Feasibility Study

Mount Mansfield Union High School to Jericho Center Multimodal Connection

In the Town of Jericho, Vermont

Prepared for:

The Town of Jericho

Prepared by

Vanasse Hangen Brustlin, Inc.

July, 2011

Table of Contents

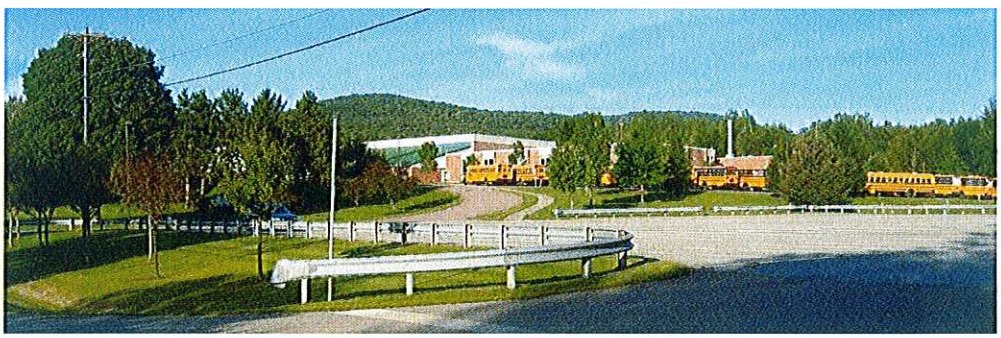
Appendices

Author: Gregory L. Bakos, P.E., LCI gbakos@vhb.com

1 Introduction

The Town of Jericho identified the need for enhanced bike and pedestrian accommodations between Jericho Center and the Mount Mansfield Union High School (MMU). These two important destinations are approximately one mile apart and are connected by Browns Trace Road. The purpose of this study is to identify and evaluate potential infrastructure improvements that would improve and encourage non-motorized transportation along this corridor.

1.1 Background

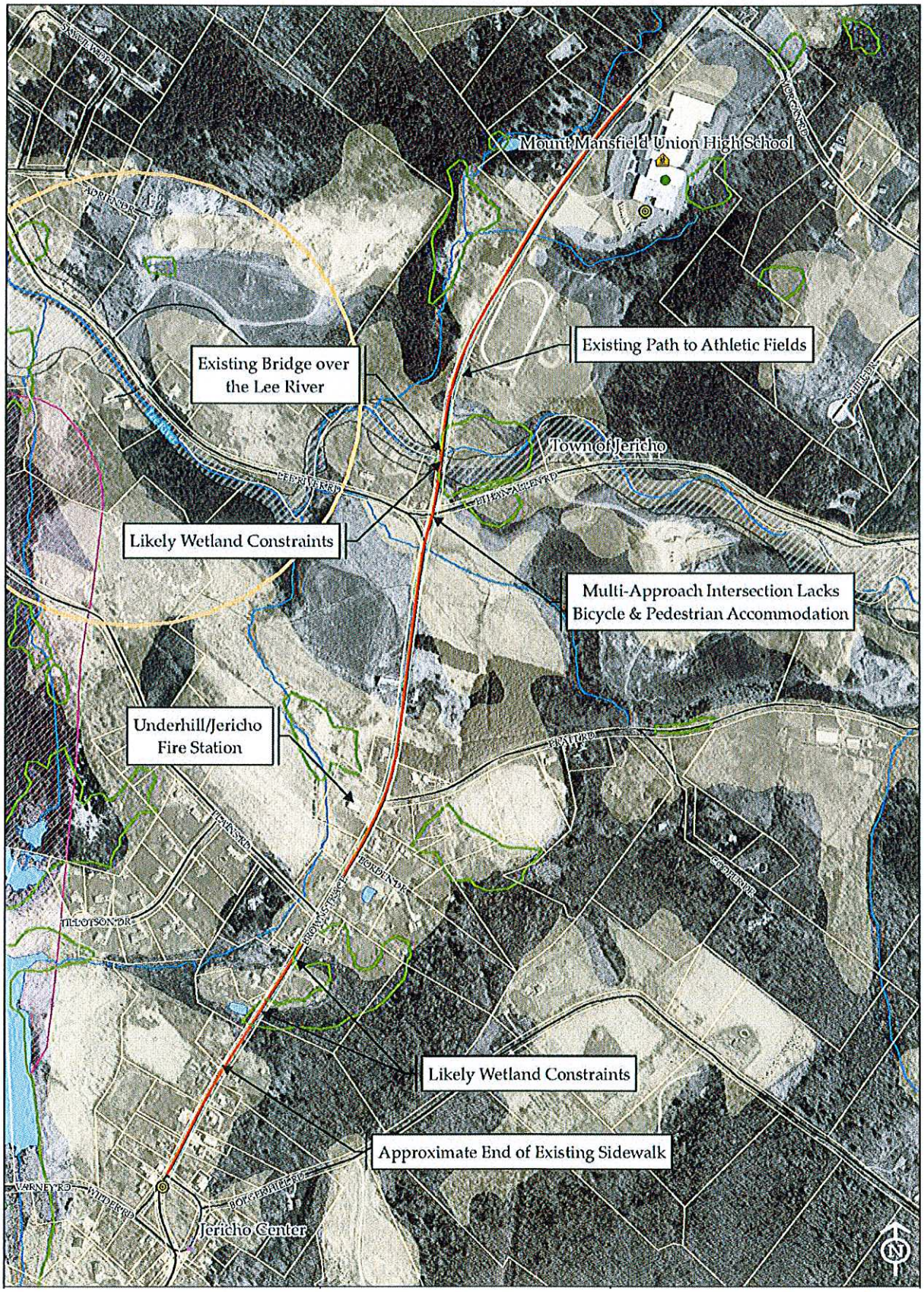


In 2008 the Vermont Agency of Transportation (VTrans) conducted a Road Safety Audit Review for the segment of Browns Trace Road (also known locally as simply "Browns Trace") between Bolger Hill Road and Lee River Road. Those study limits were essentially the same as for this multimodal study.

