





GAP STUDY

Mass Central Rail Trail

Towns of Belchertown, Palmer, Hardwick and Clinton, Massachusetts

PREPARED FOR

Office of Transportation Planning
Multimodal Planning
MassDOT
Ten Park Plaza, Suite 4150
Boston, MA 02116

PREPARED BY

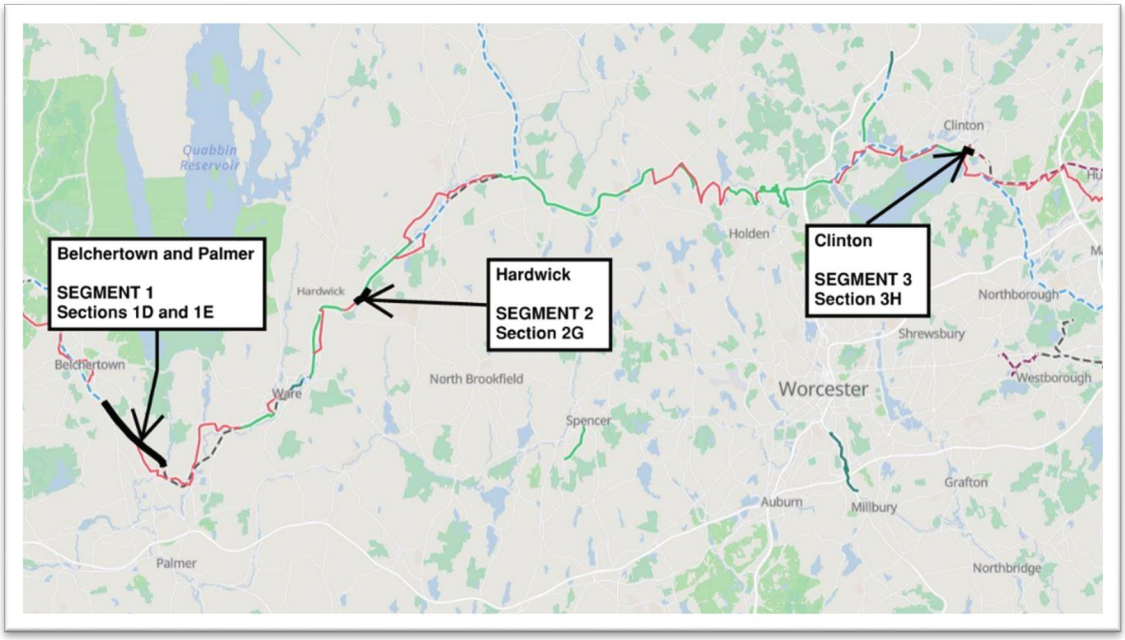
120 Front Street, Suite 500
Worcester, MA 01608

MAY 2026

Executive Summary

Project Background and Purpose

The Mass Central Rail Trail (MCRT) is a high-priority initiative for Massachusetts' trail and greenway system, as outlined in MassDOT's statewide Bike and Pedestrian Plan and other planning documents. Building on a 2020 feasibility study by MassDOT's Office of Transportation Planning (OTP), which assessed the development of an off-road shared-use path along the former Mass Central Railroad (MCRR) corridor from Berlin/Hudson to Belchertown (approximately 68 miles), this study revisits four major gaps identified in the 2020 analysis. The original study divided the corridor into three segments: Segment 1 (Belchertown to Bondsville, Palmer), Segment 2 (Bondsville, Palmer to Rutland), and Segment 3 (Rutland to Hudson). It highlighted variations in ownership, condition of the original railbed, and land uses along the corridor, including missing bridges and trail gaps.



This study focuses on closing the four gaps (illustrated in the image above) to enhance connectivity, promote sustainable transportation, and reduce carbon emissions in line with state initiatives. It evaluates alignments from the 2020 study, new alternatives, and the Clinton Greenway Conservancy Trust's 2022 "Tunnel Vision" report. Key objectives include identifying environmental impacts, right-of-way (ROW) needs, structural requirements (e.g., bridges over the Swift River and Lancaster Mill Pond), and order-of-magnitude construction costs. A limited field review was conducted in the Spring of 2025 to document existing conditions, with photographs and updated GIS mapping provided. The study emphasizes context-sensitive design to minimize impacts while ensuring accessibility and safety. Four gaps were selected in Belchertown, Palmer, Harwick and Clinton for this study since they have never been previously examined in-depth or have significant structural needs such as major bridge structures that will require substantial financial resources to design, permit, and construct. MassTrails could provide some funding but would need additional major funding to connect these gaps within this study.

Design Considerations and Assumptions

The approach to this study's design criteria draws from the American Association of state Highway and Transportation Officials (AASHTO) guidelines, MassDOT standards, Americans with Disabilities Act (ADA) requirements, and the Manual on Uniform Traffic control Devices (MUTCD). The preferred typology is a shared-use path (SUP), ideally 12-feet wide (8-feet minimum) with 2- to 3-foot grass shoulders, asphalt paving, and a 4.5% maximum running slope (up to 8.3% in limited sections with landings). However, off-road paths in wooded areas surrounded by wetland resources could use 10-foot path widths; in addition; existing paths in neighboring locations to these gaps are typically 10-feet in width. Since the MCRT gaps segments are in wooded areas, and taking into consideration neighboring trails, a 10-foot path was assumed for this study, excluding shoulder and buffers. Paths adjacent to roadways include a minimum 6-foot buffer. Bridges are designed to accommodate small emergency vehicles with widths of 16-18 feet. Alternatives like shared lanes, bike lanes, rail-with-trails, and separated bike lanes were considered but SUPs were prioritized for off-road safety.

Environmental considerations focus on wetlands, waterways, and habitats, with potential impacts assessed using desktop data and field observations. Construction costs account for earthwork, paving, structures, drainage, signage, and contingencies (e.g., 20% for unknowns). Trailheads with amenities like parking, kiosks, and bike racks are recommended for independent utility.

Segment Overviews and Key Findings

Gap 1, Section 1D: Belchertown – Springfield Road to Franklin Street (3.3 miles, Low Implementation Difficulty) This rail-to-trail section follows the former Mass Central Railroad (MCRR) corridor, tying into future MassDOT MCRT project 612245 (1C) currently funded for construction. It features flat terrain with minor wetlands and culvert upgrade needs. Construction involves clearing, grading, and minor structures (e.g., small bridges or retaining walls). Potential environmental impacts are low, with minimal wetland crossings. The right-of-way (ROW) is publicly owned and limited easements on private parcels are anticipated. Order-of-magnitude construction costs are $16.7M (2030) to $32.3M (2045), with contingencies for inflation and detailed design. Construction costs focus on path paving, drainage, and reconstruction or rehabilitation of the wood trestle bridge over Jabish Brook. Separating this segment into phases is discussed in greater detail within the report.

Gap 1, Section 1E: Belchertown/Palmer – Franklin Street to Griffin Street (1.6 miles, Moderate Implementation Difficulty) This segment includes replacing the missing Swift River bridge in Belchertown and the village of Bondsville in Palmer. Alternatives considered were a single long-span bridge or shorter crossings with alignments. Challenges include steep slopes, utilities, and riverbank stability. Environmental impacts involve riverine habitats and potential permitting under the Wetlands Protection Act. ROW acquisitions or easements would also be necessary to reclaim the railroad ROW. Order-of-magnitude construction costs are $91.6M (2030) to $177.4M (2045), with contingencies for inflation and detailed design. Construction costs focus primarily on the need for a ~525-foot bridge over the Swift River, retaining walls, and earthwork. Breaking this segment into phases is discussed in greater detail within the report.

Gap 2, Section 2G: Hardwick – East Quabbin Land Trust (EQLT) Trailhead to Creamery Road (1.4 miles, Moderate Implementation Difficulty) This section is outside the original MCRR corridor, and connects to the East Quabbin Land Trust (EQLT) trail (Gilbertville to St. Aloysius Cemetery) via roadside or off-road paths. Alternatives for this segment include shared lanes with sidewalks (River Run and Creamery Road) and a SUP along the south side of Route 32. Structural needs are minimal (e.g., culverts), but topography requires retaining walls and modifications to an existing bridge (H-09-015) on River Run. Environmental concerns include adjacent wetlands and potential wildlife corridors along the Ware River. ROW involves coordination with municipal agencies given local ownership of the roadways. Order-of-magnitude construction costs are $13.1M (2030) to $25.4M (2045), with contingencies for inflation and detailed design. Construction costs focus on grading, roadway modifications to accommodate a SUP, and work to the bridge on River Run. Separating this segment into phases is discussed in greater detail within the report.

Gap 3, Section 3H: Clinton – Wachusett Dam to Clinton Tunnel (0.2-0.4 miles, High Implementation Difficulty) This short but complex section replaces the removed bridge over Lancaster Mill Pond, using shared-use paths to the Clinton Tunnel along Route 62/70. Six (6) alternatives were evaluated, including new bridges. High implementation difficulty stems from dam proximity, historical resources, utility impacts, water resource impacts and estimated construction costs. Environmental impacts are significant (e.g., pond crossings, rare species). ROW requires negotiations with the Department of Conservation and Recreation (DCR) and private owners. Order-of-magnitude construction costs vary widely depending on the selected alternative. For the alternative of constructing a new bridge over Route 62/70 and mill pond, costs are: $168.5M (2030) to $326M (2045), with contingencies for inflation and detailed design.

Initiatives, Next Steps, and Recommendations

The MCRT supports modal shifts from vehicles to active transportation, potentially offsetting vehicle emissions.

Next steps would include detailed surveys, resource area delineations, engineering designs, right-of-way acquisitions/easements and stakeholder engagement. Further studies should refine costs, explore additional amenities, and integrate climate adaptation measures.

This study provides a roadmap for advancing these gap sections of the MCRT, enhancing regional connectivity, public health, and environmental sustainability.

Table of Contents

1 Executive Summary i

Project Background and Purpose i
Segment Overviews and Key Findings ii
Initiatives, Next Steps, and Recommendations iii

2 Project Background, Limits, and Purpose 1

1.1 Project Background 1
1.2 Project Limits 2
1.3 Project Purpose 2

3 Design Considerations 4

2.1 Shared-use Path and Bikeway Typologies 4
2.2 Design Assumptions and Criteria 5
2.3 Environmental 7
2.4 Construction Costs 10

4 Segment 1, Section 1D: Belchertown-Springfield Road to Franklin Street – 3.3-miles 12

3.1 Overview By Section 12
3.2 Construction Considerations 15
3.3 Potential Structural Needs 15
3.4 Potential Environmental Impacts 16
3.5 Right-of-Way Actions 17
3.6 Order of Magnitude Construction Costs 17

5 Segment 1, Section 1E: Belchertown/Palmer - Franklin Street to Griffin Street – 1.6-miles 18

4.1 Overview By Section 18
4.2 Construction Considerations 19
4.3 Alternative Alignments 20
4.4 Potential Structural Needs 20
4.5 Potential Environmental Impacts 21
4.6 Right-of-Way Actions 22
4.7 Order of Magnitude Construction Costs 23

6 Segment 2, Section 2G: Hardwick – EQLT to Creamery Road – 1.4-miles 24

5.1 Overview By Section....24
5.2 Construction Considerations....26
5.3 Alternative Alignments....27
5.4 Potential Structural Needs....27
5.5 Potential Environmental Impacts....28
5.6 Right-of-Way Actions....29
5.7 Order of Magnitude Construction Costs....29

7 Segment 3, Section 3H: Clinton Wachusett Dam to Clinton Tunnel – 0.2-miles....30

6.1 Overview By Section....30
6.2 Construction Considerations....33
6.3 Alternative Alignments....33
6.4 Potential Structural Needs....34
6.5 Potential Environmental Impacts....35
6.6 The following table provides a quick summary of the environmental and permitting needs this segment may require. Following the table a summary of the potential or significant impacts is provided....35
6.7 Right-of-Way Actions....36
6.8 Order of Magnitude Construction Costs....37

8 Initiatives and Next Steps....38

7.1 Defining Next Steps....38

Appendices....

