

**TECHNICAL ANALYSIS  
& RESILIENT DESIGN  
DEVELOPMENT OPTIONS FOR**

# **EAST BOSTON'S WATERFRONT**



**boston planning &  
development agency**

NOVEMBER 2021

## ACKNOWLEDGEMENTS

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**The City of Boston would like to thank the Commonwealth of Massachusetts Office of Coastal Zone Management for their generous support.**

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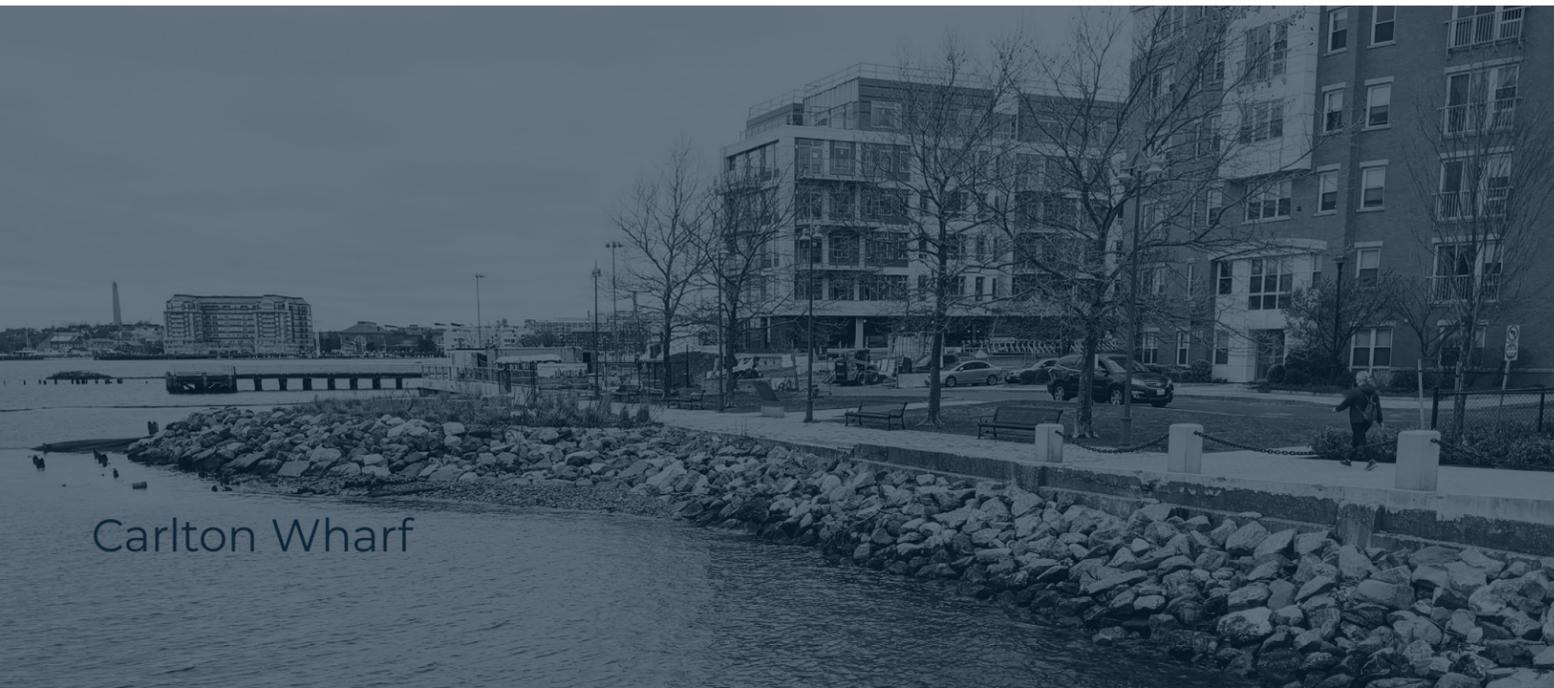
**IN ASSOCIATION WITH:**  
STOSS LANDSCAPE URBANISM  
WOODS HOLE GROUP

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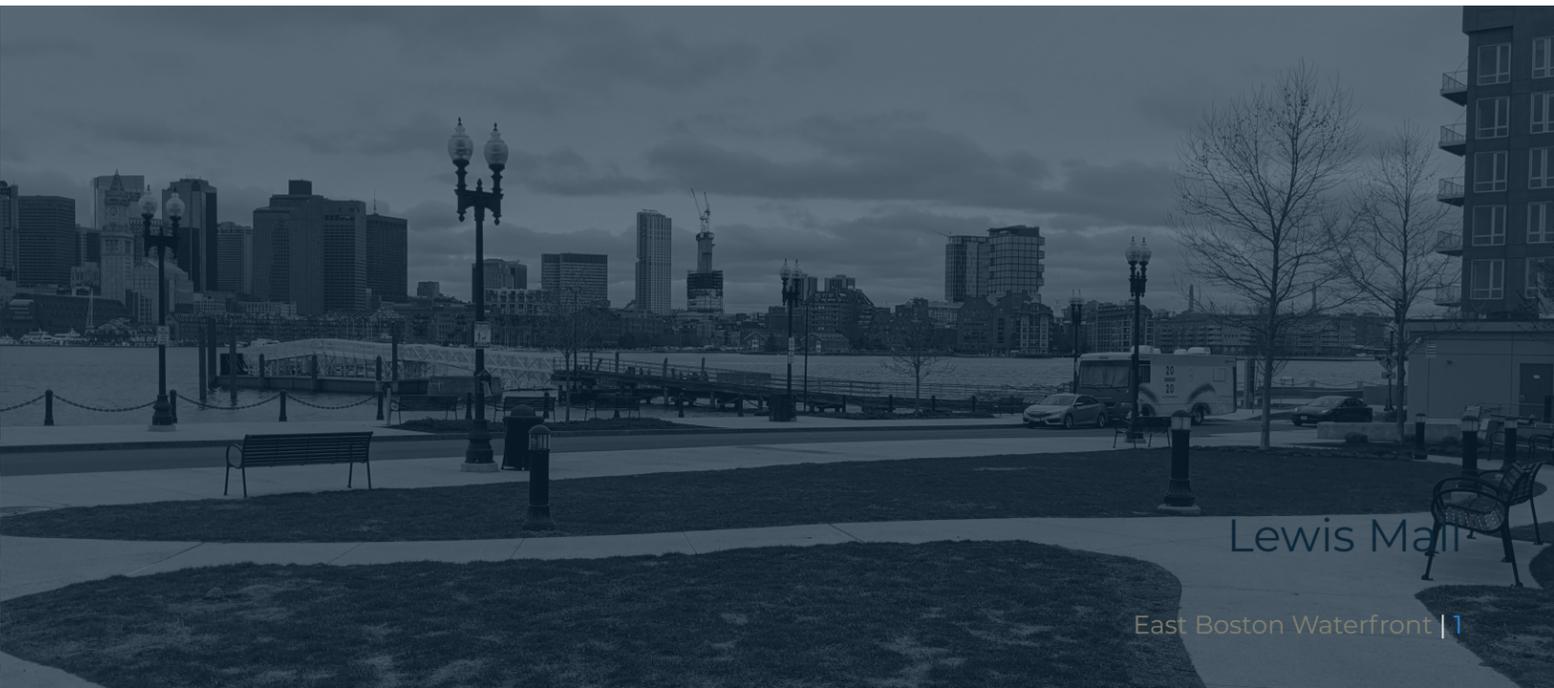
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Carlton Wharf

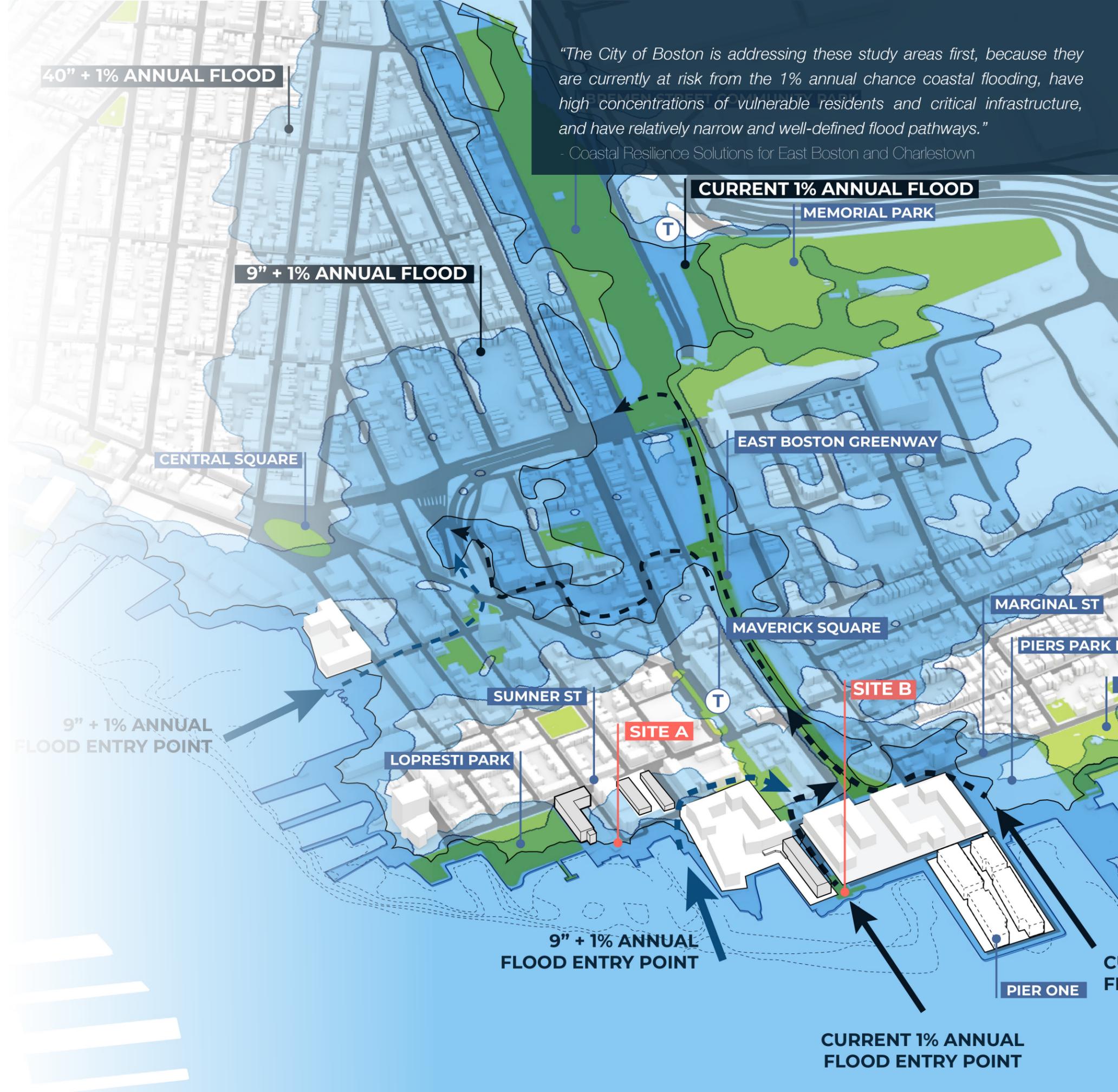


Lewis Mall

# Introduction

The East Boston waterfront is a vibrant and historic neighborhood, and the integration of climate resilience is critical to the future of this community. Open space, in conjunction with new waterfront development meeting resiliency goals set by the Climate Ready Boston initiative, will protect the neighborhood for years to come. Additionally, it is essential to meet community goals for creating equitable waterfront access and maintaining continuity of the Boston Harborwalk. This project advances the implementation roadmap from Coastal Resilience Solutions for East Boston specific to Lewis Mall and Carlton Wharf, which are two critical flood entry points for the East Boston neighborhood. Additionally, this project seeks to strengthen the connection to the waterfront and protect environmental justice communities in East Boston from the undue burden of flooding.

Through review of existing conditions, engagement with neighborhood residents and other stakeholders, and resilience technical analysis, several design scenarios were developed. This document presents design concepts for both flood pathways that consider existing site condition constraints, permitting, jurisdictional boundaries, and magnitude of flooding, while seeking to create open space and equitable access along the waterfront.