VTrans assembled a road safety audit team that included representatives from the Town and the Chittenden County Metropolitan Planning Organization (CCMPO). The road safety audit team was focused on vehicular safety and their summary report did not include reference to bike or pedestrian concerns within the study corridor. Implementation of their recommended improvements would likely improve certain conditions, such as signing, sight lines, pavement edge drop-offs, and operations at intersections, which would in turn also improve conditions for bicyclists riding on Browns Trace Road.

This multimodal study is a natural follow-on to the road safety audit since it addresses the safety and mobility needs of non-motorized users within the Browns Trace Road corridor. It is funded through a CCMPO Transportation Action Grant

and it is intended to identify and evaluate potential bike and pedestrian infrastructure improvements. The map on the next page shows the study corridor.


Mount Mansfield Union High School
Existing Path to Athletic Fields
Existing Bridge over the Lee River
Town of Jericho
Likely Wetland Constraints
Multi-Approach Intersection Lacks Bicycle & Pedestrian Accommodation
Underhill/Jericho Fire Station
Likely Wetland Constraints
Approximate End of Existing Sidewalk
Jericho Center
LEE RIVER RD
ELLEN ALLEN RD
BROWNS TRACE
BORDER DR
TILLOTSON DR
VARNEY RD
WHITCOMB RD
BOWEN RD
N

1.2 Local Concerns Meeting

A Local Concerns Meeting was held at the Mount Mansfield Union High School in December of 2009 to gather input from local and regional officials, school staff, students, and concerned citizens. The intent of the meeting was to guide the study team in understanding the concerns and desires of the community for bike and pedestrian accommodations. It was also a useful step in the data gathering phase and many of the public comments were insightful. The overwhelming response from the attendees was that non-motorized enhancements are needed between the Town center and the MMU School. One relevant observation was that the automobile dependent behavior of the students has been well accommodated, whereas there is only one bike rack and it is located behind the school.

1.3 Project purpose and Need

Purpose:

The purpose of this project is to improve bike and pedestrian safety and access along Browns Trace Road between Jericho Center and the Mount Mansfield Union High School. The ultimate goals are to improve bike and pedestrian safety which will reduce dependence on motorized vehicles throughout the study corridor, increase opportunities for physical exercise and recreation, and improve the overall quality of life in the community. The infrastructure improvements will imitate an overall colure change that will be supported by bike safety and healthy lifestyle education programs at the school.

Need:

The MMU High School is relatively isolated. It is separated from Jericho Center by approximately one mile, and is not situated near dense residential neighborhoods. In addition, there are no conveniently located bike racks at the school or in Jericho Center to support the students that do choose to ride. As a result, the vast majority of students reach the school by bus or car.

Browns Trace Road is the primary connection between the school and the Jericho Center. It is a narrow rural road, and with the exception of the short section of sidewalk within the Town Center it is devoid of sidewalks and paved shoulders. As a result, Browns Trace Road is not considered a safe or convenient connection to and from the school for pedestrians and most bicyclists. Some experienced cyclists currently use Browns Trace Road, and the track teams are known to run along the road or on the grass or gravel shoulders, but children, inexperienced cyclists and most pedestrians avoid using the road, especially in winter months.

2

Documentation of Physical and Environmental Conditions

2.1 Introduction

Prior to developing solution alternatives it was first necessary to document the existing physical and environmental conditions. This involved data gathering, review of relevant correspondence and field-based observations and measurements. The following section describes the data gathering results.

2.2 Data Collection

The study team's initial data gathering primarily consisted of Graphic Information Systems (GIS) data gathering. This was then supplemented by field observations.

