City of Newton

Bicycle Accommodation and Integration Plan

Drafted by:

Srdjan S. Nedeljkovic, M.D.
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Balancing Safety and Mobility

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BACKGROUND

The Comprehensive Planning Advisory Committee is charged with developing a document for the City of Newton that reflects potential changes and improvements in the City's transportation systems. As part of its Transportation Element, the Comprehensive Plan has two major goals:

1) To enhance and promote equity in mobility in Newton
2) To maintain city character and quality of life

In its efforts to promote mobility and equity in transportation access, the Transportation Plan has identified that promoting bicycle use in Newton should be a component of its overall efforts to improve mobility. Enhancing the ability of Newton's citizens to utilize bicycles in a safe, convenient, and efficient manner is consistent with the intention of the Plan to reduce the potential for increased automobile trips and to create an option to the use of automobiles as the sole mode of transport. Bicycle use will also serve to promote walkable pedestrian-oriented environments and can be a vital link to public transit facilities in village centers.

It is the full intention of this Bicycle Plan to promote a safe environment for both bicycle users and automobiles. Certain streets and parts of Newton are perceived as not being safe for bicycle use. The primary objective of this Plan is to promote only the safe use of bicycles in Newton. In many of our neighboring communities, bicycles have been integrated into the fabric of overall transportation, and it is the intention of this Plan to help achieve that result for Newton as well.

OBJECTIVES

The following objectives are identified in creating a Bicycle Plan for the City of Newton:

1) Investigate the feasibility of bicycle routes on selected roadways
2) Establish at least one East-West and one North-South bicycle route
3) Provide design recommendations for bicycle facilities on these routes
4) Provide recommendations on bicycle facilities at village centers and key nodes

As such, the Bicycle Plan will identify primary centers of bicycle use, including probable origin and destination points. The corridors and routes which will have priority for bicycle use will be outlined, as will the characteristics of each corridor. Recommendations will be

made to implement bicycle route improvements that will enhance the safety and utility of these routes for bicyclists.

The City of Newton promotes bicycle use as a mode of transportation, along with walking, public transportation, and other alternatives to automobile use, because these are environmentally friendly ways to travel. By improving bicycle facilities, more people will tend to use bicycles as a way to travel, and every person who is on a bike potentially removes an automobile from the street and reduces congestion and parking demand. Bicycle use is a healthy form of exercise and a way to reduce air pollution. Increased bicycle use in Newton will promote a more livable city by reducing automobile use and promoting non-polluting forms of transportation.

On slow, residential streets, bicycles can function in a safe environment where they share the road with motorists. By implementing traffic calming measures, streets with moderate amounts of traffic can also accommodate bicyclists safely. On larger arterial streets, bicycle lanes are usually the appropriate choice so that bicyclists can share the road with faster moving vehicles. However, state law allows cyclists to travel in the regular vehicle lane on most roads, with the exception of expressways and limited-access highways.

By designating certain streets in Newton as those favored for bicyclists, these streets can be made safer and more comfortable to everyone by this designation. Promoting bicycle use in Newton will serve to achieve the following goals:

- Support and encourage bicycling as a means of transportation
- Help define space on certain roads for bicycle use
- Give bicyclists a clear path so that they ride with the flow of traffic and not on sidewalks
- Remind motorists to look for bicycle riders when turning or when opening doors

The most important way to promote bicycle use and safety is by providing bicycle facilities, including places for people to ride their bicycles and safe places to park and store them when they reach their destination. Because bicyclists prefer short and direct routes to get from place to place, it is important that roads providing direct connections between key locations are identified.

STRATEGIES AND ACTIONS

Recommendations for bicycle facilities in Newton primarily relate to roadways that are classified as Primary Arterials or Secondary Arterials on Newton's Functional Classification Map (refer to Classification Map). Otherwise, bicycles are prohibited by state law from limited access routes, such as Interstate Highways, and are discouraged from use on Route 9, which is classified as a Highway, primarily due to safety reasons. On local, residential streets, bicycle use is encouraged, as bicycles can easily share these roads with automobiles, which generally move slowly.

1) Limited access highways: bicycles prohibited by state law
2) Highways: bicycle use not recommended due to potential safety issues
3) Local, residential streets: bicycle use encouraged, roads shared with automobiles

As for Primary and Secondary Arterials, Newton's Bicycle Plan defines "Designated Bicycle Routes" and "Preferred Bicycle Routes," taking into account that in the Commonwealth of Massachusetts, bicycles are actually permitted to share the road with automobiles on all of these routes.

