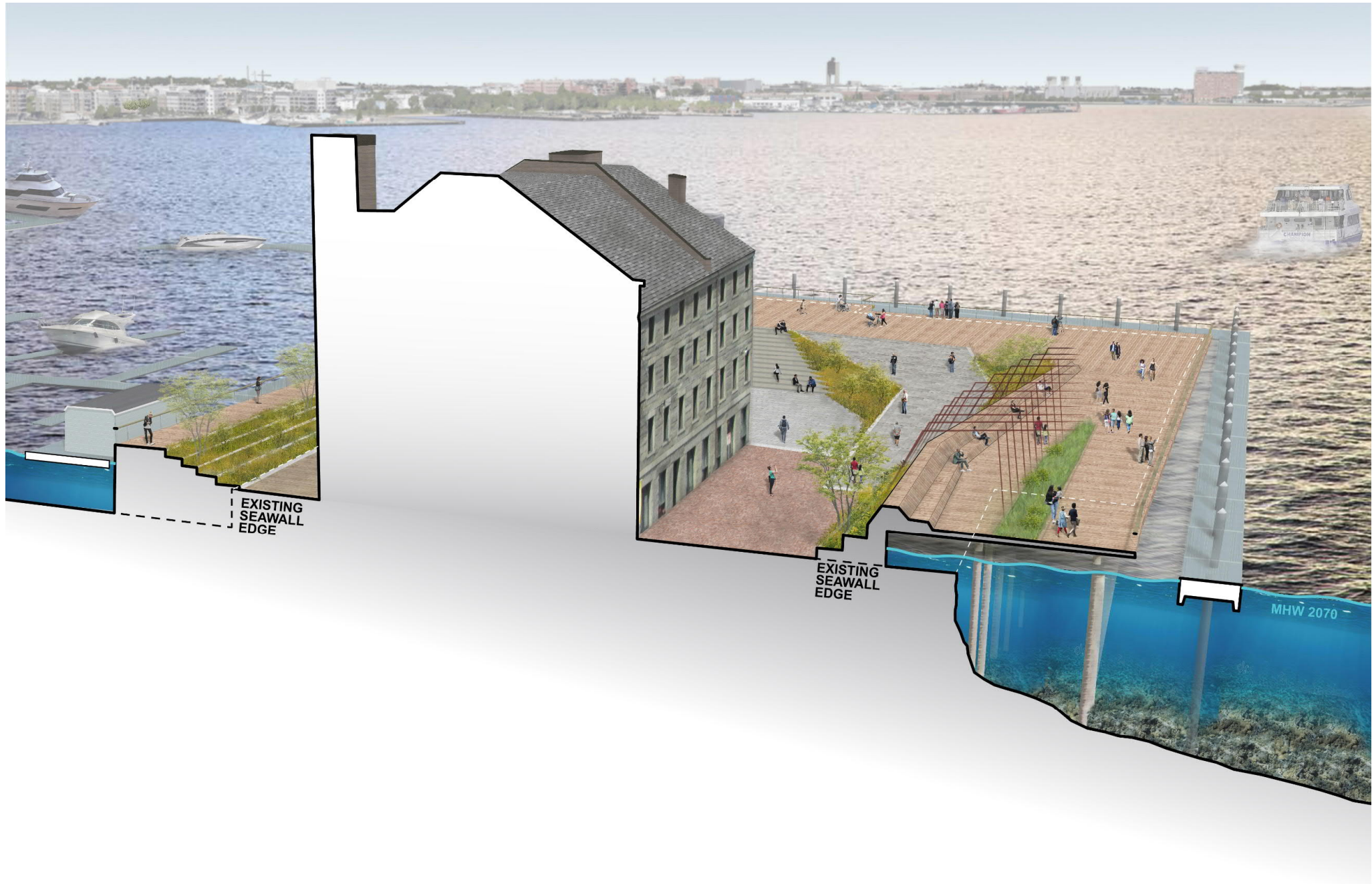
Long Wharf Flood Resiliency Plan



Long Wharf Existing Conditions



Long Wharf Flood Resiliency Plan



Long Wharf

The BPDA and Parks and Recreation Department are planning to initiate separate flood resiliency projects for Long Wharf and Christopher Columbus Park. These projects will include public engagement in the design of the flood protection and urban realm improvements.

The Long Wharf Sub-District Flood Resiliency Project will need to be closely coordinated with the Central Wharf Flood Resiliency Project and resiliency initiatives for the North End. Stormwater management needs to be considered as major overland rainfall pathways for the Wharf District run through the Project Area. The project will need to avoid adding structural loads to the MBTA's Blue Line tunnel. Vehicle access must be maintained to the Harborwalk, all seawalls, around all sides of all buildings, and truck access to the Marriott loading dock must be maintained. Water transportation operations should be maintained or improved, including providing new switchback gangway systems from the elevated Harborwalk to floating docks, and phasing construction to occur during the off-season.

The Proposed Flood Protection System is designed to be constructed in two phases. **Phase 1** is proposed to provide district-wide flood protection in the near-term before the more intensive Phase 2 Flood Protection system is constructed in the mid-term. The Phase 1 system proposes to elevate the existing grade within Christopher Columbus Park, install a floodwall along the existing solid north and east walls of the Marriott, and elevate the Long Wharf driveway above the elevation of the 2070 Highest Astronomical Tide elevation. A deployable flood barrier is proposed across this elevated Long Wharf driveway to

protect the Wharf District from storm surge flooding. As this system does not protect buildings located east of the Marriott, wet- and/or dry-floodproofing strategies will need to be employed at each of these buildings.

Phase 2 extends the flood protection system installed during Phase 1 to provide a full line of protection along the water's edge to the east end of Long Wharf. A small area of fill is proposed outboard of the existing seawall adjacent to the Customs House Block to construct new public land needed to avoid creating a vertical flood wall along this historic property, as well as to maintain access to the adjacent marina. To accommodate this fill area, several boat berths will be relocated to new floating breakwaters.

The Proposed Flood Protection System includes:

- Opportunities for Nature Based Solutions, such as living shorelines, outboard of the seawall at the Park.
- Opportunities to expand water transportation, including floating breakwaters with walkways and boat moorings, and options for a new water transportation terminal.
- New shade trees and structures along the southside of Long Wharf to improve heat resilience for visitors and workers at this active water transit hub.
- A groundwater management system, stormwater storage system, and pump station to mitigate flood risks associated with rainfall and rising groundwater.

A Secondary Flood Protection System is proposed to compartmentalize flood protection between the North End and the Wharf District. This system consists of elevated land in Christopher Columbus Park, deployable barriers at roadways and walkways, and waterproofing several existing retaining walls along the Greenway.

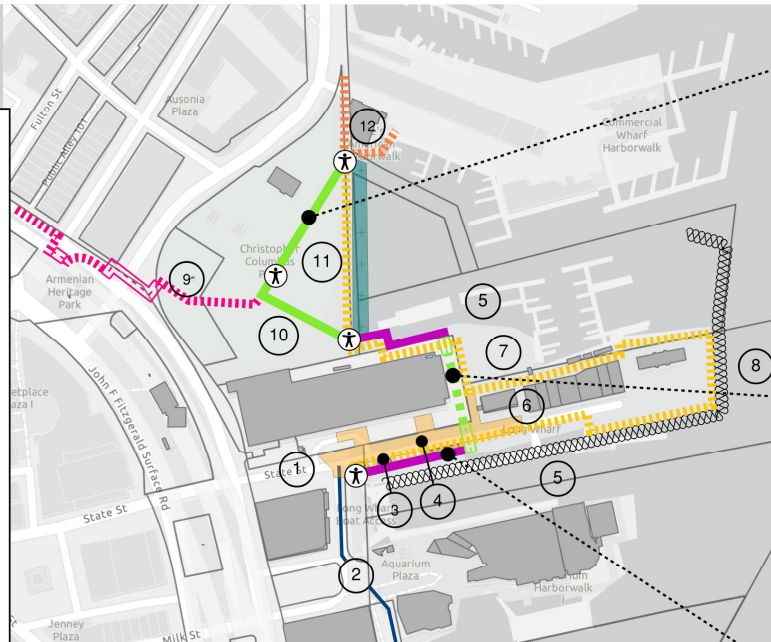
Long Wharf Flood Protection System – Phase 1

This plan summarizes Phase 1 of the preferred flood protection system for Long Wharf. Phase 1 is intended to be installed in the near-term (2020s-2030s).

PLAN VIEW

LEGEND:

