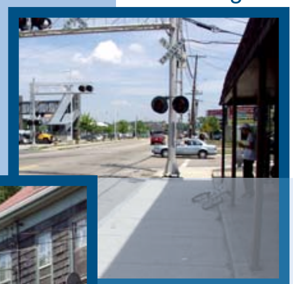
Bicycle and Pedestrian Improvements in Six Urban Centers

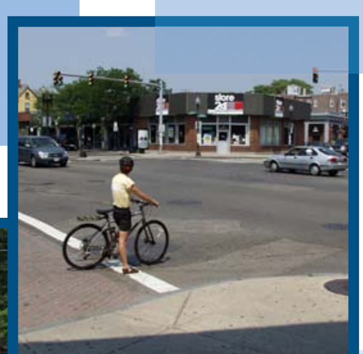
Brookline

Framingham



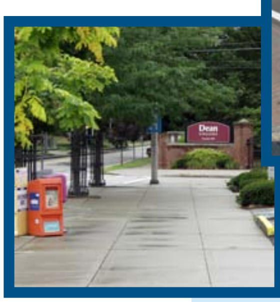
Chelsea

Weymouth



Allston

Franklin



Boston Region Metropolitan Planning Organization

Bicycle and Pedestrian Improvements in Six Urban Centers

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Central Transportation Planning Staff of the **Boston Region Metropolitan Planning Organization**. The MPO is composed of state and regional agencies and authorities, and local governments.

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Contents

Figures and Tables

FIGURES

TABLES

1 Introduction

An urban center is the heart of a community. An urban center that invites walking and bicycling is vital to a healthy community. Pleasant, safe, and convenient access for pedestrians and bicyclists to and within an urban center will attract residents, shoppers, visitors, workers, and transit commuters alike. Pedestrian and bicycle networks connecting surrounding areas to urban centers provide alternatives to the automobile for trips within a community. Improved pedestrian and bicycle access to an urban center supports economic vitality by encouraging more people to stroll and cycle by businesses and storefronts on their way to other destinations. In some cities, business owners have renovated their facades after pedestrian and bicycle improvements have been implemented. Better conditions for walking and bicycling to and within urban centers improve people's quality of life by reducing congestion, improving air quality, reducing carbon dioxide emissions, and encouraging exercise.

Most New England centers were built before the advent of the automobile. Many destinations are within walking distance of each other, including municipal offices, fire and police stations, libraries, churches, schools, health and human services centers, and connections to public transportation. Storefronts are plentiful, and many have offices or residential units above, with nearby multifamily housing that might serve elderly and low-income populations. Many of these residents are less likely to own a car and more likely to walk, bicycle, or use transit to get where they need to go. Transit stations connect many urban centers to destinations throughout the region by bus, light rail, subway, and train.

Motor vehicles have some attributes that have a more negative effect in an urban center than, at the other extreme, on an interstate highway. Cars and trucks take up a lot of space, may be loud, emit pollutants, and are massive compared to people and therefore can do great harm in collisions. On hot days, especially when their air conditioners are running, motor vehicles generate much heat, affecting nearby walkers and bicyclists. Furthermore, fewer motor vehicles in urban centers would result in less congestion and less travel time for drivers.

As urban centers became more auto oriented, investments in the maintenance and construction of pedestrian facilities lost their traditional priority. The compact New England center also has the disadvantage that the automobile has taken much of the space otherwise available to pedestrians and bicyclists. There is no space to widen the road to accommodate bicyclists. Parking lots have replaced some older buildings, requiring more vigilance at driveways from pedestrians and bicyclists, and providing much less interesting streetscapes and vistas. While parking spaces along sidewalks provide a buffer for pedestrians from moving traffic, the parked cars may reduce safety by preventing motorists from seeing crossing pedestrians. Drivers pulling into or out of parking spaces and opening car doors can endanger bicyclists.

This study includes recommendations in six selected urban centers for relatively low-cost, easy-to-implement improvements for pedestrians and bicyclists. Safer and more enjoyable environs for these modes would encourage more people to walk and bicycle, creating an even more inviting atmosphere and more vibrant, viable urban centers.

The improvements for bicycling and walking are treated separately in this report, as they are very different modes of travel. Bicycles are legal vehicles, allowed to use all roads except where specifically prohibited, such as limited-access highways. Bicyclists must yield to pedestrians. Bicyclists are generally prohibited from traveling on sidewalks, per municipal regulations.

1.1 BACKGROUND

The Boston Region Metropolitan Planning Organization (MPO) is committed to improving the transportation network for pedestrians and bicyclists. The measures for improving the network are found in the MPO's most recent policies, under the categories of system preservation, modernization, and efficiency; mobility; environment; safety and security; and land use and economic development (*Journey to 2030, Transportation Plan of the Boston Region Metropolitan Planning Organization*, June 28, 2007, pp. 4-2–4-6).

This Urban Centers study is a companion to the MPO's May 2007 report *Bicycle and Pedestrian Improvements in Town Centers*. That study focused on municipalities with a population of fewer than 20,000 people. This study includes municipalities with populations of over 30,000. Accordingly, the centers in this study are denser and more active than those in the Town Centers study.

The Town Centers study was recommended by the MPO's 2004 Report of the Congestion Management System (CMS), now known as the Congestion Management Process (CMP). The CMP is an ongoing program that provides the MPO and other parties with timely information about transportation system performance in the region, making recommendations where congestion and other mobility deficiencies are found. The CMP documents how the region's transportation network accommodates bicycling and walking.

The Massachusetts Department of Transportation Highway Division released its *Project Development and Design Guide* (*Design Guide*) in 2006, providing a framework for incorporating context-sensitive design and multimodal elements into transportation improvement projects. Transportation projects developed with the provisions outlined in the *Design Guide* are likely to significantly enhance the bicycle and pedestrian environments.

The concept of improving the bicycle and pedestrian environments in urban centers is also supported by and consistent with regional, state, and federal transportation plans and policies, which include:

- Boston Region MPO policies (referenced above)
- *Massachusetts Pedestrian Transportation Plan*, 1998
- *MetroFuture*, the long-range land use plan for the Boston region, by the Metropolitan Area Planning Council (MAPC), 2008
- MassHighway's Bicycle Route and Share the Road Signing Policy (Policy Directive P-98-003), 1998
- The Executive Office of Transportation and Public Works (now the Massachusetts Department of Transportation), *A Framework for Thinking – A Plan for Action*, the Statewide Transportation Plan, 2005
- *Massachusetts Bicycle Plan*, 2008
- *Regional Bicycle Plan*, prepared by MAPC for the Boston Region MPO, 2007

MAPC's update of the MPO's Regional Pedestrian Plan will be available in 2010.

1.1.1 OBJECTIVES

The MPO articulated three objectives for this study: 1) identify urban centers to include in the study, 2) identify opportunities to improve pedestrian and bicycle access and safety within those urban centers, and 3) recommend measures that would both improve conditions in the urban centers studied and highlight opportunities that could serve as a model for other communities in the region. Throughout this process, MPO staff was to work with municipal officials to ensure that study recommendations would be integrated into current municipal planning processes and implemented in the near future.

1.1.2 SELECTION OF URBAN CENTERS

The criteria for site selection were organized into two tiers. The first tier was based solely on population and population density. Eliminating municipalities with populations of less than 30,000 resulted in a list of 28 municipalities. MPO staff then created a list of 94 urban centers within those municipalities. Thereafter, the following second-tier criteria were applied:

- The number of residents, jobs, and pedestrian and bicycle crashes in and adjacent to the urban center
- The availability of transit services
- The location of services, such as municipal libraries, post offices, town halls, banks, grocery stores, and parks
- The location of obstacles to continuous safe access, such as major roadways or railroad tracks
- The type of urban center, such as an intersection, corridor, or multi-block area
- The geographic location within the region

- Municipalities that had hosted a Walkable Community Workshop or had recently undergone MPO studies

The above criteria yielded 12 urban centers in 9 municipalities as candidates for consideration for this study. Staff contacted officials in each of the municipalities to determine whether there were already plans underway for improving the urban center and whether there was sufficient interest in participating in the study. Staff also visited urban centers with which they were not familiar to observe the current condition of pedestrian and bicycle facilities. The list was narrowed down to six urban centers in six municipalities, and the MPO's Transportation Planning and Programming Committee approved those for inclusion.

The selected urban centers are Union Square in the Boston neighborhood of Allston, Brookline Village in Brookline, Downtown Chelsea, Downtown Framingham, Downtown Franklin, and Jackson Square in Weymouth.

1.2 COMPARATIVE DATA

Crash data and user counts are presented in the chapters devoted to specific municipalities. This section presents and compares the data for the six communities.

1.2.1 BICYCLE AND PEDESTRIAN COUNTS

Counts of bicyclists and pedestrians were done in the six study areas on Thursday, August 28, 2008. Counts were done in the morning, 6:00–10:00 AM, for three of the study areas, and from 2:00–6:00 PM for the other three. The morning counts are shown in Table 1-1.

TABLE 1-1
Counts of Pedestrians and Bicyclists and the Ratio of the Counts:
Allston, Brookline, and Weymouth, Thursday, August 28, 2008, 6:00–10:00 AM

Location	Pedestrians	Bicyclists	Pedestrians/Bicyclists
Allston	304	132	2.3
Brookline	426	121	3.5
Weymouth	57	10	5.7

For the morning counts, Brookline had the highest pedestrian count and Allston the highest volume of bicyclists. The Weymouth counts are about an order of magnitude lower than those high volumes in both categories. For all three communities, there are more pedestrians than bicyclists: from over twice as many in Allston to almost six times as many in Weymouth.

For the afternoon counts (see Table 1-2), Chelsea has by far the most pedestrians, over twice the count in Framingham, which is in turn over three times the count in Franklin. The most bicyclists were found in Framingham—about 50 percent more than in Chelsea, and almost 10 times the volume in Franklin. The ratios of pedestrians to bicyclists in these three areas are higher than in the other three communities, and significantly so in Chelsea and Framingham. There were 25 times as many pedestrians as bicyclists in Chelsea, and over 18 times as many in Framingham.

TABLE 1-2
Counts of Pedestrians and Bicyclists and the Ratio of the Counts
Chelsea, Framingham, and Franklin, Thursday, August 28, 2008, 2:00–6:00 PM

Location	Pedestrians	Bicyclists	Pedestrians/Bicyclists
Chelsea	2, 022	81	25.0
Framingham	934	128	7.3
Franklin	276	15	18.4

While the AM and PM counts cannot be strictly compared because they were taken at different times, it is clear that the highest pedestrian volumes by far are in Chelsea. The 4-hour count there, 2,022, is almost five times the next highest count of 426 in Brookline and 35 times the volume in Weymouth. The differences amongst the communities' bicyclist volumes were less striking. Allston, Framingham, and Brookline had the highest volumes and were somewhat comparable to each other. Compared to these three, the Chelsea volumes were about 50 percent less and those in Franklin and Weymouth were about an order of magnitude lower.

While all six areas in the study are called urban centers, the above data indicate that some have significantly more activity than others.