1) Designated bicycle routes
   - Include dedicated two-way bicycle lanes on a majority of the route
   - Clearly marked bicycle lanes exist, meeting national and state standards

2) Preferred bicycle routes
   - Bicycle use is encouraged by signage
   - Facilities for bicycles are provided in village centers and near transit

Approved signs and roadway markings will be used along these routes, clearly identifying them as routes intended for bicycle use.

DEFINITIONS

Standards for bicycle facilities are based on national and state efforts to define these accommodations, which have then adapted to the particular nature of Newton's historic streets and neighborhoods. The following sources are used:

1) American Association of State Highway and Transportation Officials (AASHTO) 1999 guide for the development of bicycle facilities.

2) Massachusetts Highway Department (MassHighway) – 1995 Highway Design Manual (metric edition).

3) Massachusetts Highway Department Engineering Directive 98-003 in response to MGL Chapter 87 ACTS of 1996 Bicycle and Pedestrian Accommodation.

4) 1998 Massachusetts Statewide Bicycle Transportation Plan

5) Massachusetts Highway Department Policy Directive P-98-003 – "Bicycle Route" and "Share the Road" sign policy.

Designated Bicycle Routes

These are routes where a dedicated bicycle lane is present and delineated on a majority of the route. On these routes, separate lanes are marked for automobiles and bicycles, thereby defining available road space for preferential use. On "Designated Bicycle Routes," it is acceptable that the bicycle route continues unmarked in some areas, such as in Newton's village centers and other places where having a separate bicycle lane is infeasible. In many of Newton's villages, design speeds on roadways are limited by the nature and character of

the village, and bicyclists may safely share the road with automobiles without specially marked lanes.

Otherwise, where possible, the following design parameters will apply:

- For roadways with no curb and gutter, the minimum width of a bike lane should be 4 feet (1.2 meters).
- If parking is permitted, and the road has a curb, the shared area of a bike lane and parking should have a minimum width of 12 feet (3.6 meters).
- If parking is permitted, and the road lacks a curb, the shared area of a bike lane and parking should have a minimum width of 11 feet (3.3 meters).
- If parking is permitted, and the stalls are marked, the bike lane should have a minimum width of 5 feet (1.5 meters) separate from the stalls.
- The outside minimum curb lane with of 14 feet will be maintained (as designated by the AASHTO standards). For full depth reconstruction projects to be eligible for Mass Highway or Chapter 90 funding, a minimum outside lane width of 14.76 feet (4.5 meters) must be maintained (unless a waiver is granted).
- In areas where there is heavy demand for on-street parking is permitted, an additional 1-2 feet of combined bicycle travel and parking width is desirable.

The Bicycle Element of Newton's Comprehensive Plan proposes that two primary roadways are marked as "Designated Bicycle Routes." The Needham Street – Centre Street route will be the City's preferred North-South bicycle route. The Commonwealth Avenue route will be the City's preferred East-West bicycle route. (Refer to: Bicycle Routes Map).

These routes were chosen for several reasons. First, they provide connectivity and continuity for bicyclists who are traveling to other towns and communities. These roads are common routes for travel in high demand corridors. Second, these routes are centrally located within Newton, providing easiest access to the largest proportion of the local population. Third, these routes traverse or are adjacent to many of Newton's important nodes and transit stations. Finally, these two routes extend along many local neighborhood streets and interconnect with other "share the road" bicycle routes (as outlined in the next section), allowing a robust internal bicycle circulation system.

On "Designated Bicycle Routes," the City of Newton will strive to implement bicycle-friendly amenities, such as adjusting traffic control signals to give greater priority to bicycles and providing a smooth riding surface which includes bicycle safe drainage grates. The City will also insure to maintain the route through regular street sweeping to prevent accumulation of debris. An appropriately spaced system of signs and maps will be provided along the route, showing destination information and how the route integrates with surrounding nodes of activity and bicycle routes in other communities.

Preferred Bicycle Routes

According to state law, bicycles may be ridden on most of Newton's roadways. However, there are certain routes where roadway designs are more favorable for safe bicycle riding. These are generally roadways which either have minimal traffic or which have a usable travel lane of at least 14 feet. The most critical element is the width of the outside travel lane. On most of Newton's roads, which are one lane in each direction, the outside travel lane is the only travel lane. On some roads which have two lanes in each direction, the outside travel lane should have a minimum width of 14 feet to accommodate bicyclists.

Mass Highway standards recommend that outside lanes for roadways where bicyclists will share the road with cars should be at least 14.76 feet wide (4.5 meters). In general, a wider outside lane is desirable so that motorists do not need to cross the center line or lane lines to pass a bicyclist. In areas where there is on-street parking, the combined bicycle-parking lane should be a minimum of 12 feet wide (3.6 meters).

