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EXECUTIVE SUMMARY

The North Suburban Regional Bicycle Transportation Plan was initiated by the Town of North Reading to construct a regional bicycle transportation system in the Town of Lynnfield, North Reading, Reading, Wakefield and Wilmington.

The project was subsequently approved for funding by the Massachusetts Highway Department (MassHighway) to include conceptual and final engineering under the Transportation Enhancements Program (TEP). Phase I includes \$104,000 to prepare a master plan for use by the Regional Bikeway Committee (RBC). Phase II includes \$210,000 for preliminary and final design of selected segments.

Master Plan

Development of the master plan for the RBC included data collection, field investigations, organizing town bicycle committees, public participation and selection of trail segments to be included in the system.

As a result of meetings with (and subsequent recommendations) from the five town bicycle committees, the following bike routes were identified:

<u>Bike Route</u>	<u>Description</u>
1	Central Street (North Reading) to Peabody City Line
2	Marion Street (Wilmington) to Central Street (North Reading)
3	North Wilmington MBTA Station to Andover Town Line
4	Wilmington Center to North Wilmington MBTA Station
5	Marion Street (Wilmington) to Woburn Town Line
6	Reading Center to North Reading Center
7	North Reading Center to North Andover Town Line
8	Wakefield Center to Peabody City Line via Railroad Right-Of-Way
9	Lowell Street (Lynnfield) to Abandoned Railroad Right-Of-Way via Water Co.
10	Wakefield Center to Haverhill Street (Reading)
11	Billerica Town Line to Wilmington Center
12	Woburn Town Line to Reading Center
13	Woburn Town Line to Tewksbury Town Line
14	Stoneham Town Line to Wakefield Center
15	Reading Center to Wakefield Center
16	Melrose Town Line to Wakefield Center
17	Wakefield Center to Saugus Town Line
18	Wilmington Center to Reading Center
19	Chestnut St. (Lynnfield) to Middleton Town line via Lowell/Main St.

Each route was separated into segments based upon location within the five towns as follows:

Lynnfield:	L-1, L-8, L-9, and L-19
North Reading:	NR-1, NR-2, NR-6, and NR-7
Reading:	R-6, R-10, R-12, R-15, and R-18
Wakefield:	WK-8, WK-10, WK-14, WK-15, WK-16, and WK-17
Wilmington:	WM-2, WM-3, WM-4, WM-5, WM-11, WM-13 and WM-18

Each on-road segment was evaluated based on several factors with a primary focus on functional classification and traffic use, connectivity, available shoulder width and construction cost. Each off-road segment was also evaluated upon several factors with a primary focus on right-of-way, connectivity, environmental impact and construction cost.

As a result of over two years of data collection, field investigations, several RBC meetings, several community bicycle committee meetings and one public informational meeting, resulting in several route recommendations and revisions, the segments are summarized as follows:

Lynnfield

Segment L-1:	Not Recommended
Segment L-8:	Recommended
Segment L-9:	Not Recommended
Segment L-19:	Not Recommended

North Reading

Segment NR-1:	Recommended
Segment NR-2:	Recommended
Segment NR-6:	Recommended
Segment NR-7:	Recommended

Reading

Segment R-6:	Recommended
Segment R-10:	Recommended
Segment R-12:	Recommended
Segment R-15:	Recommended
Segment R-18:	Recommended

Wakefield

Segment WK-8:	Recommended
Segment WK-10:	Recommended
Segment WK-14:	Recommended
Segment WK-15:	Recommended

Segment WK-16: Recommended
Segment WK-17: Recommended

Wilmington

Segment WM-2: Recommended
Segment WM-3: Recommended
Segment WM-4: Recommended
Segment WM-5: Recommended
Segment WM-11: Not Recommended
Segment WM-13: Recommended
Segment WM-18: Recommended

Phase II Design

The Phase II design includes \$210,000 to develop final design plans for selected segment(s) included in the Master Plan. Although a majority of the segments included in this study were recommended, it is not feasible to design all of these segments with the available resources. As a result of consideration of each segment with respect to impact, feasibility, function and estimated construction cost, the following segments are recommended to be included as part of the Phase II design:

Segment L-8

Segment L-8 will add mileage to the bikeway system and will connect to the Peabody segment already under design as a future rail-trail. The MBTA is willing to cooperate with the Town of Lynnfield by entering a 99-year lease. The project will also involve environmental permitting, which may include preparation of an Environmental Notification Form, Notice of Intent, Water Quality Certificate and 404 permit.

Segment NR-1, NR-2 and WM-2

Segments NR-1, NR-2 and WM-2 are located along Route 62, which is currently being widened as part of a safety improvement project funded by MHD. Incorporating new “share the road” signs and pavement markings (where necessary) along this corridor will require minimal design effort and encourage use by pedestrians and bicyclists.

Segment R-10, a portion of Segment R-6, and a portion of Segment NR-6

As a result of a meeting held on May 30, 2003, the RBC recommended the Phase II design include sign/pavement marking and shoulder improvements along Haverhill Street in the Town of Reading and North Reading. The improvements will begin at the rotary intersection of Route 129 and Route 128 in the Town of Reading and travel northerly along Haverhill Street into the Town of North Reading before terminating at the intersection of Haverhill Street and Route 62. As a result of recent roadway improvements along Haverhill Street in the Town of Reading from the rotary to Franklin Street, which included shoulder widening, pavement overlay and new

pavement markings, the only bicycle accommodation improvements required along this section will be the installation of “share the road” and “pedestrian crossing” signs. The section of Haverhill Street from Franklin Street in the Town of Reading to the intersection of Route 62 in the Town of North Reading (approximately 7500 feet), will require approximately 1 foot of shoulder widening, application of a new solid white edge line and installation of “share the road” and “pedestrian crossing” signs.

The design of these segments will require preparation and submission of the pre-application and final application to the Enhancement Steering Committee and subsequent approval from the Federal Highway Administration and MassHighway before proceeding to the 25%, 75%, 100% and PS&E design submissions to MassHighway.

1.0 INTRODUCTION

1.1 Background

In 1997 the Town of North Reading prepared and submitted an application for funding to the Metropolitan Area Planning Council (MAPC) to construct The Regional Bicycle Transportation System in the Town of Lynnfield, North Reading, Reading, Wakefield and Wilmington. The project was subsequently approved for funding by the Massachusetts Highway Department (MassHighway) for conceptual and final engineering under the Transportation Enhancements Program (TEP). The original Enhancement Program funding of \$314,000 included \$104,000 for Phase I master plan and \$170,000 for Phase II design, and \$40,000 for Phase II construction of a “pilot” project. However, due to a recent change in funding requirements by the Federal Highway Administration, the original allocation was revised to include \$104,000 for Phase I master plan and \$210,000 for Phase II design.

The five communities have agreed the Town of North Reading will serve as administrator for this project. Each community representative will be referred to collectively as the Regional Bikeway Committee (RBC).

The proposed project will enhance the function, amenity, safety, efficiency, accessibility, and other aspects of the inter-modal transportation system for the five communities as well as meeting regional and statewide objectives. Specifically, the North Suburban Regional Bicycle Transportation System will achieve the following:

- Increase non-motorized access to commuter rail stations in Reading, Wilmington and Andover, reducing parking demand at these facilities.
- Provide direct connections to several area bikeway systems, including the Minuteman Commuter Bikeway, the Bay Circuit Trail and Pennacook Trail, and for the proposed Border to Boston Bikeway.
- Serve as a link between the business community, recreational facilities, schools, parks and special attractions, while aiding in the reduction of local traffic congestion.
- Design, construct and maintain bike routes that comply with current federal and state guidelines.

1.2 Data Collection And Field Investigation

Property data for this report include town assessor maps, property plans and deeds for privately owned parcels impacted by the proposed master plan. This report does not include documentation of proposed routes within public ways since there is no impact to right-of-way as a result of shared roadways.

Traffic data include vehicle volumes where available and applicable. Accident data include reports dating back three years (2000, 2001, 2002) at non-signalized intersections along proposed routes.

Field work included driving or walking the proposed routes, recording existing pavement or trail widths, observing existing conditions, photos, road use, traffic volumes (observed), grades, etc.

1.3 Proposed Bike Route Alternatives

The North Suburban Regional Bicycle Transportation System includes several bike routes throughout the Town of Lynnfield, North Reading, Reading, Wakefield and Wilmington. Although a majority of the routes are along existing streets (Signed Shared Roadway), several alignments are located on former railroad right-of-way and one is along the Historic Middlesex Canal System (Shared Use Trail).

Refer to the Color Plan, located in a clear plastic sleeve at the back of this report, for the limits of the five participating towns and proposed numbered bike route alternatives within these towns. Although several routes are located entirely within the limits of one town, there are many that cross into other towns. As a result and for purposes of this report, the bike routes are designated as follows:

- Each town has been assigned a letter(s); ‘L’ for Lynnfield, ‘NR’ for North Reading, ‘R’ for Reading, ‘WK’ for Wakefield, and ‘WM’ for Wilmington.
- Each bike route has been assigned a number from one (1) to nineteen (19).
 - Each segment of the bike route within each town has therefore been identified with a letter and number. For example, the segment of Route One (1) in Lynnfield has been identified as L-1, the segment of route one (1) in North Reading as NR-1 and so forth.

