RESILIENT BORDER STREET WATERFRONT PROJECT ENGINEERING ASSESSMENT

FOUNDATION FOR PRELIMINARY DESIGN REPORT

January 2025

Weston & Sampson℠

CITY of BOSTON

PROJECT TEAM

CITY OF BOSTON

Office of Climate Resilience

Planning Department – Coastal Resilience Infrastructure Delivery Team

CONSULTANT TEAM

Weston & Sampson

Woods Hole Group

Collins Engineers, Inc.

Consensus Building Institute

PHOTO CREDIT

All photos were taken by Project Team members, unless otherwise noted.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

Appendix A. Historic Maps

Appendix B. Wetlands Delineation

Appendix C. Environmental Regulations and Permitting

Appendix D. Survey Summary

GLOSSARY OF TERMS

BCB: Boston City Base

BFE: Base Flood Elevation

BH-FRM: Boston Harbor Flood Risk Model

CZM: Massachusetts Office of Coastal Zone Management

DFE: Design Flood Elevation

DPA: Designated Port Area

FIRMs: Flood Rate Insurance Maps (FEMA)

LIMWA: Limit of Moderate Wave Action

MassDEP: Massachusetts Department of Environmental Protection

MC-FRM: Massachusetts Coast Flood Risk Model

MEPA: Massachusetts Environmental Protection Act

MHHW: Mean Higher High Water

MHW: Mean High Water

MLLW: Mean Lower Low Water

MLW: Mean Low Water

MTL: Mean Tide Level

NAVD88: North American Vertical Datum of 1988

NHESP: Natural Heritage and Endangered Species Program

NOI: Notice of Intent

RMAT: ResilientMass Action Team

WAWE: Wave Action Water Elevation

1. EXISTING CONDITIONS

INTRODUCTION

The Border Street area of East Boston's waterfront has emerged as a near-term priority in the City's efforts to address climate change and enhance coastal resilience (Figure 1). This stretch of coastline represents both a vulnerable zone and an opportunity for innovative urban planning and climate adaptation strategies. As sea levels continue to rise and the threat of coastal flooding intensifies, the Border Street waterfront has been recognized as a critical flood pathway as soon as 2030 requiring immediate attention and intervention.

During the first phase of "Coastal Resilience Solutions for East Boston"[1], a plan created in 2017 studying the East Boston waterfront, it was found that with projected sea level rise by 2030 and the growing intensity of major storms, such as the 1% annual chance flood, a flood pathway will develop through the Border Street waterfront. The Resilient Border Street Waterfront Project aims to protect East Boston residents, businesses, infrastructure, and open spaces from the impact of flooding by partnering with private landowners in the project area.

Mural by Sophy Tuttle at 60 Border Street.

The Resilient Border Street Waterfront Project goals include the following:

Develop and evaluate coastal protection options throughout the extent of the 2030 flood pathway along the Border Street waterfront and provide vertical protection to 40 inches of sea level rise during a 1% annual chance storm (2070), as set forth in the Coastal Resilience Solutions for East Boston and Charlestown Phase 1 Report;

Be informed by and reflect the input, priorities, needs, and constraints of the Community Coastal Resilience Implementation Council established through this project and the East Boston community more broadly;

Create new and enhance existing connections along the existing Harborwalk located near the project area that are Americans with Disabilities Act (ADA) compliant and accessible for people of all ages and abilities;

Integrate permeable open space, green infrastructure, and additional tree canopy throughout the design to improve stormwater management and mitigate urban heat island effect;

Restore degraded coastal ecosystems to enhance water quality and habitats to support wildlife and fisheries, where possible;

Continue to support and promote suitable water dependent industrial uses along the working shoreline and within the existing limits of the East Boston Designated Port Area (DPA), where possible; and

Identify feasible, permittable, and cost-effective solutions.

Figure 1. Aerial view of the Resilient Border Street Waterfront Project Area with projected flooding during a 1% annual chance storm with 9 inches of sea-level rise anticipated around 2030. Weston & Sampson, 2024.

As shown in Figure 1, this critical flood pathway is concentrated across several private properties. This project engages several stakeholder groups including private property owners, community groups, and public agencies. Engagement with these groups has informed and will continue to inform the development of coastal resilience focused designs that will benefit the entire community by implementation of a near-term solution that provides long-term protection from coastal flood risks.

This report provides a comprehensive overview of the current state of the Border Street waterfront, focusing on the area extending from 36 New Street/60 Border Street to 276R Border Street, just north of Liberty Plaza/Shaws. It examines the physical, environmental, and social aspects of the project area, drawing from extensive site investigations, engineering assessments, and community engagement efforts to establish a baseline for future design and implementation phases.

PAST SUPPORTING ANALYSES AND DESIGNS

Multiple analyses and designs have already been conducted city-wide and in the Border Street area. These previous efforts, described below, have been instrumental in shaping the understanding of the area and informing our approach for the Resilient Border Street Waterfront Project. This retrospective analysis not only highlights the evolution of resilience for East Boston, but also underscores the process leading to feasible solutions and honors previous community input that is being integrated into this project.

2015 A Technical Assistance Panel Report, Advancing Resiliency in East Boston[2]

Guided by the Urban Land Institute, a Technical Assistance Panel, The Kresge Foundation, and East Boston based Neighborhood of Affordable Housing (NOAH) group, this report focused on identifying vulnerabilities due to rising sea levels within East Boston and provided recommendations for integration opportunities for resiliency and adaptation planning.

2016 Climate Ready Boston Report[3]

As a part of a Citywide effort to understand and prepare for the impacts of climate change, the 2016 Climate Ready Boston Report provides updated climate projections, a vulnerability assessment for the City of Boston, focus areas that highlight location-specific climate issues, and climate resilience initiatives. This work further prompted development of the Coastal Resilience Solutions for East Boston and Charlestown Phase I, Coastal Resilience Solutions for South Boston, Coastal Resilience Solutions for Downtown and North End, Coastal Resilience Solutions for Dorchester, and Coastal Resilience Solutions for East Boston and Charlestown Phase II reports. The Technical Analysis and Resilient Design Development Options project directly advances Strategy 5 from this report, which proposed creation of a coastal protection system.

2017 Coastal Resilience Solutions for East Boston & Charlestown Phase 1[4]

As the first neighborhood coastal resilience plan from the Climate Ready Boston initiative, the 2017 Coastal Resilience Solutions for East Boston & Charlestown Phase I report was established as a roadmap for understanding risks and strategies to protect portions of the East Boston and Charlestown neighborhoods from the growing effects of sea level rise and storm surge. The document highlights coastal flooding risks, resilience solutions, and near and long-term actions for implementation in the two neighborhoods, inclusive of this project's Border Street study area. Coastal flooding risks and resilience solutions were informed by the Boston Harbor Flood Risk Model (BH-FRM).

2017 Imagine Boston 2030[5]

Released in July 2017, Imagine Boston 2030 is Boston's first citywide comprehensive plan in 50 years. Imagine Boston 2030 addresses key needs for housing, education, transportation, racial equity, climate preparedness, and more. The plan advocates for development that aligns with community priorities, including expanded access to affordable housing and open spaces, while also emphasizing climate vulnerability assessments and flood-protection strategies to ensure a resilient future.

In particular, the plan highlights an urgent need to protect vulnerable areas, such as the East Boston waterfront, where buildings and residents face significant flood risks. Projections indicate that nearly 25% of East and South Boston could experience inundation under the plan's identified 2030 conditions, with this figure potentially rising to 60-70% by the 2070s.

2018 Resilient Boston Harbor Vision[6]

In 2018, the City of Boston unveiled a strategic vision to invest in its waterfront, aiming to protect residents, homes, jobs, and critical infrastructure from the effects of rising sea levels and climate change. *Resilient Boston Harbor*

builds on the goals of *Imagine Boston* 2030, incorporating insights from the City's *Climate Ready Boston* 2070 flood maps and neighborhood-focused coastal resilience studies to address Boston's most vulnerable flood pathways. This initiative targets specific areas at risk, strengthening the city's defenses against future climate impacts.

The strategies laid out in the East Boston vision include the incorporation of elevated landscapes with revitalized and increased connections and access to the waterfront. The vision also labels the Border Street waterfront as a priority for the City of Boston, as a place to create flood protection and provide new resilient spaces with public access to the waterfront.

2019 East Boston Flood Prevention, Design Workshop Report[7]

A project of NOAH, UMass Boston Sustainable Solutions Lab, and the Kresge Foundation, this design workshop engaged East Boston residents in planning and policy discussions about how to make their neighborhoods more resilient in the face of climate change. Discussions about risks from sea level rise and additional climate impacts acted as the basis for this report as it captures key themes and proposals for actions by neighborhood residents.

2020 East Boston Today: An Interim Report of PLAN: East Boston[8]

Organized by the Boston Planning & Development Agency (BPDA), the 2020 East Boston Today: An Interim Report of PLAN: East Boston report describes the baseline conditions of the East Boston community, with regards to people, housing, climate and environment, transportation, jobs, urban form, and zoning. This report details the context of the region and the evolution of the area's planning process to date.

2024 PLAN: East Boston[9]

PLAN: East Boston is a community-driven, neighborhood-wide planning initiative in East Boston, intended to shape the neighborhood by identifying opportunities to "boost equity, resilience, and quality of life". The policy considerations and key recommendations directly advance the neighborhood and city's broader climate and environment goals.

The East Boston Border Street waterfront is characterized within this report as 'Waterfront and Evolving Industrial Areas', where the goal of this subarea is to "prioritize increasing public access to the waterfront, implement resilience infrastructure, and support essential economic activity"[9].

The plan suggests a consolidation of zoning districts within the area into one single mixed use, mid-rise waterfront

district, as well as establish a Planned Development Area overlay to enable the delivery of priority land uses previously identified by community members. This new district would support the adaptive reuse of existing structures, which would directly enhance the project area's ability to preserve the several historic structures along the waterfront.

Connecting the Harborwalk and advancing coastal resilience infrastructure are also recommendations within the report that influenced the establishment of this project.

Advancing the recommendations of this report would directly impact the enhancement of the waterfront along Border Street to transform and revitalize the space for East Boston community members.

Seawall along the 60 Border and 36 New Street waterfronts.

NEIGHBORHOOD HISTORY AND CONTEXT

HISTORY OF THE PROJECT AREA

Similar to other waterfront neighborhoods in the region, East Boston has a rich history that predates colonial times and the 19th century. From its land formation through coastal infilling to its role as a working waterfront and immigration gateway, East Boston is a vibrant community with many valued environmental, cultural, and economic assets that are essential to its future.

History of a Changing Waterfront

There is growing recognition that urban waterfronts of today must meet, in an equitable manner, the diverse and evolving needs of our communities in response to the growing urgency of multiple priorities and shared uses.

Historically, the seawalls and other shoreline structures did not account for a future changing climate. Over the past decade, much of the East Boston waterfront has been undergoing a transformation as new developments for residential and open are being built to accommodate a growing population. The new and rapid development is causing the City of Boston to take a closer look at how regional flood protection can be achieved through elevating adjacent coastal site features.

The history of the development of the East Boston waterfront is further explained in the PLAN: East Boston Report[9] and documented by a series of maps created by George Washington Bromley and Walter Scott Bromley Civil Engineers. These maps (Figure 2) come from the "Atlas for the City of Boston: Charlestown and East Boston"[10] based on surveys and official plans, published by their company G.W. Bromley and Co. There are several atlases that are dated 1884, 1892, 1901, 1912, and 1922 available through the Leventhal Map Center at the Boston Public Library. The maps depict parcel ownership for streets located through East Boston, telling the story of development along the East Boston waterfront throughout the early 1900's. The map demonstrates that a once active port with long, partially infilled wharves now consist of mostly degraded wood structures (Figure 3), in a mostly inactive waterfront within the project area.

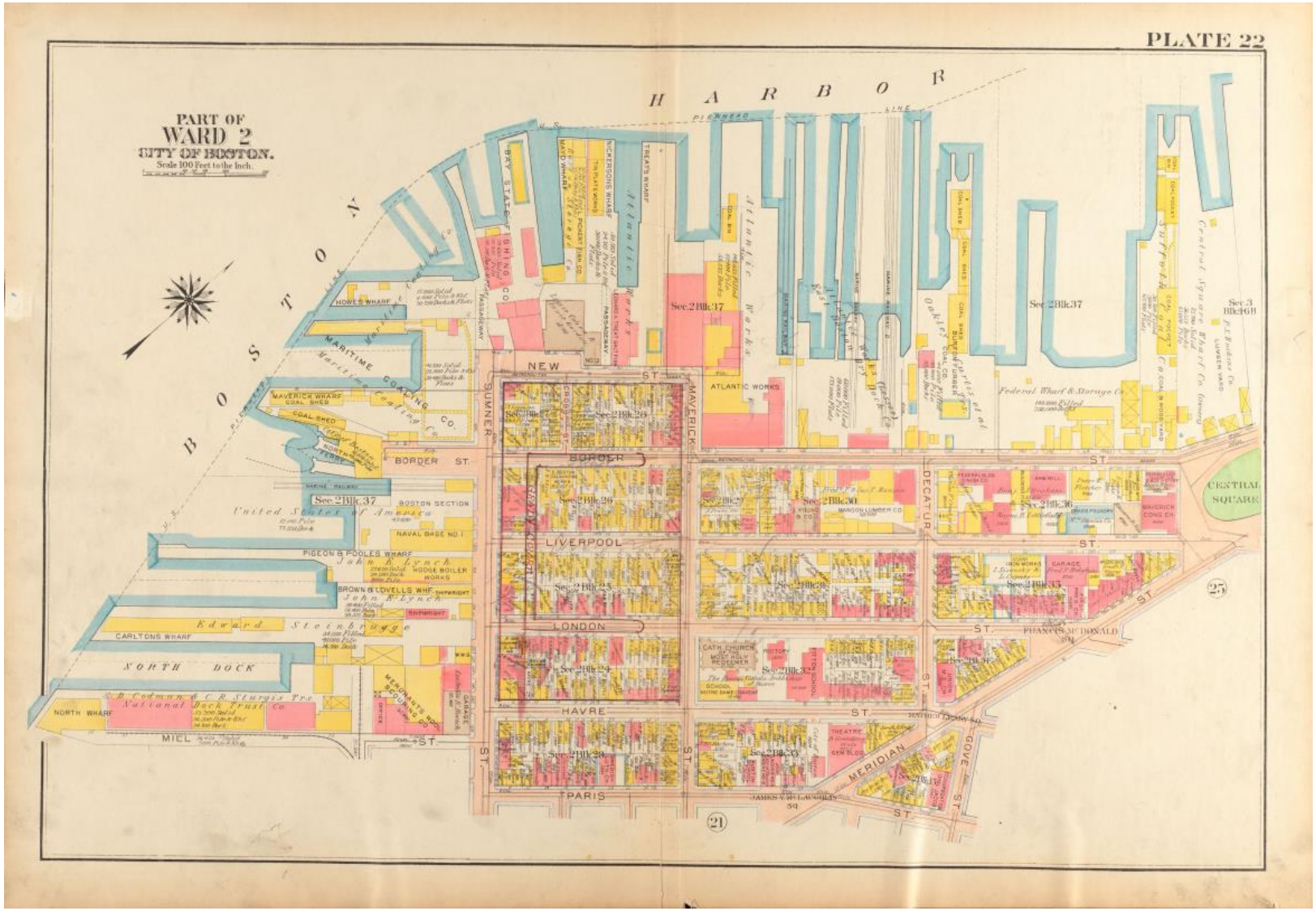


Figure 2. Plate 22 of a 1922 historic map of property ownership of 2-200; 5-173 Border Street and New Street. Source: Bromley, George Washington, and Walter Scott Bromley. "Atlas of the city of Boston: Charlestown and East Boston." Map. Philadelphia: G.W. Bromley & Co., 1922. Norman B. Leventhal Map & Education Center.

Figure 3. Existing condition of a once working historic wharf located at 36 New Street. Photo taken by Weston & Sampson, 2024.

NEIGHBORHOOD DEMOGRAPHICS AND POPULATION CHANGE

East Boston has experienced substantial demographic changes since the mid-1800s when it served as an entry point for immigrants from all over the world.

PLAN: East Boston page 4[9] demonstrates that the population of East Boston was growing almost twice as fast as the city's total population, growing a total of 21% from 2000 to 2017. In 2020, the population of East Boston saw a slight decline from the years prior. According to the U.S. Census Bureau and Analyze Boston data, the population of East Boston was 43,066 in 2020[11], compared to a population of 46,655 in 2017[12] and approximately 46,907 in 2018[13].

In 2018, nearly half (49.5%) of East Boston residents were foreign born, which is the greatest share of foreign-born population of all Boston neighborhoods. Downtown Boston has the second highest percentage of foreign-born residents but is nearly 15% lower than in East Boston[11]. As highlighted in the PLAN: East Boston report[7], pages 38-39, the most foreign-born residents in East Boston come from El Salvador, Columbia, Guatemala, Brazil, and the Dominican Republic. The report also notes that 55% of residents speak Spanish at home, which informs stakeholder engagement efforts and an understanding of community values.