Updated Gap Study Segment Maps

Gap 3 – Clinton Lancaster Mill Pond (Options 1-5)

Updated Field Assessment Matricies

Order of Magnitude Construction Cost Estimates

1

Project Background, Limits, and Purpose

1.1 Project Background

The Mass Central Rail Trail (MCRT) has been identified as a high priority for the Commonwealth's trail and greenway system in numerous visions and statewide planning documents, including the Massachusetts Department of Transportation's (MassDOT's) statewide Bike and Pedestrian Plan. In 2020 the MassDOT Office of Transportation Planning (OTP) released a feasibility study to map existing conditions and identify constraints for completing the construction of the MCRT as an off-road shared-use path along the original Mass Central Railroad (MCRR) corridor. The study area focused on the I-495 area in Berlin/ Hudson to the existing terminus of the Norwottuck Rail Trail in Belchertown. Approximately 65 miles out of the entire 104 miles between Northampton and Boston are now open.

The 2020 study divided the MCRT analysis into three segments as follows:

- Segment 1 – Belchertown to Bondsville (Palmer) – MCRT at easternmost extent of Norwottuck Rail Trail, Belchertown to MCRR corridor at Swift River (east bank), Bondsville (Palmer).
- Segment 2 – Bondsville (Palmer) to Rutland – MCRR at Swift River, Bondsville (Palmer) to westernmost extent of the MCRT at the Ware River, Barre.
- Segment 3 – Rutland to Hudson – MCRT at Glenwood Road, Rutland to MCRR at Stone Road, Berlin, just east of the I-495 underpass, Berlin/Hudson town line.

The 2020 study found that the current ownership, condition, and existing uses of the original MCRR corridor varied greatly from Hudson to Belchertown. The study also identified the location of major "gaps" in the continuity of the MCRR corridor as well as locations where major bridges and/or river crossings were previously removed or demolished. As a result of the outcome of that study, MassDOT requested that the 2020 study be revisited at four (4) major "gap" locations to identify potential impacts and construction costs to close these gaps. Additional gaps in Palmer and Berlin are being addressed in separate feasibility studies being led by both municipalities.

1.2 Project Limits

The following are the four (4) specific sections within the three original segments above where major gaps were summarized in the 2020 study and are being assessed in this study. For consistency the same implementation terminology used in the previous study is being used here with the following examples as reference:

- Low implementation difficulty (Corridor intact, some crossing improvements)
- Moderate implementation difficulty (Corridor intact, right-of-way needed)
- High implementation difficulty (multiple owners, bridges missing, proximity to active railroad)

1. Gap 1, Section 1D, Belchertown from Springfield Road to Franklin Street/MA 181, rail-to-trail along former MCRR corridor. This section would be tied to the Bondsville Section (Palmer) and was identified as having a low implementation difficulty. Length ~3.3-miles.
2. Gap 2, Section 1E, Belchertown/Palmer from Franklin Street/MA 181 in Belchertown to Griffin Street, Palmer, rail-to-trail along the former MCRR corridor including replacement of the missing former RR bridges at the crossing over the Swift River in the village of Bondsville. This section was identified as having moderate implementation difficulty. Length ~1.6-miles.
3. Gap 3, Section 2G, Hardwick-from the East Quabbin Land Trust (EQLT) trailhead on Lower Road/Route 32 to Creamery Road. The EQTL trail has been completed along former MCRR corridor from Gilbertville to St. Aloysius Cemetery. This section is outside of the original MCRR corridor and was identified as having a moderate implementation difficulty. Length ~1.4-miles.
4. Gap 4, Section 3H, Clinton-from Wachusett Dam to west end of Clinton Tunnel at MA Route 62/70 via shared-use path. The Clinton Greenway Conservancy Trust (MCRT Clinton's Tunnel Vision 2022) report identified alternatives including a new bridge (where the original railroad rail bridge existed). Other alternatives included various switchbacks, ramps and on-road sections with all identified as having a high implementation difficulty. Length ~0.2 to 0.4-miles.

1.3 Project Purpose

To develop an assessment using the 2020 study alignments and the Clinton Greenway Conservancy Trust's independent study (MCRT Clinton's Tunnel Vision 2022), this report identifies issues, opportunities, and alternatives to close these gap sections of the MCRT. The Geographic Information System (GIS) base mapping from the original study was updated as part of this study. To support the future planning and design of these trail sections, potential locations of new bridges, retaining walls, culverts, trailhead parking and other features were identified. Order of magnitude construction cost estimates were developed for planning level budgeting.

Within the project limits there are two former railroad bridges that were removed many years ago. One was located over the Swift River between the towns of Belchertown and Palmer, while the other was over Lancaster Mill Pond in the Town of Clinton. Installing new bridges in similar sizes and span may not be the most practical from a cost or constructability perspective;

however, they may be the best alternatives from a permitting or impact standpoint. Distinct options are reviewed in this study taking into consideration length of path, alternative alignments or shorter multiple crossings for bridges.

This study provides a foundation to help select, plan and prioritize the advancement of sections of the trail gap segments based on impacts to right-of-way and environmental resource areas as well as order of magnitude construction cost estimates. Further ground surveys, field observations (resource delineations) and engineering assessments and design will be needed to better understand potential impacts, right-of-way challenges, structural needs, and overall construction costs.

A limited field review of the segments was conducted in the Spring of 2025 to review existing conditions. Photographs were obtained to document existing conditions. Some photos are inserted in the chapters below, and all photos are available and provided in the form of a digital Geographic Information System (GIS) file. Each segment is summarized in its own chapter below for ease of understanding the relationship between existing conditions, issues and opportunities, and construction costs. Updated segment mapping and field assessment matrices from the original report for these gap locations are provided in the appendices.

2

Design Considerations

2.1 Shared-use Path and Bikeway Typologies

The following types of paths and bikeways are typically considered for alternative modes of transportation. The path and bikeway definitions are taken from the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, 2024, Fifth Edition (AASHTO Bike Guide). A context sensitive design approach is important in all aspects of roadway design. Applying standards without understanding how they will function in the local context can lead to inappropriate and underused facilities. Context sensitive designs should address the needs of bicyclists and should support measures that reduce the impact of motor vehicles on the environment.

- **Shared Use Path** – A shared use path (SUP) lies outside of a roadway surface and is physically separated from motorized vehicular traffic by a buffer or barrier. The SUP can be either within the roadway right-of-way or on an independent alignment. SUPs are used by pedestrians, runners, skaters, wheelchair users, and bicyclists. The types of design criteria for SUPs (design speed, minimum curve radii, stopping sight distance, etc.) are of similar type for design of roadways but modified based on the operating characteristics of a bicycle as a vehicle and a bicyclist as a vehicle operator.



Shared Use Path

- **Shared Lanes** – Shared lanes are best used on minor local neighborhood streets with low speeds and low traffic volumes where bicycles can share the road without special provisions. Generally, posted traffic speed limits are 30 mph or less with traffic volumes ideally less than 1,000 vehicles per day. In some very low volume contexts, pedestrians may use the road surface as well when a sidewalk is not available. Shared lanes are not typically implemented on MassDOT projects.



Shared Lane

- **Bike Lanes** – A bike lane is a portion of a roadway designated for exclusive use by bicyclists using pavement markings and, if provided, signs. Bike lanes can be used on major roads to provide quick and direct bicycle access to the same destinations as motorists. Bike lanes can also be used on collector roads where roadway design speeds are more than 25 mph. Traffic volumes can vary as the motor vehicle/bicycle speed differential is generally a more key factor in the decision to provide bike lanes.
- **Rail-with-Trail** – A rail-with-trail is a SUP parallel and adjacent to an active railroad, typically offset by at least 15 feet and separated by a security fence.
- **Separated Bike Lane** – A separated bike lane is a dedicated facility for bicyclists located within or adjacent to the roadway, physically separated from motor vehicle traffic by a barrier or buffer space. These lanes provide a higher level of comfort and safety compared to conventional bike lanes by reducing interactions with motor vehicles. They are designed to accommodate a wide range of cyclists, including less confident riders, and are often implemented in urban areas with moderate to high traffic volumes.



Bike Lane



Rail-with-Trail



Separated Bike Lane

2.2 Design Assumptions and Criteria

For this study, a number of design assumptions were made about the future SUP and bikeway typologies that would be incorporated into the design assessment of the trail gap sections. Assumptions include:

- 12-foot-wide SUP is ideal, 8- to 10-foot-wide minimum is acceptable due to topographic, environmental or right-of-way constraints; minimum 2-foot wide (3-foot ideal) grass shoulder on each side if space is available. Given that these paths are in rural areas and impacts to trees, right-of-way, and other environmental resources are anticipated, a 10-foot-wide path was used for this assessment.
- When adjacent to a roadway, path buffers should be 6-foot wide at a minimum (landscaped and shoulder combined).
- Asphalt paved paths are typical. A crushed graded aggregate or permeable surface was considered for a supplementary side path for equestrian use.
- Paths will be designed with a 4.5-percent (with 0.5% tolerance) running slope for full accessibility and to meet ADA. Some portions of a SUP or ramps to the SUP may be as steep as 8.3% (with no tolerance) but would need a level landing every 30 feet. When the path is adjacent to a roadway, the running slope will match the grade of the road.

- Bridges, where necessary, are typically designed for loading to accommodate small emergency vehicles such as an ambulance, but this is something that would be coordinated with emergency response teams. If the bridge is going to be paved asphalt, then the bridge needs to be designed to specific loading requirements. For short sections of path along these segments, designing for emergency vehicles may not be necessary since accessibility for emergency personnel would be easy. If this were the case, prefabricated bridges for pedestrian and bicycle use only could be a cost-effective way to provide connectivity over resource areas. Coordination with emergency response teams is needed to confirm design requirements and emergency access. Bridge widths could extend from 16- to 18-feet depending on design criteria and other amenities.



Trail bridges, like this one over the Neponset River in Boston built by DCR, are typically designed to accommodate small emergency vehicles.

- Trailheads with sign kiosks, benches, bike racks and repair stations could be considered in various locations. Trailhead parking would be needed at each of the segments to provide independent utility. Utilizing existing parking lots or providing on-street parking may be a feasible approach.

Ultimately, project design criteria will have to be derived from standard engineering practice and the successful application of regulatory standards and guidelines. The primary references for this SUP project include:

- The American with Disabilities Act (ADA) Design Guidelines for Shared Use Paths;
- The Massachusetts Department of Transportation (MassDOT) Massachusetts Highway Department Project Development and Design Guide, 2006 with revisions (MassDOT PDDG);
- The MassDOT Separated Bike Lane Planning and Design Guide, 2012;
- The American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, Fifth Edition, 2024 (AASHTO Bike Guide);
- The American Association of State Highway and Transportation Officials (AASHTO) A Policy on Geometric Design of Highways and Streets, 2018 (AASHTO Green Book);
- The American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design Guide Specifications for the Design of Pedestrian Bridges, 2009;
- The Manual on Uniform Traffic Control Devices (MUTCD) December 2023 11th Edition with revisions and applicable Interim Approvals; and
- Applicable MassDOT engineering directives.

2.3 Environmental

This feasibility study was developed using data provided by the Massachusetts Bureau of Geographic Information (MassGIS) and other data available online. The data and plans are a compilation of information acquired from a broad base of public and private agencies and serve as a useful tool for the purposes of planning and assessing potential suitability of these shared use path segments. The preliminary findings are presented in each segment's chapter summary below and are useful for anticipating permitting requirements. Further research, field surveys, and early coordination with the various permitting agencies will be needed to verify the findings.

