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MEMORANDUM

TO: Tad Staley, Bay Colony Rail Trail Association
Patty Carey, Town of Needham

FROM: John K. Hendrickson, P.E.
Jennifer A. Ducey, P.E.
Wesley N. Mize, E.I.T.
Fay, Spofford & Thorndike

DATE: June 24, 2014

SUBJECT: **Bay Colony Rail Trail**
Phase 5 – Multi-Use Trail From High Rock Street to Chestnut Street
MBTA and NSTAR Alternatives

BACKGROUND

Fay, Spofford & Thorndike (FST) has prepared this memorandum at the request of the Bay Colony Rail Trail (BCRT) Association and Town of Needham (Town). This memo discusses the design and construction cost considerations of two multi-use trail alternatives between High Rock Street and Chestnut Street. This section of the project is referred to as Phase 5 within the Conceptual and Planning Design Study dated May 2013. Phase 5 provides an important link to Needham Junction. An on-road alternative is available for near term implementation. In the long term, the BCRT and Town would like develop a direct shared use trail along or parallel to the railroad right-of-way (ROW) between High Rock Street and Chestnut Street.

The two alternatives can be used to initiate discussions with the MBTA and NSTAR in an effort to further understand their concerns and arrive at a trail design that satisfies the interests of all involved parties. It is quite possible that the selected alternative may traverse a combination of each ROW following conversations with each party.

With proper planning, shared use trails within active railroad and/or utility ROWs can be designed and managed in a way that will:

- Protect the adjacent infrastructure
- Minimize the potential for user conflicts
- Address liability concerns
- Maximize the safety and enjoyment of the public

The evaluation of each alternative was based on a review of available mapping and field reconnaissance efforts.

ALTERNATIVE 1 – MULTI-USE TRAIL ENTIRELY WITHIN MBTA ROW

As part of the study, FST met with representatives from the MBTA Railroad Operations and Engineering sections on April 3, 2013. At this meeting, the MBTA confirmed that they intend to retain exclusive use of the ROW from 1,000 feet south of the switch to the active Commuter Rail track (the entire “Y”) for track maintenance and emergency access. The 1,000 feet south of the switch extends approximately 700 feet south of the High Rock Street bridge. The MBTA acknowledged that although they do not actively use this section of ROW, it is an important piece of ROW for maintenance and emergency purposes and the track infrastructure needs to remain intact. The BCRTA and Town are aware of the MBTA’s position but asked FST to evaluate the feasibility of a rail with trail facility in this section.

There are no state or federal design standards specific to rail with trail facilities. The MBTA has guidelines for rail with trail development (see Attachment A). MassDOT is in the process of developing guidelines for rail with trail facilities under the recently issued Healthy Transportation Policy Directive (see Attachment B). For the purposes of this study, FST reviewed the MBTA guidelines and regional rail with trail examples. The MBTA guidelines require the installation of a 72-inch standard ROW fence placed a minimum of 25 feet from the centerline of the track. The northernmost half mile of the Shining Sea Bike Path in Falmouth parallels the active Old Colony Railroad track used to haul trash from the western portion of Cape Cod (See Attachment C). This corridor is owned by the Commonwealth of Massachusetts and leased to Old Colony Railroad. The horizontal distance from the centerline of the track to the edge of the paved bike path is 10 feet (minimum) and a 6-foot chain link fence forms a physical barrier between the two uses. A short retaining wall vertically separates the path from the track along a portion of this segment. The usage and volume of trains along the Shining Sea Bike Path is comparable to the Needham track and therefore these dimensions were used to develop a conceptual design along the MBTA ROW.

