

## TECHNICAL MEMORANDUM

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Pref. Alt. Description and Potential Impacts, In-Town Bike Path & Sidewalk Imp. Proj. – Nantucket, Massachusetts

**REF:** MAX-2005128.00

**DATE:** January 10, 2007

**TO:** Mr. T. Michael Burns  
Nantucket Planning & Economic Development Commission  
16 Broad Street  
Nantucket, Massachusetts 02554

**FROM:** Ms. Rebecca S. Williamson, P.E., Project Manager  
Mr. Joseph Johnson, P.E., Engineer

**RE:** Technical Memorandum  
Preferred Alternative Description and Potential Impacts  
In-Town Bike Path & Sidewalk Improvement Project  
Nantucket, Massachusetts

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Greenman-Pedersen, Inc. (GPI) has prepared this synopsis to accompany the Preferred Alternative Design Concept for the In-Town Bike & Sidewalk Improvement Project in Nantucket, Massachusetts. GPI has completed Phase I of this project which includes the field survey for the project as well as the development of four conceptual alternatives for the bike path. The concepts were provided to the County Commission and the Nantucket Planning Board for comment and guidance in the selection of a preferred alternative. Based on input provided by the Town, an initially Preferred Alternative was established. Phase II of this project will involve the final design of the Preferred Alternative. This document describes the alternatives that were considered and the preferred alternative. Discussion of the preferred alternative includes potential project impacts in terms of right-of-way, private property and environmental permitting. Design related concerns are also discussed.

**GPI** Greenman-Pedersen, Inc.

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### DESCRIPTION OF CONCEPTUAL ALTERNATIVES

In general, the intent of the project is to provide safe and convenient bicycle/pedestrian access between the downtown core of Nantucket and the outlying bicycle paths. The project limits are along Orange Street and Washington Street between the Milestone Rotary and the proposed Transportation Center at the corner of Washington Street and Commercial Wharf in the downtown core. Currently bicyclists are required to “Share the Road” with vehicles while sidewalks for pedestrians are not continuous and are located sporadically throughout the project.

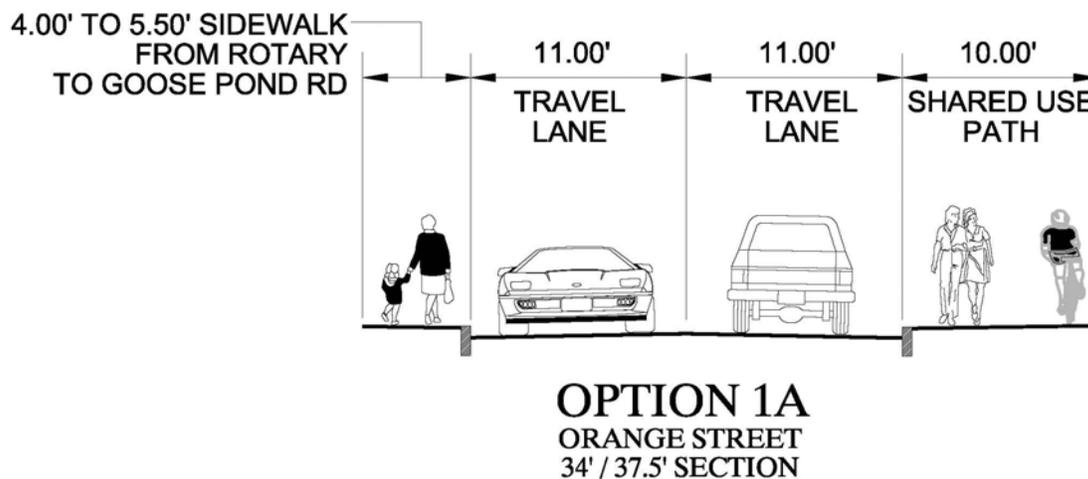
The concept alternatives that were developed consist of two basic alignments. One alignment runs from the Milestone Rotary westerly along Orange Street to Union Street, Francis Street and northerly along Washington Street to its intersection with Commercial Street.

The second alignment utilizes abandoned railroad right-of-way to connect Orange Street with Washington Street thus avoiding work along Union Street and Francis Street as described in the first alignment. The land adjacent to the abandoned railroad right-of-way consists of salt marsh on one side and wetlands on the other.

Both alignments utilize variations of either a separate bicycle path facility or shared vehicular/bicycle travel lanes. Following is a short description of each alternative and the associated advantages and disadvantages of each.

#### Option 1A:

This concept consists of a 10’ shared-use recreational path that is independent of vehicular traffic (i.e., separated from vehicle travel lanes via curbing). Adjacent roadways have minimum travel lane widths of 11’. This concept utilizes the alignment that runs along Orange Street, the abandoned railway and Washington Street. A concept plan is provided in the Appendix. Following is the proposed cross section along Orange Street.



