FEASIBILITY STUDY

DOVER RECREATIONAL PATH

DOVER, MA /// FEBRUARY 2016

FINAL REPORT

BEALS + THOMAS

Report prepared by Beals and Thomas, Inc. for the Town of Dover, 2016
Cover Image: Holliston Rail Trail, Holliston, MA

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EXECUTIVE SUMMARY

The Dover Recreational Path (hereafter the "Path") will follow the route of the MBTA rail road corridor stretching through the center of Dover from the northern Medfield town line to Centre Street Overpass (see Figure 1). With its connection to the center of Town, the Path has excellent potential to become a focal point for the Town. The Path will connect residents to the schools, the Town library, the Town Hall, the community center, and businesses in the center of Town. While a significant amount of planning for the Path already exists, prior planning had not considered the technical aspects of implementing the design, permitting and construction. The purpose of this feasibility study was to build on the work that has already been done. This work was accomplished by:

Dover Recreational Path Quick Facts

> 3.5 miles distance, ~18,700 linear feet
> 5.15 Acres (12-feet wide average disturbance)
> 4 At-Grade Street Crossings

> Evaluating the conclusions and testing the assumptions of previous planning efforts,
> Adding new analysis, particularly the technical aspects of implementing the project (such as Path design, permitting, costs, at-grade crossings, drainage, safety, accessibility considerations, and visual buffering), and
> Providing an independent, professional perspective that Dover residents, Town staff, and elected officials can use to move the project forward.

The feasibility study consists of seven tasks: parking and access analysis, at-grade crossings, wetlands, drainage conditions, site analysis, DEP guidance, and cost estimates. The key findings from each section are summarized in the pages that follow. For a more detailed analysis and discussion, consult the individual sections for each task. Site Analysis and Concept plans of the Path and details of the at-grade crossings are included as appendices.

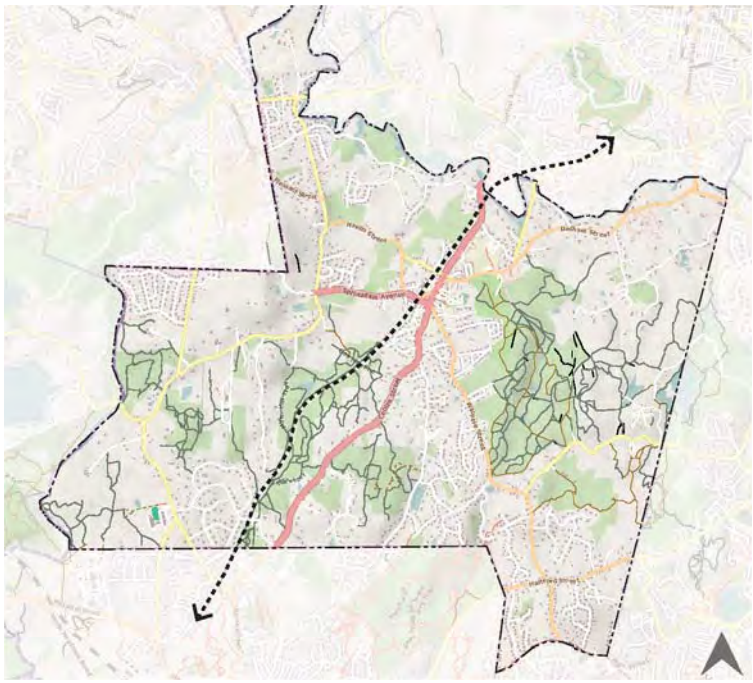

Figure 1. Dover Recreational Path Context Map

EXECUTIVE SUMMARY

Section A: Introduction & Data Gathering

Beals and Thomas gathered data to identify the potential opportunities and constraints of developing the Path. We researched and reviewed existing plans from MassGIS, Town maps, railroad valuation maps, and prior studies; evaluated existing ownership, wetlands and permitting issues, potential abutter concerns and compliance with the Americans with Disabilities Act requirements at trail access points; reviewed Town regulations to identify potential considerations that may affect the design of the project; and prepared a base map of the study area for planning purposes.

Section B: Parking & Access

Beals and Thomas reviewed the prior parking study. We agreed with the assessment that parking at the stated locations is adequate for the needs of the anticipated users of the Path. We recommend providing accessible parking at areas nearest to the Path and to include access paths from a number of these locations. We recommend an incremental approach to parking. Since the path will initially be promoted as a local path, parking needs will likely be minimal. If in the future parking does become an issue, other approaches, as noted, should be considered.

Section C: At-Grade Crossings

Beals and Thomas reviewed the at-grade street crossings of the Path. The Path crosses four roads at-grade. From south to north these are Hunt Drive, Springdale Avenue, Dedham Street, and Haven Street. We recommend that the Path crossings at Hunt Drive and Haven Street should include advanced warning signage and typical road signs. Due to the higher traffic volumes on these streets and the uses and activities adjacent to the Path, we recommend that the Path crossings at Springdale Avenue and Dedham Street should include additional Rectangular Rapid Flashing Beacons (RRFB) to alert drivers to Path users at the crosswalks.

Section D: Wetlands

In addition to a site analysis by a professional wetland scientist, Beals and Thomas researched available information from MassGIS, FEMA flood maps, the Natural Heritage and Endangered Species Program, and local by-laws to determine potential resource areas and to consider design and permitting implications. Wetland and stream locations were generally consistent with MassGIS, although in certain areas wetlands were more extensive and closer to the rail bed. An approximately 1,300-foot-long section of the rail bed north of Hunt Drive is flanked by railroad drainage ditches that now function as streams. With Conservation Commission concurrence, it may be appropriate to permit the majority, if not the entirety, of the Path through a Determination of Applicability process.

Section E: Drainage Conditions

Beals and Thomas evaluated existing drainage conditions along the corridor, including existing culverts, and identified areas with existing or potential drainage concerns. Culvert conditions

SECTION A

EXECUTIVE SUMMARY

were evaluated in the field. Overall, the culverts were found to be in good condition; we recommend cleaning out those culverts requiring maintenance to prevent future flooding of the Path. Railroad drainage ditches have become intermittent streams over time and are now considered state and local jurisdictional resources. This will require narrowing the Path width, limiting vegetative removal to pruning and limbing the existing rail bed width, and incorporating a clear and appropriate construction sequence.

Section F: Site Analysis

Beals and Thomas reviewed conditions along the corridor and evaluated adjacent uses to identify areas of potential concerns related to abutter impacts and mitigation, uses, access issues, steep slopes, and existing buffers. During site visits, areas where the Path is directly visible from adjacent residential properties were identified. To address privacy and security concerns of abutters, we recommend these areas be planted to visually screen Path users from these residences. We recommend a minimum of 10 feet for paths with two-way travel. In certain instances, a reduced width of as much as 6 feet (for short distances) may be required. Where possible, a minimum 2-foot wide graded shoulder should be maintained adjacent to both sides of the Path. Where a slope of 2H:1V or greater exists within 5 feet of the edge of the Path and the height of the vertical drop is greater than 10 feet, we recommend installing a physical barrier or plantings near the top of the slope.

Section G: Lease Considerations

Beals and Thomas reviewed the requirements of the Massachusetts Bay Transportation Authority's (MBTA) lease agreement to identify key issues affecting the acquisition, design, and maintenance of the corridor. The MBTA does not have written plan requirements, but plan reviews are expected to take 2 months. Although it is unlikely that the MBTA would require the Town to restore the corridor to the existing grade, we have estimated this cost. There are no specific submission requirements for as-built plans, but the MBTA generally expects a standard as-built plan along with the request for Notice of Project Completion.

Section H: Environmental Considerations

Beals and Thomas researched available online databases from the MassDEP to determine potential sources of contamination within the study area and abutting properties. The purpose was to determine if there are obvious or known sources of contamination within the study area. Based on the findings of our research, documented sources of contamination along the corridor, generally located in the downtown area, have been addressed. A review of the Valuation Maps showed there are no former battery vaults located along the proposed Path. The Valuation Maps depict two switches near Springdale Avenue, the former station, and an additional building. We recommended soil sampling protocols which include collecting regularly-spaced composite samples along the length of the rail trail corridor, as well as additional samples collected adjacent to former buildings and switches. Recommended sampling parameters include arsenic, lead, and

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polycyclic aromatic hydrocarbons. This option entails a higher cost and provides the Town with a higher level of confidence.