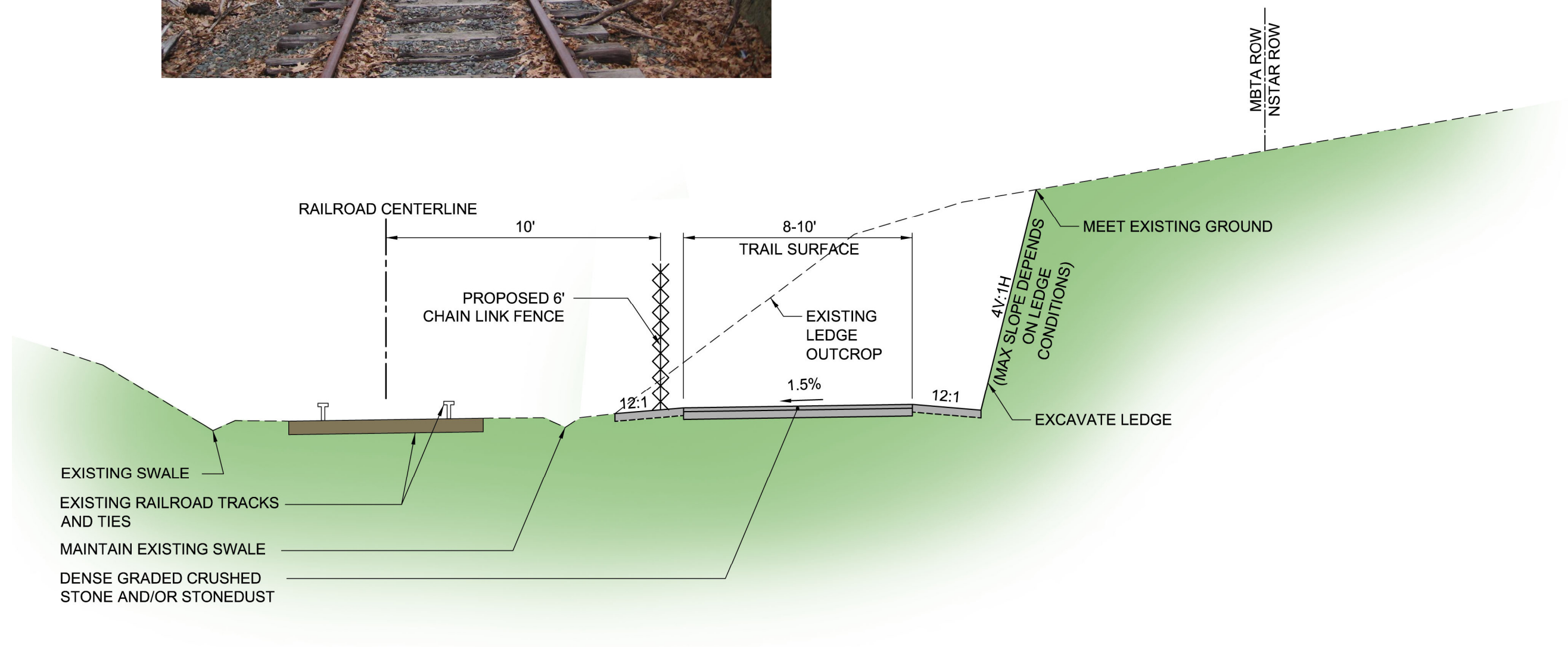
Alternative 1 is depicted on the attached plan (Figure 1) and typical sections (Figures 2A – 2C). This alternative requires the removal of the tracks and ties to a point just north of the High Rock Street bridge. There is insufficient rail bed width south of the bridge to allow for a rail with trail facility. Removing the railroad infrastructure will allow the trail to be extended from the Town Forest connection under the bridge. The trail can then parallel the tracks along the east side of the corridor to Chestnut Street. From this point north, the conceptual design of Alternative 1 involves the following activities:

- Install culvert to cross drainage swale
- Excavate ledge outcrop between MBTA and NSTAR ROW
- Maintain and/or reconstruct existing swale
- Install 72” chain link fence along entire length
- Construct retaining wall on downslope side of trail to keep trail at same elevation as tracks and avoid wetland and ROW impacts
- Construct trail at 4.5% (max) slope down to Chestnut Street
- Construct retaining wall on both sides of trail to stabilize slope and avoid wetland and utility impacts
- Extend sidewalk along Chestnut Street under railroad bridge

A magnitude of cost construction estimate for this alternative is \$850,000 (See Attachment D). Further geotechnical investigation and topographic survey is needed to evaluate the existing soil conditions for the retaining wall designs and ensure the ramp down to Chestnut Street will not compromise the stability of the rail bed.