The following bike routes have been identified for this study:

<u>Bike Route</u>	<u>Description</u>
1	Central Street (North Reading) to Peabody City Line
2	Marion Street (Wilmington) to Central Street (North Reading)
3	North Wilmington MBTA Station to Andover Town Line
4	Wilmington Center to North Wilmington MBTA Station
5	Marion Street (Wilmington) to Woburn Town Line
6	Reading Center to North Reading Center
7	North Reading Center to North Andover Town Line
8	Wakefield Center to Peabody City Line via Railroad Right-Of-Way
9	Lowell Street (Lynnfield) to Abandoned Railroad Right-Of-Way via Water Co.
10	Wakefield Center to Haverhill Street (Reading)
11	Billerica Town Line to Wilmington Center
12	Woburn Town Line to Reading Center
13	Woburn Town Line to Tewksbury Town Line
14	Stoneham Town Line to Wakefield Center
15	Reading Center to Wakefield Center
16	Melrose Town Line to Wakefield Center
17	Wakefield Center to Saugus Town Line
18	Wilmington Center to Reading Center

The following segments have been identified for this study:

Lynnfield:	L-1, L-8, L-9, and L-19
North Reading:	NR-1, NR-2, NR-6, and NR-7
Reading:	R-6, R-10, R-12, R-15, and R-18
Wakefield:	WK-8, WK-10, WK-14, WK-15, WK-16, and WK-17
Wilmington:	WM-2, WM-3, WM-4, WM-5, WM-11, WM-13 and WM-18

1.4 Definitions

Throughout this study, proposed bike route alternatives are referred to as specific types of bikeways. The American Association of State Highway and Transportation Officials (AASHTO) provides the following definitions in its *Guide for the Development of Bicycle Facilities* (1999 Edition):

Bikeway: Any road, street, path or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

Shared Use Path: A bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users.

Bike Lane: A portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.

Bike Route System: A system of bikeways designated by the jurisdiction having authority with appropriate directional and informational markers, with or without specific bicycle route numbers. Bike routes should establish a continuous routing, but may be a combination of any and all types of bikeways.

Signed Shared Roadway: A shared roadway which has been designated by signing as a preferred route for bicycle use. Also applies to a signed bike route.

Shared Roadway: A roadway which is open to both bicycle and motor vehicle travel. This may be an existing roadway, street with wide curb lanes, or road with paved shoulders.

Rail-Trail: A shared use path, either paved or unpaved, built within the right-of-way of an existing or former railroad.

1.5 Potential Users

Bicycles are a legitimate means of transportation and the purpose of a bikeway, or any roadway where bicycles may lawfully operate, is to serve as a transportation facility. The use of bicycles for commuting and other utilitarian purposes indicates that bicycles are being used for transportation purposes. One of the objectives of the Transportation Equity Act for the 21st Century (TEA-21) is to reduce automobile trips. The use of bicycles for commuting and other utilitarian travel, such as trips to schools, stores, libraries, recreational facilities, and other activity centers, clearly satisfies this objective. The North Suburban Regional Bicycle Transportation System will provide a means of improving bicycle travel in the five participating communities.

1.6 Intermodal Transportation

For the purposes of this report, Intermodal Transportation is defined as follows:

1. A single trip where one person uses two or more modes of transportation, such as someone bicycling to a transit stop, parking the bike at the stop, boarding a bus to another location, and walking to a final destination.
2. The shared use of a single transportation facility, such as a roadway that is shared by bicycles and motor vehicles, or a shared use path used by bicycles and walkers.

One of the goals of the TEA-21 program is to integrate all forms of transportation and improve the overall efficiency of existing facilities. The North Suburban Regional Bicycle Transportation System satisfies this objective with over 82% of the proposed routes being located along existing roads. By incorporating minor improvements, such as pavement markings and signs, these existing facilities can better support multiple modes of transportation and improve the overall efficiency of the entire system.

1.7 Safety

The proposed bike routes have been evaluated for compliance with current AASHTO design guidance, with the safety of bicyclists and pedestrians receiving the highest consideration. In cases where a route failed to meet minimum design standards, either safer alternative routes were selected and recommended to be included into the master plan, the specific design waiver required identified, or a possible solution was recommended for the selected route.

Existing non-signalized intersections along selected routes were not analyzed with respect to signal warrants due to this service being outside of the scope of this study.

In addition to providing a safe transportation system, it is important to educate users about personal safety. This will involve the initiation of a program sponsored by the five town communities to educate the public on riding safely in traffic, familiarization with typical bike directional and informational signs, and the importance of wearing a bicycle helmet.

1.8 Development And Evaluation Of Bike Route Segments

A majority of the proposed routes within the five towns were developed as a result of the individual community bike committees meeting over several months and recommending specific routes to be included in the master plan. Several routes were selected to link to adjacent communities or future bikeways, while other routes simply provided a safe connection from the center of town to a park or train station.

Several factors considered in the selection process included traffic flow and volume, roadway geometry, compatibility with the goals of the community, construction and maintenance cost, severity and length of grade, environmental impact, right-of-way, linkage to future bicycle facilities, etc.

All of the proposed routes are a result of a combined effort by local government, individual bikeway committees, and others bicyclists and non-bicyclists alike.

1.9 Criteria For Evaluation Of Bike Route Segments

The following criteria were used to evaluate the various segments within each bike route:

- Available Land; Public versus Private
- Geometry/Traffic; Safety Factors
- Accessibility/Connectivity
- Compatibility; Local/Regional/State Goals
- Construction Costs
- Grades
- Aesthetic/Visual; Bicycling Environment
- Environmental/Historic Impacts

Each of these criteria was assigned point values out of a possible 100-point total as a means of evaluating the merits of one alignment or group of alignments over another. A copy of the Evaluation of Bike Route Alternatives Form used for this analysis is attached (See Figure 1.1). See Appendices for a summary of each segment.

The following is a detailed description of each criterion:

Available Land; Public versus Private (0-15 pts.)

Property ownership is a concern primarily in the location of bicycle paths since bicycle lanes and routes are located within the public right-of-way. For this study, the bicycle lane and route alignments were penalized in the available land category only if they made use of private, rather than public land. For the off-road alignments, the location of the proposed bikeway is related to the physical characteristics of the land within the project study area. However, property ownership and use is also important in selecting proposed bikeway routes. Public property is preferred to private property, as is undeveloped land. Where the use of private property is required, undeveloped or vacant land is the most desirable. The use of off-road right-of-way may also be advantageous, especially when such issues, as property ownership, contamination and encroachments can be readily resolved.

Geometry/Traffic; Safety Factors (0-15 pts.)

Safety is the primary objective in selecting and designing a bikeway. The purpose of a bikeway, as with all transportation systems, is to provide for the safe and efficient movement of people. Therefore, the bikeway route selected must provide for the safety of all users of the facility.

In this category, the selection criteria distinguishes between off-road and on-road facilities, the off-road facility receiving the most points. Points are deducted for each intersection with either the railroad or street due to the potential conflict these crossings may introduce.

The main focus of this study with regard to safety is to eliminate or minimize potential conflicts between bicyclists and motor vehicles. In terms of on-road facilities, several studies have been performed to analyze roadway characteristics that affect bicycle safety. These include: traffic volume, vehicle speed, vehicle type (ie trucks, buses, cars), pavement condition, lane width, roadway functional classification (ie arterial, collector, local), and roadway section (ie shoulder, curb, parking). All of these factors affect the operation and movement of bicycles and vehicles through a corridor.

Special attention must be given to the treatment of bicycle lanes and routes at non-signalized intersections, for which points are also deducted. Bicycle and motor vehicle traffic mix at intersections, particularly left-turning bicyclists and right-turning motor vehicles. A left-turning bicyclist must exit the bicycle lane and cross at least one motor vehicle lane to execute this movement. A right-turning motor vehicle must cross the path of through-moving bicyclists to turn right at an intersection. As the number of lanes, movements, and traffic volume increase, the potential for accidents increase. In some cases, the installation of a new traffic signal may be required to accommodate the additional bicycle traffic.

Drives may present potential conflicts for less experienced bicyclists using on-road facilities. A roadway with many curb-cuts may not be suitable for use as a bikeway due to the number of turning vehicles crossing the bicycle path. This is particularly true for high-volume roads with many commercial drives.

Road surface conditions are also a factor that affects both bicycle lanes and routes. A pavement surface that is cracked, delaminated and in poor condition must be repaired to properly support new bicycle traffic. In addition, existing catch basin grates must conform to ADA requirements.

Accessibility/Connectivity (0-15 pts.)

In order to provide a bikeway that serves the communities through which it passes, access to the bikeway is essential. Users should be able to enter the facility at or nearby to residential areas and designated park-and-ride lots, and travel to destinations such as schools, libraries, commercial areas, recreational facilities and places of employment.

Compatibility; Local/Regional/State Goals (0-15 pts.)

It is important that the location and design of the bikeway reflect the goals of existing and future plans for the development and preservation of recreation, historic and cultural areas along the proposed alignment. The bikeway should enhance and complement the goals of existing or proposed parks or open space plans. In addition, it is important that the bikeway have the support of local government, project abutters and the business community.

Construction Cost (0-15 pts.)

The cost associated with the establishment of the bikeway is an important factor in alignment selection. However, the anticipated cost to construct a facility should not supercede safety and project objectives during the selection process.

The cost of constructing a bicycle path is generally greater than an on-road facility. This is due to the cost of new construction that may include providing bridges, tunnels, culverts, upgrading existing bridges and tunnels, and adding drainage, screening, and rails. The costs associated with on-road facilities are usually limited to pavement markings and signs, although on-road facilities may require roadway widening or new traffic signals in some instances, substantially increasing the cost.