The following is a list of some of the environmental constraints that may need to be considered with the proposed shared use paths. More details such as survey, resource area delineations, and further design will be needed to identify constraints and permitting needs. A table indicating impacts is provided in each of the segment chapters below.

- **Work within Water Resource Areas:** Massachusetts Department of Environmental Protection (DEP) has designated certain waters for protection based on their socio-economic, recreational, ecological and/or aesthetic values. The segments will require work within regulated resource areas and associated buffers subject to this jurisdiction and local Conservation Commission ordinances. A Notice of Intent (NOI) and other studies (stormwater, hydrologic/hydraulic, etc.) could be required. An NOI would be required for constructing the project and potentially for performing borings for boardwalks, retaining walls, or bridges where drilling occurs within a resource area.
- **Wetlands:** Some of the segments will likely impact wetland resource areas regulated by the Massachusetts Wetlands Protection Act (WPA). Wetlands meeting the regulatory definition are subject to jurisdiction under Sections 401 and 404 of the federal Clean Water Act. All wetland resource areas identified at the site are subject to federal jurisdiction. It is noted that online wetland resource areas do not always match up with field investigations. Wetland delineations and investigations for each project will need to be considered as any designs advance.
    - Under Section 401, projects which fill less than 5,000 square feet of federally regulated wetlands do not require an individual 401 Water Quality Certification provided that the work is done with a valid Order of Conditions and that 1:1 wetland replacement is provided. Projects filling greater than 5,000 square feet of federally regulated wetlands require an individual 401 Water Quality Certification. Currently, if a project has over 5,000 square feet of wetland impacts it cannot be permitted, however.
    - Pursuant to Section 404 of the Clean Water Act, the placement of fill material and other alterations within federally regulated wetlands requires authorization from the United States Army Corp of Engineers (USACE). Projects filling less than 1-acre of federal wetlands may be covered under the Massachusetts General Permit (GP). Projects eligible for coverage under the GP may be automatic (non-reporting) if total wetland impacts are less than 5,000 square feet. Projects filling 5,000 square feet to one acre are reviewed by the USACE and other federal agencies to determine if the project meets the conditions of the GP. Alterations to regulated wetlands in excess of 1-acre are not eligible for the GP and require an Individual Permit.

Any alteration or work proposed within the state and locally regulated wetlands would be limited to 5,000 square feet of alteration unless the proposed work qualified as a "limited

project" (310 CMR 10.53); (currently trails are not considered a limited project). Under the WPA (and bylaw) for approval of alteration to a wetland resource area, a Notice of Intent (NOI) would need to be filed with the Conservation Commission in the community where the segment is located. Any wetlands alterations will require 1:1 wetland replication that meets applicable performance standards.

Calculations of impacts will need to be determined as the design advances. It is important to note that culverts will need to be inspected to determine if full replacement, repairs, or extensions are needed.

- **100-Year Floodplain:** A 100-year floodplain is an area that has a 1% chance of being flooded in any given year, based on historical data and statistical modeling. It is determined by hydrological studies, often using past rainfall, river flow, and topographic data to map zones likely to be inundated during a flood event with a 1% annual probability, also called a "base flood." This does not mean it floods once every 100 years, but the risk exists each year. These areas are typically identified on Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs) in the U.S., labeled as Special Flood Hazard Areas (SFHAs), often requiring flood insurance for properties with federally backed mortgages. The boundaries account for factors like elevation, drainage, and local geography.
- **Certified or Potential Vernal Pools:** Based on the MassGIS database, vernal pools that fall within 100-feet of a project, as identified by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) may need to be considered. Potential vernal pools are sometimes not mapped in online resources.
- **Parkland or Conservation Restrictions (CR):** Impacts to parkland are not known at this time but will need to be investigated when design advances to see if work extends outside the existing limits of the defined railroad boundary.
- **Hazardous Waste:** The Department of Environmental Protection's Bureau of Waste Site Cleanup (BWSC) maintains a database of all reported releases of oil or hazardous material into the environment and hazardous material sites with Activity and Use Limitation (AUL). The AUL is a legal document that identifies activities and uses of the property that may or may not occur and the owner's obligation and maintenance conditions that must be followed to ensure the safe use of the property. Based on the MassGIS database, there are no known hazardous materials sites in the direct vicinity of the segments; however, areas that fall along old railbeds can expect to have contaminated soils, rail ties, or other issues. More investigation will be needed as designs move forward.
- **Natural Heritage & Endangered Species Program (NHESP):** MassWildlife's NHESP maintains a database of threatened habitats of State-listed rare species in Massachusetts based on observations documented in the last twenty-five years. Based on the MassGIS database 15th Edition of the Massachusetts Natural Heritage Atlas, there are NHESP Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife located in some segments.

  Work will require review under the Massachusetts Endangered Species Act (MESA). The WPA NOI will be reviewed by NHESP to determine if the project needs to be conditioned to avoid impacting rare species. A letter can be sent to NHESP requesting clarification on the species that are located within the project limits. This is sometimes done early-on during the design process. Other times it is coordinated with the NOI submission as noted above. All segments

will also require review for the removal of any trees as related to impacts to the Northern long-eared bat.

- **MassDEP Approved Wellhead Protection Areas:** Wellhead protection areas are important for protecting the recharge area around public water supply (PWS) groundwater sources. A Zone II is a wellhead protection area that has been determined by hydro-geologic modeling and approved by the DEP's Drinking Water Program (DWP). A Zone II classification is that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at approved yield, with no recharge from precipitation). In some cases, streams or lakes may function as recharge boundaries. In all cases, Zone IIs shall extend up gradient to its point of intersection with prevailing hydrogeologic boundaries (a groundwater flow divide, a contact with till or bedrock, or a recharge boundary).

  In the absence of an approved Zone II, DEP has adopted the Interim Wellhead Protection Area (IWPA) as the primary, protected recharge area for PWS groundwater sources. For PWS sources that pump less than 100,000 gallons per day (GPD), the IWPA radius is proportional to the pumping rate in gallons per minute (GPM). The minimum IWPA radius is 400 feet, the maximum (default) radius reached at 100,000 GPD (70 GPM) is 2,640 feet (1/2 mile).

  Zone I is the area closest to the well and is defined as a protective radius needed around a public water supply (PWS) well or wellfield. The PWS groundwater source locations are buffered to produce the Zone I area. Buffer radii values are determined from pumping rate information as provided by the MassDEP DWP and vary between 100'-400'.

- **National Register Districts:** The historic resources considered in this analysis are included in the Massachusetts Cultural Resource Information System (MACRIS) maintained by the Massachusetts Historical Commission (MHC). They include buildings, burial grounds, structures, and objects as well as areas and districts recognized by the National Register of Historic Places and local historic and preservation agencies. Historic boundaries do not seem to fall within the limits of these segments; however, a deeper dive into individual historic properties adjacent to the corridors will need to be investigated. Impacts on buildings are not expected to occur as part of these projects.

- **Chapter 91 License, The Massachusetts Public Waterfront Act:** Chapter 91 refers to the Massachusetts Public Waterfront Act, codified in Massachusetts General Laws (MGL) Chapter 91, which is the state's primary regulatory framework for protecting public rights in tidelands, great ponds, and certain rivers and streams. Administered by the Massachusetts Department of Environmental Protection (MassDEP) through its Waterways Regulation Program, it ensures that private uses of waterways serve a proper public purpose under the public trust doctrine. This includes regulating construction, dredging, filling, and other activities in coastal and inland waterways to preserve navigation, fishing, fowling, and public access.

  The Chapter 91 license process authorizes structures (e.g., docks, piers, wharves) or fill in jurisdictional areas. It applies to projects that could impact public waterways, such as residential docks, marinas, or commercial developments.

- **Impacts to Utilities:** Impact to utilities is anticipated to include utility poles, catch basins, manholes, paved waterways, drop inlets, or other minor surface utilities. A detailed survey will need to be prepared to confirm locations and needs of utility adjustments. In most cases when one utility pole is impacted, two other poles also need to be moved to keep overhead wires in alignment and to offset any overhead wire tensions. Existing drainage features

versus the proposed path will need to be more closely reviewed in areas where country drainage exists. Tree trimming, tree removal, or other impacts could be required.

- **Massachusetts Environmental Protection Act (MEPA) and Environmental Justice (EJ):** The MEPA Office is part of the Massachusetts Executive Office of Energy and Environmental Affairs (EEA). They provide opportunities for public reviews of the potential environmental impacts of projects for which agency action is required. There are multiple thresholds that need to be reviewed as part of any project and will need to be reviewed for these segments once survey and additional design is prepared.

2.4 Construction Costs

Order of magnitude construction cost estimates for each of the four (4) segments have been prepared using high-level pricing per linear foot and other unit cost estimates. Prices are generally obtained from the MassDOT Weighted Average Bid Application (WABA) and other projects that VHB has designed and/or bid.

The cost estimation for the proposed structural improvements could encompass multiple components including superstructure and substructure, walls, landscaping, boardwalks, culvert extensions, and storm drainage modifications, among others, and are difficult to predict at this conceptual stage of design. Additional planning, design and permitting is necessary before construction can commence; and a contingency factor and cost escalation factor have been applied to each of the costs. It is recommended that these costs be updated later if funding is not immediately pursued following the completion of this study.

Since it is likely that not all four segments will be constructed at the same time, construction costs were estimated for 2030 and 2045. The following provides a summary of some of the costs for key components of the path segments:

- For moderately raised bridges, based on recent similar projects, the estimated construction cost for a structure can range between $1,000 to $1,500 per square foot. For a pedestrian bridge, taking a cost of $1,500 per square foot (with contingencies) and considering a bridge deck width of approximately 16-feet to 18-feet, the cost per linear foot of the bridge would be on average $25,500 per foot of bridge span length. Final costs can depend significantly on the span arrangements chosen for the bridge. For instance, a longer bridge span is likely to cost less per foot, whereas a shorter bridge resting on tall abutments could potentially cost more per foot, due to the complexities and additional materials required for construction.
- For taller bridges, such as the trestle bridge considered over the Wachusett Dam/Lancaster Mill Pond in Clinton and over the Swift River in Belchertown/Palmer, these estimated cost per square foot for a structure can significantly increase over the numbers presented above since the substructure supports would be taller. Based on some recent examples the cost per square foot could be as much as $5,000 ($90,000 per linear foot).
- For boardwalks, the cost is estimated in the range of $2,000 to $3,000 per foot. These estimates are conceptual and will need to be refined as the design advances. The design details, materials quantities, and construction methods required will all influence the final cost.

- Reconstructing an established railbed to a trail with significant tree clearing is estimated at $450 per linear foot, typically for trail constructed in the middle of the woods.
- Cost to construct a shared use path along the side of the roadway or in the woods with no base established is estimated at $125 per linear foot.
- All above estimates include a 20% contingency for the level of design to account for any unknowns, as this assessment is based on field observations and GIS information.
- Other contingencies included: a 5% hazardous waste disposal estimate should contaminate materials from the railroad need to be removed from the project area, 2% for signage, bicycle furnishings (racks, repair stations) wayfinding signage and other furnishings, 24% typical MassDOT contingencies for police details, traffic management, mobilization, construction engineering and contract items and a 4.5% annual construction cost escalation over five years. In locations where work is proposed near an active railroad, a contingency of between 1% and 5% for railroad flaggers (for certain sections) has been included.

