

FLOOD MITIGATION PLANNING & FEASIBILITY AT THE RAYMOND L. FLYNN MARINE PARK

*City of Boston Planning Department
March 2026*



View of Leader Bank Pavillion and Seaport District from Boston Harbor

INTRODUCTORY LETTER

The Raymond L. Flynn Marine Park (RLFMP) is a critical component of Boston's working waterfront and industrial economy. Established to preserve marine industrial uses and Boston-based jobs, and governed by state regulations that reinforce this mission, the RLFMP continues to serve as an essential employment and economic engine for the City of Boston. Ensuring its long-term viability is a matter of both economic stewardship and climate preparedness.

Given its proximity to Boston Harbor and low-lying elevation, the RLFMP faces increasing risk from sea level rise and coastal storm surge. In response, staff of the City of Boston Planning Department initiated the Raymond L. Flynn Marine Park Flood Mitigation Planning and Feasibility Project to advance resilient, district-scale solutions that protect critical infrastructure, while supporting continued industrial operations. Through a rigorous technical and planning process, staff developed, evaluated, and refined multiple flood mitigation alternatives with input from City agencies, RLFMP tenants, and other stakeholders. This plan lays out a phased approach that supports feasibility, constructability, and long-term climate resilience, as well as financial viability.

This plan establishes a feasible and resilient flood mitigation strategy, and lays the groundwork for implementation and delivery of infrastructure improvements that will protect businesses, jobs, and public investments. Thank you to all those who contributed to this plan. It is through continued collaboration with our partners and stakeholders that the City can ensure that the RLFMP remains a resilient and productive industrial district for generations to come.

Sincerely,

Kairos Shen
Chief of Planning

ACKNOWLEDGEMENTS

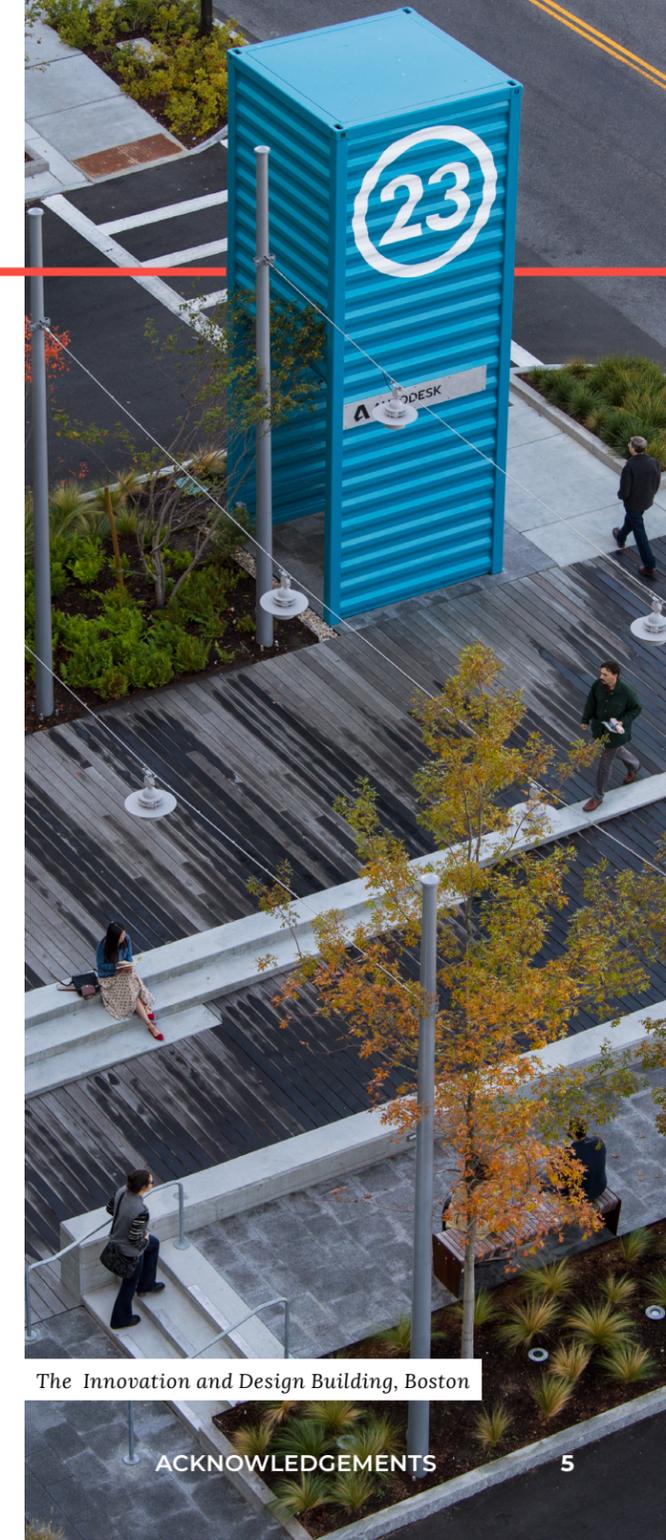
The City of Boston Planning Department wishes to acknowledge the many partners and community stakeholders who supported this project. Without their input and guidance, this project would not have been possible.

- Boston Environment Department
- Boston Office of Climate Resilience
- Boston Public Works Department
- Boston Transportation Department
- Boston Water and Sewer Commission
- Massachusetts Bay Transit Authority
- Massachusetts Port Authority
- Massachusetts Department of Transportation
- Boston Harbor Now
- Boston Ship Repair
- Save the Harbor/Save the Bay
- National Grid
- Eversource
- Raymond L. Flynn Marine Park Business Association

PROJECT TEAM:



OFFICE FOR THE NEXT ENVIRONMENT



The Innovation and Design Building, Boston

TABLE OF CONTENTS

ACKNOWLEDGEMENTS4
TABLE OF CONTENTS6

1

INTRODUCTION9
Climate Ready Boston.....10
Project Goals14
Site Conditions16
Coordination With Other Projects.....20

2

FLOODING AT RLFMP25
Flood Risk Assessment26
Flood Impacts.....28

3

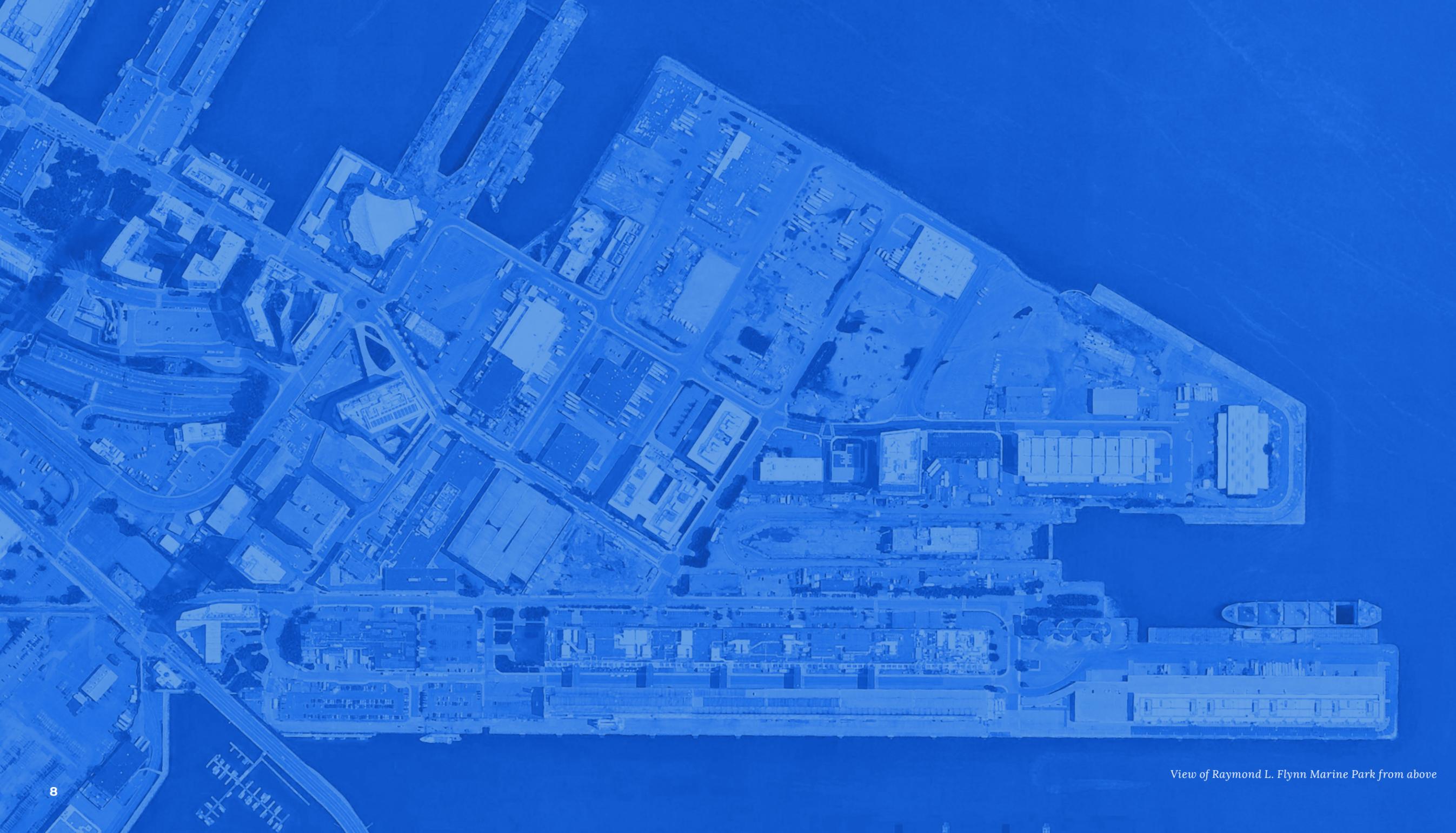
PROJECT PROCESS39
Stakeholder Engagement40
Coastal Flood Barrier System Alternatives46
Coastal Flood Barrier System Alternatives Evaluation48

4

FLOOD BARRIER SYSTEM51
Overview52
Key Features And Benefits.....54
Timeline And Phasing.....62
Project Benefits And Costs.....64
Building And Site-Level Adaptation.....66

5

LOOKING AHEAD69
Phasing Strategy.....70
Next Steps72
Key Acronyms, Abbreviations, And Definitions76



View of Raymond L. Flynn Marine Park from above

1

INTRODUCTION

CLIMATE READY BOSTON

The City of Boston has been working to comprehensively assess and plan for climate risks for over a decade. Climate Ready Boston, released in 2016, included a citywide climate vulnerability assessment and strategies to address the impacts of climate change. The report laid the foundation for subsequent actions across the city, including additional planning efforts, policy and regulatory changes, and the formation of the Office of Climate Resilience in August 2024. Today, the Office of Climate Resilience and the Coastal Resilience Delivery Team are working with partners to implement climate resilience projects across the city to address coastal flooding, stormwater flooding, and extreme heat.

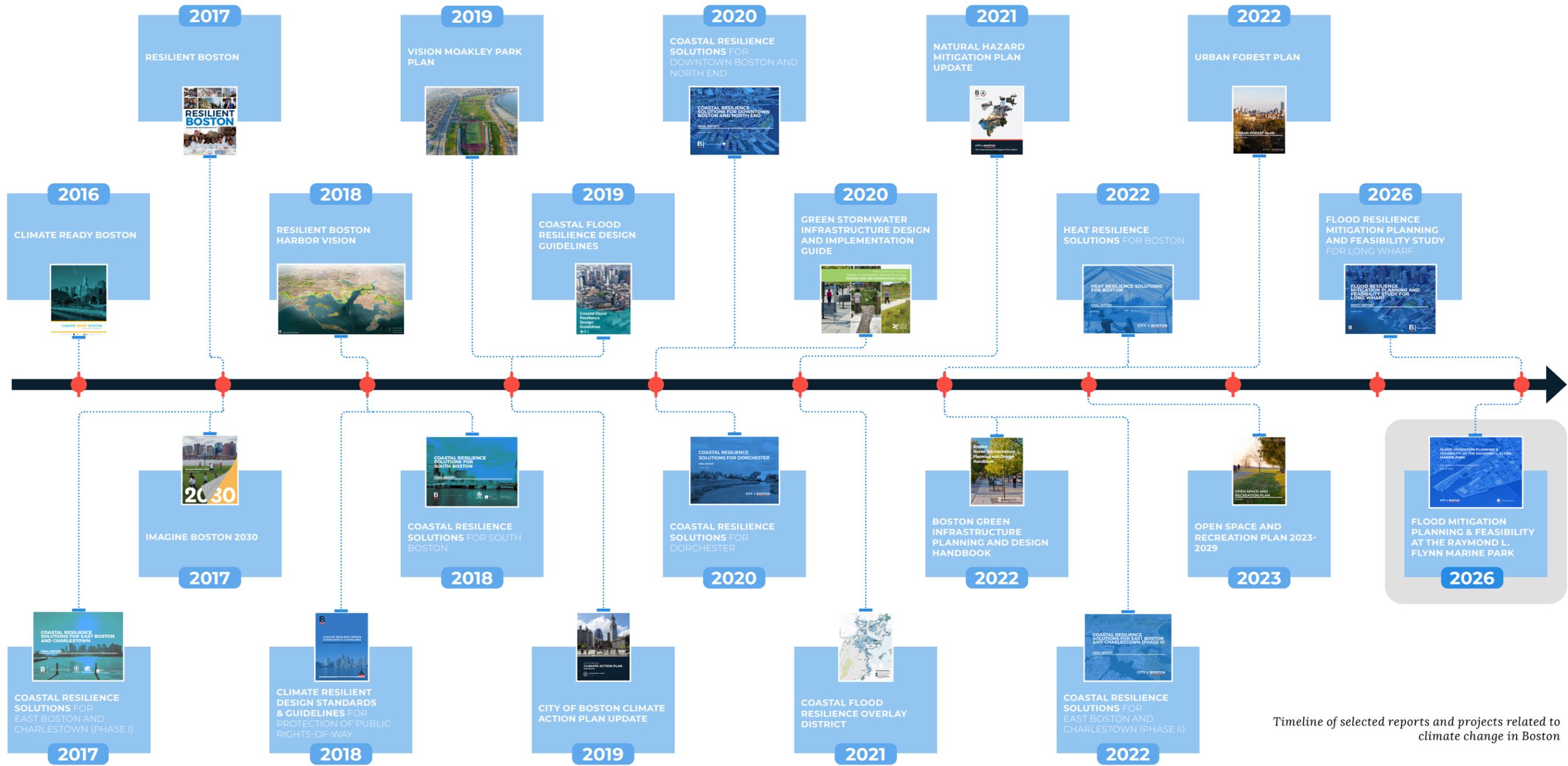
The Coastal Resilience Delivery Team – created in coordination with the Planning Department’s Real Estate Division – coordinates across City departments to facilitate immediate action to address climate risk by prioritizing projects, securing rights-of-way and funding, and identifying design solutions. The resilience projects advanced by the Coastal Resilience Delivery Team support Boston’s work towards becoming a greener, more resilient, and more equitable city.

Following the release of Climate Ready Boston, the city developed neighborhood-

level plans for Boston’s most climate-vulnerable areas. These reports assess local risk and recommend actions to mitigate those risks.

This project advances one of the recommendations of the Coastal Resilience Solutions for South Boston report released in 2017, which recommended flood protection for the Raymond L. Flynn Marine Park (RLFMP), as part of a comprehensive flood mitigation approach for the Seaport District. The RLFMP is a 191-acre marine-industrial park located adjacent to the Seaport neighborhood of the City of Boston. It is owned by the Economic Development and Industrial Corporation (EDIC).

This report serves as an executive summary of the effort to develop a flood barrier system for flood mitigation at RLFMP, which took place from 2023 through 2025. This effort included technical studies of the existing conditions of the RLFMP area, modeling of present and future flood scenarios, and stakeholder input. In addition to this report, this effort culminated in a Basis of Design Report (BODR) which provides more detailed technical information related to the recommendations presented here.



Timeline of selected reports and projects related to climate change in Boston

PLANNING FOR CLIMATE CHANGE

The RLFMP is among the most flood-vulnerable locations in the City of Boston, and its tenants are already at notable risk of flooding under certain conditions. In the future, flooding from coastal storms and rainfall will be more frequent and intense, posing increasing risk to RLFMP businesses, employees, and visitors.

Climate Ready Boston (2016) identified South Boston - which includes RLFMP - as the neighborhood most exposed to flooding in the entire city. The report described how “South Boston’s exposure will increase significantly over the course of the century, with a substantial portion of the South Boston Waterfront exposed to both chronic high-tide flooding and more severe flooding during coastal storms.” The report recommended a number of actions to respond to this challenge, including the adoption of a coastal flood resilience zoning overlay district and the development of a local climate resilience plan to support district-scale climate adaptation.