- ALTERNATIVE SYSTEM @ INLAND ALIGNMENT
- ALTERNATIVE SYSTEM @ WATER'S EDGE ALIGNMENT
- ALTERNATIVE SYSTEM - FLIP-UP FLOOD GATE
- PREFERRED SYSTEM @ INLAND ALIGNMENT
- PREFERRED SYSTEM @ WATER'S EDGE ALIGNMENT
- ~~~~~ BREAKWATER WITH WALKWAY FOR MOORING SHIPS
- HARBORWALK
- DRAIN PIPE
- ELEVATED ROADWAY
- A ADA ACCESS TO HARBORWALK
- # REFER TO NOTES



NOTES:

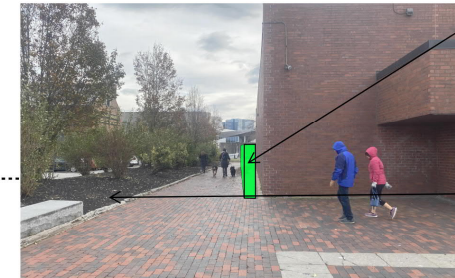
- (1) Install new underdrain system in State Street.
- (2) Install drain pipe to convey excess rainfall from the Major Rainfall Path at Old Atlantic Ave to new stormwater storage systems at the Aquarium, Harbor Towers, and Rows Wharf.
- (3) Reconstruct Boston Harbor City Cruises structures to meet raised grades.
- (4) Reduce width of Long Wharf roadway to 21-feet wide minimum. Maintain tractor trailer truck access to Marriott loading dock. Facilitate delivery, maintenance, and emergency vehicle access on raised Harborwalk to east end of pier.
- (5) Maintain existing docks and dock access.
- (6) Provide wet- and/or dry-flood-proofing strategies at the Chart House, Custom House, and MBTA Emergency Egress.
- (7) Potential opportunity area for inland water transportation terminal / public open space / parking.
- (8) Potential opportunity area for floating water transportation terminal.
- (9) Provide Redundant Flood Protection System to compartmentalize flood protection between the North End and the Wharf District. System to consist of elevated land in the Park, deployable barriers at roadways / walkways, and existing retaining walls along the Greenway.
- (10) Install an underground stormwater storage and pump system at Christopher Columbus Park to capture and manage storm flows from municipal outfall pipes during storm surge events.
- (11) Install manual sluice gates and automatic tide gates on storm sewer outfall pipes in the Park.
- (12) Coordinate transition to North End flood protection systems.

ELEVATED / CONSTRUCTED LAND @ INLAND ALIGNMENT



- Elevate lawn and walkways to elevation 15.0-ft. (near-term).
- Install 2.6-ft flood wall on top of new seawall to elevation of 17.6' (long-term).

FLOODWALL @ INLAND ALIGNMENT



- Install flood wall to 15.0-ft with at least 2-ft clearance to Marriott Hotel facade. Install groundwater cut-off wall below ground. (near-term).
- Reduce width of planted area as necessary to maintain 12-foot wide walkway for emergency vehicle access (near-term).

ELEVATED DOCK @ WATER'S EDGE & ELEVATED ROADWAY @ INLAND ALIGNMENT

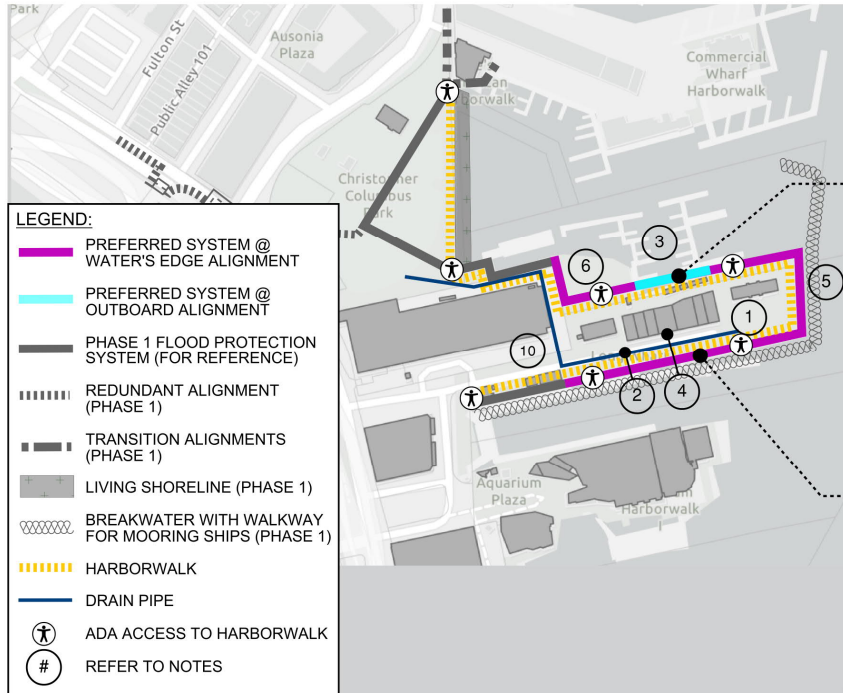


- Install social/stepped landform and/or planting beds to soften transition to Elevated Harborwalk. Width and design of landform to vary to integrate ADA access and local programming (near-term).
- Install 2.4-foot tall deployable flood walls / flip-up flood barriers across roadway and walkways to elevation 15.0-ft (near-term).
- Raise Long Wharf Drive by up to 6.6 feet to elevation 13.6-ft. Slope grades down from elevated roadway to match existing Marriott building entrances. Install groundwater cut-off wall below ground (near-term).
- Raise harborwalk to elevation 15.0-ft and extend decking system (near-term).
- Install new floodwall to elevation 15.0-ft (near-term).

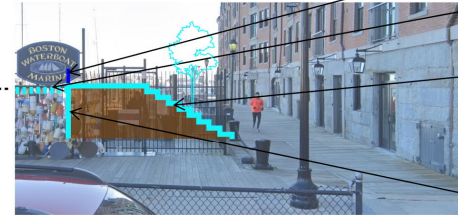
Long Wharf Flood Protection System – Phase 2

This plan summarizes Phase 2 of the preferred flood protection system for Long Wharf. The solution can be broken down into two phases: mid-term (2040s - 2060s) and long-term (2070s) to meet the increasing flood elevations.

PLAN VIEW

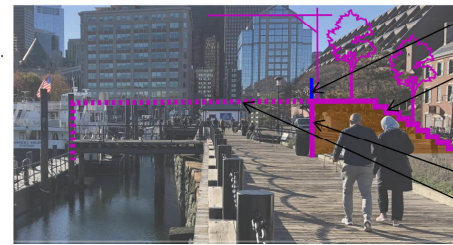


ELEVATED / CONSTRUCTED LAND @ OUTBOARD ALIGNMENT



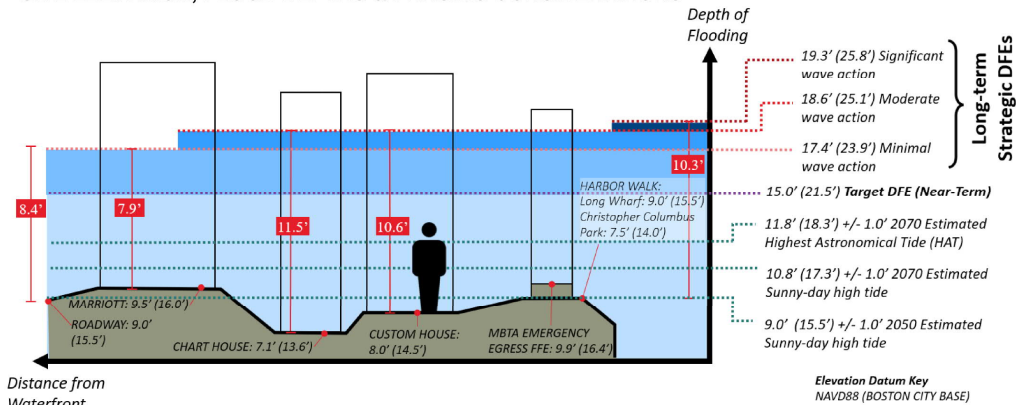
- Install 2.6-ft flood wall on top of new seawall to elevation of 17.6' (long-term).
- Install new floating decking system. Relocate existing marina structures from existing deck to new deck (mid-term).
- Install social/stepped landform and/or planting beds to soften transition to Elevated Harborwalk at elevation 15.0-ft. Use lightweight fill or relieving platform to avoid settlement at adjacent buildings. Width and design of landform to vary to integrate ADA access and local programming (mid-term).
- Install new seawall outboard of existing seawall and to elevation 15.0-ft (mid-term)

ELEVATED DOCK @ WATERS EDGE ALIGNMENT



- Install 2.6-ft composite solid + glass flood wall / seating wall to elevation of 17.6' (long-term).
- Install social/stepped landform and/or planting beds to soften transition to Elevated Harborwalk at elevation 15.0-ft. Use lightweight fill or relieving platform to avoid increased loading on MBTA tunnel. Width and design of landform to vary to integrate ADA access and local programming. Provide intermittent shade structures (mid-term).
- Install new seawall to elevation 15.0-ft (mid-term).
- Raise harborwalk to elevation 15.0-ft and extend decking system (mid-term).

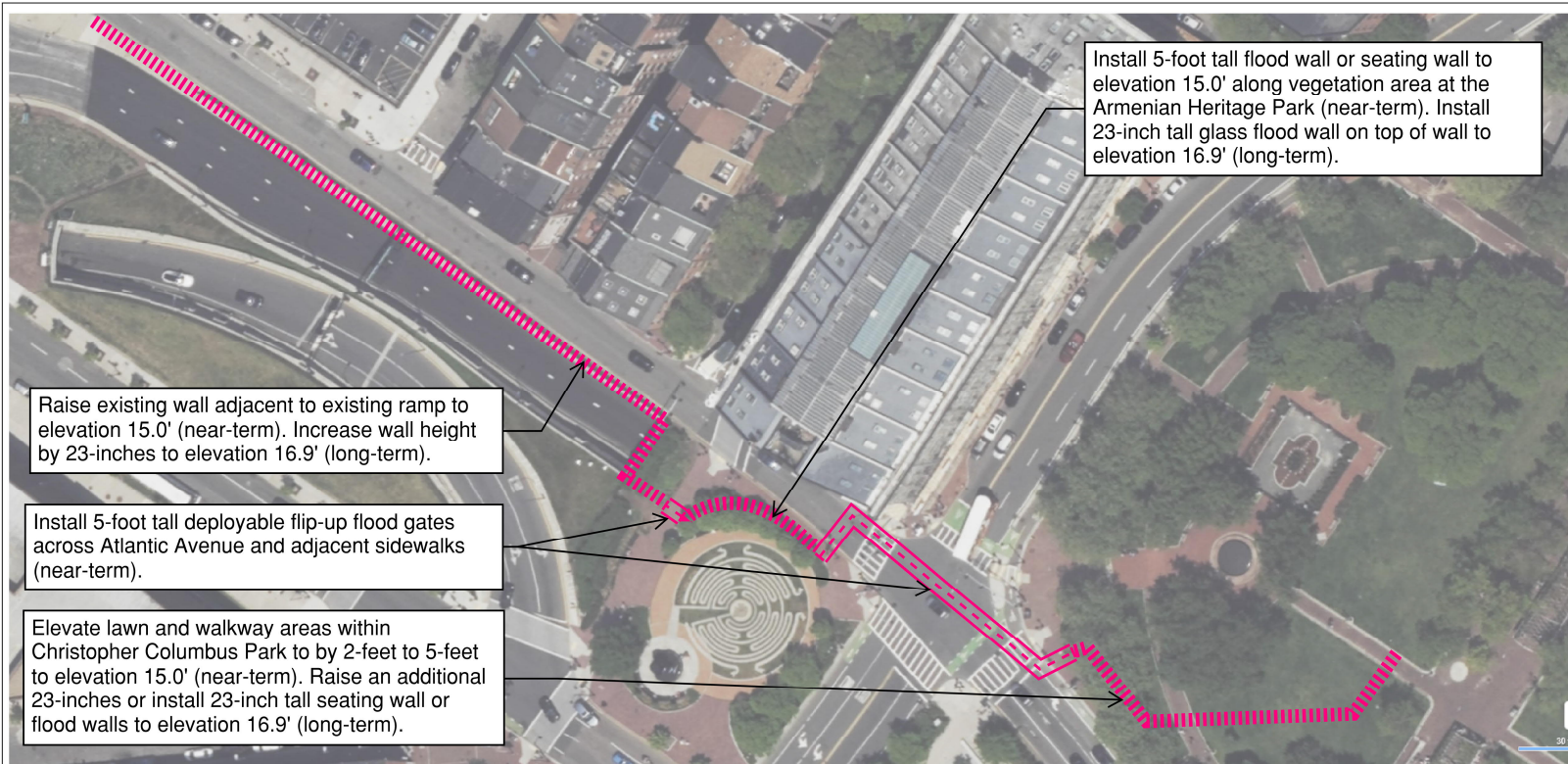
SITE ELEVATION, FLOOD DEPTHS & PHASING CONSIDERATIONS



NOTES:

- Install new groundwater management underdrain system around Long Wharf.
- Install drain pipes to connect groundwater management system to storage and pump station at Christopher Columbus Park.
- Relocate two (2) existing ship berths to new floating breakwaters.
- Reduce width of Long Wharf roadway to 21-feet wide minimum. Facilitate delivery, maintenance, and emergency vehicle access to east end of pier.
- Potential opportunity area for floating water transportation terminal / public open space.
- Potential opportunity area for inland water transportation terminal / public open space / parking.

North Resilience Zone Secondary Flood Protection System Plan



Wharf District Council Conceptual District Protection & Resiliency Plan

Flood Protection System Redundant Alignment Armenian Heritage Park

Plan Status: Draft Conceptual Sketch

Date: March 20, 2023

Plan Intent:

This plan summarizes a redundant district-scale flood protection system in the vicinity of the Armenian Heritage Park.

Resiliency System Description:

System to consist of elevated land in the Park, deployable barriers at roadways / walkways, and existing retaining walls along the Greenway.

LEGEND:

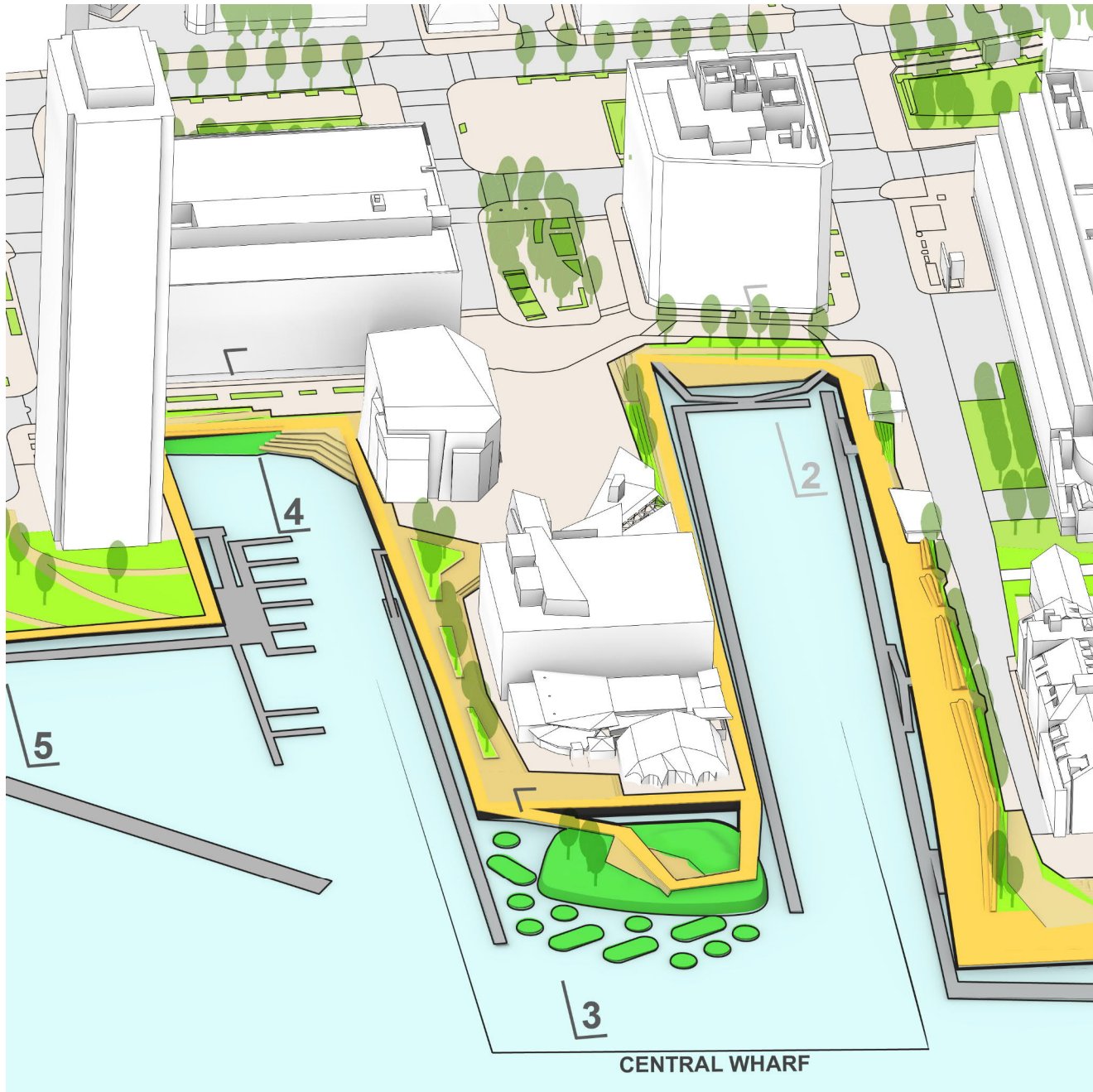
■■■■■■ FLOOD PROTECTION SYSTEM REDUNDANT ALIGNMENT

■■■■■■ DEPLOYABLE FLOOD BARRIER

■■■■■■ ELEVATED LAND

□ PROPOSED SPOT GRADE ELEVATION

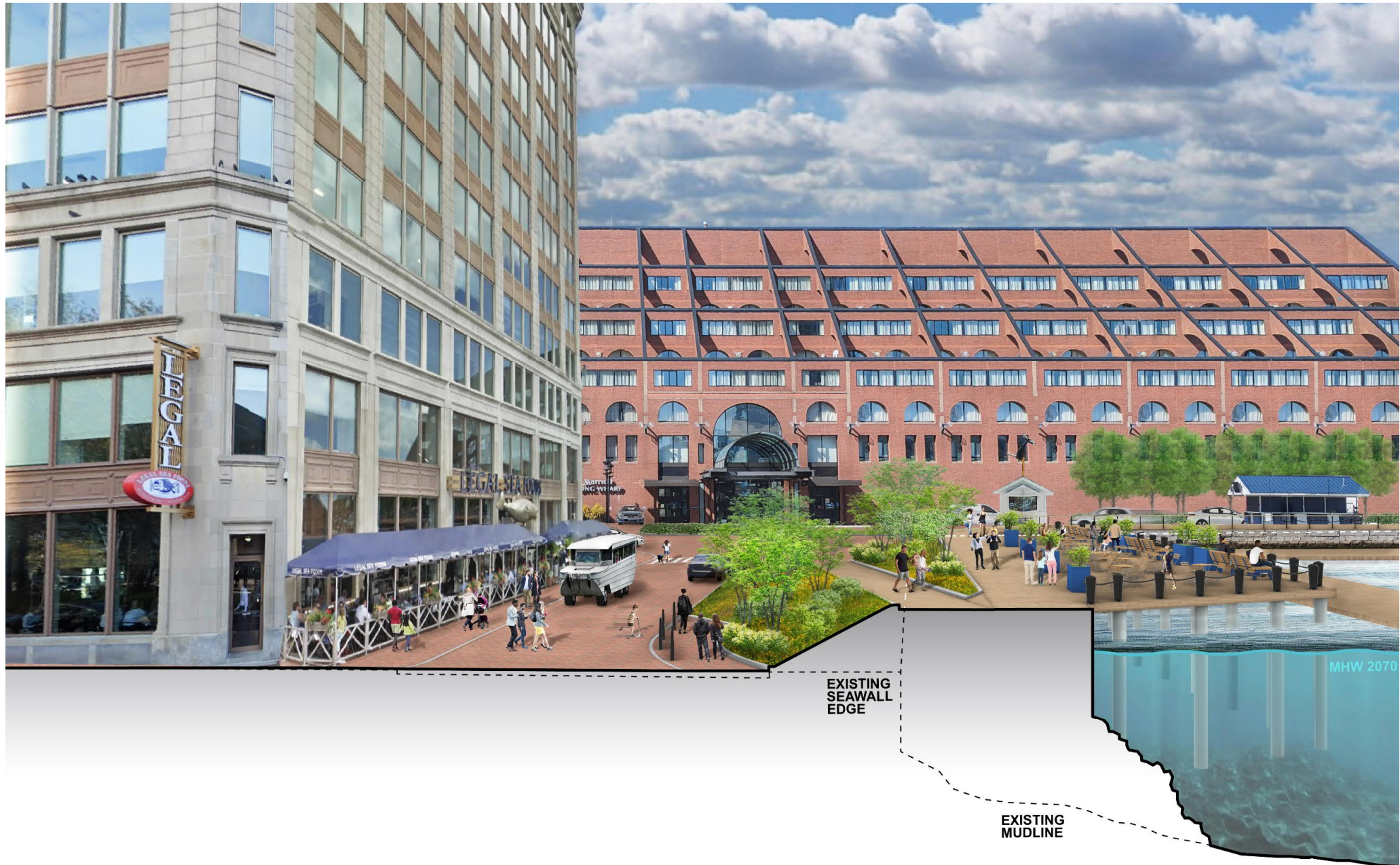
Central Wharf Flood Resiliency Plan



Central Wharf Existing Conditions



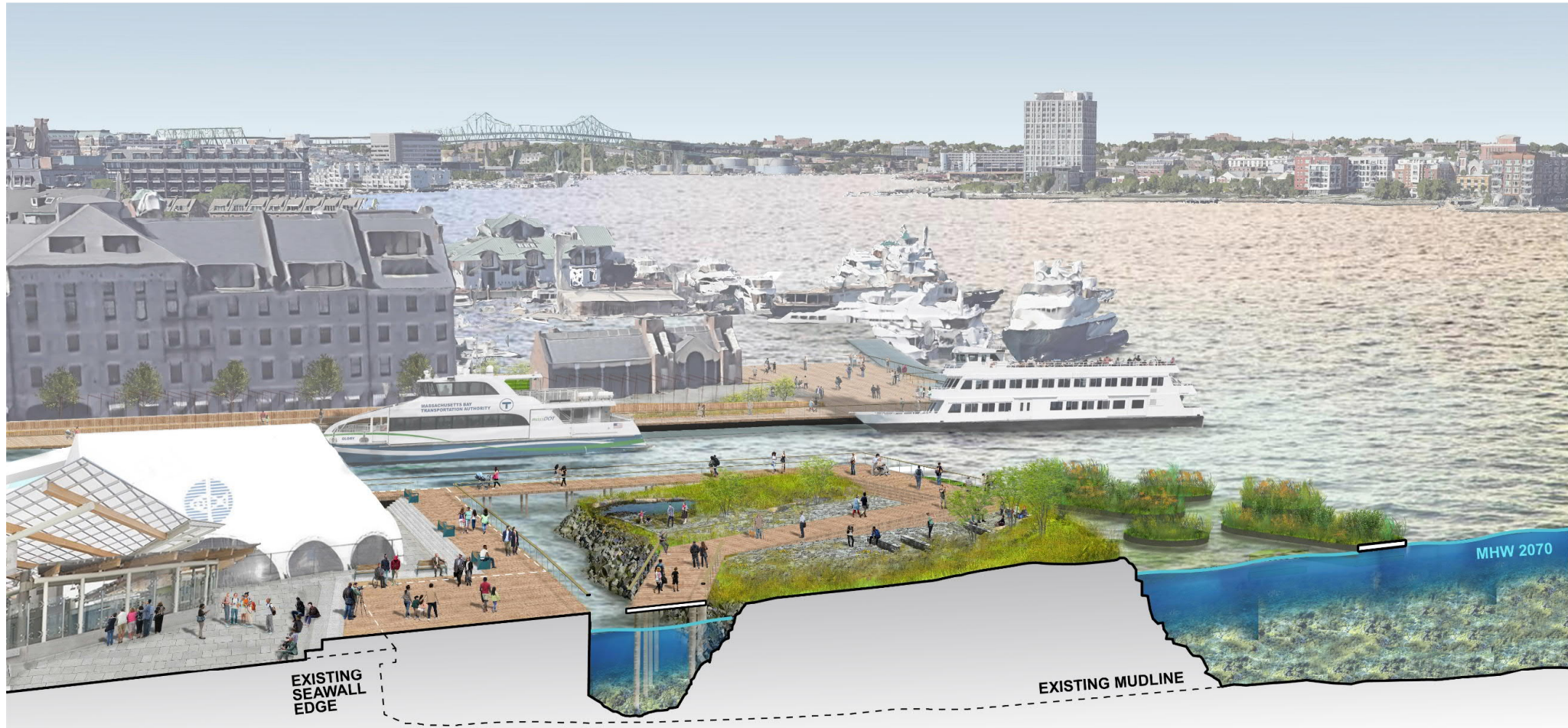
Central Wharf Flood Resiliency Plan



Central Wharf Existing Conditions



Central Wharf Flood Resiliency Plan



Central Wharf

The Central Wharf Sub-District Flood Resiliency Project will need to be closely coordinated with the Long Wharf Flood Resiliency Project. Vehicle access must be maintained to the Harborwalk at the east end of Central Wharf, to the Aquarium loading dock, and around all sides of all buildings in the project area. Stormwater management needs to be considered as a major overland rainfall pathway for the Wharf District runs through the Project Area. An existing 72"x72" box stormwater culvert located under Central Wharf may need to be reconstructed or rehabilitated to accommodate additional structural loading associated with the elevated Harborwalk.

Old Atlantic Avenue must be narrowed to provide the land necessary to install a gentle transition from existing grades up to the elevated Harborwalk at the Design Flood Elevation, such that the existing Harborwalk is not narrowed, existing public open space is not reduced, and water transportation is not negatively impacted. Options for narrowing Old Atlantic Avenue are included on the Old Atlantic Avenue Reconstruction Sketches, and includes converting Old Atlantic Avenue and Central Street to a "shared street" by raising roadway surfaces to match sidewalk elevations and incorporating Complete Street strategies to prioritize pedestrian safety in the area.

The majority of the Proposed Flood Protection System is proposed along the water's edge at Central Wharf. Three areas of fill are also proposed outboard of the existing seawall to accomplish the following objectives:

- Protect the existing theater, which is currently located on a decking system over the water.

- Construct new wave attenuation islands to reduce wave heights and erosion impacting the area.
- Relocate and improve outdoor programmable space impacted by the construction of the new flood protection systems in the project area.

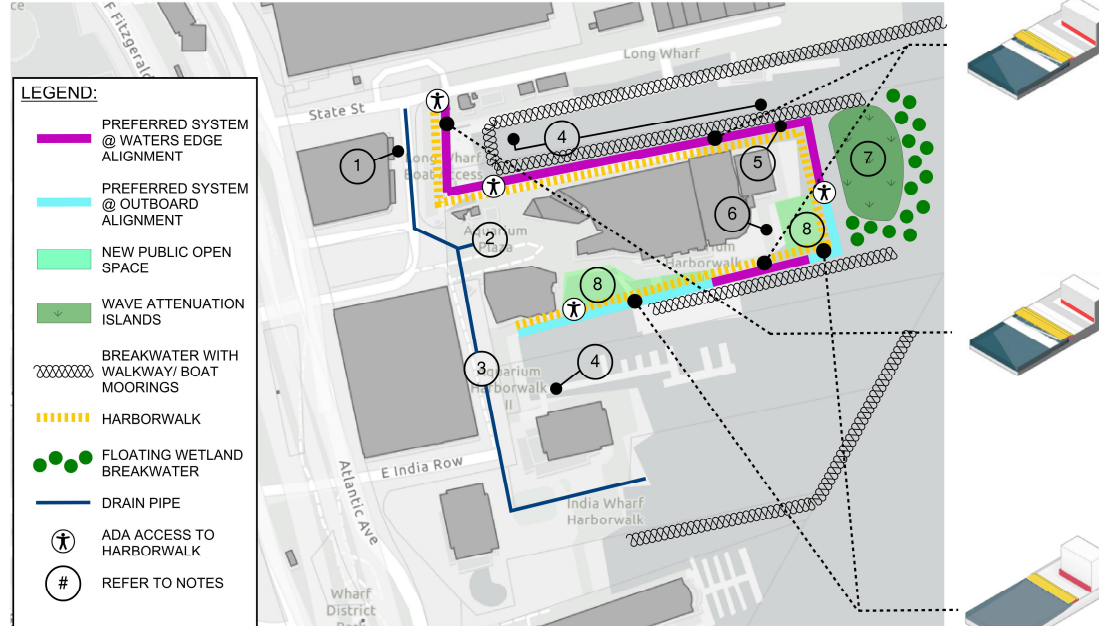
The Flood Protection System includes:

- Opportunities to expand water transportation and access, including new floating breakwaters with walkways and boat moorings.
- Wave attenuation islands to reduce wave heights, while providing opportunities for Nature Based Solutions such as living shorelines and floating wetlands, access to 'touch' the water, and outdoor educational programs associated with resiliency and marine ecosystems.
- A net increase of approximately 1,000 square feet of new outdoor programmable space at Central Wharf, not including potential programmable space on the proposed wave attenuation islands.
- Opportunities for new shade trees and structures along the southside of Central Wharf to improve heat resilience for visitors and workers.
- A groundwater management system and underground stormwater storage system to mitigate flood risks associated with rainfall and rising groundwater,
- A stormwater treatment system to improve water quality of stormwater discharged to the Harbor.

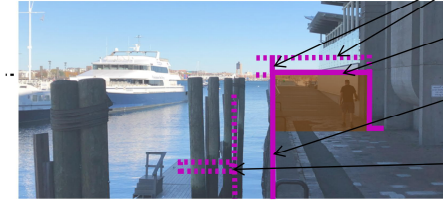
Central Wharf Flood Protection System Plan

This plan summarizes the preferred flood protection system. The solution can be broken down into two phases: near-term (2020s-2030s) and long-term (2040s-2070s) to meet the increasing flood elevations.

PLAN VIEW



ELEVATED DOCK @ WATER'S EDGE ALIGNMENT



Raise Harborwalk and install flood wall on top of seawall to elevation 17.4-ft (Long-term).

Raise harborwalk 6 to 8 feet to elevation 15.0-ft and cantilever walkway decking over water to maintain existing Harborwalk width (Near-term).

Remove existing Harborwalk. Install new steel sheetpile wall in front of existing seawall to mudline. Install new seawall to elevation 15.0-ft (Near-term).

Construct new floating breakwater with walkway for access to water and relocated ship mooring at locations indicated on plan (Near-term).

ELEVATED DOCK @ WATERS EDGE ALIGNMENT



Install glass flood wall on top of seawall to elevation 17.4-ft (Long-term).

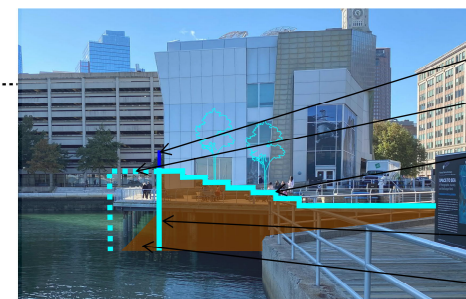
Raise harborwalk 7 feet to elevation 15.0-ft with planting soil below surface for future shade trees. Provide dock access (Near-term).

Install social/stepped landform and/or planting beds to soften transition to Elevated Harborwalk. Width and design of landform to vary to integrate ADA access and local programming. Provide intermittent shade structures (Near-term).

Reduce width of Old Atlantic Avenue (Near-term).

Provide 10-ft wide, 5% sloped walkway up to Harborwalk (Near-term).

ELEVATED/CONSTRUCTED LAND @ OUTBOARD ALIGNMENT



Remove existing Harborwalk deck and seawall, install new seawall to elevation 15.0-ft (Near-term).

Install glass flood wall on top of seawall to elevation 17.4-ft (Long-term).

Install decking to raise harborwalk 5 feet to elevation 15.0-ft. Provide dock access (Near-term).

Install social/stepped landform and/or planting beds to soften transition to Elevated Harborwalk. Width and design of landform to vary to integrate ADA access and local programming (near-term).

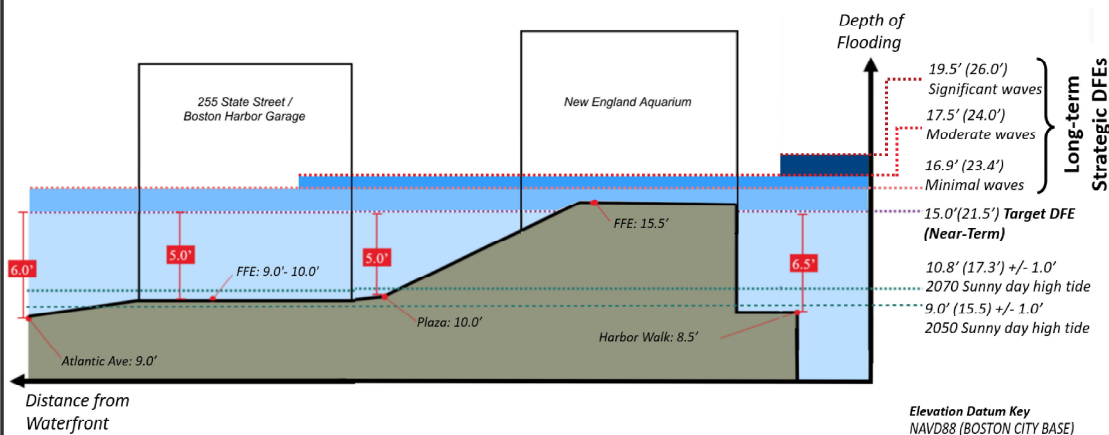
Install new seawall in front of old to elevation 15.0-ft (Near-term).

Install revetment or living shoreline (Near-term).

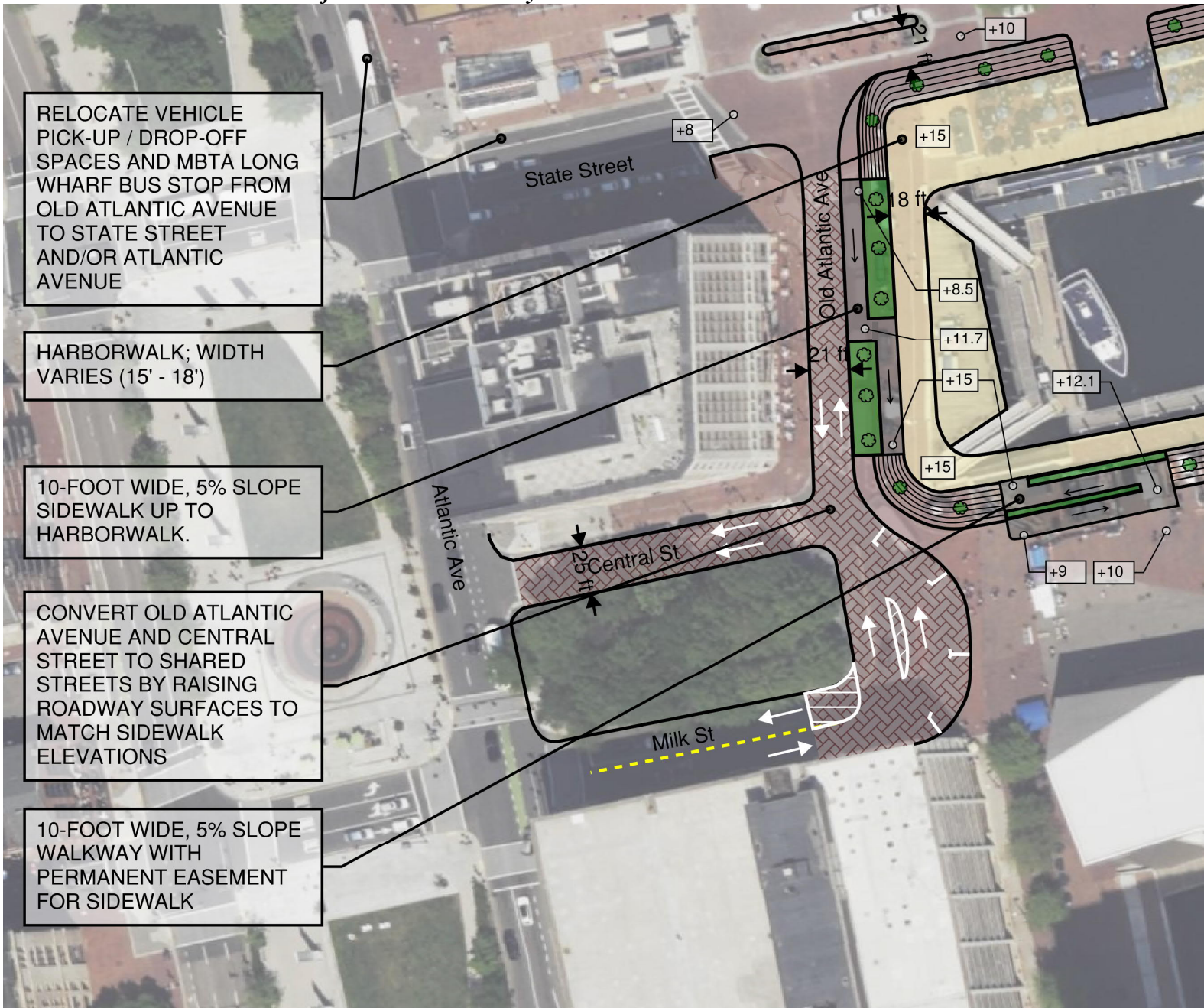
NOTES:

- (1) Relocate vehicle drop-off spaces and bus stop from Old Atlantic Avenue to adjacent roadways.
- (2) Install new underdrain system around the Aquarium, and an underground stormwater storage and treatment system at the Aquarium plaza to manage groundwater levels and provide water quality treatment of stormwater. Install overflow connection from existing 72" x 72" stormwater culvert to the new system.
- (3) Install drain pipe to convey excess rainfall from the Major Rainfall Path at Old Atlantic Avenue and Aquarium storage system to new stormwater storage systems at the Harbor Towers and Rows Wharf.
- (4) Maintain access to all existing docks.
- (5) Reconstruct or rehabilitate existing 72" x 72" stormwater outfall pipe to accommodate additional structural loading, and install manual sluice gate and automatic tidegate at outlet.
- (6) Facilitate delivery and emergency vehicle access on raised Harborwalk to east end of pier.
- (7) Construct new flood protection islands to mitigate wave action at the existing wharfs and compensate for reduced programmable open space associated with the Elevated Dock strategies.
- (8) Proposed plaza space to replace the programmable space lost from Elevated Dock strategies.

EXISTING SITE ELEVATIONS & TARGET DESIGN FLOOD ELEVATION



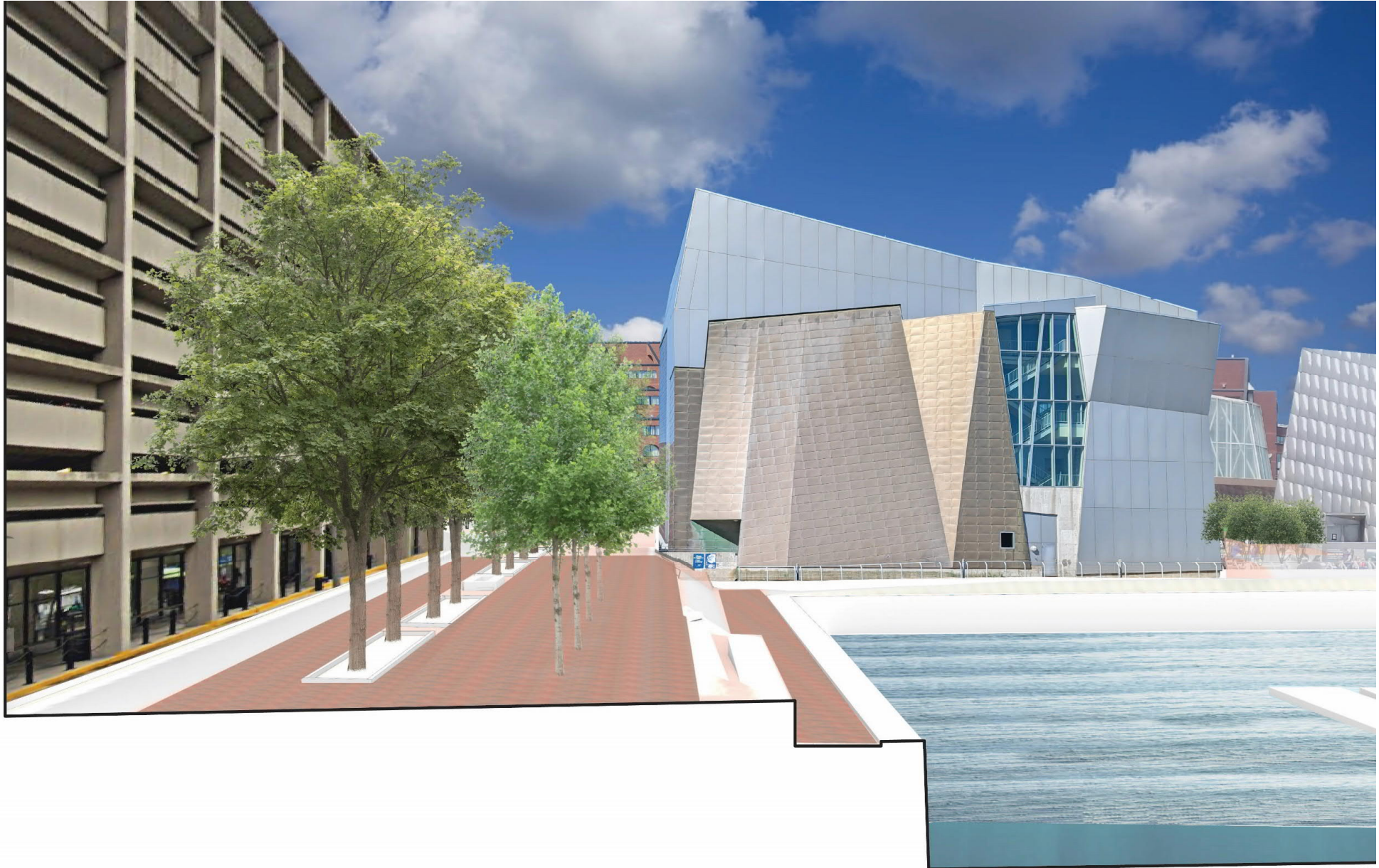
Central Wharf Flood Protection System Plan – Old Atlantic Avenue Reconstruction



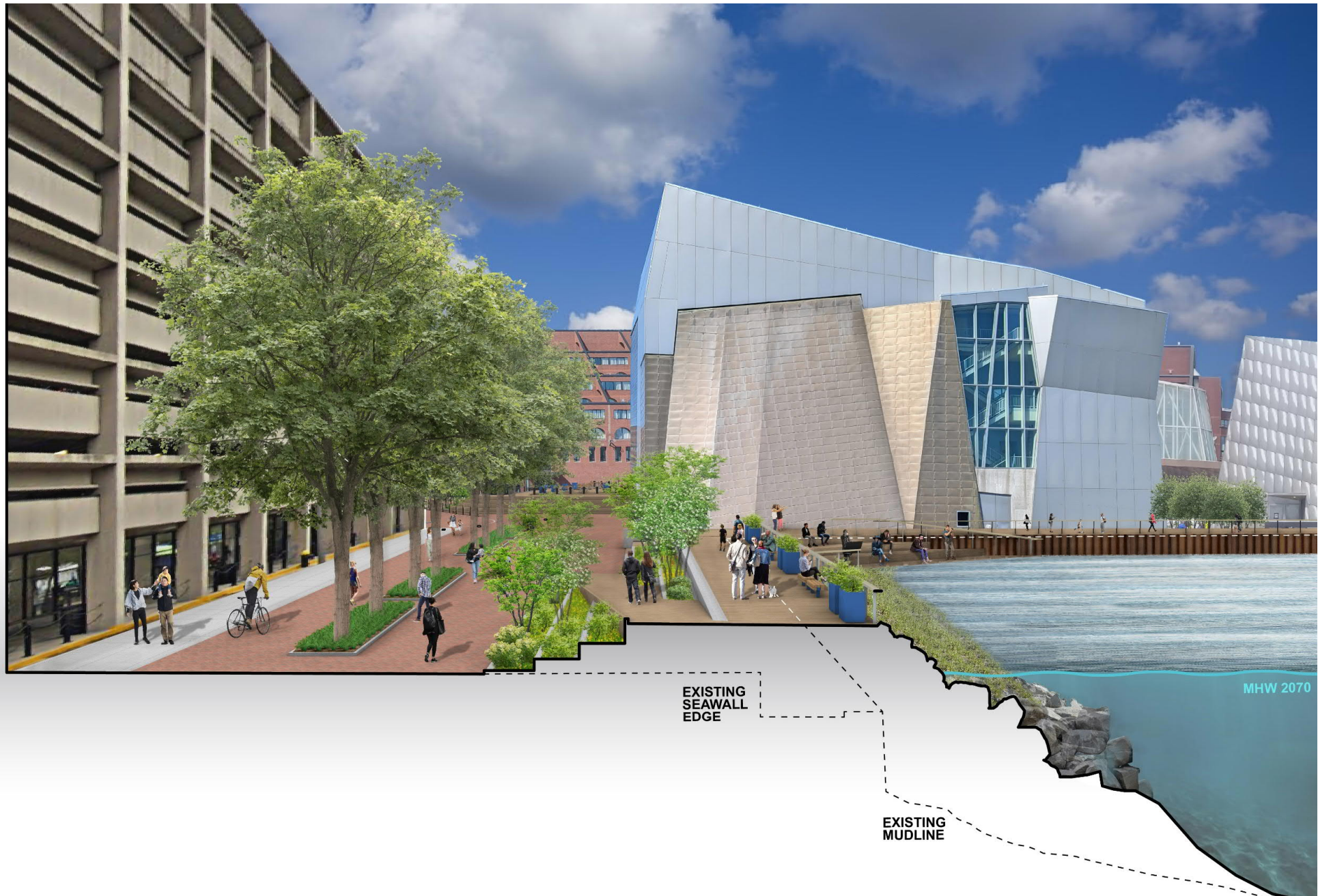
Harbor Towers Flood Resiliency Plan



Harbor Towers Existing Conditions



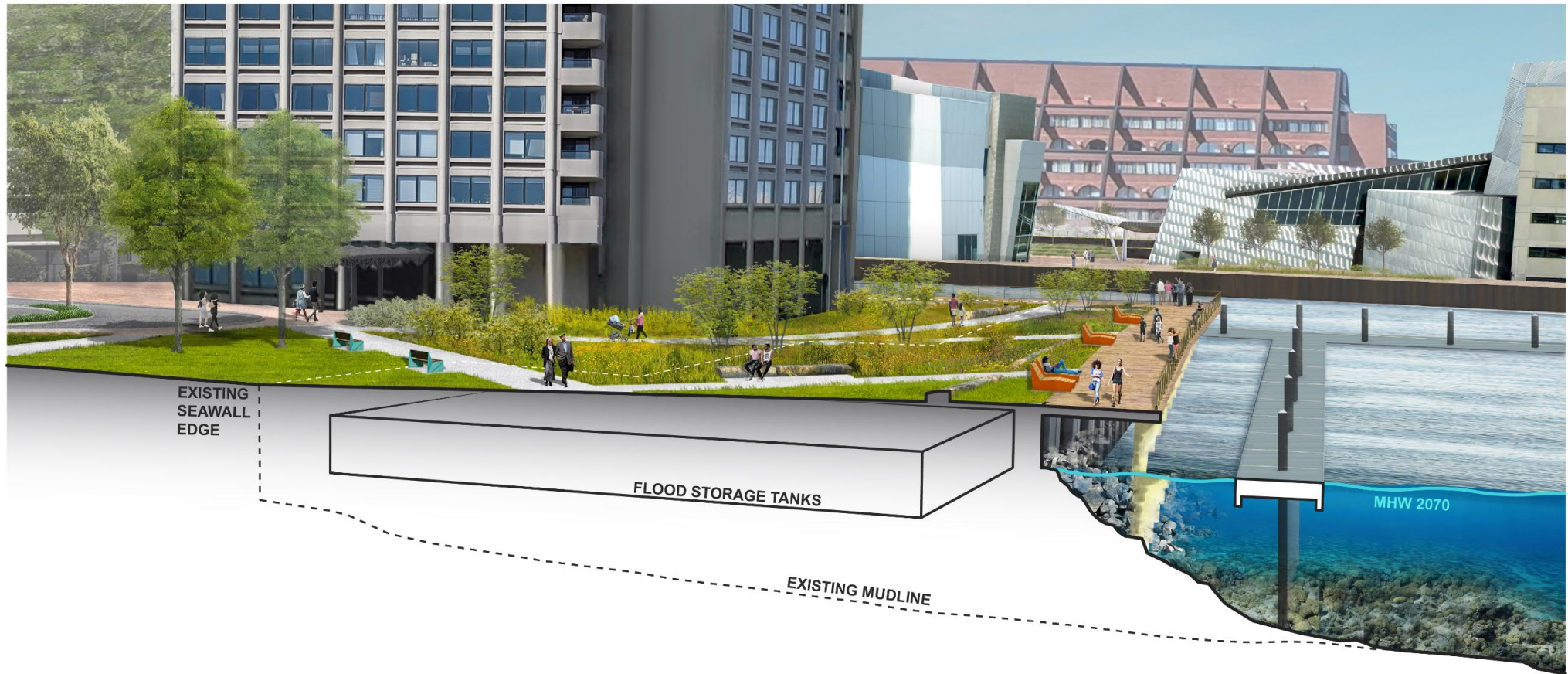
Harbor Towers Flood Resiliency Plan



Harbor Towers Existing Conditions



Harbor Towers Flood Resiliency Plan



Harbor Towers

The Harbor Towers Sub-District Flood Resiliency Project will need to be closely coordinated with the Central Wharf and Rows Wharf Flood Resiliency Projects.

The Flood Protection System is proposed at the water's edge along the north side of the property, maintaining access to the India Wharf Marina. Fill is proposed outboard of the existing seawall along the eastern edge of the property to accomplish the following objectives:

- Create new public open space with Harbor views.
- Create land necessary for a subsurface stormwater storage and pump system to reduce rainfall-based flooding for a significant area of the Wharf District (the North Resilience Zone).
- Minimize impacts to views of the Harbor from existing public open spaces by creating the land necessary to provide a gentle transition from existing grades up to the elevated Harborwalk at the Design Flood Elevation.
- Increase the width of the Harborwalk.
- Replace the existing seawalls, which were observed to have localized areas of deterioration.

The proposed Flood Protection System includes:

- A living shoreline and new public water access between Harbor Towers and the Aquarium.
- New public open space along the waterfront.
- Opportunities to improve water access and recreation, including new floating breakwaters with walkways and boat moorings.
- A stormwater storage and pump system to reduce flood risks within the North Resilience Zone associated with rainwater falling on the 'dry-side' of the flood protection system.

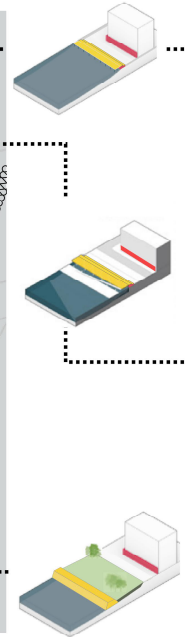
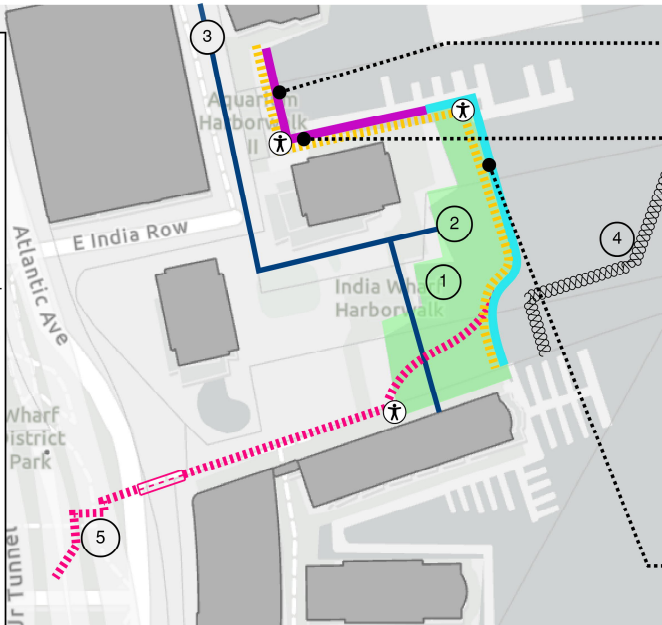
A **Secondary Flood Protection System** is proposed to create self-contained Resilience Zones within the Wharf District to reduce risks of wide-spread flooding associated with single points of failure. This Secondary Flood Protection System forms the southern leg of the proposed North Resilience Zone, and includes a new floodwall between Harbor Towers and Rows Wharf, a deployable flood gate across Atlantic Avenue, and elevating land within the Greenway by 1 – 2 feet on average.

Refer to the Rows Wharf Secondary Flood Protection System Plan provided in the Rows Wharf Sub-District Flood Resiliency Project section of this report for additional details associated with the Secondary Flood Protection System.

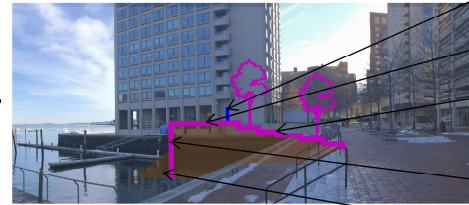
Harbor Towers Flood Protection System Plan

This plan summarizes the preferred and redundant flood protection systems. The solution can be broken down into two phases: near-term (2020s-2030s) and long-term (2040s-2070s) to meet the increasing flood elevations.

PLAN VIEW



ELEVATED OR CONSTRUCTED LAND @ WATER'S EDGE ALIGNMENT



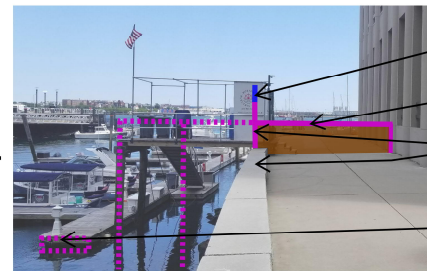
Install glass flood wall on top of seawall to elevation 17.4-ft (Long-term).

Raise Harborwalk 5-ft to elevation 15.0-ft.

Install social/stepped landform and/or planting beds to soften transition to Elevated Harborwalk. Width and design of landform to vary to integrate ADA access and local programming (near-term).

Remove existing Harborwalk deck and seawall, install new seawall to elevation 15.0-ft (Near-term).

ELEVATED DOCK ACCESS @ WATER'S EDGE ALIGNMENT



Install revetment or living shoreline (Near-term).

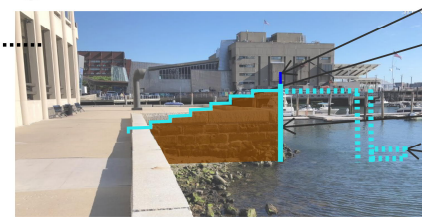
Install 26-inch tall glass flood wall to elevation 17.2' on top of new seawall (Long-term)

Raise Harborwalk 4.8 feet and install new dock access at elevation 12.0-ft (Near-term)

Rebuild seawall to elevation 15.0-ft and provide deployable flood gate for marina access (Near-term)

Maintain access to existing floating docks (Near-term)

ELEVATED OR CONSTRUCTED LAND @ OUTBOARD ALIGNMENT



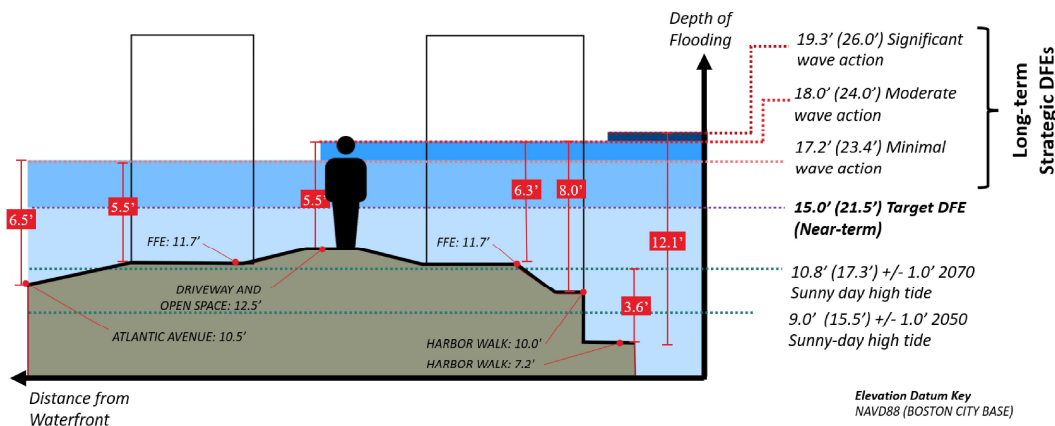
Install 26" glass flood wall on top of seawall to elevation 17.4-ft (Long-term)

Install social/stepped landform and/or planting beds to soften transition to the elevated Harborwalk. Width and design of landform to vary to integrate ADA access and local programming (Near-term)

Remove existing Harborwalk deck and seawall, install new seawall to elevation 15.0-ft (Near-term)

Construct new floating dock for access to water and boat moorings (Near-term)

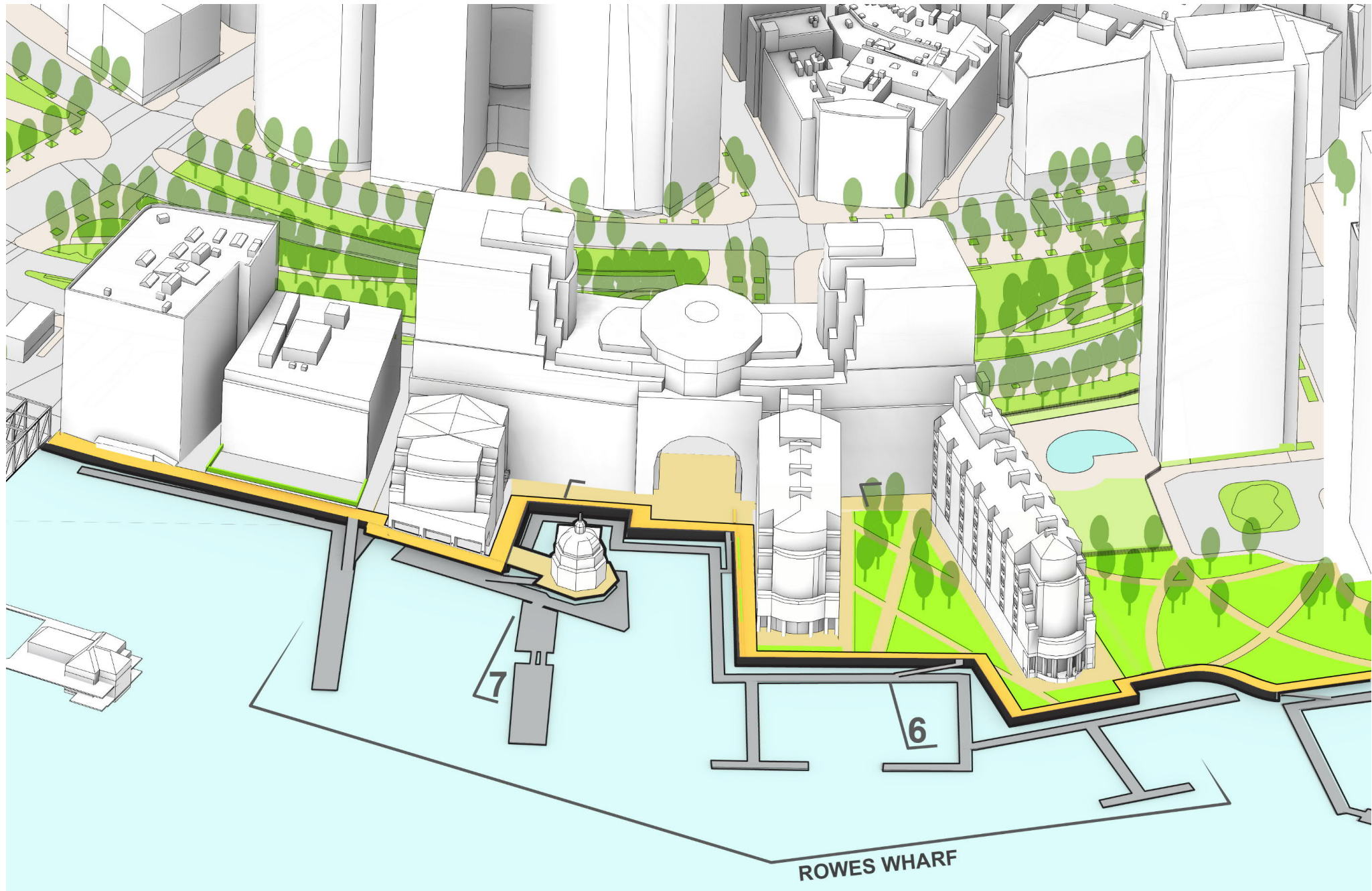
EXISTING SITE ELEVATIONS & TARGET DESIGN FLOOD ELEVATION



NOTES:

- (1) New public open space behind flood protection system. Southern limit connection of fill to be coordinated with Rows Wharf.
- (2) New below ground stormwater storage tank with above-grade pump house built into flood protection berm to manage water levels in the stormwater storage systems at the Central Wharf, Harbor Towers, and Rows Wharf.
- (3) New drain pipe to convey excess rainfall from the Major Rainfall Path at Old Atlantic Avenue to new stormwater storage systems at Central Wharf, Harbor Towers, and Rows Wharf.
- (4) Floating breakwater to include walkway for public access to water and moorings for boats. Locations are indicative and are to be determined during detailed design. (Near-term).
- (5) Provide redundant flood protection system to compartmentalize flood protection from Christopher Columbus Park to Harbor Towers. System to consist of a new elevated berm along the North Building of Rows Wharf, a new floodwall abutting existing retaining walls north of the walkway between Harbors Towers and Rows Wharf, a deployable flood gate across Atlantic Avenue roadway and sidewalks, and elevated land and seating walls through the Greenway. Replace trees impacted by installation of new walls and elevated land. (Near-term).

Rowes Wharf Flood Resiliency Plan



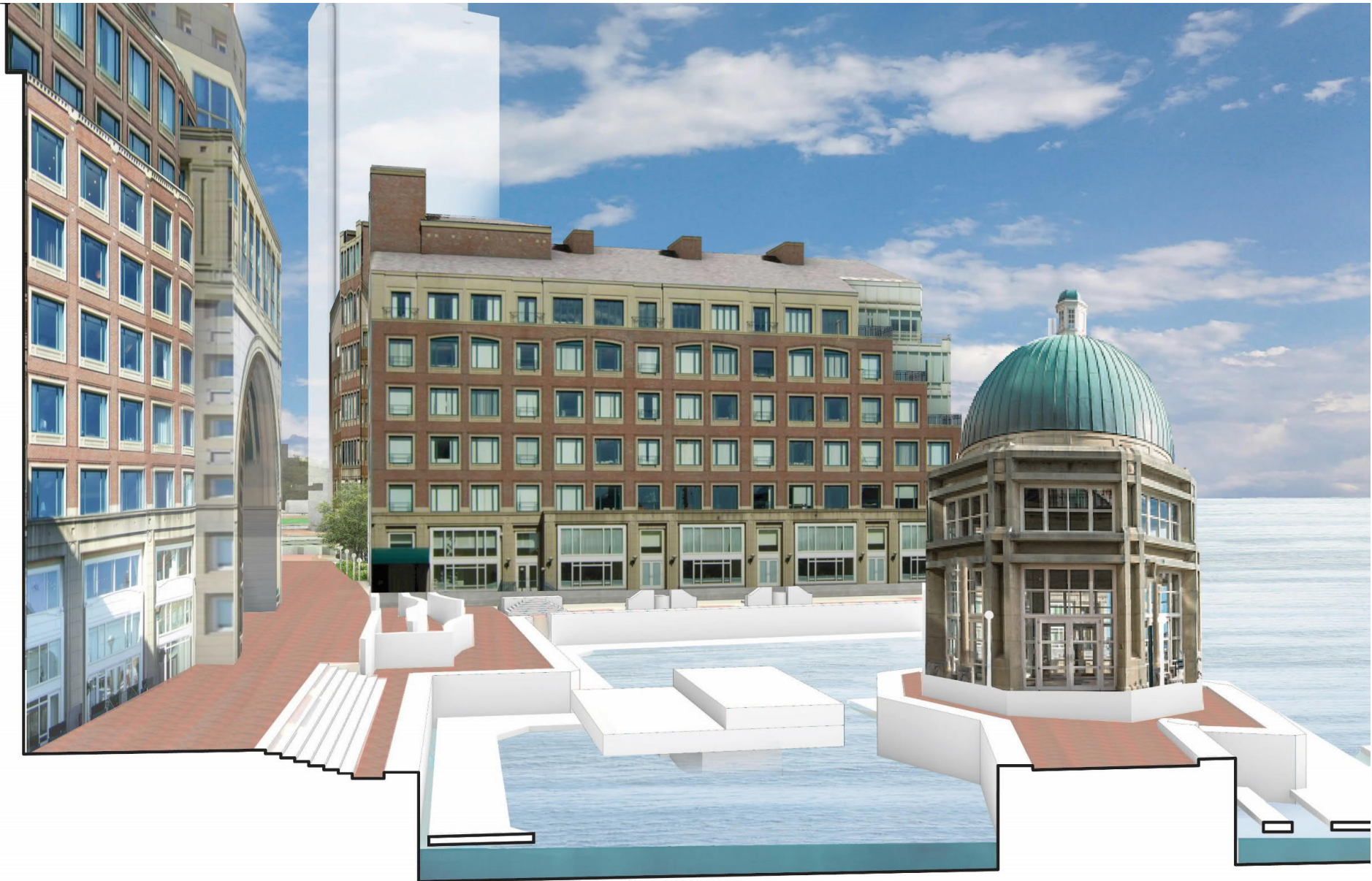
Rowes Wharf Existing Conditions



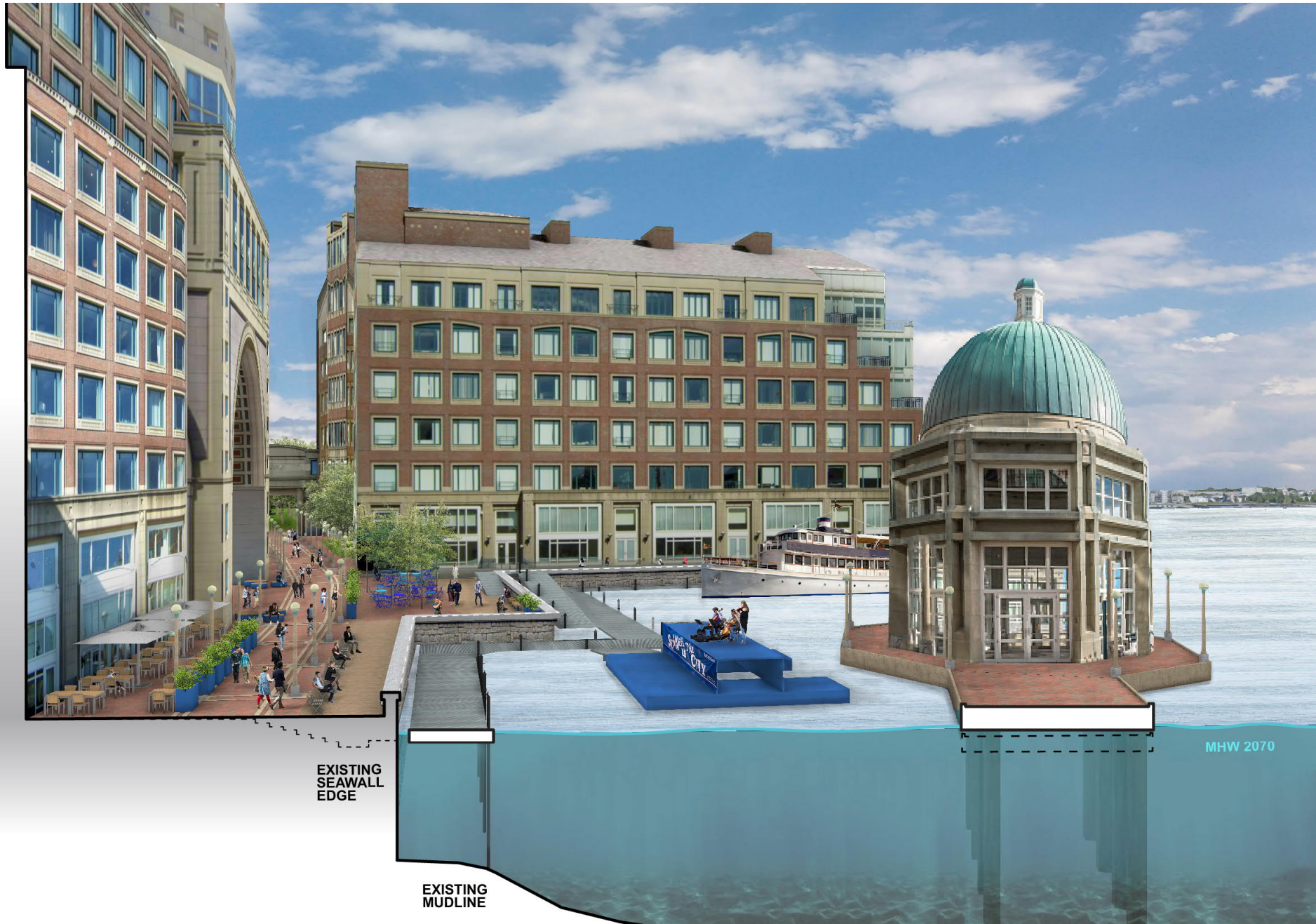
Rowes Wharf Flood Resiliency Plan



Rowes Wharf Existing Conditions



Rowes Wharf Flood Resiliency Plan



Rowes Wharf

The Rowes Wharf Sub-District Flood Resiliency Project will need to be closely coordinated with the Harbor Towers and Northern Avenue Flood Resiliency Projects. The project should facilitate building-level flood protection measures currently being planned by Rowes Wharf to address immediate and near-term flood risks to the buildings. These building-level protections will also provide a secondary level of protection for each building once the district-scale flood protection system is implemented in the mid-term. Emergency vehicle access to all buildings and the Harborwalk will need to be maintained.

The Flood Protection System is proposed outboard of the existing Harborwalk along the north side of the property where a new flood protection landform will be constructed. Along the south side of the property, a new seawall is proposed along the edge of the existing Harborwalk, outboard of the existing seawall. A series of new stormwater storage tanks are proposed to be installed beneath the three Wharf Buildings, and backfill will be placed to fill the area around these tanks between the existing seawall and new seawalls and flood protection landforms – creating a new outdoor plaza area between the North and Central Wharf buildings. Water levels in the stormwater storage tanks will be controlled by a new pump system at the Harbor Towers site. The floor of the gazebo will be raised above the height of the 2070 tidal elevations, and a new walkway will be provided to the gazebo. The existing MBTA commuter ferry and floating stage will be maintained. Existing docks located between the North and Central Wharf Buildings will be relocated to a new floating breakwater outboard of the new flood protection landform.

The proposed Flood Protection System includes:

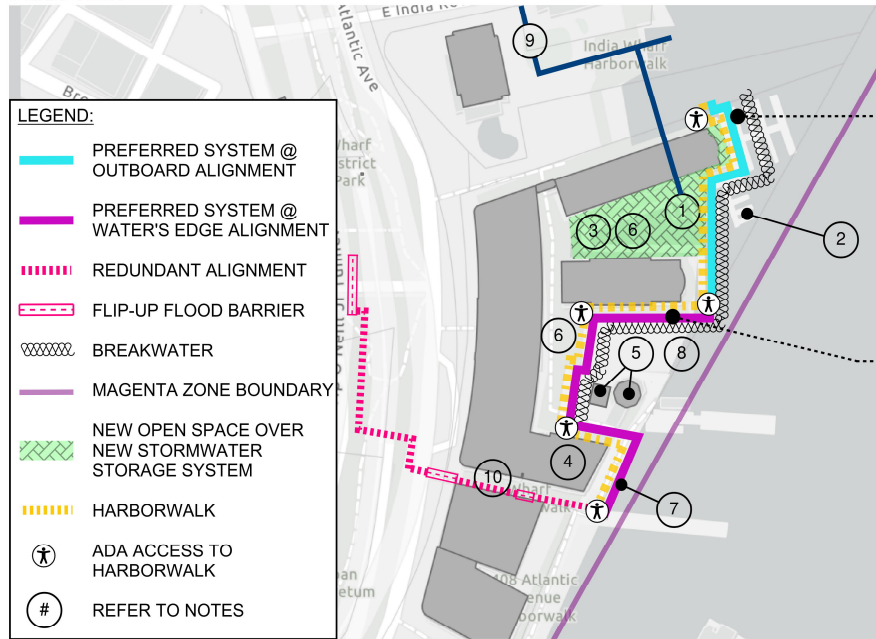
- New open space along the waterfront.
- Opportunities to improve water access and recreation, including new floating breakwaters with walkways and boat moorings.
- Extensive stormwater storage to reduce flood risks within the entire Wharf District associated with rainwater falling on the ‘dry-side’ of the flood protection system.
- Secondary flood protection systems to add resiliency to the district as a whole by preventing flood pathways between the North and South Resilience Zones.

A **Secondary Flood Protection System** is proposed to create self-contained Resilience Zones within the Wharf District to reduce risks of wide-spread flooding associated with single points of failure. This Secondary Flood Protection System forms the northern leg of the proposed South Resilience Zone. Mid-term components of this system include modifying existing walkway ramps and walls to serve as flood protection systems within the alley between Rowes Wharf and Atlantic Avenue, a deployable flood gate across Atlantic Avenue, and elevating land within the Greenway by 1 – 2 feet on average. The remainder of the Secondary Flood Protection System is intended to be installed in the long-term, and includes raising the height of the existing retaining walls along the I-93 tunnel ramps, and providing deployable flood gates across High Street and Purchase Street.

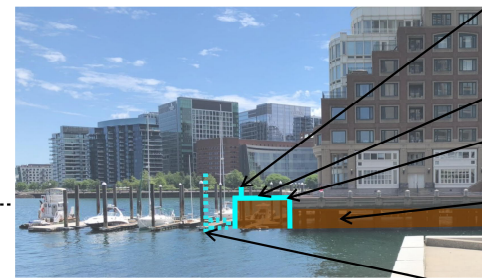
Rowes Wharf Flood Protection System Plan

This plan summarizes the preferred flood protection system. The flood protection system can be installed in two phases: mid-term (2040s-2060s) and long-term (2070s) to meet the increasing flood elevations. Building-level flood resiliency strategies are also recommended in the near-term (through the 2030s) to protect individual buildings from flood hazards prior to the installation of the district-wide flood protection system.

PLAN VIEW

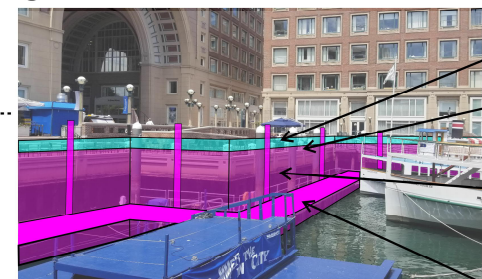


ELEVATED/CONSTRUCTED HARBORWALK @ OUTBOARD ALIGNMENT



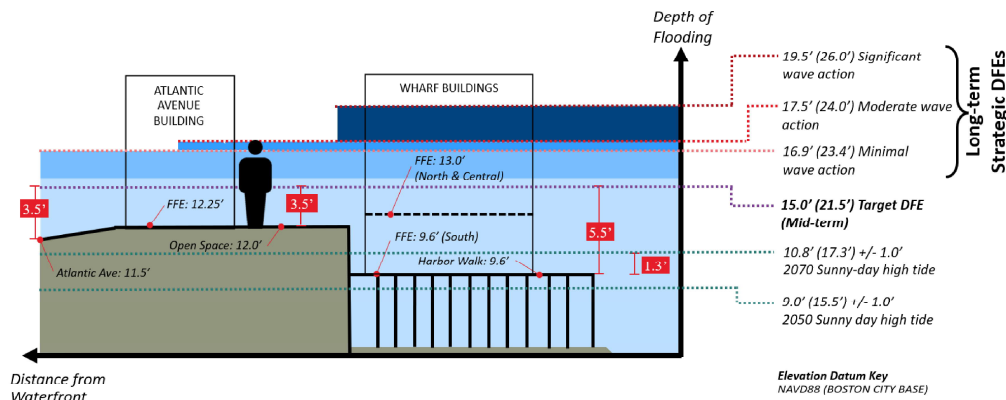
- Install flood wall on top of flood protection berm to elevation 15-ft (mid-term). Increase wall to elevation 16.9-ft for sections of berm with a breakwater, and to elevation 19.5' where there is no breakwater (long-term)
- Construct flood protection berm with Harborwalk at top of berm at elevation 12.9-ft (mid-term)
- Extend existing decking system to new berm with Harborwalk, maintaining existing elevation of 12.9-ft (mid-term)
- New stormwater storage tanks are proposed under the wharf buildings to create a new stormwater storage system for the Wharf District. The area around the storage tanks under the buildings will be backfilled (mid-term).

ELEVATED DOCK @ WATER'S EDGE ALIGNMENT



- Construct new floating breakwater with walkway for access to water and relocated ship mooring (mid-term)
- Install 2.0-ft tall glass flood wall to elevation 16.9' on top of new seawall capping beam (long-term).
- Install new sheet pile / king pile seawall outboard of existing deck. Install capping beam at top of seawall. Top of capping beam to be elevation 15.0-ft (mid-term).
- Construct new stone wall immediately outboard of new sheet pile / king pile seawall using stone blocks matching style of adjacent historic seawalls. Support stone wall on relieving platform (mid-term).
- Install new floating breakwater with walkway for access to water and new ship mooring (mid-term).

EXISTING SITE ELEVATIONS & TARGET DESIGN FLOOD ELEVATION



PREFERRED FLOOD PROTECTION SYSTEM NOTES:

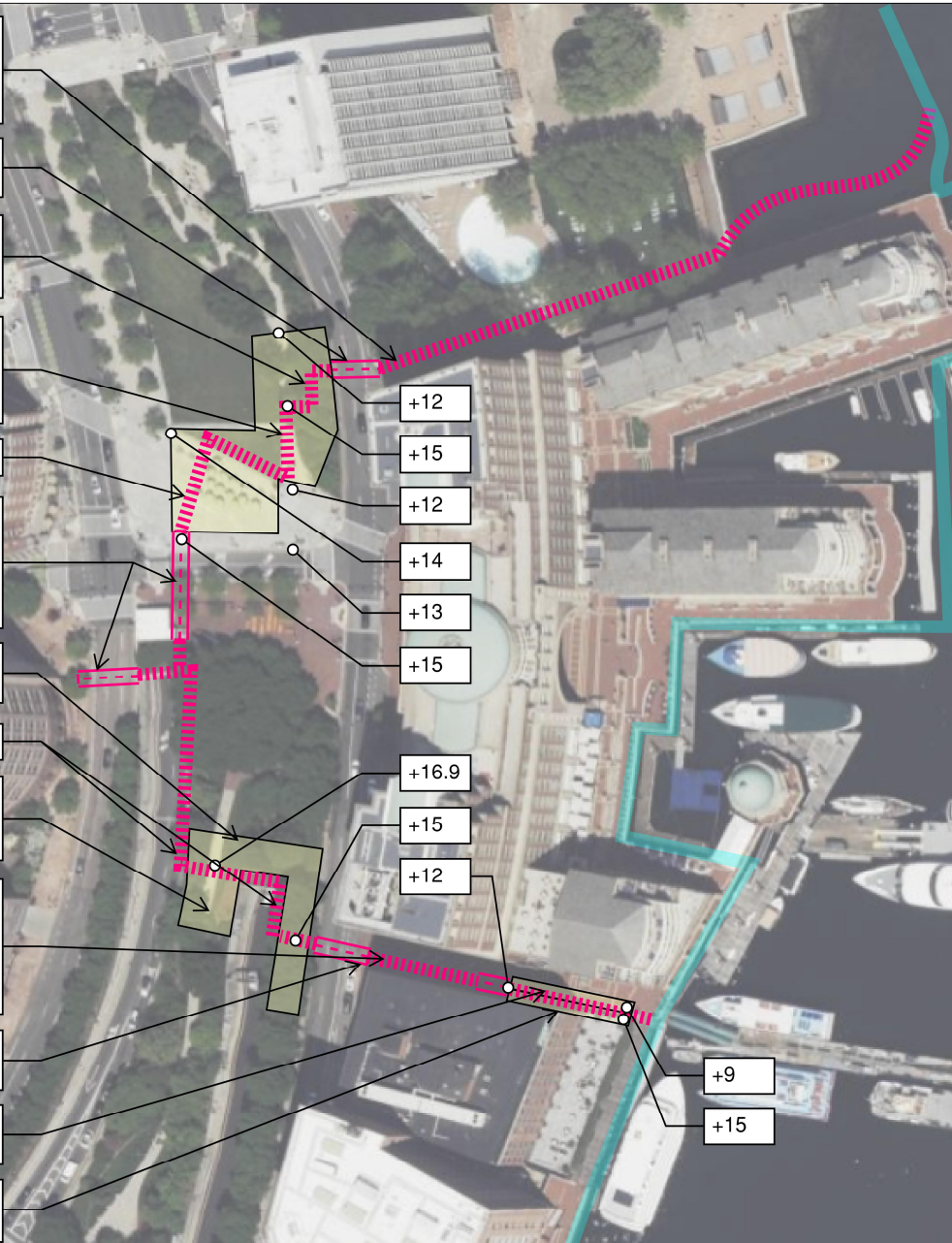
- (1) Install new vegetated open space on new infill. Install new stormwater storage tanks below open space and North Wharf Buildings to provide storage to manage rainfall for the Wharf District. Water levels within the new stormwater storage area to be maintained by a pump system to be installed at Harbor Towers. (Mid-term).
- (2) Floating breakwater with walkway for relocated ship mooring & access to water (mid-term).
- (3) Relocate existing docks to outside of flood protection berm (mid-term).
- (4) Relocate Ticketing Office and provide new ramp from the elevated harborwalk to the South Wharf Building in alley between Rowes Wharf and 400 Atlantic (mid-term).
- (5) Maintain existing Gazebo and floating stage. Raise Gazebo floor above 2070 Highest Astronomical Tide. Replace existing bridge to the Gazebo with a new pedestrian bridge from the elevated Harborwalk (mid-term).
- (6) Raise Harborwalk to elevation 12.2-ft adjacent to the Wharf Buildings, and to 12.9-ft adjacent to the plaza area between Atlantic Avenue building and the Wharf Buildings (mid-term).
- (7) Install 4.5-ft floodwall on top of capping beam to elevation 19.5-ft, where there is no breakwater (long-term).
- (8) Maintain access to the existing tourist and ferry boats.
- (9) New drain pipe to convey excess rainfall from the Major Rainfall Path at Old Atlantic Avenue to new stormwater storage systems at Central Wharf, Harbor Towers, and Rowes Wharf.

REDUNDANT FLOOD PROTECTION SYSTEM NOTES:

- (10) Provide redundant system from 400 Atlantic Avenue to the Rose Kennedy Greenway (mid-term).

Rowes Wharf Secondary Flood Protection System Plan

- Install a new 4-ft to 5-ft floodwall to Elevation 15.0' abutting the existing north face of the existing landscape wall (near-term). Raise wall 26-inches to elevation 17.2' (long-term). Replace trees impacted by installation of new walls and elevated land.
- Install 5-foot tall deployable flip-up flood gates across Atlantic Avenue and adjacent sidewalks (near-term).
- Elevate landscape area by 3-feet to elevation 15.0' (near-term). Install 26" tall flood wall on top of landform to elevation 17.2' (long-term)
- Elevate walkway 3-feet to elevation 15.0' (near-term). Install 26-inch tall flood wall / seating wall along one side of walkway and 26-inch tall deployable flood gate across walkway (long-term).
- Elevate plaza 2-feet to elevation 15.0' at alignment (near-term).
- Install 26-inch tall deployable flip-up flood gates across High Street and Purchase Street and adjacent sidewalks/plazas to elevation 17.2', and connect to I-93 ramp retaining walls; alternatively consider raising roadways with lightweight fill to elevation 17.2' (long-term).
- Elevate walkway and landscaping between I-93 ramps 1-foot to elevation 16.9' at location indicated by spot grade (long-term).
- Extend I-93 ramp retaining walls to elevation 16.9' (long-term).
- Elevate landscape area by 3-feet to elevation 15.0' (mid-term). Install 23-inch tall flood wall on top of landform to elevation 16.9' (long-term).
- Raise existing wall adjacent to existing ramp to elevation 15.0', full length of alleyway, with deployable flood gate at entrance to new ramps for access (mid-term). Increase deployable flood gate height by 23-inches to elevation 16.9', and increase wall height with glass flood wall full length of alleyway (long-term).
- Install 5-foot tall deployable flip-up flood gates across Atlantic Avenue and adjacent sidewalk (mid-term).
- Replace existing ramp with new ramp down to elevation 9.0' to tie into existing Harborwalk at Rowes Wharf (mid-term).
- Raise existing ramp to elevation 15.0' to tie into elevated Harborwalk at 400 Atlantic Avenue (mid-term).



Wharf District Council Conceptual District Protection & Resiliency Plan

Flood Protection System Redundant Alignment Central Resiliency Zone

Date: March 27, 2023

Plan Intent:

This plan summarizes a redundant district-scale flood protection system in the vicinity of Rowes Wharf.

Resiliency System Description:

The City of Boston has planned for district-scale flood protection systems from Christopher Columbus Park to Harbor Towers to be constructed by 2030, and from Rowes Wharf to the Fort Point Channel to be constructed from 2050 to 2070. The northern half of the redundant resiliency system identified hereon (from Harbor Towers to the intersection of Purchase Street and High Street) is therefore proposed to prevent flood pathways through Rowes Wharf from flanking those flood protection systems proposed north of Rowes Wharf prior to construction of the district-scale flood protection system at Rowes Wharf.

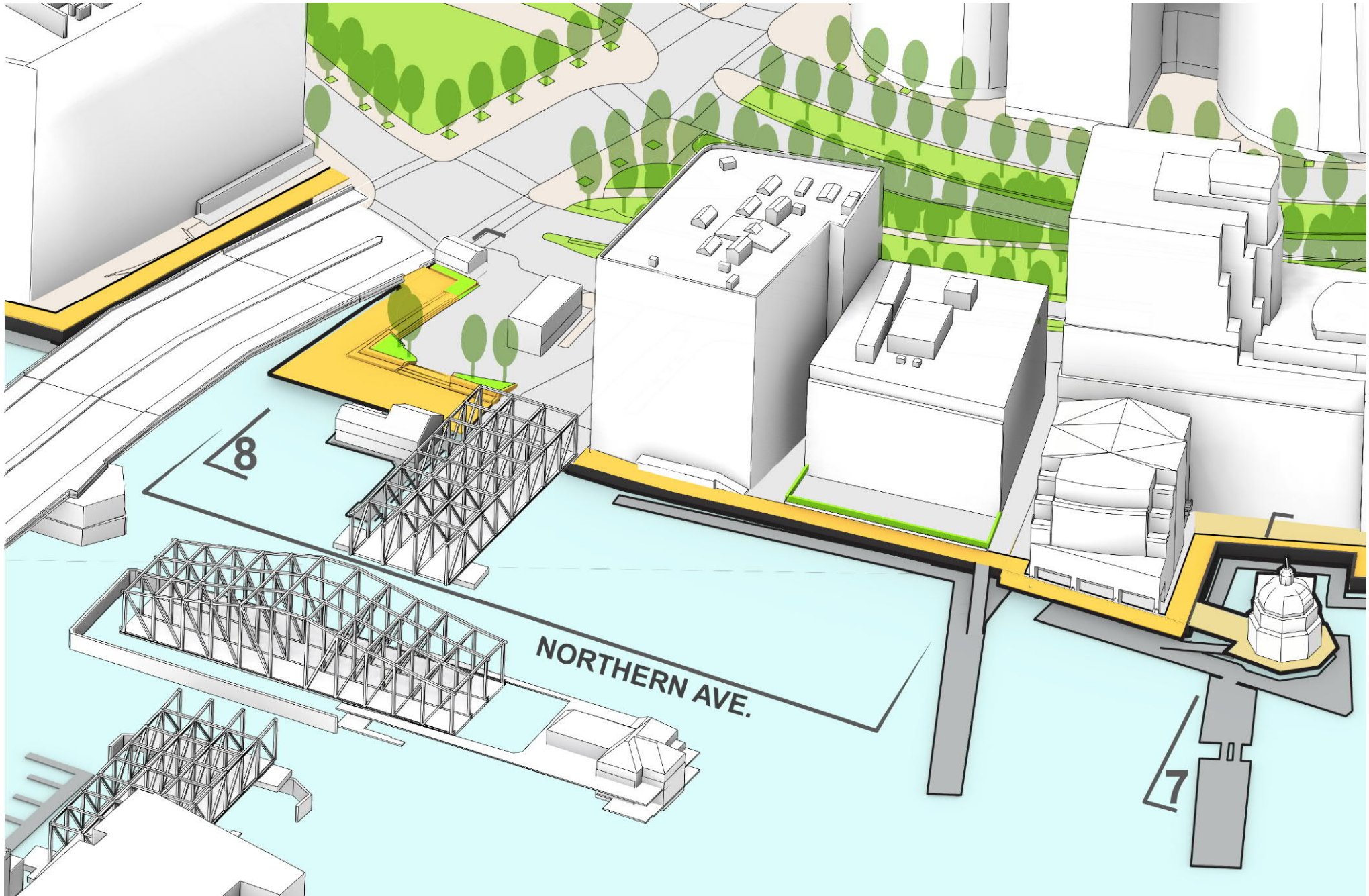
The southern half of the redundant resiliency system identified hereon is intended to provide redundancy with the district-scale flood protection system at Rowes Wharf, to protect properties and infrastructure in the Wharf District.

LEGEND:

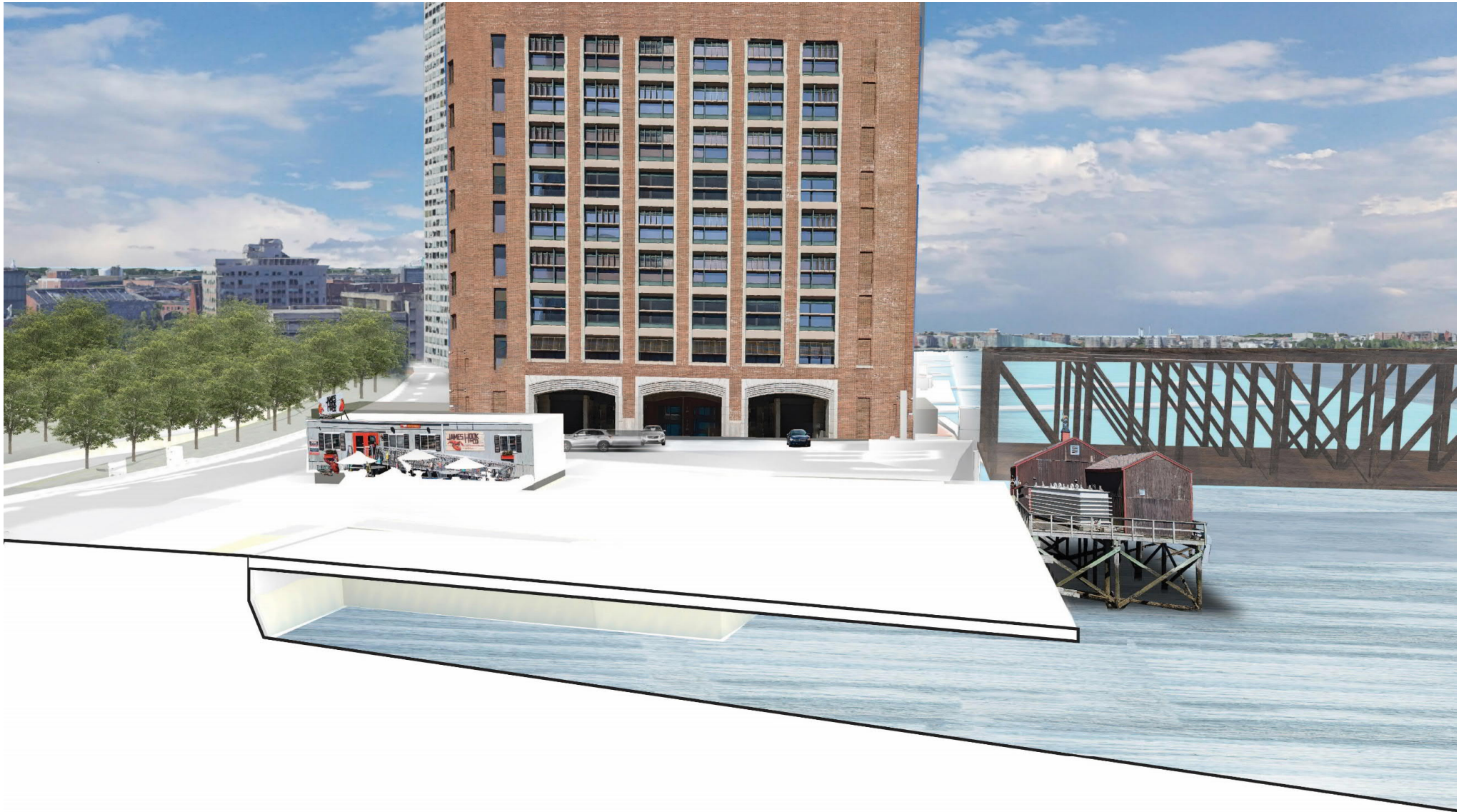
- FLOOD PROTECTION SYSTEM REDUNDANT ALIGNMENT
- DEPLOYABLE FLOOD BARRIER
- ELEVATED LAND
- + PROPOSED SPOT GRADE ELEVATION
- PRIMARY FLOOD PROTECTION SYSTEM ALIGNMENT

ARUP

Northern Avenue Flood Resiliency Plan



Northern Avenue Existing Conditions



Northern Avenue Flood Resiliency Plan



Northern Avenue

The Northern Avenue Sub-District Flood Resiliency Project will need to be closely coordinated with the Rowes Wharf Flood Resiliency Project and future development plans for the Northern Avenue bridge. Existing intake pipes from the Harbor to the James Hook + Company pump system will need to be maintained. The elevated Harbor walk along the Williams Building will need to be constructed of non-flammable materials to facilitate emergency egress from the building. Coordination with equipment and loading dock access at the Williams Building will need to be considered. Privacy screening will need to be provided between the Harborwalk and the existing private deck at 400 Atlantic Avenue.

Refer to the Fort Point Channel Sub-District Flood Resiliency Project summary on the subsequent pages of this report for further discussion related to the potential conversion of Northern Avenue Bridge to a flood gate.

The **Flood Protection System** is proposed along the existing seawalls from Seaport Boulevard the Williams Building at 406 Atlantic Avenue. A new cut-off wall is proposed along the edge of the existing Harborwalk, outboard of the existing seawall at 400 Atlantic Avenue. The area between the existing seawall and new cut-off wall is proposed to create a stormwater storage area, with water levels controlled by a new pump system in Northern Avenue or the new public open space at the James Hook + Company site. A deployable flood gate is proposed at Seaport Boulevard, and a second deployable flood gate is proposed at the Northern Avenue Bridge to provide flexibility for the future redevelopment of this bridge.

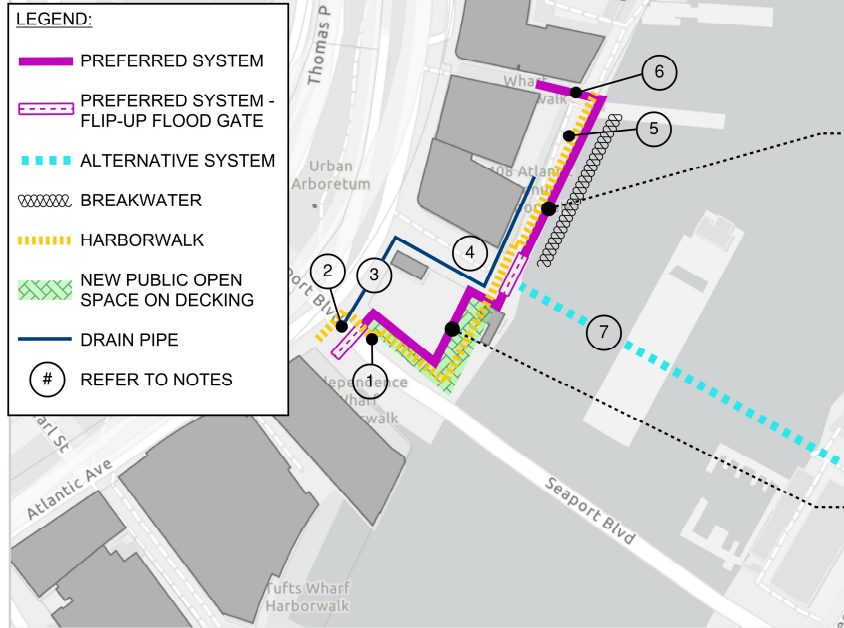
The proposed Flood Protection System includes:

- New public open space on a new decking system at the James Hook + Company site.
- A new pedestrian bridge to public access and visibility of the Harborwalk, creating a new inviting 'gateway' from the Seaport Boulevard bridge sidewalk to this new public waterfront open space.
- Opportunities to improve water access and recreation, including new floating breakwaters with walkways and boat moorings.
- A stormwater storage and pump system to reduce flood risks within the South Resilience Zone associated with rainwater falling on the 'dry-side' of the flood protection system.

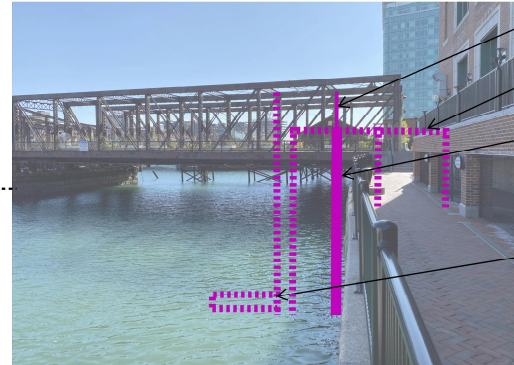
Northern Avenue Flood Protection System Plan

This plan summarizes the preferred flood protection system. The solution can be broken down into two phases: mid-term (2040s-2060s) and long-term (2070s) to meet the increasing flood elevations.

PLAN VIEW



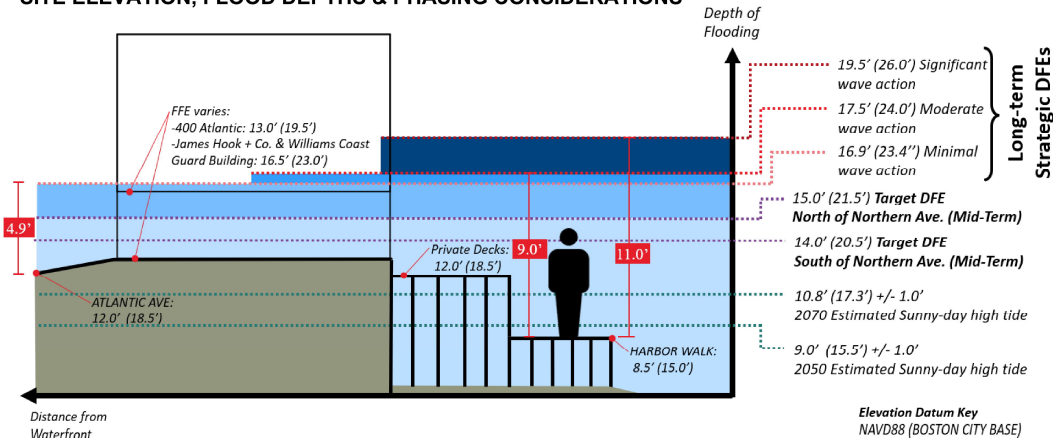
ELEVATED DOCK @ WATER'S EDGE ALIGNMENT



OVER WATER @ WATER'S EDGE ALIGNMENT



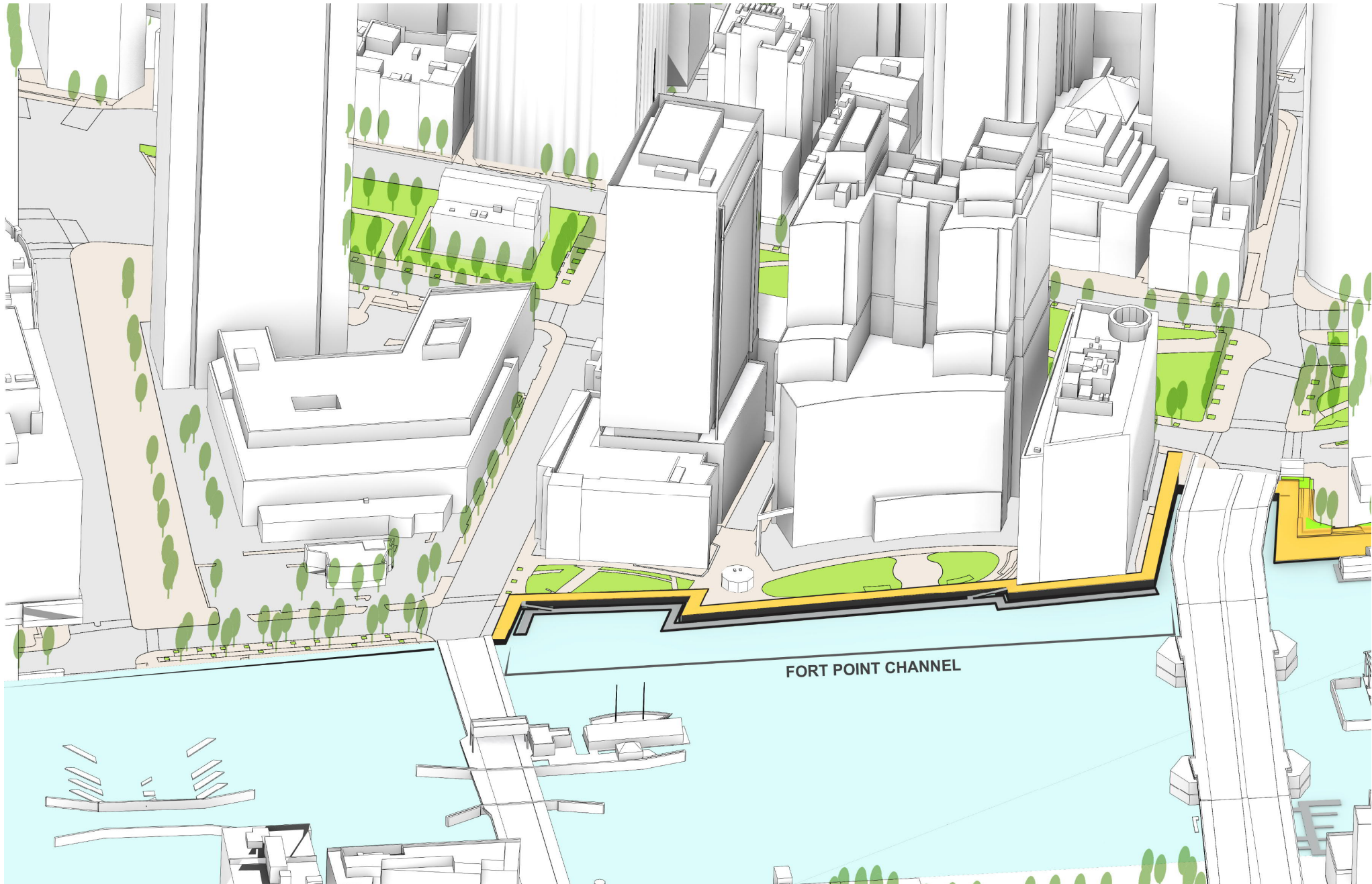
SITE ELEVATION, FLOOD DEPTHS & PHASING CONSIDERATIONS



NOTES

- Install new pedestrian bridge from Seaport Blvd sidewalk to Harborwalk on new deck system.
- Install manual sluice gate and automatic tidegate at existing combined sewer overflow.
- Install drain pipe to convey overflow from the combined sewer to the stormwater storage system between the existing and new seawalls. Install underdrain system along inland side of new cut-off walls with discharge to the new drain pipe to convey flows to the stormwater storage system.
- Install a new pump system in Northern Avenue or new public open space to manage water levels in the stormwater storage system.
- Provide privacy screening between elevated Harborwalk and existing private deck at 400 Atlantic Avenue.
- Connect cut-off wall to existing seawall if constructed prior to Rows Wharf project.
- Alternative Flood Protection System: Convert Northern Avenue bridge into a flood gate to protect all upstream properties along the Fort Point Channel.

Fort Point Channel Flood Resiliency Plan



Fort Point Channel

All flood protection systems investigated for this sub-district project area scored “Poor” in the Multi-Criteria Assessment for construction feasibility due to challenges and costs associated with constructing flood protection systems over the MBTA’s Silver Line tunnel and adjacent to the existing Harborwalk over-water decking system, as well as permitting challenges for new construction in the navigable waters of the Fort Point Channel. Additionally, all waterfront building’s first floor elevations and critical infrastructure identified in this area are higher than the anticipated 2070 Highest Astronomical Tide elevation, and therefore are anticipated to only require protection from storm surge – but not ‘sunny-day’ tidal flooding. **With the support of each waterfront property owner from Rowes Wharf to Atlantic Wharf, we therefore strongly recommend the City of Boston further investigate the construction of a Fort Point Channel Storm Surge Barrier at the current Northern Avenue Bridge location in lieu of constructing a waterfront flood protection system between Northern Avenue and Congress Street.** A conceptual illustration of this Fort Point Channel Storm Surge Barrier prepared by the BWSC is provided on the following page.

Regardless of the district-scale resiliency system ultimately implemented, near-term building-level flood protections are recommended to be installed at each waterfront building to provide a secondary level of protection for each building.

The following narrative and subsequent plans describe the recommend flood protection system for the Fort Point Channel Sub-District Flood Resiliency Project if a Fort Point Channel Storm Surge Barrier is not constructed.

The Fort Point Channel Sub-District Flood Resiliency Project will need to be closely coordinated with resiliency initiatives south of Congress Street along Dorchester Ave.

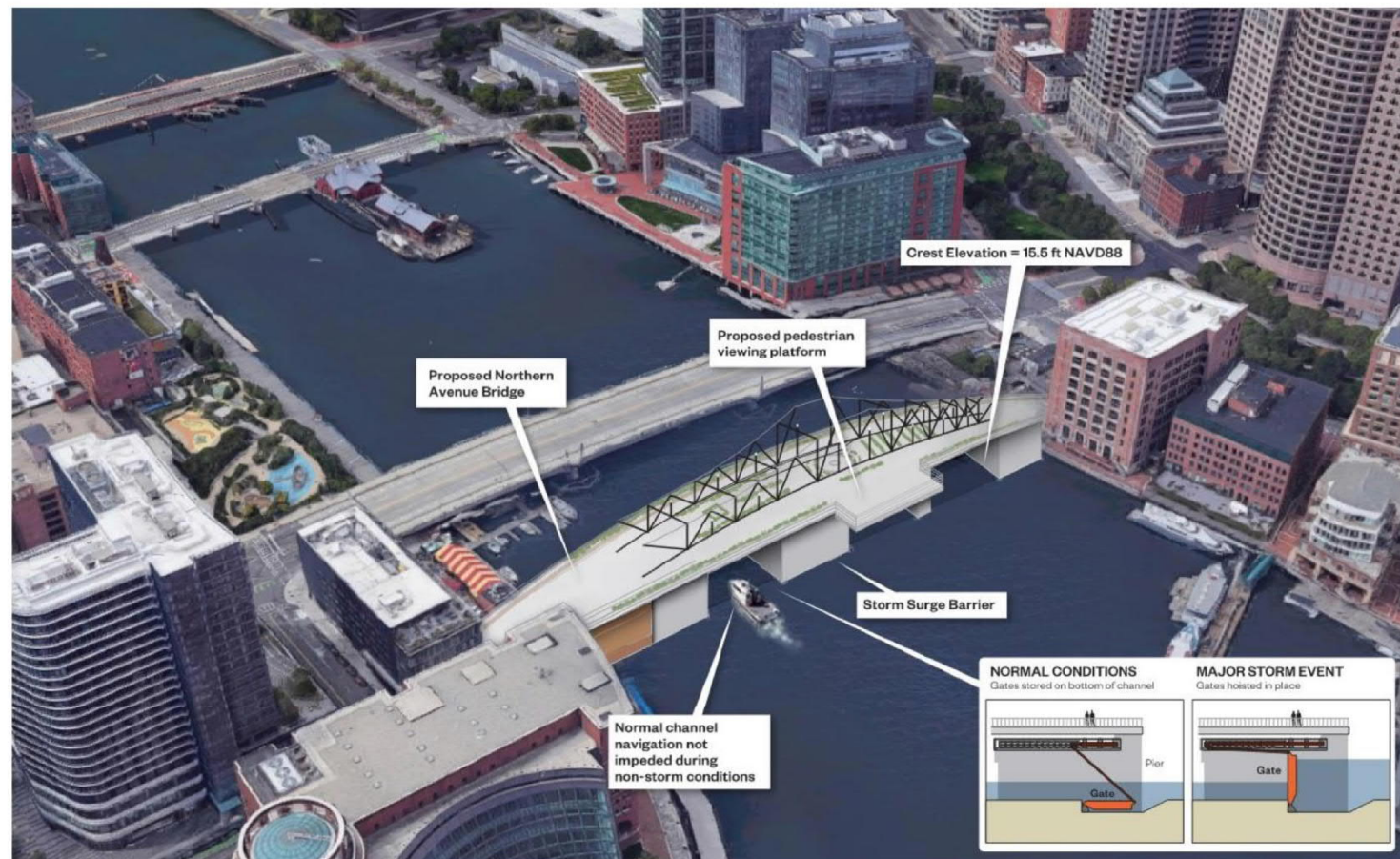
The Fort Point Channel Flood Protection System Plan illustrates the flood protection system proposed if the Fort Point Channel Storm Surge Barrier is not constructed. The system is proposed along the existing seawall at the north side of Independence Wharf. A new cut-off wall is proposed along the edge of the existing Harborwalk, outboard of the existing seawall for the remainder of the project area. The area between the existing seawall and new cut-off wall is proposed to provide a stormwater storage, with water levels controlled by a new pump system at the Intercontinental Hotel Condos site. Access for maintenance of Harborwalk and building piles will need to be maintained. A deployable flood gate is proposed at the Congress Street bridge.

The Flood Protection System includes:

- A new decking system to widen the Harborwalk and provide views of the Harbor at Independence Wharf
- New opportunities for water access and recreation, including new breakwaters with walkways and moorings.
- A stormwater storage and pump system to reduce flood risks within the South Resilience Zone from rainwater falling on the ‘dry-side’ of the flood protection system.

A **Secondary Flood Protection System** is proposed to compartmentalize flood protection between the Wharf District and the neighborhoods to the south. This system consists of deployable barriers along the Congress Street sidewalk from the Fort Point Channel to the Greenway, and a deployable barrier across Atlantic Avenue.

Fort Point Channel Storm Surge Barrier – Northern Avenue Bridge Integrated Alternative



Conceptual Solution – Alternate Location

The above graphic depicts an alternate concept for the FPC SSB that is integrated with the planned Northern Avenue Bridge Replacement. The mechanical systems are similar to the other concepts shown previously. This alternate location combines planned renovations to the Northern Avenue Pedestrian Bridge with the FPC SSB into one project. This alternative mitigates the viewshed impact of the SSB on the planned viewing platform of the bridge. Although this concept has not been advanced to the design stage at this time, and it is anticipated that both structures would need to be significantly redesigned, integration of these structures would reduce construction impacts from separate projects. In addition, an integrated project would offer an opportunity for Boston and the Commission to implement an iconic adaption project, with multiple community benefits, that could catalyze funding and coordination for further adaptation efforts.

Coastal Stormwater Discharge Analysis
Fort Point Channel



Hazen

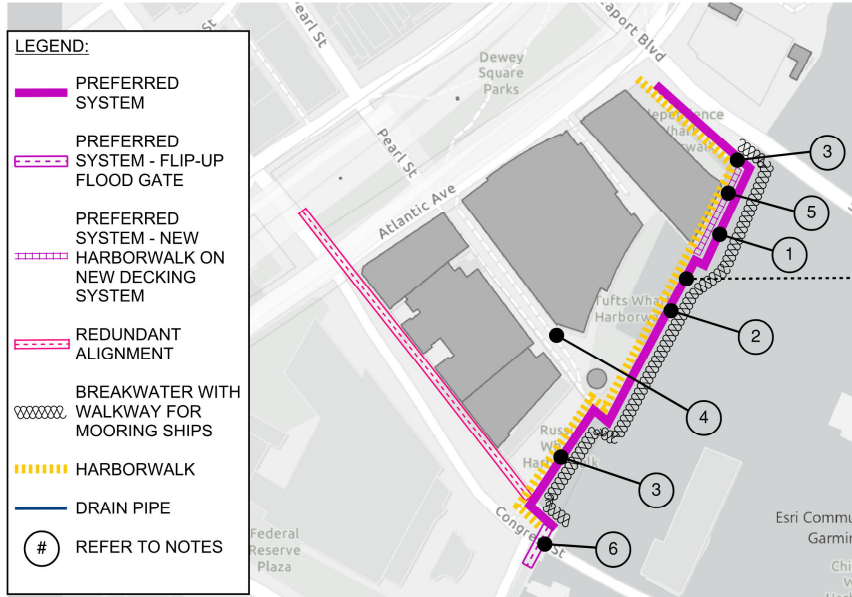
Sheet 11 of 15

November 2022

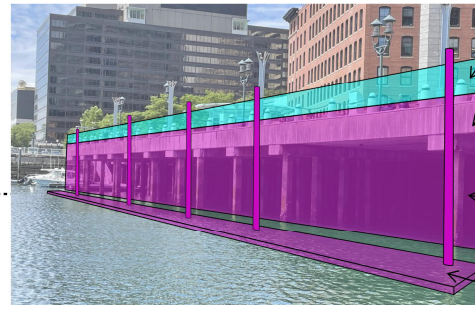
Fort Point Channel Flood Protection System Plan

This plan summarizes the preferred flood protection system. The solution can be broken down into two phases: mid-term (2040s-2060s) and long-term (2070s) to meet the increasing flood elevations. Building-level flood resiliency strategies are also recommended in the near-term (through the 2030s) to protect individual buildings from flood hazards prior to the installation of the district-wide flood protection system.

PLAN VIEW



ELEVATED DOCK @ WATER'S EDGE ALIGNMENT

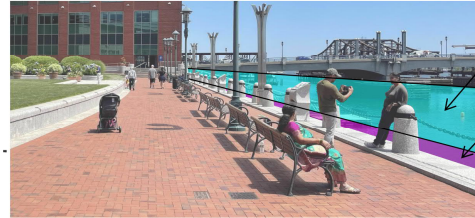


Install 3-ft tall glass flood wall to elevation 17.1-ft on top of new seawall capping beam at Atlantic Wharf and InterContinental Hotel (long-term).

Install new sheet pile / king pile seawall outboard of existing deck. Install capping beam at top of seawall. Top of capping beam to be elevation 17.1-ft at Independence Wharf, and 14.1-ft at Atlantic Avenue and InterContinental Hotel (2.1-ft above existing Harborwalk) (mid-term).

Construct new stone wall immediately outboard of new sheet pile / king pile seawall using stone blocks matching style of adjacent historic seawalls. Support stone wall on relieving platform (mid-term).

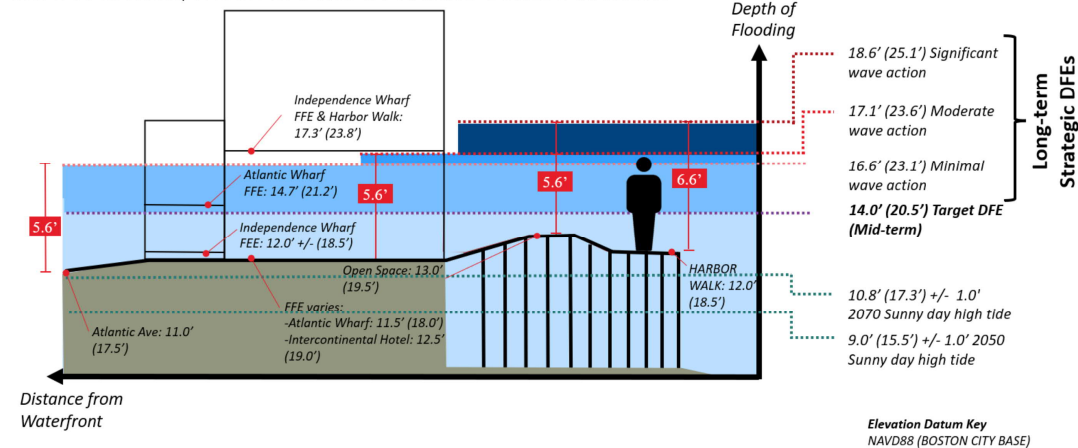
Install new floating breakwater with walkway for access to water and new ship mooring (mid-term).



Install 3-ft tall glass flood wall to elevation 17.1' on top of new seawall capping beam at Atlantic Wharf and InterContinental Hotel Condos (long-term).

Install new sheet pile / king pile seawall outboard of existing deck. Install capping beam at top of seawall. Top of capping beam to be elevation 17.1-ft at Independence Wharf, and 14.1-ft at Atlantic Avenue and InterContinental Hotel (2.1-ft above existing Harborwalk) (mid-term).

SITE ELEVATION, FLOOD DEPTHS & PHASING CONSIDERATIONS



NOTES

- 1) Seawall to be sheet pile wall at Atlantic Wharf and InterContinental Hotel, and king pile wall at Independence Wharf. Protect Independence Wharf building from settlement during wall installation.
- 2) Install sheet pile and king pile walls to approximately 30 feet below mudline either side of MBTA tunnel. Install slurry wall to top of MBTA tunnel, and protect tunnel during installation.
- 3) Install culverts through seawall and stone wall to allow water to flow through under deck area during normal conditions. Install manual gate valves to close culverts during storm surge events.
- 4) Install new pump station to control water levels under deck area, and discharge to the Fort Point Channel during storm surge events.
- 5) Install new Harborwalk at elevation 17.1-feet, located between Independence Wharf building and new seawall (mid-term).
- 6) Provide Redundant Flood Protection System to compartmentalize flood protection between the Wharf District and the neighborhoods to the south. System to consist of deployable barriers along the Congress Street sidewalk and Atlantic Avenue to the existing retaining wall and landform at the Greenway.
- 8) Alternative Flood Protection System: Convert Northern Avenue Bridge into a flood gate to protect all upstream properties along the Fort Point Channel. Provide building-level flood protection systems to protect each individual building.

Implementation Timeline

The Wharf District Flood Resiliency Plan is divided into six Sub-District Resiliency Projects. Each project is designed to phase the construction of the proposed resiliency strategies, incrementally increasing the height of the flood protection system as sea levels rise. Strategies are identified to be implemented during near-, mid-, or long-term time horizons, as indicated on the Sub-District Flood Resiliency Project plans, and in the Implementation Timeline on the following page.

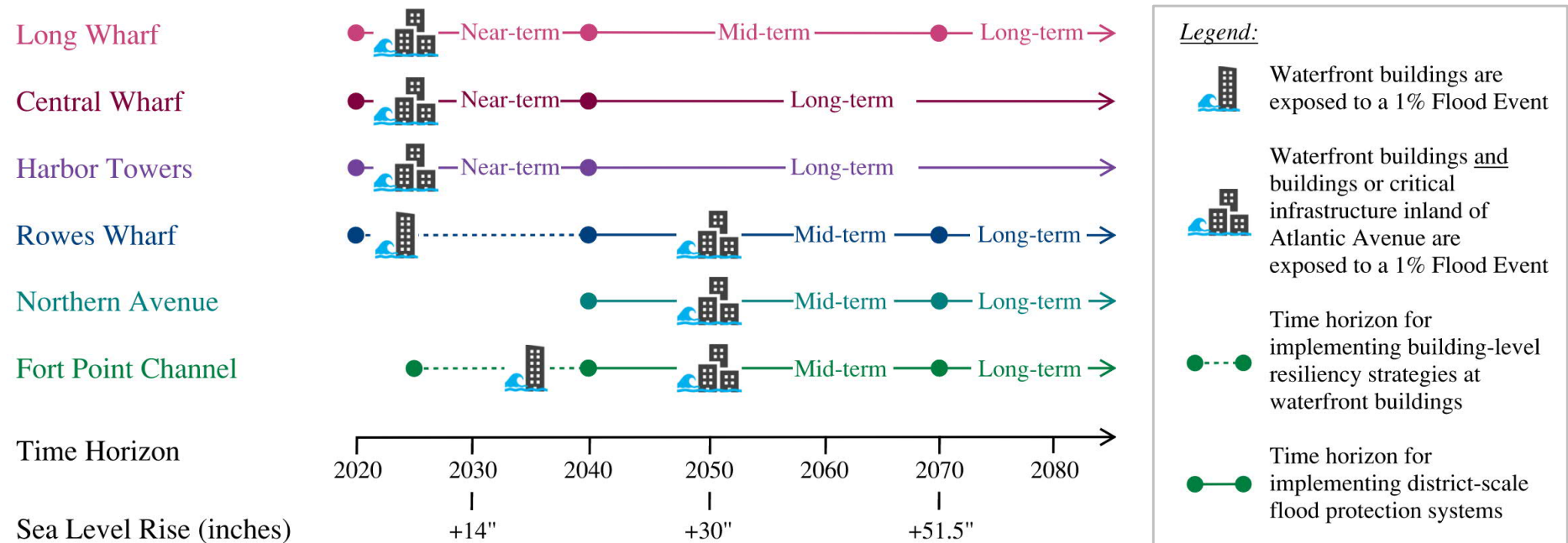
District-Scale Flood Protection: District-scale flood protection projects are recommended to be implemented prior to the date when flooding from a 1% flood event is anticipated to impact buildings and critical infrastructure located inland of Atlantic Avenue, as indicated on the Implementation Timeline. Where such buildings and critical infrastructure are already at risk, we recommend district-scale flood protection projects be initiated immediately.

Building-Level Flood Protection:

- ***Inland Buildings*** – Buildings in the Wharf District located inland of Atlantic Avenue adjacent the Long Wharf, Central Wharf, and Harbor Towers project areas are **strongly encouraged to implement building-level resiliency strategies immediately**, as most of these properties are at risk of being impacted by over 2 feet of flooding from a 1% flood event this decade. Additionally, such building-level resiliency strategies will create a critical second layer of resiliency for the Wharf District community at each building to protect people and property from risks associated with single points of failure in the district-scale flood protection system.
- ***Waterfront Buildings*** – Waterfront buildings are recommended to implement building-level resiliency strategies prior to the date when flooding from a 1% flood event is anticipated to impact the waterfront buildings or inland buildings and critical infrastructure, as indicated on the Implementation Timeline.

Building-Level Flood Resiliency Guidelines are provided in **Appendix C**.

Implementation Timeline



Notes:

-Building Adaptations at individual buildings are recommended to protect waterfront structures anticipated to be exposed to flooding during a 1% storm surge event prior to the construction of the district-wide flood protection system. Building-specific flood adaptations should be identified and implemented by individual property owners based on site-specific conditions, and are not included in the plans or cost estimate provided in this report.

-Long-term strategies for all projects include raising the height of the flood protection system as sea levels rise by raising portions of the Harborwalk, installing glass and/or solid flood walls, and replacing flood gates and stormwater valves installed during the 2020s-2030s as they reach end of their useful life.

-Sea Level Rise is based on Massachusetts specific analysis (DeConto and Kopp, 2017), and consistent with projections being used by the Commonwealth of Massachusetts (Mass. Coastal Zone Management and the Massachusetts Coast Flood Risk Model).

Regulatory Considerations

The following regulatory analysis prepared by VHB is intended to support the processes of securing regulatory approvals for the Wharf District Flood Resiliency Plan (the “Resilience Plan”) based on the conceptual-level plans for each of the Sub-District Resiliency Projects (the “projects”).

Key Findings

- All projects must file a Notice of Intent (NOI) with the Boston Conservation Commission.
- All projects require approval under Chapter 91, most likely in the form of a new or amended license.
- All projects could potentially be approved under the existing Chapter 91 regulations at 310 CMR 9.00. However, specific changes (identified in Table 2 below) would clarify and confirm licensing eligibility.
- All projects are likely to be subject to review under the Massachusetts Environmental Policy Act (MEPA), pending final design, because they require a Chapter 91 License, and they exceed at least one Environmental Notification Form (ENF) threshold (see Table 1 below).
- While no Environmental Impact Report (EIR) thresholds are likely to be exceeded, EIRs would be required due to the projects’ proximity to Environmental Justice (EJ) populations in compliance with MEPA’s EJ Protocols.
- The projects for Long Wharf, Rowes Wharf, Northern Ave, and Fort Point Channel impact historic resources and will require review by the Massachusetts Historical Commission (MHC).
- All projects include work within the FEMA 1% annual chance floodplain. The Long Wharf Phase 1 project includes measures that would be subject to the flood-related portions of the MA Building Code (wet and/or dry floodproofing strategies at the Chart House and Customs House).
- All projects include at least one element in the public right-of-way, and as such would require review by the City’s Public Improvement Commission (PIC).
- The projects at Long Wharf and Central Wharf will require review by and coordination with the Boston Transportation Department (BTD).
- The Long Wharf project will require review by and coordination with the Boston Fire Department (BFD).
- All projects have at least one element within 100 feet of land considered to be a park, and as such would require review by the Boston Parks Commission.
- Consultations with the Massachusetts Department of Environmental Protection (DEP) Waterways Department and MEPA Office are recommended as next steps.

Cost Estimate, Cost-Effectiveness Assessment, and Funding Opportunities

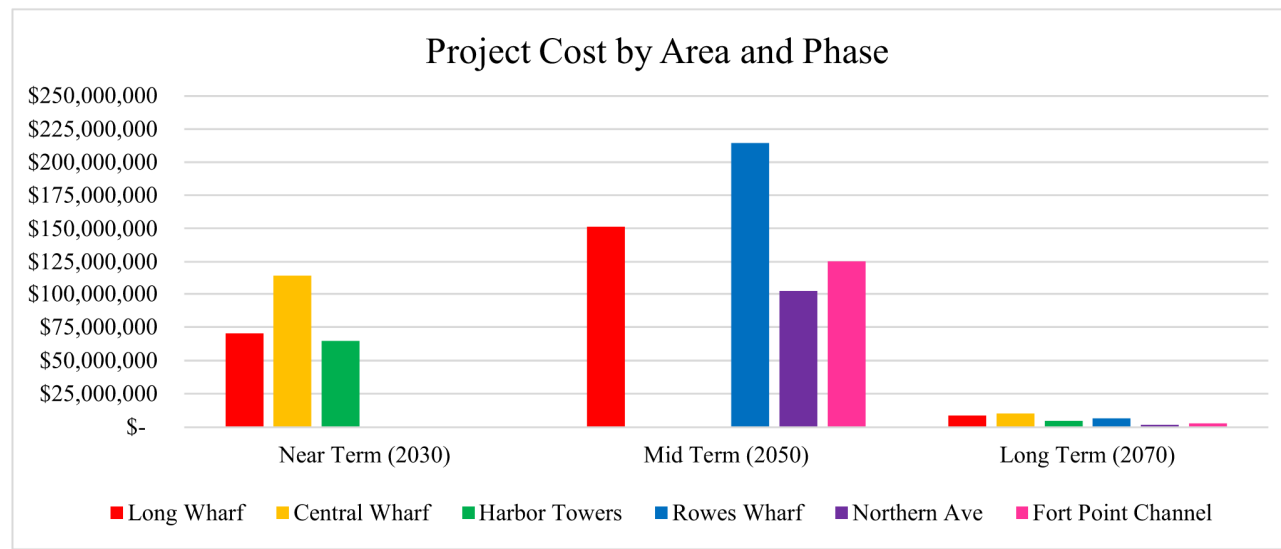
Cost Estimate

Summary of Probable Costs

A rough-order of magnitude estimate of probable construction costs for the Wharf District Flood Resiliency Plan are summarized below. As the Sub-District Resiliency Project plans are at the conceptual level of detail, the accuracy range of this estimate has been determined to be -40% and +65%, reflecting likely bid prices if the project was issued to tender at this current stage. A detailed cost estimate is provided in **Appendix E**.

Summary of Probable Construction Costs

Total Project Cost Estimate	Long Wharf	Central Wharf	Harbor Towers	Rowes Wharf	Northern Ave	Fort Point Channel	Total Term Estimate
Near Term (2030)	\$ 70,294,100	\$ 114,605,300	\$ 64,701,800	\$ -	\$ -	\$ -	\$ 249,601,200
Mid Term (2050)	\$ 151,364,000	\$ -	\$ -	\$ 214,288,100	\$ 102,179,200	\$ 125,370,100	\$ 593,201,400
Long Term (2070)	\$ 8,823,500	\$ 10,154,400	\$ 4,535,000	\$ 6,604,100	\$ 1,703,500	\$ 2,762,400	\$ 34,582,900
Total	\$ 230,481,600	\$ 124,759,700	\$ 69,236,800	\$ 220,892,200	\$ 103,882,700	\$ 128,132,500	\$ 877,385,500



Comparable Project Costs

The following flood resiliency projects have recently been issued for bid or are currently under construction. The construction cost budgets for each of these projects is broken down per linear foot of protected coastline to provide a point of comparison with the linear foot costs estimated for the Wharf District Flood Resiliency Plan.

Comparable Project Costs

Project Title	City	Total Project Construction Budget	Linear Feet of Coastline	Cost per Linear Foot of Coastline	Project Description