Vulnerable Stakeholder Populations

A distinct asset in East Boston is its diverse population of individuals who live and work in the community. While the entire community faces risks, certain groups are particularly vulnerable to the impacts of a changing climate. For instance, the project area is located near multiple Environmental Justice Populations, as shown in Figure 4. According to the 2020 Massachusetts Environmental Justice Community data for East Boston, these populations include Minority, Minority and Income, Minority and English Isolation, and Minority, Income and English Isolation. This suggests a range of races, languages, and incomes among residents, highlighting that those living

closest to the project sites are experiencing multiple or compounding vulnerabilities.

According to the 2018-2022 American Community Survey[14], nearly 45% of East Boston households were earning below $75,000 per year, with about 30% of those households earning below $50,000 annually. Furthermore, about 14.2% of East Boston households earn incomes below the poverty line, where the threshold for a family of three people was earning an income of $23,280 or lower (in 2022 adjusted dollars)[15]. These economic disparities highlight a critical need for financial support and resources from community organizations, particularly during crises. Displacement due to climate change is an escalating global issue, as rising sea levels and extreme weather events increasingly threaten communities. Low-income and marginalized populations are particularly vulnerable, as they often reside in high-risk areas with limited resources to adapt or relocate.

Understanding the balance between household incomes, property ownership, and renters is important as these metrics indicate the risk and potential for housing displacement in the neighborhood. Renters are more likely to be displaced during major flood events because they often lack the financial resources and property rights to repair or rebuild their homes, making it more difficult for them to secure resilient housing. As demonstrated in East Boston Today, an Interim Report of PLAN: East Boston[6], page 55, Hispanic and Latinx households (15%) have lower homeownership rates than white households (45%), demonstrating the likelihood of displacement for these community members.

Without proactive measures, the frequency and severity of climate-induced displacement will continue to grow, exacerbating existing inequalities and creating new challenges for communities like East Boston. As flood events increase due to sea level rise and greater intensity storms, flooding could be a major threat to residential housing in East Boston, and relocation of such a large population would be significantly challenging.

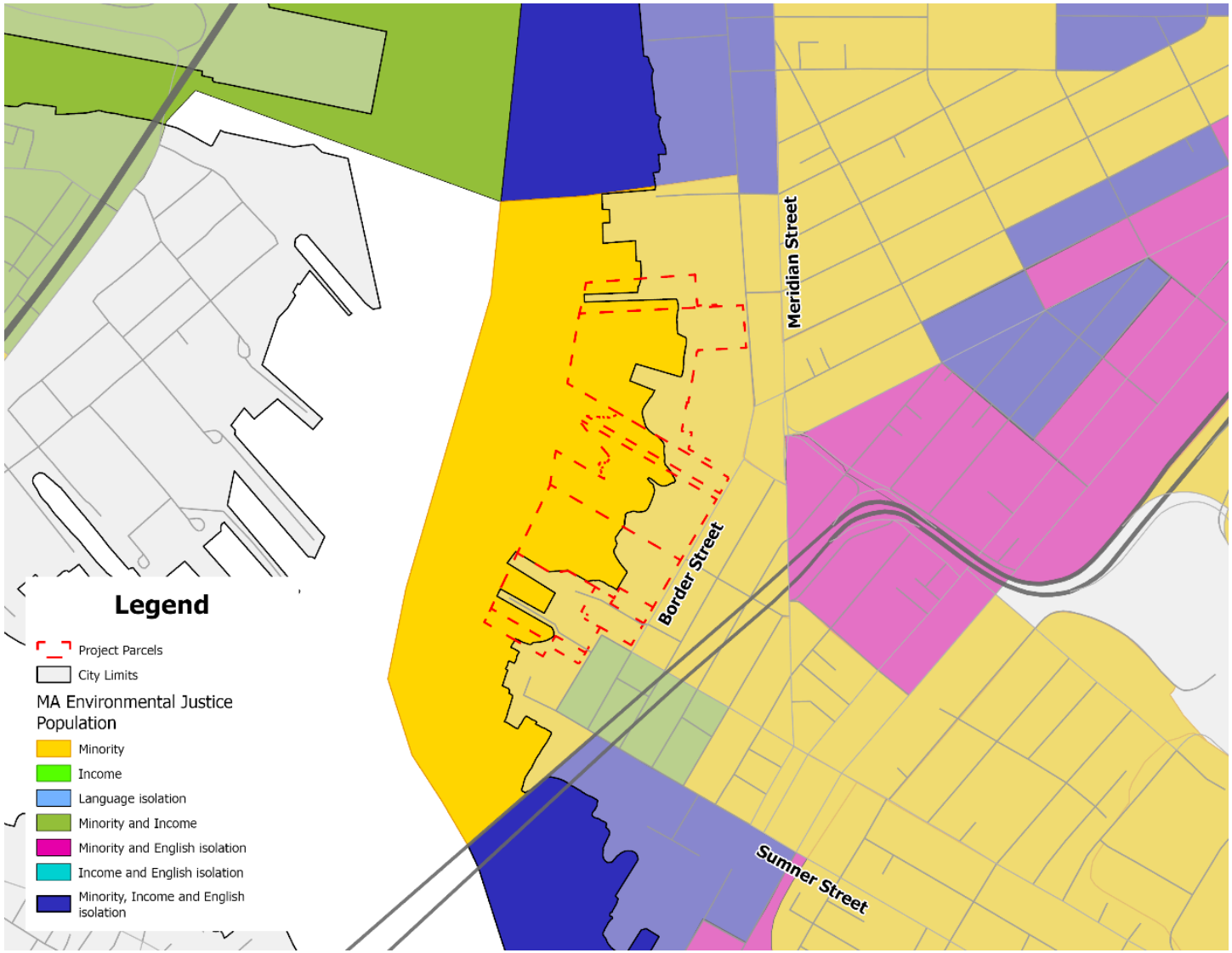


Figure 4. Massachusetts 2020 Environmental Justice Populations. Figure created by Weston and Sampson. Data sourced from Massachusetts 2020 Environmental Justice Communities.

UNDERSTANDING THE PROJECT AREA

CURRENT USES & STAKEHOLDERS

The Resilient Waterfront Border Street project area consists of seven privately-owned properties located along Border Street and New Street (Figure 5). Private property owners are crucial stakeholders in this waterfront design project as their properties and investments are directly affected by any changes that will be proposed for this waterfront area. Their involvement ensures that the project addresses concerns such as current uses and plans for future use or development, public access, and flood protection. As the project continues to engage these property owners, the project team has gathered valuable local knowledge and preferences that may lead to more effective and widely accepted solutions. Moreover, their cooperation with the project team and together as a key stakeholder group is essential for the successful implementation and maintenance of the project, as well as fostering a sense of ownership and stewardship over the waterfront's future.

Current stakeholders and property uses along the waterfront range from commercial enterprises and industrial operations to residential developments and community spaces. The current uses of the properties within the project area and their abutters are shown in the table below.

Due to the nature of this project and its public/private partnerships across the properties within the project area, the main form of feedback has been gathered through the project's three established stakeholder groups. The stakeholder groups consist of the following:

Property Owner Stakeholder Group – Property owners within the project area and abutting property owners.

Community Stakeholder Group – Representatives of East Boston community groups who will also work on community engagement efforts.

Public Agency Stakeholder Group – Representatives from relevant City departments and State agencies.

Figure 5. Property owners and abutters in the Resilient Waterfront Border Street Project Area. Photo created by Weston and Sampson.

Table 1. Project area properties and abutters as indicated in Figure 5.

PROPERTY ADDRESS	IN PROJECT AREA OR ABUTTER	ZONING[16]
10 New Street	Abutter	WMU, CFROD, PDA Designation
34-36 New Street	In Project Area	WMU, CFROD
60 Border Street	In Project Area	WMU, CFROD, PDA Permitted
80 Border Street, 102-124 Border Street	In Project Area	WMU, CFROD, PDA Permitted
126 Border Street	In Project Area	WMU, CFROD, PDA Designation
170 Border Street	In Project Area	WMU, CFROD
184-220 Border Street 246-260 Border Street	In Project Area	WMU, CFROD, PDA Permitted
266-268 Border Street	Abutter	WMU, CFROD, PDA Permitted
276 and 282 Border Street	Abutter	WMU, CFROD, PDA Permitted
276R Border Street	In Project Area	Waterfront Mixed Use, CFROD
312 Border Street	Abutter	WMU, CFROD

** Blue text indicates property is a waterfront parcel in the project area*

WMU: Waterfront Mixed Use CFROD: Climate Resilience Overlay District PDA: Planned Development Area

Property Overview

The project team conducted a desktop review of historical records and engaged with property owners through site visits conducted in late spring through summer of 2024. Both forms of data gathering led to useful and insightful information about each of the seven properties. The highlights of the data gathered are provided in the sections to follow.

34-36 New Street

34-36 New Street is a 3-acre combined lot, situated at the southern edge of the project area. 34 New Street is a small parcel with frontage along New Street (Figure 6) complete with a historic section of Mayo Wharf, as referenced in a map from 1901[17]. 36 New Street borders 34 New Street on two sides and consists of two historic wharves, Treat's Wharf and Nickerson's Wharf, and an abandoned building once used for office space (Figure 6 and 7). The parcels were evaluated together and are currently owned by Reinauer Transportation Company, LLC.

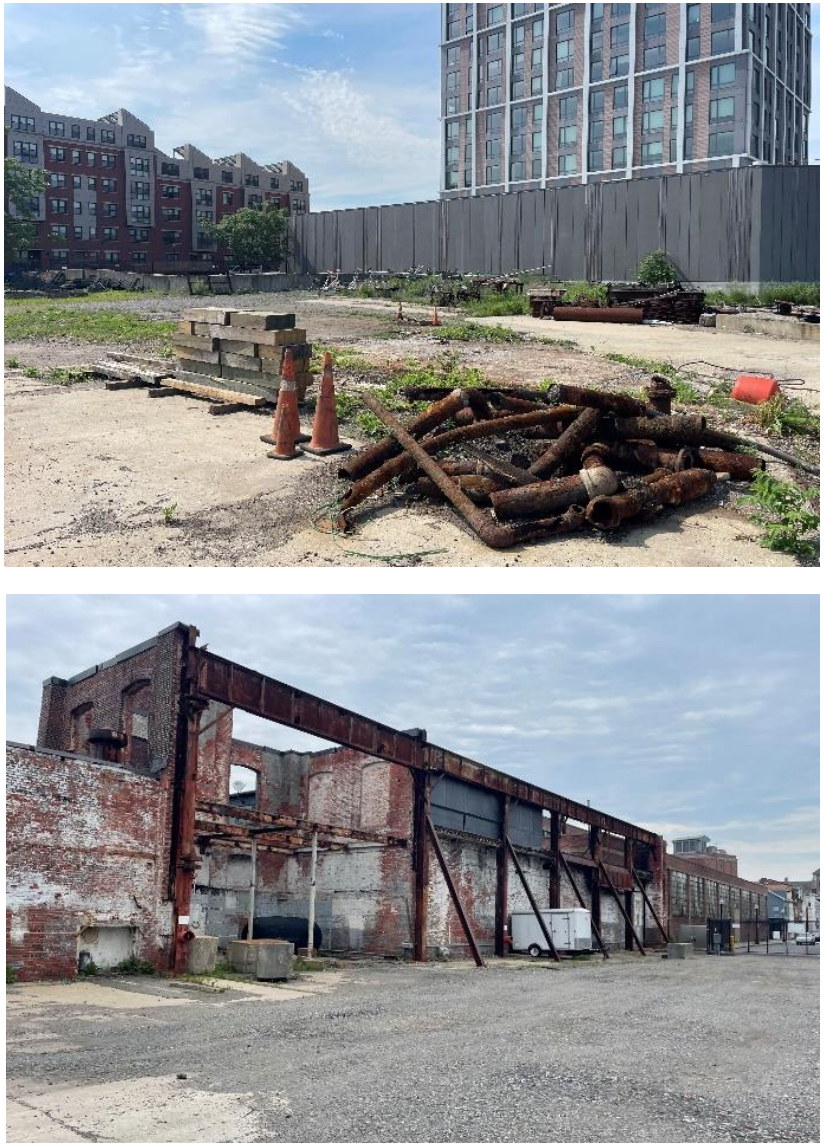


Figure 6. 34 New Street lot (top). Abandoned building bordering 36 New Street (bottom). Photos taken by Weston & Sampson, 2024.

34 New Street was previously owned by W.M.A. Gaston et al Trs. City Associates[20]. 36 New Street was previously owned by Harriet M. Adams in the late 1800's. C.W. York and Co. had a coal and wood building on the parcel at that time. In 1901, George B. Nichols was documented as parcel owner followed by Boston Cold Storage & Terminal Company with the building on the parcel being used by Leonard A. Treat Salt Fish in 1912[20].

Figure 7. Old offices (left), existing wharf (top) and repaired seawall (bottom) at 36 New Street. Photos taken by Weston & Sampson, 2024.

The existing property has three piers/wharves, a repaired seawall built in the last 10 years, and a vacant building, once used for office and storage space (Figure 7). The building on site has two large garage doors and a large metal staircase facing the waterfront. Currently, the only uses along this property are storage of construction equipment and materials, as well as day to day dock rental/industrial type boat storage within the harbor.

60 Border Street

60 Border Street is located within the project area and is currently owned by MG2 Group. The lot is historically known and was previously operated as the Wigglesworth Machine Factory. Atlantic Works also used to occupy the parcel from the late 1800's to the 1920's[20].

The main portion of the building is an approximately 35,000 square foot warehouse area historically housing large machinery equipment and is currently leased as an industrial storage site for Alaris Construction (Figure 8, top). The building has since been retrofitted to add more functionality with conference space, storage area, and office space that is currently leased by property management group, Grid Management. Around the main warehouse building, the lot is entirely comprised of an asphalt parking area.

Figure 8. Existing building being leased by Alaris Construction (top) and waterfront at 60 Border Street (bottom). Photos taken by Weston & Sampson, 2024.

This property has the smallest portion of waterfront land within the project area, along its northwestern edge, bordering the eastern property line of 34-36 New Street and the western property line of 80 Border Street (Figure 8, bottom).

80 Border Street and 102-124 Border Street

80 and 102-124 Border Street are both currently owned by the East Boston Community Development Corporation (EBCDC). Both parcels were historically used as a shipyard and industrial use area but have been inactive for at least a century. Atlantic Boiler Works leased the parcels from East Boston Dry Dock Company in the early 1900's[18] (1912-1922).

The parcel located at 80 Border Street, has its original building which had been previously used as an auxiliary building for the vacant lot located at 102-124 Border Street. The three-story brick building (Figure 9) at 80 Border Street was originally built by Atlantic Works in 1893 and was later renovated in 2010[19].

There is a large arched doorway on the side of the building and another smaller arched doorway facing New Street. The building is currently occupied by commercial uses, including a daycare on the ground floor, artist workspaces on floors one and two, and the EBCDC offices and Atlantic Works gallery on the top floor, with plans from the East Boston Museum and Historical Society to open a neighborhood East Boston Historical Museum.

Figure 9. Atlantic Works building at 80 Border Street. Photo taken by Weston & Sampson, 2024.

Figure 10. Parking area utilized by 80 Border Street (top) and the community garden (bottom) at 102-124 Border Street. Photos taken by Weston & Sampson, 2024.

The neighboring vacant lot at 102-124 Border Street is currently comprised of a grassy dirt parking area for the building located at 80 Border Street, a small community garden near the water's edge, and an unofficial dog run utilized by neighboring residents from the Boston East residential property (Figure 10). The shoreline includes a historic marine railway/boat launch and other features from its past use.

126 Border Street

126 Border Street is within the project area and is home to the Boston East apartment complex. The parcel was owned by W. J. Humphrey in 1884 and later Sylvester B. Hinckley in 1892[20]. The parcel then transferred ownership in 1901 to John F. Randall, again in 1912 to Oakley C. Curtis, and in 1922 where Burton Furber Coal Co. retained coal sheds on the parcel. The parcel was most recently owned by American Reality Advisors but was acquired by Goldman Sachs in July of 2024.

The existing apartment complex has 200 units, 26 of which are to be rented at an affordable rate. The building consists of a "U" shape, with the two arms of the building stretching towards the waterfront. The complex was completed in 2018 and provided the neighborhood with a new stretch of a publicly accessible Harborwalk along the waterfront. The Harborwalk was completed with a small seawall on the water side and a berm on the building side leading to the

building's higher elevation along the waterfront, as well as a kayak launch accessible to the public (Figure 11).