Figure 1: Alternative 1 – MBTA ROW Conceptual Alignment



**Figure 2A: Alternative 1 – MBTA ROW Conceptual Typical Section
Trail Adjacent to Ledge Outcrop**

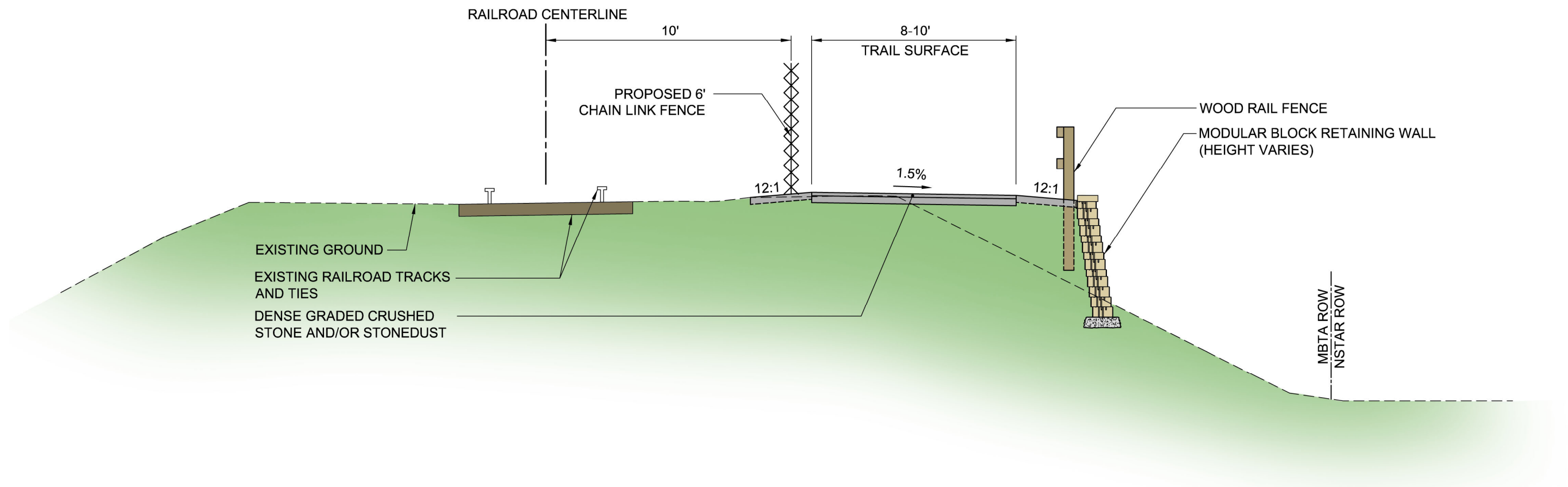


Figure 2B: Alternative 1 – MBTA ROW Conceptual Typical Section
Trail Supported by Retaining Wall to Avoid Wetland Resource and ROW Impacts

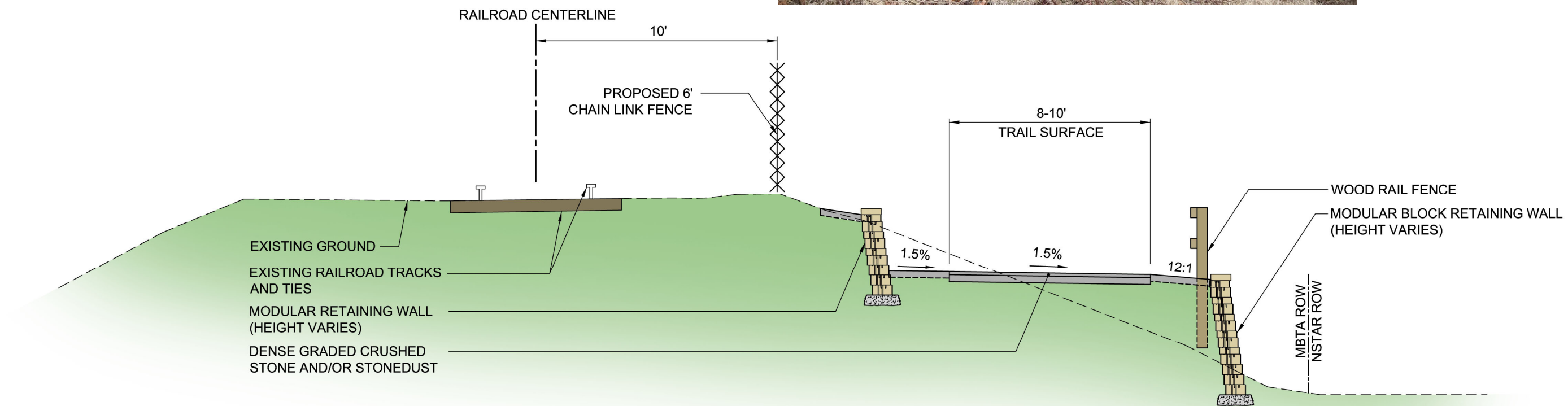


Figure 2C: Alternative 1 – MBTA ROW Conceptual Typical Section
Trail with 4.5% Ramp to Chestnut Street

ALTERNATIVE 2 – MULTI-USE TRAIL ENTIRELY WITHIN NSTAR ROW

At the request of the Town, FST did not meet with NSTAR as part of the study process. NSTAR does not have any guidelines for the development of trails within their ROWs. However, National Grid and other utility providers within New England have entered into agreements with municipalities to allow for trail development along active corridors. As part of these agreements, the utility companies typically require a minimum horizontal and vertical offset from the proposed trail to their transmission facilities.