Directly building on these efforts, the City launched the Coastal Resilience Solutions

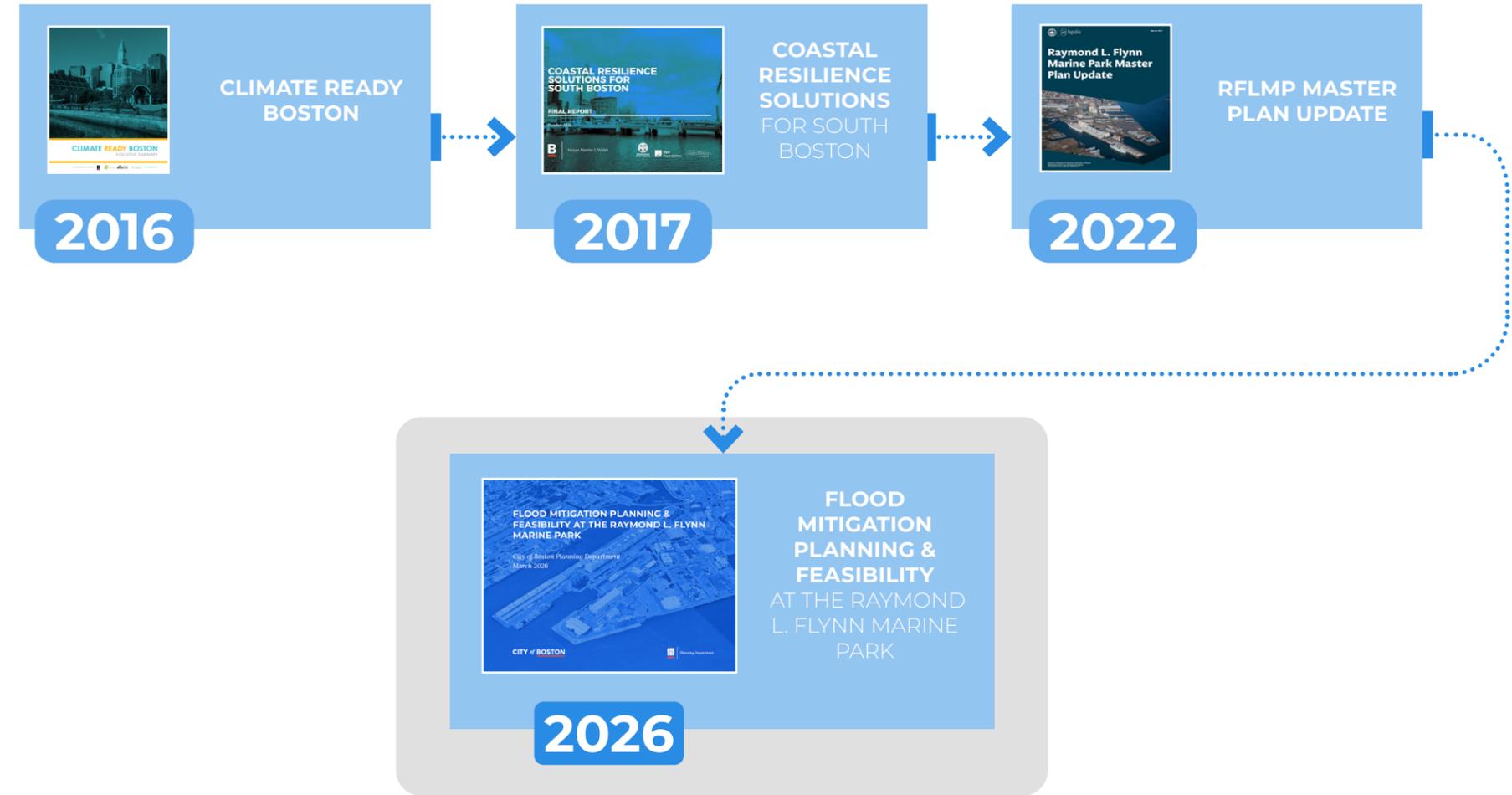
for South Boston planning process in 2017. Through extensive public engagement and technical analysis, this plan evaluated the feasibility, cost effectiveness, and stakeholder perspectives related to flood protection in the neighborhood. The RLFMP was one of five focus areas for which conceptual designs for district-scale flood protection were proposed in Coastal Resilience Solutions for South Boston. Two concepts were presented for RLFMP: a waterfront flood protection alignment (“Alternative A”) and an inland flood protection alignment (“Alternative B”). This project builds on and advances the feasibility analysis and design development of the conceptual flood mitigation approaches recommended by Coastal Resilience Solutions for South Boston.

This project - Flood Mitigation Planning & Feasibility at the Raymond L. Flynn Marine Park - also aligns and engages significantly with the RLFMP Master Plan. The first Master Plan was completed in 1999 and provided a framework for future development in the Marine Park that is consistent with State regulations

and environmental review processes, including those of the Massachusetts Public Waterfront Act (commonly referred to as “Chapter 91”) and the Massachusetts Environmental Policy Act (commonly referred to as “MEPA”). An updated Master Plan was released in 2022, which notes the importance of resilience investments and upgrades in the RLFMP, and recommendations developed by the Project are intended to be consistent with the updated Master Plan’s suggestions.

Raymond L. Flynn Marine Park Master Plan Update

RLFMP is central to maintaining the South Boston waterfront as a hub for maritime and industrial activity. The 1999 Master Plan established a development framework, a MEPA and Chapter 91 review process, and flexibility to attract job-creating industries. The Master Plan Update allows the City to reassess conditions and set priorities for the next decade. The RLFMP has seen major changes since 1999, including new seafood processing and freight facilities and rapid growth in life sciences, green tech, and R&D. Long-term plans envision a mix of maritime industrial uses—such as seafood processing, cruises, bulk cargo, and waterborne warehousing—supported by upgraded infrastructure and resilience improvements.



This project builds on a series of other city plans that considered how climate change will impact Boston.

PROJECT GOALS

The Flood Mitigation Planning & Feasibility at the Raymond L. Flynn Marine Park project was initiated in March 2023 to evaluate alternatives and advance a preferred design for flood risk mitigation within the RLFMP. The Project's overarching aim was to create a plan that mitigates flood risks to people, businesses, critical assets, and infrastructure while preserving RLFMP's working waterfront.



ASSESS FLOOD VULNERABILITY

Develop a detailed understanding of flood risk at RLFMP and the potential benefits of flood risk mitigation alternatives.



EVALUATE PRIOR MITIGATION STEPS

Evaluate flood mitigation measures that have already been implemented or are planned for properties within and neighboring RLFMP.



ENGAGE STAKEHOLDERS

Develop an understanding of mission-critical operational and other considerations related to the function of industrial and marine industrial businesses in the RLFMP and how they relate to flood mitigation in RLFMP.



DEVELOP A FEASIBLE FLOOD BARRIER SYSTEM DESIGN

Identify a preferred long-term flood protection strategy for the RLFMP that accounts for increased flood risk due to projected sea level rise.

SITE CONDITIONS

The Raymond L. Flynn Marine Park (RLFMP) is a 191-acre marine-industrial park located adjacent to the Seaport neighborhood of Boston. RLFMP is owned by the Economic Development and Industrial Corporation (EDIC) and located in the South Boston Designated Port Area. The EDIC has lease agreements with a variety of private and public tenants across the site. An incubator and hub of diverse maritime and industrial activities, the RLFMP provides significant and unique economic value to the City of Boston and surrounding region with a specialized job sector base. Since its founding as a US Navy annex and US Army base more than a century ago, the RLFMP has transformed multiple times in the face of changing trends, events, and needs. As South Boston has transitioned from its original industrial uses, RLFMP continues to grow as a hub for the life sciences industry. Amidst changing economic and environmental conditions, the City and partner agencies are committed to ensuring the continued vitality of the Marine Park in the context of changing economic conditions, development pressures, and climate-related risks. Bordered by water to the north, east, and

south, the existing shoreline at the RLFMP is in various conditions, with some sections in disrepair. Sections of the current shoreline infrastructure are not adequate to protect against current and future flooding. There is existing rip rap armament and steel bulkhead to the north. The East and South jetty's edges are of precast masonry and concrete H-pile construction, completed in 2025. While the North Jetty is no longer safe for active use, in 2025 redevelopment plans were under review to return the jetty and landward areas to a water-dependent use. An aging caisson gate at Dry Dock #3, an active ship repair facility, will be in need of future replacement. Pier 10 improvements in 2025 include the addition of berthing facilities for Seaport Ferry Service. Notably, all new major developments at RLFMP are subject to Boston Zoning Code Article 37 ("Green Building and Climate Resiliency Guidelines"), which ensures that new building projects are resilient to climate change and protected from flooding. Recently constructed buildings including the new Emergency Management Station on Drydock Avenue are in compliance.

Tenants within the marine park have expressed concern regarding the increasing frequency of flooding during rain and coastal storm events, leading to access issues and threatening operations. The landward areas of the Marine Park comprise mostly impervious surface consisting of large industrial buildings, asphalt parking and storage areas, sidewalks, and roadways. Green space in the form of trees and grass strips is concentrated in the area around the Innovation and Design Building and Pier 10 Park, and there is currently significant redevelopment occurring or planned at several of the parcels at the Marine Park.



Pier 10 and Coastal Cement (Parcel K)



Rear of Innovation and Design Building along Black Falcon Ave



Wharf 8 Harborwalk looking toward Seaport Blvd



Fid Kennedy Ave facing southeast toward Parcel U



Active Maritime Industrial Use at Parcel X



Stormwater Ponding at Clogged Catch Basin

EXISTING LANDMARKS AND AMENITIES

A 88 BLACK FALCON

B NORTH JETTY

C CRUISEPORT

D DRY DOCK #3

E FISH PIER

F HAMPTON INN

G HARPOON BREWERY

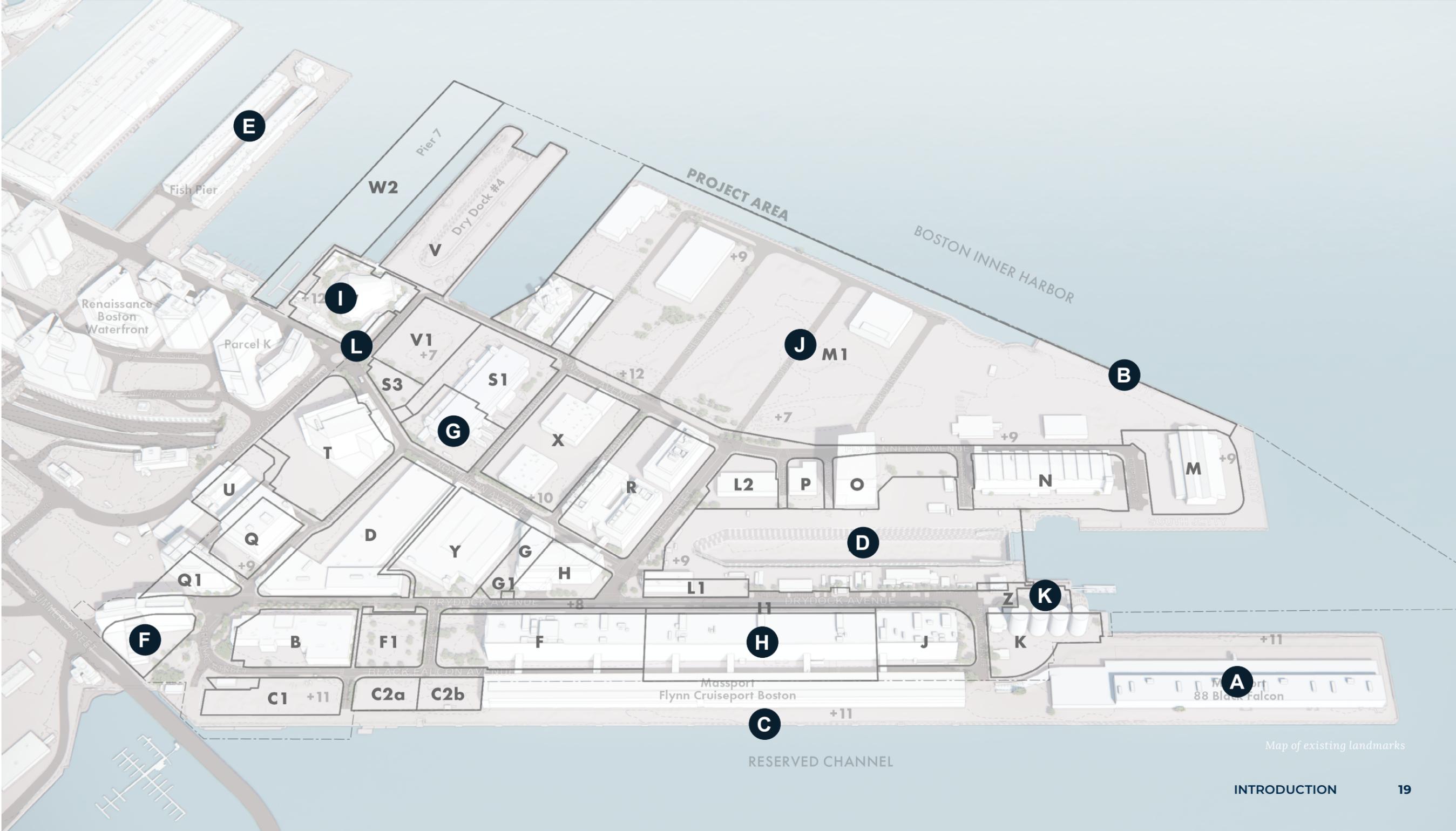
H INNOVATION & DESIGN BUILDING

I LEADER BANK PAVILION

J MASSPORT MARINE TERMINAL

K PIER 10

L YANKEE LOBSTER



Map of existing landmarks

COORDINATION WITH OTHER PROJECTS

Several active projects in and adjacent to the RLFMP will alter the built environment in a manner relevant to the development of a flood protection design as part of this study. The project team coordinated with these adjacent projects to ensure alignment and compatibility.

Adjacent projects considered as part of the design development process include:

1 Wharf 8 and Pier 10 Harborwalk & Resiliency Improvements

This project is part of the Boston Planning Department's overall initiative to improve access along the Harborwalk while implementing flood risk mitigation measures on RLFMP property consistent with City of Boston coastal resilience planning. Through this ongoing project, the aim is to repair existing infrastructure and extend the service life by 30 years, with the additional goals of protecting maritime assets, increasing climate resilience, and improving the Harborwalk public realm. There was ongoing coordination with the Wharf 8 and Pier 10 project team as the design process developed.

2 Realignment of Fid Kennedy Avenue

EDIC is in the process of designing a realignment of Fid Kennedy Avenue between Northern Avenue and Seafood Way. The goals of the ongoing project are to optimize truck flow onto Haul Road and coordinate with Massport to make the intersection of Fid Kennedy Avenue at Northern Avenue safer for all users. Realignment is necessary because trucks currently experience difficulty with the turning maneuver around the curve adjacent to Drydock 4 and the rear of Leader Bank Pavilion. The study is also assessing the feasibility of rerouting truck traffic away from Northern Avenue and developing Parcel V1, both of which draw upon proposals from the RLFMP Master Plan Update.

3 South Jetty Bulkhead Rehabilitation

The recently completed project constructed the seawall from the end of the East Jetty seawall for approximately 400 feet, terminating approximately 40 feet west of the remaining wharf structure. The project was designed to enable height increases to accommodate future coastal flood mitigation

measures. The pier supported concrete deck wrapping both the east and south was demolished and piles were cut off to the water line. The project installed several 100-ton bollards suitable for use by a Type 26 City-Class Frigate.

4 South Jetty Berthing Facility Improvements

Mooring dolphins suitable for use by a Type 26 City-Class Frigate are planned for construction completion by Summer 2026.

5 East Jetty Bulkhead Rehabilitation Project

In 2020, this Planning Department project constructed a new precast concrete seawall. The East Jetty's new wall and foundation design accommodates a nominal increase in height to accommodate future sea level rise.

6 Massport Marine Terminal

The Massachusetts Port Authority (Massport) holds a long-term lease on a more than 40-acre site within the RLFMP. They have developed this site over several decades – referred to as the Massport Marine Terminal (MMT) – into a port property that they sub-lease to a variety of businesses including water-dependent industrial uses. The MMT is one of Massport's three major port properties, and they actively work with existing and future sub-tenants to further develop and modernize it.

7 North Jetty Improvements

Pursued by Massport and the Planning Department, the North Jetty Improvements project, which is still in the planning stages, will include efforts to restore the RLFMP's North Jetty to active use, potentially including bulkhead, pile, and deck investments to return the jetty to sound condition. Once complete, the goal is to utilize the jetty and adjacent Massport Marine Terminal area as a modern multi-use bulk terminal.

8 Northern Avenue Mobility and Streetscape Project

Completed in 2022, this project included resetting the existing curbing and reconstructing the sidewalks along Northern Avenue from the Haul Road to Tide Street to integrate sidewalk level bicycle lanes with accessible ramps, walkways, and bus stops; pedestrian crosswalks, milling and overlay along Northern Ave, new stormwater management system, landscaping features, traffic signs, pavement markings, streetlights/streetscape features, relocation of four bus shelters, relocation of two fire alarm boxes, and minor utility infrastructure upgrades.

9 Drydock #4 Closure and Pier 6 Reconstruction

This evaluation and design project included an assessment of existing conditions, provisions for permanent closure of the Drydock #4 at the caisson site, designs for Pier 6 bulkhead replacement, regrading of the pier surface, and paving and fender replacement. Plans were developed and a cost estimate generated for the project but have not yet been implemented.

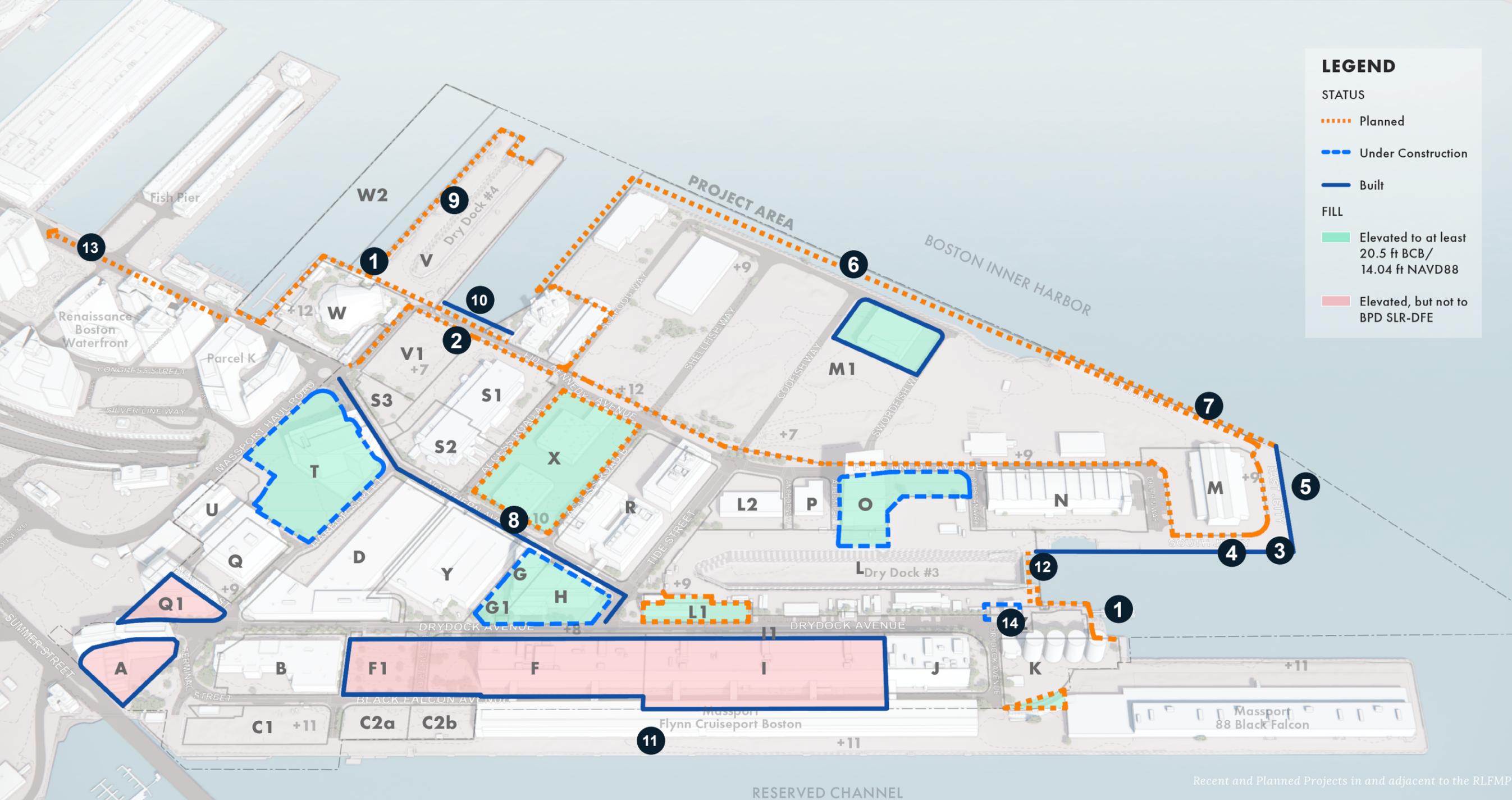
10 Parcel V1 Bulkhead & Pier 5 Cofferdam Repairs

Completed in 2018, the project included the replacement of a bulkhead along Fid Kennedy Avenue with topside roadway, sidewalk and lighting improvements, and the repair to cofferdams at Drydock #4 with the restoration of topside surface area.

