City of Chelsea

Eastern Avenue Climate Resilience Vision

June 2023

MVP
Municipal Vulnerability Preparedness

City of Chelsea
Massachusetts

Weston & Sampson℠
transform your environment

Acknowledgments

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01 Introduction

The City of Chelsea is developing a **Resilient Vision for Eastern Avenue.** Eastern Avenue is a critical transit corridor and industrial port area for the region serving commercial, industrial, and institutional purposes. It is also adjacent to schools, residences, and community centers.

This vision primarily focuses on the area between Eastern Ave and Chelsea Creek. The area is currently home to various industrial uses, warehousing, manufacturing, and a significant portion of the land is occupied by an oil tank farm.

Chelsea has a rich industrial waterfront history. In the mid-19th century, Chelsea became a powerhouse in wooden sailing ship construction, with shipbuilding, lumberyards, metalworks, and paint companies lining Marginal Street. As the century wore on, steam power began to overtake the age of the sail, and the industry in the town began to shift toward manufacturing. Chelsea underwent an industrial boom around the turn of the century, thanks to its prime waterfront location and rail connections to Boston and points beyond. Today, the waterfront is a teeming industrial harbor, with extensive industrial districts developed along the railroad corridor across Chelsea Creek to Island End.

However, the industrial waterfront along Eastern Ave. is undergoing a transformation in response to rising sea levels and the changing industrial landscape. As more industries and vehicles transition to electric power, the manufacturing and transportation of oil will undergo significant changes. Many of the properties along the waterfront in Chelsea are reaching the end of their useful life and being upgraded or sold. As an example, the property at 295 Eastern Ave is currently under design review. With these changes comes an opportunity to re-envision how the waterfront could work and how it could adapt to climate change and sea-level rise.

This transition has the potential to transform Chelsea's resilience, economies, and ecosystems. The key will be to find a balance between the waterfront's industrial use and the environmental protection necessary to ensure the city's long-term resiliency.

To address current and potential conditions surrounding Eastern Avenue, the City has developed a **transitional and transformative vision** which maintains the existing industrial uses while aiming to:

Protect against future flooding

Reduce urban heat island impacts with more tree canopy

Manage stormwater with green infrastructure

Calm traffic and improve safety

Add public amenities, bike paths, and protected sidewalks

Imagine access to the waterfront for the community


IMPACT AREA LIMIT
STUDY AREA
EASTERN AVE
STUDY AREA
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T
T
Project Vision Area

02 About the Study Area

Transportation

Eastern Avenue is a Federal Highway Association designated Critical Urban Freight Corridor (CUFC) that runs north to south along the eastern side of Chelsea. The roadway is designated a CUFC because it is the legal pathway to carry hazardous cargo (petroleum products) received in the Chelsea Creek DPA to destinations south across the Mystic River at Route 99. It also is a regional connector for the Revere, Chelsea, East Boston, Winthrop, and Everett communities.

In addition, the project boundaries are defined by the low-lying MBTA (Massachusetts Bay Transportation Authority) commuter railroad tracks to the north, connecting North Shore communities with Boston and the MBTA Silver Line bus route to the south. The heavy traffic poses challenges for pedestrians, bikes, and turning vehicles. Furthermore, the industrial and regional transit include large freight vehicles, which require wide turning radii and a need to turn across lanes to access industry on each side of the roadway.

The site is adjacent to Chelsea Street Bridge, which is a critical link between Chelsea, East Boston, and Logan Airport. The Chelsea Street Bridge is owned and operated by MassDOT.

Wastewater and Stormwater Infrastructure

The broader project area has a mix of sensitive regional infrastructure that poses potential challenges and constraints when considering future development and a climate-resilient vision. Underground utilities in the Eastern Avenue corridor include three large Massachusetts Water Resources Authority (MWRA) collector sewers that run the length of the Project Area to the MWRA Chelsea Screen House located on Marginal Street. The Project Area also includes the City of Chelsea's largest combined sewer overflow (CSO) – CHE-008, which serves the sewer service area directly north of the Project Area and discharges untreated wastewater into Chelsea Creek during intense storm events (events approximately greater than a half-inch in 24 hours). Separation efforts for the CHE-008 CSO have been underway in the City of Chelsea for two decades and several design concepts have been developed to complete the closure of this CSO, which will need to be coordinated with broader area climate resilience vision.

What is Combined Sewer Overflow (CSO)?

Combined Sewers collect both stormwater and wastewater (i.e. waste from toilets, from industrial plants, etc.) and send then to a water treatment plant. Combined Sewer Overflow is when there is a large storm and the system overflows. The sewers will overflow into water bodies or elsewhere, and the wastewater will contaminate the environment. This can be avoided if the wastewater and stormwater use separate sewer systems.

Regulations and Waterfront Access

The waterfront of the Project Area is largely within the bounds of the Chelsea Creek Designated Port Area (DPA). DPA's are regulated by the state for the purpose of reserving areas for water-dependent industrial uses. Chelsea published a Proposed Chelsea Creek Municipal Harbor Plan and Designated Port Area Master Plan in 2021 (herein the "2021 Municipal Harbor Plan"). This plan was developed by Chelsea in partnership with the Massachusetts Department of Environmental Protection Waterways Office, the Massachusetts Executive Office of Energy and Environmental Affairs Coastal Zone Management Office, and other stakeholders. It assesses historic and current conditions within the DPA, climate change considerations, provides an economic analysis, and states Chelsea's Municipal Harbor Plan and DPA policies and strategies.

While the DPA is an industrial area, we believe that improvements can be made that still serve the public for waterfront access. Not only could this be in the form of open space, but also walking paths, bike paths, and other recreational waterfront usages that would serve the emotional and physical health of the community. It could also connect to larger park, walking, and biking networks in Chelsea, improving the overall connectivity of the area. This project provides a unique opportunity to work with key property owners and stakeholders to blend civic amenities and waterfront access and to potentially create a continuous pedestrian path along the waterfront.

"The Last Mile" Transit Connectedness

While Eastern Avenue connects directly to Chelsea Greenway and to the Silver Line Corridor; there is no supported access for pedestrians who are seeking to walk or bike to those locations. The Silver Line Station is a strong candidate for becoming a multimodal hub because it already has existing access to bus rapid transit and the Chelsea Greenway. The only missing piece is biking and walking infrastructure on Eastern Ave. This hub would also be complimentary to Eastern Ave as a Complete Street. These developments would help reduce reliance on personal vehicles, improve public health and quality of life, reduce emissions, and improve safety.

Street Trees and Vegetation

Eastern Avenue would benefit from more street trees, vegetation, and green space to help reduce heat, reduce air pollution, mitigate stormwater runoff, improve air quality, improve health of the ecosystem, improve shading for pedestrians, and improve the general experience and quality of the streetscape.

03 Engagement

Currently the project area divides the larger neighborhood with residential and community resources flanking the larger industrial commercial core. To begin to address how to blend these two distinct areas and make greater community connections, three types of stakeholders were engaged to provide input into how the uses of this space can be integrated together. The three types of stakeholders included: residents, community organizations, and property owners. The strategies to collect input from these groups included surveys, public meetings, interviews, and a site walk.