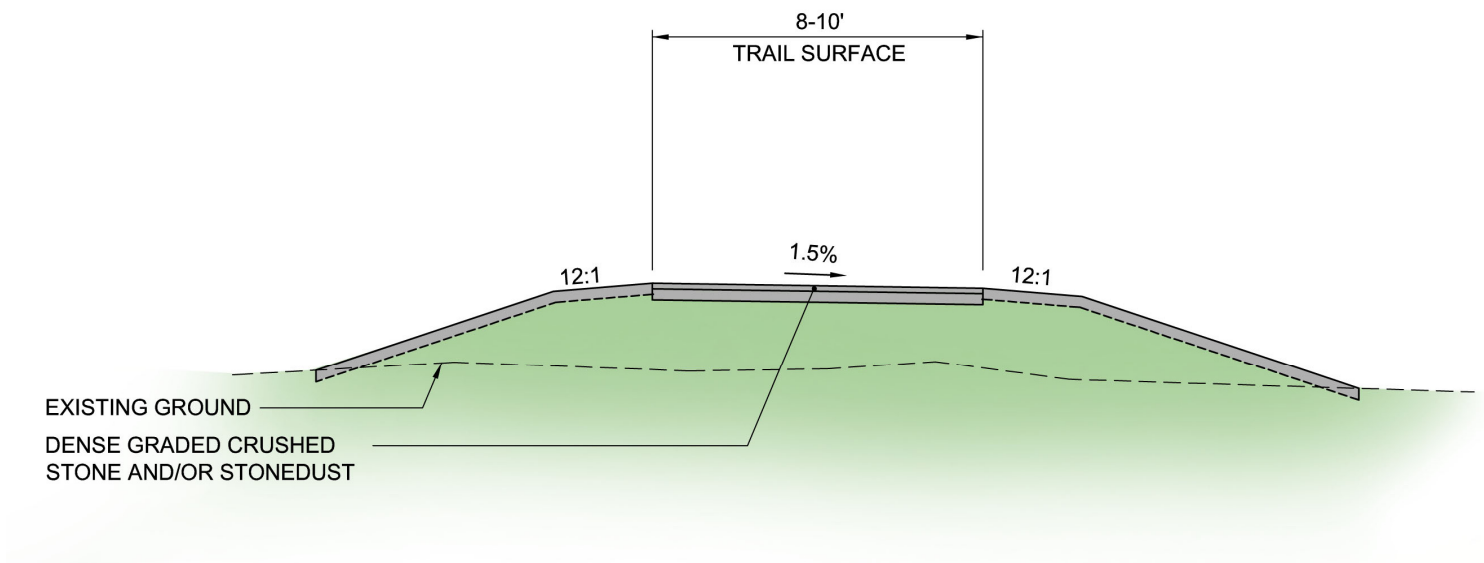
Alternative 2 is depicted on the attached plan (Figure 3) and typical sections (Figures 4A – 4C). The conceptual design of Alternative 2 involves the following activities:

- Follow existing sidewalk along north side of High Rock Street
- Install new crosswalk across High Rock Street on east side of bridge
- Construct new section of sidewalk on south side of High Rock Street to reach NSTAR access drive
- Construct trail at 4.5% (max) slope along existing access drive
- Construct retaining wall to avoid wetland impacts and existing electric facilities
- Cross wetland via culvert extension or boardwalk
- Align trail along existing sewer easement and between utility poles adjacent to avoid impacts to telecommunications shelter
- Install culvert to cross swale
- Align trail parallel to existing NSTAR access drive to avoid wetland impacts and user/truck conflicts
- Install new crosswalk across Chestnut Street at NSTAR driveway
- Follow existing sidewalk along south side of Chestnut Street

A magnitude of cost construction estimate for this alternative is \$600,000 (See Attachment D). Further geotechnical investigation and topographic survey is needed to evaluate the existing soil conditions for the retaining wall designs and to ensure the slope grading will not impact the utility infrastructure.



Figure 3: Alternative 2 – NSTAR ROW Conceptual Alignment



**Figure 4A: Alternative 2 – NSTAR ROW Conceptual Typical Section
Trail Along Existing Access Drive From High Rock Street**

