

# Feasibility Study and Design of a Pedestrian & Bicycle Crossing of the MBTA Fitchburg Line in North Cambridge

Cambridge, MA

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## Executive Summary

The idea of a pedestrian and bicycle crossing of the Fitchburg MBTA rail line in North Cambridge has been contemplated for decades. This feasibility study began with a request to the Community Development Department to analyze opportunities to construct a crossing between Alewife Brook Parkway and Sherman Street. The City purchased former rail property in 2016 next to New Street and Danehy Park on the south side of the Fitchburg MBTA rail line. The City worked closely with a consultant design team to look at:

- City-owned land, and existing and future surface easements to the City
- Safety and environmental site conditions
- Utility constraints
- And whether it was required to use MBTA right-of-way for the crossing

After reviewing all the data gathered, the design team developed three under-crossing (tunnel) and three over-crossing (bridge) concepts. The City presented these concepts to the community at the first virtual public meeting held in June 2023. Staff solicited input on these concepts to inform the ultimate design direction. Based on community input, staff developed a fourth under-crossing option that mimics the tunnel next to the Star Market on Beacon Street in Somerville, MA. Under-crossing option 4 proposed switch-back style ramping that takes up less space than the other ramp concept options studied. Such a concept, plus changes to other concepts, were presented by staff at the second virtual public meeting held in September 2023.

Given community input and the substantial existing utilities, tight property constraints and limited site distances causing safety concerns, staff and the design team concluded that a bridge crossing over the tracks is the most feasible and recommended a bridge as the design direction moving ahead.

To advance the design, the Community Development Department submitted a federal Reconnecting Communities and Neighborhoods (RCN) grant in September 2023 requesting \$2.4 million to be added to \$600,000 of city funds to complete final design of a bicycle and pedestrian bridge, plus a multi-use path parallel to the rail tracks connecting the bridge to many destinations including the Alewife MBTA station. That grant application was approved in March 2024 and the City will be receiving the \$2.4m to help fund the full design of the project. Public engagement to develop the full concept for the bicycle-pedestrian bridge and path project is expected to begin later in 2024 and continue to final design and identification of construction funding once we have developed design documents completed. Additional information can be found at [www.cambridgema.gov/fitchburgcrossing](http://www.cambridgema.gov/fitchburgcrossing) to learn more about the project.



## Introduction

### Project Purpose

The purpose of this study is to investigate the feasibility of and to explore possible design options for a pedestrian and bicycle crossing of the MBTA Fitchburg line between the existing Alewife Brook Parkway bridge and Sherman Street. In August 2016, the City of Cambridge acquired a former railroad spur parcel from the Boston and Maine Railroad Corporation. The parcel extends from Concord Ave to the Northern limit of Danehy Park, terminating at the MBTA Fitchburg line ROW. The City is designing and plans to construct a multi-use path to occupy this space as part of the Danehy Connector Path design and construction project. This path, with the connections and space it will provide, in conjunction with easements and property the City owns on the Rindge Avenue side of the tracks, provides a good opportunity to create a bicycle and pedestrian crossing across the rail right of way. This study examines a variety of general design concepts for a crossing as well as the design opportunities and constraints of each. Such a crossing connection, along with the broader bicycle network it connects to, will help fulfill the City's goals and visions for expanding a safe and equitable multi-modal transportation network within the City and the larger surrounding areas. This study seeks to continue the planning and design work related to a crossing in this area that was conducted by the City in 1999. Please visit [https://www.cambridgema.gov/~media/Files/CDD/Planning/Studies/NorthCambRailroadStudy/ncamb\\_railroad\\_study.pdf](https://www.cambridgema.gov/~media/Files/CDD/Planning/Studies/NorthCambRailroadStudy/ncamb_railroad_study.pdf) to view the North Cambridge Railroad Safety Task force report.

### Background and History

The City of Cambridge and the residents have long wanted a pedestrian and bicycle crossing of the Fitchburg line as a safer and more direct point to Danehy Park and an alternative to the busy Alewife Brook Parkway vehicular bridge which has limited accommodations for bicyclists and pedestrians. The dense residential neighborhood along Rindge Avenue on the north side of the commuter tracks is separated from important community destinations along the south side of the tracks like Danehy Park, Fresh Pond, and the shopping center. Several planning efforts and studies have been developed for the Alewife District over the years. The studies include an analysis of existing conditions, which outlines the challenges and opportunities for creating better pedestrian and bicycle connections in the District.



Figure 1: Regional Area Locus Map

The construction of a crossing of the Fitchburg Rail line will help to minimize this barrier and will provide several benefits. These benefits include new connections from neighborhoods to Daneyh Park, Fresh Pond Mall, Fresh Pond Reservation, and improved access to the Alewife MBTA station. Improving access will make it easier to travel between destinations and improve mobility without relying on additional single occupant motor vehicle trips.

The Concord-Alewife Planning Study Report (November 2005) developed by the City of Cambridge Community Development Department and the Concord Alewife Planning Study Committee has signaled that a crossing for pedestrians and bicycles is crucial to improving neighborhood connections between the Fresh Pond area to Alewife Station and North Cambridge. The crossing will provide a pedestrian

& bicycle connection to a regional network through the Minuteman Trail, Linear Park, Watertown – Cambridge Greenway, and the Somerville Community Path. The Concord-Alewife Planning Study Report states that creating a new pedestrian and bicycle connection across the MBTA Fitchburg line is the single most important element for improving transit access and connecting the Alewife district to the greater area. More recent studies have reinforced this vision.

### Purpose and Vision

A bicycle and pedestrian crossing of the MBTA Fitchburg line would be a very beneficial link between the Rindge Avenue neighborhood and Daneyh Park. It would help fulfill the City's larger goals and visions for safe and comfortable multi-modal transportation that provides people of all ages, abilities, and identities the opportunity to bike and walk safely and comfortably throughout the City. The crossing will encourage the use of sustainable modes within the district that reduce greenhouse gas emissions.

### Safety and Equity

In December 2017, the City adopted the Vision Zero Action plan to address the safety issues presented to pedestrians using multi-modal forms of transportation. (Visit [https://www.cambridgema.gov/-/media/Files/Traffic/visionzerodocuments/VisionZero\\_ActionPlan.pdf](https://www.cambridgema.gov/-/media/Files/Traffic/visionzerodocuments/VisionZero_ActionPlan.pdf) to see the full report.) The plan is a strategy to eliminate all traffic fatalities and severe injuries, while increasing access to safe, healthy, and equitable mobility options for all. The City rebuilt the Yerxa Road underpass located a half-mile east of the project area. An at-grade crossing exists at Sherman Street, but the width of the street and sidewalk make it hard for this to be a good connection for people walking and biking. The Alewife Brook Parkway Bridge to the west has a narrow-shared use path, the bridge was designed to carry heavy motor vehicle traffic and the bicycling and walking environment is not ADA compliant.

Because of this the lack of safe and direct options for crossing the rail line, there are frequent unsafe crossings made over the rail tracks by cutting through fences. Between 1974 and 1999, six fatalities were reported along this stretch of train tracks. Crossing the tracks at-grade here is illegal and dangerous, and unfortunately resulted in trains striking those who were trespassing resulting in injuries and death. Creating a safe and grade separated crossing in this area is a critical safety improvement for mobility in the area.

### Connectivity

A bicycle and pedestrian bridge over the MBTA Fitchburg Commuter Rail will connect the North Cambridge neighborhood to important open space, work and retail opportunities and the larger regional bike network. The crossing will fulfill the City's goals of better integrating the Alewife District, and the North Cambridge area with the surrounding neighborhoods and will provide access to Fresh Pond, Danehy Park, the Fresh Pond Plaza, Linear Park and the MBTA Alewife station. As stated in the Alewife District Plan (2019) "Traffic congestion, lack of connections, and auto-oriented development patterns are key mobility challenges". The plan proposes three strategies to enhance connectivity in the Alewife District. The three strategies are to enhance all modes of transportation and reduce the dependency on the automobile, design the public right of way to enhance the pedestrian & bicycle experience and to provide new connections to provide better access within the neighborhoods. The plan also states the importance of a bicycle and pedestrian crossing of the MBTA Fitchburg Line to grow the off-road active transportation network and provide a safe crossing without having to rely on traveling along Alewife Brook Parkway or Sherman Street. Multi-use paths should connect to larger open spaces and integrate seamlessly with the district street network. The Alewife District Plan outlines several benefits to the construction of a new pedestrian bridge. These benefits include new connections between the Triangle and Quadrangle Alewife subdistricts, improved access to the Alewife MBTA Station and will contribute to shifting current mobility towards non-automobile modes of travel.

