Improving Pedestrian and Bicyclist Access to Selected Transit Stations

A report produced by the Central Transportation Planning Staff for the Massachusetts Highway Department and the Massachusetts Bay Transportation Authority

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ABSTRACT

This study identifies relatively low-cost, quick-implementation measures that can significantly improve pedestrian and bicyclist access at six locations in the Massachusetts Bay Transportation Authority system: Ayer Station (commuter rail); Boston College Branch (B Line) stops, Boston College Station to Chestnut Hill Avenue (Green Line); Cleveland Circle and Reservoir stops (Green Line, C and D); Forest Hills Station (Orange Line, commuter rail, and bus); Malden Center Station (Orange Line, commuter rail, and bus); and Mansfield Station (commuter rail and bus). Detailed in the report are improvements to both station property and surrounding areas that would eliminate hazards for bicyclists and pedestrians, increase ease of access to the station from surrounding neighborhoods for those users, or otherwise enhance the attractiveness of the station for access by foot or bicycle. The report also includes a summary that describes the types of issues encountered and provides general recommendations.

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Creating and maintaining easy, pleasant, and safe access to transit stations helps to promote the use of public transit. This study identifies small investments that can make significant improvements to pedestrian and bicyclist access at six locations in the Massachusetts Bay Transportation Authority (MBTA) system.

Many transit stations are within convenient walking and bicycling distance of surrounding neighborhoods. In fact, according to the MBTA's Program for Mass Transportation (PMT), across the entire MBTA system 84 percent of riders walk or bicycle to transit stations.[1] Furthermore, approximately 54 percent of the population within the Boston metropolitan region resides within walking distance of transit service.[2]

However, in some locations, walking or bicycling to transit stations can be inconvenient, unpleasant, or unsafe. Pedestrians and bicyclists are easily deterred if barriers exist, either physical or psychological. Circuitous routes, poor pavement or sidewalk condition, heavy traffic, and dark or isolated corridors are all examples of conditions that discourage walking and bicycling. Thus, eliminating barriers, improving connectivity, and providing desirable travel environments encourage travelers to use public transit and reinforce the behavior of pedestrians and bicyclists who already reach transit stations in these ways.

Moreover, targeted, low-cost improvements that attract pedestrians and bicyclists can yield more from existing transportation facilities and services. Such improvements lessen the need for more capital-intensive projects, by reducing the need for parking spaces at park-and-ride lots, for example. Since walk trips are typically involved in at least one of the ends of a transit trip, investing in pedestrian-friendly environments can generate significant benefits at reasonable cost.

This approach is in line with the state's current investment policies. The 2003 Statewide Road and Bridge Policy, which is based on a policy of "Fix It First," expresses the purpose of providing "enhanced mobility for sustainable transportation modes (walking, bicycling, and public transportation)."[3] The "Fix-It-First" initiative is used by the Commonwealth of Massachusetts to guide its investments and policies. It allows the state to plan for growth and development by leveraging its limited financial resources and maximizing past investments and previously built assets.[4] Furthermore, the "Fix-It-First" policy helps to target investments in order to improve efficiency, economic and community development potential, and quality of life.[5]

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[1] *Program for Mass Transportation (PMT),* prepared for the Massachusetts Bay Transportation Authority (MBTA) by the Central Transportation Planning Staff, May 2003, p. 5B-32.

[2] Walking distance to transit (used to identify the potential transit market area) is defined as the distance of three-fourths mile or less from a rail station and one-half mile or less from a bus stop. Population is based on 2000 census.

[3] "Statewide Road and Bridge Policy," Governor Mitt Romney, Commonwealth of Massachusetts, January 27, 2003. Full text is found at http://commpres.env.state.ma.us/publications/Road-Policy.pdf.

[4] Matt Lambert and Kil Huh, "Fixing It First: Targeting Infrastructure Investments to Improve State Economies and Invigorate Existing Communities," an *Issue Brief* produced by the NGA Center for Best Practices, Washington, D.C., 2004.

[5] Ibid.

Study Background

The MBTA has established an aim of enhancing its service by improving access to the transit system. The PMT notes that providing automobile parking is only one way to improve access to the MBTA system. While the PMT evaluation assigns a high-priority project rating to commuter parking expansion at over a dozen stations, the PMT also highlights an effort to promote pedestrian and bicyclist use of the transit system through targeted improvements to access by those modes. In fact, the PMT assigns a high-priority rating to improving walking paths to commuter and rapid transit stations throughout the system; the anticipated results of such efforts include increased ridership without the costly expansion of parking facilities. Also in the PMT, the MBTA describes an effort to provide new or improved bicycle parking facilities at transit stations. Furthermore, the MBTA is promoting and supporting transit-oriented development through joint development partnerships and by engaging communities in land use planning at MBTA station properties.

In recent years the Executive Office of Transportation and Massachusetts Highway Department (MassHighway), through planning and transportation demand management programs, have encouraged the provision of modes of travel that serve as alternatives to the single-occupant automobile. These agencies are focusing attention on improving circulation around and accessibility to multimodal transportation centers and similar facilities.

The three transportation agencies have a general goal of improving facilities and conditions for walking and bicycling. They are aware that other states (Maryland, Delaware, and Washington, for example) have conducted studies to implement similar objectives and believe that such an effort has merit in Massachusetts, as well. Because of their common interests, the MBTA and MassHighway joined in sponsoring the present study, which has been conducted by CTPS under their guidance.

The concept of improving nonmotorized access to transit stations is also supported by and consistent with local, state, and federal bicycle and pedestrian transportation plans, including—in addition to the PMT—*Accessing the Future: The Intermodal Transportation Policy Plan for the Commonwealth of Massachusetts* (EOTC/Bureau of Transportation Planning and Development, 1995), the Boston MPO's *Regional Transportation Plan* (2003), MassHighway's *Building Better Bicycling: A Manual for Improving Community Bicycling Conditions* (1999), the City of Boston's *Access Boston 2000–2010: Boston Bicycle Plan* (Boston Transportation Department, May 2001), MassHighway's "Bicycle Route and Share the Road Signing Policy" (Policy Directive P-98-003, August 25, 1998), the MBTA's Bicycle Access to Transit program, and the Federal Transit Administration's program *Bicycles and Transit: A Partnership That Works* (August 18, 1998). In addition, the Massachusetts Office for Commonwealth Development, based on their Sustainable Development Principles and the Climate Protection Action Plan, is very supportive of improving access to transit stations.