North & West Battery Park City Resiliency Project	NYC	\$ 631,000,000	8,000	\$ 79,000	Elevated walkways and floodwalls along the coast. Elevated park space with social stairs and walking paths up the elevated flood protection berm.
Brooklyn Bridge-Montgomery Coastal Resilience (BMCR) Project	NYC	\$ 522,000,000	4,800	\$ 109,000	Deployable floodwall and gate system with plaza space for pedestrians and bicyclists.
South Battery Park City Resiliency Project	NYC	\$ 221,000,000	2,000	\$ 111,000	Integrated flood barrier along the coast, and stormwater system upgrades.
Wharf District Flood Resiliency Project	Boston	\$ 877,385,500	7,800	\$ 112,500	
East Side Coastal Resiliency Project	NYC	\$ 1,450,000,000	6,600	\$ 220,000	Improved park space and facilities, pedestrian bridges, infill, landscaping, and deployable flood gates. Work is located 300 feet or more from the waterfront.

Cost-Effectiveness Assessment

The following Cost-Effectiveness Assessment is intended as a high-level decision-making tool to help stakeholders prioritize impactful projects by weighing the project's benefits against its costs. One output of this Cost-Effectiveness Assessment is the Benefit-Cost Ratio (BCR). The BCR is calculated by dividing the benefits of project by its costs. If this ratio is greater than one, the project's benefits are found to be greater than its costs, and the project is deemed cost-effective.

A high-level Cost-Effectiveness Assessment was prepared for the Wharf District Flood Resiliency Plan based on data from the City of Boston's Climate Ready Boston report released in 2016. Despite being released in 2016, this study offers a comprehensive approach to assessing the avoided losses of a storm event and understanding the benefits that a resilient Wharf District could offer.

Findings

As summarized in the table below, this analysis found that the project would have an approximate **net project benefit of \$2.6 billion** and a **3.2 Benefit-Cost Ratio (BCR)**, indicating that the proposed project would provide a net positive return on investment.

This BCR is assumed to be conservative due to the following limitations in the data available at the time of this study:

- Sea level rise projections and associated flood extents, depths, and damages have significantly increased since the 2016 Climate Ready Boston study data which underpins this assessment.
- Costs associated with transportation assets that are not buildings (such surface roads and infrastructure located within the Central Artery Tunnel and MBTA tunnels) are not included.
- Business interruption was not included, and all impacted businesses are assumed to reopen despite FEMA estimating 25% of all businesses will never reopen.
- Social and environmental benefits are excluded.

Benefit-Cost Ratio

ITEMS	COST	NOTES
TOTAL COST	\$1.2 Billion	
AVOIDED LOSSES	\$3.9 Billion	Includes annualized direct physical damage, stress factors, and displacement costs
NET PROJECT BENEFIT	\$2.6 Billion	Excludes economic output losses, such as sales and revenues lost associated with business disruptions.
Benefit-Cost Ratio (BCR)	3.2	

Process

Avoided losses used in this assessment are based on those identified in the City of Boston's Climate Ready Boston report released in 2016, which aggregated losses due to coastal flooding experienced by the Wharf District, the West End, the North End, the Financial District, Chinatown, and the Leather District into a single "Downtown" neighborhood. To calculate the avoided losses for the portion of the neighborhood protected by the project, flood pathways and inundation areas were delineated against the proposed flood protection strategies to determine the benefiting area of the project.

The project's benefiting area was then overlaid on a map of annualized losses¹ identified in the 2016 Climate Ready Boston report to deduce the percentage of the total Downtown neighborhood the project would protect.

Avoided Losses used in this assessment were based on the anticipated annualized losses associated with direct physical damage (structures and building contents), stress factors, and displacement costs projected to be caused by the coastal flood events that would be prevented by the project during a 50-year period from 2030 to 2080.

Next Steps

This cost-effectiveness assessment is intended to provide a high-level understanding of the impact of the Wharf District Resilience Plan. This assessment is not

intended to satisfy the requirements of a Benefit-Cost Analysis that would eventually be required for eligibility under many federal and state grant programs. The accuracy of the Avoided Losses used in this analysis are also dependent on the accuracy of the inventory gathered for the 2016 Climate Ready Boston analysis.

We recommend a more in-depth consequence and benefit cost analysis be performed. In particular, we recommend this analysis be developed to include a more robust approach to quantifying the project's critical transportation, social, and ecological benefits.

Annular Costs and Benefits Summary

	2030 - 2049	2050 - 2069	2070 – 2080
Annualized Avoided Losses (Millions / Year)	\$28	\$66	\$182
One-Time Construction Costs (Millions)	\$250	\$593	\$35
One-Time Design Costs (Millions)	\$25	\$59	\$3
Annualized O&M Costs (Millions / Year)	\$3	\$6	\$9

¹ Annualized losses are the sum the damages that would occur if the flood protection system is not built. In this case, annualized losses are weighted based on the probability for all four flood frequencies (10%, 2%, 1%, 0.1%) analyzed for each sea level rise scenario (9", 21", 36") used in the 2016 Climate Ready Boston Report, which are lower than the current sea level rise projections used for the Wharf District flood resiliency project. To find probability-weighted losses, losses for a single event are multiplied by the probability of that event occurring in a given year.

Funding Opportunities

The Wharf District Flood Resiliency Plan is expected to be eligible for multiple federal and state funding programs. A summary of potential funding opportunities is provided below. Each of these programs have unique eligibility requirements. Key eligibility requirements are generally categorized as ‘funding themes’ in the tables below. The applicable funding themes for each Sub-District Resiliency Project is also identified below to aid in identifying funding opportunities for each project.

To be eligible for many of these funding opportunities, it may be necessary for private property owners to partner with public and/or non-profit organizations (public-private partnerships) to be eligible for funding.

Priority Federal Funding Opportunities:

- FEMA - Building Resilient Infrastructure and Communities (BRIC)
- NOAA - National Coastal Resilience Fund (NCRF)
- USACE - Corps Water Infrastructure Financing Program (CWIFP)

Other Potential Opportunities:

- FEMA - Pre-Disaster Mitigation Grant Program
- FEMA - Safeguarding Tomorrow Through Ongoing Risk Mitigation (STORM)
- NOAA - Transformational Habitat Restoration and Coastal Resilience Grants

Priority State Funding Opportunities:

- Massachusetts Office of Coastal Zone Management - Coastal Resilience Grant Program
- MA - Municipal Vulnerability Preparedness (MVP) Grant Program

Sub-District Resiliency Project Funding Themes

Project Area	Project Elements	Funding Themes
Long Wharf	• Living shoreline • Revetments for filter feeders • Shade trees	  
Central Wharf	• Flood protection islands • Floating wetlands • Revetments for filter feeders • Shade trees	  
Harbor Towers	• New park space • Revetments for filter feeders • Shade trees	   
Rowes Wharf	• New vegetated open space • Revetments for filter feeders	  
Northern Avenue	• New public open space • New, accessible connections to the Harbor Walk	 
Fort Point Channel	• Flood resilience features	

 Resilience
  Restoration
  Canopy
  Open space

Funding Opportunities

Grant Name	Agency	Amount (per project limit)	Eligible applicant	Summary	Funding Themes
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	DOT	\$25m	State and local governments	Funds critical freight and passenger transportation infrastructure projects. The project prioritizes projects that improve the resilience of road, rail, transit and port infrastructure to current and future weather and climate risks.	 
Building Resilient Infrastructure and Communities (BRIC)	FEMA	\$50m	Local governments and partnerships apply through designated state agency.	Focuses on system-based mitigation risk reduction projects that protect critical infrastructure. Prioritizes nature-based solutions and serving disadvantaged communities.	  
Pre-Disaster Mitigation Grant Program	FEMA	~\$5m	Local governments apply through state. Project must be identified by congress.	Funds projects designed to reduce risk to individuals and property and reducing reliance on federal funding.	 
Safeguarding Tomorrow Through Ongoing Risk Mitigation (STORM)	FEMA	\$5m	States are eligible for capitalization grants and local communities apply to state for loans.	Low-interest loans that can be used as cost-share for another FEMA HMA grant. Focused on empowering local decision-making around hazard mitigation planning.	
Hazard Mitigation Grant Program (HMGP)	FEMA	No limit	Local governments apply through state after a presidentially declared disaster.	Funds hazard mitigation plan development and hazard mitigation projects designed to build long-term resilience after a disaster declaration.	
Municipal Vulnerability Preparedness (MVP) Grant Program	MA EEA	\$3 individual \$5 regional	Municipalities	Prioritizes innovative resilience projects that incorporate nature-based solutions, present multiple co-benefits, and serve EJ communities.	  

National Coastal Resilience Fund	NOAA	\$10m Recommended cap	Local governments, non-profits, regional council of governments, for-profits, and educational institutions	Funds conservation projects that restore or expand natural features that lessen the impacts of natural disasters. Prioritizes projects that are “restoration-ready”.	
Coastal Resilience Grant Program	NOAA/ MA CZM	\$10m Recommended cap	Municipalities and non-profits	MA CZM allocates NOAA funding locally for eligible project types including habitat restoration; sea wall /harbor infrastructure redesigns and retrofits, shoreline restoration.	
Transformational Habitat Restoration and Coastal Resilience Grants	NOAA	\$15m	Higher education, non-profits, commercial (for profit) organizations, state/local governments	Focused on habitat-based resilience approaches that strengthen both ecosystem and community resilience. Projects can include supporting water industries including tourism.	
Corps Water Infrastructure Financing Program (CWIFP)	USACE	Must be greater than \$20m	Local government entities, state infrastructure financing authorities, corporations, partnerships, joint ventures, trusts	Low-cost loans that accelerate investment in infrastructure projects focused on resilience, economic development, and improving environmental quality. Funds up to 49% of project costs for groups of projects over \$20 million. However, requires dedicated source of repayment (taxes, user fees, etc.).	



Wharf District Council Conceptual District Protection & Resiliency Plan

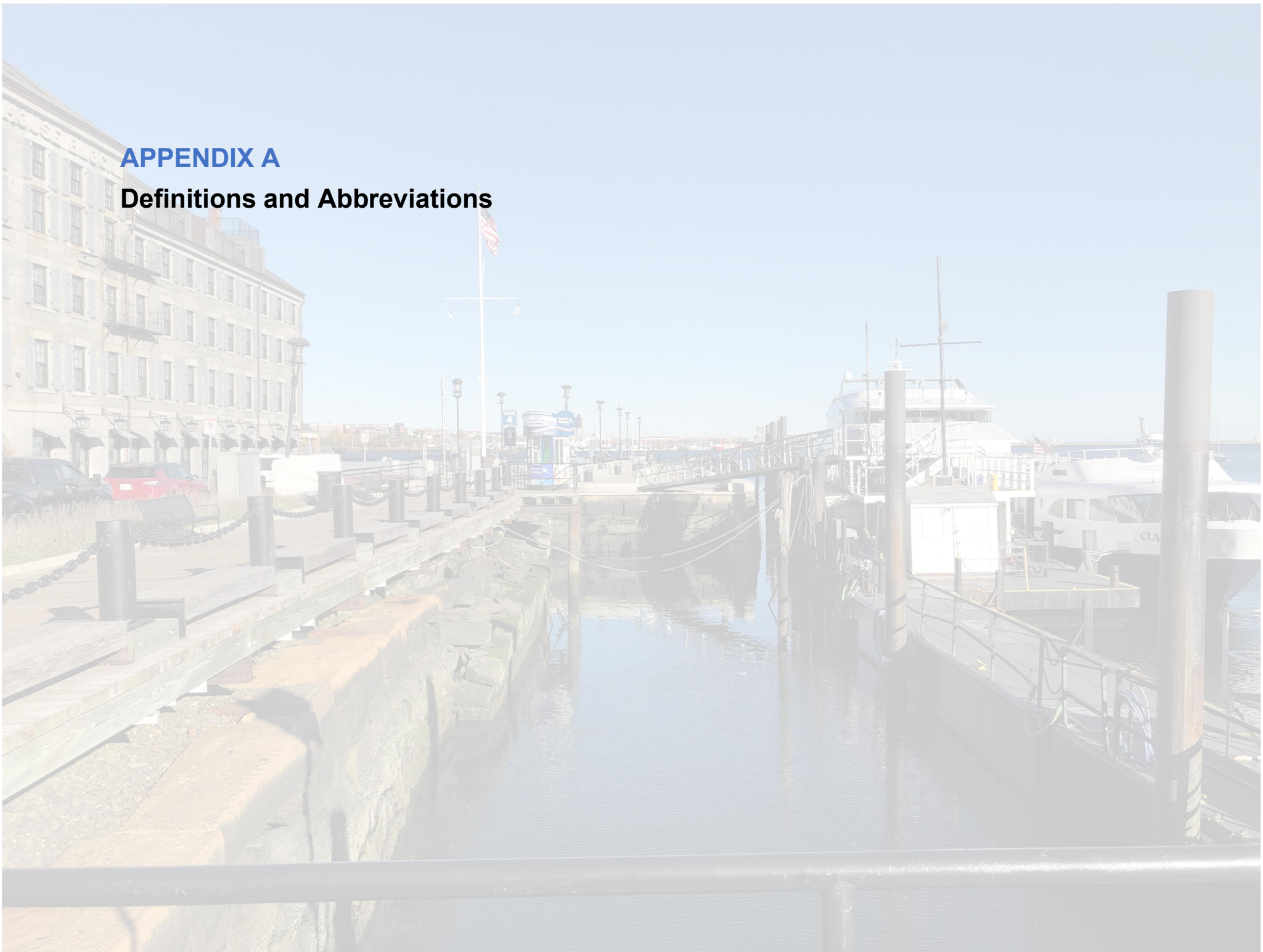
FINAL REPORT - APPENDICES

May 30th, 2023



APPENDIX A

Definitions and Abbreviations



Definitions and Abbreviations:

Annualized losses – the sum of damages that would be expected to occur due to flood risks over a one-year period if the flood protection system were not built. In this report, annualized losses are weighted based on the probability of four flood frequencies (10%, 2%, 1%, 0.1%) analyzed for three sea level rise scenarios (9", 21", 36") used in the City of Boston's Climate Ready Boston report. To calculate the probability-weighted losses, the losses for a single event is multiplied by the probability of that event occurring in a given year.

Base Flood Elevation (BFE) – the height floodwaters are expected to reach during a design storm. Depending on the model and source, BFE values may include wave height.

Boston City Base (BCB) – a Boston city-wide datum that can be converted to NAVD88 by using a conversation factor of: $NAVD88 = BCB - 6.46$ feet.

Boston Harbor Flood Risk Model (BH-FRM) – A flood model developed by Woods Hole Group and academic partners with funding from MassDOT and Federal Highway Administration to evaluate coastal flooding risks from sea level rise and increased storm surge to the Central Artery Tunnel system caused by climate change. The BH-FRM flooding simulations were developed for three time horizons: Present, 2030, and 2070. The 2070 results include approximately 40 inches (3.3 ft) of relative sea level rise and a late 21st century climatology with more intense tropical cyclones.

Climate Resilience Task Force (CRTF) – A task force of volunteers within the Wharf District Council working to address issues of climate resiliency within the district.

Climate Resilience Task Force Management Team (CRTF MT) – A group of Climate Resilience Task Force members overseeing the management of the Project.

The Community – Commonwealth of Massachusetts residents, those who may visit the Wharf District, and those who may be impacted by or benefit from the Wharf District and the Project.

Design Flood Elevation (DFE) – the height to which flood protection systems should be designed in order to reduce flood risk. DFEs often account for considerations including freeboard, projections of sea level rise for a specific time horizon, and wave height.

EDI Partners – Social equity, diversity, & inclusion (EDI) organizations and/or champions participating in the Project, identified in close coordination with the City of Boston.

Freeboard – an additional amount of height above the BFE used as a factor of safety.

Highest Astronomical Tide (HAT) elevations – The elevation of the highest predicted astronomical tide expected to occur at a specific tide station over the time period of 40 years. The 40 years period will include 2 National Tidal Datum Epoch periods.

Inland Properties – All properties of the Wharf District exclusive of the Waterfront Properties.

Massachusetts Coast Flood Risk Model (MC-FRM) – The MC-FRM is an expanded version of the BH-FRM covering the entirety of coastal Massachusetts and including updated elevation and historical storm data, statistical methods, physical processes (wave run-up and overtopping), and sea level rise projections. The MC-FRM includes simulations and results for Present, 2030, 2050, and 2070 time horizons. The 2050 and 2070 results include approximately 3.1 and 4.29 feet of relative sea level rise, respectively, compared to 2000 baseline year, and a late 21st century climatology with more intense tropical cyclones.

Mean Higher High Water (MHHW) – The average of the higher high-water elevation of each tidal day observed over the National Tidal Datum Epoch.

National Tidal Datum Epoch – The specific 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values for tidal datums. It is necessary for standardization because of periodic and apparent secular trends in sea level.

North American Vertical Datum of 1988 (NAVD88) –

The current vertical datum for the contiguous United States and Alaska used by the National Oceanic and Atmospheric Administration.

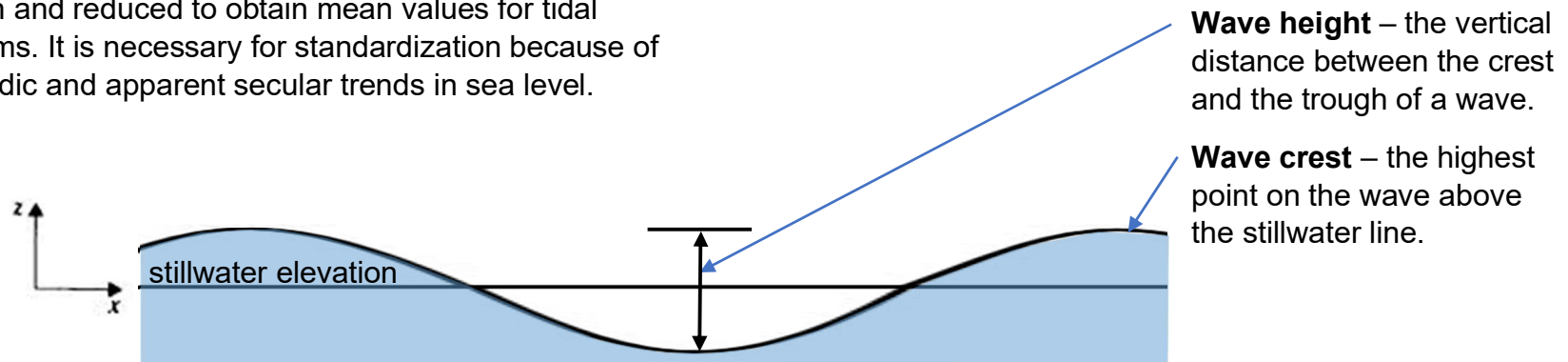
The Plan – The Wharf District Flood Resiliency Plan.

The Project – The Wharf District Council Conceptual District Protection & Resiliency Plan.

Sea Level Rise (SLR) – an increase in ocean levels due to effects of global warming.

SLR 2070 (MC-FRM) – Sea Level Rise projected through 2070 by MC-FRM (51.5 inches)

Stillwater Elevation is the water surface elevation that considers tides, Sea Level Rise (SLR), storm surge and wave set-up. Stillwater elevation does not include wave crest (or wave height) influence. See diagram below.



Sunny-day flooding (nuisance flooding) is referring to flooding associated with high tides during calm weather conditions, unlike storm surge or extreme weather events.

Waterfront Properties – The waterfront properties of the Wharf District, from Christopher Columbus Park to Congress Street at the Fort Point Channel, as indicated in the blue dashed line in image on the right.

Wharf District Council (WDC) – The Wharf District Council is a non-profit neighborhood organization recognized by the City of Boston as representing the Wharf District community – including residents, hotels, non-profit organizations, small businesses, and A Better City – on matters relating to planning, development, construction, programming events and transportation.

WDC Stakeholders – those who live, work, or own property in the Wharf District.

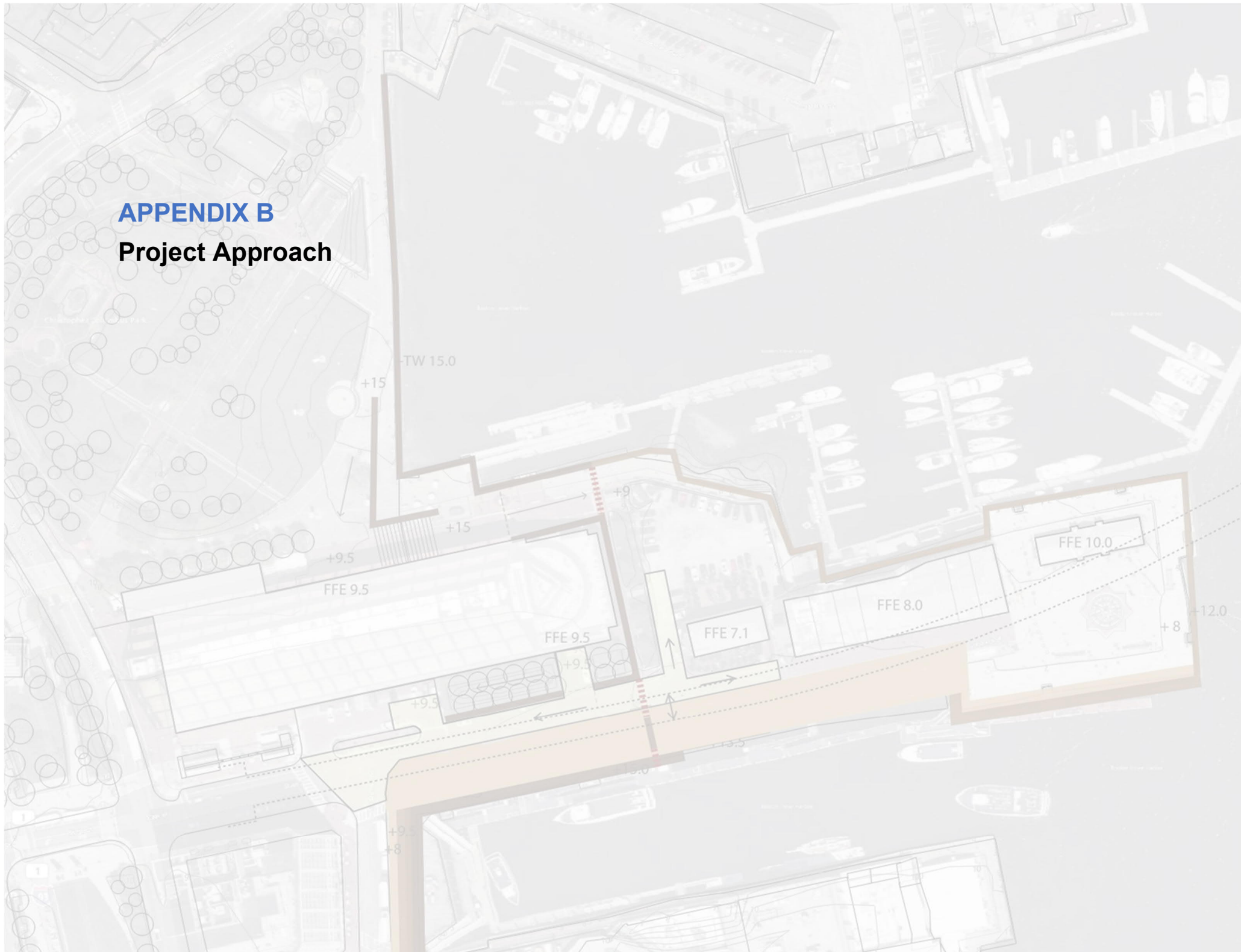
Vertical Datum – a surface elevation to which heights of various points are referenced.

Waterfront Properties



APPENDIX B

Project Approach



Project Approach

Building on Prior Planning Initiatives

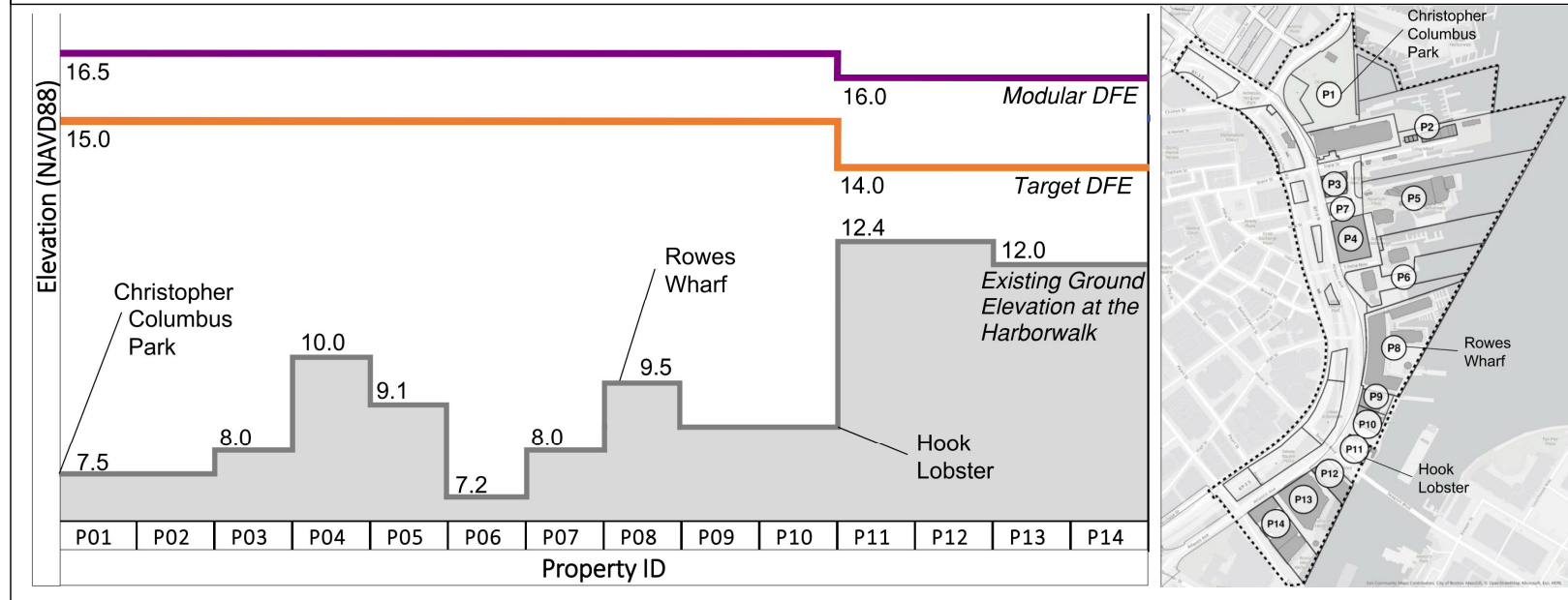
The City of Boston's Climate Ready Boston and Coastal Resilience Solutions reports provide guidelines for district-scale flood resiliency projects, including Design Flood Elevations, Alignments, Evaluation Criteria, and Strategies. This section summarizes how these guidelines have been applied and/or updated for this project.

Design Flood Elevations (DFEs)

The City of Boston has identified the following Design Flood Elevations for the Wharf District:

- A “Target” DFE is established as the minimum elevation that district-wide flood protection systems are required to meet. The Target DFE is 15.0 feet NAVD88 in the north, and 14.0 feet NAVD88 in the south part of the district.
- A “Modular” DFE is also defined a higher elevation that flood protection systems may need to be raised to in the future as sea levels rise. The Modular DFE is 16.5 feet NAVD88 in the north, and 16.0 feet NAVD88 in the south.

Summary of City of Boston Coastal Resilience Solutions Report Design Flood Elevations – for Reference Only



The City of Boston's DFEs are based on the Boston Harbor Flood Risk Model (BH-FRM) developed by Woods Hole Group for MassDOT in 2015. Since Boston's Climate Ready Boston report was issued, Woods Hole Group has developed an updated flood model for MassDOT: the Massachusetts Coast Flood Risk Model (MC-FRM). Woods Hole Group has provided updated flood projections for this Wharf District Council project based on the updated MC-FRM.

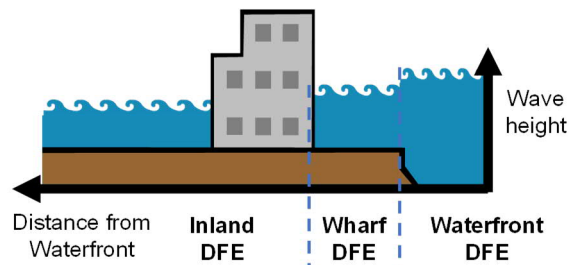
In coordination with BPDA, we recommend the following Design Flood Elevations be used for this project:

Conceptual District Protection & Resiliency Plan – Design Flood Elevations

Target DFE – Consistent with the City of Boston's Target DFE, this is the minimum elevation that district-wide flood protection systems are recommended to meet.

Strategic DFE – We recommend flood protection systems be designed to be incrementally raised over time from the Target DFE to the Strategic DFEs.

The Strategic DFEs vary based on location, with higher DFEs at the waterfront due to wave impacts near the water's edge, and lower DFEs for inland areas, as indicated in the image below:



Target DFE Assumptions:

BH-FRM Model*, 2070, 100 –year storm event + 1-ft Freeboard

Coastal flood risk model used by the Climate Ready Boston reports

50-year time-horizon

This indicates the potential flooding from a projected 1% storm with 40" sea level rise and storm surge caused by major coastal storms

Industry standard freeboard for non-essential and non-residential buildings

*Boston Harbor Flood Risk Model

Strategic DFE Assumptions:

MC-FRM Model*, 2070, 100 –year storm event + 2-ft Freeboard

Most up-to-date coastal flood risk model starting to inform statewide permit requirements

50-year time-horizon

This indicates the potential flooding from a projected 1% storm with 51.5" sea level rise and storm surge + wave crests caused by major coastal storms

Aligned with Army Corps levee requirements; Industry standard freeboard for critical infrastructure and residential buildings

*Massachusetts Coast Flood Risk Model

Conceptual District Protection & Resiliency Plan – Design Flood Elevations

Property ID	Known As	Target DFE	Strategic DFE		
			Waterfront	Wharf	Inland
Model Assumptions		2070 SLR, 1% Annual Chance Stillwater + Wave Crest (BH-FRM)	2070 SLR, 1% Annual Chance Stillwater + Wave Crest + (MC-FRM) + 2 feet of Freeboard		
Project Specific DFE Recommendation		Near-Term DFE	Long-Term Waterfront DFE	Long-Term Wharf DFE	Long-Term Inland DFE
P01	Christopher Columbus Park	15.0	19.3	18.6	17.6
P02	Long Wharf	15.0	19.3	18.6	17.6
P03	255 State Street	15.0	19.1	18.4	17.4
P04	Harbor Garage	15.0	19.1	18.4	17.4
P05	New England Aquarium	15.0	19.1	18.4	17.4
P06	Harbor Towers	15.0	19.3	18.0	17.2
P07	Frog Pond Park	15.0	19.1	18.4	17.4
P08	Rowes Wharf	15.0	19.5	17.5	16.9
P09	400 Atlantic Building	15.0	19.5	17.5	16.9
P10	Coast Guard Building	15.0	19.5	17.5	16.9
P11	Hook Lobster	14.0	19.5	17.5	16.9
P12	Independence Wharf	14.0	18.6	17.1	16.6
P13	Intercontinental Hotel Condos	14.0	18.6	17.1	16.6
P14	Atlantic Wharf (Russia Building)	14.0	18.6	17.1	16.6

All elevations reference NAVD88

Definitions:

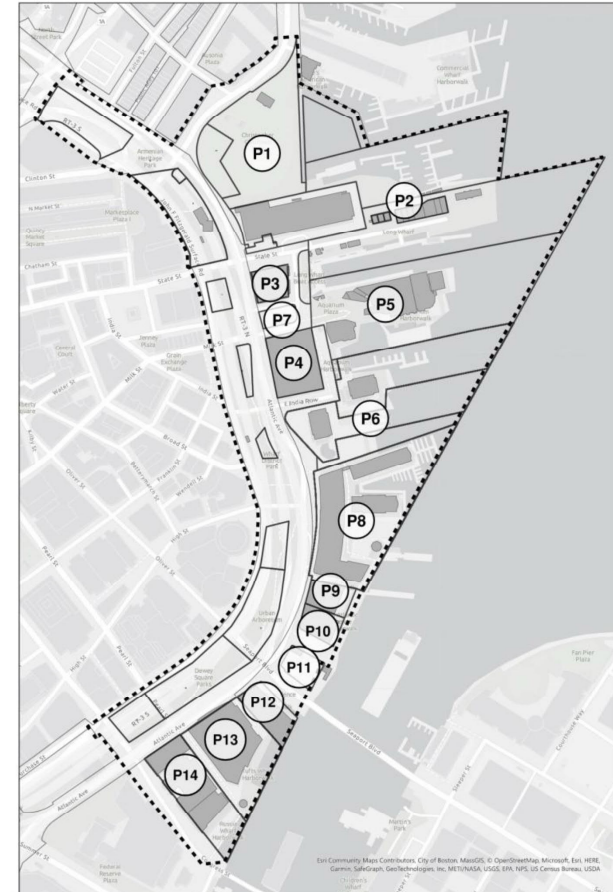
DFE: Project Design Flood Elevation Recommendations

Stillwater: water surface elevation considering tides, storm surge, & wave set-up

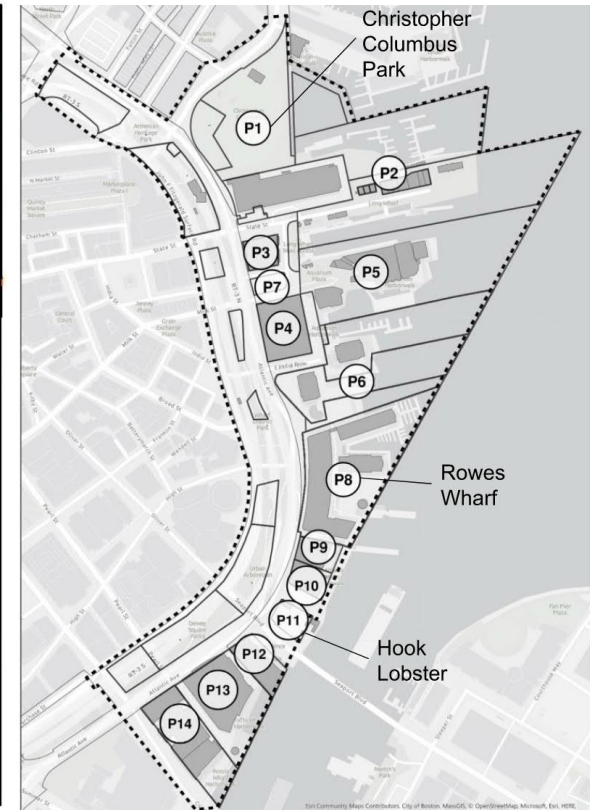
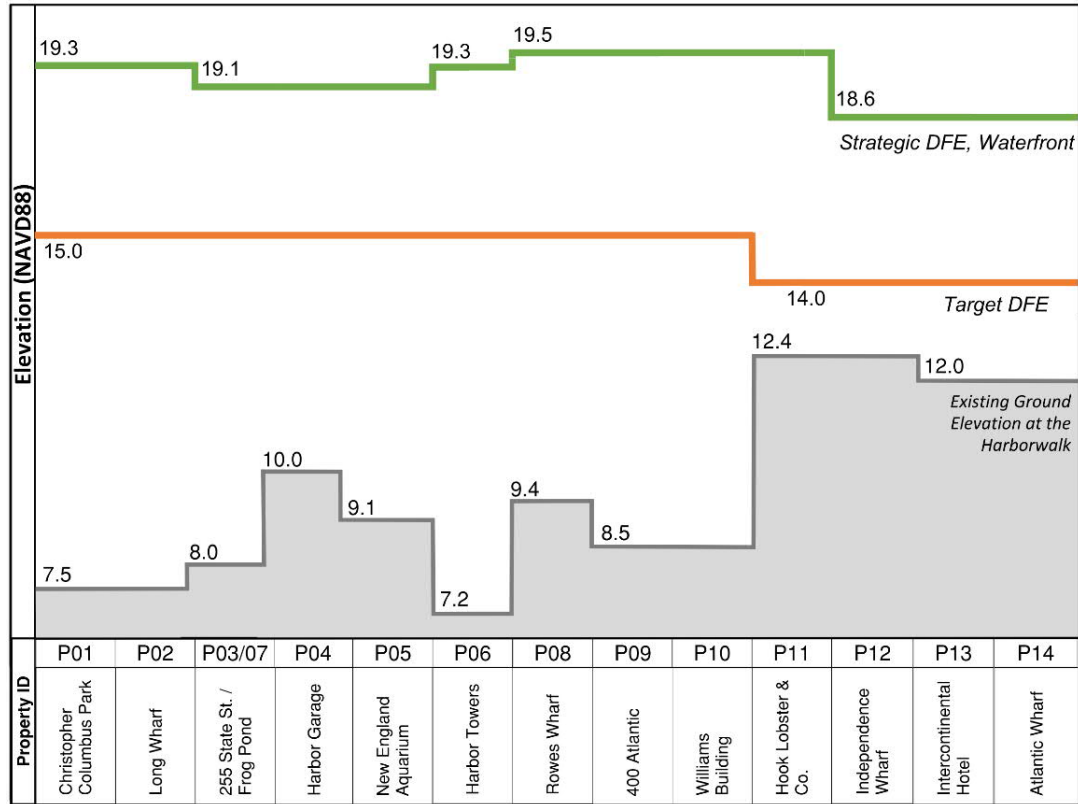
Wave Crest: wave height above the Stillwater elevation

SLR 2070 (MC-FRM): Sea Level Rise projected through 2070 by the Massachusetts Coast Flood Risk Model (51.5 inches)

Freeboard: 2-ft of freeboard applied across district to meet minimum requirements for FEMA Levee Certification Standards and Residential Building Use

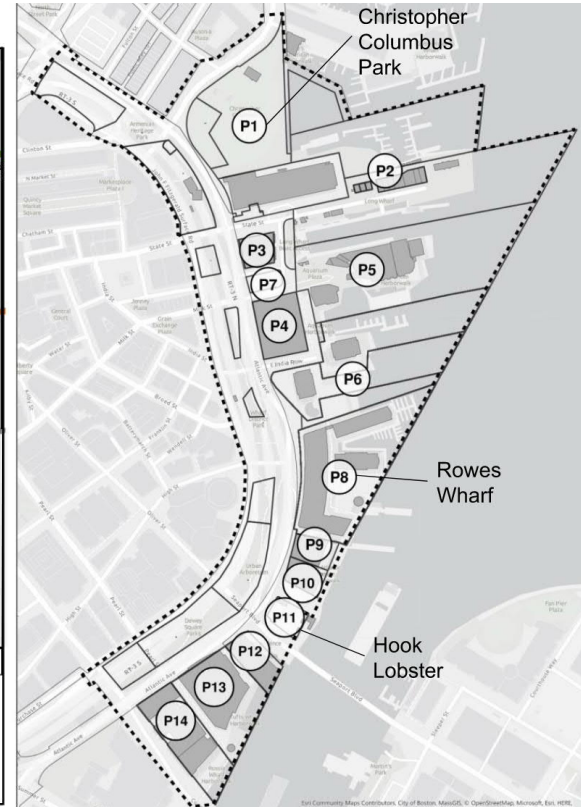
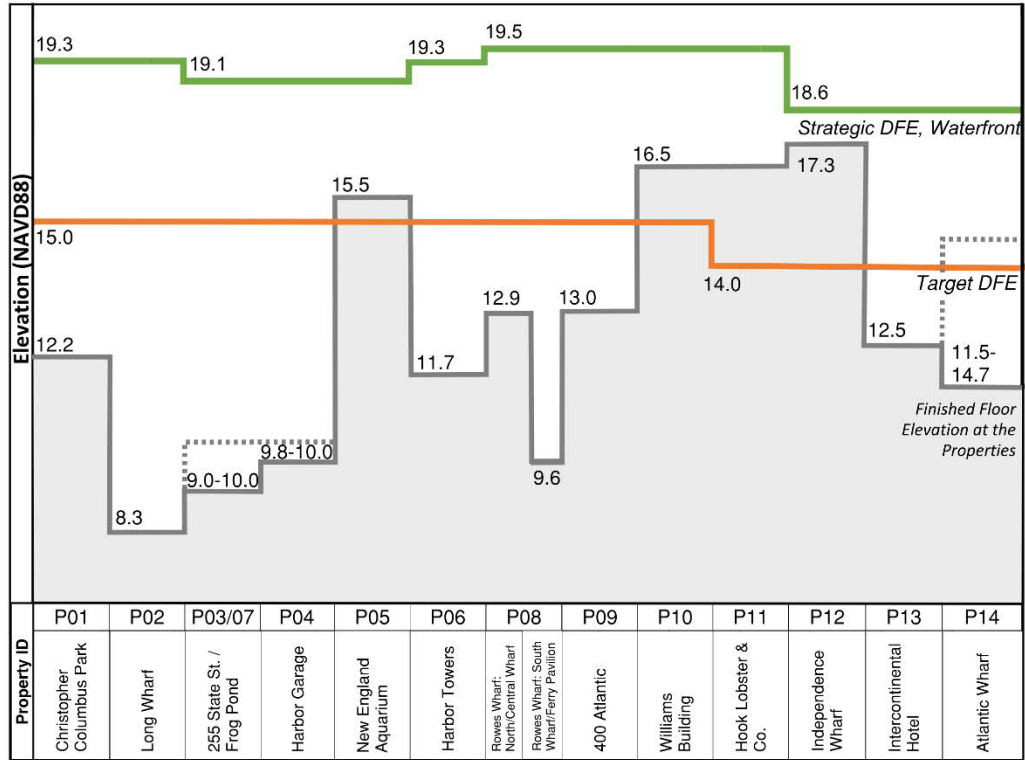


Design Flood Elevations | Ground Elevation at the Harborwalk



Ground Elevation at the Harborwalk

Design Flood Elevations | Building First Floor Elevations

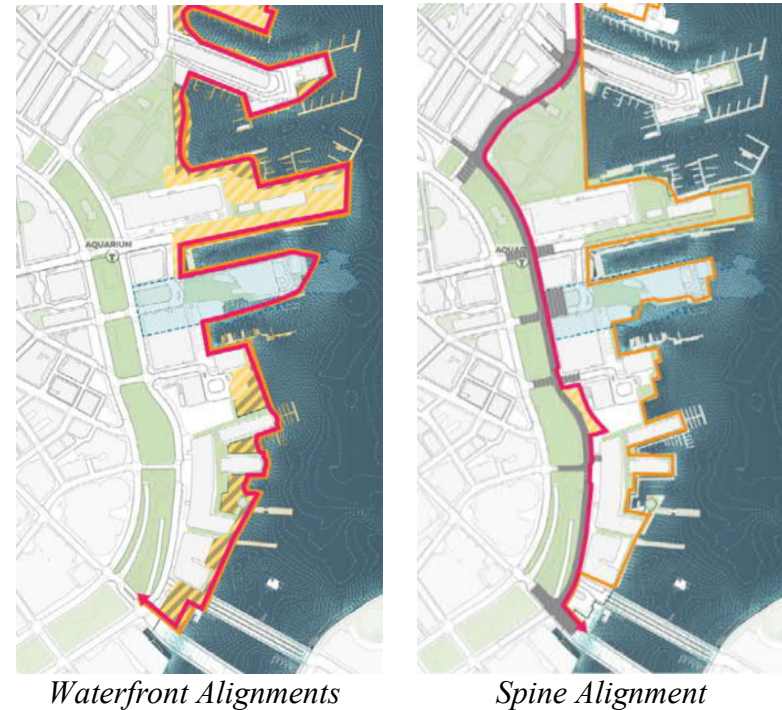


Building First Floor Elevations

Alignments: Several flood protection options are identified in the City of Boston's Coastal Resilience Solutions reports indicating the locations, or 'alignments' where a district flood protection system may be located. These include three 'Waterfront' options and one 'Spine' strategy at Atlantic Avenue:

- *Waterfront Option 1 – Inland Alignment:* A flood resiliency system consisting of a slightly elevated waterfront condition and higher inland line of defense.
- *Waterfront Option 2 – Water's Edge Alignment:* A resiliency system located entirely at the water's edge
- *Waterfront Option 3 – Outboard Alignment:* Resiliency system components such as living shorelines or filled land located outboard of the existing shoreline.
- *Spine Alignment:* Flood protection systems may be located along a roadway where a wharf or pier property is not able or willing to participate in the implementation of one of the waterfront options.

Waterfront and Spine Flood Protection Alignments



Legend:



Image Source: Coastal Resilience Solutions for Downtown Boston and North End

Waterfront Flood Protection Alignments – Christopher Columbus Park to Rows Wharf

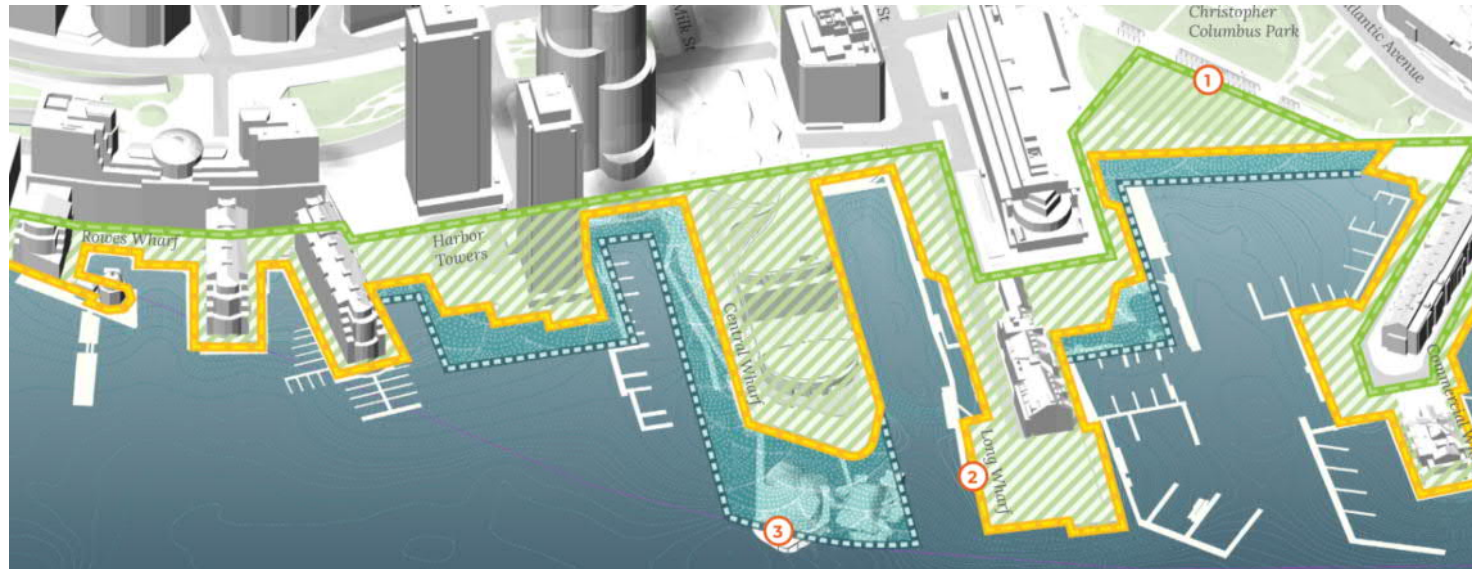


Image Source: Coastal Resilience Solutions for Downtown Boston and North End

Waterfront Flood Protection Alignments – Fort Point Channel Option B – Protection at Northern Avenue Bridge

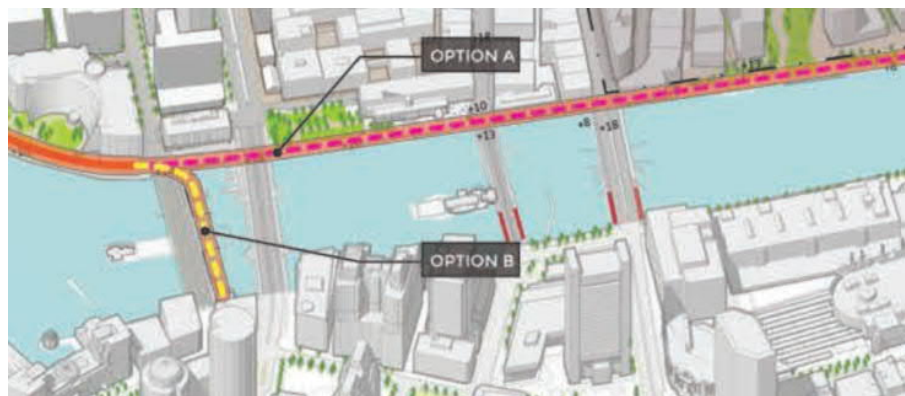
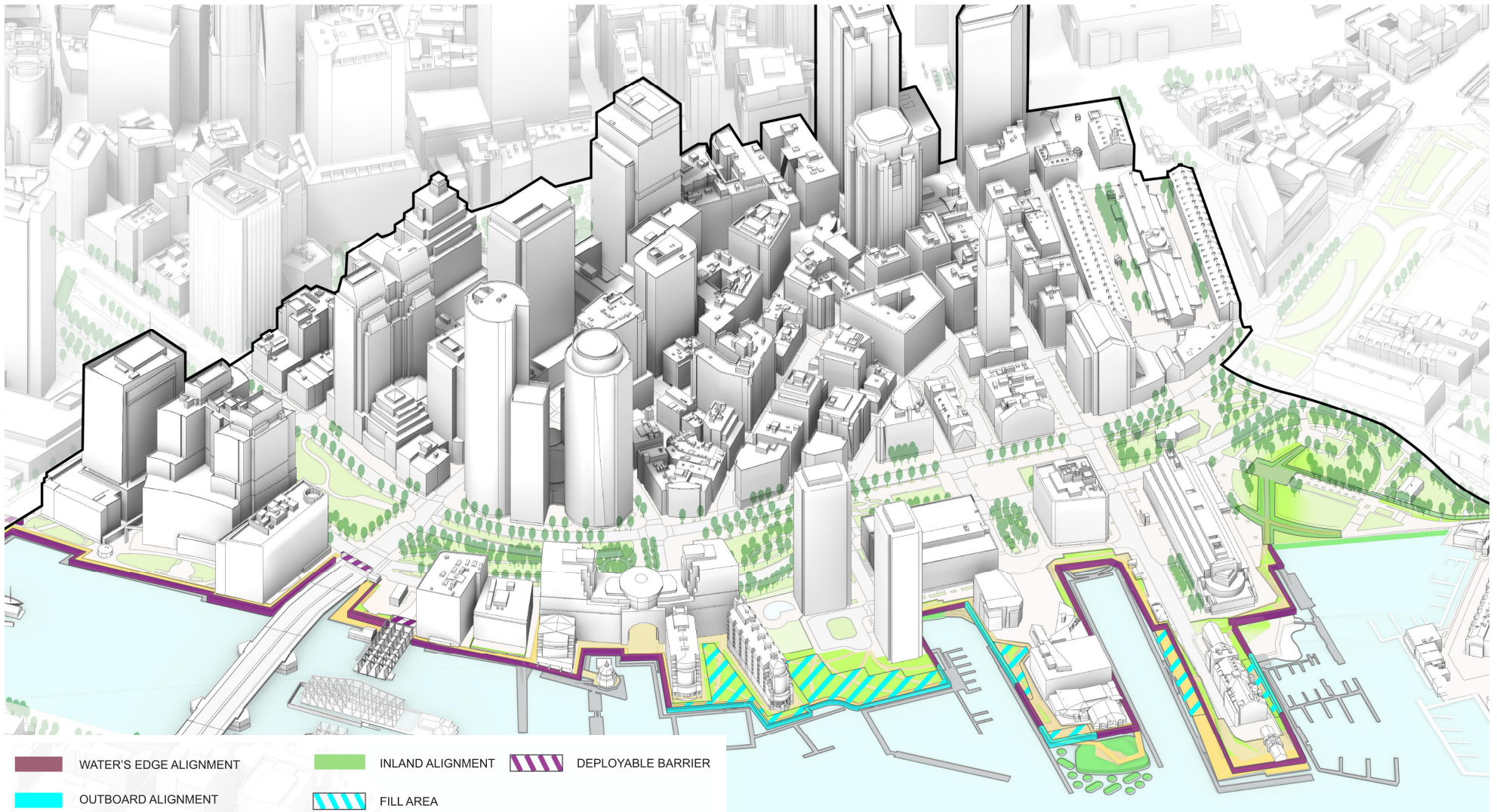


Image Source: Coastal Resilience Solutions for South Boston

The resiliency system alignment locations indicated in the City of Boston's Coastal Resilience Solutions reports were reviewed and updated for this Project based on the findings of the the Due Diligence assessment, which considered: property boundaries, existing topography, existing and potential future land and water uses, emergency and non-emergency access routes, regulatory considerations, underground utilities and stormwater systems, Wharf District Stakeholder and EDI Partner feedback. **The alignment locations used in this Project are indicated on the Conceptual District Protection & Resiliency Plans and the image below.**

Wharf District Project Resiliency System Alignments



Evaluation Criteria:

This project uses a set of Evaluation Criteria to assess and rank potential flood resiliency strategies, and to inform the selection of a set of preferred strategies for the Wharf District. It is critical to the success of this project that these Evaluation Criteria represent the current priorities and preferences of community members and stakeholders. The project's Evaluation Criteria are therefore based on community feedback from previous comprehensive public outreach and engagement initiatives, including Climate Ready Boston, Coastal Resilience Solutions for Downtown Boston and North End, and the Wharf District Public Realm Visioning Study. A summary of our understanding of the key relevant considerations from these prior public engagement initiatives is provided below:

Summary of Climate Ready Boston and Coastal Resilience Solutions Report Evaluation Criteria

Considerations for assessment and identification of preferred strategies, applicable to this Project:

- Effectiveness
- Design Life + Adaptability / Flexibility
- Environmental Impact
- Social Impact/Equity: Accessibility
- Social Impact: Impacts on Views
- Engineering Feasibility / Difficulty of implementation
- Financial Feasibility
- Potential for Multiple Benefits
- Residual Risk / Layers of Protection
- Induced Risk

Considerations for development of implementation timelines, applicable to this Project:

- Timing of Flood Risk
- Consequences for People & Economy
- Leverage Building Cycles
- Who and what are most at risk now
- Existing efforts that can be built upon
- Resources available to undertake work
- Precursor initiatives
- Risk or cost of delay
- Who has to take action
- Existing community support

Additional considerations for public and private land improvement planning and design, applicable to subsequent projects:

- Social Impact
- Value Creation
- Incorporate Local Involvement in Design

The project team integrated those key considerations identified through prior public engagement initiatives with additional feedback received from the extensive Wharf District Stakeholder and EDI Partner engagement performed during this project to develop the following set of Evaluation Criteria:

Conceptual District Protection & Resiliency Plan – Evaluation Criteria				
				
Effectiveness	Feasibility	Adaptability	Social Equity & Access	Environmental & Additional Benefits
• Meets Design Flood Elevations (DFEs) • Facilitates continuous line of protection / resilience across the entire district • Minimizes deployment complexity • Protects critical infrastructure • Avoids increasing rainfall-based flooding at abutting properties	• Minimizes ground settlement & coastal erosion • Minimizes impacts to seawalls & structural decks • Minimizes permitting risks • Minimizes construction cost • Minimizes long term operations & maintenance costs	• Compatible with existing property-specific plans and land use • Compatible with district-wide and abutting-property resiliency strategies • Provides opportunities for phased implementation	• Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage • Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage • Preserves & enhances view of the Harbor • Preserves & enhances emergency access • Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	• Preserves & enhances environmental resources • Preserves & enhances docks & water transportation functionality and access • Minimizes outdoor private land use impacts • Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources

Evaluation Criteria Information Cards Developed for Stakeholder and EDI Partner Engagement

Evaluation Criteria

The Wharf District Conceptual District Protection & Resiliency Plan will use a set of evaluation criteria to assess and rank potential flood resiliency strategies, and to inform the selection of a set of preferred strategies for the Wharf District.

These evaluation criteria are based on community feedback from previous comprehensive public outreach and engagement initiatives, including Climate Ready Boston, Coastal Resilience Solutions for Downtown Boston and North End, and the Wharf District Public Realm Visioning Study.

As this process continues, we are committed to continuing to provide opportunities for stakeholder input as well as providing timely updates on the process and decisions that are reached.

Evaluation Criteria:

- Effectiveness
- Feasibility
- Adaptability
- Social Equity & Access
- Environmental & Additional Benefits

Effectiveness

Mitigating anticipated flood risks for people, homes, businesses, critical infrastructure, and community assets by using reliable flood adaptation strategies.

Considerations:

- ✓ Meets the Design Flood Elevations
- ✓ Facilitates continuous line of protection / resilience across the entire district
- ✓ Minimizes deployment complexity
- ✓ Protects critical infrastructure
- ✓ Avoids increasing rainfall-based flooding at abutting properties



Lady of Lourdes Hospital, Binghamton NY
Image Source: FEMA Media Library

Feasibility

Providing a practical strategy that can be implemented based on construction complexity, cost, and regulatory requirements.

Considerations:

- ✓ Minimizes ground settlement & coastal erosion
- ✓ Minimizes impacts to seawalls & structural decks
- ✓ Minimizes permitting risks
- ✓ Minimizes construction cost
- ✓ Minimizes long-term operations & maintenance costs



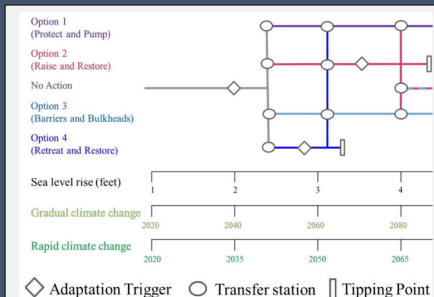
Boston Children's Museum Waterfront Plan
Image Source: Turner Construction

Adaptability

Supporting the phased implementation of district-scale and property-specific resilience strategies over time as sea levels rise.

Considerations:

- ✓ Compatible with existing property-specific plans and land use
- ✓ Compatible with district-wide and abutting-property resiliency strategies
- ✓ Provides opportunities for phased implementation



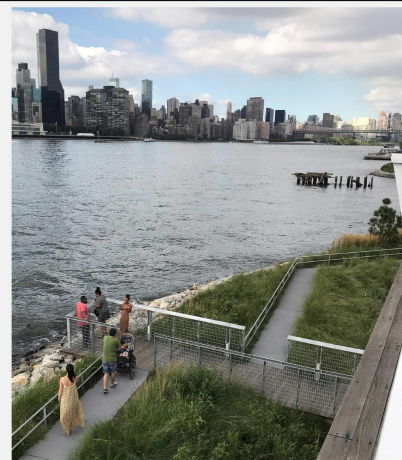
Kapalama Canal Flood Resiliency Implementation Timeline, Honolulu, Hawaii
Image Source: Arup

Social Equity & Access

Providing equitable access to the waterfront, safe transportation into, out of, and around the waterfront, & creating opportunities for new public recreational & cultural amenities.

Considerations:

- ✓ Preserves & enhances the Harborwalk, including welcoming & inclusive access & signage
- ✓ Preserves & enhances outdoor public spaces, including welcoming & inclusive access & signage
- ✓ Preserves & enhances Harbor views
- ✓ Preserves & enhances emergency access
- ✓ Preserves & enhances non-emergency access to the waterfront, public transportation & buildings



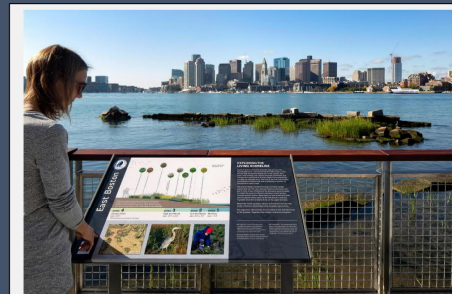
Hunters Point South
Image Source: Arup

Environmental & Additional Benefits

Providing multiple co-benefits in addition to flood adaptation, including preserving or enhancing the function of environmental resources, water dependent uses, private parcel programming, and the Wharf District's architectural & urban context.

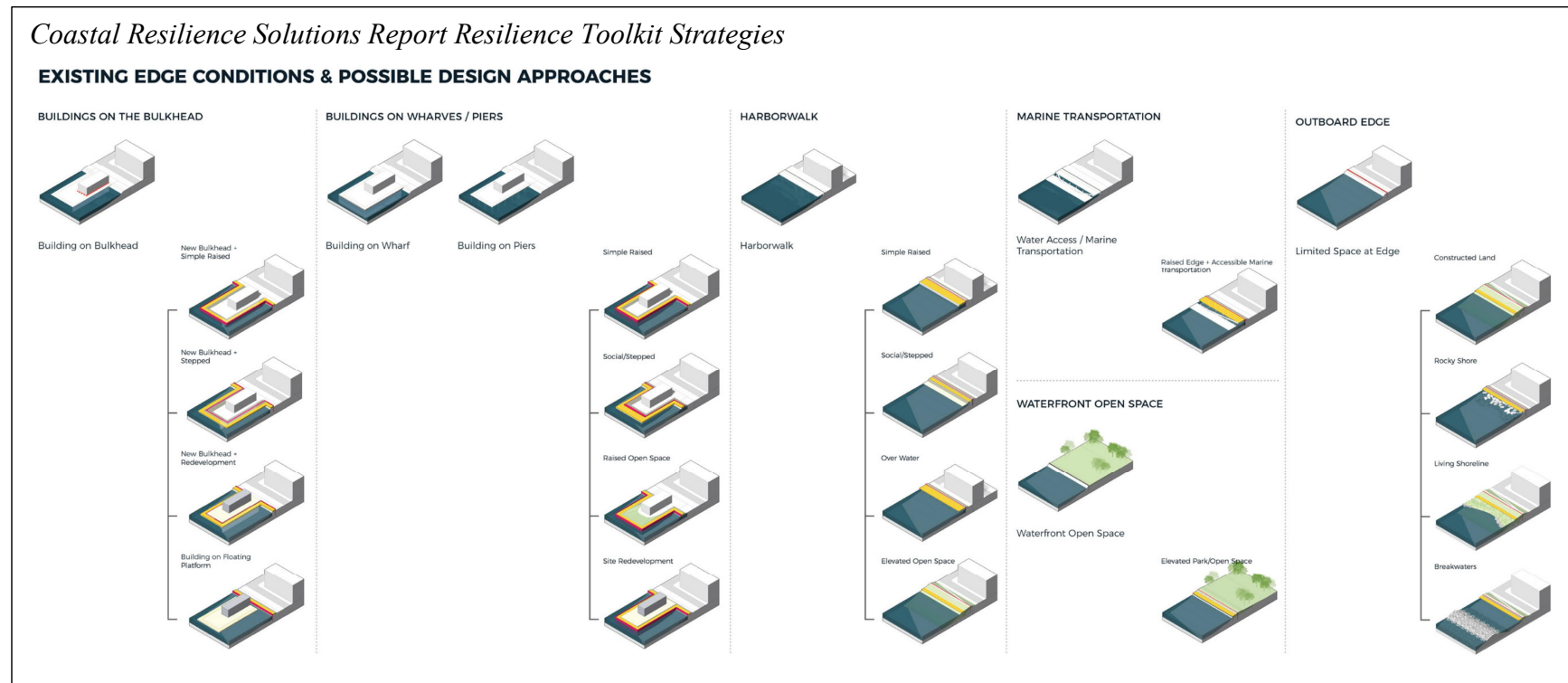
Considerations:

- ✓ Preserves & enhances environmental resources
- ✓ Preserves & enhances docks & water transportation functionality and access
- ✓ Minimizes outdoor private land use impacts
- ✓ Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources



Clippership Wharf, East Boston
Image Source: Ed Wonsek

Strategies: The Coastal Resilience Solutions report provides a Resilience Toolkit of possible design strategies that may be applied along the alignments is provided for guidance, as indicated in the image below.



The Multicriteria Assessment (MCA) indicated in the images on the following pages was used to qualitatively and quantitatively assess the feasibility of implementing each of the Strategies identified in the Resilience Toolkit at each of the Waterfront Alignment locations. This MCA was developed for the Project to provide a **consistent and transparent decision making approach for using the Evaluation Criteria to rank and prioritize Alignments and Strategies** for inclusion in the Preferred Flood Protection System for the project.

Conceptual District Protection & Resiliency Plan – Multicriteria Assessment

Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾		
		Poor	Good	Superior
Scoring		-3	0	3
Social Equity & Access				
Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	<i>Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)</i>	<i>reduces access points to the Harborwalk</i>	<i>enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)</i>	<i>increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)</i>
Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	<i>eliminates public access to existing open space</i>	<i>reduces the size of, access to, views/wayfinding to, or signage for open public space</i>	<i>no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space</i>	<i>increases the size of open public spaces or creates new open public spaces</i>
Preserves & enhances view of the Harbor	-	<i>fully or partially obstructed</i>	<i>preserves current view quality</i>	
Preserves & enhances emergency access	<i>blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department</i>	<i>blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted</i>	<i>no impact on existing emergency access routes to buildings or docks</i>	<i>Improves function of existing emergency access, or preferred by Boston Fire Department</i>
Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	<i>eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist</i>	<i>eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created</i>	<i>no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities</i>	<i>creates new public access points to the waterfront (including living shorelines)</i>

Conceptual District Protection & Resiliency Plan – Multicriteria Assessment

Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾		
		Poor	Good	Superior
Scoring		-3	0	3
Environmental and Additional Benefits				
Preserves & enhances environmental resources	<i>infills Harbor for reasons not associated with flood resiliency</i>	<i>requires infill of the Harbor that isn't a new living shoreline or wetland</i>	<i>does not infill Harbor</i>	<i>Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required</i>
Preserves & enhances docks & water transportation functionality and access	<i>Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)</i>	<i>requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)</i>	<i>No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points</i>	<i>Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner</i>
Minimizes outdoor private land use impacts	<i>eliminates private open space, or eliminates all access to existing private open space</i>	<i>reduces open private space size or access points</i>	<i>maintains or increases open private space size and access points, or in-kind replacements identified(3)</i>	
Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	<i>impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)</i>	<i>no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)</i>	
Effectiveness				
Meets Design Flood Elevations (DFEs)	<i>does not meet Target DFE</i>	<i>meets Target DFE; cannot be raised to Strategic DFE</i>		<i>Meets Target DFE; can be raised to Strategic DFE</i>
Facilitates continuous line of protection / resilience across the entire district	<i>precludes continuous flood protection system for the district</i>	<i>does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area</i>	<i>protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area</i>	
Minimizes deployment complexity	<i>fully deployable</i>	<i>partially deployable</i>	<i>fully passive</i>	-
Protects critical infrastructure	-	<i>does not protect all critical infrastructure(2) from storm surge</i>	<i>protects all critical infrastructure(2) from storm surge</i>	-
Avoids increasing rainfall-based flooding at abutting properties	<i>blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified</i>	-	<i>does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified</i>	<i>preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system</i>

Conceptual District Protection & Resiliency Plan – Multicriteria Assessment

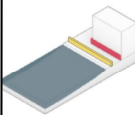
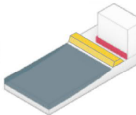
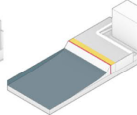
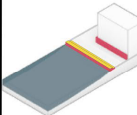
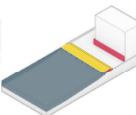
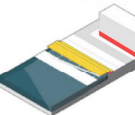
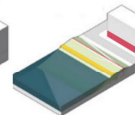
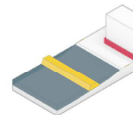
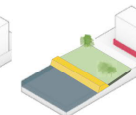
Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾		
		Poor	Good	Superior
Scoring		-3	0	3
Feasibility				
Minimizes ground settlement & coastal erosion	<i>raises ground surface ? 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified</i>	<i>raises ground surface ? 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified</i>	<i>no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers</i>	<i>mitigates existing known coastal erosion and/or settlement</i>
Minimizes impacts to seawalls & structural decks	<i>raises ground surface ? 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified</i>	<i>raises ground surface ? 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified</i>	<i>no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure</i>	<i>replaces existing coastal structure with Condition Rating of "Poor" or lower</i>
Minimizes permitting risks	<i>strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified</i>	<i>strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified</i>	<i>strategy located on existing land, with the exception of dock piling</i>	<i>strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)</i>
Minimizes construction cost		<i>strategy located outboard of seawall / shoreline</i>	<i>strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling</i>	<i>strategy located on existing land more than 30 feet away from seawall / shoreline</i>
Minimizes long term operations & maintenance costs		<i>includes movable or deployable components, pump systems, or other electric components</i>	<i>fully passive system with no pump systems, electric components, movable or deployable components</i>	
Adaptability				
Compatible with existing property-specific plans and land use	<i>irreconcilable differences with planned land use</i>	<i>requires significant reduction in function of planned land use, or not preferred by property owner</i>	<i>no impact on planned land use</i>	<i>incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner</i>
Compatible with district-wide and abutting-property resiliency strategies	<i>precludes continuous flood protection system for the district</i>	<i>precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area</i>	<i>facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area</i>	
Provides opportunities for phased implementation	-		<i>no potential for phased implementation</i>	<i>strategy can be implemented progressively with sea level rise</i>

The quantitative scores in the MCA are reported using a set of qualitative descriptions based on the numerical thresholds indicated below:

Assessment Score Thresholds		
Description	Range	Plan Symbol
Superior	1.1 to 3.0	
Good	-1.0 to 1.0	
Poor	-3.0 to -1.1	

This MCA approach provides each Strategy with a relative score to compare it with alternative strategies, and also identifies potential opportunities and negative impacts associated with each strategy that can be flagged for optimization or mitigation, respectively, during design.

Findings from the Multicriteria Assessment is summarized on scorecards, as illustrated by the example scorecard in the image below.

Conceptual District Protection & Resiliency Plan – Multicriteria Assessment Findings Scorecard Example											
		INLAND			WATER'S EDGE				OUTBOARD		
Assessment Key:		STRATEGIES									
		FLOOD WALL	ELEVATED OR CONSTRUCTED LAND	ELEVATED ROADWAY/HARBOR WALK	RAISED/ STEPPED	OVER WATER	ELEVATED DOCK	ELEVATED/ CONSTRUCTED LAND	ELEVATED / CONSTRUCTED HARBORWALK	ELEVATED / CONSTRUCTED LAND	
											
		RATING									
Prerequisite Criteria	SOCIAL EQUITY & ACCESS										
	ENVIRONMENTAL & ADDITIONAL BENEFITS										
Constructability Criteria	EFFECTIVENESS										
	FEASIBILITY										
	ADAPTABILITY										

To identify preferred resiliency Alignments and Strategies for inclusion in the district-wide flood protection system, we applied a screening approach to the findings of Multicriteria Assessment, by defining the two Evaluation Criteria of Social Equity & Access, and Environmental & Additional Benefits as '**Prerequisite Criteria**'. Any strategy that received a 'Poor' score in either of these Prerequisite Criteria was generally not recommended to be included in the proposed Plan. Such strategies are screened out as they are unlikely to gain the support of key stakeholders, the City, or regulatory agencies, and are therefore unlikely to be fully funded or built.

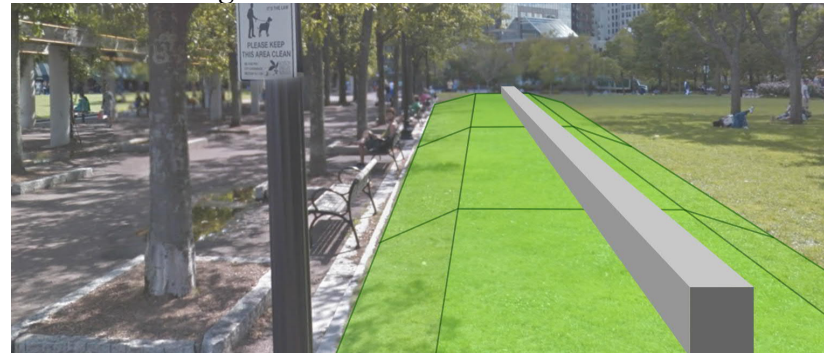
Reasons that a Strategy might receive a 'Poor' score in the Prerequisite Criteria include:

- Negative impact on emergency access
- Negative impact on the functionality of the wharves or water transportation
- Fully eliminates access to public or private open space
- Fully eliminates views of or access to the water, the Harborwalk, the wharves, historic buildings, or water transportation
- Infills the Harbor without providing commensurate flood resiliency benefits

Any Strategies that receive a 'Good' or 'Superior' score in the Prerequisite Criteria were then ranked based on the MCA scores for the remaining Evaluation Criteria of Effectiveness, Feasibility, and Adaptability, which are collectively defined as the '**Constructability Criteria**'. The engineering feasibility of those Strategies that rank the highest in the Constructability Criteria were then assessed by our multi-disciplinary engineering team based on the site-specific key considerations identified during the Due Diligence assessment and feedback received from Wharf District Stakeholders and EDI Partners.

The findings of this MCA process and engineering feasibility assessment were then used to inform the design of the flood protection systems included on the Conceptual District Protection & Resiliency Plan.

Example Elevated / Constructed Land Strategy at the Inland Alignment



Stakeholder and EDI Partner Engagement

The Conceptual District Protection & Resiliency Plan aims to define a preferred flood resiliency system along the Wharf District's waterfront that has broad support from the Wharf District community. To accomplish this goal, the Project approach centers the direct involvement of Wharf District Stakeholders as well as Equity, Diversity, and Inclusion Partners (EDI Partners) in the planning and design process. This section summarizes the Project team's engagement and coordination with Wharf District Stakeholders and EDI Partners.

Engagement Approach

The Project Team identified the following outreach and engagement approaches as being critical to the Project's ultimate success:

- **Assess Potential Impacts of the Project on Waterfront Access and Issues of Equity, Diversity, and Inclusion.** In close collaboration with the City of Boston, the Project team identified EDI organizations and champions (EDI Partners) to include in the development of the Evaluation Criteria used for assessing and identifying preferred resiliency Alignments and Strategies. EDI Partner and City of Boston representatives were then invited to and participated in multiple opportunities to review and inform the project approach, and the development of project deliverables.

- **Building Broad Support for the Plan Among Wharf District Stakeholders.** For this Project, Wharf District Stakeholders are identified as those who live, work, or own property in the Wharf District. Wharf District Stakeholders provided input to the project approach and deliverables through the following engagement activities:

- *Wharf District Council monthly public meetings:* Wharf District Stakeholders were provided periodic updates on the Project, and contributed feedback live during the meetings.
- *Project Website:* The Wharf District Council hosted a public webpage for the Project on the Wharf District Council's website at <https://www.wharfdistrictcouncil.org/>. Throughout the Project, this Project website page was updated with the latest project deliverables, and highlighted opportunities for the general public to provide written feedback to the Project team.

Wharf District Council Climate Resilience Project Page



- **Building Support for the Plan Among Waterfront Property Owners.** Waterfront property owners who will have decision making authority over the construction of flood resiliency improvements on private property were engaged in a series of workshops during the Project.

The general outcomes of these workshops are summarized below.

- *Visioning Workshops:*
 - Shared knowledge of flood risks, prior resiliency initiatives, key considerations, land use, and planned improvements
 - Waterfront Property Owners provided feedback on the Evaluation Criteria, and identified challenges, opportunities, preferences, and goals for resiliency for their properties
- *Preliminary Plan Review Workshops:*
 - Identified potential impacts of various options for flood resiliency system Alignments and Strategies at the waterfront properties
 - Identified performance requirements and objectives to address in the preferred resiliency systems at each waterfront properties
 - Identified additional information and next steps required to build support for the Plan

2019 Wharf District Public Realm Visioning Study Workshop



Image Source: Top: Wharf District Council's 'A Vision for the Future' video by NeoScape; Bottom: Halvorson

Stakeholders and EDI Partners

The following representatives from the City of Boston and Commonwealth of Massachusetts were engaged during the Project:

State Officials:

- State Representative Aaron Michlewitz
- State Senator Lydia Edwards
- Congressman Stephen Lynch

Boston City Councilors:

- District 1: Gabriela Coletta
- District 2: Ed Flynn
- At-Large Councilors: Michael Flaherty, Ruthzee Louijeune, Julia Mejia, Erin Murphy

Boston City Chiefs, Liaisons, and Advisors:

- James Arthur Jemison, Chief of Planning
- Rev. White-Hammond, Chief of Environment, Energy, and Open Space
- Oliver Sellers-Garcia, Boston Green New Deal Director
- Ciara D'Amico, Boston Neighborhood Services Wharf District Liaison
- Chris Osgood, Senior Advisor for Infrastructure

Boston Planning and Development Authority (BPDA):

- Rich McGuinness, Deputy Director for Climate and Environmental Planning
- Chris Busch, Assistant Deputy Director for Climate and Environmental Planning

Boston Parks & Recreation Department:

- Cathy Baker-Eclipse, Director of the Capital Plan

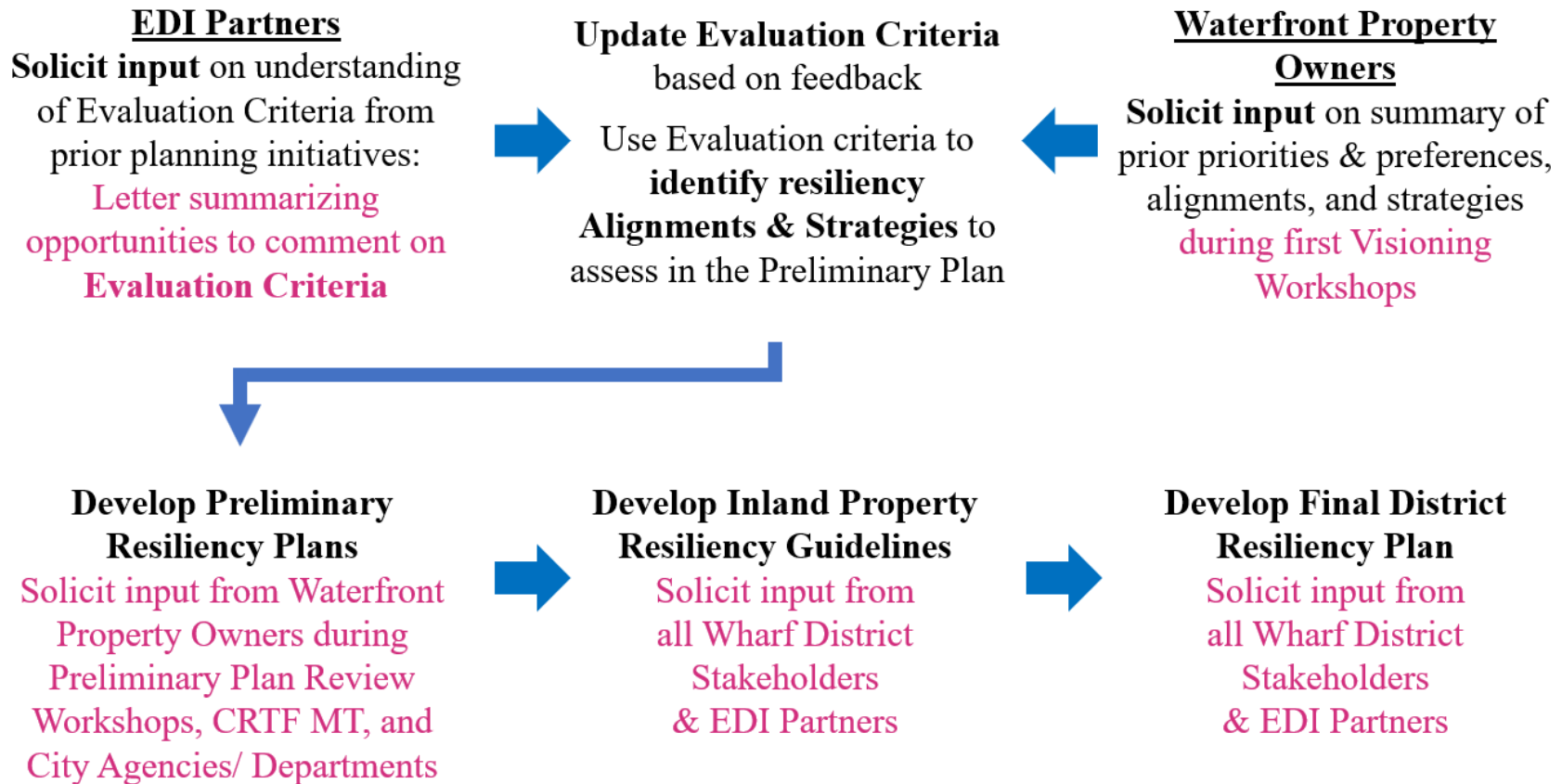
EDI Partners from the following organizations were engaged during the Project:

- Boston Harbor Now
- Alternatives for Community & Environment
- Conservation Law Foundation
- The America City Coalition
- Greenroots
- Harborkeepers
- Neighborhood of Affordable Housing

Waterfront Property Owners for the following properties were engaged during the Project:

- Rose Kennedy Greenway
- Christopher Columbus Park (Parks & Recreation)
- Long Wharf: BPDA, Marriott Long Wharf, Boston Harbor City Cruises
- Roadways: Public Works, Public Improvement Commission, Transportation Department
- 255 State Street and Frog Pond Park
- New England Aquarium
- Boston Harbor Garage
- Harbor Towers
- Rowes Wharf
- 400 Atlantic Avenue
- Williams Building – United States Coast Guard
- James Hook & Company
- Independence Wharf
- Intercontinental Hotel Condos
- Atlantic Wharf

Engagement Approach Overview

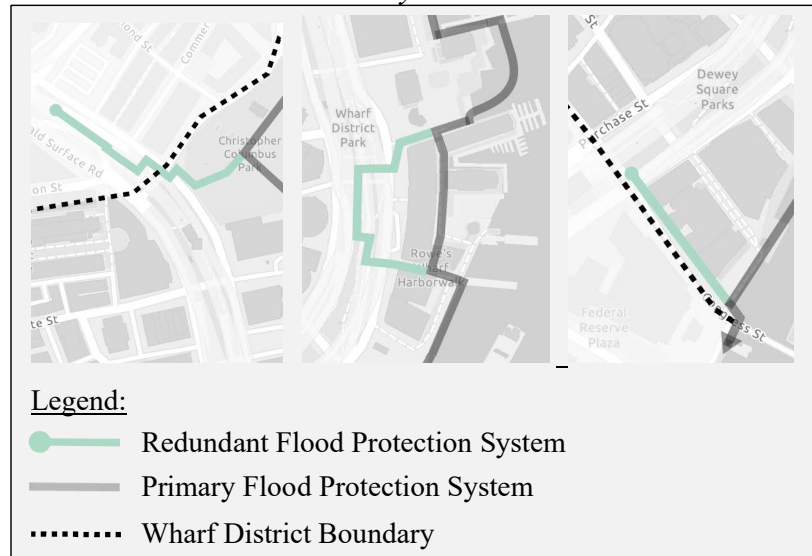


Resiliency System Design Process

Throughout this Project, we have strived to incorporate community priorities and preferences in design of a viable district-wide flood resiliency system. The Evaluation Criteria were therefore referenced by the Project team during the multi-disciplinary engineering feasibility assessments that underpinned the development of the Conceptual District Protection & Resiliency Plan. Examples of how key considerations associated with each Evaluation Criteria were incorporated into the design are summarized below.

