Salem, Massachusetts

Bicycle Circulation Master Planning Study

Prepared For:

City of Salem, Massachusetts
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By:

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Salem Bike Path Committee

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Chapter I - INTRODUCTION

A. SETTING

Salem, Massachusetts is a North Shore coastal community bounded by the City of Peabody to the west, the City of Lynn and the Town of Swampscott to the south, the Town of Marblehead to the east and the Town of Danvers to the northwest, and City of Beverly to the north. Figure I-1 shows Salem's regional setting. Bicycle travel is one important way to reduce dependence on oil, produce cleaner air, and promote physical fitness and a healthier population.

Salem has been very proactive at improving the circulation environment for its bicyclists. During June 2006, the City created a Bike Path Committee charged with enhancing and promoting bike paths citywide. The Committee, working closely with the City Planning and Community Development Department, has been instrumental in promoting a more bike-friendly environment throughout the City. Through its leadership, a Phase I multi-use Bike Path has been constructed connecting the Lafayette Street to Canal Street. A new multi-use path has recently been constructed adjacent to the new Bridge Street Bypass Road. The City is actively pursuing the design and construction of a Phase II Bike Path that will effectively connect the Phase I Bike Path to Downtown Salem, thereby creating an off-road family-friendly path between Downtown Marblehead and Downtown Salem. The City recognizes that creation of a bike-friendly environment involves much more than the development of exclusive use multi-use paths through the City – on-street connections are necessary. This Master Plan addresses potential on-road connections. At this time, bicycle travel is permitted on all of Salem's City streets open to motor vehicle use. This Master Plan does not call for the elimination of any streets for bicycle use, but does indicate routes where bicycle travel is encouraged to enhance both local and regional connections.

The Bicycle Circulation Master Plan identifies existing and future bicycle problem areas with potential solutions that may occur through a combination of public and private investments in the bicycle circulation infrastructure.

B. PURPOSE AND OBJECTIVES

This Salem Bicycle Circulation Master Plan was undertaken to realize the Salem Bike Path Committee's charge of establishing a broad vision for a better citywide cycling and walking environment.

Recognizing the reality of fiscal constraints, the Master Plan focuses on how to use limited dollars at places where the most significant improvements to bike circulation will occur and provides a context for decision-making from a citywide perspective rather than solely on a project-specific basis.

Master Plan objectives include building upon the significant progress the Salem Bike Path Committee has made during the past three years, recommending phased measures for the commuting and recreational cycling environment, providing a sound broad-based technical basis for making decisions on bike circulation facilities, and confirming the East Coast Greenway regional bike routing through the City of Salem.

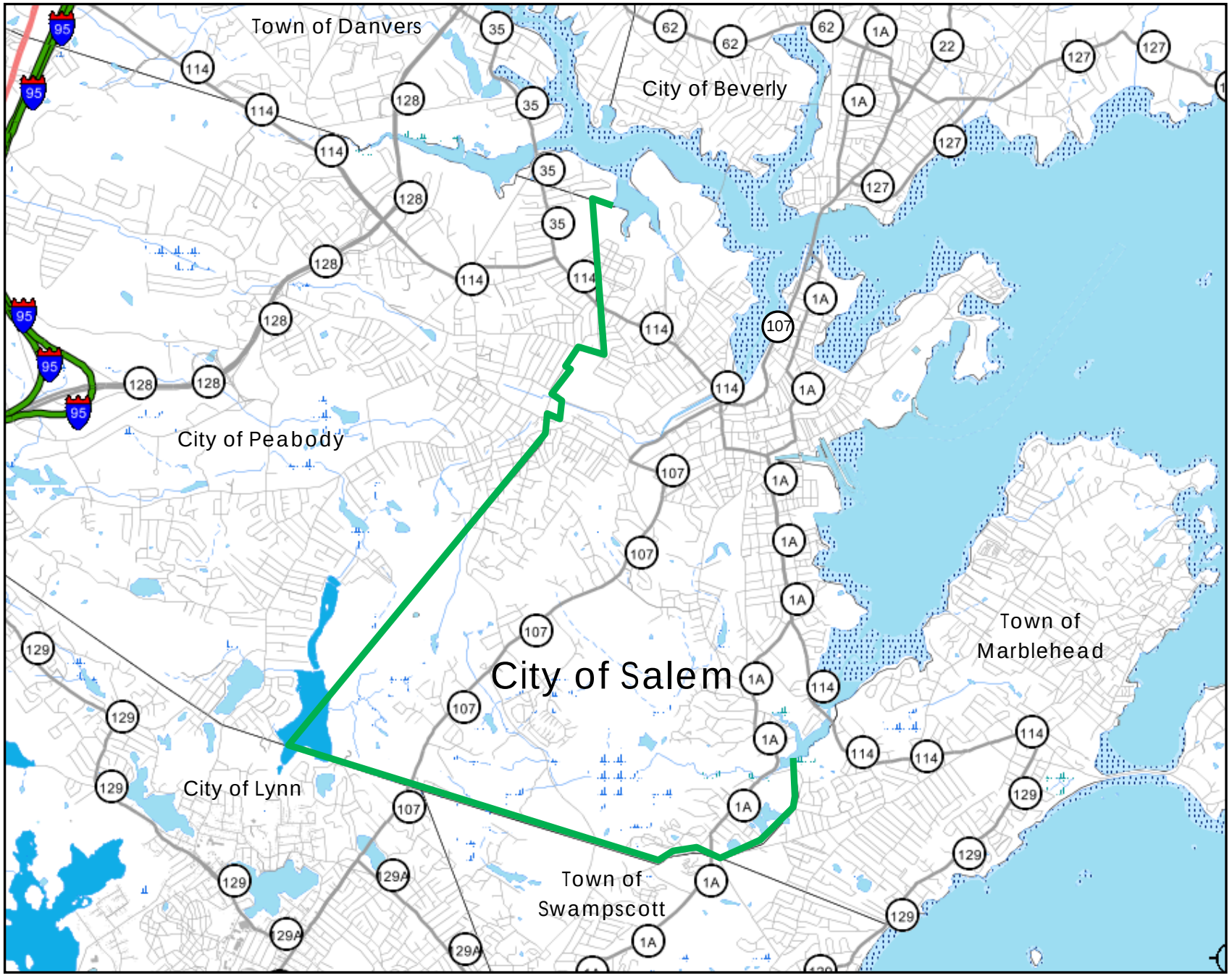


Figure I-1
Regional Context Map – City of Salem, Massachusetts

C. STUDY SCOPE

The City of Salem Bike Circulation Master Plan includes four tasks within its Scope.

1 – Update existing and proposed bicycle circulation system. Task 1 involves updating the existing and proposed citywide bicycle circulation system. The City of Salem GIS Department provided detailed information on the status of bicycle facilities in the City, focusing on the identification of a 'Pilot' Route and multiuse paths. Historic bicycle crash locations were documented to understand where bicyclists are encountering problems and to assist in the prioritization of bike circulation facilities. Field reviews were undertaken to identify specific ground-level issues associated with potential routing options. Chronologically, the full completion of Task 1 actually occurred at the end of the study, as it was necessary to review alternative route systems with the Salem Bike Path Committee prior to preparation of a map illustrating the Citywide approach to bike circulation facilities.

2 - Identify and evaluate near and long term bicycle circulation enhancement measures. Working closely with City Bike Path Committee, near and long term bicycle circulation enhancements were identified and evaluated, with an emphasis on the various pros and cons of alternative near and long term strategies. For example, the 'Pilot' Route was identified by the Committee as its highest on-road priority for implementation, while the Phase II Multiuse Path follow-up to the implemented Phase I Multiuse Path was identified as its highest priority off-road facility. The Pilot Route is intended to be a family-friendly way to traverse Salem's excellent parks system and connect to schools via well-marked and well-signed visible bike routes, bike lanes, and multi-use trails.

Beyond the Pilot Route and Phase II Multiuse Path extension, the Plan identifies potential bike routes and bike lanes citywide by type and user characteristics for improving cycling connections within the City and between Salem and its neighboring communities using a phased implementation approach as funding occurs.

3 - Recommend a Citywide bicycle circulation strategy. The recommended strategy was developed in coordination with the Salem Bike Path Committee. It includes priority sequencing and preliminary costs of potential bicycle circulation enhancement measures.

4 - Document the Citywide bicycle circulation strategy. Essentially, this report is the documentation of Salem's citywide bicycle circulation enhancements and of procedures for updating the Plan.

D. BIKE FACILITY TYPES, USERS, AND MAINTENANCE

TYPES

Two broad types of facilities – off-street and on-street are addressed in this Master Plan. Off-street facilities include travel ways that bicyclists may use with other non-motorized users such as pedestrians, skateboarders, joggers, etc. For purposes of this study all existing and proposed off-street facilities are identified as being Class I facilities, even if they are in need of additional

enhancements to bring them up to current design standards for Class I facilities. Where deficiencies apply they are noted in the text.