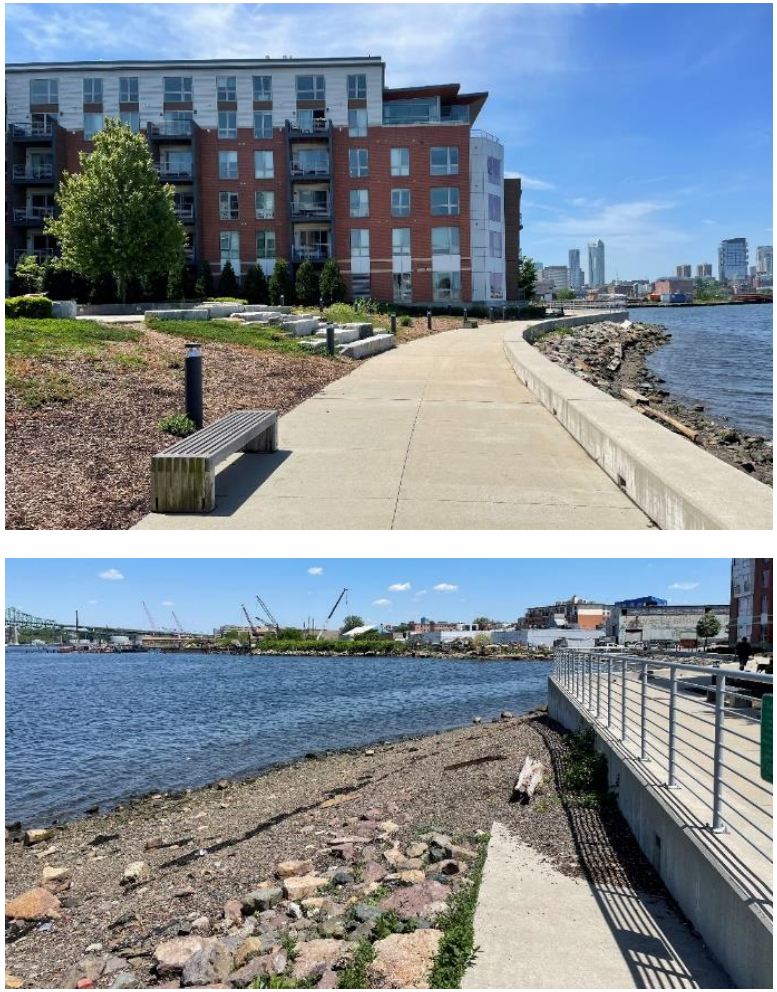


Figure 11. Harborwalk (top) and kayak launch (bottom) behind the Boston East Apartment complex at 126 Border Street. Photos taken by Weston & Sampson, 2024.

Boston East, the subject parcel, and the Eddy property to the southwest were recently developed as residential parcels. The removal from the DPA was facilitated by amendments to the East Boston Municipal Harbor Plan. The Boston East property is the only property within the project area that is not located within the bounds of the DPA, and therefore is not subject to its regulations.

170 Border Street

170 Border Street is within the project area and is currently owned by Capitol Waste Services. 170 Border Street was originally owned by Halls Shipyard in 1884, and was neighbored by several coal yards, boiler shops, and saw and planning mills. In 1892, the site was recorded under the ownership of Geo McQueston Co. Lumberyard and was sold again to Federal Wharf Storage Company around 1912[20].

The parcel is one of the smaller areas located within the project area and includes a condemned building that was originally built in 1945. The building was previously used for warehousing and is surrounded by a dirt parking lot and several storage areas along the waterfront (Figure 12).

Figure 12. Vacant building and storage space (top) and the waterfront area (bottom) at 170 Border Street. Photos taken by Weston & Sampson, 2024.

Figure 13. Sloped dirt driveway at 170 Border Street. Photo taken by Weston & Sampson, 2024.

In recent years, the lot has been rented out for parking and storage of construction equipment, first during the development of the next-door Boston East Apartment complex and more recently for MassDOT's work on the Sumner Tunnel.

Despite its potential, the parcel has remained undeveloped due to zoning restrictions and state Designated Port Area (DPA) regulations. The waterfront along the property's northwest edge is at a lower elevation than the rest of the site and frequently floods during high tides and major storms (Figure 13). Although there is no existing seawall, the higher elevations and seawalls on adjacent properties present an opportunity to integrate a new seawall. The

low-lying elevations and lack of deep water along this portion of the waterfront make it difficult for the integration of any ship-to-shore transfer marketability and use of the lot.

184-220 Border Street and 246-260 Border Street

184-220 and 246-260 Border Street are within the project area and are known today as Liberty Plaza. The parcel's oldest known owners were John S. Weeks and John F. Weeks in 1884 until 1922. The parcels were then sold to City Fuel Company who owned the parcels until the 1950s[20]. when it was purchased by the current property owner, the Lombardo family.

The shopping plaza is anchored by flagship stores such as Shaw's, AutoZone, CVS Pharmacy, and Marshalls. Notably, Shaw's serves as the neighborhood's sole food store and supermarket, making this plaza the only shopping center in the Central Square area of Border Street and within the project area.

The shipping and receiving areas for the Shaw's store is in the back of the plaza along the waterfront (Figure 14), where frequent flooding during high and king tides was noted by several community members and Shaw's employees during the site visits. Any flood mitigation techniques will need to account for turning radius for trucks frequenting the loading docks along the edge of the property. There is also a small pedestrian path near the water at the back of the parcel with benches and a fence, as well as a pier blocked off from public access.

Figure 14. Loading dock (top) and waterfront area behind the Shaw's grocery store at Liberty Plaza. Photos taken by Weston & Sampson, 2024.

Figure 15. Loading docks behind the Autozone (top) and C. White Marine Construction entrance behind Liberty Plaza. Photos taken by Weston & Sampson, 2024.

The back of the plaza is also home to the only marine industrial use within the project area boundaries. C. White Marine leases waterfront space behind the loading dock of the AutoZone and CVS building, operating a marine construction and general contracting company (Figure 15).

276R Border Street

276R Border Street is currently a vacant parcel that sits behind several parcels with frontage along Border Street. Richard F. Green owned the parcel in the late 1800's, with John A. McKie taking over in 1901. In 1922, the parcel was owned by ACME White Lead and Color Works[20]. To the best of the project team's knowledge, the current owner is believed to be deceased, and control of the trust is reliant upon probate process as of November 2024.

The parcel is almost entirely made up of fill, with a long wharf out into the harbor (Figure 16). Along the edge of the property there are clear areas of erosion, where much of the fill and vegetation has fallen into the harbor. The parcel is entirely fenced off from the public. While it is currently storing construction equipment, there is no indication of industry or lot maintenance being conducted on the parcel.

Figure 16. Vacant lot at 276R Border Street. Photos taken by Weston & Sampson, 2024.

PUBLIC & PRIVATE UTILITIES

Topographic survey, design, and as-built record documents provided by abutting property owners as well as the Boston Water and Sewer Commission (BWSC) were reviewed in order to understand any existing drainage or utility features within the project area. The largest existing drainage/utility feature within the project area is a 60" drainage outfall pipe that was relocated during the development of the Boston East Multifamily Residential Development at 126 Border Street (Figure 17).

The Utility As-Built Plan produced for Trinity Border Street, LLC in November of 2017 (Figure 22) depicts the outfall pipe in relation to the anticipated project area. In addition to the 60" outfall pipe, an underground drainage network collecting runoff from north and west portions of the Boston East site is located within the project area and connects to the aforementioned outfall pipe. At the Shaw's Supermarket parcel (246 Border Street), BWSC records show a 36" drainage outfall pipe located at the alley between Shaw's Supermarket and Wigglesworth Machinery, 60 Border St, East Boston, MA 02128 (Figure 18).

The As-Built plan provided by BWSC was produced in May of 2007 and shows that the 36" outfall pipe was partially filled with concrete at the initial structure on Border Street. It is assumed that the remainder of the pipe was abandoned in place. In addition to the two outfalls described above, other minor utilities exist within the

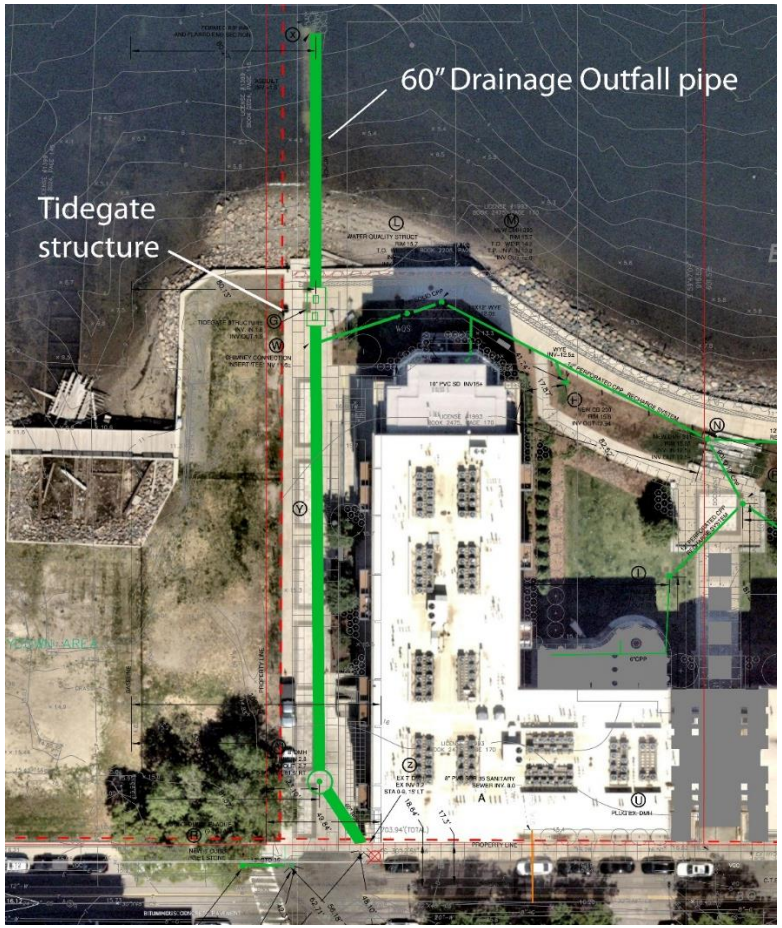


Figure 17. 60" drainage outfall pipe south of East Boston Property. Plan provided by property owner.

project area such as an abandoned 4" water service traversing the 124 Border Street lot and electrical services for lighting at the Boston East/Shaw's Supermarket waterfront areas (Figure 18).

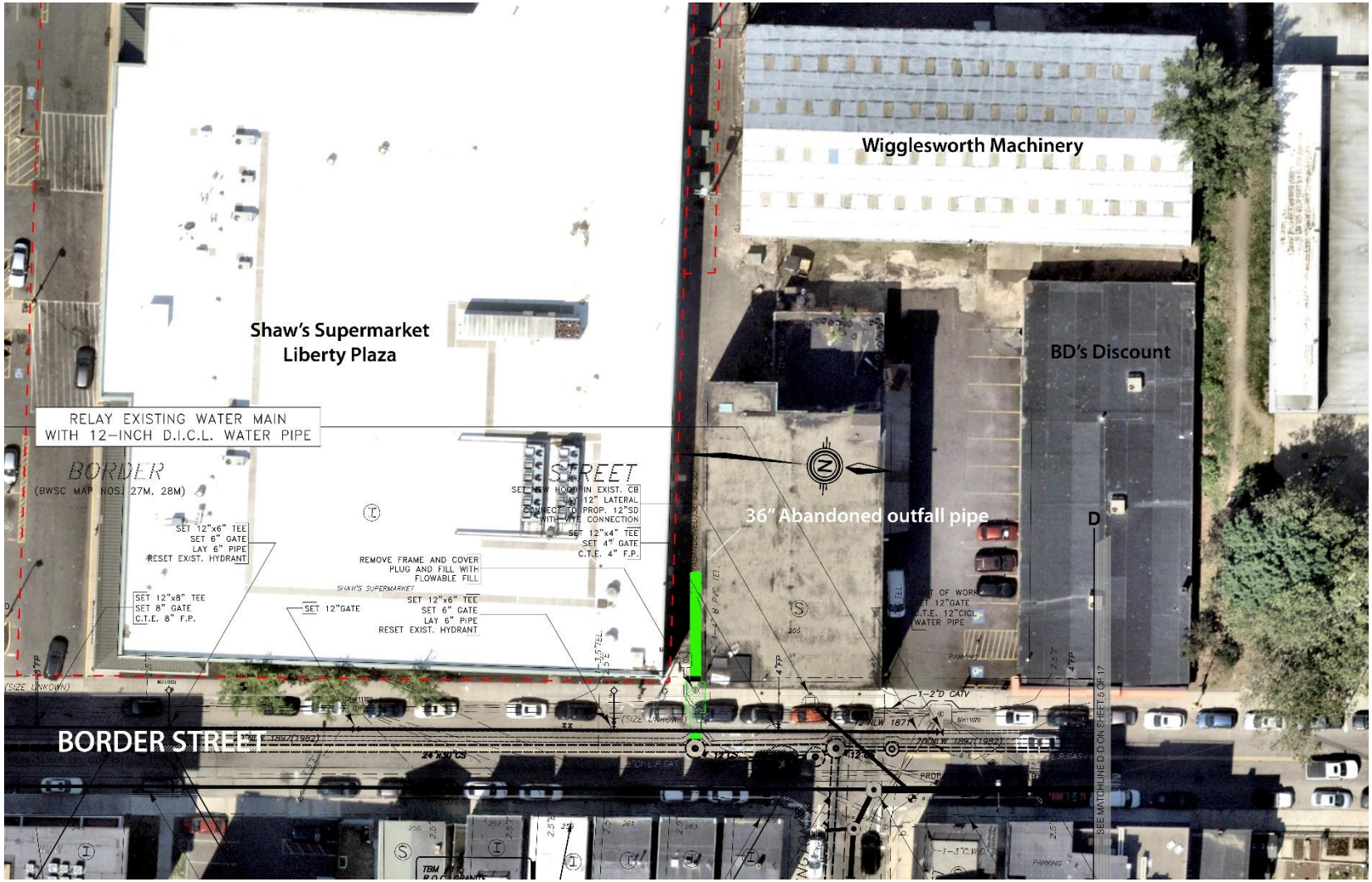


Figure 18. Abandoned 36" drainage outfall pipe north of Shaws Supermarket Property. Plan provided by BWSC.

TOPOGRAPHY

An existing conditions survey was conducted in the field between April 16, 2024 and August 19, 2024, by Green International Affiliates, Inc. This survey is based upon the Boston City Base (BCB) vertical datum, key elevations and datum conversions are provided in Table 2 below:

Table 2. Boston City Base Key Water Elevations

REFERENCE ELEVATION	ACRONYM	ELEVATION (FEET)	
		NAVD88	BCB*
100-yr Flood Elevation	Zone AE	11.0	17.46
Mean Higher High Water	MHHW	4.77	11.23
Mean High Water	MHW	4.33	10.79
Mean Low High Water	MLW	-5.16	1.30
2030 1% Flood Elevation	MC-FRM	12.0	18.5

*BCB (Boston City Base) and NAVD88 (North American Vertical Datum of 1988) are vertical datums for measuring elevation. NAVD88 is the standard used across North America, while BCB is a localized datum. The approximate conversion between BCB and NAVD88 is ±6.46 feet.

The survey obtained elevations, physical features, and visible utilities along an approximate 175-foot swath landward from the waterfront. Table 3 summarizes observed elevations within the limits of the survey area (Figure 24), landward of any seawall, revetment, bulkhead, or coastal bank.

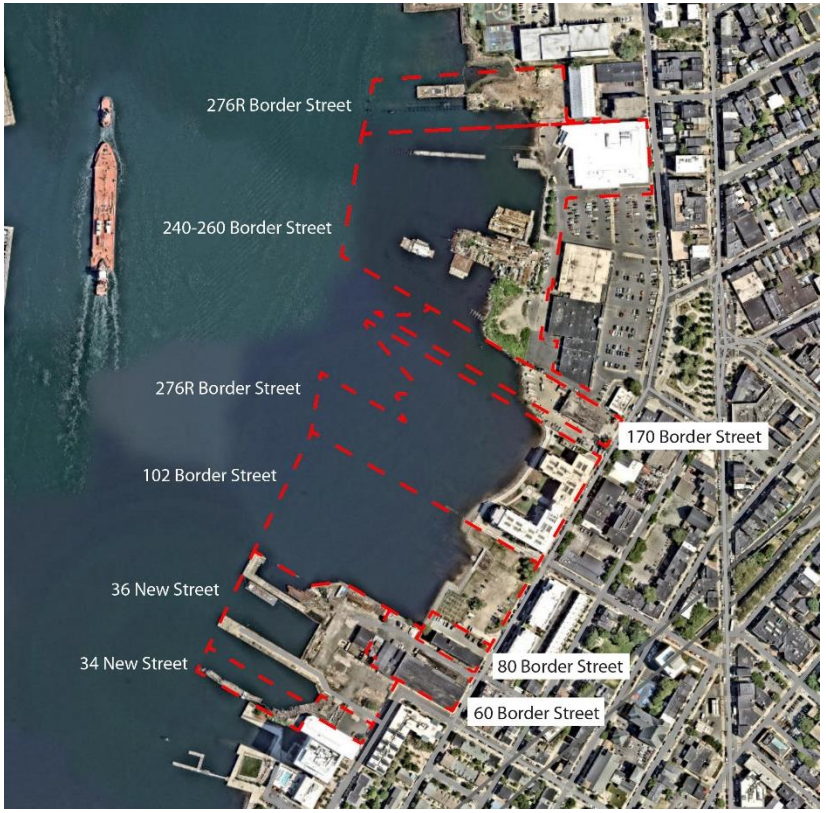


Figure 19. Properties within the Border Street Project Area. Weston & Sampson, 2024.

Table 3. Observed Landward Elevations within the Limits of the Survey. The survey was conducted on site in May and June 2024.