It is our hope that the resulting Plan will facilitate meaningful conversations about each of these Evaluation Criteria in subsequent resiliency and land improvement planning and design efforts.

Redundant Flood Protection Systems

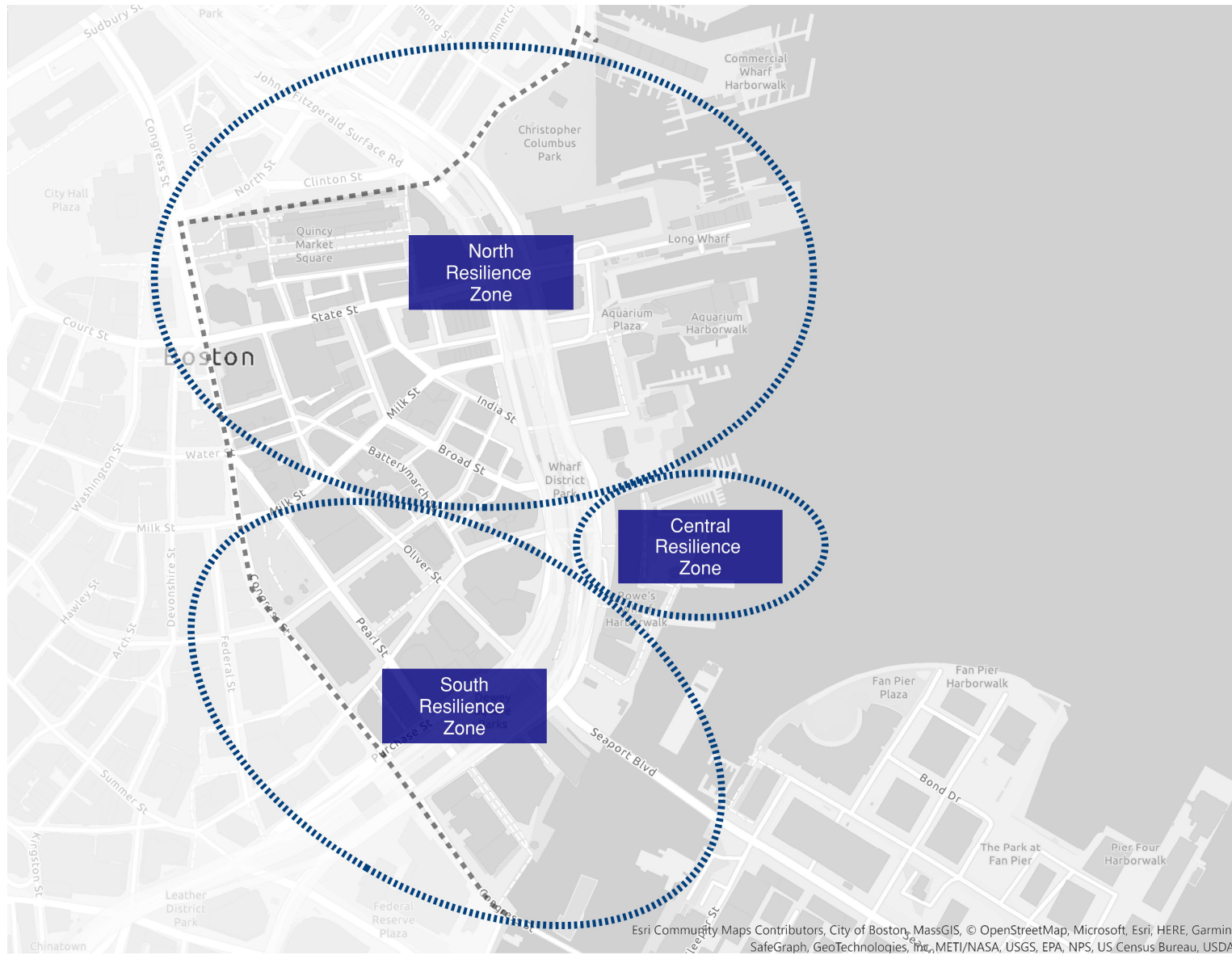


Design for Effectiveness

The Plan incorporates approaches to maximize effectiveness and minimize the risks remaining after implementation of the flood protection system by:

- Incorporating best practices for addressing all potential flood pathways, including coastal storm surge, tidally-influenced groundwater elevations, and inland rainfall on the dry-side of the flood protection systems.
- Providing multiple layers of protection, including:
 - Compartmentalizing groups of properties within the district with Redundant Flood Protection Systems that create a continuous line of protection from the resiliency systems at the water's edge to inland high points – creating three self-contained Resilience Zones within the district to reduce risks of wide-spread flooding associated with single points of failure.
 - Multiple lines of protection in areas where the water's edge solution may incorporate higher-risk strategies such as deployable barriers, or where the water's edge solution is not anticipated to be implemented in the near-term.
 - Facilitating the implementation of independent flood protection systems at each building.

Wharf District Resilience Zones



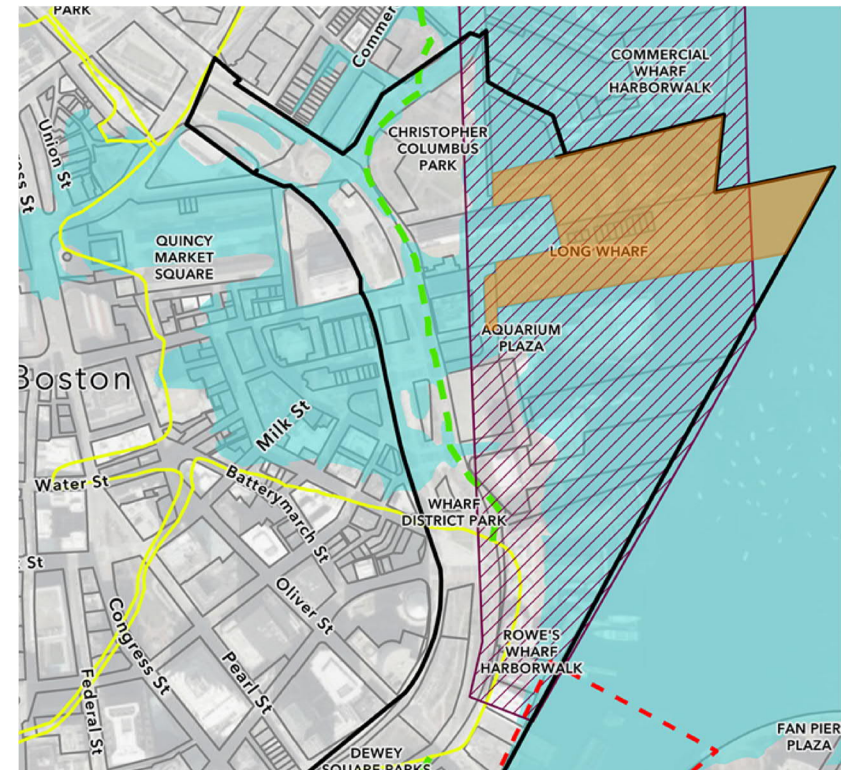
Design for Feasibility

The Plan utilizes best practices for minimizing impacts of ground settlement and additional structural loading on existing infrastructure and buildings, such as by specifying relieving platforms and lightweight fill to minimize ground settlement and increased loads on existing structures. Where such strategies were identified during the feasibility analysis to be impractical, replacement and/or rehabilitation of existing infrastructure and structures is called out in the Plan.

Additionally, regulatory approval assessments were performed by the Project team for the proposed strategies. Only strategies identified to have a probable permitting path are included in the Plan. However, as the regulatory approvals process for work at the water's edge and within the water can be complex, we have identified redundant alternative resiliency systems at several inland locations where such inland strategies have been identified as being viable.

The Project Team also considered potential construction and long-term operations and maintenance costs in the design of the flood resiliency system and developed the Plan to incorporate public benefits that are generally balanced with these costs to maximize opportunities to leverage city, state, and federal funding.

Magenta Zone – Non-Navigable Waters

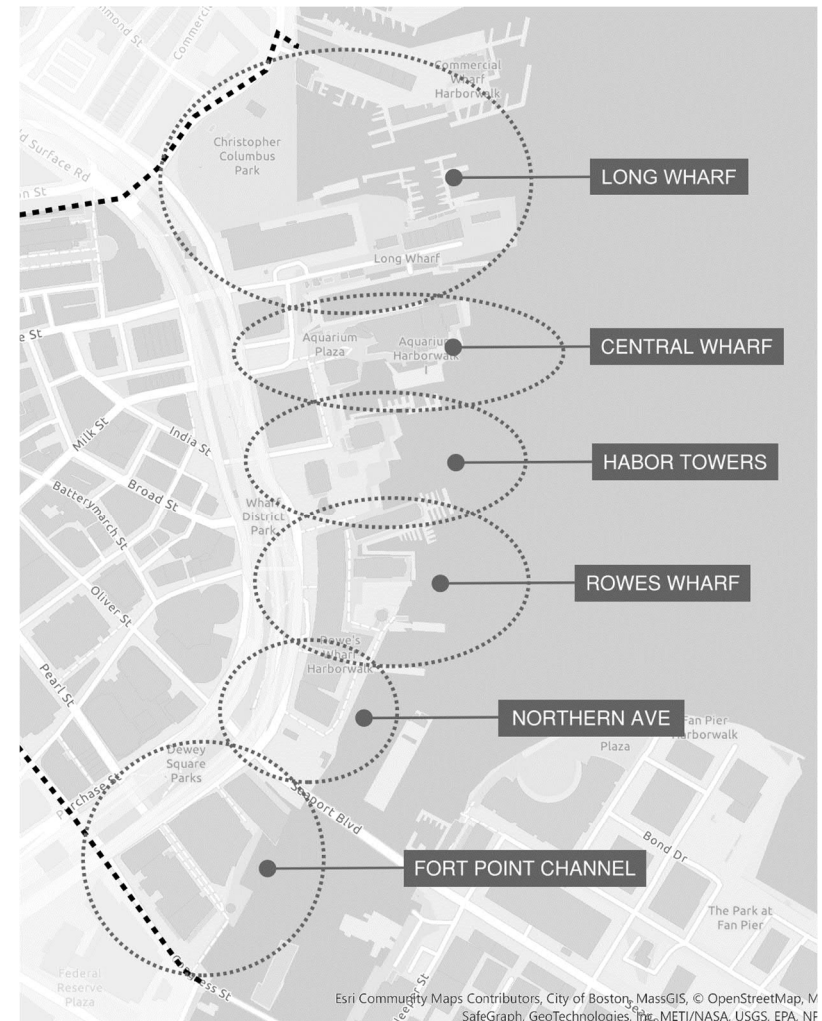


Design for Adaptability

The project has divided the Wharf District's resiliency Plan into six distinct Sub-District Resiliency Projects, each comprised of one to five properties. These Sub-District Resiliency Projects are intended to maximize flexibility for funding and phased implementation of the resiliency Plan, while identifying property owners that are recommended to coordinate together, along with public partners, to implement the resiliency solutions within their project area. These project areas are delineated at locations where multiple options for transitioning between project areas have been identified to be viable.

The Plan also identifies phased implementation of the proposed resiliency strategies, identifying strategies as near-, mid-, and long-term implementation.

Sub-District Resiliency Projects



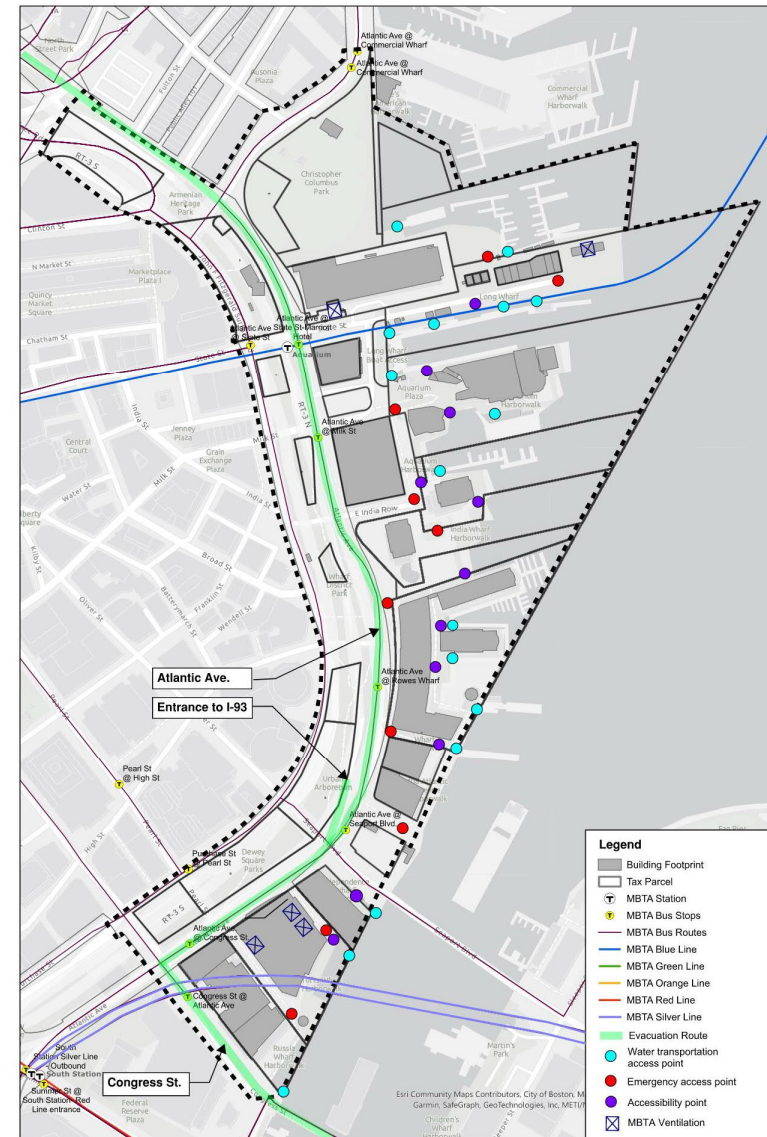
Design for Social Equity & Access

The design aims to provide equitable access to the waterfront, safe transportation into, out of, and around the waterfront, and create opportunities for new public recreational and cultural amenities. To achieve these goals, the Plan:

- Maintains emergency access routes to all buildings and Harborwalk locations
- Maintains or increases the width of the existing Harborwalk at all locations
- Results in an overall increase in existing Harborwalk and public open space areas, including identifying opportunities for new public open space areas to compensate for potential impacts to existing open space programming by the proposed resiliency strategies
- Identifies opportunities to widen the Harborwalk,
- Identifies opportunities for new accessible routes to the Harborwalk
- Minimizes impacts on views of the Harbor, and identifies new opportunities for public viewing of the water
- Identifies new opportunities for direct access for the public to ‘touch’ the water

EDI Partners and Wharf District Stakeholders were also provided opportunities to inform the Plan through review and comment periods on the Project deliverables.

Existing Waterfront Access Route Map



Design for Environmental & Additional Benefits

While the primary intent of the Project is to identify engineering strategies for reducing the Wharf District's flood risks, the Plan identifies opportunities to provide multiple co-benefits including:

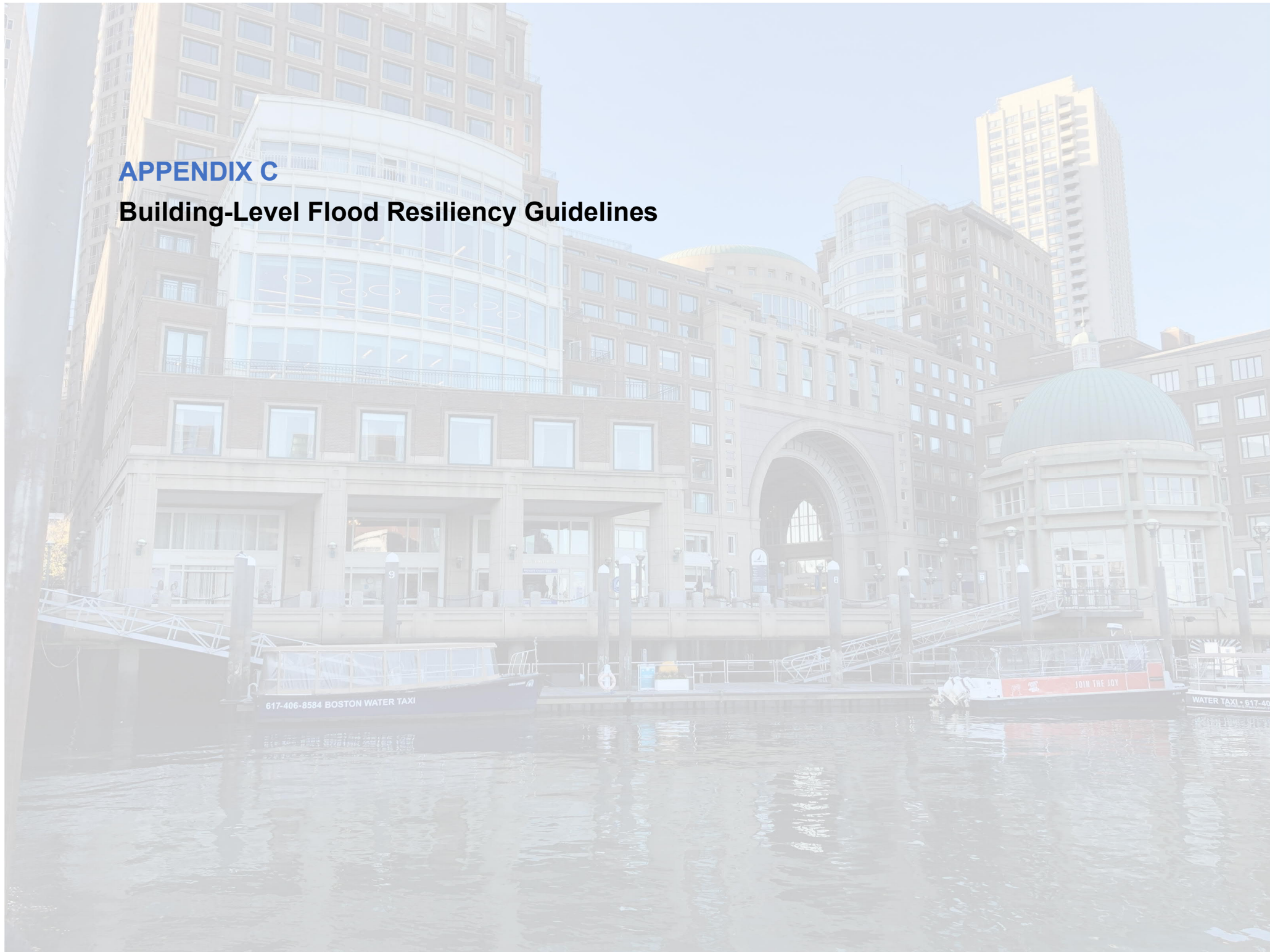
- Enhancing the function of environmental resources with Nature Based Solutions such as living shorelines, floating wetlands, flood protection islands, and revetments that may host filter feeders to improve water quality;
- Improving water access with wave attenuation devices such as floating breakwaters that include decking systems for public access to the water and opportunities to increase water transportation and recreational activities;
- Identifying stormwater storage and treatment systems that can collect stormwater from the City's stormwater and combined sewers, reduce rainfall-based flooding on the dry-side of the flood barriers, and provide treatment to improve the water quality of sewer overflows to the Harbor;
- Including strategies that support the functionality and visibility of the wharves and historic buildings;
- Identifying opportunities for shade trees and shade structures to improve heat resilience along the waterfront.

Fan Pier Marina Floating Breakwater



APPENDIX C

Building-Level Flood Resiliency Guidelines



Wharf District Council

Conceptual District Protection & Resiliency Plan

Building-Level Flood Resiliency Guidelines

May 2023

Overview

Introduction

These Building-Level Flood Resiliency Guidelines provide flood resiliency recommendations to improve the flood resiliency of individual buildings within the Wharf District. These guidelines should be implemented in addition to the construction of a contiguous district-wide flood protection system located along the waterfront – creating a second layer of resiliency for the Wharf District community at each building to protect people and property in the near-term while district-scale flood protection measures are being implemented over the coming decades, and to further reduce the risks to the community associated with single points of failure in the district-scale resiliency system.

These guidelines are intended to serve as a supplemental resource providing targeted flood resiliency recommendations for the Wharf District, complementing existing comprehensive flood resiliency guidelines provided by the City, including:

- [BPDA Coastal Flood Resilience Design Guidelines](#)
- [BPWD Climate Resilient Design Standards & Guidelines for Protection of Public Rights-of-Way](#)

Inland Flood Hazards

While the Wharf District Council has identified a district-wide contiguous flood protection system located along the waterfront, this is only one piece of the multi-layered resiliency system required to minimize flood risks to the Wharf District community. As described in more detail in the City's Climate Ready Boston report, one of these additional layers is adapting buildings located within flood-prone areas for flood risk.

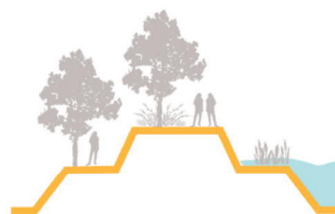
“No matter how well designed an HPS (Hurricane Protection System) may be, some level of residual risk always remains: risk is never reduced to zero.”

-National Academy of Engineering,
Committee on New Orleans Regional
Hurricane Protection Projects

Climate Ready Boston Layers of Resilience



PREPARED AND
CONNECTED
COMMUNITIES



PROTECTED SHORES



RESILIENT
INFRASTRUCTURE

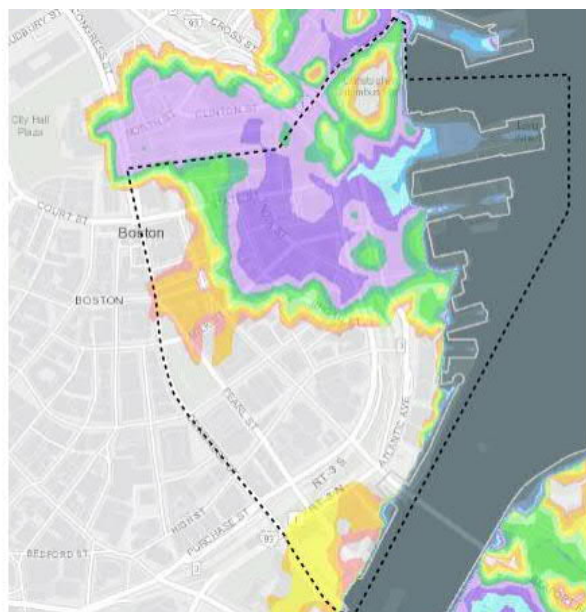


ADAPTED BUILDINGS

With sea levels projected to rise up to 51.5-inches by 2070, storms such as 2018's Winter Storm Grayson – a '100-year flood' – are likely to cause more widespread flooding throughout the Wharf District in the coming years. The flood maps below indicate the extent and depth of flooding projected to impact the Wharf District's buildings and critical infrastructure during 100-year floods in 2030, 2050, and 2070.



2030 100-Year Flood Depths

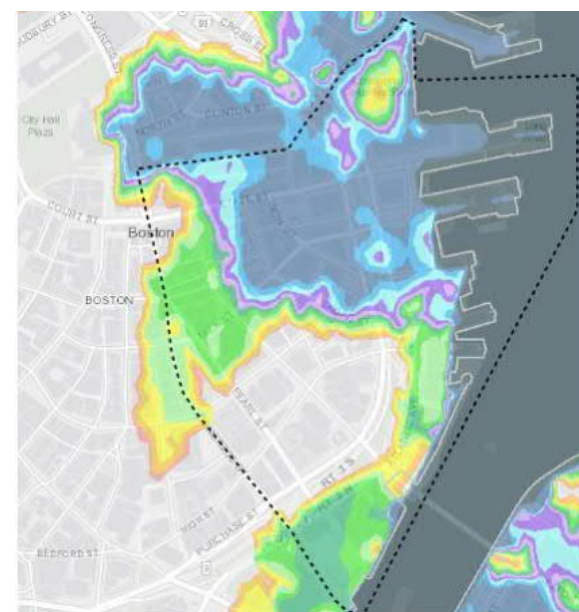


2050 100-Year Flood Depths

Why Protect Against a 100-Year Flood?

A 100-Year Flood is an event that has a 1-in-100 chance of occurring in any single year. The likelihood of one of these floods occurring over the period of a decade or more is significantly greater.

There is a 10% chance the Wharf District will experience a 100-Year Flood in the next 10 years, and a 40% chance such a flood event will occur over the next 50 years.



2070 100-Year Flood Depths



Image Source: Arup Massachusetts Flood Viewer

Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

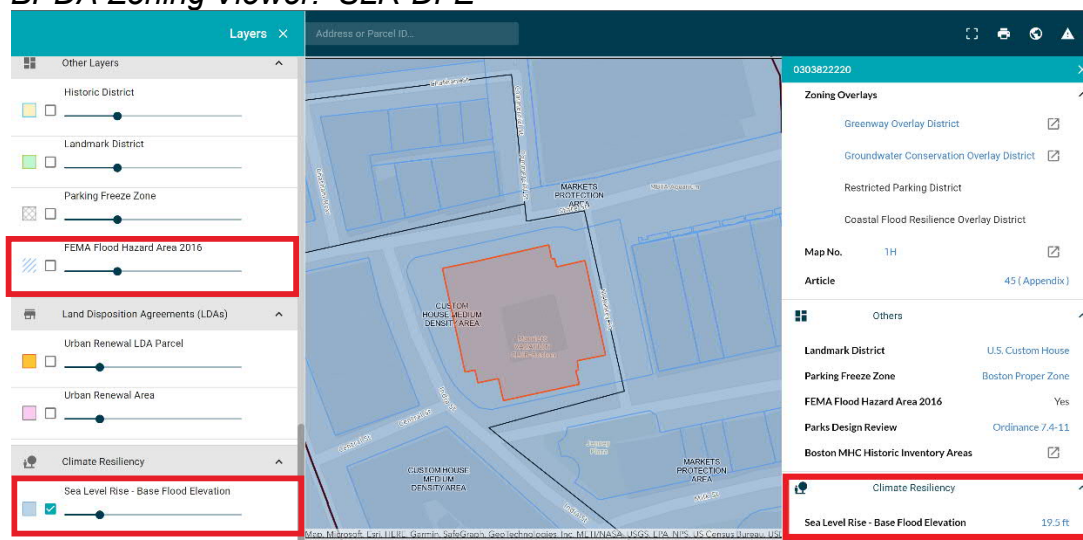
Resiliency Guidelines

Resiliency Checklist

The following checklist is provided to assist property owners and residents of individual buildings within the Wharf District identify flood resiliency strategies for their properties.

- ✓ **Confirm if the property is located within a flood prone area.** Flood prone areas can be identified on the maps on the previous page, BPDA's Zoning Viewer (<http://maps.bostonredevelopmentauthority.org/zoningviewer/?climate=true>) for coastal storm surge flood hazards, and BWSC's Inundation Model Viewer (<https://www.bwscstormviewer.com/stormapp/>) for flood hazards associated with both coastal storm surge and rainfall flood events.
- ✓ **Identify the property's Sea Level Rise - Design Flood Elevation (SLR-DFE).**
 - Identify the SLR-BFE for the property by opening the BPDA's Zoning Viewer and clicking on the parcel. The parcel information box will list the SLR-BFE number in feet (Boston City Base datum).

BPDA Zoning Viewer: SLR-DFE



- Calculate the Sea Level Rise - Design Flood Elevation (SLR-DFE) for the property by adding either 1- or 2-feet to the SLR-BFE, based on the requirements of the City's Article 25 A Coastal Flood Resilience Overlay District. Current Article 25 regulations are summarized below. Higher Design Flood Elevations may be chosen if desired by the property owner to further reduce flood risks to the building. *Note: the SLR-DFE for individual buildings may vary from the DFE's used for the district-wide flood protection system located along the waterfront.*

Building Type	DFE
Residential	Buildings with a residential or critical use for the ground floor must be 2' above SLR-BFE. 1' above SLR-BFE if the residential use starts above the ground floor
Non-residential	Buildings with a critical use on the ground floor must be 2' above SLR-BFE. 1' above SLR-BFE for all other uses
Both	Buildings in a FEMA Coastal A, V, or VE zone must be 2' above SLR-BFE

The USACE National Flood Proofing Committee has investigated the effect of various depths of water on masonry walls, discussed in their report titled *Floodproofing Test (USACE, 1988)*. The results of their work show that, **as a general rule, a maximum of 3 feet of water should be allowed on a non-reinforced concrete block wall** that has not previously been designed and constructed to withstand flood loads.

- *FEMA P-259 'Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures'*

✓ **Identify flood risks to people and physical assets at the property.** Review locations and elevations of infrastructure, emergency egress routes, and shelter-in-place facilities relative to flood elevations and pathways. Include potential above- and below-ground flood pathways in the review. Consider impacts of uplift and lateral forces of floodwaters on the structure.

✓ **Identify and implement a flood adaptation strategy.** Identify and assess potential flood adaptation strategies to mitigate the identified flood risks, and implement the preferred adaptation strategy for the property. Note that flood adaptation strategies for individual buildings shall not preclude the construction of the district-wide flood protection system. Resources for identifying and assessing adaptation strategies for retrofitting existing buildings typical to the Wharf District include:

- *BPDA's Coastal Flood Resilience Design Guidelines*
- *BPWD's Climate Resilient Design Standards & Guidelines for Protection of Public Rights-of-Way*
- *Wharf District Flood Adaptation Toolkit*, included on the following pages of these guidelines

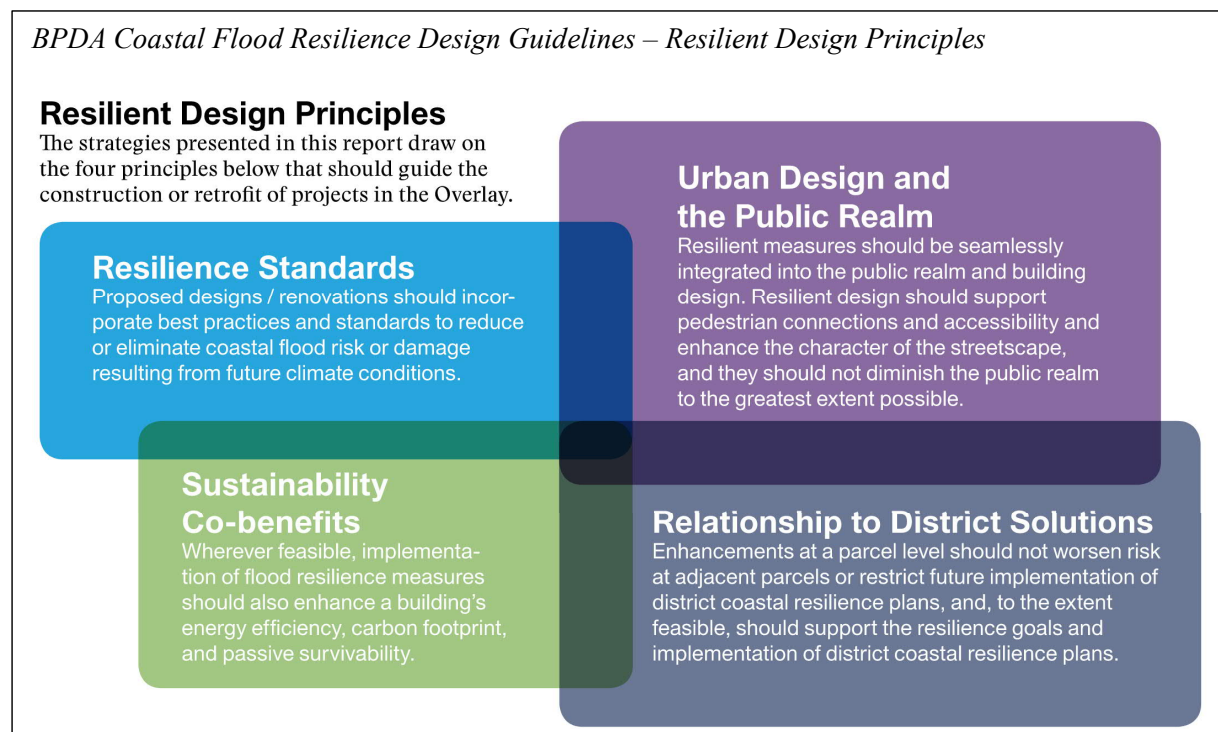
Considerations for assessing and selecting adaptation strategies may include:

- Maintaining emergency access including to emergency egresses and hydrants
- Operational capacity to store and deploy the flood protection system
- Permitting requirements
- Suitability for use based on site-specific building construction, site features, and Design Flood Elevation
- Effectiveness in addressing all above- and below-ground flood pathways
- Opportunities to reduce risk through redundant layers of protection
- Ability for incremental implementation
- Winter weather deployment considerations
- Capital costs, social impacts, and environmental impacts
- Operations & maintenance requirements and design life

- ✓ **Identify applicable regulations.** Consult City, State, and Federal regulations and any other local jurisdictions, such as Historic Districts and Boston’s Article 25A Coastal Flood Resilience Zoning Overlay District, to identify all applicable regulatory and approval requirements for any proposed work.

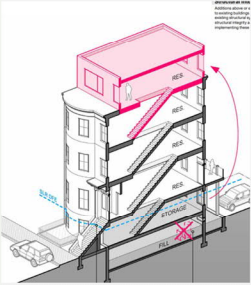
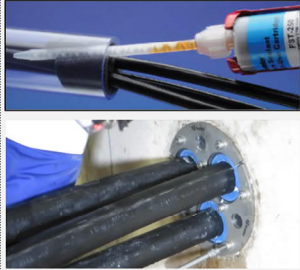
- ✓ **Develop a Flood Preparedness, Response, and Recovery Plan.** This plan should define how to prepare for and respond to a flood event. Key information to consider includes, but is not limited to:
 - Staff and key vendor roles and responsibilities (e.g. removing or securing movable furniture, deploying any deployable barriers, etc.)
 - Flood forecast monitoring and communications
 - Operational procedures (e.g. setting elevator controls to lock out elevator cabs at the 2nd floor during a flood event)
 - Evacuation and/or shelter-in-place procedures, equipment and supplies, and site access restrictions
 - Clear guidance on flood recovery priorities to facilitate rapid recovery
 - Cleaning and maintenance procedures following an event, including damage inspections of equipment and building systems

- ✓ **Train, Deploy, and Improve.** Provide regular training for staff responsible for enacting the Flood Preparedness, Response, and Recovery Plan. Following deployments of flood adaptations strategies, review and incorporate lessons learned for future flood events.



Wharf District Flood Adaptation Toolkit

Dry Floodproofing Strategies – Passive Systems

	Dry Floodproofing					
	Passive Systems					
	Repurpose or Relocate or Elevate Ground Floor Use	Floodwalls & Levees	Automatically Deployed Flood Barriers	Backflow Valves & Pressure Covers	Sealants and Membranes	Stormwater Storage
Rough Order Magnitude Capital Costs:	Varies	\$	\$\$\$	\$	\$	\$\$
Maintenance Effort:	None	Low	Low	Low	Low	Low
Deployment Effort:	None	None	None - Low	None - Moderate	None	None
Storage Requirements:	None	None	None	None - Low	None - Low	None
Design Life:	50+ Yrs	50+ Yrs	50+ Yrs	50+ Yrs	10 - 25 Yrs	50+ Yrs
Types of Products/Solutions:	External or external circulation to Design Flood Elevation 	Levees, Glass Floodwalls, Concrete Structure 	Flood Gates, Flip-Up Barriers, Flood Doors 	Backflow Valves, Pressure Covers 	Waterproof Membrane, Waterproof Sealants 	Surface Ponds, Subsurface Storage Systems, Porous Pavement, Rainwater Harvesting, Bioretention, Swales, Green Roofs 
Manufacturers/Proprietary Product Names:	N/A	FloodControl International, Oldcastle	FloodControl International, Presray, FloodPanel	Watts, Neenah, TideFlex, Flood-Guard	FST 250, Roxtec, Fiber Reinforced Plastic (FRP) Wrap	ADS StormTech, StormTrap, Brentwood StormTank, Contech

Wharf District Flood Adaptation Toolkit

Dry Floodproofing Strategies – Deployable Systems

	Deployable Systems	
	Flood Barriers	Flood Shields
Rough Order Magnitude Capital Costs:	\$\$	\$\$
Maintenance Effort:	Moderate	Moderate
Deployment Effort:	High	High
Storage Requirements:	Moderate	Moderate
Design Life:	10 - 50+ Yrs	50+ Yrs
Types of Products/Solutions:	Inflatable Flood Barriers, Modular Flood Barriers, Membrane Barriers, Sandbags	Door Barriers, Window Panels, Log Barriers
		
Manufacturers/Proprietary Product Names:	Tigerdam, Eco-Dam, Aquafence, ILC Dover Flex-Wall, SmartVent Flex-Wall, FloodBlock	Presray Door Barrier, FloodShield, Presray Window Panels, FloodPanel Flood Log, FloodControl International Removable Stop Logs

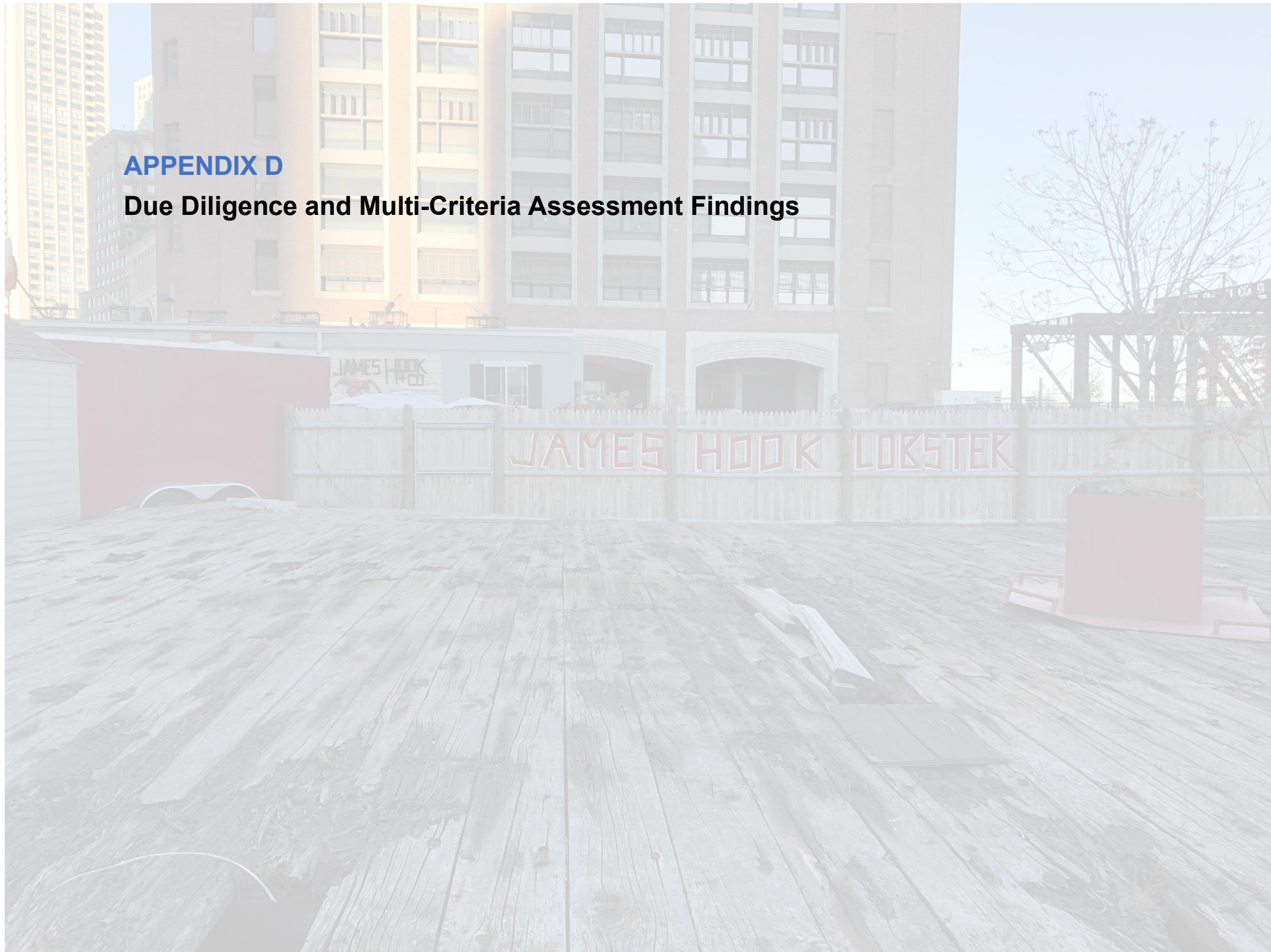
Wharf District Flood Adaptation Toolkit

Wet Floodproofing and Supporting Strategies

	Wet Floodproofing		Supporting Strategies	
	Building Modifications	Pumps and Drain Systems	Landscape Strategies	On-site Energy Generation
Rough Order Magnitude Capital Costs:	Varies; must be completed in accordance with building code	Varies	Varies	Varies
Maintenance Effort:	Low	Low	Medium	Medium
Deployment Effort:	None	None - Low	None	Medium
Storage Requirements:	None	None - Low	Low	Varies
Design Life:	20 - 50+ Yrs	Pumps: 5-10 Yrs Drainage: 50+ Yrs	7-10 years	20-40 years
Types of Products/Solutions:	Open Crawlspace, Anchoring/Raising/Relocating Mechanical & Utility Equipment, Flood Resistant Building Materials 	Sump Pumps, Floor Drains, Back Flow Preventer 	N/A 	Fuel-fired generator, piped natural gas generator, bi- modal solar electric system with battery storage, combined heat & power 
Manufacturers/ Proprietary Product Names:	N/A	N/A	N/A	N/A

APPENDIX D

Due Diligence and Multi-Criteria Assessment Findings

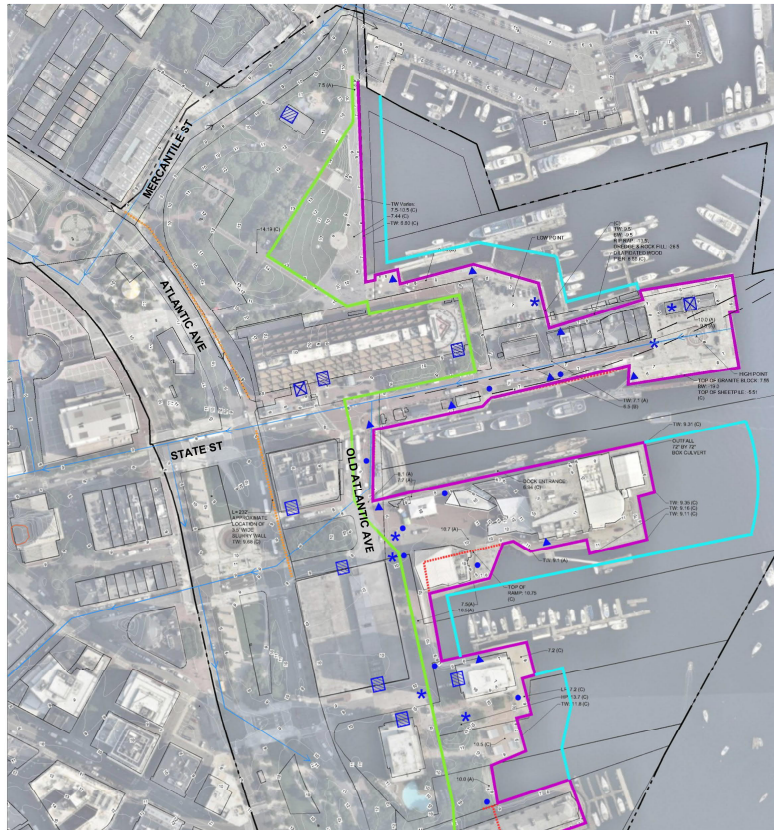


Due Diligence and Multi-Criteria Assessment Findings: Long Wharf (1 of 2)

PLAN INTENT

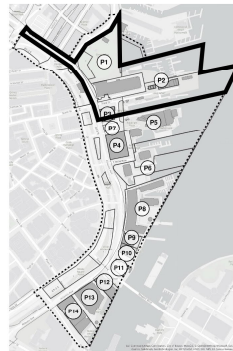
This plan summarizes key considerations associated with the selection and design of potential flood resiliency strategies.

EXISTING CONDITIONS AND ACCESS CONSIDERATIONS PLAN



Resiliency system alignment locations indicated on this Existing Conditions and Access Considerations Plan are based on the City of Boston's Climate Ready Boston reports, and may vary from the proposed Preliminary Resiliency System alignments indicated on subsequent plan sheets, which have been informed by site-specific analyses undertaken during this project.

KEY PLAN



LEGEND

- LIMIT OF STUDY AREA
- INLAND PRELIMINARY ALIGNMENT
- WATERS EDGE PRELIMINARY ALIGNMENT
- OUTBOARD PRELIMINARY ALIGNMENT
- MAJOR FLOW LINES (CRS)
- MAJOR RAINFALL PATHS
- SEAWALL
- SLURRY WALL
- 10' 1' CONTOUR LINES (LIDAR)
- MBTA SILVERLINE EASEMENT
- 10.0 (A) SPOT GRADE (ARTICLE 37)
- 10.0 (B) SPOT GRADE (LIDAR)
- 10.0 (C) SPOT GRADE (DATA REPOSITORY)
- ★ EMERGENCY ACCESS POINT
- ACCESSIBILITY POINT
- BUS STOPS
- ▲ WATER TRANSPORTATION ACCESS POINT
- ⊠ VEHICULAR ACCESS POINT
- ⊞ VENTILATION GRATE

KEY CONSIDERATIONS

Geotechnical: Existing buildings such as the Chart House and Customs building are likely supported on timber piles and granite block pile cap; although the Chart House's foundations were recently upgraded with micro-piles bearing in the bedrock. The Marriott Long Wharf building is supported on concrete piles which were likely driven to till or bedrock.

Coastal Structures: Seawalls have experienced historic deterioration, and sections of seawalls along the north and south sides of the wharf have recently been rebuilt or stabilized. Engineering inspection is recommended during detailed design. MBTA Blue Line tunnel is located below State Street / Long Wharf driveway. Portions of the Harborwalk and Long Wharf flood during present-day high tide events.

Utilities: Multiple storm sewer outfalls are located at Christopher Columbus Park (the Park), including 15" and 18" pipes, an 84" RCP culvert, and a 5'x6' wood sewer.

Rainfall Flow Path: Two major flow paths direct rainfall to the Harbor, one along State Street / Long Wharf, and one along Mercantile Street north of Christopher Columbus Park.

Water Transportation: Access to docks for water transportation is critical. The existing Harborwalk is at capacity during peak tourism season. Present-day high tides occasionally result in docks floating higher than the adjacent Harborwalk, causing operational issues for gangways. Water transportation operations are constrained due to narrow water passages.

Access: Maintenance and emergency vehicle access is required along the Harborwalk, to the MBTA Emergency Egress at the east end of Long Wharf, and to the CA/T Egress adjacent the Aquarium Station headhouse.

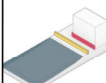
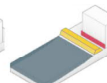
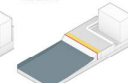
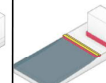
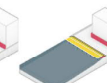
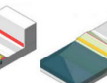
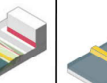
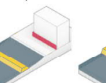
Historic Properties: The Chart House and Customs House are listed in the National Register of Historic Places. Modifications within these buildings is not subject to historic building regulations, but Section 106 review is required for work outside of buildings for federal funded projects.

Due Diligence and Multi-Criteria Assessment Findings: Long Wharf (2 of 2)

PLAN INTENT

This plan summarizes findings of a multi-criteria assessment used to identify strengths and weaknesses of potential flood resiliency strategies.

MULTI-CRITERIA ASSESSMENT SUMMARY

		INLAND			WATER'S EDGE				OUTBOARD				
Assessment Key: Superior Good Poor		STRATEGIES											
		FLOOD WALL (NORTH AND EAST FACADES OF THE MARRIOTT) 			ELEVATED OR CONSTRUCTED LAND (THE PARK) 	ELEVATED ROADWAY/HARBOR WALK (ROADWAY EAST OF MARRIOTT GARAGE ENTRANCE) 	RAISED/ STEPPED (ALL PROPERTIES) 		OVER WATER (ALL PROPERTIES) 	ELEVATED DOCK (ALL PROPERTIES) 	ELEVATED/ CONSTRUCTED LAND (THE PARK & EAST END OF LONG WHARF) 	ELEVATED / CONSTRUCTED HARBORWALK (THE PARK & LONG WHARF) 	ELEVATED / CONSTRUCTED LAND (THE PARK & LONG WHARF) 
		RATING											
Prerequisite Criteria	SOCIAL EQUITY & ACCESS												
	ENVIRONMENTAL & ADDITIONAL BENEFITS												
Constructability Criteria	EFFECTIVENESS												
	FEASIBILITY												
	ADAPTABILITY												

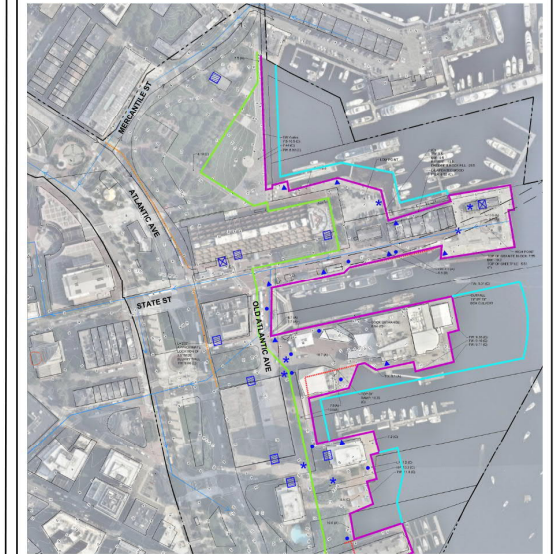
FINDINGS & RECOMMENDATIONS

Prerequisite Criteria: None of the strategies receive a Poor score in the prerequisite criteria at the specific locations noted in the Multi-Criteria Assessment Summary. The Water's Edge alignment Elevated/Constructed Land strategy has the highest prerequisite criteria scores.

Constructability Criteria: The Water's Edge alignment Over Water and Elevated Dock strategies, and the Inland Alignment Flood Wall strategy (along the existing Marriott east and north facade walls) are the most constructable strategies studied.

Recommendations: The Water's Edge alignment Elevated Dock strategy should be considered in most areas for the Preferred Flood Protection System, and should be designed to minimize impacts on views of the Harbor and the historic Chart House and Customs House, and minimize loading on existing coastal structures and the MBTA tunnel. The Inland alignment Elevated / Constructed Land strategy should be considered for the Preferred Flood protection system at the Park to minimize impacts on views of the Harbor and access to the water. The Outboard Elevated/Constructed Land should be considered for the Preferred Flood Protection System at the Customs House to minimize impacts on views of the Harbor and access to the historic building. An Alternative Flood Protection System at the Inland alignment consisting of a Flood Wall along the Marriott east and north facade walls and a Deployable Barrier or Elevated Roadway/Harborwalk at the Long Wharf roadway should also be considered.

RESILIENCY SYSTEM ALIGNMENT REFERENCE PLAN



LEGEND

- INLAND PRELIMINARY ALIGNMENT
- WATERS EDGE PRELIMINARY ALIGNMENT
- OUTBOARD PRELIMINARY ALIGNMENT

Long Wharf

INDEX	GROUP 7	Solutions List	P1 - Christopher Columbus Park			P2 - Long Wharf		
			Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard
1	Building	New bulkhead - Raised/Stepped						
2i		Floodwall						
3w	Harbor Walk	Raised/Stepped/Social						
4w		Over Water						
5w, 5o		Elevated/Constructed Land						
6i, 6o	Open Space	Elevated/Constructed Land						
7w	Dock Access	Elevated/Accessible						
8i, 8w	Roadway	Elevated						

Notes:

1. Actual benefits and trade-offs of flood resiliency strategies will be subject to numerous site-specific considerations and can be influenced by nuanced detailed design approaches. This process provides simplified Evaluation Criteria definitions for each score to provide a transparent and repeatable high level assessment of the relative potential benefits and trade-offs for comparing the major components of various flood resiliency strategies.
2. Critical Infrastructure is defined in Section 2.0 of Boston Public Works Department 2018 Climate Resilient Design Standard & Guidelines
3. In-kind dock replacement includes relocation to an area on the same property with similar or greater footprint, water depth, and protection from wind and waves. In-kind water transportation access point replacement includes relocation to an area on the same property with similar accessibility, connectivity, and visibility. In-kind private open space replacement includes relocation to an area on the same property with similar or greater footprint and access points.
4. National Register of Historic Places structures in the study area include the Long Wharf and Custom House Block, and the seawall between 360-400 Atlantic Avenue and Congress Street.

Definitions:

Facilities of Public Accommodation ("FPAs") are qualified under the State's Waterways Regulations (Chapter 91) as "facilities at which goods or services are made available directly to the public on a regular basis, or at which the advantages of use are otherwise open on essentially equal terms to the public at large." FPA space is located in buildings along the City's waterfront and is required through Chapter 91 licensing for new or redevelopment projects. Examples of interior facilities of public accommodation referenced in the regulations include restaurants, performance areas, hotels, retail establishments, and educational and cultural institutions.

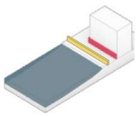
A Wharf is a level concrete, stone, or metal platform lying alongside or projecting into water to which a ship may be moored to load and unload. Adequate water depth for ships must exist alongside the structure to be defined as a wharf. The structure must be of adequate size and configuration to allow ships to moore to be defined as a wharf.

Critical Infrastructure(2)

▶ Hospitals and health care facilities ▶ Emergency Response (Police, Fire, Rescue, Ambulance) facilities and related items (garages, shelters, operations centers, communications, back-up generators, substations, etc.) ▶ Correctional facilities ▶ Wastewater treatment plants ▶ Water storage tanks ▶ Operations centers ▶ Public works yards ▶ Municipal buildings ▶ Schools and facilities that may be used as emergency shelters ▶ Power transmission facilities, substations, and power generation stations	▶ Critical transportation networks (emergency evacuation routes, public transportation, aviation facilities, tunnels, bridges, train and transit maintenance yards and shops, traffic signals) ▶ Facilities where residents have limited mobility or ability (such as nursing homes and care facilities) ▶ Buildings or structures that contain hazardous waste; waste transfer stations ▶ Pumping stations (stormwater and sanitary) ▶ Fueling storage and fuel stations ▶ Ventilation buildings and fan plants ▶ Telecommunications ▶ Major food distribution centers
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Long Wharf

Summary:

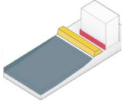
Location:	Inland		
Asset:	Building		
Solution:	Floodwall		
Group:	Group 7, along Marriott north and east façade		
Social Equity & Access	FLOODWALL 		
Environmental and Additional Benefits			
Effectiveness			
Feasibility			
Adaptability			
Notes:			
Strategic DFE inland	15		
Minimum DFE	9.0	to	10.0
Ground Elevation at Alignment	5.0	to	-9.0

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Scoring					0
	Social Equity & Access					0
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
2	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number of access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required.	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
3	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Effectiveness					-0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	fully passive	-	-3
4	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2)	-	-3
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system.	0
	Feasibility					0
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
5	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPAs(1) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
	Adaptability					1
6	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Long Wharf

Summary:

Location:	Inland
Asset:	Open Space
Solution:	Elevated/Constructed Land
Group:	Group 7: Christopher Columbus Park to east façade of Marriott
Social Equity & Access	ELEVATED OR CONSTRUCTED LAND 
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

Notes:

Strategic DFE Inland	19.3		
Minimum DFE	15		
Ground Elevation at Alignment	9.5		
Solution min and max	5.0		
	3.5' Flood wall to 15' with glass flood wall to 19.3	to	10.0
			9.8

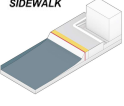
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
	Scoring		-3	0	3	
1	Social Equity & Access					-1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or water's edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					-0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	-3
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Long Wharf

Summary:

Location:	Inland			
Asset:	Roadway			
Solution:	Elevated Roadway & Harborwalk			
Group:	Group 7: Long Wharf roadway east of Marriott garage entrance			
Social Equity & Access				
Environmental and Additional Benefits				
Effectiveness				
Feasibility				
Adaptability				



Notes:

Strategic DFE Inland	17.4			
Minimum DFE	15.04			
Ground Elevation at Alignment	8.0	to		10.0
Solution min and max	5.0	to		9.4

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					-0.6
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or severely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, gangways, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
2	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the viability or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the viability of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
	Effectiveness					0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor; or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility					-1.8
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
3	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) Facility of Public Accommodation	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
	Adaptability					-3
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Long Wharf

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Raised/Stepped
Group:	Group 7; all properties, except west side of Custom House
Social Equity & Access	RAISED/ STEPPED 
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

Notes:

Strategic DFE inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

19.1			
15.04			
8.0	to		10.0
5.0	to		11.1

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					-0.8
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	Increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
2	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0.8
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resiliency across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection of a major rainfall pathway with the flood protection system	0
4	Feasibility					-1.8
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

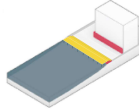
Long Wharf

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Over Water
Group	Group 7; all properties, except west side of Custom House

Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

OVER WATER



Notes:

Strategic DFE inland	19.1			
Minimum DFE	15			
Ground Elevation at Alignment	9.0	to		10.0
Solution min and max	5.0	to		10.1

HW raised to 15' with 2' floodwall, assuming breakwaters reduce wave action by 2'.

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Scoring					
	Social Equity & Access					0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk; does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resiliency across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) Facility of Public Accommodation	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Long Wharf

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Elevated or Constructed Land
Group:	Group 7: Christopher Columbus Park; east end of Long Wharf
Social Equity & Access	ELEVATED OR CONSTRUCTED LAND 
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

Notes:

Strategic DFE Inland	19.1		
Minimum DFE	15		
Ground Elevation at Alignment	9.0	to	10.0
Solution min and max	5.0	to	10.1
elevated berm to 15' with 2' flood wall to 17.1', assuming breakwaters reduce wave action by 2'			

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					1.8
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or severely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
2	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
	Environmental and Additional Benefits					1.5
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at intertidal or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					1.2
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	3
4	Feasibility					-1.8
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) Facility of Public Accommodation	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Long Wharf

Summary:

Location:	Waters Edge
Asset:	Docks
Solution:	Elevated Dock Access
Group	Group 7
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

ELEVATED DOCK ACCESS



Notes:

Strategic DFE inland	19.1		
Minimum DFE	15		
Ground Elevation at Alignment	9.0	to	10.0
Solution min and max	5.0		10.1
elevated dock to 15' with a 2' floodwall to 17.1'. Breakwaters will reduce wave action to 17.1			

Scoring:

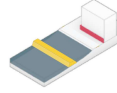
	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					1.2
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
2	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infill Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at in-lieu or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks and water transportation functionality and access	irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor; or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					0
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Long Wharf

Summary:

Location:	Outboard
Asset:	Harbor Walk
Solution:	Elevated or Constructed Land
Group:	Group 7: Christopher Columbus Park
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

**ELEVATED /
CONSTRUCTED**



Notes:

Strategic DFE inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

19.1			
15			
8.0	to		10.0
5.0	to		11.1

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					1.8
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
	Environmental and Additional Benefits					0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at intertidal waters edge alignment), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
2	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Effectiveness					1.2
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	3
	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
3	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost	strategy located outboard of seawall / shoreline	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Long Wharf

Summary:

Location:	Outboard		
Asset:	Open Space		
Solution:	Elevated or Constructed Land		
Group:	Group 7: Christopher Columbus Park		
Social Equity & Access		ELEVATED OR CONSTRUCTED LAND 	
Environmental and Additional Benefits			
Effectiveness			
Feasibility			
Adaptability			
Notes:			
Strategic DFE Inland	19.1		
Minimum DFE	15		
Ground Elevation at Alignment	8.0	to	10.0
Solution min and max	5.0	to	11.1

Scoring:

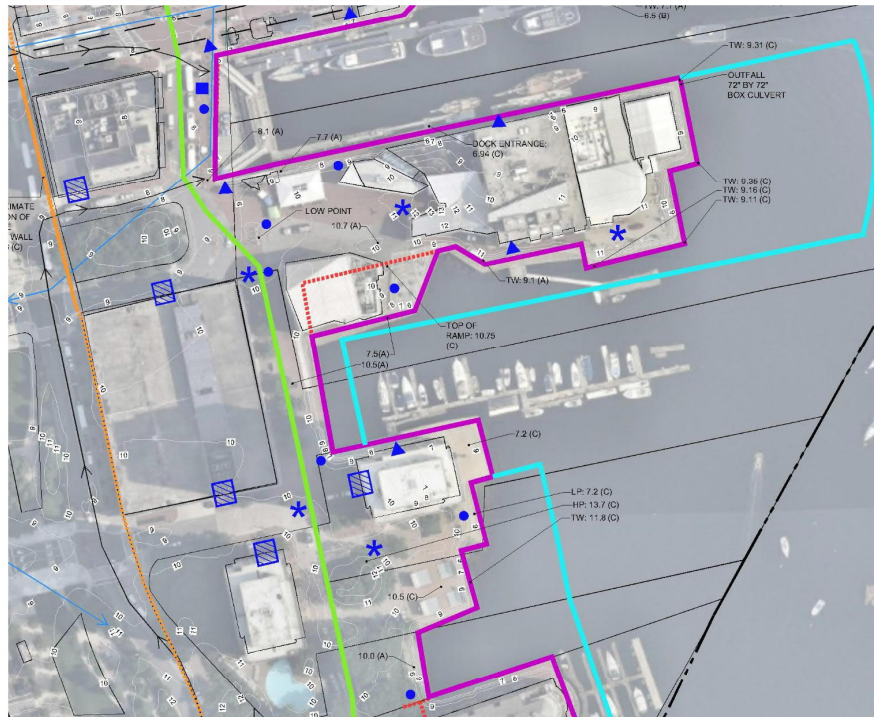
	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					1.8
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inlet or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to dry dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
2	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Effectiveness					1.2
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	3
	Feasibility					-1.8
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
3	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) Facility of Public Accommodation	-3
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Due Diligence and Multi-Criteria Assessment Findings: Central Warf (1 of 2)

PLAN INTENT

This plan summarizes key considerations associated with the selection and design of potential flood resiliency strategies.

EXISTING CONDITIONS AND ACCESS CONSIDERATIONS PLAN



Resiliency system alignment locations indicated on this Existing Conditions and Access Considerations Plan are based on the City of Boston's Climate Ready Boston reports, and may vary from the proposed Preliminary Resiliency System alignments indicated on subsequent plan sheets, which have been informed by site-specific analyses undertaken during this project.

KEY PLAN



LEGEND

- | | |
|--|-----------------------------------|
| | LIMIT OF STUDY AREA |
| | INLAND PRELIMINARY ALIGNMENT |
| | WATERS EDGE PRELIMINARY ALIGNMENT |
| | OUTBOARD PRELIMINARY ALIGNMENT |
| | MAJOR FLOW LINES (CRS) |
| | MAJOR RAINFALL PATHS |
| | SEAWALL |
| | SLURRY WALL |
| | 1' CONTOUR LINES (LIDAR) |
| | MBTA SILVERLINE EASEMENT |
| | SPOT GRADE (ARTICLE 37) |
| | SPOT GRADE (LIDAR) |
| | SPOT GRADE (DATA REPOSITORY) |
| | EMERGENCY ACCESS POINT |
| | ACCESSIBILITY POINT |
| | BUS STOPS |
| | WATER TRANSPORTATION ACCESS POINT |
| | VEHICULAR ACCESS POINT |
| | VENTILATION GRATE |

KEY CONSIDERATIONS

Geotechnical: Proposed solutions at water's edge will require groundwater cut-off.

Coastal Structures: Structures in this group are pile supported and bear in glacial till or bedrock. The existing seawall is in deteriorating condition and requires a mitigation strategy. Engineering assessment recommended during detailed design. Portions of the Harborwalk flood during present-day high tide events.

Utilities: A 60"x64" culvert in Central Street conveys combined sewer flows to a 72"x72" box culvert under the Harborwalk along the north side of Central Wharf to an outfall at the Northern tip of the wharf. An 84" storm pipe runs under the northern sidewalk of Milk Street at Frog Pond Park. A steam pipe is located below the the south side of Central Wharf below normal high tide elevation. An 8-ft wide condenser water piping easement extends from Harbor Garage to Harbor Towers through East India ROW.

Rainfall Flow Path: During major rainfall events, stormwater from significant portions of the Wharf District are conveyed overland via State Street and Central Street to Old Atlantic Avenue before overflowing to the Harbor.

Emergency Access: Emergency vehicles can access all buildings and the Harborwalk via roadways and the plaza located west and south side of the Aquarium. Emergency access must be maintained around Harbor Garage and may require future coordination during detailed design.

Due Diligence and Multi-Criteria Assessment Findings: Central Warf (2 of 2)

PLAN INTENT

This plan summarizes findings of a multi-criteria assessment used to identify strengths and weaknesses of potential flood resiliency strategies.

MULTI-CRITERIA ASSESSMENT SUMMARY

	INLAND			WATER'S EDGE			OUTBOARD	
Assessment Key:	STRATEGIES			STRATEGIES			STRATEGIES	
Superior Good Poor	FLOOD WALL ELEVATED OR CONSTRUCTED LAND (SOUTH OF OLD ATLANTIC AVE) ELEVATED ROADWAY/HARBOR WALK (OLD ATLANTIC AVE)			RAISED/ STEPPED OVER WATER ELEVATED DOCK			ELEVATED / CONSTRUCTED HARBORWALK ELEVATED / CONSTRUCTED LAND	
	RATING			RATING			RATING	
Prerequisite Criteria								
SOCIAL EQUITY & ACCESS								
ENVIRONMENTAL & ADDITIONAL BENEFITS								
Constructability Criteria								
EFFECTIVENESS								
FEASIBILITY								
ADAPTABILITY								

FINDINGS & RECOMMENDATIONS

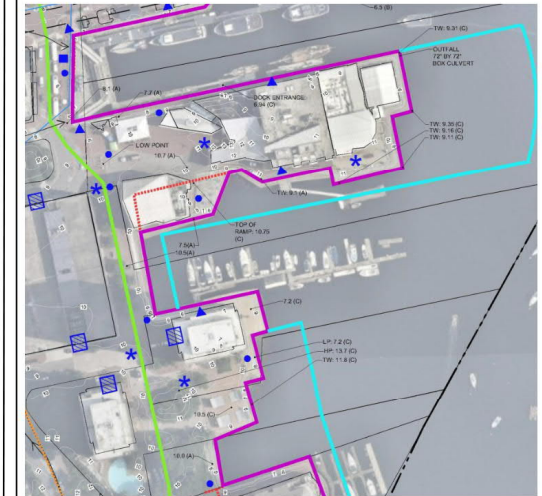
Prerequisite Criteria: The Inland alignment Flood Wall strategy is not preferred due to receiving a Poor score for Social Equity & Access due to obstructing views and access to public spaces, the Harbor, the Long Wharf bus stop on Old Atlantic Avenue, and the Aquarium. The Inland alignment Elevated Roadway / Harborwalk strategy is also not preferred due to receiving a Poor score for Environmental & Additional Benefits due to impacting the visibility of the district's wharves and historic buildings at Long Wharf and reducing access points to the sidewalk cafe at 255 State Street.

Constructability Criteria: The Water's Edge alignment strategies and the Inland alignment Elevated / Constructed Land strategy are the most constructable strategies in this assessment.

Recommendations:

The Water's Edge alignment strategies and the Elevated/Constructed land strategy at the Inland and Outboard alignment should be considered for the Preferred Flood Protection System. The strategies should incorporate approaches to minimize the impacts on views of the Harbor and wharves, to maximize programmable community space, and to minimize impacts of new fill causing ground settlement at existing buildings and sea walls. A stormwater storage and pump system will also be required to manage groundwater levels and accommodate the Major Rainfall Paths that would be impeded by the flood protection system in the vicinity of Old Atlantic Ave.

RESILIENCY SYSTEM ALIGNMENT REFERENCE PLAN



LEGEND

- INLAND PRELIMINARY ALIGNMENT
- WATERS EDGE PRELIMINARY ALIGNMENT
- OUTBOARD PRELIMINARY ALIGNMENT

Central Wharf

INDEX	GROUP 6	Solutions List	P7 - Frog Pond Park			P5 - Aquarium			P4 - Boston Harbor Garage			P3 - 255 State St		
			Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard
1	Building	New bulkhead - Raised/Stepped												
2i		Floodwall												
3w	Harbor Walk	Raised/Stepped/Social												
4w		Over Water												
5w, 5o		Elevated/Constructed Land												
6i, 6o	Open Space	Elevated/Constructed Land												
7w	Dock Access	Elevated/Accessible												
8i	Roadway	Elevated												

INDEX	GROUP 6	Solutions List	W1 - BPDA land @ Old			W2 - BPDA Land @ Old			R3 & R4 - State St, Old		
			Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard
1	Building	New bulkhead - Raised/Stepped									
2i		Floodwall									
3w	Harbor Walk	Raised/Stepped/Social									
4w		Over Water									
5w, 5o		Elevated/Constructed Land									
6i, 6o	Open Space	Elevated/Constructed Land									
7w	Dock Access	Elevated/Accessible									
8i	Roadway	Elevated									

Notes:

- Actual benefits and trade-offs of flood resiliency strategies will be subject to numerous site-specific considerations and can be influenced by nuanced detailed design approaches. This process provides simplified Evaluation Criteria definitions for each score to provide a transparent and repeatable high level assessment of the relative potential benefits and trade-offs for comparing the major components of various flood resiliency strategies.
- Critical Infrastructure is defined in Section 2.0 of Boston Public Works Department 2018 Climate Resilient Design Standard & Guidelines
- In-kind dock replacement includes relocation to an area on the same property with similar or greater footprint, water depth, and protection from wind and waves. In-kind water transportation access point replacement includes relocation to an area on the same property with similar accessibility, connectivity, and visibility. In-kind private open space replacement includes relocation to an area on the same property with similar or greater footprint and access points.
- National Register of Historic Places structures in the study area include the Long Wharf and Custom House Block, and the seawall between 360-400 Atlantic Avenue and Congress Street.

Definitions:

Facilities of Public Accommodation ("FPAs") are qualified under the State's Waterways Regulations (Chapter 91) as "facilities at which goods or services are made available directly to the public on a regular basis, or at which the advantages of use are otherwise open on essentially equal terms to the public at large." FPA space is located in buildings along the City's waterfront and is required through Chapter 91 licensing for new or redevelopment projects. Examples of interior facilities of public accommodation referenced in the regulations include restaurants, performance areas, hotels, retail establishments, and educational and cultural institutions.

A Wharf is a level concrete, stone, or metal platform lying alongside or projecting into water to which a ship may be moored to load and unload. Adequate water depth for ships must exist alongside the structure to be defined as a wharf. The structure must be of adequate size and configuration to allow ships to moore to be defined as a wharf.

Critical Infrastructure(2)

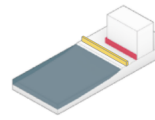
- Hospitals and health care facilities
- Emergency Response (Police, Fire, Rescue, Ambulance) facilities and related items (garages, shelters, operations centers, communications, back-up generators, substations, etc.)
- Correctional facilities
- Wastewater treatment plants
- Water storage tanks
- Operations centers
- Public works yards
- Municipal buildings
- Schools and facilities that may be used as emergency shelters
- Power transmission facilities, substations, and power generation stations
- Critical transportation networks (emergency evacuation routes, public transportation, aviation facilities, tunnels, bridges, train and transit maintenance yards and shops, traffic signals)
- Facilities where residents have limited mobility or ability (such as nursing homes and care facilities)
- Buildings or structures that contain hazardous waste; waste transfer stations
- Pumping stations (stormwater and sanitary)
- Fueling storage and fuel stations
- Ventilation buildings and fan plants
- Telecommunications
- Major food distribution centers

Central Wharf

Summary:

Location:	Inland
Asset:	Building
Solution:	Floodwall
Group:	Group 6: all properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

FLOODWALL



Notes:

Strategic DFE inland
Minimum DFE
Ground Elevation at Alignmen
Solution min and max

17.4			
15.04			
8.0	to		10.0
5.0	to		9.4

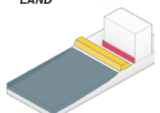
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Social Equity & Access					-1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	-3
	Preserves & enhances view of the harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number of access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points		0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					-0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					0
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Central Wharf

Summary:

Location:	Inland
Asset:	Open Space
Solution:	Elevated/Constructed Land
Group:	Group 6; all properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	



ELEVATED OR CONSTRUCTED LAND

Notes:
 Strategic DFE inland: 17.4
 Minimum DFE: 15.04
 Ground Elevation at Alignment: 8.0
 Solution min and max: 5.0 to 10.0
 to 9.4

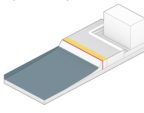
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					-0.6
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
2	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					-0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area			-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Central Wharf

