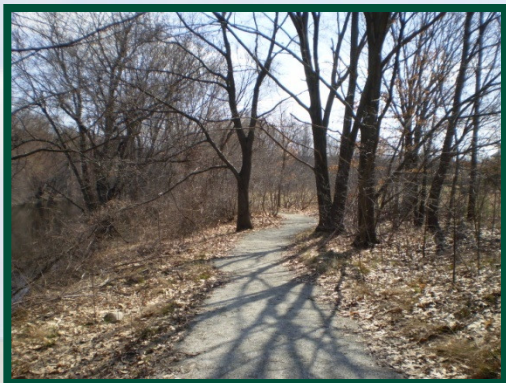
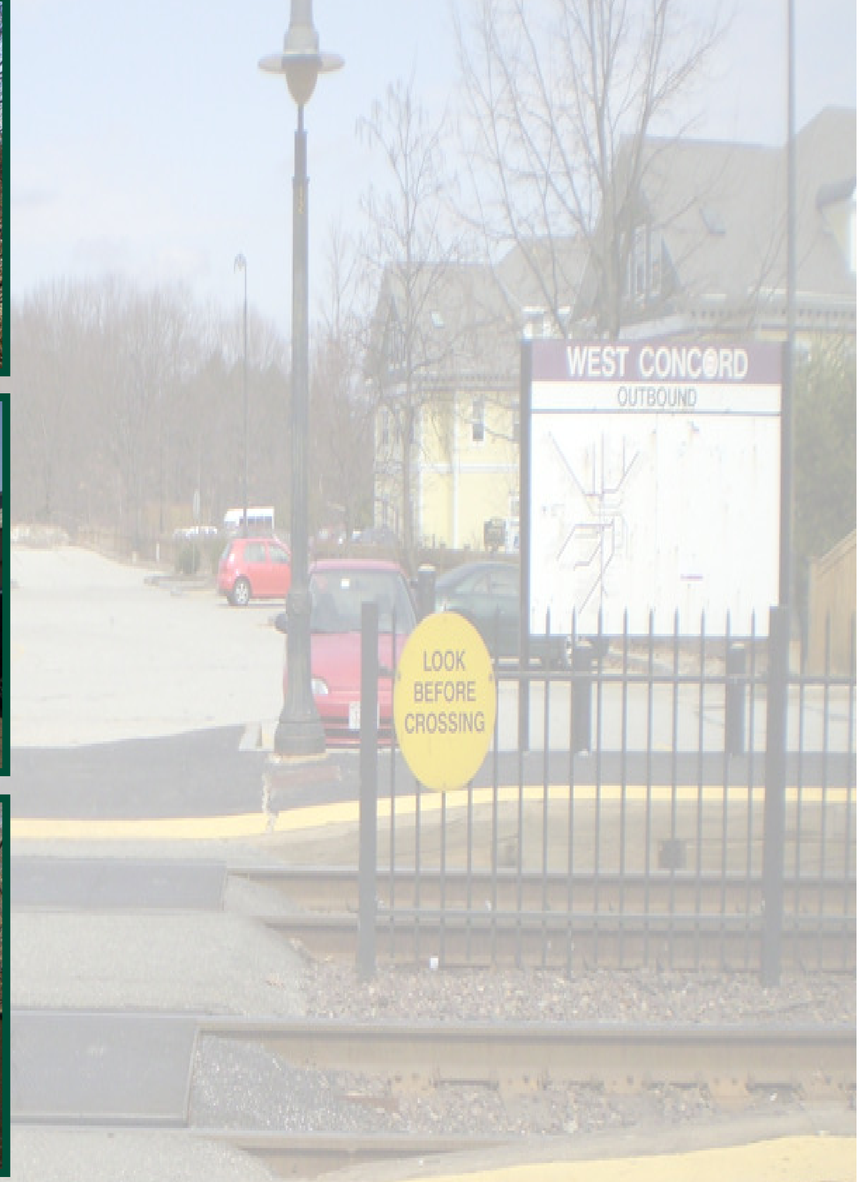
Proposed Bruce Freeman Rail Trail/MBTA Commuter Rail Crossing Alternatives Analysis