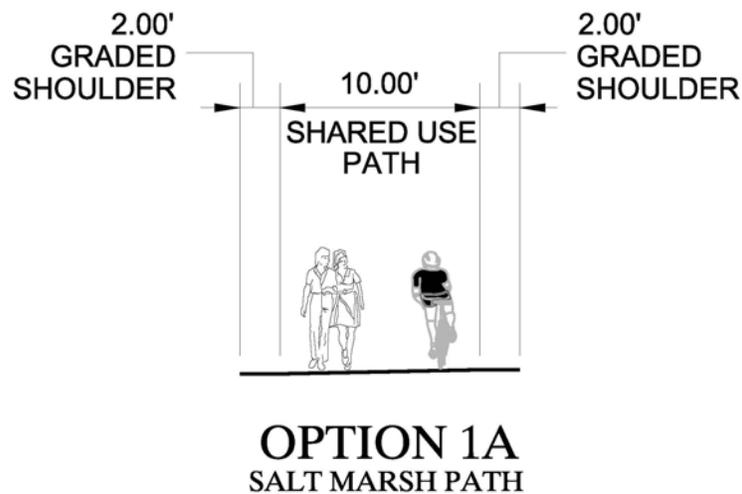
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As shown in the cross section, the 10' shared use bike path is separated from vehicular traffic, but is adjacent to the roadway. This is not always a desirable situation when bicycle traffic is heading towards oncoming vehicular traffic. Ideally, when more right-of-way is available, a grass strip (5' to 7' wide) or physical buffer would be provided between the path and vehicular travel lane to prevent potential collisions and promote a level of comfort among drivers and trail users alike. Unfortunately the right-of-way width along this project does not lend itself towards the proper separation of the roadway and the path.

The proposed cross section along Orange Street requires the roadway alignment to shift to the south to make room for the path on the northerly side. A concrete sidewalk is proposed along the southerly side of Orange Street while its width varies depending on the remaining available right-of-way.

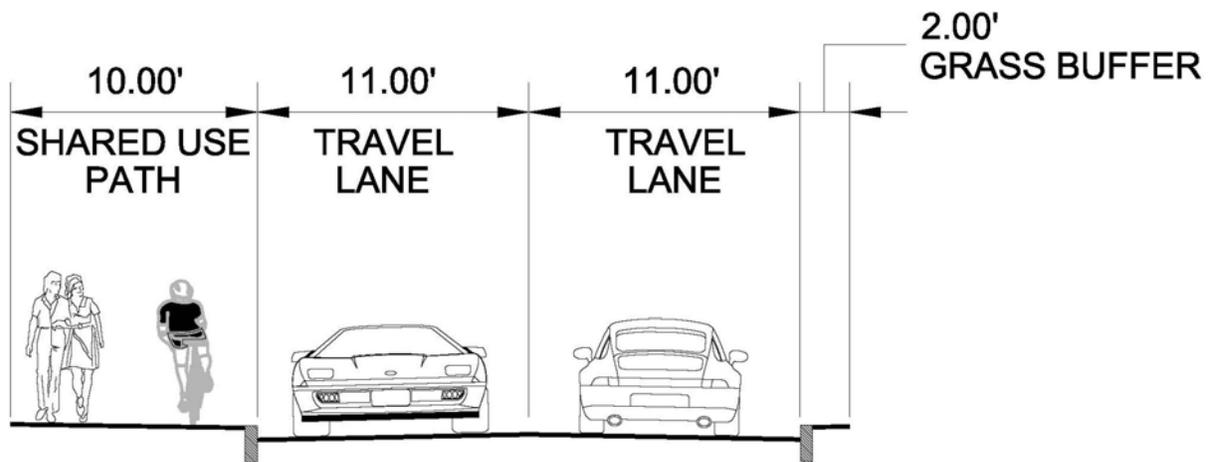
Heading northwesterly along Orange Street, the path takes a turn onto Goose Pond Road for a short distance before heading onto the abandoned railway through the salt marsh. Following is the cross section proposed through the salt marsh.



At the northerly terminus of the abandoned railway/salt marsh, the path enters a section of Washington Street that carries a very low volume of vehicles. Along this portion of Washington Street (from railway to Francis Street) the bicyclists/pedestrians are required to share the roadway with motor vehicles. From Francis Street to the northerly project limit at Commercial Street, the following cross section is proposed along Washington Street.

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### OPTION 1A WASHINGTON STREET 34' SECTION

The 10' shared path is located along the southerly side of Washington Street adjacent to the vehicular travel lane. The existing right-of-way width will not accommodate a sidewalk on the northerly side of Washington Street.