The three classes of bike facilities are:

Class I – separate travel ways to minimize conflicts with motor vehicles and maximize the potential for a less noisy and greener environment. All other things being equal, Class I facilities provide the preferred environment for cyclists.

Class II – on-street bike lanes where the roadway width is such that a minimum 5-foot wide travel lane will be available for use by cyclists. Because the potential for Class I bikeways is limited by available rights of way and oftentimes the available rights of way do not directly connect to key cyclist destinations in Salem, Class II bike lanes are preferred where they can be fit into roadway layouts. Bike lanes provide motorists with a recognizable path for cyclists which enhances motorist attention to cyclists. Where adequate width exists, provision of bike lanes is preferred over the Class III share the road bike routes.

Class III – on-street bike route where the directional roadway lane width is such that acceptable bike lanes cannot be created. Instead, along designated generally lower traffic volume routes, motorists are advised through signage or pavement markings to share the road with cyclists.

Given the environmental and historical context of Salem as a mature waterfront City, in most instances it is not possible to create Class I and II facilities, therefore, the most of the new route mileage in this Master Plan involves creating more visible Class III bike route connections throughout the City of Salem to complement enhancements to its preferred Class I and Class II facilities.

By implementing designated on-street facilities and educating motorists to the needs of cyclists, cycling risks will be minimized and greater numbers of Salem residents and visitors will be able to enjoy the benefits of cycling. All users, both cyclists and motorists must be prepared to do their part to ensure the safest possible cycling environment.

USERS

The Salem Bike Path Committee is very concerned that bike facilities provided in the City reflect the capability of bike users. The Committee would like to create as many 'family-friendly' bike routes as possible connecting parks, schools, and open spaces. Ideally routes implemented will not have grades exceeding 5% or less or at least will comply with MassHighway's recommended design guidelines cited below.

Maximum Bicycle Use Grade Lengths*

Grade (percent)	Maximum lengths (feet)
5 to 6	800
7	400
8	300
9	200
10	100
11+	50

*Source: MassHighway Flexible Design Guidelines (2006) from AASHTO Bicycle Facility Design Guidelines (1999).

The Salem Bike Path Committee promotes the need to increase motorist awareness of the needs of cyclists who use Salem's circulation system. It is also working diligently to educate cyclists about the need to ride properly maintained bicycles safely and consistent with applicable State rules and regulations.

While great exercise, bike use is inherently fraught with user risks. From an infrastructure perspective, road features such as unexpected bumps, potholes, catch basins, (particularly those with longitudinal grates), pavement deterioration, bad sight lines, and so forth, pose risks to all road users, but especially to cyclists. The Committee is taking measures to inform cyclists about bicycle operator-related cycling risks. These may include bad brakes, chain failures, flat tires, riding in poor visibility, wet/slippery conditions of rain, etc.

For purposes of this study, *more experienced cyclists* are considered to be those who normally have good control of their bicycles, good reaction times, keep their bicycles in excellent working order, wear proper helmets and bicycle gear, and are able to traverse rolling terrain. *Less experienced* cyclists are all others including all children and intermediate cyclists.

No two cyclists are alike in their capabilities, but the bike route system addressed in this Master Plan distinguishes bike routes with generally lower traffic volumes from those that have higher traffic conflicts to provide some guidance to cyclists as to which routes best reflect various experience levels.

Regardless of the route designation, every cyclist needs to be aware of his or her responsibilities to obey the rules of the road, as if they were motorists (signal turning movements, stop at stop signs and red traffic signals, etc.). The citywide route map of bike route options, Figure V-1 in Chapter V ahead, recognizes that risks for *less experienced* cyclists are greater where traffic volumes are highest or where cyclists must share the road with motorists under Class II or Class III bike route conditions or traverse steep grades. Generally, risks to *less experienced* riders will be minimized with the *implementation of a designated bike route system that increases motorist awareness of cyclists on the road*.

MAINTENANCE & AESTHETICS

Installation of a Salem citywide bike route system brings with it an inherent responsibility for the City to maintain new signs, pavement markings, and the riding surfaces of multi-use paths and on-street facilities. With implementation of the citywide bike route system identified in this Master Plan, routine maintenance will be necessary and assumptions have been made to account for life-cycle costs in the evaluation of bike route options. Local decision-makers who will need to implement the route system have to be aware of the *added annual* economic consequences of decisions regarding bicycle circulation enhancements.

As a general rule, to minimize annual maintenance requirements, **it is recommended that Salem implement bike routes either on recently resurfaced roadways or coincidental with pavement resurfacing or reconstruction plans, if possible and plan for maintenance expenses in its budgetary process. Furthermore, it is recommended that as Master Plan bike routes come on line, they must be sensitively designed and implemented such that they do not detract from the City's historic buildings and open spaces or add significantly to visual clutter along routes.**

The City of Salem has taken extraordinary measures to maintain and enhance its historic setting. Ideally, the *installation of new bike system signs and pavement markings should be minimized* for aesthetic reasons *and* for long-term maintenance cost reasons.

Generally, the City should take advantage of opportunities for private sector participation in the construction *and* maintenance of bike facilities during the development review process, where construction and maintenance of such facilities will provide a direct benefit to the development under review.

Chapter II
Existing Paths and Facilities

Chapter II – Existing Paths and Facilities

A. OVERVIEW

At present, the City of Salem has a total of 88.5 miles of roadways. Bicycle travel *is permitted on all public roads and streets in the City of Salem* with the exception of the Essex Street Pedestrian Mall area of downtown Salem. The Essex Street Pedestrian Mall, due to its pedestrian environment and numerous potential conflict points between pedestrians and cyclists, does not permit bicycle travel. ***With the exception of the Essex Street Mall, the City of Salem encourages bicycle travel on its entire street system, not just those that are designated routes.*** Motorists traveling throughout the City should be cognizant of the fact that cyclists can be encountered at any time of the day or night on the City's roadways. The Citywide Bike Circulation Strategy continues to encourage bicycle travel on all streets while enhancing the visibility of cyclist facilities on specific routes throughout the City, thereby increasing motorist's awareness of cyclists and vice versa.

The City of Salem GIS Department prepared a map dated August 19, 2008. The map identifies the Salem Bike Path Committee's vision for creation of *designated* Existing and Proposed Bike Path Segments to promote recreational and commuting cycling. The aerial based map, Figure II-1, is a very helpful resource for locating Salem's parks system and schools. This basic resource provided an excellent starting point for the Citywide Bicycle Circulation Master Plan.

B. EXISTING MULTIUSE PATH FACILITIES

Table I-1 provides a summary of existing multiuse paths in the City of Salem including their lengths and locations. Off road multiuse paths are typically preferred by recreational or commuting cyclists who enjoy riding in an environment where motor vehicles are not competing for space. At present, none of the 2.34 miles of multiuse paths in the City of Salem directly connect to one another; on-road access must be used between them.

TABLE I –1
EXISTING SALEM OFF-STREET MULTIUSE PATHS

Name	Limits	Length	Type
Phase I -- 'Salem Bike Path'	Marblehead Town Line to Canal Street	3740	Class I from Canal to Lafayette Streets; unpaved to Marblehead
Peter Tracy Multiuse Path/ Collins Cove	Szetela Lane to Cross Street	2075	Potential Class I off-road paved
Leslie's Retreat Park	North Street to Flint Street	1350	Class I
Bridge Street Path	St Peter St to March St	3690	Class I
Jefferson at Salem Station Multiuse path	Adjacent to site	1040	Potential Class I off-road paved
Palmer Cove	Lafayette Place to Leavitt Street Parkiing lot	480	Potential Class I off-road paved
Totals		**12,375**	**feet**

Existing & Proposed Bike Path Segments

Bike Path Segments

- Existing Path
- Proposed Path Link
- MBTA Commuter Rail
- Proposed On & Off Street Trail
- Marblehead Path
- Salem Ferry to Boston

Linked Parks, Schools & Waterfront

Parks & Recreation

1 Collins Cove Park
2 Irzyk Park
3 Salem Common
4 Palmer Cove Park
5 Forest River Park
6 Pickman Park
7 Salem Willows
8 Winter Island Park
9 Forest River Trail
10 Castle Hiill Park
11 Golf Course (Old Salem Green)
12 Curtis Park
13 Furlong Park
14 Main Beach
15 Dead Horse Beach
16 Waikiki Beach
17 Collins Cove Beach
18 Salem Maritime Historic Site (NPS)
19 Stepp Beach
20 Broad Street Park
21 Leslie's Retreat Park
22 Kernwood Country Club
23 McCabe Park / Kernwood Marina
24 Gonyea Park
Y YMCA

Schools

1 Carlton School
2 Bentley School
3 Saltonstall School
4 Salem Academy Charter School
5 Horace Mann School
6 Salem State College - South Campus
7 Salem State College - Central Campus
8 Salem State College - Main Campus
9 Boys & Girls Club
10 Collins School
11 St. Joseph's at St. James
12 Plummer Home for Boys
13 Bates School
14 Salem State College Athletic Center

CITY OF SALEM

0 270 540 1,080 Feet
1" = 1200'

Map created by SalemGIS
August 19, 2008

Mayor
Kimberley Driscoll

Map No. 08-076

Figure II-1
Existing Salem Bike Facilities and Generators

B. EXISTING MULTIUSE PATHS (CONTINUED)

From Table I-1 on Page I-1, the City has approximately 2.34 miles of existing multiuse paths.

