RESILIENT MOAKLEY PARK CONNECTORS

ENGINEERING ASSESSMENT & SITE INVESTIGATION REPORT EXECUTIVE SUMMARY

March 2025



CITY of BOSTON

Weston & Sampson℠

1. EXECUTIVE SUMMARY

INTRODUCTION

Rising sea levels pose a significant threat globally, prompting many major cities to urgently address the protection of their coastal communities, critical infrastructure, ecosystems, and economies. This report specifically examines extended resiliency measures connected from Moakley Park to the surrounding areas in the South Boston and Dorchester neighborhoods, which are expected to experience increased flooding in the near future, becoming a significant pathway for coastal flooding.

For the South Boston and Dorchester neighborhoods, Moakley Park and the adjacent areas represent a low-lying entryway for coastal flooding from Dorchester Bay. With a projected 40 inches of sea-level rise by 2070, this flood pathway, in combination with Fort Point Channel, would lead to significant flooding extents further into the city including portions of the South End and Roxbury during a 2070 1% storm event (100-year event). This level of flooding could directly impact an estimated 35,000 people, including over 1,700 low-income families in two Boston Housing Authority developments. Protecting these neighborhoods is a priority for the City and the region.

In early 2019, the City of Boston Parks and Recreation Department completed the Moakley Park Vision Plan, which is a collective vision for adding climate resilience and new programs to the park. The Vision Plan was followed by two phases of work, Preliminary Resilience Design (2019-2020) and Schematic Design (2020-2021), which included field investigations, detailed analyses, and studies for off-site flood barrier options. Building upon those phases, the City submitted an application for a FY21 Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure and Communities (BRIC) Grant to complete design and construction of the Park's resilience elements including protection extending to the north of the Park.

Potential inundation resulting from the projected 40-inches of sea level rise combined with the 100-year storm event (or 1% annual chance event) extends along the shoreline beyond the bounds of Moakley Park. In order to entirely close the flood pathway, it is necessary to extend the resilience improvements planned for Moakley Park to those areas immediately adjacent to the northern and southern edges of the park.

This Report represents the results of combining reviews of existing regulatory documents and reports and a Technical Analysis which provides supplemental inventory of existing conditions through topographic survey, field testing, site visits, and analysis of surface, subsurface and adjacent conditions.

The goals of the Resilient Moakley Connector project are to:



Develop and evaluate coastal protection options to reduce current and future flood damage and provide vertical protection to 40 inches of sea level rise plus 0.5% annual chance storm (2070) in line with the flood resilience project at Moakley Park;



Connect to the planned resilience improvements in Moakley Park with investments currently being designed at Dorchester Bay City. These connections will provide broader protection to residential neighborhoods, infrastructure, utilities, and structures in the flood pathway affecting the South End and Roxbury;



Reflect the needs and constraints of the stakeholders who own the land and infrastructure in the area;



Be informed by and reflect the input, priorities, needs, and constraints of the communities and stakeholders in the area;



Create new and enhance existing pedestrian connections between Moakley Park and communities to the north and south that are Americans with Disabilities Act (ADA) compliant and accessible for people of all ages and abilities;



Identify feasible, permittable, and cost-effective solutions.

UNDERSTANDING THE PROJECT AREA

CURRENT USES & STAKEHOLDERS

The Resilient Moakley Park Connector project consists of two locations, North and South Connector sites, representing the approximate limits of work to extend Moakley Park's flood alignment to existing and planned higher elevations (22ft Boston City-Based (BCB) Datum) adjacent to the Park (Figure 1). The sites include State and the City-owned properties under the jurisdiction of MA Department of Conservation and Recreation (DCR), City of Boston Parks and Recreation Department (BPRD), Massachusetts Water Resource Authority (MWRA), and Massachusetts State Police.

The North Connector Site, defined as the area between Babe Ruth Park Drive, Columbia Road, Day Boulevard and G Street, consists of the MWRA Headworks facility, a dog park, pedestrian paths, and mature tree canopy (Figure 2). The South Connector Site, defined as the southeast edge of Moakley Park and the land between Day Boulevard, Dorchester Bay shoreline, and the planned Dorchester Bay City (DBC), consists of the MA State Police StationH-6, MWRA's Ventilation Facility, and the southern edge of Carson Beach (Figure 3). Additionally, both sites include significant utility structures operated by MWRA and Boston Water and Sewer Commission (BWSC).

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



Partner Team

State and City agencies/entities including BPRD, DCR, MWRA, MA State Police, and BWSC.



Community Stakeholder Group

Property owners, residents, businesses, non-profits, and other interested parties.



Planned Resilience Design Teams

Representatives from the Moakley Park and Dorchester Bay City Design Teams.



Figure 1. Aerial view of the Resilient Moakley Park Connector North and South sites with adjacent, planned resilience improvements at Moakley Park and Dorchester Bay City. Weston & Sampson, 2024.