Another reason the transportation agencies are interested in the issue of bicyclist and pedestrian access to transit is that they want to enhance the sense of well-being and safety of those who are already using those modes of access.

Project Objectives

In order to further the goal of improved nonmotorized access to transit stations, the transportation agencies have articulated three objectives. The first is to identify stations and surrounding areas where there are opportunities for improving the safety and ease with which bicyclists and pedestrians can get to the station. The second objective is to design and implement relatively low-cost, readily achievable measures that can take advantage of those opportunities. The third objective is to assess to what degree the implemented measures did, in fact, improve access to transit stations.

This study was designed to support these objectives, with the focus on the first objective and on identifying the measures to be implemented under the second objective. The tasks of this study are as follows:

1. Identify transit stations to include in this pilot study.
2. Identify opportunities to improve pedestrian and bicyclist access at those stations.
3. Recommend measures to accomplish those identified improvements.

Selection of Transit Sites

Six sites, representing a diverse array of stations, were selected for this pilot study. The selected sites are: Ayer Station (commuter rail); Boston College Branch (B Line) stops, Boston College Station to Chestnut Hill Avenue (Green Line); Cleveland Circle and Reservoir stops (Green Line, C and D); Forest Hills Station (Orange Line, commuter rail, and bus); Malden Center Station (Orange Line, commuter rail, and bus); and Mansfield Station (commuter rail and bus).

The project steering committee initially identified 20 candidate stations to investigate. These stations were selected based on knowledge of the system and of current activities related to these sites. The candidate stations were also chosen to represent different transit modes, rail lines, characteristics, and geographic areas of the region. Station areas that would require major modifications to the station and neighboring facilities in order to improve bicyclist and pedestrian access were not selected for this study.

As part of the final site selection process, CTPS staff visited the station areas. Via photographs and a cursory field audit, staff noted the condition of facilities and assessed need for improvement. To select the final sites to study, the project steering committee used the field-collected information and other criteria, including boardings at stations, park-and-ride lot utilization, walk and bicycle access-mode share, proximity to shared-use paths, nearby residential population and density, surrounding land use patterns, and current transit-oriented development activity.

The study set out to examine the access-to-transit issues at each site and recommend actions. The set of recommendations consists of low-cost, quick-implementation improvements.

Systemwide Conditions

Ridership

Approximately 1,100,000 trips are taken on the MBTA transit system on an average weekday.[6] The MBTA rapid transit, light rail, and bus rapid transit systems serve 134 stations on six lines: the Green Line, Blue Line, Orange Line, Red Line, Mattapan High Speed Line, and Silver Line. Daily ridership on these systems is about 630,000. On the bus and trackless trolley system, which serves 44 communities, total ridership is approximately 344,000 trips per weekday. The present MBTA commuter rail network is comprised of 13 radial lines, with 123 stations and 365 miles of track; ridership per weekday is approximately 110,000 passengers. The Attleboro/Stoughton Line is the most heavily used commuter rail line, with an average of 10,300 persons boarding per weekday. Commuter boat ridership adds approximately 5,000 trips to the system.

[6] The ridership figures by transit service that are presented in this paragraph are the Spring 2002 Estimated Daily Boardings from the *2003 Fare Mix Study* (draft), conducted by CTPS for the MBTA. Ridership data are a composite average and are reported as unlinked trips.

Transit Service	*Average Weekday Trips*
Green Line	183,000
Blue Line	50,000
Orange Line	174,000
Red Line (incl. Mattapan)	223,000
Silver Line	14,000
Bus/trackless trolley	344,000
Commuter rail	110,000
Commuter boat	5,000
Total	1,103,000

Transit Market

Based on 2000 census figures, approximately 54 percent of the population within the Boston metropolitan region[7] is within walking distance of transit service.[8] Notably, 55 percent of all work trips and 42 percent of all trips into downtown Boston are by transit. In the Boston metropolitan region overall, 6.8 percent of all trips are made by transit, and that number is projected to increase to 7.5 percent by 2025.[9]

Proportion of Transit Riders Who Walk or Bicycle to a Station

Based on the results of the most recent rapid transit (including light rail) passenger surveys, just over 50 percent of morning-commute riders reached their station by walking.[10] Three out of every four riders at over half of the stations walked from their point of origin to reach the station; and 30 percent of stations on the rapid transit system have a walk-access mode share of 90 percent or more. Although walking is not the primary mode of access to most of the commuter rail stations, pedestrians do make up a significant portion of these riders. On the Needham and Fairmount Lines, for instance, 48 percent of riders walked to their station, and 40 percent of riders on the Worcester Line accessed their station by walking. About a third of riders on the Rockport, Haverhill/Reading, and Fitchburg Lines walked to their station, and one-fifth of riders on the Lowell and Franklin Lines walked to their station.

The passenger surveys from the 1990s indicate that less than one percent of MBTA riders reached their station by riding a bicycle. Although bicycle use is affected by the seasons, the potential exists to increase this mode share through improved access conditions.

[7] The Boston metropolitan region is defined as the Boston MPO region, comprised of 101 cities and towns in Eastern Massachusetts. The 2000 Census population figure for these communities is 3,066,394 inhabitants. For the 164 cities and towns in the Boston metropolitan transportation planning area, the population figure is 4,306,692, and the potential transit market (as defined in the footnote below) is just under 40 percent.

[8] Walking distance to transit (used to identify the potential transit market area) is defined as the distance of 3/4-mile or less from a rail station and 1/2-mile or less from a bus stop. Population is based on 2000 census.

[9] *PMT, p. 2-1.*

[10] The figures in this paragraph's discussion are based on the results from the 1993 passenger survey of commuter rail lines, 1994 passenger survey of rapid transit lines, and the 1998 passenger survey for the Old Colony Commuter Rail Restoration, all conducted by CTPS for the MBTA.

Park-and-Ride Lot Use

Park-and-ride lots at transit stations play a key role in accommodating other transit users, which can drive or carpool to the rail system. Most of the riders on commuter rail lines in the MBTA system are motorists and passengers of park-and-ride vehicles. For instance, over 70 percent of riders on the Providence-Attleboro-Stoughton line, which draws the highest number of morning commuters, arrived at their station via the park-and-ride mode.[11] Systemwide, the MBTA reports that 54 percent of users drive to stations to access the commuter rail service.[12]

However, many park-and-ride lots at transit stations are at the limit of their capacity. In fact, 71 percent of the 107 commuter rail station lots surveyed in 2000 and 2002 were reported to be near or at capacity.[13] Furthermore, 49 of the lots (46 percent) reached capacity well before the last morning peak-period inbound train. Nevertheless, the analysis described in the PMT concludes that expanding parking capacity at most stations is not a viable (or is at least a challenging) option.