Roadways in Newton that are primary or secondary arterials and where bicycle use is preferred are to be designated "Preferred Bicycle Routes." These are roadways where bicycle traffic is expected but which are not "Designated Bicycle Routes" that have separate lanes dedicated to bicycle travel. The roadways that are delineated as "Preferred Bicycle Routes" will have signs that read "Share the Road." These routes with "Share the Road" signing may not absolutely conform to the above-noted minimum width requirements in some sections. It is understood that many of these routes traverse village centers and some other areas where road width is relatively narrow. In those areas, it is expected that traffic calming measures will reduce the speed of automobiles and allow for safe bicycle riding. Otherwise, it is desirable that most of the route marked as a "Preferred Bicycle Route" fulfills the previously noted width requirements for comfortable bicycle riding.

Add typical roadway cross-sections here
1) Designated route, no parking (Centre Street)
2) Preferred route, with "Share the Road" signs (Walnut Street)

In Newton, approximately 20 roads are marked as "Preferred Bicycle Routes." These roads are chosen because they all for direct connections between nodes of interest, such as villages and transit stations. They also allow for interconnectivity between areas in Newton and centers of activity in adjacent towns and cities. These routes will have frequent signage indicating to both bicyclists and automobile drivers to "Share the Road," which will serve to increase the awareness of these routes being appropriate bicycle routes.

To make bicycle use more desirable, Newton will endorse the provision of bicycle parking facilities at nodal centers such as villages, major institutions and public buildings, and at key transit locations. Parking facilities will be located in a well-lighted and frequented location in each node and will include implements for securing bicycles. The Comprehensive Plan supports the concept of "shared bicycle use" as implemented in some cities, whereas a number of inexpensive public bicycles are made available, as long as they are used only between nodes.

IMPLEMENTATION

Bicycle Accommodation, Safety, and Appropriateness of Use

The safety of a roadway for bicycle use and its overall desirability is dependent on several major factors. These include issues of traffic flow and roadway geometry, as well as the topography of the route and its connectivity between destinations. Major determinants of the desirability of a route for bicycle use include:

- Total traffic volume of the road
- Amount of truck traffic and heavy vehicles
- Speed of vehicular travel on the road
- Width of the outside lane, where bicycles would travel
- Number and severity of potential traffic conflict points
- Directedness of travel and connectivity between nodes
- Topography and geography of route

As traffic volumes approach capacity, the desirability of a route for bicycle use decreases. There is more potential conflict between automobiles and bicyclists. Studies show that a traffic flow of greater than 900 vehicles per hour per lane (or about 15 vehicles per minute) will create stress for both automobile drivers and bicyclists. It is important to consider traffic volumes when bicycle use may be highest, such as mid-day and on weekends. Trucks and heavy vehicles also affect bicycle safety and comfort levels. Usually, if there are greater than 10 heavy trucks per hour on a road, there is a decreased level of comfort for riding a bicycle.

High motor vehicle speeds can affect the stability of a bicyclist when passing vehicles are traveling greater than 45 miles per hour. Bicyclists are most comfortable when roadway speeds are less than 30 miles per hour. Therefore, considerations should be given to designating bicycle routes in Newton with speed limits no greater than 30 miles per hour, whenever possible. Studies show that the width of an outside lane interrelates with speed in determining whether a roadway is appropriate for bicycle use. For example, an outside lane width of 15 feet can accommodate bicycles and automobiles with a speed of less than 40 miles per hour. On most roads, bicycles are not expected to any impact on motor vehicle traffic where the outside lane is greater than 14 feet.

The number and severity of potential traffic conflict points may also have an impact on the desirability of a route for bicycle use. Routes with complicated intersections or frequent curb cuts may decrease safety for bicycle riders. Similarly, routes with a known high incidence of motor vehicle accidents are not favored for bicycle use. The sight distance, grade, pavement condition, and presence of immediately adjacent trees may reduce the desirability of a route for bicyclists. Finally, on street parking may have a dual effect. The presence of parking on a roadway may serve to calm traffic, reduce its speed, and make it easier for a bicyclist to share the road with cars. Also, areas with on-street parking are often in commercial centers or near transit stops, which are desirable destination points for bicyclists. However, on street parking may also create potential conflict points, as cars enter and emerge from parking spaces, and when doors are not opened carefully. Both of these conditions may cause bicyclists to swerve into traffic.

Any of these potential effects would be greater in zones where parking activity is more frequent. Because of these contrasting effects on bicyclists, it is likely that on-street parking has a neutral effect on bicycle use.