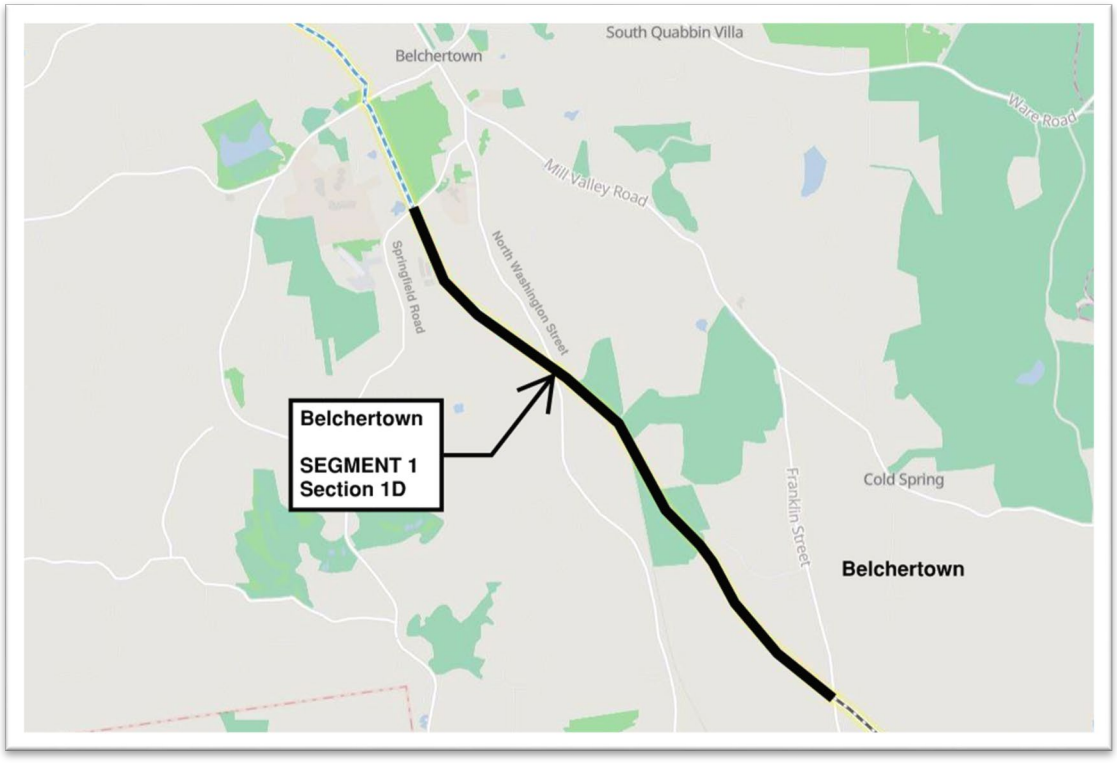
The more detailed construction cost estimates have been included as an attachment to this memo. The costs do not include design, permitting, or right-of-way. It is noted that design and permitting could identify items that add unknown costs thus increasing construction costs. These unknowns could be considered in the contingency carried. The order of magnitude estimated costs includes contingencies and cost escalation for 5-years and 20-years. Construction costs are summarized in each segment below.

3

Segment 1, Section 1D: Belchertown-Springfield Road to Franklin Street – 3.3-miles

3.1 Overview By Section

The old railroad corridor in this segment is intact and owned by the Town of Belchertown. It continues in parallel to the New England Central Railroad (NECR) corridor southerly for approximately 1.5 miles before the NECR diverges south. There appears to be sufficient right-of-way available to allow for a 20- to 25-foot (minimum) or greater buffer between the active railroad and the trail; this will need to be confirmed through the development of a surveyed base plan and coordination with the railroad owner and operator. A fence between the trail and active railroad will need to be proposed providing a barrier between two corridors.



The corridor is well-established and used but is a dirt bicycle and pedestrian trail that varies in width between approximately 6- to 9-feet with trees of many sizes along both sides. This is much narrower than what is needed for the proposed shared use path and as a result significant tree clearing (and grading) will be required. A well-established dirt trail north of Springfield Road exists and there is an existing bituminous concrete sidewalk along the northerly side of Springfield Road. There currently is not a marked crossing on Springfield Road connecting the trails, which offset each other by around 25-feet. The Jabish Middle School is located approximately 1,200-feet easterly on Springfield Road and could be an option for off-site trail parking. If allowed by the school district, a safer connection could be created to this destination. Springfield Road is a local road and is under the jurisdiction of the Town of Belchertown. There was no observed speed limit posted along the roadway in this area; however, local ordinance states 40 mph outside settled districts.

Springfield Road to North Washington Street – 1.1-miles

The MCRT section between Springfield Road and its intersection with North Washington Street is approximately 1.1 miles long and follows the active railroad corridor within a separate abandoned railroad right-of-way. The soil conditions observed were primarily compact soil with exposed rock except near the North Washington Street crossing where there is a noticeable change to organic material. There were no observed remnants of railroad ties or tracks in this section.

The trail crosses North Washington Street with a marked crosswalk, pedestrian curb ramps and flashing LED crosswalk signs. This crossing is on a curve to the street before crossing under the active railroad. The southbound approach to the crossing has bike route signage posted, as well as yellow chevron signs, a narrow bridge sign, and a 15-mph bend sign. The northbound approach to the crossing has similar signage; however, the railroad underpass is present between the two bends in North Washington Street. Sight distance is limited in the northbound direction due to the curvature of the roadway and the railroad bridge.



South of Springfield Road

There is a packed gravel area along the westerly side of North Washington Street approximately 70 feet north of the crossing, which appears to be informal trailhead parking for 3 to 4 vehicles. However, if vehicles park here the sight distance to the crosswalk driving southbound is obscured.

On the southerly side of North Washington Street, the trail continues into the woods but also appears to serve as an access drive for the next 150 feet, then branches to the east to a gate for land owned by the Springfield Water and Sewer Commission (SWSC). The area is well posted by the SWSC for No Trespassing.

North Washington Street in the vicinity of the crossing is a minor arterial roadway and under the jurisdiction of the Town of Belchertown.

This segment could be a rail-to-trail conversion and may be relatively straightforward from a design and construction perspective since the Town owns the old railroad right-of-way.

North Washington Street to Franklin Street (Route 181) – 2.2-miles

The section from North Washington Street to Franklin Street (Route 181) is approximately 2.2-miles. Similar to the previous section and for the first approximately 2,700 feet the alignment falls within close proximity to the active railroad right-of-way before diverging onto an abandoned railroad right-of-way. Based on GIS mapping the first approximate 200-feet of the existing alignment south of the North Washington Street intersection crossing appears to veer off onto a private parcel abutting the corridor. There is an access drive in this area to Springfield Water and Sewer Commission (SWSC) land. Survey is needed to determine if this is the case. There is also a utility pole (VZ 34 ½) along this drive approximately 50-feet south of the intersection with overhead utilities to it from the roadway and then going underground. This utility will need to be further investigated when survey is conducted. The active railroad continues south away from the dirt trail through the woods. The soil observed in this area contains many organics and the trail is lined on both sides with trees of many sizes. This section of trail intersects with several other informal trails and paths that are used by snowmobiles and equestrian riders. Unofficial intersection warning signs were observed on the MCRT approaching one of the snowmobile trail crossings as well as stop signs for the trail approaches. Equestrian riders were observed. There are some large culverts that will need to be investigated and upgraded or replaced.

There is an existing timber trestle bridge that appears to be in fair to good condition and carries the trail over Jabish Brook, though the railroad ties used for the bridge decking are in poor condition. A chain-link fence exists along both sides of the bridge to prevent users of the trail from falling off the bridge and surrounding slopes. This bridge does not appear within the MassDOT bridge inventory list.



Existing Bridge over Jabish Brook

The dirt trail intersects Franklin Street (Route 181) where there is a posted trailhead sign on a tree on the northerly side of the roadway. A natural surface parking area exists where vehicles must drive over the flat berm curb from the roadway. There is no marked crossing on the roadway, so there is no defined connection to the opposite side of the roadway.

Franklin Street (Route 181) is a principal arterial on the National Highway System (NHS) with a posted speed limit of 45 MPH and under the jurisdiction of the Town of Belchertown.

This segment could be a rail-to-trail conversion and may be relatively straightforward from a design and construction perspective since the Town owns the old railroad right-of-way.

3.2 Construction Considerations



Pipe Culvert Crossing Under Trail

- There are three (3) pipe culverts along this segment that will need to be evaluated hydraulically and potentially upgraded. They cross under the existing trail and are exposed and blocked with debris. The construction cost estimate for this study assumes replacement of three pipe culverts with an in-kind 24-inch pipe on the northern end just south of Springfield Road. The characteristics of the resource area will need to be determined to confirm if in-kind replacement is sufficient. It will need to be determined if headwalls are needed for culverts.
- In addition, several large stone box culverts (6 each) and large (48") pipe culverts (1 each) need to be evaluated to determine if they are hydraulically and structurally sufficient. For the purposes of the study, it has been assumed (further investigation needed) that they will be retained with minor work such as repointing of the stones and widening of the top for the trail.
- New culverts may be needed to control drainage or divert runoff from the surrounding topography, at least one location has been identified and assumed in the estimate.
- Additional swales or other drainage improvements will need to be investigated to ensure runoff from steep embankments does not flood the proposed shared use path.
- Snowmobile and equestrian trails exist today, a separate side trail for equestrian riding should be considered and safe crossings added to a portion of the shared use path.
- A trailhead with parking is assumed to be constructed at two locations in this segment (Springfield Street and Franklin Street), with the exact locations to be determined.
- Significant tree clearing and widening into embankments are anticipated to occur with the proposed shared use path in place. An estimated 1,600 feet of retaining walls could be required to accommodate changes in grade.
- Around 9,000-feet of fencing is anticipated to be needed to create a barrier between the shared use path and the active railroad. In addition, around 6,000-feet of railing or fencing could be needed to keep users from traveling down embankments.
- Widening into embankments is anticipated but the intent would be to make up the grading differences where possible with 2:1 side slope instead of retaining walls. There are several areas where this may be feasible and room within the right-of-way.

3.3 Potential Structural Needs

- At least 500-feet of retaining wall and railing/fencing could be needed to keep users from traveling down embankments.
- An approximate 60-foot-long wood deck trestle bridge over Jabish Brook exists. A proposed 80-foot pedestrian bridge with new abutments and approaches is anticipated to be needed to replace the existing wood bridge if the trestle cannot be rehabilitated.

3.4 Potential Environmental Impacts

The following table provides a quick summary of the environmental and permitting needs this segment may require. Following the table a summary of the potential or significant impacts is provided.

Environmental Due Diligence Table

Environmental / Permitting Issue	Belchertown Segment 1, Section 1D
Work within Water Resource Areas	P
Impacts to Wetlands	P
100-year Floodplain Impacts	P
Certified Vernal Pools	X
Parkland Impacts/ Conversation Restriction (CR)	X
Hazardous Waste	S
Threatened or Endangered Species (NHESP)	P
MassDEP Approved Wellhead Protection Areas	P
National Register Districts	X
Chapter 91 License	X
Impact to Utilities	X
MEPA/ Environmental Justice	P

LEGEND

X: Impact not anticipated

P: Potential Impact

S: Likely significant impact

- Potential Impact, Work within Water Resources Areas, Wetlands and 100-year floodplain: Impacts are anticipated, but the significance is not known at this time. More detailed survey, wetland delineations, and hydraulic studies will be needed. This will particularly be important for the rehabilitation or replacement of the trestle bridge over Jabish Brook and the unnamed tributary that passes under the proposed MCRT feeding into the Jabish River just north of Franklin Street (Route 181).
- Likely Significant Impact, Hazardous Waste: Impacts could be significant since this alignment follows an old railroad corridor. Use of the MassDEP *Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails* will be required to minimize disposal of contaminated soil. The reuse of materials within the project could reduce disposal needs; however, this alignment could have significant grading and cut immediately adjacent to the old rail bed and given constraints outside the narrow right-of-way, reuse may not be feasible.
- Potential Impact, NHESP: Impacts are not known at this time, but there is a polygon associated with the Jabish Brook watershed that abuts and crosses the proposed MCRT.
- Potential Impact, MassDEP Approved Wellhead Protection Areas: Impacts are not anticipated, but this will need to be reviewed more closely as there is a Zone II wellhead

associated with the Bondsville Fire and Water District that covers a portion of the proposed MCRT from Franklin Street to just south of the Mill Valley Golf Course.