11 Flynn Cruiseport Flood Mitigation Planning (Massport)

Massport is proceeding with a long term resiliency study for the Flynn Cruiseport.

Note:
Number Labels on this page correspond with the map on the following page.



RECENT PARCEL DEVELOPMENT

Three parcels have recently been redeveloped including Parcels O and P, Parcel T (Phase 1) and Parcels G and H. Notably, these developments are subject to Article 25A of the Boston Zoning Code. Article 25A established a Coastal Flood Resilience Overlay District (CFROD) of which RLFMP is a part, and mandates that development in the CFROD be designed in a manner that is resilient to flood including 2 feet of sea level rise.

12 Dry Dock #3 Caisson Replacement

The existing caisson at Dry Dock #3 was constructed in 1919 and has been identified by the tenant (Northeast Ship Repair) as needing replacement. The design of the replacement caisson gate at Dry Dock #3 is not part of the City of Boston's scope of work for this study. However, a flood barrier system at RLFMP would need to be tied together with a replacement caisson to create a consistent flood mitigation barrier crossing from South Jetty to Pier 10.

13 Seaport Boulevard Flood Protection Planning

Through this study's coastal modeling efforts, flanking coastal flood pathways were identified in the Seaport District outside of the footprint of the RLFMP (and as such not within the ownership of EDIC). The primary flood pathway which could result in significant flooding in the RLFMP under the design storm conditions, even with the full recommended coastal flood barrier system in place, is via Seaport Boulevard to

the north and west of RLFMP. Massport is actively developing project plans for a flood mitigation strategy along the boulevard as of the date of this report. Full protection of the RLFMP is reliant on this project moving forward to construction.

14 EMS Building at 34 Drydock Avenue

Under construction as of 2025, this building was considered as part of the alignments developed as part of this project. This facility must be able to have emergency response vehicles exit the facility and have immediate access to exit the RLFMP during normal daily operations and during a flood event.



2

FLOODING AT RLFMP

FLOOD RISK ASSESSMENT

OVERVIEW

A coastal flood risk assessment was performed as part of this Project to understand and communicate current and future flood impacts within the RLFMP. Using available building and asset data, as well as field surveys of existing infrastructure, this assessment considered the expected damages in the project area from a range of flood events – today and in the future – if no actions are taken to reduce flood risks. Multiple types of flooding were considered as part of the assessment, including both coastal, tidal, and rainfall flooding.

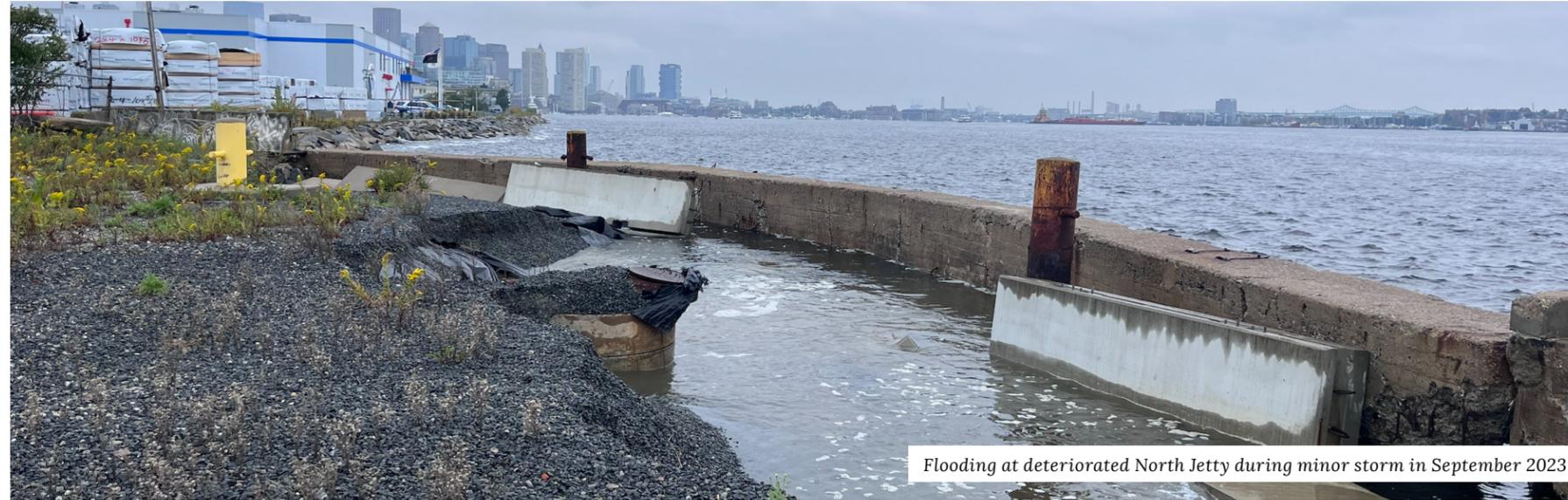
FLOOD HAZARDS

The RLFMP is already exposed to flooding from coastal storms, tides, and rainfall. Rising sea levels will make high tide flooding and coastal flooding worse. Climate change is also expected to cause increased levels of precipitation. As a result, flooding in the RLFMP is expected to be both more frequent and more severe in the future.

The sea level rise projections included in the MC-FRM were developed specifically for the Commonwealth of Massachusetts and the conditions expected to occur in the Northeast United States in alignment

with emissions scenarios generated by the Intergovernmental Panel on Climate Change (IPCC)..

Note: Key terms and abbreviations used in this chapter and in the rest of this report are defined in the glossary on page 76.

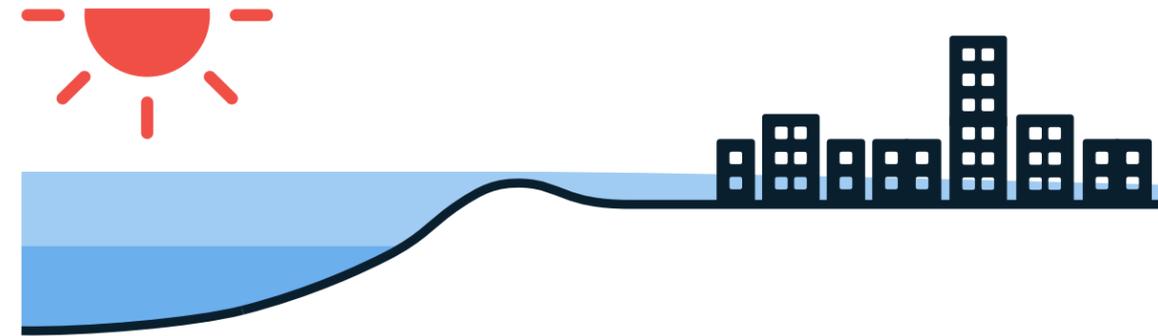


Flooding at deteriorated North Jetty during minor storm in September 2023



COASTAL FLOODING

Also referred to as storm surge, coastal flooding occurs when the forces generated by a severe storm's wind, waves, and low atmospheric pressure cause an abnormal rise in water levels along the shore.



HIGH TIDE FLOODING

High tide flooding occurs when water spills onto usually dry land during certain high tides. As relative sea levels rise, high tide flooding is occurring more frequently, even on sunny days. This project used Mean Higher High Water data to consider high tide flooding in 2030, 2050, and 2070.



RAINFALL FLOODING

Flooding from rainfall (stormwater) occurs when water falls on an area but is not able to drain by either soaking into the ground or flowing through sewer infrastructure.

FLOOD IMPACTS

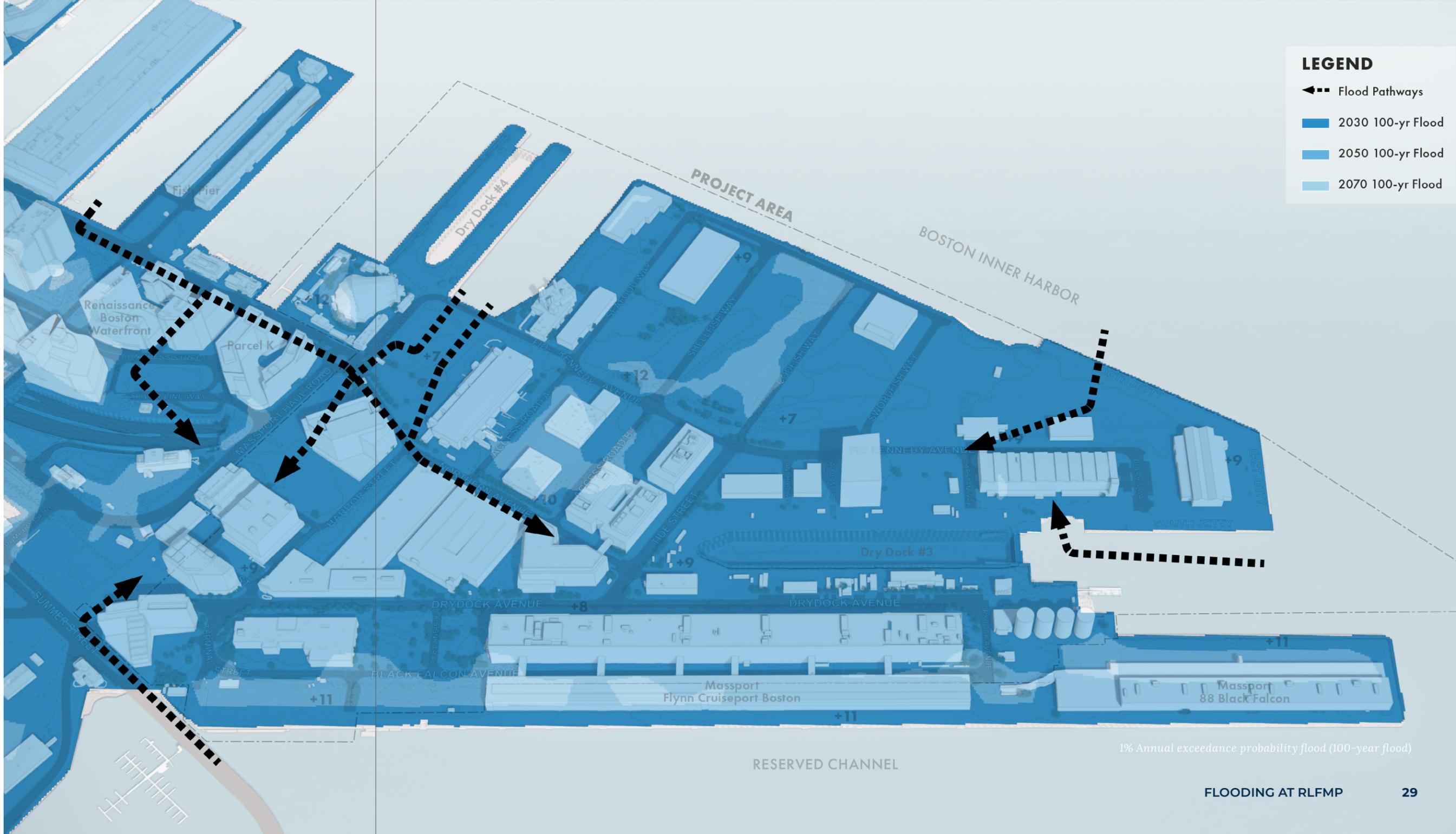
COASTAL FLOODING

Nearly all structures in the RLFMP are already exposed to storm surge flooding under a very severe coastal storm (a 1% annual exceedance probability event, often referred to as a “100 year storm”) in the present day. By 2050, the entire project area will be exposed to flooding under such a storm scenario. Increases in the depth of flooding will result in additional risk exposure as time progresses. Within RLFMP, at least \$1.0 billion in losses are expected from coastal flooding between 2023 and 2070. By 2070, a severe coastal storm (a 1% annual exceedance probability event, often referred to as a “100 year storm”) would impact 113 buildings in the RLFMP.

Coastal flooding also poses a significant threat to transportation and access within the RLFMP, a concern highlighted by stakeholders throughout the process. While the flood risk has been mitigated for many of the structures in RLFMP at the building and site scale, the transportation network is more challenging to address due to interdependencies that exist between

individual streets and intersections in RLFMP, and the broader transportation network of the Seaport District.

This assessment considered two coastal storm events, one of which has a lower probability of occurring in any given year but is more severe (a 1% annual exceedance probability event, often referred to as a “100 year storm”) and the other of which has a somewhat higher probability of occurring but is slightly less severe (a 5% annual exceedance probability event, often referred to as a “20 year storm”). This assessment considered both of these storms in the context of projected sea level rise conditions in 2030, 2050, and 2070. Sea level rise will exacerbate coastal flooding by increasing the base sea level, meaning the same severity of storm will result in more flooding. Additionally, climate change may increase the frequency and severity of storms. Black arrows indicate the key pathways through which water is expected to enter the RLFMP during coastal flood event.

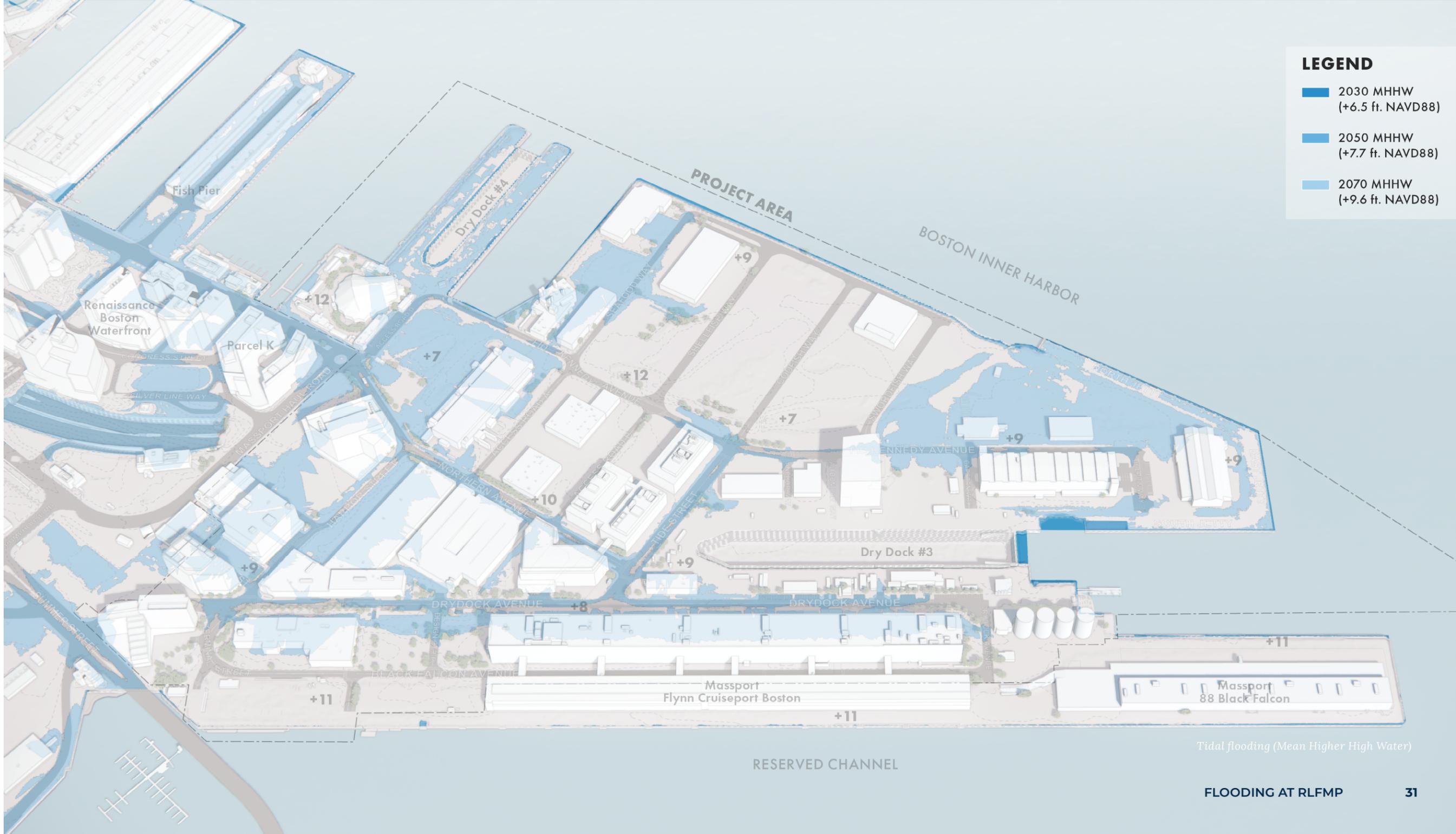


FLOOD IMPACTS

HIGH TIDE FLOODING

High Tide Flooding generally creates short-term impacts like road closures, overflowing storm drains, and temporary business closures. Over the long term, however, recurrent high tide flooding causes more lasting impacts such as damage to below-ground infrastructure.