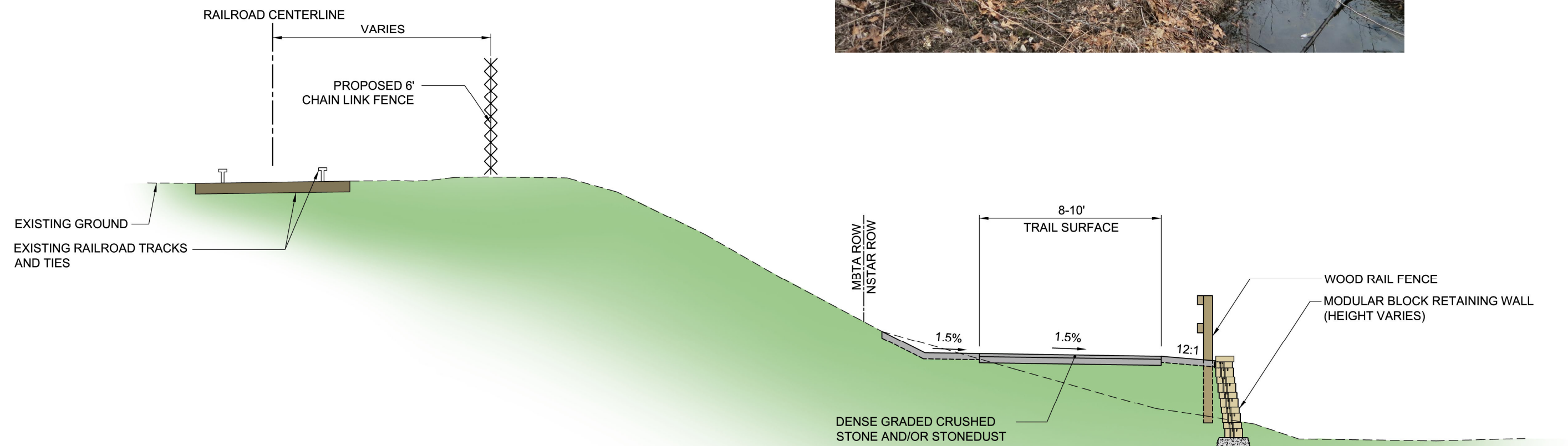
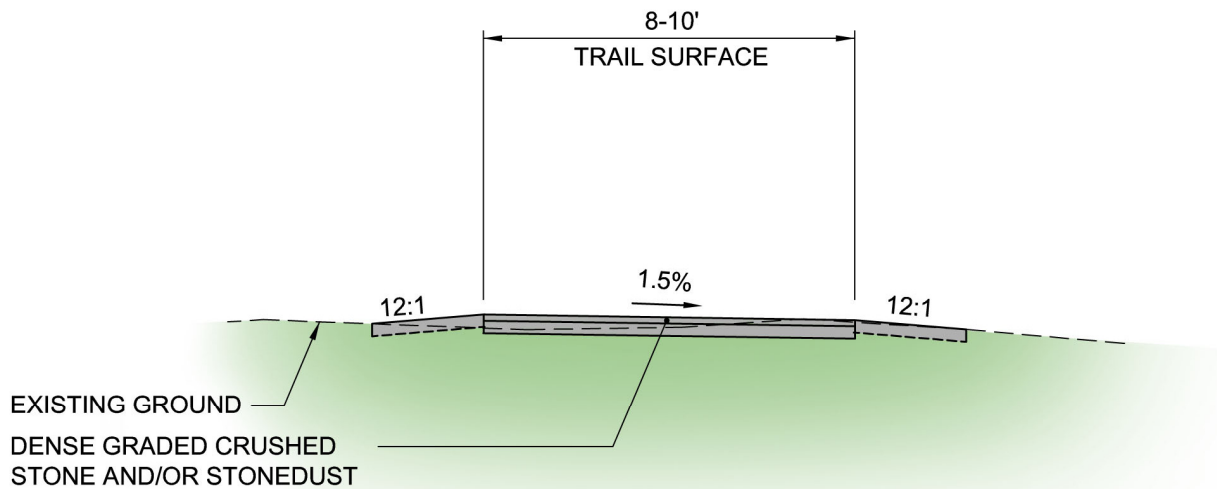


Figure 4B: Alternative 2 – NSTAR ROW Conceptual Typical Section
Trail Supported by Retaining Wall to Avoid Wetland Resource and Electric Facility Impacts



**Figure 4C: Alternative 2 – NSTAR ROW Conceptual Typical Section
Trail Along Sewer Easement and Adjacent to Existing Access Drive to Chestnut Street**

LIST OF ATTACHMENTS

Attachment A	MBTA Rail with Trail Guidelines
Attachment B	MassDOT Healthy Transportation Policy Directive
Attachment C	Example Rail with Trail Shining Sea Bike Path – Phase III, Falmouth, Massachusetts
Attachment D	Magnitude of Cost Construction Estimate