PROPERTY ADDRESS	HIGH ELEVATION (FEET)		LOW ELEVATION[1] (FEET)		FIRST FLOOR ELEVATION (FEET)	
	NAVD88	BCB[2]	NAVD88	BCB	NAVD88	BCB
34-36 New Street	10.94±	17.4±	-3.46±	13.7±	10.43±	16.89
60 Border Street	11.14±	17.6±	6.54±	13.0±	11.0±	17.46
80 Border Street	11.24±	17.7±	8.24±	14.7±	11.21±	17.67
102-124 Border Street	10.24±	16.7±	8.64±	15.1±	Not Applicable	
126 Border Street	13.34±	19.8±	8.94±	15.4±	14.16±	20.62
170 Border Street	9.64±	16.1±	6.54±	13.0±	9.82±	16.28
184-220 Border Street	11.84±	18.3±	8.14±	14.6±	10.34±	16.8±
246-260 Border Street	10.04±	16.5±	7.14±	13.6±	11.64±	18.1±
276R Border Street[3]	9.24±	15.7±	6.54±	13.0±	Not Applicable	

[1] Low elevation provided is landward of any seawalls, revetments, bulkheads, or coastal banks.
[2] A conversion factor of 6.46 was utilized to convert the elevation from NAVD88 to Boston City Base.
[3] A complete survey of the 276R Border Street property was not able to be completed due to lack of access.

Elevations generally slope downward from east to west towards the harbor and then gently slope downward from south to north. Three (3) of the seven (7) buildings lie below the current 100-year flood zone elevation of 17.46 BCB. The interface with Boston Harbor varies from steel sheet-pile bulkheads, concrete revetments, rip-rap slopes, and natural slopes (including rocky-intertidal shore, coastal beaches, and coastal banks).

ENVIRONMENTAL CONSIDERATIONS

To evaluate the presence of oil and/or hazardous materials (OHM) within the project sites, a desktop review of historical documentation was conducted, as well as a review of available MassDEP documents for surrounding state-listed hazardous waste sites on file with the Bureau of Waste Site Cleanup. Historical documentation was used to evaluate former occupants, industries, and overall area land use to identify potential areas of environmental concern. Sanborn maps and historical city atlases were collected for the project area through Environmental Data Resources (EDR), covering a period from the 1870s until Present. The maps can be found in Appendix A.

Historical Records Review

East Boston's waterfront has been historically dominated by shipbuilding and industrial operations. Common industries along the waterfront included dry docking, canning, and machining, as well as the storage of coal, wood, sugar, and other commodities. Beginning in the early to mid-19th century, the area experienced a rapid expansion in land by way of filling. Surrounding waterways and tidal flats were filled with a mix of natural and anthropogenic materials. During subsequent development of the project area, significant earthwork and remediation of these conditions has occurred to support the new construction. In recent years, the area has been primarily occupied by commercial and residential properties. The findings of assessments done on the properties surrounding the project area were documented in regulatory filings to MassDEP and were reviewed to gain additional information on likely contaminants and conditions that may be encountered during future construction activities associated with the project.

Site Contamination and Remediation Activities

A review of available documentation accessible through the MassDEP Searchable Site List Database was conducted for local sites which have had a release of oil or hazardous materials (OHM) reported to MassDEP. These releases are managed under the Massachusetts Contingency Plan (MCP), as promulgated in 310 CMR 40.0000. Following identification of the release and reporting to MassDEP, a unique Release Tracking Number (RTN) is assigned to each Site for tracking of subsequent report submittals detailing assessment and remediation activities. The review identified three (3) RTNs associated with the locus sites that were considered most likely to impact subsurface

conditions. Approximate boundaries of the disposal sites that occur within the project area or in proximity are presented as Figure 20. Note that in some instances, multiple RTNs had been assigned to a single parcel.

In general, releases in the project area are largely attributed to impacted historical fill, underground storage tank (UST) releases, and spills from previous property use. Urban fill is ubiquitous, with contamination from polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH), and heavy metals documented on numerous parcels at concentrations exceeding regulatory thresholds. This is not uncommon for Boston waterfront areas.

A former Brownfield site exists onsite at the 102-144 Border Street location. According to available documentation, investigations at the vacant property indicated no evidence of former USTs, a former presence of oils and hazardous waste, and a potential for asbestos containing material (floor tile). Investigation indicated that environmental cleanup was necessitated and subsequently completed through Brownfield funding. In addition to locus concerns, off-site releases have the potential to migrate toward the locus through groundwater flow and could result in the need for the services of a licensed site professional (LSP) for the proper handling and disposal of excavation.

Parking area and community garden at 102 Border Street.

Figure 20. Locations of previously identified Release Tracking Numbers for reporting assessment and site remediation activities to MassDEP.

COASTAL INFRASTRUCTURE AND FEATURES

A routine-level above-water inspection of the existing coastal infrastructure was conducted by Collins Engineers, Inc. (Collins) between August 13th and 14th 2024. The purpose of the inspection was to evaluate the condition of the existing earth retaining structures and identify the sizes and extents of unstable areas or significant deterioration. Collins' inspection was limited to a visual conditions assessment in the waterfront areas of each site, which were publicly accessible from the topside or shoreline, or accessible by boat to observe from the water. Inaccessible areas of the topside of sites were supplemented with drone photographs to aid in the conditions assessment of the shoreline structures.

These properties consist of various waterfront structures including steel sheet pile (SSP) bulkheads, timber bulkheads, soldier (king) pile bulkheads, urban fill embankments, stone revetments, cast-in-place (CIP) and precast concrete seawalls, granite block seawalls, and a Harborwalk located immediately behind some of the publicly accessible existing shoreline structures. Each individual waterfront structure within the limits of the project was visually assessed and assigned a condition assessment rating, in accordance with the American Society of Civil Engineers Manual on Practice 130 for Waterfront Facilities Inspection and Assessment (ASCE MOP 130) Condition Assessment Rating scale. This Scale and description of each level of the Condition Rating is provided below in Table 4.

Historic drydock infrastructure at low tide on the 102 Border Street waterfront.

Table 4. Condition Assessment Rating scale, developed by the ASCE Waterfront Facility Inspection Committee and summarized in the MOP 130.

RATING	DESCRIPTION
Good (6)	No visible damage or only minor damage is noted. Structural elements may show very minor deterioration, but no overstressing is observed. No repairs are required.
Satisfactory (5)	Limited minor to moderate defects or deterioration are observed, but no overstressing is observed. No repairs are required.
Fair (4)	All primary structural elements are sound, but minor to moderate defects or deterioration are observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
Poor (3)	Advanced deterioration or overstressing is observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may be carried out with moderate urgency.
Serious (2)	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
Critical (1)	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very priority basis with strong urgency.

Conditions of the existing waterfront infrastructure within the project limits varied greatly by property, ranging from critical to satisfactory condition overall. Much of the existing infrastructure exhibited signs of significant deterioration, indicating that improvements to these structures would be required to stabilize the existing shoreline and prevent further failures from occurring prior to or in tandem with performing any resilience improvements. The primary typical deterioration observed included corrosion holes and loss of fill behind steel and timber bulkheads, erosion and washout of formerly retained fill on earthen banks, undersized or missing/displaced stones and settlement in riprap revetments, minor spalls and cracks of the cast-in-place and precast concrete seawalls, and loss of mortar, bulging of the seawall, and stone displacement in masonry seawalls. Primary modes of failure originated from corrosion holes in the steel sheet pile and timber bulkheads resulting in loss of fill and failure of the tie-rods and wales, and collapse of isolated areas of the masonry seawall.

Results from the waterfront structural inspection will be used in the preliminary evaluation of coastal resilience alternatives including necessary repairs, replacements, and/or new construction of various flood protection alternatives. The observations and deficiencies noted during the inspection will be referenced in future phases of design to determine the limitations of the existing waterfront infrastructure in terms of supporting future construction efforts under the Resilient Border Street Waterfront Project. Given the deteriorated condition of a majority of the shoreline infrastructure at the site, repairs and replacements of deteriorated components of the waterfront will be necessary to ensure the structural integrity and longevity of the existing infrastructure as well as to provide a solid foundation to support proposed improvements that adapt for current and future resilience considerations.

EASEMENTS

Full title reports and boundary surveys have not been conducted for the properties in the Resilient Border Street Waterfront Project study area at this time. A review of readily available records at the Suffolk Country Registry of Deeds (SCRD) for the subject properties has identified several easements that are in the vicinity of the area of work. These easements and their ancillary rights will need to continue to be accommodated during construction and post-construction phases of any contemplated project(s). The properties are also subject to Chapter 91 licenses that are recorded at the SCRD and discussed later in this report. A summary of identified easements within the vicinity of the Resilient Border Street Waterfront Project study area are provided below:

34-36 New Street (SCRD Book 25722 Page 277)

The locus deed identifies two easements (including one modification) that encumber the property. The references are:

- SCRD Book 2721 Page 387 recorded November 26, 1900
- SCRD Book 2726 Page 243 recorded November 27, 1900 modifying the above referenced easement; and
- SCRD Book 2795 Page 134, recorded December 16, 1901

Deeds referenced above pre-date the online files at the SCRD and will need to be investigated further.

60 Border Street (SCRD Book 53977 Page 153)

The locus deed identifies the following conditions, encumbrances, and/or easements:

- SCRD Book 6918 Page 177 recorded November 24, 1953
- SCRD Book 6749 Page 93 recorded December 31, 1951, identified a restrictive covenant.

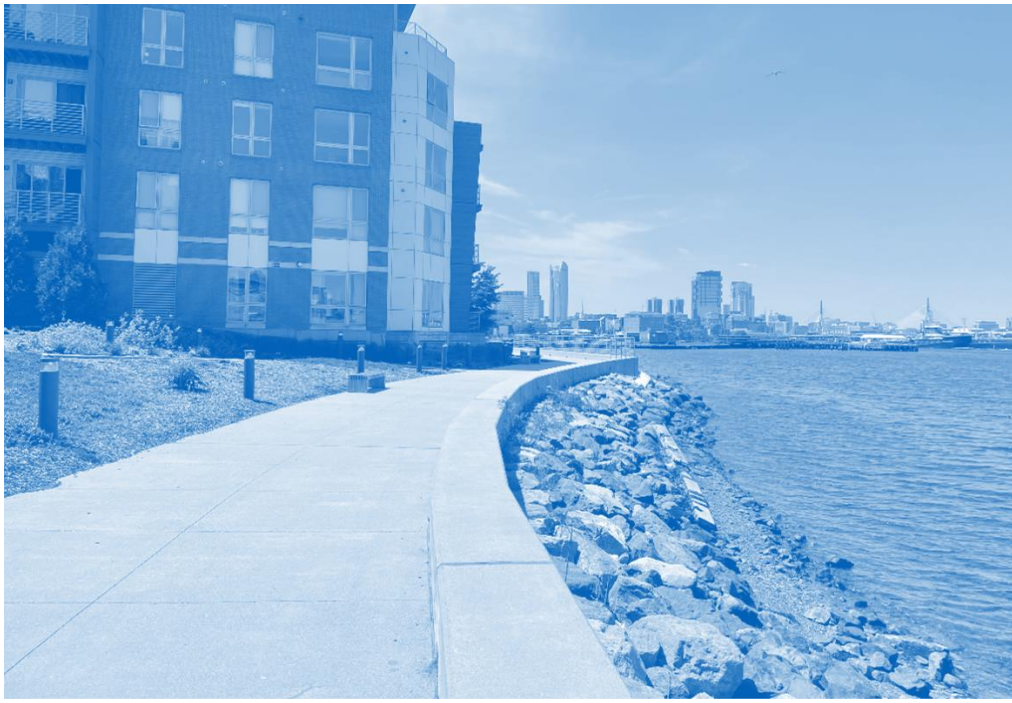
Deeds referenced above pre-date the online files at the SCRD and will need to be investigated further.

80 Border Street (SCRD Book 38727 Page 171)

No easements referenced in locus deed.

102-124 and 126 Border Street (SCRD Book 55516 Page 319)

The locus deed refers to a plan recorded with the deed (SCRD Plan 533 of 2015) indicating five easements for public access that must be honored in the design. Easement areas are depicted as the shaded areas in Figure 21, below.



Existing Harborwalk at 126 Border Street.

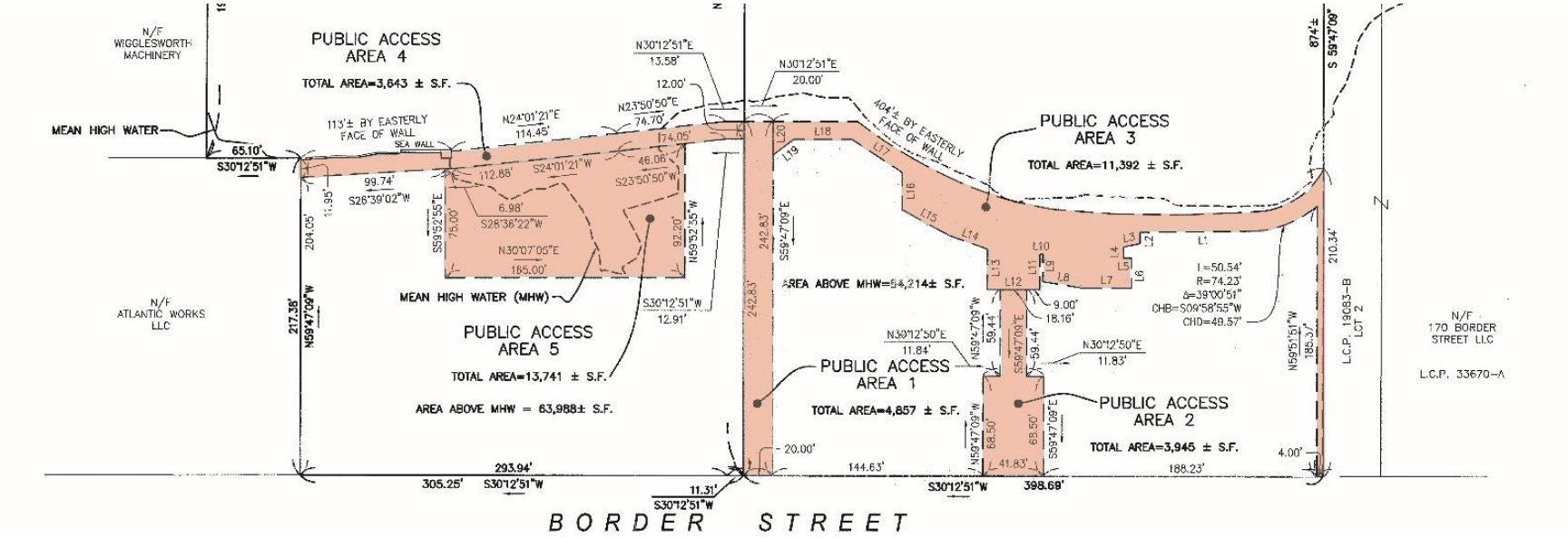


Figure 21. Portion of Suffolk County Registry of Deeds Plan No. 533 of 2015 Showing Public Access Easements over 120-124 Border Street and 128 Border Street.

170 Border Street (SCRD Book 10181 Page 305)

The locus deed refers to an easement filed in the Land Court as Document No. 171971 that allows the City of Boston the right to install and maintain an underground drainage culvert and sewer system overflow across the land to the Harbor.

184-220 Border Street and 246-260 Border Street (SCRD Book 56307 Page 177)

The locus deed refers to Plan No. 291 of 1997 indicating several easements for access and deliveries that will need to be honored in any design for mitigation shown in Figure 22.

276R Border Street (Land Court Certificate No. 139052)

The locus deed references a common easement for the use, repair, and maintenance of existing power lines and transformers serving the parcel. The referenced plan was not able to be located through the Land Court.