Identification of "Designated" and "Preferred" Bicycle Routes

In determining whether a roadway in Newton should be a designated or preferred route for bicycle riding, three major criteria were utilized. First, the route should serve major centers and nodes, such as villages, public facilities, or transit stations. Also, the route should help connect Newton to surrounding communities if it traverses City boundaries. Second, the route must be safe and otherwise suitable for bicycle use. Safety considerations must be met for both bicyclist, automobile drivers, and pedestrians who may come in contact with bicyclists. Finally, the implementation of a route must be done in a cost-effective manner. This is especially true for the "Designated" routes, where a dedicated bicycle lane will be implemented. The implementation of bicycle routes must be realistic and practical.

Designated Routes

The Bicycle Plan envisions two major "Designated Bicycle Routes" in Newton, one being a north-south route and the other being an east-west route. For the east-west route, the following streets were under consideration:

East-West Streets	Avg. Daily Traffic	Peak Hr. Volume	Outside Lane Width
Washington Street	36,300	1,306	12 ft
Watertown Street	35,230	1,268	13 ft
Commonwealth Ave.	14,921	695	18 ft
Beacon Street	24,616	1,592	16.5 ft
Nahanton Street	13,370	889	22.5 ft
Brookline Street	10,331	620	16.5 ft

Two other major east-west thoroughfares were excluded as one is a limited access highway (Massachusetts Turnpike) where bicycles are illegal and the other is Route 9, where vehicle speeds and overall volume and topography is not conducive to safe bicycle riding. The Bicycle Plan suggests that Commonwealth Avenue is the most appropriate east-west route for a "Designated Bicycle Route." It is in a central location in Newton, tying together the Auburndale, Waban, Newton Centre, and Chestnut Hill neighborhoods. It is near City Hall and the Public Library, and passes near the village of Newton Centre. At its eastern end, there is an MBTA Green Line station, which then continues into Boston, as well as the main campus of Boston College. There is a relatively low peak hour volume of traffic on the roadway, and the outside travel lane is a wide 18 feet. Also, parts of the "carriage lane" on Commonwealth Avenue may be considered for becoming part of the "Designated Bicycle Route" on this roadway.

As for the north-south route, the following streets were under consideration:

North-South Streets	Avg. Daily Traffic	Peak Hr. Volume	Outside Lane Width
Grove Street			
Lexington Street	16,970	859	16.5 ft
Washington Street	36,300	1,306	12 ft
Waltham Street	12,881	632	18 ft
Chestnut Street	10,415	312	13 ft
Walnut Street	14,357	582	17 ft
Needham Street			
Centre Street	26,824	1,143	16 ft
Dedham Street	15,900	954	17 ft
Parker Street	12,049	628	15.5 ft
Hammond Pond Pkwy			

Of the major contiguous north-south routes in Newton, there are no ideal alternatives for a "Designated Bicycle Route," one that would have a dedicated bicycle lane. However, the recent reconstruction of Centre Street and the planned reconstruction of Needham Street have been cone under Massachusetts Highway Department regulations for accommodating a bicycle lane. In their completed form, these roadways meet the specifications for having a dedicated bicycle lane and have the necessary infrastructure to accommodate bicycles safely. In addition, the Needham Street-Centre Street route directly traverses Newton from its southern to its northern end, and is in a relatively central location in the city. Importantly, this route ties together major centers of activity, including the Needham Street corridor, Newton Highlands, Newton Centre, and Newton Corner. The route also provides a direct connection between Needham and Watertown, as well as the Charles River bicycle paths that continue into Boston. Both light rail and commuter rail transit stations are accessible from this route. A spur from this route may also cross the Charles River on an abandoned rail bridge just south of Needham Street, thereby connecting to the Needham Industrial Park and future Needham Business Center development.

Preferred Bicycle Routes

A major consideration for determining "Preferred Bicycle Routes" is the interconnectivity of the routes and their ability to serve bicyclists with the most direct routes through Newton and between major destinations. It is important that bicyclists are able to travel safely between Newton's villages in all four directions. Therefore, most of Newton's primary and secondary arterials should be marked as "preferred" routes, with a "share the road" mentality prevailing.

For east-west routes, this would include the Washington-Watertown Street corridor, Concord Street, Beacon Street, Woodward Street, Elliot Street and Lincoln Street, Nahanton Street and Brookline Street, and connecting streets such as River Street, Crafts Street, and Tremont Street into Brighton. For north-south routes, this would include Grove and Lexington Streets, Washington Street and Waltham Street, Walnut Street, Dedham Street, Parker Street, Hammond Pond Parkway, and Hammond Street. Excluded from this list are streets such as Chestnut Street, which has a narrow roadway configuration and some challenging topography, as well as Waverly Street, which does not connect to any major centers.