NORTH CONNECTOR SITE

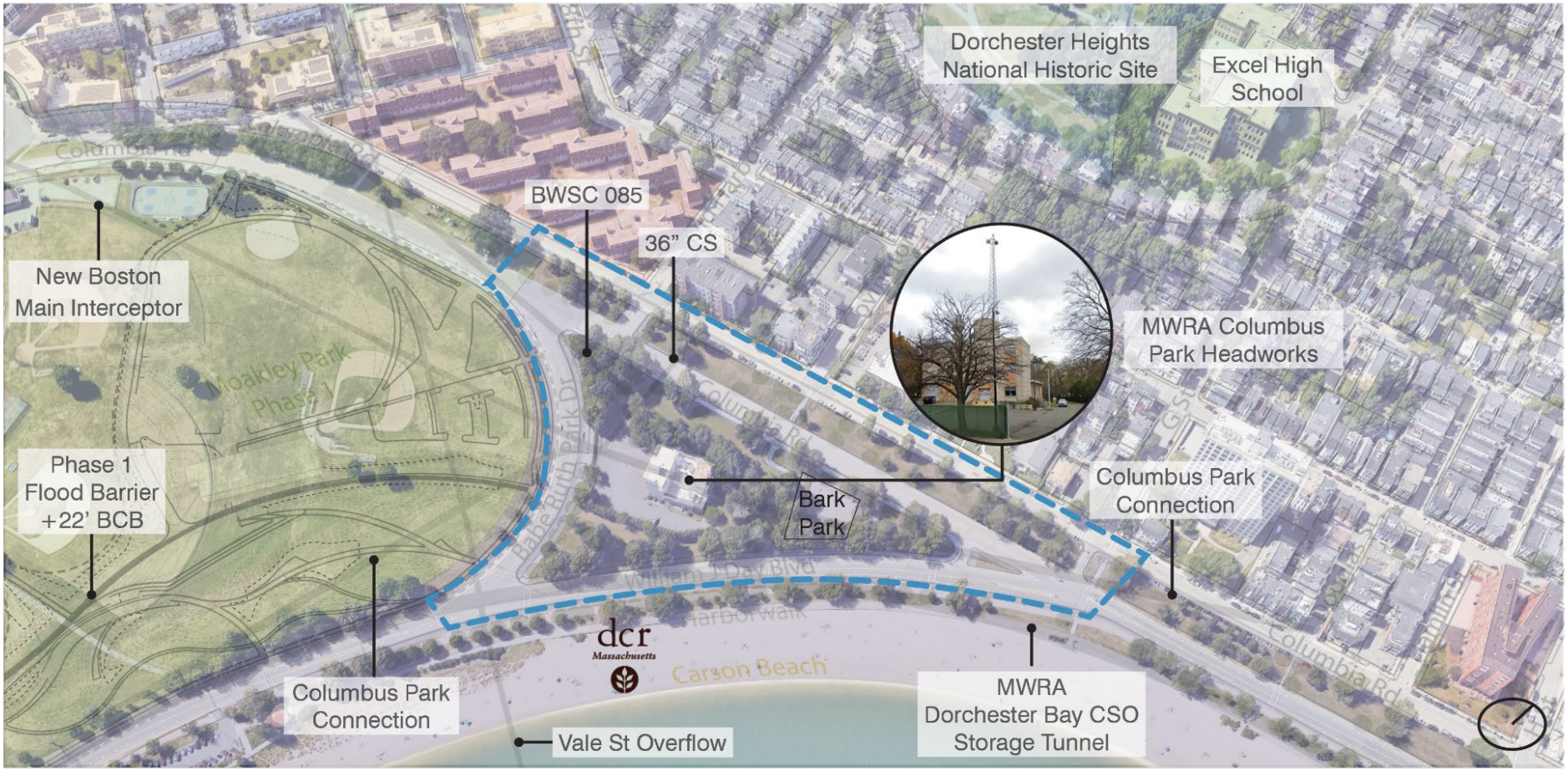


Figure 2. Property owners, jurisdiction and infrastructure at the Resilient Moakley Park North Connector site. Weston and Sampson, 2024.