Section I: Cost Estimate

Through the concept planning stages, Beals and Thomas researched and estimated relative "order-of-magnitude" costs for three alternatives: low-cost, a recommended option, and high-cost. The assumptions of each alternative are documented to justify estimated costs. Permitting costs and costs common to each of the alternatives are also discussed. The estimate ranges from $941,000 for the low-cost option to $1,373,400 for the high-cost option. The recommended alternative cost estimate is $1,074,600. The cost estimate also considered unlikely scenario and paved surface cost alternatives.

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SECTION A

INTRODUCTION & DATA GATHERING

Key Findings

> While a significant body of planning for the Path already exists, prior planning had not considered the technical aspects of implementing the project such as path design, at-grade crossings, drainage, safety, accessibility considerations, and visual buffering.

> The purpose of this feasibility study was to evaluate the conclusions and test the assumptions of previous planning efforts, add new analysis, and provide an independent, professional perspective.

Introduction

Drawing on years of experience designing, planning, permitting, and implementing rail trail projects, Beals and Thomas, Inc. knows these amenities offer significant benefits to a community. The Path, with its connection to the center of Town, has excellent potential to become a focal point for the Town. The Path will connect residents to the schools, the Town library, the Town Hall, the community center, and businesses in the center of Town. It also provides the opportunity to inform the public of Dover's history. The history of the railroad could be interpreted with images of the Dover Center Depot or tales of the Boston Girl Scouts riding the rail line to the camps in the area to take in the "fresh air." Other unique natural features or historical information could also be showcased along the corridor.

A multi-use path is much different from a hiking trail. People who wouldn't normally consider hiking in the woods will walk or ride on a multi-use path. Holliston—a nearby Town that recently implemented a rail trail project—has seen parents and empty nesters purchase bicycles and take up a healthy activity that they would not have considered otherwise due to the danger of riding on busy streets; now they take advantage of safer recreational opportunities provided by the Rail Trail. The flat, even surface, with no obstructions, is ideal for all ages and abilities. Establishing the Path has the potential to serve as a spine to connect Dover's significant existing trail network, allowing Path users to explore natural areas and hiking trails off of the main Path.

Key components to planning and implementing a rail trail project are building consensus that the project is beneficial for the Town and gaining community support for the project. Examples of this community-building process can be found locally with the Upper Charles Rail Trail in Holliston, Hopkinton, and Milford. These communities have created partnerships with numerous groups that have fostered activities and support. This process has already begun in Dover with the formation of the Dover Rail Trail Committee and the subsequent meetings and data gathering by that group which led to their 2014 report: *Recreational Path Feasibility Study.*

The purpose of this feasibility study was to build on the work that has already been done by:

> Evaluating the conclusions and testing the assumptions of previous planning efforts,

> Adding new analysis—particularly the technical aspects of implementing the project such

as path design, cost, at-grade crossings, drainage, safety, accessibility considerations, and visual buffering, and

> Providing an independent, professional perspective that Dover residents, Town staff, and elected officials can use to move the project forward.

Data Gathering

The purpose of the data gathering phase was to identify the opportunities and constraints associated with constructing the Path. Data gathering included reviewing existing plans and relevant printed and electronic documentation, recording the existing conditions during numerous site visits, and researching relevant documentation related to right-of-way, legal issues, and permitting. Data gathering took place between May and July 2015. Spatial data was compiled into the base map (see Appendix I).

The documentation consulted includes, but is not limited to:

> Massachusetts Office of Geographic Information (MassGIS) – used tax parcel boundary data, DEP wetland data, and LiDAR elevation data,

> Railroad Valuation Maps provided by the Town of Dover, with updated information to 1970, and review of the earlier, clearer original versions obtained online from the University of Connecticut Archives,

> *Recreational Path Feasibility Study*, prepared by the Dover Rail Trail Committee, Final Report, dated Spring 2014,

> MBTA Draft Lease, with a received date of April 8, 2013 from the Town of Dover,

> Wetlands Permitting and Construction Opinion memorandum from Paul McManus, EcoTec, Inc., dated July 24, 2012,

> Massachusetts Department of Environmental Protection's *Best Management Practices for Controlling the Exposure to Soil During the Development of Rail Trails*, and

> Dover Wetlands Protection Bylaw, Chapter 181, dated 2005.

SECTION B

PARKING AND ACCESS ANALYSIS

Key Findings

> We generally agree with the assessment that parking areas at the various locations are viable for the intended localized use of the Path.

> We recommend providing accessible parking at various locations and to include access paths from a number of locations to direct the users to the Path.

> We recommend an incremental approach to parking. Since the path will be promoted as a local path, parking needs will likely be minimal. If in the future parking does become an issue, other approaches should be considered before constructing dedicated parking areas. This might include providing signage, public information, or websites to notify and direct users to park at other available parking areas.

DRTC Study

The parking analysis included within the Dover Rail Trail Committee's Study (the "DRTC study") recommended that no additional parking capacity is required to support the Path's usage. This was based on the anticipated low weekday demand and due to the finding that many local users are expected to arrive at trailheads by bicycling or walking.

The DRTC Study states that 155 parking spaces are available at various locations, with additional parking at Dedham Street, Caryl Park, and Chickering Fields. Observations of other rail trails indicate that the availability of sufficient parking can become a significant issue when the Path is considered a regional attraction. Another key consideration is the features that are available along the corridor, including scenic areas, restaurants, museums, parks, or other mutually-beneficial activities. Based on the understanding that the Path is not intended to connect with the Path in Needham, the relatively short length of the Path is not anticipated to constitute a regional attraction. The parking would therefore mainly be used by residents of Dover who live in the immediate area of the Path or by those who join walking groups or attend promoted events.

We contacted representatives from the various parking locations identified in Appendix III of the DRTC Study to confirm the number and availability of spaces for Path users.

> Mr. Jack Savage, Commander of the Dover Legion, stated on June 1, 2015, that the potential exists for providing a maximum of 15 parking spaces with use-conditions and that the final decision or conditions of use would require committee vote. Mr. Savage discussed potential timing considerations, such as when the Legion is open and when parking is likely to be made available to Path users.

> Ms. Cheryl Abdullah, Director of the Dover Town Library, on June 5, 2015, stated that the parking lot at the Library is considered a municipal lot and is available for public parking. However, the Library currently holds very popular events that already exceed the available parking. Path users and Library attendees vying for parking could be

problematic during popular Library events. She mentioned that there are mutual benefits between the Library and the Path because the Library is currently the "Heart of the Community" bringing people to the downtown area. She spoke of an outdoor area that could attract Path users to picnic or to attend events. One recommendation is to provide signage to direct Path users to other parking areas at peak times.

Potential parking areas are identified in the plans included in Appendix I.

Accessible Parking

To comply with Federal and State accessibility laws, we recommend providing a minimum of six accessible parking spaces at available locations along the Path. Potential locations include the Dover Public Works Garage, the Dover Library, and on-street parking areas downtown. Costs were estimated for signage, pavement striping, and accessible paths at the recommended locations.

Appendix III includes the Dover Rail Trail Committee's summary of the number of parking spaces available at various identified location close to the path.

SECTION C

AT-GRADE CROSSINGS

Key Findings

> The Path crosses five roads. From south to north these are Hunt Drive, Springdale Avenue, Dedham Street, Haven Street, and Centre Street.

> We recommend that the Path crossings at Hunt Drive and Haven Street should include advanced warning signage and typical road markings with signage.

> Due to the higher traffic volumes and adjacent uses and activities, we recommend that the Path crossings at Springdale Avenue and Dedham Street (see Figure 2) should include additional Rectangular Rapid Flashing Beacons (RRFB), to alert drivers to Path users at the crosswalks.

Figure 2. Springdale Avenue and Dedham At-Grade Crossings

Overview

The Path crosses five roads. From south to north these are Hunt Drive, Springdale Avenue, Dedham Street, Haven Street, and Centre Street. The Centre Street overpass will not be considered within the scope of this report. Stopping sight distances for vehicles approaching the crosswalk were measured in the field using MassDOT standards. Corrections for slope were provided at relevant intersections with sloping conditions. Table 1 summarizes stopping sight distance findings.

To ensure the safety of both Path and road users, the sections of the Path that cross Hunt Drive, Springdale Avenue, Dedham Street, and Haven Street will require various control improvements. Where applicable, existing vegetation should be removed to maximize sight distance and pedestrian visibility.