Grades (0-5 pts.)

The physical limitations of the bicyclist determines acceptable grades on a bikeway. The purpose of developing a maximum grade criterion is to provide a balance between comfort and ability, and the physical terrain of the proposed bikeway.

Several studies have been conducted to determine physical capabilities of bicyclists of varying age groups and health. These studies have indicated the amount of aerobic work required for a bicyclist to climb short grades increases with age and declining health. As a result, it is necessary to establish a maximum grade for a bikeway that will provide a healthy, safe and economical facility that meets project objectives. In the selection of a bikeway alignment, a 5% maximum grade was used in evaluating alternatives. Where this grade was exceeded due to existing terrain, recommendations were made to eliminate or reduce this problem. Where this

was not feasible, grades over 5% may be used if the length of grade does not exceed 152 meters (500 feet).

Aesthetic/Visual; Bicycling Environment (0-10 pts.)

One of the objectives of the bikeway system is to promote bicycle access to the environmental, scenic and historical areas within the five communities. For bike trails, this can be accomplished by constructing spurs or secondary trails to selected areas, constructing picnic areas and overlooks, and the use of guide signs directing users to these areas. For on-road alignments, this can also be accomplished through the use of guide signs, as well as education programs sponsored by the towns and business community to make users more aware of these areas.

Environmental/Historic Impact (0-10 pts.)

In general, a bikeway is designed to improve and enhance the environmental and historical characteristics of a corridor by providing safe, non-motorized access to these areas. Although it is common for bikeway projects to result in impacts to the environment (i.e. wetlands, streams, trees, wildlife etc.), each segment was evaluated with respect to these issues and addressed accordingly.

Figure 1.1
North Suburban Regional Bicycle Transportation Plan
Evaluation of Bike Route Segment

This evaluation matrix was derived from the “Evaluation of Bikeway Alignment Alternatives Matrix Form, developed for the *Massachusetts Blackstone River Bikeway Conceptual Design and Feasibility Study*, September 1996.

<u>Category</u>	<u>Points</u>
1. <u>Available Land: Public versus Private (15 pts)</u>	
• Percentage of segment on publicly-owned land (x 0.15)	_____
2. <u>Geometry/Traffic: Safety Factors (15 pts)</u>	
Off Road:	
• Segment outside railroad right-of-way (15 pts)	
Segment within railroad right-of-way (10 pts)	_____
• If segment has existing or proposed at-grade railroad crossings, subtract 5 points for each crossing	_____
• If segment has existing at-grade street crossings, subtract 2 points for each crossing	_____
On Road:	
• Road meets requirements for Group B/C bicyclists as a function of AADT, average mean vehicle speed and sight distance (15 pts)	
• Road requires physical improvements to meet requirements for Group B/C bicyclists due to width constraints (8 pts)	
• Road cannot meet requirements for Group B/C bicyclists due to width and ROW constraints (0 pts)	_____
• If segment has street crossings, subtract 2 points for each crossing	
Note: Bicyclist Group type is defined in the AASHTO <i>Guide</i> , page 6	
3. <u>Accessibility/Connectivity (15 Pts)</u>	
• Access points to segment are within ¼ mile of population center, segment provides for intermodal connectivity, and segment has access points no greater than 3 miles apart (0-8 pts)	_____
• Segment provides access to parks, historic and cultural features, schools, commercial areas and employment sites within ¼ mile (0-7 pts)	_____
Sheet Total	= _____

<u>Category</u>	<u>Points</u>
4. <u>Compatibility: Local/Regional/State Goals (15 Pts)</u>	
• Segment preferred by town representatives and community interests (0-8 pts)	_____
• Segment compatible with town master plan (0-7 pts)	_____
5. <u>Construction Cost (15 Pts)</u>	
• Per mile cost under \$100,000 (15 pts)	
Per mile cost between \$100,000 and \$400,000 (8 pts)	
Per mile cost in excess of \$400,000 (0 pts)	_____
6. <u>Grades (5 Pts)</u>	
• If segment has a section(s) of grade over 5% greater than 500 feet in length, subtract 1 point for each section (5 pt max)	_____
7. <u>Aesthetic/Visual: Bicycling Environment (10 Pts)</u>	
• Quality of surrounding area-compatibility of adjacent land use, accessibility to river and/or canal, scenic value (0-10 pts)	_____
8. <u>Environmental/Historic Impact (10 Pts)</u>	
• Segment has no impact on wetlands, habitats, archaeological sites or historic features (10 pts)	
• Segment potentially impacts wetlands (applicability determination filing under Wetlands Protection Act), habitats, archaeological sites or historic features (6-9 pts)	
• Segment involves impact on wetland resource areas (Notice of Intent filing under Wetlands Protection Act), habitats, archaeological sites or historic features (0-5 pts)	_____
	Sheet Total = _____
	Segment Total = _____

1.10 Lane Width And Paved Shoulders

As a result of a majority of the proposed routes within this study being shared road, the available paved travel lane and usable shoulder width become vital to the success of the bike system.

Lane Width

AASHTO recommends a usable lane width of 14 feet (4.2m) for shared use. The usable width is measured from the center of pavement to travel edge and does not include the gutter pan, regardless of whether it is paved or not. Where steep grades are encountered and bicyclists require additional maneuvering space, a usable lane width of 15 feet (4.5m) is recommended. The 15-foot width may also be required in areas where drainage grates, raised reflectors, or on-street parking effectively reduce the usable width. AASHTO goes on to caution that widths greater than 14 feet (4.2m) that extend continuously along a roadway may encourage the operation of two vehicles in one lane or unsafe passing.

MassHighway has also established recommended travel lane widths based on the roadway functional classification (Table 5.1, MHD Manual, 1997 Edition). The minimum travel lane width for Arterial roads is 11.5 feet (3.5m), 10.7 feet (3.25m) for Collector roads, and 9 feet (2.75m) for Local roads.

Since MassHighway will be the primary reviewing agency during the design stage for these segments, and will most likely be supervising the construction, the recommended lane widths established by MassHighway will be used as the standard design criteria.

Shoulder Width

Where budget constraints prevent lane improvements, the addition of paved shoulders to an existing road is one method of accommodating bicyclists and motorists in rural areas. Paved shoulders may extend the service life of the road surface and provide more maneuvering space for bicyclists, reducing conflicts with motor vehicles. AASHTO recommends a minimum paved shoulder width of 4 feet (1.2m) but also notes that where this width cannot be achieved, any additional shoulder width is better than none at all. The paved shoulder width is measured from the edge pavement line to the edge of the gutter pan.

MassHighway has also established recommended usable shoulder widths based on roadway functional classification (Table 5.1, MHD Manual, 1997 Edition). The usable shoulder width for Arterial roads is 8.2 feet (2.5m)-Right and 4.1 feet (1.25m)-Left, 4.1 feet (1.25m) for Collector roads, and 2.5 feet (0.75m) for Local roads.

Since MassHighway will be the primary reviewing agency during the design stage for these segments, and the will most likely be supervising the construction, the recommended usable shoulder widths established by MassHighway will be used as the standard design criteria.

1.11 Conceptual Design Development

This report includes preliminary design information such as typical sections and design criteria for route segments based on current MassHighway design standards and AASHTO design guidance. Routes that do not meet minimum current design standards and require a design waiver have been identified.

1.12 Public Participation

Public input was provided by several groups: the Regional Bikeway Committee (RBC), comprised of the individual bikeway committees from the Town of Lynnfield, North Reading, Reading, Wakefield and Wilmington, and the general public through a series of public workshops/bike committee meetings and one public meeting conducted over the past two years. These meetings are summarized as follows:

Regional Bikeway Committee (RBC) Meetings

August 7, 2001, North Reading Town Hall:

This meeting served as a kickoff for the project with all of the five towns represented. The majority of the meeting was spent identifying proposed routes and scheduling dates for kickoff meetings with the individual town bicycle committees.

June 10, 2002, Wakefield Town Hall:

This meeting served as an overall project update. Representatives from the RBC from four of the five towns were in attendance. One of the major items of discussion was the \$40,000 available for a “pilot” project. It was agreed that this money should be used to fund the installation of signs and pavement markings to better define “space” for cyclists for as many of the shared road segments as possible.

May 30, 2003, North Reading Town Hall:

The purpose of this meeting was to present an update of the project to the RBC and the public, and to give the public the opportunity to ask questions, voice concerns and offer constructive comments with regard to the master plan. Several committee members including representatives from WSE were in attendance. The meeting began with a general overview of the project and brief history, followed by a presentation of the report. The meeting was then opened to the public for discussion.

Community Bicycle Committee Meetings

September 11, 2001, Lynnfield Town Hall:

The Lynnfield Bicycle Committee began with a presentation of the proposed alternatives along with discussion of the proposed alternatives. Items discussed included zoning issues, railroad right-of-way, environmental impacts and shared road use. The presentation was followed by a question and answer session with Weston & Sampson Engineers, Inc. in attendance.

September 12, 2001, North Reading Town Hall: no minutes available

This meeting served as a kickoff for the North Reading Bicycle Committee. After introductions of the committee members, the agenda focused on the proposed alignments.

March 11, 2002, Wakefield Town Hall:

This meeting served as the initial kickoff meeting with the Wakefield Bicycle Committee, with three members in attendance. The main focus of this meeting was to organize and discuss how Wakefield fits into the master plan.