The 'Salem Bike Path', designed to current standards is approximately 10 feet wide between Lafayette Street and Canal Street is the first part of a fully compliant segment of a path ultimately connecting downtown Salem to downtown Marblehead via off-road bike paths.

Looking west on Salem Bike Path

Looking east on Salem Bike Path to Marblehead

West of Lafayette Street, the Salem Bike Path has a gravel surface, and is not designed to full multiuse path standards easterly toward the Town of Marblehead. If a future affordable housing residential development located in the Town of Marblehead moves forward, upgrading the easterly bike path to current standards from Lafayette Street in Salem along the site's boundary which extends into the Town of Marblehead, should be part of the site's mitigation requirements.

At Collins Cove, the Peter Tracy Multuse Path is an off-road facility that extends between Cross Street and Szetela Lane. North of Szetela Lane, it is unpaved but used by cyclists and walkers. Generally, the paved cross section of the Peter Tracy Multi-use Path near Collins Cove is approximately 7-8 feet in width, or just under the typical minimum width needed for a full Type I classification. West of Collins Street, the path is typically 10 feet wide westerly to cross street, where it ends in a corridor that is scheduled to be paved in the near future as part of the Bridge Street Multi-use Path project. When the connection is made, the Peter Tracy Multiuse Path will connect to the newly constructed Bypass Road Multiuse Path.

Looking west on Peter Tracy Multiuse Path

Looking south – Bypass Road Multiuse Path

The new Bypass Road Multiuse Path is designed to full Mass DOT standards and is approximately 10-12 feet wide between Saint Peter Street and March Street. One of the drawbacks of the new

multiuse path is that it does not provide a direct bicycle or walking connection to the MBTA Commuter Rail Station located just south of the multiuse path and no direct connection to the Beverly/Salem Bridge.

Looking northeast across Bridge Street from multifamily site

A private multiuse path can be traversed via the entry road to a recently-developed high density Jefferson at Salem Station multi-family development. This path is adjacent to, but also disconnected from, the MBTA Commuter Rail Station.

Leslie's Retreat Park is served by a multiuse path, located southwest of the Route 114 Bridge. Like the Bridge Street Bypass Road Multiuse Path and private multiuse path at the Jefferson at Salem Station, it is also disconnected from the MBTA Commuter Rail Station.

Looking northeast to Leslie's Retreat Park next to Bridge Street and Flint Street

The north segment of the Palmer Cove multiuse path is the newest and shortest of the City's off-street bike circulation facilities. It provides a necessary connection of the Pilot Route, discussed further on, between Lafayette Place and Congress Street.

Approximately 6-7 feet in width, slightly under current Class I standards, but consistent with the previously paved walkway next to Palmer Cove. The new surface has relatively sharp horizontal curvature, but grassed shoulders are available to allow cyclists to pass one another.

Looking east on newly paved Palmer Cove connection to Congress Street

Looking north on Palmer Cove to previously paved connection from Lafayette Place

C. ON-STREET BIKE LANE FACILITIES AND BICYCLE DETECTION AT TRAFFIC SIGNALS

During 2009, the City of Salem installed its first on-street bike lanes in connection with the Lafayette Street safety improvement project from

Looking south on Lafayette Street at Raymond Road to new bike lane markings

the Marblehead line to Raymond Road, the primary purpose of which was to reduce run-off road crashes, particularly those occurring late at night. Because Lafayette Street is a relatively wide roadway, it was possible to create a dedicated on-street bike lane in the southbound direction and a shoulder wide enough to accommodate bike use in the northbound direction.

The Lafayette Street bike lanes represent the southerly component of the Pilot Route to enhance bicycle access to many of Salem's waterfront and other parks and provide an on-road connection to the Salem Bike Path.

Looking north- on Marlborough Road from Highland Avenue to an example of Salem's bike detector markings

Recent traffic signal installations in the City of Salem have included detectors for bicycles approaching them. Salem Bike Path Committee members are concerned as the bicycle detectors and logos indicating bicycle detection are typically placed at the center of travel lanes, rather than the right edge, where cyclists tend to be located (see photo right). The solution to this issue is addressed further on Chapter V of this report.

D. SHARED ROUTE FACILITIES

As mentioned in the Introduction, all of Salem's public roads with the exception of the Essex Street Pedestrian Mall between Washington and Liberty Streets, which is heavily pedestrian oriented, are available as shared route facilities. Some, like the recently reconstructed North Street (Route 114) and Jefferson Avenue have been striped to provide wide shoulders to accommodate cyclists.

E. DOWNTOWN SALEM BICYCLE STORAGE FACILITIES

The importance of having adequate bicycle storage facilities at primary bike destinations cannot be understated. Salem has taken, and is continuing to take, a pro-active role in providing public bike storage facilities in Downtown Salem. Figure II-2, developed by the City of Salem, illustrates the locations of Salem's existing downtown public bicycle storage locations. Decals, shown to the right are posted at the facilities to inform cyclists about the parking areas.

The City has also has identified and installed three types of outdoor bike racks for addressing a range of conditions:

- The Vintage Bike Rack (for historically appropriate areas).

Salem Vintage Bike Rack Example (Source: City of Salem)

Bike Rack Decal Labels (Source: City of Salem)

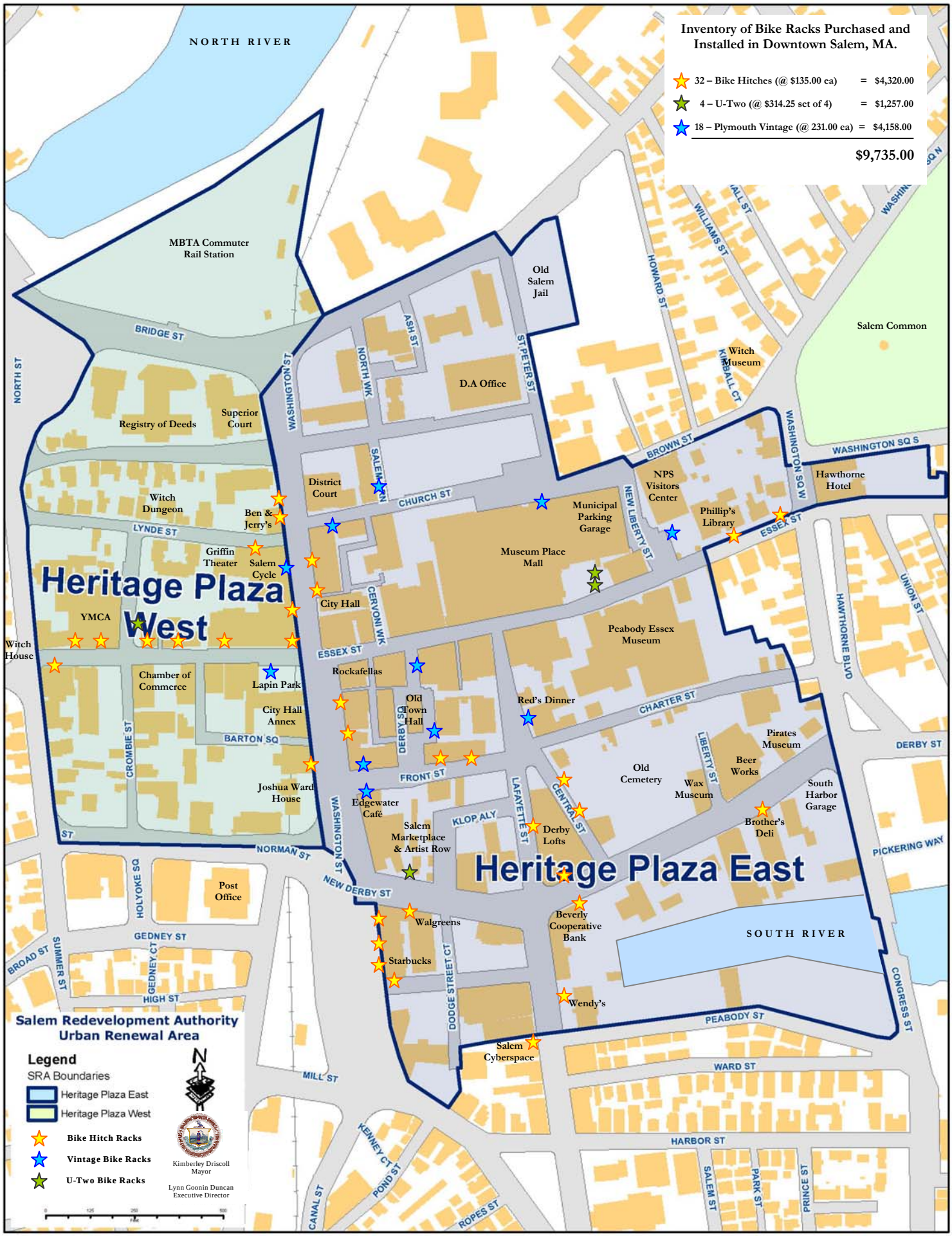


Figure II-2
Existing Downtown Bicycle Storage Facilities

- The Bike Hitch (installed in densely developed areas or narrow sidewalks).