Hunt Drive & Haven Street

Hunt Drive (FFC 7[1]) and Haven Street (FFC 5) are both low-volume local roads with two travel lanes and a posted speed of 30 MPH. Both approaches (See Figures 3 and 4) have good sight distance in both directions (see Table 1). As a result, we propose simple at-grade crossings that conform to AASHTO standards (AASHTO 2012). Trail users will be required to stop at the crossing and proceed only when it is clear to do so. Improvements will include AASHTO-approved advanced warning signage and road markings with signage and markings at the crosswalk. See Appendix II, Figures 3 and 4.

1 Federal Functional Class

Sight Distance Measurements

Stopping sight distance for vehicles approaching the crosswalk were measured using MassDOT standards. Corrections for slope were provided at relevant intersections with sloping conditions.

Table 1. At-Grade Crossing Stopping Sight Distances

Intersection Crossing	Posted Speed Limit	AASHTO Required Minimum Sight Distance	Measured Sight Distance	Considerations
HUNT DRIVE				
Driving easterly (with negligible downgrade)	30	200	410	
Driving westerly (with negligible upgrade)	30	200	471	
SPRINGDALE AVENUE				
Driving easterly (with 3% downgrade)	25	158	240	RRFB Recommended
Driving westerly (with 6% downgrade)	25	165	270	RRFB Recommended
DEDHAM STREET				
Driving easterly (with 3% downgrade)	25	158	230	RRFB Recommended
Driving westerly (with negligible upgrade)	25	155	390	RRFB Recommended
HAVEN STREET				
Driving easterly (with negligible upgrade)	30	200	360	
Driving westerly (with negligible upgrade)	30	200	340	

Figure 3. Hunt Drive Sight Distance Looking Westerly

Figure 4. Haven Street Sight Distance Looking Westerly

SECTION C

Springdale Avenue & Dedham Street

Due to their proximity, Springdale Avenue and Dedham Street will be considered together. Springdale Avenue is considered a minor arterial road (FFC 4) and will need more advanced roadway signaling and control to ensure the safety of both Path and road users.

Springdale Avenue Dedham Street both have maximum posted speeds of 25 MPH. Although Springdale Avenue and Dedham Street will meet the minimum required stopping sight distances in both directions, Springdale Avenue (see Figure 6) has shorter sight distances in both directions and Dedham Street (see Figure 5) has shorter sight distances in the easterly driving direction (see Table 1). As a result, we recommend installing Rectangular Rapid Flashing Beacons (RRFB) with push button activation at the both the Springdale Avenue and Dedham Street crossings. When Path users activate the RRFBs, motorists will be required to stop and yield to the crossing Path users. Additionally, improvements will also include AASHTO-approved advanced warning signage and road markings with signage and markings at the crosswalk. See Appendix II, Figures 1 and 2.

Figure 5. Dedham Street Sight Distance Looking Westerly

Figure 6. Springdale Avenue Sight Distance Looking Westerly

SECTION D

WETLANDS

Key Findings

> Wetland and stream locations were generally consistent with MassGIS, although in certain areas wetlands were more extensive and closer to the former rail bed.

> An approximately 1,300-foot section of the rail bed north of Hunt Drive is flanked by railroad drainage ditches that now function as streams (see Figures 7 and 8).

> With Conservation Commission concurrence, it may be appropriate to permit the majority—if not all—of the Path through a Determination of Applicability process. However, if a Notice of Intent is required, it is recommended that it address the portions of the Path within the Riverfront Areas (RFA) and Bordering Lands Subject to Flooding (BLSF).

Figures 7 and 8. Drainage ditches now functioning as streams

Wetland Resource Area Site Visit

A site visit to reconnoiter sections of the Path route that have MassGIS-depicted wetlands or streams was undertaken on July 10, 2015. The former rail line contains a generally intact track system, with wood railroad ties, steel rails, and stone ballast. A large portion of the former rail line is essentially unvegetated, although vegetation is growing through the stone ballast along certain portions of the Path route, particularly where wetlands/streams are present immediately adjacent to the rail bed.

Wetland and stream locations were generally consistent with MassGIS, although in certain areas wetlands were more extensive and closer to the former rail bed than depicted by MassGIS; however, the majority of these are not anticipated to require narrowing the proposed Path width. Approximately 1,300 feet of the rail bed north of Hunt Drive is flanked by railroad drainage ditches that now function as streams (not depicted on MassGIS), with flow entering from a high-gradient natural stream perpendicular to the rail bed and then exiting east from the rail bed to another steep area as a natural stream flowing away from the rail bed.

With the exception of Riverfront Area (RFA) and Bordering Land Subject to Flooding (BLSF), no resource areas were observed within the former rail line, although resource areas are present

SECTION D

within 100 feet of and immediately adjacent to the former rail line in specific areas. RFA extends 200 feet from the Charles River as well as other mapped perennial streams that cross the route via existing culverts. Other resource areas observed proximate to the Path route include Bordering Vegetated Wetland (BVW), Bank, and Land Under Water Bodies and Waterways (LUWW). A 100-foot buffer zone extends from BVW and Bank.

In addition to these state-jurisdictional resource areas, the Town of Dover Wetlands Protection Bylaw also protects Isolated Vegetated Wetlands (IVW), Banks up-gradient of vegetated wetlands, Vernal Pools, and 100-foot buffer zone to Bordering Land Subject to Flooding. Although no certified Vernal Pools are mapped proximate to the rail bed, they may be present in wetlands within 100 feet of the former rail bed, particularly in flooded areas such as the ponded area in lawn east of the section of rail bed north of Haven Street and inundated wetlands north of Hunt Drive, for example.

The Dover Zoning Bylaw also maintains a 150-foot impervious surface setback from the Charles River and certain other streams (Article V Section 185-29). However, as the Path is proposed to be a stone dust surface, this setback is not applicable.

BVW observed generally consisted of a typical red maple (*Acer rubrum*) swamp community, including, among others, skunk cabbage (*Symplocarpus foetidus*), poison ivy (*Toxicondendron radicans*), sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), high bush blueberry (*Vaccinium corymbosum*), and buttonbush (*Cephalanthus occidentalis*), for example.

Canopy openings were observed within portions of the wetlands in the vicinity of the rail bed; these contained sedges and ferns which are sufficiently distant that the communities would not be impacted by proposed work. Areas of sphagnum moss were also observed but would similarly not be disturbed by proposed work.

Portions of the route, particularly in the vicinity of the adjacent stream channels (railroad drainage ditches), contained speckled alder (*Alnus incana*); and the stream bed (LUWW) was observed to contain areas of mucky and leaf-covered substrate, as well as areas of sandy and gravelly substrate with riffles.

The width of the existing rail bed was generally observed to be approximately 12-to-14-feet wide where BVW was present on either side. This width narrows to approximately 8-to-10-feet wide where the rail bed is flanked by the intermittent streams (railroad drainage ditches).

The rail bed itself contains a variety of vegetation, including, among others, poison ivy, raspberry (*Rubus spp.*), sweet fern (*Comptonia peregrina*), meadowsweet (*Spiraea alba*), and goldenrod (*Solidago spp.*).

Dry swales adjacent to the rail bed were observed to contain upland vegetation such as sassafras (*Sassafras albidum*) and exhibited non-hydric soils with no evidence of flow; whether these constitute intermittent streams will be evaluated in more detail when the resource area delineation is undertaken.

Invasive species observed within and adjacent to the portions of the former rail line reconnoitered include bittersweet (*Celastrus orbiculata*), common reed (*Phragmites australis*), and glossy buckthorn (*Rhamnus frangula*). An EcoTec, Inc. letter dated July 24, 2012 (the EcoTec Letter) that summarizes a reconnaissance of the entire route additionally notes tartarian honeysuckle (*Lonicera tatarica*), winged euonymus (*Euonymus alatus*), and Japanese barberry (*Berberis thunbergii*).

Regulatory Considerations (Conservation Commission)

With Conservation Commission concurrence, it may be appropriate to permit the majority if not the entirety of the Path through a Determination of Applicability process. However, if a Notice of Intent is required it is recommended that it address the portions of the Path within RFA and BLSF, and possibly the sections that lie immediately adjacent to streams and other areas where buffer zone setback exceptions from the Rules and Regulations for the Dover Wetlands Protection Bylaw are required (see further discussion below). Additionally, an evaluation of whether a wildlife habitat evaluation for work in RFA and BLSF is required should be undertaken subsequent to delineation of these resource areas and evaluation of the total area of impact.