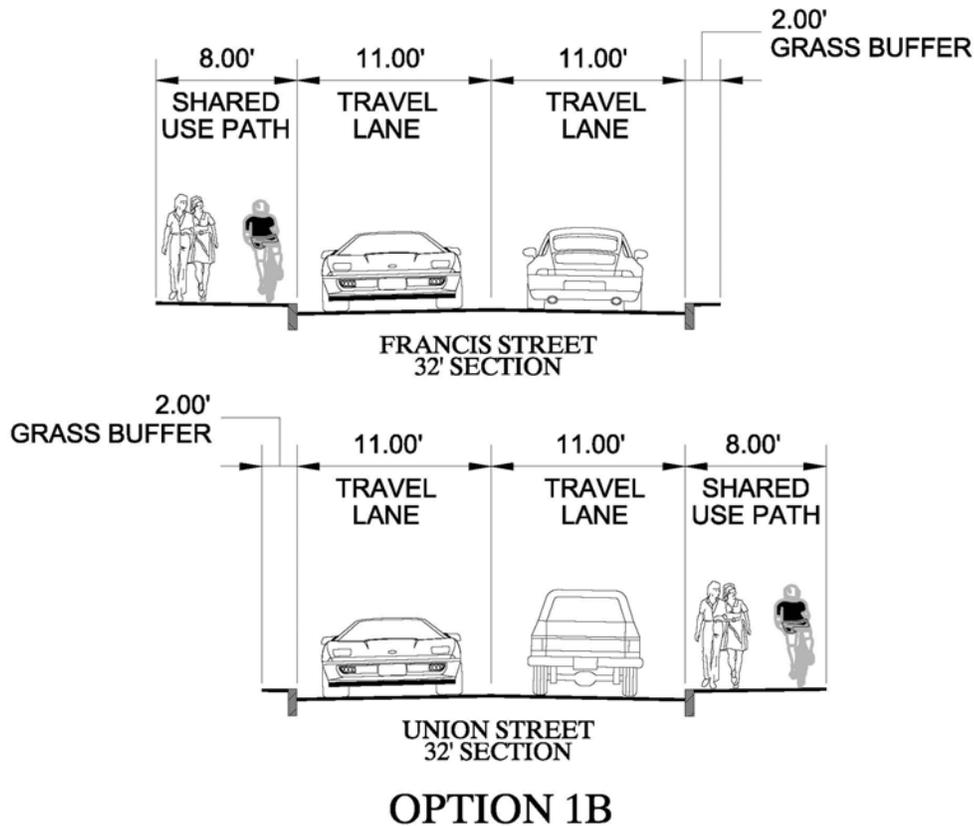
Of all the concepts, Option 1A has the least encroachment on private property and has the lowest construction cost. It is also anticipated that wetland impacts will be minimal depending on the type of construction used for the path along the abandoned railway. This concept does shift the roadway alignment of Orange Street closer to abutting properties on one side of the roadway and does not provide the ideal separation of the path and vehicular traffic.

#### Option 1B:

This concept consists of a shared-use recreational path that is independent of vehicular traffic (i.e., separated from vehicle travel lanes via curbing). The path is 10' wide along Orange Street and Washington Street. The proposed path is 8' wide along Union Street and Francis Street. Adjacent roadways have minimum travel lane widths of 11'. This concept does not utilize the abandoned railway alignment. A concept plan is provided in the Appendix. The proposed cross sections along Orange Street and Washington Street are identical to those presented previously under Option 1A. Following are the proposed cross sections for Union Street and Francis Street.

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Along Francis Street the path is located along the westerly curbline while the path is located along the northeasterly curbline of Union Street. No pedestrian/bicycle accommodations are proposed on the opposite curblines along Francis Street and Union Street.

Similarly to Option 1A, it is less than desirable to have bicycle traffic heading towards oncoming vehicular traffic without a grass strip or a physical barrier of some sort. Unfortunately the right-of-way width along this project does not lend itself towards the proper separation of the roadway and the path.

Similarly to Option 1A, the Orange Street roadway alignment is shifted to the south to make room for the path on the northerly side. A concrete sidewalk is proposed along the southerly side of Orange Street while its width varies depending on the remaining available right-of-way.

The 10' shared path is located along the southerly side of Washington Street adjacent to the vehicular travel lane. The existing right-of-way width will not accommodate a sidewalk on the northerly side of Washington Street.

Option 1B provides a continuous path along the project adjacent to the roadways and does not utilize the abandoned railway alignment. It is anticipated that wetland alteration will be required