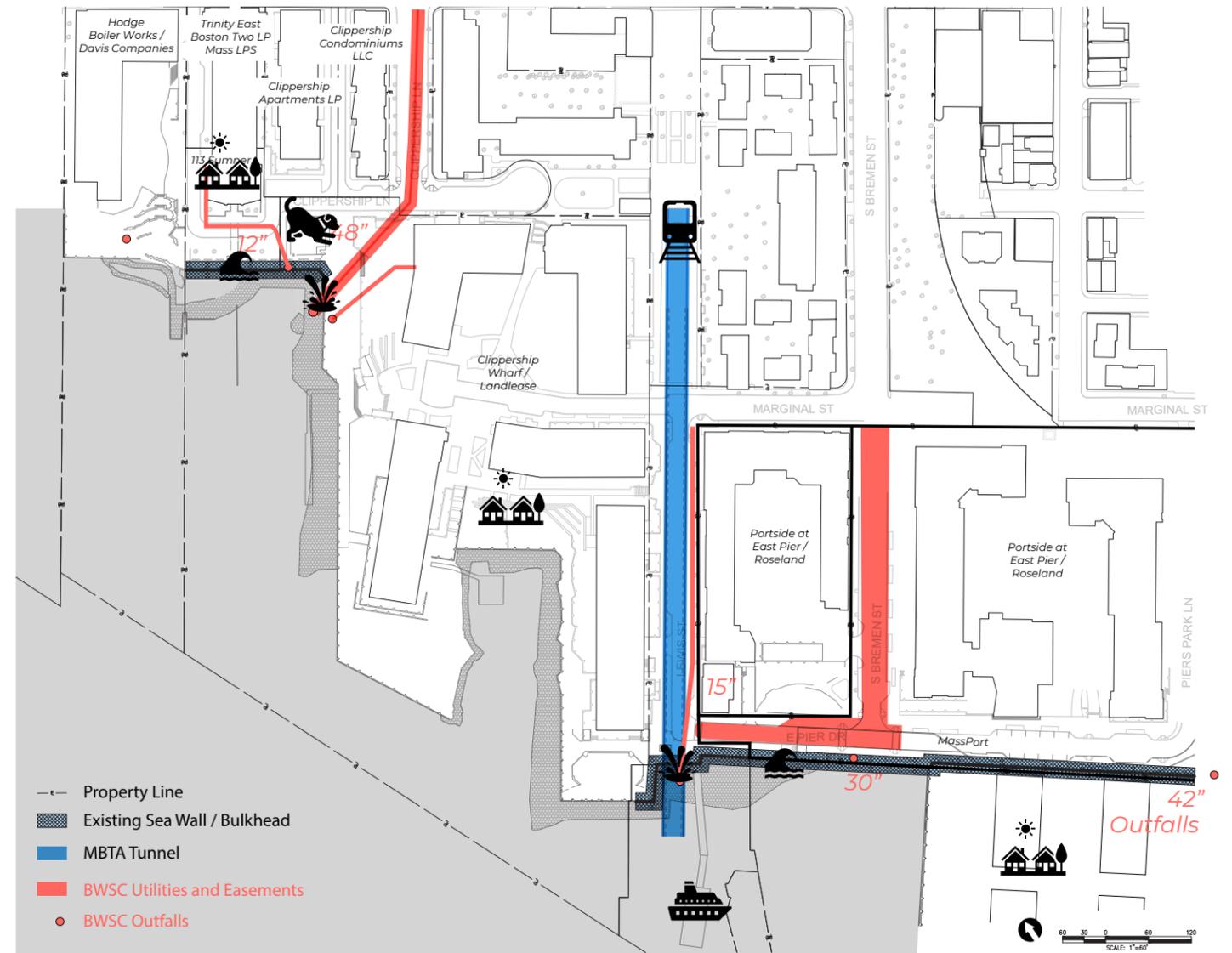
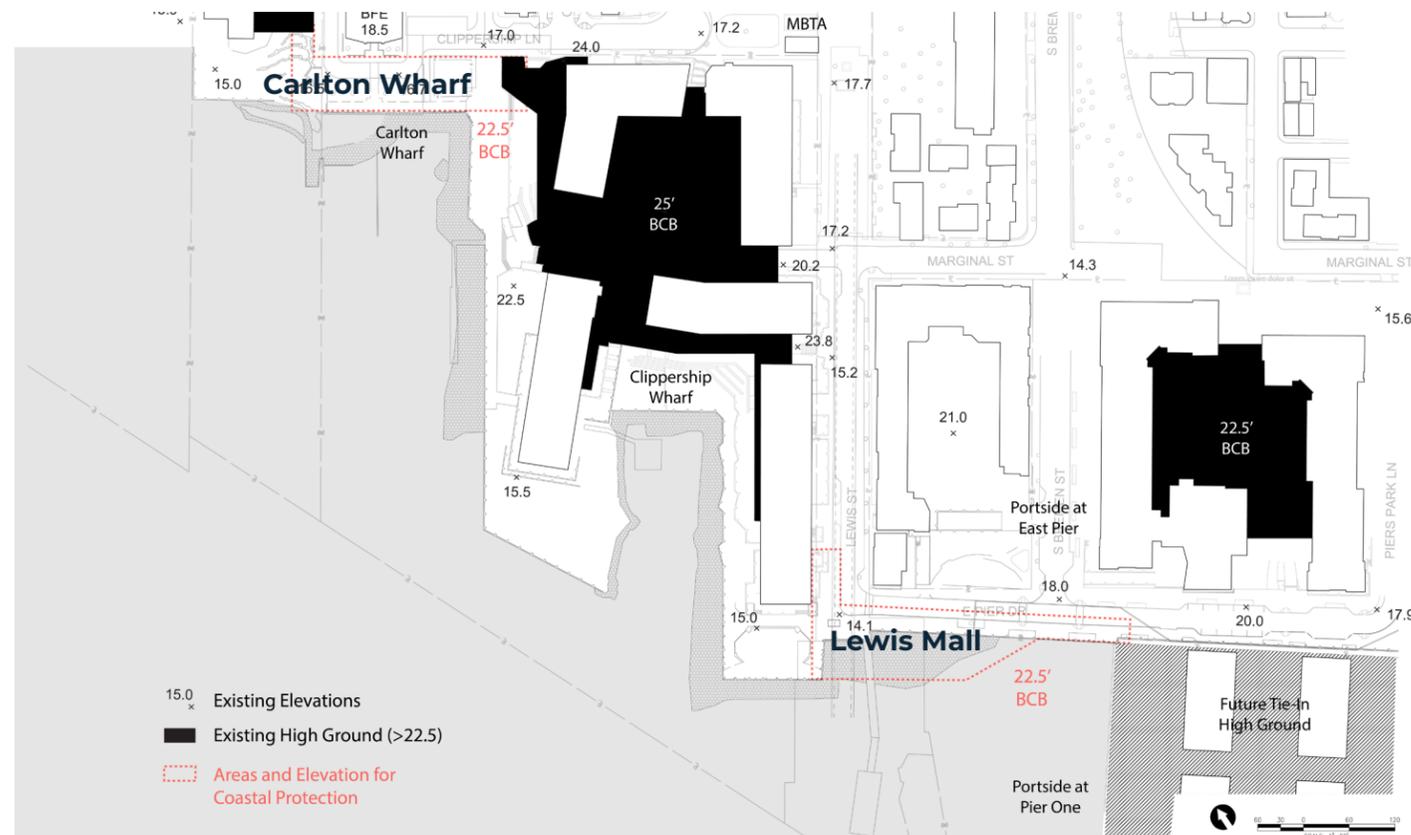
# Site Constraints & Opportunities

Lewis Mall and Carlton Wharf, though close in proximity, present different challenges and serve as examples of different coastal conditions throughout the City of Boston. Both sites are near-term flood pathways and currently flood during storm events; they are part of the waterfront's historic fill area and are low lying. At Lewis Mall, the existing ground elevation ranges from 14 ft-Boston City Base (BCB) up to 20 ft-BCB along East Pier Drive in front of Portside at East Pier. Heading toward Lewis Street Mall in the direction of Maverick Station, the ground elevation rises slightly, with the MBTA station situated at around 18 ft-BCB. At Carlton Wharf, the existing ground elevation ranges from 16 ft-BCB to 18 ft-BCB. With a recommended design flood elevation of 22.5 ft-BCB or higher, this requires up to 8.5 ft. of flood protection at Lewis Mall and up to 6.5 ft. of flood protection at Carlton Wharf. The selected design flood elevation of 22.5-BCB is the convergence of

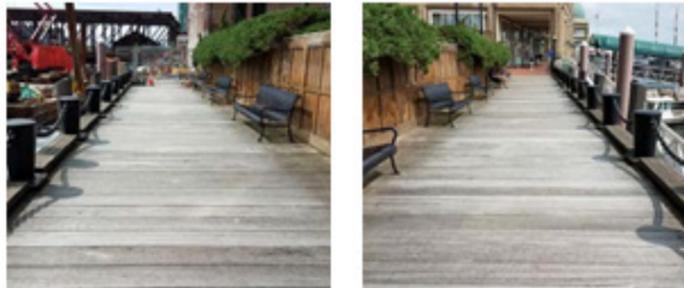
the Climate Ready Modular Elevation and recent update from the Massachusetts Coast Flood Risk Model(MC-FRM) 0.1% event.

Since the release of the Coastal Resilience Solutions for East Boston Report, several of the adjacent waterfront properties have been redeveloped considering future coastal flooding and now have existing ground surface elevations of 22.5 ft-BCB. This provides an opportunity for the designs for Lewis Mall and Carlton Wharf to tie into those properties and effectively mitigate the neighborhood flood pathway.

The designs advanced through this project also considered additional existing conditions, including numerous below ground utilities, transportation considerations, and environmental factors – all with the goal of developing permissible, buildable solutions.



- Adjacent property ownership
- Environmental conditions
- MBTA tunnel runs under Lewis Mall
- Water Taxi service at Lewis Mall
- BWSC easements and outfalls
- Existing dog park at Carlton Wharf
- Condition of the existing seawall



# Design Introduction

As a first step, several preliminary strategies were identified for the Lewis Mall and Carlton Wharf areas. These strategies were deemed achievable in the public rights-of-way and in coordination with local adjacent property owners. The strategies considered the Boston Public Works Department Climate Resilient Design Standards & Guidelines, which recommends a capacity for an additional 2 ft of flood protection, as well as the evaluation criteria developed through the Climate Ready Boston planning process.

Following the initial design process, the preliminary strategies were presented as two scenarios for each site during a public meeting for feedback. The feedback informed the development of the design for each project site.

A simplified design goals checklist was established so that the design scenarios developed for this project emphasized:

Protection– to design flood elevation

Place-making– to meet PLAN: East Boston’s waterfront goals

Maintenance of equitable access– to existing structures & waterfront

Existing Infrastructure– to minimize impact / changes and maintain access

The ultimate goal of the project is to develop buildable and replicable solutions which meet resiliency goals despite site constraints and create more equitable access to the waterfront.



# Carlton Wharf

Early Concepts

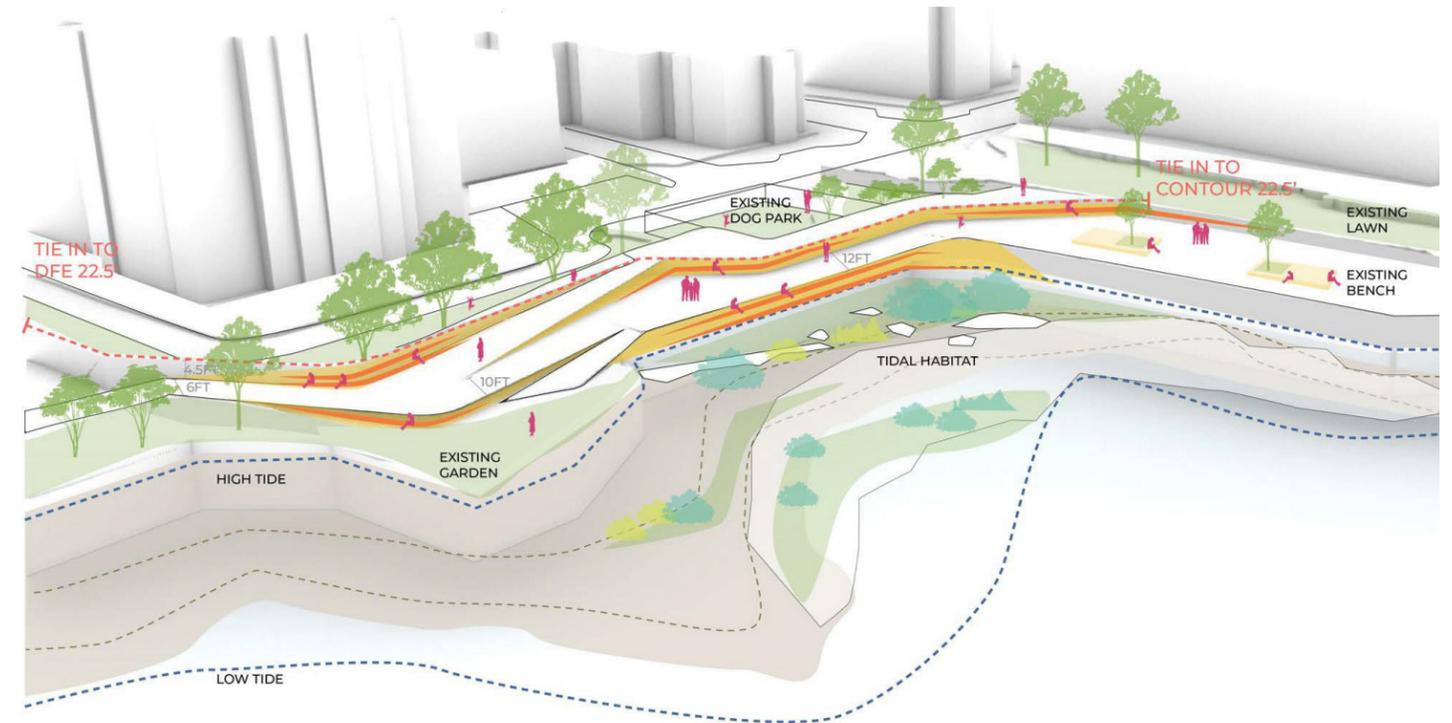
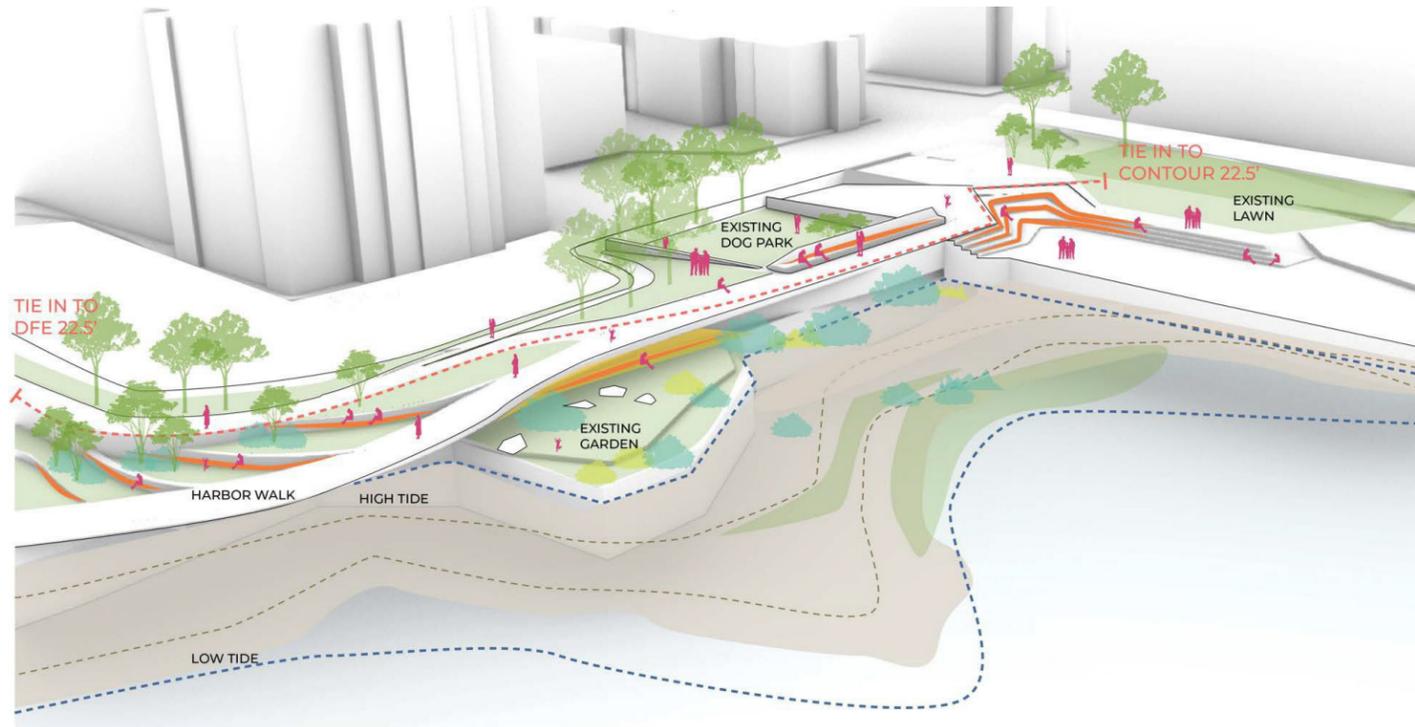
Stakeholder Feedback