SOUTH CONNECTOR SITE

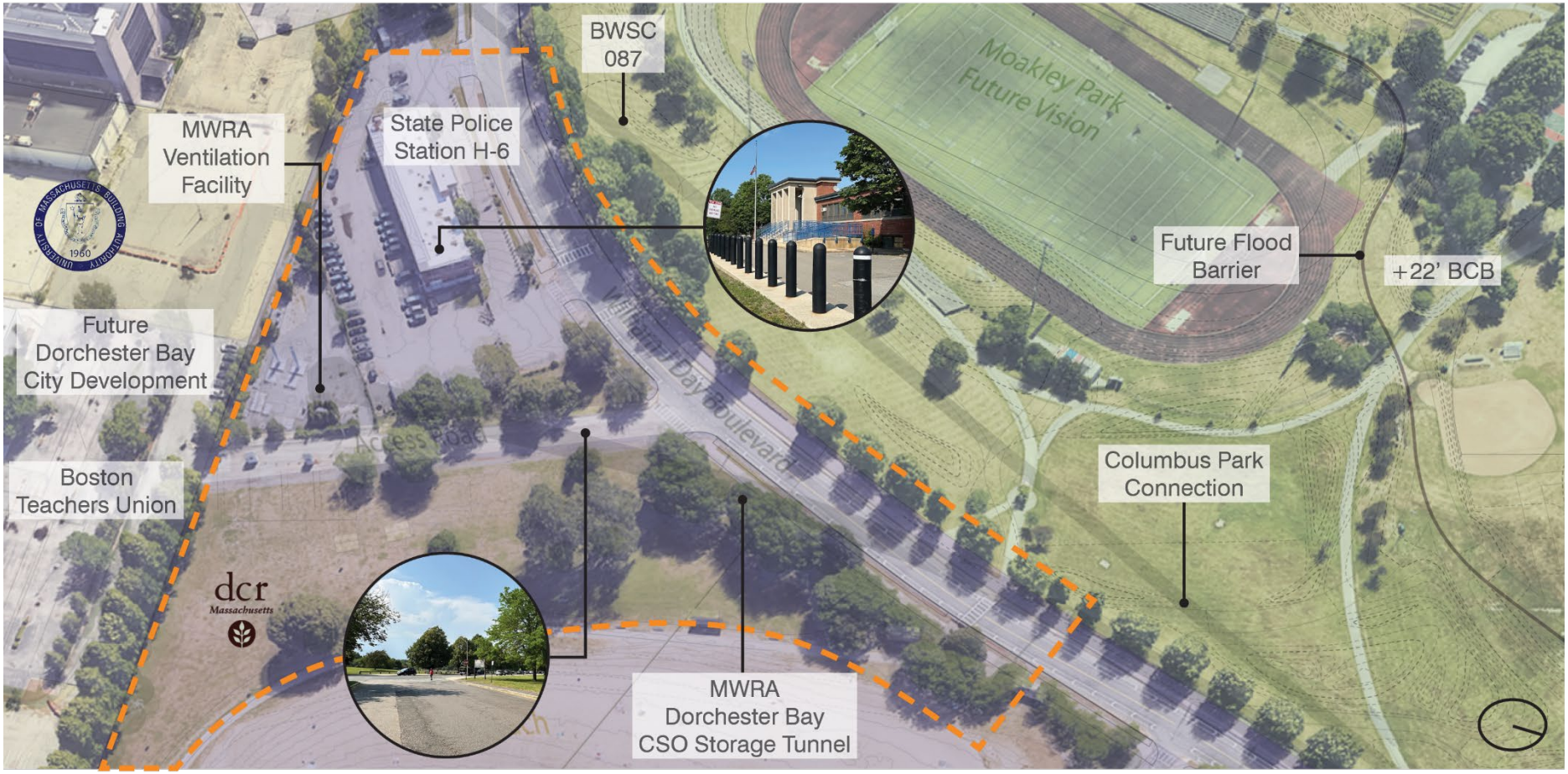


Figure 3. Property owners, jurisdiction and infrastructure at the Resilient Moakley Park South Connector site. Weston and Sampson, 2024.

HISTORIC AND PRESENT-DAY FLOODING

In the winter of 2018, when two nor'easters pushed storm surge into the streets of neighborhoods along the Boston Harbor, the City of Boston got a glimpse of how the future might look. Historically, the land where many of the neighborhoods along the waterfront now sit was filled to accommodate a growing city. The North and South Connector sites lay on filled land from the mid-1800s, which was used as commercial port areas and housing. The filled land was built up just enough to be out of the zone of tidal influence during that era; however, rising sea levels and increasingly severe storms have made the area more vulnerable to flooding.

The Storm of Record for Boston, meaning the storm which had the highest recorded flood elevation, was Winter Storm Grayson, January 4th, 2018. That storm had a recorded high-water elevation nearby at Boston's Long Wharf of 15.98ft BCB datum or 9.52 ft North American Vertical Datum 1988 (ft-NAVD88) according to a NOAA Tide and Current Station adjacent to Fort Point Channel. Soon after in March 1-3, 2018, Winter Storm Riley hit and a high-water mark of 13.5 ft-BCB (7 ft-NAVD88) was recorded at Fort Point Channel. The flooding experienced during these winter storms Grayson and Riley is expected to occur more frequently and with increased severity in the coming decades.

FUTURE CLIMATE RISK AND VULNERABILITY

Understanding the extent of flood vulnerability in Moakley Park and the Moakley Park Connector Sites requires an analysis of both present-day flood risk and future projections under various sea level rise scenarios. The Climate Ready Boston report identified significant flood pathways into the city based on model results from the former Boston Harbor Flood Risk Model (BH-FRM) that included Moakley Park (Figure 4).

The Massachusetts Coastal Flood Risk Model (MC-FRM) was developed by the Office of Coastal Zone Management's (CZM) StormSmart Coasts Program to "depict exposure of community facilities and infrastructure to coastal flooding under various conditions."[1] The MC-FRM data and flooding projections, serve as recommended standards for buildings and infrastructure projects across the Commonwealth.

The model, combining 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 project area is expected to be fully inundated in the first scenario of the projected 2030 0.5% annual storm (Figure 5). During the 2050 and 2070 storms (Figures 6 and 7), the inundation levels are projected to engulf the surrounding community, flooding much of the lower lying areas west of Moakley Park.

Climate design parameters for this project were first identified as part of the Moakley Park Resiliency Design development. The recommendations were based on the Resilient Massachusetts Action Team (RMAT) Climate Resilience Design Standards supported by the critical infrastructure and assets the coastal alignment would be protecting. The target design flood elevation (DFE) for the Moakley Park Connector project will align with the Moakley Park project at 22ft BCB (15.5ft NAVD88).