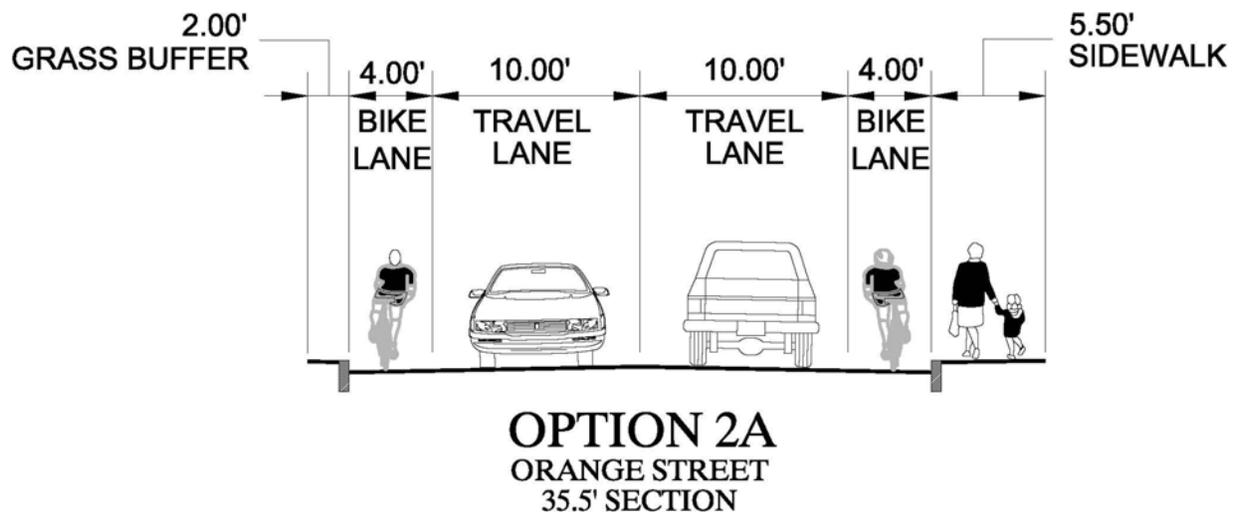
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in two locations with this Option. This Option also has severe widening impacts on private property along Union Street, Francis Street and a narrow section of Orange Street. This concept does shift the roadway alignment of Orange Street closer to abutting properties on one side of the roadway and does not provide the ideal separation of the path and vehicular traffic.

### Option 2A:

This concept consists of striped bicycle lanes along Orange Street and Washington Street while also using the abandoned railway alignment through the salt marsh. A concept plan is provided in the Appendix. Following is the proposed cross section along Orange Street.



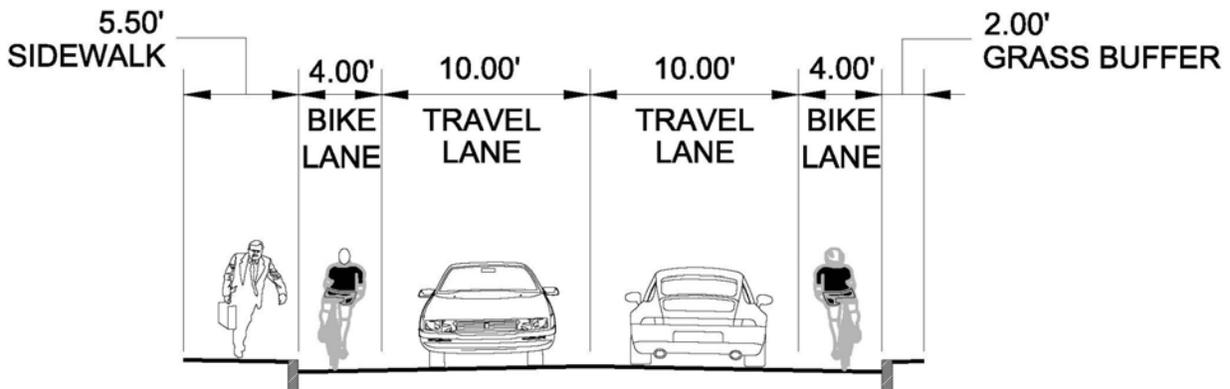
As shown in the cross section, 10' motor vehicle lanes are proposed with 4' bicycle lanes. A sidewalk is proposed along the northerly side of Orange Street. The existing right-of-way width along Orange Street does not allow for a sidewalk on the southerly side of Orange Street. The proposed cross section along Orange Street requires the roadway alignment to shift to the south to make room for the sidewalk on the northerly side.

Heading northwesterly along Orange Street, bicyclists and pedestrians will turn onto Goose Pond Road for a short distance before heading onto the abandoned railway through the salt marsh. The cross section proposed through the salt marsh is identical to that shown for Option 1A.

At the northerly terminus of the abandoned railway/salt marsh, the path enters a section of Washington Street that carries a very low volume of vehicles. Along this portion of Washington Street (from railway to Francis Street) the bicyclists/pedestrians are required to share the roadway with motor vehicles. Following is the proposed cross section along Washington Street from Francis Street to the northerly project limit at Commercial Street.

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### OPTION 2A WASHINGTON STREET 35.5' SECTION

The concrete sidewalk is proposed along the southerly side of Washington Street. The existing right-of-way width will not accommodate a sidewalk on the northerly side of Washington Street. The alignment of Washington Street is shifted to the north to make room for the increased roadway width as well as the proposed sidewalk.