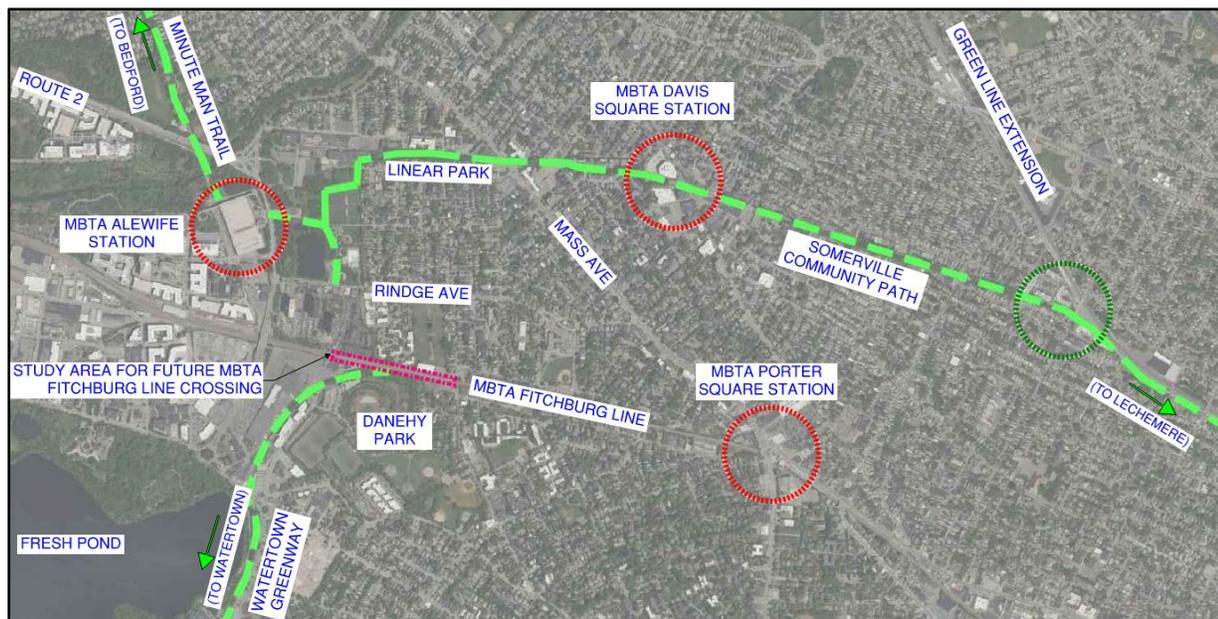


Figure 2: Regional Multi-Use Path Network

## Existing Conditions

### Overall Alewife District Area

The Alewife area is a varied mixed-use district with a variety of land uses including retail and light industrial buildings, residences, parks and open spaces and transportation facilities (roadways, rails and MBTA Alewife Station). The area was the subject of an urban revitalization plan by the City in 1979 with an emphasis on changing the district from an unplanned industrial neighborhood into an office, research, and service-oriented space. (Visit [https://www.cambridgema.gov/~media/Files/CDD/Planning/Studies/Alewife/alewife\\_fishbook\\_1979.pdf](https://www.cambridgema.gov/~media/Files/CDD/Planning/Studies/Alewife/alewife_fishbook_1979.pdf) to see the full report). As part of this 1979 urban revitalization plan, the former City landfill was capped and transformed into Danehy Park, using excavated soils from the Red Line extension project to fill in the space. There has been much progress since that time, and the City has since developed the Concord-Alewife Planning Study (visit [https://www.cambridgema.gov/~media/Files/CDD/Planning/Studies/ConcordAlewifeStudy/concale\\_plan\\_2006.pdf](https://www.cambridgema.gov/~media/Files/CDD/Planning/Studies/ConcordAlewifeStudy/concale_plan_2006.pdf) to see the full report). As well as the Alewife District Plan (visit [https://www.cambridgema.gov/~media/Files/CDD/compplan/envisioncambridgefinalplan/20191022\\_Alewife.pdf](https://www.cambridgema.gov/~media/Files/CDD/compplan/envisioncambridgefinalplan/20191022_Alewife.pdf) to see the plan) that was part of the city's Envision plan. These studies and plans emphasize economic opportunity through new jobs, additional and affordable housing, new open spaces, local retail, and public amenities that promote sustainable modes of transportation and increase the opportunities for social connection within the District.

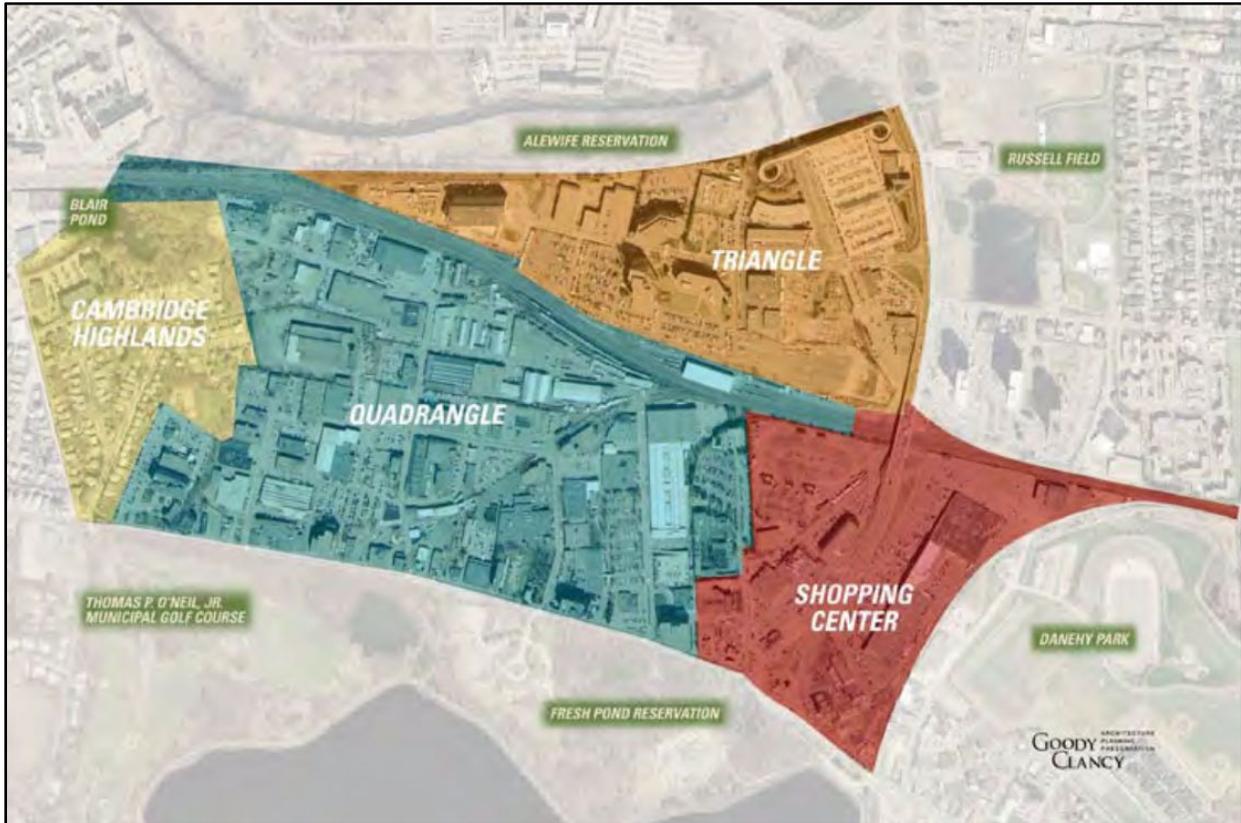


Figure 3: Alewife District Map Concord-Alewife Planning Study – November 2005 (Goody Clancy)

Some of the City's most significant open space resources, including Fresh Pond Reservation, Alewife Reservation and Daney Park are in relatively proximity to each other, but there is a lack of connectivity between the resources and the surrounding neighborhoods. The street network is busy, sparse and disconnected, which makes biking and walking inconvenient. The existing Alewife bridge over the Fitchburg Rail Line does not promote a comfortable pedestrian environment.

## Pedestrian & Bicycle Crossing – Study Area

The crossing study area is bounded by Alewife Brook Parkway to the West, Sherman Street to the East, and the residential properties of the three Rindge Towers (Just A Start & Schochet Property), Brickworks development and Jefferson Park are to the North. Fresh Pond Mall, Apple Cinemas and Aladdin Auto Service, as well as Danehy Park are to the South. The tracks are MBTA operated and consist of two main line tracks as well as sidings. The width of the MBTA ROW within the study area is approximately 65’.