Summary:

Location:	Inland
Asset:	Roadway
Solution:	Elevated Roadway & Harborwalk
Group	Group 6, Old Atlantic Avenue

Social Equity & Access	ELEVATED ROADWAY & 
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

Notes:			
Strategic DFE inland	17.4		
Minimum DFE	15.04		
Ground Elevation at Alignment	8.0	to	10.0
Solution min and max	5.0	to	9.4

Scoring:

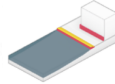
	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					-0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					-1.6
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		-3
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection of a major rainfall pathway with the flood protection system	0
4	Feasibility					-1.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Central Wharf

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Raised/Stepped
Group	Group 6: all properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

RAISED/
STEPPED



Notes:

Strategic DFE inland
Minimum DFE
Ground Elevation at Alignmen
Solution min and map

19.1

15.04

8.0

5.0

to

to

10.0

11.1

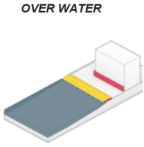
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Social Equity & Access					-0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities or licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	strategy located outboard of seawall / shoreline	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					2
	Compatible with existing property-specific plans and land use	Irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Central Wharf

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Over Water
Group:	Group 6: all properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	



OVER WATER

Notes:
 Strategic DFE inland
 Minimum DFE
 Ground Elevation at Alignmen
 Solution min and max

19.1			
15.04			
8.0	to	10.0	
5.0	to	11.1	

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Social Equity & Access					0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas for all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor; or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					2
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Central Wharf

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Elevated or Constructed Land
Group	Group 6: all properties
Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

**ELEVATED OR
CONSTRUCTED
LAND**



Notes:

Strategic DFE inland
Minimum DFE
Ground Elevation at Alignmen
Solution min and max

19.1

15.04

8.0

5.0

to

10.0

11.1

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					#DIV/0!
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	
2	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	
	Environmental and Additional Benefits					#DIV/0!
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of inflled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	private space size and access points, or in-kind replacements identified(3)		
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					#DIV/0!
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		
	Provides opportunities for phased implementation	-	no potential for phased implementation		strategy can be implemented progressively with sea level rise	

Central Wharf

Summary:

Location:	Waters Edge
Asset:	Docks
Solution:	Elevated Dock Access
Group:	Group 6: all properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

Notes:
Strategic DFE inland
Minimum DFE
Ground Elevation at Alignmen
Solution min and max

19.1			
15.04			
8.0	to		10.0
5.0	to		11.1



ELEVATED DOCK ACCESS

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	3
2	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
	Environmental and Additional Benefits					0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of inflled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive		0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline; access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					2
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	no potential for phased implementation		strategy can be implemented progressively with sea level rise	3

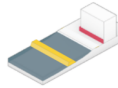
Central Wharf

Summary:

Location: Outboard
Asset: Harbor Walk
Solution: Elevated or Constructed Land
Group 6 from Aquarium to Harbor Towers

Social Equity & Access	
Environmental and Additional Benefit	
Effectiveness	
Feasibility	
Adaptability	

ELEVATED /
CONSTRUCTED



Notes:
Strategic DFE inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

19.1				
15.04				
8.0	to		10.0	
5.0	to		11.1	

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
	Scoring		-3	0	3	
1	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding in, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
2	Environmental and Additional Benefits					1.8
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					0.8
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
5	Adaptability					1
	Compatible with existing property specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Central Wharf

Summary:

Location:	Outboard
Asset:	Open Space
Solution:	Elevated or Constructed Land
Group	Group 6 from Aquarium to Harbor Towers
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

ELEVATED OR CONSTRUCTED LAND



Notes:
Strategic DFE inland 19.1
Minimum DFE 15.04
Ground Elevation at Alignment 8.0
Solution min and max 5.0

to 10.0
to 11.1

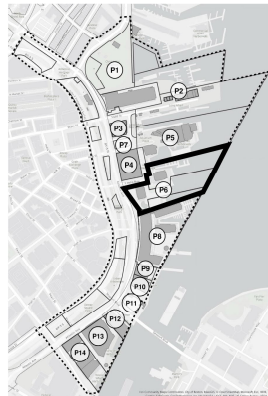
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous Harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
2	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
	Environmental and Additional Benefits					1.5
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflifted aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation or inflifted aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed and at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
3	Minimizes outdoor private land use impacts	eliminates private open space or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the viability or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the viability of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
4	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
5	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
	Adaptability					2
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise		3

Due Diligence and Multi-Criteria Assessment Findings: Harbor Towers

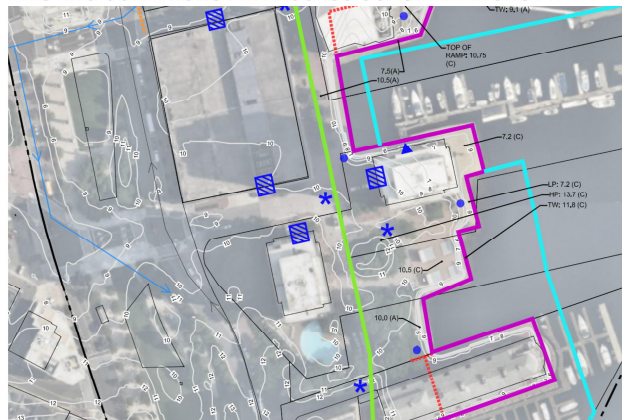
This plan summarizes key considerations associated with the selection and design of potential flood resiliency strategies, and the findings of a multi-criteria assessment used to identify strengths and weaknesses of potential flood resiliency strategies.

KEY PLAN AND LEGEND



- | | |
|----------|-----------------------------------|
| --- | LIMIT OF STUDY AREA |
| — | INLAND PRELIMINARY ALIGNMENT |
| — | WATERS EDGE PRELIMINARY ALIGNMENT |
| — | OUTBOARD PRELIMINARY ALIGNMENT |
| → | MAJOR FLOW LINES (CRS) |
| → | MAJOR RAINFALL PATHS |
| ===== | SEAWALL |
| ===== | SLURRY WALL |
| 10 | 1' CONTOUR LINES (LIDAR) |
| | MBTA SILVERLINE EASEMENT |
| 10.0 (A) | SPOT GRADE (ARTICLE 37) |
| 10.0 (B) | SPOT GRADE (LIDAR) |
| 10.0 (C) | SPOT GRADE (DATA REPOSITORY) |
| * | EMERGENCY ACCESS POINT |
| ● | ACCESSIBILITY POINT |
| ■ | BUS STOPS |
| ▲ | WATER TRANSPORTATION ACCESS POINT |
| ▲ | VEHICULAR ACCESS POINT |
| ☒ | VENTILATION GRATE |

EXISTING CONDITIONS AND ACCESS CONSIDERATIONS PLAN



Resiliency system alignment locations indicated on this Existing Conditions and Access Considerations Plan are based on the City of Boston's Climate Ready Boston reports, and may vary from the proposed Preliminary Resiliency System alignments indicated on subsequent plan sheets, which have been informed by site-specific analyses undertaken during this project.

KEY CONSIDERATIONS

Geotechnical: The buildings are supported by piles bearing in the underlying glacial till and bedrock at depths exceeding 95-ft below ground.

Coastal Structures: The existing seawalls have experienced settlement, bowing, cracking, and movement. Existing timber piles supporting the sea walls are deteriorated due to marine borers.

Utilities: Condenser and condensate pipe easements between Harbor Garage and Harbor Tower 2 site. Storm easement between Harbor Tower 1 & 2 for 10" storm pipe. No major sewer outfalls were identified, but storm, sewer and water pipes run east-west along East India Row.

Flood Flow Path: No major rainfall flow path on site.

Access: Emergency access to the buildings and waterfront is via East India Row for EMS vehicles & via water access for fire boats.

Additional Considerations: The Harborwalk currently experiences flooding during some high tide events. Outdoor public art installation may need to remain on site. The City's Climate Ready Boston reports indicate resiliency systems south of Harbor Towers may not be constructed until the 2050s.

FINDINGS & RECOMMENDATIONS

Prerequisite Criteria: The Inland Alignment strategies are not preferred as they receive Poor scores for Social Equity & Access due to obstructing water views, and reducing emergency and non-emergency access to the Harborwalk and Harbor Towers buildings.

Constructability Criteria: The Outboard Alignment Elevated or Constructed Land strategy is the most constructable strategy in this assessment, and also scores the highest for the Prerequisite Criteria. No significant relative differences were identified between the Water's Edge Alignment strategies.

Recommendations:
The Elevated or Constructed Land strategy at the Outboard Alignment should be considered for the Preferred Flood Protection System, and should incorporate strategies to minimize the following impacts associated within infill of the Harbor: permitting risks, construction costs, environmental impacts, and boat access. In particular, Elevated Dock Access should be considered at the existing marina.

An Alternative Flood Protection System at the Water's Edge Alignment should be considered and may incorporate any of the Water's Edge strategies.

[illegible]

Harbor Towers

INDEX	GROUP 5	Solutions List	P6 - Harbor Towers		
			Inland	Waters Edge	Outboard
1	Building	New bulkhead - Raised/Stepped			
2i		Floodwall			
3w	Harbor Walk	Raised/Stepped/Social			
4w		Over Water			
5w,5o		Elevated/Constructed Land			
6i	Open Space	Elevated/Constructed Land			
7w	Dock Access	Elevated/Accessible			
8	Roadway	Elevated			

Notes:

1. Actual benefits and trade-offs of flood resiliency strategies will be subject to numerous site-specific considerations and can be influenced
2. Critical Infrastructure is defined in Section 2.0 of Boston Public Works Department 2018 Climate Resilient Design Standard & Guidelines
3. In-kind dock replacement includes relocation to an area on the same property with similar or greater footprint, water depth, and
4. National Register of Historic Places structures in the study area include the Long Wharf and Custom House Block, and the seawall between

Definitions:

Facilities of Public Accommodation ("FPAs") are qualified under the State's Waterways Regulations (Chapter 91) as "facilities at which goods A Wharf is a level concrete, stone, or metal platform lying alongside or projecting into water to which a ship may be moored to load and unload. Adequate water depth for ships must exist alongside the structure to be defined as a wharf. The structure must be of adequate size and configuration to allow ships to moore to be defined as a wharf.

Critical Infrastructure(2)

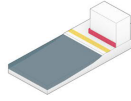
▶ Hospitals and health care facilities ▶ Emergency Response (Police, Fire, Rescue, Ambulance) facilities and related items (garages, shelters, operations centers, communications, back-up generators, substations, etc.) ▶ Correctional facilities ▶ Wastewater treatment plants ▶ Water storage tanks ▶ Operations centers ▶ Public works yards ▶ Municipal buildings ▶ Schools and facilities that may be used as emergency shelters ▶ Power transmission facilities, substations, and power generation stations	▶ Critical transportation networks (emergency evacuation routes, public transportation, aviation facilities, tunnels, bridges, train and transit maintenance yards and shops, traffic signals) ▶ Facilities where residents have limited mobility or ability (such as nursing homes and care facilities) ▶ Buildings or structures that contain hazardous waste; waste transfer stations ▶ Pumping stations (stormwater and sanitary) ▶ Fueling storage and fuel stations ▶ Ventilation buildings and fan plants ▶ Telecommunications ▶ Major food distribution centers
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Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Inland
Asset:	Building
Solution:	Floodwall
Group	5
Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

FLOOD WALL



Notes:

Strategic DFE inland 17.2
Minimum DFE 15
Ground Elevation at Alignment 10-13.8
Solution min and max 4 to 7.2
example: 5.5' flood wall

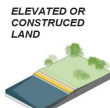
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Scoring					-0.6
	Effectiveness					
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
2	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility					0
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	3
3	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
4	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
	Environmental and Additional Benefits					-0.75
5	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		-3
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					-1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	Increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3

Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Inland
Asset:	Building
Solution:	Elevated or Constructed Land
Group	5
Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	



Notes:
 Strategic DFE Inland 17.2
 Minimum DFE 15
 Ground Elevation at Alignment 10-13.8
 Solution min and max 4 to 7.2
 example: 3' berm with 2.5' seating wall

Scoring:

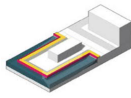
	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾		Assessment Score
			Poor -3	Good 3	
1	Scoring				
	Effectiveness				0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE: cannot be raised to Strategic DFE	Meets Target DFE: can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure ⁽²⁾	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure ⁽²⁾	-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	0
2	Protects critical infrastructure	-	does not protect all critical infrastructure ⁽²⁾ from storm surge	protects all critical infrastructure ⁽²⁾ from storm surge	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility				0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	0
3	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places ⁽⁴⁾ ; potential permitting strategy identified	strategy located on existing land	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	3
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components	0
	Adaptability				0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	-3
4	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure ⁽²⁾	facilitates protection of immediately adjacent buildings and critical infrastructure ⁽²⁾	0
	Provides opportunities for phased implementation	-	-	strategy can be implemented progressively with sea level rise	3
	Environmental and Additional Benefits				0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified ⁽⁵⁾	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified ⁽⁵⁾	No impact on existing dock area or access to water transportation access points, or in-kind replacements ⁽⁵⁾ identified for any reduction of existing dock area or water transportation access points	0
5	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified ⁽⁵⁾	0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places ⁽⁴⁾	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places ⁽⁴⁾	0
	Social Equity & Access				-1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, view/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	0
6	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality	-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	-3
				creates new public access points to the waterfront (including living shorelines)	

Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Raised/Stepped
Group	5
Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

**RAISED/
STEPPED**



Notes:

Strategic DFE waters edge 19.3
 Minimum DFE 15
 Ground Elevation at Alignment 7.2 to 11.8
 Solution min and max 5.4 to 12
 example: raise harborwalk to 12.3' (2.3' tall @ south side of property; 5.1' @ north side of property); install 3' solid wall + 4' glass wall on top of harborwalk; vertical wall from water-side edge of harborwalk to

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					1
	Compatible with existing property-specific plans and land use	incompatible differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of inflilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	incompatible differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					-0.6
5	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0

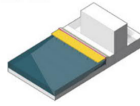
Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Over Water
Group	5

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

OVER WATER



Notes:

Strategic DFE waters edge 19.3
 Minimum DFE 15
 Ground Elevation at Alignment 7.2 to 11.8
 Solution min and max 5.4 to 12
 example: raise harborwalk to 12.3' (2.3' tall @ south side of property; 5.1' @ north side of property); install 3' solid wall + 4' glass wall on top of harborwalk; vertical wall from land-side edge of harborwalk to seabed

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
	Scoring		-3	0	3	
1	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		0
5	Social Equity & Access					0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0

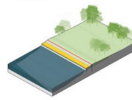
Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Elevated or Constructed Land
Group	5

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

ELEVATED OR
CONSTRUCTED
LAND



Notes:

Strategic DFE waters edge 19.3
 Minimum DFE 15
 Ground Elevation at Alignment 7.2 to 11.8
 Solution min and max 5.4 to 12
 example: raise harborwalk to 12.3' (2.3' tall @ south side of property; 5.1' @ north side of property); install 3' solid wall + 4' glass wall on top of harborwalk; slope living shoreline from water-side edge of harborwalk to seal

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
1	Scoring Effectiveness		-3	0	3	0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-1.8
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	-3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		-3
	Social Equity & Access					0.6
5	Preserves & enhances the Harborwalk including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3

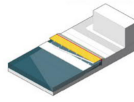
Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Waters Edge
Asset:	Docks
Solution:	Elevated Dock Access
Group:	5

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

ELEVATED DOCK ACCESS



Notes:

Strategic DFE waters edge 19.3
 Minimum DFE 15
 Ground Elevation at Alignment 7.2 to 11.8
 Solution min and max 5.4 to 12
 example: raise harborwalk to 12.3' (2.3' tall @ south side of property; 5.1' @ north side of property); install 3' solid wall + 4' glass wall on top of harborwalk; vertical wall from land-side edge of harborwalk to seabed

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
Scoring			-3	0	3	
1	Effectiveness					0.75
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		0
5	Social Equity & Access					0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0

Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Outboard
Asset:	Harbor Walk
Solution:	Elevated or Constructed Land
Group	5

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	



Notes:

Strategic DFE waters edge 19.3

Minimum DFE 15

Ground Elevation at Alignment 7.2 to 11.8

Solution min and max 5.4 to 12

example: new elevated harborwalk to 12.3'; install 3' solid wall + 4' glass wall on top of harborwalk; vertical wall from water-side edge of harborwalk to seabed; slope living shoreline from water-side edge of harborwalk to :

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
	Scoring		-3	0	3	
1	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
4	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
	Environmental and Additional Benefits					1.5
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments); and no other infill of the Harbor is required	3
5	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3

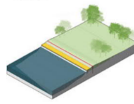
Harbor Towers

Summary:

Group / Property:	Group 5 / P06 - Harbor Towers
Location:	Outboard
Asset:	Open Space
Solution:	Elevated or Constructed Land
Group	5

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

**ELEVATED OR
CONSTRUCTED
LAND**



Notes:

Strategic DFE waters edge 19.3

Minimum DFE 15

Ground Elevation at Alignment 7.2 to 11.8

Solution min and max 5.4 to 12

example: new elevated harborwalk to 12.3'; install 3' solid wall + 4' glass wall on top of harborwalk; vertical wall from water-side edge of harborwalk to seabed; slope living shoreline from water-side edge of harborwalk to :

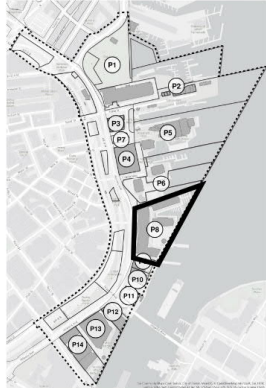
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
	Scoring		-3	0	3	
1	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	3
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	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
5	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
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	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3

Due Diligence and Multi-Criteria Assessment Findings: Rows Wharf

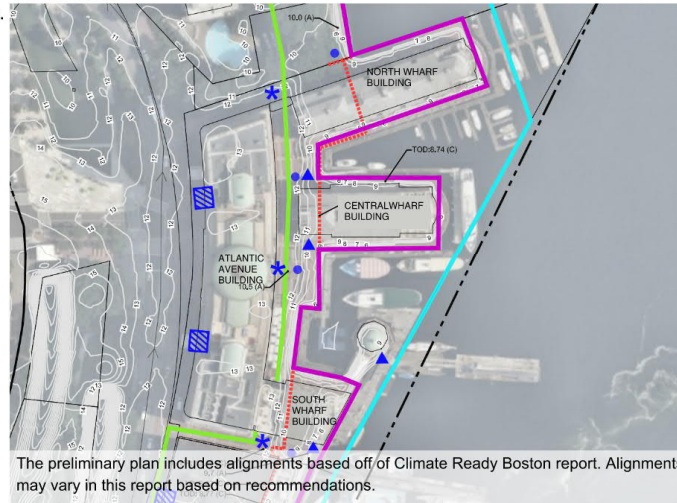
This plan summarizes findings of a multi-criteria assessment used to identify strengths and weaknesses of potential flood resiliency strategies.

KEY PLAN AND LEGEND



-  LIMIT OF STUDY AREA
-  INLAND PRELIMINARY ALIGNMENT
-  WATERS EDGE PRELIMINARY ALIGNMENT
-  OUTBOARD PRELIMINARY ALIGNMENT
-  MAJOR FLOW LINES (CRS)
-  MAJOR RAINFALL PATHS
-  SEAWALL
-  SLURRY WALL
-  10' CONTOUR LINES (LIDAR)
-  MBTA SILVERLINE EASEMENT
-  SPOT GRADE (ARTICLE 37)
-  SPOT GRADE (LIDAR)
-  SPOT GRADE (DATA REPOSITORY)
-  EMERGENCY ACCESS POINT
-  ACCESSIBILITY POINT
-  BUS STOPS
-  WATER TRANSPORTATION ACCESS POINT
-  VEHICULAR ACCESS POINT
-  VENTILATION GRATE

PLAN VIEW



The preliminary plan includes alignments based off of Climate Ready Boston report. Alignment may vary in this report based on recommendations.

KEY CONSIDERATIONS

Geotechnical: The Wharf buildings are supported by concrete caissons bearing in underlying glacial till at depths exceeding 80-ft below ground. An underground garage built using concrete diaphragm walls extends from the Atlantic Avenue building to approximately 10 feet from the seawall.

Coastal Structures: Wharf buildings are located on piers above the Harbor. Wharf building piers extend to till / bedrock A reinforced concrete slurry wall exists approximately 10 feet or more inland of the seawall. The Wharf building floor elevations are lower than the Design Flood Elevations, and therefore may experience significant uplift forces during storms.

Utilities: 42" Storm drain outfall located on the south side of the property.

Rainfall Flow Path: No major rainfall flow path on site.

Emergency Access: to the buildings and waterfront is via the pedestrian walkways from Atlantic Avenue to the Wharf Buildings (center, south-side, north-side of the Atlantic Ave Building) for EMS vehicles & via water access for fire boats.

Pedestrian Access: to the waterfront and retail store fronts occurs along the water's edge where elevations are lowest.

FINDINGS & RECOMMENDATIONS

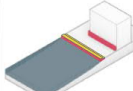
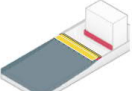
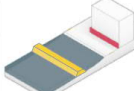
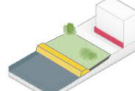
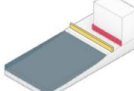
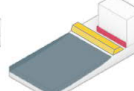
Prerequisite Criteria: The Inland Alignment strategies receive Poor scores for Social Equity & Access due to obstructing water views, and reducing emergency and non-emergency access to the Harborwalk and Wharf buildings. The Outboard Alignment Elevated/Constructed Land strategy and the Water's Edge strategies receive Poor scores for Environmental & Additional Benefits due to infill of the Harbor that does not incorporate living shorelines or wetlands. These strategies are therefore not preferred.

Constructability Criteria: The Outboard Alignment Elevated/Constructed Harborwalk strategy is the most constructable strategy in this assessment, and also scores the highest for the Prerequisite Criteria.

Recommendations:

The Elevated/Constructed Harborwalk strategy at the Outboard Alignment should be considered for the Preferred Flood Protection System, and should incorporate strategies to minimize the following impacts associated within infill of the Harbor: permitting risks, construction costs, long-term O&M costs, and fire boat access.

An Alternative Flood Protection System should be considered at the Inland Alignment and/or along the Rose Kennedy Greenway, and should combine elements of the elevated or constructed land and flood wall strategies to minimize the feasibility and effectiveness risks of the individual strategies.

MULTI-CRITERIA ASSESSMENT		WATER'S EDGE			OUTBOARD		INLAND	
Assessment Key:		STRATEGIES			STRATEGIES		STRATEGIES	
 Superior  Good  Poor		RAISED / STEPPED 	OVER WATER 	ELEVATED DOCK ACCESS 	ELEVATED / CONSTRUCTED HARBORWALK 	ELEVATED / CONSTRUCTED LAND 	FLOOD WALL 	ELEVATED OR CONSTRUCTED LAND 
		RATING			RATING		RATING	
Prerequisite Criteria	SOCIAL EQUITY & ACCESS							
	ENVIRONMENTAL & ADDITIONAL BENEFITS							
Constructability Criteria	EFFECTIVENESS							
	FEASIBILITY							
	ADAPTABILITY							

Rowes Wharf

INDEX	GROUP 4		P8 - Rowes Wharf		
		Solutions List	Inland	Waters Edge	Outboard
1	Building	New bulkhead - Raised/Stepped			
2i		Floodwall			
3w	Harbor Walk	Raised/Stepped/Social			
4w		Over Water			
5w, 5o		Elevated/Constructed Land			
6i, 6o	Open Space	Elevated/Constructed Land			
7w	Dock Access	Elevated/Accessible			
8w	Roadway	Elevated			

Notes:

1. Actual benefits and trade-offs of flood resiliency strategies will be subject to numerous site-specific considerations and can be
2. Critical Infrastructure is defined in Section 2.0 of Boston Public Works Department 2018 Climate Resilient Design Standard &
3. In-kind dock replacement includes relocation to an area on the same property with similar or greater footprint, water depth, and
4. National Register of Historic Places structures in the study area include the Long Wharf and Custom House Block, and the seawall

Definitions:

Facilities of Public Accommodation ("FPAs") are qualified under the State's Waterways Regulations (Chapter 91) as "facilities at A Wharf is a level concrete, stone, or metal platform lying alongside or projecting into water to which a ship may be moored to load

Critical Infrastructure(2)

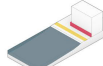
▶ Hospitals and health care facilities ▶ Emergency Response (Police, Fire, Rescue, Ambulance) facilities and related items (garages, shelters, operations centers, communications, back-up generators, substations, etc.) ▶ Correctional facilities ▶ Wastewater treatment plants ▶ Water storage tanks ▶ Operations centers ▶ Public works yards ▶ Municipal buildings ▶ Schools and facilities that may be used as emergency shelters ▶ Power transmission facilities, substations, and power generation stations	▶ Critical transportation networks (emergency evacuation routes, public transportation, aviation facilities, tunnels, bridges, train and transit maintenance yards and shops, traffic signals) ▶ Facilities where residents have limited mobility or ability (such as nursing homes and care facilities) ▶ Buildings or structures that contain hazardous waste; waste transfer stations ▶ Pumping stations (stormwater and sanitary) ▶ Fueling storage and fuel stations ▶ Ventilation buildings and fan plants ▶ Telecommunications ▶ Major food distribution centers
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Rowes Wharf

Summary:

Group / Property:	Group 4 / P08 - Rowes Wharf
Location:	Inland
Asset:	Building
Solution:	Floodwall
Group	4
Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

FLOOD WALL



Notes:

Strategic DFE inland 17.5
 Minimum DFE 15
 Ground Elevation at Alignment 10
 Solution min and max 5 to 8
 example: solid 3' flood wall @ elev 12 with option to raise to 5.5' with glass wall; would require deployable barrier at and/or interior building modifications at raised atrium between South Wharf bldg & Atlantic

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
1	Scoring		-3	0	3	
	Effectiveness					-1.8
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	-3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
2	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline, no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or view of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	0
3	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
	Environmental and Additional Benefits					-0.75
4	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflit aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of inflit aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at intent or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock area, or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		-3
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					-1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
5	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, view/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, view/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3

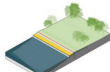
Rowes Wharf

Summary:

Group / Property:	Group 4 / P08 - Rowes Wharf
Location:	Inland
Asset:	Open Space
Solution:	Elevated/Constructed Land
Group	4

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

**ELEVATED OR
CONSTRUCTED
LAND**



Notes:

Strategic DFE inland 17.5
Minimum DFE 15
Ground Elevation at Alignment 10
Solution min and max 5 to 8
example: solid 3' raised walkway between buildings @ elev 12 with option to raise to 5.5 with flood wall along eastern side of walkway; would require deployable barrier at and/or interior building modification

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Effectiveness					-0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive		-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
3	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of inflled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock area or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		-3
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					-1.8
5	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, view/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, view/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3

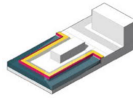
Rowes Wharf

Summary:

Group / Property:	Group 4 / P08 - Rowes Wharf
Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Raised/Stepped
Group	4

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

**RAISED/
STEPPED**



Notes:

Strategic DFE inland 19.5
Minimum DFE 15
Ground Elevation at Alignment 8.5
Solution min and max 5 to 11
example: infill below buildings; raised harborwalk to elev 15 with option for 3.5' flood wall at waters edge, adjacent to lower walkway for egress @ buildings at elev 13 (8.7 for south wharf bldg); alt: raise floor of sout

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Scoring Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	-3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
5	Social Equity & Access					-0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0

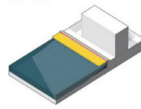
Rowes Wharf

Summary:

Group / Property:	Group 4 / P08 - Rowes Wharf
Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Over Water
Group	4

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

OVER WATER



Notes:

Strategic DFE inland 19.5
Minimum DFE 15
Ground Elevation at Alignment 8.5
Solution min and max 5 to 11

example: infill below buildings; raised harborwalk to elev 15 with option for 3.5' flood wall at waters edge, adjacent to lower walkway for egress @ buildings at elev 13 (8.7 for south wharf bldg); alt: raise floor of sout

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
1	Scoring		-3	0	3	
	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
2	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
3	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
4	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	-3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
5	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					0
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0

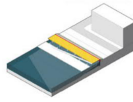
Rowes Wharf

Summary:

Group / Property:	Group 4 / P08 - Rowes Wharf
Location:	Waters Edge
Asset:	Docks
Solution:	Elevated Dock Access
Group	4

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

ELEVATED DOCK ACCESS



Notes:

Strategic DFE inland	19.5
Minimum DFE	15
Ground Elevation at Alignment	8.5
Solution min and max	5 to 11

example: infill below buildings; raised harborwalk to elev 15 with option for 3.5' flood wall at waters edge, adjacent to lower walkway for egress @ buildings at elev 13 (8.7 for south wharf bldg); alt: raise floor of sout

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
	Scoring		-3	0	3	
1	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of infilled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of infilled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	-3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
5	Social Equity & Access					-0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the Harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0

Rowes Wharf

Summary:

Group / Property:	Group 4 / P08 - Rowes Wharf
Location:	Outbound
Asset:	Harbor Walk
Solution:	Elevated or Constructed Harborwalk
Group	4

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	



Notes:

Strategic DFE waters edge 19.5
 Minimum DFE 15
 Ground Elevation at Alignment <8.5
 Solution min and max >5 to 11
 example: infill belowland between buildings creating new open space or wetlands/stormwater storage between buildings; raised outboard harborwalk to elev 15 with option for 3.5' flood wall at waters edge; no change to

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
1	Scoring Effectiveness		-3	0	3	1.2
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
2	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	3
	Feasibility					-1.5
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
3	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
4	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
	Environmental and Additional Benefits					0.75
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of inflled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
5	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3

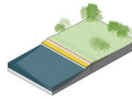
Rowes Wharf

Summary:

Group / Property:	Group 4 / P08 - Rowes Wharf
Location:	Outbound
Asset:	Open Space
Solution:	Elevated or Constructed Land
Group	4

Effectiveness	
Feasibility	
Adaptability	
Environmental and Additional Benefits	
Social Equity & Access	

**ELEVATED OR
CONSTRUCTED
LAND**



Notes:

Strategic DFE waters edge 19.5
Minimum DFE 15
Ground Elevation at Alignment <8.5
Solution min and max >5 to >11
example: infill below and between buildings creating new open space or wetlands/stormwater storage between buildings; raised outboard harborwalk to elev 15 with option for 3.5' flood wall at waters edge; no change to

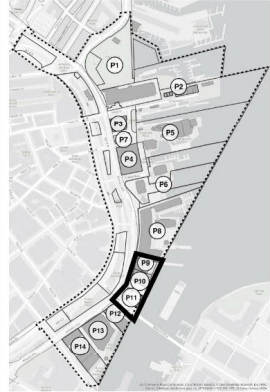
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
1	Scoring Effectiveness		-3	0	3	0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings on the property, or precludes protection of immediately adjacent buildings or critical infrastructure(2)	protects all buildings on the property, and facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
2	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
3	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3
4	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor; no compensatory mitigation of inflled aquatic resources identified	requires infill of the Harbor that isn't a new living shoreline or wetland; compensatory mitigation of inflled aquatic resources identified	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	-3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharfs or structures included in the National Register of Historic Places(4)		0
5	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3

Due Diligence and Multi-Criteria Assessment Findings: Northern Avenue

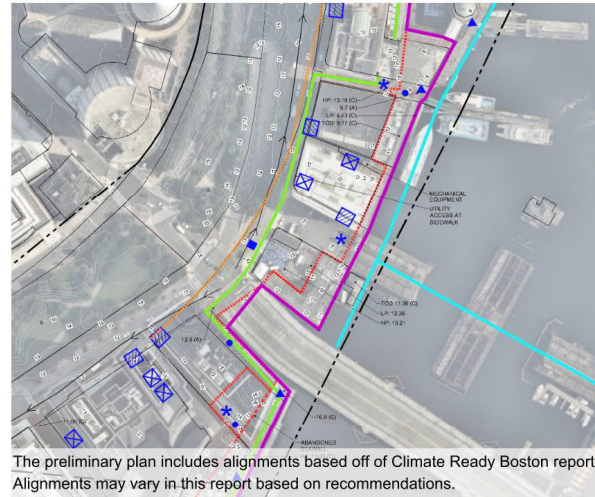
This plan summarizes findings of a multi-criteria assessment used to identify strengths and weaknesses of potential flood resiliency strategies.

KEY PLAN AND LEGEND



-  LIMIT OF STUDY AREA
-  INLAND PRELIMINARY ALIGNMENT
-  WATERS EDGE PRELIMINARY ALIGNMENT
-  OUTBOARD PRELIMINARY ALIGNMENT
-  MAJOR FLOW LINES (CRS)
-  MAJOR RAINFALL PATHS
-  SEAWALL
-  SLURRY WALL
-  1' CONTOUR LINES (LIDAR)
-  MBTA SILVERLINE EASEMENT
-  SPOT GRADE (ARTICLE 37)
-  SPOT GRADE (LIDAR)
-  SPOT GRADE (DATA REPOSITORY)
-  EMERGENCY ACCESS POINT
-  ACCESSIBILITY POINT
-  BUS STOPS
-  WATER TRANSPORTATION ACCESS POINT
-  VEHICULAR ACCESS POINT
-  VENTILATION GRATE

PLAN VIEW



The preliminary plan includes alignments based off of Climate Ready Boston report. Alignments may vary in this report based on recommendations.

KEY CONSIDERATIONS

Geotechnical: 400 Atlantic building piles are driven into deep till / bedrock. Williams Coast Guard building piles may rest in clay and be subject to settlement from new structural loads. There are numerous piles at the James Hook + Co decking system which may present obstructions for sheet pile walls.

Coastal Structures: Seawall conditions were not assessed due to access constraints with piers and deck systems located in front of sea walls. Detailed sea wall assessment recommended.

Utilities: Sewer outfalls are located under the Seaport Blvd bridge and at 400 Atlantic Avenue. A 10" sewer line is located under the centerline of Northern Avenue. Numerous underground utilities are located under Seaport Blvd / Atlantic Ave intersection. Independence Wharf & the Williams Coast Guard Building have below ground utility rooms. The Williams Coast Guard Building includes a cooling tower along the Harborwalk. J Hook Co site includes a pump house with intake pipes from the Harbor.

Access: I-93 Tunnel access is located at Seaport Blvd / Atlantic Ave intersection & is a local evacuation route. Northern Ave is utilized for emergency access. James Hook + Co parking lot provides access for deliveries.

Other Considerations: The seawall between Rows Wharf and Congress St is listed in the National Register of Historic Places.

FINDINGS & RECOMMENDATIONS

Prerequisite Criteria: The Inland alignment Flood Wall strategy is not preferred due to receiving a Poor Social Equity & Access score due to reducing access to the Harborwalk and waterfront buildings. The Water's Edge alignment Raised/Stepped and Elevated Roadway/Harborwalk strategies are not preferred for receiving a Poor Environmental & Additional Benefits score due to infill of the Harbor and impacting views of the historic seawall. All strategies that allow vehicular traffic over the two bridges have a Poor score in one of the two Prerequisite Criteria.

Constructibility Criteria: The Water's Edge alignment Over Water and Elevated Dock strategies and the Inland alignment Elevated / Constructed Land strategy are the most constructible strategies in this study. The Inland Alignment Elevated / Constructed Land strategy is only applicable as a transition between Outboard and Inland alignments at 400 Atlantic Avenue.

Recommendations: The Water's Edge alignment Over Water and Elevated Dock strategies should be considered for the Preferred Flood Protection System, and should incorporate approaches to mitigate impacts on views of the historic sea walls. Deployable flood walls should be considered at Seaport Boulevard and Northern Avenue Bridge. Conversion of Northern Avenue bridge into a flood gate should be further investigated to protect all upstream properties along the Fort Point Channel.

MULTI-CRITERIA ASSESSMENT		INLAND			WATER'S EDGE					OUTBOARD	
Assessment Key:		STRATEGIES									
		 Superior  Good  Poor	FLOOD WALL (Atlantic Ave & at Seaport Blvd & Northern Ave)	ELEVATED OR CONSTRUCTED LAND (400 Atlantic @ Rowes Wharf)	ELEVATED ROADWAY/ SIDEWALK (Atlantic Ave north of Seaport Blvd)	RAISED/ STEPPED (north of Seaport Blvd)	OVER WATER (north of Seaport Blvd)	ELEVATED / CONSTRUCTED LAND (north of Seaport Blvd)	ELEVATED DOCK (north of Seaport Blvd)	ELEVATED ROADWAY/ HARBOURWALK (Seaport Blvd & Northern Avenue)	ELEVATED / CONSTRUCTED LAND (400 Atlantic to James Hook + Co)
		RATING									
Prerequisite Criteria	SOCIAL EQUITY & ACCESS										
	ENVIRONMENTAL & ADDITIONAL BENEFITS										
Constructability Criteria	EFFECTIVENESS										
	FEASIBILITY										
	ADAPTABILITY										

Northern Avenue

INDEX	GROUP 2	Solutions List	P9 - 400 Atlantic			P10 - Williams Building (Coast Guard)			P11 - James Hook + Co.			R5 - Northern Ave			R7 - Seaport Blvd		
			Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard
1	Building	New bulkhead - Raised/Stepped															
2i		Floodwall															
3w	Harbor Walk	Raised/Stepped/Social															
4w		Over Water															
5w, 5o		Elevated/Constructed Land															
6i, 6o	Open Space	Elevated/Constructed Land															
7w	Dock Access	Elevated/Accessible															
8i,8w	Roadway	Elevated															

Notes:

1. Actual benefits and trade-offs of flood resiliency strategies will be subject to numerous site-specific considerations and can be influenced by nuanced detailed design approaches. This process provides simplified Evaluation Criteria definitions for each score to provide a transparent and repeatable high level assessment of the relative potential benefits and trade-offs for comparing the major components of various flood resiliency strategies.

2. Critical Infrastructure is defined in Section 2.0 of Boston Public Works Department 2018 Climate Resilient Design Standard & Guidelines

3. In-kind dock replacement includes relocation to an area on the same property with similar or greater footprint, water depth, and protection from wind and waves. In-kind water transportation access point replacement includes relocation to an area on the same property with similar accessibility, connectivity, and visibility. In-kind private open space replacement includes relocation to an area on the same property with similar or greater footprint and access points.

4. National Register of Historic Places structures in the study area include the Long Wharf and Custom House Block, and the seawall between 360-400 Atlantic Avenue and Congress Street.

Definitions:

Facilities of Public Accommodation ("FPAs") are qualified under the State's Waterways Regulations (Chapter 91) as "facilities at which goods or services are made available directly to the public on a regular basis, or at which the advantages of use are otherwise open on essentially equal terms to the public at large." FPA space is located in buildings along the City's waterfront and is required through Chapter 91 licensing for new or redevelopment projects. Examples of interior facilities of public accommodation referenced in the regulations include restaurants, performance areas, hotels, retail establishments, and educational and cultural institutions.

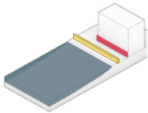
A Wharf is a level concrete, stone, or metal platform lying alongside or projecting into water to which a ship may be moored to load and unload. Adequate water depth for ships must exist alongside the structure to be defined as a wharf. The structure must be of adequate size and configuration to allow ships to moore to be defined as a wharf.

Critical Infrastructure(2)

► Hospitals and health care facilities ► Emergency Response (Police, Fire, Rescue, Ambulance) facilities and related items (garages, shelters, operations centers, communications, back-up generators, substations, etc.) ► Correctional facilities ► Wastewater treatment plants ► Water storage tanks ► Operations centers ► Public works yards ► Municipal buildings ► Schools and facilities that may be used as emergency shelters ► Power transmission facilities, substations, and power generation stations	► Critical transportation networks (emergency evacuation routes, public transportation, aviation facilities, tunnels, bridges, train and transit maintenance yards and shops, traffic signals) ► Facilities where residents have limited mobility or ability (such as nursing homes and care facilities) ► Buildings or structures that contain hazardous waste; waste transfer stations ► Pumping stations (stormwater and sanitary) ► Fueling storage and fuel stations ► Ventilation buildings and fan plants ► Telecommunications ► Major food distribution centers
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Northern Avenue

Summary:

Location:	Inland
Asset:	Building
Solution:	Floodwall
Group:	Group 2: Atlantic Ave & at Seaport Blvd & Northern Ave
Social Equity & Access	FLOODWALL 
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

Notes:

Strategic DFE inland
Minimum DFE
Ground Elevation at Alignmen
Solution min and map

17.4			
15.04			
8.0	to		10.0
5.0	to		9.4

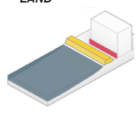
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
1	Scoring		-3	0	3	
	Social Equity & Access					-1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	-3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number of access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3
2	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock area or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					-0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					0
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	3
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	no potential for phased implementation		strategy can be implemented progressively with sea level rise	3

Northern Avenue

Summary:

Location:	Inland
Asset:	Open Space
Solution:	Elevated/Constructed Land
Group:	Group 2: 400 Atlantic @ Rowes Wharf
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	



ELEVATED OR CONSTRUCTED LAND

Notes:

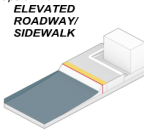
Strategic DFE inland	17.4			
Minimum DFE	15.04			
Ground Elevation at Alignment	8.0	to		10.0
Solution min and max	5.0	to		9.4

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					-0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
2	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3
	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3	Effectiveness					0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area			-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					0
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	3
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
5	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Northern Avenue

Summary:

Location:	Inland		
Asset:	Roadway		
Solution:	Elevated Roadway & Harborwalk		
Group	Group 2: Atlantic Ave North of Seaport Blvd		
Social Equity & Access	 ELEVATED ROADWAY/ SIDEWALK		
Environmental and Additional Benefits			
Effectiveness			
Feasibility			
Adaptability			
Notes:			
Strategic DFE Inland	17.4		
Minimum DFE	15.04		
Ground Elevation at Alignment	8.0	to	10.0
Solution min and max	5.0	to	9.4

Scoring:

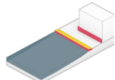
	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					0
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
2	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
3	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
	Effectiveness					0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection / resilience system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		-3
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
4	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
5	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
	Adaptability					0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Northern Avenue

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Raised/Stepped
Group	Group 2: North of Seaport Blvd