Flooding from everyday tidal conditions is not projected to occur within the project area through 2050. However, longer-term sea level rise anticipated through 2070 and beyond will increase the risk of frequent tidal inundation in the RLFMP. Such flooding will particularly affect access to, from, and within the Marine Park.



FLOOD IMPACTS

RAINFALL FLOODING

Flooding from rainfall (stormwater) occurs when water falls on an area but is not able to drain by either soaking into the ground or flowing through sewer infrastructure. Because the majority of the RLFMP is impervious surface which prevents water from soaking into the ground, water must flow through sewers to drain. The sewer system in the RLFMP may not be of sufficient size to drain stormwater during a heavy rainfall event, especially if sea level rise affects drainage from outfalls.

To gain necessary additional information regarding stormwater flooding in the RLFMP, a study was performed as part of this project to analyze the stormwater drainage system under current and future conditions. The key goals of the study were to understand the location and severity of flooding that would occur if the coastal flood barrier

system was constructed without drainage improvements. It additionally sought to understand how the effects of climate change – most notably more extreme and frequent rainfall and sea level rise – would impact that flooding in the future.

The study considered a future storm scenario to further illustrate this risk. The scenario imagined that significant rainfall and coastal flooding (storm surge) occurred simultaneously, including modeled rainfall and sea level rise in 2070. Under these conditions, the most significant impact to RLFMP is on access and transportation as most of the main roadways would experience flooding greater than 0.5 feet. Flooding along Fid Kennedy Avenue, Drydock Avenue, and Northern Avenue would additionally pose a threat to several buildings.



CRITICAL AND ESSENTIAL FACILITIES

Critical and essential facilities include structures and infrastructure that are integral to public safety and wellbeing, as well as the ongoing function of the Marine Park. Within and immediately adjacent to RLFMP there are several facilities, both existing and planned, critical to both operations within the facility and to the safety and quality of life in Boston and the region more broadly. These “Tier 1” sites are structures and facilities that provide critical services to the RLFMP and surrounding community. As such, they are the most important to protect from flooding damage. In addition, RLFMP is home to a number of structures used for maritime industries, such as ship repair, fish processing, and bulk goods transfer. These “Tier 2” sites are existing maritime industry facilities that are central to RLFMP’s mission of serving as a hub for water-dependent industrial uses. Protecting these facilities is central to protecting the character and advancing the mission of the RLFMP and the South Boston Designated Port Area.



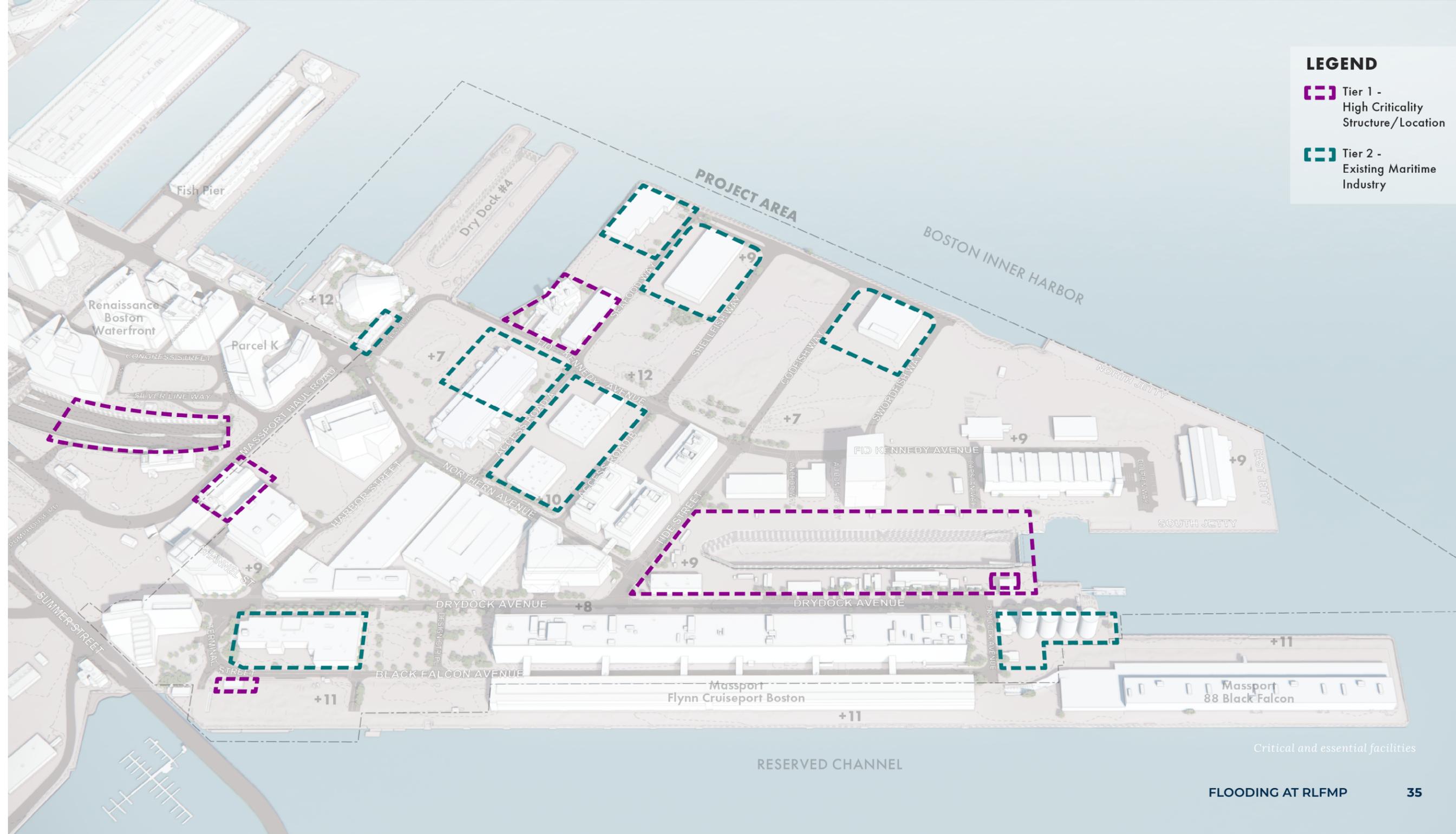
I-90 Ventilation Shaft



Dry Dock 3



EMS Building Rendering



COASTAL FLOOD PROTECTION

This project focuses on creating a long-term plan for flood resilience in the RLFMP – including protection from flooding through 2070 – while advancing a design to mitigate the risk of flooding in the near-term. The strategies developed as part of this project tie into and support the advancement of a longer-term plan for resilience, both within RLFMP and adjacent areas of the Seaport District.

The design flood elevation (DFE) is the flood elevation to which risk mitigation measures should be designed to effectively limit damage and service interruption. Considering RLFMP site conditions in the context of industry standards and federal, state, and local requirements, the design team worked to determine DFEs for multiple flood scenarios. Accounting for shoreline conditions and exposure to the harbor, separate DFEs were developed for three

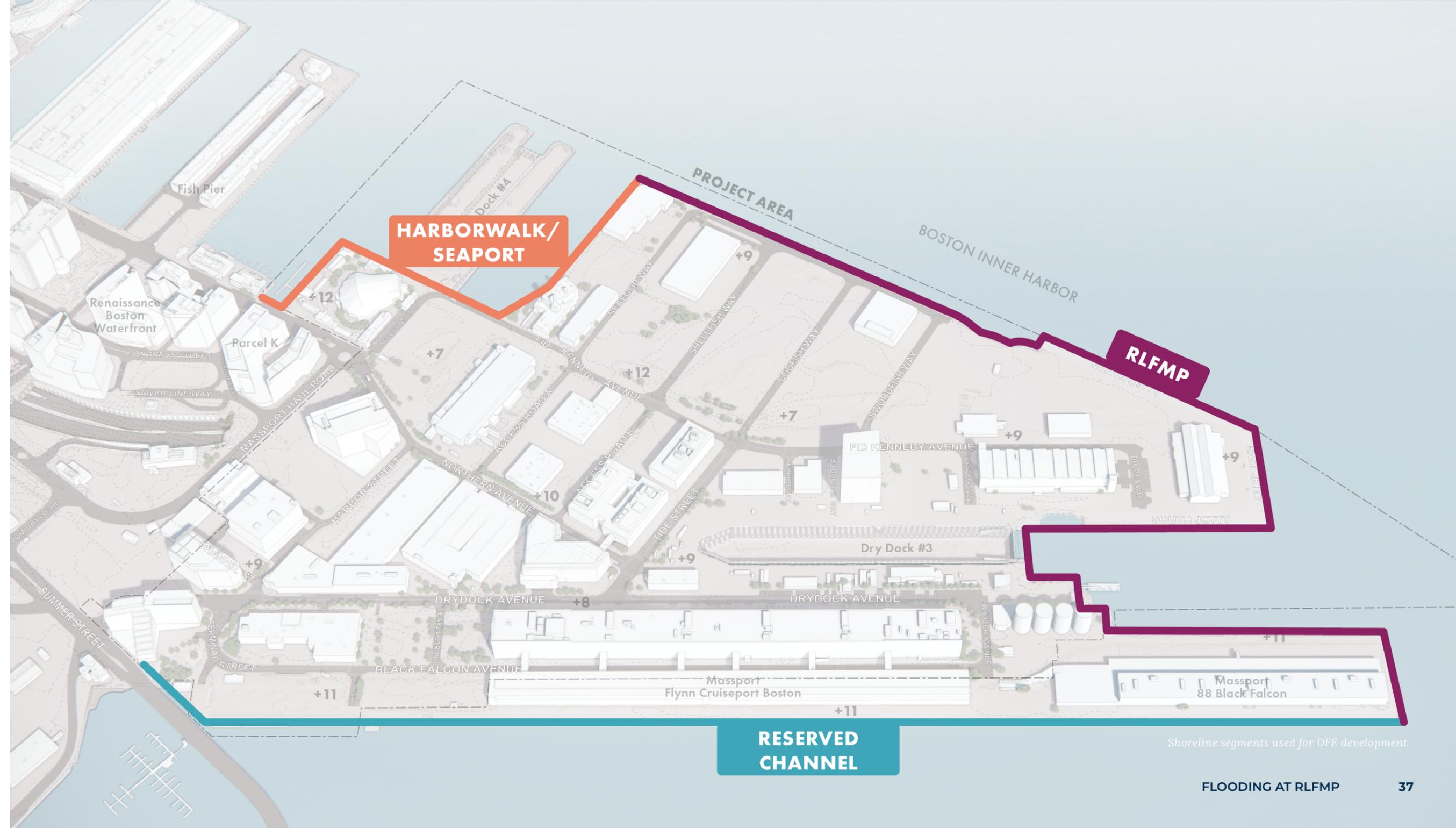
different segments of shoreline in the RLFMP. The flood barrier system focuses on implementation of these strategies in the near-term (2030) but includes protection to higher DFEs (mid-term in 2050 and long-term in 2070).

DESIGN FLOOD ELEVATION

The flood barrier system designs and recommended approaches presented in this report were developed based on the DFEs presented in the below table, with a focus on above-grade elevations designed to the mid-term DFE and the sub-structural components of the design, which are more complicated to modify in the future, designed to the long-term DFE.

A different DFE was established for each of three shoreline segments for the near-, mid-, and long-term.

CLIMATE HORIZON	DFE (WATER SURFACE ELEVATION + SIGNIFICANT WAVE HEIGHT), (FT, NAVD88)		
	Harborwalk / Seaport	RLFMP	Reserved Channel
Near-term (2030 1% AEP)	12.8	13.4	11.9
Mid-term (2050 1% AEP)	14.6	15.2	13.8
Long-term (2070 1% AEP)	16.6	17	15.9
CLIMATE HORIZON	APPROX REQUIRED TOP OF WALL HEIGHT ABOVE GRADE (FT, NAVD88)		
	Harborwalk / Seaport	RLFMP	Reserved Channel
Near-term (2030 1% AEP)	4.30	3.90	0.40
Mid-term (2050 1% AEP)	6.10	5.70	2.30
Long-term (2070 1% AEP)	8.10	7.50	4.40
APPROX GRADE AT SHORELINE (FT, NAVD88)			
	Harborwalk / Seaport	RLFMP	Reserved Channel
Existing Conditions, 2023	8.50	9.50	11.50





3

PROJECT PROCESS

STAKEHOLDER ENGAGEMENT

Stakeholders in the RLFMP include a variety of marine industrial, general industrial, research and development, and design businesses. Meaningful engagement with stakeholders was a priority throughout all phases of this project and provided a critical foundation for success. Over the course of this project, the engagement approach originally described in the existing conditions report evolved to better meet the needs of both the project and RLFMP stakeholders.

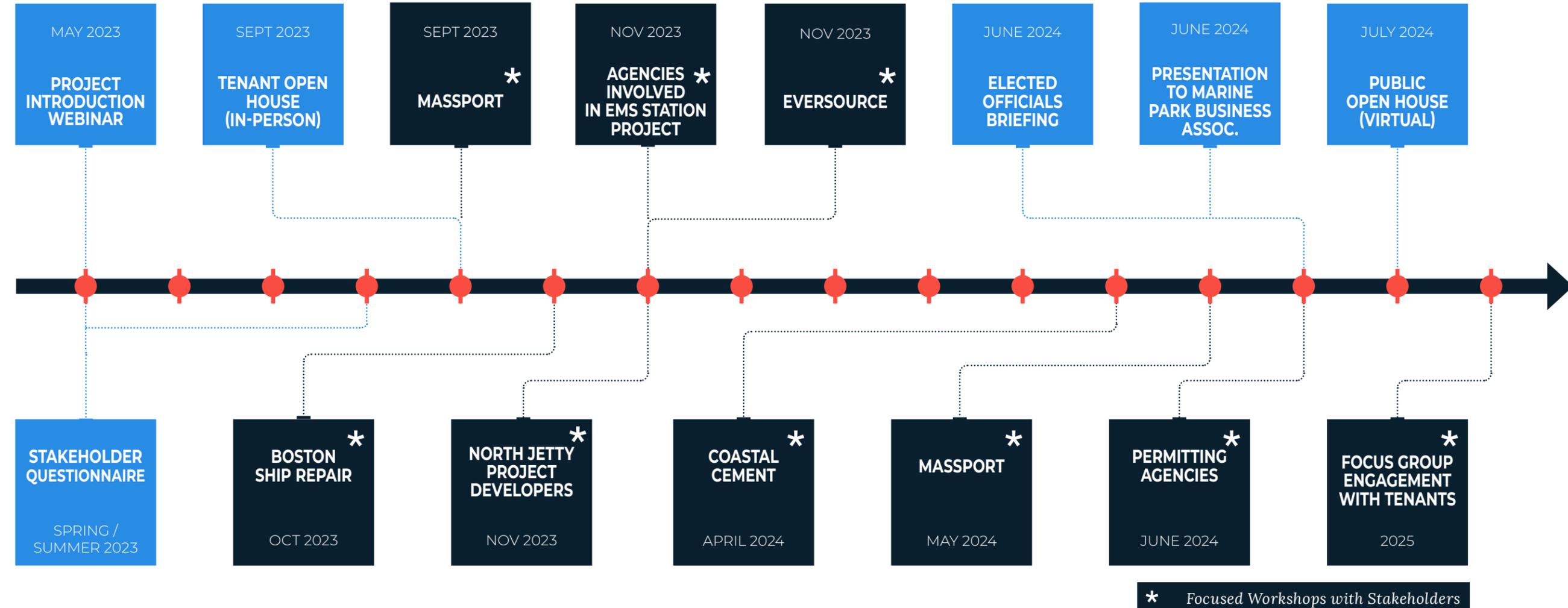
The project team hosted an open house-style engagement event on September 28, 2023 at the Boston Planning Department (BPD) offices within the RLFMP. Over the course of two hours, stakeholders were invited to stop by at their convenience to learn about current and future flood risks in the marine park and explore the initial flood barrier system design concepts. Approximately 22 individuals, representing multiple RLFMP tenants, attended.

Throughout Fall 2023 and Spring 2024, the project team engaged in focused conversations with stakeholders to identify preferences and refine the design of the preferred alternative.

Finally, the project team hosted a virtual public open house on July 11, 2024 to review the study findings to date, share how the flood barrier system will help address current and future flood risk, and provide an opportunity for stakeholders to share feedback on the flood barrier system. Approximately 27 individuals attended including representatives of RLFMP tenants and sub-tenants, community organizations, elected officials, city agencies, and other members of the community.

Engagement efforts began with a Project Introduction Webinar in May 2023, with invitations distributed to a group of identified RLFMP tenants and key stakeholders. Thirty-five of these stakeholders attended, providing feedback on key considerations to inform evaluation of flood barrier system alternatives, as well as on additional stakeholders to be engaged. Following the Project Introduction Webinar, a questionnaire was distributed to all those who had been invited to the webinar. Responses to the questionnaire furthered the project team's understanding of historic & future flooding, existing and planned flood mitigation measures, and key uses and dependencies of properties within RLFMP.

TIMELINE OF KEY ENGAGEMENT EFFORTS



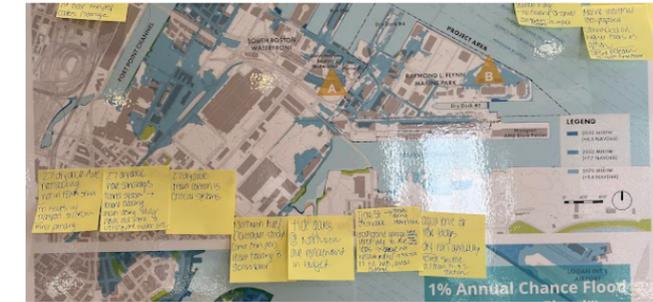
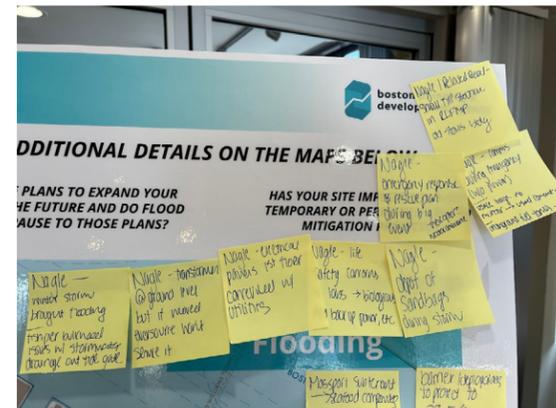
WHAT WE LEARNED

Stakeholder feedback was incorporated throughout the project process to both shape the development of potential shoreline protection alternatives and inform the evaluation of those alternatives. Feedback from stakeholders on their preferences, potential conflicts with business operations, and acceptable trade-offs to ensure protection were critical in shaping the selection of the flood barrier system.