Specifically, given the location and disturbed nature of the proposed route, it is anticipated to be feasible to construct the Path without direct impacts to BVW, Bank or LUWW resource areas that are present adjacent to the route. Additionally, at certain "pinch" points where the former rail bed is flanked by streams (railroad drainage ditches), it is anticipated to be feasible to construct the Path such that work within the buffer zone will not indirectly adversely affect adjacent resource areas. Achieving this will require:

> Narrowing the Path width,

> Limiting vegetative removal and pruning/limbing to the existing rail bed width, such that potential changes in shading regime are avoided, and

> Incorporation of a clear and appropriate construction sequence.

Furthermore, in areas where the proposed Path lies within RFA, the streams are already crossed by existing culverts, the proposed work may qualify as redevelopment of previously developed RFA if measures to improve existing conditions are included, and even if not undertaken as redevelopment, the proposed work is not anticipated to significantly alter the character of the RFA.

SECTION D

Similarly, work within BLSF will not significantly change the existing elevations within that resource area, and with incorporation of the previously-listed measures for constrained areas the work will meet the applicable state and local performance standards for BLSF.

Additionally, even if Vernal Pools are present within 100 feet of the proposed route, the conversion of the former rail bed to a stone dust path will not impair their capacity to function, including allowing migration of animals to and from the pools. The Rules and Regulations for the Dover Wetlands Protection Bylaw presume that work within undeveloped and unimproved areas within 100 feet of a Vernal Pool will impair the pool's capacity to function. Given the existing disturbed and previously developed nature of the rail bed and the anticipated insignificant change in character from the existing rail bed to the proposed path, it is anticipated that compliance with the Vernal Pool presumption and performance standards will be achieved.

Finally, although some of the work within the 100-foot buffer zone will occur in close proximity to resource areas, the work is not anticipated to adversely affect soil stabilization, wildlife habitat cover, shading, or other contributions of the buffer zone to these resource areas. The Rules and Regulations for the Dover Wetlands Protection Bylaw require that no more than 50 percent tree cover be removed for any one-hundred-foot long section of buffer zone, which is anticipated to be met. The Regulations also maintain disturbance and structure setbacks, the distance of which depends upon slope (30 feet for steep slopes and 25 feet for shallow slopes). Exceptions to the disturbance setback will be necessary. Note that the Regulations specify that exceptions to the structure setback may be granted, but the Regulations are silent with regard to disturbance setback exceptions.

It will be necessary to demonstrate compliance with state and local performance standards in the filing(s) with the Conservation Commission, and as previously noted, coordination with the Conservation Commission to confirm the preferred permitting approach is recommended.

SECTION E

DRAINAGE CONDITIONS

Key Findings

> Culvert conditions were evaluated in the field. Overall, culverts were found to be in good condition; we recommend cleaning out those culverts requiring maintenance to prevent future flooding of the Path.

> Railroad drainage ditches have become intermittent streams overtime and are now considered state and local jurisdictional resources. This will require narrowing the Path width, limiting vegetative removal and pruning/limbing to the existing rail bed width, and incorporating a clear and appropriate construction sequence.

Culvert Condition Inspections

During site visits culvert conditions were noted (see Figures 9 and 10) along with any identified drainage concerns. Culvert conditions are noted below in Table 2:

Table 2. Culvert Conditions

Val Map Feature Number	Structure	Condition	Notes	Action Needed	Handrail Needed
770+13	3.5'x4' Stone box	Good	Clear	None	Yes
978	1'x1' Stone box		Not found		
974	6'x5' Stone box	Good	Clear	Retreat Timber, install decking	Yes
968	2'x2' Stone box	Poor	Filled with sediment, 11" clear	Clear sediment	Yes
963	10'x5.5' rail top crossing	Fair	Some surface rot at base of posts, but structurally sound	Retreat Timber, install decking	Yes
956	18" Cast Iron pipe	Poor	Filled with sediment, 11" clear; stones on west side have collapsed	Clear sediment; reset stones	Yes
948	2'x2' Stone box	Poor	Filled with sediment, 10" clear	Clear sediment	Yes
921	3'x3' Stone box	Poor	Filled with sediment and debris, 5" clear	Clear sediment and debris	No
835	3'x3' Stone box	Good	Clear	None	No

SECTION E

Val Map Feature Number	Structure	Condition	Notes	Action Needed	Handrail Needed
785	2.5'x2.5' Stone box	Good	Clear	None	No
770	3.5'x3.5' Stone box	Good	Clear	None	No
745	2.5'x3' Stone box	Good	2'-3" clear	None	No

Figure 9. Culvert 956 - 18" pipe requires cleaning

Figure 10. Culvert 785 - 2.5'x2.5' stone box in good condition

Path Cross-Sections

There are three typical Path cross-sections that respond to the rail bed's existing condition: a "valley" condition where the terrain rises up from the edges of the rail bed (see Figure 11), a "ridge" condition where the terrain drops off from the rail bed (see Figure 13), and a "narrow"condition (see Figure 15). The "narrow" condition contain a section of the Path where intermittent streams along the rail bed constrain the width of the path and cannot be filled because they are considered jurisdictional resources. Each of these Path cross-section conditions is represented below, showing the dimensions of the travel lanes, shoulders, and other design elements (see Figures 12, 14, 16).

In the "narrow" condition where the former rail bed is flanked by intermittent streams (railroad drainage ditches), it is anticipated to be feasible to construct the Path so that work within the buffer zone will not indirectly adversely affect adjacent resource areas. To achieve this, the Path width will have to narrow to as little as 6 feet. Vegetation removal in this area will be limited to pruning and limbing of the existing rail bed width to avoid potential changes in shading. See Section D for in-depth discussion of wetland issues.