Salem Bike Hitch Example
(Source: City of Salem)

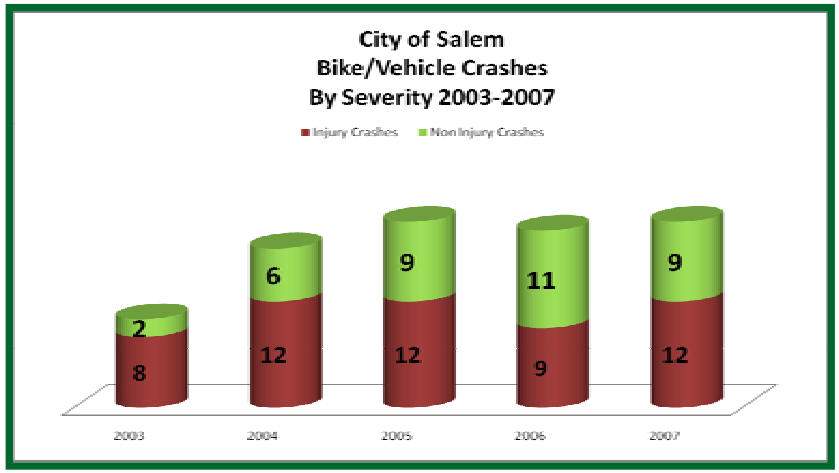
- The U-Rack Bike Rack style (for areas with high bicycle parking demands)

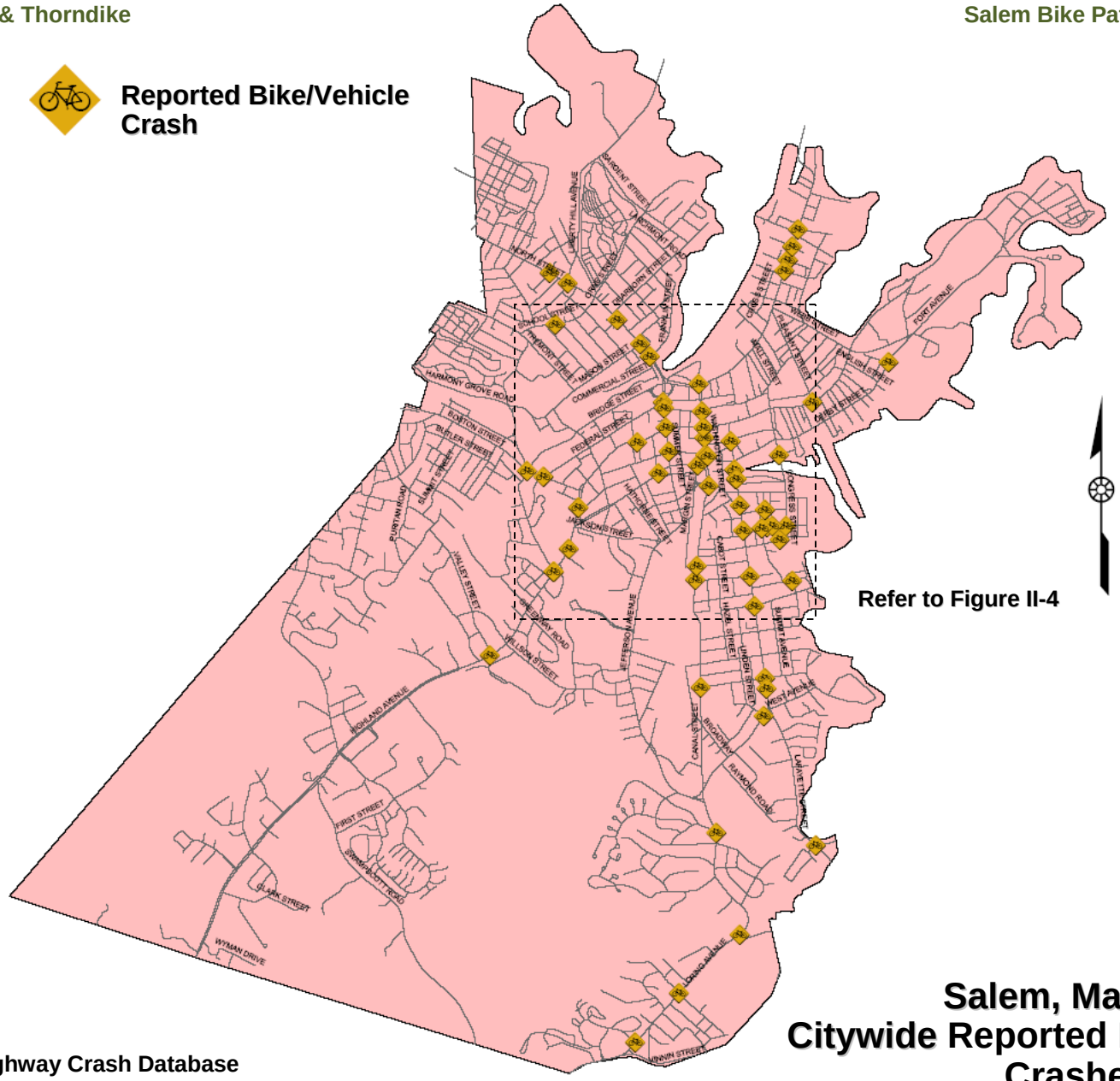
Salem U-Rack Bike Rack Example
(Source: City of Salem)

F. BICYCLE CRASH DATA REVIEW – 2003-2007

A review of Salem's historical bicycle/vehicle crashes was undertaken to identify trends in such crashes throughout the City over the five-year period from 2003 to 2007. Results are summarized on Figures III-3 and III-4. Crashes involving cyclists are *greatly* under reported, as they include only those reported by motorists. Bike crashes involving single bicycles without motor vehicles are not included, nor are crashes between bicycles and pedestrians. Trends in vehicle/bike crashes are helpful in identifying priorities for the implementation of Citywide on-road bicycle- riding enhancements and reflect relative seasonal bicycle usage. Not surprisingly, most of the crashes were on arterial streets like Lafayette Street (Route 114), Bridge Street (Route 1A), Highland Avenue (Route 107), Jefferson Avenue (Route 1A), Canal Street, and Boston Street. An analysis of the historical data revealed the following trends in crash findings:

Severity and annual reported crash trends:

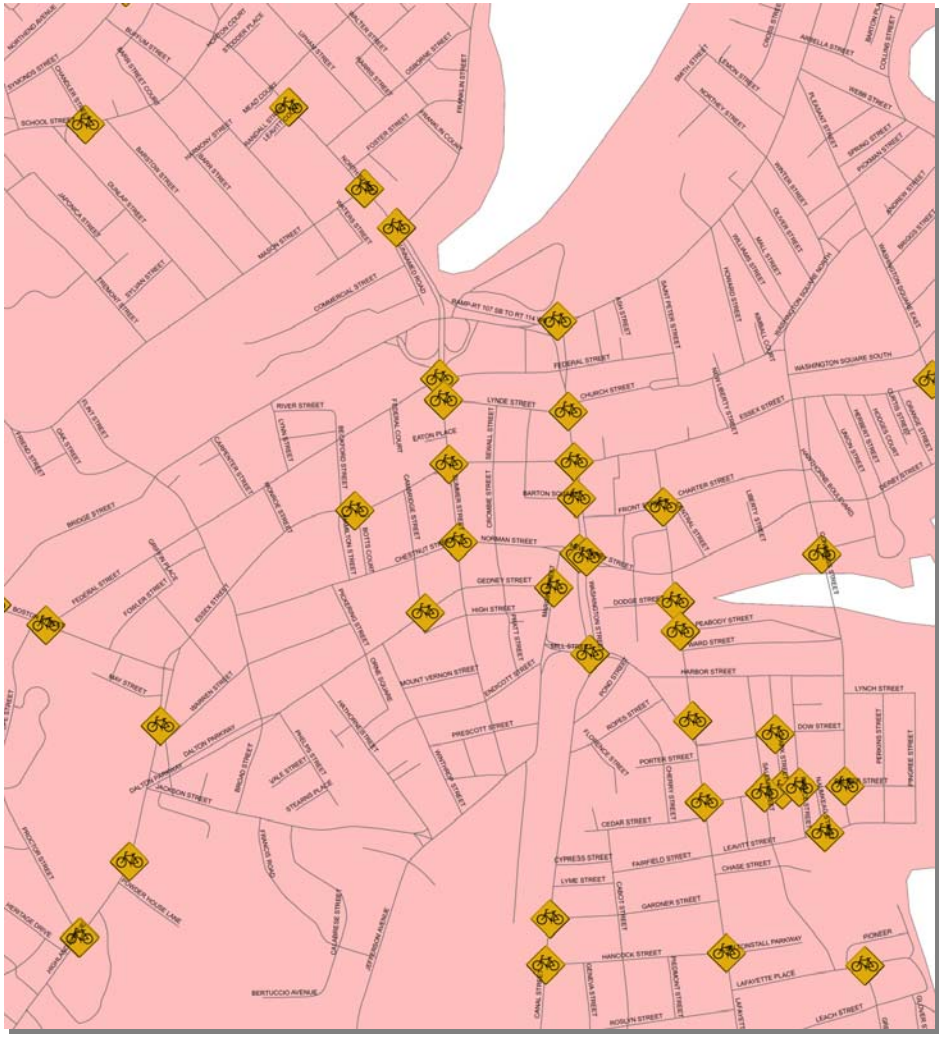




Source: MassHighway Crash Database

Figure II-3

Salem, Massachusetts Citywide Reported Bike/Vehicle Crashes 2003-2007



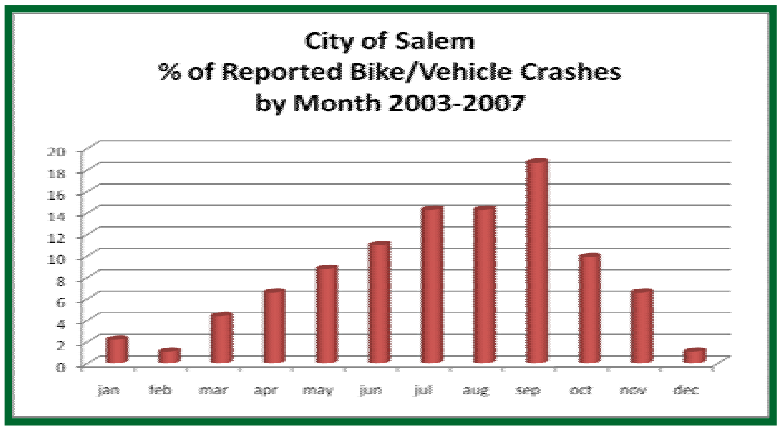
Data Source: MassHighway Crash Database

Figure II-4

Close-up Central Salem, Massachusetts Reported Vehicle/bicycle Crashes Cluster Area 2003-2007

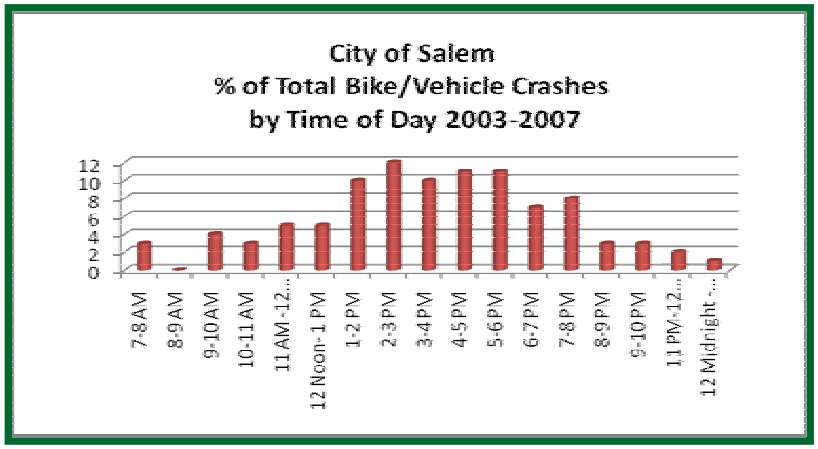
From the Severity and annual reported crash trends on page II-7, not surprisingly, slightly more than half of 91 reported bicycle vehicle crashes involved personal injuries. Reported bike/vehicle crashes have leveled off in recent years at approximately 20 per year.

Monthly trends:



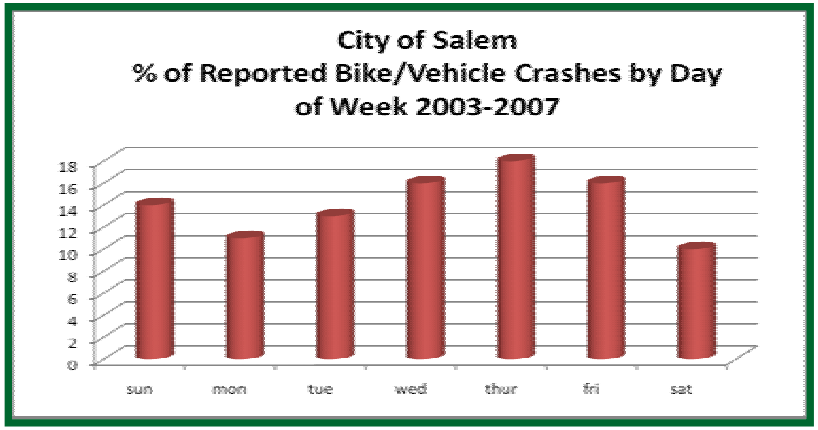
September was the highest month for bicycle crashes, followed by July and August. The above chart provides a reasonable approximation of the percentage of month-to-month bicycling volumes in Salem.

Time of day trends:



Most bicycle crashes occurred between 1-6 PM. The highest hourly number of crashes occurred between 2-3 PM, the time period when schools typically are dismissed.

Day of week trends:



Results of the day of week crash trend analysis were somewhat surprising. The highest number of bike/vehicle crashes was reported on Thursdays. Sunday, which typically has the

lowest traffic volumes of the week, experienced more crashes than Monday, Tuesday, and Saturday.

Once again, it is important to understand that the ***reported bike/vehicle crashes represent only a small fraction of total bicycle related crashes.*** All bike/vehicle crashes are not reported, as the value of the crash is typically less than the minimum reporting requirements. Additionally, all bicycle/pedestrian crashes and single bicycle crashes that may involve unreported injuries to cyclists are not included in the MassHighway data base. At the present time, there is no good way to compile all bicycle crashes as there is no reporting requirement for most bike related crashes.

Chapter III
Analysis of Options

Chapter III – Analysis of Options

A. SHORT TERM OPTIONS - PROS AND CONS

SHORT TERM OPTIONS

The Salem Bike Path Committee, via this Master Planning process, has developed a vision of citywide cycling enhancements . The vision incorporates the full gamut of facility types with the first choice being those that afford cyclists the best connections to its parks and open space system, while minimizing bike/vehicle conflicts. Initial emphasis is on the implementation of the Committee-conceived Pilot Route. The Pilot Route (refer to Chapter IV for details) is approximately 4.85 miles in length and includes all three types of bike facilities – a multi-use path, bicycle lanes and shared roadways. Other action items include creating a missing connection between the Peter Tracy Walkway and the new Bypass Road This is being done as part of the Bridge Street Improvement project by MassDOT. Additionally, as part of the Canal Street Improvement Project, the Phase II multiuse Bike Path will connect to the northerly end of the Lafayette-Canal Phase I Bike Path and ultimately link downtown Salem to downtown Marblehead with an entirely off-road path.

Do-Nothing

Always the 'starting point' option, the ***advantages*** of the 'Do-Nothing'are infrastructure and maintenance cost savings.

Disadvantages involve greater risks to the cycling population who will not have an enhanced circulation system for bicycle use. Adverse health and environmental impacts will be realized. The 'Do-Nothing' approach is not a viable option.

Pursue Off-road Multiuse Path Facilities and Enhancements

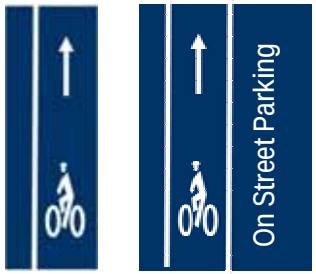
By definition, all other things being equal, the highest priority of the Salem Bike Path Committee, as its name suggests, is to maximize and enhance off-road multiuse paths and ancillary facilities.

The ***advantages*** of multiuse paths is that they afford cyclists the best and safest opportunities for recreational and commuting cycling in an environment unencumbered by the hazards of motor vehicle conflicts. They are highly advantageous for family or group use with local or regional recreational travel, such as that promoted as part of the East Coast Greenway project discussed further on. It is easier for riders to interact in larger tandem groups, rather than the typical single-file riding associated with on-street facilities. Multiuse paths provide the best opportunities for low-noise cycling conditions as well as enjoying Salem's waterfront and park/open space vistas by recreational cyclists.