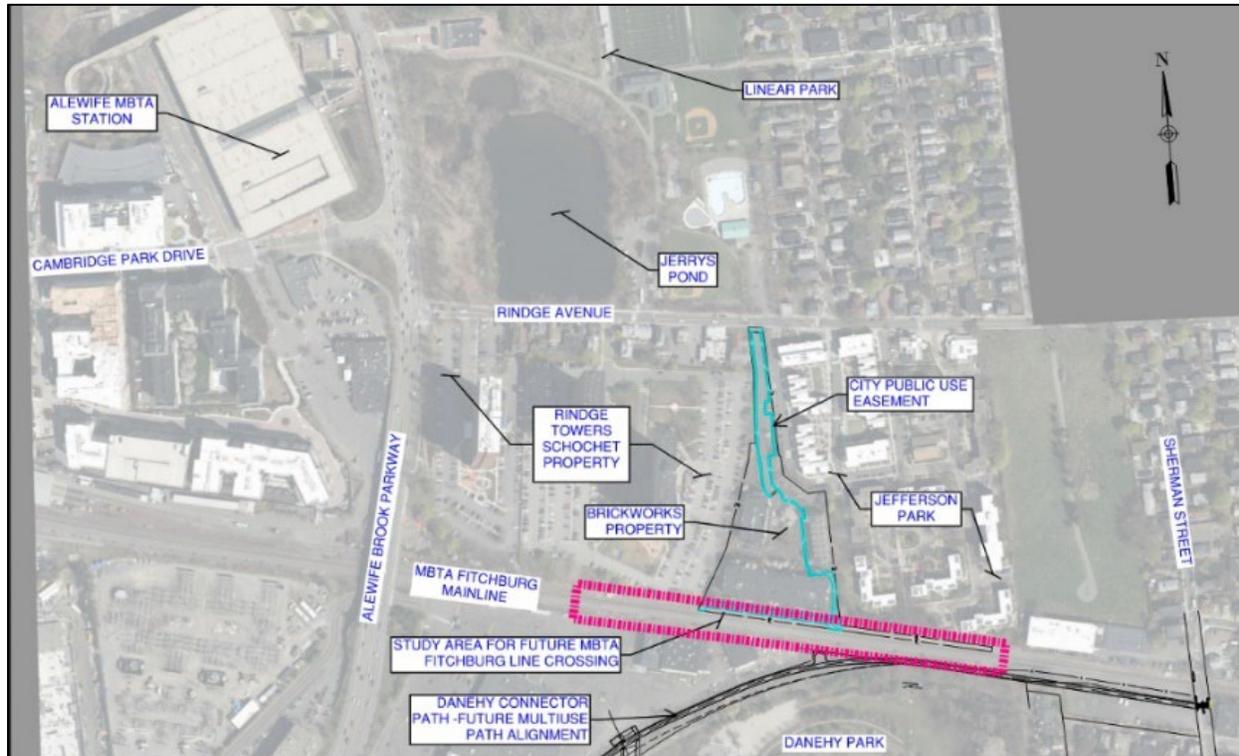


Figure 4: Pedestrian & Bicycle Crossing Feasibility Study Area

As part of the Danehy Connector Path Project, the City of Cambridge will construct a multi-use path along the rail spur parcel that the City acquired, formerly owned by the Boston and Maine Railroad Corporation. The multi-use path will extend from Concord Ave and connect back into Danehy Park at the Northern limit beyond New Street. A possible extension of the path to Sherman Street is currently under consideration.

## City Property Rights

The public was granted easements (Book 47186 Page 490) across the Brickworks parcel (310, 320, and 324 Rindge Ave). Shown as easement areas A, B, C and D on a plan titled “Plan of Land in Cambridge, Massachusetts, surveyed for Brickworks, LLC” (Plan 340 of 2006). The perpetual, non-exclusive easement is for pedestrian and bicycle passage. The public use easements are defined separately as

“pedestrian access over sidewalks and crosswalks”, as well as “bike paths over roads”. These easements extend from the Northern side of the MBTA ROW, through the Brickworks property to Rindge Avenue.

At the rear of the Brickworks site, adjacent and parallel to the MBTA ROW, and within the City of Cambridge 30’ Wide Sewer easement, the City of Cambridge was deeded an 18’ wide perpetual easement to construct and maintain a multi-use path (Book 47186 Page 487). This easement is also shown in the above referenced plan (Plan 340 of 2006). This easement extends the entire limit of the Southern Brickworks property line.

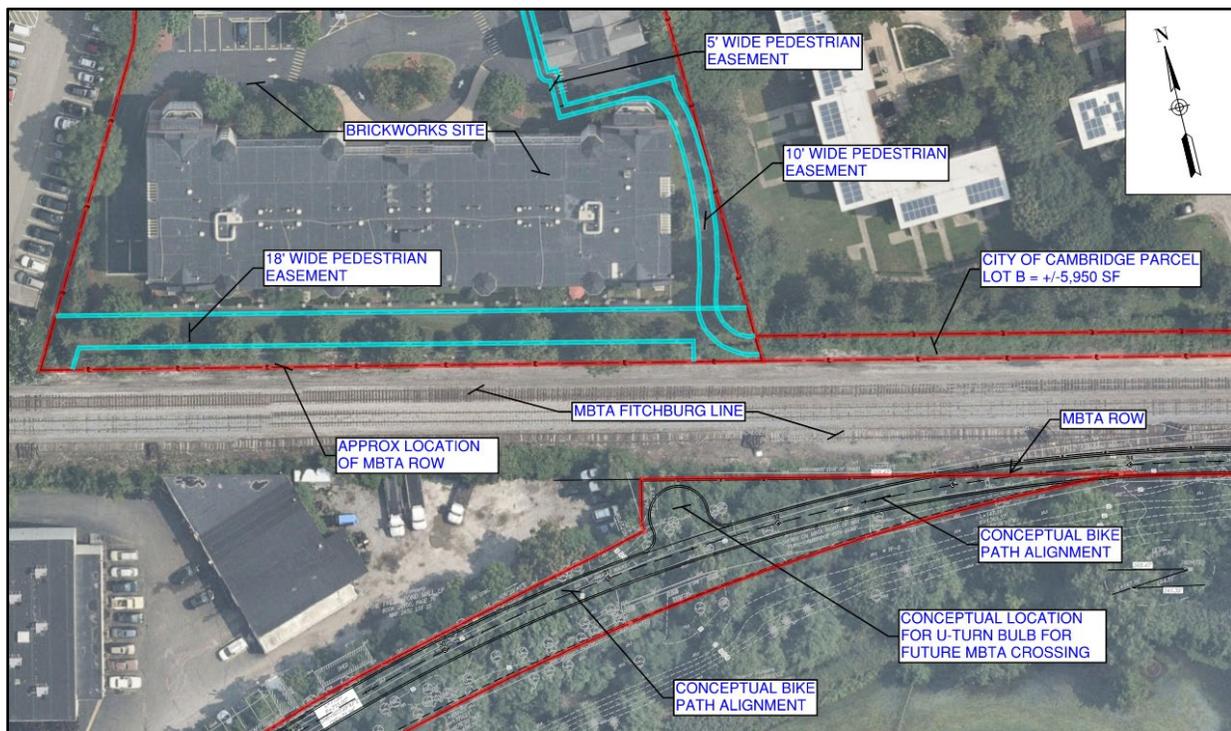


Figure 5: City of Cambridge Easement Areas and Property Rights

Additionally, the City was deeded a parcel of land (Book 47186 Page 485) along the North side of the MBTA ROW and shown as Lot “B” on a plan titled “Subdivision Plan of Land in Cambridge, Massachusetts Middlesex County Surveyed for Brickworks, LLC” (Plan 339 of 2006) and recorded at the Middlesex Registry of Deeds March 29, 2006. The parcel is approximately 5,950 SF. This parcel is located to the East of the Brickworks property and is bounded by the Jefferson Park residences to the North and the MBTA ROW to the South. (See Appendix A for Deeds and Plans for Property and Easements and Appendix B for City of Cambridge Easement and Property Rights).

As part of the Jefferson Park Redevelopment, a 16’ wide pedestrian easement for a future multi-use path will be provided. The easement will be located at the rear of the property, and will run parallel to the City-owned Parcel B.

### Existing Utilities and Environmental Conditions

The City of Cambridge owns and operates a 75" x 96" stormwater box and combined-sewer overflow (CSO) culvert which runs parallel to and along the north edge of the MBTA Fitchburg line property. The culvert is within a 30' City of Cambridge drainage easement on the adjacent Brickworks property. (See Appendix C City of Cambridge Sanitary Sewer Easement, Plans and Sections).