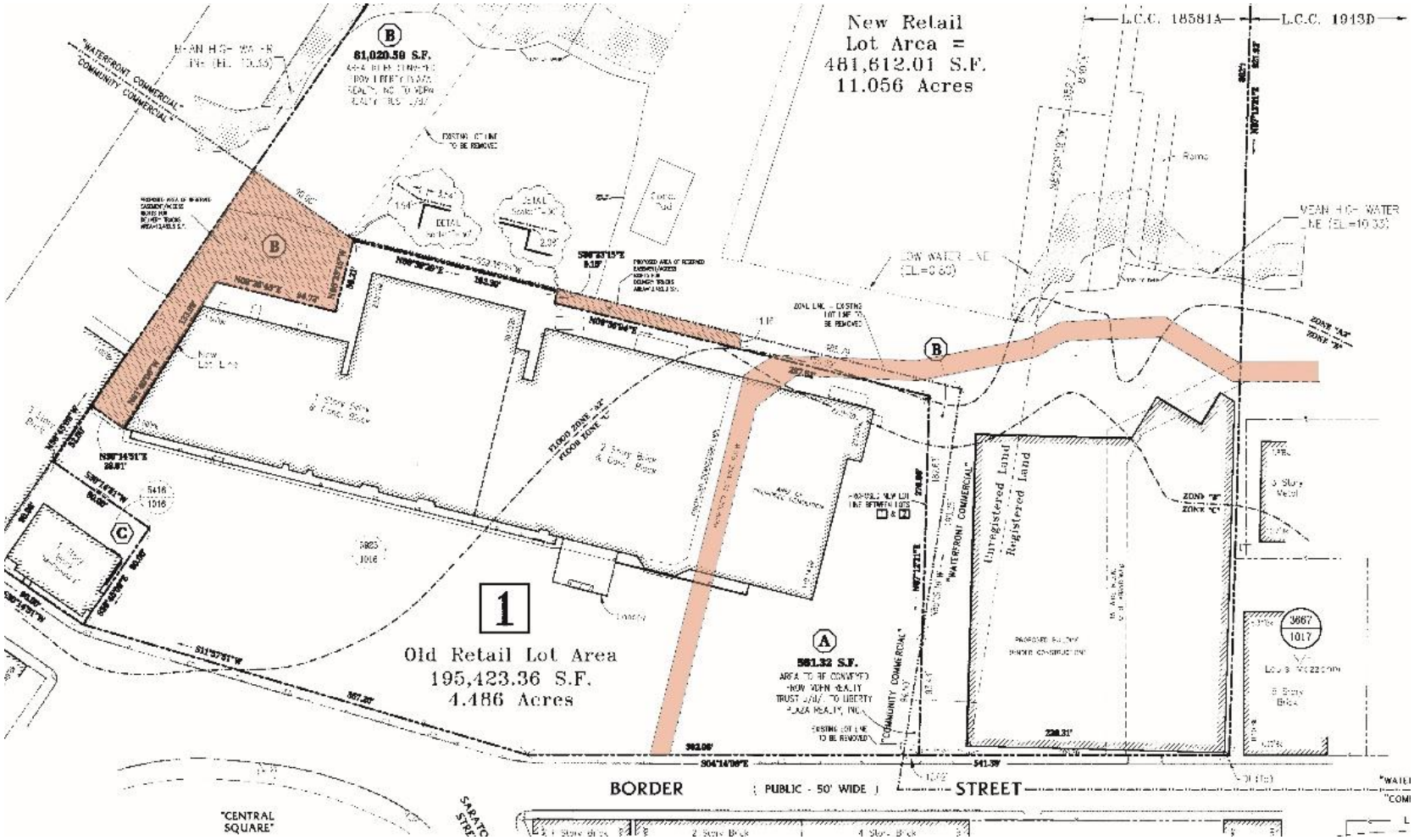


Figure 22. Portion of Suffolk County Registry of Deeds Plan No. 291 of 1997 Showing Access Easements over 246-260 Border Street

HISTORIC AND PRESENT-DAY FLOODING

Many waterfront neighborhoods were built on filled land to accommodate the growing city. The Resilient Border Street Waterfront Project area in East Boston, developed in the mid-1800s, was originally used for commercial port activities and housing. This land was elevated enough to be functional at the time, but as sea levels have risen (and are expected to continue rising), the flooding experienced during the 2018 winter storms Grayson and Riley and during winter 2023/2024 is anticipated to become more frequent and severe in the coming decades.

Storms have increased in frequency and intensity. Flooding in and around the Resilient Border Street Waterfront Project area have become a much more common occurrence. In January of 2024, a coastal storm led to high levels of inundation along the Border Street waterfront. Many of the parcels within the project area saw impacts from coastal flooding as sea levels rose against the existing flood protection (Figures 23-25).

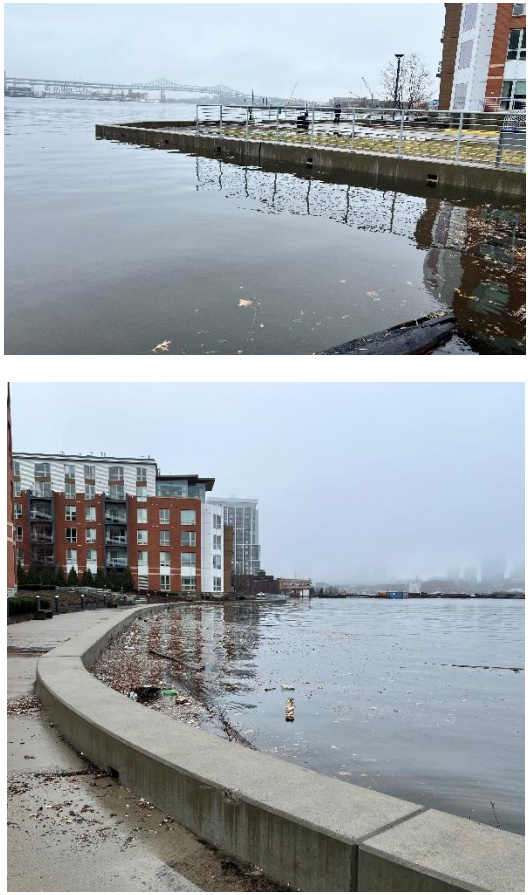


Figure 23. Flood waters reaching the scuppers on the seawall at the Boston East Apartments at 126 Border Street during January 2024. Coupled with a king tide event, or a few more inches of rain and the seawall's elevation would not have blocked the flood waters. Weston & Sampson, 2024.

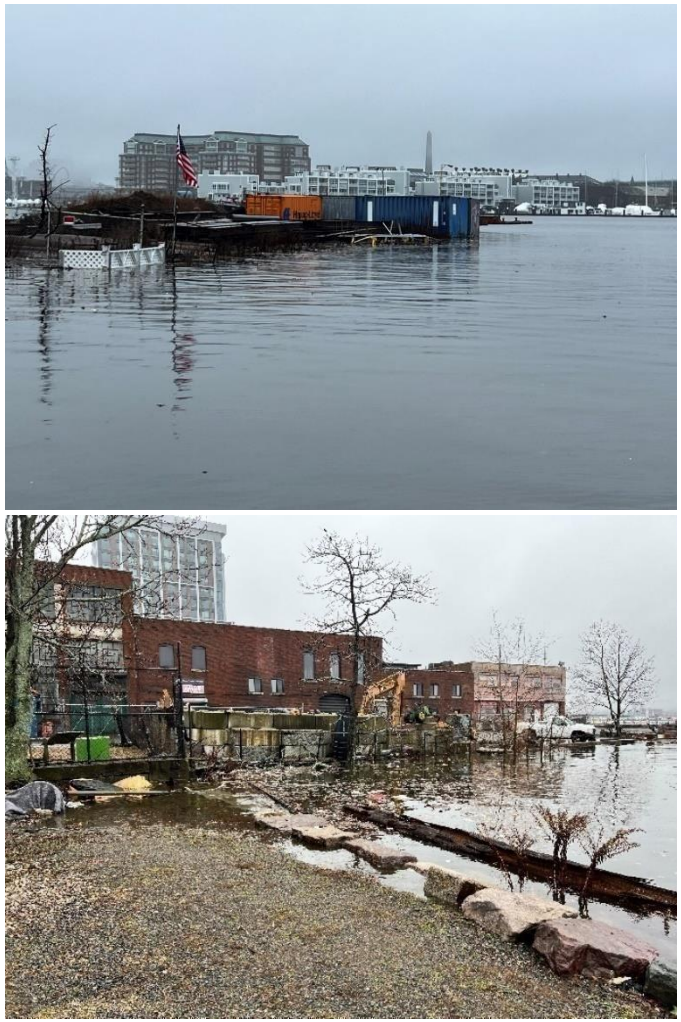


Figure 24. Flood waters overlooking the patio at end northwestern corner of 60 Border Street where it meets the 36 New Street property. January 2024 (top). Flooding just coming over the revetment at the back of 80 Border Street along the gravel Harborwalk. January 2024 (bottom). Weston & Sampson, 2024.

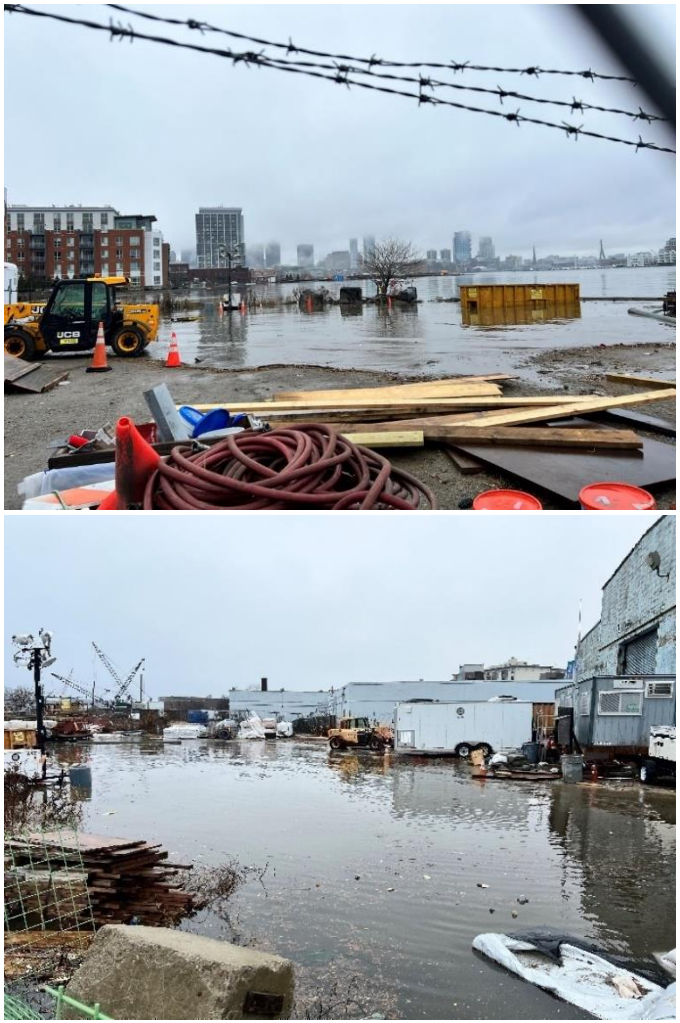


Figure 25. Flooding present on the 170 Border Street property during the January 2024 storm. The flood waters are completely over the earthen slope and are spanning well onto the property's low-lying areas, reaching the edge of the building. Weston & Sampson, 2024.

FEMA

FEMA manages the federal government's response to natural and man-made disasters. FEMA also manages the National Flood Insurance Program, which produces Flood Insurance Rate Maps (FIRMs), which are a resource for assessing the present-day coastal flood risk along the Border Street Waterfront, as shown for the project areas in Figure 26.

Much of the project area is located within the 1% Annual Chance Flood Hazard zone, also known as the 100-year floodplain. This can be explained as the properties within the boundary having a 1% probability of experiencing a significant flood event in any given year. Flooding on waterfront property is not uncommon, but as sea levels continue to rise and major storm events continue to increase in frequency and intensity, flooding is projected to worsen over time. According to the FEMA FIRMs, the base flood elevation across the project area ranges from elevation 17.5 ft-BCB (11 ft-NAVD88) at the southern end at 34/36 New Street property to 16.5 ft-BCB (10 ft-NAVD88) across the majority of the project area. The Limit of Moderate Wave Action (LIMWA) is approximately 10-15 ft inland from the existing shoreline on the 34/36 New Street property.

Waterfront at the abutting property, the Eddy.

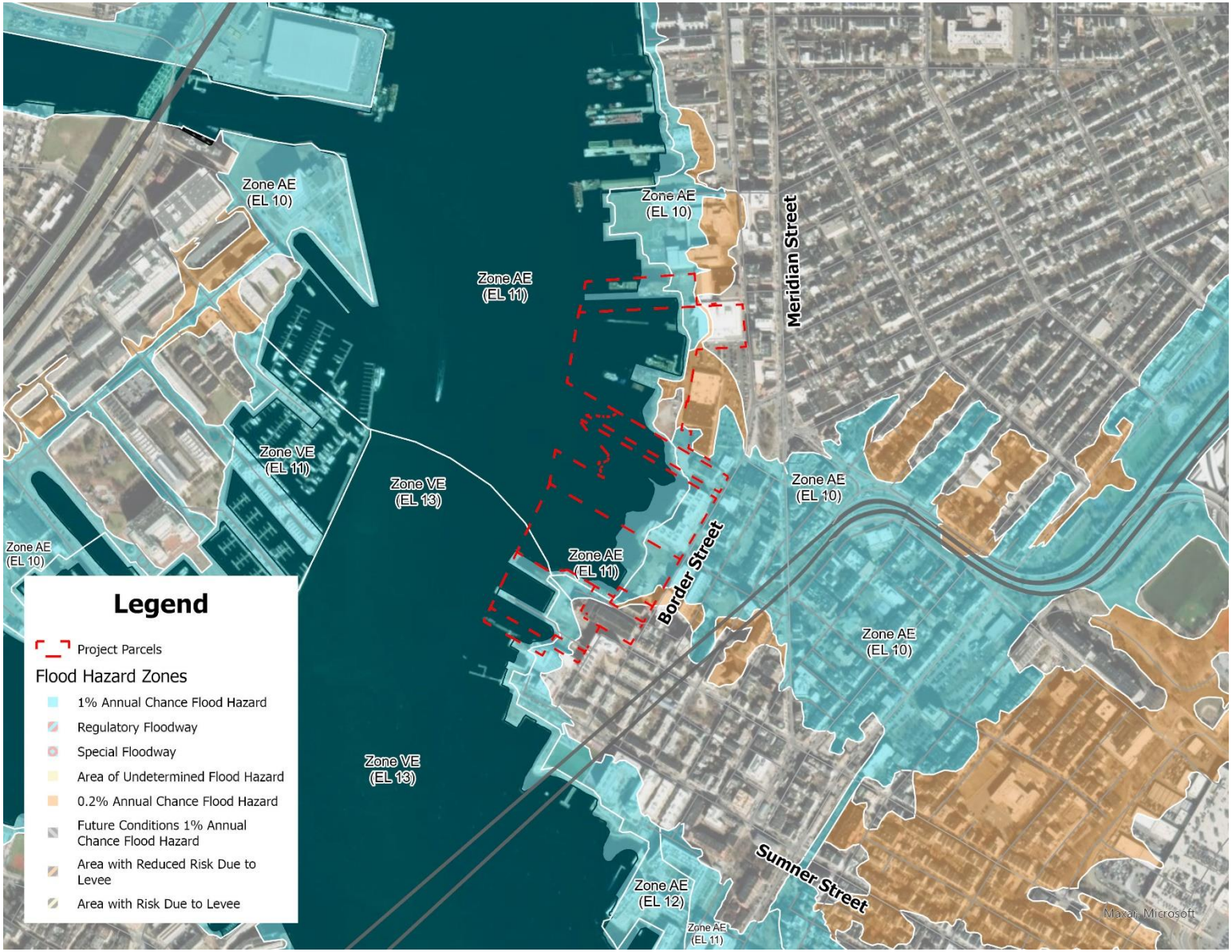


Figure 26. FEMA FIRM Map of the Project Area. Source data: FEMA.

REGULATORY AND LAND USE CONSIDERATIONS

The determination of applicable environmental permits and approvals is dependent on the type and magnitude of proposed impacts to protected environmental resources as well as use(s) and type(s) of activity/activities occurring within regulated waterways. Environmental resources and regulated waterways in the general project area include the following:

- Navigable Waters of the United States (tidal and sub-tidal);
- NOAA ESA listed species habitat;
- Land under the ocean;
- Coastal beach;
- Coastal bank;
- Land subject to coastal storm flowage (100-year flood zone);
- 100-foot buffer zones of coastal beach and coastal bank;
- Priority and estimated habitat for rare or endangered species;
- Waterfront area (25-foot buffer zone of coastal beach and coastal bank;
- Filled and flowed tidelands;
- East Boston Designated Port Area (DPA); and
- Waterfront Mixed Use Subdistrict, per City of Boston Zoning Code.

The location of proposed project improvements will determine which of the above-mentioned resource(s) and/or regulated area(s) may be impacted, as well as the magnitude of impact(s). For example, if work is only conducted on land, the following permits could be required:

- Massachusetts Department of Environmental Protection (MassDEP) and Boston Conservation Commission Wetlands Notice of Intent (NOI);
- Massachusetts Environmental Protection Act (MEPA) Certificates on the Environmental Notification Form (ENF) and Environmental Impact Report (EIR);
- Public Benefits Determination;
- Massachusetts Historical Commission (MHC) Determination of Adverse Effect; and
- MassDEP Chapter 91 Waterways License(s).

If work is to occur on both land and in the Inner Boston Harbor, additional regulatory permits may be required:

- Massachusetts Office of Coastal Zone Management (CZM) Federal Consistency Review;
- MassDEP 401 Water Quality Certificate; and
- US Army Corps of Engineers (USACE) 404 and/or Section 10 Permit.

REGULATORY SUMMARY

Considering existing land use types and proposed project designs, the regulatory process may vary by property. However, each subject parcels is located either wholly or partially within filled tidelands, lands subject to flooding, port areas, historic and/or archaeological areas, and within jurisdictional buffer zones. The regulatory considerations, assuming the integration of a new seawall, light gradings, or berm on land within 25 ft of the waterfront may include the following permits:

MGL c. 30 §§ 61 through 62L 301 CMR 11.00 – Massachusetts Environmental Policy Act and Regulations

The Massachusetts Policy Act (MEPA) is administered through the Executive Office of Energy and Environmental Affairs (EOEEA) and the Secretary of the Environment. MEPA allows for public review and comment on environmental issues for projects that exceed certain thresholds of disturbance. Jurisdictional projects are required to submit either an Environmental Notification Form (ENF) or Environmental Impact Report (EIR) based upon the project's cumulative impacts. The anticipated work associated with the Resilient Border Street project(s) have the potential to exceed the following thresholds:

301 CMR 11.03(3)*b.1.f*

Alteration of ½ or more acres of any other wetlands. The entirety of the shore facing portions of the properties lies within the Land Subject to Coastal Storm Flowage (LSCSF) resource area (wetlands) and disturbances are projected to exceed ½ acre.