During the engagement events and meetings with stakeholders, a few common themes arose:

1. Eastern Avenue is currently not safe or pleasant for drivers or pedestrians, but the road needs to maintain it's ability to serve high traffic levels due to its role as a regional connector.
2. Eastern Avenue needs to maintain functionality during extreme events, because it is used for emergency vehicle trips by MWRA (Massachusetts Water Resources Authority) for repairs and to evacuate students from Mary C. Burke Elementary School.
3. The Designated Port Area regulatory requirements make integration of publicly accessible waterfront more challenging, but the community desires this amenity.
4. Currently, the lack of tree canopy and other types of vegetation create hot and uncomfortable conditions.

The city of Chelsea is committed to recognizing the disparate impacts of climate change and other environmental harms on immigrants, people of color, and those with societal disadvantages. To better serve environmental justice communities and reflect their needs in community projects, the city engaged bilingual materials, interpretation, and visuals were used to convey the project story to the community, and feedback collected from these stakeholders shaped the project vision.

Community Workshop held at the Public Library on March 21, 2023

The city recognizes the importance of effective communication pathways and climate justice in achieving equitable climate resiliency.

To successfully implement the Resilient Vision for this area, careful coordination and buy-in is needed from property-owners along Eastern Ave. During the engagement process, several business owners or managers conveyed that current resilience measures are planned for their sites. The City hopes to integrate these plans and efforts into the City's Resilience Vision. Key properties along Eastern Avenue include the following:

Gulf Oil Terminal

The terminal is the largest industrial property owner within the Project Area and the site is predominantly used for receipt, storage and distribution of petroleum products including gasoline, #2 Oil, and Diesel. The facility relies on access to the water for port activities and Eastern Avenue for local distribution.

Preflight Parking and Rental Car Storage (to the East of Chelsea Bridge Park)

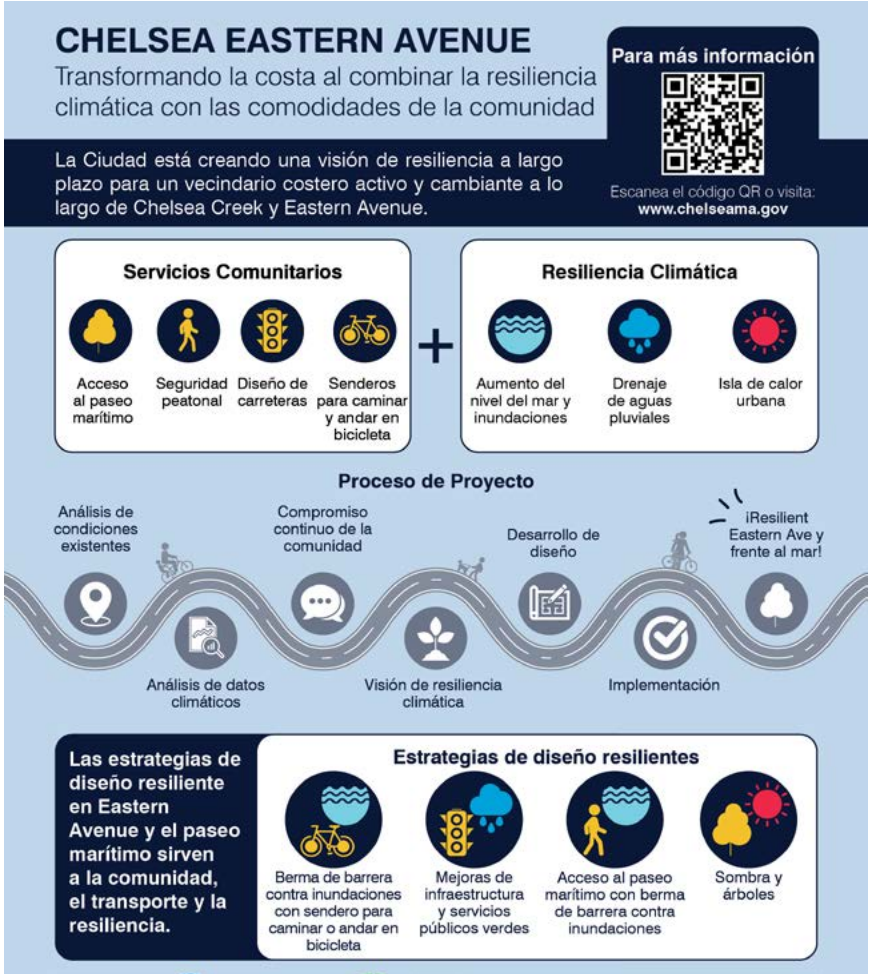
Though it is privately held, this property acts as remote parking and shuttle facility support for Logan Airport. It is also used for rental car storage. The lot abuts Chelsea Street Bridge, Gulf Oil Terminal, and Eastern Ave. There is potential for this lot to provide pedestrian access in conjunction with its current functions. This facility is within the DPA but does not actively use its waterfront spaces for marine activity or support of marine activity.

Former Forbes Lithography

This site is being considered for redevelopment and the plans are subject to change. Redevelopment presents opportunity for coordination with community resilience and waterfront access priorities in the Eastern Avenue corridor. Green Roots has been involved in the discussions on the next steps for this site.

295 Eastern Avenue Inc. Site

This site is planned for redevelopment and will potentially serve as a hybrid commercial and public space. It will provide rental space for small businesses, greenspace, adaptive water management and remediation strategies (i.e., rain gardens, native plants, etc.), and pedestrian waterfront access. The site is currently under review and design flood elevations are being selected for the facility and the pedestrian path. There is opportunity for alignment with the Eastern Avenue Vision.



Fact sheet developed for community engagement

04 Climate Vulnerability

The Eastern Avenue study area is vulnerable to current and future sea level rise/storm surge flooding, extreme rain, and extreme heat.

The Resilient Massachusetts Action Team's Climate Resilience Design Standards and Guidance recommends "flexible adaptation pathways" for flood mitigation projects. For this project, this means that the proposed solutions incorporate ways to incrementally change the location and height of the flood barrier over time. Therefore, the result of this project is two design concepts that both build on each other and provide room for flexibility in the future.

Flood Alignment 1 is the near-term design concept and Flood Alignment 2 is the long-term design concept. Flood Alignment refers to the continuous flood barrier that will protect the area behind it.