1.2.2 CRASH DATA

Table 1-3 presents the total number of pedestrian crashes and the total number of bicycle crashes for the six municipalities for two different five-year periods: 1997-2001 and 2002-2006. Data from both of these time periods are presented because a significant change in the reporting requirements took place in December 2001. The Massachusetts Registry of Motor Vehicles lengthened the crash report form, requiring more information. While the increased level of detail would be helpful in determining the causes of crashes and possible trends, the change to the longer form seems to have had the effect of decreasing the number of reported crashes.

For the six municipalities, the average number of reported bicycle crashes in 2002-2006 fell to 57 percent of the 1997-2001 level. The ratio of bicycle crashes in the more recent time period to the 1997-2001 time period fell the least in Framingham, where the rate decreased to 85 percent. The largest decrease was in Allston-Brighton, where there was

TABLE 1-3
Bicycle and Pedestrian Crashes Reported in the Six Urban Center Communities, and the Ratios of the Crashes for the Two Time Periods, 1997-2001 and 2002-2006

	1997-2001		2002-2006		Bicycle	Pedestrian
Community	**Bicycle Crash**	**Pedestrian Crash**	**Bicycle Crash**	**Pedestrian Crash**	**Ratio of 2002-2006 / to 1997-2001**	**Ratio of 2002-2006 / to 1997-2001**
Allston-Brighton	45	122	8	27	0.18	0.22
Brookline	158	321	86	177	0.54	0.55
Chelsea	112	270	59	170	0.53	0.63
Framingham	142	333	121	144	0.85	0.43
Franklin	21	54	7	15	0.33	0.28
Weymouth	95	168	44	109	0.46	0.65
Average	95	211	54	107	0.57	0.51

less than one bicycle crash reported in 2002-2006 for every five reported in the previous five years. The reported number of bicycle crashes in Franklin fell by two-thirds. Reported bicycle crashes filed in Brookline, Chelsea, and Weymouth police fell to approximately half of their previous five-year levels.

The pedestrian crashes reported in 2002-2006 fell to 51 percent of the 1997-2001 level, a slightly larger decline than the corresponding bicycle percentage. The lowest decreases occurred in Chelsea and Weymouth, where about two pedestrian crashes were reported in 2002-2006 for every three reported the previous five-year period. The largest decline was again in Allston-Brighton (22 percent as many reported) followed by Franklin (28 percent as many reported). Falling in the middle were Brookline (55 percent as many reported) and Framingham (43 percent as many reported).

It is not known how much, if any, of these differences between the two time periods may be due to an actual decrease in the number of crashes. Also unknown is the comparative rate at which different police departments reported crashes prior to the 2001 change in the form. For example, during the 1997-2001 period, there were 158 bicycle crashes reported in Brookline and 45 in Allston-Brighton. Were there three times as many bicycle crashes in Brookline during this period, or were crashes there reported more diligently? An analysis of hospital data might help shed light on these questions, but that inquiry is beyond the scope of this study. It should be noted that both police officers and individuals involved in crashes can file these reports. It is generally believed that the police reports are more objective.

In comparing the number of crashes in different municipalities, it is important to consider population and user volumes. That is, one would expect fewer crashes in settings with little or no traffic than in ones where there is more activity. Table 1-4 indicates, for each municipality, the pedestrian and bicyclist crashes per 10,000 residents, using U.S. Census data from 2000, and the number of crashes compared to the user volumes collected.

TABLE 1-4
Population (2000 U.S. Census); Reported Bicycle and Pedestrian Crashes per 10,000 Residents, 2002-2006; August 2008 Four-Hour Volumes of Pedestrians and Bicyclists; and Crashes per Count Index, for the Six Communities

Community	Population	Bicycle Crashes/ 10,000 Residents	Pedestrian Crashes/ 10,000 Residents	4-Hour Bicycle Count	4-Hour Pedestrian Count	Bicycle Crashes per Count Index*	Pedestrian Crashes per Count Index**
Allston-Brighton	64,961	1	4	132	304	6	9
Brookline	57,107	15	31	121	426	49	42
Chelsea	35,080	17	48	81	2,022	73	8
Framingham	66,910	18	22	128	934	95	15
Franklin	29,560	2	5	15	276	47	5
Weymouth	53,988	8	20	10	57	440	191

*Bicycle Crashes per Count Index: Bicycle Crashes (2002-2006) divided by the 4-hour bicycle count, multiplied by 100.
** Pedestrian Crashes per Count Index: Pedestrian Crashes (2002-2006) divided by the 4-hour pedestrian count, multiplied by 100.

There are problems with almost all the data in the above table. The limitations of the reported crash data were noted above. Also, the user volumes were taken on only one day at one location in each municipality. The population figures, although probably accurate as of 2000, are being used to compare crash data for the years 2001-2006. This would only be an issue if the populations of these six municipalities changed significantly relative to each other. Given the other problems with the data, this one is relatively minor.

Given all these data limitations, detailed comparisons of rates amongst the communities are not warranted. A couple of points are worth noting, however. First, the Allston-Brighton numbers reinforce the conclusion that reported crash data there are low. The Allston-Brighton crashes per capita for bicyclists and for pedestrians are the lowest for all six communities. In terms of crashes per volume of users, Allston-Brighton is the lowest by far for bicycle crashes and amongst the lowest for pedestrian crashes.

Second, the crashes per capita are higher for pedestrians than for bicyclists by a factor of at least two to one for each municipality except Framingham, where the pedestrian rate is only slightly higher. Yet the ratios based on user counts tell a different story. The number of crashes using the count index is higher for bicyclists than for pedestrians in all municipalities except Allston-Brighton. And, except for Brookline, the bicycle ratio is significantly higher than the pedestrian ratio: more than two to one in Weymouth, six to one in Framingham, and nine to one in Chelsea and Franklin. Even taking into account the limitations of the data, it is fair to say that bicyclists are involved in crashes disproportionately more than pedestrians when considering the relative number of trips these two groups make. Overall there are more pedestrian crashes because there are many more walking than bicycling trips.

A third point is that in Weymouth, for both bicyclists and pedestrians, the number of reported crashes compared to the volumes is significantly higher than in the other five communities.

In summary, high crash numbers may indicate more diligent reporting of crashes or higher levels of activity, or both, rather than less safe conditions. The crash data may help, however, in identifying specific areas that could be improved for bicyclists and walkers.

1.3 OVERVIEW OF REPORT

The next chapter provides information on methods to improve the environment for pedestrians and bicyclists in urban areas. These methods are presented separately for the two modes. While this report focuses on physical improvements, efforts in other areas – such as education and enforcement – are also important. A section on funding then presents information on programs at the federal, state and local levels of government that are potential sources to undertake improvements. Tables in Chapter 2 present cost estimates for various types of construction.

The remaining six chapters are each devoted to one of the urban centers. Each of these chapters begins with an overview of the entire community in which the urban center is located, including a history, and information on land use, population and employment, transportation services, and crash data. Then, the specific study area within each community is described in more detail. The study areas then are broken down into even smaller areas, to describe the existing conditions and recommendations in more detail. These descriptions are presented separately for the two modes.

While the recommendations are specific to the urban areas in this report, they also are intended to convey general concepts applicable to other sites.

2 Best Practices

This chapter discusses pedestrian and bicycle issues encountered in urban areas and information on the types of measures that can be implemented to address them. The subsequent six chapters describe specific pedestrian and bicycle issues for each of the urban centers evaluated in this study and the recommended actions for addressing them. The estimated capital costs of these measures are included in this chapter, as well as potential sources of funding.

This chapter is strongly informed by *Bicycle and Pedestrian Improvements in Town Centers* (Boston Region MPO, May 2007), mentioned in Chapter 1. A major source of information for both that study and this one is MassDOT Highway Division's *Project Development and Design Guide* (January 2006). This *Design Guide* provides a framework for incorporating context-sensitive design for all transportation modes, from trucks to pedestrians.

The main source of information for general costs of materials and treatments is *Weighted Average Bid Prices from Highway and Bridge Projects*, which MassDOT Highway Division produces annually.

The four E's—engineering, education, enforcement, and encouragement—are a description of ways to address bicycling and pedestrian issues. While this report is concerned primarily with engineering and design issues, the others issues are also important.

Walking and bicycling are very healthy for individuals and therefore should be encouraged. The laws that protect people who are walking and bicycling need to be enforced. Likewise, pedestrians and bicyclists need to follow the law. And all road users need to be educated and reminded that following the rules does not guarantee safety. Many pedestrians, for example, are hit while lawfully crossing a road in a crosswalk. Pedestrians need to be certain that oncoming motorists see them and yield to them before crossing.

Traveling on the roads without the surrounding armor of a motor vehicle makes bicyclists very vulnerable to injury in a collision. Unsafe bicycling habits include riding against motor vehicle traffic, going through stop signs and red lights, and passing too closely. Some bicyclists, including children, were observed disobeying traffic laws in the urban centers evaluated for this study. It is especially important for children to be educated about how to ride safely on and off the roads. Parents need to model safe bicycling and pedestrian behavior to their children. Educating children about safe walking and bicycling is one component of the Commonwealth's Safe Routes to School program, described later in this chapter.

2.1 PEDESTRIAN ENVIRONMENT

We can divide walking areas into two major categories: shared use paths, or trails, and facilities that are integrated into the roadway system. The former are separated from motor vehicles everywhere except at intersections. The only trail system discussed in this report is in Weymouth. The bulk of this study deals with walking within the street system. The major physical components of the walking environment are sidewalks, crosswalks, and the connections between them—curb ramps. Other important items are street furniture, buffers between sidewalks and roadways, and signage.

A comprehensive pedestrian network provides safe, convenient, and pleasant access to places pedestrians want to go. Sidewalks should be located strategically to connect centers of activity, including residential and commercial areas, schools, libraries, places of worship, and recreation areas. A well-maintained, attractive sidewalk designed to meet safety standards can reduce crashes, as well as encourage more people to walk.

The *sidewalks* discussed in this study are made of concrete, brick, or asphalt. Brick and concrete are found more often in urban areas than in suburban and rural areas. These materials wear differently over time, and the installation and maintenance costs vary considerably. While cost and durability are major factors in deciding which treatment to employ, connectivity, character, aesthetics, and accessibility for persons with disabilities are also important. Table 2-1 indicates the median bid prices for items related to the pedestrian environment.

As are our roads, so are sidewalks subject to the vicissitudes of New England winters. Freezing and thawing can cause cracking and buckling of a sidewalk's surface. The roots of nearby trees can push upward on a sidewalk, creating bumps and cracks. General wear over time causes deterioration of the surface. All sidewalk surface materials require periodic maintenance, some more frequently than others. The condition of sidewalk surfaces is discussed in each chapter devoted to a municipality.

A six-foot width allows two pedestrians to walk side by side comfortably. Sidewalks should be at least five feet wide to allow pedestrians to pass one another. Likewise the Massachusetts Architectural Access Board requires a five-foot width for the passage of two wheelchairs.[1] A three-foot width is considered acceptable in order to bypass obstructions. If there is no buffer between the roadway and the sidewalk, a six-foot width is desirable in residential areas, eight feet in commercial areas.

Curb ramps connect sidewalks to intersecting roadways or driveways, providing a smooth pedestrian transition. Curb ramps make sidewalks accessible for those with limited mobility, as well as for people pushing strollers. Curb ramps should be at least three feet wide, preferably four.