Preferred Design



# Carlton Wharf Early Concepts

The existing elevation at the shoreline of the Carlton Wharf site is higher than the current high tide elevation by about 4 ft. and is armored by riprap that protects the existing concrete seawall. There is an existing dog park and Harborwalk path along the waterfront. The overall location of flood barrier alignment for Carlton Wharf connects to higher grades at Clippership Wharf to the East and The Mark property to the West. Both scenarios are designed to the 2070 1% storm event, which correlates to approximately 6.5 ft. of flood protection along the waterfront.



Images from left to right: Mulini Beach, Croatia; Noesterber Arena, Netherlands; Hunters Point, NY



Images from left to right: Bostanli Waterfront and Bridge, Turkey; Mulini Beach, Croatia; Brooklyn Bridge Park New York, NY

## Scenario 1 - Green Spaces

Scenario 1 provides transition from Clippership to The Mark property with an emphasis on landscaped and natural surfaces. Scenario 1 envisions a broader public realm by utilizing:

- More landscaped spaces, with complementary decking and terracing;
- Strategically placed higher elevation decking between the dog park and Clippership which will provide additional connectivity; and
- Accessible pathways which will extend into the adjoining neighborhood.

## Scenario 2 - Expanded Decks

Scenario 2 provides transition from Clippership to The Mark property with an emphasis on hardscaped urban elements. Scenario 2 envisions a broader public realm by utilizing:

- An expanded deck which conveys an urban feel, while maintaining the desired accessibility and connectivity;
- A preserved entrance to the dog park and waterfront access; and
- A pocket park created behind the elevated decking adjacent to the dog park

## Stakeholder Feedback Informing Design

A community workshop was conducted to garner feedback on the design and guide the process into the next phase. Additionally, a survey was released for community members who could not attend the workshop and provided an opportunity for input, guidance and feedback. The first workshop in May 2021 informed a more refined program for the site and elements to advance in the preferred design.

The goals of the May 2021 workshop were the following:

- Share project background;
- Summarize existing site conditions, provide an overview of the resulting findings and of the early design process used to generate the design scenarios; and
- Gather feedback on the design scenarios from the community.

Key take-aways informing a more refined design include attributes which received the greatest consensus. These attributes include:

- Improving the Harborwalk, wild gardens, and decks;
- Improved lighting and security; and
- Tidal habitat.

# Educational opportunities

Harborwalk continuity

Space for work

Lighting

Beach

Trees

Upkeep

swimming area

urban wilds

Green space

Wild gardens Beer garden

# Harbor Walk

# Continuity

Natural shoreline

floating wetlands

puppies

widen harborwalk

Floating spaces

More trees

Water access People of color

Cooling areas

# Lots of lighting

History

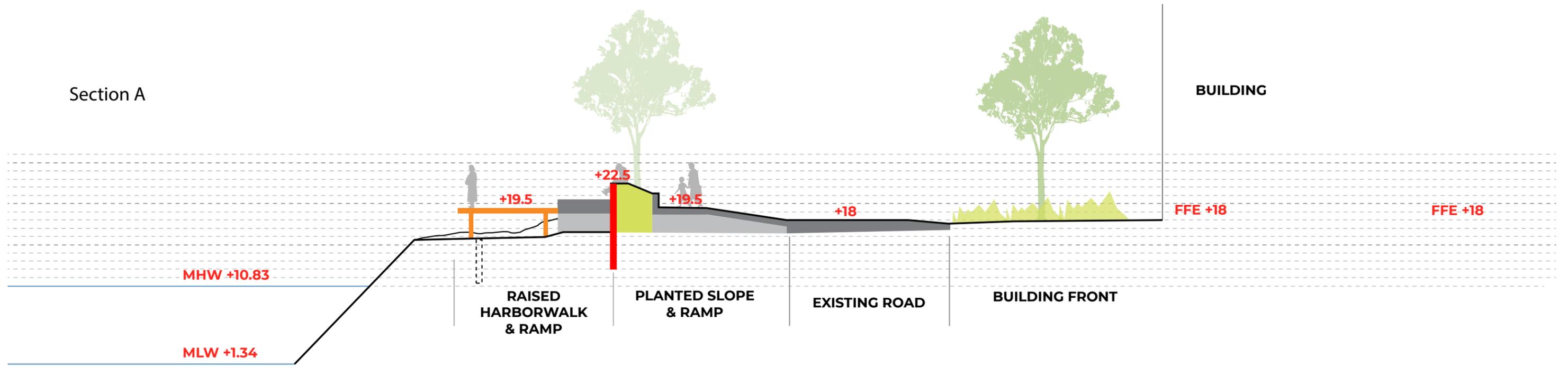
Word Cloud generated during the May Workshop for Carlton Wharf.



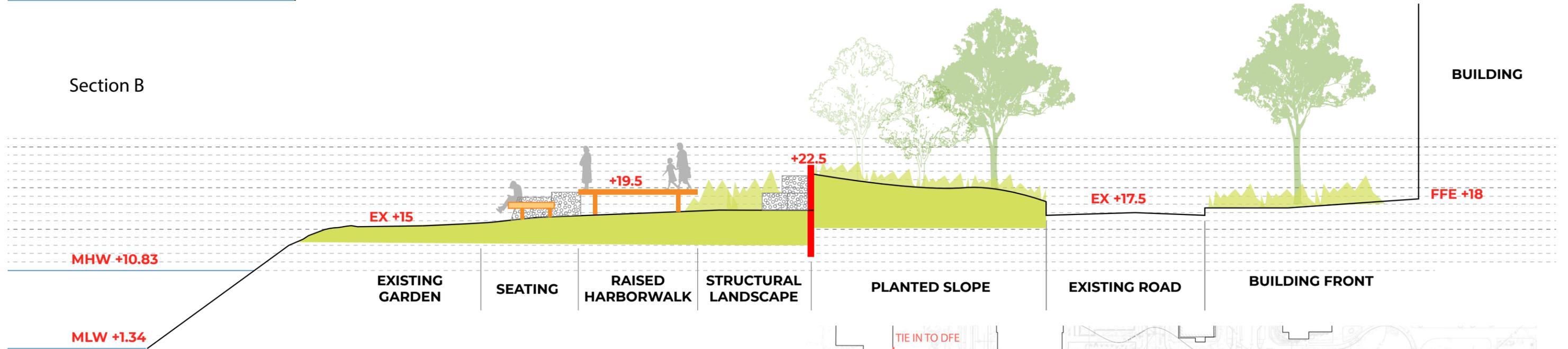
# Carlton Wharf Preferred Design



Section A



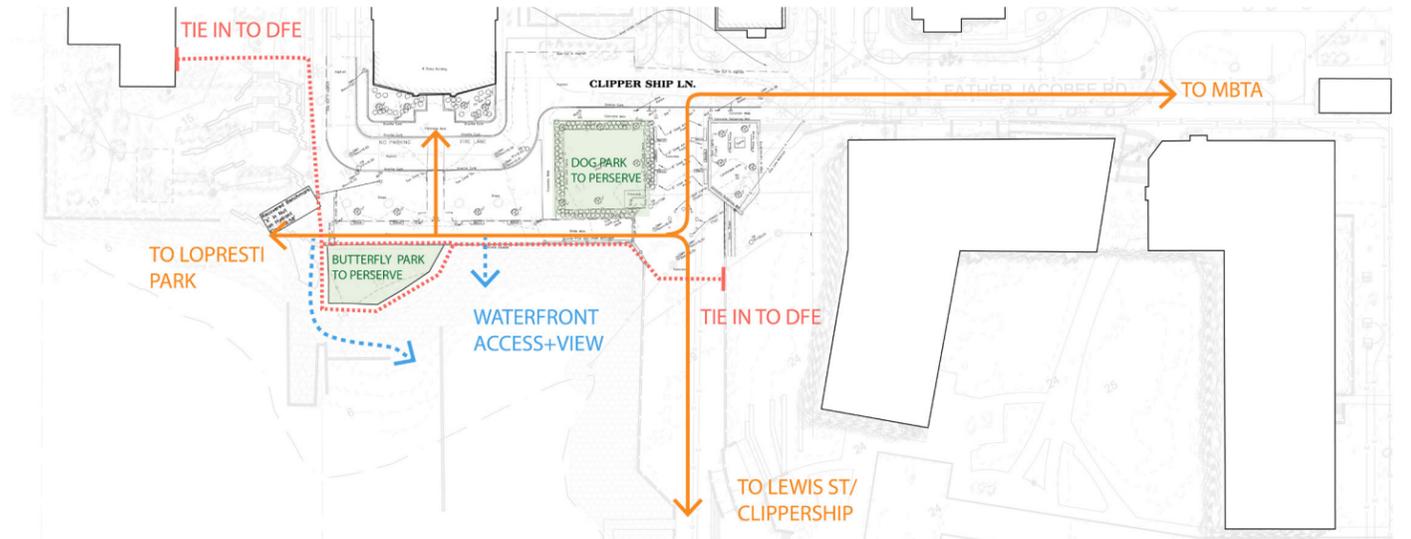
Section B

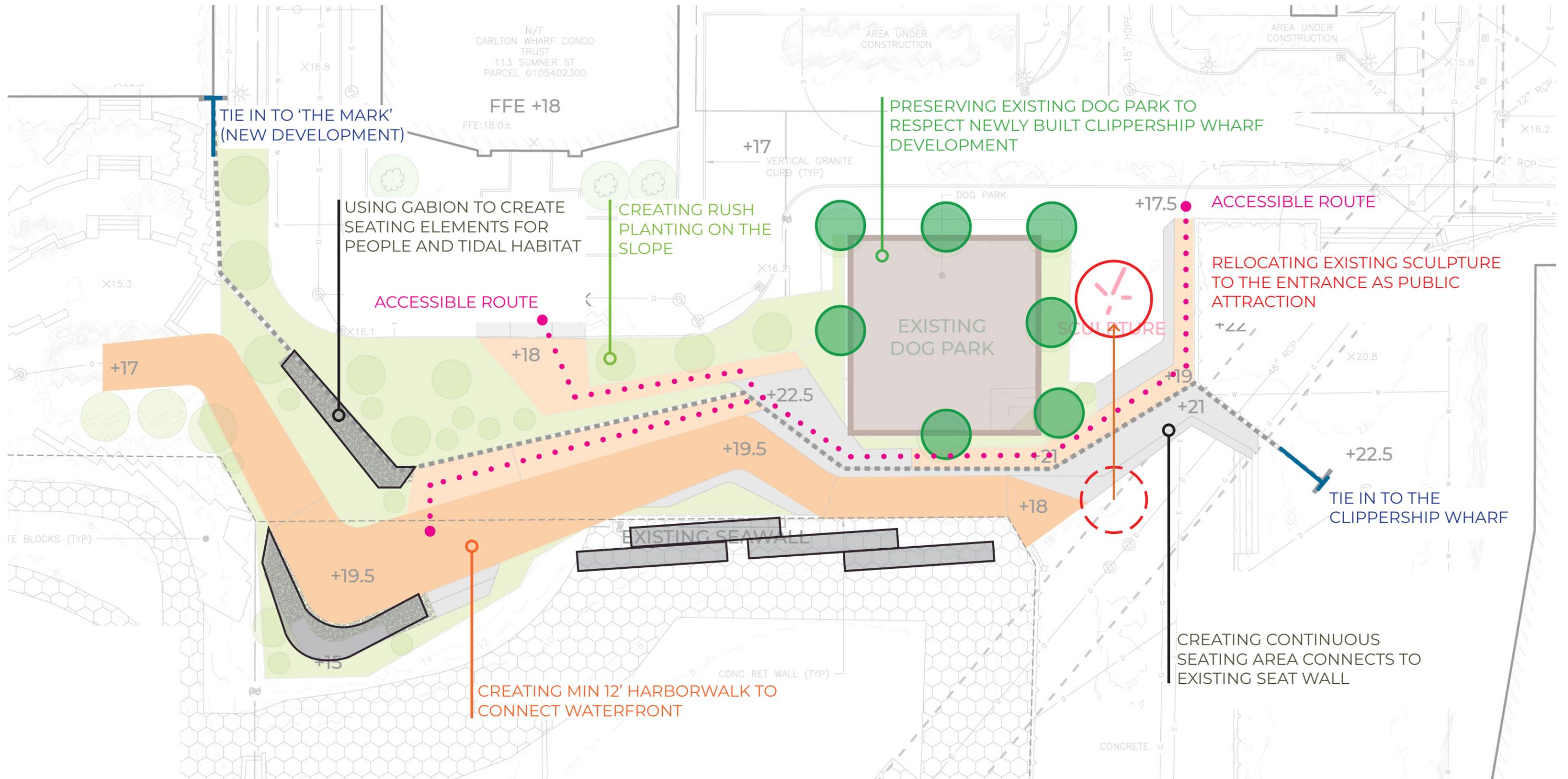


Preferred Design

The preferred design for Carlton Wharf provides for a flood alignment which ties-in to the high elevations at both The Mark and Clippership Wharf at 22.5 ft-BCB. The design preserves the existing dog park, enhances the existing natural landscape, and enhances views of downtown Boston.