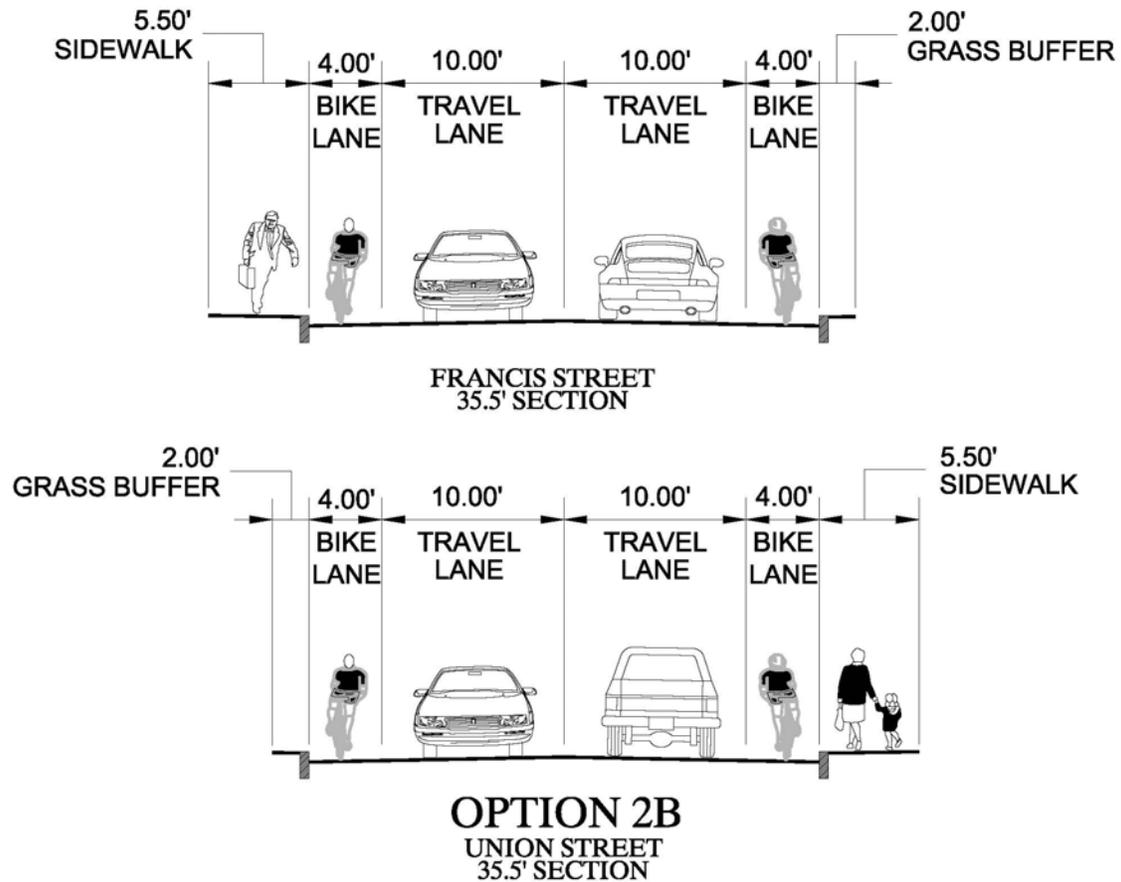
Option 2A provides a more desirable configuration of a striped bicycle lane as opposed to the off road facilities proposed in Options 1A and 1B. Generally off road paths are preferred as long as a buffer from the adjacent roadway can be provided. Unfortunately the right-of-way width along this project does not allow for a buffer in Options 1A and 1B. It is anticipated that wetland impacts will be minimal depending on the type of construction used for the path along the abandoned railway. This concept does shift the roadway alignment of Orange Street and Washington Street closer to abutting properties on one side of the roadway.

#### Option 2B:

This concept consists of striped bicycle lanes along Orange Street, Union Street, Francis Street and Washington Street. This concept does not utilize the abandoned railway alignment. A concept plan is provided in the Appendix. The proposed cross sections along Orange Street and Washington Street are identical to those presented previously under Option 2A (10' motor vehicle lanes with 4' bicycle lanes). Following are the proposed cross sections for Union Street and Francis Street.

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As shown in the cross sections, 10' motor vehicle lanes are proposed with 4' bicycle lanes. Along Francis Street the proposed sidewalk is located along the westerly curblines. The proposed sidewalk is located along the northeasterly curblines of Union Street. No pedestrian/bicycle accommodations are proposed on the opposite curblines along Francis Street and Union Street.

Similarly to Option 2A, the Orange Street and Washington Street roadway alignments are shifted to make room for the proposed sidewalks. This places the roadways closer to abutting properties and reduces the existing buffer.