March 21, 2002, Wakefield Town Hall:

This meeting served as a follow-up to the March 11 meeting. Weston & Sampson Engineers, Inc. was in attendance and provided a project update with regard to the other community involvement. The meeting focused on developing goals and objectives for Wakefield with regard to the master plan project.

March 25, 2002, Wilmington Town Hall:

This purpose of this meeting was for the committee to confirm the proposed bike routes through Wilmington to be included in the master plan.

May 13, 2002, Wakefield Town Hall:

The third monthly meeting for the Wakefield Bicycle Committee included a new member also on the Wakefield Traffic Advisory Committee with insight to traffic issues around town. Several design issues and asphalt alternatives were the topic of discussion at this meeting.

September 17, 2002, Wakefield Town Hall:

This monthly committee meeting served to review the status of master plan project. A majority of the meeting was used to plan the upcoming five community bike ride.

September 22, 2002, Five Community Bike Ride:

Organized by a local resident and Wakefield Bike Committee member, the event included approximately 50 cyclists from the surrounding area along with the North Shore Cyclist Bike Club. The riders cycled through the towns of Lynnfield, North Reading, Reading, Wakefield and Wilmington.

Public Information Meetings

February 28, 2002, Reading Senior Center:

The purpose of this meeting was to present an update of the project to the RBC and the public, and to give the public the opportunity to ask questions, voice concerns and offer constructive comments with regard to the master plan.

1.13 Phase II Design

The Phase II design includes \$210,000 to develop final design plans for selected segment(s) included in the Master Plan. Although a majority of the segments included in this study were recommended, it is not feasible to design all of these segments with the available resources. As a result of consideration of each segment with respect to impact, feasibility, function and estimated construction cost, the following segments are recommended to be included as part of the Phase II design:

Segment L-8

Segment L-8 will add mileage to the bikeway system and will connect to the Peabody segment already under design as a future rail-trail. The MBTA is willing to cooperate with the Town of Lynnfield by entering a 99-year lease. The design of this 3.5-mile segment will require preparation and submission of the pre-application and final application to the Transportation Improvement Program and subsequent approval from the Federal Highway Administration and MassHighway before proceeding to the 25%, 75%, 100% and PS&E design submissions to the Department. The project will also involve environmental permitting, which may include preparation of an Environmental Notification Form, Notice of Intent, Water Quality Certificate and 404 permit.

Segment NR-1, NR-2 and WM-2

Segments NR-1, NR-2 and WM-2 are located along Route 62, which is currently being widened as part of a safety improvement project funded by MHD. Incorporating new “share the road” signs and pavement markings (where necessary) along this corridor will require minimal design effort and encourage use by pedestrians and bicyclists.

Segment R-10, a portion of Segment R-6, and a portion of Segment NR-6

As a result of a meeting held on May 30, 2003, the RBC recommended the Phase II design include sign/pavement marking and shoulder improvements along Haverhill Street in the Town of Reading and North Reading. The improvements will begin at the rotary intersection of Route 129 and Route 128 in the Town of Reading and travel northerly along Haverhill Street into the Town of North Reading before terminating at the intersection of Haverhill Street and Route 62. As a result of recent roadway improvements along Haverhill Street in the Town of Reading from the rotary to Franklin Street, which included shoulder widening, pavement overlay and new pavement markings, the only bicycle accommodation improvements required along this section

will be the installation of “share the road” and “pedestrian crossing” signs. The section of Haverhill Street from Franklin Street in the Town of Reading to the intersection of Route 62 in the Town of North Reading (approximately 7500 feet), will require approximately 1 foot of shoulder widening, application of a new solid white edge line and installation of “share the road” and “pedestrian crossing” signs.

2.0 TOWN OF LYNNFIELD

2.1 History

The original settlers of Lynnfield, originally called “Lynn End”, were recipients of land grants, the first being John Humphrey, who died in 1661. In 1663, the sawmill located on the Saugus River between Wakefield and Lynnfield was constructed and operated by John Poole. In 1711, several inhabitants petitioned to become a “precinct by ourselves”, which was granted, thus creating what is now Lynnfield.

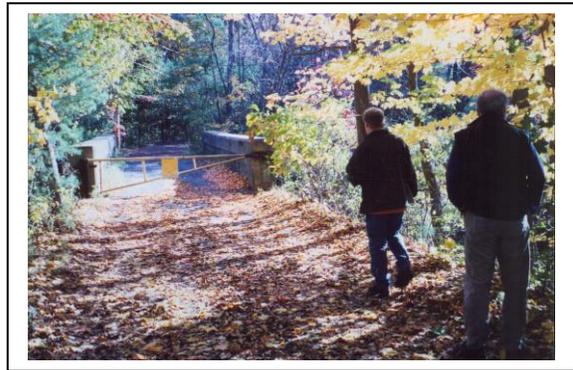
- The first town hall was built during the late 1800’s and was dedicated on January 28, 1892 with many residents and prominent local figures in attendance. The town center is a small green bordered by the Old Meeting House, built in 1715, and the Lynnfield Public Library, built just before the Civil War.

2.2 Segment L-1

Type=Rail-Trail (Score=57)

Length=3,394 Ft. (1035m)

Estimated Construction Cost=\$160,000



Looking Toward Abandoned Railroad

Description:

Segment L-1 begins at the center of a bridge structure over the Ipswich River, which is also the line separating the Town of North Reading and Lynnfield. The structure connects a gravel access road from Concord Street (Rt. 62) located within the Town of North Reading to the abandoned railroad right-of-way. The road provides access to an existing pump station and water supply system that is operated and maintained by the City of Lynn. From the bridge, the proposed bikepath continues easterly along the abandoned railroad right-of-way.

It should be noted the abandoned railroad right-of-way also extends westerly approximately 1795 Ft (547m) where it terminates at a residential development.

Right-of-Way:

The access road and bridge structure fall within an existing water supply easement owned by the City of Lynn. The easement begins at Concord Street (Rt. 62) in the Town of North Reading and travels southerly into the Town of Lynnfield, crossing the Ipswich River and railroad right-of-

way owned by the Massachusetts Bay Transit Authority (MBTA) and continues through Lynnfield Center Water District property to the City of Lynn.

The proposed bikepath travels easterly along abandoned railroad right-of-way, a portion of which is owned by the MBTA (1.20 ac), the Lynnfield Center Water District (4 ac) and Richardson Farms, Inc. (1.89 ac) to the Peabody city line. From this point, the former railroad right-of-way is located on land owned now or formerly of Bostik, Inc.

The west section is located entirely on abandoned railroad right-of-way owned by MBTA.

Environmental Impacts:

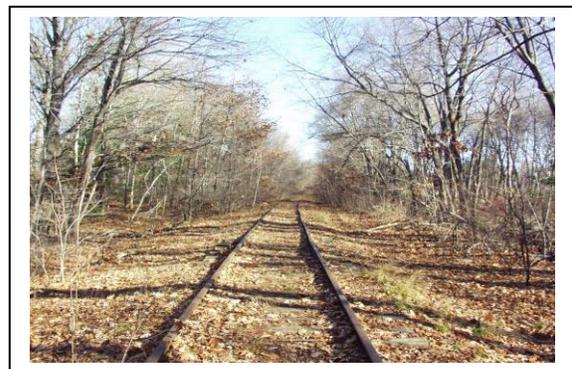
The proposed route including the west section is located on existing track bed that has been previously disturbed. As a result, there are no known direct impacts to existing bordering vegetated wetlands (BVW) or other resource areas. However, the proposed route crosses over a bridge structure and the Ipswich River, within 200 feet of a riverfront. In addition, the proposed route including the west section is located within 100 feet of existing wetlands at several locations.

Endangered Species:

Based on the *Estimated Habitats of Rare Wildlife and Certified Vernal Pools Map, dated 1999-2001*, the proposed route including the west section is not located within a rare wildlife habitat.

2.3 Segment L-8

Type=Rail-Trail (Score=63)
Length=13,577 Ft. (4139m)
Estimated Construction Cost=\$520,000



Looking North Along Abandoned Rail

Description:

Segment L-8 begins at the Wakefield town line and travels northeasterly along abandoned railroad right-of-way owned by the MBTA to the Peabody City Line.

Right-of-Way:

The proposed bikepath travels northeasterly along abandoned railroad right-of-way owned by the MBTA to the Peabody city line. The railroad right-of-way continues into the City of Peabody.

Weston & Sampson Engineers, Inc. has contacted the Real Estate Division of the MBTA and has confirmed the railroad is prepared to enter a 99-year lease agreement with the Town of Lynnfield at the request of the town.

Environmental Impacts:

The proposed route is located on a railroad right-of-way that has been previously disturbed. As a result, there are no known direct impacts to existing bordering vegetated wetlands (BVW) or other resource areas. However, the proposed route crosses over the Saugus River, within 200 feet of a riverfront. In addition, the proposed route crosses over several small streams and is located within 100 feet of existing wetlands at several locations.

Endangered Species:

Based on the *Estimated Habitats of Rare Wildlife and Certified Vernal Pools Map, dated 1999-2001*, the proposed route is located within wildlife habitat #105 and #536.

2.4 Segment L-9

***Type=Signed Shared Roadway/
Shared Use Path (Score=67)
Length=7,543 Ft. (2300m)
Estimated Construction Cost=\$620,000***



Looking North Along Glen Drive

Description:

Segment L-9 begins at Lowell Street, turns onto North Hill Drive and onto Glen Drive to a cul-de-sac. From this point, the proposed route becomes a bikepath and travels northerly over property owned by the Lynnfield Center Water District and connects to abandoned railroad right-of-way owned by the MBTA.