Most RLFMP tenants indicated that their sites have plans for expansion and will consider flood mitigation as part of these mitigation efforts. To this point, a number of site-level flood mitigation measures have already been implemented in the park or are planned, including backup generators, sandbags, removable flood planks, elevated buildings, and perimeter flood barriers. However, stakeholders in the RLFMP have

varied levels of experience with flooding which results in disparities in preparedness between sites.

Stakeholders emphasized the importance of selecting an alternative that limits disruption to existing businesses within the RLFMP. This includes both protecting them from disruptive flooding and minimizing the disruption caused by the flood barrier system measures themselves. Considering off-site dependencies including reliable utilities – especially electricity and natural gas – and vehicular access is critical to the maintenance of business operations in the RLFMP. The overall stakeholder preference for a hybrid alternative that preserves vehicular and pedestrian access along Dry Dock Avenue is reflected in the flood barrier system.



Images from stakeholder engagement events

STAKEHOLDERS ENGAGED THROUGHOUT THE PROCESS INCLUDE:

- Blue Engine & ADL Ventures
- Coastal Cement
- Harborfront Neighborhood Alliance
- Massachusetts Department of Environmental Protection (DEP)
- Boston Ship Repair
- Boston Marine Park Business Association
- City Point Neighborhood Association
- Coastal Zone Management (CZM)
- Clarke Living
- Massport
- Boston Marine Park Business Association
- Massachusetts Environmental Policy Act Office (MEPA)
- John Nagle Co.
- Boston Harbor Now
- State Senator Nick Collins Office
- Massachusetts Department of Transportation (MassDOT)
- Related Beal
- Boston Water and Sewer Commission
- Eversource
- Stavis Seafoods
- Seaport Neighborhood Association
- South Boston Marine Multiport

KEY THEMES FROM ENGAGEMENT INCLUDED:

- Truck parking and access requirements
- Maintenance of property value
- Pedestrian and vehicular safety
- Enhancing the environment
- Value of a phased approach to enhance feasibility
- Minimizing visual impacts
- Preservation of historic uses and infrastructure
- Minimizing impacts to marine industrial and other water-dependent industrial uses
- Operations and access during both flood and non-flood conditions

KEY QUESTIONS ANSWERED THROUGH ENGAGEMENT EFFORTS INCLUDED:

"What types of structural, non-structural, nature-based, and other resilience solutions do stakeholders want, what might be immediately off the table, and on what might they compromise? "

"What operational and maintenance challenges do marine industrial stakeholders foresee in implementing resilience infrastructure?"

"What are the regulations, ongoing plans and projects, and other factors that may influence how we pursue resilience?"

"What do tenants and other stakeholders currently know about risk and the climate challenges that lie ahead?"

"What are stakeholders' tolerances for risk?"

KEY QUOTES FROM QUESTIONNAIRE AND OPEN HOUSE ENGAGEMENT SUCH AS:

"Flood risks are part of our thought process as we look at opportunities within the Raymond Flynn Marine Park, but also at other properties...so flooding is always a concern these days."

"We have applied protective film to windows for storm protection. We have installed removable flood planks that can be put in place at doors."

"We do have long term plans for expansion and flooding is one of the many risks we would evaluate prior to implementing those plans."

"All uses at the site require vehicular access for tenants and deliveries."

COASTAL FLOOD BARRIER SYSTEM ALTERNATIVES

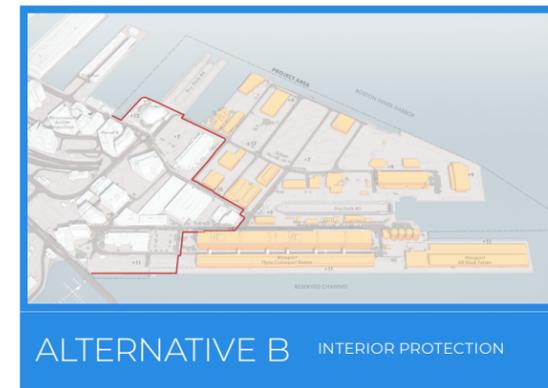
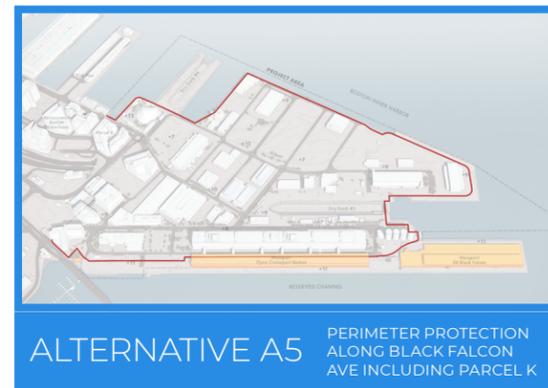
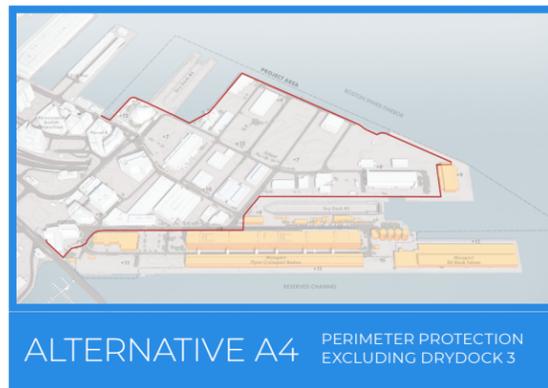
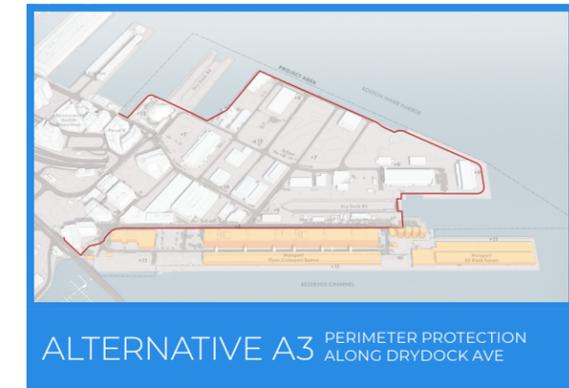
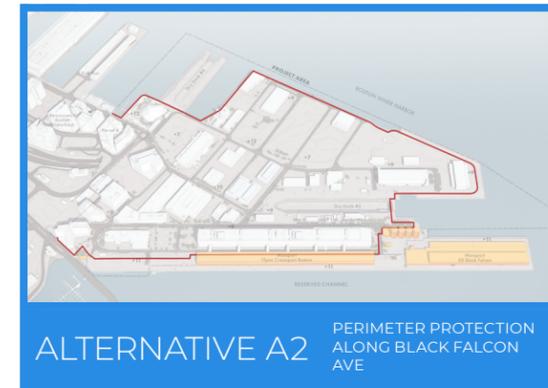
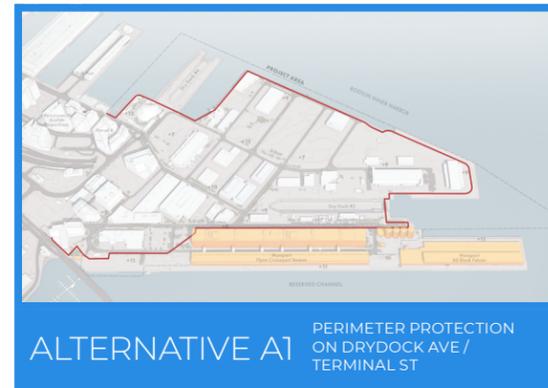
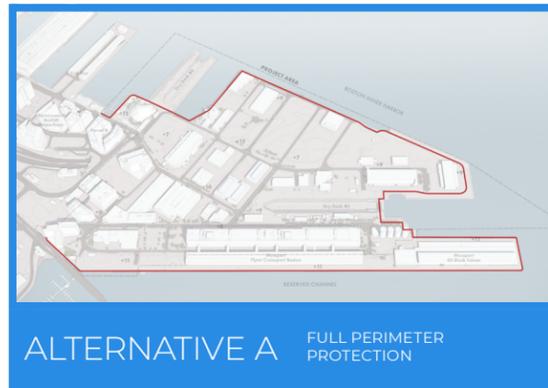
There are multiple ways to mitigate flood risk, including combinations of different approaches. Based on the risk assessment, a number of potential alternatives (approaches) to mitigate flood risk in the RLFMP were studied. The different alternatives developed focused primarily on two elements. First, alternatives differed in alignment (or location) of flood protection measures. Second, alternatives differed in the approach that would be utilized in a given location. Developing alternatives in this manner allowed the team to engage with stakeholders to review a set of approaches, discuss key technical considerations and tradeoffs, and incorporate feedback that improves the project before proceeding to more detailed design for the preferred alternative.

Generally, approaches fall into two categories: **Building/Site-Scale Protection** and **District-Scale Protection**. The alternatives developed as part of this project include various combinations of these approaches for the RLFMP, with a focus on district-scale alternatives that align with Seaport District-wide strategies studied in *Coastal Resilience Solutions for South*

Boston and provide flood protection to both structures and access routes.

Seven structural coastal flood barrier system alignment alternatives were developed for the project. Incorporating additional analysis and stakeholder engagement conducted for this project, these alternatives expand and refine the two alternatives (“Alternative A” and “Alternative B”) presented in *Coastal Resilience Solutions for South Boston*. All alignments are intended to meet the long-term design flood elevations (DFEs) described in Part 2 of this report. All alternatives will include additional necessary measures for stormwater management and interior drainage.

In addition to the seven coastal flood barrier system alignments, an “independent utility” alternative was developed for consideration alongside any of the presented perimeter protection alternatives. The purpose of the independent utility alternative is to create a fully independent coastal flood protection plan for the RLFMP that does not depend on implementation of ongoing or future flood risk mitigation projects at neighboring properties nor district-scale flood protection for the seaport.



Summary of flood protection alignments

COASTAL FLOOD BARRIER SYSTEM ALTERNATIVES EVALUATION

Once developed, the seven alternatives were evaluated to identify a preferred design that best advances the goals of the project. Evaluation criteria were developed based on global best practices, the specific context of the RLFMP, and initial stakeholder feedback regarding priorities for flood protection. Evaluation criteria were developed under three categories: Effectiveness, Feasibility, and Design Life and Adaptability. An **effective** flood barrier system alternative reduces long-term flood risk to businesses and infrastructure within RLFMP. A **feasible** flood barrier system alternative integrates with industrial business operations, minimizes disruption to shorefront activities, and is technically achievable and consistent with laws and regulations. An **adaptable** flood barrier system alternative provides protection through at least 2030 and could be adapted to higher levels of flood protection in the future. The recommended alternative is effective, feasible, and adaptable.

Each alternative was scored based on the evaluation criteria. Alternative A2 and Alternative A5 performed well in the evaluation and were found to best advance the goals of the project. These “more-preferred” alternatives were then further

refined and evaluated through additional stakeholder engagement to understand site-specific concerns and priorities, with Alternative A5 emerging as the flood barrier system.

	EFFECTIVENESS	+	FEASIBILITY	+	DESIGN LIFE AND ADAPTABILITY	=	TOTAL
Alternative A: Full Perimeter Protection	9		8		6		23
Alternative A1: Perimeter Protection on Drydock Ave / Terminal St	7		9		5		21
Alternative A2: Perimeter Protection on Black Falcon Ave	9		10		5		24
Alternative A3: Perimeter Protection on Drydock Ave	3		9		4		16
Alternative A4: Perimeter Protection excluding Drydock 3	3		9		4		16
Alternative A5: Perimeter Protection on Black Falcon Ave, including Parcel K	9		10		6		25
Alternative B: Inland Right of Way	0		5		0		5
Independent Utility Alternative	Not scored as a separate alternative						

Summary of evaluation results

EFFECTIVENESS		0 POINTS	1 POINT	3 POINTS
	Protects critical infrastructure to DFE	Least	Moderate	Most
	Provides protection to structures and infrastructure to DFE	Least	Moderate	Most
	Provides continued access to current and planned maritime industries to DFE	Least	Moderate	Most
FEASIBILITY		0 POINTS	1 POINT	3 POINTS
	Consistent with industrial business operations including trucking access and ship-to-shore connections	No	Some changes required, but longer-term disruption is minimal	No significant changes to operations required
	Consistent with existing local, state, and/or federal regulations	Inconsistent	Uncertain	Consistent
	Maintenance and operations needs (driven by number of active gates)	Most	Moderate	Least
	Constructability	High Complexity	Moderate Complexity	Lower Complexity
	Property owners, tenants, and sub-tenants support alternative	Least	Moderate	Most
DESIGN LIFE AND ADAPTABILITY		0 POINTS	1 POINT	3 POINTS
	Potential to provide sitewide protection beyond 2070	Least	Moderate	Most
	If design to 2030 or 2050 DFE is necessary due to site constraints and operations, design could be adapted to 2070 DFE	High Complexity	Moderate Complexity	Low Complexity

Summary of evaluation criteria by category



4

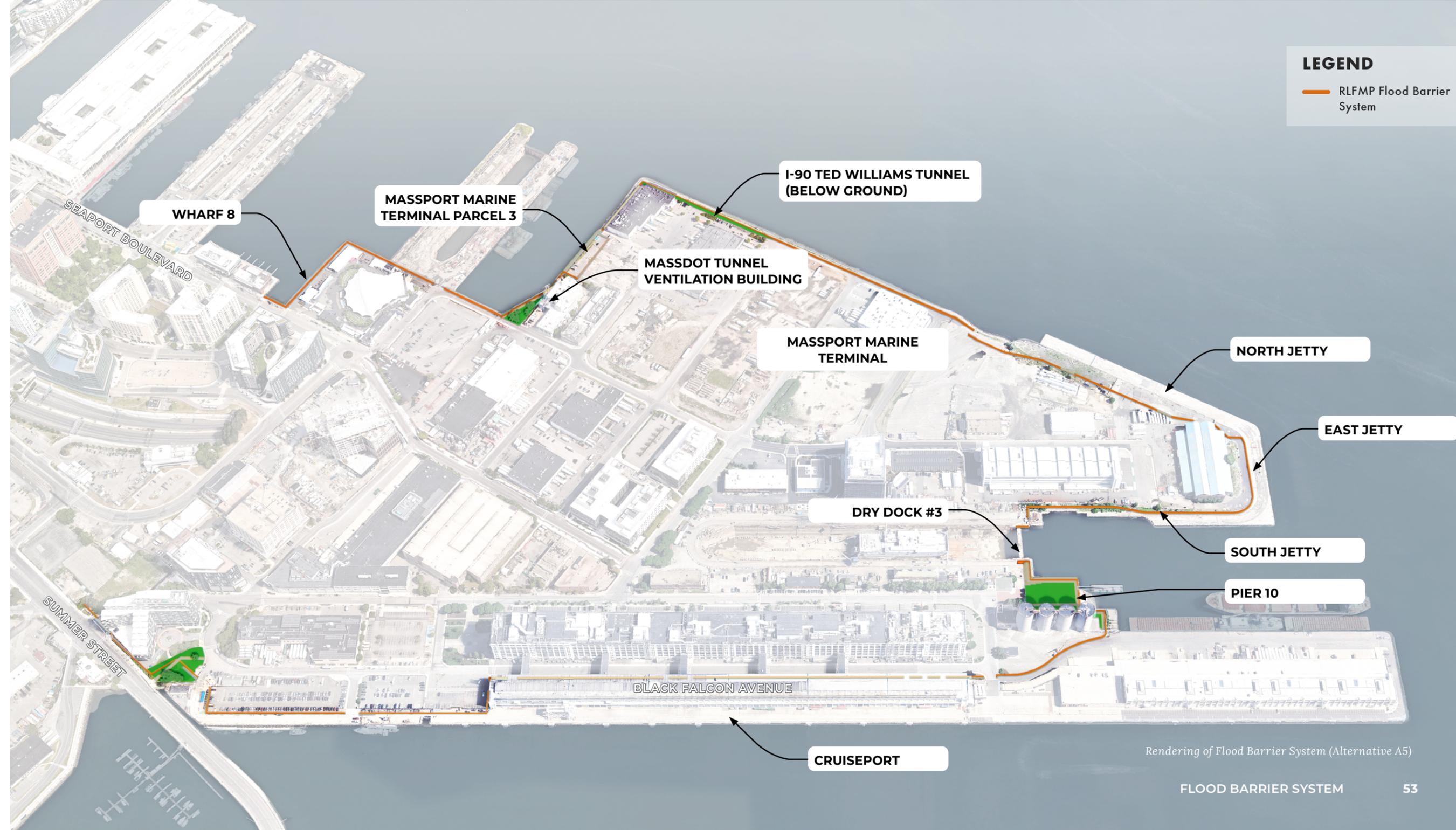
FLOOD BARRIER SYSTEM

OVERVIEW

Following the alternatives analysis previously described, Alternative A5 – Perimeter Protection on Black Falcon Avenue—was selected as the recommended flood barrier system (FBS). The project team further refined this design through the development of a Basis of Design Report (BODR) which identifies and describes key details of the recommended flood barrier system. The BODR is intended to present the design standards and controls at a level of detail suitable for advancing the design for implementation, including preliminary review with regulatory agencies and developing funding applications to federal and state partners.