Option 2B provides continuous bike lanes along the project and does not utilize the abandoned railway alignment. Proposed is a more desirable configuration of a striped bicycle lane as opposed to the off road facilities as shown in Options 1A and 1B. It is anticipated that there will be wetland alteration in two locations with this Option. This Option also has widening impacts on private property along Union Street, Francis Street and a narrow section of Orange Street. This concept does shift the roadway alignment of Orange Street and Washington Street closer to abutting properties on one side of the roadway.

## **PREFERRED ALTERNATIVE**

Based on input from the Town, Option 2A was chosen as the preferred alternative for the project. Advantages and disadvantages of each option are provided in the Appendix. It appears that use of the abandoned railway alignment and proposing striped bicycle lanes provides the least impact to wetlands and abutters while providing the safest bicycle/pedestrian accommodations. The Preferred Alternative is provided in the Appendix.

Right-of-Way Impacts – Given the narrow width of right-of-way through the project area, Option 2A does have impacts to adjacent private property. Based on the conceptual design, it is estimated that 60% of the properties (42 properties) abutting the project will require a fee taking of some degree (approximately 9,500 sf of property taking project wide). Approximately 15% of the abutting properties (26 properties) will only require a temporary easement for construction while approximately 25% of the abutting properties (16 properties) will have no right-of-way impacts. Impacts to properties include driveway and slope grading, removal and resetting of fence and the removal and resetting of walls.

Environmental Permitting – With the implementation of Option 2A, wetland alteration may be necessary along the abandoned railway alignment. Depending on how the path is designed through the wetlands, different degrees of impacts result. An environmental assessment of Option 2A has been completed and is included in the Appendix.

Utility Concerns – The construction of Option 2A will require the relocation of approximately 16 utility poles along the project. Hydrants and drainage catch basins will also require relocation as a result of the proposed curblines locations. All manholes, water meters, water gates and any other surface installed utilities will require adjustment as well.

Design Concerns – The design of the path through the wetlands will need to be finalized as part of Phase II of the project. This may require the narrowing of this portion of the trail or other alternative treatments as discussed in the environmental assessment. Following are other design concerns along the project:

- Design should minimize impacts to abutting properties. Design may require resetting existing fences and walls, the replacement of existing landscaping features and rebuilding existing access points to building (i.e., stairs, walkways).
- Design of Washington Street from railway to Francis Street should incorporate signing and striping to have pedestrians/bicyclists share the road.
- There are pinch points along the project where abutting properties have existing immovable features that will encroach on the sidewalk. These encroachments will need to be minimized and the design will have to be advanced in accordance with guidelines compliant with the Americans with Disabilities Act regulation.
- Proper signing should be utilized along Orange Street to direct bicyclists/pedestrians along the Goose Pond Road/marsh path.

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- Striping should be utilized at Goose Pond Road to separate bicyclist/pedestrian traffic from motor vehicles.
- Portions of the proposed sidewalk along the north side of Orange Street are not continuous. These sections should either be justified or eliminated from the project. Consideration could also be given to midblock crossings where sidewalks are terminated.
- Guide signing at the project limits should be considered to direct bicyclists to existing nearby bicyclist routes/paths.

## **CONCLUSIONS AND RECOMMENDATIONS**

The existing roadway widths throughout the project limits are very narrow and are unsuitable to safely accommodate pedestrians and bicyclists. It is recommended that Option 2A (the preferred alternative) be presented publicly for comment and be advanced to final design and eventual construction. The proposed project will have impacts to abutting properties and wetlands but will enhance public safety and positively contribute to the already existing network of shared-use recreational paths in Town.

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***APPENDIX***

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**CONCEPTUAL ALTERNATIVE - OPTION 1A  
CONCEPTUAL ALTERNATIVE - OPTION 1B  
CONCEPTUAL ALTERNATIVE - OPTION 2A  
CONCEPTUAL ALTERNATIVE - OPTION 2B  
CONCEPT COMPARISON/ANALYSIS  
PREFERRED ALTERNATIVE  
ENVIRONMENTAL ASSESMENT**

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**CONCEPTUAL ALTERNATIVE - OPTION 1A**

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**CONCEPTUAL ALTERNATIVE - OPTION 1B**

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**CONCEPTUAL ALTERNATIVE - OPTION 2A**

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**CONCEPTUAL ALTERNATIVE - OPTION 2B**

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**CONCEPT COMPARISON/ANALYSIS**

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## Nantucket In-Town Bike Path Concepts

### Rating Scale

1	2	3	4	5
More Desirable		Average		Less Desirable

	Option 1A	Option 1B	Option 2A	Option 2B
<b>Bicycle Safety</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>4</b>
	<p><u>Notes:</u> Options 1A and 1B consist of a shared use bicycle/pedestrian path off the roadway which makes them safer than Options 2A and 2B which consist of bicycle lanes on the roadway.</p>			
<b>Construction Cost</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>5</b>
	<p><u>Notes:</u> Options 1A and 2A would cost significantly less than options 1B and 2B because part of the bicycle route would be directed through the salt marsh as opposed to reconstructing and widening Union St., Francis St. and an additional section of Orange St. through town.</p>			
<b>ROW Impacts</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>5</b>
	<p><u>Notes:</u> All of the options would have significant right of way impacts, however routing the bicycle route through the salt marsh as in Options 1A and 2A would yield much less impacts than in Options 1B and 2B.</p>			
<b>Environmental Impacts</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>5</b>
	<p><u>Notes:</u> 2 Wetland Alterations would be required with Options 1B and 2B while no alterations are anticipated with Options 1A and 2A.</p>			