Lowell Street is classified as an Urban Collector with a paved width of approximately 24 feet (7.32m) and curb/walk on one side. North Hill Drive and Glen Drive are considered local roads with very low traffic volumes and will not require and shoulder upgrades.

Right-of-Way:

The proposed shared road portion of the route is located entirely within existing town layout. The bikepath portion of the route is located entirely within land owned by the Lynnfield Center Water District.

Environmental Impacts:

The proposed shared road portion of the route does not impact any water resource areas. However, the bikepath portion of the route is located adjacent to several wetland areas and may impact existing bordering vegetated wetlands (BVW) or other resource areas.

Endangered Species:

Based on the *Estimated Habitats of Rare Wildlife and Certified Vernal Pools Map, dated 1999-2001*, the proposed route is not located within a rare wildlife habitat.

2.5 Segment L-19

Type=Signed Shared Roadway (Score=52)
Length=10,560 Ft. (3220m)
Estimated Construction Cost=\$5,000



Looking North Along Lowell Street

Description:

Segment L-19 begins at Lowell Street near the entrance to Camp Curtis Guild Army Base and travels easterly along Lowell Street and northerly along Main Street to the Middleton Town line. The purpose of this segment is to connect Segment L-9 to the abandoned railroad right-of-way in the City of Peabody in order to bypass Segment L-1 due to the impass at the Bostik property (See Segment L-1).

Lowell Street is classified as an Urban Collector with a paved width of approximately 24 feet (7.32m) and curb/walk on one side. Main Street is classified as an Urban Minor Arterial with a paved width of approximately 30 feet (9.15m) and curb/walk on one side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

2.6 Shoulder And Lane Width

The following table summarizes the existing paved width versus minimum required paved width for roads within each shared roadway segment. The existing paved width includes left outside edge to right outside edge. The minimum required paved width is based on recommended roadway section widths developed by MassHighway (Table 5.1, MHD Manual, 1997 Edition)(See Appendices).

**Table 2.1
Existing Roadway Section Widths
Town of Lynnfield**

Roadway	Functional Class	Existing Paved Width (m)	Minimum Required Paved Width (m)	Design Waiver Required
Lowell Street	Urban Collector	7.32	7.00	No
Main Street	Urban Minor Arterial	9.15	9.50	Yes

2.7 Conclusions And Recommendations

Segment L-1

In order to provide access to the east, land takings and/or easements would be required from MBTA, Richardson Farms, Inc., Lynnfield Central Water District and Bostik, Inc. The MBTA has indicated a willingness to cooperate and the Lynnfield Water District has not objected to a lease agreement. However, Bostik, Inc. has indicated reluctance to a bike trail through their property. Richardson Farms, Inc. has not been contacted or approached.

Although the portion of Segment L-1 from the bridge to the Peabody City Line is owned by three separate entities, the critical link is the portion owned by Bostik, Inc., who is reluctant to grant access through their property that would provide a connection to abandoned railroad property on the other side in the City of Peabody. Costs associated with easement acquisitions and/or land

takings could be substantial for the length of trail achieved. As a result and at the request of the Lynnfield Bikeway Committee, Segment L-1 is not recommended.

The westerly portion of Segment L-1 from the residential community end of the abandoned railroad to the bridge is also owned by the MBTA and could probably be acquired at a reasonable cost but with little benefit due to the terminus. In order to extend the trail farther west, several properties would be impacted, require extensive screening and easements and/or land takings required, resulting in escalated cost. As a result and at the request of the Lynnfield Bikeway Committee, this section is not recommended.

Segment L-8

Although this segment is located adjacent to existing BVW and through riverfront, the only major obstacle is right-of-way acquisition from the MBTA. The MBTA has been contacted and has confirmed the segment has been abandoned and is not programmed for reactivation. The MBTA is prepared to offer a long-term lease (ie. 99 years) to the Town of Lynnfield for use of the corridor as an alternate transportation facility at the request of the Town. The segment also meets the future rail-trail project in Peabody currently under design. Therefore, Segment L-8 is recommended.

Segment L-9

This segment serves as an alternative connection from Route 62 to abandoned railroad right-of-way in the City of Peabody via Lowell Street, allowing users to bypass the restricted access along the abandoned railroad as a result of Bostik, Inc. However, due to the potential impact to wetlands and the need for an access easement from the water company and at the request of the Lynnfield Bikeway Committee, Segment L-9 is not recommended.

Segment L-19

This segment serves to connect Segment L-9 to the Peabody City Line. Lowell Street will accommodate bicycle traffic without shoulder widening. Main Street will require either a design waiver or an increased paved shoulder width of approximately 6 inches (150mm) either side.

However, due to the fact that Segments L-1 and L-9 are not recommended, and it has been recommended to extend Segment NR-1 approximately 1 mile along Rte 62 to the Middleton Town Line, Segment L-19 is not required. As a result, Segment L-19 is not recommended.

3.0 TOWN OF NORTH READING

3.1 History

The history of North Reading was initiated with the legislative act of 1713, establishing the Second Precinct of Reading, thereby enabling the inhabitants to hire a minister and build a meetinghouse. The town's physical development had begun in earnest on land in its center. A meetinghouse was built in 1718, followed soon by a cemetery, necessary house, stables and a hearse house. It was from the meetinghouse that the residential and business community expanded and grew steadily over the next 290 years.

3.2 Segment NR-1

Type=Signed Shared Roadway (Score=81)

Length=17,851 Ft. (5442m)

Estimated Construction Cost=\$9,000



Looking West Along Park Street

Description:

Segment NR-1 begins at the intersection of Central Street and Park Street (Rt. 62) and travels easterly along Park Street, which turns into Washington Street (Rt. 62), which turns into Elm Street (Rt. 62) runs along Rte 62 to the Middleton Town Line. This segment provides access to an existing gravel road that connects to abandoned railroad right-of-way (See Segment L-1).

Park Street is classified as an Urban Minor Arterial with a paved width of approximately 36 feet (10.98m) and curb/walk on the west side, curb only on the east side. Washington Street is classified as an Urban Minor Arterial with a paved width of approximately 30 feet (9.15m) with curb/walk on one side. Elm Street is classified as an Urban Minor Arterial with a paved width of approximately 25 feet (7.62m) with curb/walk on one side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

3.3 Segment NR-2

Type=Signed Shared Roadway (Score=66)

Length=15,086 Ft. (4599m)

Estimated Construction Cost=\$7,500



Description:

Segment NR-2 begins at the Wilmington town line and proceeds easterly along Lowell Road (Rt. 62), runs parallel with Main Street (Rt. 28), turns onto Winter Street (Rt. 62), which turns into Park Street (Rt. 62) to Central Street (See Segment NR-1).

Lowell Road is classified as an Urban Minor Arterial with a paved width of approximately 24 feet (7.32m). Main Street is classified as an Other Principal Arterial with a paved width of approximately 48 feet (14.63m) with walk on one side. Winter Street is classified as an Urban Minor Arterial with a paved width of approximately 34 feet (10.37m). Park Street is classified as an Urban Minor Arterial with a paved width of approximately 30 feet (9.15m) and curb/ walk on one side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

3.4 Segment NR-6

Type=Signed Shared Roadway (Score=76)

Length=10,560 Ft. (3220m)

Estimated Construction Cost=\$5,500



Description:

Segment NR-6 begins at the Reading town line and proceeds northerly along Charles Street, turns onto Haverhill Street to North Reading Center. This segment includes a spur that begins at the intersection with Chestnut Street and proceeds northwesterly along Chestnut Street before connecting to Park Street (Rt. 62) (See Segment NR-2).

Haverhill Street is classified as an Urban Minor Arterial from the Reading Town Line to Park Street, and an Urban Collector from Park Street to the Andover Town Line with a paved width of approximately 24 feet (7.32m).

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

3.5 Segment NR-7

Type=Signed Shared Roadway (Score=74)

Length=11,314 Ft. (3449m)

Estimated Construction Cost=\$5,500



Description:

Segment NR-7 begins at Park Street and proceeds northerly along Haverhill Street to the Andover town line.

Haverhill Street is classified as an Urban Collector from Park Street to the Andover town line with a paved width of approximately 24 feet (7.32m).

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

3.6 Shoulder And Lane Width

The following table summarizes the existing paved width versus minimum required paved width for roads within each shared roadway segment. The existing paved width includes left outside edge to right outside edge. The minimum required paved width is based on recommended roadway section widths developed by MassHighway (Table 5.1, MHD Manual, 1997 Edition)(See Appendices).

**Table 3.1
Existing Roadway Section Widths
Town of North Reading**

Roadway	Functional Class	Existing Paved Width (m)	Minimum Required Paved Width (m)	Design Waiver Required
Park Street (Rt. 62)	Urban Minor Arterial	10.98	9.50	No
Washington Street (Rt. 62)	Urban Minor Arterial	9.15	9.50	Yes
Elm Street (Rt. 62)	Urban Minor Arterial	7.62	9.50	Yes
Lowell Road (Rt. 62)	Urban Minor Arterial	7.32	9.50	Yes
Main Street (Rt. 28)	Other Principal Arterial	14.63	9.50	No
Winter Street (Rt. 62)	Urban Minor Arterial	10.37	9.50	No
Haverhill Street	Urban Minor Arterial	7.32	9.50	Yes

3.7 Conclusions And Recommendations

Segment NR-1

This segment provides a link from North Reading Center to the Middleton Town Line with potential access to abandoned railroad right-of-way (See Segment L-1).