The DBC development is using a DFE of 22.7ft BCB across their entire site. The higher elevation reflects their increased exposure and fetch along Dorchester Bay to incoming waves. For the South Connector site, a DFE of 22.7ft BCB will be used from the DBC property through Day Boulevard before transitioning to DFE 22ft BCB in Moakley Park.

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

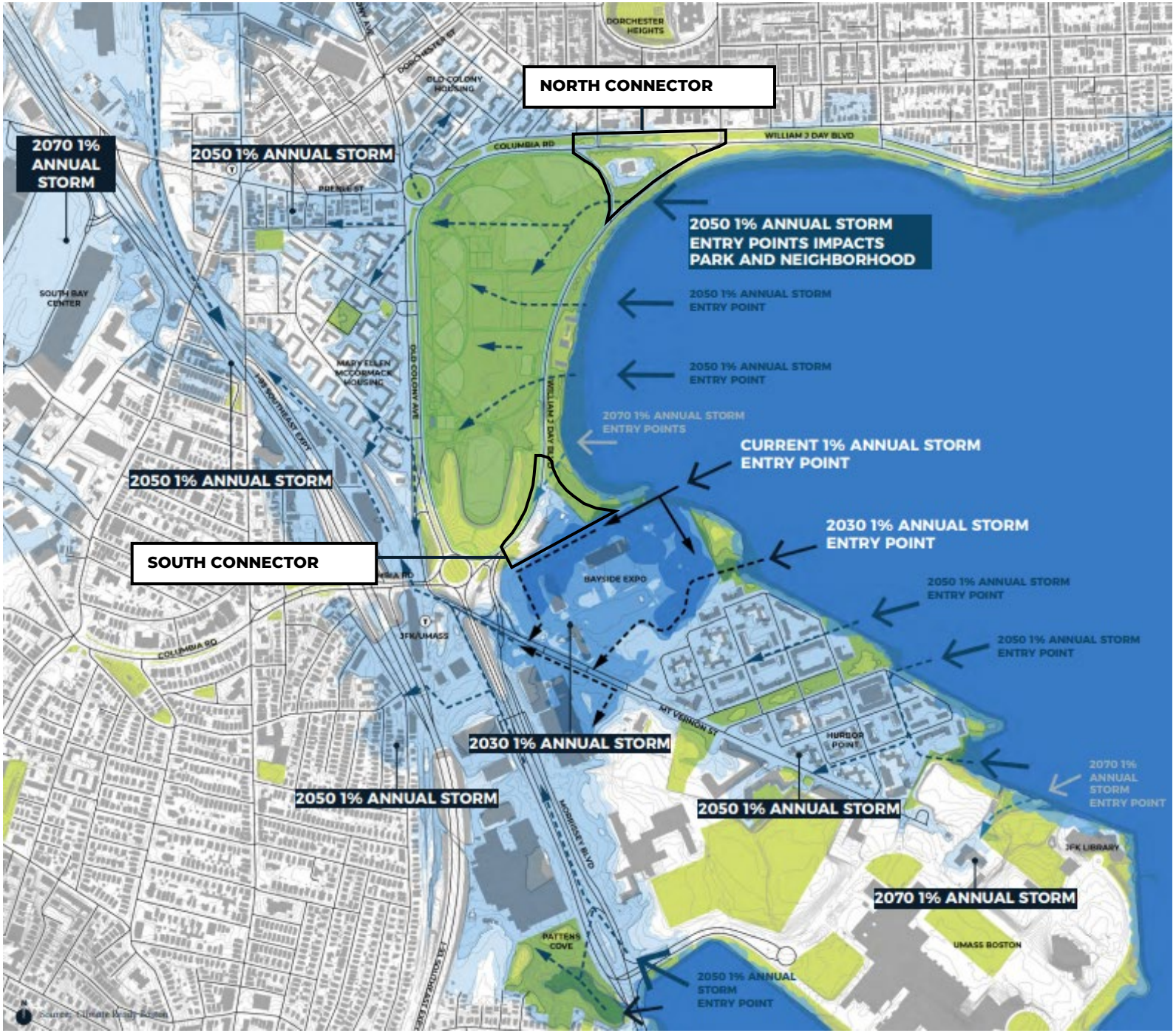


Figure 4. 1% Annual Flood Pathways at Moakley Park Connector Sites for 2030, 2050 and 2070 planning horizons.