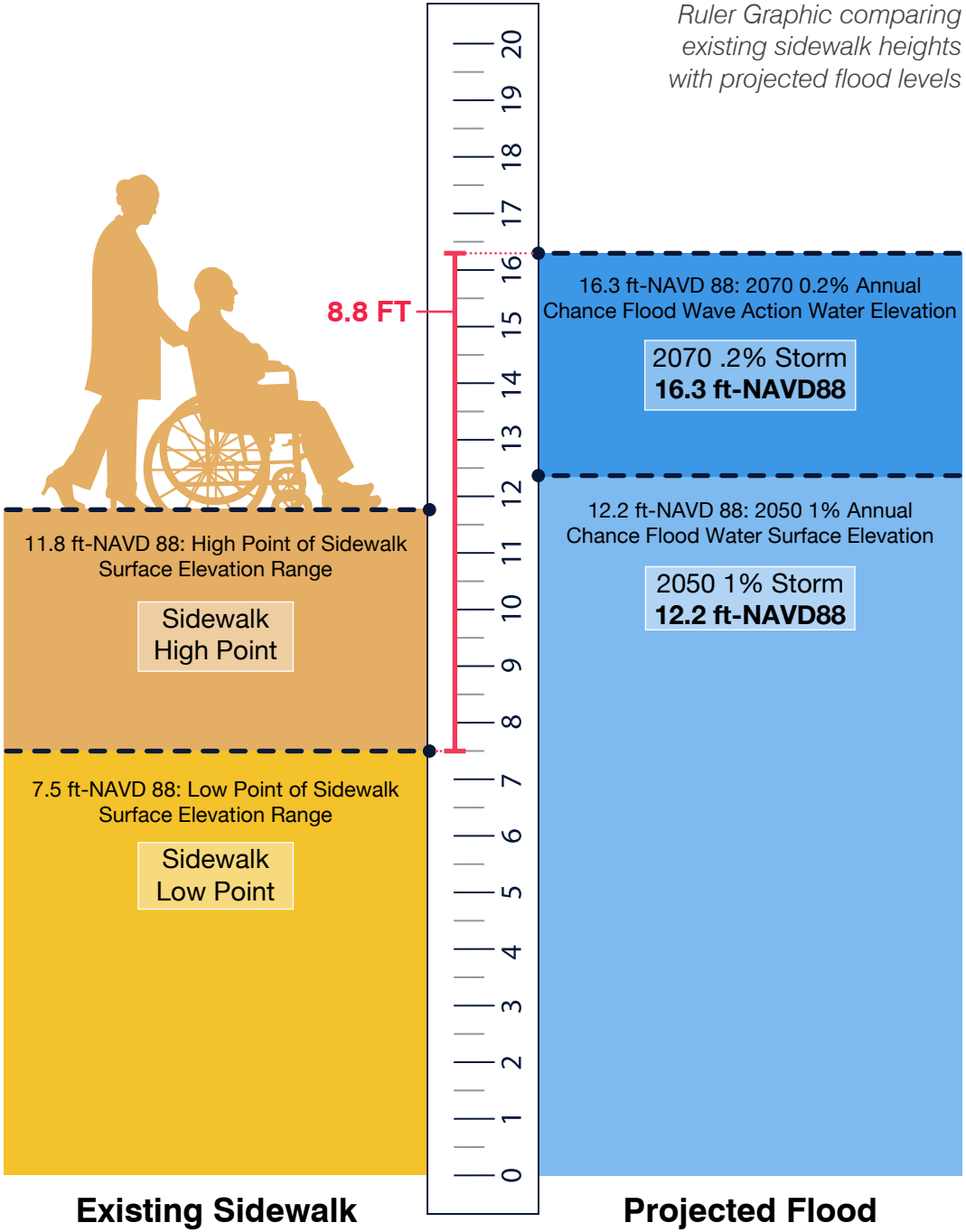
Flood Alignment 1:

- *Location:* Mostly on Eastern Avenue
- *Near-term:* This alignment prevents 2050-level flooding
- *Flood Elevation:* 2050 1% Annual Chance Flood Water Surface Elevation – 12.2 ft-NAVD 88

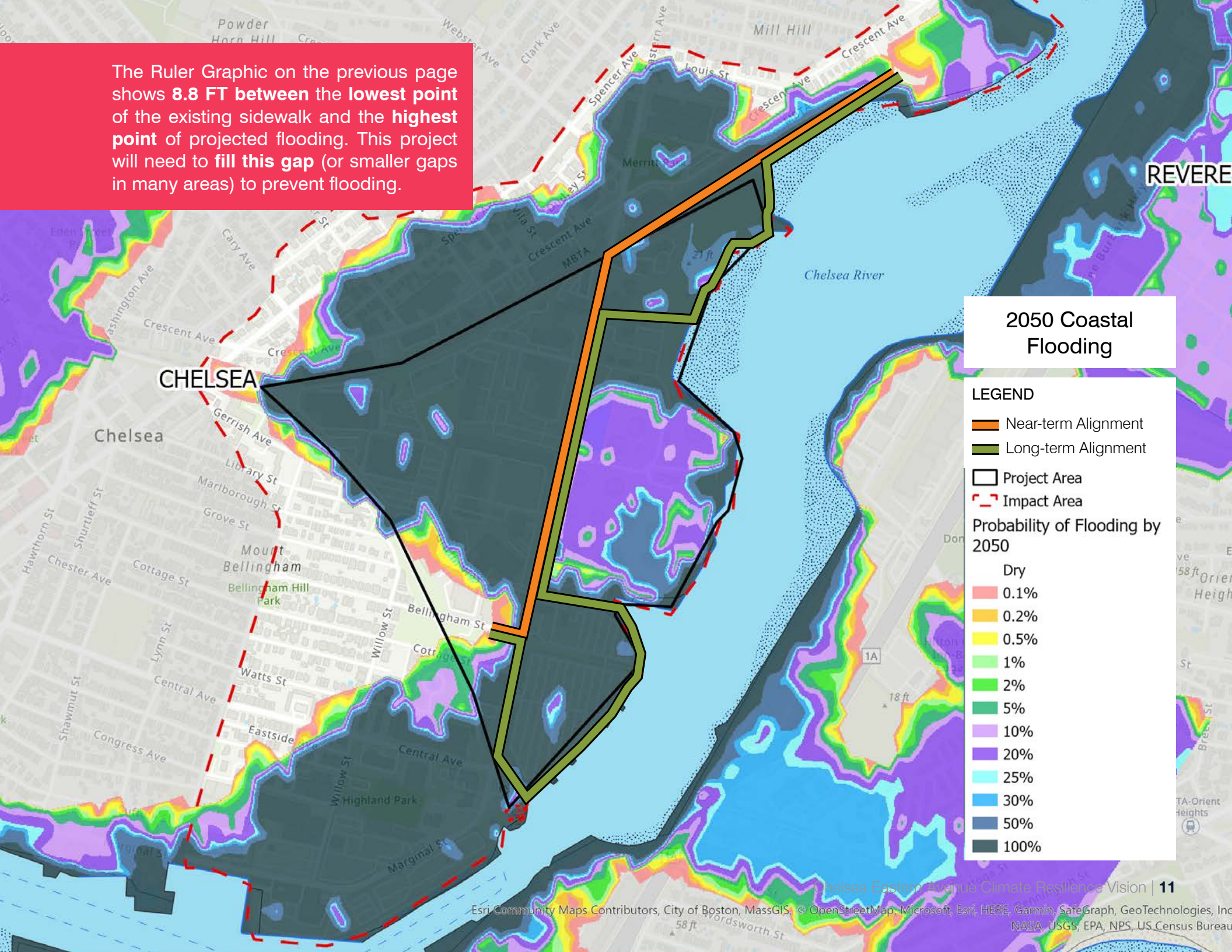
Flood Alignment 2:

- *Location:* Eastern Avenue and the Waterfront
- *Long-term:* This alignment prevents 2070-level flooding
- *Flood Elevation:* 2070 0.2% Annual Chance Flood Wave Action Water Elevation – 16.3 ft-NAVD 88