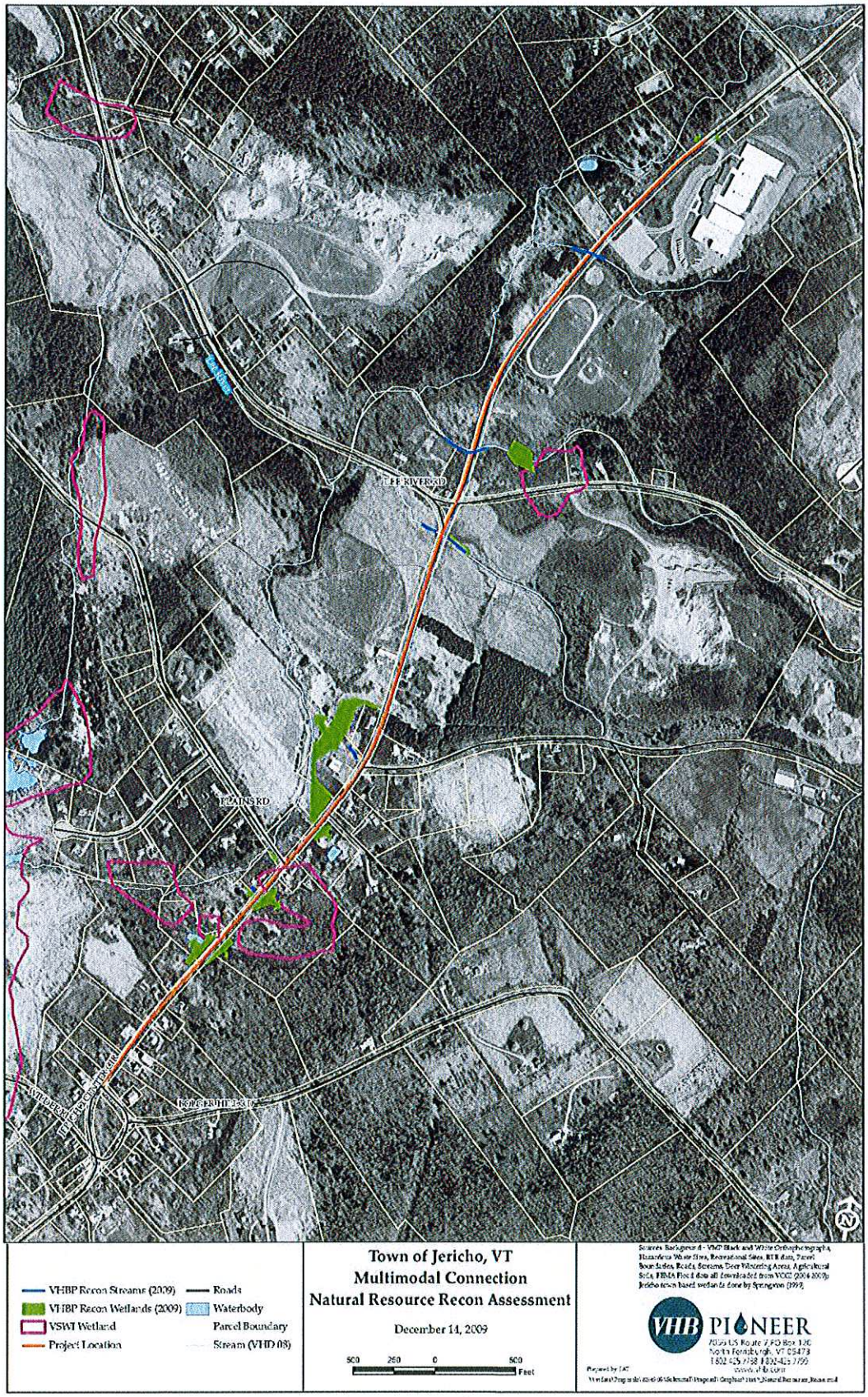
GIS Base Mapping

The GIS mapping utilizing available geospatial information was assembled and organized as an ArcGIS geodatabase and was overlaid on available orthophotography.

Field Review

Once the electronic base files were assembled the study team performed a field review of the corridor to assess natural resources. One important result of this effort was that the GIS-based natural resources information was reviewed and modified based on real conditions on the ground. This was accomplished by using a Global Positioning System (GPS)-based field computer that showed the GIS mapping as well as the environmental scientist's position on the mapping. The environmental field review was important because GIS data is by no means a complete representation of the actual conditions. For example, the National Wetlands Inventory (NWI) does not depict all of the wetlands present in a given area since NWI maps are based on interpretation of aerial photographs and often miss smaller wetland resources.

The map on the following page shows the results of the natural resource inventory.


VHBP Recon Streams (2009)
VHBP Recon Wetlands (2009)
VSWI Wetland
Project Location
Roads
Waterbody
Parcel Boundary
Stream (VHD 08)
Town of Jericho, VT
Multimodal Connection
Natural Resource Recon Assessment
December 14, 2009
500 250 0 500
Feet
VHB PIONEER

For the purposes of this feasibility analysis, the fieldwork was performed at a reconnaissance level only. VHB did not attempt to formally delineate wetland boundaries, but instead adjusted the GIS based wetland boundaries based on visual field observations by an environmental scientist.

In addition to collecting data on natural resources, the study team conducted evaluations of the various constraints and opportunities along the corridor. Physical constraints that were observed included roadside embankments, residential and agricultural buildings, drainage culverts and swales, utility poles, mature trees and the narrow bridge over the Lee River. In addition, the geometry and operations of the Browns Trace Road/Lee River Road/Ethan Allen Road intersection were observed.

Cultural Resources

The VTrans Archaeologist and Historic Preservation Officer reviewed the corridor for potential historic and archaeological resources and provided their initial assessment in written form. They found that the land within the roadway right-of-way has been disturbed and would therefore not be considered sensitive. Outside of the right-of-way there were several areas of potential archeological sensitivity, such as the fields on either side of Browns Trace Road near the Lee River Road intersection, and fields in the vicinity of Plains Road. A foundation was found in the southeast quadrant adjacent to the bridge over the Lee River, north of Ethan Allen Road. That foundation was thought to be the remains of a blacksmith shop. Three buildings (two homes and a barn) were found to be historic. All of the sensitive areas should be avoided if possible, and if unavoidable will require additional archeological study. A copy of the VTrans cultural resources memo may be found in the appendix.

2.3 Corridor Description

Roadway Classification

Browns Trace Road is a two-lane rural road that generally extends south to north from Jericho Center. Within the study area the adjacent land use transitions quickly from Town Center to thinly populated residential, to open agricultural land. Though it is a local road, Browns Trace Road is classified as a major rural collector between Jericho Center and Lee River road. North of Lee River road it is classified as a minor rural collector.

Origins and Destinations

In recent years the Town extended sidewalks on Browns Trace a short distance northward of Jericho Center and these sidewalks connect a number of the local walking destinations, such as the Country Store, the Library, the Community Center

and the Congregational Church. In speaking with local residents it appears that the existing sidewalks have been very well received.

The new concrete sidewalk on the west side of Browns Trace Road ends abruptly just north of the residence shown in the photo below.

Pedestrian demand extends much further north of this point since there are nearby existing and future residential developments off of Plains Road and Pratt Road. These destinations would certainly benefit from new bike and pedestrian connections to the Town Center. Beyond Plains Road and Pratt Road, the MMU High School is the prominent bike and pedestrian destination, notwithstanding the fact that it is currently reached almost exclusively by car and bus.

Constraints

Beginning at the MMU High School there are a handful of locations where there are physical or environmental constraints that will make construction of a shared use path more challenging.

The first constraint is the existing Browns Trace roadway bridge over the Lee River, as shown in the photo. The existing bridge does not have sidewalks and the road does not have shoulders. Furthermore, the bridge's railings are too low to be considered safe for bicyclists or pedestrians. Bicyclists and pedestrians are therefore forced to share the road with motorists if they want to go south of the Lee River towards the Town Center.

The southeast quadrant bridge approach visible in this photo was the location where the VTrans archeologist suspects there was a blacksmith shop, so a pedestrian bridge crossing in this area would need to skirt that site once the site boundaries are better documented.

The next constraint is the Browns Trace Road/Lee River Road/Ethan Allen Road intersection, as shown below. Three legs of this intersection are under stop sign control, but the northbound approach is uncontrolled and the eastbound approach has a free right slip ramp configuration. This intersection was reviewed during the VTrans 2008 Road Safety Audit Review. The conclusion was that the configuration is a little odd because the heaviest through movement is stop controlled. The study noted that a long term solution might be to reconfigure the intersection to be a more standard 90 degree intersection.

The implications for a shared use path are that the path would need to be integrated safely through the existing intersection, as well as any future reconfigured intersection. University of Vermont engineering students are currently examining a range of improvement alternatives for this intersection and they are aware of the potential for a shared use path through the intersection.

South of the intersection the path would follow one side of Browns Trace Road or the other up the long and steep hill to the barn and farm house near the top of the hill.