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

**RAISED/
STEPPED**



Notes:

Strategic DFE inland
Minimum DFE
Ground Elevation at Alignmen
Solution min and map

19.1			
15.04			
8.0	to	10.0	
5.0	to	11.1	

Scoring:

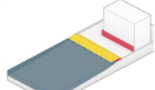
	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Scoring					
	Social Equity & Access					0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
2	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE, can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive		-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor; or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-3
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Northern Avenue

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Over Water
Group	Group 2: North of Seaport Blvd
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

OVER WATER



Notes:

Strategic DFE inland	19.1			
Minimum DFE	15.04			
Ground Elevation at Alignment	8.0	to	10.0	
Solution min and max	5.0	to	11.1	

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
2	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points; or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection of a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Northern Avenue

Summary:

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Elevated or Constructed Land
Group:	Group 2: North of Seaport Blvd
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

Notes:

Strategic DFE inland

Minimum DFE

Ground Elevation at Alignment

Solution min and max

19.1				
15.04				
8.0	to		10.0	
5.0	to		11.1	

ELEVATED OR CONSTRUCTED LAND

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	-3
2	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
	Effectiveness					0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection of a major rainfall pathway with the flood protection system	0
	Feasibility					-3
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
3	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Northern Avenue

Summary:

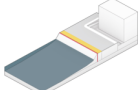
Location:	Waters Edge			
Asset:	Docks			
Solution:	Elevated Dock Access			
Group:	Group 2: North of Seaport Blvd			
Social Equity & Access		ELEVATED DOCK ACCESS 		
Environmental and Additional Benefits				
Effectiveness				
Feasibility				
Adaptability				
Notes:				
Strategic DFE inland	19.1			
Minimum DFE	15.04			
Ground Elevation at Alignment	8.0	to	10.0	
Solution min and max	5.0	to	11.1	

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor -3	Good 0	Superior 3	
1	Scoring					
	Social Equity & Access					1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
2	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	0
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	Impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-0.6
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	0
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Northern Avenue

Summary:

Location:	Waters Edge
Asset:	Roadway
Solution:	Elevated Roadway & Harborwalk
Group	Group 2: Seaport Blvd & Northern Ave
Social Equity & Access	ELEVATED ROADWAY & 
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	
Notes:	
Strategic DFE inland	17.4
Minimum DFE	15.04
Ground Elevation at Alignmen	8.0
Solution min and max	5.0 to 10.0
	to 9.4

Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
	Scoring		-3	0	3	
1	Social Equity & Access					0
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resiliency across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4	Feasibility					-2.4
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
5	Adaptability					-1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	-3
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	0

Northern Avenue

Summary:

Location:	Outboard
Asset:	Open Space
Solution:	Elevated or Constructed Land
Group	Group 2: 400 Atlantic to James Hook + Co.
Social Equity & Access	ELEVATED OR CONSTRUCTED LAND 
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	
Notes:	
Strategic DFE inland	19.1
Minimum DFE	15.04
Ground Elevation at Alignment	8.0
Solution min and max	5.0
	to
	10.0
	to
	11.1

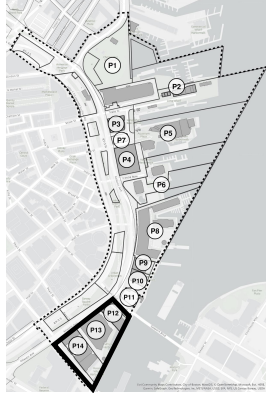
Scoring:

	Criteria Description	Screening Criteria	Assessment Criteria ⁽¹⁾			Assessment Score
			Poor	Good	Superior	
			-3	0	3	
1	Social Equity & Access					1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	3
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	3
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	3
2	Environmental and Additional Benefits					-0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully replaces existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock master	-3
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					0.6
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive		-3
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor; or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	3
4	Feasibility					-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost	strategy located outboard of seawall / shoreline	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		0
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Due Diligence and Multi-Criteria Assessment Findings: Fort Point Channel

This plan summarizes findings of a multi-criteria assessment used to identify strengths and weaknesses of potential flood resiliency strategies.

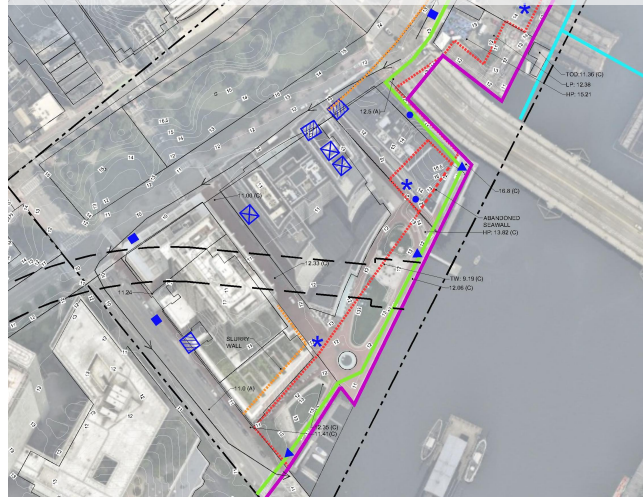
KEY PLAN AND LEGEND



- LIMIT OF STUDY AREA
- INLAND PRELIMINARY ALIGNMENT
- WATERS EDGE PRELIMINARY ALIGNMENT
- OUTBOARD PRELIMINARY ALIGNMENT
- MAJOR FLOW LINES (CRS)
- MAJOR RAINFALL PATHS
- SEAWALL
- SLURRY WALL
- 10 1' CONTOUR LINES (LIDAR)
- MBTA SILVERLINE EASEMENT
- 10.0 (A) SPOT GRADE (ARTICLE 37)
- 10.0 (B) SPOT GRADE (LIDAR)
- 10.0 (C) SPOT GRADE (DATA REPOSITORY)
- * EMERGENCY ACCESS POINT
- ACCESSIBILITY POINT
- BUS STOPS
- WATER TRANSPORTATION ACCESS POINT
- VEHICULAR ACCESS POINT
- VENTILATION GRATE

PLAN VIEW

The preliminary plan includes alignments based off of Climate Ready Boston report. Alignments may vary in this report based on recommendations.



KEY CONSIDERATIONS

Geotechnical: The building at Independence Wharf is supported on Bell Caisson piles driven into clay. The Fort Point Channel mudline along the waterfront properties is estimated to be approximately elevation -10' NAVD88.

Coastal Structures: Indications of building settlement observed at Independence Wharf, and the associated sea wall is in critical condition. The MBTA Silver Line tunnel is located below the Harborwalk at Intercontinental Hotel, with estimated top of tunnel elevation of -14.9' to -18.7' NAVD88.

Utilities: Outfall pipes observed at Intercontinental Hotel and Atlantic Wharf. CA/T vent observed at Intercontinental Hotel.

Rainfall Flow Path: A major flow path at Congress Street directs rainfall to the Fort Point Channel. Storm drains around the buildings and in the Harborwalk deck direct rainwater into the building drainage systems.

Access: The alley between Intercontinental Hotel and Atlantic Wharf is used for generator fuel deliveries, access to a MassDOT facility located in Intercontinental Hotel, and for emergency vehicle access to the Harborwalk.

Regulatory: Structures outboard of the State Harbor Line (roughly at the face of InterContinental Hotel deck) generally require Massachusetts legislative authorization. Seawalls in this area are listed in the National Register of Historic Places. Access to the Harborwalk via the alley between Atlantic Wharf and Intercontinental Hotel, and public programming of the Harborwalk deck are Chapter 91 requirements.

FINDINGS & RECOMMENDATIONS

Prerequisite Criteria: The Inland alignment Flood Wall, Elevated / Constructed Land, and Deployable Barrier strategies are not preferred due to Poor Social Equity & Access scores resulting from reducing Harborwalk access. The Water's Edge Flood Wall, Raised/Stepped, and Over Water strategies are not preferred due to Poor Environmental & Additional Benefits scores resulting from impacting the visibility of historic seawalls and infilling the channel.

Constructability Criteria: The Water's Edge alignment Elevated Dock and Elevated/Constructed Land strategies are the most constructable strategies in this study, however the Elevated/Constructed Land strategy is not recommended due to potentially impacting navigable waters in Fort Point Channel and adding loading to the MBTA tunnel.

Recommendations: The Water's Edge alignment Elevated Dock strategy should be considered for the Preferred Flood Protection System, and should be designed to avoid increasing loads at the MBTA tunnel and Independence Wharf, and mitigate impacted views of historic sea walls. Coordination is required with City of Boston to continue the flood protection system south along the Channel. Conversion of Northern Avenue bridge into a flood gate should also be further investigated to protect all properties along the Channel.

MULTI-CRITERIA ASSESSMENT		INLAND					WATER'S EDGE				
Assessment Key:		STRATEGIES					STRATEGIES				
		FLOOD WALL (ATLANTIC WHARF & INTERCONTINENTAL)	ELEVATED / CONSTRUCTED LAND (ATLANTIC WHARF & INTERCONTINENTAL)	ELEVATED ROADWAY/ HARBORWALK (CONGRESS ST.)	DEPLOYABLE BARRIER (CONGRESS ST. @ DORCHESTER AVE.)		FLOOD WALL (INDEPENDENCE WHARF)	RAISED/ STEPPED (ATLANTIC WHARF & INTERCONTINENTAL)	OVER WATER (ALL PROPERTIES)	ELEVATED DOCK (ALL PROPERTIES)	ELEVATED / CONSTRUCTED LAND (ALL PROPERTIES)
		RATING					RATING				
Prerequisite Criteria	SOCIAL EQUITY & ACCESS	●	●	●	●		●	●	●	●	●
	ENVIRONMENTAL & ADDITIONAL BENEFITS	●	●	●	●		●	●	●	●	●
Constructability Criteria	EFFECTIVENESS	●	●	●	●		●	●	●	●	●
	FEASIBILITY	●	●	●	●		●	●	●	●	●
	ADAPTABILITY	●	●	●	●		●	●	●	●	●

Fort Point Channel

INDEX	GROUP 5	Solutions List	Atlantic Wharf			InterContinental Hotel Condos			Independence Wharf			Congress St.		
			Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Edge	Outboard	Inland	Waters Ed	Outboard
1	Building	New bulkhead - Raised/Stepped												
2i, 2w		Floodwall												
3w	Harbor Walk	Raised/Stepped/Social												
4w		Over Water												
5w		Elevated/Constructed Land												
6i	Open Space	Elevated/Constructed Land												
7w	Dock Access	Elevated/Accessible												
8w	Roadway	Elevated												
9i, 9w	Applicable to All	Deployable Barrier												

Notes:

- Actual benefits and trade-offs of flood resiliency strategies will be subject to numerous site-specific considerations and can be influenced by nuanced detailed design approaches. This process provides simplified Evaluation Criteria definitions for each score to provide a transparent and repeatable high level assessment of the relative potential benefits and trade-offs for comparing the major components of various flood resiliency strategies.
- Critical Infrastructure is defined in Section 2.0 of Boston Public Works Department 2018 Climate Resilient Design Standard & Guidelines
- In-kind dock replacement includes relocation to an area on the same property with similar or greater footprint, water depth, and protection from wind and waves. In-kind water transportation access point replacement includes relocation to an area on the same property with similar accessibility, connectivity, and visibility. In-kind private open space replacement includes relocation to an area on the same property with similar or greater footprint and access points.
- National Register of Historic Places structures in the study area include the Long Wharf and Custom House Block, and the seawall between 360-400 Atlantic Avenue and Congress Street.

Definitions:

Facilities of Public Accommodation ("FPAs") are qualified under the State's Waterways Regulations (Chapter 91) as "facilities at which goods or services are made available directly to the public on a regular basis, or at which the advantages of use are otherwise open on essentially equal terms to the public at large." FPA space is located in buildings along the City's waterfront and is required through Chapter 91 licensing for new or redevelopment projects. Examples of interior facilities of public accommodation referenced in the regulations include restaurants, performance areas, hotels, retail establishments, and educational and cultural institutions.

A Wharf is a level concrete, stone, or metal platform lying alongside or projecting into water to which a ship may be moored to load and unload. Adequate water depth for ships must exist alongside the structure to be defined as a wharf. The structure must be of adequate size and configuration to allow ships to moore to be defined as a wharf.

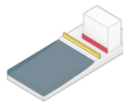
Critical Infrastructure(2)

- | | |
|--|--|
| <ul style="list-style-type: none"> ► Hospitals and health care facilities ► Emergency Response (Police, Fire, Rescue, Ambulance) facilities and related items (garages, shelters, operations centers, communications, back-up generators, substations, etc.) ► Correctional facilities ► Wastewater treatment plants ► Water storage tanks ► Operations centers ► Public works yards ► Municipal buildings ► Schools and facilities that may be used as emergency shelters ► Power transmission facilities, substations, and power generation stations | <ul style="list-style-type: none"> ► Critical transportation networks (emergency evacuation routes, public transportation, aviation facilities, tunnels, bridges, train and transit maintenance yards and shops, traffic signals) ► Facilities where residents have limited mobility or ability (such as nursing homes and care facilities) ► Buildings or structures that contain hazardous waste; waste transfer stations ► Pumping stations (stormwater and sanitary) ► Fueling storage and fuel stations ► Ventilation buildings and fan plants ► Telecommunications ► Major food distribution centers |
|--|--|

Fort Point Channel

Location:	Inland
Asset:	Building
Solution:	Floodwall
Group:	1, Atlantic Wharf and Intercontinental Hotel
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

FLOODWALL



Notes:

Strategic DFE Inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

16.6
15
12
3 to 5

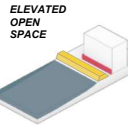
Scoring:

	Criteria Description	Assessment Score				Assessment Score
		"Non-starter"	Negative	Neutral	Positive	
	Scoring		-3	0	3	
1	Social Equity & Access					-1.8
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3
2	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to docks, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					1.5
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	3
4	Feasibility					-3
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long-term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Fort Point Channel

Location: Inland
Asset: Building
Solution: Elevated Open Space
Group: 1, Atlantic Wharf and Intercontinental Hotel

Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	



Notes:

Strategic DFE Inland 16.6
Minimum DFE 15
Ground Elevation at Alignment 12
Solution min and max 3 to 5

Scoring:

	Criteria Description	Assessment Score				Assessment Score
		"Non-starter"	Negative	Neutral	Positive	
1	Scoring		-3	0	3	-1.2
	Social Equity & Access					
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	-3
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3
2	Environmental and Additional Benefits					0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	3
	Preserves & enhances docks & water transportation functionality and access	irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
3	Effectiveness					1.2
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE, cannot be raised to Strategic DFE		Meets Target DFE, can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	3
4	Feasibility					-3
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPAs (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long-term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5	Adaptability					1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-	no potential for phased implementation	no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Fort Point Channel

Location: Inland
Asset: Roadway
Solution: Elevated
Group: 1, Congress St. / Dorchester Ave Intersection

Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

ELEVATED ROADWAY & HARBOR WALK



Notes:
Strategic DFE inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

18.6
15
12
3 to 7

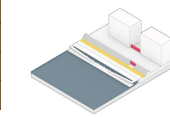
Scoring:

	Criteria Description	Assessment Score			Assessment Score
		"Non-starter"	Negative -3	Neutral 0	Positive 3
5	Scoring:				
	Social Equity & Access				0
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the Harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality	
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department
4	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)
	Environmental and Additional Benefits				0
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)	
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)	
1	Effectiveness				0
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE, cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor, no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system
2	Feasibility				-1.2
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline, no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline
	Minimizes long-term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components	
3	Adaptability				0
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner
	Compatible with district-wide and abutting property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise

Fort Point Channel

Location: Inland
Asset: All
Solution: Deployable Barrier
Group: 1, Congress St. / Dorchester Ave Intersection

Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	



Notes:
Strategic DFE inland 16.6
Minimum DFE 15
Ground Elevation at Alignment 12
Solution min and max 3 to 5

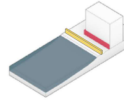
Scoring:

Criteria Description	Assessment Score				Assessment Score
	"Non-starter"	Negative	Neutral	Positive	
Scoring		-3	0	3	
1 Social Equity & Access					-1.8
Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	-3
Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		0
Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	improves function of existing emergency access, or preferred by Boston Fire Department	-3
Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	-3
2 Environmental and Additional Benefits					0
Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new living shorelines or wetlands (e.g. elevated constructed land at inland alignment), and no other infill of the Harbor is required	0
Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or is preferred by dock owner	0
Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		0
3 Effectiveness					0
Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	-3
Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge		0
Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
4 Feasibility					0
Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	0
Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	0
Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	0
Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline	strategy located on existing land more than 30 feet away from seawall / shoreline	3
Minimizes long-term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
5 Adaptability					1
Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
Compatible with district-wide and abutting property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of immediately adjacent buildings or critical infrastructure(2)	facilitates protection of immediately adjacent buildings and critical infrastructure(2)		0
Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Fort Point Channel

Location:	Inland
Asset:	Building
Solution:	Floodwall
Group:	1; Independence Wharf
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

FLOODWALL



Notes:

Strategic DFE Inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

16.6
15
12
3 to 5

Scoring:

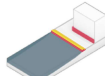
	Criteria Description	Assessment Score				Assessment Score
		"Non-starter"	Negative	Neutral	Positive	
	Scoring		-3	0	3	
1	Social Equity & Access					-0.6
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)	0
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces	0
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality		-3
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department	0
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)	0
2	Environmental and Additional Benefits					-1.5
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required	-3
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to docks, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner	0
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)		0
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)		-3
	Effectiveness					0.75
3	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system	0
	Feasibility					-3
4	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement	-3
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower	-3
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)	-3
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline	-3
	Minimizes long-term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components		-3
	Adaptability					1
5	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner	0
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area		0
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise	3

Fort Point Channel

Location: Waters Edge
Asset: Harbor Walk
Solution: Raised/Stepped Harbor Walk
Group: 1, Atlantic Wharf and Intercontinental Hotel

Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

RAISED/
STEPPED



Notes:
Strategic DFE inland 18.6
Minimum DFE 15
Ground Elevation at Alignment 12
Solution min and max 3 to 7

Scoring:

	Criteria Description	Assessment Score			Assessment Score
		"Non-starter"	Negative -3	Neutral 0	Positive 3
1	Scoring				
	Social Equity & Access				0
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous Harborwalk, or eliminates (licensed facilities of public accommodation (FPAs))	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality	
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department
2	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)
	Environmental and Additional Benefits				-1.5
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)	
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)	
3	Effectiveness				1.2
	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE	Meets Target DFE; can be raised to Strategic DFE	3
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	0
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	0
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system
4	Feasibility				-3
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline
	Minimizes long-term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components	
5	Adaptability				1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise

Fort Point Channel

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Over Water
Group:	1; All Properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

OVER WATER



Notes:
Strategic DFE inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

18.6
15
12
3 to 7

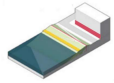
Scoring:

	Criteria Description	Assessment Score			Assessment Score
		"Non-starter"	Negative -3	Neutral 0	Positive 3
1	Scoring:				
	Social Equity & Access				1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality	
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)
2	Environmental and Additional Benefits				-1.5
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)	
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)	
	Effectiveness				-3
	Meets Design Flood Elevations (DFE)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE	Meets Target DFE; can be raised to Strategic DFE	3
3	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	-
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system
	Feasibility				-3
	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower
4	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)
	Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline
	Minimizes long-term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components	
	Adaptability				1
	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner
	Compatible with district-wide and abutting-property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Provides opportunities for phased implementation	-	-	no potential for phased implementation	strategy can be implemented progressively with sea level rise
5					3

Fort Point Channel

Location:	Waters Edge
Asset:	Harbor Walk
Solution:	Elevated or Constructed Land
Group:	1; All Properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	

ELEVATED OR
CONSTRUCTED
LAND



Notes:
Strategic DFE inland
Minimum DFE
Ground Elevation at Alignment
Solution min and max

18.6
15
12
3 to 7

Scoring:

1

Criteria Description	Assessment Score			Assessment Score
	"Non-starter"	Negative	Neutral	
1		-3	0	3
Social Equity & Access				1.8
Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)
Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, view/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces
Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality	
Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department
Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)
2				-0.75
Environmental and Additional Benefits				3
Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required
Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points, or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner
Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)	
Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)	
3				-3
Effectiveness				1.2
Meets Design Flood Elevations (DFE)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE
Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
Minimizes deployment complexity	fully deployable	partially deployable	fully passive	
Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	
Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system
4				-3
Feasibility				-3
Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement
Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower
Minimizes permitting risks	strategy located outboard of existing seawall / shoreline, no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPAs(3) (Facility of Public Accommodation)
Minimizes construction cost	-	strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline
Minimizes long-term operations & maintenance costs	-	includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components	
5				1
Adaptability				0
Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner
Compatible with district-wide and abutting property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise

Fort Point Channel

Location:	Waters Edge
Asset:	Docks
Solution:	Elevated Dock
Group:	1; All Properties
Social Equity & Access	
Environmental and Additional Benefits	
Effectiveness	
Feasibility	
Adaptability	
Notes:	
Strategic DFE inland	18.6
Minimum DFE	15
Ground Elevation at Alignment	12
Solution min and max	3 to 7



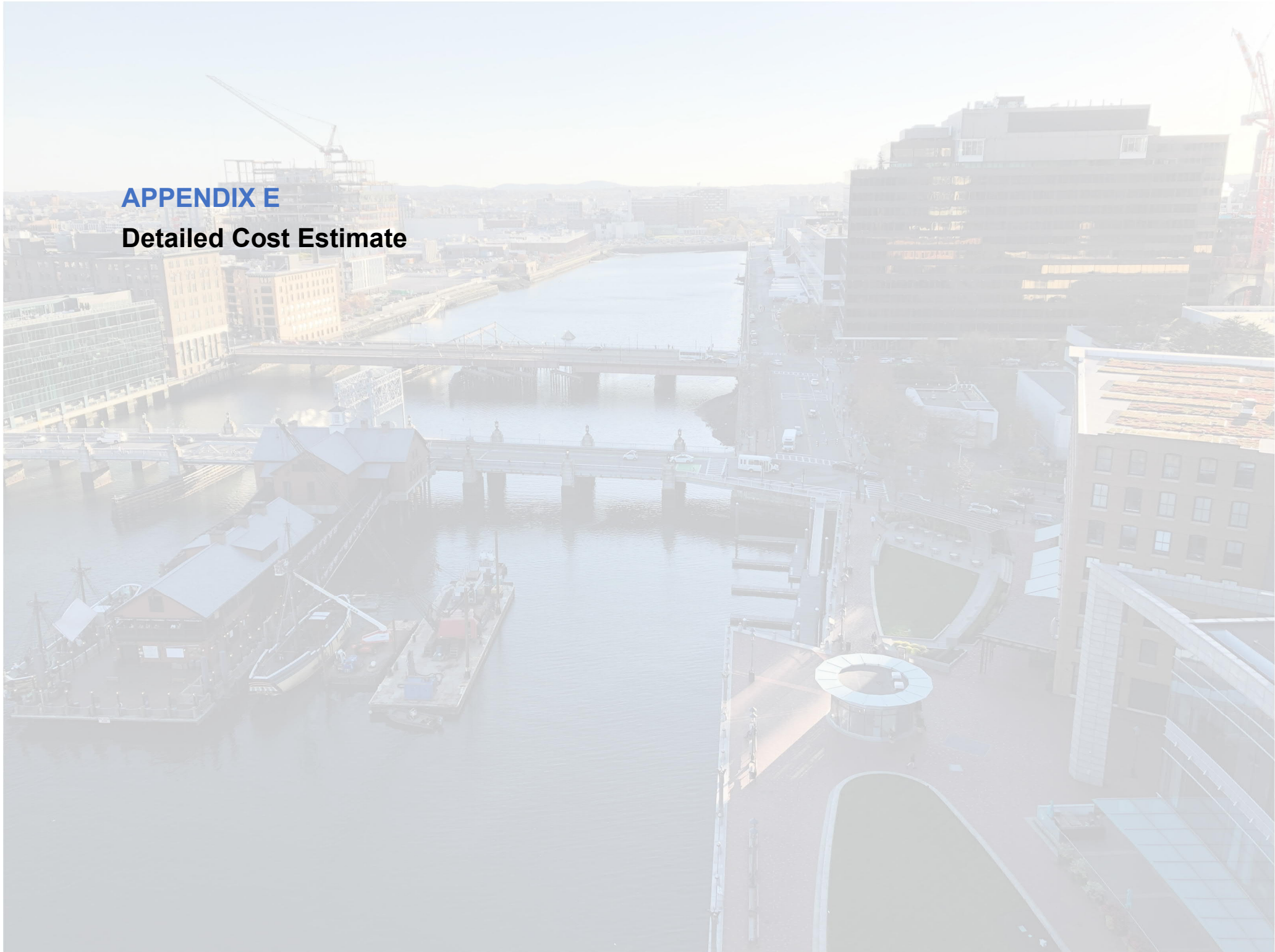
ELEVATED DOCK ACCESS

Scoring:

	Criteria Description	Assessment Score			Assessment Score
		“Non-starter”	Negative -3	Neutral 0	Positive 3
1	Social Equity & Access				1.2
	Preserves & enhances the Harborwalk, including welcoming & inclusive access and signage	Reduces width of Harborwalk, obstructs view of water from Harborwalk, precludes or adversely impacts contiguous harborwalk, or eliminates licensed facilities of public accommodation (FPAs)	reduces access points to the Harborwalk	enables contiguous harborwalk, does not reduce access to, width of, or water views from the harborwalk, and maintains access to existing facilities of public accommodation (FPAs)	increases harborwalk width or views of water, or includes new facilities of public accommodation (FPAs)
	Preserves & enhances outdoor public spaces, including welcoming & inclusive access and signage	eliminates public access to existing open space	reduces the size of, access to, views/wayfinding to, or signage for open public space	no reduction in size of, number of access points to, views/wayfinding to, or signage for open public space	increases the size of open public spaces or creates new open public spaces
	Preserves & enhances view of the Harbor	-	fully or partially obstructed	preserves current view quality	
	Preserves & enhances emergency access	blocks any evacuation route, or blocks all existing emergency access routes to buildings or docks, or results in unacceptable loss of functionality of existing emergency access as determined by the Boston Fire Department	blocks existing emergency access routes to buildings or docks (including for fire boats), but alternative access routes remain and are not impacted	no impact on existing emergency access routes to buildings or docks	Improves function of existing emergency access, or preferred by Boston Fire Department
	Preserves & enhances non-emergency access to the waterfront, public transportation, & buildings	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; no practical alternatives to impacted access points exist	eliminates access to Harborwalk Accessibility Points, Water Transportation Access Points, bus/subway facilities, parking garages, or loading areas; alternative access routes are available or created	no reduction in the number access routes to the waterfront, and no loss of functionality of existing access program to loading areas, garages, building entrances, or bus/subway facilities	creates new public access points to the waterfront (including living shorelines)
					0
2	Environmental and Additional Benefits				-0.75
	Preserves & enhances environmental resources	infills Harbor for reasons not associated with flood resiliency	requires infill of the Harbor that isn't a new living shoreline or wetland	does not infill Harbor	Provides new opportunities for trees, living shorelines, or wetlands (e.g. elevated constructed land at inland or waters edge alignments), and no other infill of the Harbor is required
	Preserves & enhances docks & water transportation functionality and access	Irreconcilable differences with existing use (e.g. fully eliminates existing dock areas or all water transportation access points to any dock); in-kind replacements not identified(3)	requires reduction in function or access to docks (e.g. partially reduces existing dock area or the number of water transportation access points); in-kind replacements not identified(3)	No impact on existing dock area or access to water transportation access points, or in-kind replacements(3) identified for any reduction of existing dock area or water transportation access points	Increases dock area, or increases or improves water transportation access points; or facilitates development of a new water transportation center at Long Wharf, or is preferred by dock owner
	Minimizes outdoor private land use impacts	eliminates private open space, or eliminates all access to existing private open space	reduces open private space size or access points	maintains or increases open private space size and access points, or in-kind replacements identified(3)	
	Compatible with the district's architectural & urban context, including the functionality & visibility of wharves and historic resources	-	impacts the visibility or use of the district's heritage and historic resources, including impacting the function of wharves, or impacting structures listed in the National Register of Historic Places(4)	no impact, or highlights the visibility of the district's heritage and history, including wharves or structures included in the National Register of Historic Places(4)	
					-3
	Effectiveness				1.2
3	Meets Design Flood Elevations (DFEs)	does not meet Target DFE	meets Target DFE; cannot be raised to Strategic DFE		Meets Target DFE; can be raised to Strategic DFE
	Facilitates continuous line of protection / resilience across the entire district	precludes continuous flood protection system for the district	does not protect all buildings in the study area, or precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	protects all buildings in the study area, and facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Minimizes deployment complexity	fully deployable	partially deployable	fully passive	-
	Protects critical infrastructure	-	does not protect all critical infrastructure(2) from storm surge	protects all critical infrastructure(2) from storm surge	
	Avoids increasing rainfall-based flooding at abutting properties	blocks major rainfall pathway to the Harbor; no practical mitigation strategies identified	-	does not block major rainfall pathway to the Harbor, or practical mitigation strategies identified	preserves or creates land for rainfall storage & pumping system at intersection a major rainfall pathway with the flood protection system
					-3
	Feasibility				-3
4	Minimizes ground settlement & coastal erosion	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; no practical mitigation strategies identified	raises ground surface ≥ 2 feet within 30 feet of buildings, tunnels, or large diameter sewers; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of buildings, tunnels, or large diameter sewers	mitigates existing known coastal erosion and/or settlement
	Minimizes impacts to seawalls & structural decks	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; no practical mitigation strategies have been identified	raises ground surface ≥ 2 feet within 30 feet of Coastal Structure; practical mitigation strategies have been identified	no changes to ground surface exceeding 2 feet within 30 feet of Coastal Structure	replaces existing coastal structure with Condition Rating of "Poor" or lower
	Minimizes permitting risks	strategy located outboard of existing seawall / shoreline; no potential permitting strategy identified	strategy located outboard of existing seawall / shoreline, or impacts access or views of a structure on the National Register of Historic Places(4); potential permitting strategy identified	strategy located on existing land, with the exception of dock piling	strategy located on existing land, and identifies specific opportunities for licensed FPA(s) (Facility of Public Accommodation)
	Minimizes construction cost		strategy located outboard of seawall / shoreline	strategy located on existing land within 30 feet of seawall / shoreline, with the exception of dock piling	strategy located on existing land more than 30 feet away from seawall / shoreline
	Minimizes long-term operations & maintenance costs		includes movable or deployable components, pump systems, or other electric components	fully passive system with no pump systems, electric components, movable or deployable components	
					-3
	Adaptability				1
5	Compatible with existing property-specific plans and land use	irreconcilable differences with planned land use	requires significant reduction in function of planned land use, or not preferred by property owner	no impact on planned land use	incorporates elements of current redevelopment or resiliency plans, or is preferred by property owner
	Compatible with district-wide and abutting property resiliency strategies	precludes continuous flood protection system for the district	precludes protection of buildings or critical infrastructure(2) located immediately adjacent to the study area	facilitates protection of buildings and critical infrastructure(2) located immediately adjacent to the study area	
	Provides opportunities for phased implementation	-		no potential for phased implementation	strategy can be implemented progressively with sea level rise

APPENDIX E

Detailed Cost Estimate



**Boston Wharf District
Resiliency Plan**

Project Cost Estimate by Area
and Phase

Class 5 Estimate

Friday, May 26, 2023

Prepared by:-

ARUP

60 State Street

Boston, MA 02109

USA

Estimate Level	Estimate Description	Design Phase	Level of Completion	Methodology	Accuracy Range
5	Rough Order of Magnitude	Planning Schematic Design	0% to 5%	Parametric Models Capacity Factored Historical Costs	L: -20% to - 50% H: +30% to +100%
4	Concept Feasibility	Planning Schematic Design	1% to 15%	Equipment Factored Parametric Models	L: -15% to - 30% H: +20% to +50%
3	Budget Authorization	Planning Schematic Design Design Documents	10% to 40%	Unit Costs Assembles	L: -10% to - 20% H: +10% to +40%
2	Budget Control Estimate	Preliminary Design Engineering Design Documents Construction Documents	30% to 70%	Detailed Unit Cost Detailed Take-Off	L: -5% to - 15% H: +5% to +30%
1	Bid	Detailed Design Engineering Construction Documents	50% to 100%	Detailed Unit Cost Detailed Take-Off Productivities Subcontractor Quotes	L: -2% to - 5% H: +3% to + 15%

PROJECT NOTES & BASIS OF ESTIMATE

1 Basis of Pricing / Methodology

The cost estimate is classified as a **Class 5** estimate according to the Association for the Advancement of Cost Engineering's (AACE) estimate classification matrix.

The accuracy range of this estimate has been determined to be **-40% and +65%**. The accuracy range is a gauge of likely bid prices if the project was issued to tender at this current stage.

Pricing shown reflects probable construction costs obtainable for the infrastructure works on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors, that is to mean 4 to 5 bids. If fewer bids are received, bid results can be expected to be higher.

Base date of estimate is **Q2 2023**, with prices shown in USD\$.

2 Scope of the Project

The scope of this cost estimate includes for the followings works;

- Construction of multiple different kinds of resiliency measures designed to protect waterfront and inland property from flooding, sea level rise, and storm surge.
- Scope is divided into three different phases to be completed at different points in time: near-term, mid-term, and long-term. Each phase is treated as an independent project.

3 Below the Line (BTL) Costs

Indirects includes contractor's costs for general conditions, site supervision, flaggers and public protection, temporary works not included in direct costs, site facilities and laydown areas.

Mobilization & Demobilization includes contractor's costs for mobilizing and demobilizing their crews, equipment, and materials to the job site.

Overhead & Profit includes overhead and profit for the general contractor's head office.

4 Contingency and Escalation

- Contractor's Contingency is included at **15%** to cover variation in pricing.
- Owner's Contingency is included at **20%** to cover additional costs triggered by realized project risks.
- Escalation has been included at **4%** per annum. Prices have been escalated to the mid-point of construction based the phase the construction work is intended to be completed. The midpoints for near-, mid-, and long-term are 2030, 2050, and 2070 respectively.

5 Soft Costs

Soft costs have not been included for this estimate. (detail design, construction management, program management, financing, etc.)

Legal / Permits / Fees include costs associated with any legal requirements, permits, and/or fees required by the delivery of this project.

Geotechnical and Environmental Investigations include costs to investigate the geotechnical characteristics of the project site and related environmental impacts.

Preliminary Design includes costs to prepare preliminary designs for the construction of this project.

Detailed Design includes costs to prepare detailed designs that can be passed on to the contractor to construct this project.

PROJECT NOTES & BASIS OF ESTIMATE

6 Assumptions

- Cost estimate assumes the project will be procured using a Design-Bid-Build model.
- Sheet Pile Bulkheads are assumed to be barge driven with a deadman system and concrete coping beam.
- King Pile Bulkheads are assumed to be barge driven with a deadman anchorage system and concrete coping beam. King Piles Bulkheads are reinforced and offer greater strength than Sheet Pile Bulkheads.
- Stone Walls are assumed to be installed in front of newly installed Sheet Pile Bulkheads on top of a base plate. These walls are not designed to carry structural load.
- Stone Walls are assumed to be sourced with stones that look comparably to the existing stone sea walls.
- Permanent Floodwalls are assumed to be 1.5' thick reinforced concrete walls.
- Glass Floodwalls are stainless steel framed toughened laminated safety glass flood barriers that are assumed to be built on top of the seawall capping beams to add additional flood protection to the harbor walk.
- The unit rate for Glass Floodwalls are derived from an April 4th 2023 quote from Flood Control International.
- Automatic Deployable Floodbreak Barriers are walls that are stored below ground that can be deployed vertically out of their storage cavity in the event of a floods. They are assumed to be installed by certified installers after initial civil infrastructure (trench and reinforced concrete walls and foundations with associated drainage and electrical connections) is complete.
- The unit rate for Automatic Deployable Floodbreak Barriers are derived from an April 3rd 2023 quote from FloodBreak. Civil infrastructure works and a 30% markup for installation costs are included in the unit rate to align with recommended budget pricing from FloodBreak. Unit rates for the "Roadway" and "Vehicle" barriers are directly derived from the quote on a per-square-foot basis, and the "FreeView" unit rate is prorated based the design differences.
- "Roadway" and "Vehicle" FloodBreak barriers are each rated for vehicle loads. "Roadway" barriers are more robust and intended for larger loads and areas than the "Vehicle" barriers. "FreeView" barriers are not designed for vehicle loads and are intended to be placed along waterfronts and pedestrian zones.
- Retaining Walls are assumed to be reinforced cast-in-place cantilevered concrete retaining walls on land.
- Underground Slurry Walls are assumed to be slurry trenches with non-reinforced concrete. The unit rate is assumed to include excavation.
- Lightweight Structural Fill is assumed to be artificially engineered aggregate.
- Flowable Fill is assumed to be slurry fill to be placed underneath existing harbor walk deck. The unit rate includes dewatering required for the sectioned area.
- Dewatering for Harbor Towers Allowance is a lump sum that covers the scope associated with dewatering Harbor Towers to accommodate associated works.
- Dewatering for Rowes Wharf Allowance is a lump sum that covers the scope associated with dewatering and rewatering Rowes Wharf to accommodate associated works.
- Cofferdams are assumed to be supported by soldier beams & lagging with wood sheeting. The unit rate includes dewatering.
- Privacy Screening is assumed to be a 10' tall wood screening fence.
- Social Stepped Stairway Landform is assumed to be a linear landscape feature with soil formed into steps with a vertical face of concrete or plank running length-wise to support the soil. A tie-back system is included in this line item. The cost for excavation for this mass of soil is included under the "Excavation" line item.
- Building A is assumed to be the Boston Harbor Cruises Gift Shop on Long Wharf. The building area is assumed to be 1350 SF and the new building is assumed to be the same size as existing.
- Building B is assumed to be the Landing at Long Wharf. The building area is assumed to be 800 SF and the new building is assumed to be the same size as existing.
- The Flood Protection Island is assumed to be a combination of soil infill, rip rap, and plantings in the water adjacent to the harbor walk.

PROJECT NOTES & BASIS OF ESTIMATE

- Rip Rap Armour Stone Revetment is assumed to create a "Living Shoreline" along the side of the bulkhead. The dimensions of the revetment are assumed to be 12' from bulkhead to the outside of the base with a total height of 35'.
- Emerald Tutu is a proprietary technology still under development. Each module is assumed to be a 6' diameter oblong sphere of biomass encased by a metal frame and synthetic fiber netting, covered by salt marsh vegetation, attached in a network, and anchored by a conservation mooring. Attachments are assumed to be synthetic fiber lines.
- The unit rate for Emerald Tutu Module is derived from an April 13th 2023 quote from Emerald Tutu.
- Permanent Floating Dock / Breakwater assumed to be one of the SF Marina breakwater models (SF 300, 400, 500, 600 or 1200BW).
- The unit rate for Permanent Floating Dock / Breakwater is derived from an April 10th 2023 quote from SF Marina. It includes 20 meter long attenuator units, 30" steel piles, cable connections, joint plates, cleats, rub rails, and basic utility ducts for lighting and water routing. An average unit rate per square foot is used based because detailed designs have not been developed for this element. Sizing of breakwaters may vary by location, however more detailed analysis is required for more detailed breakdown of costs by size.
- Underground Stormwater Storage Tank is assumed to be a reinforced concrete water storage tank 7' deep underground. The cost for excavation associated with this tank is included under the "Excavation" line item.
- Underpier Stormwater Storage Tank is assumed to be reinforced concrete water storage tanks with dimensions of 20'x40x14' and 20'x50'x14'. The assumed construction methodology for this element is assumed to be as follows (the scope of the items other than the storage tanks and anchors are captured in other line items):
 - Permanently build sheetpile bulkhead walls surrounding Rowes Wharf with the area between North Wharf and Central Wharf buildings (considered the "drop-zone") being included in the land-side of the bulkhead.
 - Dewater the land-side area of Rowes Wharf.
 - Infill structural fill underneath the piers that the buildings rest on to serve as the base.
 - Rewater the land-side area of Rowes Wharf to a medium-level depth - enough for the storage tanks to float and be moved easily with enough clearance for them to travel beneath the pier decking.
 - Drop storage tanks in from a barge (sitting on the east side of the bulkhead) with a crane into the land-side of Rowes Wharf in the "drop-zone".
 - Move the floating storage tanks into position in between the piers.
 - Dewater the land-side area of Rowes Wharf.
 - Anchor the tanks to the ground atop the structural fill.
 - Connect the tanks with stormwater culverts.
 - Infill over top of the tanks - flowable fill under the piers / pier decking and typical fill in the "drop-zone".
- All linear pipes include excavation and backfill in their unit rates. However, the cost to reinstate pavement along the path of the pipe will be captured under the "Construct Walkway / Plaza" or "Construct Roadway / Street" line items.
- Underground Stormwater Culverts are assumed to be 36" reinforced concrete drain pipe. The unit rate includes excavation and backfill.
- Overflow Protection Pipes are assumed to be 36" reinforced concrete drain pipe. The unit rate includes excavation and backfill.
- Underground Stormwater Manhole Accesses are assumed to be 6-foot diameter concrete manholes.
- Surface Drainage Pipes are assumed to be 6" diameter perforated PVC pipe wrapped in nonwoven geotextiles, 5' deep minimum. The unit rate includes excavation and backfill.
- Main Connector Pipes are assumed to be 12" diameter solid PVC pipe, 5' deep minimum. The unit rate includes excavation and backfill.
- Stormwater Treatment Box is assumed to be a large debris separating baffle box.
- 100 HP Submersible Pump is assumed to be a 100 horsepower submersible pump, with a flow rate of 10,000 GPM at 30 ft.
- The unit rate for 100 HP Submersible Pumps are derived from an April 13th 2023 quote from KSB for the KRTK 400-500 / 7510XNG-S model.
- 20 HP Submersible Pump is assumed to be a 20 horsepower submersible pump, with a flow rate of 1,700 GPM at 35 ft.
- The unit rate for 20 HP Submersible Pumps are derived from an April 13th 2023 quote from KSB for the KRTK 200-316 / 186XEG-S model.
- Pump Control House assumes a 30' wide by 17' long by 10' high pump house with pump controllers (motor control center, variable frequency drivers, sensors, gauges).
- Emergency Backup Power is assumed to include a 300kW/375 kVA 480/277V generator with 500 LF of gas pipe and electrical wiring.
- Wetwell is assumed to be a 50' wide by 30' long by 10' high temporary holding tank for stormwater made of reinforced concrete.
- Manual Sluice Gates are assumed to be prefabricated slide gates to be installed within existing sewer manhole structure.
- Automatic Tide Gates are assumed to be 72" diameter flap gates to be installed within existing sewer manhole structure.