Ruler Graphic comparing existing sidewalk heights with projected flood levels



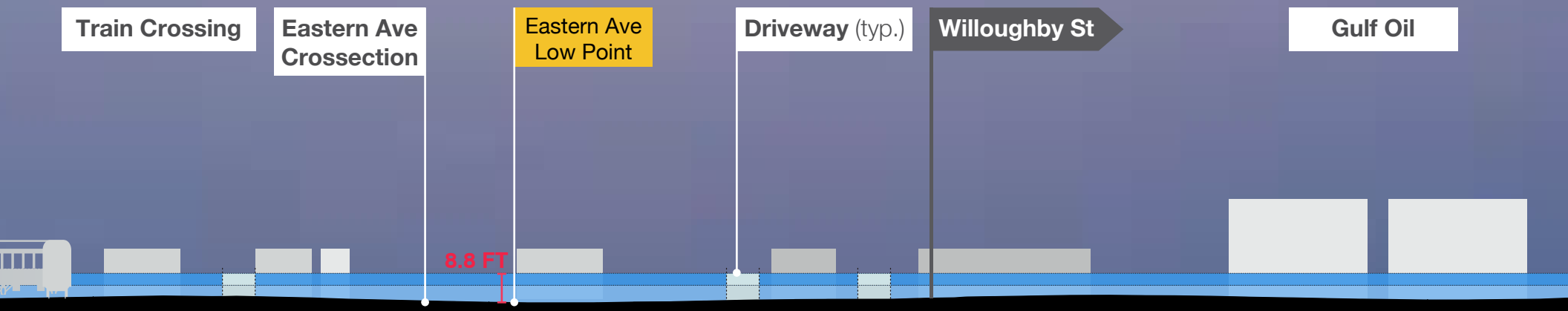
The Ruler Graphic on the previous page shows **8.8 FT between** the **lowest point** of the existing sidewalk and the **highest point** of projected flooding. This project will need to **fill this gap** (or smaller gaps in many areas) to prevent flooding.



05 | Design Options

The City is proposing two conceptual designs for flood barrier systems. The placement of the flood barrier systems was developed based on existing grading, property ownership, land use, and the projected flooding timelines described above. The primary intent of each system is to block flooding up to the projected flood level. Additionally, the flood barrier systems also include pedestrian infrastructure improvements such as protected pathways and bike lanes, new vegetation such as tree canopy and green infrastructure, and access to the waterfront.

At this phase, the City considered the constraints and opportunities of the existing site but further assessment is needed.



2050 **Near-term Vision**

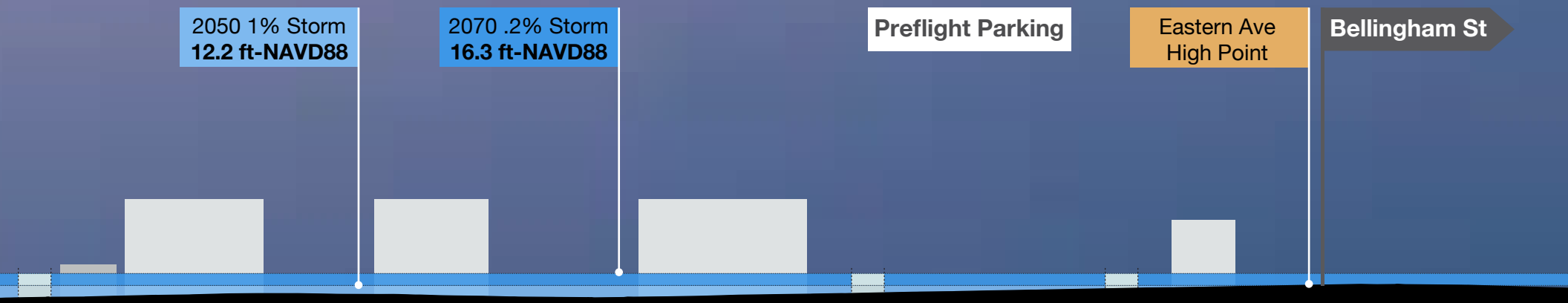
Concept: Shared Path + Roadway Berm

The 2050 near-term vision includes improvements to Eastern Avenue aimed at improving the existing commercial roadway with heavy vehicular and freight traffic as well as adding pedestrian features. These improvements include a multi-use shared path integrated with a flood barrier berm, traffic calming measures, and new vegetation. This alternative also includes reconfiguration of existing vehicular traffic lanes to slow traffic at high speeds as well as space for additional tree plantings and green infrastructure to better cool down the road and drain stormwater.

2070 Long-term Vision

Concept: Shared Path + Waterfront Berm

The 2070 long-term vision builds on the short-term vision but also includes a riverwalk berm that connects the Chelsea community to Chelsea Creek and expands public waterfront access. Waterfront improvements include this riverwalk berm, new vegetation, and pedestrian and bike infrastructure. This vision will require private property owners adjacent Chelsea Creek to provide open space access and the public waterfront zones will need to navigate around the working industrial waterfront uses.