Every street crossing needs an exclusive curb ramp. In many instances in the urban centers in this study, a shared curb ramp is installed at the corner of an intersection. Crosswalks are then

[1] Commonwealth of Massachusetts Regulations: 521 CMR Section 6.2.

TABLE 2-1

MassHighway Weighted Bid Prices, All Districts, Pedestrian Environment, 9/07-9/08

http://www.mhd.state.ma.us/PE/WeightedAverageBook.aspx

Surface Treatments	Recommendation	Item Number	Median Average Bid
Sidewalks Surface Treatment	Cement Concrete Sidewalk	701.	$50/sq. yd.
	Cement Concrete Sidewalk at Driveways	701.1	$60/sq. yd.
	Cement Concrete Wheelchair Ramp	701.2	$78/sq. yd.
	Brick Walk	706.	$170/sq. yd.
	Hot Mix Asphalt Walk Surface	702.	$135/ton
Curb Cut Ramps	Granite Transition Curb for Wheelchair Ramp - Straight	509.	$38/ft.
	Granite Transition Curb for Wheelchair Ramp - Curved	509.1	$43/ft.
	Cement Concrete Wheelchair Ramp	701.2	$78/sq. yd.
Curbs	Granite Curb	501. to 506.1	$32 to $52/sq. ft.
	Granite Transition Curb for Wheelchair Ramp - Straight	509.	$38/ft.
	Granite Transition Curb for Wheelchair Ramp - Curved	509.1	$43/ft.
	Concrete Curb	520.	$24/ft.
	Hot Mix Asphalt Curb	570. to 572.3	$5 to $10/ft. or $182.50 to $225.00/ton
Buffers	Brick Walk	706.	$170/sq. yd.
	Loam Borrow	751.	$40/cu. yd.
	Topsoil Rehandled and Spread	752.	$20/cu. yd.
	Impervious Soil Borrow	760.	$35/ cu. yd.
	Seeding	765.	$1.60/sq. yd.
	Lawn Sodding	770.	$10/sq. yd.
	Plantings (Trees, Shrubs, Bushes)	772.058 to 796.853	$30 to $1,035/each
Street Furniture	Park Bench	707.1	$1810/each
	Plantings (Trees, Shrubs, Bushes)	772.058 to 796.853	$30 to $1035/each
	Area Lighting Luminare 400Watt	823.17	$10,000/lump sum
Crosswalk Markings	Cross Walks and Stop Lines Reflectorized White (painted)	865.	$2.25/sq. ft.
	Cross Walks and Stop Lines Reflectorized White (thermoplastic)	865.1	$1.50/sq. ft.
Signage	*Pedestrian Traffic, School, State Law Yield to Peds*		
	Demountable Reflectorized Reference Location Sign	834.	$34.50/each
	Removed and Reset	734.	$200/each
	Traffic Sign Removed and Stored	874.4	$40/each
Stop Lines	Cross Walks and Stop Lines Reflectorized White (painted)	865.	$2.25/sq. ft.
	Cross Walks and Stop Lines Reflectorized White (thermoplastic)	865.1	$1.50/sq. ft.
Signalized Pedestrian Crosswalks	Traffic Control Signal	815.	$122,000/lump sum

marked to connect to such shared curb ramps, resulting in longer crossing distances for pedestrians. All such shared curb ramps should be replaced with exclusive ones.

Sidewalks with asphalt surfaces often slope down to the level of intersecting roadways and driveways. This requires pedestrians to go down when crossing the road or driveway and then back up again. There is also a psychological message established: you are now entering the domain of the motor vehicle. The corresponding message goes to the drivers, that this crossing is their territory, albeit a shared one.

An alternative to constructing curb ramps is to increase the height of the intersecting roadway or driveway to the height of the sidewalk. This not only eliminates the need to go down and up, but also reinforces that this is the realm of the pedestrian, and that motorists have permission to cross when there are no conflicts. Most of the sidewalks evaluated for this study have either curb ramps or sloping asphalt at intersecting roadways and driveways.

Curbs between a sidewalk and a roadway improve pedestrians' perceived and real safety, forming a physical barrier from traffic. Curbs also help deter motorists from parking on sidewalks and channel roadway water runoff. Curbs are made of granite, concrete, or asphalt.

Curb extensions are an extension from the curb line of the sidewalk at crosswalks. A curb extension shortens the crossing distance for a pedestrian, thereby decreasing the time of exposure to traffic and the time required to cross. The extension also allows motorists and pedestrians to be more visible to each other. Curb extensions also preclude motorists from parking too closely to intersections and decreasing sight distance on cross streets. The space made available by the curb extension can be used for such items as plantings, fire hydrants, or benches.[2]

Buffers between the sidewalk and the roadway increase the distance between the walking area and moving traffic. For pedestrians, this creates a sense of security and a more pleasant environment. Buffers that are landscaped with grass, brick, or plants, including trees, further enhance the walking experience, as well as that of drivers. There are buffers along some of the sidewalks in each of the urban centers evaluated in this study.

It is important to keep sidewalks clear for safe passage. In many cases, it is the responsibility of owners to clear the sidewalks that front their property. In the winter, snow and ice can make sidewalks hazardous, or even impassable. People clearing roads and driveways sometimes plow extra material onto sidewalks. Throughout the year, but especially in late winter and early spring, sand and debris collect on sidewalks. The accumulation of leaves, most common in autumn, can be a hazard, especially when they are wet and slippery.

Street furniture items such as benches offer a welcome respite to many, from parents with young children to the elderly. Benches under shade trees are wonderful respites from the summer heat. After dark, lighting not only allows pedestrians to see where they are going and motorists to see pedestrians, but also provides a sense of security. If street furniture needs to be located in places where it partially obstructs the sidewalk, then it should not reduce the width to less than three feet.

[2] *Design Guide*, p. 16-29.

Crosswalks connect sidewalk segments across roadways and sometimes across driveways. A well-designed crosswalk includes a highly visible treatment in the roadway, usually consisting of a painted pattern or inlaid brick, curb ramps on both sides, and sometimes signs to alert motorists. Crosswalks should be installed at intersections and at other locations where it is safe and desirable for pedestrians to cross a roadway or a driveway. They should be strategically placed where pedestrians make connections to high-traffic destinations.

There are several treatments that make crosswalks more visible to pedestrians and motorists. MassDOT Highway Division allows three crosswalk-marking patterns: ladder-style (the agency's preferred option), parallel-bar-style, and zebra-style. These patterns are shown in Figure 2-1. Many crosswalks evaluated in this study are a modified parallel-bar-style. In many cases, those crosswalks are accented by a solid painted color (yellow or green), or inlaid bricks, between two parallel white lines.

The condition of the crosswalk markings in this study varies widely. Some crosswalks had recently been repainted and were highly visible, but others were very faded. Generally, municipal staff members repaint crosswalks annually, usually in the spring. Crosswalks therefore get increasingly less visible through the fall and into the winter. The lack of visibility in winter is compounded by the accumulation of sand and other materials on roadways.

Signs are often installed near crosswalks to warn motorists of the possible presence of pedestrians. Several types of signs were observed in the Urban Centers study areas: pedestrian-traffic, school, and state-law-yield-to-pedestrians signs, with or without an indication of a fine for not yielding. Yield-to-pedestrian signs on movable posts are often placed in, or adjacent to, the roadway, particularly at crosswalks near schools.

Medians or crossing islands provide a refuge for pedestrians. Pedestrians can cross one half of a roadway and wait for an opening to cross the other side. Medians also can help slow down motor vehicles. These islands need to be at least six feet wide. Fifty feet is considered the longest acceptable length for an uninterrupted crosswalk, but medians can be used for much shorter crossings.[3]

Stop lines, indicating where vehicles should stop at a stop sign or traffic signal, should be positioned at least four feet before the crosswalk.[4] Stop lines remind motorists to look for pedestrian traffic. They are also very important to pedestrians. By stopping well before the crosswalk, motorists indicate to the pedestrians that they are seen.

This is even more critical on multilane roads. If a motorist in the lane closest to the sidewalk stops well before the crosswalk, a motorist coming up in an adjacent lane has more time to see the pedestrian in the crosswalk, and respond. Likewise, the pedestrian has more time to react to the motorists in the adjacent lane.

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[3] Ibid., p. 6-63.
[4] Ibid., p. 6-61.

Figure 2-1
Various Crosswalk Designs in the Urban Centers

Parallel Bars with Inlaid Brick
Harvard and Brighton Avenues, Allston

Ladder Style with Parallel Bars
Harvard and Linden Streets, Brookline

Ladder Style with Parallel Bars
Concord and Clinton Streets, Framingham

Parallel Bars, Solid Green Infill
Jackson Square, Weymouth

Zebra Style
Beacon Street off-ramp, Tobin Bridge, Chelsea

Parallel Bars
Alpine Place, Franklin

Signals allowing pedestrians to cross are typically integrated into traffic signals located at intersections. Sometimes separate pedestrian signals are placed where there is significant pedestrian traffic or where it may be unsafe to cross while automobile traffic is moving. At intersections, these signals provide either an exclusive pedestrian phase, when only pedestrians are allowed to traverse the intersection, or a concurrent pedestrian phase, when pedestrians cross a crosswalk while motor vehicle traffic is allowed to move in a parallel direction. A concurrent phase decreases the time pedestrians have to wait to cross. A variant on this is a leading pedestrian interval that allows pedestrians to begin crossing before the traffic light turns green for the parallel-moving motorists. This increases the visibility of pedestrians and helps prevent motorists from making turns ahead of the pedestrians, resulting in, at best, delays, and at worst, crashes.[5]

The pedestrian phase of a signalized crosswalk consists of a walk signal, which indicates when pedestrians may enter the crosswalk, and a flashing don't-walk signal, which indicates that pedestrians already in the crosswalk may continue to the other side of the roadway, but pedestrians not yet in the crosswalk should not begin to cross. The pedestrian phase should be long enough for a pedestrian walking at a speed of 3.5 feet per second to cross to the other side.[6]

Countdown signals indicate how much time remains to complete the crossing. They allow pedestrians to make a more informed decision as to whether to initiate a crossing or not. They are particularly recommended where crossing time is limited or where there have been signal-related crashes.[7] One study in San Francisco reported that countdown signals were associated with a 53 percent decrease in pedestrian injuries. In addition, 92 percent of those interviewed preferred them to traditional signals.[8]

The time allotted to pedestrians was measured for the 25 signalized crossings in this study. The time was called adequate if there was enough from the beginning of the "Walk" phase to the end of the flashing "Don't Walk" phase. It would be more conservative, however, to measure the walk time from the end of the "Walk" phase to the end of the "Don't Walk" phase, as pedestrians are allowed to begin crossing up until the "Don't Walk" phase begins. Municipal staff are urged to adjust the timing on signals so that the "Don't Walk" phase allows enough time to cross.

In addition to good accommodations, the pedestrian environment is greatly affected by the *speed of motor vehicles* on adjacent roadways. Slower-moving motorists are less likely to hit a pedestrian and, if there is a collision, less likely to inflict serious injury. As indicated in Table 2-2, in a crash, the speed of the motor vehicle largely determines the fate of the pedestrian. A pedestrian's chance of survival in a crash goes from 95 percent when the motorist is traveling at 20 miles per hour to 55 percent when the motorist is traveling at 30 miles per hour, only 10 miles per hour faster.