Currently, the Harborwalk through the Carlton Wharf site feels disconnected and dated compared to the Harborwalk on either side. This design intends to improve the connectivity of the site to the adjacent properties.





The new development, The Mark, provides an ideal location to tie-in to through a foundation wall (at El. 22.5 ft.-BCB). Following along the street side, the approach toward the flood protection is through a gently sloped landscape planted with trees and native plants.

An accessible ramp located directly across from 113 Sumner St. leads up to the highpoint of the barrier where there is a small landing to stop and take in the evening sunsets.

The existing dog park will remain in place; the trees surrounding the enclosure should remain, as they are mature canopy trees. The entrance of the dog park will need to be relocated closer to the roadway.



In collaboration with Stoss Landscape Urbanism



Highlighted in orange, the continuous coastal protection elevation of 22.5'BCB is integrated into the landscape and can have various material finishes.

In collaboration with Stoss Landscape Urbanism



On the roadway side closer to Clippership Wharf, there is an additional accessible ramp leading from the street up to the viewing platform. The existing sculpture can be relocated to the street side of the barrier as a monument to welcome visitors to the site, while prioritizing existing view corridors.

in the images at the top of the page, an elevated Harborwalk will appear to float above the existing landscape and, by elevating the pathway, will extend the life of this section of the Harborwalk. This side of the protective barrier will be planted with salt-tolerant species, as the porous nature of the elevated deck Harborwalk will allow rising seas to flow under the walkway with more regularity as sea levels rise.

There is a high ground elevation at Clippership Wharf (El. 22.5 ft-BCB) that is part of a grassy side yard. Natural stone seating currently transitions from the elevated yard down to the existing Harborwalk. Similar natural stone seating will wrap the wall, steering users towards the new Harborwalk and landscaped open space.

Continuing along the water side shown

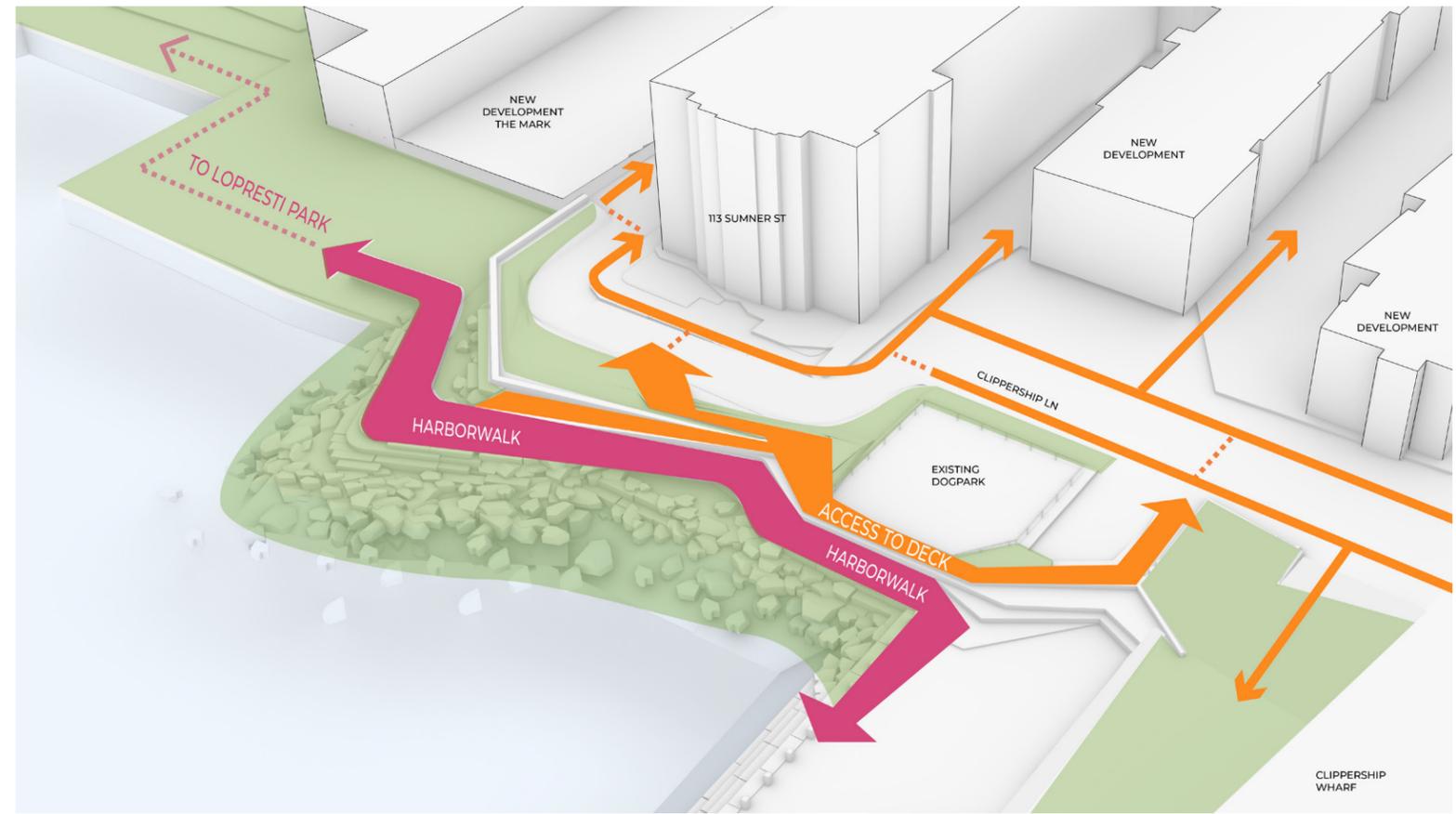
## View Corridors

Maintaining the view corridors is an important value of the East Boston Municipal Harbor Plan and the PLAN: East Boston program. To test the impact of the flood protection barrier on the Havre/Lisbon Street view corridor, the changes were rendered at scale into an existing view corridor photo. The renderings demonstrate how moving the art sculpture and the barrier can draw the eye to the city views and signal this area as a point of interest.

## Site Access

As previously mentioned, the access and movement through the site and over the barrier is meant to be seamless. The design intent is to keep pedestrian surfaces below 5% slopes and to maintain accessible routes through the site from the street to the Harborwalk.

Along this stretch of the Harborwalk in East Boston, this piece of the path will play an important role in connecting LoPresti Park to the west and Piers Park to the East.



Existing View down to the waterfront from Lisbon St.



View of Carlton Wharf coastal protection from Lisbon St.



# Lewis Mall

Early Concepts

Stakeholder Feedback

Additional Considerations

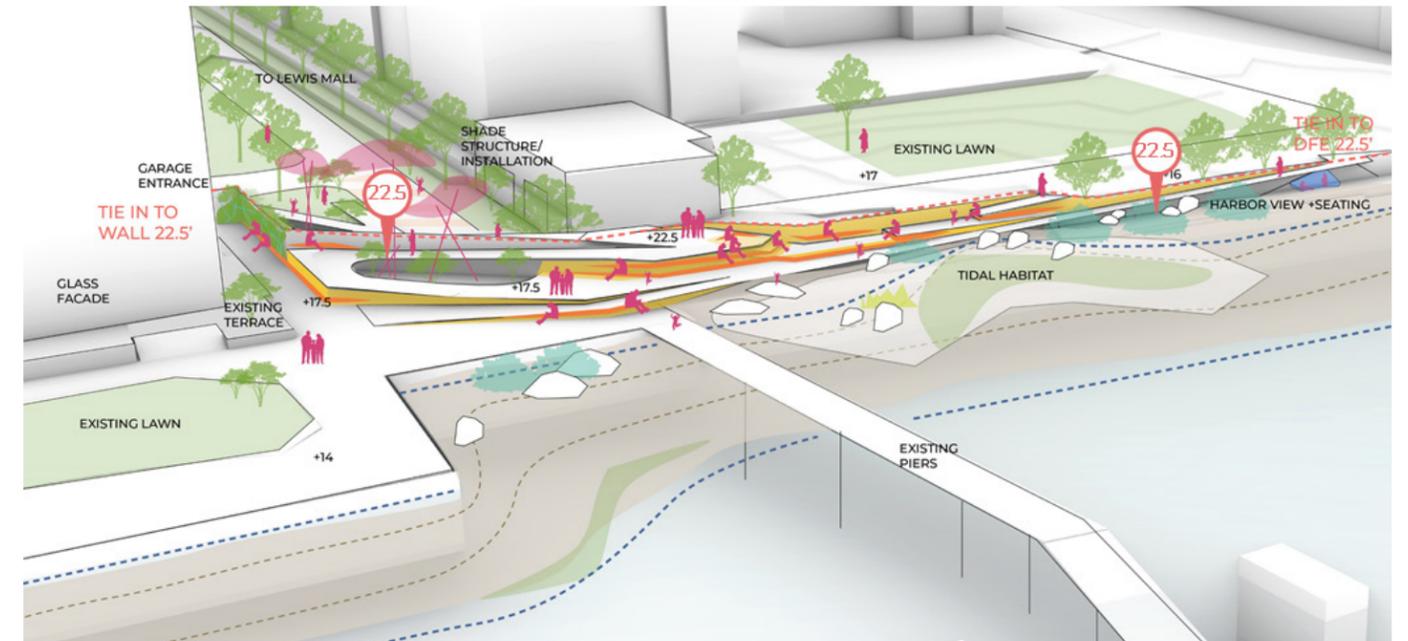
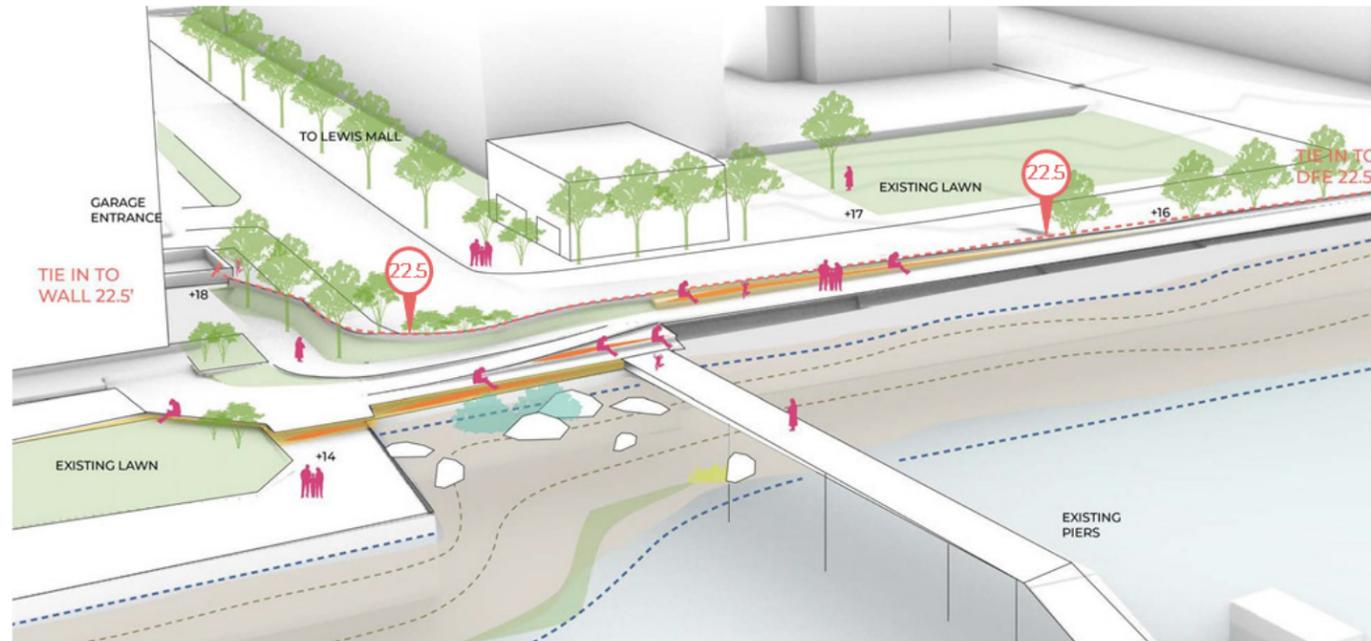
Preferred Design

Assessed Conceptual Design



# Lewis Mall Early Concepts

The existing elevation at the shoreline of the Lewis Mall site is higher than the current high tide elevation by about 4 ft. and the existing seawall is partially armored by riprap. There is an existing Harborwalk path and public ferry terminal along the waterfront. The overall location of flood barrier alignment for Lewis Mall connects to higher grades at Clippership Wharf to the west and at Portside at East Pier, as well as at future Portside at the Pier One development to the east. Both scenarios are designed to the 2070 1% storm event, which correlates to approximately 8.5 ft. of flood protection along the waterfront.



DECK



TERRACE



WATERFRONT SEAT

## Scenario 1 - Harborwalk Plaza

Scenario 1 prioritizes access and Harborwalk connectivity along the waterfront within the existing waterfront footprint.