Pedestrian Safety

According to 2001 statistics on traffic-related crashes in the state, pedestrians were involved in 1.5 percent of the crashes but the 70 fatalities made up close to 15 percent of all traffic-related fatalities. In the Boston MPO region, pedestrians were involved in 1.5 percent of the crashes, as well, and made up close to 17 percent of the fatalities (46). Both statewide and in the Boston MPO region less than 1 percent of traffic crashes involved a bicyclist. Around 2 percent of traffic-related fatal crashes involved a bicyclist (7 fatalities statewide, 6 in the MPO region).

Conclusion

The idea of improving access to transit by foot and by bicycle is rooted in the principle of customer service. People should not have to struggle or feel unsafe getting from home to the station. Instead, residents living near stations should be provided with an inviting connection. The costs of making links between residential neighborhoods and transit stations safe, convenient, and pleasant are generally very low. The benefits, however, are substantial. For the traveler, these benefits include a true choice of transportation options, healthful exercise, and a safer environment. For the transit operator, the advantages are an increase in ridership with a very small investment, less pressure to build costly parking facilities, and positive community relations. For the public at large, the benefits are reduced congestion, improved air quality, and a reduced subsidy.

The six case studies presented in this report describe, for each study area, the particular issues that need to be addressed and the measures that are appropriate for addressing them. Before these individual cases are discussed, however, a chapter summarizing the study's general findings is provided.

[11] Access-to-transit mode from the *1993 Passenger Survey*, conducted by CTPS for the MBTA, 1993.
[12] *PMT*, p. 5B-32.
[13] Defined as at least 85 percent of parking spaces occupied. Park-and-ride lot surveys performed by CTPS, reported in the 2004 *Congestion Management System* report.

SUMMARY AND LESSONS LEARNED

For each of the six sites studied, the subsequent chapters of this report describe the specific issues that need to be addressed and recommend specific measures for addressing them. This chapter summarizes some of the general issues encountered at the study locations and the types of measures that can be implemented to address the issues.

Examining Access Issues

The field audit conducted for this study examined the physical, safety, and quality elements of walking and bicycling to a transit station. Based on such observations, the study set out to define improvements to both station property and surrounding areas that would eliminate hazards for bicyclists and pedestrians, increase the accessibility of the station from surrounding neighborhoods for those users, or otherwise enhance the attractiveness of the station for access by foot or bicycle. The recommendations focus on relatively low-cost, quick-implementation improvements, such as:

- Striping and painting of crosswalks, bike lanes, and other pavement markings
- Adding or fixing signs (including those related to traffic control, safety, and wayfinding)
- Adjusting signal timing (including changes to pedestrian phases and signal activation)
- Reducing bicycle/pedestrian–vehicle conflicts
- Providing bicycle parking
- Providing additional sidewalks
- Adding or fixing street lighting
- Landscaping and vegetation removal

The study did not closely examine access issues from the perspective of people with disabilities. However, the study did note the presence of wheelchair ramps, especially at street corners and crosswalks.

Pedestrian and Bicyclist Comfort

Accessibility has to do not only with physically being able to get to a place, but also with the safety and quality of that trip. Safety relates to the potential for exposure to crime or for injury due to collisions with vehicles, fixed objects, or other hazards. What is meant here by the quality of an access trip is the traveler's subjective, personal comfort with the surrounding environment in both its practical and its aesthetic aspects.

Despite differences in personal perceptions and choices related to accessibility, pedestrians and bicyclists as a group tell a collective story of what is deemed acceptable or desirable: they express themselves by action. For example, a facility (such as a sidewalk, crosswalk, or bicycle parking rack) having a high number of users typically is an indication of approval and thus of effective deployment (though the potential for improvements must still be examined). On the other hand, users exhibit discomfort or displeasure by not using a facility. Furthermore, users sometimes express a desire for a facility through inventive actions, as demonstrated by a dirt path through the grass or a bicycle chained to a fence; such expressions were noted in this study's field audit.

General Issues and Recommendations

Overall, none of the study locations have issues that seriously impede the access of pedestrians and bicyclists to a transit station. However, general maintenance issues should be addressed in all of the study areas. In addition, conditions and facilities can be further improved in order to enhance the safety and quality of pedestrian or bicyclist access; best-practices guidelines should be consulted and applied when possible.

Maintenance of Existing Facilities and Amenities

In each of the study areas, many of the existing facilities and amenities are in need of repair or upkeep. Faded crosswalk paint, uneven and broken pavement surfaces on sidewalks and roadways, malfunctioning pedestrian signals, and broken streetlamps are examples of facilities and amenities that are in need of attention. At a minimum, these should be in good, functional condition.

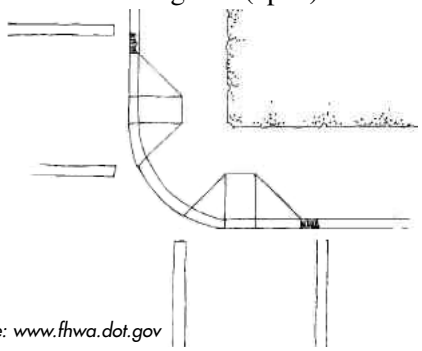
Seasonal Maintenance

Another common condition found at many study locations is a need for regular and seasonal upkeep of sidewalks and roadways. Dirt, sand, and debris accumulate in the gutters of roads and on sidewalks, particularly during and after the winter season. The winter also presents the issue of snow and ice, which are often piled onto sidewalks and along the sides of roads. In the summer, weeds and overgrown plants can obstruct pedestrian and bicyclist movement. Aside from being unpleasant and a nuisance, these conditions create obstructions that may make travel hazardous and impede transit patrons from easily using the MBTA system.

Sidewalks

In general, the streets in the study locations, particularly the main access routes, have sidewalks on both sides. Although the presence of sidewalks is generally not an issue, the sidewalks are often in need of maintenance, as noted above. Surfaces should be level, smooth, and without obstructions in the pathway of pedestrians. In addition, best-practices guidelines recommend a buffer between the sidewalk and the roadway. On most streets in the study areas, roadway widths may not permit this feature.