- Additional assumptions are noted throughout the estimate.

PROJECT NOTES & BASIS OF ESTIMATE

7 Allowances

- The unit rate for Lightweight Structural Fill Anchoring System is assumed as a lump sum allowance because detailed designs have not been developed for this element.

8 Items excluded from the Cost Estimate

- All resiliency measures to be taken for buildings within the district including, but not limited to, reconstruction, entry protection, and waterproofing (unless stated)
- Grass, shrubs, ground cover, and low-height plantings.
- The costs or impacts of latent environmental issues that result in litigations or development delays
- Protection, relocation, or removal of existing utilities (unless stated)
- New utilities required (unless stated)
- Owner's facilities onsite
- Owner's direct management costs, running, and maintenance costs
- Planning and enquiry costs, including legal expenses and fees (beyond what is accounted for in below the line costs)
- Land acquisition costs
- Risk-based contingency analysis
- Tests and inspections performed by others (beyond geotechnical and environmental investigation)
- Compensatory costs to other interested parties
- Cost benefits and impacts associated with improvements in construction technology, more severe regulatory requirements, and future construction that may impact the work contemplated under this project
- Hazardous or contaminated mitigation
- Agency engineering, management and administrative costs.
- Quality Assurance to be carried out by the Owner
- Discovery of archaeological artifacts and their consequential effect on the project
- Local taxes and duties

9 Items that may affect the cost estimate

- Modifications to the scope of work included in this estimate.
- Special phasing requirements.
- Restrictive technical specifications or excessive contract conditions.
- Any other non-competitive bid situations.

10 Statements of Probable Cost

ARUP has no control over the cost of labor and materials, general contractor's or any subcontractor's method of determining prices, or competitive bidding and market conditions. This opinion of probable cost of construction is made on the basis of the experience, qualifications, and best judgment of the professional consultant familiar with the construction industry. ARUP cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from this or subsequent cost estimates.

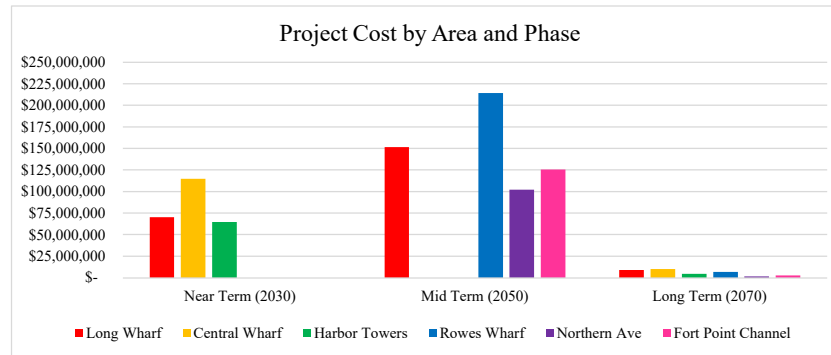
11 Recommendation for Cost Control

ARUP recommends that the Owner carefully review this document, including line item descriptions, unit prices, clarifications, exclusions, inclusions and assumptions, contingencies, escalation and markups. If the project is over budget, or if there are unresolved budgeting issues, alternate systems schemes should be evaluated before proceeding into the construction phase.

12 Request for Modifications

Requests for modifications of any apparent errors or omissions to this document must be made to ARUP within thirty (30) days of receipt of this estimate. Otherwise, it will be understood that the contents have been concurred with and accepted.

Total Project Cost Estimate	Long Wharf	Central Wharf	Harbor Towers	Rowes Wharf	Northern Ave	Fort Point Channel	Total Term Estimate
Near Term (2030)	\$ 70,294,100	\$ 114,605,300	\$ 64,701,800	\$ -	\$ -	\$ -	\$ 249,601,200
Mid Term (2050)	\$ 151,364,000	\$ -	\$ -	\$ 214,288,100	\$ 102,179,200	\$ 125,370,100	\$ 593,201,400
Long Term (2070)	\$ 8,823,500	\$ 10,154,400	\$ 4,535,000	\$ 6,604,100	\$ 1,703,500	\$ 2,762,400	\$ 34,582,900
Total	\$ 230,481,600	\$ 124,759,700	\$ 69,236,800	\$ 220,892,200	\$ 103,882,700	\$ 128,132,500	\$ 877,385,500



Direct Cost Summary	Long Wharf	Central Wharf	Harbor Towers	Rowes Wharf	Northern Ave	Fort Point Channel	Total
Line Item	Subtotal Cost	Subtotal Cost	Subtotal Cost	Subtotal Cost	Subtotal Cost	Subtotal Cost	Subtotal Cost
Bulkhead / Wall	\$ 23,930,100	\$ 15,787,500	\$ 10,446,600	\$ 13,191,700	\$ 8,774,000	\$ 18,674,500	\$ 90,804,300
Bulkhead							
Sheet Pile Bulkhead	\$ 14,512,500	\$ 11,250,000	\$ 8,250,000	\$ 8,250,000.0	\$ 4,500,000	\$ 4,650,000	\$ 51,412,500
King Pile Bulkhead	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,675,000	\$ 3,675,000
Remove Stone Wall	\$ -	\$ 250,000	\$ -	\$ -	\$ -	\$ -	\$ 250,000
Rebuild Stone Wall	\$ -	\$ 250,000	\$ -	\$ -	\$ -	\$ -	\$ 250,000
Stone Wall	\$ 625,000	\$ 3,000,000	\$ -	\$ 2,040,000.0	\$ 1,500,000	\$ 2,750,000	\$ 9,915,000
Floodwall							
Permanent Floodwall	\$ 1,227,600	\$ 137,500	\$ 270,050	\$ 331,650.0	\$ 192,500	\$ -	\$ 2,159,300
2.5' tall Glass Floodwall	\$ 2,205,000	\$ 840,000	\$ 945,000	\$ 1,260,000.0	\$ 577,500	\$ -	\$ 5,827,500
3' tall Glass Floodwall	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,092,500	\$ 1,092,500
Automatic Deployable FloodBreak Barrier							
Roadway Barrier	\$ -	\$ -	\$ -	\$ 1,170,000.0	\$ 1,200,000	\$ 1,792,000	\$ 4,162,000
Vehicle Barrier	\$ 3,504,000	\$ -	\$ 894,000	\$ -	\$ 504,000	\$ -	\$ 4,902,000
FreeView Barrier	\$ 1,730,000	\$ -	\$ 25,000	\$ 110,000.0	\$ -	\$ 4,340,000	\$ 6,205,000
Retaining Wall	\$ 126,000	\$ 60,000	\$ 62,500	\$ 30,000.0	\$ -	\$ -	\$ 278,500
Underground Slurry Wall	\$ -	\$ -	\$ -	\$ -	\$ 300,000	\$ 375,000	\$ 675,000
Earthwork & Dewatering	\$ 2,281,000	\$ 6,904,500	\$ 2,414,500	\$ 13,934,800.0	\$ 35,200	\$ -	\$ 25,569,900
Excavation	\$ 408,500	\$ 1,180,500	\$ 139,000	\$ -	\$ -	\$ -	\$ 1,728,000
Soil Infill	\$ 177,500	\$ 793,000	\$ 1,040,625	\$ 670,500.0	\$ 35,150	\$ -	\$ 2,716,775
Structural Infill	\$ 111,000	\$ 741,000	\$ 1,234,875	\$ 2,218,275.0	\$ -	\$ -	\$ 4,305,150
Lightweight Structural Infill	\$ 1,284,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,284,000
Lightweight Structural Fill Anchoring System	\$ 300,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 300,000
Flowable Fill	\$ -	\$ 4,165,000	\$ -	\$ 10,996,000.0	\$ -	\$ -	\$ 15,161,000
Dewatering for Harbor Towers Allowance	\$ -	\$ 25,000	\$ -	\$ -	\$ -	\$ -	\$ 25,000
Dewatering for Rowes Wharf Allowance	\$ -	\$ -	\$ -	\$ 50,000.0	\$ -	\$ -	\$ 50,000
Cofferdams	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Pavement	\$ 3,517,500	\$ 2,732,500	\$ 1,956,800	\$ 1,736,500.0	\$ 345,900	\$ 337,900	\$ 10,627,000
Remove Walkway / Plaza	\$ 584,500	\$ 340,000	\$ 181,500	\$ 157,500.0	\$ 4,800	\$ 74,400	\$ 1,342,700
Remove Street / Roadway	\$ 22,100	\$ 52,500	\$ 6,750	\$ 8,500.0	\$ 8,100	\$ 5,750	\$ 103,700
Construct Walkway / Plaza	\$ 2,823,300	\$ 2,340,000	\$ 1,728,000	\$ 1,519,500.0	\$ 284,400	\$ 223,200	\$ 8,918,400
Construct Street / Roadway	\$ 87,600	\$ -	\$ 40,500	\$ 51,000.0	\$ 48,600	\$ 34,500	\$ 262,200
Harborwalk	\$ 15,045,000	\$ 16,630,000	\$ 6,995,000	\$ 725,000.0	\$ 8,595,000	\$ 2,250,000	\$ 50,240,000
Deconstruct Harborwalk	\$ -	\$ 320,000	\$ -	\$ 650,000.0	\$ 500,000	\$ -	\$ 1,470,000
Wood							
Concrete							
Concrete & Brick							
Construct Harborwalk	\$ 14,850,000	\$ 16,250,000	\$ 6,950,000	\$ -	\$ 8,000,000	\$ 2,250,000	\$ 48,300,000
Wood							
Metal							
Concrete							
Concrete & Brick							
ADA Access to Harborwalk	\$ 195,000	\$ 60,000	\$ 45,000	\$ 75,000.0	\$ -	\$ -	\$ 375,000
Pedestrian Bridge	\$ -	\$ -	\$ -	\$ -	\$ 80,000	\$ -	\$ 80,000
Prefabricated Metal Stairs	\$ -	\$ -	\$ -	\$ -	\$ 15,000	\$ -	\$ 15,000
Landscaping / Urban Realm Improvements	\$ 2,411,500	\$ 348,800	\$ 382,500	\$ 11,300.0	\$ 25,500	\$ -	\$ 3,179,500
Privacy Screening	\$ -	\$ -	\$ -	\$ -	\$ 18,000	\$ -	\$ 18,000
Shade Structure	\$ 640,000	\$ 96,000	\$ -	\$ -	\$ -	\$ -	\$ 736,000
Bus Stop Relocation	\$ 1,500	\$ 1,500	\$ -	\$ -	\$ -	\$ -	\$ 3,000
Shade Trees	\$ 30,000	\$ 11,250	\$ 45,000	\$ 11,250.0	\$ 7,500	\$ -	\$ 105,000
Social Stepped Stairway / Landform	\$ 1,320,000	\$ 240,000	\$ 337,500	\$ -	\$ -	\$ -	\$ 1,897,500
Building Works							
Demolish Building A	\$ 20,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 20,000
Demolish Building B	\$ 15,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 15,000
Reconstruct Building A	\$ 285,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 285,000
Reconstruct Building B	\$ 100,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 100,000
Natural Flood Protection	\$ 360,000	\$ 3,242,500	\$ 560,000	\$ 320,000.0	\$ -	\$ -	\$ 4,482,500
Flood Protection Island	\$ -	\$ 2,730,000	\$ -	\$ -	\$ -	\$ -	\$ 2,730,000
Rip Rap Armour Stone Revetment	\$ 360,000	\$ 400,000	\$ 560,000	\$ 320,000.0	\$ -	\$ -	\$ 1,640,000
Emerald Tutu Module	\$ -	\$ 112,500	\$ -	\$ -	\$ -	\$ -	\$ 112,500
Docks	\$ 2,729,000	\$ 1,706,500	\$ 736,900	\$ 1,865,700.0	\$ 515,600	\$ 1,550,200	\$ 9,103,900
Remove Existing Dock	\$ 160,000	\$ 100,000	\$ 16,800	\$ 280,000.0	\$ 28,000	\$ 70,000	\$ 654,800
Relocate Existing Dock	\$ 652,500	\$ -	\$ -	\$ 378,000.0	\$ -	\$ 90,000	\$ 1,120,500
Construct Permanent Dock / Breakwater	\$ 1,860,000	\$ 1,550,000	\$ 697,500	\$ 1,162,500.0	\$ 465,000	\$ 1,356,250	\$ 7,091,250
Dock Gangway / Accessibility Ramp	\$ 56,500	\$ 56,500	\$ 22,600	\$ 45,200.0	\$ 22,600	\$ 33,900	\$ 237,300
Drainage System	\$ 4,696,600	\$ 2,026,000	\$ 3,639,100	\$ 9,303,700.0	\$ 828,100	\$ 912,100	\$ 21,405,600
Underground Stormwater Storage Tank	\$ 3,200,000	\$ 650,000	\$ 1,945,000	\$ -	\$ -	\$ -	\$ 5,795,000
Underpier Stormwater Storage Tank	\$ -	\$ -	\$ -	\$ 8,955,700.0	\$ -	\$ -	\$ 8,955,700
Underground Stormwater Culverts	\$ -	\$ 180,000	\$ -	\$ 189,000.0	\$ -	\$ 6,000	\$ 375,000
Underground Stormwater Manhole Access	\$ 42,000	\$ 42,000	\$ 42,000	\$ 42,000.0	\$ 21,000	\$ 21,000	\$ 210,000
Stormwater Treatment	\$ -	\$ 450,000	\$ 450,000	\$ -	\$ -	\$ -	\$ 900,000
Overflow Protection	\$ 141,000	\$ 141,000	\$ 240,000	\$ -	\$ -	\$ -	\$ 522,000
Surface Drainage Pipe	\$ 175,000	\$ 150,000	\$ 150,000	\$ -	\$ 30,000	\$ 30,000	\$ 535,000
Main Connector Pipe	\$ 277,500	\$ 185,000	\$ 185,000	\$ -	\$ 111,000	\$ 111,000	\$ 869,500
Stormwater Pipe Retrofit / Reinforcement	\$ -	\$ 150,000	\$ -	\$ -	\$ -	\$ -	\$ 150,000
Pump Station							
100 HP Submersible Pump	\$ 390,000	\$ -	\$ 390,000	\$ -	\$ 390,000	\$ 390,000	\$ 1,560,000
20 HP Submersible Pump	\$ 60,000	\$ -	\$ 60,000	\$ -	\$ 60,000	\$ 60,000	\$ 240,000
Pump Control House	\$ 55,000	\$ -	\$ 55,000	\$ -	\$ 55,000	\$ 55,000	\$ 220,000
Emergency Backup Power	\$ 90,100	\$ -	\$ 90,100	\$ -	\$ 90,100	\$ 90,100	\$ 360,400
Wetwell	\$ 32,000	\$ -	\$ 32,000	\$ -	\$ 32,000	\$ 32,000	\$ 128,000
Storm Sewer Outfall Protection							
Manual Sluice Gates	\$ 111,600	\$ 37,200	\$ -	\$ 55,800.0	\$ 18,600	\$ 55,800	\$ 279,000
Automatic Tide Gates	\$ 122,400	\$ 40,800	\$ -	\$ 61,200.0	\$ 20,400	\$ 61,200	\$ 306,000
Total Direct Cost	\$ 54,970,700	\$ 49,378,300	\$ 27,131,400	\$ 41,088,700	\$ 19,119,300	\$ 23,724,700	\$ 215,412,700

Near-Term Estimate			Long Wharf		Central Wharf		Harbor Towers		Rowes Wharf		Northern Ave		Fort Point Channel	
Line Items	Unit Rate	Unit	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost
Bulkhead / Wall				\$ 8,298,000		\$ 14,750,000		\$ 8,685,000						
Bulkhead														
Sheet Pile Bulkhead	\$ 150	SF	21,750	\$ 3,262,500	75,000	\$ 11,250,000	55,000	\$ 8,250,000						
King Pile Bulkhead	\$ 175	SF	0	\$ -	0	\$ -	0	\$ -						
Remove Stone Wall	\$ 25	SF	0	\$ -	10,000	\$ 250,000	0	\$ -						
Rebuild Stone Wall	\$ 25	SF	0	\$ -	10,000	\$ 250,000	0	\$ -						
Stone Wall	\$ 100	SF	0	\$ -	30,000	\$ 3,000,000	0	\$ -						
Floodwall														
Permanent Floodwall	\$ 110	SF	5,650	\$ 621,500	0	\$ -	1,500	\$ 165,000						
2.5' tall Glass Floodwall	\$ 1,050	LF	0	\$ -	0	\$ -	0	\$ -						
3' tall Glass Floodwall	\$ 1,150	LF	0	\$ -	0	\$ -	0	\$ -						
Automatic Deployable Floodbreak Barrier														
Roadway Barrier	\$ 1,600	SF	0	\$ -	0	\$ -	0	\$ -						
Vehicle Barrier	\$ 1,200	SF	2,920	\$ 3,504,000	0	\$ -	225	\$ 270,000						
FreeView Barrier	\$ 1,000	SF	910	\$ 910,000	0	\$ -	0	\$ -						
Retaining Wall	\$ 100	SF	1,260	\$ 126,000	600	\$ 60,000	0	\$ -						
Underground Slurry Wall	\$ 50	CF	0	\$ -	0	\$ -	0	\$ -						
Earthwork & Dewatering				\$ 1,071,500		\$ 6,904,500		\$ 2,414,500						
Excavation	\$ 50	CY	6,960	\$ 348,000	23,610	\$ 1,180,500	2,780	\$ 139,000						
Soil Infill	\$ 50	CY	1,330	\$ 66,500	15,860	\$ 793,000	20,813	\$ 1,040,625						
Structural Infill	\$ 75	CY	0	\$ -	9,880	\$ 741,000	16,465	\$ 1,234,875						
Lightweight Structural Infill	\$ 100	CY	5,070	\$ 507,000	0	\$ -	0	\$ -						
Lightweight Structural Fill Anchoring System	\$ 150,000	LS	1	\$ 150,000	0	\$ -	0	\$ -						
Flowable Fill	\$ 500	CY	0	\$ -	8,330	\$ 4,165,000	0	\$ -						
Dewatering for Harbor Towers Allowance	\$ 25,000	LS	0	\$ -	1	\$ 25,000	0	\$ -						
Dewatering for Rowes Wharf Allowance	\$ 50,000	LS	0	\$ -	0	\$ -	0	\$ -						
Pavement				\$ 2,635,000		\$ 2,732,500		\$ 1,924,500						
Remove Walkway / Plaza	\$ 10	SF	33,950	\$ 339,500	34,000	\$ 340,000	18,000	\$ 180,000						
Remove Street / Roadway	\$ 5	SF	2,920	\$ 14,600	10,500	\$ 52,500	600	\$ 3,000						
Construct Walkway / Plaza	\$ 30	SF	73,110	\$ 2,193,300	78,000	\$ 2,340,000	57,450	\$ 1,723,500						
Construct Street / Roadway	\$ 30	SF	2,920	\$ 87,600	0	\$ -	600	\$ 18,000						
Harborwalk				\$ 3,750,000		\$ 13,630,000		\$ 6,995,000						
Deconstruct Harborwalk														
Wood	\$ 50	SF	0	\$ -	6,400	\$ 320,000	0	\$ -						
Concrete		SF	0	\$ -	2,600	\$ 0	0	\$ -						
Concrete & Brick		SF	0	\$ -	3,800	\$ 0	0	\$ -						
Construct Harborwalk														
Wood	\$ 500	SF	7,200	\$ 3,600,000	26,500	\$ 13,250,000	13,900	\$ 6,950,000						
Metal		SF	7,200	\$ 0	13,500	\$ 0	13,900	\$ 0						
Concrete		SF	0	\$ -	0	\$ -	0	\$ -						
Concrete & Brick		SF	0	\$ -	8,000	\$ 0	0	\$ -						
ADA Access to Harborwalk	\$ 30	SF	5,000	\$ 150,000	2,000	\$ 60,000	1,500	\$ 45,000						
Pedestrian Bridge	\$ 80,000	EA	0	\$ -	0	\$ -	0	\$ -						
Prefabricated Metal Stairs	\$ 15,000	EA	0	\$ -	0	\$ -	0	\$ -						
Landscaping / Urban Realm Improvements				\$ 4,854,000		\$ 378,800		\$ 637,500						
Privacy Screening	\$ 40	SF	0	\$ -	0	\$ -	0	\$ -						
Shade Structure	\$ 32,000	EA	10	\$ 320,000	3	\$ 96,000	0	\$ -						
Bus Stop Relocation	\$ 1,500	EA	1	\$ 1,500	1	\$ 1,500	0	\$ -						
Shade Trees	\$ 750	EA	10	\$ 7,500	15	\$ 11,250	60	\$ 45,000						
Social Stepped Stairway / Landform	\$ 75	LF	3,600	\$ 270,000	3,200	\$ 240,000	4,500	\$ 337,500						
Park Landscaping	\$ 5	SF	767,000	\$ 3,835,000	6,000	\$ 30,000	51,000	\$ 255,000						
Building Works														
Demolish Building A	\$ 20,000	LS	1	\$ 20,000	0	\$ -	0	\$ -						
Demolish Building B	\$ 15,000	LS	1	\$ 15,000	0	\$ -	0	\$ -						
Reconstruct Building A	\$ 285,000	LS	1	\$ 285,000	0	\$ -	0	\$ -						
Reconstruct Building B	\$ 100,000	LS	1	\$ 100,000	0	\$ -	0	\$ -						
Natural Flood Protection				\$ 360,000		\$ 3,242,500		\$ 560,000						
Flood Protection Island	\$ 105	SF	0	\$ -	26,000	\$ 2,730,000	0	\$ -						
Rip Rap Armour Stone Revetment	\$ 800	LF	450	\$ 360,000	500	\$ 400,000	700	\$ 560,000						
Emerald Tutu Module	\$ 750	EA	0	\$ -	150	\$ 112,500	0	\$ -						
Docks				\$ 2,256,500		\$ 1,706,500		\$ 736,900						
Remove Existing Dock	\$ 20	SF	8,000	\$ 160,000	5,000	\$ 100,000	840	\$ 16,800						
Relocate Existing Dock	\$ 45	SF	4,000	\$ 180,000	0	\$ -	0	\$ -						
Construct Permanent Dock / Breakwater	\$ 155	SF	12,000	\$ 1,860,000	10,000	\$ 1,550,000	4,500	\$ 697,500						
Dock Gangway / Accessibility Ramp	\$ 11,300	EA	5	\$ 56,500	5	\$ 56,500	2	\$ 22,600						
Drainage System				\$ 4,579,600		\$ 1,987,000		\$ 3,639,100						
Underground Stormwater Storage Tank	\$ 500	CY	6,400	\$ 3,200,000	1,300	\$ 650,000	3,890	\$ 1,945,000						
Underpier Stormwater Storage Tank	\$ 650	CY	0	\$ -	0	\$ -	0	\$ -						
Underground Stormwater Culverts	\$ 300	LF	0	\$ -	600	\$ 180,000	0	\$ -						
Underground Stormwater Manhole Access	\$ 7,000	EA	6	\$ 42,000	6	\$ 42,000	6	\$ 42,000						
Stormwater Treatment	\$ 450,000	EA	0	\$ -	1	\$ 450,000	1	\$ 450,000						
Overflow Protection	\$ 300	LF	470	\$ 141,000	470	\$ 141,000	800	\$ 240,000						
Surface Drainage Pipe	\$ 50	LF	3,500	\$ 175,000	3,000	\$ 150,000	3,000	\$ 150,000						
Main Connector Pipe	\$ 185	LF	1,500	\$ 277,500	1,000	\$ 185,000	1,000	\$ 185,000						
Stormwater Pipe Retrofit / Reinforcement	\$ 150,000	LS	0	\$ -	1	\$ 150,000	0	\$ -						
Pump Station														
100 HP Submersible Pump	\$ 130,000	EA	3	\$ 390,000	0	\$ -	3	\$ 390,000						
20 HP Submersible Pump	\$ 30,000	EA	2	\$ 60,000	0	\$ -	2	\$ 60,000						
Pump Control House	\$ 55,000	EA	1	\$ 55,000	0	\$ -	1	\$ 55,000						
Emergency Backup Power	\$ 90,100	LS	1	\$ 90,100	0	\$ -	1	\$ 90,100						
Wetwell	\$ 32,000	EA	1	\$ 32,000	0	\$ -	1	\$ 32,000						
Storm Sewer Outfall Protection														
Manual Sluice Gates	\$ 18,600	EA	3	\$ 55,800	1	\$ 18,600	0	\$ -						
Automatic Tide Gates	\$ 20,400	EA	3	\$ 61,200	1	\$ 20,400	0	\$ -						
Total Direct Cost				\$ 27,804,600		\$ 45,931,800		\$ 25,592,500						
Indirect Costs / General Requirements	10%			\$ 2,780,500		\$ 4,593,200		\$ 2,559,300						
Mobilization & Demobilization	2%			\$ 556,100		\$ 906,600		\$ 511,900						
Overhead & Profit	10%			\$ 3,114,100		\$ 5,077,200		\$ 2,866,400						
Contractor's Contingency	15%			\$ 5,138,300		\$ 8,377,300		\$ 4,729,500						
Total Construction Price				\$ 39,393,600		\$ 64,226,100		\$ 36,359,600						
Legal / Permits / Fees	2%			\$ 787,900		\$ 1,284,500		\$ 725,200						
Geotechnical and Environmental Investigation	2%			\$ 787,900		\$ 1,284,500		\$ 725,200						
Preliminary Design	3%			\$ 1,181,800		\$ 1,926,800		\$ 1,087,800						
Detailed Design	6%			\$ 2,363,600		\$ 3,853,600		\$ 2,175,600						
Escalation	32%			\$ 14,063,600		\$ 22,928,900		\$ 12,944,800						
Owner's Contingency	20%			\$ 11,715,700		\$ 19,100,900		\$ 10,783,600						
Owner's Contingency				\$ 42,176,500		\$ 69,269,200		\$ 38,821,700						
Total Project Price				\$ 70,294,100		\$ 114,605,300		\$ 64,701,800						
Upper Bound	65%			\$ 115,985,300		\$ 189,098,700		\$ 106,758,000						

Mid-Term Estimate				Long Wharf		Central Wharf		Harbor Towers		Rowes Wharf		Northern Ave		Fort Point Channel	
Line Items	Unit Rate	Unit		Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost
Bulkhead / Wall					\$ 12,155,500					\$ 10,580,400		\$ 8,100,300		\$ 17,582,000	
Bulkhead															
Sheet Pile Bulkhead	\$ 150	SF		75,000	\$ 11,250,000					55,000	\$ 8,250,000	30,000	\$ 4,500,000	31,000	\$ 4,650,000
King Pile Bulkhead	\$ 175	SF		0	\$ -					0	\$ -	0	\$ -	21,000	\$ 3,675,000
Remove Stone Wall	\$ 25	SF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Rebuild Stone Wall	\$ 25	SF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Stone Wall	\$ 100	SF		6,250	\$ 625,000					20,400	\$ 2,040,000	15,000	\$ 1,500,000	27,500	\$ 2,750,000
Floodwall															
Permanent Floodwall	\$ 110	SF		2,550	\$ 280,500					1,640	\$ 180,400	875	\$ 96,250	0	\$ -
2.5' tall Glass Floodwall	\$ 1,050	LF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
3' tall Glass Floodwall	\$ 1,150	LF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Automatic Deployable Floodbreak Barrier															
Roadway Barrier	\$ 1,200	SF		0	\$ -					0	\$ -	420	\$ 504,000	0	\$ -
Vehicle Barrier	\$ 1,600	SF		0	\$ -					0	\$ -	750	\$ 1,200,000	1,120	\$ 1,792,000
Freeview Barrier	\$ 1,000	SF		0	\$ -					110	\$ 110,000	0	\$ -	4,340	\$ 4,340,000
Retaining Wall	\$ 100	SF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Underground Slurry Wall	\$ 50	CF		0	\$ -					0	\$ -	6,000	\$ 300,000	7,500	\$ 375,000
Earthwork & Dewatering					\$ 1,149,000					\$ 13,933,800		\$ 35,200		\$ -	
Excavation	\$ 50	CY		1,210	\$ 60,500					0	\$ -	0	\$ -	0	\$ -
Soil Infill	\$ 50	CY		2,220	\$ 111,000					13,390	\$ 669,500	703	\$ 35,150	0	\$ -
Structural Infill	\$ 75	CY		1,480	\$ 111,000					29,577	\$ 2,218,275	0	\$ -	0	\$ -
Lightweight Structural Infill	\$ 100	CY		7,770	\$ 777,000					0	\$ -	0	\$ -	0	\$ -
Lightweight Structural Fill Anchoring System	\$ 150,000	LS		1	\$ 150,000					0	\$ -	0	\$ -	0	\$ -
Flowable Fill	\$ 500	CY		0	\$ -					21,992	\$ 10,996,000	0	\$ -	0	\$ -
Dewatering for Harbor Towers Allowance	\$ 25,000	LS		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Dewatering for Rowes Wharf Allowance	\$ 50,000	LS		0	\$ -					1	\$ 50,000	0	\$ -	0	\$ -
Pavement					\$ 860,000					\$ 1,736,500		\$ 345,900		\$ 337,900	
Remove Walkway / Plaza	\$ 10	SF		21,000	\$ 230,000					15,750	\$ 157,500	480	\$ 4,800	7,440	\$ 74,400
Remove Street / Roadway	\$ 5	SF		0	\$ -					1,700	\$ 8,500	1,620	\$ 8,100	1,150	\$ 5,750
Construct Walkway / Plaza	\$ 30	SF		21,000	\$ 630,000					50,650	\$ 1,519,500	9,480	\$ 284,400	7,440	\$ 223,200
Construct Street / Roadway	\$ 30	SF		0	\$ -					1,700	\$ 51,000	1,620	\$ 48,600	1,150	\$ 34,500
Harborwalk					\$ 11,295,000					\$ 725,000		\$ 8,595,000		\$ 2,250,000	
Deconstruct Harborwalk	\$ 50			0	\$ -					13,000	\$ 650,000	10,000	\$ 500,000	0	\$ -
Wood		SF		0	\$ -					0	\$ -	10,000	\$ -	0	\$ -
Concrete		SF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Concrete & Brick		SF		0	\$ -					13,000	\$ -	0	\$ -	0	\$ -
Construct Harborwalk	\$ 500			22,500	\$ 11,250,000					0	\$ -	16,000	\$ 8,000,000	4,500	\$ 2,250,000
Wood		SF		22,500	\$ -					0	\$ -	13,000	\$ 4,500	0	\$ -
Metal		SF		0	\$ -					0	\$ -	2,000	\$ -	0	\$ -
Concrete		SF		0	\$ -					13,300	\$ -	0	\$ -	0	\$ -
Concrete & Brick		SF		0	\$ -					15,600	\$ 1,000	0	\$ -	0	\$ -
ADA Access to Harborwalk	\$ 30	LF		1,500	\$ 45,000					2,500	\$ 75,000	0	\$ -	0	\$ -
Pedestrian Bridge	\$ 80,000	EA		0	\$ -					0	\$ -	1	\$ 80,000	0	\$ -
Prefabricated Metal Stairs	\$ 15,000	EA		0	\$ -					0	\$ -	1	\$ 15,000	0	\$ -
Landscaping / Urban Realm Improvements					\$ 1,392,500					\$ 218,800		\$ 25,500		\$ -	
Privacy Screening	\$ 40	SF		0	\$ -					0	\$ -	450	\$ 18,000	0	\$ -
Shade Structure	\$ 32,000	EA		10	\$ 320,000					0	\$ -	0	\$ -	0	\$ -
Bus Stop Relocation	\$ 1,500	EA		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Shade Trees	\$ 750	EA		30	\$ 22,500					15	\$ 11,250	10	\$ 7,500	0	\$ -
Social Stepped Stairway / Landform	\$ 75	LF		14,000	\$ 1,050,000					0	\$ -	0	\$ -	0	\$ -
Park Landscaping	\$ 5	SF		0	\$ -					41,500	\$ 207,500	0	\$ -	0	\$ -
Building Works															
Demolish Building A	\$ 20,000	LS		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Demolish Building B	\$ 15,000	LS		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Reconstruct Building A	\$ 285,000	LS		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Reconstruct Building B	\$ 100,000	LS		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Natural Flood Protection					\$ -					\$ 320,000		\$ -		\$ -	
Flood Protection Island	\$ 105	SF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Rip Rap Armour Stone Revetment	\$ 800	LF		0	\$ -					400	\$ 320,000	0	\$ -	0	\$ -
Emerald Tutu Module	\$ 750	EA		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Docks					\$ 472,500					\$ 1,865,700		\$ 515,600		\$ 1,550,200	
Remove Existing Dock	\$ 20	SF		0	\$ -					14,000	\$ 280,000	1,400	\$ 28,000	3,500	\$ 70,000
Relocate Existing Dock	\$ 45	SF		10,500	\$ 472,500					8,400	\$ 378,000	0	\$ -	2,000	\$ 90,000
Construct Permanent Dock / Breakwater	\$ 155	SF		0	\$ -					7,500	\$ 1,162,500	3,000	\$ 465,000	8,750	\$ 1,356,250
Dock Gangway / Accessibility Ramp	\$ 11,300	EA		0	\$ -					4	\$ 45,200	2	\$ 22,600	3	\$ 33,900
Drainage System					\$ -					\$ 9,303,700		\$ 828,100		\$ 912,100	
Underground Stormwater Storage Tank	\$ 500	CY		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Underpier Stormwater Storage Tank	\$ 650	CY		0	\$ -					13,778	\$ 8,955,700	0	\$ -	0	\$ -
Underground Stormwater Culverts	\$ 300	LF		0	\$ -					630	\$ 189,000	0	\$ -	20	\$ 6,000
Underground Stormwater Manhole Access	\$ 7,000	EA		0	\$ -					6	\$ 42,000	3	\$ 21,000	3	\$ 21,000
Stormwater Treatment	\$ 450,000	EA		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Overflow Protection	\$ 300	LF		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Surface Drainage Pipe	\$ 50	LF		0	\$ -					0	\$ -	600	\$ 30,000	600	\$ 30,000
Main Connector Pipe	\$ 185	LF		0	\$ -					0	\$ -	600	\$ 111,000	600	\$ 111,000
Stormwater Pipe Retrofit / Reinforcement	\$ 150,000	EA		0	\$ -					0	\$ -	0	\$ -	0	\$ -
Pump Station															
100 HP Submersible Pump	\$ 130,000	EA		0	\$ -					0	\$ -	3	\$ 390,000	3	\$ 390,000
20 HP Submersible Pump	\$ 30,000	EA		0	\$ -					0	\$ -	2	\$ 60,000	2	\$ 60,000
Pump Control House	\$ 55,000	EA		0	\$ -					0	\$ -	1	\$ 55,000	1	\$ 55,000
Emergency Backup Power	\$ 90,100	LS		0	\$ -					0	\$ -	1	\$ 90,100	1	\$ 90,100
Wetwell	\$ 32,000	EA		0	\$ -					0	\$ -	1	\$ 32,000	1	\$ 32,000
Storm Sewer Outfall Protection															
Manual Sluice Gates	\$ 18,600	EA		0	\$ -					3	\$ 55,800	1	\$ 18,600	3	\$ 55,800
Automatic Tide Gates	\$ 20,400	EA		0	\$ -					3	\$ 61,200	1	\$ 20,400	3	\$ 61,200
Total Direct Cost					\$ 27,324,500		\$ -		\$ -	\$ 38,683,900		\$ 18,445,600		\$ 22,632,200	
Indirect Costs / General Requirements	10%				\$ 2,732,500		\$ -		\$ -	\$ 3,868,400		\$ 1,844,600		\$ 2,263,200	
Mobilization & Demobilization	2%				\$ 546,500		\$ -		\$ -	\$ 773,700		\$ 368,900		\$ 452,600	
Overhead & Profit	10%				\$ 3,060,400		\$ -		\$ -	\$ 4,332,600		\$ 2,065,900		\$ 2,534,800	
Contractor's Contingency	15%				\$ 5,049,600		\$ -		\$ -	\$ 7,148,800		\$ 3,408,800		\$ 4,182,400	
Total Construction Price					\$ 38,713,500		\$ -		\$ -	\$ 54,807,400		\$ 26,113,800		\$ 32,065,200	
Legal / Permits / Fees	2%				\$ 774,300		\$ -		\$ -	\$ 1,096,100		\$ 522,700		\$ 641,300	
Geotechnical and Environmental Investigatio	2%				\$ 774,300		\$ -		\$ -	\$ 1,096,100		\$ 522,700		\$ 641,300	
Preliminary Design	3%				\$ 1,161,400		\$ -		\$ -	\$ 1,644,200		\$ 784,000		\$ 962,000	
Detailed Design	6%				\$ 2,322,800		\$ -		\$ -	\$ 3,288,400		\$ 1,568,000		\$ 1,923,900	
Escalation	188%				\$ 82,390,400		\$ -		\$ -	\$ 116,641,200		\$ 55,618,100		\$ 68,241,400	
Owner's Contingency	20%				\$ 25,227,200		\$ -		\$ -	\$ 35,714,700		\$ 17,029,900		\$ 20,895,000	
Lower Bound					\$ 151,364,000		\$ -		\$ -	\$ 214,288,100		\$ 102,179,200		\$ 125,370,100	
Total Project Price					\$ 151,364,000		\$ -		\$ -	\$ 214,288,100		\$ 102,179,200		\$ 125,370,100	
Upper Bound					\$ 249,750,600		\$ -		\$ -	\$ 353,575,400		\$ 168,595,700		\$ 206,860,700	

Long-Term Estimate			Long Wharf		Central Wharf		Harbor Towers		Rowes Wharf		Northern Ave		Fort Point Channel	
Line Items	Unit Rate	Unit	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost	Quantity	Subtotal Cost
Bulkhead / Wall				\$ 3,350,600		\$ 977,500		\$ 1,761,600		\$ 2,611,300		\$ 673,800		\$ 1,092,500
Bulkhead														
Sheet Pile Bulkhead	\$ 150	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
King Pile Bulkhead	\$ 175	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Remove Stone Wall	\$ 25	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Rebuild Stone Wall	\$ 25	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Stone Wall	\$ 100	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Floodwall														
Permanent Floodwall	\$ 110	SF	2,960	\$ 325,600	1,250	\$ 137,500	955	\$ 105,050	1,375	\$ 151,250	875	\$ 96,250	0	\$ -
2.5' tall Glass Floodwall	\$ 1,050	LF	2,100	\$ 2,205,000	800	\$ 840,000	900	\$ 945,000	1,200	\$ 1,260,000	550	\$ 577,500	0	\$ -
3' tall Glass Floodwall	\$ 1,150	LF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	950	\$ 1,092,500
Automatic Deployable FloodBreak Barrier														
Roadway Barrier	\$ 1,200	SF	0	\$ -	0	\$ -	0	\$ -	975	\$ 1,170,000	0	\$ -	0	\$ -
Vehicle Barrier	\$ 1,600	SF	0	\$ -	0	\$ -	390	\$ 624,000	0	\$ -	0	\$ -	0	\$ -
Freeview Barrier	\$ 1,000	SF	820	\$ 820,000	0	\$ -	25	\$ 25,000	0	\$ -	0	\$ -	0	\$ -
Retaining Wall	\$ 100	SF	0	\$ -	0	\$ -	625	\$ 62,500	300	\$ 30,000	0	\$ -	0	\$ -
Underground Slurry Wall	\$ 50	CF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Earthwork & Dewatering														
Excavation	\$ 50	CY	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Soil Infill	\$ 50	CY	0	\$ -	0	\$ -	0	\$ -	20	\$ 1,000	0	\$ -	0	\$ -
Structural Infill	\$ 75	CY	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Lightweight Structural Infill	\$ 100	CY	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Lightweight Structural Fill Anchoring System	\$ 150,000	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Flowable Fill	\$ 500	CY	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Dewatering for Harbor Towers Allowance	\$ 25,000	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Dewatering for Rowes Wharf Allowance	\$ 50,000	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Cofferdams	\$ 200	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Pavement														
Remove Walkway / Plaza	\$ 10	SF	1,500	\$ 15,000	0	\$ -	150	\$ 1,500	0	\$ -	0	\$ -	0	\$ -
Remove Street / Roadway	\$ 5	SF	1,500	\$ 7,500	0	\$ -	750	\$ 3,750	0	\$ -	0	\$ -	0	\$ -
Construct Walkway / Plaza	\$ 30	SF	0	\$ -	0	\$ -	150	\$ 4,500	0	\$ -	0	\$ -	0	\$ -
Construct Street / Roadway	\$ 30	SF	0	\$ -	0	\$ -	750	\$ 22,500	0	\$ -	0	\$ -	0	\$ -
Harborwalk														
Deconstruct Harborwalk														
Wood	\$ 50	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Concrete	\$ 50	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Concrete & Brick	\$ 500	SF	0	\$ -	6,000	\$ 3,000,000	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Construct Harborwalk														
Wood	\$ 50	SF	0	\$ -	6,000	\$ 300,000	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Metal	\$ 50	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Concrete	\$ 50	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Concrete & Brick	\$ 500	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
ADA Access to Harborwalk	\$ 30	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Pedestrian Bridge	\$ 80,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Prefabricated Metal Stairs	\$ 15,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Landscaping / Urban Realm Improvements														
Privacy Screening	\$ 40	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Shade Structure	\$ 32,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Bus Stop Relocation	\$ 1,500	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Shade Trees	\$ 750	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Social Stepped Stairway / Landform	\$ 75	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Park Landscaping	\$ 5	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Building Works														
Demolish Building A	\$ 20,000	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Demolish Building B	\$ 15,000	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Reconstruct Building A	\$ 285,000	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Reconstruct Building B	\$ 100,000	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Natural Flood Protection														
Flood Protection Island	\$ 105	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Rip Rap Armour Stone Revetment	\$ 800	LF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Emerald Tudu Module	\$ 750	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Docks														
Remove Existing Dock	\$ 20	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Relocate Existing Dock	\$ 45	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Construct Permanent Dock / Breakwater	\$ 155	SF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Dock Gangway / Accessibility Ramp	\$ 11,300	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Drainage System														
Underground Stormwater Storage Tank	\$ 400	CY	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Underpier Stormwater Storage Tank	\$ 650	CY	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Underground Stormwater Culverts	\$ 300	LF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Underground Stormwater Manhole Access	\$ 7,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Stormwater Treatment	\$ 450,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Overflow Protection	\$ 300	LF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Surface Drainage Pipe	\$ 50	LF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Main Connector Pipe	\$ 185	LF	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Stormwater Pipe Retrofit / Reinforcement	\$ 150,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Pump Station														
100 HP Submersible Pump	\$ 130,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
20 HP Submersible Pump	\$ 30,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Pump Control House	\$ 55,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Emergency Backup Power	\$ 90,100	LS	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Wetwell	\$ 32,000	EA	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Storm Sewer Outfall Protection														
Manual Sluice Gates	\$ 18,600	EA	3	\$ 55,800	1	\$ 18,600	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Automatic Tide Gates	\$ 20,400	EA	3	\$ 61,200	1	\$ 20,400	0	\$ -	0	\$ -	0	\$ -	0	\$ -
Total Direct Cost				\$ 3,490,100		\$ 4,016,500		\$ 1,793,900		\$ 2,632,300		\$ 673,800		\$ 1,092,500
Indirect Costs / General Requirements														
Indirect Costs / General Requirements	\$ 0			\$ 349,000		\$ 401,700		\$ 179,400		\$ 261,200		\$ 67,400		\$ 109,300
Mobilization & Demobilization	\$ 0			\$ 69,800		\$ 80,300		\$ 35,900		\$ 52,200		\$ 13,500		\$ 21,900
Overhead & Profit	\$ 0			\$ 390,900		\$ 449,900		\$ 200,900		\$ 292,600		\$ 75,500		\$ 122,400
Contractor's Contingency	\$ 0			\$ 645,000		\$ 742,300		\$ 331,500		\$ 482,700		\$ 124,500		\$ 201,900
Total Construction Price				\$ 4,944,800		\$ 5,690,700		\$ 2,541,600		\$ 3,701,000		\$ 954,700		\$ 1,548,000
Legal / Permits / Fees														
Legal / Permits / Fees	\$ 0			\$ 98,800		\$ 113,800		\$ 50,800		\$ 74,000		\$ 19,300		\$ 31,000
Geotechnical and Environmental Investigation	\$ 0			\$ 88,900		\$ 113,800		\$ 50,800		\$ 74,000		\$ 19,300		\$ 31,000
Preliminary Design	\$ 0			\$ 148,300		\$ 170,700		\$ 76,200		\$ 111,000		\$ 28,600		\$ 46,400
Detailed Design	\$ 0			\$ 296,700		\$ 341,400		\$ 152,500		\$ 222,100		\$ 57,300		\$ 92,900
Escalation	\$ 0			\$ 1,765,300		\$ 2,031,600		\$ 907,300		\$ 1,321,300		\$ 340,800		\$ 552,700
Owner's Contingency	\$ 0			\$ 1,470,600		\$ 1,692,400		\$ 755,800		\$ 1,100,700		\$ 283,500		\$ 460,400
Lower Bound				\$ 5,294,100		\$ 6,092,600		\$ 2,722,000		\$ 3,962,500		\$ 1,022,100		\$ 1,637,400
Total Project Price				\$ 8,823,500		\$ 10,154,400		\$ 4,535,000		\$ 6,604,100		\$ 1,703,500		\$ 2,762,400
Upper Bound				\$ 14,558,800		\$ 16,754,800		\$ 7,482,800		\$ 10,896,800		\$ 2,810,800		\$ 4,558,000

APPENDIX F

Coastal Structures Assessment



Memorandum

To	Marc Margulies, Wharf District Council President
Date	August 6, 2022
Copies	
Reference number	286928
From	Emily Roberts
File reference	4-05
Subject	Seawall and Pier Condition Assessment Field Report

Introduction

This assessment is intended to inform concept-level resiliency strategies for the Wharf District Council Conceptual District Protection and Resiliency Plan. For recommendations refer to the project Final Report.

This information is based on site walks that took place on the following dates at low tide:

Thursday 21st June (11am – 2pm)

Tuesday 28th June (6.30am – 8.30am)

A desk study was also carried out to review available existing information pertaining to the seawalls and decks. Where this information was available, a summary has been noted at the start of each section under “background”.

The condition of the seawalls and some selected piers (piles and deck) has been assessed using the following scale:

Rating	Description	
"Good"	No significant reduction	No visible damage or only minor problems noted . Structural elements may show some very minor deterioration, but no significant reduction in structural capacity.
"Satisfactory"		Limited Minor to moderate defects and deterioration observed, but no significant reduction in structural capacity.
"Fair"		All primary structural elements are sound; but minor to moderate defects and deterioration observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the structural
"Poor"	Some capacity reduction	Advanced deterioration or overstressing observed on widespread portions of the structure. Some reduction in structural capacity.
"Serious"	Local failures possible	Advanced deterioration, overstressing or breakage may have significantly affected the load bearing capacity of primary structural components . Local failures are possible.
"Critical"	Local failures exist	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.
"Not Inspected"	Not inspected	Structural element was not visible and therefore not inspected .

The majority of the seawalls in question are granite block walls. There are various types of damage or defect that are common for block walls, including:

- Settlement behind the wall indicating washout.
- Displacement of wall, visible either based on movement of face outwards into channel or irregular movement of horizontal joints.
- Displacement or loss of individual blocks, cracking or breakage of individual blocks, either localized or widespread.
- Condition of joint material, open with loss of mortar/pointing or vegetation growth.

The condition assessment consisted of a visual appraisal only. The information gathered is limited to observations made from publicly accessible vantage points. Due to the distance between the viewer and the structures, the condition of individual structural elements has not been assessed and any opinion offered on the condition of elements will need to be confirmed through a detailed study.

A summary of the condition assessment provided in the graphic below. Relevant images and notes for each property assessed are included on the following pages.

Stationing	0+00	0+82	1+85	2+80	3+13	3+93	5+12	5+61	6+00	8+74	10+79	11+06	15+76	16+48	22+79	24+31
Property ID	P14	P13	P12	R7	P11	R5	P10	P09	P08	P06	P04	P05	P03	P02	P01	
Walls			5	1	1, 2	1	1	1				2		4		
Piles			3	3	3	3	3		3	3	3	3	3	3	3	
Decks			3	3	3	3	3	3	3	3	3	3	3	3	3	

Rating	Description	
"Good"	No significant reduction	No visible damage or only minor problems noted . Structural elements may show some very minor deterioration, but no significant reduction in structural capacity.
"Satisfactory"		Limited Minor to moderate defects and deterioration observed, but no significant reduction in structural capacity.
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"Critical"	Local failures exist	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.
"Not Inspected"	Not inspected	Structural element was not visible and therefore not inspected .

Notes:

- 1 Not able to observe due to site conditions and/or access constraints.
- 2 Site is under development or anticipated for development.
- 3 Structure not in scope.
- 4 Some parts of structure visible, others not. Condition of visible elements varies, overall condition cannot be assessed.
- 5 Assessment provided for granite seawall. Building concrete wall located behind seawall wall not assessed.

Seawall and Pier Condition Assessment Images and Notes

P01 – Christopher Columbus Park

Background: granite block seawall, no visible pointing. 1976 Chapter 91 drawings available showing typical section and indicating repairs and maintenance occurred. Seawall sits on timber piles. Concrete slab added spanning back from seawall to new steel pipe piles inboard.



A – View of sea wall, note displacement of top of wall.



B – View of seawall, note some loss of blocks and opening of joints. Moderate portions have this level of damage.

Background: Base construction is granite block seawall. Historical drawings for north side indicate areas of concrete wall and loose slopes are also present. East end has steel sheet pile toe stabilization of granite wall in places. South side has some concrete wall sections behind granite or new wall foundations consisting of concrete filled steel sheet piling.



A – Key plan summary



B – Typical South edge conditions – rebuilt granite seawall and existing granite seawall with concrete wall behind



C – North edge conditions



D – Documented wall types

P03 – 255 State St. (Legal Seafoods)

Background: Granite block seawall, no visible pointing. No drawings available.



A – View of seawall

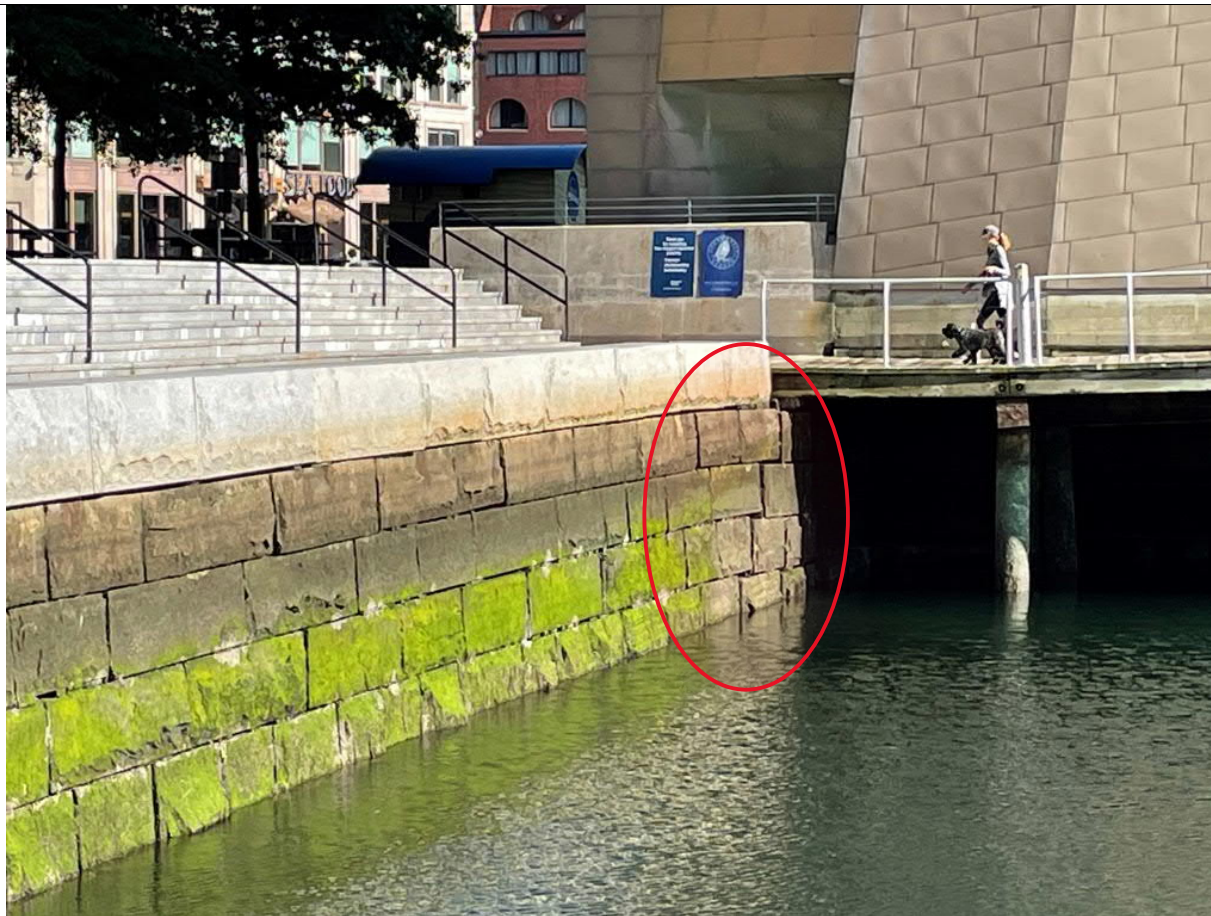
Note visible opening up of wall joints, tilt and rotation of stones, widespread loss of blocks. Deterioration is widespread over this length of wall.



B – View of seawall

P04 – Harbor Garage

Background: Granite block wall, Chapter 91 section indicates on concrete footing over rock fill. Constructed 1967.



A – View of seawall, bearing failure at far end visible



B – Detail showing crack/displacement at deck interface



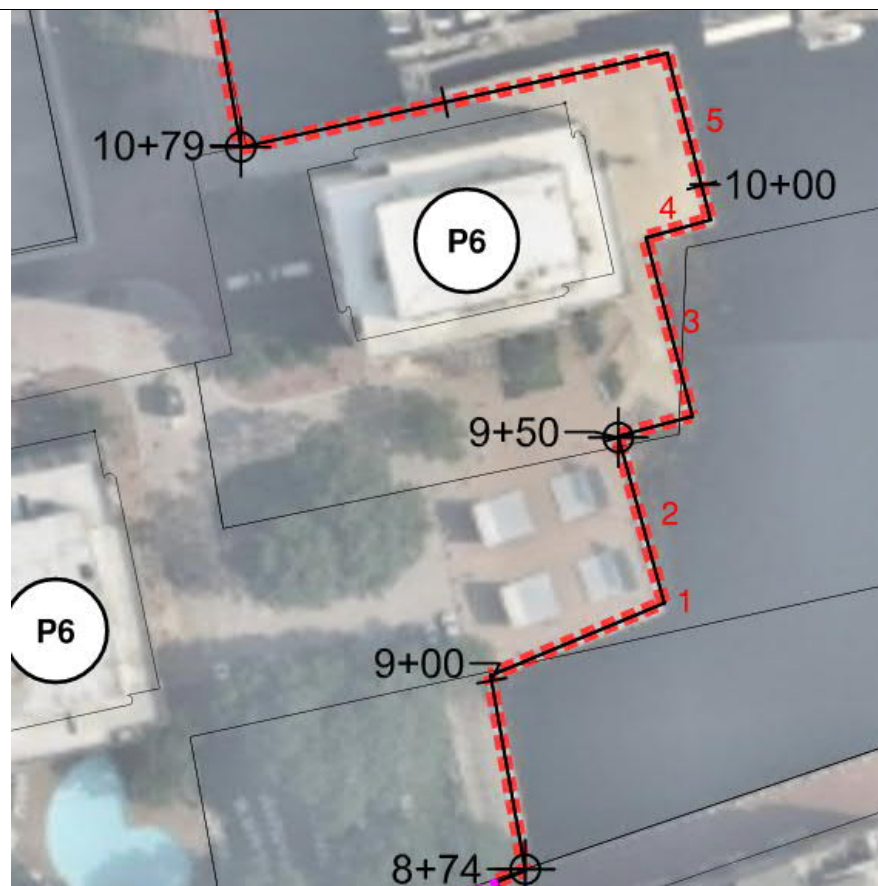
C – Capstone misalignment

P05 – New England Aquarium

Not inspected.

P06 – Harbor Towers

Background: 2012 drawings available showing proposed repairs to granite block sea wall at nine (9) locations. Repairs involved creation of rip rap berm to stabilize the toe of the existing granite block wall and addition of non-shrink grout at capstone joint. On Northern edge of site, a steel sheet pile wall has been placed behind the existing seawall. Control density fill was added at the NE corner of the site to fill voids and raise the settled slab. Areas have been repointed.



A – Key plan



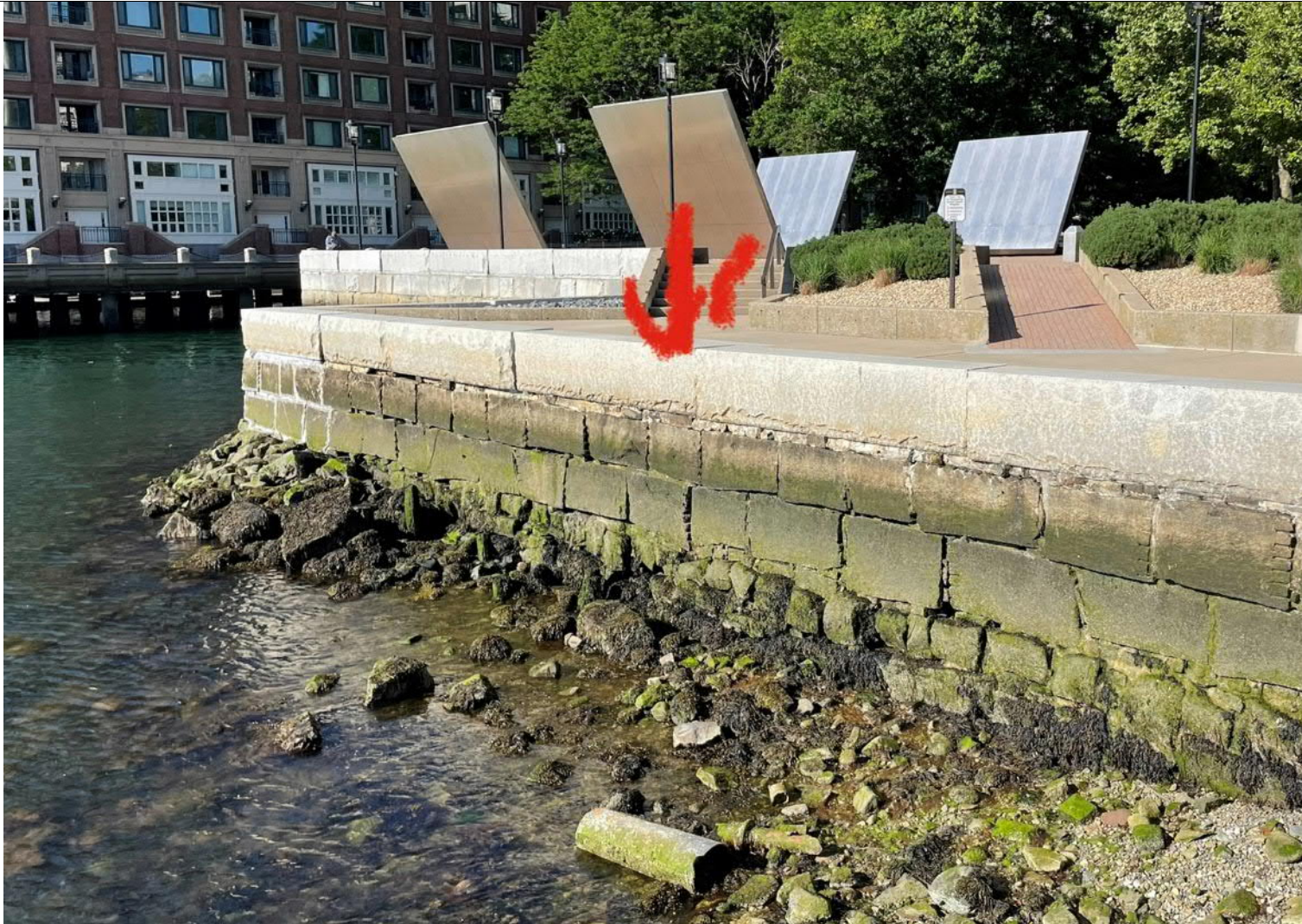
B – View of seawall (location 1)

Gaps between blocks and misalignment.



C – View of seawall (location 2)

Displacement of blocks, moderate/widespread.



D – View of seawall (location 3) Bowing corrected with capstone, potential settlement behind wall.



XX

E – View of seawall (location 4)

Wall has been repointed. Some blocks look to be missing.



F – View of seawall (location 5) Settlement and cracking behind wall.



H – View of seawall (North edge)

Note bowing, cracking and movement of wall likely due to washout. Note that this portion of wall has sheet piling behind.

P08 – Rowes Wharf

Background: Building development drawings are available which show a new sheet pile wall in front of a new RC concrete slurry wall which forms the building basement. The concrete wall is set back by ~10ft or more from the sheet pile wall.



A – View of sheet pile seawall

Note that from vantage point, alignment or condition of individual piles was not visible. Corrosion and flaking of sheet pile surface was visible, unclear if moderate or major damage.



B – View of deck and sheet pile wall

There is an RC concrete beam/slab deck supported by RC concrete piles outboard of the sheet pile wall. The width of this deck varies across the site. Note cracking in deck beams and marine growth on RC columns.

P09 – 400 Atlantic

Background: 2020 drawing available from timber deck pile repairs (concrete filled fiberglass jacket around existing concrete pile). Brick building sitting on existing granite block seawall with open joints.



A – View of seawall and piles

Timber deck supported by concrete filled, fiberglass jacketed, piles. Some rusting of timber deck to pile steel connection brackets. Decking not inspected. Piles recently repaired so in good condition. Seawall not visible so not inspected.

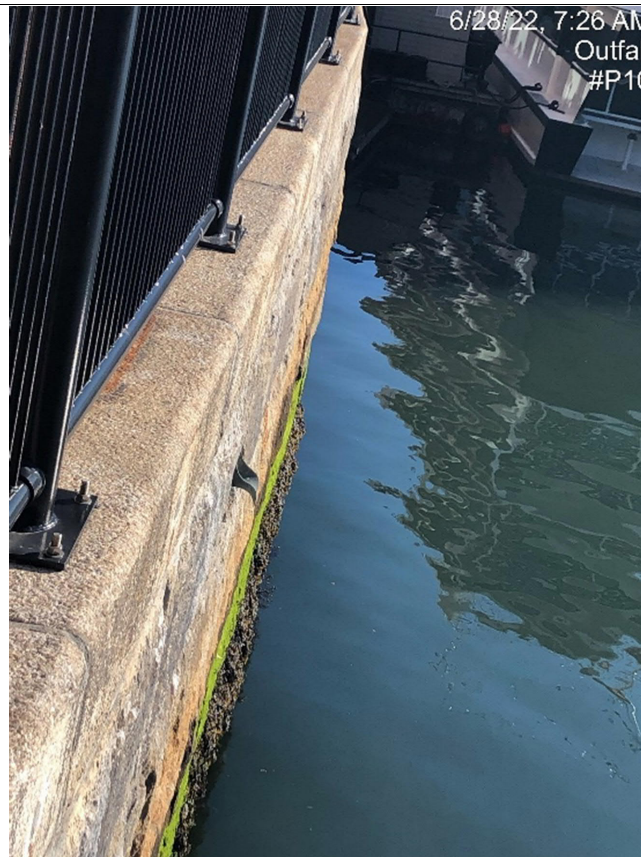


B – View of building facade

Seawall is set back below existing building façade. Note cracking in façade indicative of movement of seawall.

P10 – Coast Guard Building (GSA)

No existing drawings or plans available.



A – View of seawall

Note that seawall is not properly visible from vantage point therefore has not been inspected. Seawall has been repointed.



B – View behind seawall

Note settlement of pavement behind seawall. There was reported washout of fines from this wall by geotechnical engineer which resulted in repointing of wall.

P11 – Hook Lobster
Background: 1995 drawings from seawall repair, two blow outs in block seawall. Repaired using riprap and concrete fill.
Not inspected.

P12 – Independence Wharf

Background: 2017 building repair plans for foundations indicate the granite seawall as the limit of land subject to coastal storm flowage. The granite seawall looks to be abandoned.



A – View of severely deteriorated granite seawall with rocky intertidal shores in front. Building concrete wall visible behind. Blocks are loose with large joints, many blocks are destabilized.



B – View of building supports

Building edge aligns with adjacent decks and is supported by a concrete waffle slab in turn supported on concrete beam/column system with fiberglass jackets/piles at sea level. Both were repaired in 2017.

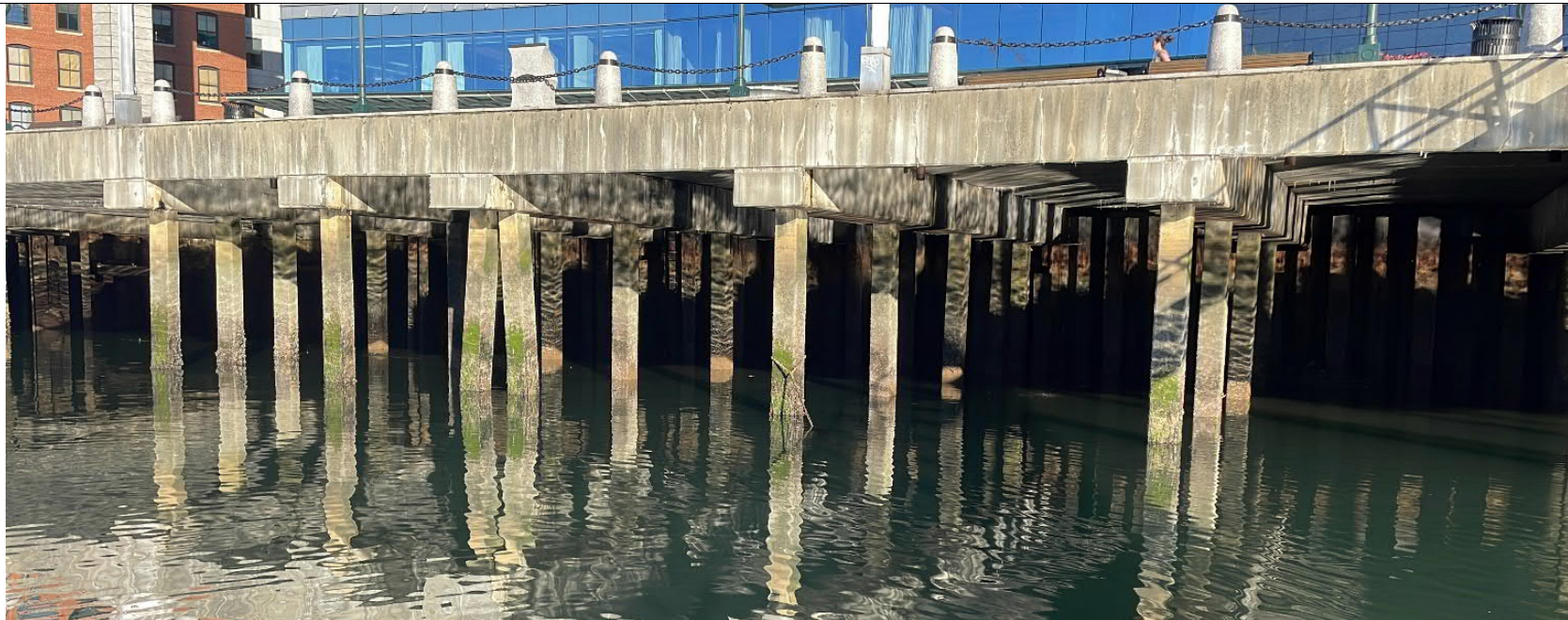


C – View of Easternmost corner

NE face adjacent to Seaport Blvd bridge consists of an RC wall sitting on existing block seawall. RC wall is in poor condition with exposed reinforcement. Unclear how this ties into new RC seawall where present, there may be a void behind this wall.

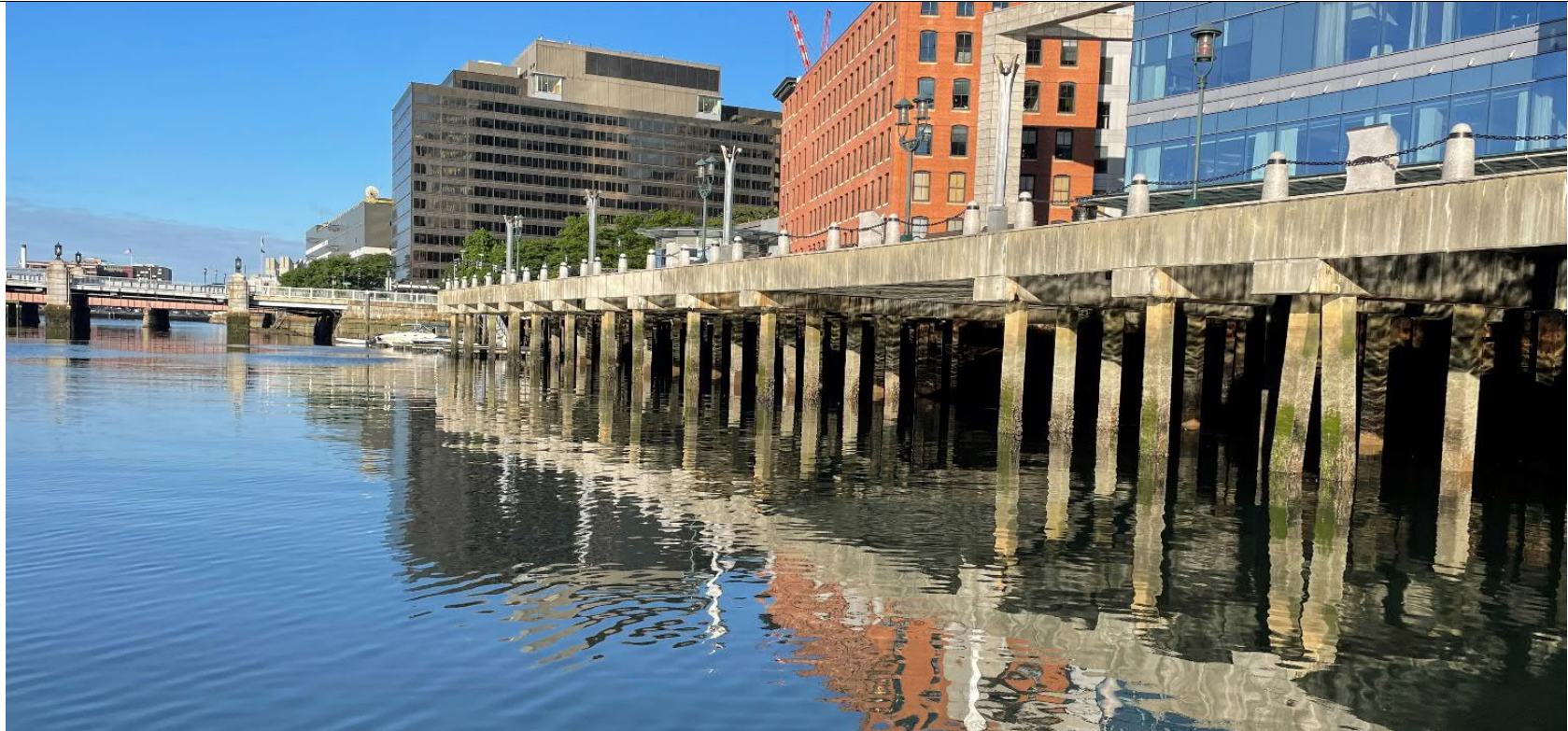
P13 – Intercontinental Hotel

Background: 1998 Plans and sections available. Concrete slurry wall with battered sheet pile wall in front. Existing stone or wooden seawall behind and abandoned in place.



A – View of piers and deck with sheet pile sea wall visible in background

Note lack of proximity to sheet pile wall – details including alignment and interlock not visible. Binocular view of sheet piles indicated corrosion and flaking of surface.



B – Side angle view showing gap in piles for silver line tunnel passing below.



C – Detail view of crack in concrete deck structure and condition of piles.

No disintegration or spalling of concrete observed. Concrete deck in front of slurry/sheet-pile wall, supported by concrete beams and square concrete piles. On a dry day following some wet weather, water was observed dripping through the deck.

P14 – Russia Wharf Condos

Background: 2008 drawings available. New concrete slurry wall behind existing seawall.



A – View of seawall

Note isolated debris at base, some isolated distortion or settlement of blocks observed. Pointing present.



B – View of Pier Structure

Appears to consist of concrete filled steel tubular piles (moderate to severe steel section loss suspected) supporting concrete beams and concrete deck above. No visible cracking or settlement of concrete beams. Surface of piles is rusting/pitted – moderate damage but no spalling observed.



C – Pier support detail view showing condition of piles.

APPENDIX G

Final Permitting Assessment





To: Derek Anderson, ARUP

Date: April 25, 2023
Project #: 15730.00

Memorandum

From: Stephanie Krueel

Re: WDC Resiliency Plan
Updated Permitting Assessment

This memorandum provides an updated assessment of permitting and agency review requirements for the Wharf District Flood Resiliency Plan (the "Resilience Plan") based on the conceptual-level plans for each of the study area's six sub-districts. This memo is intended to support the processes of securing regulatory approvals. As the Resilience Plan is advanced to the schematic design stage and beyond, compliance with applicable regulations and policies should be continuously reviewed. The actual permits and reviews required may differ from those presented below based on the details of the final construction documents. The proposed flood protection systems for each of the sub-districts are referred to herein as the "projects," collectively.

1. Key Findings

- › All projects must file a Notice of Intent (NOI) with the Boston Conservation Commission.
- › All projects require approval under Chapter 91, most likely in the form of a new or amended license.
- › All projects could potentially be approved under the existing Chapter 91 regulations at 310 CMR 9.00. However, specific changes (identified in Table 2 below) would clarify and confirm licensing eligibility.
- › All projects are likely to be subject to review under the Massachusetts Environmental Policy Act (MEPA), pending final design, because they require a Chapter 91 License, and they exceed at least one Environmental Notification Form (ENF) threshold (see Table 1 below).
- › While no Environmental Impact Report (EIR) thresholds are likely to be exceeded, EIRs would be required due to the projects' proximity to Environmental Justice (EJ) populations in compliance with MEPA's EJ Protocols.
- › The preferred projects for Long Wharf, Rows Wharf, Northern Ave, and Fort Point Channel impact historic resources and will require review by the Massachusetts Historical Commission (MHC).
- › All projects include work within the FEMA 1% annual chance floodplain. The Long Wharf Phase 1 project includes measures that would be subject to the flood-related portions of the MA Building Code (wet and/or dry floodproofing strategies at the Chart House and Customs House).
- › All projects include at least one element in the public right-of-way, and as such would require review by the City's Public Improvement Commission (PIC).
- › The projects at Long Wharf and Central Wharf will require review by and coordination with the Boston Transportation Department (BTD).