Submitted to:

Town of Concord

Department of Planning and Land Management
141 Keyes Road
Concord, MA 01742

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Submitted by:

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Engineers, Architects, Planners, Construction Engineers and Inspectors

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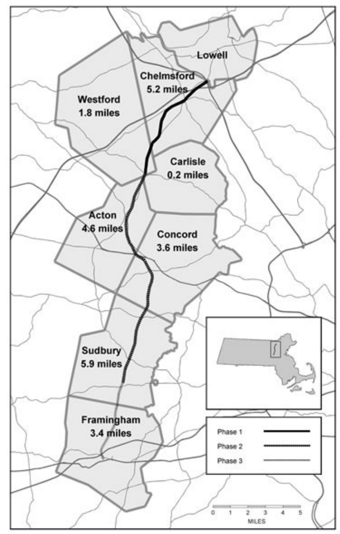
A. INTRODUCTION

West Concord center is a small "suburban town center". West Concord has established its identity as a separate village and has a unique architectural character defined by styles popular in the late 19th and early 20th centuries. Its structures are defined by similarities in materials, scale and orientation. The residents of West Concord value this character and want to ensure that it remains. Several studies have been done in Concord which include goals for West Concord. These studies include the "Long Range Plan for Land Use to the Year 2000" of 1987, the "West Concord Study of 1993," the "Comprehensive Long Range Plan of 2005", and the "Concord Villages Study of 2007". The goal in each is to maintain the character of West Concord. A West Concord Task Force was established in 2008 to develop recommendations for West Concord.

The Bruce Freeman Rail Trail (BFRT) corridor extends approximately 25 miles along the Framingham and Lowell Railroad Corridor. The Town of Concord is currently designing the section of the BFRT from Commonwealth Avenue south to the Sudbury Town Line. The portion north of Commonwealth Avenue is being designed by the Massachusetts Department of Transportation Highway Division (MassDOT) as part of the Concord Rotary Project. The Concord section will meet the trail in Acton to the north and Sudbury to the south. Concord's 25% Preliminary Design of the trail includes a section of the trail that passes through the West Concord Village Center and crosses the active Massachusetts Bay Transit Authority (MBTA) Fitchburg Commuter Rail Line. This crossing presents a concern for both residents and the MBTA.



Greenman-Pedersen, Inc. (GPI) was retained by the Town of Concord to develop and evaluate several alternatives (see illustration on the next page) for the BFRT to cross the active MBTA Rail Line including the following:

1. Follow an existing abandoned railroad spur in the northern portion of the West Concord commuter railroad station to Commonwealth Avenue and instruct bicyclists to dismount and walk their bicycles on the sidewalk on the north side of Main Street to the existing traffic light in front of the 99 Restaurant, cross at the existing traffic signal and then re-mount south of Main Street at the existing Massachusetts Executive Office of Transportation and Construction (EOTC) owned right-of-way. Another option would be to allow bicyclists to ride on Commonwealth Avenue on a specially marked "sharrow" lane to the traffic light in front of the 99 Restaurant.

2. Follow the existing railroad right-of-way with a gap in the trail at the existing MBTA commuter railroad right-of-way.

3. Re-route the BFRT to the Assabet River east of the Concord Park assisted living facility, crossing under the active rail road and Main Street at the Assabet River.

4. Construct a tunnel under the active MBTA railroad right-of-way in the vicinity of the existing crossing.

5. Construct a ramp/bridge/elevator facility over the existing MBTA railroad right-of-way in the vicinity of the existing crossing.

6. Follow an existing abandoned railroad spur in the northern portion of the West Concord commuter railroad station to and across Commonwealth Avenue to the driveway between Concord Teacakes and Twin Seafood, over a town right-of-way through the parking lot. From there, the trail would go behind Concord Teacakes and up the slope to the Harvey Wheeler Community Parking lot, across the parking lot and down the slope to Main Street. The trail would turn left on Main Street to the intersection with Commonwealth Avenue and then back to the BFRT right-of-way.