The barn and opposite farm house represent one of the more significant constraints on the project. The road at that location is only 25 feet wide and both structures are historically significant. The mature trees are also considered contributing to the historic setting and should not be impacted.

Fitting a shared use path through this constriction will be challenging. It may be necessary to actually shift the road and construct low fieldstone masonry retaining walls to manage the grading through this section. The path width may also need to be reduced to 8 feet or even less due to the extreme circumstances.

South of the farm buildings is another constriction. This next location is a historic home with a mature tree that appears to be overhanging into the right-of-way, as shown in the below photo. If a shared use path is located on the west side of the road, the roadway may need to be realigned in order to allow the tree to remain. That would require relocation of the utility poles on the opposite side of the road.

The next areas of concern that are south of the above property are wetland areas that come close to the roadway. The south-facing photo below shows a wetland on the west side of Browns Trace Road and utility poles on the east side. Note the beginning of the concrete sidewalk on the west side in the distance. The attached wetland mapping shows the approximate locations where wetlands must be dealt with if a shared use path is proposed.

Selecting the location to end a shared use path is also important. The south-facing photo below shows additional constraints closer to the Town Center. These include the stone walls, fences and mature trees that line the eastern right-of-way boundary.

The chapter that follows discusses possible design approaches that would address the constraints described in this chapter.

3

Identification of Multimodal Solutions

3.1 Introduction

The observations from the data collection phase, combined with public input, help shape the types of design solutions that will be possible or necessary to satisfy the project Purpose and Need Statement. This chapter identifies conceptual design solutions that could be employed to address the project challenges.

3.2 Improvement Alternatives

Levels of Improvement

There are several levels of improvement that may be considered along this corridor. Five basic improvement alternatives are listed and described below from the lowest level of improvement to the highest. It may be appropriate to apply different solution alternatives along specific segments of the corridor.

Alternative 1. Add Gravel Shoulders to Browns Trace Road

This alternative would provide the minimum level of improvement.

The paved width of Browns Trace Road currently averages between 24 and 26 feet. Paved or unpaved shoulders are minimal or non-existent throughout most of the study corridor so pedestrians generally have difficulty walking along the side of the road because of uneven surfaces. Bicyclists and pedestrians are therefore both forced to occupy the edge of the paved travelway.

The Annual Average Daily Traffic (AADT) on Browns Trace Road is approximately 4,000 vehicles per day according to 2007 VTrans automatic traffic count data. The Vermont State Standards recommend 11 foot lanes and 3 foot shoulders for two-lane rural collectors with an AADT over 2,000, for all design speeds. This equates to an overall road width of 28 feet. Under Alternatives 1 and 2 the road would be widened

by 1 to 2 feet to achieve the required overall road width. Under Alternative 1 the widening would be accomplished by adding a smooth level 1 to 2 foot wide gravel shoulder on both sides.

Advantages:

- Lowest cost
- Minimal Impacts to resource areas an abutting properties

Disadvantages:

- Minimal benefit, especially for bicyclists
- Not durable
- Cannot widen the bridge over the Lee River to achieve the desired width

Discussion:

This could be a reasonable low cost short term improvement, and it would have the minor added benefit of also improving motor vehicle safety. But this alternative falls well short of satisfying the project Purpose and Need. We do not believe it would improve bike or pedestrian safety sufficiently, and we further doubt that the improvements would entice people to walk or bike along the corridor.

Alternative 2. Add Paved Shoulders to Browns Trace Road

This alternative would be similar to Alternative 1 except it would provide added benefit to bicyclists. The road would be upgraded to a uniform width with 11 foot lanes with 3 foot shoulders. The intent would be to provide added paved road width for cyclists to "share the road" with motor vehicles.

Advantages:

- Low cost
- Minimal Impacts to resource areas and abutting properties

Disadvantages:

- Minimal benefit
- Wider pavement could result in higher motor vehicle speeds
- Cannot widen the bridge over the Lee River to achieve the desired width

Discussion:

This alternative may provide the most benefit for the lowest cost for experienced cyclists who would share the road with motor vehicles, however it falls far short of providing added safety for pedestrians and inexperienced cyclists, including children. It would have the added benefit of improving motor vehicle safety, however the wider pavement may lead to higher motor vehicle speeds, which is counterproductive with respect to bicyclist and pedestrian safety.

Alternative 3. Add Paved Shoulders plus a Sidewalk on One Side to Browns Trace Road

This alternative would provide paved shoulders to improve bike safety, as in the above alternative, and it would also construct a paved sidewalk along one side of the road to accommodate pedestrians.

Advantages:

- Separates pedestrians from all other users
- Provides paved shoulders for experienced cyclists

Disadvantages:

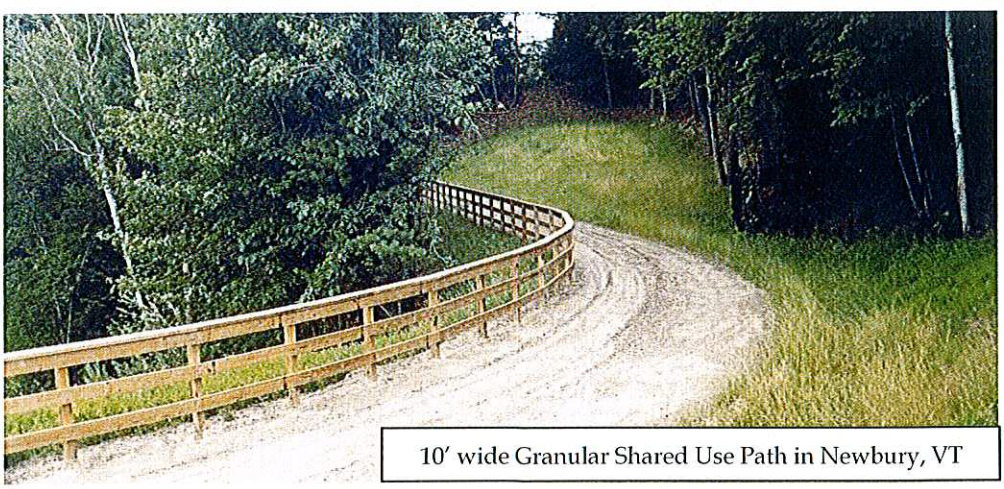
- Does not account for inexperienced cyclists that may not be comfortable riding in the road
- Would need a pedestrian bridge over the Lee River
- The combined new shoulders and sidewalk would be of similar width as the shared use paths in the next alternatives

Discussion:

This alternative may result in the same amount of impact as the shared use path alternatives, yet the benefits would not be as great. Furthermore, the wider road width that the paved shoulders would provide could result in higher motor vehicle speeds. This concern was voiced by the public and goes against their desire to actually calm traffic.