In a few locations the sidewalks do not have a curb wheelchair ramp at crosswalks. In many locations sidewalks have diagonal (apex) curb ramps, where one ramp is provided at the street corner; these ramps typically are not aligned with the marked crosswalks. Diagonal curb ramps are the predominant type used in the study areas; however, this type of curb ramp is not recommended by current Federal Highway Administration best-practices guidelines. Instead, street corners should have two curb ramps, one aligned with one street's crosswalk and the other aligned with the other street's crosswalk (see diagram, left). For additional safety, the bottom of the ramps should have a strip of detectable warning surface.



Source: www.fhwa.dot.gov

Crosswalks

The crosswalks in the study areas generally are striped with basic, standard markings. Very few of the crosswalks are marked in a manner that goes above and beyond the Manual on Uniform Traffic Control Devices (MUTCD) standards. Typically, they are striped with two parallel solid white lines or have a ladder-style marking. In most cases, the stop line for vehicle traffic is too close to the crosswalk.

Best-practices guidelines recommend that crosswalks be well marked and accentuated by curb extensions. This study recommends, at a minimum, marking sidewalks with ladder-style striping. A 10-foot distance between the stop lines and crosswalks is recommended. Treatments for multilane roadways should include a 10- to 30-foot distance between the stop line and the crosswalk, pedestrian refuge islands/medians, and curb extensions for increased visibility of pedestrians. Also, this study recommends appropriate signs to warn motorists of pedestrian crossing activity.


Source: streetprint.com

In order to improve sight lines between motorists and crossing pedestrians, on-street parking should be spaced at least 30 feet back from crosswalks. Furthermore, other innovative options for enhancing crosswalks should be considered, including the use of reflective paint or thermoplastic striping, pavement texturing (see photo, left), in-pavement lights, crosswalk cones and barrels, and overhead signs.

Signalized Pedestrian Crosswalks

Some signalized pedestrian crossings in the study area have broken signals and buttons, as well as long activation times for the pedestrian walk phase. As a first step, all existing signals should have functioning buttons and walk signals. Studies should be conducted to investigate reducing activation times at many signals. Moreover, the crossings should be enhanced with more modern signal technology. For example, signals should be equipped with pedestrian activation buttons that light up when pushed, as an indication of having been successfully activated. Also, countdown-style pedestrian crossing signals (see photo, left) should be used in places with a sufficient amount of pedestrian activity.

Intersection Safety


Source: www.pedbikeimages.org/DanBurden

Several intersections in the study areas should be made safer for pedestrians and bicyclists through some minor redesign. Curb extensions at the corners, for instance, create a tighter turning radius for vehicles, which slows the speeds of traffic at turns. Curb extensions also provide better sight lines for motorists to watch for pedestrians and vice versa. Furthermore, medians and islands can be enlarged to better guide and control traffic, often slowing vehicle speeds as well. Medians and traffic islands should be large and visible enough to provide sufficient refuge for pedestrians. Plus, striping should be clear and delineate the vehicle-turning lanes, the crosswalks, and the stop lines. Lastly, intersections with significant pedestrian activity could be marked as a pedestrian crossing zone (instead of having only crosswalks), where an all-red pedestrian phase is part of the signal cycle.

On-Street Bicycling

On many roads that lead to transit stations, bicyclists must contend with high traffic volumes and on-street parking. High traffic volumes, particularly when combined with high speeds and frequent turning movements, can be intimidating to bicyclists. On-street parking poses challenges in the form of conflicts between vehicles that are parking or discharging passengers, and bicyclists, who are often negotiating traffic to their left in addition to coping with the parked-vehicle activity to their right.

Roadway design and condition are also issues for bicyclists. Narrow lanes and narrow shoulders are a concern, particularly on roads with high traffic volumes. Potholes and poor pavement should be fixed, as bicyclists are more sensitive to pavement conditions than are motorists. Storm-sewer grates were not an issue in the study areas: the grates either were grids or were parallel bars appropriately placed perpendicular to traffic flow.

The study does not recommend bicycle lanes in the locations examined, due to the common presence of on-street parking and high traffic volumes on major corridors to the stations. However, if local communities are willing to eliminate on-street parking, further study of bicycle traffic volumes should be conducted in order to determine the demand for on-street bicycle lanes.

Bicycle Parking

All of the stations studied, with the exception of Boston College Station, provide at least one bicycle rack. In some cases, additional racks should be installed. Providing sufficient parking capacity for bicycles is not sufficient in itself, however. Some stations would benefit from relocating the existing racks in order to improve visibility, provide shelter, and promote use. Visibility is a big issue for bicyclists; a secure location is often one that is watched by others. Also, proper lighting conditions enhance visibility; hence well-lit locations are preferred for bicycle parking. Protection from the elements is another highly desirable characteristic of a bicycle rack location. Thus, if space is available, racks should be located in a station building; otherwise, a roof or other shelter should be provided. Lastly, racks should be situated in spots that offer enough space not only for storing bicycles but also for maneuvering them.

Current bicycle parking guidelines[1] recommend that providers of bicycle racks select types that:

- Support the bicycle upright by its frame in two places, enabling the frame and one or both wheels to be secured
- Allow both front-in and back-in parking
- Are compatible with today's bike frames and with U-locks

Common bicycle parking racks that meet the above guidelines include: the inverted-U or hoop (see photo, above), "A" (a hoop with a horizontal bar), and post-and-loop (also known as bike hitch) style racks. Many manufacturers produce these or acceptable variations of these styles. These rack elements are typically arranged in a row or array; the spacing between the rack elements should be a minimum of 30 inches (on centers), but preferably a more comfortable 36 to 42 inches.

[1] One reference is *Bicycle Parking Guidelines* (2002), adopted by the Association of Pedestrian and Bicycle Professionals. For more information, please refer to www.bicyclinginfo.org/de/parkguide.htm.

Signs: Wayfinding for Transit Stations

Well-placed wayfinding signs—pointing the way to a transit station—reach out to potential riders. They are similar in function to signs that direct motorists to highway ramps. Care should be taken to install the signs at a height and orientation favorable to pedestrians. Also, these signs should use conventional MBTA symbols, lettering, and colors.