7. Cut through the MBTA parking lot then head easterly toward the Assabet River parallel to the MBTA Commuter Rail Line crossing the Assabet River over a pedestrian-type bridge to the property associated with Baker Avenue. The trail would then turn right to Baker Avenue crossing over the MBTA Commuter Rail proceeding toward Main Street. At this point, two options were considered. The first option proposes that the trail continue westerly on Main Street back to the Commonwealth Avenue intersection and the BFRT right-of-way. The second proposes that the trail crosses Main Street and continues up Cottage Street to Old Marlboro Road, turns right onto Old Marlboro Road which intersects with the BFRT right-of-way.

STUDY AREA AND ALTERNATIVES

Alternatives 7A and 7B are continued on the following page.

Each alternative was then evaluated based on the following criteria:

1. Effectiveness (will the users of the trail use the recommended alternative)
2. Short-term and long-term reliability
3. Short-term and long-term maintenance costs
4. Difficulty in implementing, including property ownership and permitting issues
5. Cost to design and implement
6. Risk to public safety
7. Vehicular impacts
8. Benefits to the community
9. Timeliness to implement
10. Context-sensitive aesthetics

After the presentation of each Alternative, a summary is included with each Alternative and a ranking for each of the above criteria.

Aerial mapping, Concord GIS data and some field survey were used to evaluate each alternative. Field survey data was not available for Alternatives 7A and 7B. Some of the right-of-way information is approximate only and the sketches are conceptual. More detailed field survey information and CADD drafting are required to accurately determine the true impacts of the proposed alternatives on ROW, utilities and resource areas. Construction costs are preliminary in nature and are based on current MassDOT costs.

In order to complete the evaluation, GPI researched available data from the Town's GIS database, the Chappell Engineering Survey along the railroad spur and the Vanasse Hangen Brustlin, Inc. (VHB) Survey for the Preliminary Engineering Design and became familiar with the original Feasibility Study for the BFRT, the Engineering Assessment completed by Fay, Spofford & Thorndike (FST) in 2004, the 25% Design Report completed by VHB in 2008 and the Concord Greenways Alliance Report completed in 2008.

GPI attended an orientation meeting and site walk on May 21, 2009 with the BFRT Advisory Committee. A meeting was held on July 13, 2009 with Mr. Paul Hadley of the MBTA, Mr. Frank Frey and Mr. Tim Davis of the Department of Public Utilities (DPU), Mr. Dave Shedd of MassDOT, Ms. Marcia Rasmussen of the Town of Concord and GPI. At that meeting Mr. Paul Hadley stated that regardless of which alternative was selected, no parking spaces can be lost within the commuter rail lots and that train service could not be interrupted at any time for construction. They also stated that they could not maintain any type of elevator system on their property. Representatives from both the MBTA and DPU felt that the abandoned rail spur and crossing at Commonwealth Avenue would be the most practical solution. In addition, they felt that leaving a gap in the trail would not have an impact on their facilities but agreed it would not be practical for a bike path solution. However, Mr. Paul Hadley did state that if the "spur" or a "gap" were chosen as alternatives that fencing would be required around the MBTA property to prevent cut through use of the existing at-grade crossing. Mr. Paul Hadley raised concerns with the length of ramps required for a bridge structure and stated that although the required clearance is 22.5 feet over the tracks, they have allowed an exception with only 18 feet required over the tracks. In addition, if a bridge structure was proposed and not closed in, it would need to be plowed/salted in the winter if the remainder of the path was going to be maintained all winter. If the structure was to be closed in, ventilation would be necessary and anything over 800 feet in length must have mechanical ventilation. Representatives from both the DPU and MBTA raised concerns over the tunnel option in terms of water table, construction under the rail line and public safety. A tunnel would be extremely costly, would require very long ramps and, with the proximity to the Assabet River, the water table may be very high making flooding a concern and a pumping system necessary.

The concept of utilizing the existing at-grade pedestrian crossing was discussed at this meeting. Representatives from both the MBTA and DPU agreed that these types of at-grade pedestrian crossings are hazardous. The MBTA is actually attempting to eliminate at-grade crossings at stations by installing high level platforms, so various stations are going through rehabilitation. In addition, Mr. Paul Hadley stated that at some point the platforms at this station may be changed to high level ADA accessible platforms and the crossing could be eliminated. Therefore representatives from both the MBTA and DPU felt that it would not be practical or desirable to add additional activity, particularly faster moving bicyclists to this crossing. Representatives from both the DPU and MBTA stated that no new crossings would be allowed.