The recommended FBS alignment builds off the “Option A” concept proposed in Coastal Resilience Solutions for South Boston. Implementation would include construction

of a flood barrier system along the northern and eastern coastal perimeter of RLFMP, moving to an inland alignment along Black Falcon Avenue in order to preserve access to waterside operations associated with the Massport-owned Cruiseport. Additional Massport-owned sites on Black Falcon Avenue are also located on the water side of the alignment. The recommended FBS alignment will protect all structures located within the RLFMP except those owned by Massport along Reserved Channel. This alternative also connects to ongoing projects at Wharf 8 and Pier 10 as part of an integrated line of flood protection. The recommended FBS must either tie-in to the Independent Utility Alternative or a district-scale flood protection plan for the rest of the Seaport District to achieve the full long-term flood mitigation benefits.



Rendering of Flood Barrier System (Alternative A5)

KEY FEATURES AND BENEFITS

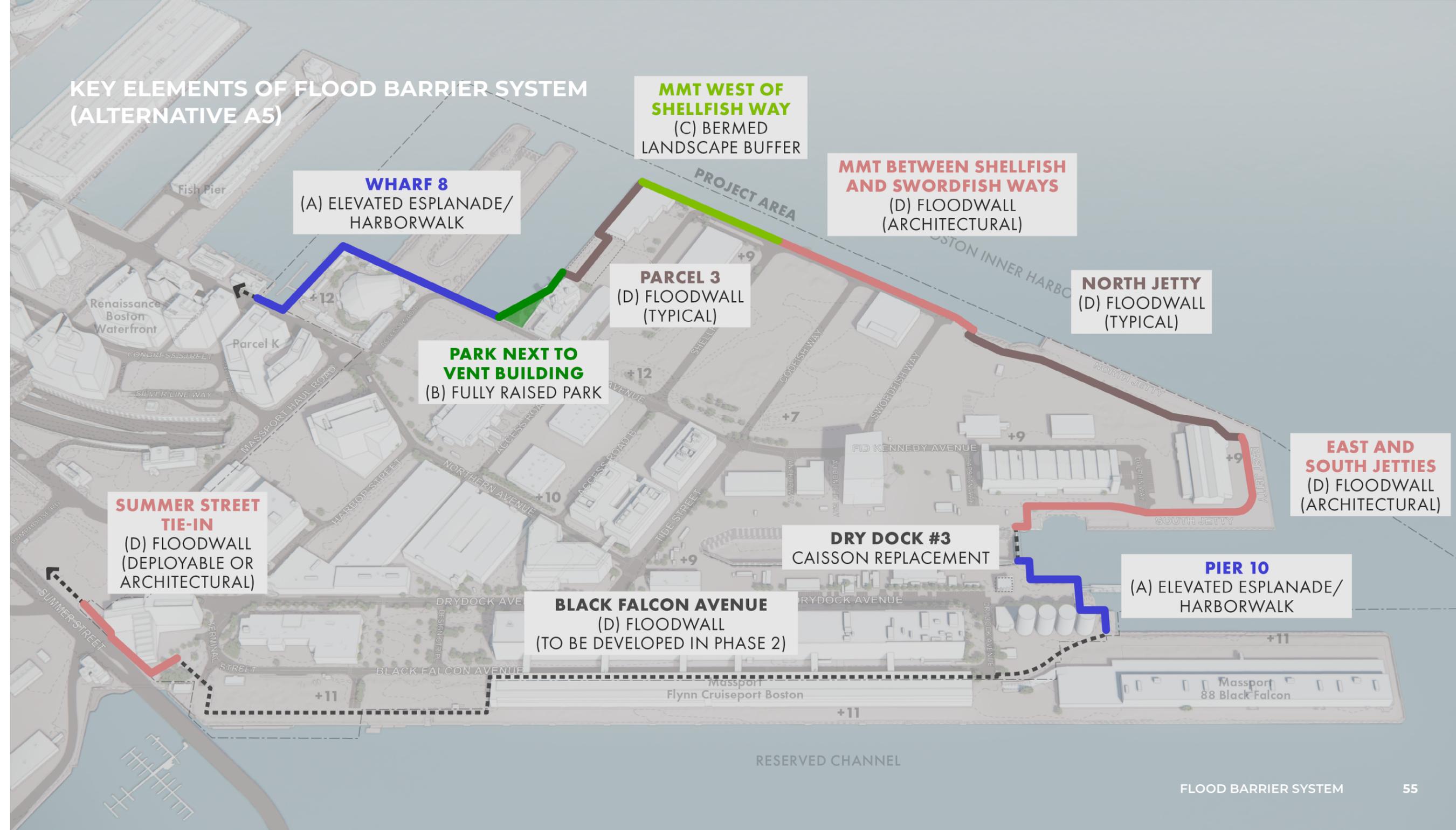
The recommended flood barrier system design includes an elevated Harborwalk section serving as flood protection beginning at Wharf 8 and extending around the Rockland Bank Concert Pavilion to the bulkhead near the Harpoon Brewery. The elevated Harborwalk transitions to a floodwall structure and elevated park as it extends to the northeast away from Fid Kennedy Avenue along the park next to the MassDOT-owned I-90 ventilation building. The remainder of the FBS alignment consists of a floodwall located along the shoreline around the perimeter of the RLFMP running past North Jetty and East Jetty until it reaches Dry Dock #3.

On the south side of Dry Dock #3, the FBS transitions to an elevated Harborwalk at the shoreline around Pier 10 and then turns inland along Black Falcon Avenue, traveling between the Boston Design Center and the Cruiseport. This corridor is narrow with extensive pedestrian, loading, and vehicular traffic. Additional coordination with Massport operations at the Cruiseport and tenants of the Boston Design Center will be needed prior to progressing the

detailed design for the FBS along Black Falcon Avenue.

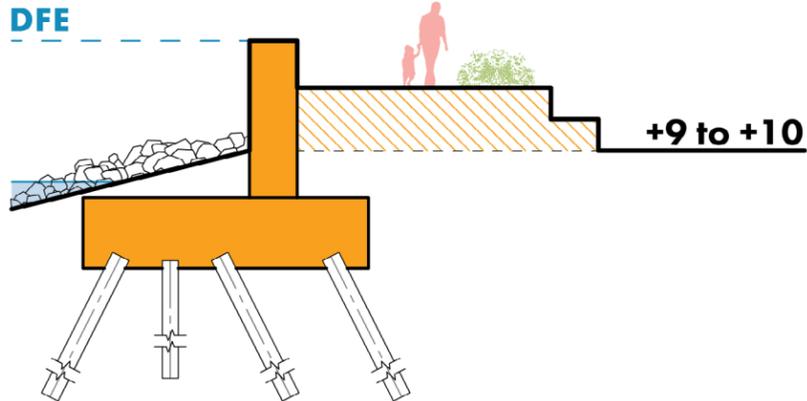
The FBS alignment turns back to the shoreline on the west side of the Boston Design Center and terminates near the Hampton Inn Boston Seaport District on Summer Street. The tie-in at this location will be coordinated with either the independent utility alternative or deferred to subsequent phases of district-scale coastal flood protection planned for South Boston.

Massport is actively developing project plans for a flood mitigation strategy along Seaport Boulevard as of the date of this report. Protection of the RLFMP is reliant on this project moving forward to construction. If the flood risk along Seaport Boulevard is not addressed in the near-term, it is recommended that the independent utility alternative be constructed to protect the RLFMP from the flanking flood pathway originating on Seaport Boulevard. This consideration will need to be addressed as part of the mid-century (2050 to 2070) phase of flood protection planning for RLFMP.

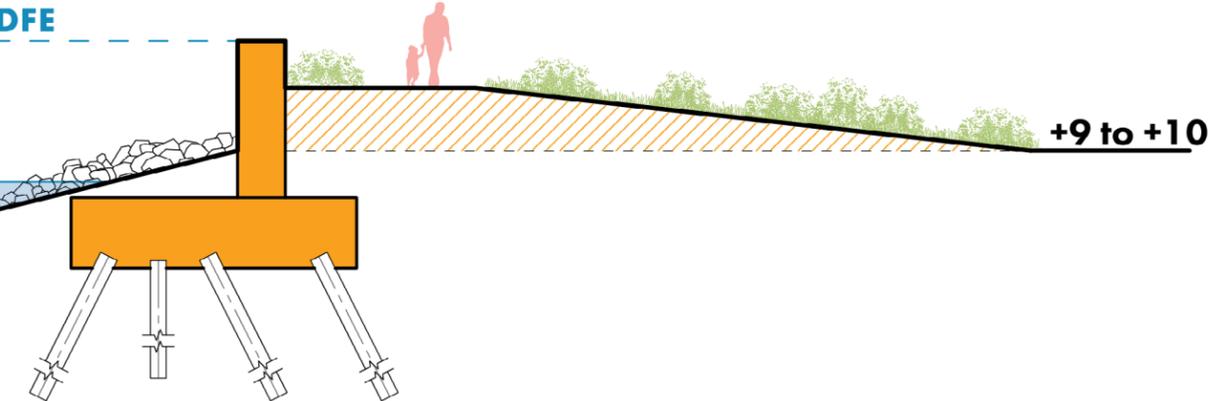


KEY ELEMENTS OF RECOMMENDED DESIGN

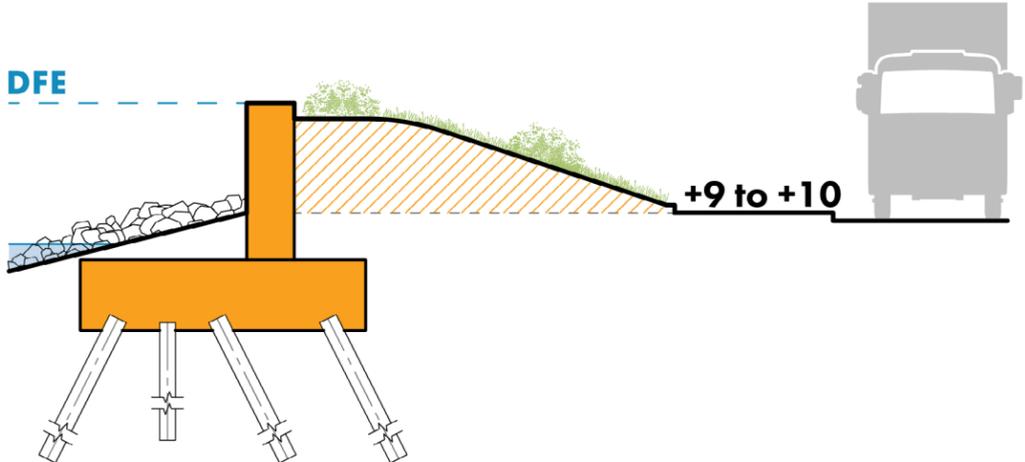
NOTE: Refer to map on previous page for locations of the following elements



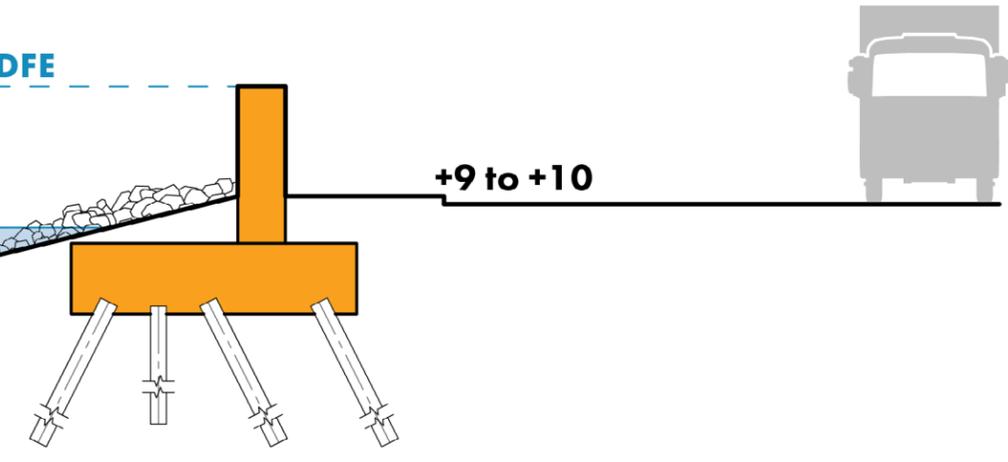
SECTION A
ELEVATED ESPLANADE / HARBORWALK



SECTION B
FULLY RAISED GRADE OR PARK



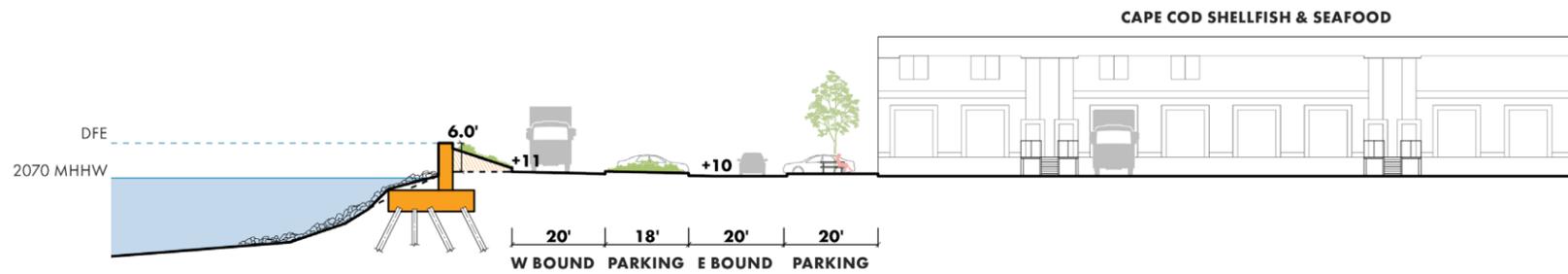
SECTION C
BERMED LANDSCAPE BUFFER



SECTION D
FLOODWALL (ARCHITECTURAL OR TYPICAL)

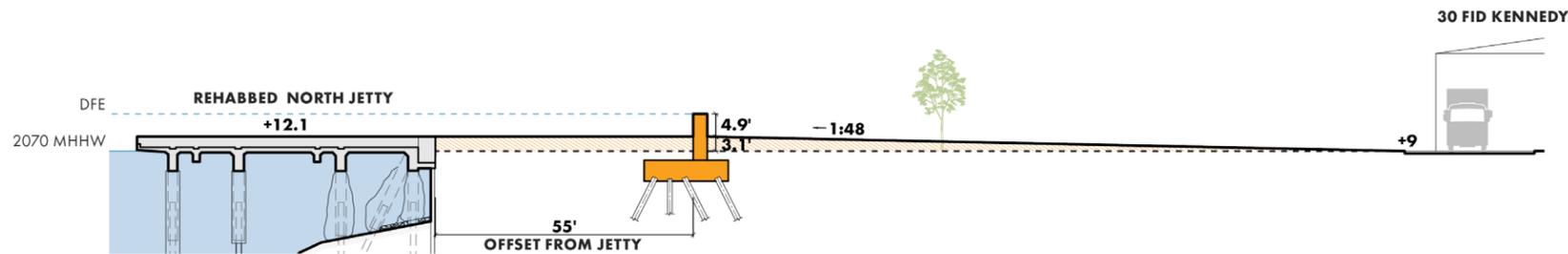
KEY FUNCTIONS OF RECOMMENDED DESIGN

The recommended flood barrier system provides flood protection that specifically benefits the RLFMP and implementation of the Master Plan in key areas identified - in key areas identified throughout the stakeholder engagement process.



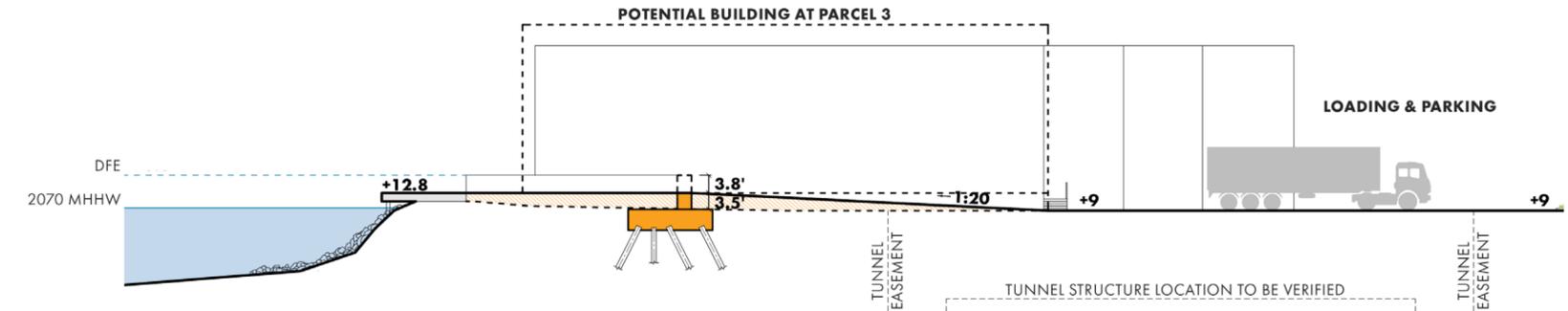
PROTECTING TRANSPORTATION ROUTES

Ensuring continued vehicle and pedestrian access to RLFMP businesses and tenants is an important component of protecting the operations of RLFMP. The flood barrier system protects such access both by preventing flood of key access points and routes, and by mindfully ensuring the flood barrier system structures themselves do not impede access on a day-to-day basis. To this end, trucking access to maritime and industrial businesses is maintained. Seventeen locations for pedestrian/vehicle gates are identified in the recommended flood barrier system, although the exact number may shift in the final design.



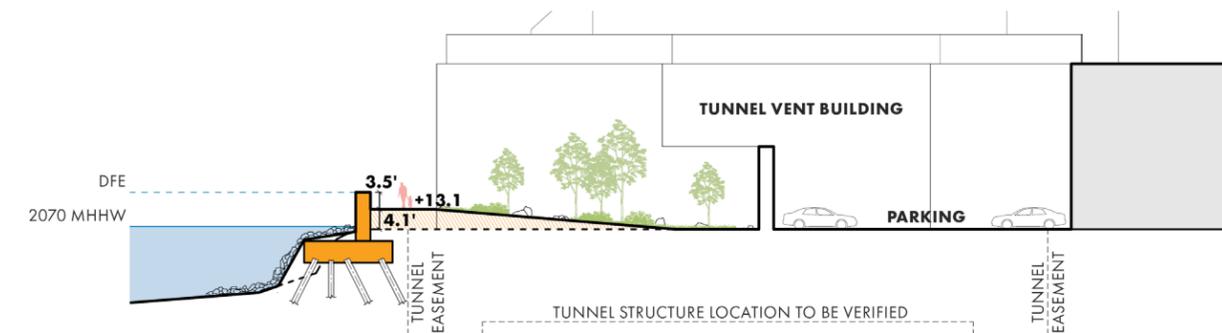
ENABLING CONTINUED. RESILIENT MARITIME ACCESS

As a Designated Port Area, the RLFMP must pursue actions that ensure the continued viability of marine industrial activities within it. To this end, the recommended flood barrier system facilitates resilient waterside access while protecting waterfront industries. It will enable continued and growing resilient operations for these businesses that serve as important job centers for Bostonians.