Although Route 62 is an arterial and carries heavy traffic, the road is currently under reconstruction by MassHighway to increase existing travel lane and shoulder widths. After the improvements are completed, Route 62 will meet pedestrian and bicycle accommodation requirements. Therefore, Segment NR-1 is recommended.

Segment NR-2

This segment serves as an important link because it connects Wilmington Center to the City of Peabody (See Segment NR-1). As previously mentioned, although Route 62 is an arterial and carries heavy traffic, the road is currently under reconstruction by MassHighway to increase existing travel lane and shoulder widths. Once these improvements are completed, Route 62 will provide a safer corridor that will accommodate pedestrians and bicyclists. Therefore, Segment NR-2 is recommended.

Segment NR-6

This segment provides a vital link from the Reading Highlands along Charles and Haverhill Street into North Reading and eventually to the Town of Andover. Charles and Haverhill Street is substandard and will require approximately 1.5 feet (0.5m) of additional paved shoulder on either side to meet pedestrian/bicycle accommodation requirements or a design waiver. As a result, Segment NR-6 is recommended.

Segment NR-7

As previously mentioned, this segment provides a connection to the Town of North Andover. The segment is entirely along Haverhill Street and will require either additional paved shoulder widening or a design waiver to meet minimum standard. As a result, Segment NR-7 is recommended.

4.0 TOWN OF READING

4.1 History

The original settlers of Reading arrived from England during the 1630's, with many arriving through the seaports of Lynn and Salem. In 1639, citizens of Lynn petitioned the government of the Massachusetts Bay Colony for a "place for an inland plantation". The General Court granted them six square miles and subsequently an additional four square miles. The first settlement called Lynn Village was on the south shore of the Great Pond, what is now known as Lake Quannapowitt. On June 10, 1644, the settlement was incorporated by the House of Deputies as the Town of Reading, taking its name from Reading, England.

The first church was organized shortly after the settlement and the first parish, later known as South Reading, became Wakefield in 1868. In 1651, a special grant added land north of the Ipswich River to the town, which later became the Town of North Reading in 1853. During the early years, the area currently the Town of Reading, was known as "Wood End", or "Third Parish".

In 1769, the meetinghouse, in what is now Reading was built. It was constructed in the area that is currently the Common in Reading. A stone marker commemorates the site.

Reading played an active role in the American Revolutionary War. Minute Men were prominently involved in the engagements pursuing the retreating British Red Coats after the skirmish at Concord Bridge. Dr. John Brooks, Captain of the “Fourth Company of Minute” remained in the army for eight years after the war and later became the ninth governor of Massachusetts.

In 1791, sixty members of the “West Parish” which is the current Town of Reading, started the Federal Library. Members paid a \$1.00 to join and an annual membership fee of \$.25. The Town public library was created in 1868.

In 1845, the Boston & Main Railroad came to Reading and improved access to Boston and the southern markets. During the first half of the 19th century, Reading became a manufacturing town with the businesses like Sylvester Harnden’s furniture factory, Daniel Pratt’s clock factory, and Samuel Pierce’s organ pipe factory. By the mid 1800’s, Reading boasted thirteen manufacturers of chairs and cabinets. Shoes and neckties were produced in Reading for many years.

A total of 411 men from Reading fought in the Civil War at the battle of Bull Run in Manassass, Virginia. The memory of the 15 soldiers who died in battle and the 33 who died of sickness are commemorated in the Laurel Hill Cemetery.

After the Civil War, Reading became more of a residential community but kept pace with the Industrial Revolution with businesses such as General Tire & Rubber Company, The Boston Stove Company and Ace Art.

4.2 Segment R-6

Type=Signed Shared Roadway (Score=74)
Length=15,840 Ft. (4829m)
Estimated Construction Cost=\$8,000



Intersection of Charles/Haverhill St.

Description:

Segment R-6 begins at Reading center and proceeds northerly along Charles Street, connecting to Haverhill Street to the North Reading town line.

Charles Street is classified as an Urban Collector with a paved width of approximately 31 feet (9.45m) and curb/walk on one side. Haverhill Street is classified as an Urban Minor Arterial with a paved width of approximately 24 feet (7.32m) and curb/walk on one side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

4.3 Segment R-10

Type=Signed Shared Roadway (Score=76)

Length=6,789 Ft. (2070m)

Estimated Construction Cost=\$3,500



Description:

Segment R-10 begins at the Wakefield town line (See Segment WK-10) and proceeds northwesterly along Bay State Road, turning onto Haverhill Street before connecting to the intersection with Charles Street (See Segment R-6).

Bay State Road is classified as a Local Road. Haverhill Street is classified as an Urban Minor Arterial with a paved width of approximately 24 feet (7.32m) and curb/walk on one side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

4.4 Segment R-12

Type=Signed Shared Roadway (Score=81)

Length=7,291 Ft. (2223m)

Estimated Construction Cost=\$3,500



Description:

Segment R-12 begins at the Woburn town line and proceeds northeasterly along West Street, turning onto Prescott Street to the MBTA train station.

West Street is classified as an Urban Minor Arterial with a paved width of approximately 32 feet (9.76m). Prescott Street is classified as an Urban Minor Arterial with a paved width of approximately 30 feet (9.15m) with curb/walk on either side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

4.5 Segment R-15

Type=Signed Shared Roadway (Score=83)

Length=5,029 Ft. (1533m)

Estimated Construction Cost=\$2,500



Description:

Segment R-15 begins at the Wakefield town line and proceeds northwesterly along Walkers Brook Drive, which turns into John Street, then turning onto Village Street, then onto Washington Street, then onto Main Street to Reading center.

Walkers Brook Drive and John Street are classified as an Urban Minor Arterial with a paved width of approximately 45 feet (13.72m). Village and Washington Streets are classified as Local Roads with a paved width of approximately 25 feet respectively. Washington Street has curb/walk on either side. Village Street has a paved width of approximately 34 feet (10.37m) and curb/walk on either side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

4.6 Segment R-18

Type=Signed Shared Roadway (Score=83)

Length=9,051 Ft. (2759m)

Estimated Construction Cost=\$4,500



Description:

Segment R-18 begins at Reading center and proceeds northwesterly along Lowell Street to the Wilmington town line.

Lowell Street is classified as an Other Principal Arterial with a paved width of approximately 30 feet (9.15m) with curb/walk on either side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

4.7 Shoulder And Lane Width

The following table summarizes the existing paved width versus minimum required paved width for roads within each shared roadway segment. The existing paved width includes left outside edge to right outside edge. The minimum required paved width is based on recommended roadway section widths developed by MassHighway (Table 5.1, MHD Manual, 1997 Edition)(See Appendices).

**Table 4.1
Existing Roadway Section Widths
Town of Reading**

Roadway	Functional Class	Existing Paved Width (m)	Minimum Required Paved Width (m)	Design Waiver Required
Charles Street	Urban Collector	9.45	7.75	No
Haverhill Street	Urban Minor Arterial	7.32	9.50	Yes
West Street	Urban Minor Arterial	9.76	9.50	No
Woburn Street	Urban Minor Arterial	9.15	9.50	Yes
Walkers Brook Drive	Urban Minor Arterial	13.72	9.50	No
Village Street	Urban Local	10.37	6.25	No
Washington Street	Urban Local	7.32	6.25	No
Lowell Street	Other Principal Arterial	9.15	9.50	No

4.8 Conclusions And Recommendations

Segment R-6

This segment provides an important link from the Reading Highlands along Charles and Haverhill Street into North Reading and eventually to the Town of Andover (See Segment NR-7). The existing paved width of Haverhill Street is substandard and will require approximately 1.5 feet (0.5m) of additional paved shoulder on either side to meet pedestrian/bicycle accommodation requirements or a design waiver. The existing paved width of Charles Street will not require any widening. As a result, Segment R-6 is recommended.

Segment R-10

This segment provides an alternative to bypass the existing rotary and interchange at I-95 (Rt. 128-Exit 34) and connect Wakefield to Andover via Haverhill Street. The portion along Haverhill Street from the rotary to Charles Street does not require additional widening. The existing paved width of Haverhill Street from Franklin Street to Rte 62 the rotary to Franklin Street is substandard and will require approximately 1.5 feet (0.5m) of additional paved shoulder on either side to meet pedestrian/bicycle accommodation requirements or a design waiver. Therefore, Segment R-10 is recommended.

Segment R-12

This segment is an important link because it provides the only connection from Woburn to Reading. West Street will accommodate bicycle and pedestrian traffic without shoulder widening. However, Woburn Street will require additional widening on one side and a design waiver for the side with existing curb/walk. As a result, Segment R-12 is recommended.

Segment R-15

This segment provides an alternative to bypass the existing rotary and interchange at I-95 (Rt. 128) and connects Wakefield Center to Reading Center. The segment travels along local roads where traffic volumes are very light and there is sufficient paved width to accommodate bicycles. As a result, Segment R-15 is recommended.

Segment R-18

This segment provides a connection from Reading Center to Wilmington Center via Lowell Street. Lowell Street will accommodate bicycle and pedestrian and bicycle traffic without shoulder widening. As a result, Segment R-18 is recommended.

5.0 TOWN OF WAKEFIELD

5.1 History

The Town of Wakefield was first settled in 1638 by a small band of settlers from Lynn. The original settlers were farmers who also took advantage of the abundant flocks of wild pigeons and turkeys, overstocked rivers and ponds and local fruit including blackberries and blueberries.