301 CMR 11.03(3)*b.6.*

Construction, reconstruction or Expansion of an existing solid fill structure of 1,000 or more sf base area or of a pile-supported or bottom-anchored structure of 2,000 or more sf base area, except a seasonal, pile-held or bottom-anchored float, provided the structure occupies flowed tidelands or other waterways. The entirety of the shore facing portions of the properties are considered flowed tidelands and the footprint of mitigation practices is anticipated to exceed 2,000 sf. in base area.

301 CMR 11.03(10)(*b*)2.

Destruction of all or any part of any Archaeological Site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth. The entirety of the project area is inventoried as a Historical and Archeological Asset identified as the East Boston Inner Harbor Industrial Area. The placement of fill and/or land berms may be considered as "destruction" of the site and could potentially trigger MEPA review.

The entire project site is located within one (1) mile of multiple Environmental Justice (EJ) population Designated Geographic Areas (DGA). Therefore, if any of the thresholds for an ENF are met or exceeded, an EIR will become a mandatory requirement for the project.

MGL c. 131 §40 and 310 CMR 10.00 – Wetlands Protection Act and Regulations

The Massachusetts Wetlands Protection Act (WPA) and its Regulations apply to lands within resource areas and their jurisdictional buffers. Permitting for work within jurisdictional areas includes the filing of a Notice of Intent (NOI) with the MassDEP and the local conservation commission to document project compliance with the performance standards for each impacted resource area. As previously indicated, jurisdictional resource areas on the project sites include:

- Land under the ocean;
- Coastal beach;
- Coastal bank;
- Land subject to coastal storm flowage (100-year flood zone);
- 100-foot buffer zones of coastal beach and coastal bank;

It should be noted that MassDEP is currently seeking to implement changes to these regulations that would, at a minimum, establish additional performance standards to the Lands Subject to Coastal Storm Flowage resource area that may impact the design of this project.

Following a wetlands delineation, it was confirmed that the project area includes coastal wetlands resources areas protected under the WPA, including land under the ocean, coastal beach, coastal bank, non-sediment source coastal bank, non-sediment source vertical buffer LSCSF and a 100-foot buffer zone extending landward from the limit of coastal beach and/or coastal bank as shown in Figure 28 and included as Appendix B. Project impacts to these resource areas and within the 100-foot buffer zone will require the filing of an NOI. The project area also includes priority and estimated habitat of rare and endangered species, and therefore will require NHESP review as part of the NOI. As part of the project design, stormwater management improvements may be required in order to meet the MassDEP Stormwater Management Standards, and as such, a Stormwater Report will need to be submitted as a supplement to the NOI application.

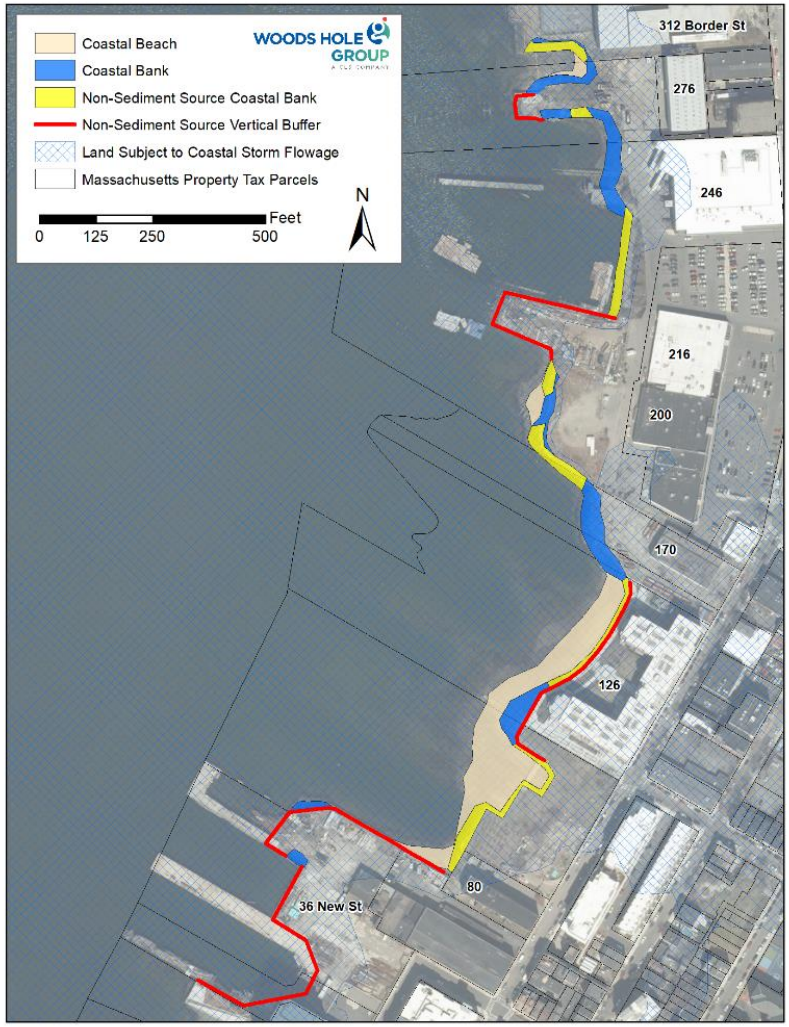


Figure 27. Wetlands Delineation for the Resilient Border Street Project. Source: Woods Hole Group, 2024.

City of Boston Code, Chapter 7, §7.1.4 *et seq.* - The City of Boston Wetlands Protection Ordinances

The City of Boston Conservation Commission administers the issuance of an Order of Conditions (OOO) under the requirements of the WPA, above. The City of Boston has enacted its own local ordinance but has yet to place regulations that significantly differ from the WPA into effect. Additional documentation beyond those required in the above referenced NOI are necessitated; however a single OOO is required for the project.

Section 401 of the Clean Water Act and 314 CMR 9 - Water Quality Certification

The MassDEP administers the 401 Water Quality Certification program that governs the placement of dredged or fill materials within waters of the United States including the flowed tidelands within the Resilient Border Street project areas. This permit works in conjunction with the Army Corps of Engineers Section 404 Permit discussed later in this section of the report.

It should be noted that MassDEP is currently seeking to implement changes to these regulations that may impact the design of this project.

MGL c. 21A §4 and 301 CMR 20.00 – Coastal Zone Management Program

The Massachusetts Office of Coastal Zone Management (CZM) administers and reviews federal actions and permits, obtains public comments, and administers enforceable policies for coastal projects with impacts to waters of the United States, including flowed tidelands.

MGL c. 21A §2 and 4a and 301 CMR 25.00 – Designation of Port Areas

Excluding the Boston East property, all the subject parcels are located within a Designated Port Area (DPA) (Figure 28). The regulations and development restrictions within the DPA are administered by the CZM and enforced by MassDEP through Chapter 91 licensing. The regulations define those specific water dependent industrial uses allowed within the DPA.

In its response to comments on the Boundary Review Designation Report, included in the 2022 EBDPA Designation Decision[21], CZM stated the following: "Structural resilience strategies such as elevated sites and linear berms along upland parcel edges can be implemented within DPAs to address coastal flood risks." This statement conveys that the construction of this project is allowable within the DPA zone, as it will be implementing resilience strategies that will directly address coastal flood risks.

Waterfront behind Shaw's at Liberty Plaza, 246 Border Street.

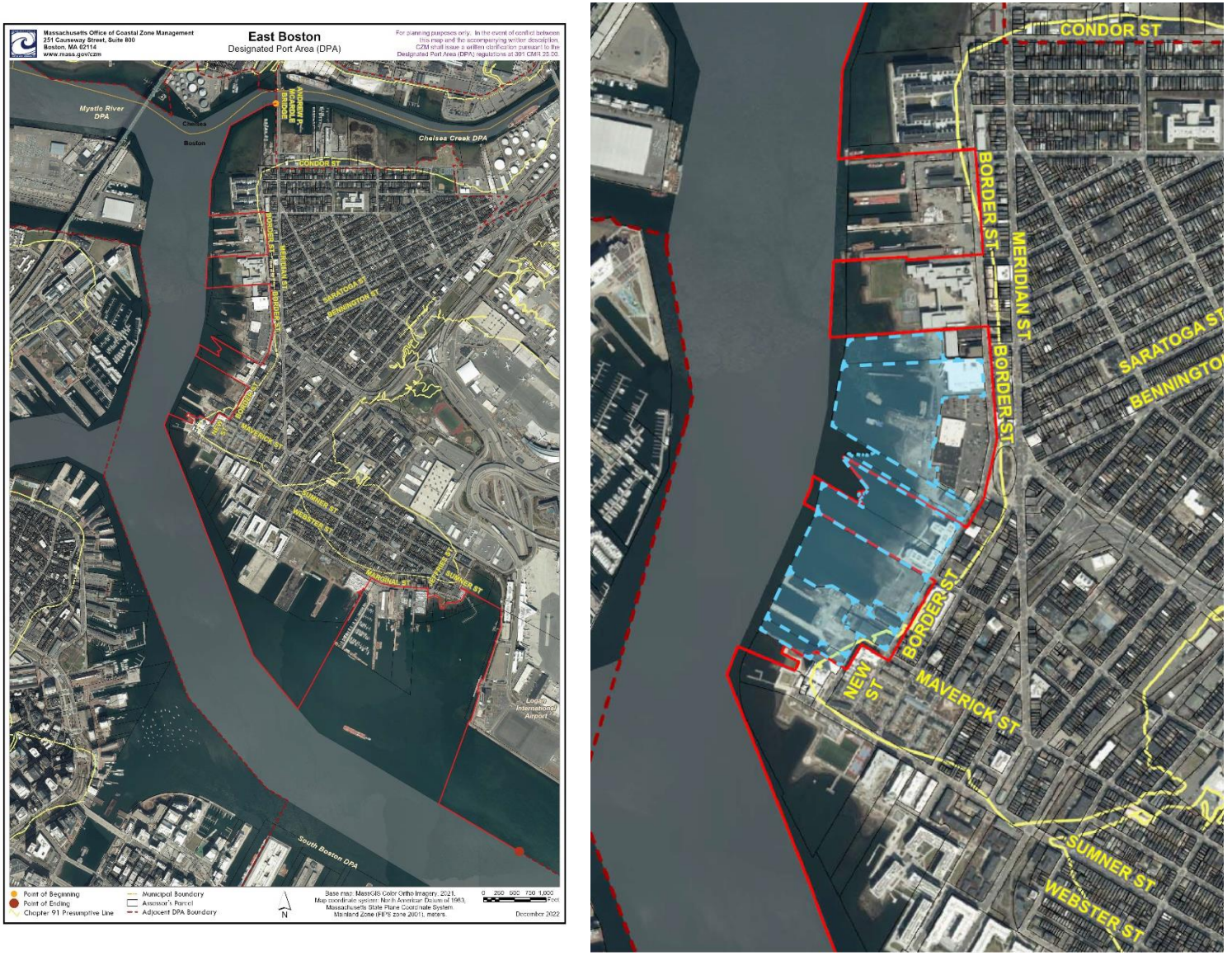


Figure 28. Project parcels (shown in Blue) located within the East Boston DPA (EBDPA) Boundary which is shown in red.

MGL Chapter 91 and 310 CMR 9.00 – Waterways Regulation

MassDEP protects the public interest along coastal and inland waterways through the issuance of licenses that govern the construction, dredging and filling of tidelands, great ponds, and certain rivers and streams. The goals of the program are to preserve pedestrian access along the water's edge for recreation, public use and enjoyment. It also seeks to preserve public navigation rights within waterways, protect commercial water dependent uses, and the maintenance of structures such as piers, docks, jetties, and seawalls. The project sites all consist of flowed tidelands and are subject to Chapter 91 Waterways licenses.

MGL c. 131A and 321 CMR 10.00 – Massachusetts Endangered Species Act

Portions of the properties at Liberty Plaza and 276R Border Street have been identified as having Priority Habitat Areas which require review by MassWildlife's Natural Heritage & Endangered Species Program for potential impacts to species and habitat. A "no take" ruling will be required because of the project that determines project impacts will not harass, harm, disrupt the nesting, breeding, or migratory activity of any species of concern. This can include the disturbance of rare vegetation in addition to animal species impact(s).

As a more definitive project design evolves, expanded impacts may necessitate additional permits to the one contemplated above. A more detailed description of environmental regulations and permits at the local, state and federal level and how they may apply to this project are provided in the Appendix C.

Waterfront at 126 Border Street.

2. DEVELOPING A BASIS OF DESIGN

Establishing a basis of design is a critical step in moving forward with a project that is both effective and resilient. The assessment of existing conditions found in part one of this report, provides a foundation for the technical design process. Various inputs such as site-specific histories, survey data, environmental regulations, engineering standards, state zoning regulations, and long-term resilience goals will inform the decision-making process for developing a solid base for protecting against coastal flooding.

FUTURE CLIMATE RISK AND VULNERABILITY

Understanding the extent of flood vulnerability in East Boston requires an analysis of both present-day flood risk and future projections under various sea level rise scenarios. This includes evaluating critical infrastructure, assessing at-risk populations, and identifying areas where flood risks are most concentrated. As such, it is imperative to consider both short-term adaptation strategies and long-term resilience planning to protect this vibrant and historically significant neighborhood from the increasing impacts of climate change.

This section guides the selection of Design Flood Elevations (DFE's) for the coastal flood mitigation infrastructure planned for the Border Street waterfront. The DFEs reflect the acceptable annual probability or return period up to which the coastal flood mitigation infrastructure will reduce damage from coastal flood hazards and inland areas will experience reduced coastal flood hazards. These elevations account for reasonably foreseeable climate change influences throughout the infrastructure's service life. It's important to note that regardless of the chosen DFE, there will always be residual risks from less likely and more extreme storm events and sea level rise scenarios.

BH-FRM

The Boston Harbor Flood Risk Model (BH-FRM), which was used for Coastal Resilience Solutions for East Boston and Charlestown Phase I (CRS EB), was developed by Woods Hole Group and academic partners with funding from MassDOT and Federal Highway Administration to evaluate coastal flooding risks from sea level rise and increased storm surge to the Central Artery Tunnel system. A DFE of 20.5 ft-BCB (14ft NAVD88) was selected. The City of Boston adopted the BH-FRM projections in its own Climate Resilient Design Guidelines for Protection of Public Rights-of-Way (2018) as well as in its Zoning Code through the

Coastal Flood Resilience Zoning Overlay District (2021) and associated design guidelines (2020).

MC-FRM

The Massachusetts Coastal Flood Risk Model (MC-FRM), developed by the CZM StormSmart Coasts Program to "depict exposure of community facilities and infrastructure to coastal flooding under various conditions."[22] This data includes the entire Massachusetts coastline and utilizes numerous climate projections, including sea level rise and storm scenarios developed by the National Oceanic and Atmospheric Administration (NOAA), US Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), and Woods Hole Group. The MC-FRM data and flooding projections, serve as recommended standards for buildings and infrastructure projects across the Commonwealth; it will be recommended that cities and towns adopt this for future development.

The model, which combines the risk of sea level rise with several other storm factors such as surge, waves, and tides, was used to understand the current coastal flood pathways, as well as the severity of future coastal flood risks in the project area. The MC-FRM data for 2030, 2050, and 2070 planning horizons for this project can be seen below (Figures 29-31).

As shown in Figure 29, the project area is expected to be fully inundated in the first scenario of the projected 2030 1% annual storm and has a similar boundary shown in the FEMA FIRM. During the 2050 and 2070 storms (Figures 30 and 31), the inundation levels are projected to engulf the surrounding community, flooding much of the lower lying levels of East Boston. Considering these scenarios is important to the project's planning and design because it will not only protect the immediate project area but also extend protection to the greater East Boston community.

Figure 29. Conceptualization of the Projected 2030 1% Annual Flood Pathway for the Border Street Waterfront. Weston & Sampson, 2024.

Figure 30. Conceptualization of the Projected 2050 1% Annual Flood Pathway for the Border Street Waterfront. Weston & Sampson, 2024.

Figure 31. Conceptualization of the Projected 2070 1% Annual Flood Pathway for the Border Street Waterfront. Weston & Sampson, 2024.

In addition to coastal flooding storm events, everyday tidal datums for the future were developed as part of the MC-FRM modeling analysis shown in Table 5. Tidal datums are useful to understand the potential for every day or monthly flooding which could cause infrastructure and plantings to degrade at a faster rate. By 2070, several of the properties could experience flooding daily, monthly, or seasonally.

Table 5. Projected Tidal Elevation Data

Planning Horizon	MHHW	MHW	MTL	MLW	MLLW
	(ft-BCB)				
2030	13	12.6	7.8	3	2.7
2050	14.3	13.9	9	4.1	3.8
2070	16.2*	15.8	10.8	5.8	5.5

**This elevation is higher than the ground elevation for multiple properties across the waterfront.*

Comparison of Flood Elevations

In the development of the scoping for this project, the City of Boston requested the project be built to the span the extents of a 2030 1% flood pathway, but to the height of a 2070 1% flood elevation. A summary of the maximum wave crest elevations based on MC-FRM outputs from the previously mentioned sources are summarized below in Table 6 and Figure 32 below. The elevations provided are a preliminary baseline for developing concepts and will be refined as the design is further developed.