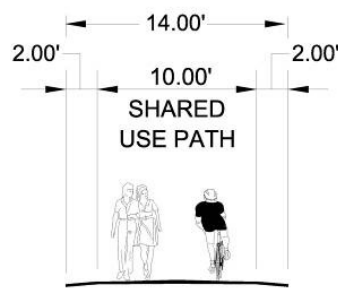
Trail Design Criteria


Photo by Doug Mink

Technically called Shared Use Paths (SUPs), the terms bike trails and SUPs will be used interchangeably to refer to off-road paths accommodating bicycles as well as other non-motorized transportation including pedestrians, rollerbladers, wheelchair users and pedestrians with baby carriages. Bike trails provide a safe environment for pedestrian and leisurely bicycle traffic separated from motorized traffic. The 1999 American Association of State Highway and Transportation Officials (AASHTO) ***Guide for the Development of Bicycle Facilities*** presents guidelines for the creation of shared use paths. The MassDOT ***Project Development and Design Guide*** follows these guidelines but also allow for context sensitive design features as long as safety is not compromised.

1. Width

Because these paths are designed to provide two-way travel of bikes and are also assumed to accommodate pedestrians, the width of the paths must be sufficient to safely and comfortably accommodate all users. The AASHTO guideline is that such paths should have a minimum width of 10 feet with 2-foot graded shoulders adjacent to the path. In addition 3 feet clearances from the edge of path should be provided to any obstruction (i.e. sign, fence, building, etc.) A path width of 8 feet may be considered where the following conditions prevail:



SUP SEPARATE FROM ROAD
DESIRED CROSS SECTION

- Bicycle traffic is expected to be low, even on peak days or during peak hours
- Pedestrian use of the facility is not expected to be more than occasional
- There will be good horizontal and vertical alignment providing safe and frequent passing opportunities
- Vehicle loading conditions that would not cause pavement edge damage during normal maintenance

MassDOT's 2006 ***Project Development & Design Guide (Guide)*** further states that an 8-foot path may be considered where severe environmental, historical and/or structural constraints exist. It should be noted, however, that an 8 foot trail was not supported by the majority voting at the Concord Town Meeting.

In order to accommodate bicycles on roadways, a minimum of four feet is necessary when the bicycle lane is adjacent to the edge of pavement, however, five foot bicycles lanes are preferred for most conditions, especially when the lane is adjacent to curbside parking, vertical curb or guardrail. Where on street parking is allowed, five foot shoulders are recommended.

2. Alignment

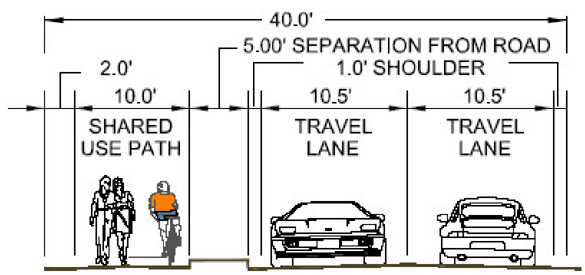
Photo By Doug Mink

The horizontal alignment or curvature of a path is dependent on the desired design speed, anticipated lean angle and the cross-slope of the path. For most paths a lean angle of 15 degrees is appropriate and a typical design speed would be 20 mph. Based on a 20 mph design speed the minimum radius for a horizontal curve would be 100 feet. Smaller radii of as little as 36 feet can be used in areas with design speeds as low as 12 mph. Appropriate warning signs should be installed along the path in these instances. While it is always desirable to provide a smooth alignment and horizontal curvature, due to physical constraints or limited right-of-way, areas of sharper corners may be necessary. In these areas of sharper, almost 90 degree curves, appropriate warning signs should be posted along the bike path advising users of the alignment.

In areas where paths start or end, particularly at streets or intersections, additional right-of-way is typically required to provide appropriate trail definition, provide some form of physical vehicle barrier and maintain appropriate clearances for two-way bike travel.