SECTION E

"Valley" Condition Cross-section

Figure 11. Existing "Valley" Condition Corridor Cross-Section

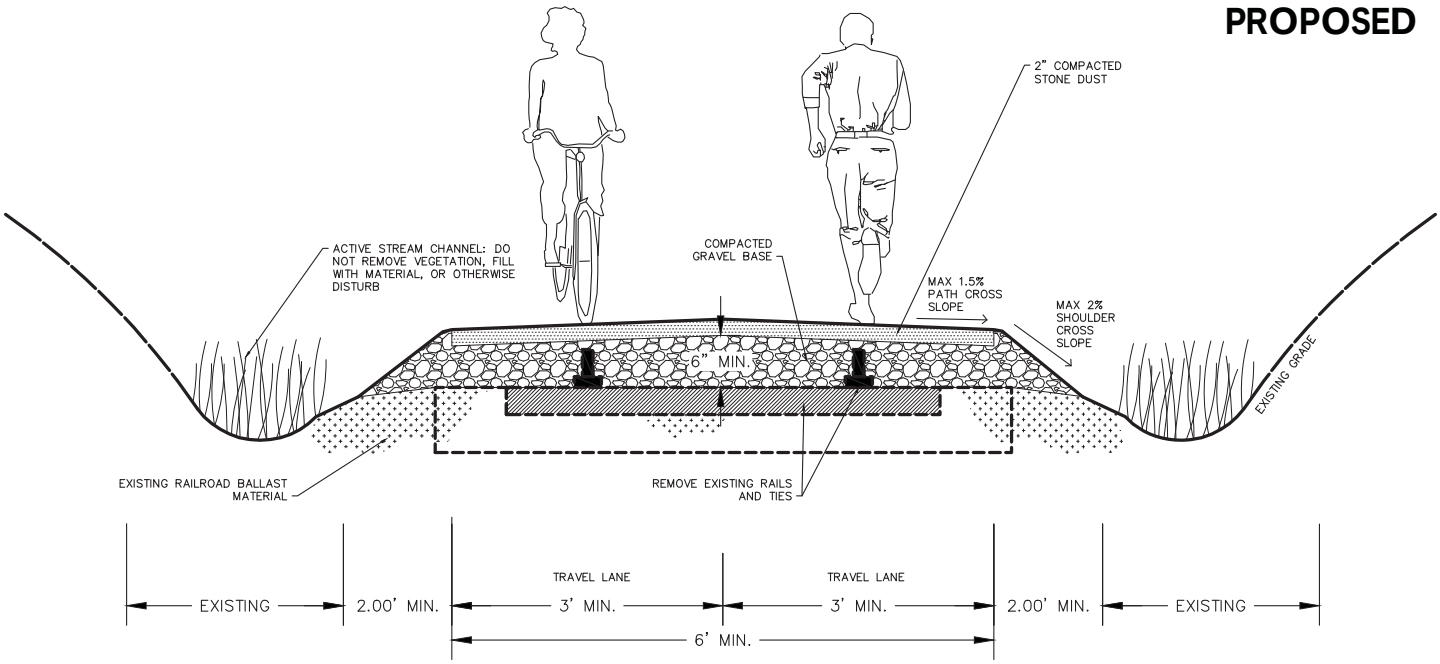


Figure 12. Proposed "Valley" Condition Path Cross-Section

SECTION E

"Ridge" Condition Cross-section

Figure 13. Existing "Ridge" Condition Corridor Cross-Section

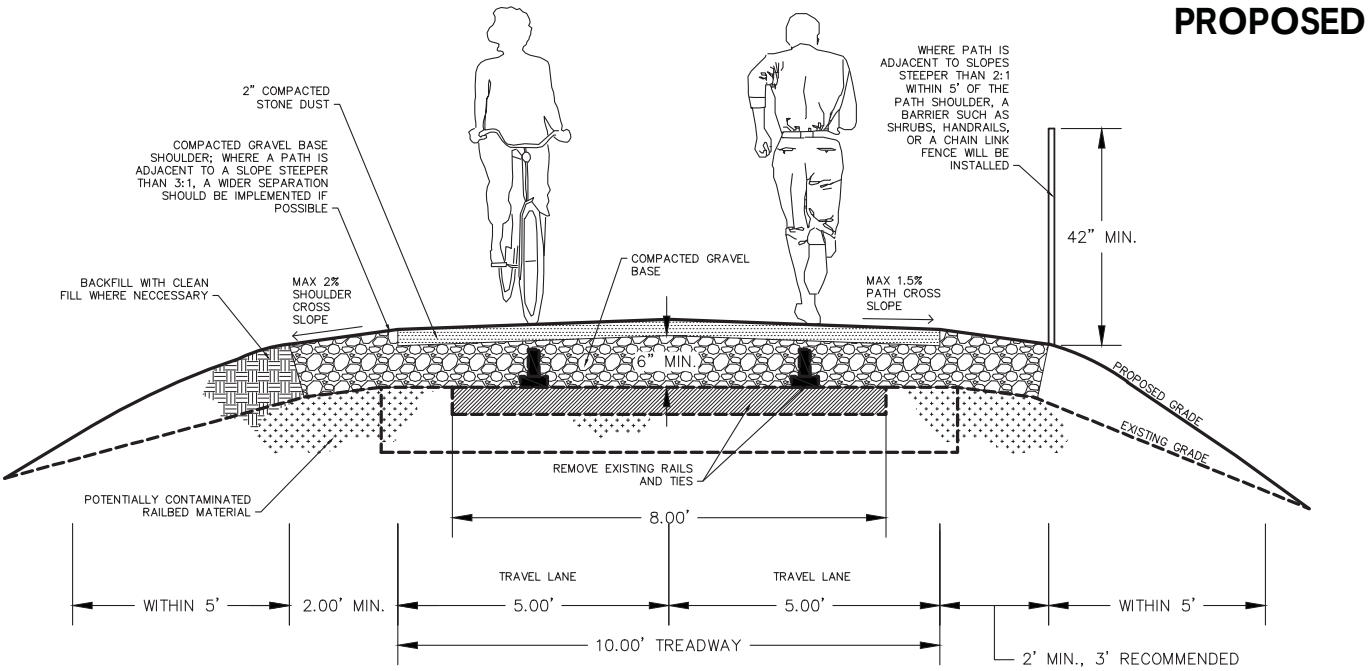


Figure 14. Proposed "Ridge" Condition Path Cross-Section

SECTION E

"Narrow" Condition Cross-section (Stream)

Figure 15. Existing "Narrow" (Stream) Condition Corridor Cross-Section

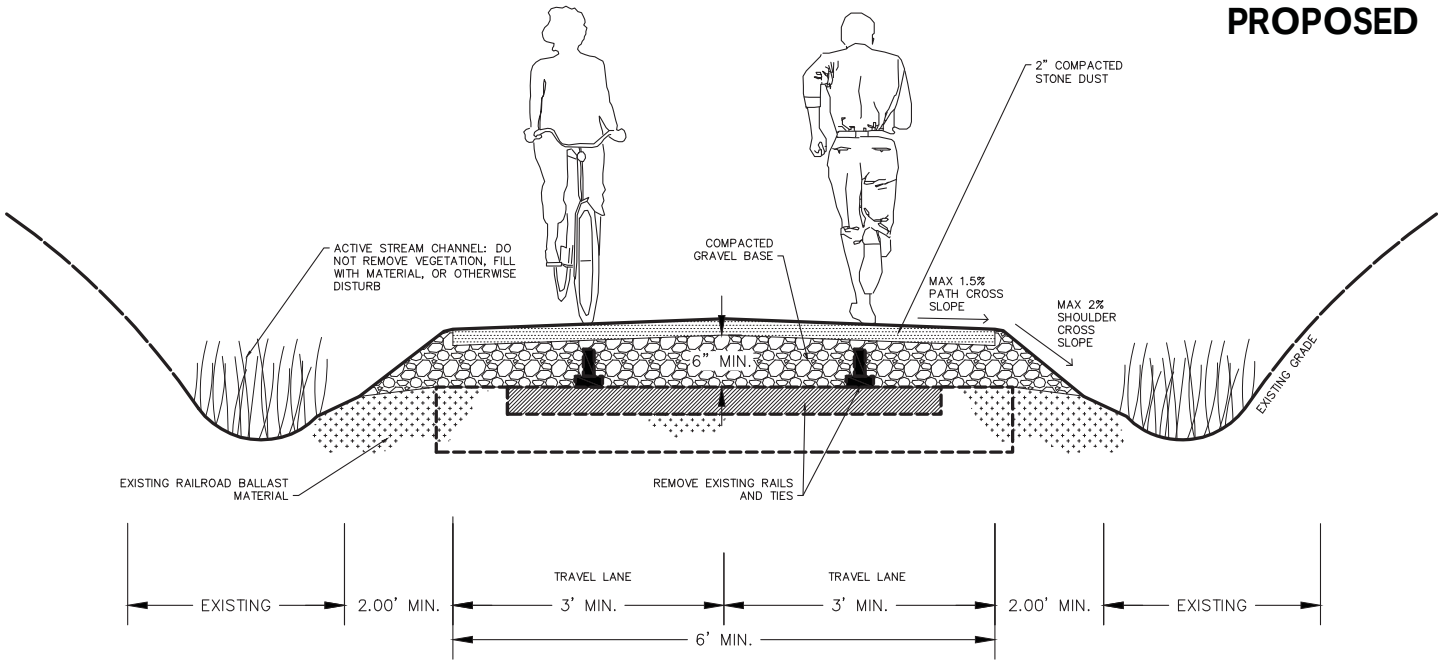


Figure 16. Proposed "Narrow" (Stream) Condition Path Cross-Section

SECTION F

SITE ANALYSIS

Key Findings

> **Visual buffering**: During site visits, areas were identified where the Path is directly visible from adjacent residential properties. To address privacy concerns of abutters, we recommend these areas be planted or have fencing installed to visually screen Path users from these residences.

> **Path Width and Shoulders**: We recommend a minimum of 10 feet for paths with two-way travel. In certain instances, a reduced width of as much as 6 feet (for short distances) may be acceptable. Where possible, a minimum 2-foot-wide graded shoulder should be maintained adjacent to both sides of the Path.

> **Physical Barriers**: Where a slope of 2H:1V or greater exists within 5 feet of the edge of the Path and the height of the vertical drop is greater than 10 feet, we recommend installing a physical barrier or vegetation at the top of the slope (see Figures 17 and 18).

Figures 17/18. Typical conditions where a physical barrier is recommended

Visual Buffering

According to a National Park Service study *The Impacts of Rail-Trails* most adjacent owners experience a minimal loss of privacy from the establishment of a rail trail. Like most rail trails, many portions of the existing rail corridor in Dover have established vegetation. During site visits, areas where the Path is directly visible from adjacent residential properties were identified (see Site Analysis and Concept Plans, Appendix I). Where existing vegetative screening is inadequate (see Figures 19 and 20), we recommend supplementing existing planting to protect privacy. Fencing is expensive and difficult to maintain; we did not identify any areas where we found fences would be necessary. Individual abutters may choose to add additional plantings or erect fences on their property at their own expense.

Some rail trail conversions face opposition from landowners living alongside or near the corridors, often citing privacy and security concerns. Lack of information and unanswered criticism of trail proposals usually fuel this opposition and lead to misconceptions related to property rights issues, concerns that property values will drop and liability will increase, and fears of increased crime, such as littering, trespassing, burglary, and vandalism. In most cases, trail opponents find that their fears about the trail never materialize.