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[5] Ibid., p. 6-20.
[6] The *Manual on Uniform Traffic Control Devices* changed the walking speed from 4.0 to 3.5 feet per second in January 2010.
[7] Ibid., p. 6-21.
[8] F. Markowitz, S. Sciortino, "Pedestrian Countdown Signals: Experience with an Extensive Pilot Evaluation," *ITE Journal,* 76, No. 1, 2006, as reported in *Pedestrian Safety, Report to Congress*, FHWA, August 2008, p. 13.

TABLE 2-2
Effect of Impact Speed of Motor Vehicle on Fatality and Injury Rates of Pedestrians[9]

	Speed of Motor Vehicle			
Probability of:	**20 mph**	**30 mph**	**40 mph**	**50 mph**
Death	5%	45%	85%	100%
Injury	65%	50%	15%	-
No Injury	30%	5%	-	-

There are many recommendations in this report to reduce the *width of travel lanes*. The reduced widths not only slow down motorists but also make more of the roadway width available to bicyclists. A travel lane width of 10 feet is considered appropriate when the intent is to calm traffic. Wider travel lanes are necessary on roadways with a large number of trucks or buses, and on arterials.[10]

Right-turn (auxiliary) lanes are generally not recommended in areas where the emphasis is on accommodating pedestrians. The extra pavement width for the right-turning traffic requires pedestrians to walk a longer distance to cross the street, and there is an increased potential for conflicts between pedestrians and motorists. *Left-turn lanes* should also be used sparingly. The slowing of traffic due to waiting for left-turning vehicles can have a positive effect in areas of high pedestrian activity. Removing on-street parking from both sides at an intersection can accommodate left-turn lanes where they are needed.[11]

2.2 BICYCLE ENVIRONMENT

Other than the Back River Trail discussed in the Weymouth chapter (Chapter 8), the focus on bicycling in this study is on accommodating that mode within the roadway system. In general, given the rarity of rights-of-way available for trails, almost all bicycling in our region, in the Commonwealth, and in our country, is on the roadway system. Costs of items associated with bicycling on the roadway system are shown in Table 2-3.

While many factors affect how safe and welcome a bicyclist feels on a road, the *roadway width* is perhaps the main factor. The width of available space determines whether there is room for a bicycle lane or a shoulder or whether bicyclists need to share lanes with motor vehicles.

Bumps, cracks, and potholes are a nuisance to motorists, sometimes resulting in damage to their vehicles. These nuisances can be much more dangerous to bicyclists, possibly causing falls or last-minute swerves into motor vehicles. Unfortunately, bumps and cracks occur more often near the edge of a roadway, where bicyclists travel. This is why this study assessed the *condition of the roadway surface,* particularly near the edge, because it is a major factor in bicyclist safety and comfort.

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[9] US DOT, Leaf WA, Preusser DF, 1999.
[10] *Design Guide*, p. 16-19.
[11] Ibid., p. 16-21.

TABLE 2-3

MassHighway Weighted Bid Prices, All Districts, Bicycle Environment, 9/07-9/08

www.mhd.state.ma.us/PE/WeightedAverageBook.aspx

Surface Treatments	Recommendation	Item Number	Median Average Bid
On-Street Bicycling			
Roadway Surface	Hot Mix Asphalt	460.	$82/ton
Shoulders	Hot Mix Asphalt	460.	$82/ton
	Drainage Grates	222. to 222.2	$500 to $600/each
Bicycle Lanes	6" Reflectorized White Line (painted)	860.06	$0.45/ft.
Signage	*Bicycle Traffic, Bike Lane Ahead, Bike Lane Ends, Share the Road*		
	Demountable Reflectorized Reference Location Sign	834.	$34.50/each
	Traffic Sign Removed and Reset	734.	$200/each
	Traffic Sign Removed and Stored	874.4	$40/each
Bicycle Parking	Bicycle Rack	707.9	$1,000/each

Paved shoulders provide space for bicycling outside of the travel lane. Shoulders that are at least four feet wide can fully accommodate bicyclists, but even narrower shoulders provide some space for bicyclists. Shoulders should be kept free of debris (sand, gravel, and refuse) so as not to obstruct bicyclists. Drainage grates that are set back from the roadway so that bicyclists do not have to ride over them make for a smoother, safer bicycle ride.

Bicycle lanes are delineated by a six-inch wide solid stripe and symbols on the pavement. Bicycle lane markings increase a bicyclist's confidence that motorists will not stray into their path of travel. Likewise, passing motorists know that this space is for bicyclists. When there is no delineation, some motorists overcompensate for bicyclists and swerve left out of their own travel lane. Bicycle lanes should be at least four feet wide, but five feet is preferred in most situations.[12] Many of the roadways in the urban centers evaluated in this study are not wide enough to accommodate bicycle lanes. Bicycle lanes need to be wider when they are adjacent to parking lanes (see further discussion below).

On-street parking may constitute a hazard for bicyclists. Both motorists and bicyclists must be alert. Bicyclists should ride outside the reach of an opened car door to avoid a collision. Likewise, motorists wishing to exit their parked vehicle should look behind them for bicyclists before opening the door. Bicyclists should reduce their speed and ride to the left of parked cars in a straight, predictable line. Bicycle lanes and shoulder lines between on-street parking and travel lanes guide bicyclists to a safe location on the roadway. They also remind motorists to be alert for passing bicyclists.

[12] Ibid., p. 5-6.

An on-street configuration that is safer for bicyclists is *back-in diagonal parking*. This is similar to traditional angle parking except instead of driving into the parking spot, the motorist backs in. Because the parking is angled away from the curb, the maneuver is less difficult than parallel parking. A major reason for this being an improvement is that bicyclists have a much better view of the drivers wishing to exit, and vice versa. With head-in diagonal parking, the motorist is looking through the vehicle and around any adjacent parked vehicles. Likewise, the bicyclist cannot see if anyone is in the vehicle until passing it.

Back-in parking is also better than head-in for motorists and their occupants. First, the car doors open facing the sidewalk, blocking access to the roadway, the opposite of head-in parking. This is especially important with children in the car, who might suddenly run in the direction of the opened door. Second, the trunk or storage area of the vehicle is on the sidewalk side, not the street side.

Diagonal parking also has benefits over parallel parking. As noted above, it is easier to back into a diagonal parking spot than a parallel one. Also, no car doors have to be opened into traffic. This latter reason is the most important one for bicyclists. When traveling alongside parallel-parked cars, bicyclists have to be constantly on the alert for a door suddenly opening in front of them.

The width required for diagonal parking varies, depending primarily on the angle of the parking. The City of Vancouver, Washington, allows 12 feet for parking at 45 degrees from the curb.[13] Less width is required as the parking angle approaches zero degrees, or parallel to the curb. More width is required as the angle approaches 90 degrees, perpendicular to the curb (the configuration in most parking garages).

Bicycle-route signs are used to mark a suggested route for bicyclists. The only long-distance bicycle route in Massachusetts is the Claire Saltonstall Bikeway, between Boston and Cape Cod. *Share-the-road signs* are used when there is not enough width to create bicycle lanes or shoulders. These signs remind motorists to be on the alert for bicyclists sharing the roadway. None of the urban centers evaluated in this study have bicycle-route or share-the-road signs. MassDOT Highway Division sometimes installs these signs along state highways if several criteria are met. For more information, see MassDOT Highway Division's Bicycle Route and Share the Road Signing Policy (Policy Directive P-98-003, August 25, 1998).

Bicyclists need safe, convenient places to store their bicycles at a destination. *Bicycle racks* should be located at important activity centers, such as town halls, libraries, post offices, schools, commercial areas, recreational facilities, and transit stations. They should be located near the main entrance to these facilities, and should be highly visible, not only so that bicyclists can easily find them and but also to discourage theft and vandalism. Where possible, racks should be positioned so that bicycles are protected from precipitation.

The MPO's Bike Rack Program, described later in this chapter, provides some reimbursement for bicycle racks. The guidelines recommend that bicycle racks: support the bicycle frame in two

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[13] Back-in/Head-out Angle Parking, Nelson\Nygaard Consulting Associates, January 2005.

locations, enabling the frame and one or both wheels to be secured; allow both front-in and back-in parking; and be compatible with today's bicycle frames and locks.

Among racks that meet the above guidelines are the inverted-U, the *A* (an inverted-U with a horizontal bar), and the post-and-loop (also known as *bike hitch*). Each of these racks supports two bicycles. Many manufacturers produce these or similar styles. These racks are often arranged in a row; the spacing between the racks should be a minimum of 30 inches (on centers), but preferably 36 to 42 inches.

2.3 SOURCES OF FUNDING

The following state programs are potential sources of funding for the improvements to pedestrian and bicycle networks recommended in this study. Many of these programs in turn receive funds from the federal government.

Some municipal transportation projects are funded through the Commonwealth's Chapter 90 program. These funds, distributed by MassDOT Highway Division, may be used for many types of transportation projects, including roadway resurfacing, sidewalk construction, the installation of street lighting, and the construction and maintenance of trails. Municipalities pay for the projects they choose to undertake and are reimbursed for eligible expenditures.

In state fiscal year (SFY) 2009, MassDOT Highway Division allocated $150 million in Chapter 90 funds to municipalities. Funding is made available annually based on a municipality's population, employment, and number of miles of local roadways. For more information on the Chapter 90 program, visit www.massdot.state.ma.us.

Since federal fiscal year (FFY) 2007, the Regional Bike Parking Program reimbursed municipalities in the Boston region for the purchase of bicycle racks. The program, administered by the Metropolitan Area Planning Council (MAPC) and funded by the Boston Region MPO, MassDOT, and the Federal Highway Administration (FHWA), had three participating vendors that provided a variety of styles of bicycle racks and other related products. Municipalities paid up front for their purchases and then were reimbursed. The cost of shipping and installation were the responsibility of the municipality. In FFY 2010, the program was incorporated into the MPO's Clean Air and Mobility Program. Bike parking infrastructure projects are eligible under the new program, and the same guidelines apply. For further information, go to www.bostonmpo.org.

The Commonwealth's Transit-Oriented Development (TOD) Infrastructure and Housing Program (also known as the TOD Bond Program) was created to increase the supply of compact, mixed-use, walkable development close to transit stations. The program provides financial assistance for the construction of pedestrian improvements, bicycle facilities, housing projects, and parking facilities within a quarter mile of a commuter rail station, subway station, bus or bus rapid transit station or stop, or a ferry terminal. The program also funds the preliminary design of pedestrian and bicycle facility projects near transit stations.

In SFY 2006, $7 million was awarded to four projects. In SFY 2007, $6 million was awarded to 16 projects. No awards were given in SFY 2008, and awards are still pending for SFY 2009. All public entities, including municipal governments, are eligible for the program.

Massachusetts' Safe Routes to School (SRTS) program aims to improve walking and bicycling conditions for children traveling to school in the commonwealth. Elementary schools that are partnered with the program help implement education programs, activities to encourage bicycling and walking, traffic enforcement, and engineering solutions.