Alternative 4. Construct a Granular Shared Use Path

This alternative involves constructing an un-paved shared use path between the Town Center and the MMU High School. The width would be 8 feet in constrained areas and 10 feet elsewhere. The minimum vegetated buffer between the path and Browns Trace Road would be 3 feet. Additional buffer would be included where possible.



10′ wide Granular Shared Use Path in Newbury, VT

Advantages:

- Separates non-motorized users from motorized users
- Lower initial cost relative to paved path
- Aesthetically more pleasing than a paved path in the rural setting
- May be the preferred surface for runners, walkers and equestrians

Disadvantages:

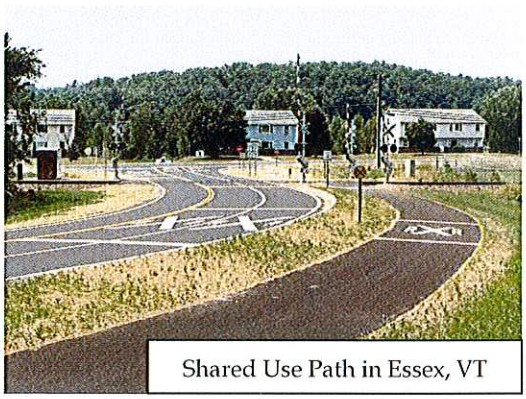
- Greater impacts to resources and right-of-way compared to Alternatives 1 and 2
- Granular surface does not accommodate all non-motorized users as well as a paved path
- Granular surface requires annual maintenance

Discussion:

This alternative provides considerably more benefit than the previous alternatives in terms of bicyclist and pedestrian safety since it separates the non-motorized from the motorized users. Granular trail surfaces are a concern on steep slopes, which there will be on this path, because the surface is prone to erosion and because loose spots can be hazardous for cyclists going downhill at high speeds. This alternative would be ideal for walking and running, and would accommodate equestrians. Experienced road cyclists would possibly still use Browns Trace Road.

5. Construct a Paved Shared Use Path

This alternative involves constructing a paved shared use path between the Town Center and the MMU High School. The width would be 8 feet in constrained areas and 10 feet elsewhere. The minimum vegetated buffer between the path and Browns Trace Road would be 3 feet. Additional buffer would be included where possible.



Shared Use Path in Essex, VT

Advantages:

- Separates non-motorized users from motorized users
- Accommodates all non-motorized users, including baby carriages, skate boarders and roller bladers
- More durable than gravel path, especially on steep slopes

Disadvantages:

- Greater impacts to resources and right-of-way compared to Alternatives 1 and 2

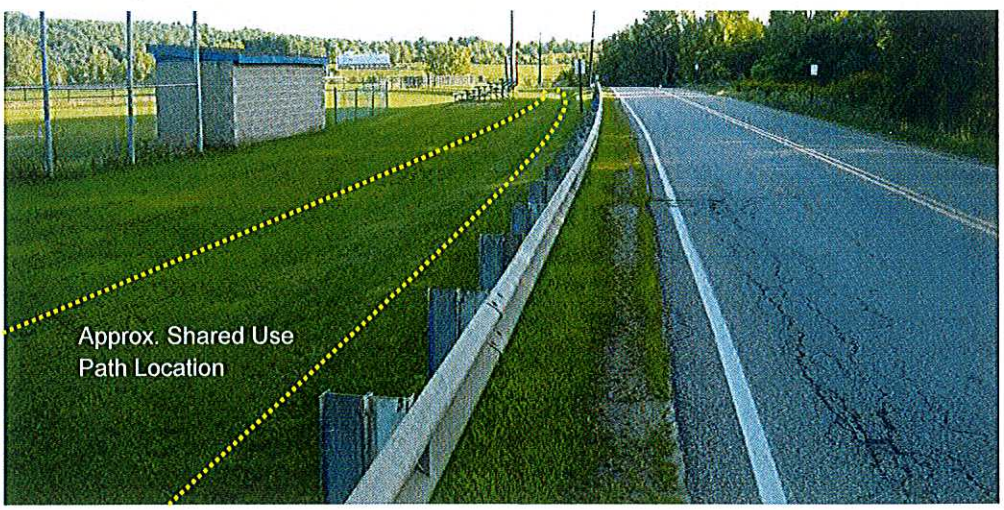
- Highest initial cost alternative

Discussion:
This alternative represents the highest level of improvement. It provides the greatest benefit for the largest set of potential users.