REFERENCES

Attachment A
MBTA Rail with Trail Guidelines

BIKE PATH DESIGN ELEMENTS

- Pathway must be located so that it is fully compliant with MBTA standard plans Nos. 1000, 1002, 1012 and 1014. (Copies attached)
- All Trackside appliances must be on the track side of the pathway, the clearance from signals, signs and other safety related fixtures must not be less than 6 feet.
- The pathway must not construct or utilize any feature that would diminish the visibility of railroad employees in the performance of their duties.
- The bike path must be separated from the Track and any railroad appliances by a standard right of way fence at least 72 inches high. Gates must be installed in the fence at location identified by the railroad.
- Railroad facilities on the pathway side of the fence must be further protected from vandalism and also to prevent injury to pathway users. i.e. culverts, headwalls, retaining walls, power lines, fiber optic facilities and facilities of other MBTA tenants that may exist from time to time.
- The fence must be inspected and repaired on a very tight frequency. Inspection should be daily and repairs should be made when found.
- Generally the minimum distance from the center line of the nearest track to the fence must be 25 feet. (See attached sketch)
- Signage must be placed at all access points to the pathway that directs users to stay away from railroad facilities.
- Signage must be installed that tells users that herbicides are in use on the right of ways and that they are using the pathway at their own risk.
- Vegetation must not be allowed to go on the track side of the fence but should also be encouraged to grow on the pathway side.
- Railroad drainage structures were not designed for the increase in drainage that will result from a paved pathway and therefore all pathway runoff must be directed to other than MBTA catch basins pipes, ditches, or other structures.
- The MBTA should reserve the right to use relocate or modify the pathway for any reason relating to the goals of the MBTA.(Maintenance access, fiber optic installation, track improvements, ETC.)
- The MBTA reserves the right to close the pathway for safety reasons and during maintenance activities that would otherwise be hindered by pathway users.(weed spraying, brush cutting, cross ROW excavation, ETC.)
- The pathway must be closed to users during the winter when snow and ice flying off the passing 70 mph trains could injure users.
- The pathway proponents should be required to present user safety training to area elementary schools to impress upon students the dangers of the trespassing outside the confines of the pathway.
- Local police must agree to provide periodic patrols and to respond quickly to any problems on the pathway.
- Motor vehicles other than those used for maintenance, Railroad and pathway, must be prevented from entering the pathway.
- Pathway must not attach device to any facility used by the railroad.(poles, signs, bridges, ETC.)
- Vegetation growing on the far side of the pathway from the tracks must be controlled so that it does not overhang any portion of the railroad system.(tracks, signals, polelines, ETC.)
- The MBTA must be indemnified by the pathway proponents.
- The proponents must provide railroad protective liability insurance naming MBTA, Amtrak and the freight operators as insureds.
- The MBTA and it's contractors shall have no responsibility for maintenance, construction, repair, replacement of any part or function of the pathway.
- All plans and specifications for construction of any item on any portion of the right of way must be submitted for MBTA approval prior to any portion there of being undertaken.
- Users of the pathway must be cautioned that train whistles are sounded at certain areas along the track and at any location where the locomotive engineer deems it necessary for safety.

Attachment B
MassDOT Healthy Transportation Policy Directive



Policy: P-13-0001

Date: September 9, 2013

HEALTHY TRANSPORTATION POLICY DIRECTIVE

Secretary of Transportation and Chief Executive Officer

Highway Division Administrator

MBTA General Manager and Rail and Transit Administrator

Aeronautics Division Administrator

Executive Director, Office of Transportation Planning

I. Healthy Transportation Policy Directive:

This directive formalizes MassDOT's commitment to the implementation and maintenance of transportation networks that serve all mode choices for our customers and that was memorialized in our Mode Shift Goal announced October 2012.

II. Goal:

To further MassDOT's GreenDOT Implementation Plan, the Commonwealth's Healthy Transportation Compact and statewide Mode Shift Goal, this *Healthy Transportation Policy Directive* is issued to ensure all MassDOT projects are designed and implemented in a way that all our customers have access to safe and comfortable healthy transportation options at all MassDOT facilities and in all the services we provide. This directive builds on other existing directives and guidance that addresses such issues. Healthy Transportation modes as defined by GreenDOT are walking, bicycling and taking transit.

III. Implementation:

1) *Project Reviews*

In order to ensure that healthy transportation modes are considered equally as potential solutions within project design, this *Healthy Transportation Policy Directive* requires the following:

- 1A. All MassDOT funded and or designed projects shall seek to increase and encourage more pedestrian, bicycle and transit trips. MassDOT has established a statewide mode shift goal that seeks to triple the distance traveled by walking, bicycling and transit by 2030, promoting intermodal access to the maximum extent feasible will help the agency meet this goal.
- 1B. The MassDOT Highway, Rail & Transit, and Aeronautics Divisions shall undertake a review process to evaluate all projects currently under MassDOT design oversight for conformance with the specifications and spirit of this *Healthy Transportation Policy Directive*. This process must be completed by January 1, 2014 and submitted to the Secretary and CEO for review. Projects programmed for federal and state funding within the next four fiscal years should be reviewed as a priority. For projects under the Highway Division, the emphasis should be on those projects that entered the design review process before the adoption of the *2006 Project Development and Design Guide*. Projects should not advance in the design process until they have undertaken this review.
- 1C. MassDOT funded and or designed projects that fail to provide facilities for healthy transportation modes, as identified by the aforementioned reviews, shall require signoff by the Secretary and CEO of Transportation prior advancing additional design work. For the Highway Division, this shall not apply to roadway facilities that already prohibit bicyclists and pedestrians, such as limited access highways, or Interstates.
- 1D. Projects under contract for construction, currently under bid review, or advertised for construction on the date of this policy adoption, do not need to undergo major modifications. However, each MassDOT Division shall submit a list of these projects to the Secretary and CEO of Transportation by October 1, 2013 highlighting healthy transportation design opportunities.
- 1E. MassDOT construction projects shall include provisions of off-road accommodations (shared use path, or bridge side path) or clearly designate safe travel routes for pedestrians, bicyclists, and transit users along existing facilities, including customers that fall under the protection of the Americans with Disabilities Act.