Mass*RIDES* administers the program for MassDOT. The SRTS Manual has been sent to all elementary school principals in Massachusetts. The program is funded by the FHWA, which allocated over $2.7 million in SFY 2008 to Massachusetts for its SRTS program. Massachusetts is projected to receive over $3.4 million in SFY 2009. For more information, visit www.commute.com.

The Commonwealth's Public Works Economic Development (PWED) program, administered by MassDOT, assists municipalities in funding transportation infrastructure projects that stimulate economic development. The program supports transportation projects that are consistent with the Commonwealth's Sustainable Development Principles. For more information, visit www.massdot.state.ma.us.

8 Weymouth

The first section of this chapter provides a profile of the town. The second section describes existing bicycling and walking conditions in the study area and recommendations for improvements. The study area, Jackson Square and the adjoining neighborhoods south and west, is located in northeast Weymouth. The findings are based on meetings and correspondence with local staff, fieldwork, and a review of previous studies. The studies consulted in the preparation of this report are *East Weymouth Station: Preparation for Station Opening*, August 2005, prepared by the Town of Weymouth, and *Back River Trail: Master Plan and Design Guidelines,* August 2005, prepared by ICON for the Town of Weymouth.

8.1 COMMUNITY PROFILE

Included in this chapter are a short history of Weymouth, a general description of land use, population, and employment data, an overview of the transportation network, and crash data.

8.1.1 HISTORY

Weymouth is the second oldest town in Massachusetts, preceded only by Plymouth. Settled in 1622 as Wessagusset and incorporated in 1635, Weymouth enjoyed an economy based on fishing and agriculture into the 19th century, and then shoemaking until 1973. Today the town serves as a coastal suburb of Boston. Weymouth's proximity to Route 3 helps support a variety of commercial activities. In 1999 the residents voted to adopt a mayoral form of government, but the formal name remains the Town of Weymouth.

8.1.2 LAND USE

In 1940, with a population of just under 24,000, Weymouth had several dense, walkable retail districts. After World War II, significant changes in local demographics and regional economies profoundly affected the town. Dramatic increases in car ownership rates, coupled with highway expansion projects, led to a population boom, with the number of residents more than doubling between 1940 and 1960 to over 48,000. Commuter rail service on the Plymouth and Greenbush commuter rail lines of the Old Colony Railroad and the 1956 opening of Route 3 contributed to the town's development as a "bedroom community" within the greater Boston region. Three years later, in 1959, commuter rail service in Weymouth ended. At the same time that new expressways allowed residents to travel easily throughout the region, traditional industries such as shoe factories closed. The local economy became based largely on service, retail, and wholesale operations.

8.1.3 POPULATION AND EMPLOYMENT

The population of Weymouth declined slightly, from 54,063 in 1990 to 53,987 in 2000, but the Metropolitan Area Planning Council (MAPC) projects an 18.2 percent residential growth from 2000 to 2030, to 63,788. MAPC projects employment to grow at more than twice that rate during the same time period, increasing by 40 percent from 16,560 to 23,168. (See Table 8-1.)

TABLE 8-1
Population and Employment in Weymouth – 2000, 2010, and 2030

Weymouth	2000	2010	% Change 2000-2010	2020	% Change 2010-2020	2030	% Change 2020-2030
Population	53,987	58,435	7.6%	61,373	4.8%	63,788	3.8%
Employment	16,560	19,335	14.4%	21,780	11.2%	23,168	6.0%

8.1.4 TRANSPORTATION

Three MBTA commuter rail stations—Weymouth Landing and East Weymouth on the Greenbush Line, and South Weymouth on the Plymouth/Kingston Line—serve the town, as well as four MBTA bus routes: 220, 221, 222 and 225.

The only grade-separated highway in Weymouth is State Route 3, which runs east–west about midway through the town. The main north–south arterial is Route 18, which has the town’s only interchange with Route 3, about a mile from the town’s western border with Braintree. The other numbered arterial in town is Route 53, which runs north of Route 3 and roughly parallels it.

8.1.5 CRASH DATA

Between 2002 and 2006, of all reported crashes in Weymouth, 95 involved pedestrians, representing 1.5 percent of the total. Those 95 crashes resulted in three fatalities. In the same period there were 41 reported crashes involving bicyclists, representing 0.7 percent of all crashes; those resulted in one fatality. These data are shown in Table 8-2, along with motor-vehicle crashes. The latter category refers to crashes involving motor vehicles only; the reported bicycle and pedestrian crashes almost always involve a motor vehicle.

Figure 8-1 shows the location of the above bicycle and pedestrian crashes. As noted in Chapter 1, some crashes may not have been reported.

FIGURE 8-1
Weymouth: Crashes in 2002-2006 Involving Pedestrians and Bicyclists

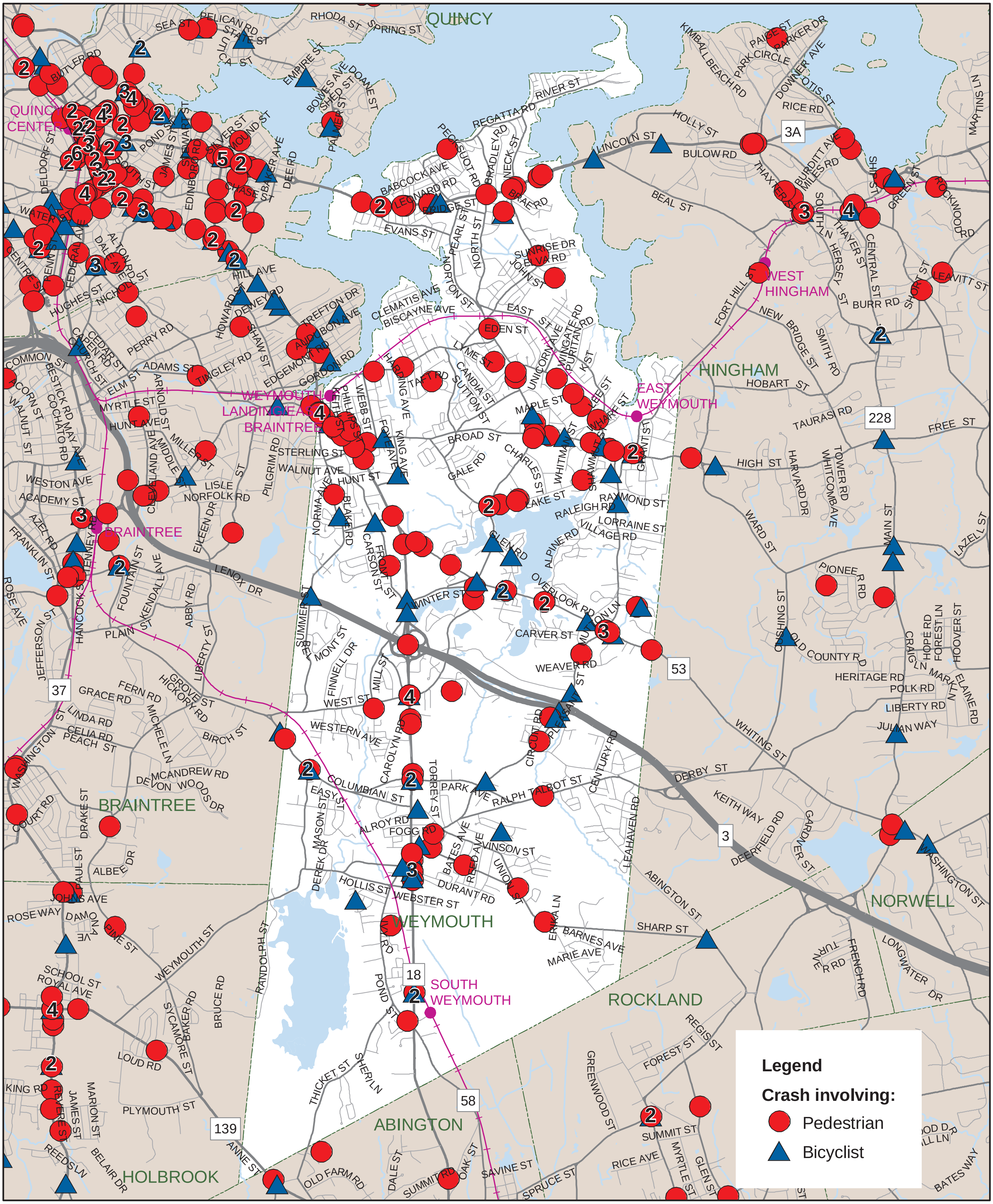


TABLE 8-2
Bicycle, Pedestrian, Motor-Vehicle, and Total Crashes and Fatalities in Weymouth, By Number and Percentage – 2002–2006 Inclusive

	Crashes		Fatalities	
Mode	**Number**	**Percentage**	**Number**	**Percentage**
Bicycle (Bike)	41	0.7%	1	12.5%
Pedestrian (Ped)	95	1.5%	3	37.5%
Motor vehicles (MV) only	6,170	97.8%	4	50.0%
All crashes (Bike, Ped, & MV)	6,306	100.0%	8	100.0%

8.2 STUDY AREA

The first part of this section of the chapter defines the study area and gives an overview of transit service and walking and bicycling conditions. Subsequent sections give more details on different parts of the study area.

Jackson Square is the largest of Weymouth's four villages. The study area (shown in Figure 8-2) includes most of Jackson Square and adjoining areas west and south. In this report, the study area has been divided into the following categories:

- Broad Street from Middle Street east to Jackson Square
- Pleasant Street from Jackson Square to Riley Avenue/Raymond Street
- The neighborhood southwest of Jackson Square
- The corridor for the proposed Back River Trail

The East Weymouth commuter rail station, on the Greenbush Line, is located about a third of a mile north of the study area, off of Commercial Street. There are 12 inbound trains departing between 6:07 AM and 8:34 PM, and 12 outbound trains arriving between 7:23 AM and 10:28 PM. There is a 398-space parking lot with eight accessible spaces and three ribbon-style bicycle racks.

MBTA bus Route 222, Quincy Center Station–East Weymouth, serves the study area. The route, which provides service on Water, Pleasant, and Broad Streets, runs 45 times a day on weekdays, between 5:35 AM and 12:34 AM, most frequently during the morning and afternoon rush hours. The midday frequency is about every 30 minutes, and nighttime service is hourly. There are 34 trips on Saturdays, from 6:36 AM to 11:51 PM, hourly in the morning and evening, and more frequently from the early afternoon through the early evening. There is hourly service on Sundays, from 7:51 AM to 11:51 PM.


FIGURE 8-2
Weymouth – Jackson Square
Existing Conditions
Legend
Crosswalk
No curb ramp
Shared curb ramp
Sidewalk in good condition
Sidewalk in fair condition
Sidewalk in poor condition
Narrow sidewalk
Poor sidewalk/street distinction
Train station
Train line
School
Library
Post office
Fire department
Playground
Community center
Park
Traffic signal
0
0.25 Miles
0
300 Feet
N
Sidewalk and curb in disrepair
Potential for bike lanes
Unhealthy street tree
Narrow path to school
No crossings for pedestrians
Lack of separation leads to parking issues
No separation between the street, sidewalk, and parking lot
Large paved area
New curb ramps but no sidewalk separation
EAST WEYMOUTH
Jackson Square
Skate Park
Fish Ladder
Ballfield
Broad St
Middle St
Cain Ave
Putnam St
Madison St
Filomena St
Fairmount Ave
Whitman St
Hillcrest Rd
Randall Ave
Cottage St
Commercial St
Shawmut St
Shawmut Ave
Washburn St
Pleasant St
Off Lake St
Lake St
Iron Hill St
Water St
Riley Ave
Raymond St
School St
Skelly Ave
Russel Whiting St
Lakeside

Overall, sidewalks are in good condition in the commercial area in Jackson Square, and in fair to poor condition elsewhere. The sidewalks in the commercial area are concrete, with granite curbs. The sidewalks elsewhere are either asphalt with granite curbs, or asphalt with no curbs, which results in little distinction from the roadway. Many of the sidewalks have weeds and minor cracking. Some of the minor streets have no sidewalks. Only sidewalks in the commercial area in Jackson Square along Broad Street have street trees, but there are only a few and some are in poor health.