06 Near-Term Vision

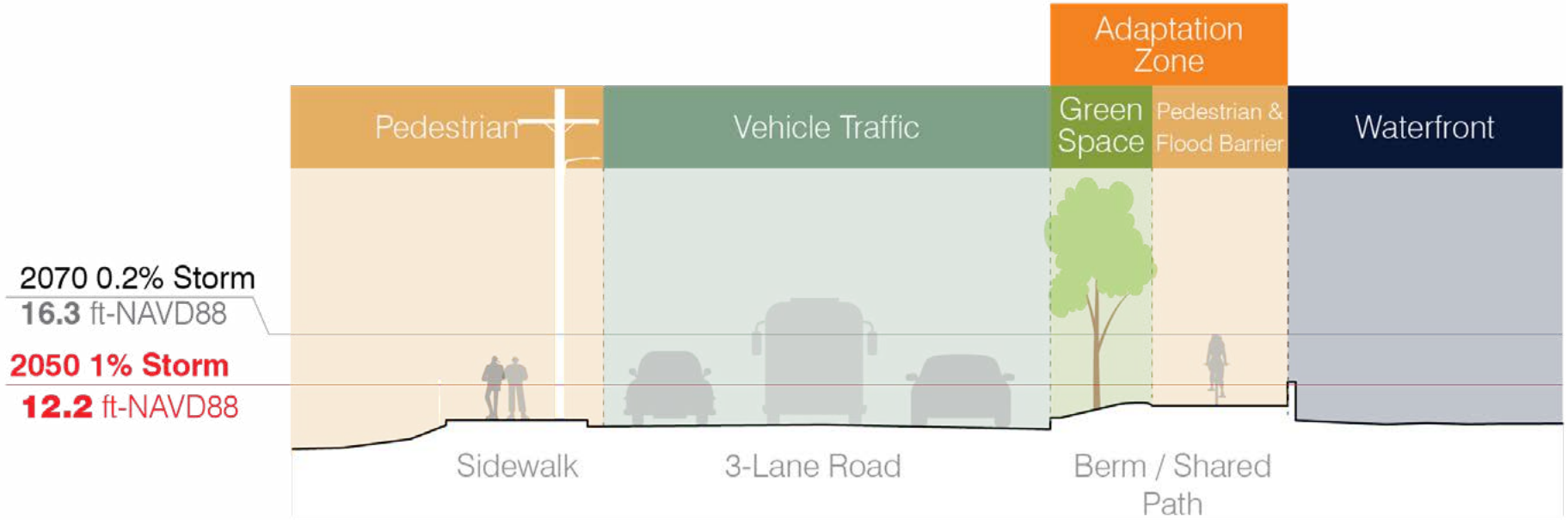
2050 1% Storm
12.2 ft-NAVD88

Pedestrian Connection + Flood Barrier Berm

The near-term vision aims to mitigate flooding in the area inland of Eastern Ave., while also enhancing the use of Eastern Ave for pedestrians, cyclists, and drivers. This project combines the need for pedestrian infrastructure with the need for flood protection. The design concept proposes a flood berm that has a shared walking and biking path on it. This design also includes more trees, vegetation, and traffic reconfiguration. These strategies would cool the road, strengthen the ecosystem, and create safer and slower traffic patterns.

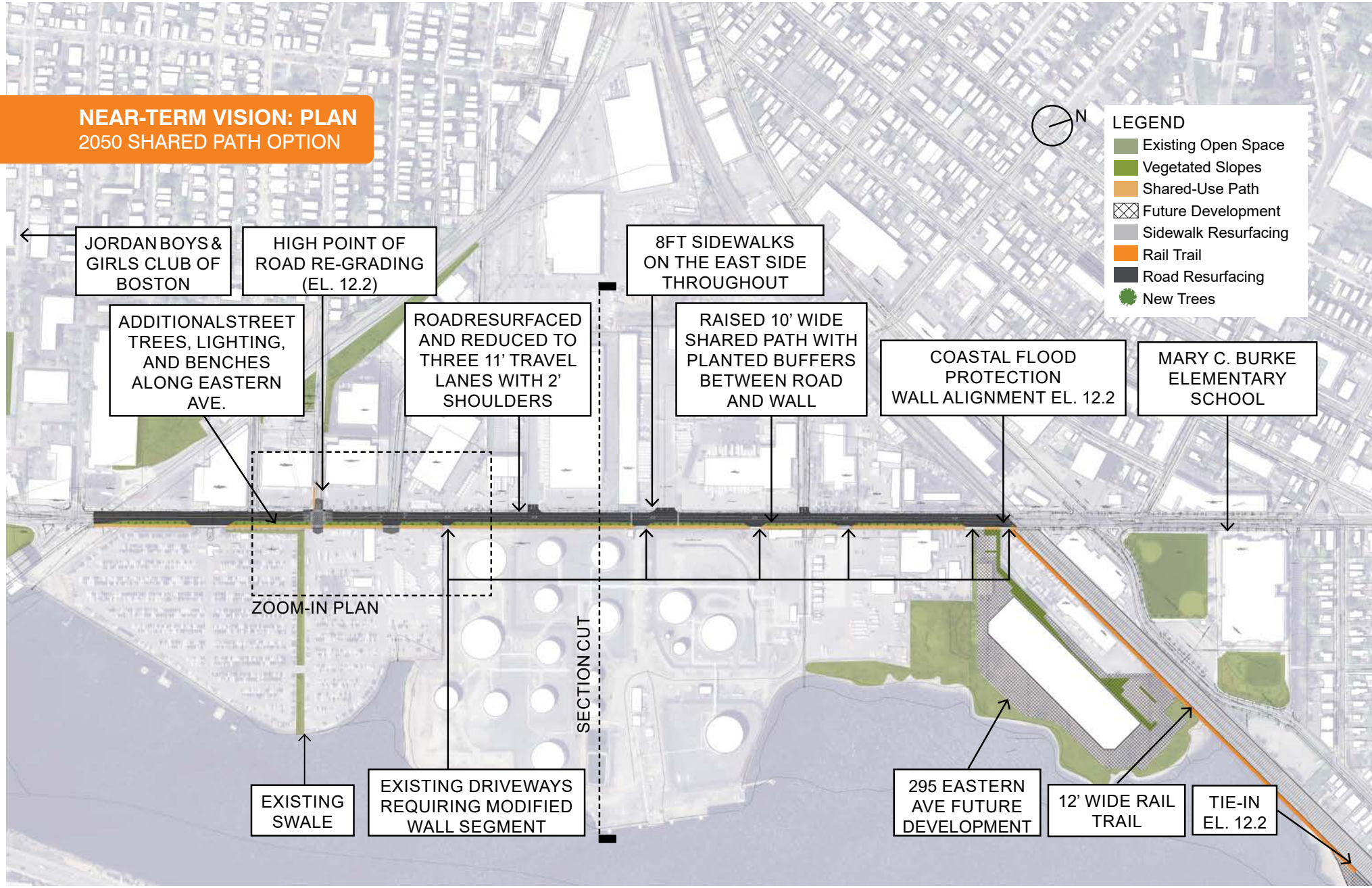
This concept proposes a protected pedestrian path adjacent to the existing commuter rail to connect Eastern Ave. to the future Forbes Lithography development site.

This near-term vision will maintain the existing industrial and commercial properties as they are and seeks to alleviate some of the challenges heard during the engagement process about the danger of making turns to and from the waterfront properties. This concept will also require partnering with the private properties whose driveways will translate to openings in the flood wall/berm system. These openings will require mechanical and deployable interventions.