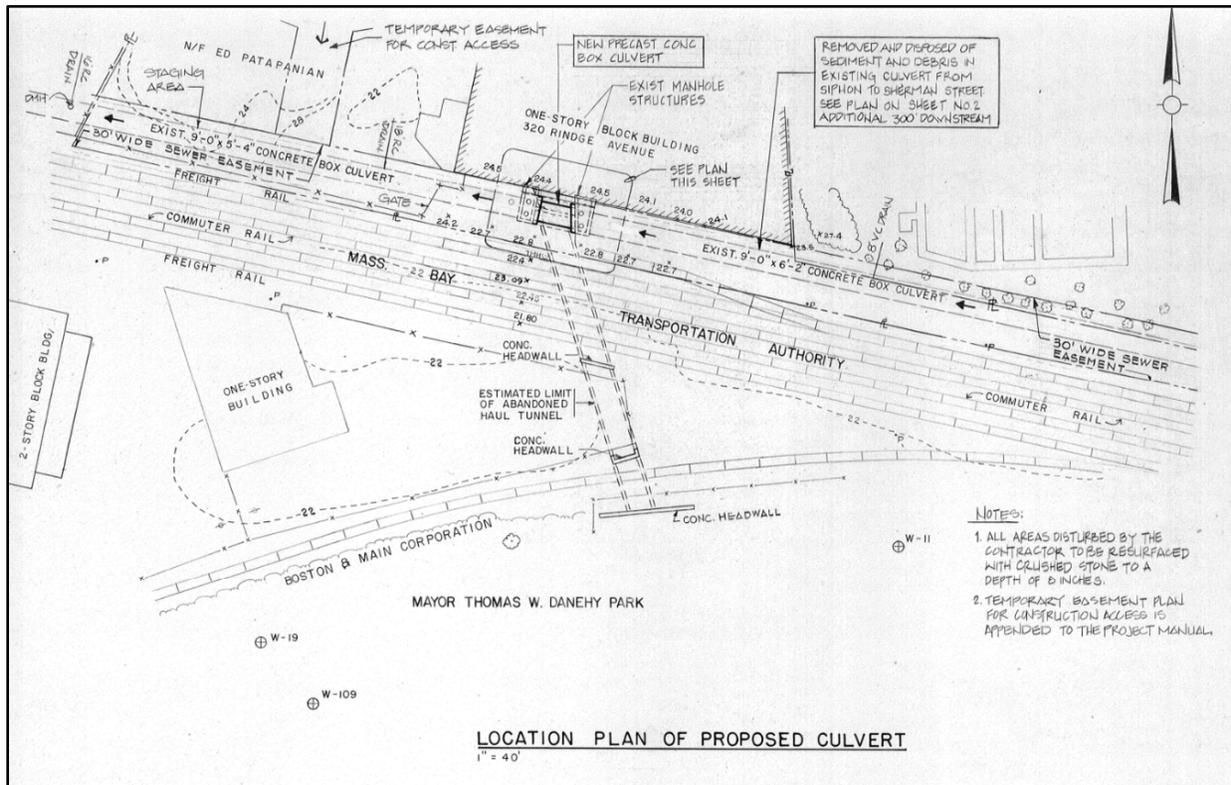


Figure 6: CDM Record Plan – Siphon Replacement Plan and Section – July 1991

### Precipitation Flood Area

The City of Cambridge Flood Viewer (visit <https://www.cambridgema.gov/services/floodmap> for more information) shows that the general project area may be impacted by the 2070 1% Sea Level Rise / Storm Surge (SLR/SS). For the purposes of planning City projects, we use the higher of the 2070 1% SLR/SS flood elevation or 2070-1% Precipitation Flooding (capacity of City’s Storm drain system) when reviewing the impact of a possible project. In this area of the City, the SLR/SS flood elevations are higher due to flooding as a result of overtopping and flanking of the Amelia Earnhardt (Mystic River) dam. Because the study area would be impacted by flooding under these scenarios, passive flood protection would be required for all the below-grade crossing options. (See Appendix D).

## Proposed Crossing Options

This section reviews the proposed options that the design team and City identified as having the greatest promise to create a bicycle-pedestrian connection across the Fitchburg Line rail tracks. Options that pass under as well as over were reviewed. This study investigated both a bridge crossing, as well as an underpass. Multiple configurations, layouts and touch down locations were evaluated for each option. (See Appendix F and G for Crossing Exhibits).

## Pedestrian & Bicycle Underpass Crossing

### Design Criteria

Key design criteria considered for the underpass crossing were the depth of cover to the top slab, the height of the underpass (vertical clearance), the distance and orientation to the existing City owned box culvert on the North side and required ramp lengths meeting ADA criteria. There are several existing site constraints that create challenges for this option, such as existing infrastructure, depth to groundwater, and venting requirements for methane gas from the adjacent former landfill. The site geometry, space constraints and existing properties does not make it possible to replicate the user experience that was created for the Yerxa Road underpass. Open site lines through an underpass will not be possible in any of the options without significant impacts to Danehy Park and the private parcels North of the MBTA ROW. Additionally, open cut excavation, if approved by MBTA, would be the likely method of construction, which would require temporary shutdowns for the MBTA as well as removing and resetting existing rail lines and/or temporary track realignments. Pump stations to keep standing water out of the underpass would be needed in all options. Given flooding in the Alewife area, special attention would need to be paid to sizing the stations properly and possibly providing options for backup power and, as noted above portion of the proposed underpass crossing options that fall within the 2070 1% flood area would require incorporating passive flood protection measures.

### Pedestrian & Bicycle Underpass Crossing – Concept 1

Concept 1 places the underpass in the same alignment as the bridge overpass options shown later in concepts 1 and 2 which are near the boundary of Jefferson Park and Brickworks properties. Vertical separation of 3' from existing grade to top of underpass slab was used to establish depth. The inside height of the underpass was set to +/-8.25'. The landing on the North side is located within the City of Cambridge Parcel B, adjacent to the existing drainage box culvert. An approximate 2' separation from the culvert to the underpass retaining wall was maintained. Note: The City of Cambridge Department of Public Works would need to conduct an in-depth design review of this 2' offset and may conclude that 2' is not enough of an offset to guarantee that the box culvert could remain in operation safely in its location adjacent to the proposed under crossing ramping. The ramp on the North side turns 90 degrees from the underpass and runs parallel to the Fitchburg line for approximately 220'. The open ramp stays within the City of Cambridge Parcel B and does not encroach onto MBTA ROW. Retaining walls with railings at the top will be required to accommodate the ramp. Due to space constraints between the existing culvert and the MBTA ROW, the ramp cannot achieve our goal of 12' – 14'. The widest ramp width that might be achieved is approximately 8'. Note: an 8' foot ramp may be an unacceptably narrow width for a multi-use path ramp with no clear sight lines around a 90 degree turn in the undercrossing.

The landing is located to the South of the Jefferson Park property. An at-grade accessible walkway will connect the ramp landing to Jefferson Park. Additional grading and easements will be required to construct this path.

The ramp on the South side will turn 45-degrees from the underpass and run parallel to the multi-use path for approximately 220'. Retaining walls and railings at the top will be required for the length of ramp on this side.