Many crosswalks are barely visible, and several have shared curb ramps. A few crosswalks have no curb ramps. Almost all of the existing crosswalks extend along the most logical path for pedestrians. The crosswalks are green with white parallel bars in Jackson Square, and parallel bar-style elsewhere. There are no curb extensions.

Sidewalk on Broad Street

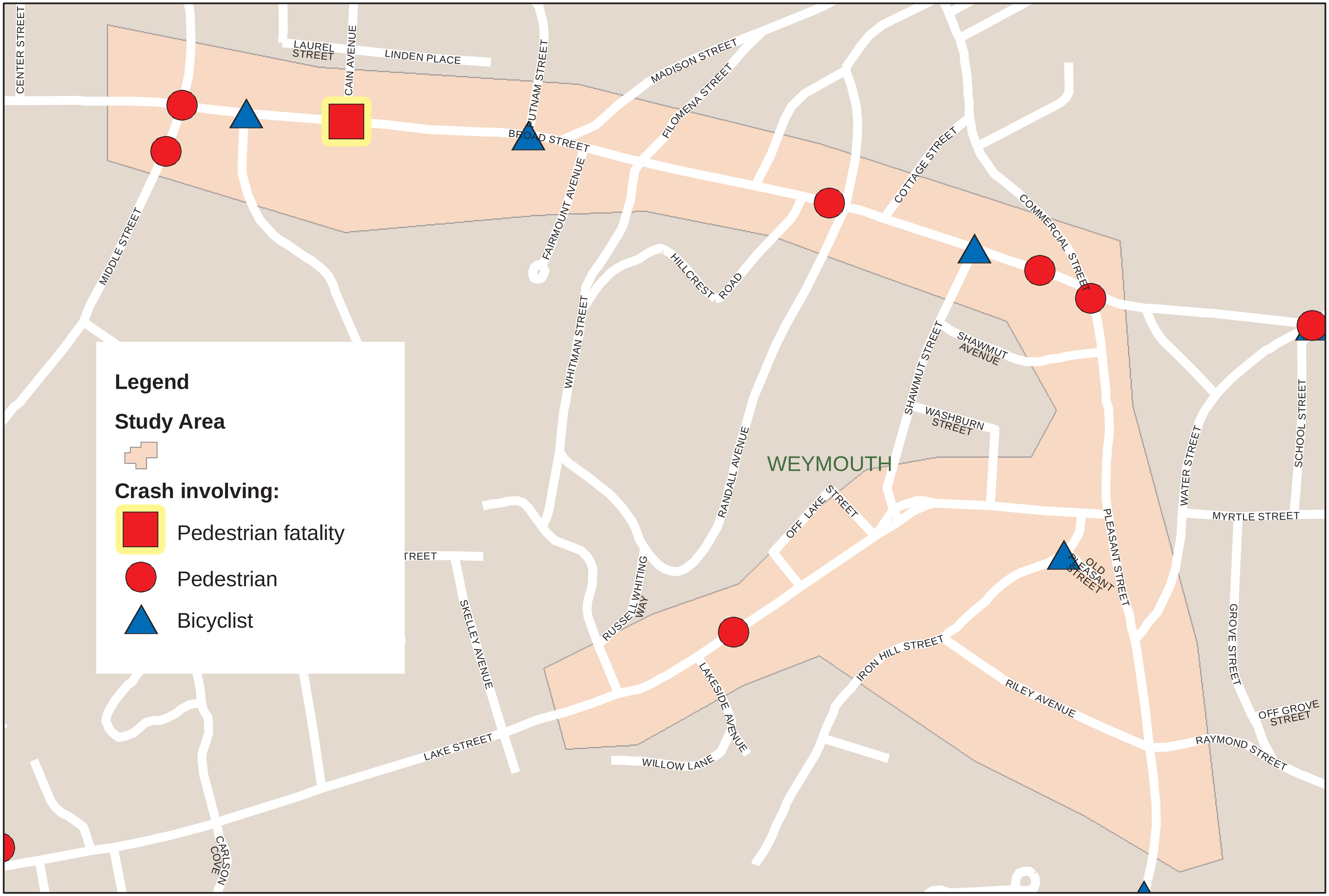
There are a few signalized pedestrian crossings, none of which have countdown signals. The pedestrian signal phases, all of which are exclusive, vary from too short in time to adequate for crossing.

Broad and Pleasant Streets accommodate on-street bicycling since they are wide enough and have marked shoulders. The shoulders along Broad Street accommodate parking; those along Pleasant Street do not, being only a few feet wide. The other streets are either not striped (Lake Street) or are too narrow (Shawmut Street between Lake and Pleasant Streets) to safely accommodate bicyclists.

All of the roadways are two lanes wide, except where there are turning lanes at some intersections. The edges of the roadway generally do not have significant cracks or large pieces of debris, and drainage grates are set back from the roadway. There is no formal bicycle parking in the study area. The closest bicycle parking is at the East Weymouth commuter rail station.

In the five-year period of 2002 through 2006, there were seven crashes within the study area involving a pedestrian and four involving a bicyclist (see Figure 8-3). One of the

FIGURE 8-3
Jackson Square, Weymouth
Crashes in 2002-2006 Involving Pedestrians and Bicyclists



pedestrian crashes, which occurred at Broad Street and Cairn Avenue, was fatal. As shown in the figure, although most crashes occurred on Broad Street, they were not concentrated at any particular locations. The number on Broad Street might be more of an indication that more bicycling and walking occurs there than that the conditions are relatively more hazardous than at other areas.

The following sections give more details on existing conditions and list recommendations, which are illustrated in Figure 8-4.

8.2.1 BROAD STREET: MIDDLE STREET TO PLEASANT/COMMERCIAL STREETS

Broad Street is an important east–west roadway that stretches across most of Weymouth. Within the study area, Broad Street connects a small commercial area located on Middle Street, in the western portion of the study area, with the commercial area of Jackson Square, to the east. In between, in addition to medium-density housing, there are several churches and a fire station.

Bicycling

Existing Conditions

Broad Street is a two-way street and is two lanes wide in the study area. Parking is allowed on both sides, but few cars park between Middle Street and Randall Avenue. Broad Street’s width ranges from 38 to 40 feet. Double yellow lines separate the east- and westbound travel lanes, and a single white line demarcates the parking areas. The roadway surface is mostly smooth, with no major impediments. The roadway edge is clear of obstructions that would have an impact on bicyclists. There is no bicycle parking.

Recommendations

1. With roadway widths ranging from 38 to 40 feet, stripe a single white line on both sides of Broad Street. This line could be painted 9 feet from the curb to accommodate parking and provide a guideline for bicyclists. The width of the travel lanes would vary between 10 and 11 feet.

2. Install bicycle racks in or near the intersection of Broad and Middle Streets. Also install racks in Jackson Square, possibly in or near the Korean War Memorial Park, which is northwest of the Broad/Pleasant/Commercial Streets intersection; the Edward W. Owens Jr. Memorial Park, in front of the post office; and in the municipal parking lot between Broad Street and Shawmut Avenue. Preferably, the racks should be sheltered from the elements.

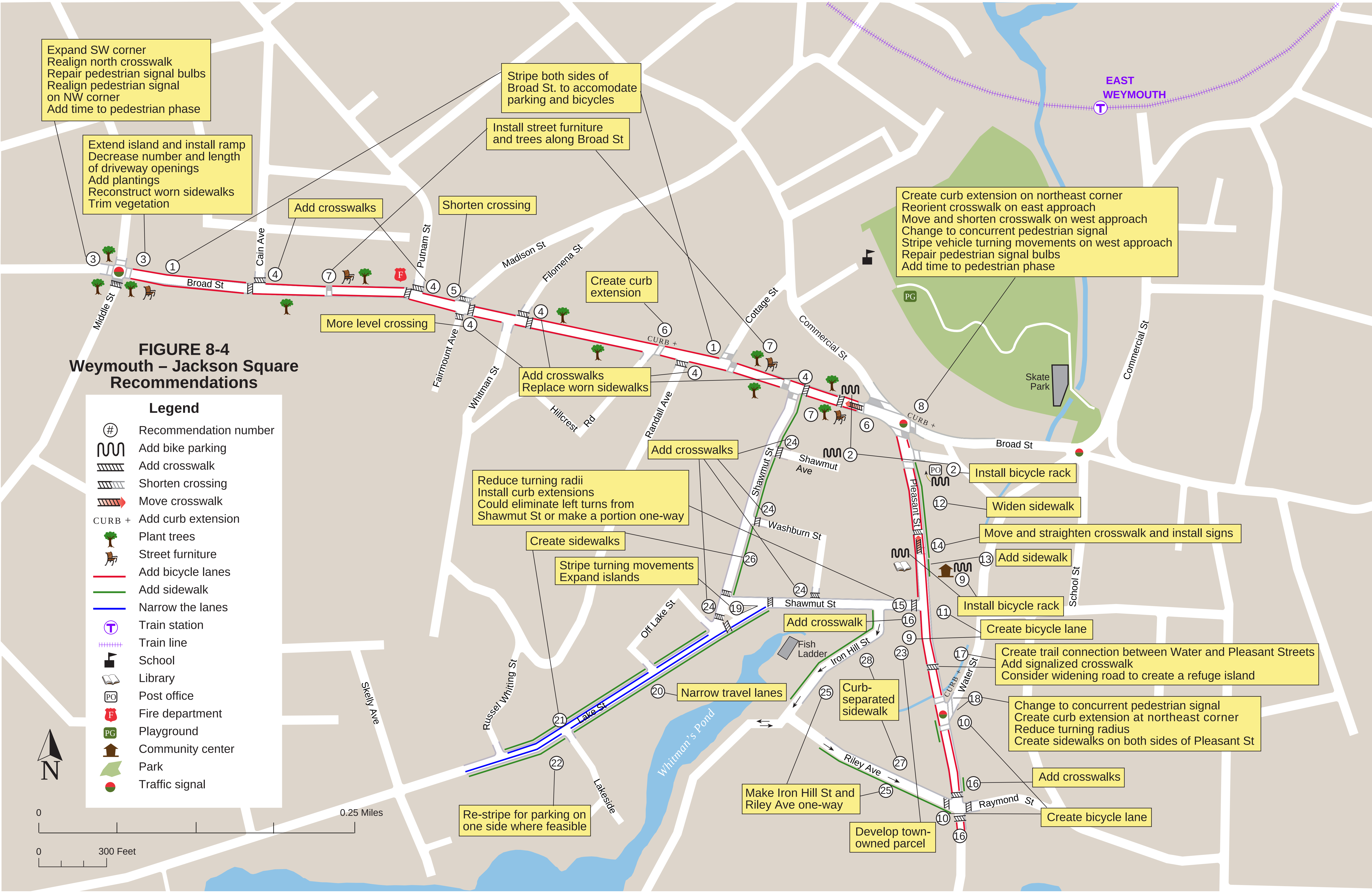


FIGURE 8-4
Weymouth – Jackson Square Recommendations

Walking

Existing Conditions

Sidewalks extend along both sides of the roadway and generally are more than five feet wide. Some sidewalks on Broad Street between Putnam Street and Randall Avenue are too narrow and, in some places, made even more so by overgrown vegetation. Between Hillcrest Road and Pleasant Street, the sidewalks are concrete, with granite curbs. The rest of the sidewalks are asphalt, and also have granite curbs. In general, the sidewalk surfaces are smooth and free of significant bumps or cracks. There are some sections of sidewalk, especially near Fairmount Avenue, that are in poor condition.