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**PREFERRED ALTERNATIVE**

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**ENVIRONMENTAL ASSESMENT**

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## Preferred Bike Path Option

The preferred option for the proposed bike path, previously identified as *Options 1/1A and 2/2A*, route the 10-foot wide pathway along the abandoned railroad bed from Goose Pond Road to Washington Street. The elevated railroad bed traverses wetlands: Freshwater Wetlands are located on the leeward or interior side, and salt marsh is located on the seaward facing side. Additionally, the top of the seaward facing embankment constitutes the top of the Coastal Bank.

This routing option was selected in part because direct alteration to wetland resource areas can be avoided and/or minimized to the greatest extent practicable; other alignment options have both physical and environmental constraints. In accordance with the regulations at 310 CMR 10.55(4), the various design alternatives to the preferred option are discussed below.

### Alternative Design Options

Proposed wetland alteration is necessary to widen the existing, nearly level surface, requiring placement of fill on the side slopes. Due to the steepness of these slopes, any fill on these slopes would unavoidably result in alteration to the wetland resource areas. Within the proposed bike path alignment along the abandoned railroad bed, various options on path widths were considered. The first option involves a path width of 10 feet with 2-foot shoulders on both sides, giving a total right of way width of 14 feet. The second option involves a path width of 8 feet with 2-foot shoulders on both sides, giving a total right of way width of 12 feet. The third option is a 10-foot wide wooden boardwalk with safety barriers on each side. Based on these options the impact areas to the adjacent wetlands were determined (see Table 1).

Table 1. Summary of different options for path widths along the preferred bike path route and associated wetland impacts.

Design Options		Wetland Impact Area (s.f.)	Coastal Bank Impact (s.f.)
1	10-ft. wide, 2-ft. shoulder	1,600	1,400
2	8-ft. wide, 2-ft. shoulder	800	1,200
3	14-ft. wide boardwalk	0	0

Several assumptions were made in the determination of the impact areas. The proposed centerline grade of the bike path would mimic the existing footpath elevation. Any cutting or filling would have a side slope of 2 (horizontal) to 1 (vertical) feet (i.e., 2:1 slopes). Due to the sensitive nature of the seaward side of the abandoned railroad bed, all estimated wetland impacts would occur on the leeward (interior) side of the footpath, resulting in unavoidable alteration to the freshwater Bordering Vegetated Wetland (BVW) surrounding Consue Springs. Alterations on the seaward side are limited to the Coastal Bank. For the first two design options, the wetland resource impacts are due to the side slopes required to maintain the stability of the proposed width of the pathway and not the actual pathway or shoulder. The boardwalk option would not result in impacts to wetland resource areas because the width between the wetland boundaries is at least 10 feet over the existing footpath. Although the boardwalk option does not have any wetland impact areas, the cost to build and maintain a wooden boardwalk that is up to 560 linear feet in length, as well as the safety concerns of an elevated section of the bike way, should be considered when selecting this design option.

## Regulatory Implications

Any alteration to these wetland resource areas or within the 100-foot jurisdictional buffer zone will require review and permitting under the Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40),

its implementing Regulations (310 CMR 10.00), and the Town of Nantucket Wetlands By-law (Chapter 136) and any associated local regulations.

No work is proposed in any portion of salt marsh, as any proposed salt marsh alteration would require additional permitting, requiring a 401 Water Quality Certification from the Massachusetts Department of Environmental Protection (DEP), as well as review through the Massachusetts Environmental Policy Act, M.G.L. c. 30 §§ 61 through 62H, inclusive (MEPA). However, alteration of a Coastal Bank is one of the review thresholds requiring submittal of an Environmental Notification Form in accordance with MEPA; see 301 CMR 11.03(3)(b)(a)] should State funding is used to implement the proposed project or if additional State or federal permitting is required. A list of the potential wetland-related permits required for construction of the preferred bike path option follows.

#### Massachusetts Wetlands Protection Act

As the proposed project will result in the unavoidable alteration of BVW and Coastal Bank, as well as within the coastal flood zone (Land Subject to Coastal Storm Flowage or LSCSF), the Town will be required to obtain a permit (Order of Conditions or OOC) from DEP, as implemented through the Nantucket Conservation Commission. In addition, the Nantucket Conservation Commission must issue an OOC under the local Nantucket Wetlands Bylaw. This may be done concurrently with the OOC issued under the Massachusetts *Wetlands Protection Act*.