3. Buffer

Where the path is adjacent to roadways, AASHTO and MassDOT both recommend a minimum separation of 5 feet between the path and the roadway surface. When a 5 foot separation cannot be provided, suitable physical barriers such as fences, walls, cushioning vegetation or concrete/guardrail barriers are recommended. These barriers should be a minimum height of 3.5 feet to prevent bicyclists from toppling over it and should be designed to not be a hazard to motorists or bicyclists.



SUP ADJACENT TO ROAD - DESIRED CROSS SECTION

The criteria recommend that 17-18 feet be available for establishing a 10 foot SUP adjacent to the roadway. If an 8 foot SUP is utilized the required Right-of-Way (ROW) associated with the SUP would be 15-16 feet. However, it should be noted that these are guidelines and the cross section for each proposed segment should be carefully reviewed and designed to maximize the width of the path and separation from the roadway.

4. Vertical Grades

Vertical grades are a major concern in the design of SUPs. Generally grades in excess of 5% are not desirable for SUPs because ascents are difficult for many cyclists and descents may cause some cyclists to exceed a comfortable speed. Steeper grades also do not meet pedestrian accessibility requirements.

While grades in excess of 5% may be considered for bicycle facilities for shorter distances, grades for pedestrians cannot exceed 5% unless treated as a ramp (switchback), with a maximum slope of 8.33% in the built condition. This restriction would apply to any shared use path unless a variance from 521 CMR from the Massachusetts Architectural Access Board has been granted.

5. Intersections

Intersections along SUP routes are a critical issue, particularly roadway intersections. It is imperative that the design of a crossing provide a clear indication to users of the path where and how they should cross the intersection as well as who has the right-of-way. Generally, the following basic design principles should be followed:

- Unusual conflicts should be avoided
- Intersection design should create a path for bicyclists that is direct, logical and as close to the path of the motor vehicle traffic as possible
- Bicyclists following the intended trajectory should be visible and their movements should be predictable
- Potential safety problems associated with the difference between auto and bicycle speeds should be minimized

Trail Maintenance

Short-term and Long-term Maintenance Costs

Maintenance should include keeping the trail safe and in usable condition. It includes tasks ranging from mowing, tree trimming and clearing, trail sweeping, graffiti removal, seasonal planting, drainage structure cleanout, trash removal to replacing damaged materials and reconstructing the trail. The level of maintenance required may vary by section along the corridor depending upon the number of trail users.

According to ***Rail Trail Maintenance and Operations*** published by the Rails-to-Trails Conservancy Northeast Regional Office, the average annual reported cost per mile for maintenance is just under $1,500.00. This figure does not include long-term maintenance costs such as repaving the trail or replacing a structure.

Vegetation management is both a short-term and long-term cost with a grass strip along both sides of a trail and trees growing along the trail. This includes litter clean-up, mowing, leaf removal, pruning, invasive species removal, tree removal (fallen, health/safety/aesthetics), tree and shrub planting, flower planting and chemical herbicides. Drainage maintenance is also a short-term and long-term cost ensuring that the trail remains crowned or sloped to drain and ditches, culverts and drainage structures are cleaned. If the drainage is not maintained, it creates an erosion problem which leads to more costly maintenance.

Signs, fences, gates, bollards and pavement markings must be maintained. Surveys of existing trails show that two-thirds of trails report vandalism to their signs including graffiti, damage and theft.

Trail resurfacing is a major component of long term costs. The average surface life of asphalt trails is seventeen (17) years. Resurfacing costs can be estimated at approximately $80,000.00/mile. Resurfacing the second time will also require cold planing which would increase the cost to approximately $130,000.00/mile. Although transportation enhancement funds can be used for maintenance, there are limited dollars and competition for these dollars can be fierce. The Town should establish a long-term maintenance fund and add funds to it each year for the occasion when it is needed.

Police patrols should be considered in both the short-term and long-term. Regular police patrols should be conducted along the length of the trail. This sends a message that the community has developed a high quality, safe resource and encourages trail users to follow the trail rules. Insurance is both a short-term and long-term cost with an average coverage amount of $3,000,000 and an average annual cost of $2,100.00.