Travel Environment

The aesthetic look and feel of the travel environment encourages use by pedestrians and bicyclists. Communities should implement measures to improve the quality of the street environment through the use of landscaping (trees, shrubs, and flowers, all appropriately placed), lighting, furniture (such as benches and trashcans), and artwork (such as sculptures and murals). Chambers of commerce and business owners should also be encouraged to enhance storefronts and streetscapes.

Future Considerations

The opportunity to implement many of the recommended improvements may only arise when a roadway construction project occurs. Any roadway construction project should apply best-practices guidelines for serving pedestrian and bicyclist travel in general. More specifically, projects should improve walk and bike access to transit stops and stations as much as possible. In essence, the MBTA, MassHighway, local governments, and land developers should coordinate and cooperate on all transportation improvement projects to ensure that pedestrian and bicyclist needs are integrated into the final designs.

When improvements are made to the accessibility of transit to pedestrians and bicyclists, they can be highlighted in public information campaigns promoting the option of bicycling to transit stations. The improved accessibility can be extolled along with the cost, time, and health benefits to individuals.

AYER COMMUTER RAIL STATION AREA

The commuter rail station located in Ayer serves a community that is undergoing changes. With the closure of the nearby military base at Devens, Ayer is experiencing a change in economy and housing. The population surrounding Ayer Station shares characteristics similar to target environmental justice communities,[1] based on median household income. With the loss of jobs in the area, workers could be looking for opportunities in employment areas served by commuter rail. New developments are reshaping the former military base. Rising housing prices in communities closer to Boston and the Route 128 belt are forcing many homebuyers to communities in the outer suburbs, such as Ayer and nearby Groton. Thus, for more than one reason, Ayer Station could be seeing an increase in riders—and an increase in demand for use of the park-and-ride lot.

However, the Program for Mass Transportation's evaluation of potential parking expansion projects assigns a low-priority rating to increasing the capacity of the park-and-ride lot at Ayer Station. Obstacles to any expansion include land rights and funds availability, among others.

Recently, a new off-road, paved, shared-use path—the Nashua River Rail Trail—has opened, connecting downtown Ayer (where the station is located) with Groton, Pepperell, and Dunstable to the north. This path is a step toward improving access by pedestrians and bicyclists to the station. Unfortunately, the end of the path is not well connected to the station: the final connection is not direct, the station is partially hidden from view, and traffic along Main Street is constant.

Because of the potential increase in demand for use of the park-and-ride lot and the opportunity to improve the connection between the multiuse path and the station, Ayer Station was chosen as a site for this study.

Station Area Characteristics

About 2,800 people (close to 40 percent of Ayer's population) in 1,150 households reside within a three-quarter-mile radius of this station, according to the 2000 census. (In the area within a half-mile radius from this station reside approximately 1,800 people in just over 770 households.) Approximately 10 percent of the households do not have a private vehicle. Residential developments make up just over 25 percent of the area; the land use within a three-quarter-mile radius of this station is predominantly undeveloped or undevelopable, including forest and other open space. Among the developed parcels, residential land use takes up 60 percent of the land; commercial 15 percent; and light industrial close to 6 percent.

[1] Environmental justice is the equitable sharing of the transportation system's benefits and burdens. In order to identify possible target communities—areas with significant minority or low-income populations—this study applied the following criteria: minority population greater than the MPO-region average (21.4 percent); median household annual income less than 75 percent of the MPO-region median (that is, less than $41,850).

Figure 1
Ayer Station
Area Features

Station Amenities

In terms of station amenities for pedestrians and bicyclists at the Ayer commuter rail station, the following two issues are discussed in this section:

- Bicycle parking
- Station visibility

Bicycle Parking at the Station

On the south (inbound) side of the station platform, a dish-style bicycle rack is located in an open area beside the benches and shelter for the station. No bicycles were parked there on the day of the observation; bicycles were chained to posts on the north side of the station.

Recommendation: Move the existing bike rack to the north side of the station (not MBTA property), between the commuter parking lot and the outbound platform. This spot is more visible, on a hard surface, and in an area where bicyclists have been observed to lock their bicycles. Consider a location next to or behind the building, which may facilitate adding a shelter over the racks. Alternatively, there seems to be enough room between the parking lot and the railroad tracks to comfortably add a rack.

Visibility of the Station

The Ayer commuter rail station is inconspicuously situated behind a commercial/retail area along Main Street (Routes 2A and 111)—even the "T" lollipop sign is hidden from the view from Main Street.

Recommendations:

- Add a more prominent lollipop (the existing one could be taller by about 3 feet).
- Add a trailblazing sign at the entrance to the commuter parking lot. The signs should face both directions of traffic. This sign would follow up on a sign at Columbia Street announcing, "commuter rail parking ahead." (Note: On the ladder sign for the establishments at "Depot Square" off Main Street, one sign does indicate "T parking." However, the sign is below two other signs, and the lettering is not standard MBTA lettering.)
- Work with appropriate property owners to add station signs at the following locations:
    - main walkway to the station platform, just to the east of the adjacent building;
    - westside wall of the building immediately to the east of the parking lot entrance.

Station Access by Pedestrians and Bicyclists

This section discusses the station-area accessibility issues at the following locations:

- Access from the North: Park Street and the Rail Trail
- Intersection of Park Street (Route 2A/111) and Main Street
- Bike Path/Rail Trail Terminus at Main Street
- Access from the Northeast and East
- Access to the Station from the Southeast
- Access from the West: W. Main Street

Overview of Station Use and Access by Riders

CTPS field observations on the clear Tuesday morning of September 9, 2003, recorded a total of 188 boardings on the inbound commute trains. Since no passenger survey information is available for this station (which would provide the walk-access mode share), CTPS staff observed how riders arrived at the station; the findings are:

- 53 percent (101 riders) originated as motorists or passengers in vehicles parked at the commuter rail lot
- 26 percent (47 riders) walked from the rail trail (although most of these riders, we later found out, actually parked at the rail trail's lot, and thus are park-and-ride users)
- 11 percent (20 riders) were dropped off at the commuter rail station lot
- 10 percent (18 riders) were pedestrians, of which two came over the tracks from the southeast residential neighborhood
- 2 riders were bicyclists, including one cyclist who chained his bicycle to a post on the north side of the tracks and one who parked his bicycle at the rail trail parking lot racks.