Scenario 1 emphasizes access and movement by utilizing:

- Decking to create meaningful transitions between paths, slopes, and seating that speak to the past use of the industrial waterfront while creating an accessible waterfront promenade.
- Terracing to create areas for planting and mediate the grade changes.
- Waterfront seating to create moments for people to stop, relax, or wait for the water taxi.

From top to bottom: Soesterber Arena, Netherlands; Stranden Aker Bridge, Sentrum, Norway; Soesterber Arena, Netherlands



DECK + SEATING



SHADE STRUCTURE



VIEW SPOT + SEATING

## Scenario 2 - Lewis Landing

Scenario 2 integrates access and connectivity with pocket parks and a larger public realm by narrowing the existing intersection of East Pier Drive and Lewis Street, which is then converted into a shared street.

Scenario 2 envisions a broader public realm landing by utilizing:

- Decking and plazas to transition between elevations, thus creating an accessible waterfront promenade and destination.
- Shade structures or art installations to establish an identity for the waterfront and frame new spaces.
- Innovative views and seating that enhance city views and create new opportunities for accessing and experiencing the waterfront.
- Tidal habitat and in-water solutions

From top to bottom: Bostali, Turkey; Burning Man Shade Installation, Nevada; Seating Rendering

## Stakeholder Feedback Informing Design

A community workshop was conducted to garner feedback on the design and guide the process into the next phase. Additionally, a survey was released for community members who could not attend the workshop and provided an opportunity for input, guidance and feedback. The first workshop in May 2021 informed a more refined program for the site and elements to advance in the preferred design. The design attributes which received the greatest consensus were:

- View spots & seating
- Public Art
- Prioritizing the water taxi service
- Improving the Harborwalk
- Adding greenery

The Lewis Mall site presents complex issues due to the depth of the site and height needed to achieve flood protection, requiring a barrier of 8.5 ft at the intersection of Lewis St. and East Pier Dr. The MBTA is a significant stakeholder, as the flood barrier alignment spans the below ground Blue Line tunnel, and the Ferry Terminal is along the waterfront. Massport is another significant stakeholder, as they own and maintain sections of East Pier Drive and are advancing designs at Portside Pier One and Piers Park. Discussions with stakeholders focused on maintaining right-of-way access and options to expand the buildable space to achieve a more gradual transition of the landscape.



Word Cloud generated during the May Workshop for Lewis Mall.



# Lewis Mall

## Additional Considerations

Given the numerous site constraints within the limit of work at Lewis Mall, three main further design considerations were explored:

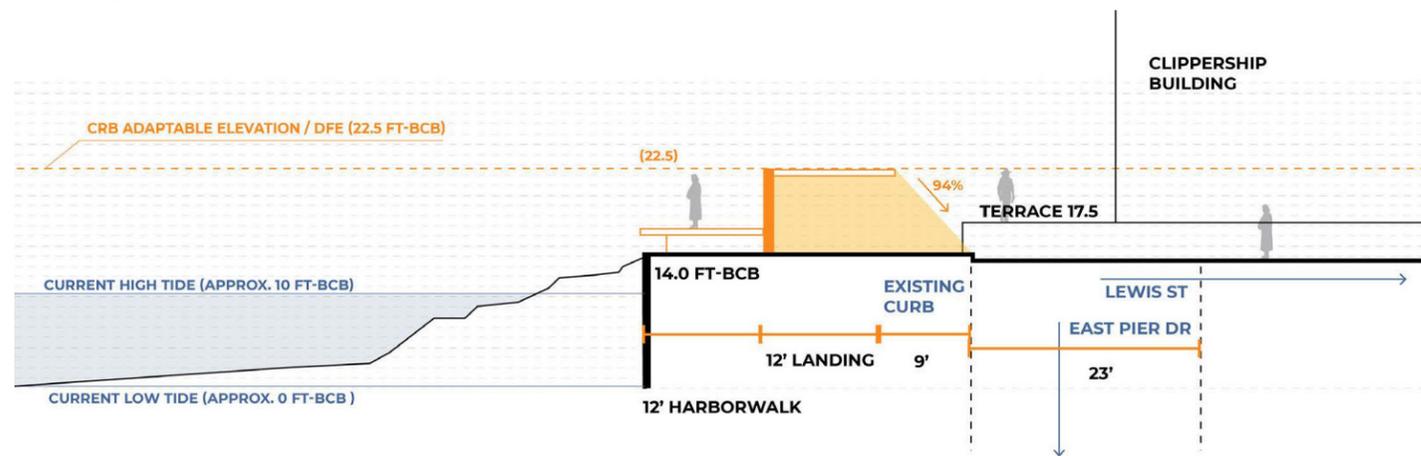
- 1) Phased Protection
- 2) Moving into the Street
- 3) Moving into the Harbor.

Moving into the roadway will require additional stakeholder coordination with adjacent property owners and City of Boston departments. Building into the waterway will require coordination with state and federal regulatory environmental agencies. To advance the design conversation, these alternatives were conceptually explored to gain a better understanding of possibilities for achieving the desired level of flood protection for the neighborhood and fulfill the mission of Climate Ready Boston.

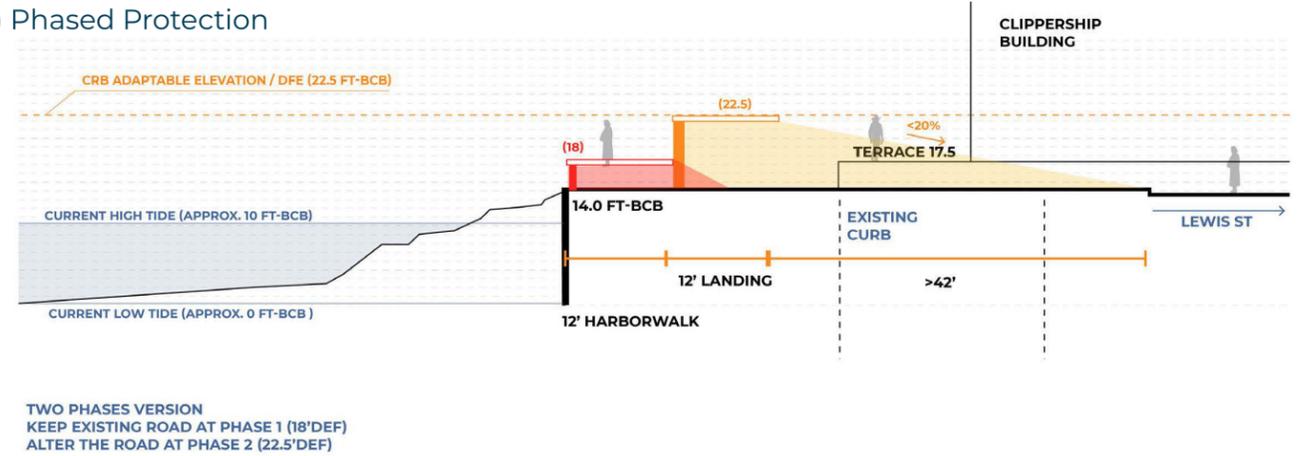
1. A phased approach to increase flood protection and public realm improvements over time, with the focus to mitigate existing and near-term flood risk;
2. Opportunities to expand into the public rights-of-way at the end of Lewis Street to create a larger landing and space to accomplish changes in grade; and
3. Feasibility of expanding into the waterway, which would require coordination with state and federal regulatory environmental agencies.

Ultimately, a combination of all three approaches was explored to develop a **Preferred Design Alternative**.

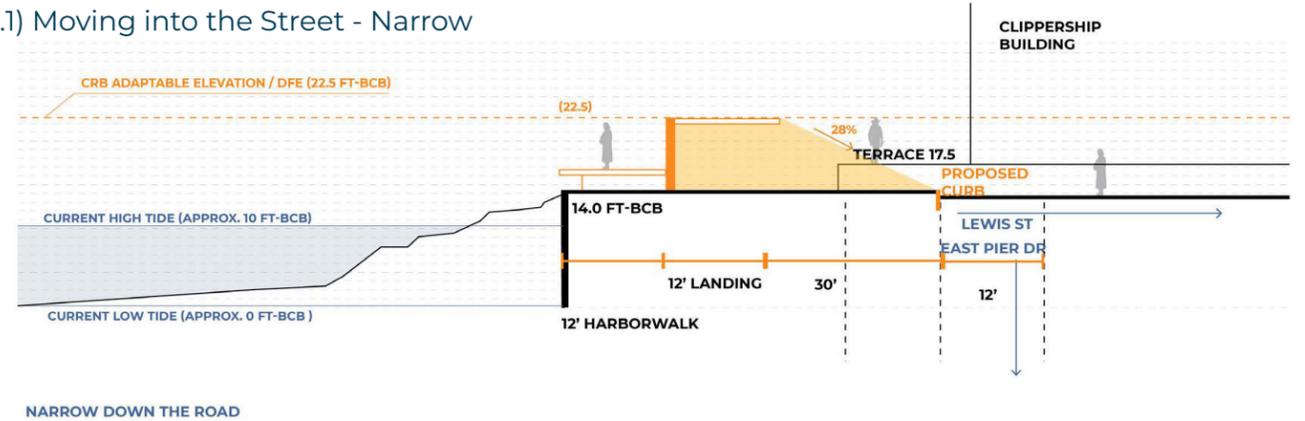
### Existing Limit of Work Dimensions



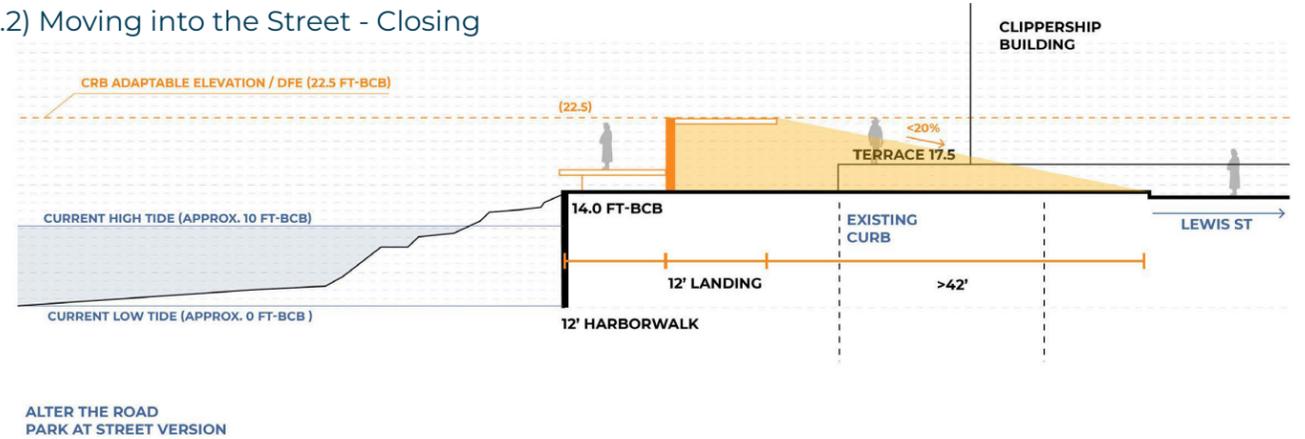
### 1) Phased Protection



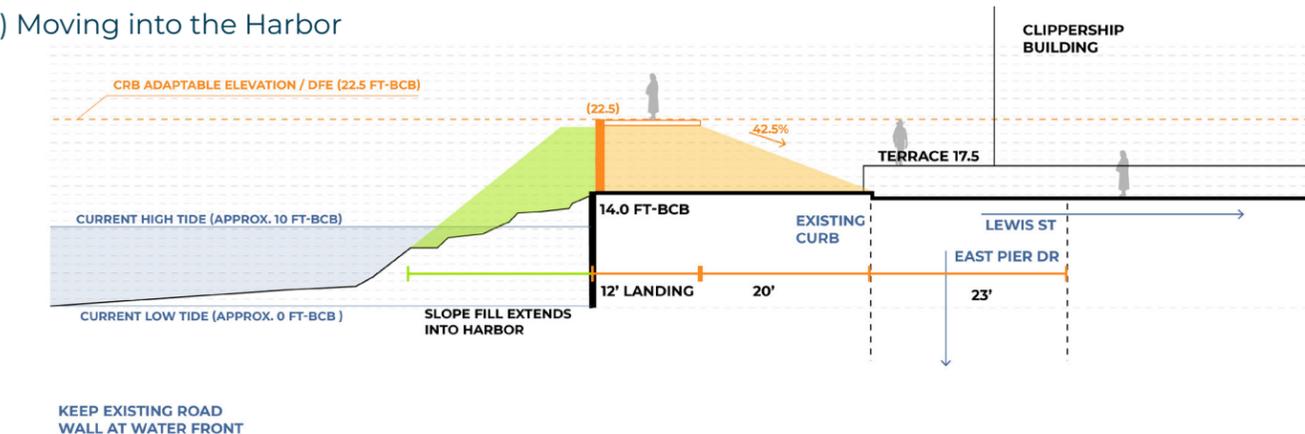
### 2.1) Moving into the Street - Narrow