Figures 19/20. Numerous private yards and homes are visible from the corridor

Path Width

Consistent with the Massachusetts Department of Transportation (MassDOT) recommendations, we recommend a minimum of 10 feet for paths with two-way travel. In certain instances, a reduced width of 6 feet (for short distances) may be acceptable where there are severe environmental, historical, and/or structural constraints. Due to wetland constraints discussed in Section D, path width will need to be reduced to as little as 6 feet unless the Dover Conservation Commission permits modification of the drainage swales.

Shoulders

Where possible, a minimum 2-foot-wide graded shoulder should be maintained adjacent to both sides of the Path. We recommend maintaining a 3-foot clearance from the edge of the Path to signs, trees, poles, walls, fences, guardrails, and other obstructions. Where this is not possible, a minimum 2-foot clearance should be maintained unless environmental or other constraints preclude this.

Physical Barriers

Where the Path is adjacent to slopes steeper than 3H:1V, a minimum 5-foot separation from the edge of the Path to the top of the slope is recommended. Where a slope of 2H:1V or greater exists within 5-foot of the edge of the Path and the height of the vertical drop is greater than 10 feet, we recommend installing a physical barrier at the top of the slope. This might include dense shrubbery, a guard/hand rail with a "desired" height of 42 inches, or a chain link fence. Rail bridge crossings will require decking and hand rails (see Figures 21 and 22).

Scenic Overlooks

There are two areas along the Path (see Figures 23 and 24) where, with some limbing and brush trimming, the opportunity for scenic overlooks were identified. Overlooks could enhance the experience of Path users by offering bench seating and interpretative signage. These overlooks are noted on the concept plan (see Appendix I).

SECTION F

Figures 21/22. Rail bridge crossings will require decking and hand rails

Figures 23/24. Areas along Path with opportunity for scenic overlooks

Figures 25/26. Dumping of snow and yard waste in a few areas along the Path

Figures 27. Some rails have been removed along one section of the Path

Figures 28. Graffiti in the Centre Street underpass

Figures 29. Charles River Crossing Area

Figures 30. Rail crossing timber support structure is in sound condition but should be retreated

SECTION G

LEASE CONSIDERATIONS

Key Findings

> Funding for the Path may be phased without negating the municipal liability exemption.

> Although it is unlikely that the MBTA would require the Town to restore the Premises to the grade existing at the commencement of this lease, we have estimated this cost.

> MBTA does not have specific plan or submission requirements, but plan reviews are expected to take 2 months.

> There are no specific submission requirements for as-built plans, but the MBTA generally expects a standard as-built plan along with the request for Notice of Project Completion.

Background

The Massachusetts Bay Transportation Authority (the "MBTA") has provided a draft lease agreement to the Town of Dover, entitled *Alternative Transportation Corridor Lease Agreement* between MBTA and the Town of Dover, dated 2013 (Appendix IV) . This Agreement includes terms that we understand are not open to modification. The Dover Board of Selectmen obtained a Summary of Lease Terms and Environmental Issues memorandum, prepared by M. Anderson & Krieger LLP, dated September 12, 2012, relative to this draft lease agreement. The memorandum identifies important lease terms and environmental considerations.

As discussed in the section "Experience of Other Communities" in the memorandum, special conditions were included in leases between MBTA and the Cities of Malden and Everett that had known pre-existing contaminated sites. Beals and Thomas performed research, as noted in Task 8, to determine if any pre-existing contaminated sites are known along or adjacent to the corridor.

We contacted Ms. Pat Fitzgibbon, Massachusetts Realty Group on June 9, 2015 to discuss the lease considerations. The following discusses the issues clarified based on that discussion.

1. The lease states that "a failure to undertake efforts to secure funds may negate the municipal liability exemption." A question was raised based on the potential for Dover to phase or segment the project over a longer duration. Ms. Fitzgibbon stated that the MBTA realizes that the projects typically take time to be implemented, and specifically, based on the time to secure funds, that they may be phased.
2. There is a provision in the lease, Condition 12, that may require "Dover" to restore the Premises to the grade existing at the commencement of this lease. This essentially means that the MBTA could require the removal of all imported gravel and stone dust surface material if the lease is terminated. The clause is in the lease, but it is not likely to be enforced by the MBTA, and Ms. Fitzgibbon stated that she is not aware of any times that this has occurred. Given that this is not likely to occur, we have nevertheless estimated costs for removal of material, in today's prices, in the unlikely event that it may be required.

3. Condition 3 of the Lease agreement states that the "Corridor is to be used for purposes of installation, operation, maintenance and use of a rail trail…" The question was asked whether or not sections of the corridor may remain unused (undeveloped for purposes of a rail trail). Ms. Fitzgibbon stated that this would need to be answered by legal counsel.
4. The MBTA is not aware of any specific plan or submission requirements. Ms. Fitzgibbon stated that the plans once submitted to MBTA for review will be distributed to various offices including Safety, Design and Construction, and the Railroad group to approve or disapprove the plans. Generally, these groups expect fully surveyed plans, accurately mapped wetlands, and adequate design and safety improvements. Even though the process takes a minimum of one month, two months should be anticipated for MBTA review.
5. Ms. Fitzgibbon is not aware of specific submission requirements for as-built plans, but the MBTA generally expects a standard as-built plan along with the request for Notice of Project Completion, rather than a contractor's record drawing.

SECTION H

ENVIRONMENTAL CONSIDERATIONS

Key Findings

> Based on the findings of our research, documented sources of contamination along the corridor, generally located in the downtown area, have been addressed.

> Based on a review of the Valuation Maps, there are no battery vaults located along the proposed Path. The Valuation Maps depict two switches near Springdale Street, the former station, and an additional building.

> Recommended protocols for soil sampling include collection of regularly-spaced composite samples along the length of the rail trail corridor, as well as additional samples collected adjacent to former buildings and switches. Recommended sampling parameters include arsenic, lead, and polycyclic aromatic hydrocarbons. This option entails a higher cost.

> Due to the corridor's location in historically residential, rural and significant areas of undeveloped land, a reduced sampling program could be considered.

> We recommended path design and development follow MADEP's *Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails*.

Introduction

The purpose of this section is to identify potential contamination issues within or in close proximity to the project corridor.

Contamination along a former rail corridor is typically the result of either residual contamination from railroad operations or contamination associated with adjacent uses along the corridor.

The most common contamination found along a rail corridor is residual contamination from railroad operations. According to the Rails-to-Trail Conservancy's study on "Understanding Environmental Contaminants" (October 2004), the most commonly reported contaminants along rail corridors include arsenic, which was used as an herbicide to control weeds, metals and constituents of oil or fuel (petroleum products), which likely dripped from the rail cars as they passed over the corridor. Coal ash is also considered residual contamination. In addition, any existing railroad ties along a corridor were likely treated with creosote and therefore need to be removed and transported in accordance with local, state, and federal hazardous waste disposal requirements.

There is also the possibility that use histories of adjacent properties may have resulted in contamination along the corridor. Such histories could include improper disposal actions along the rail corridor or a release of oil or hazardous material on an adjacent site.

MADEP Research

On June 5, 2015, Beals and Thomas reviewed the Waste Site/Reportable Release Look Up and Release Lists for the Town of Dover. We reviewed files for four releases in the vicinity of the proposed Path. Please note that only the most recent MassDEP file with comprehensive site information was reviewed for each site where files were available.

> Dover Highway Department, 2 Dedham Street, RTN 3-0003865: According to theResponse Action Outcome Statement dated August 1, 1997, methyl-tert butyl ether(MTBE) and ethylene dibromide (EDB) were detected in municipal wells on ChurchStreet. The source of contamination was presumed to be from a Mobile Oil servicestation and the DPW. A Phase I report with the conclusion that the Highway DepartmentGarage, located adjacent to the western boundary of the proposed Path, was not thesource of EDB was submitted to MassDEP in 1993. The site achieved closure in August1997 with a Class B1 Response Action Outcome, indicating that remedial actions werenot conducted because a level of No Significant Risk exists.