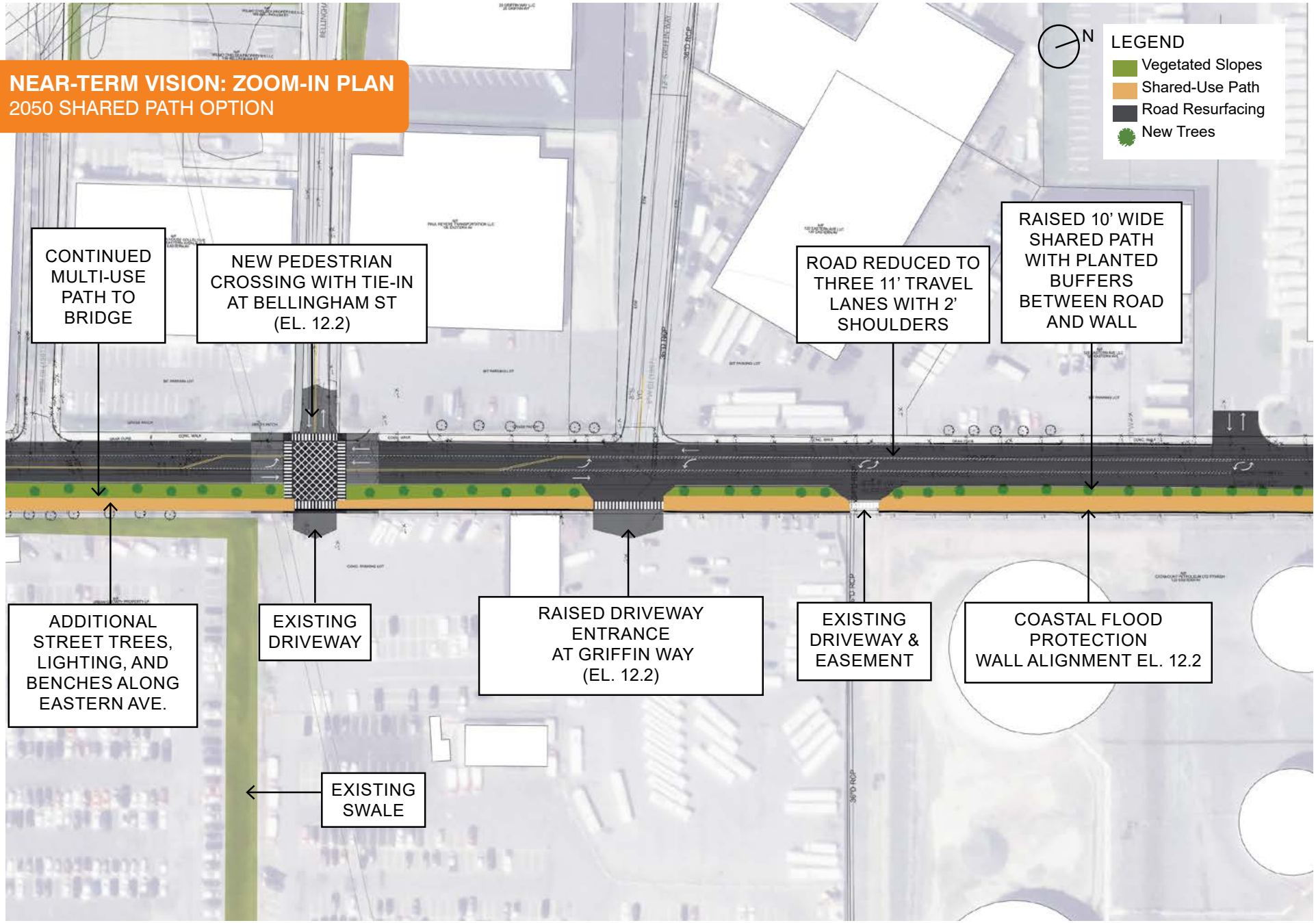


Diagrammatic Section

NEAR-TERM VISION: PLAN
2050 SHARED PATH OPTION



NEAR-TERM VISION: ZOOM-IN PLAN
2050 SHARED PATH OPTION



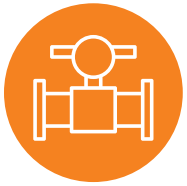
Improvements Beyond Flood Mitigation

Transportation and Traffic Management

Street Trees and Vegetation

Complete Streets and Biking

Wastewater Separation for the Combined Sewer Overflow



“The Last Mile” Transit Connectedness

Transportation and Traffic Management

Traffic and travel lanes will be reconfigured to provide easy and fast left-hand turns, speed management, and safer driving conditions.

Trees and Vegetation

Additional trees, plants, and green space dividers will be added along Eastern Avenue between Chelsea Street Bridge and the Train Crossing.

Complete Streets and Biking

Eastern Avenue will be redesigned to better accommodate pedestrians, bikers, and people with disabilities through adding the shared path, cross walks, traffic lights, and safety lighting.

Wastewater Separation for the Combined Sewer Overflow

The sewer running beneath Eastern Avenue will be renovated to prevent polluted sewer water from entering Chelsea Creek through the current outfalls.

“The Last Mile” Transit Connectedness

Through adding pedestrian and biking infrastructure, Eastern Avenue can serve as a “Last Mile” connector between the Silver Line Rapid Bus Station and riders’ end destinations.