ENHANCED AND RESILIENT ECONOMIC VITALITY

By protecting the entire Marine Park, including buildings and transportation corridors, the strategy enables continued economic vitality and growth that adapts to future climate conditions. Protecting new and older businesses of various types, the recommended flood barrier system supports the RLFMP's role in providing jobs and economic impact to the city, region, and country.



TARGETED OPPORTUNITIES FOR RESILIENT PUBLIC ACCESS

As a designated port area, most areas of the RLFMP are not suitable for public access due to safety risks. However, the recommended flood barrier system strategically identifies locations to enhance and expand public access to the waterfront. At these key locations, effort is taken to ensure high quality and resilient public spaces.

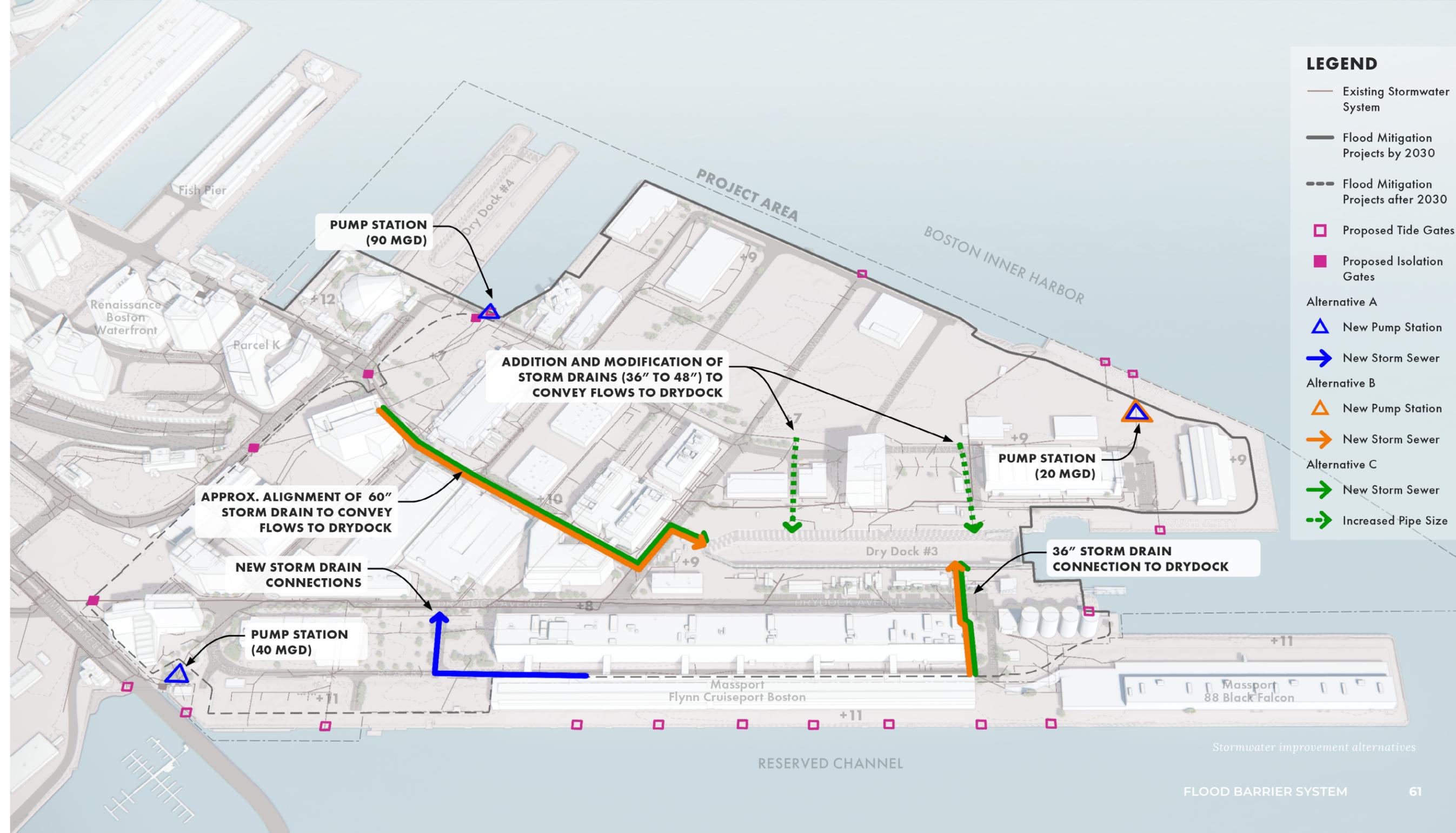
IMPROVED STORMWATER MANAGEMENT

This project considered a suite of stormwater drainage solutions to manage precipitation-based flooding in conjunction with the recommended coastal flood barrier system infrastructure. The proposed stormwater management alternatives incorporate a range of potential solutions, including the installation of tide gates and/or isolation gates, increasing the size of existing storm drains, installing new storm drain alignments, adding or enlarging stormwater inlets, installing pump stations, and providing for the storage of stormwater. Additional on-site management of stormwater measures should also be required for all future development in the RLFMP.

Three stormwater management alternatives were developed, all of which include tide gates on storm drain outfalls and isolation gates (which isolate segments of the stormwater conveyance system) at other strategic locations. These measures work cohesively to prevent backflow from storm surge or other flooding outside the boundaries of the RLFMP flood barrier system. Across all alternatives, improvements such as increased storm drain diameters, new catch basins, trench drains, and rainfall storage provide additional flood risk reduction.

A variety of features distinguish each of these alternatives from each other:

- Alternative A is expected to have the highest total cost and will provide the most robust flood protection. It utilizes three pump stations (in the northwest, northeast, and southwest corners of the RLFMP) to move water from within to outside the flood barrier system line of protection.
- Alternative B conveys water to Dry Dock #3 for storage using storm drains and a small pump station in the northeast corner of the RLFMP.
- Alternative C is expected to have the lowest total cost but would have the most disruptive construction impacts. It does not utilize any pump stations, and instead upsizes existing storm drains and adds new storm drains to direct water to Dry Dock #3 for storage. Additional improvements may also be needed within the Dry Dock to provide for storage but were not considered as part of this study.



TIMELINE AND PHASING

Phased implementation of the recommended alternative is based on the timing and location of coastal flood impacts throughout the RLFMP.

IMPLEMENTATION BY 2030-2035 (PHASE I)

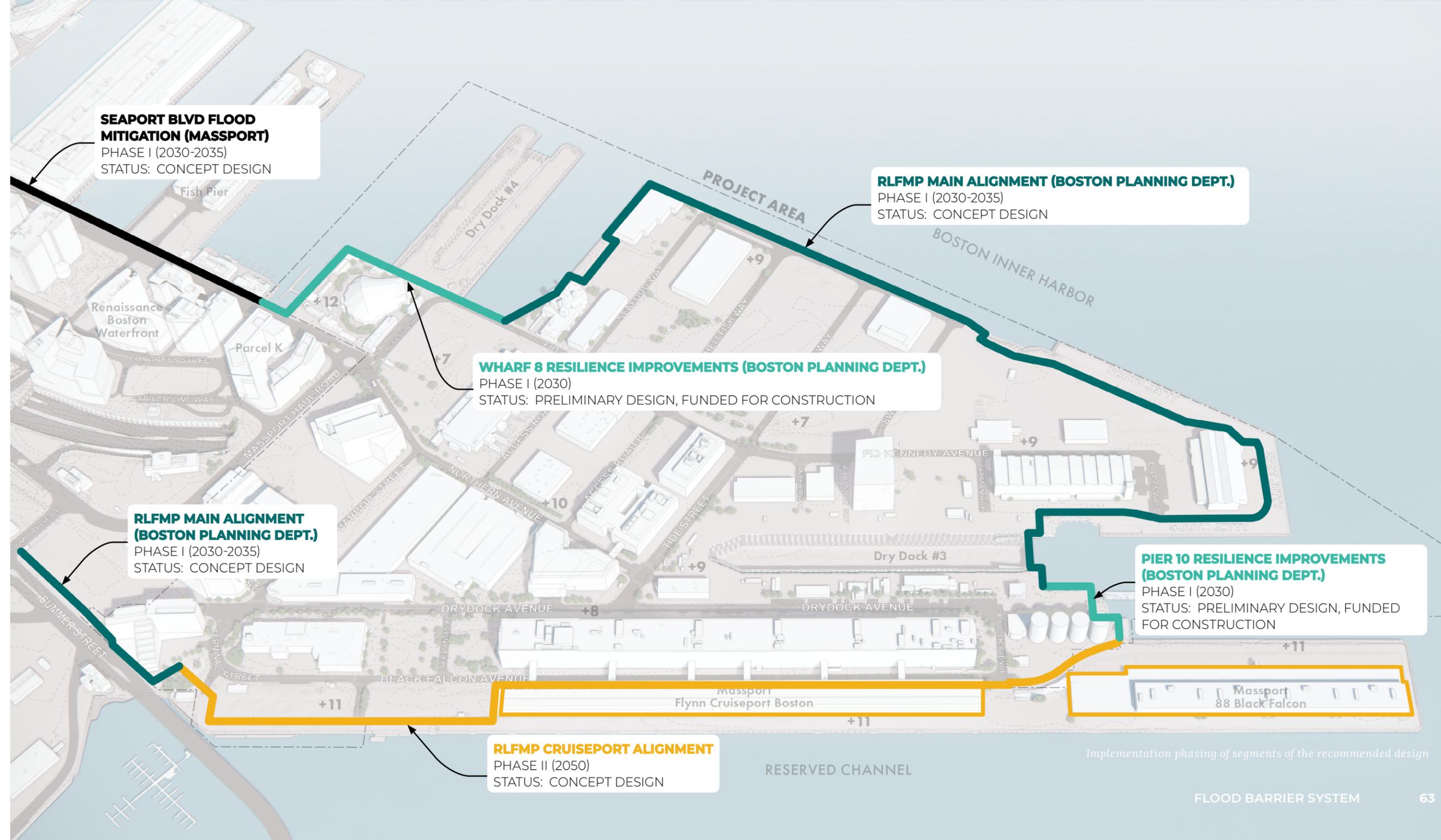
Because the majority of the RLFMP is at risk of flooding in the near-term (present-day to 2030), much of the recommended flood barrier system should be implemented by the 2030s to the 2050 DFE (or higher if feasible) as the Phase I project. This includes shoreline protection segments extending from Wharf 8 along the shoreline to Pier 10. Another portion of the recommended alternative extending northwest along Summer Street from the Parcel A open space plaza inland to the northwesternmost extent of the RLFMP boundary should also be implemented by the 2030s. Beyond the RLFMP boundaries, extensions of the flood barrier system along Seaport Boulevard and Summer Street are also necessary by the 2030s to mitigate flood pathways originating outside of RLFMP but affecting the facility. Interior stormwater infrastructure improvements will also be required to facilitate interior drainage of the Marine Park.

IMPLEMENTATION BY 2050 (PHASE II)

The southern portion of the RLFMP site, where it abuts Massport-owned property (Flynn Cruiseport and 88 Black Falcon), is at a higher elevation than the rest of the RLFMP and as such faces lower near-term flood risk. While fringe flooding at the Cruiseport may be experienced during large coastal floods in the near-term (present-day to 2030), this area does not become a significant pathway for inland flooding until mid-century. Therefore, implementation of structural coastal protection extending from Parcel K to approximately Parcel A should be planned for 2050 as a Phase II project. This segment of the flood barrier system should be designed to integrate with (i.e., “tie-in to”) any coastal flood protection implemented prior.

Building-level flood mitigation for the Cruiseport and 88 Black Falcon should be considered for implementation sooner than 2050 given the potential for coastal flooding to affect these facilities during significant flood events

If progress has not been made on mitigating other flood pathways that impact from RLFMP from outside, then the Independent Utility Alternative should be advanced by 2050 to provide effective flood risk mitigation within RLFMP.



Implementation phasing of segments of the recommended design

PROJECT BENEFITS AND COSTS

COST ESTIMATE

The following projects all play a role in mitigating coastal flooding risk at the Marine Park. To evaluate the cost-effectiveness of protecting the RLFMP from damages due to coastal flooding, the level of protection and the associated cost of each segment of the comprehensive line of protection must be considered jointly. Based on the level of detail available for the various coastal protection projects in development around the Marine Park, \$850M was determined to be the total cost of these four projects. This total cost is used to determine the benefit-cost-ratio of protecting the assets within the RLFMP.

PROJECT	SOURCE	ALIGNMENT	LOW COST (\$M)	HIGH COST (\$M)
Wharf 8 / Pier 10 Harborwalk and Resiliency Improvements South Boston, Massachusetts Design Basis Report	Boston Planning Department, Collins Engineers	Wharf 8	\$2.7	\$3.4
		Pier 10	\$1.5	\$3.1
Seaport Boulevard Floodproofing Program Definition Report	Massport, Kleinfelder	Seaport Blvd	\$20	\$30
Basis of Design Report: Flood Mitigation Planning & Feasibility at the Raymond L. Flynn Marine Park	Boston Planning Department, Arcadis	Main Alignment	\$500	
Conceptual Cost Estimation Approach for Flood Mitigation Planning & Feasibility at the Raymond L. Flynn Marine Park	Boston Planning Department, Arcadis	Cruiseport	\$290	\$320
Total			\$810	\$850

Summary of project costs

Note: Total costs represent the rounded sum of non-rounded cost estimates for each alignment

BENEFIT COST ANALYSIS

A Benefit Cost Analysis (BCA) helps demonstrate the cost-effectiveness of the recommended alternative. The analysis focused on quantified avoided losses (benefits) associated with buildings. Buildings are the primary driver of losses due to flooding, including both direct physical damages to the structures as well as a variety of associated economic and human impacts, such as:

- content and inventory loss
- business relocation costs
- economic output loss
- mental stress and anxiety
- lost productivity
- residential relocation costs

The BCA considered 18 total flood events reflecting six different severities of flooding across three time horizons (2030, 2050, and

LEVEL OF PROTECTION	DISCOUNT RATE	Includes All Projects Represented in the Table on p. 66		
		Est Benefits (\$M)	Low BCR (\$850M Cost)	High BCR (\$810M Cost)
Near-Term (2030)	3%	\$4,100	4.76	5.01
	7%	\$960	1.13	1.18
Mid-Term (2050)	3%	\$4,300	5.05	5.32
	7%	\$1,000	1.19	1.24

BCA results

2070). This analysis represents a high-level initial assessment of benefits assuming a full build out of coastal protection within RLFMP and in adjacent areas to reduce risk from coastal flooding expected as soon as 2070. The BCA compared these benefits to two cost scenarios: \$810 million (low) and \$850 million (high). This is based on the available cost estimates for the RLFMP and Seaport Boulevard flood protection projects at the beginning of 2026.

The methodology used to develop the BCA incorporates models from multiple public-sector data sources and assesses the impacts of long-term sea level rise. These inputs yield a more refined Benefit Cost Ratio (BCR) than would be developed using only FEMA's standard methodology.

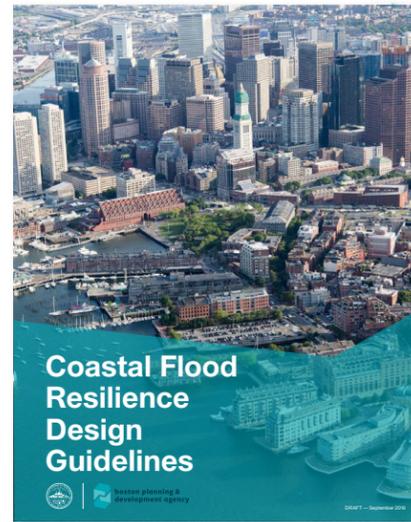
Note: Because of the nature of coastal flooding in the Seaport District, coastal flood protection infrastructure will need to be constructed over time by different public and private entities. Additional risk modeling and analysis may be necessary to evaluate cost effectiveness of individual projects pursued by these entities within or outside of RLFMP based on the implementation timing and extent of each flood protection project.

BUILDING AND SITE-LEVEL ADAPTATION

Many RLFMP stakeholders have already taken steps to address flood risk and build the resilience of their buildings and sites. Even as this project is implemented, such efforts will continue to play an important role in ensuring the protection of RLFMP and the continuity of its operations. Building and site-level adaptation measures supplement the district-scale approach of the flood barrier system and can enhance the benefits.

The City of Boston's *Coastal Flood Resilience Design Guidelines* provide a foundation for context-appropriate building and site-level adaptation in the City's Coastal Flood Resilience Zoning Overlay District, which includes the RLFMP. These guidelines include information on best practices related to building form, envelope and access, critical systems, and more for both new construction and retrofits. As described in the *Coastal Flood Resilience Design Guidelines*, stakeholders should implement the appropriate measures for their sites by first identifying flood risk, then understanding what regulations apply and how, and finally evaluating and choosing a strategy.

As with the design of district-scale flood protection measures, there are multiple approaches to building and site-level protection. The proper approach for any given site is highly context-dependent, and should be selected based on a variety of factors including site conditions, specific flood risk, and tenants' operational needs.