Source: Climate Ready Boston

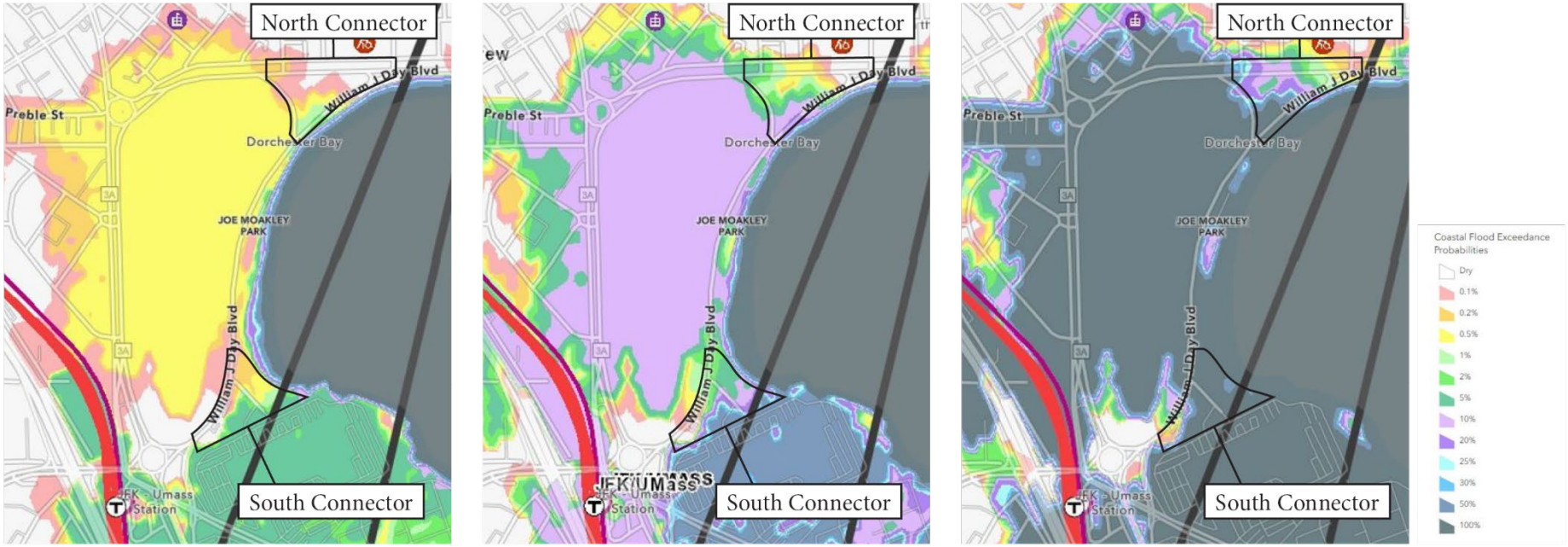


Figure 5. MC-FRM Annual Coastal Exceedance Probability for Moakley Park Vicinity for 2030, 2050, and 2070 planning horizons (left to right).

Comparison of Flood Elevations

In scoping this project, the City of Boston requested that the DFE match the resilience standard of the Moakley Park project of 22ft BCB, or protection from the 2070 0.5% water surface elevation plus wave heights. A summary of the maximum water surface elevations based on MC-FRM outputs from the previously mentioned sources are summarized below in Table 1. The elevations provided are a preliminary baseline for developing concepts and will be refined as the design is further developed.

Table 1. Flood Elevations Comparison

Property	FEMA		BH-FRM[1]		MC-FRM					
	Historic/Present Day (Feet)		2070 0.5% Storm (Feet)		2030 0.5% Storm* (Feet)		2050 0.5% Storm* (Feet)		2070 0.5% Storm* (Feet)	
	NAVD88[2]	BCB[3]	NAVD88	BCB	NAVD88	BCB	NAVD88	BCB	NAVD88	BCB
North and South Connector Sites	11.0	17.5	15.5	20.0	11.0	17.5	12.8	19.3	14.5	21.0

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

[1]BH-FRM: Boston Harbor Flood Risk Model

[2]NAVD88: North America Vertical Datum of 1988

[3]BCB: Boston City Base (NAVD88 + 6.46ft)

STAKEHOLDER FEEDBACK

Stakeholder engagement and interviews for the Resilient Moakley Park Connector project are designed to foster collaboration throughout the duration of the project to ensure that interested parties are appropriately engaged, that project milestones are met, that each milestone product meets the City's standards, and that the final products can support actionable next steps.

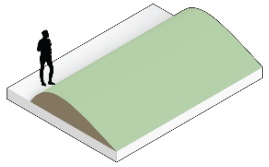
Early in the project development, MWRA indicated that it was their preference to have their Headworks (North Connector site) and Ventilation Facility (South Connector site) protected by the alignment options being considered. Given the criticality of their infrastructure at a regional level, the Project Team agreed and moving forward will keep both structures on the “dry side” of the flood alignment options.

Similarly, the Project Team heard from the MA State Police that their station (South Connector site) should be on the “dry side’ of the flood alignment. Additionally, neither their site (building, parking lot, and Day Blvd. driveways) nor its use can be modified from its current condition.

STRATEGIES FOR COASTAL FLOODING RESILIENCE

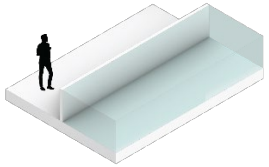
The Moakley Park Connector project needs to connect and build off of the coastal flood barriers being planned inside in Moakley Park (North & South Connector site) and DBC (South Connector site). Both of these projects propose earthen berms across their sites. DBC is designing an earthen berm along their waterfront edge and raising the ground elevation behind to establish site-wide higher ground. The Moakley Park team is designing an earthen berm incorporating a driven core wall in the middle due to subsurface conditions within the Park .

The Moakley Park Connector sites have their own unique needs and challenges. One type of strategy for the entire alignment is unlikely to be favorable or work technically given the spatial constraints, subsurface utilities and construction of structures. To address these challenges, several types of flood barrier strategies are being considered.