There are places where the driveways are either too wide or unnecessary. Two examples are a condominium complex, which has a driveway opening that is much wider than needed, and a church on the north side of Broad Street that has four driveways, all relatively wide. Just east of Middle Street, in front of a gas station, there is a sidewalk median with no curb ramps.

Lack of curb ramps along Broad Street;
the Middle Street intersection is in the background

There is no vegetation buffer between the sidewalk and the roadway, but many front yards have large trees that provide shade along the street, except between Randall Avenue and Pleasant Street where there are commercial fronts and only a few street trees. In general, the sidewalk along the street angles down to the level of intersecting driveways.

There are several crosswalks along this corridor. One at the intersection of Middle and Broad Streets does not have any curb ramps. There is no curb ramp on the north side of the mid-block crossing of Broad Street between Cain Avenue and Putnam Street. Three other pairs of crosswalks in the area share curb ramps. All of the crosswalks in the

Jackson Square area are white parallel lines filled in with green; most of the other crosswalks are parallel-bar style. There is a long crosswalk across Madison Street that lacks refuge points.

There are two signalized intersections. The intersection of Middle and Broad Streets has a four-way stoplight with pedestrian-activated crossing signals. The signal has an exclusive pedestrian phase consisting of a seven-second “Walk” signal and an eight-second flashing “Don’t Walk” signal. These signals cannot be seen from all corners, however. Of the eight signals, one faces the wrong direction, one works for “Walk” but not for “Don’t Walk,” and one is not working. The parallel-bar-style crosswalks on the four approaches of the intersection are 54, 46, 53, and 48 feet long. Using the 3.5-foot-per-second standard, the pedestrian phase is barely adequate for the crossings.

The intersection at Broad and Commercial/Pleasant Streets has a four-way stoplight with a pedestrian-activated phase. Commercial and Broad Streets intersect at a skewed angle. The exclusive pedestrian phase consists of four-second “Walk” and 12-second flashing “Don’t Walk” phases. One of the pedestrian signals is not working. The crosswalks on each approach of the intersection are white parallel bars filled in with green paint and measure 70, 51, 64 and 62 feet long. Using the 3.5-foot-per-second standard, the pedestrian phase is not adequate for the lengths of the crossings.

Recommendations

3. Intersection of Broad and Middle Streets and east on Broad Street toward Jackson Square:
   - Expand the southwest corner to create more of a right angle.
   - The crosswalk on the north approach should be realigned so that it will be at a right angle across the street, thereby shortening the walking distance.
   - Fix the broken pedestrian signal bulbs and align the pedestrian signal on the northwest corner to face east.
   - Add more time to the pedestrian phase, unless the crossing distances are shortened.
   - Extend the island in front of the gas station and install curb ramps.
   - Visually emphasize the presence of sidewalks across the driveways of the gas station and the parking lots by raising the level of sidewalks or by striping.
   - Decrease the number and/or length of driveway openings, including the entrance to the condominium complex on the south side of Broad Street near Middle Street, and to the church on the north side of Broad Street.
   - Add street trees and other plantings.
   - The very worn sidewalks should be reconstructed. In the short term, remove or trim the vegetation growing through cracks and have property owners trim vegetation that obstructs the sidewalks.

4. Add crosswalks at the following locations:
   - Broad Street and Cain Avenue, across Cain Avenue and the west approach of Broad Street.

- At Putnam and Broad Streets, across Putnam Street and the west approach of Broad Street.
- At Broad Street and Fairmount Avenue, on the east approach across Broad Street and on Fairmount Avenue.
- Across Filomena Street and on the east approach of Broad Street.
- Across Randall Avenue; also consider regrading Randall Avenue to make the crosswalk more level.
- Across Broad Street on the east approach of the intersection with Shawmut Street.
- Mid-block across Broad Street, between Shawmut and Pleasant Streets, at the walkway leading to the parking area south of Broad Street.

5. Shorten the crosswalk on Madison Street by either (1) painting or installing an island or (2) squaring the northwest corner and aligning it closer to Fairmount Avenue.

6. Create a curb extension in front of the church on the north end of the crosswalk on Broad Street, between Hillcrest Road and Randall Avenue, and on the north end of the mid-block crossing of Broadway between Cain Avenue and Putnam Street.

Curb ramp and extension are needed on Broad Street

7. Install street furniture and trees along Broad Street between Middle and Commercial/Pleasant Streets.

8. Intersection of Broad, Commercial, and Pleasant Streets:
   - Create space for a curb extension on the northeast corner on Broad Street by narrowing the through and turning lanes at the intersection.
   - Reorient the crosswalk on Broad Street on the east approach, connecting it to the above-referenced curb extension, thereby shortening the crossing distance.
   - On the west approach of Broad Street, make the crosswalk perpendicular to the sidewalks, thereby shortening the crossing distance, and place it slightly farther back from the intersection than it is currently.
   - Change the pedestrian signals from exclusive to concurrent.
   - Stripe the turning movements for vehicles on the west approach of Broad Street.
   - Fix broken bulbs in pedestrian signal.

- Add at least four seconds to the pedestrian phase.

Intersection of Broad, Commercial, and Pleasant Streets

8.2.2 Pleasant Street: Broad Street to Riley Avenue/Raymond Street

Pleasant Street is an important north–south roadway through the east central portion of Weymouth. In the study area, Pleasant Street connects the commercial area of western Jackson Square south to Riley Avenue/Raymond Street. Along the roadway are some civic buildings, including a post office, a library, and the Weymouth Teen Center; commercial buildings; and multi- and single-family housing. Pope Towers, a senior-housing facility, is located on Water Street, just behind and south of the Teen Center.

Bicycling

Existing Conditions

Pleasant Street is two-way with two lanes and no parking. Its width ranges from 30 to 33 feet between Broad and Water Streets, and is approximately 44 feet wide farther south. Double yellow lines separate the north- and southbound travel lanes, and a single white line marks a shoulder of varying width. The roadway surface is mostly smooth, with no major impediments, and the edge is generally clear of obstructions. There is no bicycle parking.

Recommendations

9. Install bicycle racks at the Teen Center and library.

10. With roadway widths of around 44 feet south of Water Street, and parking on both sides, stripe 7-foot parking lanes and 5-foot bicycle lanes on each side. This leaves space for 10-foot travel lanes. Alternatively, allow back-in angle parking on one side only. Allow a 4.5-foot bicycle lane on the non-parking side, two 11-foot travel lanes, a 5.5-foot bicycle lane, and a 12-foot parking lane, with cars parked at a 45-degree angle.

11. With roadway widths ranging from 30 to 33 feet from Water Street north to Broad Street, stripe a bicycle lane on both sides of Pleasant Street. Travel lanes could be 11 feet in each direction. The bicycle lanes, using the remaining width, would range from 4 to 5.5 feet.

Walking

Existing Conditions

Sidewalks on both sides of the roadway are sometimes less than five feet wide. The sidewalks are asphalt, with granite curbs. Due to wide driveways and parking lots, there are numerous expanses where there is no distinction between the sidewalk and the roadway. The surface of the sidewalks is rough and contains some significant bumps and cracks. From Jackson Square to the Teen Center, the sidewalks are narrow and in poor condition. Most of the sidewalks slope down to the level of intersecting driveways.

There is no vegetation buffer between the sidewalk and the roadway, and there are no front yards with trees to provide shade and aesthetics. There is also no vegetation buffer between the sidewalk and adjacent parking lots, except in front of the library. Coupled with the wide driveways and lack of curbing, there is no distinction in some areas between the sidewalk, roadway, and parking lots.

The sidewalk is not clearly separated from the roadway at the intersection of Pleasant and Water Streets

There are several crosswalks along this corridor, but more are needed. At Riley Avenue/Raymond Street, new concrete curb ramps have been installed, but there are no crosswalks. The crosswalk between the Teen Center and library, which is zebra style, crosses at an oblique angle between the parking lots of the two buildings. The other crosswalks are white parallel bars filled in with green. All of the existing crosswalks are sufficiently to highly visible.

The recent reconstruction of the intersection of Pleasant and Water Streets included a three-way stoplight with pedestrian-activated signals. The exclusive pedestrian phase consists of a 7-second “Walk” signal and a 19-second flashing “Don’t Walk” signal. The parallel-bar-style crosswalks are 50, 65, and 82 feet long, clockwise from the north. The pedestrian phase is adequate for the lengths of the crossings.

Recommendations

12. Widen the sidewalk between Jackson Square and the Weymouth Teen Center.

A narrow sidewalk leading to the Teen Center

13. Construct a sidewalk with vegetation buffers in front of the Teen Center parking lot. Ideally, have a buffer on both the street and parking lot sides of the sidewalk.

14. Straighten and move the crosswalk on Pleasant Street that connects the Teen Center and the library to the northern edge of the Teen Center, both to increase the sight distance and to move it away from the parking lots; install signs alerting motorists to the crosswalk.

15. Reduce the turning radius for vehicles turning right from Shawmut Street onto Pleasant Street and vehicles turning right from Pleasant Street onto Shawmut Street. Install curb extensions on Shawmut Street. (Alternatively, consider eliminating all left turns out of Shawmut Street, given the limited sight distance, or prohibit traffic from exiting from Shawmut Street onto Pleasant Street by creating a one-way, westbound block for traffic entering from Pleasant Street.)

16. Add crosswalks at the following locations:
    - Across the west approach of Shawmut Street at Pleasant Street
    - At Pleasant/Riley/Raymond Streets, across all approaches

17. Create a trail connection between Water and Pleasant Streets on the walkway south of Pope Towers, and add a crosswalk across Pleasant Street. Install a signalized

crosswalk that flashes yellow to alert motorists. Consider widening the roadway here, using land in the town-owned lot on the west side of Pleasant Street, to allow the creation of a median island sufficiently wide to be a refuge for people to cross the road. This trail connection would be part of the Back River Trail, which is discussed in the next section.