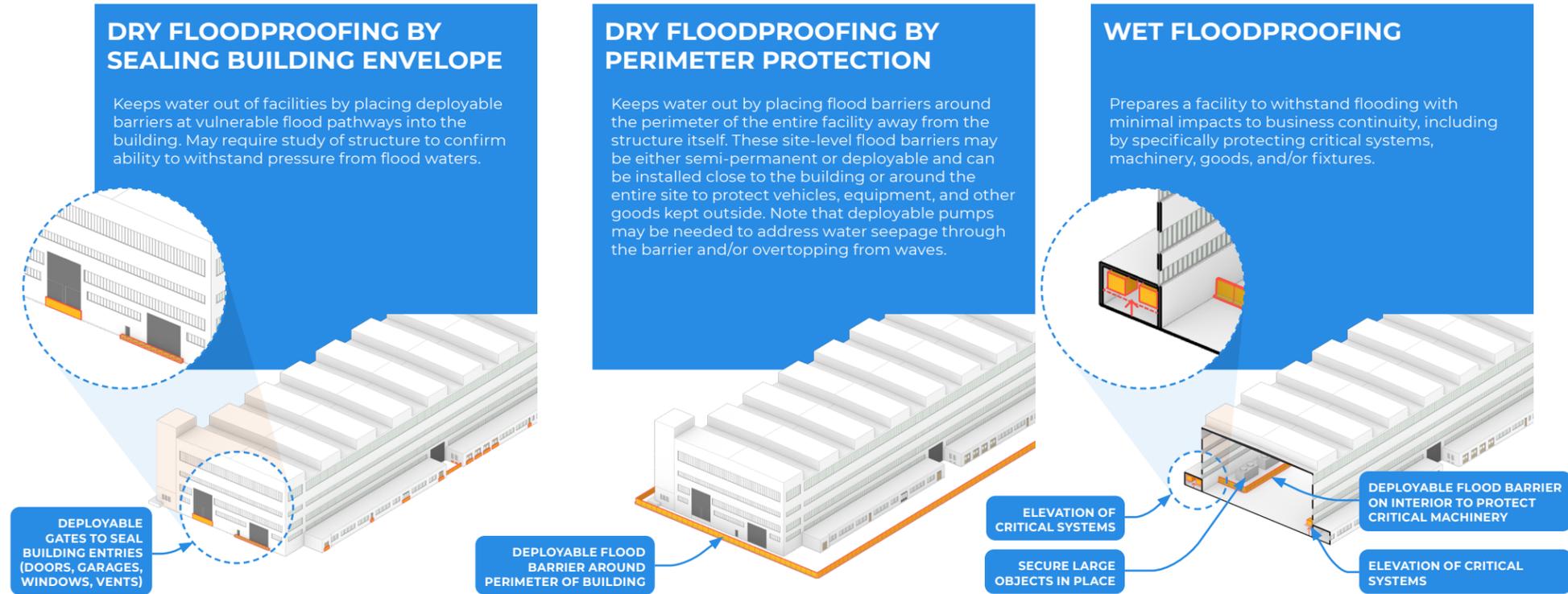


Scan the QR code to view the City of Boston's Coastal Flood Resilience Design Guidelines

BUILDING-LEVEL FLOOD MITIGATION

Below are examples of key building-level strategies that could be used by businesses and property managers across the RLFMP to reduce flood risks. These strategies can usually be implemented much more quickly and with lower costs than the district-wide approaches outlined in this report. Additional study and design is needed for each building since each business is unique in its operations and flood mitigation priorities. The visuals below show a typical industrial structure layout in the RLFMP, modeled after the Cannistraro facility on FID Kenedy Avenue. Key characteristics of many businesses in the RLFMP include active ground floor uses for day-to-day business operations, multiple exterior openings including loading docks, doors, windows, and vents, a combination of industrial and office spaces, and critical equipment located both on the interior and exterior of the facility. The below diagrams are for illustrative purposes to show the range of options that could be considered by industrial businesses in RLFMP.

Operational Actions can also mitigate impacts to facilities. These actions include advanced emergency preparedness operations planning, relocation of vulnerable equipment/goods to higher elevations, protection of hazardous materials, maintaining a clean site to expedite pre-flood preparations, and installing an emergency generator for business continuity (such as to operate industrial refrigerators).



It is important to note that many of the building-level flood mitigation approaches shown here are “deployable” which means they must be installed or activated by people immediately prior to a flood in order to be effective. This means business operators in RLFMP should consider the operational and installation requirements and costs when selecting a preferred approach.

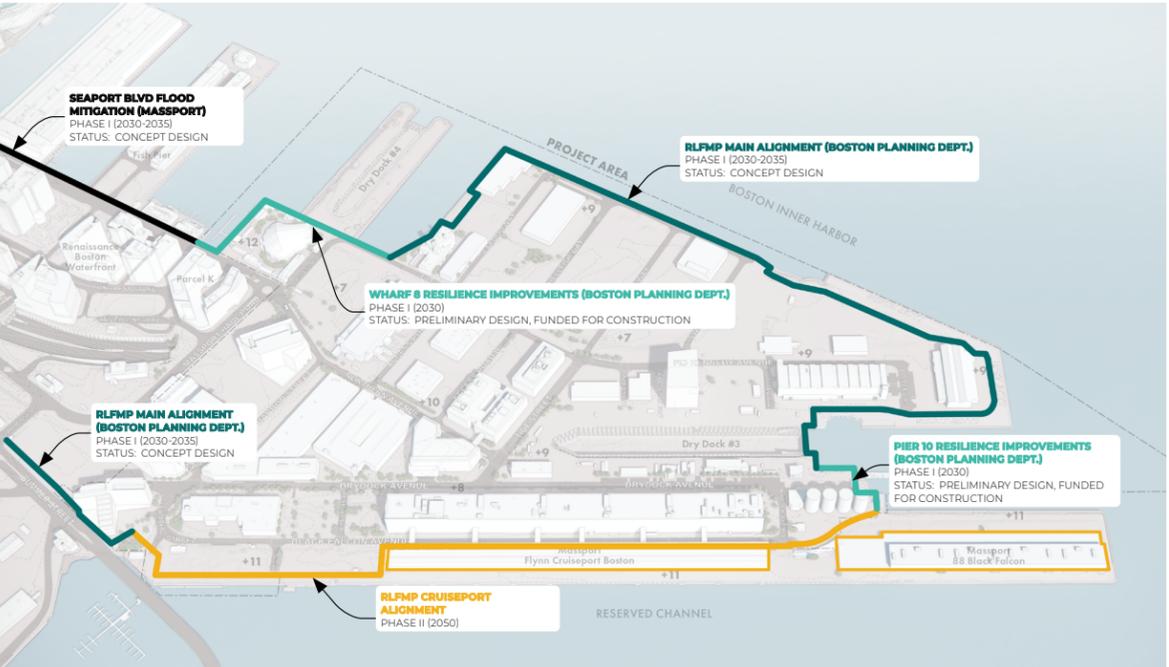
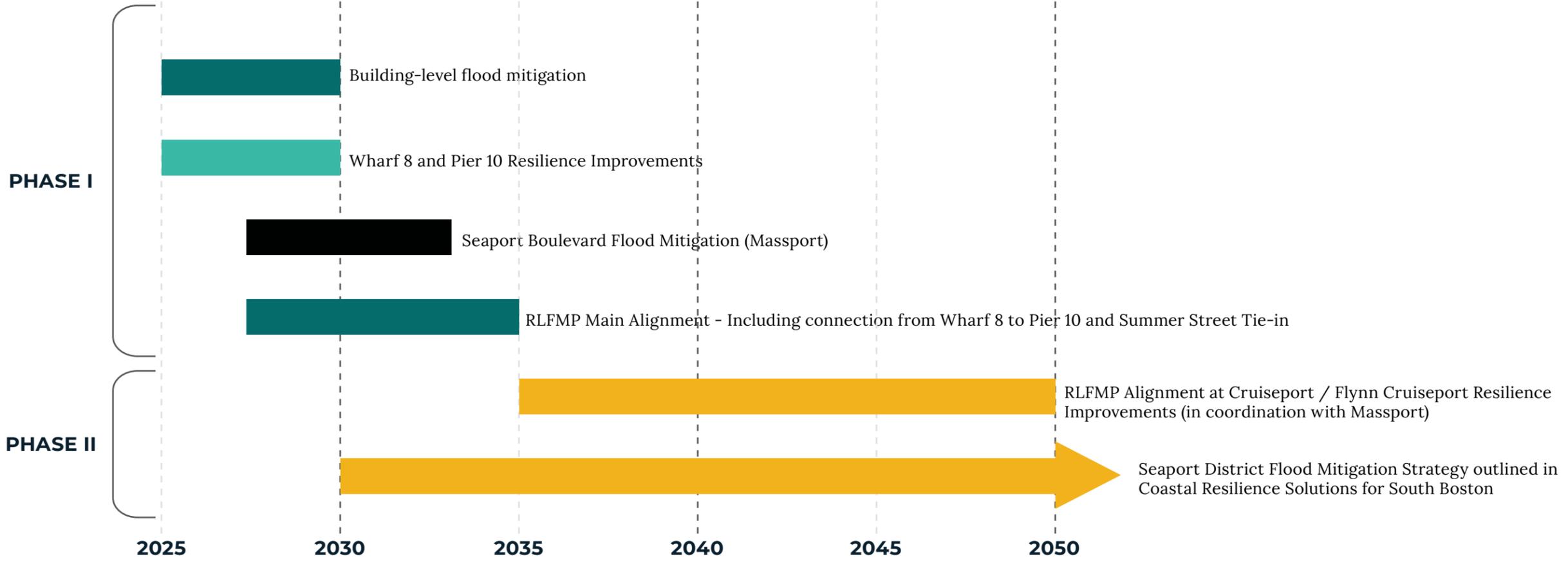


5

LOOKING AHEAD

PHASING STRATEGY

Note the periods represented on this timeline include the approximate duration of additional planning, design, permitting, and construction. Implementation timelines for each project may change as planning and design advances.



Phasing Strategy

NEXT STEPS

Following completion of this study, the City of Boston will be in a position to seek funding and move into implementation of the Phase I flood barrier system project and the associated stormwater infrastructure improvements to address interior drainage. Continued engagement with Marine Park tenants and with the leaders of adjacent projects, particularly Massport will be crucial for an efficient and effective implementation of the project. A summary of the next steps in the implementation process are outlined below.

PROJECT FUNDING

The concepts presented in this report and the associated Basis of Design Report were prepared to the level of detail necessary for the City of Boston to identify the necessary capital funds to design and construct the Phase I flood barrier system. Projects of this magnitude are often funded by a mix of local, state, and federal funding sources. With the completion of this report, elected officials in the City of Boston and the

Commonwealth of Massachusetts will be positioned to begin conversations about funding the design and construction of the project and identifying potential sources of public or private grant funding to aid local funding sources.

FIELD DATA COLLECTION

Once the project is funded for implementation, the next stage of the process is to collect data to comprehensively understand the location and conditions of the existing infrastructure and the specific above- and below-ground site conditions within the RLFMP. This field data is necessary to support the engineering and design of the flood barrier system and associated stormwater infrastructure improvements, as well as the safety of construction teams that will eventually build the project. Key field data collection steps include updated boundary, topographic, and bathymetric surveys across project footprints and where conditions have changed since the conclusion of this study, as well as surveys and assessments of

stormwater infrastructure and outfalls.

Information on the characteristics of soil and bedrock of the RLFMP is also necessary to inform the design. While existing geotechnical data, including over 100 historical borings, is sufficient for the initial design of the recommended flood barrier system, additional subsurface soil information will be necessary. Because the flood barrier system included extensive, complex subsurface structural design components, further site-specific geotechnical exploration and analyses will also be needed as the design advances. Site environmental hazards must be identified and testing for historical contamination must also be conducted.

DETAILED DESIGN AND ENGINEERING

In conjunction with the collection of the necessary field data, detailed design and engineering can begin on the RLFMP project. The preliminary design will be advanced based on the preferred alternative

recommended by this study to detailed technical drawings, specifications, and calculations to ensure compliance with relevant local, state, and federal codes and standards. Following approval of these drawings, construction drawings will be prepared so the project is ready for bidding and construction.

STORMWATER MANAGEMENT

The development of concepts and designs for stormwater infrastructure upgrades to manage precipitation-based flooding in the RLFMP was initiated in this study and will require additional refinement and coordination with MassDOT, the Boston Water and Sewer Commission, and RLFMP tenants. Further coordination will be necessary to understand the feasibility and benefits of each alternative presented in this report and to select a preferred alternative for stormwater infrastructure upgrades that will complement the implementation of the RLFMP Phase I project. The Planning Department and the Boston Water and Sewer Commission should work together

to understand the feasibility of proposed solutions and advance them as appropriate. In the near term, a variety of smaller scale projects may help mitigate stormwater flooding in the RLFMP. These include the installation of site-level stormwater storage on properties slated for redevelopment, the installation of tide gates on all stormwater sewer outfalls, and undertaking stormwater sewer improvement projects as part of roadway repairs.

U.S. ARMY CORP OF ENGINEERS COORDINATION

The City of Boston's partnership with the [U.S. Army Corps of Engineers](#) (USACE) will build on the work of the [Climate Ready Boston](#) planning initiatives for the near- and long-term effects of climate change. The partnership between the City of Boston and the U.S. Army Corps of Engineers focuses on long-term coastal storm risk through a USACE process known as a Coastal Storm Risk Management (CSRMP) Feasibility Study.

The Boston CSRMP study will consider long-

term flood risk and existing city, federal, state, and local plans and projects along Boston's 47-mile coastline, including RLFMP. USACE is assessing coastal flood effects on people, ecosystems, property, and critical infrastructure. USACE will develop potential strategies to manage flood risk, including different tools and approaches that would be eligible for up to 65% federal funding. The City will continue to coordinate with the USACE to identify approaches for flood resilience in RLFMP that align with USACE criteria and support long-term resilience within the facility.

PERMITTING

During the detailed design and engineering stage, coordination with regulatory and environmental review agencies will be necessary. Permit application packages will be prepared for all the required regulatory approvals needed to construct the project in compliance with federal, state, and local laws. These permit applications will be submitted to the appropriate regulatory agencies for review and consideration for approval. All permits are required to be obtained before the project can begin construction.

ONGOING PUBLIC AND TENANT ENGAGEMENT

As the recommended alternative is further developed through subsequent phases of planning and design, continued stakeholder engagement of the Marine Park's tenants, businesses, and workers will play a key role in ensuring support for both the refined design and the recommended implementation phasing approach. Continued engagement should include:

- Stakeholders previously engaged (see Part 3 of this report)
- Infrastructure and utility owners (e.g. Eversource, MBTA, MassDOT, etc.)
- Regulators including Massachusetts Department of Environmental Protection (DEP), Coastal Zone Management (CZM), Environmental Policy Act Office (MEPA)
- Potential funders including the Federal Emergency Management Agency (FEMA), United States Army Corps of Engineers (USACE), United States Department of Transportation (DOT)
- Members of the general public

ANTICIPATED AUTHORIZATIONS AND PERMITS

There are a series of federal, state, and local authorizations that will likely be required to implement the Phase I flood barrier system, based upon a preliminary analysis of environmental, cultural, and historic resources, which are listed below:

- ☑ US Clean Water Act National Pollutant Discharge Elimination System: Construction General Permit
- ☑ US Dept. of the Army Massachusetts General Permit: Pre-Construction Notification or Self-Verification Notification
- ☑ US Environmental Protection Agency - NPDES Construction General Permit
- ☑ US Coastal Zone Management Act: Federal Consistency Concurrence
- ☑ U.S. Magnuson-Stevens Fishery Conservation and Management Act (USMSFCA) - Essential Fish Habitat (EFH) Identification
- ☑ U.S. Endangered Species Act (USES) Section 7 Consultation
- ☑ Massachusetts Clean Waters Act: Water Quality Certification
- ☑ Massachusetts Wetlands Protection Act: Notice of Intent or Notice of Intent
- ☑ Massachusetts Endangered Species Act
- ☑ Massachusetts Waterways Act: Existing Chapter 91 License Modification or New License
- ☑ Massachusetts Environmental Policy Act: Environmental Notification Form or Environmental Impact Statement
- ☑ Massachusetts Office of Coastal Zone Management – Consistency Determination
- ☑ Massachusetts Department of Transportation Permit
- ☑ Massachusetts Historical Commission: Project Notification Form
- ☑ Massport's Tenant Alteration Process (for Massport properties)
- ☑ Local Jurisdictions / Bylaws
 - ☑ City of Boston Conservation Commission
 - ☑ Boston Water and Sewer Commission Site Plan Review
 - ☑ Boston Public Improvement Commission Approval
 - ☑ Boston Transportation Department - Construction Management Plan
 - ☑ Boston Public Works Department
 - ☑ Boston Inspectional Services Department - Building Permit

KEY ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

ACRONYM / ABBREVIATION	MEANING	DEFINITION
AEP	Annual Exceedance Probability	The likelihood that a flood of a specified size or intensity will be equaled or exceeded in any given year.
BFE	Base Flood Elevation	The elevation to which floodwater is anticipated to rise during the base (1% annual chance) flood event.
BODR	Basis of Design Report	A document outlining the fundamental criteria, assumptions, and design decisions guiding the development of this project's recommended flood barrier system.
BPD	Boston Planning Department	The municipal agency responsible for urban planning, zoning, and land use regulation within the City of Boston.
CRS	Coastal Resilience Solutions for South Boston	A 2017 planning report that considered coastal hazards in South Boston and recommended this project, among others.
CZM	Massachusetts Office of Coastal Zone Management	A state agency overseeing the stewardship and sustainable management of Massachusetts' coastal areas and resources.
DFE	Design Flood Elevation	The elevation used in planning and constructing buildings and infrastructure to withstand a specified flood event.
EDIC	Economic Development and Industrial Corporation	A quasi-public entity that leads local economic development activities at industrial and manufacturing properties in Boston, including the Raymond L. Flynn Marine Park.
FBS	Flood Barrier System	A network of engineered structures designed to prevent or mitigate the impacts of flooding on vulnerable areas.
MC-FRM	Massachusetts Coast Flood Risk Model	A high-resolution, physics-based model used to predict coastal flooding from storm surges and sea-level rise.
MHHW	Mean Higher High Water	The average of the higher of the two daily high tides over a defined period.
MMT	Massport Marine Terminal	A waterfront facility at the RLFMP operated by the MassPort with sub-tenant cargo, logistics, and maritime operation.
NAVD88	North American Vertical Datum of 1988	A standardized reference for measuring elevations across North America based on a fixed network of benchmarks.
RLFMP	Raymond L. Flynn Marine Park	The project location. A commercial and industrial waterfront district in South Boston managed by the EDIC.
SLR	Sea Level Rise	The long-term increase in the average level of the world's oceans due to climate change and other factors.
USACE	US Army Corps of Engineers	A federal agency providing engineering services, infrastructure management, and water resource solutions across the United States.





CITY of **BOSTON**