### 2.2) Moving into the Street - Closing

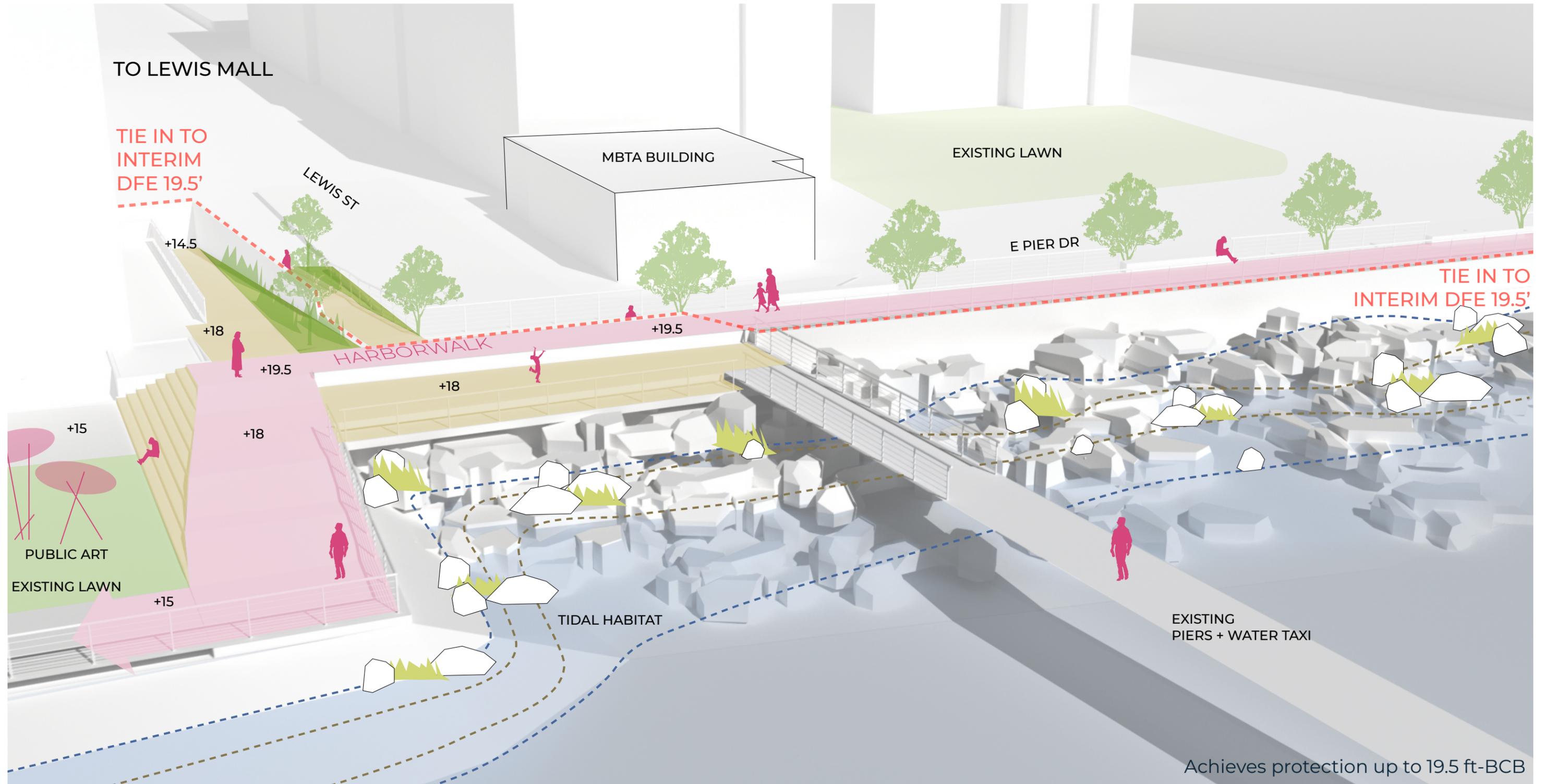


### 3) Moving into the Harbor



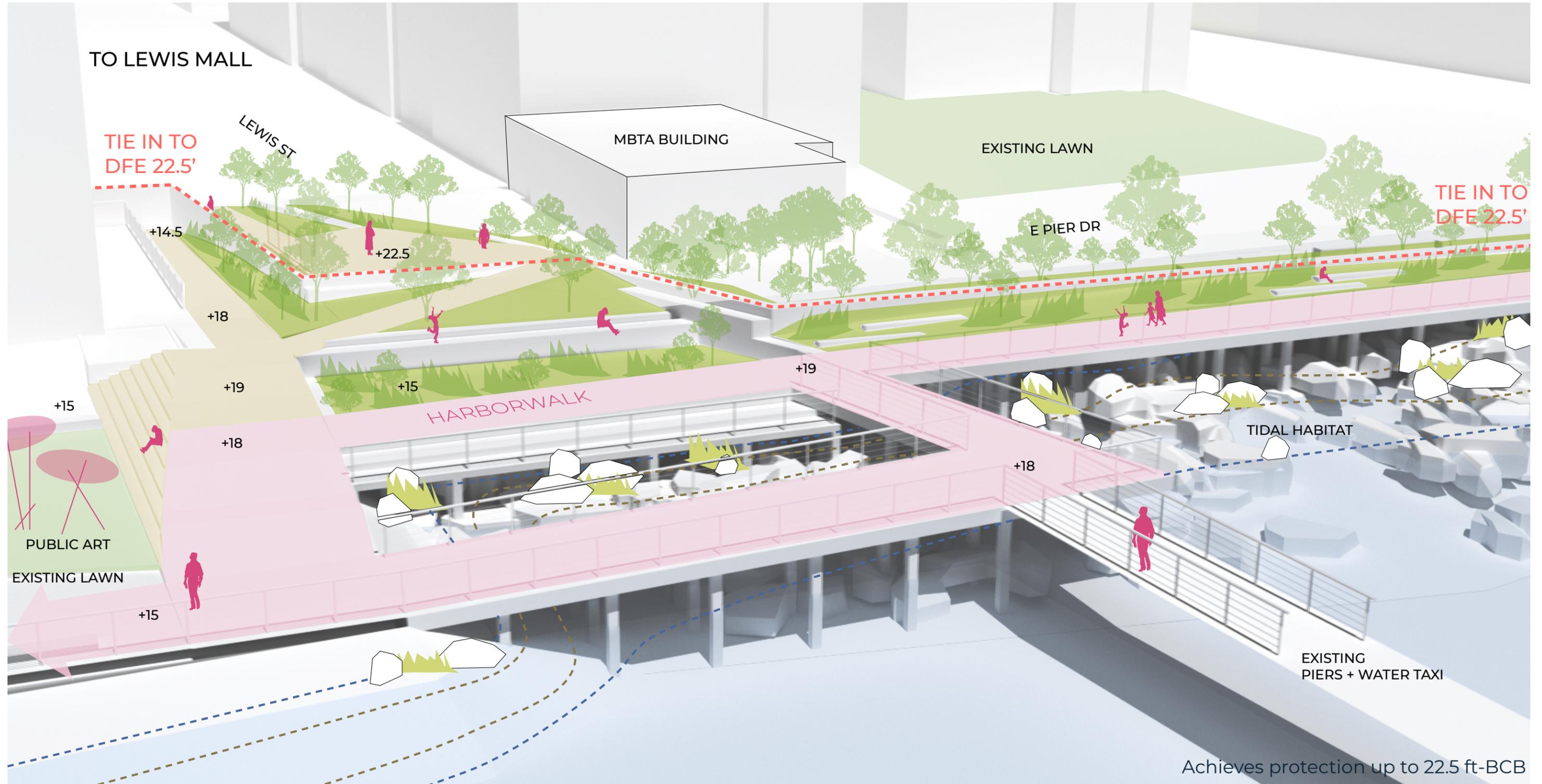
# Lewis Mall

## Preferred Design Alternative - Phase 1

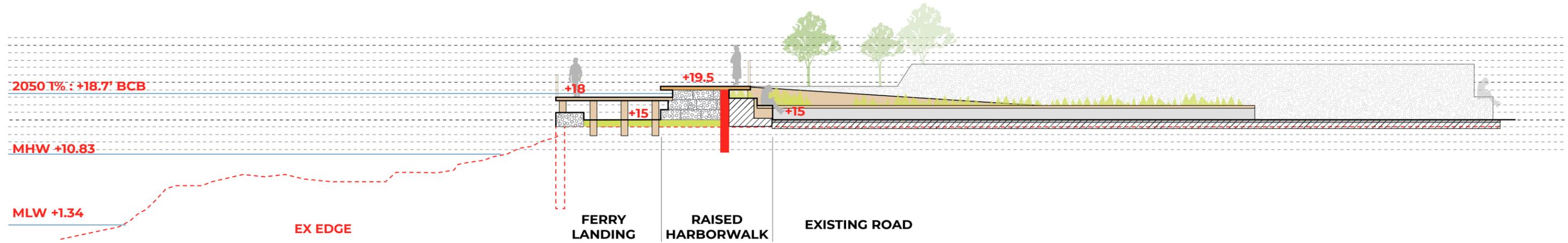


# Lewis Mall

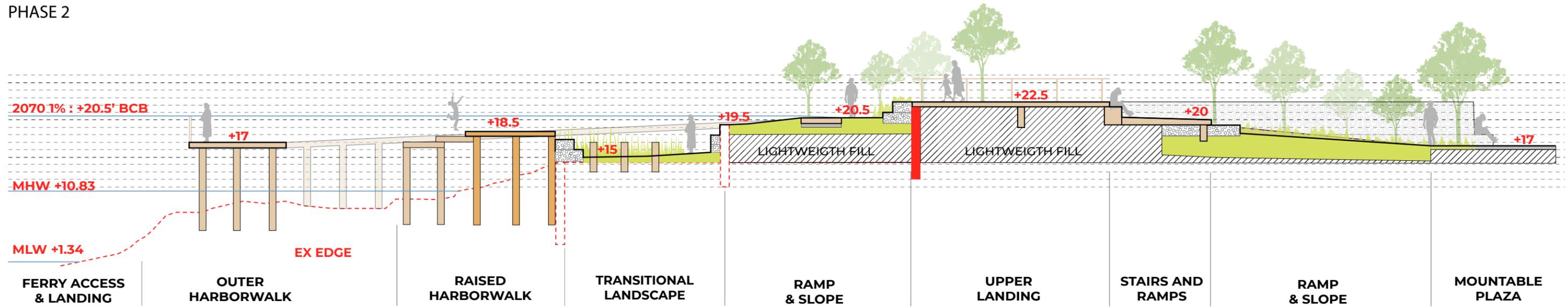
## Preferred Design Alternative - Phase 2



Phase 1



PHASE 2



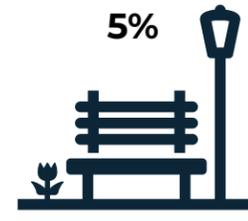
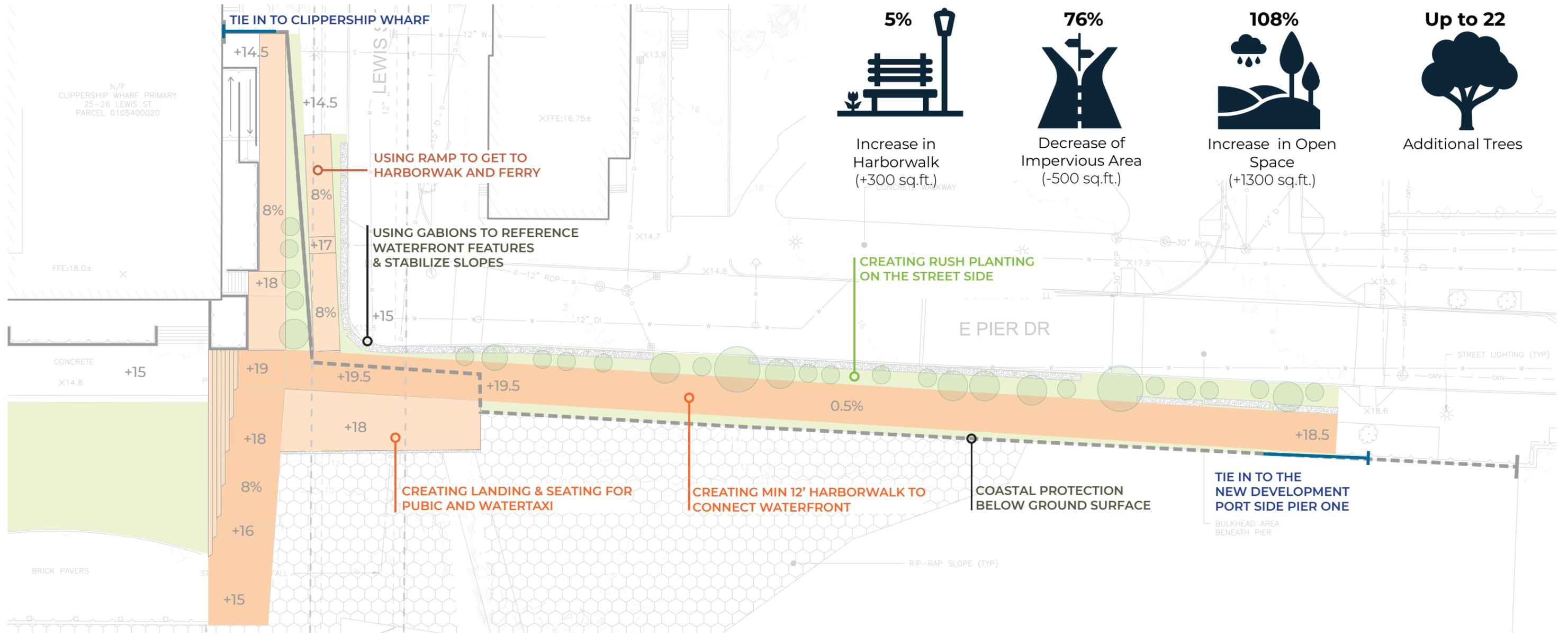
**Preferred Design Alternative**

The Preferred Design Alternative provides a phased approach which establishes near and long-term design elevations that provide flood protection while accommodating potential, future vertical and horizontal expansion of the limit of work.

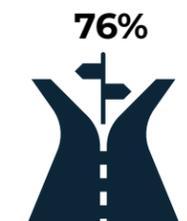
**Phase 1** utilizes the existing right-of-way as a limit of work to establish an interim design flood elevation of 19.5' BCB. The design prioritizes accessibility and movement along the waterfront while providing the flexibility to be built upon in the future. This approach provides protection during near-term flood events while the grander, more complex design for Phase 2 is funded, permitted, and fully designed.