Volunteers can be very helpful with trail maintenance. In fact, studies published by the Rails to Trails Conservancy have shown that volunteers are often at the heart of every trail maintenance effort. Enlisting the help of volunteers will stretch the Town's maintenance dollars. Often times, Trail Committees enlist the help of boy and girl scouts, school and church groups and even adult organizations.

In 2004, Rails to Trails Conservancy surveyed managers of more than 100 open rail trails in the northeast region of the United States regarding trail maintenance and operations issues. Twenty-five trail managers responded with detailed information regarding the maintenance tasks they are performing and the frequency these tasks are being completed. Most responses in this survey indicated that maintenance tasks are being completed "as needed" due to a lack of funds and manpower. The numbers in the columns of the tables represent the number of survey respondents that perform the activity at that frequency. For example, the activity 'Surface cleaning of asphalt trail' is done weekly by one survey respondent, monthly by two survey respondents, etc.

Table 16: Frequency of Common Maintenance Tasks

Maintenance Activity	How often is it done?						
	Day	Week	Month	Quarter	Year	As Needed	Other
Repaving of asphalt trail						5	
Coating or sealing of asphalt trail						5	5 years
Pothole repair on asphalt trail						5	
Snow removal from asphalt trail						6	
Surface cleaning of asphalt trail		1	2	1		4	
Pavement markings maintenance and replacement					2	3	
Resurface non-asphalt trail						12	
Grade non-asphalt trail					2	8	
Pothole repair and other patches on non-asphalt trail				1		13	
Snow removal from non-asphalt trail						2	
Surface cleaning of non-asphalt trail				1		5	
Keep trail-side land clear of trash and debris	1	4	5		3	9	
Mowing		7	5	1	2	6	
Leaf removal			2		3	8	
Tree pruning		1	1		3	17	
Tree removal			1		1	17	
Invasive species removal			1			12	
Planting new vegetation					1	7	
Application of herbicides or pesticides					5	6	
Clearing of drainage channels and culverts					4	18	
Surface maintenance of parking areas		2		1	3	12	
General maintenance of trailheads (litter clean-up, etc.)	1	6	1		1	9	

Frequency of Common Maintenance Tasks (Continued)

Maintenance Activity	How often is it done?					
	Day	Week	Month	Quarter	Year	As Needed	Other
Landscaping/gardening at trailheads		4	2	1	2	4	
Empty trash cans at trailheads		2	3	1			2
Maintenance of stationary toilets at trailheads (clean, empty, etc.)	4	2				1	
Maintenance of portable toilets at trailheads (clean, empty, etc.)		6				2	
Empty trash cans along trail		4				1	
Maintenance of stationary toilets along trail (clean, empty, etc.)	1	2					
Maintenance of portable toilets along trail (clean, empty, etc.)		2					
Maintenance of informational kiosks (repairs, etc.)		1	3		1	8	
Maintenance of picnic tables, benches, etc.				1		10	
Updating information in informational kiosks		2	1	2	1	8	
Installation of signs					1	19	
Repair/maintenance of signs					3	17	
Installation of pavement markings						4	1
Maintenance of pavement markings						3	
Patrols by police agency	7	1				5	random
Patrols by non-police agency (e.g. trail watch)	5	3				1	ongoing
Recovery from illegal acts such as dumping and vandalism	3		1		1	11	
Installation of lighting						1	
Maintenance of lighting						2	
Installation of emergency call boxes							–
Maintenance of emergency call boxes							–
Installation of gates, bollards and fencing						11	
Maintenance of gates, bollards and fencing			1			16	
Bridge, tunnel, underpass and crossing inspection	1	1		1	3	6	2-3 years
Bridge redecking						14	
Paint/stain/treat bridge deck or structure					1	6	
General bridge maintenance					2	14	
Tunnel lighting maintenance							–
Tunnel open/closed status							–
Paint tunnel/underpass walls and ceiling						2	
General tunnel/underpass maintenance						4	
Railroad grade crossing maintenance					1	4	
Road grade crossing maintenance		1			1	11	