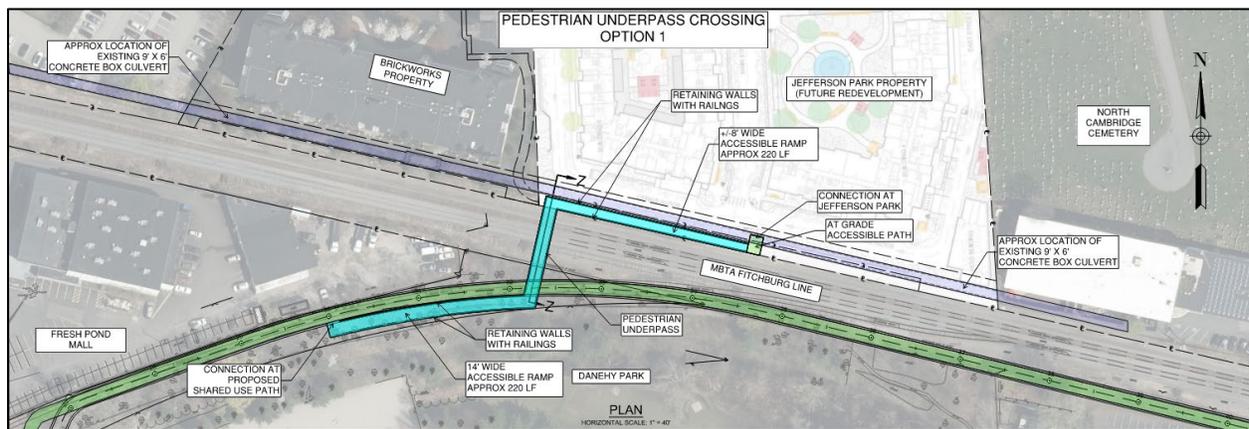


Figure 7: Pedestrian & Bicycle Under Crossing Concept 1 - Plan Diagram

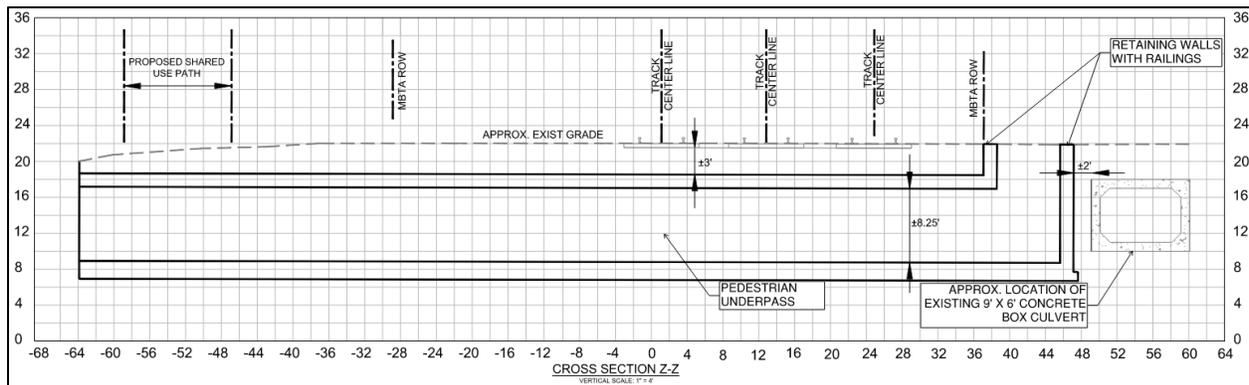


Figure 8: Pedestrian & Bicycle Under Crossing Concept 1 - Section Diagram

**Pros**

- Shorter tunnel length
- Less excavation required

**Cons**

- Blind corners with uncomfortable sight lines
- Pumping system

### Pedestrian & Bicycle Underpass Crossing – Concept 2

Concept 2 maintains a similar alignment as concept 1, however in this option, the underpass spans underneath the existing box culvert on the North side. Separation of 2' from the approximate bottom of culvert to top slab of underpass was used to establish the depth of the underpass. Additionally, 2' of horizontal clearance from the wall of the culvert to the proposed retaining wall was used to establish the location of the landing area on the North side. To drop the underpass below the culvert, the top of the underpass is located approximately 14' below existing grade. Because of the lower grade, the required ramp lengths are approximately 350', which is significantly longer than the ramps in concept 1. On the North side, the landing location where the ramp meets existing grade is located at the rear of the Jefferson Park Residential buildings. The available space on the North side of Jefferson Park is not adequate to accommodate the required length and desired width of the ramp for this configuration. The ramp would need to occupy the South Street drive aisle that is proposed in the future Jefferson Park redevelopment plan. As such, underpass concept 2 does not appear feasible.

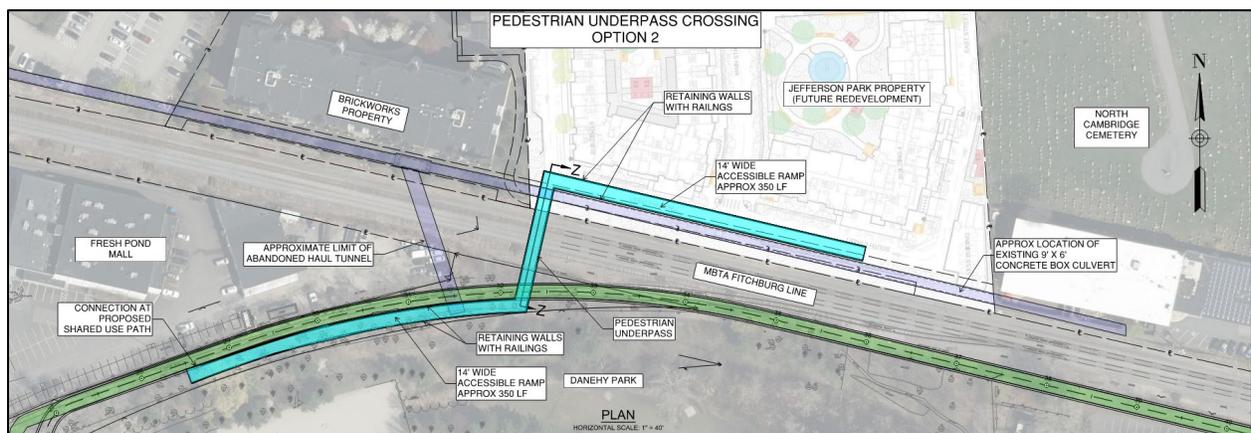


Figure 9: Pedestrian & Bicycle Under Crossing Concept 2 – Plan Diagram

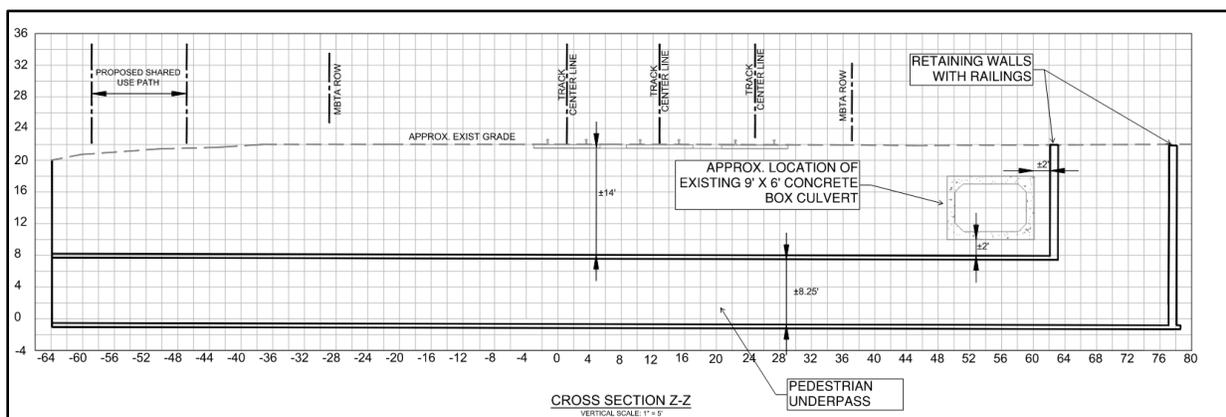


Figure 10: Pedestrian & Bicycle Under Crossing Concept 2 – Section Diagram

**Pros**

- Minimized impacts to box culvert

**Cons**

- Deep excavation with longer ramps
- Pumping system

**Pedestrian & Bicycle Underpass Crossing – Concept 3**

Concept 3 proposes the construction of a siphon at the existing culvert. The siphon will lower the culvert to a depth so that the underpass can span across. Lowering the culvert will allow the underpass to cross over it and will minimize excavation required to construct. This differs from option 2, which required a much deeper excavation for the underpass to go below the existing culvert. Concept 3 proposes 2' of vertical separation from the bottom slab of the underpass to the top of relocated culvert will be maintained. In this concept, the depth to the underpass will maintain 3' from existing grade to top of slab, much the same as was done in concept 1. The depth to the top slab of relocated culvert will be approximately 16'. The North side landing will turn 90 degrees and ramp up for approximately 220' to an at-grade accessible path. Like concept 2, the ramp would need to occupy the South Street drive aisle at the permitted Jefferson Park redevelopment plan. The South landing and ramp configuration will match the design as outlined in concept 1. Because we cannot occupy space in the Jefferson Park redevelopment area, this option does not appear feasible.