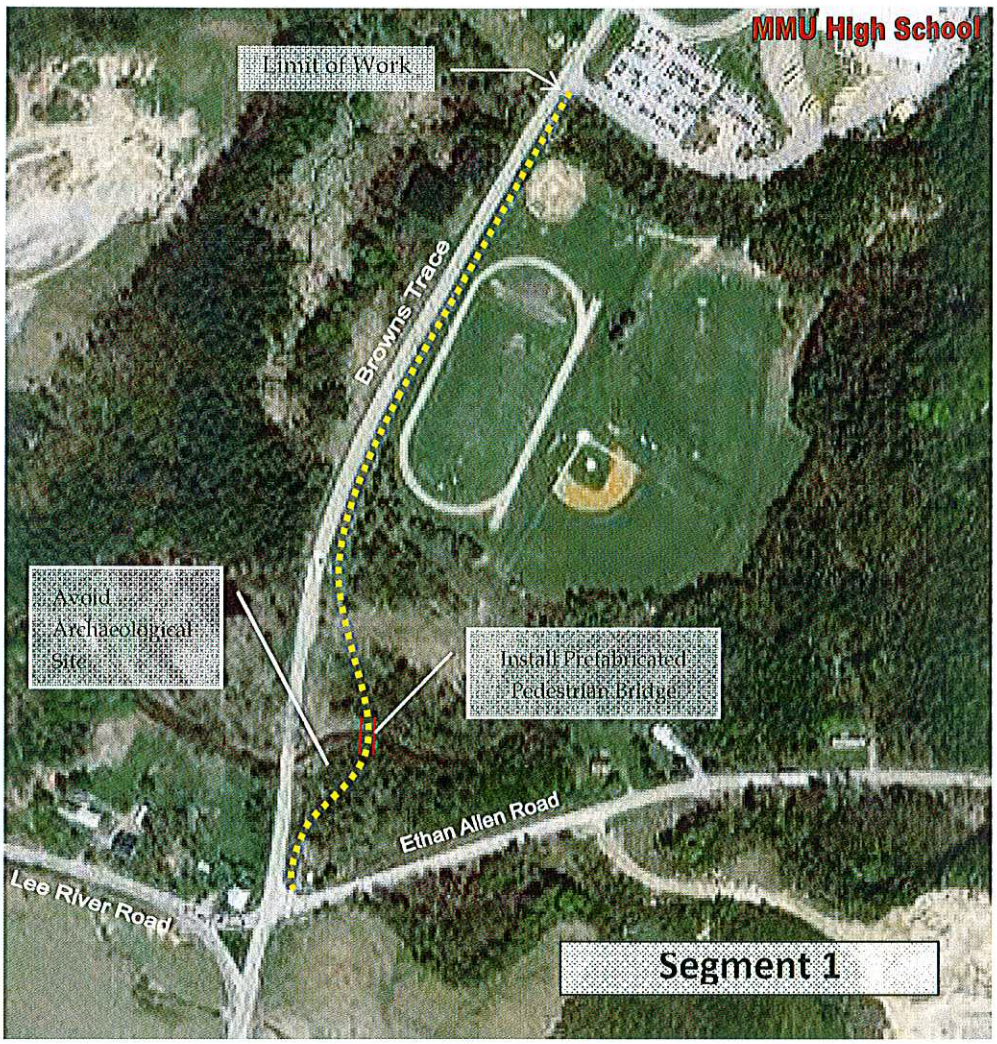
3.3 Shared Use Path Alternatives

It is evident from the discussions in the previous section that the shared use path alternatives provide the highest level of improvement and satisfy the project Purpose and Need to the greatest extent. It is also clear from the discussion of constraints in Section 2.3 that it will be difficult to construct a shared use path from the school all the way to the Town Center. A segment by segment evaluation of shared use path solution alternatives follows, beginning at the MMU High School.

Segment 1 – MMU High School to Ethan Allen Road



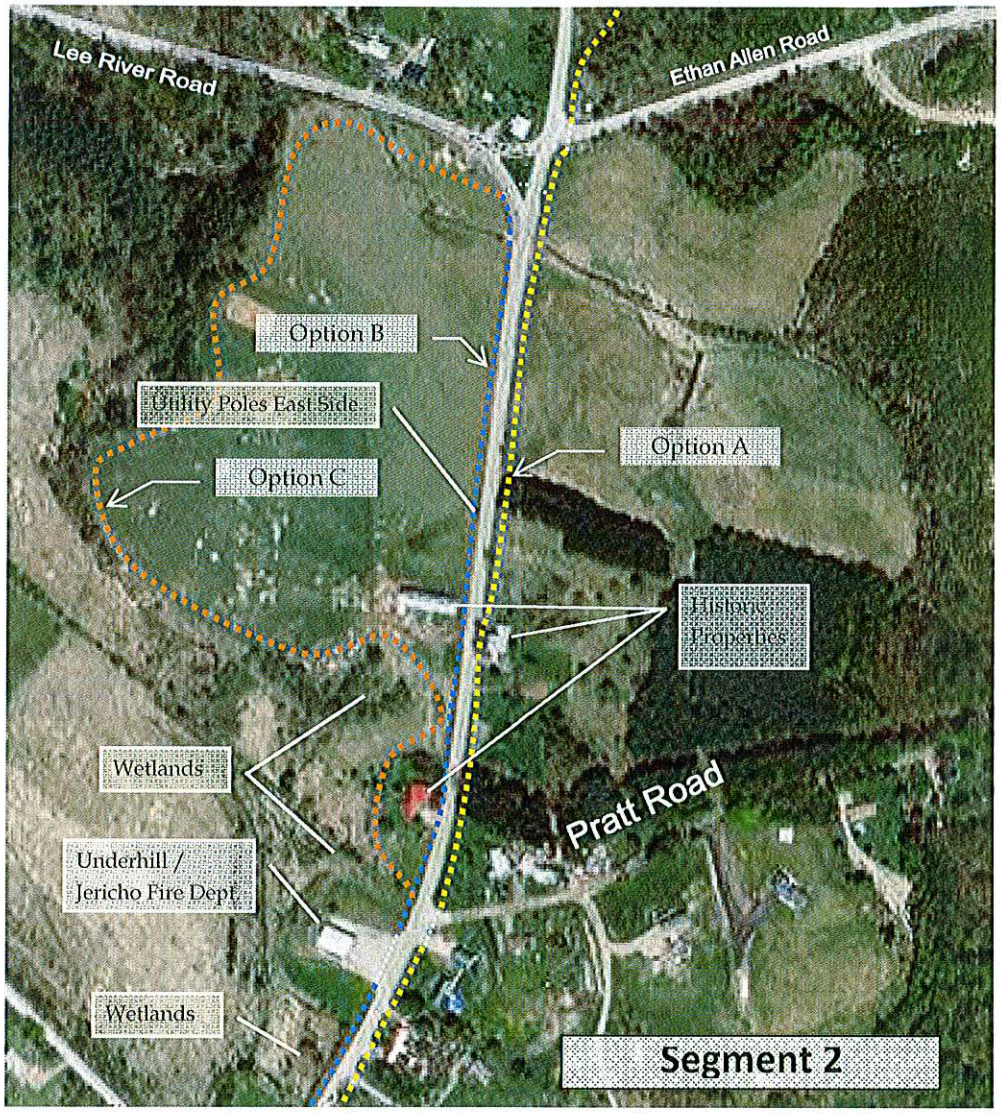
The path would originate at the school parking lot and proceed southward behind the existing guardrail as illustrated in the above photo. Within the school parking lot signs and pavement markings would be used to help define a preferred path and to alert motorists. Bike racks should be added at the school and/or at the trailhead.