› Potential Impact, MEPA/Environmental Justice: This will need to be reviewed more closely as the design advance. Given the proposed length, at around 3.3-miles, five or more acres of impervious area could trigger MEPA review, as could any impacts to species within the NHESP purview.

3.5 Right-of-Way Actions

This segment is intact and owned by the Town of Belchertown. The intersecting roadways Springfield Road, North Washington Street and Franklin Street (Route 181) are municipal public ways. Some of the potential right-of-way actions that may be required to construct this segment include:

› Potential right-of-way impacts could be realized for grading of embankments, construction of trailhead parking, or maintenance of drainage structures that may fall outside the old railroad layout. Temporary easements for construction and construction access will be required.

› Since a portion of this alignment parallels an active railroad as close as 25-feet at one area, railroad flaggers may be needed during survey, design related field work, and construction.

3.6 Order of Magnitude Construction Costs

The following summarizes order of magnitude construction cost estimates to construct each of the sections. They have been prepared using high-level pricing per linear foot and lump sum items. The more detailed construction cost estimate breakdowns have been included in the appendix. The costs do not include design or permitting fees. The order of magnitude estimated costs (including contingencies and cost escalation for 5-years and 20-years) of completing construction of the sections are summarized below:

- **Springfield Road to North Washington Street – 1.1-miles**
    - Fiscal Year 2030 - $4.5 Million
    - Fiscal Year 2045 - $8.7 Million
- **North Washington Street to Franklin Street (Route 181) – 2.2-miles**
    - Fiscal Year 2030 - $12.2 Million
    - Fiscal Year 2045 - $23.6 Million

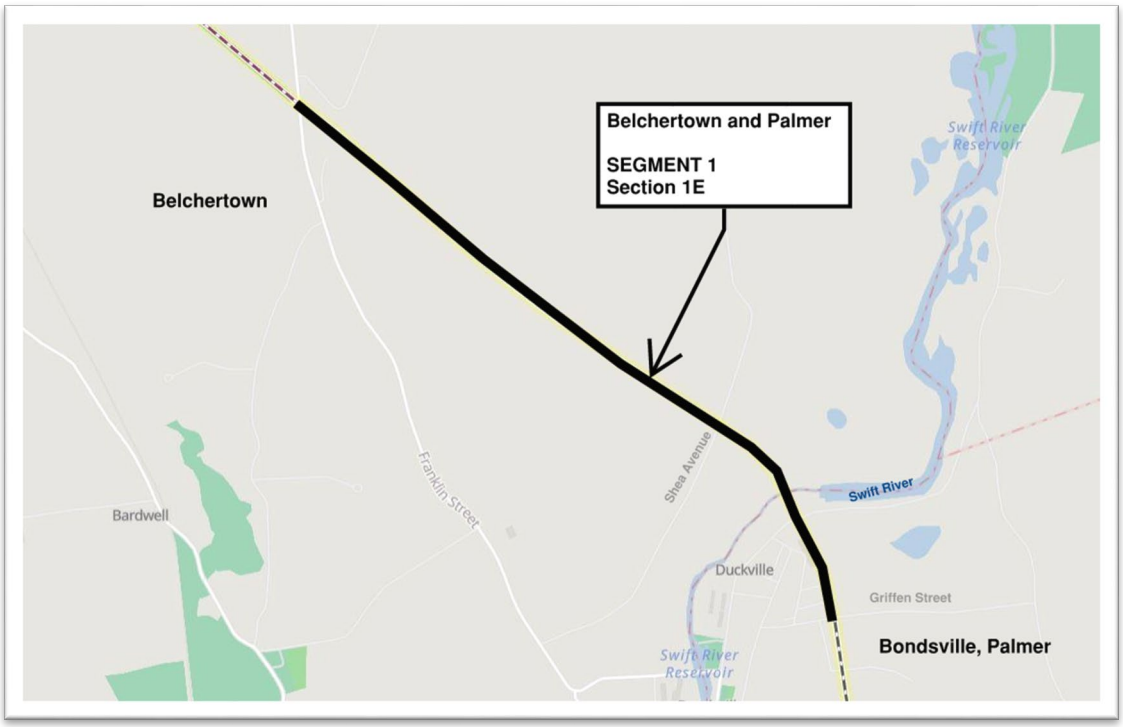
Construction costs focus on path paving, drainage, and reconstruction or rehabilitation of the wood trestle bridge over Jabish Brook. Approximately 27% of the cost associated with the North Washington Street to Franklin Street (Route 181) section can be attributed to the bridge over Jabish Brook. Also, as noted in Section 2.4 a 20% design contingency, a 24% MassDOT contingency for construction, and a 4.5% per year inflation are included. Additional details are provided in the appendix.

4

Segment 1, Section 1E: Belchertown/Palmer - Franklin Street to Griffin Street – 1.6-miles

4.1 Overview By Section

The abandoned railroad corridor from Franklin Street to the Swift River is intact but under private ownership. This segment has an existing dirt trail, though not as well established as its sister segment north of Franklin Street. The path varies in width from 4- to 14-feet. One reason the path is not well established is likely due to private ownership and the trail is posted "No Wheeled Vehicles." It is very apparent that this segment is not as heavily used.



Franklin Street to Shea Avenue – 1.1-miles

The only road crossing after Franklin Street is Shea Avenue which is a local roadway under the jurisdiction of the Town of Belchertown. The corridor at Shea Avenue is currently posted private property no trespassing on both sides.

This segment could be a rail-to-trail project from Franklin Avenue to Shea Street, which would require acquisition of private land.



South of the Franklin Street (Route 181) Crossing

Shea Avenue to Palmer Main Street Old Bridge Abutments/ High Street – 0.3-miles

At the Swift River, the abutments for the former railroad bridge in both the Town of Belchertown and the Town of Palmer still exist; however, the bridge(s) do not. Crossing Swift River will require one large bridge span or multiple bridges and boardwalks through the peninsula in the middle of the river. If multiple structures are explored, switchbacks will also be required to get an ADA compliant path down and through the river area. In addition, a multi-span structure would require bridge supports in the river, making them prone to flood damage as well as require more complicated permitting. For these reasons, a bridge spanning over the Swift River and Main Street may be preferred to cross the river. This crossing could be upwards of 525 feet.

High Street to Griffin Street – 0.2-miles

South of the river, the corridor passes to the east of an industrial building and then meets Griffin Street at grade through the old railroad corridor. This is a short section of path to connect the bridge over the Swift River and Main Street to Griffen Street and Segment 2A of the MCRT. The alignment passes alongside a private parking area and then continues through a wooded area below grade near back yards of residential homes. Tree clearing and slope stabilization will be needed along the embankment between the trail and yards.



Bridge Pier Foundation along Swift River

4.2 Construction Considerations

- Two stone box culverts (size unknown) will require further evaluation. It has been assumed that they will be retained with minor work such as repointing of the stones and widening of the top for the trail.
- NO TRESSPASSING signs exist, wood rail ties are still present and will need to be mitigated, and a wildlife preserve (Blue Star Farm) exists adjacent to the old railroad right-of-way.
- Roadway crossing at Shea Avenue is needed, especially if an extension to the bridge abutment area is desired for an overlook area should a connection over the river not be constructed.
- Land acquisitions will be required for constructing the trail on private property. Investigations of APR land limits are needed.

- This section needs to be evaluated more closely to determine the feasibility of building the path over the river. Survey and design will be required to develop more details and evaluate flooding limits and constructability of a bridge(s) over the river. One long span bridge (525-foot) is likely desired over building switchbacks and a series of boardwalks and bridges to cross the river. The ability to reuse the old bridge abutments is not known at this time. The type of bridge proposed could influence construction costs, especially if vehicle loadings need to be accounted for.
- A switchback on both riverbanks connecting to a shared use path over the river via two pedestrian bridges with loading capacity, and a boardwalk within the peninsula, was considered but dismissed since much of this work would be difficult to construct and could be subject to river flooding.



View from Railroad Bridge Abutment in Palmer Access

4.3 Alternative Alignments

A short-term alternative alignment could be considered along Shea Road, Franklin Street (Route 181), Depot Street (Route 181), and Main Street rather than waiting for funding to construct the bridge over the Swift River. This route is approximately 1.5-miles, which if selected as an MCRT route, would likely require the reconstruction of all roadways and potentially the Depot Street bridge over the Swift River to accommodate an off-road SUP. On-road accommodations or sharrows do not seem like the best alternative for many of these roadways. This alignment does not seem to meet the vision of the MCRT and would likely be a relatively expensive (~$15M to $23M, 5-year horizon) and impactful (adjacent properties) bypass, especially if only used as a short-term connection. For these reasons, the alignment was not reviewed in any more detail.

4.4 Potential Structural Needs

- At least 700 feet of retaining wall and railing/fencing could be needed to keep users from traveling down embankments.
- An approximate 525-foot bicycle/pedestrian bridge is anticipated to be needed over the Swift River.
- Headwalls may be required where culverts need to be reconstructed and are close to the proposed SUP.
- Retaining walls may be needed in areas along Shea Avenue at the backside of a new sidewalk.

4.5 Potential Environmental Impacts

The following table provides a quick summary of the environmental and permitting needs this Segment may require. Following the table a summary of the potential or significant impacts is provided.

Environmental Due Diligence Table

Environmental / Permitting Issue	Belchertown/ Palmer Segment 1, Section 1E
Work within Water Resource Areas	P
Impacts to Wetlands	P
100-year Floodplain Impacts	P
Certified Vernal Pools	X
Parkland Impacts/ Conversation Restriction (CR)	P
Hazardous Waste	S
Threatened or Endangered Species (NHESP)	X
MassDEP Approved Wellhead Protection Areas	P
National Register Districts	X
Chapter 91 License	P
Impact to Utilities	X
MEPA/ Environmental Justice	P

LEGEND

X: Impact not anticipated

P: Potential Impact

S: Likely significant impact

- Potential Impact, Work within Water Resources Areas, Wetlands and 100-year floodplain: Impacts are anticipated, but their significance is not known at this time. More detailed survey, wetland delineations, and hydraulic studies will be needed. This will particularly be important for the options explored for crossing the Swift River.
- Potential Impact, Parkland/Conservation Restriction (CR): Since there is wildlife preserve land owned by Blue Star Farm on either side of the old railroad and the same property owner now owns the old railroad, it is not clear if the proposed trail will have impacts to this preserve. The preserve appears to be land documented with an Agricultural Preservation Restriction (APR)
- Likely Significant Impact, Hazardous Waste: Impacts could be significant since this alignment follows an old railroad corridor. Following the *MassDEP Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails* will be required to minimize disposal of contaminated soil. The reuse of materials within the project could reduce disposal needs; however, this alignment could have significant grading and cut immediately adjacent

to the old rail bed and given constraints outside the narrow right-of-way, reuse may not be feasible.

- Potential Impact, MassDEP Approved Wellhead Protection Areas: Impacts are not anticipated but this will need to be reviewed more closely as there is a Zone II wellhead associated with the Bondsville Fire and Water District that covers a portion of the proposed MCRT.
- Potential Impact, Chapter 91 License: If the Swift River is considered navigable, this permit may be required for new bridge(s) construction.
- Potential Impact, MEPA/Environmental Justice: This will need to be reviewed more closely as the design advances, particularly for impacts to APR land or the requirement of a Chapter 91 license.