2) *Project Design Process*

- 2A. All design notices and public communications for projects shall clearly state the following: 1) existing walking, bicycling and transit facilities/routes that are within the project site area to educate the community on their options for attending public meetings or hearings, and 2) walking, bicycling and transit facilities/routes that are within the project site area that are proposed in the project.

- 2B. All proposed project scopes of work and associated budgets being prepared by the Highway Division shall clearly detail walking (along with identified deficiencies in ADA compliance), bicycling and transit facilities/routes that are within the project site area at the time of project number issuance. In addition, existing or proposed networks within a 2-mile radius of the proposed project, critical connections to downtowns or transit facilities, and all Bay State Greenway routes shall be clearly identified.
- 2C. All MassDOT facilities shall be responsive to adjacent land uses and site context. Wherever adjacent land uses include commercial development or residential development of greater than five units per acre, a sidewalk should be provided along the roadway adjacent to the use. The potential for walking, bicycling and transit activity increases due to existing or planned land uses such as: schools, public parks and playgrounds, hospitals, retail centers, senior centers or housing, multi-family housing, or community centers. Design features to consider shall include, but not limited to: wider sidewalks, street trees, landscaped buffers, benches, lighting, frequent crossing opportunities and strong intermodal connectivity to transit. All project proposals being reviewed or designed by MassDOT shall provide a project site context map with basic information about the site location, and land use (commercial, office, institutional, educational, etc.).
- 2D. MassDOT shall initiate road safety audits of known clustered incident sites where healthy transportation users are involved, to improve customer safety for more vulnerable users. This effort shall have an initial emphasis on healthy transportation users in Environmental Justice communities. By December 31, 2014 the Highway Division shall identify and conduct road safety audits for all high crash location clusters for healthy transportation users along MassDOT owned facilities where that cluster falls in areas where two of three, or all Environmental Justice community thresholds are exceeded (low-income, minority or limited English proficiency). By June 30, 2015 the Highway Division shall have developed a process to implement safety projects to address the locations identified. This process shall include the development of metrics for success and identify a reasonable completion date.
- 2E. For projects along non-limited access rights-of-way in urbanized areas, sidewalks shall be provided on both sides of roadway rights-of-way with added attention to ADA compliance. Every bridge, overpass or underpass shall provide sidewalks on both sides of the road, even if comparable facilities do not yet exist on the abutting road segments, unless pedestrian travel is already prohibited along the roadway.
- 2F. All project proposals being reviewed or designed by MassDOT including new design, retrofits and maintenance shall not remove existing pedestrian or bicycle facilities unless those are replaced by facilities providing equal or better Level of Service. They shall also seek to add facilities that increase and encourage healthy transportation for pavement restoration and resurfacing projects including opportunities to meet ADA compliance. These plans shall be signed off on by the District Highway Engineer and electronic copies provided to the Office of Transportation Planning.
- 2G. The MassDOT Highway and Rail & Transit Divisions shall establish a guide for use by communities that propose Shared Use Paths on or along rail beds. The guide shall be written to assist communities in understanding the design standards (including ADA compliance) for such paths, especially along active rail lines, and acquiring rights of way with the intention of accelerating the design of Shared Use Paths, especially those facilities that are an element of the Bay State Greenway and/or provide critical connections to downtowns or transit facilities. The MassDOT Highway and Rail & Transit Divisions shall permit Shared-Use Paths to be installed along active or future railroad rights-of-way (Rails with Trails) provided appropriate fencing separates the two uses.

- 2H. For the design of bicycle facilities MassDOT shall consider, but not be limited to, the *AASHTO Guide for the Development of Bicycle Facilities* (2012) and the *NACTO Urban Bikeway Design Guide* (2012) as supplements to the *Project Development and Design Guide* (2006), except for pavement markings not approved by MUTCD. MassDOT should utilize other guides as they emerge and evolve from NACTO, AASHTO, and/or the US Department of Transportation.
- 2I. For the design of bus stop facilities MassDOT shall consider, but not be limited to, guidelines of the MBTA Bus Stop Planning and Design Guide (2013) and guidance on ADA compliance. MassDOT should utilize other guides as they emerge and evolve from NACTO, AASHTO, and/or the US Department of Transportation.
- 2J. Upon completion of all healthy transportation facilities, the location, description, and length must be submitted to the appropriate MassDOT offices to facilitate asset management activities.

Please Post _____

Do Not Post _____

Attachment C
Example Rail with Trail Project

SHINING SEA BIKE PATH – PHASE III FALMOUTH, MASSACHUSETTS

Status: Existing, with expanded sections opened in 2010.

Description: The Shining Sea Bike Path – Phase III parallels the Old Colony Railroad along a 0.5-mile segment at the end of the rail line. The rail line is currently used to haul trash from the western portion of Cape Cod. This corridor is owned by the Commonwealth of Massachusetts and leased to Old Colony Railroad.