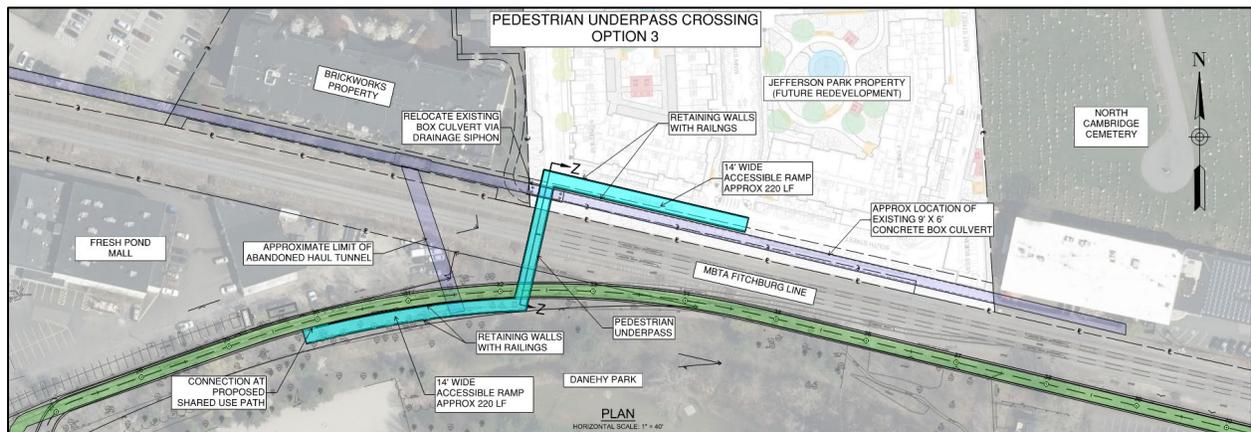


Figure 11: Pedestrian & Bicycle Under Crossing Concept 3 – Plan Diagram

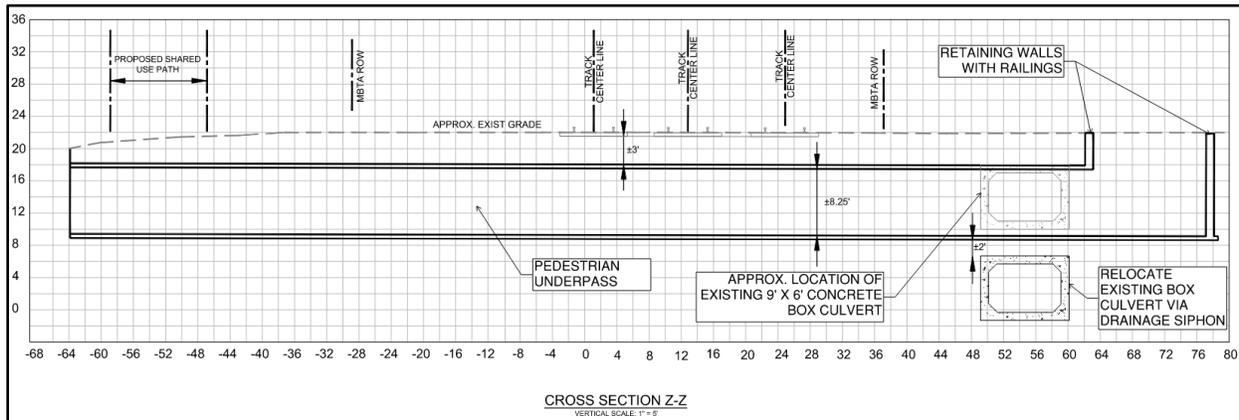


Figure 12: Pedestrian & Bicycle Under Crossing Concept 3 – Section Diagram

**Pros**

- Less excavation required
- Shorter ramp lengths

**Cons**

- Expensive siphon with relocated box culvert
- Impacts Jefferson Park redevelopment

**Pedestrian & Bicycle Underpass Crossing – Concept 4A**

Concept 4A proposes the construction of a ramp system that evaluates an underpass that includes “more open sightlines” like the Beacon Street at Sacramento Street underpass in Somerville, as well as other precedent underpass examples at other locations. The ramp system includes two 180-degree switchbacks. The ramp width on the South side is 8’ and the ramp width on the North side is 7’. The switchback ramps occupy less space, however, create an uncomfortable experience for bicyclists to traverse. Staircase access is included on both sides of the ramp. On the North side, the staircase must turn 90 degrees, due to the lack of space. Additionally, the narrow width of Parcel B requires use of MBTA land, and the location of the existing box culvert is a significant engineering constraint. A minimum horizontal offset of 12’-6” from the MBTA center line of tracks is required. The result is that there are no clear sight lines through the tunnel, and a significant pinch point between the stairs and the roof of the tunnel is unavoidable. Because of these constraints, this option does not appear feasible.

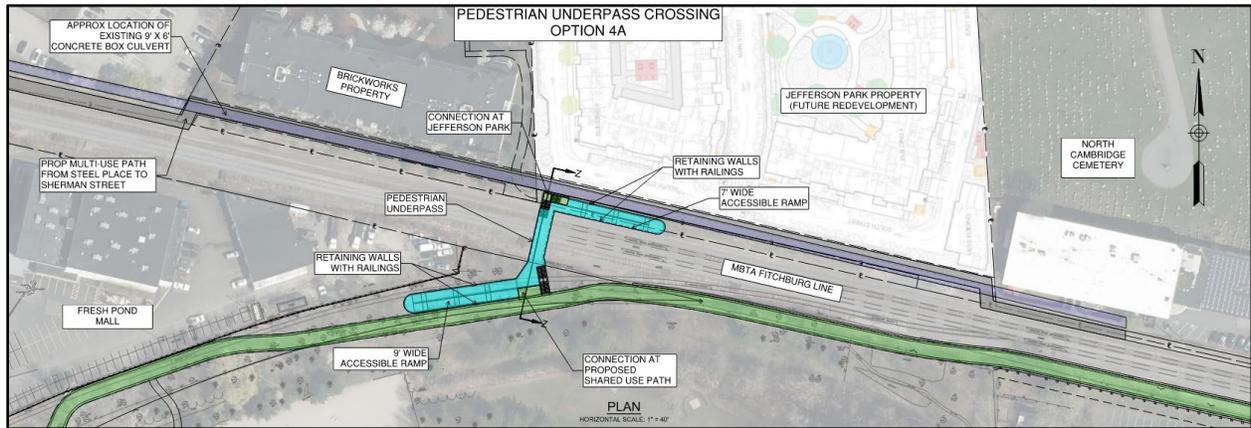


Figure 13: Pedestrian & Bicycle Under Crossing Concept 4A – Plan Diagram

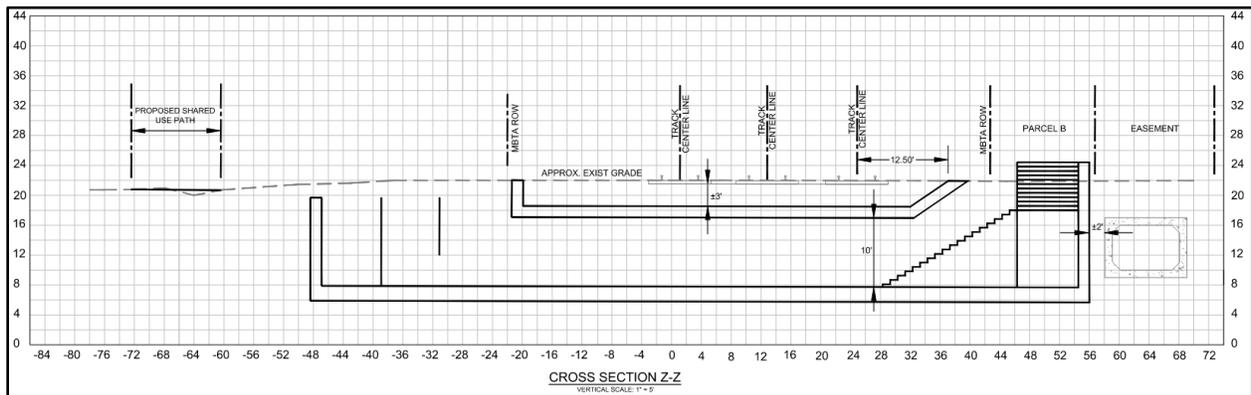


Figure 14: Pedestrian & Bicycle Under Crossing Concept 4A – Section Diagram

**Pros**

- More open sight lines
- Shorter ramp lengths

**Cons**

- Narrow ramps and stairs
- Pinch point between stairs and tunnel roof
- Use of MBTA land required

**Pedestrian & Bicycle Underpass Crossing – Concept 4B**

Concept 4B proposes similar design features as concept 4A, however in this concept, a portion of the staircase on the North side is atop the existing box culvert. Shifting the staircase allows for increased headroom between the stairs and the roof of the tunnel and eliminates a pinch point. In this option, the use of MBTA land is still required, and the location of the existing box culvert remains a significant engineering constraint. The ramp width on the South side is 8' and the ramp width on the North side is 7'.