The ***disadvantages*** of exclusive multiuse paths are that they typically are a rare commodity, involve very high implementation costs of approximately $700,000 per mile, have long lead times for implementation involving years of work to apply for grants and surmounting environmental and permitting hurdles. User security issues requiring monitoring may occur on isolated multiuse paths. Furthermore, locating, permitting, and constructing effective multiuse paths in a mature City environment such as Salem is extremely challenging. Typical candidates for multiuse path corridors are abandoned railroad layouts – i.e., rails to trails – that present difficult right of way and environmental clean up issues. Due to the random nature of available rights of ways, it is not uncommon to create trails that, for various reasons, do not connect well with one another or to the major bike generators shown

previously on Figure II-1. More often than not, multiuse paths require supplemental on-road use to connect bike generators to one another. Unlike on-street plowing that is routinely done, all-season use of multiuse paths by cyclists requires special plowing equipment. Such multiuse path trail maintenance that may be cost-prohibitive (e.g., the Salem Phase I Bike Path is closed during the winter months) as the cost/benefit would be low.

Bike lanes provide a highly visible motorist cue to the needs of bicyclists on roadway systems. They are particularly applicable to roads that have very wide single lane pavements of at least 16 feet excluding on street parking. Two types of bike lanes (see right) are presumed; those that are adjacent to the curb and those adjacent to parked vehicles. Bike lanes should be a minimum of 4-feet wide adjacent to unpaved shoulders, 5-feet adjacent to curbed roadways and parked vehicles or 6-feet minimum adjacent to roads with vehicle speeds posted at 40+ miles per hour. Installation of bike lanes requires attention to the quality of the roadway-riding surface and the types of lane markings used. For curbside bike lanes, all drainage structures should be bicycle compatible. Longitudinal drain grates represent a hazard for cyclists, as do surface potholes, and rapid grade shifts, like speed bumps or construction zones.



Alternate Bike Lane Configurations

The ***advantages*** of bike lanes are that they provide critical highly visible bike connections between generators where it is not possible to create multi-use paths.

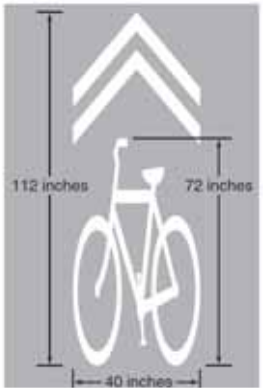
The ***disadvantages*** of bike lanes are that they are not impervious to the incursion of motorists who can cross them for reasons of on-street parking or accessing roads or driveways. They can also be blocked by delivery trucks, and/or stopped vehicles. When placed directly adjacent to parking lanes, motorists opening doors can be hazardous (recent Massachusetts legislation prohibits opening of car doors into bicyclists, but motorists may not necessarily be aware of it). Bike lanes also require a long-term maintenance commitment to the applicable signs and markings. Sporadic utility work and routine road resurfacing requires an additional expense when maintaining bike lanes. Also, bike lane signs (and pavement markings) may be considered unaesthetic in historical neighborhood settings. Bike lanes should not end abruptly at intersections, but road capacity constraints at signalized intersections may preclude them from being carried through, thereby creating breakdowns in bike circulation continuity.

Implement shoulders along Salem's busiest roads

The City of Salem has implemented shoulders of sufficient in width to accommodate bicyclists along North Street (Route 114) and Loring Avenue (Route 1A). Shoulders are an alternative to official bike lanes, and their primary ***advantage*** is that they require less maintenance than bike lanes. Their principal ***disadvantage*** is that they do not increase motorists' recognition of bicycling as a travel mode to be encouraged.

Implement Formal Shared Roadway Bike Routes and Shared Lane Markings or 'Sharrows'

The constricted roadway environment generally found in the City of Salem makes it impractical to consider the installation of bike lanes and multiuse paths everywhere. Impacts on motor vehicle traffic (and pedestrian traffic, if widening is required) would be unacceptable, particularly if bike lanes result in motor vehicle through lane below 11-feet in width. Because **all roads open to bicycling in Salem are shared roadways**, implementation of a bike route system for *formalizing* a selected number of the City's shared roads would provide additional guidance to cyclists as to the 'best' routes for cycling.



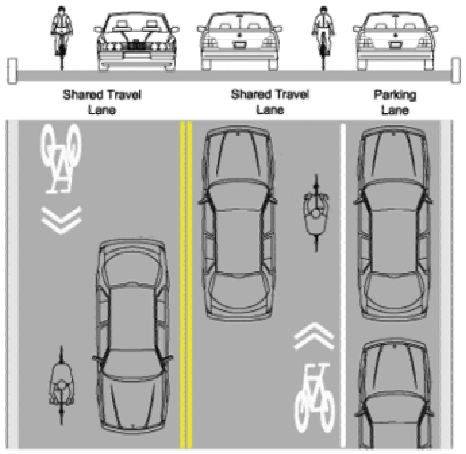
"Sharows" - Shared Lane Markings
Source: Figure 9-C9 2009 MUTCD

Roads that have relatively low traffic volumes and provide good connections to and from Salem's schools and park systems are candidates for shared roadway bike routes or 'sharrowed' lanes (see right and on the page that follows). Augmented with bike route signs, the application of sharrows may provide an effective way to distinguish preferred destination-oriented cycling routes to and from Salem's parks, open spaces, historical sites, and schools. Spacing of sharrows should be in accordance with street layouts, typically 300 to 400 feet apart in both directions of 2-way streets. Spacing may be less frequent if sharrows are offset 300-400 feet from one another (e.g., one directional sharrow spaced at 350 feet, the next sharrow is for the opposite direction at 350 feet, so that

Source: 2009 MUTCD

Motorists:
- Expect to see bicyclists on the street
- Remember to give bicyclists three feet of space when passing
- Follow the rules of the road as if there were no sharrows

Bicyclists
- Use the sharrow to guide where you ride within the lane
- Remember not to ride too close to parked cars
- Follow the rules of the road as if there were no sharrows



Source: City of Portland,Oregon
Excerpt from FAQ on Shared Lane Markings

The ***advantages*** of sharrows are that they can be used to minimize the need for signs along bicycle routes and can be mapped to better guide users. As noted above in the Portland, Oregon frequently asked questions excerpt, sharrows encourage both motorists and cyclists to follow the rules of the road. Sharrows provide a visual cue that motorists *should expect to encounter bicyclists*. Sharrows are found in the new edition of the US Department of Transportation's 2009 Manual on Uniform Traffic Control Devices (MUTCD) released on December 16, 2009.

Several ***disadvantages*** are associated with the application of sharrows. Perhaps the main disadvantage is that both motorists *and* cyclists generally do not know what they mean. Application of sharrows is not included in the *existing*

(2003) Manual on Uniform Traffic Control Devices and therefore requires an effective public education campaign (refer to page 3 for a portion of the Portland, Oregon public education material on 'sharrows').

Additionally, because all shared roads cannot *and* should not be sharrowed, there is a risk that motorists may think they don't need to worry about bicyclists on roads without sharrows. This is an issue that requires public education as well.

Another disadvantage of sharrows is that, along with the supplemental signs used to augment them, they must be maintained, if they are to be effective. This means that, like bike lanes, there is a continuing cost associated with their implementation. Assuming a typical sharrow and bike lane markings last approximately five years, the annual amortized cost will be 1/5 of the original implementation costs. Snow plows and normal pavement deterioration increase the maintenance requirements of sharrows.

Unlike sign maintenance, maintaining sharrows also presents an issue for worker safety in that it requires workers to apply templates directly within a motor vehicle travel lane.

Implement the Salem Bike Path Committee's Pilot Route for Bike Access to Parks along Salem's Waterfront

The approximately 4.85-mile Pilot Route (shown as a green line in Figure II-1) is a very important testing venue for enhancing bicycle circulation within the City of Salem.

It has several ***advantages.*** Relative to other routing options, implementation of the Pilot Route involves a wide array of bicycle circulation enhancements to test before/after bicycle use along the route. At 4.85 miles in length, it can be ridden in parts or as a whole. The Pilot Route is designed to promote bicycling along Salem's waterfront parks and open spaces in along a generally family-friendly route with connections to many schools. A *preliminary analysis* of the Pilot Route was provided at an early meeting of the Salem Bike Path Committee and is posted on the City's website. Chapter IV of this report details *recommended implementation features* of the Pilot Route based on comments received on the preliminary analysis.

Disadvantages of the Pilot Route are that it involves a meandering route with varying features for cyclist facilities. Approximately 25% of its mileage is along roadways that have high traffic volumes that are not family-friendly. Some segments, e.g., Leach Street and Winter Island Drive have pavement ruts and maintenance issues which should be addressed, as described in Chapter IV. From the recommended plan detailed in Chapter IV, implementation of the Pilot Route is estimated at approximately $62,000. The Pilot Route will also require a commitment to annual maintenance of approximately $12,000 over and above existing maintenance costs.