The path would follow the short existing path that leads from the recreations fields to Browns Trace Road. It would then diverge away from the road to cross the river on a new prefabricated bike/pedestrian bridge. The new bridge would have a span longer than the roadway bridge to minimize impacts to the stream bank. The path alignment would be adjusted to avoid the reported remnants of a blacksmith shop building foundation that the VTrans archaeologist reported near the southeast corner of the existing roadway bridge.

Assuming the intersection configuration does not change, the path would cross Ethan Allen Road via a crosswalk at the stop sign controlled approach.

Segment 2 – Ethan Allen Road to Pratt Road



There are three alignment options presented for this segment. They are discussed as follows.

Option A Alignment

Option A is the most direct alignment up the hill to Pratt Road. This option would roughly parallel the east side of Browns Trace Road, separated from the road by a vegetated buffer of at least three feet, and more where possible. It would therefore be constructed partially within and partially outside the reported three rod right-of-way.

Construction of the path would require some cuts and fills since the adjacent terrain is rolling. The path would cross the drainage swale near Ethan Allen Road by

extending the culvert, and the path would need to avoid utility poles near the intersection.

The most difficult aspect of Option A is passing the historic home near the top of the hill. The trees in front of that home have been identified by the VTrans Historic Preservation Officer as contributing to the historic nature of the property, and in his opinion they need to be preserved.

An engineered solution at this location is to narrow the paved path to 8 feet wide along the constrained section, cutting into the very toe of the earth embankment and supporting it with a low (2+/- foot high) fieldstone masonry wall, and shifting the road alignment approximately 6 feet to the west to accommodate the path. The road shift would be accomplished over an approximately 400 foot length. The path would end up adjacent to the roadway, and this condition would need to be signed for both path users and motorists.

Option B Alignment

The Option B alignment is similar to Option A except the path will follow the west side of Browns Trace Road instead. To do this it must first cross Browns Trace Road and the slip ramp from Lee River Road onto Browns Trace Road. There are obvious safety concerns with crossing the slip ramp since it is a free right movement. The VTrans road safety audit suggested reconfiguring the intersection to a more conventional 90 degree intersection where Lee River Road would be stop sign controlled. That change would improve the multimodal path crossing. If the intersection is not reconfigured it may be necessary to install pedestrian actuated crossing lights or warning flashers on the slip ramp. Another option would be to install a speed table on the slip ramp at the path crossing. This would slow vehicles down at all times.

The Option B path becomes constrained at the top of the hill by the historic barn opposite the historic house. The barn is approximately 20 feet from the road, but it may still be necessary to shift the road slightly to the east to fit the path on the west side.

Prior to reaching the Pratt Road intersection the path must pass by another historic property that has a mature tree that hangs into the right-of-way, as described in Chapter 2. To avoid the tree it would be necessary to shift the roadway alignment slightly to the east. The path would once again need to be narrowed to 8 feet and it would be separated from the road with a solid white line.

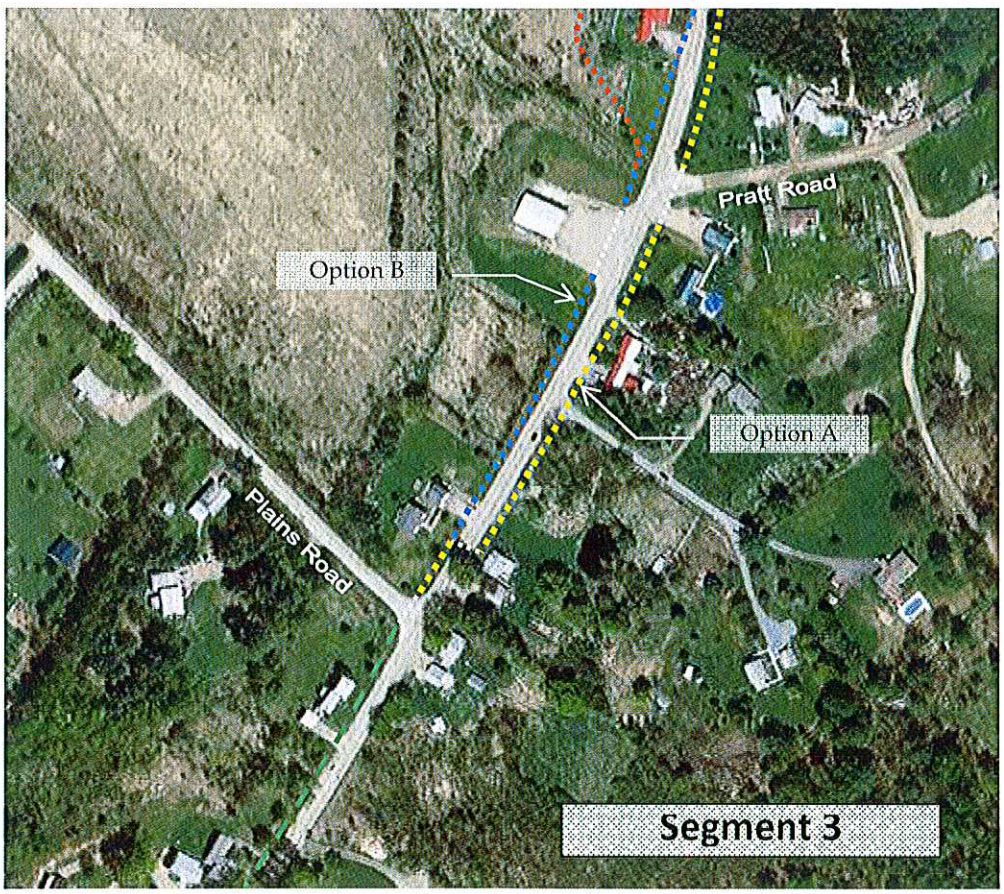
The road crossing at Lee River Road and the two constrained areas at the top of the hill make this option less desirable than Option A. Furthermore, Option A has a direct connection to Pratt Road, whereas Option B is across Browns Trace Road from Pratt Road.