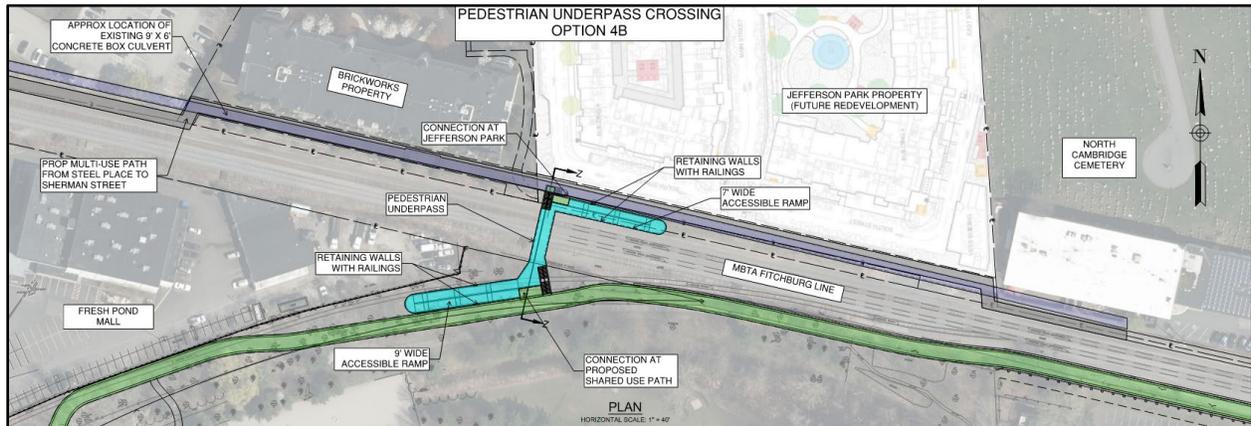


Figure 15: Pedestrian & Bicycle Under Crossing Concept 4B – Plan Diagram

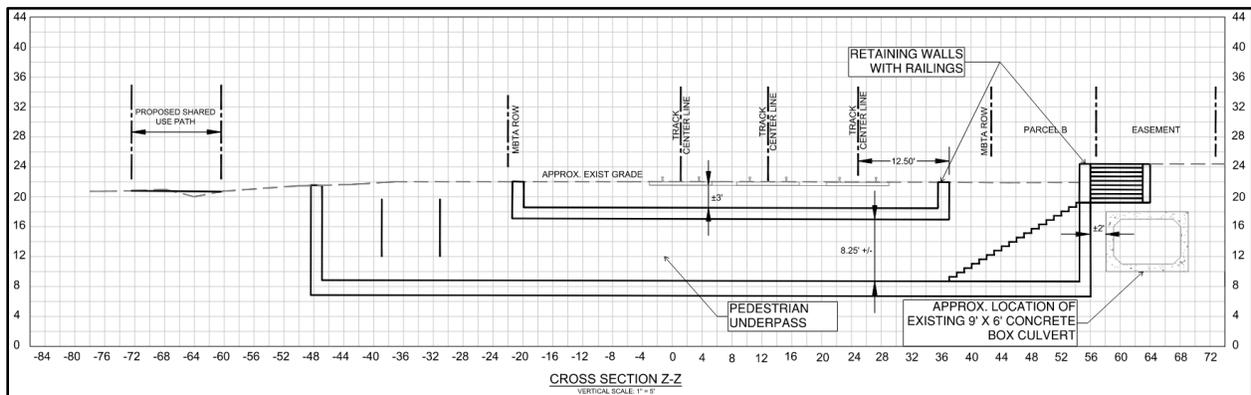


Figure 16: Pedestrian & Bicycle Under Crossing Concept 4B – Section Diagram

**Pros**

- More open sight lines
- Shorter ramp lengths

**Cons**

- Unacceptably narrow pinch point in future multi-use path area
- 90-degree turns

## Pedestrian & Bicycle Bridge Crossing

### Design Criteria

Key criteria analyzed for the bridge crossing were the locations of the bridge footings, the bridge span length, bridge super structure depth, the location of ramping and a minimum vertical clearance over the rail tracks. Like the under-pass crossing study, three concepts were generated to show the bridge crossing the rail at approximately the same location from Danehy Park across to an area approximately at the Brickworks and Jefferson Park property boundary.

For each of the options, the bridge footings were positioned such that they were located outside of the MBTA ROW and such that they maintained acceptable horizontal clearance from the face of the bridge column to the nearest track centerline. Once the footing locations were established, an approximate bridge span length was determined. The bridge span length was used to establish an approximate depth of bridge superstructure, using the LRFD Guide Specifications for the Design of Pedestrian Bridge (2009). The depth of bridge is dependent on the bridge type, i.e., truss bridge, beam bridge, suspension etc. and bridge width. For this study, the bridge superstructure was assumed to be 12' – 14' in width and consist of three (3) – W24 x 104 rolled beams with an 8-inch concrete composite deck. Only pedestrian and bicycle live loading was assumed in the determination of the superstructure depth. Using these parameters, a value of 2.5' was calculated for the structure depth. A conservative value of 3' was used to establish the structure depth for each of the three crossing concepts developed for this study. An increase in the bridge width would be a feasible design alternative. Design implications could potentially be deeper / wider beams, increased elevation of finished deck, longer ramp lengths and associated added costs.

The MBTA Book of Standard Plans – Track and Roadway April 29, 1996 (See Appendix E) lists minimum vertical clearances by route segment. Per this MBTA plan, the acceptable vertical clearance is equaled to 22'-6", measured from the lowest projection (i.e. rivet, bolt, pipe etc.) to the vertical obstruction. In some instances, the MBTA does allow for reduced vertical clearance, contingent upon MBTA and Mass Department of Public Utilities approvals. Specific to the MBTA Fitchburg Main line, an absolute minimum vertical clearance of 20'-8" can be used if required approvals are granted. For this study, a vertical clearance of 22'-6" was used as a conservative value.

All of these metrics were used to set the bridge deck elevation, in relation to the existing grade. Using a maximum ramp slope of 7.5% as well as the required 5' x 5' level landings required for every 2.5' of vertical elevation change (2010 ADA Standards for Accessible Design), an approximate required length of ramp was calculated. Level landings on both sides of the bridge crossing were located using the required ramp lengths. Using these established parameters, the following three bridge layout concepts were studied.

#### Pedestrian & Bicycle Bridge Crossing – Concept 1

Concept 1 shows a proposed pedestrian and bicycle bridge with ramping on the north side of the tracks which is approximately 400' long, and with ramping located in Parcel B. The ramp will connect to an east-west multi-use path that runs north of the ramping and occupies the space within the proposed 16' Jefferson Park surface easement. The multi-use path will extend east to Sherman Street and West to Alewife Station. The locations and concepts of the at-grade walkways will need to be coordinated with the layout for the future redevelopment design of Jefferson Park.

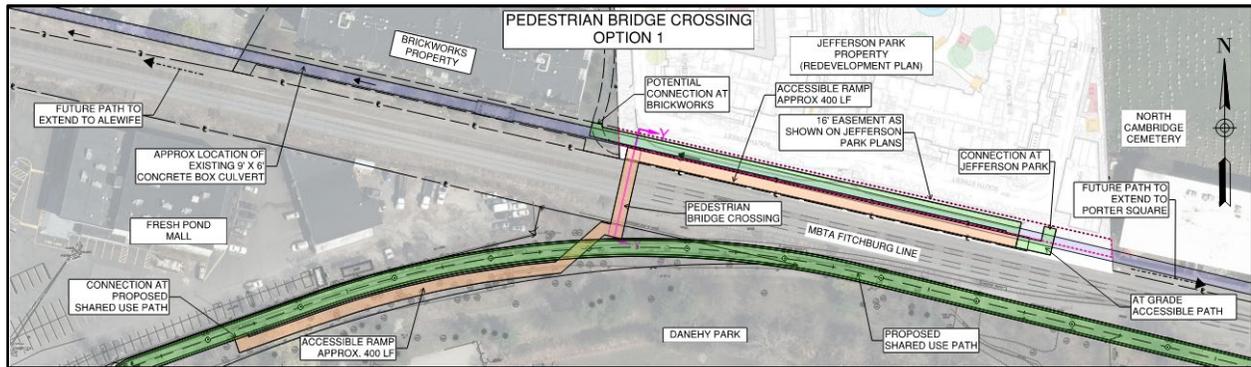


Figure 17: Pedestrian & Bicycle Bridge Crossing Concept 1 – Plan Diagram

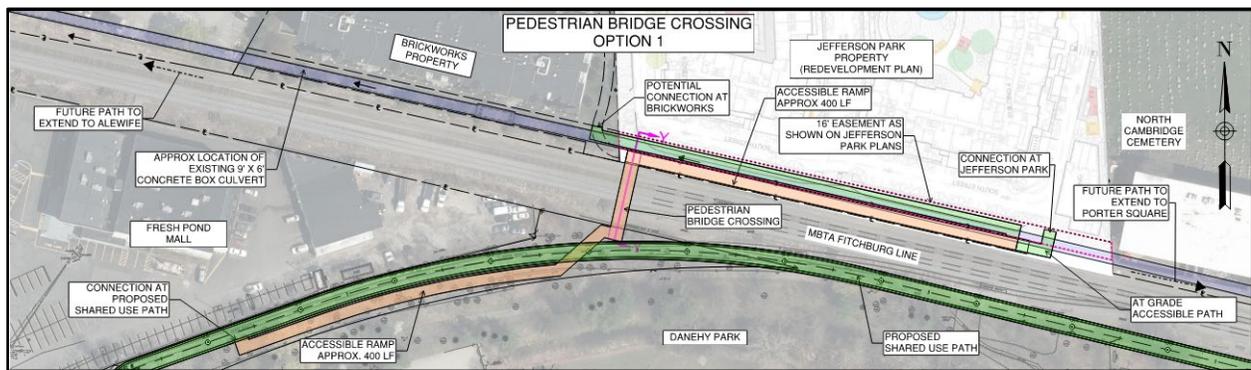


Figure 18: Pedestrian & Bicycle Bridge Crossing Concept 1 - Section Diagram. Note that due to similarities, concepts 2 and 3 section drawings are omitted.