4.6 Right-of-Way Actions

This is not as intact as the previous segment, and the old railroad right-of-way is privately owned. The intersecting roadways, Franklin Street (Route 181) and Shea Avenue, are municipal public ways. Some of the potential right-of-way actions that may be required to construct this segment include:

- Potential right-of-way impacts could be needed for grading of embankments and maintenance of drainage structures that may fall outside the old railroad layout. Temporary easements for construction and construction access will be required.
- According to online maps, approximately 1,500 feet of the railroad right-of-way starting at Franklin Street is privately owned residential property, as is the last 1,500 feet of the path before Shea Avenue.
- The portion between these two properties appears to be owned by the adjacent landowner of Blue Star Farm (a wildlife preserve), which is agriculturally preserved land - Agricultural Preservation Restriction (APR). However, unlike the other parcels, the old railroad right-of-way boundary lines appear to be intact, which could mean this land, while owned by the same farm owner, is not part of the APR. The railroad is abandoned along this section but there are existing railroad ties visible.
- Along the Swift River where the old bridge abutments are located, there is one privately owned parcel that falls between Shea Avenue and land owned by the Belchertown Land Trust. A portion of this parcel along the north side of the alignment was recently developed with a new residential type building with an access driveway. Both riverbanks of the Swift River appear to be owned by the Belchertown Land Trust.
- The existing right-of-way appears to be intact east of High Street in Palmer.

4.7 Order of Magnitude Construction Costs

The following summarizes order of magnitude cost estimates to construct each of the sections. They have been prepared using high-level pricing per linear foot and lump sum items. The more detailed construction cost estimate breakdowns have been included in the appendices. The costs do not include design or permitting fees. The order of magnitude estimated costs (including contingencies and cost escalation for 5-years and 20-years) of completing construction of the sections are summarized below:

- **Franklin Street to Shea Avenue – 1.1-miles**
    - Fiscal Year 2030 - $5.7 Million
    - Fiscal Year 2045 - $11.1 Million
- **Shea Avenue to Palmer Main Street Old Bridge Abutments/ High Street – 0.3-miles**
    - Fiscal Year 2030 - $85.1 Million
    - Fiscal Year 2045 - $164.7 Million
- **High Street to Griffin Street – 0.2-miles**
    - Fiscal Year 2030 - $0.8 Million
    - Fiscal Year 2045 - $1.6 Million

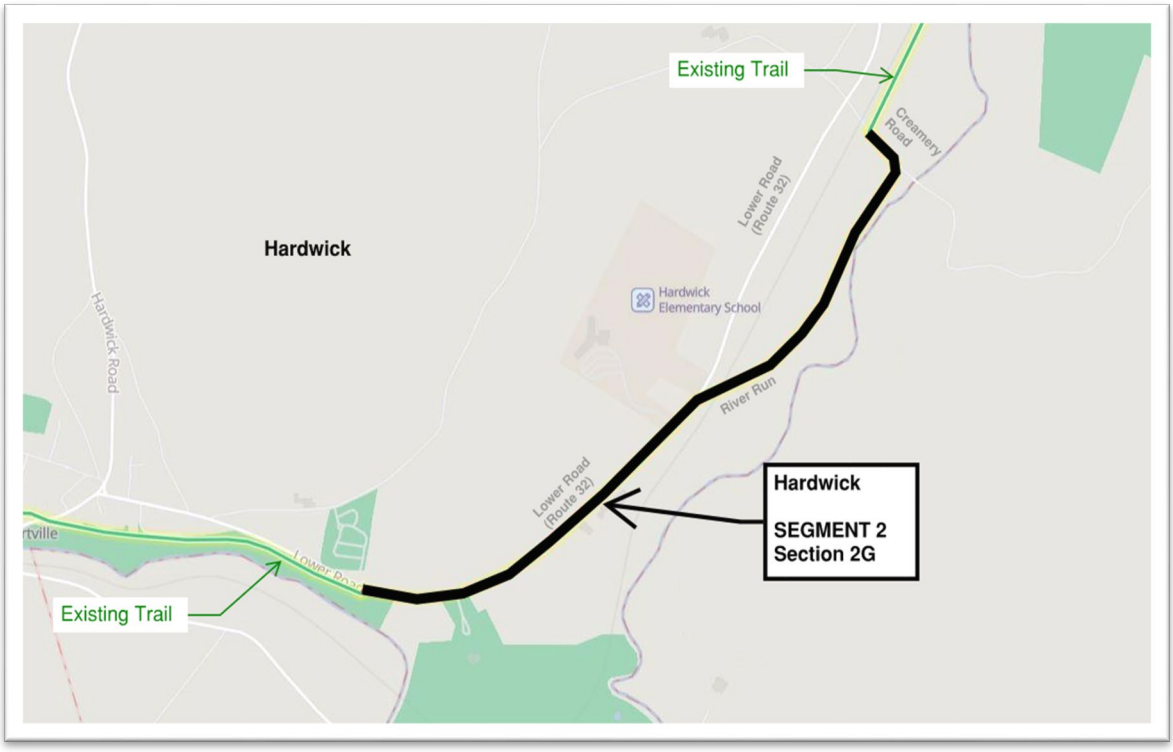
Construction costs are primarily driven by the need for a ~525-foot bridge over the Swift River, retaining walls, and earthwork. Cost associated with the Shea Avenue to Palmer Main Street Old Bridge Abutments/ High Street section can be attributed to a new bridge over Swift River. Also, as noted in Section 2.4 above a 20% design contingency, a 24% MassDOT contingency for construction, and a 4.5% per year inflation are included. Additional details are provided in the appendices.

5

Segment 2, Section 2G: Hardwick – EQLT to Creamery Road – 1.4-miles

5.1 Overview By Section

The proposed trail in this section begins at an existing trailhead (around 1,700-feet east of Upper Church Street) on the south side of Lower Road (Route 32) where the East Quabbin Land Trust (EQLT) trail ends and will continue along Lower Road (Route 32), River Run and Creamery Road where it will meet the existing trail previously completed by the EQLT.



Lower Road to River Run – 0.7-miles

A shared-use -path (SUP) is proposed in the tree belt area along the south side of Lower Road (Route 32) until the intersection with River Run. Lower Road (Route 32) is a principal arterial on the National Highway System with a speed limit of 45 MPH so maintaining an adequate buffer between the roadway and shared use path is a priority. Lower Road may need to be realigned in a few locations to provide the necessary room to construct a shared use path with a grass buffer and avoid a steep slope and the need to reposition guardrail. Wetlands and swales adjacent to the roadway will need to be investigated to confirm this. The trail is proposed to continue along the southbound tree belt area of the roadway to its transition to River Run.



South Side of Lower Road (Route 32)

River Run to EQLT on Creamery Road – 0.7-miles

River Run is a low volume local roadway under the Town of Hardwick's jurisdiction and bicycle accommodations can be provided on-road with signage and striping and pedestrianscan be separated with a new sidewalk in the treebelt. According to MassDOT's roadway inventory viewer, River Run does not appear to be eligible for federal aid.

The MCRT is proposed to transition from a SUP along the south side of Lower Road (Route 32) to on-road facilities on River Run. The route will need to cross an existing active railroad grade crossing approximately 200 feet east of Lower Road. The crossing will need to be upgraded to accommodate the improvements and may require a Public Utilities Commission (PUC) review and action. River Run is a local roadway so on-road bicycle facilities are a good context-sensitive option. A sidewalk is proposed along the northerly side to accommodate pedestrians and is also where most of the residential homes are located on this roadway. The opposite side of the roadway parallels the Ware River near the Creamery Road intersection and is lined with trees. River Run is an approximately 18-foot-wide roadway with an observed poor pavement condition. A full depth reconstruction of this roadway is proposed to create a uniform pavement width and new travel surface for shared vehicle and bicycle travel. Since this is a relatively narrow roadway, pedestrians will be separated on the sidewalk in the tree belt area to minimize any user conflicts. Drainage improvements may be required depending on how the new roadway is pitched to drain and the location of the sidewalk in the adjacent tree/ grass belt area. A topographic survey is needed to determine drainage improvements.



MCER Crossing on River Run

The sidewalk would continue along Creamery Road on the westerly side of the roadway crossing at the EQLT trail around 125-feet south of the active railroad crossing.

5.2 Construction Considerations

Lower Road

- The section includes the reconstruction of the roadway for approximately 750- to 1,000-feet to make room for a 10-foot SUP on the southerly side in areas of constraint and where guardrail is present with a steep slope that changes to an embankment. Survey and design criteria for horizontal and vertical geometries will need to be considered. There also appears to be APR parcel on the southerly side of the roadway within this curve.
- There are two (2) culverts present along this roadway that may need to be extended or reconstructed; further study is needed to determine the position of the roadway and SUP with respect to the culvert. These culverts drain onto private properties so drainage easements will need to be investigated prior to any alterations.
- Utility pole relocations will be required, which can increase construction costs. Based on field observations, 20 to 25 utility poles may require relocation. The utility poles switch from the northerly to the southerly side of the roadway shortly after the trailhead. If utility poles are moved or added, streetlighting on the utility poles should be considered for the SUP.
- Retaining walls are likely going to be required to limit impacts to off-street parking lots and reduce impacts to adjacent parcels. An estimatation of around 350-feet of retaining wall could be needed, but survey will be needed to narrow down the specific limits or determine if the roadway can be shifted.

River Run

- River Run is functionally classified as a local road and does not appear to be eligible for federal aid.
- The existing railroad equipment is flashing signals. A diagnostic team review will be required for the bicycle and sidewalk upgrades to the crossing per the MUTCD. For work within 50-feet of the Massachusetts Central Railroad (MCER) crossing and construction improvements up to the railroad right-of-way, flaggers are typically required during construction. Since this railroad corridor is owned by MassDOT, coordination of work and rail use may reduce the amount of time flaggers are needed.
- The width of the roadway is limited in one area due to the size of an existing bridge (H-08-015) over Fish Brook. This bridge is owned by the Town of Hardwick. If widening of the roadway is needed this short-span bridge may need to be replaced. Another option would be to cantilever the sidewalk over the bridge. The railings on the bridge do not appear to meet current crash standards and the guardrail leading up to the bridge is in disrepair and not present, which would require the construction of bridge rail transitions. The observed existing pavement width on the bridge is around 18-feet with approximately 4-foot dirt or debris covered shoulders leading to the concrete supporting the railings (25- to 26-feet in total width).
- There are numerous trees along this section that are encroaching into the roadway and will need to be removed. Depending on the width of the roadway layout, these trees could be considered public shade trees triggering MEPA review if five or more trees, each ten feet in diameter are removed.

- Retaining walls may be required to limit impacts to surrounding areas where steep slopes are present. Survey will be needed to narrow down the specific limits.
- Utility pole relocations will be required, which can increase construction costs. Based on field observations, 10 to 15 utility poles may require relocation. The utility poles switch from the northerly to the southerly side of the roadway middway down the roadway and then terminate approximately 500-feet shy of Creamery Road. If the roadway is widened, these poles will need to be relocated; however, if the roadway width can be maintained and a sidewalk constructed, then the total pole relocations could drop to five or so. If utility poles are moved or added, streetlighting on the utility poles should be considered.

Creamery Road

- Creamery Road is funcitonally classified as a local roadway and does not appear to be eligible for federal aid.
- The sidewalk could be constructed on either side of the roadway the only difference would be where the crossing is located. Survey will be required to review surrounding topography more closely. If the sidewalk were on the easterly side, two to four utility poles may need to be relocated.