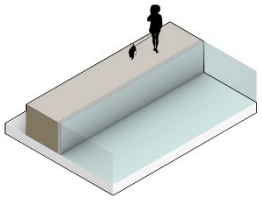
EARTHEN BERM

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



SEAWALL

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



RAISED ROADWAYS

Portions of Day Boulevard, Babe Ruth Drive, and Columbia Road will need to be crossed by the flood alignments. Road reconstruction with raised crosswalks and side slope or retaining walls will be considered.

COASTAL FLOOD ALIGNMENT STUDIES

From the onset of the Moakley Park Vision Project, the question of how the flood protection would extend beyond the park to connect to high ground in the surrounding neighborhood has been a high priority. Previous studies for flood alignments at both North and South Connector Sites have conceptually shown how site re-grading, alteration of existing uses, pedestrian access, circulation, and transportation would be necessary to develop flood protection. These studies showed the potential of the flood alignment construction supporting other site improvements, better accessibility, pedestrian circulation, and safer movement to and from Moakley Park. The following options utilize the various previously mentioned strategies to achieve resilience along the waterfront. The strategies used to achieve resilience will vary depending on the site's unique conditions with multiple strategies likely being utilized. These previous flood alignments were used as a starting point for this Report. Several additional alignment alternatives have been identified for consideration and were reviewed during the December 2023 site walk.

North Connector Site

There are four (4) general flood protection alignments that have been evaluated within the North Connector Site (Figure 6). All of the alignment options begin at the edge of Moakley Park along Babe Ruth Park Drive building off the future Moakley Park flood alignment currently being designed. However, there are options for the final tie-in location into South Boston, at either Old Harbor Street or G Street. These alignments are conceptual in that they represent feasible locations for implementing flood protection and require further engineering for final design. These options have been used for the evaluation knowing that further design development can lead to adjustments of a final alignment. The options are identified as following:

- Option 1: Cross Columbia Road to Old Harbor Street
- Option 2: Along Columbia Road to G Street
- Option 3: Along William J Day Boulevard to G Street
- Option 4: Dog Park across Columbia Road to G Street

South Connector Site

There are four (4) general flood protection alignments that have been evaluated within the South Connector Site (Figure 7). All options begin at the edge of the DBC property boundary and tie-into the waterfront berm designed as part of the DBC development. The alignment options either continue along the property boundary or north of Access Road. Options 1 and 2 tie-into existing high ground (22 feet BCB) closer to K-Circle within the State Police Barracks parking lot. Options 3 and 4 terminate at the edge of Moakley Park on Day Boulevard. The options are identified as following:

- Option 1: Connect to high ground at Day Boulevard South of the State Police Barracks
- Option 2: Connect to high ground at Day Boulevard in front of the State Police Barracks
- *Option 3: Along Access Road, across Day Boulevard North of the State Police Barracks.
- *Option 4: Along the shoreline, across Day Boulevard North of Barracks (in coordination with DBC design team)

* Dashed alignments represent portions of the alignment that cross into Moakley Park. Because this area of the park will be developed in future phases of work, the location of the alignment will need to consider future park grading, amenities, trees, and underground utilities. This will be evaluated during next steps.