> Dover Garage, 4 Whiting Road, RTN 3-0010973: The only file available online fromthe MassDEP Bureau of Waste Site Cleanup for this site was a Release AmendmentForm dated February 26, 2009 which did not describe the release. According tothe Site Information page for the site, a number of chemicals (1,1,2-trichloroethane; 1,1-dichloroethane; 1,2-dichloroethane; 2-butanone; 2-pentanone, 4-methyl-; benzene; benzene, dimethyl-, benzene, ethyl-; ethane, tetrachloro; ethane, trichloro-; toluene, andwaste oil) from an unknown source were detected in May 1994 approximately 200 feetto the east of the proposed Path. An Immediate Response Action was conducted. The siteachieved closure in May 1995 with a Class A2 Response Action Outcome, indicating thata permanent solution had been achieved and a level of No Significant Risk existed, butcontamination had not been reduced to background.

> Off Haven Street, 9 Haven Terrace, RTN 3-0012906: According to the Response ActionOutcome Statement Supporting Information, dated January 6, 1996, approximately 200to 300 gallons of no. 2 fuel oil from a fuel supply line were released beneath the concretefloor in the basement of a residence located approximately 100 feet to the west of theproposed Path. Approximately 100 cubic yards of soil were removed, stockpiled, anddisposed of under an Immediate Response Action Plan. The site achieved closure in January 1996 with a Class A2 Response Action Outcome.

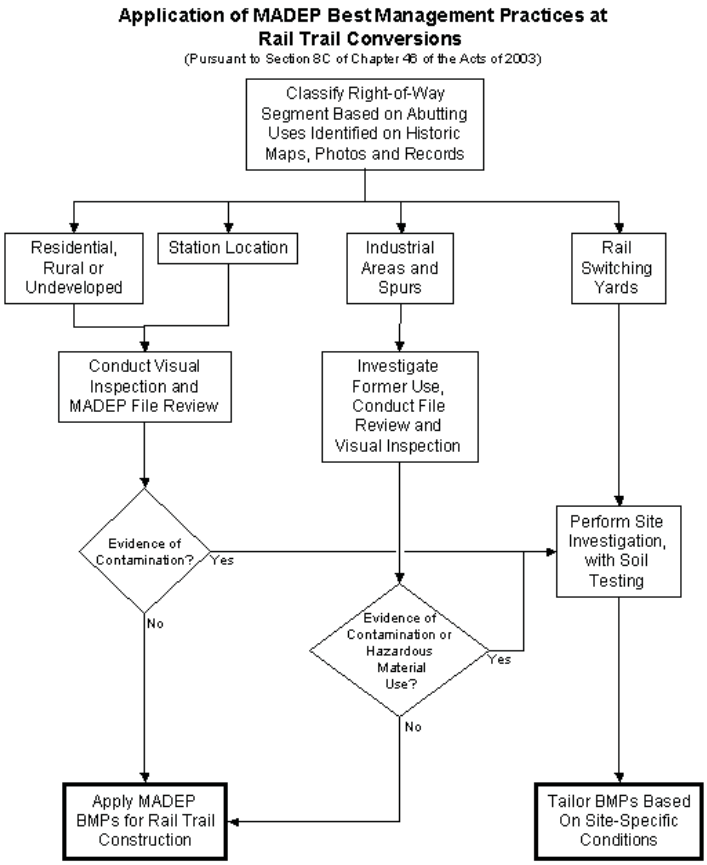
> Intersection with Springdale Ave, 2 Whiting Road, RTN 3-0018654: The only file availableonline from the MassDEP Bureau of Waste Site Cleanup for this site was a ReleaseNotification Form dated September 16, 1999 which only indicated that 14,600 mg/kgof no. 2 fuel oil was released approximately 200 feet to the east of the proposed Pathon July 30, 1999. According to the Site Information page for the site, the site achievedclosure in January 2000 with a Class A2 Response Action Outcome.

According to MassGIS, there are no underground storage tanks, Solid Waste Land Disposal sites, or Bureau of Waste Prevention Major Facilities within the general vicinity of the proposed Path.

Recommended Testing

MADEP Best Management Practices at Rail Trail Conversions employ a decision tree (see Figure 31) for assessing when testing is reccommended. Visual inspection of the site did not identify obvious signs of contamination. To better understand the potential for contaminants to exist within the railbed, we recommend a limited testing program that samples the soils at various intervals in the corridor and at former switch locations.

SECTION H



Figures 31. MADEP BMP Decision Tree

The following discusses the recommended program:

Sampling protocols developed by CSX Transportation include a testing program through the overall corridor using composite sampling methods. Additional testing is recommended at switch locations, platforms, train stations, and where buildings are located or may have previously been located within the corridor. The following, and Appendix V, is taken from that recommended testing protocol.

Following the "Minimum Sampling, Soil Management, and Capping Requirements For Rails-to-Trails Conversion of Rail Corridors" for rail corridors greater than 1 mile in length, included as Appendix V, composite samples should be calculated using the following formula

> Number of Composite Samples = 20 + 5x, where x = total corridor length in excess of 1 mile

The total length of the proposed Path in Dover is approximately 3.5 miles. Therefore, 33 composite soil samples should be collected along the corridor approximately every 575 feet. Composite samples should consist of five samples evenly spaced over each 575-foot interval, taken from the upper 6 inches of soil.

In addition to the above-noted samples collected along the length of the corridor, an additional sample should be collected from the area adjacent to the former station and the building adjacent to the rail line as depicted on the valuation maps. Finally, three composite samples should be collected from each of the two switches near Springdale Street.

The total estimated sampling quantity is thus 41 samples.

The following parameters are recommended for testing:

> Arsenic,
> Lead, and
> Polycyclic Aromatic Hydrocarbons (PAH).

Coal Ash

A recent concern across the state has been the presence of coal ash along former railroad corridors. Coal ash is residual contamination from former railroad operations. This by-product is exempt from the Massachusetts Contingency Plan (MCP). The MCP (310 CMR 40.0000) is the set of regulations that governs the reporting, assessment and cleanup of oil and hazardous material spills in Massachusetts.

While, it is acceptable to both leave and re-use soil containing coal ash along a corridor, the DEP's antidegradation policy restricts off-site reuse to a similar setting. Consequently, leftover materials may need to be transported to an approved landfill at additional costs to the Contractor, which ultimately increases the overall cost of the trail project to the Town. It is therefore important for the trail design to balance cut and fill volumes to minimize any transportation of material off-site. We recommend following a plan to minimize cut within the corridor and instead use the gravel and stone dust as fill over the existing grade to the maximum extent possible with no soil material to be removed from the site.

Design Implications

We recommended the proposed path design and development conforms to MADEP's *Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails*. Our proposed design recommendations are based on BMPs.

These BMPs were developed by MADEP to eliminate or minimize potential exposures to residual oil or hazardous materials commonly found along railroad rights-of-way being converted to rail trails. MADEP notes that these BMPs, by themselves, are insufficient for use without more extensive site investigation in industrial areas with known or likely non-railroad sources, or in rail yards. As a result, the purpose of additional sampling using the CSX sampling method is:

1. To identify potential areas of contamination that exceed residual levels and require more extensive environmental remediation before path development

2. Rule out areas with no contamination or residual contamination levels in order to tailor the application of BMPs to site-specific conditions

It should be noted that the rail trail construction would not introduce any hazardous waste or contaminated materials to the project area. Design plans and specifications should contain spill prevention plans and protocols, EPA standards, and contain specific BMPs from the MADEP *Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails*.

SECTION I

COST ESTIMATE

Key Findings

> Through the concept planning stages, Beals and Thomas researched and estimated relative "order-of-magnitude" costs for three alternatives: low-cost, a recommended option, and high-cost. The assumptions of each alternative are documented to justify estimated costs.

> Permitting costs and costs common across each of the alternatives are also discussed.

> The estimate ranges from $941,000 for the low-cost option to $1,373,400 for the high-cost option. The recommended alternative cost estimate is $1,074,600.

> The paved alternative significantly increases the cost of the project.

Cost Estimates

Costs for implementing rail trail projects vary greatly depending on various factors including the need for soft costs like design and permitting, the availability of volunteer labor and donated materials, local labor costs for contracted labor, and market prices for salvaging rails. Town agencies could supply labor and town-owned machinery to help reduce the cost of implementing the project. Actual hard and soft costs will depend on the Town's design and implementation preferences. Considering this variability in cost, we will present alternative cost estimates and the assumptions underlying each estimate.

The Town should also consider maintenance costs over time, such as cleaning out culverts, trimming vegetation, removal of material dumped by abutters, repairing surface conditions, and replacing decking and handrails, etc. A breakdown of 10 year maintenance costs is included in Appendix VII.

The cost estimate does not assume phasing costs. The soft costs, if phased, can increase considerably. Also materials costs can increase over time, affecting the total costs.