NEAR-TERM VISION
2050 SHARED PATH OPTION
2050 1% Storm
12.2 ft-NAVD88

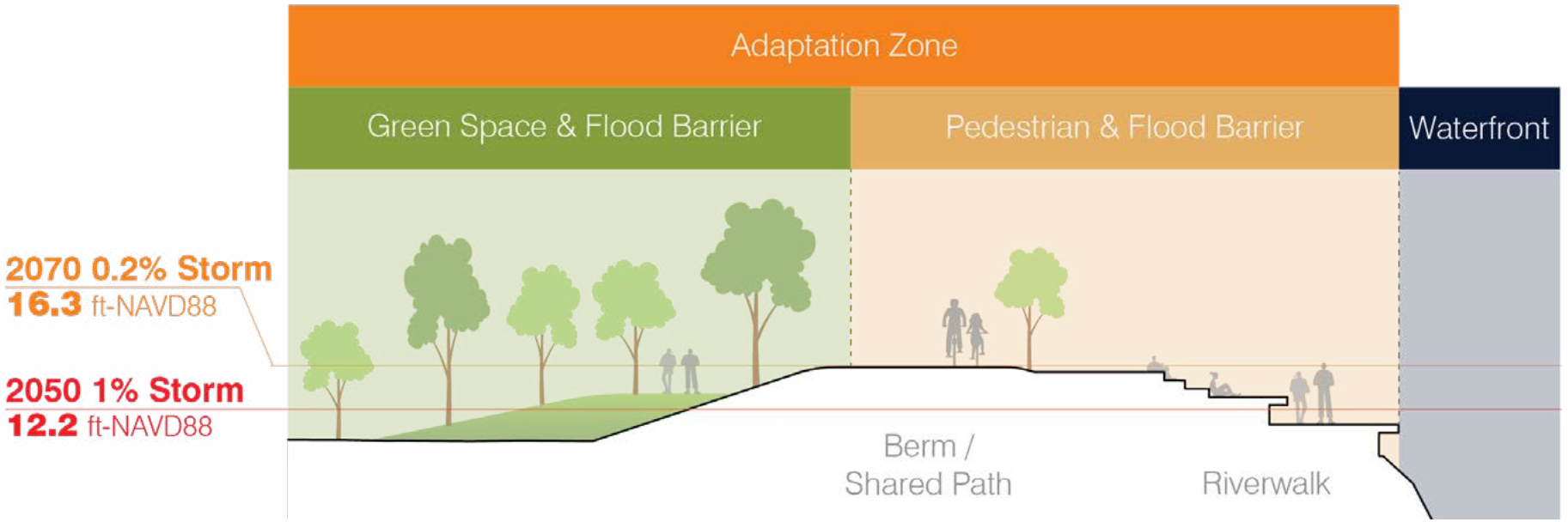
07 Long-Term Vision

2070 .2% Storm
16.3 ft-NAVD88

Waterfront Access + Higher Flood Protection

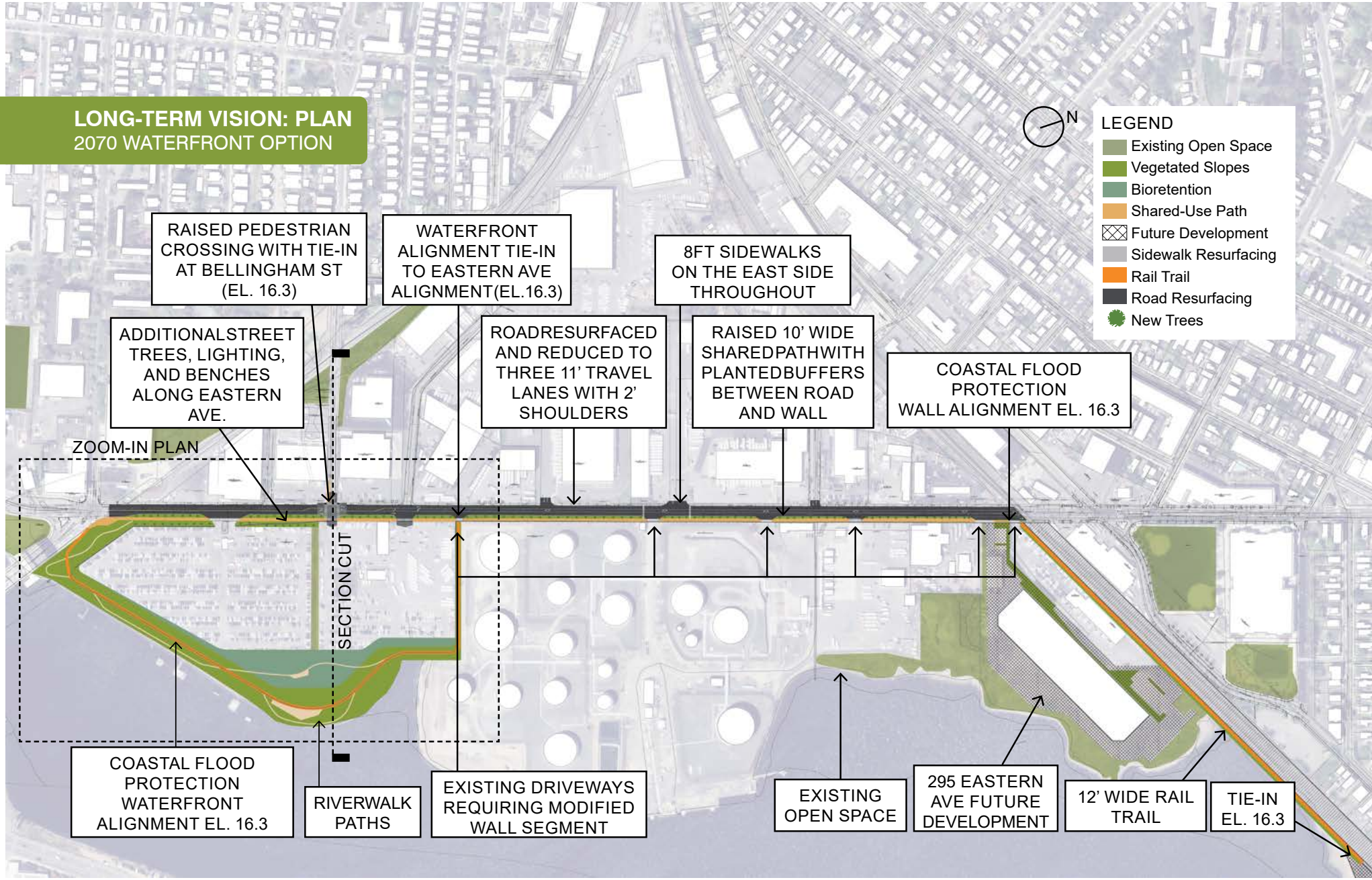
This long-term vision concept builds from the short-term by raising the flood protection to a higher level and adds a public waterfront access element to the project. This concept proposes creating a waterfront berm and green space that are high enough to block flooding. On top of this berm, there would be a riverwalk, pedestrian pathway, bike paths, and publicly accessible open space. There would also be additional trees and vegetation planted along the waterfront and along Eastern Avenue. These would serve to both cool the area through shading and also strengthen the natural ecosystem that has been damaged through industrial uses.

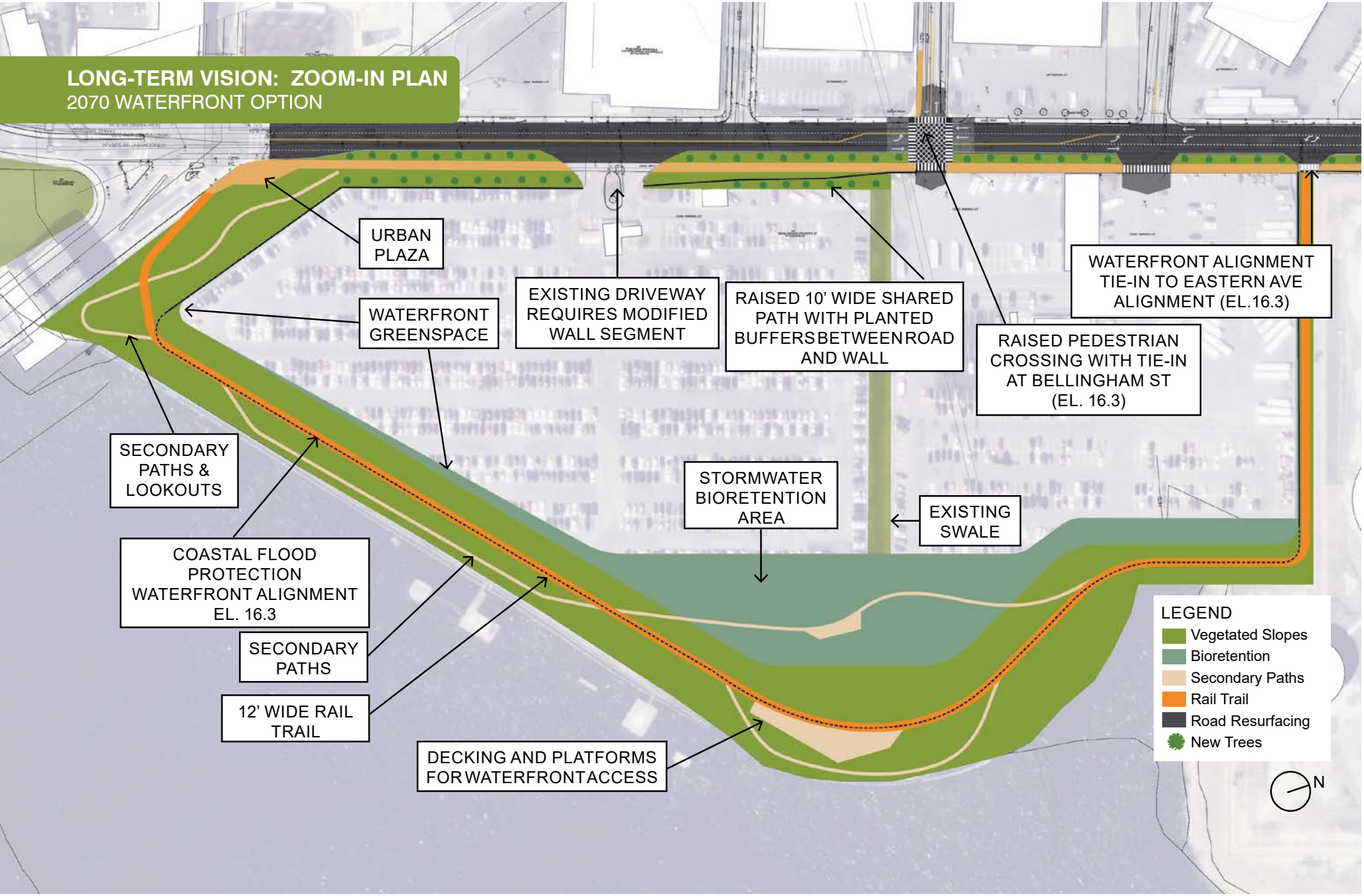
Like the short-term vision, this concept includes a shared path along Eastern Avenue integrated into a flood berm. However, the path would double back at Chelsea Street Bridge and continue to wrap around the waterfront at Chelsea Creek. Currently, there is limited public access to this waterfront area of Chelsea. Waterfront access would be a health and quality of life benefit and, in this project, it would also serve as a flood barrier