Table 6. Flood Elevations Comparison

Property	FEMA		BH-FRM		MC-FRM					
	Historic/Present Day (Feet)		2070 1% Storm (Feet)		2030 1% Storm* (Feet)		2050 1% Storm* (Feet)		2070 1% Storm* (Feet)	
	NAVD88	BCB	NAVD88	BCB	NAVD88	BCB	NAVD88	BCB	NAVD88	BCB
34-36 New Street	11.0	17.5	14.0	20.5	12.5	19	14.5	21	16.5	23
All other properties	10.0	16.5			12.0	18.5	14.0	20.5	16.0	22.5

**Elevations are averages across the project area and used as a reference for further design discussion.*

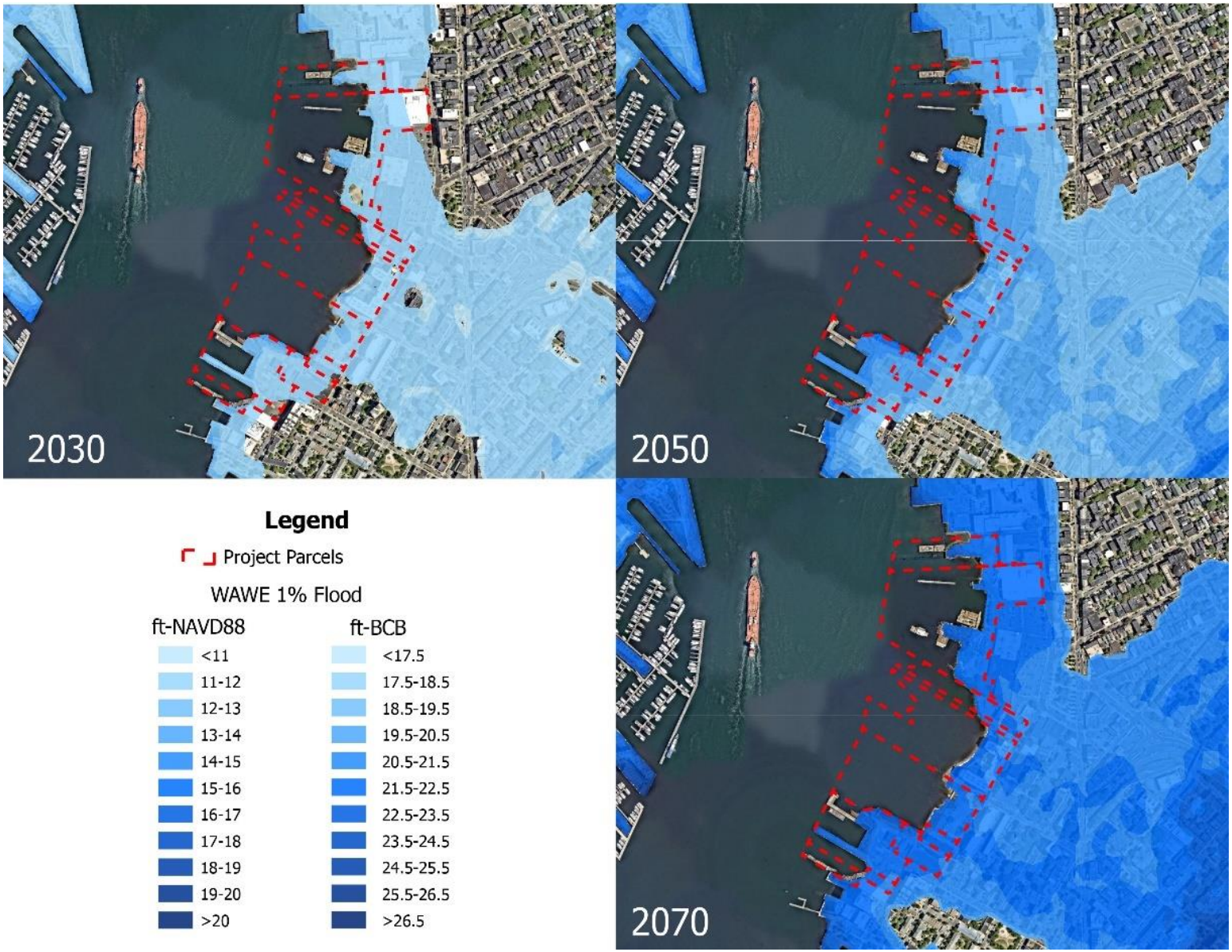


Figure 32. Projected Wave Action Water Elevation levels along the Resilient Border Street Waterfront. Weston & Sampson, 2024.

PRECIPITATION FLOODING

The area's proximity to the harbor places the community at an elevated risk of flooding, both from storm surges and the gradual rise in sea levels projected for the coming decades. Combined with heavy precipitation events and the potential for more intense storms, the neighborhood faces increasing risks of both tidal and stormwater flooding. East Boston's densely populated areas, critical infrastructure, and historic waterfront assets are all particularly vulnerable to heavy rainfall events and stormwater runoff concerns.

Within densely urbanized areas, stormwater often has fewer places to absorb into the ground which can result in frequent pooling and flooding on streets and in lower elevation areas during major storm events. These issues can be further exacerbated by aging stormwater infrastructure that can often not handle the increased volume of water in such short periods.

Climate change is projected to produce more frequent and intense rainfall, which will increase already existing precipitation flooding issues. High tides can also have an impact on precipitation flooding by inhibiting stormwater drainage during storms. When intense rain and high tides combine, there is a risk of compounding flooding within the area which can escalate all flooding impacts. Considering precipitation flooding, while adapting to coastal flooding is an important step of the process to alleviate flood risk within the East Boston community.

Remnants of precipitation flooding at 276R Border Street.

Stormwater from the Resilient Border Street Waterfront Project study area predominantly flows overland to Boston Harbor. Stormwater from Border Street above the proposed limit of work and the recently developed Boston East site is conveyed via the aforementioned 60-inch outfall (see Figure 22). As stormwater from most sites is conveyed via overland flow to the edge of the Harbor there is potential for impoundment of this surficial flow behind the proposed mitigation structure(s). Accommodation of stormwater runoff will require storage and gravity discharge through culverts equipped with tide gates or the use of pumping. This approach aligns with the findings from the BWSC coastal stormwater analysis, which emphasizes the necessity of these measures.

Currently, other than the recently developed Boston East site, stormwater in the project area receives minimal or no treatment prior to discharge to the Harbor. Future development efforts will require compliance with BWSC standards. The sites, if redeveloped, will be required to retain and infiltrate 1.25-inches of runoff over all impervious surfaces at the site and provide pre-treatment prior to infiltration. Any proposed stormwater mitigation associated with the resiliency efforts should be designed so that it may be modified for use in compliance with the BWSC standards.

Table 7 provides a preliminary estimate of stormwater volumes that are currently tributary to the Harbor using the Natural Resources Conservation Service Technical Release No. 55 methodology (TR-55). These estimates are not the result of a full hydrologic analysis but are provided to identify potential volumes of stormwater generated landward of any proposed flood mitigation.

Low-lying waterfront behind Shaw's at Liberty Plaza.

Table 7. Preliminary Estimate of Stormwater Volumes.

Property	Tributary Area (sf)	Existing CN	Proposed CN[4]	2-year Event (3.20“/ 24hr)		10-year Event (5.06“/24hr)		100-year Event (8.01“/24hr)	
				Existing Volume (cf)	*Proposed Volume (cf)*	Existing Volume (cf)	*Proposed Volume (cf)*	Existing Volume (cf)	*Proposed Volume (cf)*
34-36 New Street	90,650±	98	94	22,420	19,220	36,450	33,000	58,700	55,100
60 Border Street	52,900±	98	94	13,100	11,200	21,300	19,250	34,250	32,150
80 Border Street	22,300±	98	94	5,500	4,750	9,000	8,150	14,450	13,550
102-124 Border Street	61,500±	74	94	5,300	13,050	12,400	22,400	25,300	37,400
126 Border Street[5]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
170 Border Street	24,600±	98	94	6,100	5,200	9,900	8,950	15,950	14,950
184-220 Border Street	61,700±	98	94	15,250	13,100	24,800	22,450	39,950	37,500
246-260 Border Street	170,000±	94	94	36,050	36,050	61,8900	61,900	103,300	103,300
276R Border Street	30,850±	91	94	5,800	6,550	10,400	11,250	17,850	18,750

[4] Proposed Curve Number is based upon a commercial buildout with 85-percent impervious cover.
[5] 126 Border Street was recently constructed and is equipped with a structured drainage system that conveys stormwater directly to the BWSC system and outfall.

HEAT VULNERABILITY

In addition to mitigating future flood pathways, this project will consider heat resilience of the area. The urban heat island effect is experienced in dense urban areas where structures like buildings and roads absorb and re-emit the sun's heat more than natural landscapes like forests or water bodies.[23] In the City of Boston's "Heat Resilience Solutions" report published in 2022, that the city has experienced hotter days and nights than any other decade in the previous 50 years. With major attributions pointing to climate change as the source for these extra heating days, it is noted that if no action is taken to reduce emissions, the city will experience as many as 46 days per year over 90 degrees Fahrenheit by 2070, as opposed to the historic annual of 10 days per year.[24] The City is on trend to experience hotter temperatures and longer heat wave events which can bring many health issues for vulnerable populations. Integrating heat mitigation strategies into possible project designs will help to reduce the urban heat island effect (as shown in Figure 39) and protect the neighborhood from worsening health and climate hazards.

Vulnerable populations such as environmental justice communities, like those surrounding the project area, are particularly vulnerable to heat-related health issues due to limited access to air conditioning and healthcare. Implementing heat mitigation strategies alongside flood mitigation measures, such as increasing green spaces or enhancing shade with trees and structures, the community can benefit through resulting lower ambient temperatures, reducing the urban heat island effect, and improving overall air quality.

These measures not only enhance the quality of life for residents but also contribute to public health and safety, energy savings, and the resilience of communities to climate change impacts. By prioritizing these strategies, The City can ensure more equitable and sustainable living conditions for East Boston residents.

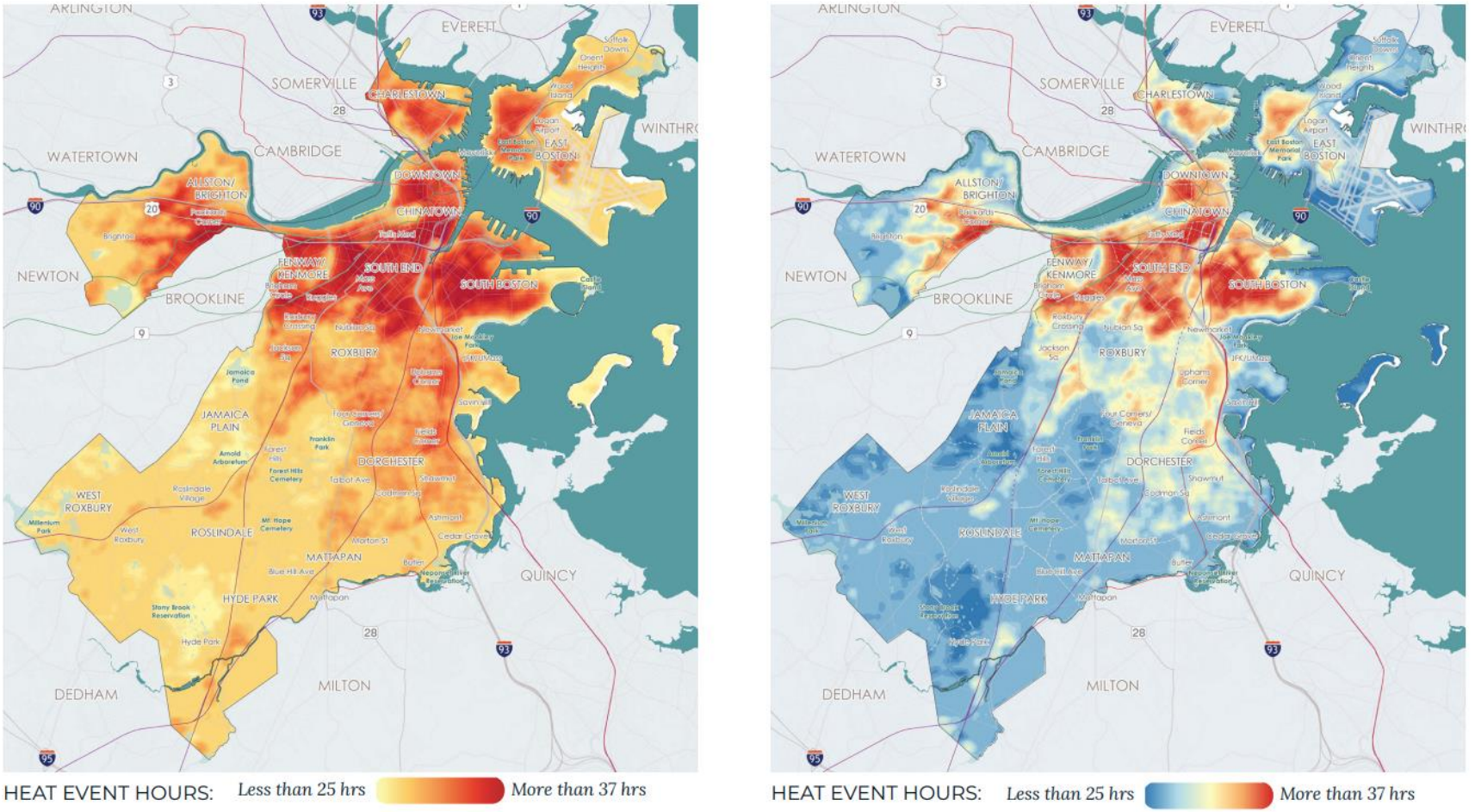


Figure 33. Citywide Heat Analysis from Boston's Heat Resilience Solutions report. The left color scale demonstrates extreme heat that already affects the city of Boston, while the right color scale highlights the hottest areas within the city. Source: Heat Resilience Solutions, 2022.

COMMUNITY FEEDBACK

Public engagement events for the Resilient Border Street Waterfront project are designed to foster community involvement and ensure that the local community has knowledge of the project that will shape the future of East Boston's waterfront. These events provide a platform for residents, business owners, and other stakeholders to share their concerns, insights, and ideas regarding coastal resilience and flood management strategies.

Following meetings with the established stakeholder groups in the spring of 2024, the project team kicked off the beginning of extensive public engagement efforts. To reach the broader community, the project team used a threefold approach: (a) issue an online survey, (b) attend local events, and (c) facilitate interactive exercises in the neighborhood.

So far, the data for residents from East Boston collected as part of the community engagement process tells us that the community members' ideal waterfront includes the following:

- **Infrastructure**: Restrooms, public transport, trash and recycling
- **Amenities**: Universally accessible play areas, community gardens, BBQ spots
- **Water features**: Water taxi/ferry, splash pads, fishing access, kayaks
- **Programs**: Food trucks, fairs and festivals, pop-up business and market space
- **Vegetation**: Trees, gardens to collect stormwater, pollinator gardens
- **Paths**: Boardwalk, dedicated bike lanes, water promenade

More detailed information about the community stakeholder process is available in Appendix D.

DISTRICT CONSIDERATIONS

The Resilient Border Street project area presents several key factors related to its designation, current use, and future development that must be address when designing coastal flood mitigation strategies.

CZM Designated Port Area (DPA) Requirements: Many properties within the Resilient Border Street project area are located in the CZM Designated Port Area (DPA) and, until that designation changes, must support water-dependent industrial uses where feasible. Given that much of the area lacks sufficient water depth and cannot accommodate traditional ship-to-shore operations, any mitigation strategies developed will need to maintain a viable Harbor connection that supports these uses as practicably as possible.

Economic Viability of Water Dependent Industrial Uses: Property owners within the CZM DPAs have lobbied to remove the designation and its associated use restrictions but have been unsuccessful. Most property owners have been unable to find economically viable water dependent uses at their properties resulting in limited funds to invest into resiliency efforts and as a result many properties remain vacant or underutilized.

Liberty Plaza at 246 Border Street.

Utility Infrastructure: All of the parcels are or have the potential to be served by municipal water, wastewater, and stormwater utilities. A key element to consider in the design process are the utility easements and a large stormwater culvert that discharges through the properties and to the Harbor. The impact of additional loading on culvert will need to be carefully evaluated.

Topography: Many of the properties are situated below Border Street and slope toward the Harbor. Flood mitigation should consider the surficial runoff generated during precipitation events and the potential for the impoundment of runoff.

Industrial History and Remediation: The historic industrial use of the project area introduces the possibility of environmental contamination. Considerations for the potential need for remediation and safe handling of hazardous materials will need to be integrated into the planning process to ensure the safety and compliance of the site.

Property Surveys and Easements: Formal property surveys and title reports have not been conducted, though a cursory review of available records at the Suffolk County Registry of Deeds has identified several easements within the project area. The extent, validity, and appurtenant rights from these easements should be investigated through a title examination and review by legal counsel, especially in relation to any public works that might impact private property. Boundary surveys will be needed to establish new easement boundaries where required.

Permitting: Various local, state, and federal permit thresholds may be exceeded due to the flood mitigation efforts. Pre-permit meetings with regulatory agencies should be held as the design advances to streamline the permitting process and follow compliance. Additionally, a strategic decision must be made regarding the permitting approach for the project across multiple property owners.

Adaptability to Climate Change: Mitigation strategies must be adaptable to address both near-term (2030) and long-term (2070) sea level rise and climate change impacts. Designs should be forward looking and flexible to accommodate future changes in environmental conditions.