The costs do not consider grants, donations, and other sources to reduce the overall costs. For example, under the Massachusetts Department of Conservation and Recreation's Recreational Trails Program (RTP), funding can be provided for 80 percent of the costs for the Path-specific construction. The Town could use volunteer or donated labor and equipment as part of the 20 percent match. This can significantly reduce the costs to the Town for the implementation of the project. As observed on other trail projects, significant volunteerism results in further cost reductions as sections of the path are constructed and these individuals and groups want to contribute to the full implementation of the project.

Permitting Costs

It is anticipated that the project will be funded entirely with local, private funds, and RTP funds, will not require federal aid, and will not be constructed through the Massachusetts Department of Transportation (MassDOT). Therefore, review by the Federal Highway Authority (FHWA)

pursuant to the National Environmental Policy Act (NEPA) is not anticipated. Should NEPA review be required, the FHWA maintains a Categorical Exemption (CE) for "Construction of bicycle and pedestrian lanes, paths, and facilities," which would exempt the project from more detailed environmental review. The costs for NEPA review are not considered in the estimate.

Costs Common to All Alternatives

A number of costs related to the safety of Path users and/or the protection of environmental resources apply to all scenarios. These common costs include:

- Legal,
- MBTA requirements for design, review , approval and As-built Survey Permitting,
- Environmental testing,
- Stormwater Pollution Prevention Plan (SWPPP),
- Rail salvage costs roughly equal to tie removal and disposal costs (value of salvaged rails pays for tie removal and disposal),
- Surface construction and erosion controls,
- Gravel material imported to project site,
- At-grade crossings,
- Limited areas of parking expansion,
- Accessible parking requirements,
- Erosion control,
- Construction administration and permitting oversight (for the Town)
- Contracted labor for vegetation clearing and surface maintenance, and
- Traffic signage maintenance and equipment.

Low-Cost Alternative Assumptions

- The topographic plan is not based on a full topographic survey, wetland mapping, or property survey. It includes LiDAR topography for areas outside of the work area, wetland mapping at narrow profile of Path, limited topography of the boundaries of the work area, limited property survey at key locations, and use of approximate wetland areas based on visual and Mass GIS sources for other areas,
- No environmental insurance since the town indemnifies MBTA,
- Volunteers (or Massachusetts Mosquito Control Project) perform limited drainage improvements, vegetative barrier and chain link fence enhancements at slope area, handrails only at bridge and relevant culvert crossings (i.e. areas with a vertical drop), and
- No additional vegetative screening.

SECTION I

Recommended Alternative Assumptions

> The topographic plan is not based on a full topographic survey, wetland mapping, or property survey. It includes LiDAR topography for areas outside of the work area, wetland mapping at narrow profile of Path, limited topography of the boundaries of the work area, limited property survey at key locations, and use of approximate wetland areas based on visual and Mass GIS sources for other areas,

> No environmental insurance since the town indemnifies MBTA,

> Volunteers (or Massachusetts Mosquito Control Project) perform limited drainage improvements,

> Vegetative barrier enhancements at slope area, handrails only at bridge and relevant culvert crossings (i.e. areas with a vertical drop), and

> Limited vegetative screening.

High-Cost Alternative Assumptions

> The topographic plan is based on full topographic and property line survey, wetland mapping of work area, LiDAR topography for areas outside of the work area, and use of approximate wetland areas based on visual and Mass GIS sources for other areas,

> Environmental Insurance is included,

> More substantial erosion controls, if required through permitting,

> Full vegetative and handrail barrier enhancements, and

> Full vegetative screening in visibility areas.

Addition Costs of Unlikely Scenarios:

> MBTA salvages rails but leaves ties when possible within lease agreement and

> Cost associated with restoring elevations prior to rail and tie removal if MBTA exercises lease condition to restore rail service.

Paved Surface Alternative

The prior studies for the Dover Recreational Path identified that a soft surface was the most desirable surface for the Path's intended uses and site conditions. The potential for a paved path was requested to be considered. The following discusses the costs and benefits of the paved alternative.

A paved path is constructed with Hot Mix Asphalt (HMA), also known as Bituminous Concrete. HMA paths have numerous advantages over stone dust paths. HMA is a more durable surface and resists wear, weathering, and deterioration from aging while requiring minimal maintenance. HMA surfaces also offer more traction than stone dust and, as a result, are better suited for promoting access. However, HMA paths have several drawbacks. HMA paths are significantly more expensive to design, permit, and construct than stone dust paths and the paved surface is impervious: increasing more stormwater runoff and triggering the need for additional permitting. A significant consideration with HMA surface paths is heaving and damage caused by tree roots, especially when the path is enclosed within a canopy of trees, as is much of the conditions along the path in Dover. Also, the user experience of stone dust versus HMA paths is also very different. Stone dust paths evoke a more naturalistic experience and are often preferred by walkers and runners because it has a lower impact on joints. Paved paths encourage more road bikes and higher bicycle speeds which often make these paths less desirable for walkers and runners.

Another factor to consider for a HMA path is the timing for the design and construction. If it is decided to move forward with the paved alternative, the project could potentially be funded through Federal sources. Federal sources of funding place a priority on regional and transportation-oriented projects. The history of the project planning for the Dover path is that there is a strong desire to keep the path local and not reconstruct the bridge over the Charles River. In order to be considered for funding under the Federal sources, the Town of Dover would need to work with the Town of Needham to coordinate the construction of the bridge connection. This would be needed to increase the priority of the regional planning agency to fund the path. The benefit of using the Federal sources of funding is that the Town is required to fund 10% of the design and construction costs. The remainder is funded by State and Federal sources. The drawback to using Federal sources is that the process involves a lengthy design sequence administered through the Massachusetts Department of Transportation (MassDOT). Unfortunately, the steps involved with the design and review process with MassDOT can take years to complete. A sampling of high priority projects were done in 3-4 years, others, more typically can take 10 or more years. Additionally, the availability and release of construction funding could also take years due to the extreme competitiveness for the funding.

SECTION I

Paved Surface Alternative Continued

In general, a paved path that is constructed through the MassDOT process and design standards currently costs approximately $1.5-$2M per mile to construct. There are a number of design considerations that drive the costs higher for the paved alternative. The following table summarizes the increased (and decreased) costs for the project, should the paved alternative be considered.

Table 3. Paved Surface Alternative Costs

Work Item	Total	Comment
SOFT COSTS		
Increased soft costs for the MassDOT process	$80,000	
Increased soft costs for Stormwater Management Design	$15,000	
Increased soft costs for Permitting		
Wetland Protection Act	$15,000	
MEPA/NEPA	$10.000	
HARD COSTS		
Charles River Bridge Reconstruction shared 50%	$600,000	Bridge cost based on Bay Colony Rail Trail Conceptual Planning and Design Study, Needham, Massachusetts, May 2013, by Fay, Spofford and Thorndike.
Eliminated stone dust cost	($56,000)	
Increased gravel depth (+3")	$80,000	
Hot Mix Asphalt (2.5" binder, 1.5" wearing)	$1,600,000	The cost of pavement can vary significantly with the changes to fuel costs, both for the trucking and the asphalt material costs.
MAINTENANCE COSTS		
10 years pavement maintenance recommendation	$180,000	Based on resurfacing every 15 years, calculated to a 10 year window
Total Net Cost Increase	**$2,600,000**	

CITATIONS

Guide for the Development of Bicycle Facilities, 2012. Washington, DC: American Association of State Highway and Transportation Officials, 2012.

Massachusetts Office of Geographic Information (MassGIS) – used tax parcel boundary data, DEP wetland data, and LiDAR elevation data.

Railroad Valuation Maps provided by Town of Dover, with updated information to 1970, and review of the earlier, clearer original versions obtained online from the University of Connecticut Archives.

Recreational Path Feasibility Study, prepared by Dover Rail Trail Committee, Final Report, dated Spring 2014.

MBTA Draft Lease, with a received date of April 8, 2013 from the Town of Dover.

Wetlands Permitting and Construction Opinion memorandum from Paul McManus, EcoTec, Inc., dated July 24, 2012.

Massachusetts Department of Environmental Protection's *Best Management Practices for Controlling the Exposure to Soil During the Development of Rail Trails.*

Dover Wetlands Protection Bylaw, Chapter 181, dated 2005.

National Park Service/ The Impacts of Rail-Trails: A Study of the Users and Property Owners. 1992. http://www.nps.gov/ncrc/programs/rtca/helpfultools/impact_railtrail_final.pdf.

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