The 64 available parking spaces at the commuter rail lot were all occupied before the second-to-last peak-period train at 7:17 A.M. Nine other vehicles were parked in unmarked spaces, including a dirt/gravel area adjacent to the paved parking lot. After the last peak-period train at 7:41 A.M., staff noted a total of 40 vehicles parked at the rail trail's parking lot. Both lots are fee-free and unattended.

Access from the North: Park Street and the Rail Trail

The main roadway approach from the north is along Park Street (Route 2A/111). The road has 12-foot lanes, with 3-foot shoulders and a 25-mph speed limit south of Brook Street (whereas the posted speed limit is 35 mph north of Brook Street, when the state highway designation begins). The road primarily has commercial development along this stretch, and connects to residential areas to the north.

Between Main Street and a point 80 feet north of the intersection there are 6-foot brick-and-concrete sidewalks on both sides of the road. Further north of this point, a sidewalk is present only on the west side; this sidewalk is 5-feet wide, blacktop, and in good condition (except for cracks at roadway curb cuts). Not many pedestrians were observed using this roadway in the morning commuter hours.

Cyclists and pedestrians traveling from the north are better off using the rail trail than Park Street. In fact, this is what was observed during the morning commute hours: the trail was used by bicyclists and pedestrians, most of whom parked at the rail trail parking lot, and walked south to the train station. A

Dunkin' Donuts establishment is located on the west side of Park Street; no crosswalks are provided in the vicinity of this activity generator.

Overall, though, this is a low-activity corridor for bikes and pedestrians—not many residences are located along and north of this stretch of Park Street. Further north of the rail trail parking lot, there is a connection to the rail trail, via two dirt paths, from the residential area off Park Street. Such connections are important to encourage people to use the rail trail rather than face the conditions on parallel Park Street.

Recommendation: Add trailblazing signs at points far north on Park Street to direct bicyclists to the rail trail.

Intersection of Park Street (Route 2A/111) and Main Street

The intersection of Park Street and Main Street is unsignalized. Traffic tends to mostly travel along Route 2A/111, turning between Park Street and E. Main Street. Much truck traffic passes through this intersection; as with most of the traffic here, the primary movement includes the turns. During the peak morning commute hour, a traffic control officer was observed directing traffic. Red stop signs are in place for traffic approaching from the north (Park) and south (driveway).

Recommendations: Increase the safety of the intersection of Main Street at Park Street by implementing the following improvements:

- Install additional street lighting for stronger illumination of the intersection
- Install single-bulb, flashing yellow lights ("flashing beacons") for the two Main Street traffic approaches and a single-bulb, flashing red light for the southbound Park Street traffic approach
- Install a warning sign for the southbound Park Street traffic indicating that the cross-street traffic does not stop