By 1667, the community encompassed land now known as Reading and North Reading and supported approximately 59 houses. In 1686, the settlers were able to purchase their land from the Saugus Indians.

Although no battles were fought on Wakefield soil, the town sent many men to fight in the Revolutionary War. When the Declaration of Independence was first read in public, the town voted unanimously to “adhere to its sentiments and stand by it to the last”.

By the late 1700’s, the town had been divided into three separate parishes: the First Parish (Wakefield), the Second Parish (North Reading) and the Third Parish (Reading). By 1785, the First Parish petitioned to be recognized as a separate town, which was finally granted by the legislature in 1811.

The Boston and Maine Railroad came to town in 1845 and changed the community dramatically, doubling the population from 1600 to 3200 people in 15 years. The railroad brought new business to the town such as ice harvesting from the two lakes, the Boston and Maine Foundry Company and the Wakefield Rattan Company, popularizing the use of wicker nationwide. In 1868, Cyrus Wakefield offered to build a new town hall, after which the town voted to change its name from South Reading to Wakefield.

In 1889, the town’s economy flourished with the development of the Miller Piano Factory and the Winship Boit Company (Harvard Knitting Mills). Natural gas was introduced in 1860 by the Citizen’s Gas Light Company; telephone service was introduced 1894; and water service in 1883.

5.2 Segment WK-8

Type=Rail-Trail (Score=61)

Length=9,429 Ft. (2875m)

Estimated Construction Cost=\$325,000



Looking North Along Abandoned Rail

Description:

Segment WK-8 begins at Northern Avenue and proceeds northeasterly along MBTA-owned right-of-way to the Lynnfield town line (See Segment L-8).

Right-of-Way:

The proposed bikepath travels northeasterly along MBTA-owned right-of-way.

Weston & Sampson Engineers, Inc. has contacted the Real Estate Division of the MBTA and has confirmed the railroad is currently coordinating with the Town of Wakefield to enter a 99-year lease agreement with the town.

Environmental Impacts:

The proposed route is located on a railroad right-of-way that has been previously disturbed. As a result, there are no known direct impacts to existing bordering vegetated wetlands (BVW) or other resource areas. However, the proposed route is located within 100 feet of existing wetlands at several locations.

Endangered Species:

Based on the *Estimated Habitats of Rare Wildlife and Certified Vernal Pools Map, dated 1999-2001*, the proposed route is not located within a rare wildlife habitat.

5.3 Segment WK-10

Type=Signed Shared Roadway (Score=58)

Length=15,086 Ft. (4599m)

Estimated Construction Cost=\$7,500



Description:

Segment WK-10 begins at the intersection of North Avenue and Main Street and proceeds northerly along Main Street, which becomes Rt. 129 at Water Street, turns easterly onto Salem Street, then northerly onto Vernon Street to the Lynnfield town line. At this point, Vernon Street becomes Main Street in the Town of Lynnfield. The segment continues on Main Street in Lynnfield, crosses under Interstate 95 (Rt. 128) in Lynnfield, then turns onto Bay State Road in Lynnfield, which crosses back into Wakefield, continuing to the Reading town line (See Segment R-10).

Main Street is classified as an Other Principal Arterial with a paved width of approximately 36 feet (10.98m) and curb/walk on either side. Salem Street is classified as an Urban Minor Arterial with a paved width of approximately 20 feet (6.10m) and curb/walk on either side. Vernon Street is classified as an Urban Minor Arterial with a paved width of approximately 30 feet (9.15m) and curb/walk on either side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

5.4 Segment WK-14

Type=Signed Shared Roadway (Score=79)

Length=4,777 Ft. (1456m)

Estimated Construction Cost=\$2,500



Looking East Along Broadway

Description:

Segment WK-14 begins at the Stoneham town line and proceeds northeasterly along Albion Street, turning onto Broadway before connecting to North Avenue/Main Street and Wakefield center.

Albion Street is classified as an Other Principal Arterial with a paved width of approximately 30 feet (9.15m) and curb/walk on either side. Broadway is classified as an Urban Collector with a paved width of approximately 30 feet (9.15m) and curb/walk on either side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

5.5 Segment WK-15

Type=Signed Shared Roadway (Score=77)

Length=7,543 Ft. (2300m)

Estimated Construction Cost=\$4,000



Description:

Segment WK-15 begins at the intersection of Main and Church Streets, proceeds westerly along Church Street, turns northerly along North Avenue to the Reading town line.

Church Street is classified as an Urban Minor Arterial with a paved width of approximately 38 feet (11.59m) and curb/walk on either side. North Avenue is classified as an Urban Minor Arterial with a paved width of approximately 36 feet (10.98m) and curb/walk on either side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

5.6 Segment WK-16

Type=Signed Shared Roadway (Score=79)

Length=9,051 Ft. (2759m)

Estimated Construction Cost=\$4,500



Description:

Segment WK-16 begins at the Melrose town line and proceeds northerly along Main Street, turns and travels northerly along Greenwood Avenue, crosses Oak Street and onto Green Street before turning onto Main Street again, proceeding northerly to the intersection with North Avenue.

Main Street is classified as an Other Principal Arterial with a paved width of approximately 36 feet (10.98m) with curb/walk on either side. Greenwood Avenue and Green Street are considered local roads.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

5.7 Segment WK-17

Type=Signed Shared Roadway (Score=83)

Length=7,291 Ft. (2223m)

Estimated Construction Cost=\$3,500



Description:

Segment WK-17 begins at the intersection of Main and Water Streets (Rt. 129) and continues easterly along Water Street to the Saugus town line.

Water Street is classified as an Other Principal Arterial.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

5.8 Shoulder And Lane Width

The following table summarizes the existing paved width versus minimum required paved width for roads within each shared roadway segment. The existing paved width includes left outside edge to right outside edge. The minimum required paved width is based on recommended roadway section widths developed by MassHighway (Table 5.1, MHD Manual, 1997 Edition)(See Appendices).

**Table 5.1
Existing Roadway Section Widths
Town of Wakefield**

Roadway	Functional Class	Existing Paved Width (m)	Minimum Required Paved Width (m)	Design Waiver Required
Main Street	Other Principal Arterial	10.98	9.50	No
Salem Street	Urban Minor Arterial	7.93	9.50	Yes
Vernon Street	Urban Minor Arterial	9.15	9.50	Yes
Albion Street	Other Principal Arterial	9.15	9.50	Yes
Broadway	Urban Collector	9.15	7.75	No
Church Street	Urban Minor Arterial	11.59	9.50	No
North Avenue	Urban Minor Arterial	10.98	9.50	No
Water Street	Other Principal Arterial	10.98	9.50	No

5.9 Conclusions And Recommendations

Segment WK-8

Although this segment is located adjacent to existing BVW and through riverfront, the only major obstacle is right-of-way acquisition from the MBTA. The segment also meets Segment L-8 and the future rail-trail project in Peabody currently under design. Therefore, Segment WK-8 is recommended.

Segment WK-10

This segment provides an alternative to bypass the existing rotary and interchange at I-95 (Rt. 128-Exit 34) and connect Wakefield Center to Reading and eventually the Town of North Andover. A majority of the roads within this segment have curb and walk on either side and in some instances support on-street parking. However, Vernon Street is the only street with insufficient paved width and thus will require a design waiver. Regardless, the segment provides an important connection from Melrose and “Bikeway to the Sea” to points north. Therefore, Segment WK-10 is recommended.

Segment WK-14

This segment is an important link because it provides the only connection from Stoneham to Wakefield. Although Broadway Street will accommodate bicycle and pedestrian traffic without shoulder widening, Albion Street has insufficient paved width and will require a design waiver due to the fact there is existing curb/walk on either side. Despite the need for a design waiver, Segment WK-14 is recommended.

Segment WK-15

This segment provides an alternative to bypass the existing rotary and interchange at I-95 (Rt. 128-Exit 34) and connect Wakefield to Reading via Church Street and North Avenue. Both Church Street and North Avenue will accommodate bicycle and pedestrian and bicycle traffic without shoulder widening. As a result, Segment WK-15 is recommended.

Segment WK-16

This segment provides the only connection from Melrose to Wakefield and “Bikeway to the Sea”. The portions of the segment along Main Street will accommodate bicycle and pedestrian traffic without shoulder widening. A majority of the segment is located along local roads where traffic volumes are light and widening is not required. As a result, Segment WK-16 is recommended.

Segment WK-17

This segment provides the only connection from Wakefield to Saugus. Water Street will accommodate bicycle and pedestrian traffic without shoulder widening. Therefore, Segment WK-17 is recommended.

6.0 TOWN OF WILMINGTON

6.1 History

The Town of Wilmington can be traced back to the Queen Ann's War in the 17th century, during which it was part of an unstable colonial frontier. By 1702, its early agricultural economy included a sawmill operated by Daniel Snow, an early settler.

The Town of Wilmington formed as an independent town in 1730 and has retained many of its 18th century houses. A bronze plaque commemorates the discovery of the Baldwin apple on Butters Farm in the 1790's. The town became one of the largest producers of hops in the State by 1837 by producing several thousand tons.