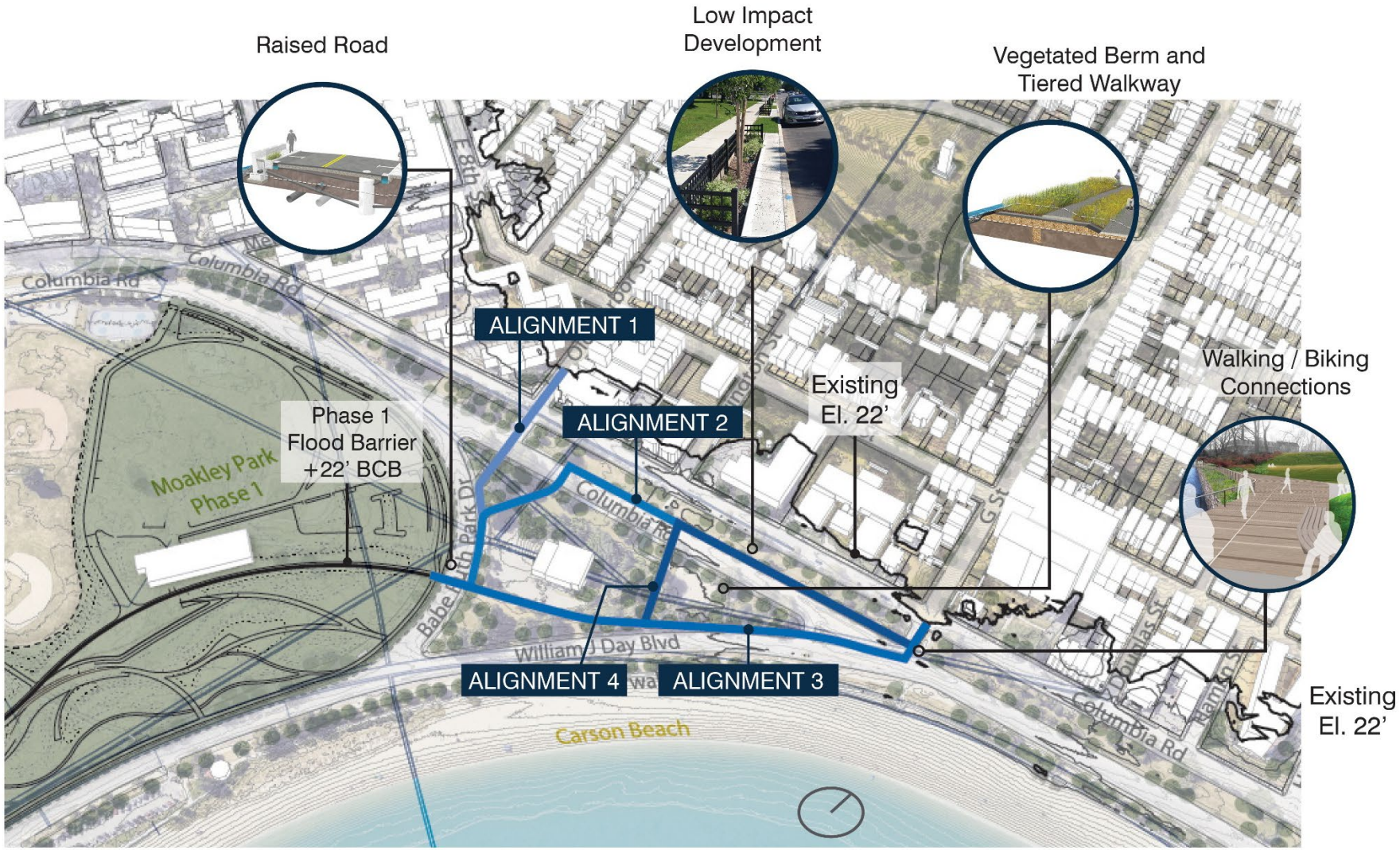


Figure 6. North Connector Site alignment studies and design opportunities.