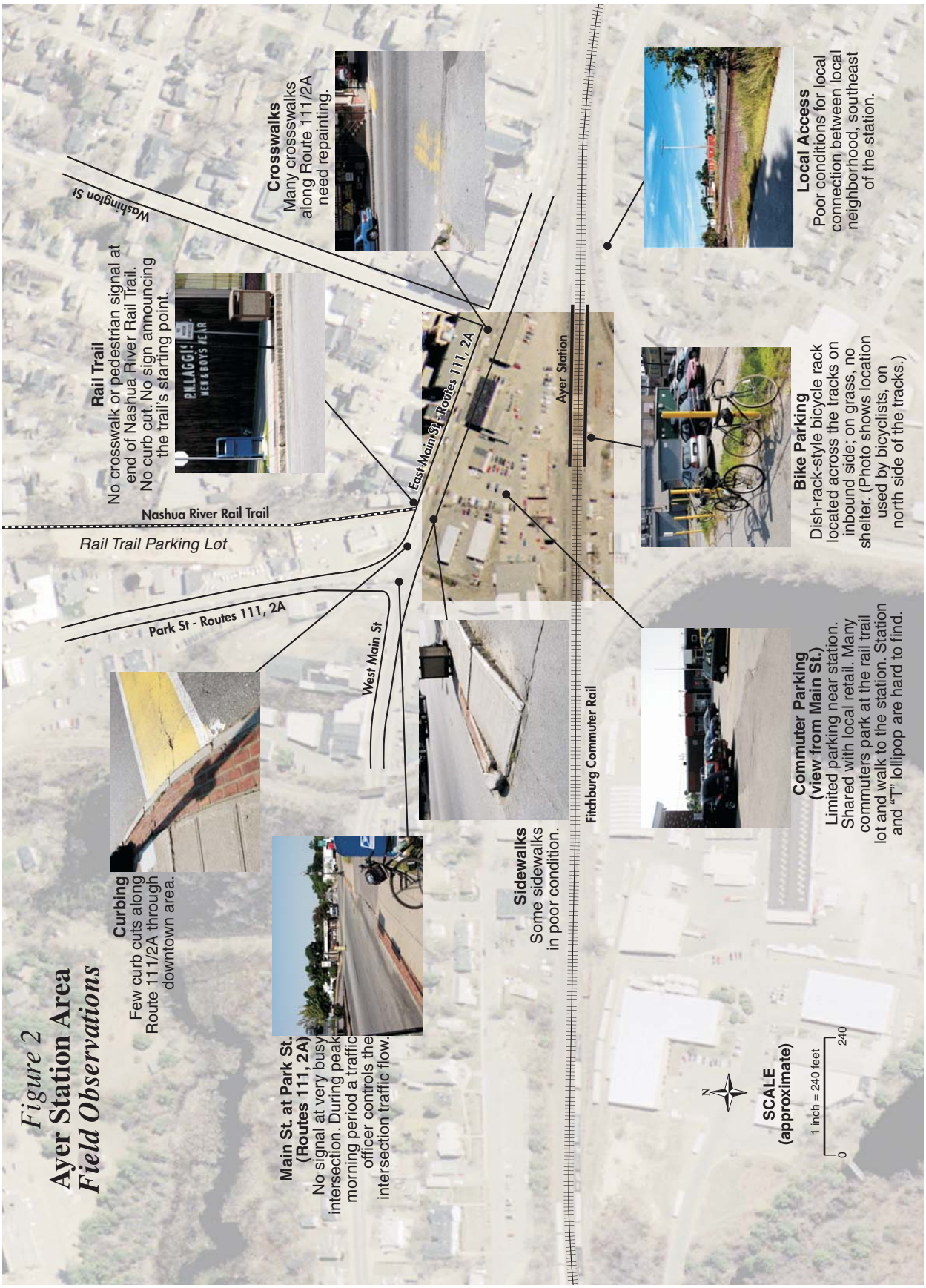


Figure 2
Ayer Station Area
Field Observations
Washington St
Crosswalks
Many crosswalks along Route 111/2A need repainting.
Rail Trail
No crosswalk or pedestrian signal at end of Nashua River Rail Trail. No curb cut. No sign announcing the trail's starting point.
Nashua River Rail Trail
Rail Trail Parking Lot
East Main St - Routes 111, 2A
Ayer Station
Local Access
Poor conditions for local connection between local neighborhood, southeast of the station.
Bike Parking
Dish-rack-style bicycle rack located across the tracks on inbound side; on grass, no shelter. (Photo shows location used by bicyclists, on north side of the tracks.)
Park St - Routes 111, 2A
West Main St
Curbing
Few curb cuts along Route 111/2A through downtown area.
Main St. at Park St. (Routes 111, 2A)
No signal at very busy intersection. During peak morning period a traffic officer controls the intersection traffic flow.
Sidewalks
Some sidewalks in poor condition.
Fitchburg Commuter Rail
Commuter Parking (view from Main St.)
Limited parking near station. Shared with local retail. Many commuters park at the rail trail lot and walk to the station. Station and "T" lollipop are hard to find.
N
SCALE (approximate)
1 inch = 240 feet
0
240

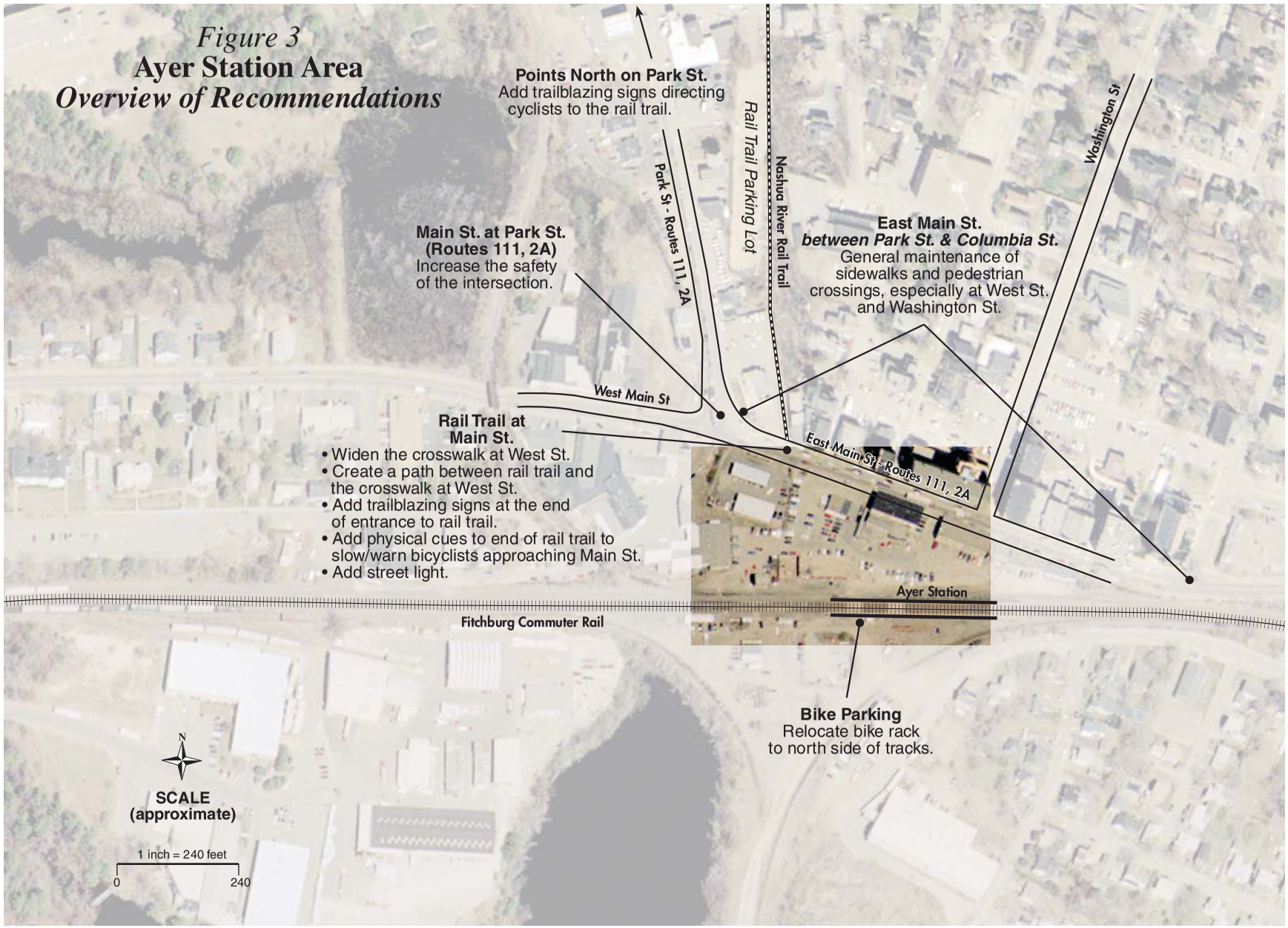


Figure 3
Ayer Station Area
Overview of Recommendations
Points North on Park St.
Add trailblazing signs directing cyclists to the rail trail.
Rail Trail Parking Lot
Nashua River Rail Trail
Park St - Routes 111, 2A
Washington St
Main St. at Park St.
(Routes 111, 2A)
Increase the safety of the intersection.
East Main St.
between Park St. & Columbia St.
General maintenance of sidewalks and pedestrian crossings, especially at West St. and Washington St.
West Main St
Rail Trail at Main St.
• Widen the crosswalk at West St.
• Create a path between rail trail and the crosswalk at West St.
• Add trailblazing signs at the end of entrance to rail trail.
• Add physical cues to end of rail trail to slow/warn bicyclists approaching Main St.
• Add street light.
East Main St - Routes 111, 2A
Ayer Station
Fitchburg Commuter Rail
Bike Parking
Relocate bike rack to north side of tracks.
N
SCALE
(approximate)
1 inch = 240 feet
0
240

Bike Path/Rail Trail Terminus at Main Street

The Nashua River Rail Trail ends at Main Street (Routes 2A and 111), across from the Ayer commuter rail station parking lot and the adjacent gas station property. No crosswalk is provided at the rail-trail terminus; the most direct access to the station is via a crosswalk about 12 yards to the east of the rail trail, at West Street.