**Pros**

- Connection to existing pedestrian easements
- Clear sight lines, straight ramping
- Uses City-owned property, Parcel B, for the North ramp

**Cons**

- 90-degree turns
- Parcel B has limited width

**Pedestrian & Bicycle Bridge Crossing – Concept 2**

The concept 2 layout maintains the same bridge location as concept 1 as well as the same ramp configuration to the South. The variation occurs on the North side ramp, which ramps to the West along the southern edge of the Brickworks property. An at-grade accessible path would connect the ramp landing to an east-west multi-use path from this location east to Sherman Street and west to Alewife Station. Between Jefferson Park and the MBTA property, this path would be along a 16’ easement which is in process from Jefferson Park. This arrangement would land users of the bridge further west and closer to Steel Place and further from the easement to Rindge Avenue.

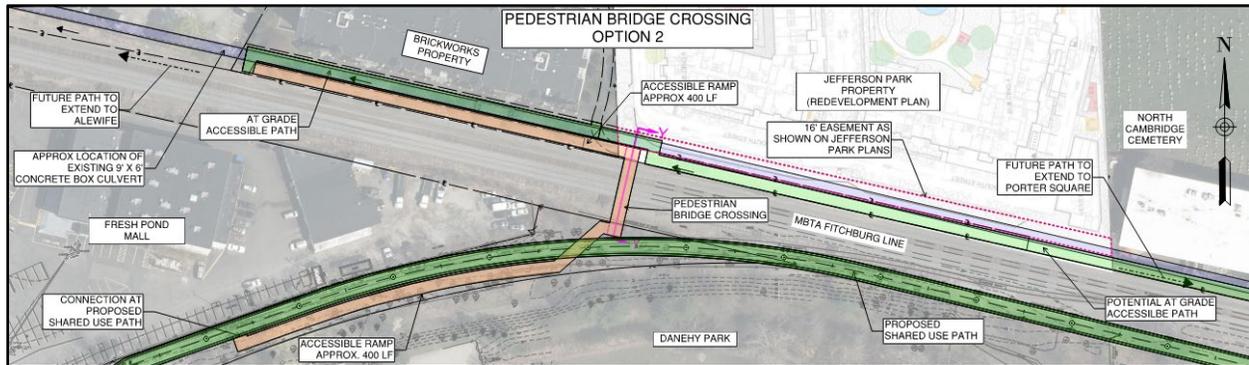


Figure 19: Pedestrian & Bicycle Bridge Crossing Concept 2 – Plan Diagram

**Pros**

- Clear sight lines
- Ramps do not occupy MBTA ROW

**Cons**

- Does not connect to existing easement
- Ramping needed on easement south of Brickworks property
- Unclear if north side ramp is allowed under existing easement language

Pedestrian & Bicycle Bridge Crossing – Concept 3

Concept 3 shifts the pedestrian bridge to the west, adjacent to the Schochet Property and the Apple Cinemas. The bridge pier footing on the north side is located at the southeast corner of the Schochet Property. The bridge pier footing on the south side is located adjacent to the Apple Cinemas, within the MBTA ROW.

The ramp on the north side extends to the west and runs parallel to the rear parking aisle for the Schochet property. The existing topography around the ramp touch down location is approximately 10’ higher than the existing grade along the track ROW. This raised condition affords an opportunity to reduce the ramp length while still maintaining a 7.5% minimum slope, leading to an approximate ramp length of 300’. An at-grade accessible path will connect the ramp landing to the adjacent parking area. Additional grading will be required to ensure this ramp is ADA accessible. A loss of approximately (2) parking spaces will be required to accommodate the multi-use path through the parking area, to an existing sidewalk within the Schochet property. Additional easements on the Schochet property will be required to accommodate this concept. People who want to access Brickworks, Jefferson Park and Rindge Avenue would need to walk east on the multi-use path to those destinations, unless a staircase can be accommodated at the landing where the bridge ends.

The ramp on the south side will run parallel to the MBTA Fitchburg line for approximately 400’ and will touch down adjacent to the multi-use path within the City of Cambridge property. The footprint of the ramp in the air will be over and occupy MBTA ROW.

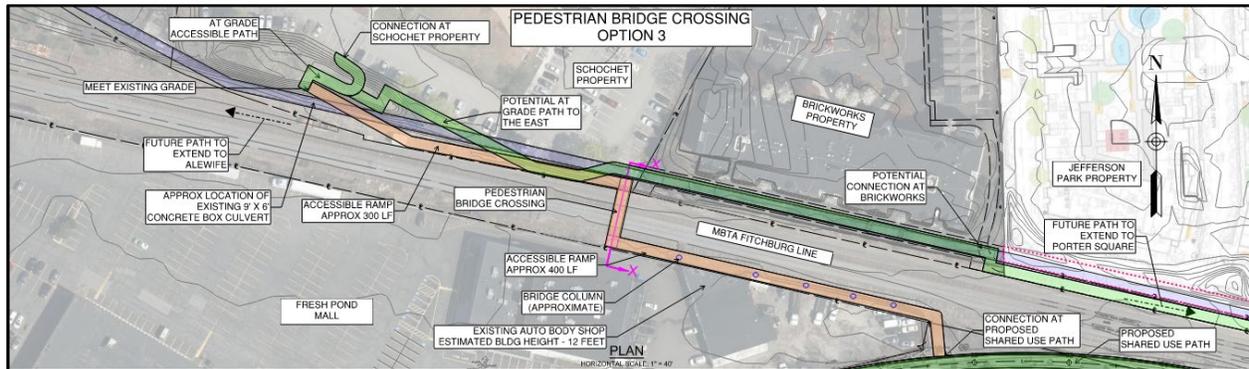


Figure 20: Pedestrian & Bicycle Bridge Crossing Concept 3 – Plan Diagram

**Pros**

- Favorable topography
- Shorter ramp lengths

**Cons**

- Ramping needed on MBTA & adjacent private property
- Does not connect to existing easements

## Order of Magnitude Costs

### Pedestrian & Bicycle Overpass Crossing

The scope of work included in the construction of a pedestrian & bicycle bridge encompasses site work, excavation and foundation, ramps, super structure, grading, staging, utility, and lighting, permits and coordination with MBTA. Based on similar projects, an order of magnitude construction cost of \$14 - \$16 million is estimated for 2023 construction. Future estimated costs will need to be escalated for each year that passes beyond this date.

### Pedestrian & Bicycle Underpass Crossing

The scope of work included in the construction of a pedestrian & bicycle underpass encompasses site work, excavation and foundation, dewatering, venting, ramps, super structure, grading, staging, utility, lighting, permits and coordination with MBTA, removal and relocation of existing MBTA tracks. An order of magnitude construction cost of \$20 million is estimated in 2023.

## Conclusion

The study provides preliminary feasibility evaluations of various crossing concept options to identify a reasonable location for a future crossing. Based on the preliminary findings and evaluations, a pedestrian & bicycle bridge crossing is a feasible option to meet the goals and visions of the City for an enhanced pedestrian & bicycle network. Due to engineering and property constraints, plus visibility and safety concerns, a pedestrian & bicycle underpass crossing does not appear to be a viable option for a crossing in this location.

It is recommended that the immediate next steps would be to engage the MBTA with the proposed concept and layout for feedback and requirements. Additional steps would be to coordinate with adjacent private property landowners such as Brickworks, Jefferson Park, Schochet, and Fresh Pond Mall



and to engage the community and public for solicitation of comments and feedback while engaging in a design development, then final design process.

## Appendices