Diagrammatic Section

LONG-TERM VISION: PLAN
2070 WATERFRONT OPTION




LONG-TERM VISION: ZOOM-IN PLAN
2070 WATERFRONT OPTION
URBAN PLAZA
WATERFRONT GREENSPACE
EXISTING DRIVEWAY REQUIRES MODIFIED WALL SEGMENT
RAISED 10' WIDE SHARED PATH WITH PLANTED BUFFERS BETWEEN ROAD AND WALL
RAISED PEDESTRIAN CROSSING WITH TIE-IN AT BELLINGHAM ST (EL. 16.3)
WATERFRONT ALIGNMENT TIE-IN TO EASTERN AVE ALIGNMENT (EL.16.3)
SECONDARY PATHS & LOOKOUTS
STORMWATER BIORETENTION AREA
EXISTING SWALE
COASTAL FLOOD PROTECTION WATERFRONT ALIGNMENT EL. 16.3
SECONDARY PATHS
12' WIDE RAIL TRAIL
DECKING AND PLATFORMS FOR WATERFRONT ACCESS
LEGEND
Vegetated Slopes
Bioretention
Secondary Paths
Rail Trail
Road Resurfacing
New Trees
N

Improvements Beyond Flood Mitigation

Transportation and Traffic Management

Street Trees and Vegetation

Complete Streets and Biking

Wastewater Separation for the Combined Sewer Overflow

“The Last Mile” Transit Connectedness

Green Space and Waterfront Access

Transportation and Traffic Management

Traffic and travel lanes will be reconfigured to provide easy and fast left-hand turns, speed management, and safer driving conditions.

Trees and Vegetation

Additional trees, plants, and green space dividers will be added along Eastern Avenue between Chelsea Street Bridge and the Train Crossing.

Complete Streets and Biking

Eastern Avenue will be redesigned to better accommodate pedestrians, bikers, and people with disabilities through adding the shared path, cross walks, traffic lights, and safety lighting.

Wastewater Separation for the Combined Sewer Overflow

The sewer running beneath Eastern Avenue will be renovated to prevent polluted sewer water from entering Chelsea Creek through the current outfalls.

“The Last Mile” Transit Connectedness

Through adding pedestrian and biking infrastructure, Eastern Avenue can serve as a “Last Mile” connector between the Silver Line Rapid Bus Station and riders’ end destinations.

Green Space and Waterfront Access

There will be green space, waterfront areas, and walking paths that will be publicly accessible and serve the surrounding community.

DESIGN CONCEPT 1: RENDERS
2070 WATERFRONT OPTION

2070 .2% Storm
16.3 ft-NAVD88

08 | Roadmap

The City of Chelsea is appling for future funding to advance the resilient vision concepts developed during this project phase. Future funding, if awarded, will focus on the 2050 Near-Term Vision:

1. Analyze the projected effectiveness of the berm as a flood barrier.
2. Retool the City's hydraulic model developed for this area to evaluate future no-action and with-action compound flooding events.
3. Identify locations for future green infrastructure in the neighborhood and provide evidence that this infrastructure would reduce present day flooding.
4. The City will also work with adjacent property owners to further investigate entries and exits to private properties and potential connections with their sites, particularly at the northern end of the project area at the MBTA Commuter Rail tracks.

In the future, the City will continue to evaluate the Long-Term Vision which is designed to the 2070 planning horizon, based on the best available data at the time and the present development conditions.

Appendix

The Appendix includes the following sections:

Feasibility Assessment Matrix Memorandum

Chelsea MVP Eastern Avenue Resilient Vision Concept Drawing Set

Eastern Avenue Infrastructure Assessment (Memorandum)

Key Terms & Acronyms

2050 1% Annual Chance of Flood Water Surface Elevation (2050 1% Storm)
The projected flood level in 2050 for a storm with a 1% chance of occurring that year. Water Surface Elevation means that waves and other natural forces are not included in this calculation. This is a common metric that governments use when planning for Climate Change.

2070 .2% Annual Chance of Flood Wave Action Elevation (2070 .2% Storm)
The projected flood level in 2070 for a storm with a .2% chance of occurring that year. Wave Action Elevation means that forces from waves are included in this calculation. This is a common metric that governments use when planning for Climate Change.

Climate Resilience
Broadly encapsulates the plans and actions that communities and governments are taking to prepare for and prevent impacts from Climate Change.

Climate Resilience Design Standards
Standards developed by the Commonwealth of Massachutts' Executive Office of Energy & Environmental Affairs.

Climate Vulnerability
This term refers to the risk of damage or danger from various Climate Change hazards to people and places.

Complete Streets
A term used in City Planning to describe streets that prioritize pedestrians, bikers, and transit riders in addition to drivers. This term arose in reaction to the rise of car-centric planning across the US.

Critical Urban Freight Corridors
Industrial urban roads designated by the Federal Highway Adminiatration as critical.

Flood Alignment
The location of a continuous flood barrier.

Flood Barrier Berm
A linear ridge or hill that is made of rocks, soil, and vegetation that is high enough and strong enough to act as a flood barrier. It is a natural alternative to concrete or other materials.

Green Infrastructure
A broad category of infrastructure that is made of natural materials, such as soil, gravel, vegetation, trees, etc. It often refers to drainage infrastructure, such as rain gardens or bioswales, which are vegetated areas that create pathways for water to drain down to the groundwater table.

NAVD 88
North American Datum of 1988. This is a standard elevation map that governments use. It standardizes heights of objects or data across the globe to prevent confusion.

Road Resurfacing
Re-paving and re-painting roads

Tie in
The location where a new flood barrier connects and locks into an existing object or land. Often, this refers to a place where the existing land is high enough to protect against future flooding.

Traffic Management
Planning and designing of roadways to create safe and effective traffic patterns. This includes traffic calming, or slowing, as well as traffic reconfiguration, or re-drawing the lanes and traffic signals.

Tree Canopy
The collective branches, leaves, and foliage from a group of trees. It also refers to the shade that these parts of the trees provide.

Urban Heat Island
The phenomenon where cities are hotter than their surrounding areas due to concrete surfaces, lack of open space, lack of vegetation, and lack of shade.

Waterfront Access
Places where the public can walk, bike, or spend time at the waterfront. This may or may not include swimming or boating access to the water itself. These areas are beneficial for mental health, physical health, and environmental health.