**Phase 2** combines an expanded limit of work over the water and into the existing street with a target design flood elevation of 22.5' BCB. The design significantly increases the square footage of public space through the inclusion of plazas and shared streets. It also increases the area of open, green space ten fold. With the increase in the limit of work and inclusion of public & green space, Phase 2 illustrates the potential for integrating coastal protection seamlessly into the landscape.

When compared to the existing waterfront, Phase 1 design includes:



5%  
Increase in Harborwalk (+300 sq.ft.)



76%  
Decrease of Impervious Area (-500 sq.ft.)



108%  
Increase in Open Space (+1300 sq.ft.)



Up to 22  
Additional Trees

**The specific considerations and broad strategies for approaching Lewis Mall Phase 1 design include the following:**

- Near-term design flood elevation of 19.5' BCB provides protection for the 2050 0.5% Storm Event + Freeboard.
- Existing site constraints (MBTA tunnel, rights-of-ways, garage entrances, utilities).
- The location where flood alignment will tie into Clippership Wharf to the West and into Portside at East Pier / the future Portside at Pier One development to the East.
- The location and path of the alignment

allows for different types of spaces to be created along the waterfront.

- Circulation to and through the site as both a connector and destination.
- Presence and importance of the Harborwalk.
- Prioritizing and enhancing waterfront access and views to downtown.

These design strategies outline the approach that was taken. Moving through the site from West to East, the following design recommendations were developed:

- Stepped seating along the waterfront edge

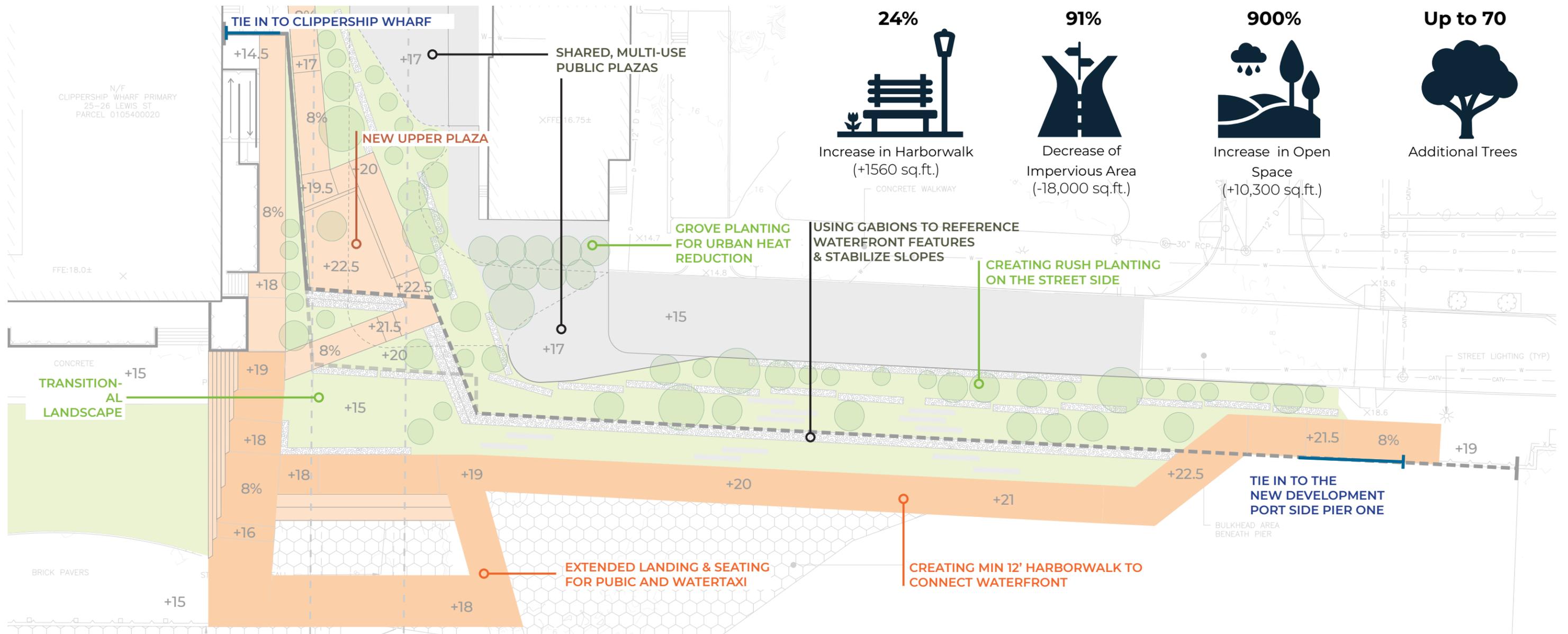
will provide a waiting area for the water taxi and closer access to the water.

- Ramps and stairs will move people directly from Lewis Street up and over the coastal protection elevation to the Harborwalk and ferry landing.
- Vertical elements and structures can have various textures, including gabions and rocks, to create unique waterfront features.
- Coastal Protection running nearly 440 linear feet from Clippership Wharf to Port Side Pier
- The Harborwalk will maintain a 12-foot width connecting each end of the site.
- The construction of the Harborwalk can be

on pilings on the inland side, leaving room for multi-level vegetation and tree planting; this will soften the visual impact of vertical structures.

- Nature influenced materials can be used to create seating elements for people and carve out space for tidal habitats.
- The material choices and construction techniques can allow for easy deconstruction and potential reuse for implementation of **Phase 2 Design.**

When compared to the existing waterfront, Phase 2 design includes:



**The specific considerations and broad strategies for approaching Lewis Mall Phase 2 design include the following:**

- Long-term design flood elevation of 22.5' -BCB provides protection for the 2070 1% storm event + freeboard outlined by MC-FRM
- Building off of **Phase 1** design for potential reuse of materials and limit deconstruction.
- Existing site constraints (MBTA tunnel, rights-of-ways, garage entrances, utilities).
- The location where flood alignment will tie into Clippership Wharf to the West and into Portside at East Pier / the future Portside at

- Pier One development to the East.
- The location and path of the alignment allows for different types of spaces to be created along the waterfront.
- Access around buildings and adequate turn-around space for emergency vehicles.
- Circulation to and through the site as both a connector and destination.
- Presence and importance of the Harborwalk.
- Prioritizing and enhancing waterfront access and views to downtown.
- Emphasizing water-dependent use with extending landing for the water taxi

These design strategies outline the approach that was taken. Moving through the site from West to East, the following design recommendations were developed:

- Ramps and stairs will move people directly from Lewis Street up and over the coastal protection elevation to the Harborwalk and New Upper Landing.
- Extended Landing and seating along the waterfront edge will provide a waiting area for the water taxi and closer access to the water.
- Vertical elements and structures can have

- various textures, including gabions and rocks, to create unique waterfront features.
- Shared, Multi-use public plazas created by dead-ending Lewis St and East Pier Dr.
- The Harborwalk will maintain a 12-foot width connecting each end of the site over the water.
- 75 linear feet of new Coastal Protection as a result of realigning further into the street. The rest of the protection is built off of the alignment in Phase 1.
- Additional trees and planting help reduce urban heat and soften slopes around coastal protection.

Currently, the Lewis Mall Ferry Dock connection at the Lewis Mall project site is one of four stops along the Inner Harbor Connector services. This project serves as an opportunity to enhance and strengthen the ferry service.

The **Phase 1** Approach incorporates the design elements and goals within the existing waterfront footprint. The Harborwalk is aligned with the existing seawall and provides stepped down terraces to get people closer the existing water edge and tide pools. This Phase will include increased waiting area and signage for the Ferry Service.

The **Phase 2** Approach expands the footprint of the project area into the water. The proposed Harborwalk spans over the water as a boardwalk on pilings. This provides more space for planting, trees, and recreation. The new alignment and location of the Harborwalk creates pocket parks and transitional landscapes that allows for coastal migration.



# Stronger Connection to Maverick Square and Activating the Streetscape



Lewis St - Phase 1  
Looking Down Lewis St

By activating the Harborwalk and developing a stronger connection to Maverick Sq., the preferred design provides a more cohesive connection to the water from the neighborhood.

The **Phase 1** Approach design flood elevation of 19.5' BCB reduces the fill needed to create coastal protection and allows for less obstructed views in the near-term. While view corridors have not been formally analyzed yet, the elevation at Maverick Station is El. 18.5, so the views to the waterfront from the Station are not expected to be impacted significantly with this interim solution. Direct access to the waterfront from Lewis St is illustrated through the simple circulation and ramps.

The **Phase 2** Approach expands the footprint of the project area into street. Raised shared, multi-use plazas are created by the closure of Lewis St. and East Pier Dr. and allow for emergency access & turnaround space. The improvements into the right-of-way will also encourage more pedestrian and bicycle traffic from the Maverick Station (MBTA) to the waterfront and the water taxi. The coastal protection alignment supports a new upper landing connecting ramps and decking throughout the site. Green open spaces and planting support transitions between grading and provide urban heat reduction.



Lewis St - Phase 2  
Looking Down Lewis St

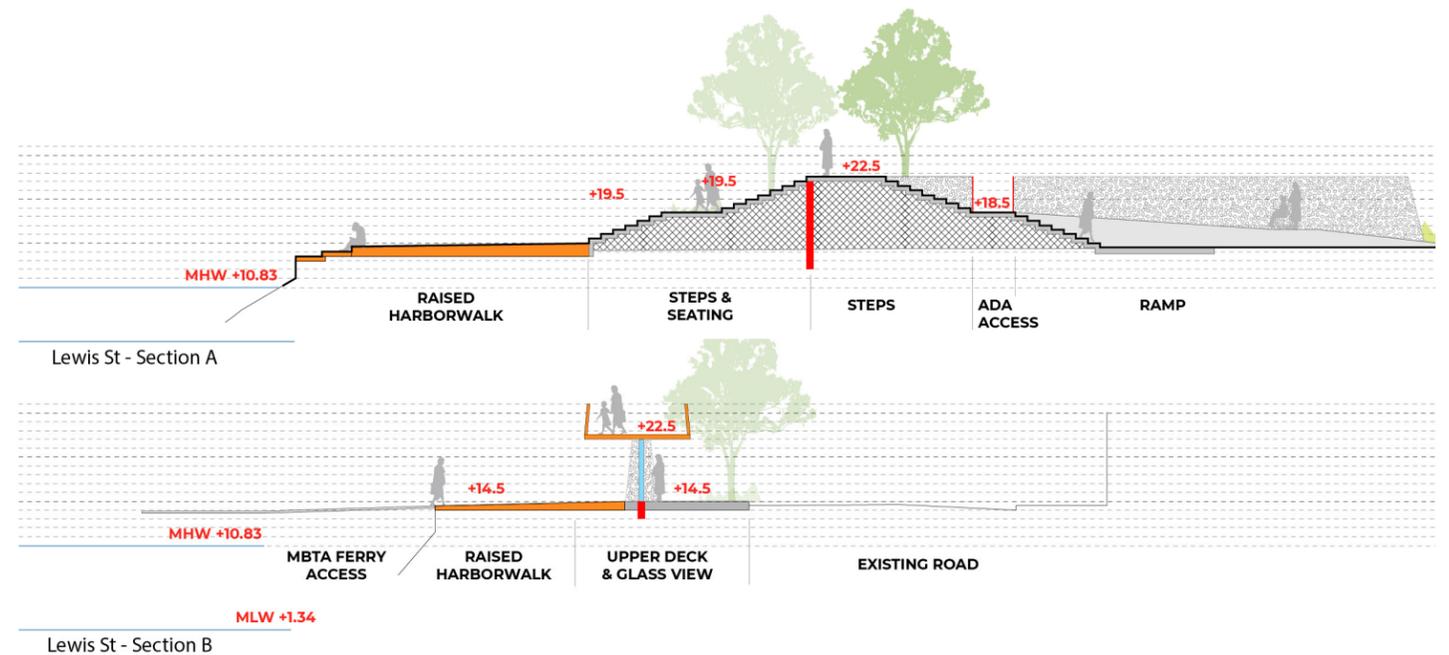
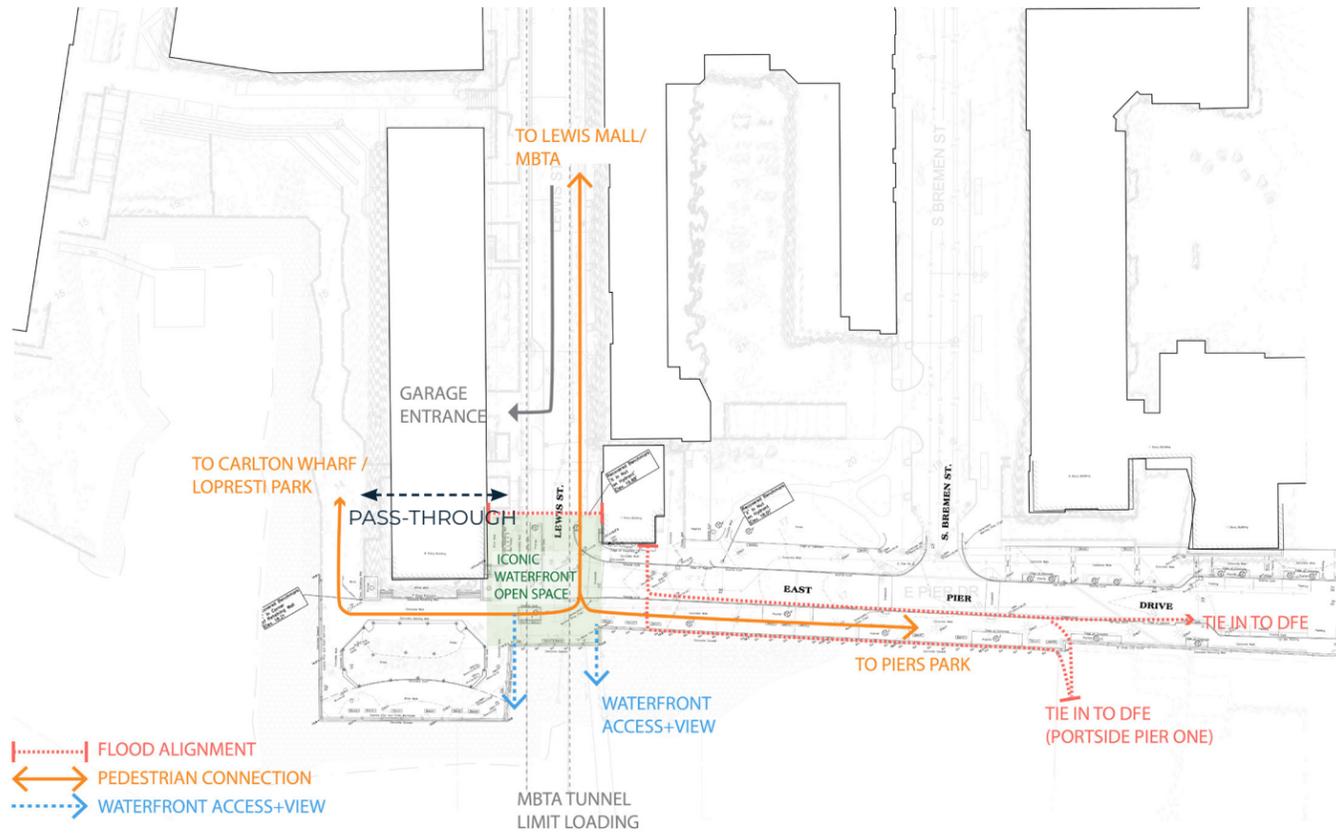
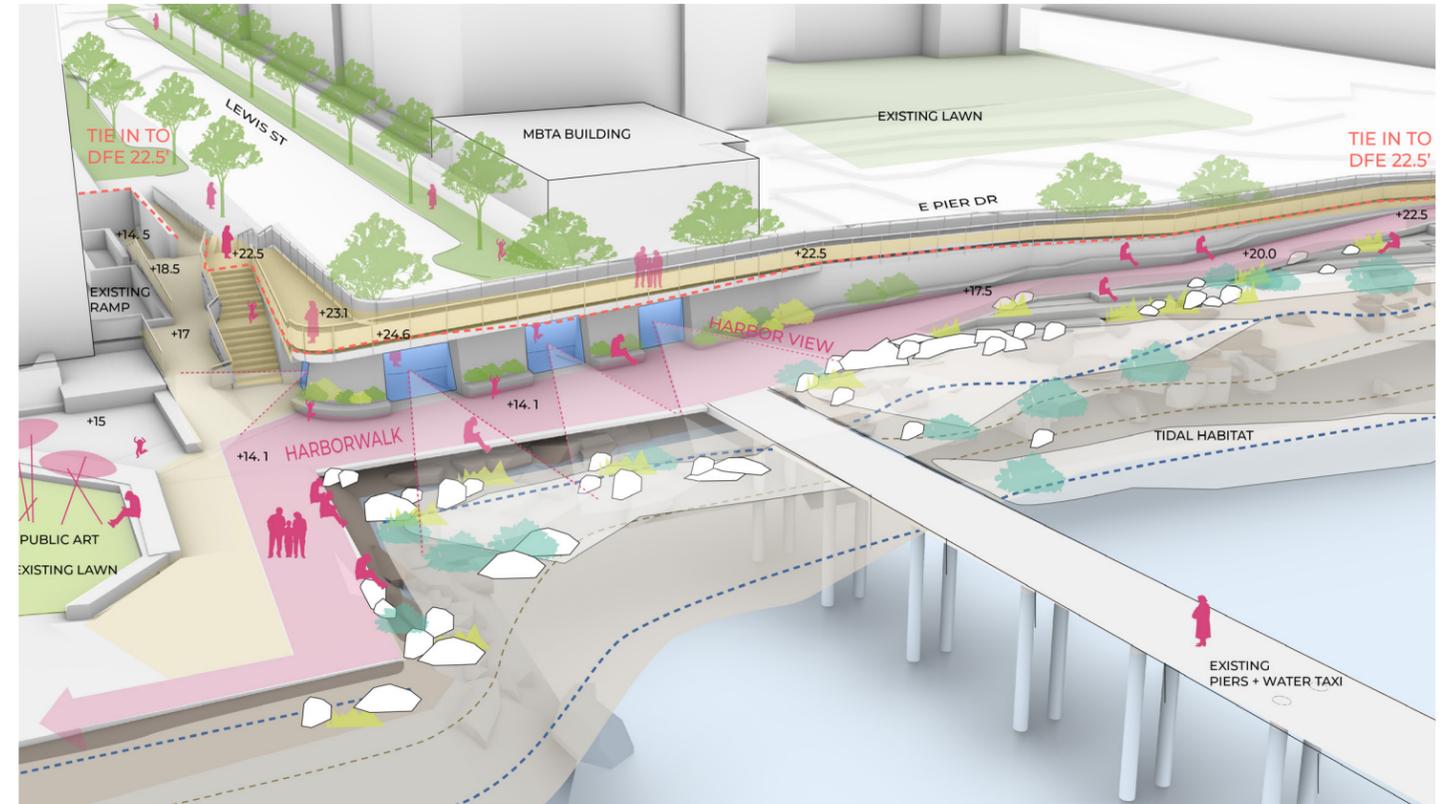
# Lewis Mall Assessed Conceptual Design