By addressing these considerations early in the planning process, the Resilient Border Street Project can effectively balance the needs of property owners, environmental protection, and regulatory compliance while building long-term flood resilience.

Existing gravel walkway connecting 126 Border Street to 102 Border Street.

ENVIRONMENTAL IMPLICATIONS FOR FUTURE DEVELOPMENT

Through our review of the MassDEP filings and historical documentation, the overall area encompassing the project exhibits elevated soil concentrations of various metals, PAHs and petroleum hydrocarbons from historical filling and petroleum use/storage. While most of these releases have achieved regulatory closure under the MCP, the areas associated with the proposed project improvements will likely overlie residual impacted materials.

At this time, the final location and nature of any proposed improvements has yet to be determined, and samples of soil and/or groundwater have not been collected from within the proposed alignment. Based on these factors, a specific opinion on soil quality within the project area cannot be rendered at this time. Based on the file review, it is likely that similar conditions will be encountered as outlined above during any earthwork required to support future improvements. As such, work conducted under the Project may require a Release Abatement Measure (RAM) Plan filing with MassDEP.

Surplus soils generated during the project may require off-site disposal at a Massachusetts Lined or Unlined Landfill, at an out-of-state landfill facility, or, in select cases, as a hazardous waste. Costs associated with the material disposal are dependent on the specific chemical concentrations within the removed soil, with costs generally increasing with increased levels of contamination.

Existing seawall located at 34 New Street.

As such, it is recommended to characterize material during future design activities to assess options for off-site disposal, associated costs, and environmental management requirements under state and federal regulations. Such testing will support project cost estimation and will be required by receiving facilities to accept the material during construction.

Note that any testing, if conducted on City of Boston property, that identifies contamination in excess of regulatory criteria may trigger a notification condition to MassDEP. Notification from the City of Boston to MassDEP is required in this scenario, as is subsequent assessment or remediation to achieve a condition of No Significant Risk. Should any of the property become the property of the City of Boston, the City will by statute, be considered a Responsible Party liable for these response actions. As such, the current recommendation is that sampling be limited to those areas in which future construction is anticipated.

STRUCTURAL CONSIDERATIONS FOR FLOOD PROTECTION

Based on the waterfront structural inspection conducted by Collins, supplemented with a review of historical files, photographs, licenses, and referencing discussions held between the landowners and the client, several structural considerations were developed based on current and anticipated loadings at each site. Considerations range from minor maintenance repairs including filling revetment voids and removal of vegetation to major replacement of waterfront infrastructure including construction of a new steel bulkhead system.

Deficiencies observed across the site vary greatly, as there is a wide range of service life remaining on the structures, and there are several different material types and structures that were evaluated as part of the shoreline infrastructure. Some structures have been constructed within the last decade, while others date back to over 70 years ago and have failed or have not been adequately maintained throughout their life. In the locations of vertical buffer failure (i.e. failed timber and steel sheet pile bulkheads), and in the locations where there is currently no or minimal shoreline protection (i.e. earthen slopes, temporary shoreline protection consisting of stored steel piles), a full reconstruction or replacement of the shoreline infrastructure would be required to stabilize the shoreline and support load requirements for the proposed coastal resilience flood protection structure improvements. Typical considerations that were evaluated within these sites include construction of new steel bulkheads, installation of new armor stone revetments, or construction of a concrete seawall. In locations where coastal infrastructure has not failed and still provides a stable shoreline (i.e. concrete seawalls, stone masonry seawall, armor stone revetments), repair improvements to the existing structures including spall repairs to concrete,

supplementing armor stone revetments with additional stones, resetting portions of the stone masonry block seawall and installing a concrete infill, and resetting dislodged locations within the armor stone revetments may be adequate to support the current and future anticipated loadings from proposed coastal resilience flood protection structure improvements.

To further analyze proposed designs at the various sites, additional site investigations are recommended to be performed at the site to gain a more comprehensive understanding of the existing conditions of the shoreline infrastructure, including a geotechnical investigation, bathymetric survey, underwater inspection, topside inspection of properties that were inaccessible during the scope of work, and an additional topographic survey data collection effort to obtain elevations and extents of the coastal infrastructure where data was not collected. This information will be used to inform the feasibility of proposed designs, identify additional areas of concern that were not visible from the topside inspection, and provide data that will be used for geotechnical and structural calculations on proposed replacement and reconstruction efforts.

DESIGN APPROACHES

Proposed flood resilience strategies for the project area will account for several considerations that have been identified throughout this report:

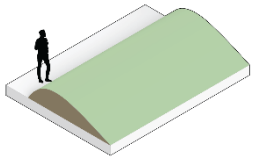
- The proposed options must be permitted by regulatory agencies and authorities.
- The proposed options must not limit the current use and future development of the impacted private properties including any appurtenant rights that may currently exist.
- The proposed options must be scalable to meet current and future needs as discrete and separate projects.
- The proposed options must consider current and future conditions regarding inclusion in or removal from the Designated Port Area, with an emphasis that no investments will be made to prevent future marine industrial usage.
- The proposed options should provide public benefits beyond those associated with flood resilience. To accomplish this, conceptual visions for the Resilient Border Street project area will be developed by the project team to explore resilience options that include various public benefits. The options will span scenarios that focus upon:
    - Enhancing the waterfront and activation of the existing commercial areas; and

- Potential future changes to the extents and/or restrictions in the Designated Port Area.

STRATEGIES FOR COASTAL FLOODING RESILIENCE

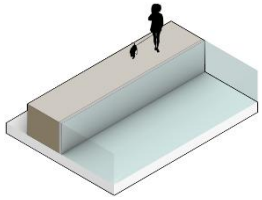
Each property along the Border Street waterfront has its own unique needs and challenges. One type of strategy for the entire waterfront is unlikely to be favorable or work technically given the uses and construction of waterfront structures. Additionally, flooding impacts each property differently given the change in elevation across the waterfront and exposure to waves. To address these challenges, several types of flood barrier strategies are being considered.

Table 8 shows a comparison of the solutions considered for this project at a macro scale range for approximately 100 linear feet of each solution.



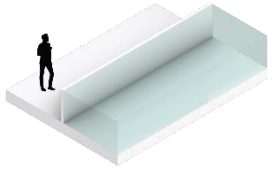
EARTHEN BERM

A berm is a raised barrier or mound of earth, often used in landscaping, construction, or erosion control, to manage water flow and provide visual separation between different areas.



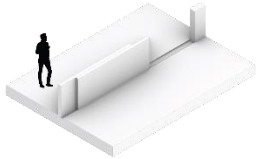
ELEVATED HARBORWALK

Similar to the berm, an elevated Harborwalk is a raised earthen structure supported by structural walls.



ELEVATED SEAWALL

A flood wall, whether a sea wall or an interior concrete wall is a robust, engineered barrier designed to protect land and infrastructure from rising water levels and flooding by redirecting or containing excess water.



DEPLOYABLE GATES & BARRIERS

A deployable flood barrier is a portable flood defense system designed for quick setup in response to imminent flooding. It provides protection by blocking or diverting water from vulnerable areas and can include deployable gates to support marine uses, such as those required by C. White Marine.

Table 8: Comparison of Solutions

Solution Type	Cost per linear ft	Description
Earthen berm	$1,700-$2,100	Earthen berm with reinforced CIP concrete core wall, loam and seed berm
Stone seawall reconstruction	$2,200-$5,600	Resetting top 2 courses of blocks with steel pins, repointing wall, and raising elevation of seawall or seawall reconstruction with concrete stability layer and raising elevation of seawall
New bulkhead	$3,600-$4,500	Steel sheet pile bulkhead with steel channel cap and crushed stone infill between existing bulkhead and new bulkhead
Cast-in-place concrete seawall extension	$500-$600	Reinforced CIP concrete seawall extension on top of existing seawall
New cast-in-place concrete	$2,500-$3,200	Reinforced CIP concrete floodwall
Deployable gates and barriers	$500-$8,500	Plank systems and gates

Note: The costs reflected in the able are current to the year 2024.

The following approaches utilize the previously mentioned strategies to achieve resilience along the waterfront. The strategies that are ultimately used will vary depending on the site's unique conditions, and multiple strategies may be needed across the project area.

SEAWALL REPAIR AND ELEVATION

Figure 34. Visual of elevating a seawall along the waterfront.

Most of the waterfront in the project area needs seawall improvements or replacement. All of the properties have steel and/or wooden bulkheads, concrete walls, or other revetments along the coastline. Given the poor condition of this infrastructure today, a required foundational step for any future investments along the waterfront must include improving the structural integrity of existing infrastructure, such as seawalls or bulkheads, and elevating this infrastructure above the projected flood elevation.

Elevating seawalls along the waterfront would achieve flood protection and have the least impact to the individual properties. However, this would result solely in improvements to flood resilience without aesthetic or other public-use benefit(s). Seawalls may impact waterfront views, but visual impacts can be mitigated with grading behind the seawalls, as exposed heights on the landward side could be between two-feet and six-feet high. This approach alone includes maintaining the Harborwalk where it currently exists, without expanding connection along the waterfront.

HARBORWALK CREATION AND CONNECTION

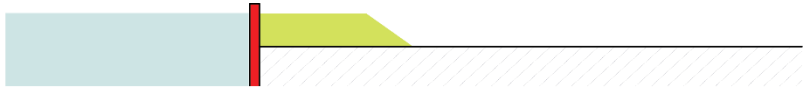


Figure 35. Visual of elevating a seawall and creating new Harborwalk connections along the waterfront.

While repairing and elevating seawalls along the waterfront would be the lowest probable construction cost to prevent long-term flooding, this approach by itself is not generally the preferred long-term vision for the waterfront. New Harborwalk connections could be created on top of or behind repaired, elevated seawalls to establish a north-south connection from the Eddy to Liberty Plaza.

The proposed approach would enhance accessibility, provide expansive views across the harbor, and improve connectivity from residential properties to the commercial uses at Liberty Plaza. Feedback from the waterfront property owners and the East Boston community more broadly revealed that this is strongly preferred to enhance the waterfront for public use.

This proposed approach also allows for the creation of additional areas for waterfront activation as explored in the following section. While current DPA regulations limit uses to waterfront industrial or supporting activities, resilience improvements could facilitate new opportunities for waterfront activation and public engagement that could comply with the DPA as it exists today.

Accessory Uses within the DPA

DPAs in Massachusetts allow for a diverse mix of uses while promoting water dependent industrial uses. Up to 25% of a project area within a DPA can be allocated to commercial or industrial supporting uses, such as office space, storage facilities, or retail establishments. While these supporting uses are not typically considered "community-serving," creative approaches can enhance public accessibility and appeal of the waterfront.

Some Massachusetts DPAs have successfully incorporated breweries, museums, and restaurants as supporting uses. There are examples of alternative uses in a DPA in East and South Boston. In East Boston, Downeast Cidery and the Institute of Contemporary Art Watershed are located in the DPA boundary. DPAs can also accommodate maritime academies or industrial job training centers that require water access, offering local educational and vocational opportunities.

Vacant spaces within DPAs can be utilized for temporary purposes such as parking or warehousing with special licenses. These areas can serve dual purposes, hosting local events, markets, fairs, and festivals when not in use for industrial activities. By fostering collaboration between community groups and private owners, the waterfront can become a vibrant space that benefits both local businesses and residents. This approach allows for increased community engagement while maintaining the primary focus on water-dependent industrial uses, as mandated by DPA regulations.

FUTURE PROPERTY REDEVELOPMENT

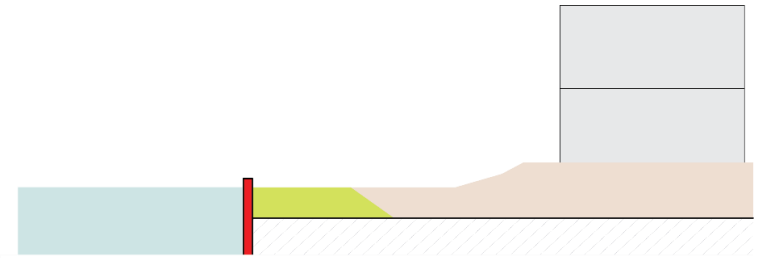


Figure 38. Visual of future build out potential along the waterfront.

Should the DPA be adjusted in the future, waterfront property owners could utilize the elevated seawall and/or Harborwalk connection to build resilience into future waterfront development. The creation of a new Harborwalk could be expanded to include potential pocket parks, esplanades, and vistas to fully integrate the community and waterfront in the project areas.

The Boston Planning and Development Agency requested a review of the DPA boundary in 2022; however, no parcels were removed. Many of the property owners believe that removal or reduction of DPA requirements would allow them to realize other uses for the properties and provide greater public access to the waterfront. If removed from the DPA, redevelopment of the sites would be subject to the City's Coastal Flood Resilience Overlay District requirements for building-level elevation and access to public space under Chapter 91.

Waterfront taxi stand located at the Eddy.

SITE DATA GAPS

BOUNDARY SURVEY

The creation of easements to affect the proposed flood mitigation work by the City of Boston on private lands will necessitate a title report, opinion of ownership, and property boundary survey to clearly identify all restrictions, encumbrances, and appurtenant rights to the subject properties and existing easements thereon. Agreements will be required with all parties of interest and should be coordinated through the City's Law Department.

FAA PERMITTING

The Resilient Border Street Waterfront project area lies within proximity to Logan Airport and is within the Boston Logan airspace[25]. A Federal Aviation Administration (FAA) Obstruction Evaluation / Airport Airspace Analysis (OE/AAA) will be required prior to construction. Discussions with potential contractors regarding the heights of excavators, pile drivers, cranes, and/or other construction apparatus should be conducted in conjunction with the design phase to verify the need for additional permitting and potential work restrictions.

GEOTECHNICAL

The Resilient Border Street Waterfront project area is located within filled tidelands. The composition of fill materials and the associated bearing capacities are unknown at this time. At a minimum standard penetration tests (SPTs) should be administered in project areas to assess the ability of the soils to handle additional loading from berms and the suitability for retaining wall foundations.

ENDANGERED SPECIES

As previously identified in this report, portions of the Resilient Border Street Waterfront project area lie within priority habitat areas as designated by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). A request should be made to the NHESP for a list of state-listed species on the parcel to aid in understanding potential restrictions to project design and construction timing and methods.

TRANSPORTATION

The project area access is via narrow roadways with sharp corners. Access by construction vehicles, transport of materials, and potential future uses may impact traffic patterns in the area. Considerations of time of work, traffic volumes and time will require evaluation during design phases of the project.

NEXT STEPS

Following the completion of the existing conditions report, the project team will convene the Property Owner's Stakeholder Group to present a preliminary district-scale vision for the waterfront and discuss the next steps for design and permitting. Similar presentations will be held with the Community Stakeholder Group and with the Public Agency Stakeholder Group to provide a progress update and gather additional feedback. The team remains on track to achieve 30% design completion by spring 2025.

Members of the project team will also begin coordination discussions with regulatory agencies, such as CZM, DEP, and MEPA, as well as coordinate separate meetings with city departments and regulators.

ENDNOTES

[1] Coastal Resilience Solutions for East Boston and Charlestown. (2017).

[2] A Technical Assistance Panel Report, Advancing Resiliency in East Boston. (2015).

[3]Climate Ready Boston, Final Report. (2016).

[4]Coastal Resilience Solutions for East Boston and Charlestown. (2017).

[5] Imagine Boston 2030, A Plan for the Future of Boston. (2017).

[6] Resilient Boston Harbor. (2018).

[7]East Boston Flood Prevention Design Workshop Report. (2019).

[8] East Boston Today, An Interim Report of PLAN: East Boston. (2020).

[9] PLAN: East Boston. Boston Planning & Development Agency. (2024).

[10] Bromley, George Washington, and Walter Scott Bromley. Atlas of the city of Boston: Charlestown and East Boston. Map. Philadelphia: G.W. Bromley & Co., 1922. *Norman B. Leventhal Map & Education Center*.

[11] Analyze Boston, Neighborhood Data. City of Boston. (2024).

[12] U.S. Census Bureau, 1910-2010 Decennial Census, NHGIS; 2013-2017 American Community Survey; BPDA Research Division Analysis and PLAN: East Boston, BPDA, January 2023.

[13] Boston by the Numbers 2020. Boston Planning & Development Agency. (2020).

[14] MyCensus Viewer. Boston Planning and Development Agency. (2024).

[15]Poverty In the United States: 2022. Census.gov. (2023).

[16] East Boston Zoning Map. Map 3A/3B. (2024).

[17] Bromley, George Washington, and Walter Scott Bromley. Atlas of the city of Boston: East Boston. Map. Philadelphia: G.W. Bromley & Co., 1901. Norman B. Leventhal Map & Education Center.

[18] *Massachusetts Cultural Resource Information System.* https://mhc-macris.net/queryresults

[19] *Atlantic Works*, East Boston CDC Inc. https://www.ebcdc.com/atlantic-works

[20]170 Border Street, East Boston's Growth and Industry. Ricciardi, A. (2021).

[21] Designation Decision for the East Boston Designated Port Area. (2022).

[22] MA CZM Sea Level Rise and Coastal Flooding Viewer. MassGIS, CZM.

[23] *Heat Island Effect*. US Environmental Protection Agency. (2024). Heat Island Effect | US EPA

[24] Heat Resilience Solutions for Boston. City of Boston. (2022).

[25] Boston Logan international Airport. Composite of Critical Airspace Surfaces. (2011).