B. LONG TERM OPTIONS

The City should keep up to date on legislative changes regarding Massachusetts Bike Law Chapter 6 of the General Laws, Section 116. Section 116D is the latest modification (2007). Updates can be obtained via www.massbike.org.

Continue Pursuing Multiuse Path Enhancements

While limited options are available, the City has the ability to expand the amount of multiuse paths available for cycling. Adoption of the City's Bike Circulation Master Plan identified in Chapter V will set the stage for a series of short and long term actions needed to secure access to available railroad rights-of-way and to enhance multiuse access to and from all of Salem's neighborhoods.

One of the most important options that might be pursued involves working with the MBTA to create a new pedestrian crossing of the Commuter Rail Line. The main ***advantages*** of such a crossing are that it would permit residences of the Jefferson at Salem Station and Bridge Street Neck Neighborhood to reduce their access distance to Salem Station by nearly a quarter mile, and would improve the station's ADA/MAAB accessibility.

Its ***disadvantages*** include the high infrastructure investment it would take to create it, an increase in the risk of a rail/pedestrian crash, and a likely increase in illegal parking demands at the Jefferson's parking lots.

Continue Implementation of On-street Enhancements

Following implementation and evaluation of the Pilot Route, the City will have a basis for implementing other bike lane and shared route enhancements in the long term (5+ years in the future).

Private Sector Participation in the Construction and Maintenance of Bicycle Circulation Facilities

Opportunities may arise to involve the private sector in the implementation of the Master Plan multiuse path or on-street bike enhancements as part of traffic mitigation. The City, in the past, has in the past, encouraged developers to enhance biking and walking facilities directly connected to the development.

Potential Zoning Modifications to Encourage Cycling

Many cold climate cities such as Cambridge, MA and Pittsburgh, PA have adopted zoning articles that encourage bicycling in their communities via private development. Following is an example from the City of Cambridge's zoning ordinance pertaining the amounts and design of bicycle rack or storage spaces:

"6.10 INTENT AND APPLICABILITY OF PARKING AND LOADING REQUIREMENTS

"….The parking standards contained herein are intended to encourage public transit, bicycle usage and walking in lieu of automobiles where a choice of travel mode exists."

"6.20 OFF STREET PARKING REGULATIONS

"6.22.3 *Accessory bicycle parking spaces* required under the provisions of this Article 6.000 must be located on the same lot as the use being served or a contiguous lot in the same ownership."

"6.35 *Relief from Parking Requirements.* Any required amount of parking may be reduced by issuance of a

special permit from… bicycle parking required by Subsection 6.37…"

"6.37 *Bicycle Parking.* Off street parking of bicycles shall be provided as follows:"

"6.37.1 For multifamily residences there shall be one bicycles space or locker for each two dwelling units or portion thereof."

"6.37.2 For all other uses, except those exempted in Subsection 6.37.4, there shall be one bicycle parking space for each ten (10) automobile parking spaces or fraction thereof required in Subsection 6.36."

"6.37.3 Uses allowed to have reduced parking by special permit under Subsection 6.35 shall nevertheless be required to provide bicycle spaces or lockers in the amount of one for each ten (10) automobile parking spaces or fraction thereof that would otherwise be required for such use in Subsection 6.36."

"6.49 *Design of Bicycle Parking spaces.* Bicycle parking spaces shall be provided in accordance with the amounts required by Section 6.37 and with the(se) design regulations…"

"6.49.1 Each bicycle parking space shall be sufficient to accommodate a cycle at least six (6) feet in length and two feet wide, and shall be provided with some form of stable frame permanently anchored to a foundation to which a bicycle frame and both wheels may be conveniently secured using a chain and padlock, locker or other storage facilities which are convenient for storage and are reasonably secure from theft and vandalism. The separation of the bicycle parking spaces and the amount of corridor space shall be adequate for convenient access to every space when the parking facility is full."

"6.49.2 When automobile parking spaces are provided in a structure, all required bicycle spaces shall be located inside that structure or shall be located in other areas protected from the weather. Bicycle parking spaces in parking structures shall be clearly marked as such and shall be separated from auto parking by some form of barrier to minimize the possibility of a parked bicycle being hit by a car."

"6.49.3 Bicycle parking spaces shall be located near the entrance of the use being served and within view of pedestrian traffic if possible, and shall be sufficiently secure to reasonably reduce the likelihood of bicycle theft."

"6.49.4 Changes in the requirements of this section, consistent with the intent of this article, may be approved by the Board of Zoning Appeal for an individual building by special permit."

The City of Salem has been effective at providing new facilities for bicycle storage in its downtown. Perhaps the most significant change in future cycling demands could take place if the City fosters bike use encouragement through new zoning policies it develops on its own that may or may not be similar to those cited above through zoning as development and redevelopment occurs. Zoning articles adopted need to be discussed with affected developers as the required bike rack/storage facility quantities should reflect actual usage experience in the City of Salem. As zoning amendments

pertaining to bicycle storage facilities require voter approval, they also require a significant lead-time prior to implementation.

Other Cycling Encouragement Methods

Following are some non-zoning policy options available to the City:

- Continue to provide and enhance the bike route information available to cyclists via City's Website (perhaps an opening page tab) for Biking in Salem.

- Continue to provide secure short/long term bike parking at bicycle generators. Secure bike parking should be enhanced for special events and can be indoor or outdoor and publicized during 'Haunted Happenings' ant throughout the summer with locations identified via the internet, cell phones, etc.

- Continue to pursue bike share or change of mode stations at the two key public transportation stations -- the Salem commuter rail stop in downtown Salem -- and the Salem Ferry terminal.

- Recognize bike-friendly businesses and destinations through the media or through City-issued window stickers.

- Continue to educate motorists *and* bicyclists about available marked and signed bicycle routes in the City as they come on line. In particular let lower-skilled cyclists know where low traffic volume routes are located.

- Continue regular public events promoting bicycle safety and bicyclist riding responsibilities and behaviors. Entice local business entrepreneurs to print *regularly-updated* maps of Salem's bike circulation system and increase enforcement of bicycle and motorist attention to bicycle facilities.

- Update the Bicycle Circulation Master Plan as conditions change, approximately every 5-10 years.

- Retain the Salem Bike Path Committee to shepherd phased implementation of Bicycle Circulation Master Plan recommendations.

- Implement on-street facilities with signage as streets are reconstructed to maximize the long-term viability of on-street improvements. Explore the maintenance requirements of bike markings and employ non-skid surfaces for bike related markings to the maximum extent possible.

Chapter IV
Immediate Action Pilot Route

Chapter IV – Recommended Immediate Action Pilot Route

A. Pilot Route Characteristics Summary

For the last few years, the Salem Bike Path Committee has worked with the City's Department of Planning and Community Development to define a 'family- friendly' bike route that creates a north-south biking corridor through the City and connects the Salem Bike Path at the Marblehead line to Winter Island. Along the way, the Route connects to several City Parks, open space, schools, attractions, beaches, etc. Described initially as the 'Green Line' by the Salem Bike Path Committee, the ***'Pilot Route'*** is nearly 4.85 miles in length and its tentative alignment was illustrated previously on Figure II-1 prepared by the Salem GIS Department.

One of the major objectives of this study was to review, in detail, the characteristics of the Pilot Route with an objective its early implementation, preferably within a year of study completion. Early on in this study, the Pilot Route was reviewed in draft from end-to-end, and its initial analysis was posted on the City of Salem's website at: http://www.salem.com/pages/salemmabcomm/review.pdf.

The draft Pilot Route described in the above link has been modified to incorporate follow up comments received from the Salem Bike Path Committee and the Salem Historical Committee, among others. As currently envisioned, 73% of the Pilot Route consists of shared (or 'sharrowed') roadways, while 19% of its length involves bike lanes, and approximately 8% involves multiuse pathways. Table IV-1 summarizes the characteristics of the Pilot Route. The posted speed limits on the public roadway segments of the Pilot Route are 30 miles per hour unless otherwise noted.

B. Recommended Pilot Route Action Plan

All signs and markings on public ways shall be installed in accordance with the Federal Manual on Uniform Traffic Control Devices (MUTCD) and Massachusetts Amendments, as amended.

Lafayette Street (Route 114) – Marblehead Line to Loring Avenue (Route 1A) and West Avenue

Lafayette Street is functionally classified as an Urban Principal Arterial and its average weekday traffic volume is in excess of 20,000 vehicles per day with a 50-foot curb-to-curb width. Its pavement is in excellent condition and pavement markings and signage along this segment of Lafayette Street were recently modified in connection with a safety improvement project primarily intended to slow traffic through a series of horizontal and vertical curves. It is traffic signal controlled at Loring Avenue.