Option C Alignment

The Option C alignment entirely avoids the historic properties by taking a cross country route behind the properties. The property is owned by the Underhill / Jericho Fire Department. The option would be dependent on obtaining their permission to cross the property. The property is currently in agricultural use, however the Fire Department is concerned over the negative impacts that the path could have on their ability to sell or develop the property. The path alignment that is depicted in the above Segment 2 figure follows the outskirts of the pastures, but it could be routed differently to appease the Fire Department.

Option C is considerably longer than Options A and B, but as a result it is also generally less steep. If allowed by the Fire Department this option would likely be preferred since it would avoid the severely constrained areas by the historic properties, and the path would be safely way from the road.

Segment 3 – Pratt Road to Plains Road

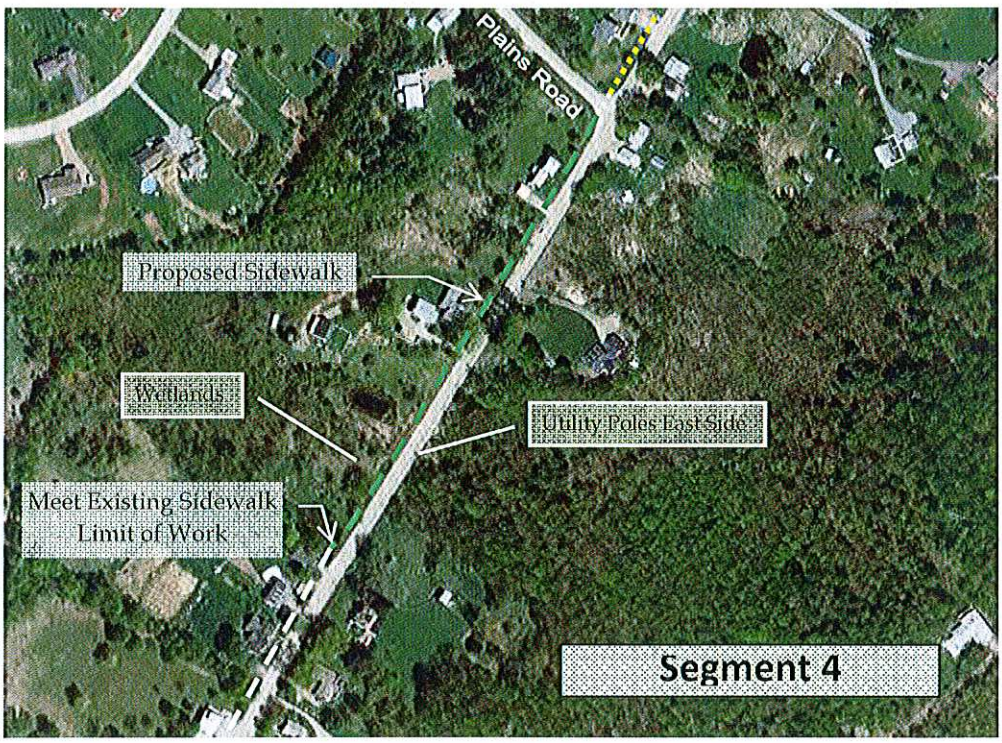


There are two shared use path options for this segment. The selection will be driven by which side of the road the path is on under Segment 2.

Option A passes in front of two residences, one of which is very close to the road. Option B crosses the wide Fire Department driveway and passes by one residence. Option B is somewhat constrained by wetlands that extend close to the road. To minimize impacts the path may need to be supported by a low retaining wall, and the width would be reduced to 8 feet in that area.

Option A is shown crossing Browns Trace Road just prior to Plains Road. The sight lines are good at that location and the crossing would be out of the Plains Road intersection area. The goal is to move the path to the west side by Plains Road since the east side becomes very difficult south of Plains Road.

Segment 4 – Plains Road to the Existing Sidewalk in Town Center



Segment 4 is very constrained on both sides by utility poles, wetlands and residences. The recommended solution in this segment is to extend the existing concrete sidewalk along the west side to Plains Road. This will provide a pedestrian connection to the residents of Plains Road as well as to the shared use path that reaches all the way to the MMU High School.

Another recommendation for this segment is to add 2 to 3 foot paved shoulders to Plains Road, where possible. This would provide better accommodations for cyclists

than currently exist. It is also recommended that the 25 MPH speed limit in the Town Center be extended to Plains Road to account for the fact that cyclists will be sharing the road with motorists until the start of the shared use path at Plains Road.

It is recommended that the new sidewalk include curbing for enhanced pedestrian safety and to signal motorists that they are now in a village setting and should slow down. The addition of curbing creates a need to install a closed drainage system, and that can become very costly if there are no convenient outlets. This would be preferable, however, to allowing the roadway runoff to cross an uncurbed sidewalk.

4

Assessment of Probable Costs

4.1 Introduction

In order to evaluate the feasibility of the proposed multimodal connections on a segment by segment basis it is first necessary to estimate the likely costs associated with the proposed improvements. At this early stage the costs are very conceptual in nature, as is the design. They will, however, provide an overall order of magnitude guide as well as a way to compare individual alignment options.

4.2 Cost Estimating Methodology

The enclosed cost estimates are based on average unit construction item costs as well as average linear foot costs for similar bike and pedestrian facilities in Vermont and New Hampshire. Linear foot costs can be dramatically affected by the setting and the difficulty of construction. For example, the cost estimates use a linear foot cost of $100 / foot for construction of a 10 foot wide paved shared use path. That cost includes an allowance for earthwork, drainage, traffic control, signs, railings, landscaping and other necessary items of work for a typical path. Sections of path through difficult urban or high traffic conditions will obviously cost more than paths through wide open rural conditions. The Jericho project falls somewhere in the middle since there are a variety of challenges within the corridor. It will not be until subsequent stages of design, permitting and right-of-way negotiations that the costs will be predicted with better certainty.

The enclosed costs do include assumed costs for engineering, permitting and project oversight. Right-of-way costs are <u>not</u> included since they are impossible to predict at this early stage.

4.3 Cost Estimating Results

The attached table represents a segment by segment breakdown of costs based on the calculated cost per linear foot for each typical section within the corridor. The shared use path costs are based on the paved path alternative since it best satisfies the project Purpose and Need. The granular path alternative would be only marginally less expensive than the paved path.