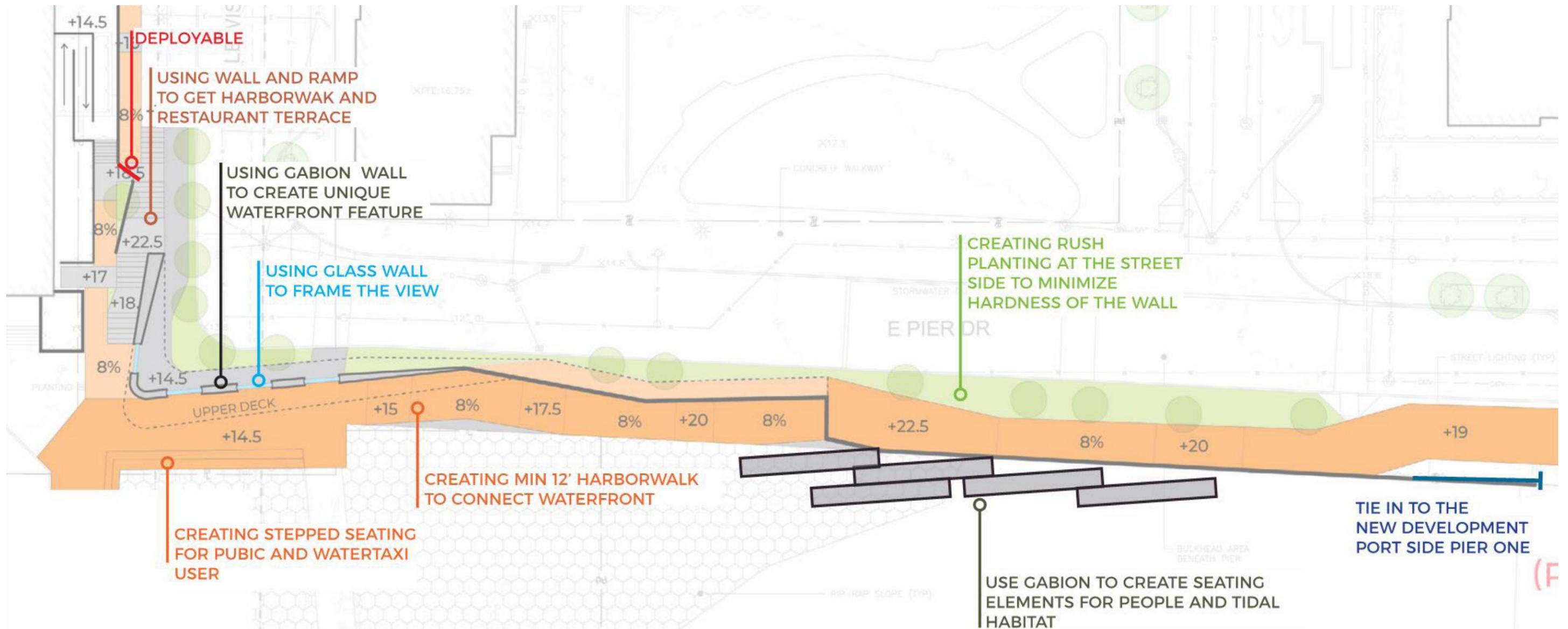
## Concept Development

The assessed conceptual design for Lewis Mall as shown in this report provides neighborhood scale flood protection for the 2070 1% storm event and wave action within the footprint of the existing Harborwalk, however concerns were raised about the trade-off of providing protection versus amplifying water and open space access issues.

This concept was used as the basis for Appendix B - Lewis Mall Plans, Appendix C - Operations & Maintenance, Appendix E - Preferred Design Cost Estimate, Appendix G - Life Cycle Assessment, Appendix H - Benefit Cost Diagram, and Appendix K - Design Performance Modeling.

One of the greatest challenges of the Lewis Mall site is the considerable height needed to achieve the design flood elevation of 22.5 ft-BCB. The proposed flood alignment will tie-in to Clippership just inland of a building pass-through. The proposed tie-in to achieve consistent flood protection to the east will be the proposed Portside Pier One site. This projection will provide a wall for the future site to connect to and continue future consistent flood protection.





**The specific considerations and broad strategies for approaching Lewis Mall design include the following:**

- Existing site constraints (MBTA tunnel, rights-of-ways, garage entrances, utilities).
- The location where flood alignment will tie into Clippership Wharf to the West and into Portside at East Pier / the future Portside at Pier One development to the East.
- The location and path of the alignment allows for different types of spaces to be created along the waterfront.
- Circulation to and through the site as both a connector and destination.

- Presence and importance of the Harborwalk.
- Prioritizing and enhancing waterfront access and views to downtown.

**These design strategies outline the approach that was taken. Moving through the site from West to East, the following design recommendations were developed:**

- One opening in the wall will be made to provide ADA accessibility at a high elevation of 18.5 ft.; this opening can be blocked using a deployable, prior to a storm event. This deployable could be engaged in coordination with Clippership's flood protection. The

waterfront is still accessible with the deployable barrier in place at the east end of the alignment.

- Stepped seating along the waterfront edge will provide a waiting area for the water taxi and closer access to the water.
- Ramps and stairs will move people directly from Lewis Street up and over the coastal protection elevation to the Harborwalk and upper deck.
- Vertical elements and structures can have various textures, including gabions and rocks, to create unique waterfront features.
- Flood glass wall cutouts will provide visual access from Lewis Street to the waterfront,

and will strategically frame select views.

- The Harborwalk will maintain a 12-foot width connecting each end of the site.
- Where the Harborwalk peels away from the street, room can be created for multi-level vegetation and tree planting; this will soften the visual impact of vertical structures.
- Nature influenced materials can be used to create seating elements for people and carve out space for tidal habitats.

# Next Steps

The designs advanced through this project provide a basis to be continued through design, permitting, and construction. In the second workshop hosted in June of 2021, there was general consensus of approval for Carlton Wharf's preferred design, and a desire for additional studies to be considered for the Lewis Mall project site.

The results of the additional conceptual design exercise to develop a preferred design will need to be further vetted for constructibility and feasibility. This should start with additional stakeholder engagement to present the preferred design alternative to abutting stakeholders and the community for feedback. This alternative will also require coordination with state and federal regulatory environmental agencies for construction in the waterway.

The Boston Public Works Department (BPWD) Climate Resilient Design Standards and Guidelines for Protection of Public Rights-of-Way includes technical design considerations that will need to be advanced for both sites. The following high level considerations are based on our understanding of needs identified through this project and is not intended to be all-inclusive of technical considerations that will be identified through design, permitting, and construction.

## Stormwater Considerations

The barrier alignment for both Carlton Wharf and Lewis Mall will prevent overland stormwater flow from reaching the harbor, and could result in localized stormwater flooding during extreme rainfall events. Rainfall is projected to increase in frequency and intensity due to climate change, and additional modeling in coordination with efforts underway with the Boston Water and Sewer Commission (BWSC) is recommended to evaluate the impact of the designs and potential for green infrastructure solutions.

## Utility Considerations

Design scenarios advanced at the Lewis Mall site will need to be designed to span the below ground MBTA Blue Line Tunnel so that no loads are transmitted to the tunnel and to limit risk of settlement. The BWSC owns and operates several utilities and outfalls within both project sites. Additional similar coordination will be required to protect the existing BWSC utilities.

## Structural Considerations

The flood wall at for both Carlton Wharf and Lewis Mall will require structural design, with special attention paid to the foundations and utility crossings. Materials will need to be selected to withstand a coastal environment and coastal wave forces, including potential uplift of decking features.

## Geotechnical & Environmental Considerations

Additional borings to evaluate soil properties and environmental characterization should be performed in close coordination with utility owners. Stability, seepage, and settlement analyses should be performed in accordance with USACOE guidelines. Additional protection to reduce scour and erosion in front of the flood walls (in addition to proposed schematic gabion structures) may be required. Foundations will need to be coordinated with structural and utility

considerations.

## Groundwater Considerations

Groundwater, both current and future due to sea level rise, should be evaluated with respect to the proposed alternatives and impacts to structures, utilities, and vegetation. It appears that currently parts of East Pier Drive are on piles. The impacts of a flood wall seaward of those piers needs to be further evaluated at Lewis Mall.

## Vegetative Considerations

Plant material selection will need to consider an evolving tidal habitat, as well as opportunities for green infrastructure. Plant heights should be considered as they relate to the view corridor, as well as maintaining an offset of at least 15 ft. from the flood barrier alignment and trees.

**Updated Lewis Mall Plans, Operations & Maintenance Considerations, Cost Estimates, Life Cycle Assessment, Benefit Cost Diagram, and Design Performance Modeling are recommended for the preferred design alternative, including both Phases, as the design advances.**

**These considerations, in addition to those already presented in the report, will be advanced through next steps in design with the goal of making a resilient, equitable open space along the East Boston Waterfront.**