#### Massachusetts Environmental Policy Act

Should the project require the use of State funds, the project will require submittal of an Environmental Notification Form (ENF) through the Massachusetts Environmental Policy Act (MEPA) under regulation 310 CMR 11.03(3)(b)f. for “alteration of coastal dune, barrier beach or coastal bank.”

### **Mitigation Measures**

#### Erosion and Sedimentation Control

The applicant proposes to protect the downgradient wetland resource areas by implementing a sedimentation and erosion control program during and immediately following construction. A sediment and erosion control barrier consisting of siltation fencing will be placed at the limit of proposed site grading and along the seaward facing slope. Erosion control barriers will remain in place and will be maintained in good condition until all soils have been stabilized.

#### Wetland Mitigation

As stated above, proposed alterations within the interior BVW will require review and permitting through the Conservation Commission. Minimal, unavoidable alterations would occur with at least two of the three practicable design options, and the preferred design option would result in the loss of up to 1,600 s.f. of BVW. It should be noted that the vegetative community within the BVW is dominated by common reed (*Phragmites australis*) and Japanese knotweed (*Polygonum cuspidatum*), two aggressively colonizing, non-native species, identified by the Massachusetts Invasive Plant Advisory Group (MIPAG) as invasive (see Photos 1 and 2). Wetland replacement in close proximity to this wetland wouldn't be advisable as a viable mitigation option.



Photo 1. View of the Consue Springs vegetative community dominated by common reed (*Phragmites australis*).



Photo 2. View of existing trail along abandoned railroad bed (southern aspect). Consue Springs is to the right. The vegetative community dominated along the side slopes of the embankment between Consue Springs and the salt marsh associated with Nantucket Harbor is dominated by *Phragmites* and Japanese knotweed (*Polygonum cuspidatum*).

### Concurrent Project

The Nantucket Land Council in cooperation with the Town of Nantucket is currently advocating a separate project in the same vicinity through the Massachusetts Wetlands Restoration Program (MWRP). A study concluded in June 2006 examined the hydrologic and hydraulic characteristics of the tidal culverts that connects Nantucket Harbor with Consue Springs, examining the culvert replacement options that may improve tidal flushing and mixing between Consue Springs and Nantucket Harbor. Currently, the existing twin 18-inch culverts within the abandoned railroad bed that connect Consue Springs with Nantucket Harbor appear to restrict tidal exchange between these two water bodies. This study considered two potential restoration scenarios to improve tidal fluctuations within Consue Springs that involve lowering the culvert. Both scenarios involve replacing the existing 18-inch pipes with a box culvert having a two-foot high by three-foot wide opening and a flat slope.

Due to the nature of the existing BVW, it is our professional option that improved tidal exchange will provide better mitigation than the more traditional 1:1 physical wetland replacement. The culvert replacement project will result in a vast improvement to the wetland areas, both the impacted, *Phragmites*-dominated BVW, and within the salt marsh, and will improve the ability of these resource areas to protect the interests under the Massachusetts *Wetlands Protection Act* and the Nantucket Wetlands Bylaw. We suggest that the culvert replacement project will provide ample mitigation for the loss of up to 1,600 s.f. of highly degraded BVW. However, should the issuing authority require wetland replacement, the applicant will propose a wetland replacement area in accordance with the performance standards at 310 CMR 10.55(4)(b)(1 through 7).

### Coastal Bank Impacts

The abandoned railroad embankment, while physically meeting the regulatory definition of a Coastal Bank, does not represent a naturally occurring physical feature in the traditional sense. The Coastal Bank is densely vegetated with non-native species, such that it is unlikely that the Coastal Bank provides a sediment source to downgradient coastal beaches, coastal dunes, or barrier beaches. Alterations to the Coastal Bank will involve placement of fill along approximately 225 l.f. (up to 1,400 s.f.), due to existing contours and the need to provide a safe passage along this segment of the proposed bike path. These alterations are not anticipated to adversely affect the ability of the Coastal Bank to provide storm damage prevention and flood control.

The existing vegetative community provides limited wildlife habitat value. Suggested mitigation for alterations to the Coastal Bank include revegetation with a native seed mix to stabilize the disturbed slope and enhancement plantings with native shrubs and grasses to provide increased habitat value. Recommended species include beach plum (*Prunus maritima*), bayberry (*Myrica pensylvanica*), and switchgrass (*Panicum virgatum*), among other species.

The tidal restriction removal project will serve the wetland interests and values, as specified in the Massachusetts *Wetlands Protection Act* and the local bylaw pertaining to wetland resource area protection, by contributing at a minimum to the prevention of pollution, protection of land containing shellfish, protection of marine fisheries, the protection of wildlife habitat, recreation, and aesthetics. The project will also serve these interests and values by meeting the performance standards for the protected wetland resource areas in or near the project location.