Five different elements should be improved in order to create a safe crossing of Main Street for bicyclists and pedestrians between the rail trail terminus (on the north side) and the commuter (also commercial) parking lot and station (on the south side). These are described in detail below, beginning with improvements that should be made to the Main Street crosswalk at the west side of West Street.

Crosswalk at West Street

Currently, the crosswalk's paint is worn and faded from its original solid yellow with two parallel white border stripes. The curbs lack wheelchair ramps.

Recommendations:

- Widen the existing crosswalk to 10 feet.
- Add a ramp/curb cut at the north end of the crosswalk.
- Place a pedestrian crossing cone (or barrel) in the middle of the road for both vehicle approaches, similar to the signs found at nearby crosswalks.
- Add additional overhead street lighting for this crossing.
- Install either an overhead pedestrian-crossing sign (preferably illuminated) or in-pavement lights along the crosswalk. Both measures are used to alert oncoming motorists of potential ` pedestrian activity.
- Add signs warning oncoming motorists of the upcoming pedestrian/bicycle crossing.
- Add a sign at the end of the trail directing bicyclists and pedestrians to use the crosswalk "to the left" (at West Street) in order to reach the commuter rail station.

Rail-Trail-to-Station Connection

The recommendations above should be enhanced by creating a path (a widened sidewalk) along the north side of Main Street between the rail trail and the crosswalk at the west side of West Street. The roadway is wide enough to accommodate such a path, without impacting traffic or the provision of on-street parking.

Recommendation: Create a new path connection by widening the sidewalk on the north side of Main Street by 6 feet. This will still permit a 12-foot eastbound traffic lane with a 3-foot shoulder, a 12-foot westbound lane, and an 11-foot parking lane. The new sidewalk extension should have a smooth surface.

Commuter Rail Parking Lot

On the south side of Main Street, across from West Street, the crosswalk terminates at the Depot Square parking lot entrance, at the west side of the driveway. From here, pedestrians and cyclists must cross the driveway and cut across the lot to reach the station on the south side of the lot.

Recommendations: The following improvements can be made to enhance the final connection from Main Street to the rail station:

- Paint (or highlight with appropriate pavement surface treatments) a crosswalk across the parking lot driveway. It should be aligned with the sidewalk.
- Repair the sidewalk and wheelchair ramps along Main Street in front of the commuter parking lot.

End of Rail Trail: Safety

The following advisories are located at the end of the rail trail at Main Street: a "hwy x-ing" pavement marking in yellow paint, a "Bike Route—End" sign with a stop-sign-ahead warning, a stop sign, and a median post/bollard. A trash can is located on the sidewalk at the end of the path, also serving as a physical barrier for bicyclists as they reach Main Street.

Recommendation: Improve the safety of bicyclists approaching the end of the trail at Main Street by adding a rumble strip at the end of the path, just before the sidewalk. A rumble strip, in addition to the other features in place, should combine to encourage bicyclists to stop and even dismount at this point.

End of Rail Trail: Directional Signs

The end of the trail does not provide any signs that give users any further direction to landmarks, roadways, or amenities in the area. From the standpoint of bicyclists and pedestrians at the trail entrance no signs are present that indicate that a rail trail begins here; the only sign at the start of the rail trail is a warning that no motor vehicles are allowed.

Recommendations:

- Add a trailblazing sign pointing trail users to:
  - Commuter rail station, accessible via crosswalk "to the left"
  - Main Street (commercial center of Ayer) and town hall, library, and court house, all to the east
  - W. Main Street and the town of Shirley, to the west
- Add sign on eastbound Main Street indicating the beginning of a bicycle path to the north (a "Bike Route—Begin" sign exists in the westbound direction).
- Add a sign for bicyclists and pedestrians at the rail trail indicating the beginning of a trail.

Access from the Northeast and East

Most of the residential areas near the station lie northeast of the station (north of Main Street) and further east (south of Main Street and the railroad tracks). Main Street—the commercial center of Ayer—and roads connecting to it are the main roadway access points to the station from these areas. Sidewalks along Main Street have good design elements for pedestrians: they are wide (typically 4 feet with a 3-foot brick-and-curb buffer from the road on the south side, and 8 feet on the north side with a similar buffer) and have on-street parking lanes on both sides. Accessibility (particularly from a wheelchair-user's perspective) may be an issue, as there are few ramps at the crosswalks along Main Street, and sidewalk condition could be improved in certain spots. Bicycle travel through here requires alertness by the cyclist, due to the volume of traffic and parked vehicles; however, with posted speeds of 25 mph and the downtown nature of the roadway, a bicyclist should be able to navigate this stretch of road without major discomfort.

Recommendation: Maintain or increase driver awareness of pedestrian/bicycling activity along Main Street. This can be accomplished by some general maintenance: repairing any broken sidewalks and ramps, restriping pedestrian crossings, and ensuring good nighttime visibility

Access to the Station from the Southeast

The residential neighborhood to the southeast of the Ayer commuter rail station lacks a connection to the station platform. Weeds, brush, gravel, and a freight railroad are uninviting elements to pedestrians who may want to approach the station platform from this neighborhood. CTPS staff observed that pedestrians handled these impediments to reach the station by walking through the brush and crossing the gravel and tracks. The alternative path for pedestrians and bicyclists to reach the station is to head east to Main Street and then head west to the station—a half-mile route.

Recommendation: Work with the railroad company to either (1) create a safe connection between the station and the residential neighborhood to the southeast, or (2) take appropriate measures to prevent or discourage such crossings.

Access from the West: W. Main Street

West of Park Street is a small residential area. Its principal connection to the CBD and the commuter rail station is via W. Main Street, a two-lane road with wide lanes and shoulders (15 feet and 2 feet, respectively, in each direction). Although vehicle travel speeds on W. Main Street may be on the higher side—even though the posted speed limit is 25 mph (35 mph west of this area)—bicyclists should feel comfortable with the wide lanes and few (if any) parked vehicles. Thus, striping bike lanes would not be necessary. Looking at pedestrian travel, the sidewalks seem adequate; these are wide and in good condition.