5.3 Alternative Alignments

Lower Road

- Placing the trail along the northerly side of Lower Road (Route 32) was reviewed, but this would require two SUP crossings of Lower Road and since this is an arterial with the likelihood of high vehicle speeds, the southerly side was determined to be preferred. Furthermore, the curvilinear alignment of the roadway limits the crossing sight distance at the proposed crossing locations. Realignment of the roadway to provide adequate sight distance is not a practical feasible alternative within the scope of this project. For this reason, an alternative with the SUP on the north side of the roadway was deleted from further consideration.

River Run

- Placing the sidewalk on the southerly side of the roadway could have more impacts to the Ware River and the adjacent resources and utility poles. This could also require more retaining walls and railings to meet ADA requirements.

Creamery Road

- A sidewalk could be placed on either side of the roadway, and this may depend on grading needs surrounding the roadway. Survey will be required to evaluate this more closely.

5.4 Potential Structural Needs

- At least 350-feet of retaining wall could be required to minimize impacts to adjacent properties.
- Headwalls may be required where culverts need to be reconstructed and are close to the proposed SUP.

› The existing bridge over Fish Brook will likely need modifications (or replacement) to accommodate a sidewalk and pavement rehabilitation, including but not limited to new parapet walls or railings and bridge end treatments for guardrail transitions.

5.5 Potential Environmental Impacts

The following table provides a quick summary of the environmental and permitting needs this segment may require. Following the table a summary of the potential or significant impacts is provided.

Environmental Due Diligence Table

Environmental / Permitting Issue	Hardwick Segment 2, Section 2G
Work within Water Resource Areas	P
Impacts to Wetlands	P
100-year Floodplain Impacts	P
Certified Vernal Pools	X
Parkland Impacts/ Conversation Restriction (CR)	X
Hazardous Waste	X
Threatened or Endangered Species (NHESP)	X
MassDEP Approved Wellhead Protection Areas	X
National Register Districts	X
Chapter 91 License	X
Impact to Utilities	S
MEPA/ Environmental Justice	S

LEGEND

X: Impact not anticipated

P: Potential Impact

S: Likely significant impact

› Potential Impact, Work within Water Resources Areas, Wetlands and 100-year floodplain: Impacts are anticipated but their significance is not known at this time. More detailed survey, wetland delineations, and hydraulic studies will be needed. This will particularly be important for the options explored for the bridge at Fish Brook.

› Significant Impact on Utilities: Impacts on utilities along Lower Road and River Run are anticipated to be significant to accommodate roadway widening and the construction of a sidewalk.

› Significant Impact, MEPA/Environmental Justice: This will need to be reviewed more closely as the design advances. MEPA review will be triggered if more than five public shade trees measuring at least 10" in diameter need to be removed, or if the roadway is widened by more than 4-feet for 0.5 miles or more.

5.6 Right-of-Way Actions

- The right-of-way for Lower Road will need to be reviewed closely to determine if the roadway is centered in the layout to determine where widening can occur while minimizing impacts to resource areas and adjacent properites. Approximately 23 properties abut the Lower Road project limits (12 on the northerly side and 11 on the southerly side).
- The right-of-way for River Run and Creamery Road will also need to be reviewed closely, as there are 25 properties that abut the project limits with the majority (17) on the northerly side of roadway.
- Coordination with the active railroad will be needed for work adjacent to the railroad crossing. This will require both the owner (MassDOT) and the users of the rail to participate in a review of the project.

5.7 Order of Magnitude Construction Costs

The following summarizes order of magnitude cost estimates to construct each of sections. They have been prepared using high-level pricing per linear foot and lump sum items. The more detailed construction cost estimate breakdowns have been included in the appendices. The costs do not include design or permitting fees. The order of magnitude estimated costs (including contingencies and cost escalation for 5-years and 20-years) of completing construction of the sections are summarized below:

- **Lower Road to River Run – 0.7-miles**
  - Fiscal Year 2030 - $7.1 Million
  - Fiscal Year 2045 - $13.8 Million
- **River Run to EQLT on Creamery Road – 0.7-miles**
  - Fiscal Year 2030 - $6.0 Million
  - Fiscal Year 2045 - $11.6 Million

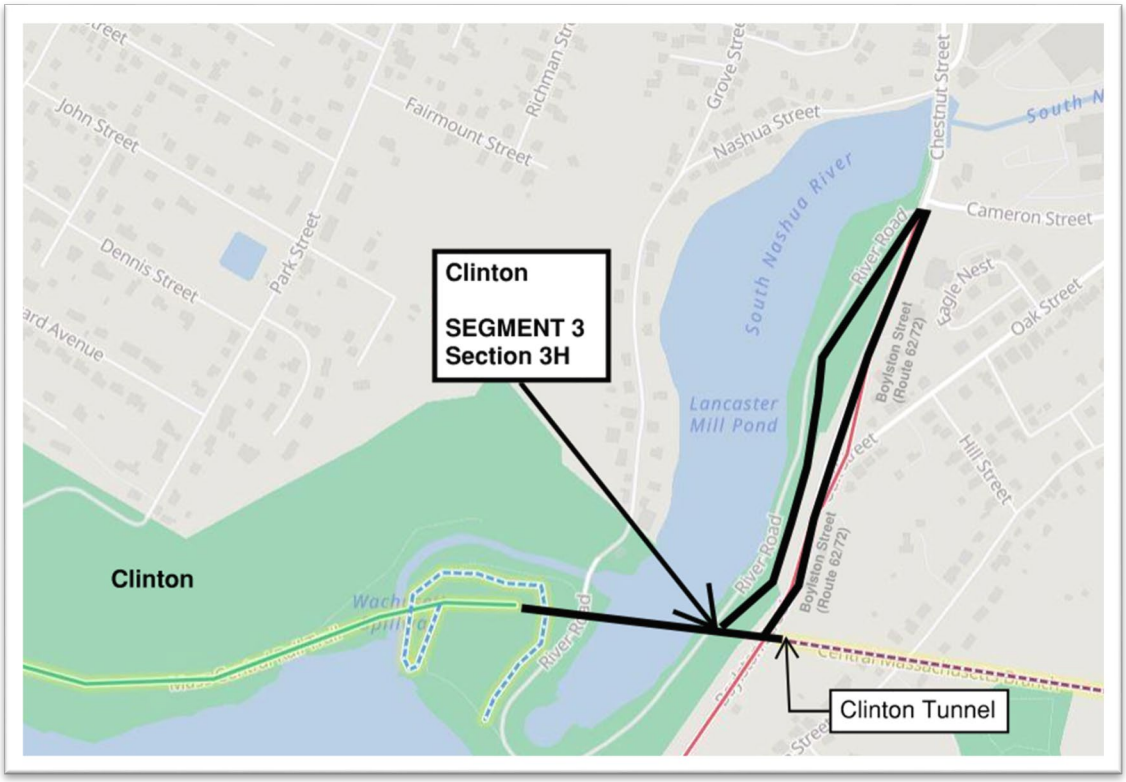
Construction costs focus on grading, roadway modifications to accommodate a SUP, and work to the bridge on River Run. Approximately 60% of the cost associated with River Run to EQLT on Creamery Road section can be attributed to the rehabilitation of the roadway with a new sidewalk. Also, as noted in Section 2.4 a 20% design contingency, a 24% MassDOT contingency for construction, and a 4.5% per year inflation are included. Additional details are provided in the appendices.

6

Segment 3, Section 3H: Clinton Wachusett Dam to Clinton Tunnel – 0.2-miles

6.1 Overview By Section

This segment includes the connection from River Road within the Wachusett Dam area surrounding Lancaster Mill Pond to the western end of the historic Clinton Tunnel just east of the Wachusett Dam and Boylston Street (Route 62/70). **Work within the Clinton Tunnel itself is outside this project limits and modifications to the railroad abutment just west of the tunnel and adjacent to Route 62/70 is not anticipated.** The MCRR originally bridged over State Route 62/70 and the Nashua River Valley (now Lancaster Mill Pond). The abutments for the road crossing exist and appear to be in good condition. The bridge structures were removed in the 1970s, and only the bridge footings are now visible in the middle of the mill pond.



Assessment of this segment includes the review four potential alignments presented in the Clinton Greenway Conservation Trust's MCRT Clinton's Tunnel Vision report aimed at making the connection from the west side of the Wachusett Dam to the Clinton Tunnel. These options described in that report are as follows:

1. Tunnel Exit 1 - Ramping down from the tunnel along the embankment and crossing Route 62/70 at grade and following the roadway to the intersection with River Road and then utilizing River Road to follow the perimeter of Lancaster Mill Pond.
2. Tunnel Exit 2 - Ramping down from the tunnel along the embankment and crossing Route 62/70 at grade and creating a switchback along the embankment down to River Road on the east side of Lancaster Mill Pond and then utilizing River Road that follows the perimeter of Lancaster Mill Pond.



Clinton Tunnel Railroad Bridge Abutment

3. Tunnel Exit 3 - Creating an elevated crossing over Route 62/70 and then using a combination of a ramp and switchbacks down to the east side of Lancaster Mill Pond and then utilizing River Road to follow the perimeter of Lancaster Mill Pond.
4. Tunnel Exit 4 - Constructing a new shared-use-path bridge utilizing the alignment of the former railroad bridge.

Using the top of the Wachusett Dam to avoid a new bridge or having to ramp up and down to the Lancaster Mill Pond would be an ideal route but is currently gated and prohibited from being used by the public. This connection was therefore not reviewed as part of the study. Should the top of the dam be open to the public at some point in the future, this could be reviewed as an alternate or spur of the MCRT.



Clinton Tunnel

In addition, the Lawrence & Lillian Solomon Foundation developed strategies to extend the MCRT through the Town of Clinton. The study also identified a new bridge over the Lancaster Mill Pond (similar to the Clinton Greenway Conservation Trust MCRT Clinton's Tunnel Vision Alternative 4) as well as using the top of the Wachusett Dam.

When reviewing the independent study - Clinton Greenway Conservation Trust MCRT Clinton's Tunnel Vision alternatives - an additional option was developed for consideration and a second bridge crossing alternative with a shorter span was reviewed.

A total of five alignments were reviewed for this segment, as follows. **More details on each are provided in the alternatives section below.**

- Option 1 – This is Tunnel Exit 1 from Clinton Greenway Conservation Trust MCRT Clinton's Tunnel Vision report. This alternative continues the use of River Road surrounding Lancaster Mill Pond and transitions into an off-road SUP along the west side of Route 62/70 which would then cross the roadway and switch back up to the tunnel.
- Option 2 – This is Tunnel Exit 2 from Clinton Greenway Conservation Trust MCRT Clinton's Tunnel Vision report. This alternative continues the use of River Road surrounding Lancaster Mill Pond and transitions into an off-road SUP close to the maintained grass portion of the dam. A switchback ramp would be proposed supported by either pier foundations or retaining walls through the wooded embankment to an at grade crossing on Route 62/70 to the tunnel.



Sidewalk along Route 62/70

- Option 3 – This is Tunnel Exit 3 from Clinton Greenway Conservation Trust MCRT Clinton's Tunnel Vision report. This alternative continues the use of River Road surrounding Lancaster Mill Pond and transitions into an off-road SUP utilizing switchbacks along the slope to access Route 62/70. This option brings the SUP to an elevation above Route 62/70 so the trail can cross over the roadway and lead directly to the tunnel.
- Option 4 – This is similar to Option 1 with a SUP running parallel with Route 62/70 but with an elevated crossing over the roadway directly to the tunnel.
- Option 5 - This is Tunnel Exit 4 from Clinton Greenway Conservation Trust MCRT Clinton's Tunnel Vision report. A new SUP bridge over Lancaster Mill Pond follows the same alignment as the former railroad bridge at a fairly flat grade (~0.2%). This would be an approximate 1,050-foot bridge crossing Lancaster Mill Pond, River Road and Route 62/70.