Two of the more challenging routes in the "preferred" list are Washington Street south of the Massachusetts Turnpike and Hammond Pond Parkway. Both of these roadways have 4 travel lanes and tend to have higher vehicle speeds. For Hammond Pond Parkway, a reconfiguration that creates a median strip, one lane of travel in each direction, and a bicycle lane on each side would be a cost-effective method of enhancing both automobile and bicycle safety on this route. The outside lane of Washington Street between Wellesley and the Massachusetts Turnpike is 12 feet wide, which is under the desired 14 feet outside lane width for bicycle use. Therefore, this corridor would benefit from traffic calming measures to reduce vehicle speed, thereby enhancing safety for bicycle use.

The Issue of Accommodating Bicycles in Narrow Historic Corridors and Village Centers

Many of Newton's roads which have been proposed as "Preferred Bicycle Routes" have pavement widths of 32-34 feet. In village centers, other commercial areas, and in many residential areas, most of Newton's streets allow on-street parking. In some locations, there are dedicated parking stalls marked on the road, while in other areas there are no markings. Based on various AASHTO and Mass Highway specifications, these roadway widths are less than the recommended pavement widths. Therefore, in Newton and in many other older, historic cities and towns, establishing bicycle lanes that meet current standards for increased width is infeasible, as it would require property takings, loss of parking, and undesirable widening of roadways.

In spite of these contextual limitations, it is the intention of the Bicycle Plan that Newton contain safe and connected designated bicycle routes that will encourage use of the non-auto mode of transportation. On many of Newton's arterial roadways, although parking is allowed, the demand is relatively low. For example, large sections of Beacon Street and Walnut Street allow on-street parking, but only a few cars park there. On these streets, both of which are about 32-34 feet wide, two travel lanes of 12 feet each may be striped so that about 5 feet of roadway remain to the curb. Since parking is infrequent, this would provide for a bicycle lane 5 feet wide. Although parking would not be officially banned, the striping of the road would suggest to those who consider parking there that this is not a preferred area for parking. Potential obstructions to bicyclists from parked cars would be an infrequent event.

When bicycle routes pass through commercial areas, or areas where there is marked on-street parking or heavy parking demand, there are a number of options. For village centers, a bicycle lane can be continued even if there is on-street parking by narrowing the on-street parking stalls to their minimum of 7 feet and by narrowing the width of the automobile travel lane to 10 feet. In many cases, this would allow a 3 feet wide bicycle lane to pass between the travel lane and the parking lane. This approach as been utilized with success in Cambridge. A similar narrowing of travel lanes can occur in segments where the overall roadway width falls to as low as 24 feet. In those cases, two 10 feet wide travel lanes can be striped so that 2 feet wide bicycle lanes run adjacent to the curbline. The narrower automobile lanes will encourage drivers to move more slowly, which will increase safety in these areas. By providing edge lines and markings, bicycle users auto drivers will perceive that roadways are intended for use by both modes.

The second major option for narrow routes is to simply post "Share the Road" signage and implement traffic calming measures to decrease vehicle speed. These types of behavioral cues will promote safe bicycle riding, as both bicyclists and drivers alike will have the expectation that the route in question is intended to include bicyclists. Further encouragement for bicycle use would include the provision of convenient bicycle parking for adequate numbers of users. Safe, well-lighted, and secure bicycle parking in highly visible and frequented locations will increase the perception that bicycle riding is desirable. By building sheltered facilities for bicycles, potential users will be more likely to use this mode of transportation on days that may not be ideal.

CONCLUSION

The Master Plan for the City of Newton encourages the use of bicycles as a component of an overall transportation plan that enhances and promotes equity in mobility in Newton. Bicycle use is consistent with maintaining the City's character and quality of life, and it should be promoted. To that effect, the Bicycle Plan promotes the safe and effective use of bicycles in Newton, as this will help reduce the potential for increased automobile trips and create an option to automobile use as a sole mode of transport. Bicycle use will serve to promote walkable pedestrian oriented environments and can be a vital link between residential areas and villages, and a method to access public transportation, jobs, and recreational and cultural resources.

Taking into account safety, feasibility, and connectivity, the Bicycle Plan for the City of Newton has developed a paradigm for "Designated" and "Preferred" bicycle routes in Newton. By investigating all of the relevant factors and options, it proposes to establish at least one east-west and one north-south "Designated Route" in Newton, along with a network of "Preferred Routes" between nodes of activity and transit stations. Design recommendations based on state and national standards are used, and these are modified in some cases based on the contextual issues of our historic villages and neighborhoods.