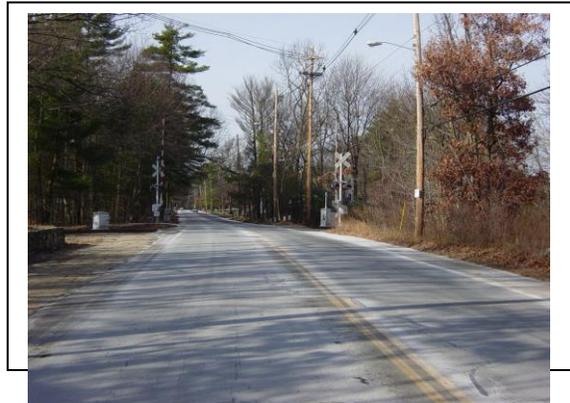
The Middlesex Canal became a vital link to the commercial trade industry when it was completed in the early 19th century, allowing local growers to transport their produce to market. A railroad connected Boston and Lowell to Wilmington in 1835 and included Andover in 1836. Primarily a farming community through the 18th, 19th and early 20th centuries, industrial development has had a major impact on the growth of the town and the development of residential areas.

6.2 Segment WM-2

Type=Signed Shared Roadway

Length=6,286 Ft. (1916m)

Estimated Construction Cost=\$3,000



Description:

Segment WM-2 begins at the intersection of Federal Street and Middlesex Avenue (Rt. 62), proceeds easterly along Federal Street, turns onto Concord Street to the Reading town line.

Federal Street is classified as an Urban Collector with a paved width of approximately 38 feet (11.59m) and curb/walk on either side. Concord Street is classified as an Urban Collector with a paved width of approximately 33 feet (10.06m).

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

6.3 Segment WM-3

Type=Signed Shared Roadway (Score=72)

Length=15,086 Ft. (4599m)

Estimated Construction Cost=\$7,500



Looking South Along Andover Street

Description:

Segment WM-3 begins at the North Wilmington MBTA crossing and proceeds northerly along Middlesex Avenue (Rt. 62) to Woburn Street where it travels northerly onto Andover Street to the Andover town line.

Middlesex Avenue is classified as an Urban Minor Arterial to High Street, and an Urban Collector to Woburn Street with a paved width of approximately 38 feet (11.59m) and curb/walk on either side. Woburn Street is classified as an Urban Minor Arterial with a paved width of approximately 26 feet (7.93m) and berm/walk from Elm to Lowell Street.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

6.4 Segment WM-4

Type=Signed Shared Roadway (Score=79)

Length=9,554 Ft. (2913m)

Estimated Construction Cost=\$5,000



Looking North Along Church Street

Description:

Segment WM-4 begins at the intersection of Rts. 129 and 62 and proceeds northerly along Church Street (Rt. 62), which turns into Middlesex Avenue to the North Wilmington MBTA crossing (See Segment WM-3).

Church Street and Middlesex Avenue are classified as an Urban Minor Arterial.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

6.5 Segment WM-5

Type=Signed Shared Roadway (Score=83)

Length=17,600 Ft. (5366m)

Estimated Construction Cost=\$9,000



Description:

Segment WM-5 begins at the Woburn town line and proceeds northerly along Progress Way, turns westerly onto Industrial Way then onto Woburn Street where it travels northerly before it turns onto Wildwood Street and connects to Church Street (Rt. 62) (See Segment WM-4).

Progress Way and Industrial Way are classified Local Roads with a paved width of approximately 30 feet (9.15m) and 43 feet (13.11m) respectively. Woburn Street is classified as an Urban Minor Arterial from the Woburn town line to Lowell Street, and an Urban Collector to Wildwood Street with a paved width of approximately 26 feet (7.93m) and berm/walk from Elm to Lowell Street. Wildwood Street is classified as an Urban Collector with a paved width of approximately 24 feet (7.32m) and curb/walk on one side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

6.6 Segment WM-11

Type=Rail-Trail (Score=35)

Length=12,069 Ft. (3680m)

Estimated Construction Cost=\$735,000



Description:

Segment WM-11 begins at the intersection of Rt. 129 and 62 and proceeds northward, parallel along the active MBTA railroad line to the Billerica town line.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

6.7 Segment WM-13

*Type=Shared Use Path/
Signed Shared Roadway (Score=77)*

Length=20,869 Ft. (6363m)

Estimated Construction Cost=\$850,000



Historic Middlesex Canal-Looking East

Description:

Segment WM-13 begins at the Woburn town line and travels northerly along Main Street before connecting to the Historic Middlesex Canal system that follows Maple Mendon Brook and Maple Brook. The alignment then connects to Main Street via Burlington Avenue (Rt. 62) and travels northerly along Main Street (Rt. 38) to the Tewksbury town line.

Main Street is classified as an Other Principal Arterial with a paved width of approximately 50 feet (15.24m) and curb/walk on either side.

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

6.8 Segment WM-18

Type=Signed Shared Roadway (Score=77)

Length=11,314 Ft. (3449m)

Estimated Construction Cost=\$6,000



Looking West Along Lowell Street

Description:

Segment WM-18 begins at Reading town line and proceeds northwesterly along Lowell Street to Wilmington Center.

Lowell Street is classified as an Other Principal Arterial with a paved width of approximately 30 feet (9.15m).

Right-of-Way:

The proposed route is located entirely within existing town layout.

Environmental Impacts:

The proposed route does not impact any water resource areas.

Endangered Species:

The proposed route does not impact endangered species.

6.9 Shoulder And Lane Width

The following table summarizes the existing paved width versus minimum required paved width for roads within each shared roadway segment. The existing paved width includes left outside edge to right outside edge. The minimum required paved width is based on recommended roadway section widths developed by MassHighway (Table 5.1, MHD Manual, 1997 Edition)(See Appendices).

**Table 6.1
Existing Roadway Section Widths
Town of Wilmington**

Roadway	Functional Class	Existing Paved Width (m)	Minimum Required Paved Width (m)	Design Waiver Required
Federal Street	Urban Collector	6.10	7.75	Yes
Concord Street	Urban Collector	10.06	7.75	No
Middlesex Avenue	Urban Minor Arterial	11.59	9.50	No
Middlesex Avenue	Urban Collector	8.84	7.75	No
Woburn Street	Urban Minor Arterial	7.93	9.50	Yes

Woburn Street	Urban Collector	7.93	7.75	No
Progress Way	Urban Local	9.15	6.25	No
Industrial Way	Urban Local	13.11	6.25	No
Wildwood Street	Urban Collector	7.32	7.75	Yes
Main Street	Other Principal Arterial	15.24	9.50	No

6.10 Conclusions And Recommendations

Segment WM-2

This segment serves as an important link because it connects Wilmington Center to the City of Peabody. As previously mentioned, although Rt. 62 is an arterial and carries heavy traffic, the road is currently under reconstruction by MassHighway to increase existing travel lane and shoulder widths. Once these improvements are completed, Route 62 will provide a safer corridor that will accommodate pedestrians and bicyclists. Therefore, Segment WM-2 is recommended.

Segment WM-3

This segment provides a connection from Wilmington Center to Andover. It also serves as a connection to the MBTA station for commuters. Middlesex Avenue will accommodate pedestrian and bicycle traffic without shoulder widening, Woburn Street will require additional widening. Although on-street commuter parking adjacent to the MBTA station presents a problem for bicyclists and will have to be addressed, the majority of the segment is feasible. Therefore, Segment WM-3 is recommended.

Segment WM-4

This segment provides a connection from Wilmington Center to North Wilmington and the MBTA station as well as linking several other segments, namely WM-2, WM-3, WM-5 and WM-13. Church Street and Middlesex Avenue will accommodate pedestrian and bicycle traffic without shoulder widening. Although on-street commuter parking adjacent to the MBTA station presents a problem for bicyclists and will have to be addressed, the majority of the segment is feasible. Therefore, Segment WM-4 is recommended.

Segment WM-5

This segment provides an alternative connection from Woburn to Wilmington via Woburn Street and Wildwood Street. All streets along this segment will accommodate pedestrians and bicycle traffic with minor shoulder widening. As a result, Segment WM-5 is recommended.

Segment WM-11

This segment travels along the existing active MBTA rail corridor from the intersection of Rts. 62/38 to the Billerica town line. This option presents several design issues. First, the existing corridor will have to be widened to accommodate both active track and a bikepath. Second, the active track and bikepath will have to be separated with a fence, barrier or similar device to ensure safe use. Third, an access easement will be required from the MBTA to construct the facility. At this time, the railroad company has not been contacted with regard to an access easement. Finally, access is a major concern, specifically, where to terminate or connect this segment. As a result, Segment WM-11 is not recommended.

Segment WM-13

This segment provides a connection from Woburn, through Wilmington to Tewksbury via Main Street and along the Historic Middlesex Canal system. Although the canal is mostly overgrown with vegetation and no more than a walking path today, it preserves an important part of town history. The property is owned by the town and maintained by the park and recreation department. Although this segment is located adjacent to existing BVW, the impact from a trail would be minor. The trail presents an opportunity to enhance this area and restore a historic feature. The corridor would require clearing but could be managed with selective tree removal and thinning. Several surface options could be utilized including stonedust. Therefore, Segment WM-13 is recommended.

Segment WM-18

This segment provides a connection from Wilmington Center to Reading Center via Lowell Street. Lowell Street will accommodate bicycle and pedestrian traffic without shoulder widening. As a result, Segment WM-18 is recommended.

APPENDIX A
MISCELLANEOUS TRAFFIC STUDIES AND REPORTS

APPENDIX B
SUMMARY OF CONSTRUCTION COST ESTIMATES

APPENDIX C
IMPACTED RIGHT-OF-WAY INFORMATION

APPENDIX D
PUBLIC PARTICIPATION DOCUMENTATION

APPENDIX E
EVALUATION OF BIKE ROUTE SEGMENT

APPENDIX F
MISCELLANEOUS DESIGN STANDARDS

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