Route 62/70 is a two-lane roadway arterial roadway on the National Highway System with posted speed limits of 30 MPH (eastbound direction) and 40 MPH (westbound direction) in the area of the Oak Street intersection, and the roadway is under MassDOT jurisdiction.

6.2 Construction Considerations

- Overall constructability requires a switchback down the embankment from Route 62/70 to Lancaster Mill Pond and River Street, which is Article 97 designated land.
- The steep embankments leading to and from the mill pond will make this project challenging to construct.
- 1,400- to 2,800-feet of retaining walls will be required for the path down embankment options.
- Construction of a safe at-grade crossing will be needed across Route 62/70.
- Reuse or construction of new pier foundations required for a trestle bridge over the mill pond.



River Road

- Work in this area could require a permit from the MWRA. Section 8(m) of chapter 372 of the Acts of 1984 enables the Authority to issue permits to other entities to build, construct, excavate, or cross within an easement or other property interest held by the Authority.

6.3 Alternative Alignments

In all options reviewed, coordination with the Massachusetts Water Resources Authority (MWRA) and the Massachusetts Department of Conservation and Recreation (DCR) – Office of Dam Safety (ODS) will be needed. Studies may be required to show that the proposed improvements will not have a detrimental effect on the dam itself.

- Option 1 – This alternative continues the use of River Road as a path of access for users and transitions into an off-road SUP along the west side of Route 62/70 around 50-feet south of the intersection with Chestnut Street, Boylston Street and Cameron Street. This option provides for a connection to the MCRT for the Clinton area roadways at this intersection.

  The SUP would follow the existing grade of Route 62/70 and be supported by a retaining wall or sheet piles on the Lancaster Mill Pond side and require fill. The SUP would be separated from the roadway by a guardrail and 5-foot grass tree belt. The trail would cross Route 62/70 at grade with either a pedestrian signal or a High-Intensity Activated Crosswalk beacon (HAWK). The SUP would ramp up to the tunnel along the embankment on the east side of Route 62/70 and would require cutting into the embankment and providing a retaining wall to support the path and slope.

- Option 2 – This alternative continues the use of River Road for a SUP and transitions into an off-road SUP close to the maintained grass portion of the dam. A ramp is proposed supported by retaining walls through the wooded embankment to an at-grade crossing on Route 62/70 controlled with either a pedestrian or HAWK signal.

  The SUP would then ramp up to the tunnel along the embankment on the east side of Route 62/70. A switchback on the east side of Route 62/70 would connect the crossing to the tunnel. This option would require more fill than Option 1. An alternative would be the potential use of a pier system to support the path on a switchback, which would require more detailed engineering and geotechnical assessments.

- Option 3 – This alternative continues the use of River Road for a SUP and transitions into an off-road SUP utilizing switchbacks along the slope between Route 62/70 and Lancaster Mill Pond. This option brings the SUP to an elevation above Route 62/70 so the trail can cross over the roadway and lead directly to the tunnel. This crossing maintains a 17-foot clearance over the roadway to allow for truck traffic.

  This alternative may not be ideal due to the winding switchbacks needed to bridge the difference in elevation between River Road and the Tunnel entrance (~75-feet). It should be noted that bicyclists traveling from the tunnel down to River Road will be constantly breaking to control their speed and slow for tight turning maneuvers. Conversely, it is a long uphill climb to the tunnel.

- Option 4 – This alternative is similar to Option 1 with a SUP running parallel with Route 62/70 but with an elevated crossing over the roadway directly to the tunnel. This alternative continues the use of River Road for a SUP and transitions into an off-road SUP on the east side of River Road approximately 1,000-feet south of the intersection with Chestnut Street, Boylston Street and Cameron Street. The SUP begins as an earthen supported trail and then transitions into a pier (or similar structure) supported SUP that ramps up to an elevated crossing over Route 62/70 directly to the tunnel, which would require more detailed engineering and geotechnical assessments.

- Option 5 – A new SUP bridge over Lancaster Mill Pond follows the same alignment as the former railroad bridge at a fairly flat grade (~0.2%). This would be an approximate 1,050-foot bridge crossing Lancaster Mill Pond, River Road and Route 62/70. This is the most direct route of all the options reviewed, follows the original alignment, and may allow for the reuse of the existing abutments, but is more costly.

These five options were consolidated into three (3) alternatives for future evaluation, and a construction cost estimate was prepared. One with an at-grade crossing on Route 62/70 (Option 1), an elevated crossing over Route 62/70 (Option 4) and a new bridge over Route 62/70, River Street and Lancaster Mill Pond using the original MCRT alignment (Option 5). Concept plans and profiles are provided in the appendices.

6.4 Potential Structural Needs

- Option 1: ~1,400 feet of a raised bridge ramp structure with complementary retaining walls as needed.
- Option 4: ~1,600 feet of bridge ramp SUP with railing/fence.
- Option 5: ~1,050-foot trestle bridge with railing/fence.

6.5 Potential Environmental Impacts

The following table provides a quick summary of the environmental and permitting needs this segment may require. Following the table a summary of the potential or significant impacts is provided.

Environmental Due Diligence Table

Environmental / Permitting Issue	Clinton Segment 3, Section 3H
Work within Water Resource Areas	S
Impacts to Wetlands	P
100-year Floodplain Impacts	X
Certified Vernal Pools	X
Parkland Impacts/ Conversation Restriction (CR)	S
Hazardous Waste	X
Threatened or Endangered Species (NHESP)	X
MassDEP Approved Wellhead Protection Areas	P
National Register Districts	X
Chapter 91 License	P
Impact to Utilities	P
MEPA/ Environmental Justice	P

LEGEND

X: Impact not anticipated

P: Potential Impact

S: Likely significant impact

- Significant Impact, Work within Water Resources Areas: Significant impacts could be realized if abutments need to be reconstructed; otherwise, this may have negligible impact.
- Potential Impacts to Wetlands, Resource areas need to be delineated to determine if impacts will occur.
- Significant Impact, Work within the Wachusett Reservoir Watershed subject to Article 97 review.
- National Register Districts, the Clinton Tunnel is a Massachusetts Historic Commission Inventoried property, and the bridge abutment falls within the boundary of the Wachusett Dam Historic District. Impacts to the abutment are not anticipated but will need to be confirmed. Work within the tunnel is not considered as part of this assessment.
- Potential Impact, MassDEP Approved Wellhead Protection Areas: Impacts are not anticipated but this will need to be reviewed more closely as there is a Zone II wellhead associated with the Lancaster Water Department over and surrounding Lancaster Mill Pond.
- Potential Impact, Chapter 91 License: A Chapter 91 License will be required if the Lancaster Mill Pond is considered a great pond and a bridge is constructed over it. This pond is over 20 acres and the threshold for great ponds is 10 acres.

- Potential Impact to Utilities: There may be impacts to utilities along Route 62/70, especially with the connection up to the westerly side of the tunnel whether at-grade or overhead. Utilities are located on the southerly side of the roadway. Impacts to four or so utility poles could be realized.
- Potential Impact, MEPA/ Environmental Justice: This will need to be reviewed more closely as the design advances and particularly if a Chapter 91 license is required. Public shade tree removal should not come into consideration since Route 62/70 is under MassDOT jurisdiction.

6.6 Right-of-Way Actions

- Right-of-way will likely be needed from the MWRA to establish this connection. The process to pursue this is not clear at this time and will need to be explored. Online sources note that the Lancaster Mill Pond area is owned by the Metropolitan Water District in Boston.
- The Town of Clinton owns the railroad tunnel and westerly landing area adjacent and above Route 62/70.
- River Road is identified as an unaccepted local roadway that is gated to vehicular traffic at the intersection with Route 62/70. Ownership of this roadway will need to be confirmed if used.
- There are two parcels adjacent to the town's land and the MassDOT layout where acquisitions might be needed to construct an access path across Route 62/70 and switch back up the embankment to the tunnel with retaining walls.

6.7 Order of Magnitude Construction Costs

The following summarizes order of magnitude construction cost estimates to construct each of sections. They have been prepared using high-level pricing per linear foot and lump sum items. The more detailed construction cost estimate breakdowns have been included in the appendix. The costs do not include design or permitting fees. The order of magnitude estimated costs (including contingencies and cost escalation for 5-years and 20-years) of completing construction of the sections are summarized below:

- **Option 1 – 0.4-miles**
    - Fiscal Year 2030 - $4.5 Million
    - Fiscal Year 2045 - $8.7 Million
- **Option 4 – 0.4-miles**
    - Fiscal Year 2030 - $55.4 Million
    - Fiscal Year 2045 - $107.7 Million
- **Option 5 – 0.2-miles**
    - Fiscal Year 2030 - $168.5 Million
    - Fiscal Year 2045 - $326.0 Million

Order of magnitude construction costs vary widely depending on the selected alternative. As noted in Section 2.4 a 20% design contingency, a 24% MassDOT contingency for construction, and a 4.5% per year inflation are included. Additional details are provided in the appendix.

7

Initiatives and Next Steps

7.1 Defining Next Steps

The specific shared use path (SUP) alignments for each of the segments, including structures such as bridges, retaining walls, culvert extensions, replacements, improvements, boardwalks, etc. may deviate from what has been proposed in this feasibility study, especially after more detailed surveys are conducted to locate trees, wetland resources, and other features such as utilities. In addition, each segment will require further public review as the designs progress.

While MassDOT is not pursing a project at this time, the MCRT Gap Study represents an important early step in the project implementation process. If other parties or agencies choose to move forward with any elements of this study, the project development process follows these initial general stages.

a. *Prioritize Segments:* The entire MCRT, including these segments, are priority corridors for trails, as shown in the MassDOT Priority Trail Network: Priority Trails Network Viewer The following summarizes the potential order for segment advancement:

   - Gap 1, Section 1D: Springfield Road to Franklin Street (Route 181) in Belchertown may be the first priority given that the old railroad right-of-way is owned by the Town of Belchertown. If the segment is too costly to build all at once, the northerly section between Springfield Street and North Washington Street could be constructed first as it provides independent utility by connecting two public streets. The proposed bridge over Jabish Brook, between North Washington Street and Franklin Street (Route 181) will need further design and consideration for constructability if it will be replaced and not rehabilitated.
   - Gap 2, Section 2G: Lower Road (Route 32) and River Run in Hardwick may be the second priority given the improvements would fall primarily within public right-of-way; however, easements or acquisitions would likely be needed outside the roadway layout.

   1. Gap 1, Section 1E (Phase I of II): Franklin Street (Route 181) to Shea Avenue in Belchertown, could be the next alternative, which also provides independent connectivity between two public streets. While the old railroad bed appears to be intact, ownership is among several private properties.
   2. Gap 1, Section 1E (Phase II): Shea Avenue to Griffin Street in Belchertown and Palmer could be the next segment, which would focus on developing a

bridge alternative over the Swift River. The preferred alignment could be a 525-foot bridge extending over the Swift River between the ten to twelve feet footings that appear to still be intact.

3. Gap 3, Section 3H navigates from the westerly side of the Clinton Tunnel an extends over the Lancaster Mill Pond with a ~1,000-foot trestle bridge using the eighteen to twenty feet footings that are still in place from the railroad.

Design: In order for any of these potential projects to advance into more detailed design and permitting, the involvement of local and regional stakeholders is essential. The advocacy of residents, state legislators, local officials and planning departments, as well as the two Metropolitan Planning Organizations serving the study area, will be critical to gathering support and securing funding for the project's advancement.

Updated Gap Study Segment Maps

Segment 3 Clinton Lancaster Mill Pond (Options 1-5)

Updated Field Assessment Matrices

Order of Magnitude Construction Cost Estimates