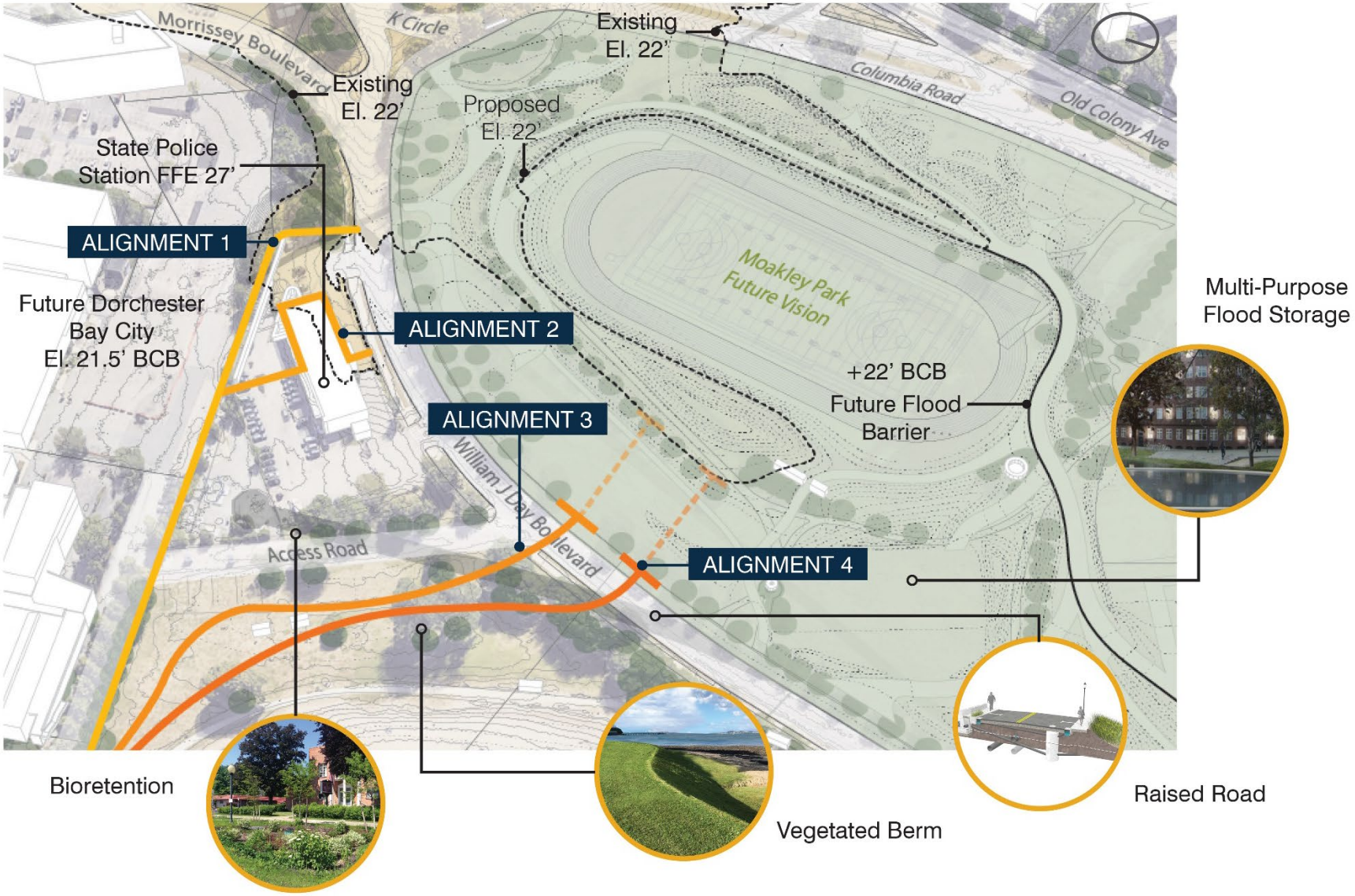


Figure 7. South Connector Site alignment studies and design opportunities

FLOOD PROTECTION ALIGNMENT CONSIDERATIONS

Landscape Elements

Circulation

The Moakley Park Connector project is an opportunity to reconnect the park with the surrounding neighborhoods. The Connector sites will be an extension of circulation strategies from within the park prioritizing safety and accessibility (Figure 8). The circulation strategies incorporated into the alignment options must consider increased pedestrian traffic projected with the opening of the DBC development.

Programming

The alignment options will incorporate the community's input for site amenities while coordinating with the programming in Moakley Park and DBC. Inclusion and access guided the park's redevelopment with Recreation & Play, Public Health & Community Well-Being, and Resiliency & Environment serving as core goals. While the current uses in the Moakley Park Connector sites are not expected to change, there is an opportunity to add community-focused programming as part of the alignment designs.

Trees

Urban tree canopy is ecologically and culturally critical in this area of Boston. Urban Heat Island Effect (UHIE) is a growing threat as temperatures continue to rise. All of the alignments will have some impact on the mature shade trees that exist within the Connector sites. Minimizing these impacts is a priority. New trees will be planted as part of the final construction project.

Stormwater

Each alignment will have some impact on stormwater with the creation of new low points behind the elevated flood barrier. Utilizing existing low points / catch basins will limit the requirements for new stormwater infrastructure. Regrading must be carefully reviewed to understand impacts of additional loading on existing utilities within these sites.



Figure 8. Rendering of Moakley Park's City Edge. Stoss Landscape Urbanism.

Utilities and Underground Structures

The majority of alignment options will cross at least one of the below listed utilities (Table 2). While currently in discussion with the utility owners regarding acceptable impacts to their utilities, the Project Team will follow conservative limits of negligible impacts when considering alignment options and construction methods. Alignment options that cross over shallower utilities should consider tie-in locations that limit fill and loading above those utilities. Costs of construction will increase if the weight of new fill above utilities cannot be mitigated through alternative materials like lightweight fill.

Table 2. Subsurface Utilities within the Moakley Park Connector vicinity

Utility	Owner	Size	Material	Approximate Invert Elevation (BCB)	Study Area
MWRA 204 CSO Drainage Tunnel	MWRA	17 feet diameter	Reinforced Concrete	-21.5 to -24 feet	North and South
Columbus Park Connector	MWRA	9.66 feet by 7.25 feet	Cast-in-place and precast concrete	-13 to -14 feet	North and South
Boston Main Drainage Tunnel	MWRA	10 feet	Concrete Lined	-297 feet	North
Boston Main Interceptor	MWRA	8.5 feet diameter	Reinforced Concrete	-14 feet	North
BWSC 085 Vale Street Overflow	BWSC	6.5 feet by 6.5 feet	Brick, Sections of reinforced concrete towards the outfall	2.3 to 0 feet	North
BWSC 087 Crescent Ave Overflow	BWSC	8 feet diameter to 6.33 feet by 8 feet	Brick near Old Colony Road, becomes double 7.5 x 10 reinforced concrete structure	4 to 0 feet	South

Transportation Impacts

There is a lot of complexity to the existing transportation context at these sites with Kosciuszko and Preble Circles, heavily traveled roadways, and challenging intersections. The Connector project must consider this complexity and prioritize safety in any of the proposed solutions.

Roadway Impacts

The Connector project will carefully consider the amount of full-depth road construction required for each alignment. Impacts to Day Boulevard, the State Police Barracks, MWRA site access, and Babe Ruth Drive are all being evaluated.

Environmental

This area of Boston has a complex history of previous environmental impacts from former industrial waterfront uses. MassDEP will be involved in any construction projects and will likely require a Release Abatement Measure (RAM) Plan, and conformance with applicable Activity and Use Limitations (AULs) within the construction area. The potential for off-site disposal of surplus soils will have cost implications that must be carefully considered in each option.

Preliminary Geotechnical

Soils in this area are varied and include compressible subsurface conditions that would settle with increased surface loads. MWRA has a directive of allowing only negligible impacts to their below grade utilities. Future improvements like concrete walkways, walls, etc. will not tolerate settlement. Any filling operations must limit additional weight onto these existing soils through the use of lightweight fill alternatives.

NEXT STEPS

These following next steps for the Resilient Moakley Park Connector project will help the Project Team move closer toward finalizing Phase I of this work and progressing to Phase II – 30% Design Development:

- Identify final alignment options for both North and South Connector sites based on Stakeholder Team and Planned Resilience Design Team inputs
- Develop a Basis of Design document that presents conceptual designs for each alignment option
- Evaluate options based on feasibility, impacts to site conditions, permitting, and costs consideration.
- Recommend one alignment option for each site to move forward into Phase II.