Design: Along this segment, the horizontal distance from the centerline of the track to the edge of the paved bikeway is 10 feet (minimum). A 6-foot chain link fence forms a physical barrier between the two uses. A short retaining wall vertically separates the trail from the track along a portion of this segment.



Photo courtesy of VHB, Inc.

Attachment D
Magnitude of Construction Cost Estimate

6/24/2014

ALTERNATIVE 1 - MBTA ROW

Phase 5 - Create multi-use trail from High Rock Street to Needham Junction Entirely Within MBTA ROW

Item	Description	Quantity	Units	Unit Price	Amount
Clearing and Grubbing	Assumed 10' along trail length	0.60	Acre	\$ 12,000.00	\$ 7,200
Rock Excavation	For section East of High Rock Street Bridge	1200	CY	\$ 75.00	\$ 90,000
Compost Filter Tubes	For areas within 100' of wetland resources	900	FT	\$ 5.00	\$ 4,500
Borrow / Fill Material	For path construction / grading	500	CY	\$ 30.00	\$ 15,000
Culvert Structure	At drainage swale	1	EA	\$ 30,000.00	\$ 30,000
6' Chain Link Fence	To separate trail from tracks	1600	FT	\$ 30.00	\$ 48,000
Wood Rail Fence	Trail sections with retaining wall and/or 2:1 slope or greater	1200	FT	\$ 25.00	\$ 30,000
Modular Block Retaining Wall	To avoid ROW, utility and environmental impacts	8500	SF	\$ 45.00	\$ 382,500
Intersection Approach Treatment	See intersection approach figure in study for details	0.5	EA	\$ 12,500.00	\$ 6,250
10' Trail - Town Forest Connection to Chestnut St	2" compacted stone dust surface over 4" dense graded crushed stone	24750	SF	\$ 2.50	\$ 61,875
Sidewalk Extension At Chestnut Street	To connect to existing sidewalk	70	SY	\$ 50.00	\$ 3,500
Subtotal					\$ 678,825
Contingencies (25%)					\$ 169,706
Total					\$ 848,531
Say					\$ 850,000

ALTERNATIVE 2 - NSTAR ROW

Phase 5 - Create multi-use trail from High Rock Street to Needham Junction Entirely Within NSTAR Property

Item	Description	Quantity	Units	Unit Price	Amount
Clearing and Grubbing	Assumed 10' along 1,300 foot section of trail	0.40	Acre	\$ 12,000.00	\$ 4,800
Compost Filter Tubes	For areas within 100' of wetland resources	900	FT	\$ 5.00	\$ 4,500
Borrow / Fill Material	For path construction / grading	3600	CY	\$ 30.00	\$ 108,000
Culvert Structure	At drainage swale / wetland crossing	2	EA	\$ 30,000.00	\$ 60,000
6' Chain Link Fence	To separate trail from tracks	1600	FT	\$ 30.00	\$ 48,000
Wood Rail Fence	At trail sections with retaining wall and/or 2:1 slope or greater	400	FT	\$ 25.00	\$ 10,000
Modular Block Retaining Wall	To avoid ROW, utility and environmental impacts	4000	SF	\$ 45.00	\$ 180,000
Intersection Approach Treatment	See intersection approach figure in study for details	1	EA	\$ 12,500.00	\$ 12,500
10' Trail - Town Forest Connection to Chestnut St	2" compacted stone dust surface over 4" dense graded crushed stone	15700	SF	\$ 2.50	\$ 39,250
Sidewalk Extension At High Rock Street	To connect to NSTAR access drive	70	SY	\$ 50.00	\$ 3,500
Subtotal					\$ 470,550
Contingencies (25%)					\$ 117,638
Total					\$ 588,188
Say					\$ 600,000

REFERENCES

Rail-Trails and Liability: A Primer on Trail-Related Liability Issues & Risk Management Techniques, Rails to Trails Conservancy in cooperation with National Park Service Rivers, Trails and Conservation Assistance Program, September 2000.

http://www.railstotrails.org/resources/documents/resource_docs/tgc_liability.pdf

Rails-with-Trails: Design, Management, and Operating Characteristics of 61 Trails Along Active Rail Lines, Rails to Trails Conservancy in cooperation with National Park Service Rivers, Trails and Conservation Assistance Program, November 2000.

http://www.railstotrails.org/resources/documents/resource_docs/Rails-with-Trails%20Report%20reprint_1-06_lr.pdf

Rails-with-Trails: Lessons Learned. Literature Review, Current Practices, Conclusions, U.S. Department of Transportation, August 2002.

<http://transit-safety.volpe.dot.gov/publications/safety/RailsWithTrails/HTML/RailsWithTrails.htm#SECTION%20IV%20Legislation,%20Liability,%20and%20Insurance>

Telephone conversation and email correspondence, FST and Vanasse Hangen Brustlin, Inc. (VHB), March 2011.