- › The Long Wharf project will require review by and coordination with the Boston Fire Department (BFD).
- › All projects have at least one element within 100 feet of land considered to be a park, and as such would require review by the Boston Parks Commission.



- › Consultations with the Massachusetts Department of Environmental Protection (DEP) Waterways Department and MEPA Office are recommended as next steps.

2. Applicable Permitting and Review Processes

VHB's *Initial Permitting Assessment* (June 10, 2022) provided a summary of the potentially applicable regulations, plans and guidelines, as well as constraints they may have on constructing district-scale flood protection measures. That assessment found that none of the regulations, plans or guidelines categorically prohibit alterations to the shoreline¹ for the purpose of increasing resilience to flooding.

Table 1 below identifies which of the following permitting and review processes are likely to be required for each of the six sub-districts:

- | | |
|---|---|
| › Wetlands Protection Act (WPA) (310 CMR 10) | › Massachusetts Building Code (780 CMR) |
| › The Boston Wetlands Ordinance | › Historic Resources (Section 106) |
| › Chapter 91 (310 CMR 9.00) | › City of Boston approvals (Public Improvement Commission, Transportation Department, Fire Department, and Parks and Recreation Department) |
| › Massachusetts Environmental Policy Act (MEPA) (301 CMR 11.00) | |

The proposed Resilience Plan does NOT require compliance with the following, as described below:

- › Boston Zoning Code
- › Clean Water Act (Sections 401 & 404)
- › Rivers and Harbors Act (Section 10)

Compliance with the Boston Zoning Code is required when there is any change in the use of a building or land and when reconstruction, extension or structural changes to buildings is undertaken. Although the zoning code is technically also applicable to structures other than buildings (bridge, trestle, tower, framework, retaining wall, tank, tunnel, tent, stadium, reviewing stand, platform, bin, fence, sign, flagpole, or the like), in practice it does not identify requirements for structures such as piers, wharfs, and coastal engineering structures. Further, implementation of the Resilience Plan does not trigger large or small project review under Article 80.

Due to the presence of the Magenta Zone (an area along the waterfront of the Boston Inner Harbor and the Fort Point Channel designated in 1968 by Congress (PL 90-312) to be "not a navigable water of the United States," even though the area is factually navigable), the proposed Resilience Plan projects are NOT subject to Section 404 of the Clean Water Act, which requires a permit from the U.S. Army Corps of Engineers before dredged or fill material may be discharged into navigable waters of the United States. Since no federal permits are required for discharging fill, Section 401 of the Clean Water Act, wherein a federal agency may not issue a permit or license to conduct any activity that may result in any discharge into waters of the United States unless a Section 401 water quality

¹ The term "shoreline" means the mean high water line, which, within the Study Area, is generally the face of the existing coastal engineering structures or the perimeter of piers or wharfs.



April 25, 2023
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Memorandum

certification is issued, is NOT applicable. Section 10 of the Rivers and Harbors Act, which requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the construction of any structure in or over any navigable water of the United States, is also NOT applicable.



Memorandum

Table 1 Overview of Applicability of Permitting/Review Processes by Sub-District

Permitting/Review Process	1a. Long Wharf (Phase 2)	1b. Long Wharf (Phase 1)	2. Central Wharf	3. Harbor Towers	4. Rowes Wharf	5. Northern Ave	6. Fort Point Channel
WPA Notice of Intent (Performance Standards)							
Land Under Ocean	✓	x	✓	✓	✓	✓	✓
Coastal Bank ^a	✓	✓	✓	✓	✓	✓	✓
Land Subject to Coastal Storm Flowage (LSCSF)	✓	✓	✓	✓	✓	✓	✓
BWO Notice of Intent (Performance Standards)							
Land Under Ocean	✓	x	✓	✓	✓	✓	✓
Coastal Bank	✓	✓	✓	✓	✓	✓	✓
LSCSF	✓	✓	✓	✓	✓	✓	✓
Waterfront Area	✓	✓	✓	✓	✓	✓	✓
Coastal Flood Resilience Zone ^b	Likely	Likely	Likely	Likely	Likely	Likely	Likely
Chapter 91 (New or Amended Waterways License)							
Commonwealth Tidelands	✓	✓	✓	x	x	x	x
Private Tidelands ^c	x	x	✓	✓	✓	✓	✓
MEPA Review (Environmental Notification Form Threshold + Environmental Justice Policy = EIR-Level Review)							
301 CMR 11.03(3)(b)1.a. Alteration of Coastal Bank ^{a, d}	✓	✓	✓	✓	✓	✓	✓
301 CMR 11.03(3)(b)1.e. New or Expanded fill or structure (except pile supported) in a velocity zone ^d	✓	✓	✓	✓	✓	✓	x
301 CMR 11.03(3)(b)1.f. alteration of ½ or more acres of any other wetlands (LSCSF) ^d	x	✓	x	x	x	x	x



Memorandum

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Permitting/Review Process	1a. Long Wharf (Phase 2)	1b. Long Wharf (Phase 1)	2. Central Wharf	3. Harbor Towers	4. Rowes Wharf	5. Northern Ave	6. Fort Point Channel
301 CMR 11.03(3)(b)6. Construction, reconstruction or Expansion of an existing solid fill structure of 1,000 or more sf base area or of a pile-supported or bottom-anchored structure of 2,000 or more sf base area in flowed tidelands	✓	✓	✓	✓	✓	✓	✓
Massachusetts Historical Commission (MHC) Review							
National Historic Landmark	✓	x	x	x	x	x	x
National Register District	✓	x	x	x	✓	✓	✓
MA Building Code (780 CMR)							
Special Flood Hazard Area Floodproofing Requirements (A Zone)	x	✓	x	x	x	x	x
City of Boston Approvals							
Public Improvements Commission (PIC)	✓	✓	✓	✓*	✓*	✓	✓
Boston Transportation Department (BTD)	✓	✓	✓	x	x	x	x
Boston Fire Department (BFD)	✓	✓	x	x	x	x	x
Parks Department Review (100' Rule, Section 7-4.11)	✓	✓	✓	✓*	✓*	✓	✓

✓ = Applicable; x = Not Applicable

* Redundant alignment only

a Confirm with DEP whether Coastal Engineering Structure (CES) itself would be considered bank.

b The extent of the Boston Wetlands Ordinance's Coastal Flood Resilience Zone has not yet been established.

c Requires confirmation via a title search to determine whether the property has ever been owned by the Commonwealth or a political subdivision thereof.

d Provided a permit (e.g., Ch91 License or WPA Superseding Order of Conditions) is also required.



Memorandum

3. Regulatory Compliance

Table 2 below identifies how each sub-district project could demonstrate compliance with the applicable performance standards and regulatory requirements that impact design. It also identifies regulatory adjustments that would help facilitate the permitting process. As design progresses compliance with existing and proposed regulations should be continuously reviewed.

Please note the following pertaining to fill in Boston Harbor:

- › While restrictions on fill within Boston Harbor do exist, they are nuanced and depend on several specific factors such as intended use and potential adverse impacts.
- › There is no categorical restriction applicable to the Resilience Plan projects in the Chapter 91 regulations (see 310 CMR 9.32 *Categorical Restrictions on Fill and Structures* in Table 2).
- › There is no categorical restriction applicable to the Resilience Plan projects in the WPA (see performance standards for 310 CMR 10.25 *Land Under Ocean* in Table 2; this should not be confused with the resource area described in 310 CMR 10.56 *Land Under Waterbodies and Waterways*, for which there ARE restrictions on fill).

The sub-districts include a mixture of private and Commonwealth tidelands under Chapter 91. Because the uses are categorized as water-dependent, the additional requirements for activation of Commonwealth tidelands for public use at 310 CMR 9.53 are not applicable (although the projects would not diminish the capacity of the sites to meet such requirements if they were applicable).

4. Next Steps

The biggest hurdles to implementing district-scale flood protection measures are likely to be related to agency positions and unofficial policies rather than to actual regulatory constraints. While the concept of resilience to the impacts of sea level rise is promoted at the local and state levels, some agencies, particularly the Boston Conservation Commission and the Massachusetts Office of Coastal Zone Management (CZM), are not in practice comfortable with placing fill in waterways, raising seawalls, and/or placing fill in the floodplain. Barring any changes to the MEPA regulations at 301 CMR 11.00 that may alter review thresholds related to wetlands and waterways, the projects recommended in the Plan are likely to be subject to MEPA review, which will in turn provide a venue for CZM input.

Consultations with the following are recommended:

1. DEP Waterways Department
 - a. Present the Resilience Plan to identify any potential issues related to Chapter 91 licensing.
 - b. Suggest regulatory changes and explore a timeline for their implementation.
 - c. Discuss potential permitting strategies, including the potential for minor modifications and/or a Consolidated Written Determination.



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- d. Discuss the implications of the Magenta Zone to confirm that permitting under Sections 401 and 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act is not required (it may be necessary to get feedback from additional DEP departments).

2. MEPA Office

- a. Present the Resilience Plan to get initial feedback.
- b. Explore the potential to allow each of the six sub-district projects to move through review and permitting individually, or to set up a Special Review Procedure to cover review of the entire Resilience Plan.
- c. Obtain a recommendation for how to address potential impacts on adjacent properties through flow path analyses or other modeling efforts.

Once design has reached the 30-60% phase, the projects can begin the permitting process. Chapter 91 Licenses cannot be issued until the WPA and MEPA processes are complete and projects are in the 100% design phase (stamped engineering plans are required). Once permitting strategies are agreed upon by the proponent(s) and agencies, the processes required to comply with the WPA, MEPA, and Chapter 91 could take between 17 and 24 months (combined) to complete from the time of submission.



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Table 2 Sub-District Regulatory Considerations

Regulation	Summary of Standard	Compliance	Suggested Regulatory Changes
Wetlands Protection Act 310 CMR 10.00			
Land Under Ocean 10.25(5)	Projects...which affect nearshore areas of land under the ocean shall not cause adverse effects by altering the bottom topography so as to increase storm damage or erosion of coastal beaches, coastal banks, coastal dunes, or salt marshes.	Pile supported structures and fill placed for the purposes of flood control will be designed by a coastal engineer to avoid such adverse effects.	None.
Land Under Ocean 10.25(6)	Projects...which affect land under the ocean shall if water-dependent be designed and constructed, using best available measures, so as to minimize adverse effects on marine fisheries habitat or wildlife habitat caused by: (a) alterations in water circulation; (b) destruction of eelgrass (<i>Zostera marina</i>) or widgeon grass (<i>Ruppia maritima</i>) beds; (c) alterations in the distribution of sediment grain size; (d) changes in water quality, including, but not limited to, other than natural fluctuations in the level of dissolved oxygen, temperature or turbidity, or the addition of pollutants; or (e) alterations of shallow submerged lands with high densities of polychaetes, mollusks or macrophytic algae.	Pile supported structures and fill placed for the purposes of flood control will be designed by a coastal engineer to minimize or avoid such adverse effects. In-water work may be subject to Time of Year (TOY) restrictions established by the Division of Marine Fisheries (DMF).	None.
Coastal Bank 10.30(6)	Any project on such a coastal bank or within 100 feet landward of the top of a coastal bank [that is considered a vertical buffer] shall have no adverse effects on the stability of the coastal bank.	The projects will be designed to have no adverse effect on bank stability.	None.



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Regulation	Summary of Standard	Compliance	Suggested Regulatory Changes
Boston Wetlands Ordinance Chapter VII-I.IV			
Land Subject to Coastal Storm Flowage (LSCSF) Part II, Sec. XVII. E.9.	The Commission may, in its sole discretion, permit the following activities provided that the applicant demonstrates to the satisfaction of the Commission that best available measures, as defined by the Ordinance, are utilized to minimize or eliminate adverse impacts on the critical characteristics of and Resource Area Values protected by LSCSF: iii. Pedestrian walkways for public shoreline access and nonmotorized use; viii. Projects that are designed and intended to reduce the risk of coastal flooding, inland flooding, extreme weather events, SLR, and other adverse impacts of climate change, including, but not limited to, strategies and plans described in Climate Ready Boston or any successor initiative of the City.	The projects meet the criteria for permitting under this section. The projects will protect the resource area values of LSCSF, i.e., storm damage prevention, flood control, and prevention of pollution. However, they will by definition result in the elimination of the resource area, as the adjacent land on the sites will no longer be subject to the 1% annual chance flood event.	It would be helpful to adjust the regulations to acknowledge the allowable loss of the resource area itself while protecting the values identified in the ordinance.
LSCSF Part II, Sec. XVII. F.2.	Notwithstanding the provisions of Section XVII(E), the Commission may permit work or activity that constitutes a Redevelopment, provided that the work or activity shall conform to the following criteria: i. At a minimum, proposed work or activity shall result in an improvement over existing conditions of the capacity of LSCSF to protect at least one of the Resource Area Values described in Section XVII(A)(i.e., storm damage prevention, flood control, protection of wildlife and wildlife habitat, prevention of pollution, erosion and sedimentation control, and to mitigate the impacts of climate change) and adaptations to or mitigation against the impacts of SLR on the project and the area of the proposed work or activity;	The projects will protect the following resource area values of LSCSF: storm damage prevention, flood control, prevention of pollution, and mitigating the impacts of climate change. However, they will by definition result in the elimination of the resource area, as the adjacent land on the sites will no longer be subject to the 1% annual chance flood event.	It would be helpful to adjust the regulations to acknowledge the allowable loss of the resource area itself while protecting the values identified in the ordinance.



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Regulation	Summary of Standard	Compliance	Suggested Regulatory Changes
Chapter 91 310 CMR 9.00			
9.32 (1)(a)	Projects that are restricted to fill or structures which accommodate the uses specified below are eligible for licensing: 1. fill or structures for any use on previously filled tidelands; 2. fill or structures for water-dependent use located below the high water mark; 3. structures to accommodate public pedestrian access on flowed tidelands	The projects are eligible for a license because they propose fill on previously filled tidelands, structures for water dependent use located below the high water mark, and/or structures to accommodate public pedestrian access on flowed tidelands. The projects can likely be categorized as a water-dependent use as per 9.12(2)(a)11 & 12.	It would be helpful to confirm categorization of the project as water dependent by revising 9.12(2)(a)11. to read "shore protection structures <i>including grey infrastructure such as</i> seawalls, bulkheads, revetments, dikes, breakwaters, and any associated fill, <i>as well as green infrastructure such as vegetation, edging and sills,</i> which are necessary to protect an existing structure from either natural erosion or accretion <i>or flood damage caused by sea level rise,</i> or to protect, construct, or expand a water-dependent use.
9.35 (2)(a)&(b)	The project shall not significantly interfere with public rights of navigation which exist in all waterways. Projects shall not extend seaward of any state harbor line, extend into an existing channel, impair navigational site lines, require the alteration of an established course of vessels, interfere with access to adjoining areas, significantly interfere with the public rights of free passage over and through the water.	The projects avoid the identified adverse effects. No project is anticipated to require alteration of the established course of the F4 Boston-Charlestown or F2/FH Quincy-Hull-Logan-Boston ferries.	None.
9.35(3)	The project shall not significantly interfere with public rights of fishing and fowling or of on-foot passage on private tidelands in the exercise of these rights and must include reasonable measures to provide on-foot passage on filled tidelands.	The projects do not interfere with public rights. They maintain these rights and accommodate additional activities by making	None.



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Regulation	Summary of Standard	Compliance	Suggested Regulatory Changes
		improvements to and increasing the longevity of the Harborwalk.	
9.36(2)	The project shall not significantly interfere with littoral or riparian property owners' right to approach their property from a waterway, and to approach the waterway from said property.	The projects do not impact the rights of adjacent property owners.	None.
9.36(3)	The project shall not significantly disrupt any water-dependent use in operation, as of the date of license application, at an off-site location within the proximate vicinity of the project site.	The projects will not significantly impact water-dependents uses in operation in the vicinity of the project sites. Temporary and/or insignificant impacts are anticipated.	None.
9.37(3)	Projects with coastal or shoreline engineering structures shall comply with the following: (a) any seawall, bulkhead, or revetment shall be located landward of the high water mark unless it must lie below the high water mark to permit proper tieback placement, to obtain a stable slope on bank areas, or to be compatible with abutting seawalls, bulkheads, or revetments in terms of design, size, function, and materials, or unless it is associated with new fill permitted according to the provisions of 310 CMR 9.32; (b) any breakwater or similar structure designed to dissipate or otherwise reduce wave energy or to interfere with current flow shall not 1. cause or contribute to water stagnancy; 2. reduce the ability of adjacent water bodies to flush adequately; or 3. cause or contribute to sedimentation problems in adjacent or nearby navigation channels, anchorages, or wetland resource areas, or cause increased erosion to inland or coastal beaches, banks, or other wetland resource areas;	See narrative for 9.32(1)(a) above.	9.37(3)(a) should be altered to include an additional carve out: <i>"or unless its purpose is to provide protection from flooding associated with sea level rise in conjunction with a municipally-sanctioned district scale flood protection measure."</i>



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Regulation	Summary of Standard	Compliance	Suggested Regulatory Changes
9.52 (1)	A nonwater-dependent use project that includes fill or structures on any tidelands shall not unreasonably diminish the capacity of such lands to accommodate water-dependent use. In the event the project site includes a water-dependent use zone, the project shall include at least the following: (a) one or more facilities that generate water-dependent activity of a kind and to a degree that is appropriate for the project site, given the nature of the project, conditions of the water body on which it is located, and other relevant circumstances. (b) a pedestrian access network of a kind and to a degree that is appropriate for the project site and the facility(ies) provided in 310 CMR 9.52(1)(a).	While the interventions themselves qualify as water dependent use projects, they should not interfere with the ability of the non-water dependent uses on the same parcel to fulfill their obligation to comply with this requirement.	None.

APPENDIX H

Initial Permitting Assessment





To: Derek Anderson, ARUP

Date: June 10, 2022
Project #: 15730.00

Memorandum

From: Stephanie Krueel

Re: WDC Resiliency Plan
Initial Permitting Assessment

This memo describes the current understanding of the *Wharf District Council Conceptual District Protection & Resiliency Plan* (the "Plan") and provides a summary of the following potentially applicable regulations, plans and guidelines, as well as constraints they may have on constructing district-scale flood protection measures:

Regulations:

- › Wetlands Protection Act (310 CMR 10) and the Boston Wetlands Ordinance
- › Chapter 91 (310 CMR 9.00)
- › Massachusetts Environmental Policy Act (301 CMR 11.00)
- › Massachusetts Building Code (780 CMR)
- › Boston Zoning Code
- › Historic Resources (Section 106)
- › Parks Review (Section 7-4.11)
- › Clean Water Act (Sections 401 & 404)
- › Rivers and Harbors Act (Section 10)

Plans & Guidelines:

- › Climate Resilience Solutions for North End and Downtown
- › BPDA Greenway District Planning Study Use and Development Guidelines
- › BPDA Coastal Flood Resilience Design Guidelines
- › BPDA Downtown Waterfront Design and Use Guidelines
- › Public Works Department - Climate Resilient Design Guidelines & Standards
- › Coastal Zone Management
- › Division of Marine Fisheries Time Of Year Restrictions

1. Key Findings

- › None of the above regulations, plans or guidelines categorically prohibit alterations to the shoreline¹ for the purpose of increasing resilience to flooding, and many expressly support such activities.
- › The biggest hurdles to implementing district-scale flood protection measures are likely to be related to agency positions and unofficial policies rather than to actual regulatory constraints. While the concept of resilience to the impacts of sea level rise (SLR) is promoted at the local and state levels, some agencies, particularly the Boston Conservation Commission and CZM, are not in practice comfortable with placing fill in waterways, raising seawalls, and/or placing fill in the floodplain.

¹ The term "shoreline" means the mean high water line, which, within the Study Area, is generally the face of the existing coastal engineering structures or the perimeter of piers or wharfs.



- › Designing, permitting, and constructing district-scale flood protection measures will require cooperation and flexibility from multiple stakeholders who may have different goals related to public access, conservation of the natural environment, and protection of property, which often come into conflict with one another.
- › Stakeholders may also focus on different timeframes (near-term versus long-term) or place differing value on to whom benefits accrue (e.g., the public at large, private site users, and property owners).
- › Projects recommended in the Plan are very likely to impact jurisdictional resource areas and will require review and approval from the Boston Conservation Commission.
- › Barring potential changes to the MEPA regulations at 301 CMR 11.00 that may alter review thresholds related to wetlands and waterways, the projects recommended in the Plan are likely to be subject to MEPA review, which will in turn provide a venue for CZM input.
- › Consultation with MEPA is recommended to determine whether they consider any projects recommended under the plan are individual undertakings or are undertaken under a common plan (regardless of the number of property owners).
- › Permitting under the WPA, MEPA, and Chapter 91 could take between 17 and 24 months, combined, to complete.

Note: The Magenta Zone

The Magenta Zone is an area along the waterfront of the Boston Inner Harbor and the Fort Point Channel (extending along the entirety of the Study Area shoreline) designated in 1968 by Congress (PL 90-312) to be “not a navigable water of the United States,” even though the area is factually navigable (Figure 1). As a result of this designation:

- › Projects within the Study Area are NOT subject to Section 404 of the Clean Water Act, which requires a permit from the U.S. Army Corps of Engineers before dredged or fill material may be discharged into navigable waters of the United States.
- › Since no federal permit is required for discharging fill, Section 401 of the Clean Water Act, wherein a federal agency may not issue a permit or license to conduct any activity that may result in any discharge into waters of the United States unless a Section 401 water quality certification is issued, is NOT applicable.
- › Section 10 of the Rivers and Harbors Act, which requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the construction of any structure in or over any navigable water of the United States, is NOT applicable.

2. Project Understanding

The Plan’s “Study Area” comprises the parcels along the shoreline between (and inclusive of) Christopher Columbus Park and Congress Street, as well as the abutting parcels to the west up to the western limit of the southbound side of Purchase Street between North and Congress streets (Figure 1). As we understand it, the goals of the Plan are to:

- › Create a conceptual district-scale flood protection and resiliency plan to reduce the risk of flooding due to sea level rise,
- › Obtain buy-in on a conceptual plan from property owners,
- › Coordinate with city and state regulators, and
- › Identify a path to permitting the selected design.

The Plan's recommendations include the following categories of potential district-scale flood protection measures:

- › Outboard
 - Construct elevated Coastal Engineering Structures² (CES) immediately seaward of the existing shoreline
 - Construct elevated CES off-shore to contain new fill (i.e., "landmaking")
- › Inland
 - Raise elevations of the existing CES
 - Raise ground elevations landward of the existing CES
- › Building
 - Elevate structures
 - Floodproof structures

3. Detailed Regulatory Considerations

3.1 Wetland Resource Areas

The following wetland resource areas are regulated under the Wetlands Protection Act (WPA) and/or the Boston Wetlands Ordinance (BWO). Work within these areas must be approved by the Boston Conservation Commission under an Order of Conditions.

- › Land Under Ocean (WPA, BWO)
 - Definition: All land seaward of mean low water (MLW), which is -5.2' NAVD88/1.3' BCB in Boston Harbor.
 - In the Study Area: It is assumed that all areas seaward of the face of the existing coastal engineering structures is LUO, although there may be small areas with shallow conditions, particularly underneath wharves, where the resource area could more accurately be categorized as Land Subject to Tidal Action (LSTA).

² Such as seawalls, bulkheads and revetments

- Performance Standards: Work within LUO cannot result in alterations that would increase storm damage or erosion of banks, impact water circulation, alter distribution of sediment grain size, cause changes in water quality, or alter shallow area with a high density of sea life.
- Relevant Measures: Outboard
- › Coastal Bank (WPA, BWO)
 - Definition: The seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of a coastal beach, land subject to tidal action, or other wetland. MassDEP interprets this to include the land immediately behind a CES. The BWO expands this definition to include seawalls and bulkheads themselves under the definition of Coastal Bank.
 - In the Study Area: Regulated Coastal Bank is present in the Study Area where there are CESs.
 - Performance Standards: Work is prohibited from adversely impacting Coastal Bank stability.
 - Relevant Measures: Inland
- › Land Subject to Coastal Storm Flowage (LSCSF)(WPA, BWO)
 - Definition: According to 310 CMR 10.04, LSCSF means land subject to any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater. The landward boundary of LSCSF is located where the ground elevation is the same as the Base Flood Elevation (BFE) depicted on the currently effective or preliminary FEMA Flood Insurance Rate Map (FIRM).
 - In the Study Area: As per FIRM panel 250286, effective March 16, 2016, the northern portion of land within the Study Area is located within an AE zone with a base flood elevation (BFE) of 10 feet NAVD88. A VE zone³ exists seaward of the existing shoreline with a BFE of 13 feet NAVD88. The Limit of Moderate Wave Action (LimWA)⁴ is generally located approximately 25 feet from the shoreline.
 - Performance Standards: Under the BWO, paved surfaces within LSCSF are considered redevelopment, and work must result in an improvement (i.e., increase in pervious cover) over existing conditions. Currently, there are no performance standards for LSCSF within the state wetlands regulations.
 - Relevant Measures: Inland
- › Waterfront Area (BWO)
 - Definition: The portion of the buffer zone which extends twenty-five (25) feet horizontally from the edge of several resource areas, including coastal bank (BWO Section 7-1.4 b.).
 - In the Study Area: The area within 25 feet of the shoreline.

³ VE zones are areas within the floodplain that have additional hazards associated with storm waves of 3+ feet.

⁴ The area between the LimWA and the VE zone is known as the "Coastal A Zone," and is the area within the floodplain that has additional hazards associated with storm waves of 1.5 and 3 feet.

- Performance Standards: The Commission has a strong preference for restoring or maintain a strip of continuous, undisturbed or restored vegetative cover or waterfront public access throughout the Waterfront Area.
- Relevant Measures: Inland
- › Coastal Flood Resilience Zone (BWO)
 - Definition: The area of land beyond the current boundary of LSCSF or LSTA that the Commission determines has a reasonable probability of becoming subject to future coastal storm flowage or tidal action due to sea level rise (SLR) within approximately the next 50 years.
 - In the Study Area: The Commission has not yet adopted a map delineating this resource area. However, it is likely to be similar to the extent of the Article 25A Coastal Flood Resilience Overlay District.
 - Performance Standards: None at this time.
 - Relevant Measures: Inland

3.2 Chapter 91

- › Summary: Any construction, placement, excavation, addition, improvement, maintenance, repair, replacement, reconstruction, demolition or removal of any fill or structures, and any change in use of fill or structures in filled or flowed tidelands is subject to jurisdiction under M.G.L. c. 91, the Massachusetts Public Waterfront Act, and its implementing regulations at 310 CMR 9.00 (together, "Chapter 91").
- › In the Study Area: The entire Study Area is within Chapter 91 jurisdiction (Private Tidelands), and therefore all proposed work will require a new or amended license or a minor modification to an existing license, depending on the work proposed, issued by the Massachusetts Department of Environmental Protection's (MassDEP) Waterways Department.
- › Implications:
 - Parcels of land along the shoreline that contain any non-water dependent uses are required to reserve ground-floor spaces in facilities of public accommodation, provide ground-level usable open space, and preserve access or sight lines to the water. These requirements often directly conflict with implementing flood resilience measures such as raising first occupiable floors and seawalls.
 - In addition, these facilities are supposed to be provided in perpetuity, which presents a conundrum for low-lying areas in the path of SLR impacts.
 - While Chapter 91 does not categorically restrict the use of fill for flood protection purposes, it does not expressly allow it for that purpose either. Under the existing regulations, in-water coastal flood protection measures could potentially be licensed as a water-dependent use project, as a water-dependent infrastructure project, or through the variance process.
 - The Chapter 91 licensing process can take upwards of 9 months to complete.
 - Placing fill within flowed tidelands requires payment of a Tidewater Displacement Fee.

- Relevant Measures: Outboard, Inland, Buildings

3.3 Municipal Harbor Plan (MHP)

- › Summary: Based upon a recent court decision, the Downtown Waterfront MHP is not in effect. As a result, projects must comply with the standard Chapter 91 regulations. The following information is being provided in the event that the existing Downtown Municipal Harbor Plan is re-authorized in the future.
- › In the Study Area: The Downtown Municipal Harbor Plan sets up parameters and funding mechanisms for some sites within the Study Area to pursue coastal resilience strategies. It identifies specific strategies for the Harbor Garage and Hook Wharf sites and identifies amplifications for engineering and construction standards, and for activation of Commonwealth Tidelands for public use. It also identifies a 12-foot wide Water Dependent Use Zone along the waterfront.
- › Implications:
 - The MHP specifies that areas improved for public open space shall be incrementally elevated (identified as a non-structural alternative) to improve resiliency, as feasible, to be guided by the City's Design and Use Standards which recommend appropriate increases in elevation for public open spaces in the planning area.
 - It also specifies that all exterior private tideland areas that are planned for public access shall be held to the public activation standard used for Commonwealth Tidelands.
 - Public open space and accessible areas must be designed and constructed with materials that will ensure their continued use by the public after periods of inundation.
 - Waterside infrastructure such as new docks, piers, as well as bulkhead and seawalls, must be designed and constructed to withstand storm surge, wave action and future sea level rise.
 - Materials for public spaces should also be of a higher albedo to assist in limiting heat island effect and incorporate vegetation and structural elements that provide shade and refuge from summer heat, as well as wind and precipitation.
 - Relevant Measures: Outboard, Inland, Buildings

3.4 Massachusetts Environmental Policy Act (MEPA)

- › Summary: Review under MEPA is required when projects meet or exceed review thresholds related to environmental impacts AND require a related state agency action. MEPA will advise on jurisdiction based on whether projects are considered individual undertakings or are undertaken under a common plan (regardless of the number of property owners).
- › In the Study Area: Projects within the study area are most likely to trigger MEPA review as follows:
 - CH91 License + alteration of coastal bank OR new fill or structure in a velocity zone OR alteration of ≥ 0.5 acres of LSCSF.

- CH91 License + construction, reconstruction or expansion of an existing solid fill structure of 1,000 or more sf base area or of a pile-supported or bottom-anchored structure of 2,000 or more sf base area provided the structure occupies flowed tidelands or other waterways.
- › Implications:
 - Projects are likely to be subject to MEPA.
 - The Study Area is within one mile of Environmental Justice Communities, and projects subject to MEPA must therefore conduct extensive outreach and impact analysis as per the recently promulgated EJ policies.
 - The MEPA process must be complete before any state agency actions can occur (such as issuance of licenses or permits or distribution of financial assistance).
 - The MEPA process can take between 4 and 18 months to complete, depending on project details.
 - Relevant Measures: Outboard, Inland, Buildings

3.5 Massachusetts Building Code

- › Summary: New buildings and substantial improvements to existing buildings within FEMA's 1% annual chance floodplain as depicted on the Flood Insurance Rate Maps (FIRM) must comply with the flood-related portions of the Building Code, which provide minimum requirements for flood-resistant structural design and building methods and materials (for example, floodproofing materials). The Building Code does not address the design, construction or maintenance of docks, piers, bulkheads or waterway structures.
- › In the Study Area: Much of the Study Area between Christopher Columbus Park and Rowes Wharf is at least partially within the FEMA Floodplain.
- › Implications: All changes to buildings should comply with the Building Code as applicable.
- › Relevant Measures: Buildings

3.6 Boston Zoning Code

- › Summary: The Boston Zoning Code controls building and site use and bulk/dimensions including floor area ratios and lot coverage; minimum lot sizes; minimum yard setbacks; maximum height; and finish floor elevation. It also sets requirements for open space, parking and loading, and accessory structures. CESs are not subject to zoning.
- › In the Study Area: Parcels within the Study Area are subject to Zoning under Articles 42A (Downtown Waterfront Subdistrict of the Harborpark: North End Waterfront District), 49A (Greenway Overlay District), and 25A (Coastal Flood Resilience Overlay District).
- › Implications:
 - Changes to buildings or new structures may trigger compliance with the Zoning Code.

- If compliance with Article 25A is required, then building first floor elevations must be set at the required Sea Level Rise Design Flood Elevation (SLR-DFE).
- In addition, the project would need to demonstrate consistency with the Coastal Flood Resilience Design Principles related to resilience, urban design and public realm, relationship to district-scale resilience solutions, and sustainability co-benefits.
- Relevant Measures: Buildings

3.7 Historic Resources

- › Summary: Portions of the Study Area are listed in the National Register of Historic Places. Changes to structures and districts with this designation may require review by the Massachusetts Historical Commission (MHC).
- › In the Study Area: The Long Wharf and Custom House Block (BOS.AQ) is listed as a National Historic Landmark and a National Register District. The Fort Point Channel National Register Historic District (BOS.WZ) includes the seawall between 360-400 Atlantic Avenue and Congress Street.
- › Implications:
 - Any project that impacts National Historic Landmarks or Districts that requires federal funding, licenses, or permits must be reviewed by MHC in its role as the State Historic Preservation Office (SHPO), in compliance with Section 106.
 - If a Project is determined to result in an adverse effect that cannot be avoided or minimized, mitigation stipulations are documented in a Memorandum of Agreement (MOA) signed by the Proponent, the MHC, the lead federal agency, and other consulting parties or participating agencies as needed.
 - Relevant Measures: Inland

3.8 Parks Review

- › Summary: Section 7-4.11 of the Boston Code of Ordinances requires that buildings or structures erected or altered within 100 feet of a park or parkway must gain permission from the Boston Parks and Recreation Department (BPRD).
- › In the Study Area: City-owned parks within the Study Area include Christopher Columbus Park and Long Wharf Park. The Rose Kennedy Greenway may also be considered a Park under Section 7-4.11.
- › Implications: Work within 100 feet of the areas described above will be subject to review by the BPRD.
- › Relevant Measures: Outboard, Inland, Buildings

4. Applicable Plans and Guidelines

4.1 Climate Resilience Solutions for North End and Downtown (CRB-NED)

- › Summary: This report presents a toolkit that pairs existing edge conditions with possible design approaches, which may be appropriate as stand-alone solutions or in various combinations depending on existing edge conditions:
- › In the Study Area: The Design Flood Elevation (DFE) target is 15' NAVD88, while the Modular target is 16.5' NAVD88. This document identifies the area between Christopher Columbus Park and Rowe's Wharf as a "near-term + catalytic" project because it is vulnerable to flooding with 9 inches of SLR., while the area to the south is designated as a "long-term" project, which should be designed to address risks occurring as a result of 40 inches of SLR.
- › Implications: Projects within the Study Area should be designed to a minimum elevation of 15' NAVD88 to facilitate continuous protection throughout the Study Area and within adjacent areas.
- › Relevant Measures: Outboard, Inland

4.2 BPDA Greenway District Planning Study Use and Development Guidelines

- › Summary: Published in 2010, the Guidelines are specifically for the parcels adjacent to the Greenway and represent an effort to preserve the Rose Kennedy Greenway open space, activate the public realm, maximize the quality of its parks, and balance development.
- › In the Study Area: The Guidelines present four goals for the Wharf District: 1) Create and enhance access to the waterfront and South Boston; 2) Reinforce the openness of the freestanding pier-like structures; 3) Facilitate the accessibility of the Harborwalk; and 4) Further diversify abutting uses. It mainly focuses on the redevelopment of the Boston Harbor Garage and Hook Lobster/U.S. Coastguard/400 Atlantic Avenue sites. It also identifies areas for programmatic activation, important pedestrian nodes, and pedestrian connections.
- › Implications: The Guidelines are the culmination of a two-year planning study, and as such represent consensus among stakeholders about issues that may impact the design of the WDC Plan, particularly related to connectivity (both physical and visual) between the Greenway and the waterfront.
- › Relevant Measures: Inland, Buildings

4.3 BPDA Coastal Flood Resilience Design Guidelines

- › Summary: The Guidelines provide best practices for flood resistant design for new construction and building retrofits and are intended to be used by BPDA staff during review of projects within the CFROD (Article 25A). It warns that "enhancements at a parcel level should not worsen risk at adjacent parcels or restrict future implementation of district coastal resilience plans, and, to the extent feasible, should support the resilience goals and implementation of district coastal resilience plans."

- › In the Study Area: This document can provide ideas for building-level adaptations.
- › Implications: These guidelines do not present any specific constraints to designing district-scale flood protection measures.
- › Relevant Measures: Inland, Buildings

4.4 BPDA Downtown Waterfront Design and Use Guidelines

- › Summary: The BPDA is developing Design and Use Guidelines to advance the open space and public realm objectives of the 2017 Downtown Waterfront Municipal Harbor Plan & Public Realm Activation Plan. The guidelines are intended to provide consistent design standards for both exterior and interior public spaces, wayfinding elements, landscaping, signage and public amenities to improve connectivity within the district and to adjacent open space resources such as the Greenway and Boston Harbor. Climate resilience will be a priority in the development of the Guidelines to ensure the long-term viability of public spaces. Design options to support a variety of year-round public activation and programming will also be explored. Additionally, the project will develop management concepts to better coordinate vessel berthing, water transportation and shoreside support infrastructure. The final Guidelines will inform new development and public realm improvements to ensure the district is welcoming, active and accessible to all residents and visitors. This effort is currently on hold until the status of the Downtown Waterfront MHP is resolved.
- › In the Study Area: TBD
- › Implications: TBD
- › Relevant Measures: Outboard, Inland, Buildings

4.5 Public Works Department - Climate Resilient Design Guidelines & Standards

- › Summary: This document includes design, operations, maintenance, and cost considerations for designing resilient flood protection for public rights-of-way. While it recommends that the 2070 climate projections be used to inform design, the guidelines note that if the 2070 DFE is not feasible to achieve immediately due to available funding and/or site constraints, intermediary DFEs should be used to prepare a plan to reach the 2070 DFE elevation incrementally. Temporary, deployable flood barriers may use an intermediary DFE (2030 and 2050 time horizons) but are not considered appropriate for long-term flood defense from SLR and storm surge. The guidelines provide a suite of considerations that should be incorporated into designs, rather than specific designs themselves.
- › In the Study Area: These guidelines are applicable to designing protection for public ROWs within the Study Area.
- › Implications: These guidelines do not present any specific constraints to designing district-scale flood protection measures.
- › Relevant Measures: Inland

4.6 Coastal Zone Management

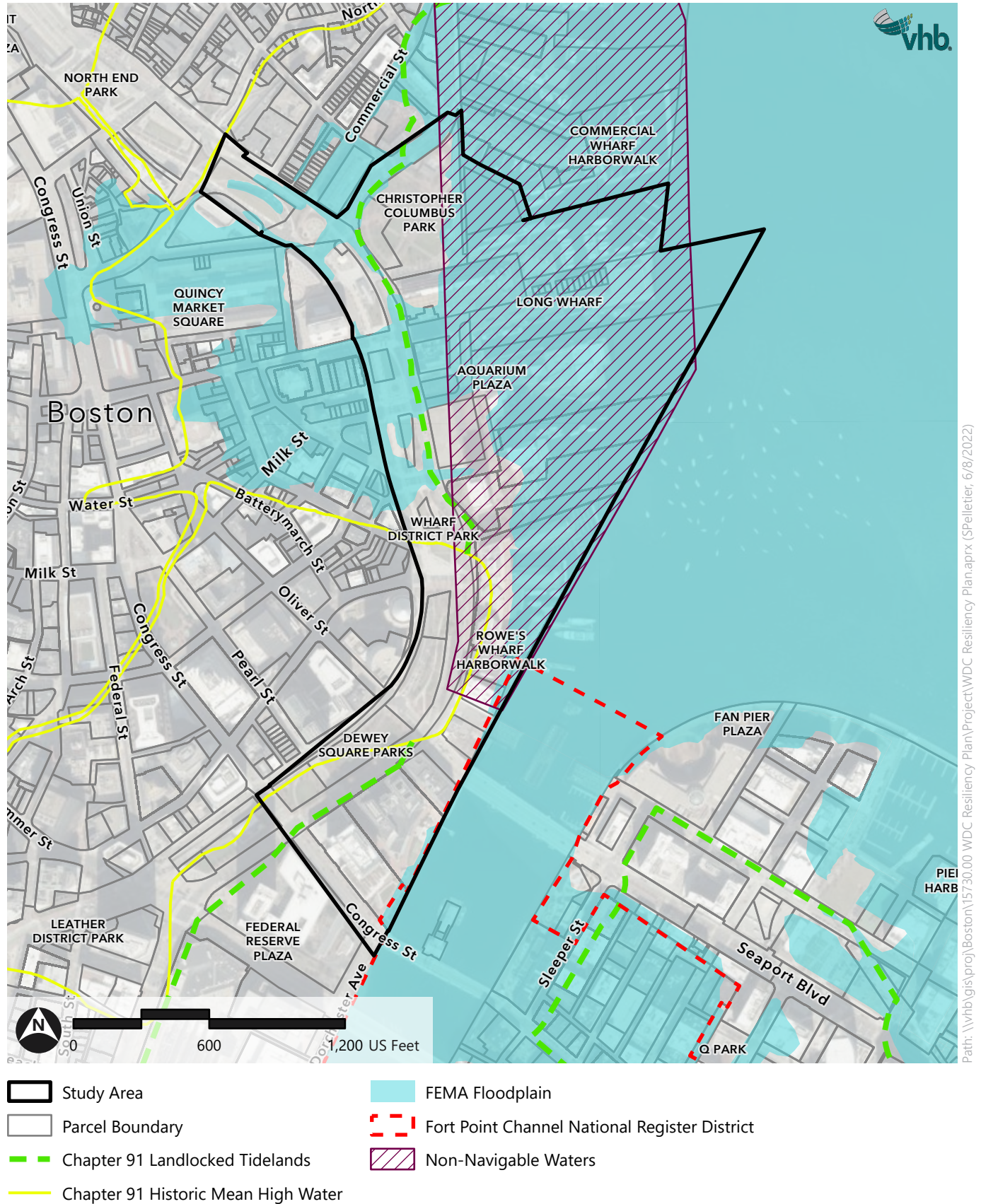
- › Summary: The Massachusetts Office of Coastal Zone Management (CZM) implements the federal consistency review process in Massachusetts. Federal consistency review is required for most projects that: 1) are in or can reasonably be expected to affect a use or resource of the Massachusetts coastal zone, and/or 2) require federal licenses or permits, receive certain federal funds, are a direct action of a federal agency. Projects subject to MEPA are reviewed and commented on by CZM.
- › In the Study Area: The entire study area is within the Coastal Zone.
- › Implications:
 - CZM has a strong preference for resilience solutions that avoid CESs. Alternatives analyses may be scoped in a MEPA certificate.
 - Projects subject to Federal Consistency Review would need to demonstrate compliance with all of the Massachusetts Coastal Program Policies.
 - Relevant Measures: Outboard, Inland

4.7 Division of Marine Fisheries (DMF) Time Of Year (TOY) Restrictions

- › Summary: The DMF recommends a TOY from February 15 to November 15 for work in Boston Harbor to avoid impacts to Winter Flounder, Horseshoe Crab and Shellfish (where Suitable Habitat is indicated).
- › In the Study Area: Any silt-producing activity within the in-water portion of the Study Area is likely to be subject to the TOY, required as a condition of the Boston Conservation Commission's Orders of Conditions.
- › Implications: In-water work would likely be limited to the period outside the TOY. Consultation with DMF is recommended during the WPA NOI process.
- › Relevant Measures: Outboard

Figure 1: Regulatory Constraints

WDC Resiliency Plan | Boston, Massachusetts



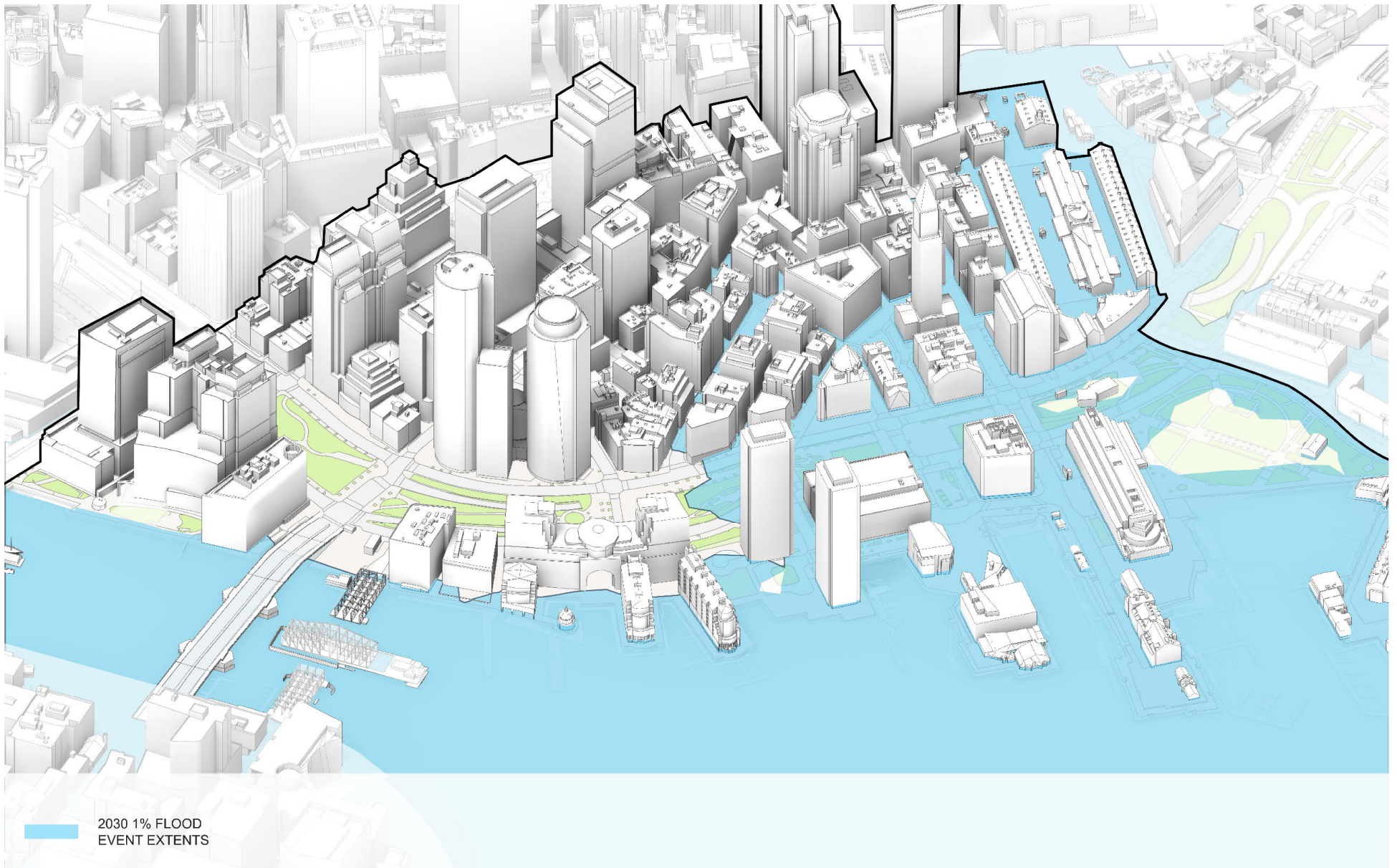
Source: VHB, MassGIS, NOAA, FEMA

APPENDIX I

Flood Maps

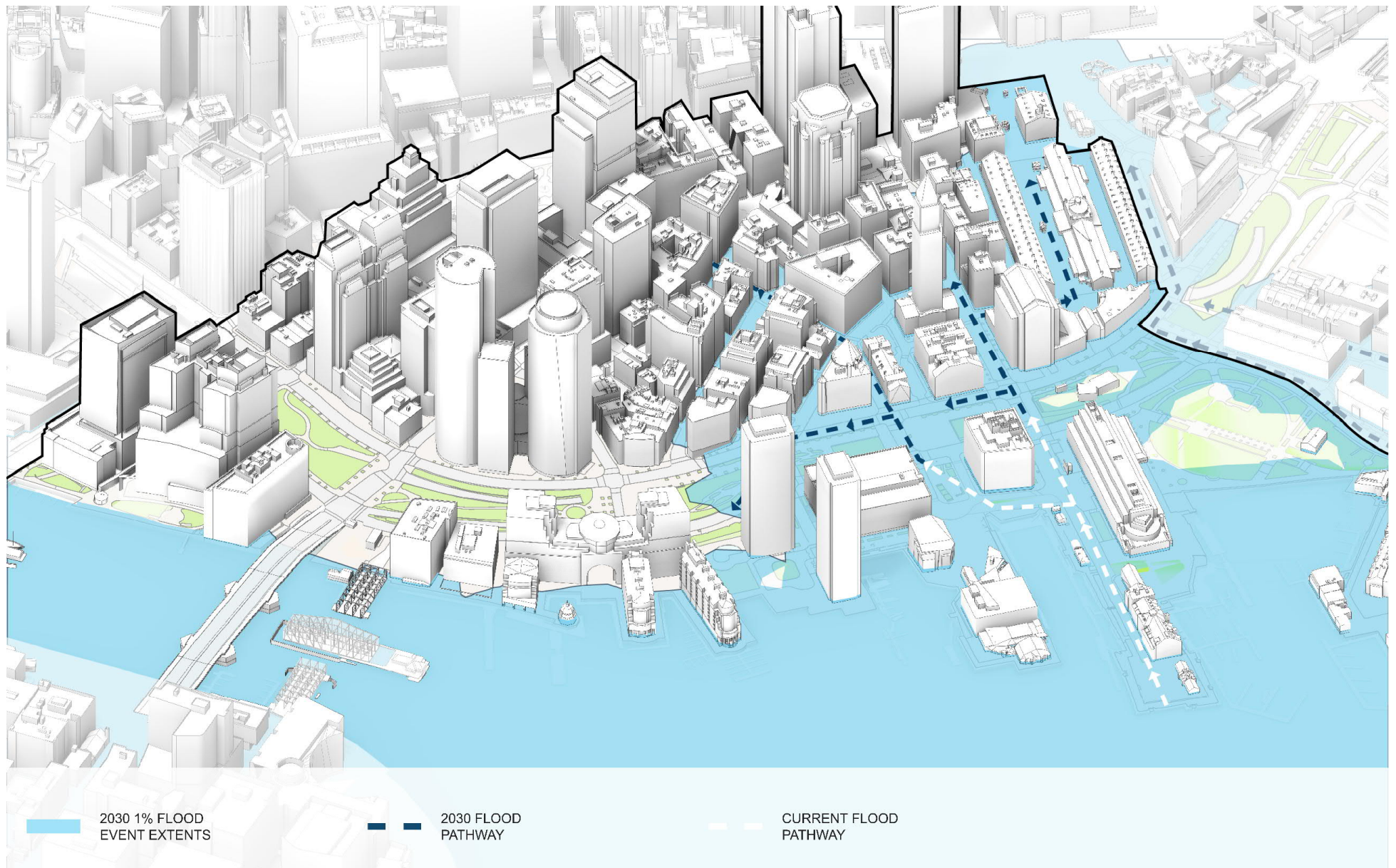


2030 1% Flood Extents



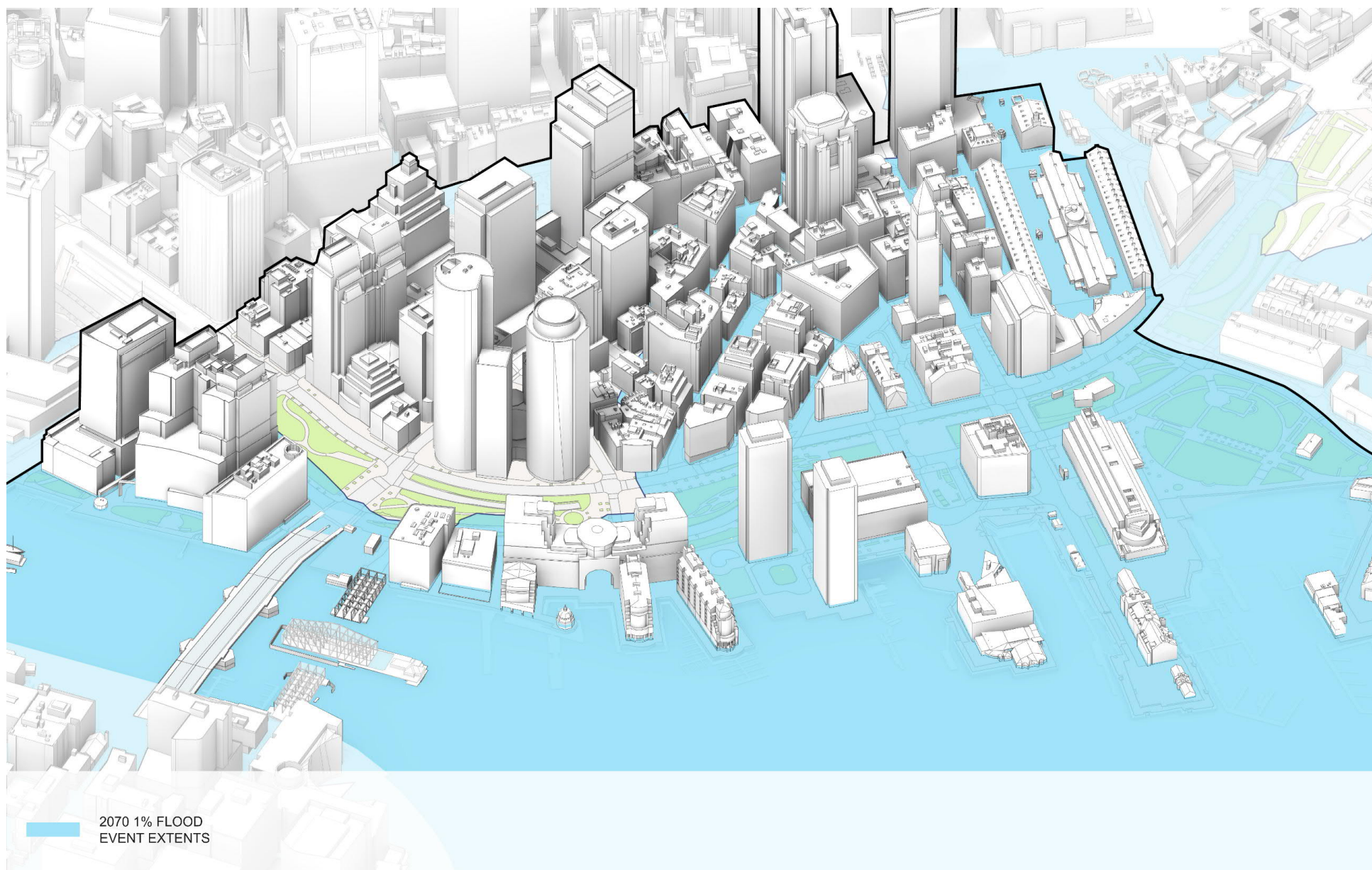
Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

2030 1% Flood Extents and Flood Pathways



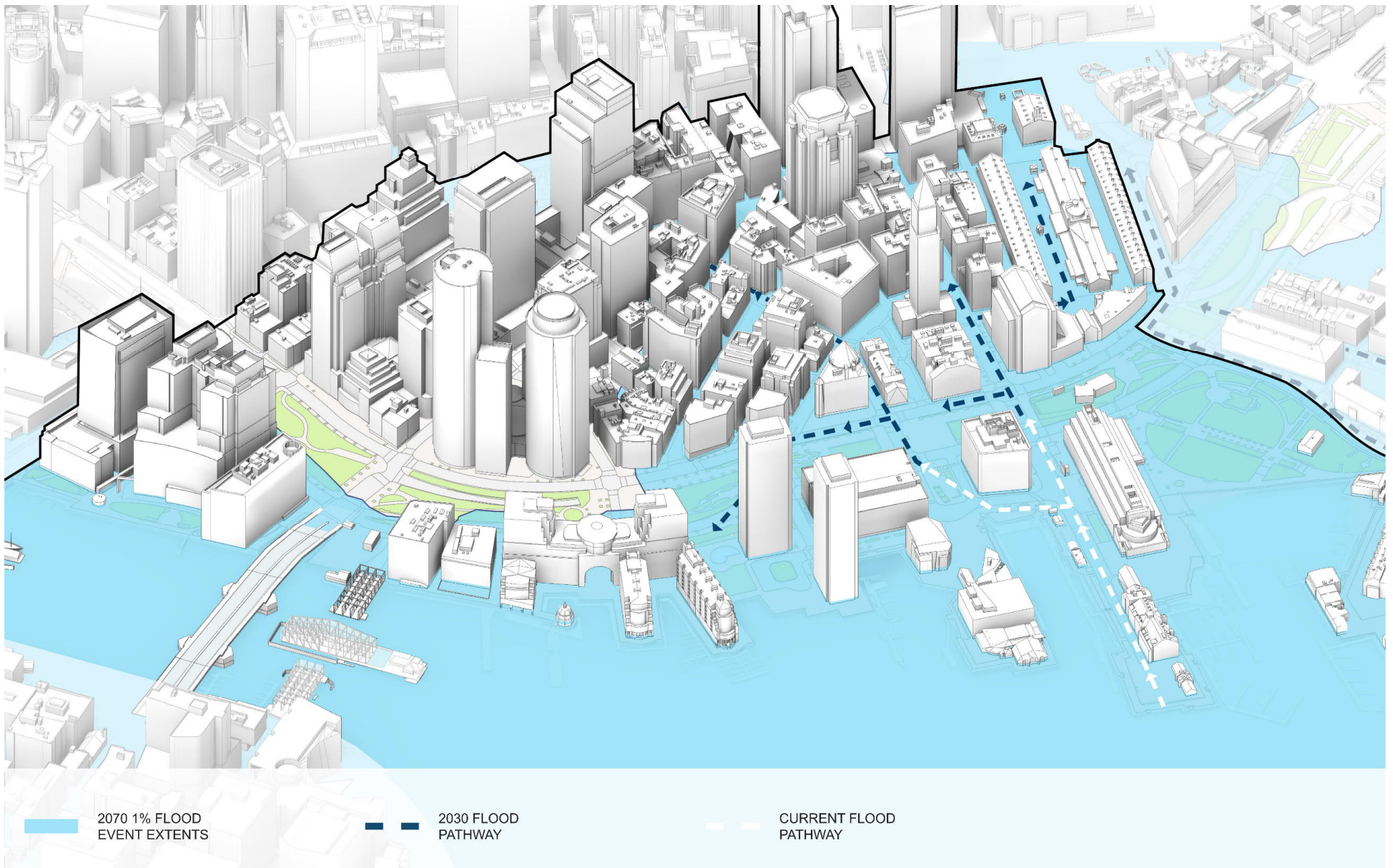
Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

2070 1% Flood Extents



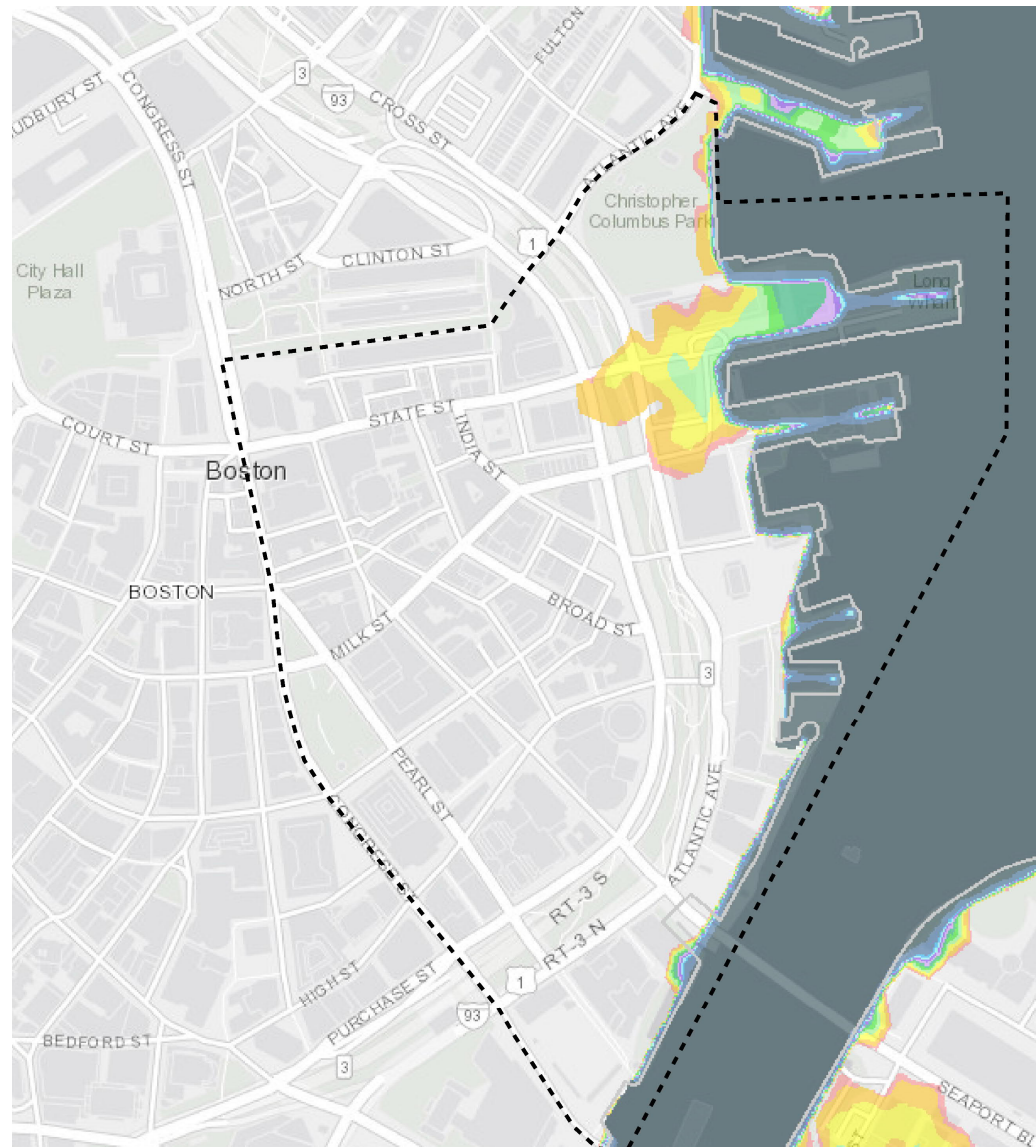
Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

2070 1% Flood Extents and Flood Pathways



Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

Present-Day 1% Flood Depths

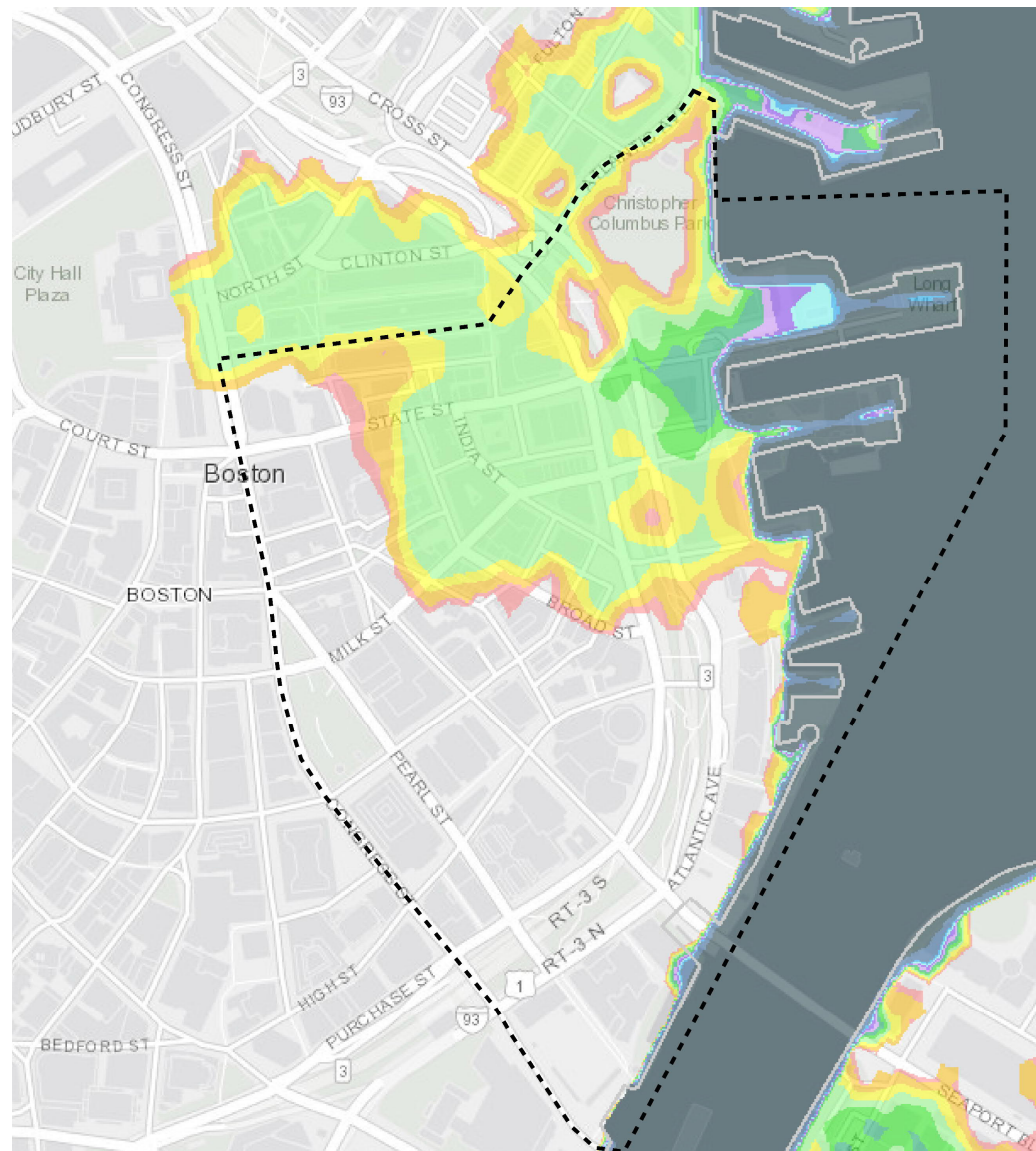


0.5 ft 1 ft 1.5 ft 2 ft 2.5 ft 3 ft 3.5 ft 4 ft 4.5 ft 5 ft 10 ft >10 ft

----- Wharf District Boundaries

Image Source: Arup Massachusetts Flood Viewer | Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

2030 1% Flood Depths

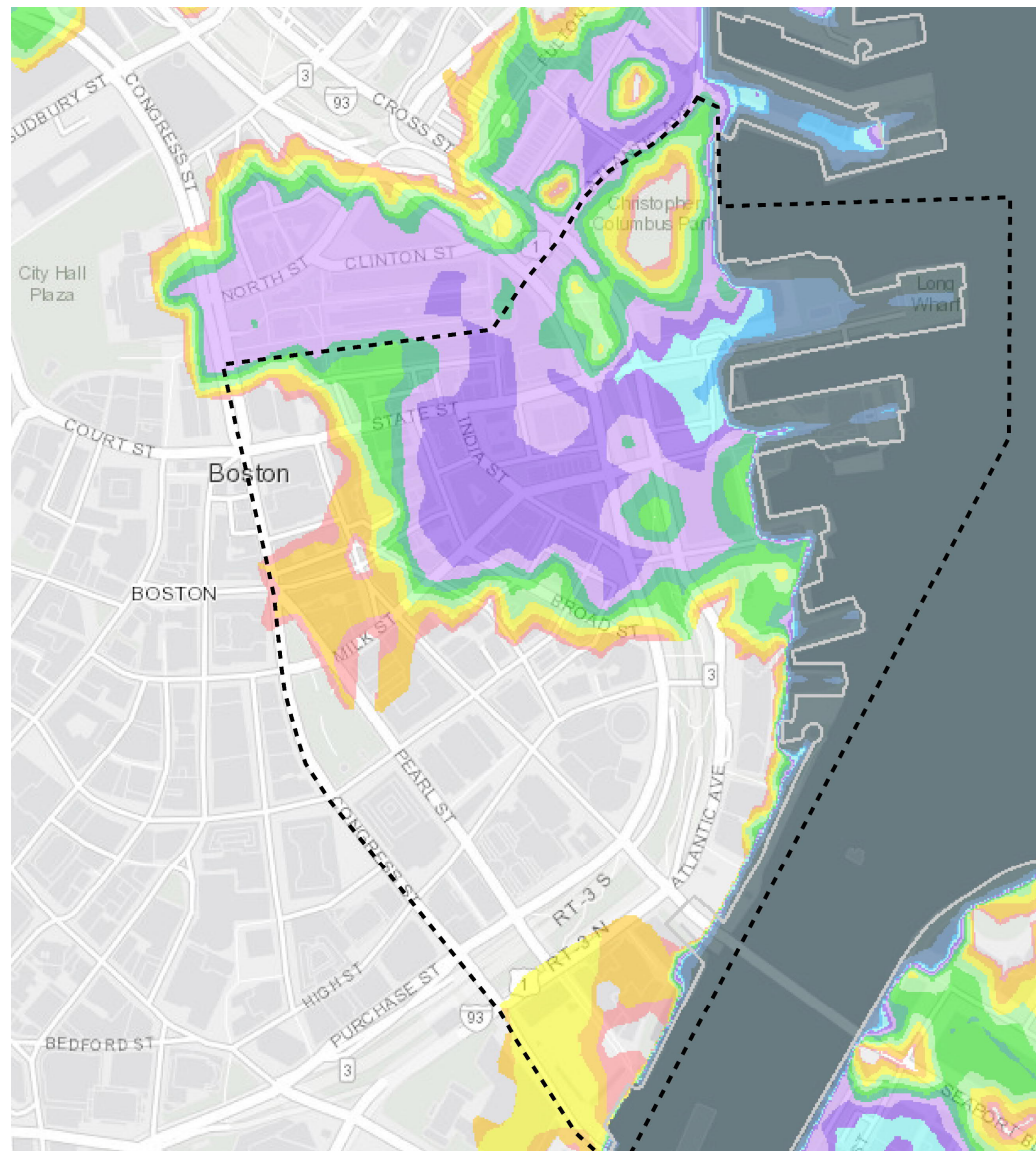


0.5 ft 1 ft 1.5 ft 2 ft 2.5 ft 3 ft 3.5 ft 4 ft 4.5 ft 5 ft 10 ft >10 ft

----- Wharf District Boundaries

Image Source: Arup Massachusetts Flood Viewer | Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

2050 1% Flood Depths

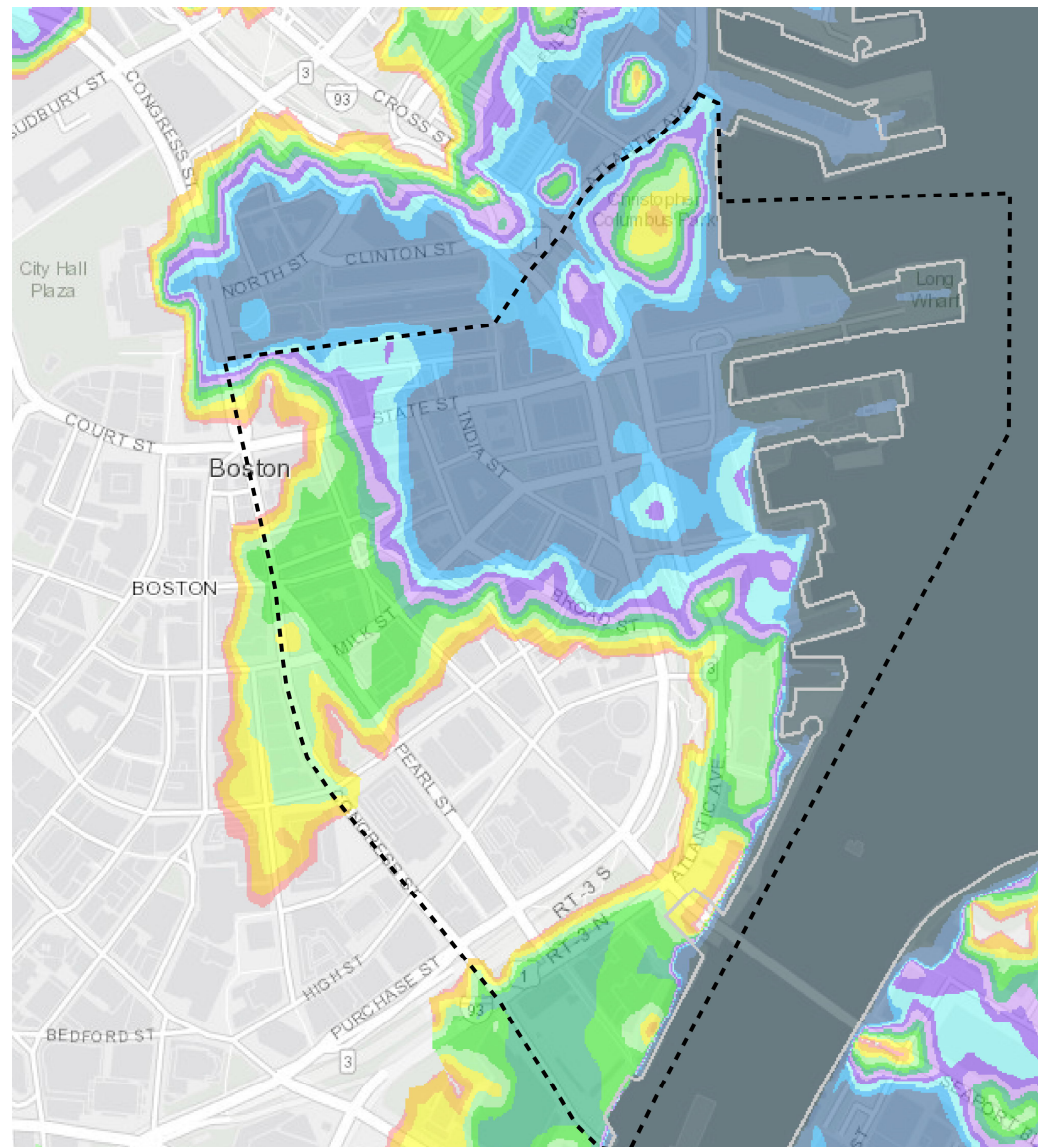


0.5 ft
 1 ft
 1.5 ft
 2 ft
 2.5 ft
 3 ft
 3.5 ft
 4 ft
 4.5 ft
 5 ft
 10 ft
 >10 ft

----- Wharf District Boundaries

Image Source: Arup Massachusetts Flood Viewer | Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

2070 1% Flood Depths



0.5 ft 1 ft 1.5 ft 2 ft 2.5 ft 3 ft 3.5 ft 4 ft 4.5 ft 5 ft 10 ft >10 ft

----- Wharf District Boundaries

Image Source: Arup Massachusetts Flood Viewer | Flood Layer Data Source: Massachusetts Coast Flood Risk Model (MC-FRM)