18. Intersection of Pleasant and Water Streets:
    - Change the pedestrian signals from exclusive to concurrent
    - Create a curb extension on the north side of the east approach on Water Street to alter the turning radius and to provide pedestrians with a wider area to wait for the pedestrian signal. Realign crosswalks accordingly
    - Reduce the turning radius for vehicles turning right from Pleasant Street to Water Street
    - Create a curb-separated sidewalk along the west side of Pleasant Street in front of the car dealership, and on the east side of Pleasant Street in front of the convenience store, which is just north of Raymond Street

8.2.3 The Neighborhood Southwest of Jackson Square

This area is primarily residential. A fish ladder with a small viewing platform is located just off Iron Hill Street. Southwest of the viewing platform is Whitman’s Pond. There are some commercial developments on Lake Street and a ball field at Russel Whiting Street.

Bicycling

Existing Conditions

The roadways in this neighborhood, all two-way, are generally in fair condition. The relatively major streets in the neighborhood are Shawmut and Lake Streets. The minor roads are Riley Avenue and Iron Hill Street. The intersection of Lake and Shawmut Streets is confusing. There is a large, open parking area on the southwest corner of Shawmut and Pleasant Streets.

Parking is allowed on both sides of most portions of Lake Street, and on Shawmut Street between Lake and Broad Streets. There are no striped areas for parking, and because of the poorly defined sidewalks, motorists sometimes park on the sidewalk. The width of Lake Street ranges from 24 to 33 feet. Shawmut Street is approximately 24 feet wide between Lake and Pleasant Streets and approximately 25 feet wide between Lake and Broad Streets.

There are double yellow lines on Lake Street, thence on Shawmut Street to Pleasant Street, as well as fog lines on Lake Street. The roadway edges are generally clear of obstructions.

Recommendations

19. Intersection of Shawmut Street and Lake Street:
    - Stripe and sign the turning movements for vehicles.

- Expand the islands to better guide traffic or consider constructing a roundabout.

20. Reduce the width of travel lanes on Lake Street to 10 feet. This will allow more room for bicyclists and pedestrians, and will help slow traffic down to the 30 miles-per-hour speed limit that is signed in the northeast-bound direction. Add a similar speed limit sign in the other direction.

Walking

Existing Conditions

None of the sidewalks are in good condition. All are asphalt, some with granite curbs. The sidewalks along the southeast side of Iron Hill Street, the north side of Riley Avenue, and both sides of Shawmut Street between Lake and Pleasant Streets have curbs and are in fair condition. The sidewalks along the east side of Shawmut Street between Broad and Lake Streets have curbs and are in poor condition. There is little distinction between the roadway and the sidewalks on the west side of Shawmut Street between Broad and Lake Streets and along Lake Street since there are no curbs. There are no sidewalks along the south side of Riley Avenue and the northwest side of Iron Hill Street.

There are no vegetation buffers between the sidewalk and the roadway. There are no street trees in the neighborhood, but many front yards have trees that provide shade and aesthetics along the street, except along Lake Street. The sidewalks slope down to the level of intersecting roadways and driveways. There are no signalized pedestrian crossings or crosswalks in this corridor.

Recommendations

21. Create curb-separated sidewalks along both sides of Lake Street southwest of its intersection with Shawmut Street.

22. Re-stripe Lake Street to accommodate parking on one side of the street where space allows, and eliminate parking on sidewalks.

23. Redevelop the town-owned parking/open area on the southwest corner of Pleasant and Shawmut Streets. One option would be to create a park with either a fenced-in playground or simply an open area with trees and plantings. Some parking could be retained.

24. Add crosswalks at the following locations:
    - All approaches of the intersection of Shawmut and Lake Streets
    - Across Washburn Street and Shawmut Avenue where they intersect with Shawmut Street

25. Make Iron Hill Street one-way southwest from Shawmut Street to Riley Avenue, and make Riley Avenue one-way southeast toward Pleasant Street.

26. Construct a curb-separated sidewalk on the east side of Shawmut Street between Broad and Lake Streets.

27. Construct a curb-separated sidewalk along the south side of Riley Avenue between Pleasant and Iron Hill Streets

28. Construct a curb-separated sidewalk along the northwest side of Iron Hill Street between Riley Avenue and Shawmut Street.

8.2.4 THE ALIGNMENT OF THE PROPOSED BACK RIVER TRAIL

In August 2005, ICON Parks Design prepared the *Back River Trail: Master Plan and Design Guidelines* at the request of the Town of Weymouth. According to this plan, the proposed Back River Trail will connect Abigail Adams State Park in North Weymouth to the Iron Hill Fish Ladder site in the study area. Walkers, bicyclists, joggers, in-line skaters, people in wheelchairs, and walkers pushing strollers could use the trail system.

The Town requested that the Boston Region MPO staff comment on that plan for the portion of the trail from the East Weymouth commuter rail station to the Iron Hill Fish Ladder. According to the plan:

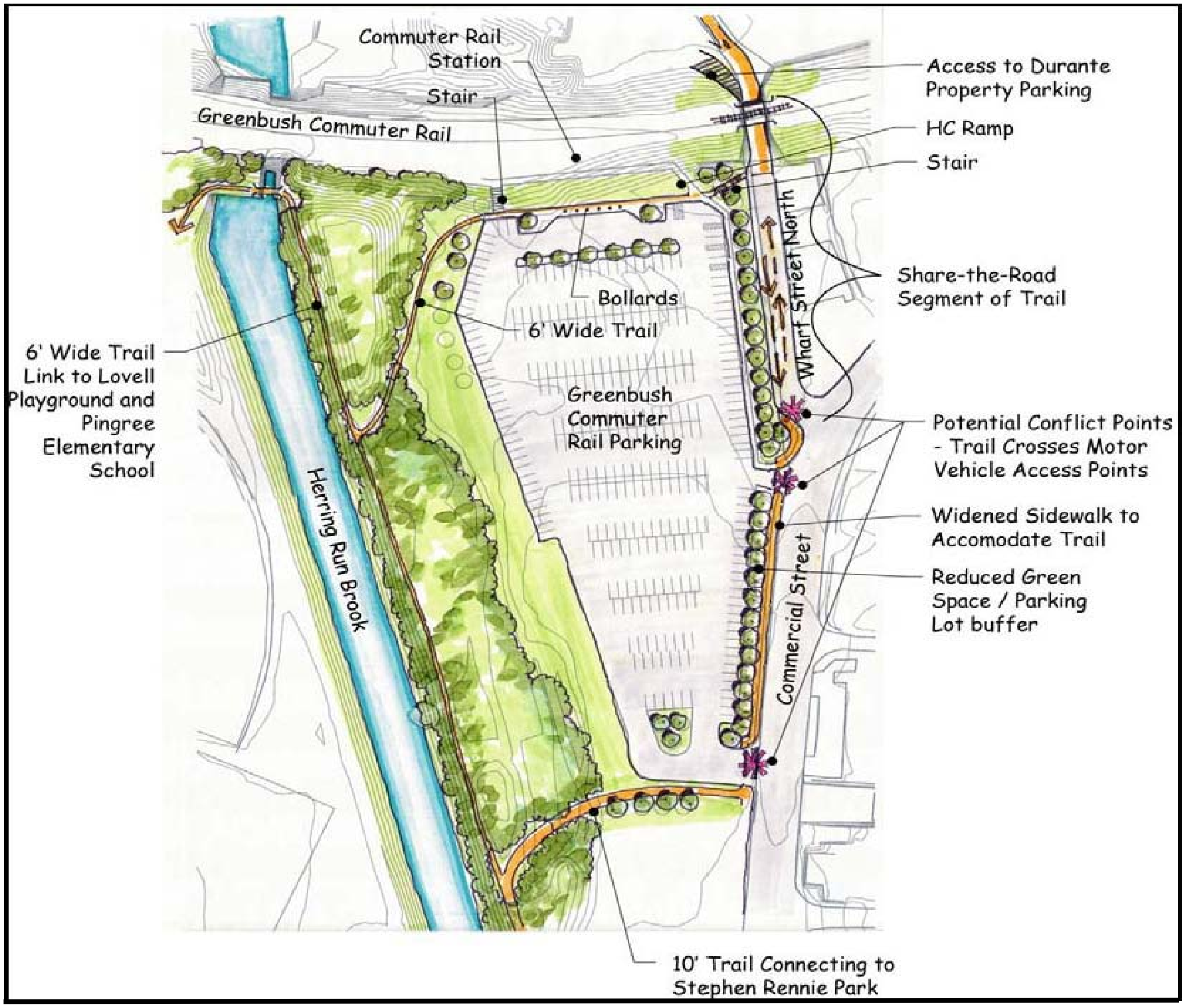
> The trail will turn and follow along the northernmost end of the new MBTA train station parking lot before turning to follow Herring Brook into Lovell Playground. From Lovell Playground the trail will become an on-road trail with dedicated bike lanes along Water Street up to and through the intersection with Pleasant Street. Intersection improvements at Pleasant Street will include user activated crossing signals and minor road realignments [Ed. note: these intersection improvements have been completed]. The trail will continue along Iron Hill Street to the site of the Iron Hill Fish Ladders, where site improvements will include a fish ladder, viewing improvements, picnic tables and playground. A network of on street “share the road” bicycle routes will connect the trail to other points of interest in the immediate neighborhoods and the surrounding communities.

Recommendations

Figure 8-5, which is Figure 13 in the ICON report, shows the area near the East Weymouth MBTA station.

A1. As the ICON report points out, Alternative A is more desirable than Alternative B at the commuter rail parking area because it keeps the trail away from the parking lot and street. Putting the trail between the drop-off area and the station would eliminate all conflicts with motor vehicles but would maximize conflicts with passengers. Therefore, require bicyclists on this portion of the trail to reduce speed, and install signage reminding them to yield to pedestrians.

Figure 8-5
Proposed Back River Trail through MBTA East Weymouth Station Parking Lot



A2. As the trail approaches the intersection of Broad, Commercial, and High Streets, it should use the path and bridge through Stephen Rennie Herring Run Park. The trail should be striped through the park.

A3. At Stephen Rennie Herring Run Park, one branch should continue to the Herring Run Pool (Branch A), and another branch should connect to the school (Branch B). Branch B could replace, or be an addition to, the proposed northern branch to the school from the commuter rail station. Branch B, according to the plan, would better accommodate users, including students, traveling to school, the ball fields, and Lovell Playground.

A4. Once Branch B passes over the bridge, it should follow the existing path along the skate park and around the ball fields to the school parking lot. This path should be expanded to 10 feet wide. From the parking lot, striping should guide people to the school entrance. Widen the sidewalks on both sides of the roadway up the hill. Additional striping and a crosswalk could then connect these sidewalks to the proposed bicycle lanes on both sides of Commercial Street.

A5. From the park, Branch A would follow the river to Pope Towers on Water Street and use an off-road connection to reach Pleasant Street (see Recommendation 17 above). A safe crossing must be provided across Pleasant Street for the path to continue through the parking lot and up Iron Hill Street to the proposed Iron Hill Park. The off-road connection between Water and Pleasant Streets would obviate the need for southbound trail users to backtrack north on busy Pleasant Street to reach Iron Hill Street.

A6. Having the path cross through the private parking lot at the intersection of Commercial, High, Broad, and Water Streets would be preferable to having it use roadways.

A7. Potential on-street connections to the Back River Trail, discussed elsewhere in this chapter, include bicycle lanes on Pleasant Street, and improved accommodations for bicycles on Broad Street.