Lafayette Street looking to northbound Bike Shoulder

Table IV-1
Pilot Route Summary Characteristics

Street Name	*Limits*	*Distance (ft.)*	*Treatment*	*# of Bike Logos*	*# of signs/sign assemblies*
Lafayette Street	Marblehead Town Line to West Ave	3620	Class II - Bike lane SB; shoulder NB	1	2
West Avenue	Lafayette St to Forest River Pk	1050	Class III - not enough width for lanes; sharrows only	4	2
Forest River Park	West Ave to Clifton Ave	360	Class III - not enough width for lanes; sharrows only	3	2
Clifton Avenue	Forest River Pk to Summit Ave	510	Class III - not enough width for lanes; sharrows only	2	2
Summit Avenue	Clifton Ave to Leach St.	1590	Class III - not enough width for lanes; sharrows only	7	6
Leach Street	Summit Ave. to Lafayette Pl	870	Class III - not enough width for lanes; sharrows only - pavement quality enhancements before sharrows added	6	2
Lafayette Place Approaching Palmer Cove	Leach St. to Palmer Cove	695	Class III - not enough width for lanes; sharrows only	4	6
Palmer Cove to Congress Street parking lot	Lafayette Place to Congress Street	320	Paved multiuse path is narrow at 6-7 feet; in the long term, should be improved to 10 feet in width when resurfacing is needed	0	4
Congress Street	Palmer Cove to Ward/ Peabody St	1190	Class II - Bike lanes adjacent to parked cars (note: could also be sharrowed adjacent to parked cars to reduce costs)	14*	2
Congress Street/Hawthorne Boulevard	Ward St to Washington Square at Salem Common	1725	Class III - primarily sharrows & a short 100-foot long Class II bike lane immediately right of southbound left/through lane at Derby Street	14	4
Washington Sq	Hawthorne Boulevard to Briggs/Andrew Streets	1600	Class III - not enough width for lanes; sharrows only	6	5
Briggs Street	Washington Square East to Webb St (1-way eastbound)	770	Class III - EB sharrows adjacent to parked cars	3	2
Andrew Street	Webb St to Washington Square East (1-way westbound)	770	Class III - WB sharrows adjacent to parked cars	3	2
Webb Street	NB from Briggs Street to Collins Cove Access	250	Class III - not enough width for lanes; sharrows only	3	2
Public access to Collins Cove	Webb Street to Collins Cove	90	Class III - sharrows	2	2
Collins Cove	Collins Cove Access to Szetela Lane - Existing path	800	Paved multiuse path is narrow at 6-7 feet; add bike route signs, sweep surface; in the long term should be considered for widening to 10 feet when resurfacing is needed	0	2
Collins Cove along Szetela Lane	Unpaved existing path to crosswalk at Bentley school	980	Unpaved multiuse path is narrow at 2-5 feet but has grass shoulders; add bike route signs, sweep surface; provide bike stop sign at school crosswalk	0	2
Szetela Lane	Bentley School Crosswalk to Memorial Drive.	675	Class III - not enough width for lanes; sharrows only	6	2
Memorial Drive	Szetela Ln to Restaurant Row	2230	Class III - not enough width for lanes; sharrows only	8	4
Memorial Drive	Restaurant Row to Fort Ave	590	Class III - not enough width for lanes; sharrows only and add a stop sign	2	0
Restaurant Row	Memorial Drive to Fort Ave	1015	Class III - not enough width for lanes; sharrows only - remove speed bump & provide a stop sign	4	3
Fort Ave	Restaurant Row to Winter Island Drive	2090	Class III - not enough width for lanes; sharrows only	6	3
Winter Island Drive	Columbus Square to Winter Island	1800	Class III - not enough width for lanes; sharrows only and add a stop sign	8	5
		25,590	Feet		
		4.85	Miles	**106**	**66**
Totals		**8%**	Separate Rights of way		
	*** Includes 10 bike lane logo & arrows**	**19%**	Bike Lanes		
	and 4 sharrows.10 Bike Lane Logo/ Arrows	**73%**	Shared Bike Routes		

In conjunction with the Lafayette Street project, as shown in the photo on the previous page, a *five (5)-foot curb shoulder*, usable by bicyclists, was created to provide sufficient width for cyclists traveling in the *northbound* direction from the Marblehead line.

Also in conjunction with this project, designated *southbound* bike lanes were created with two (2) distinct segments. One segment involves a five (5)-foot wide bike lane offset 2 feet from parked vehicles southerly from a Salem State College parking lot access driveway to Raymond Avenue to minimize the door-opening hazard. South of Raymond Avenue, a southbound curb bike 5-foot bike lane is provided to Rosedale Avenue.

Lafayette Street looking southbound to Raymond Avenue at New Bike Lane

Lafayette Street Recommendations

It is recommended the existing *southbound* bike lane markings on Lafayette Street adjacent to parked cars be extended between its intersection with Salem State College driveway and Loring Avenue/West Avenue. This should be augmented by one bike route sign with arrow straight ahead just south of the intersection with Loring Avenue.

On the *northbound* approach to West Avenue, it is recommended that the right shoulder lane at least five (5)-foot in width be maintained around the mature trees that encroach on the paved surface between Fairview Street and approximately 100 feet south of the marked exclusive left and shared through / right lanes at the intersection. The existing northbound shoulder ends at Fairview Street. A 'Bike Route /Parks' sign with an arrow pointing to the right (to West Avenue) should be installed on

Lafayette Street looking north to West Avenue/Loring

an existing pole in advance of West Avenue. A yellow/green 'Bicycles Share the Road' should be installed on the approach to the intersection at the beginning of the exclusive turn lanes. As can be seen from the photo on the previous page, necessary new signs to designate the Pilot Route at this intersection will need to compete with lots of other signs for motorist's attention. Existing poles are available to place the recommended sign assembly (see right) in accordance with design requirements.

Based on observations, intersection traffic demands are such that retention of the exclusive left and shared through/right approach lanes is needed to accommodate the volumes. After examining potential options for accommodating bikes, detectors in the lanes that would need to be removed to accommodate a new bike lane and a single northbound lane would create excessive queuing. The recommended 'share the road' approach for this short 200-foot segment in the northbound direction of Lafayette Street entails the installation of 1 sharrow in the through/right lane to draw attention to motorists to bicyclists in the lane along with the supplemental 'Share the Road' sign. We note that the ideal solution to this busy intersection would be costly, as it involves retaining both approach lanes and a five (5)-foot shoulder, but it would require relocation of the existing median and signal is replaced an exclusive lane is recommended if the right of way can be reserved with the elimination of three (3) parking spaces on the southwest corner of the street.

West Avenue between Lafayette Street and Forest River Park

This two- lane two-way road is a functionally classified as a local street and has on-street parking on its north side and relatively low traffic volumes. Its curb-to-curb width is approximately 28 feet and its pavement is in good to excellent condition. Except for the previously cited traffic signal at its intersection with Lafayette Street, West Avenue is uncontrolled at all of its remaining intersections.

West Avenue looking west at Belleau Road

<u>West Avenue Recommendations</u>

It is recommended that a total of four (4) sharrows be installed approximately every 350 feet on this roadway. To minimize the number of required sharrows, install an eastbound sharrow just east of Lafayette Street, a westbound sharrow just east of Belleau Road, an eastbound sharrow just west of Plymouth Street and a westbound sharrow just west of Forest River Park.

Looking west on West Avenue at Forest Park Road

Two (2) 'Bike Route Parks' left arrow sign assemblies should be installed, one facing eastbound bikes opposite West Avenue at its intersection with Forest River Park, and the other within 50 feet of Lafayette Street facing westbound bikes.

Forest River Park between West Avenue and Clifton Avenue

Forest River Park curb-to-curb is a narrow two- lane two-way local street approximately 23 feet in width. Parking is not permitted on either side. Its pavement is in good to excellent condition. It is uncontrolled at its intersections with West Avenue and Forest River Park

Forest River Park looking north from West Avenue Area

Forest River Park Recommendations

It is recommended a total of three (3) sharrows be installed on Forest River Park, including a southbound sharrow approximately 50 feet south of the rock gate to Clifton Avenue, a northbound sharrow approximately 150 northwest of West Avenue, and a southwestbound sharrow approximately 50 feet northwest of West Avenue, indicating the southbound bike route goes to West Avenue.

Supplemental signage should include two (2) 'Bike Route Parks' sign assemblies. An assembly with a left facing arrow should be provided on the opposite side of Clifton Avenue opposite Forest River Park and a similar right arrow sign assembly should be provided on the south side of West Avenue facing southbound Forest River Park bicycle traffic.

Clifton Avenue between Forest River Park and Summit Avenue

Clifton Avenue is a two-lane two-way local street approximately 38 feet curb-to-curb in width with on street parking on both sides. It also has 'SLOW' pavement marking westbound just west of Forest River Park and eastbound just east of Summit Avenue. Its pavement is in good condition and it is stop controlled at its intersection with Forest River Park and uncontrolled at its intersection with Summit Avenue.

Clifton Avenue Recommendations

It is recommended that a total of two (2) sharrows be installed on Clifton Avenue. Both sharrows should be in the vicinity of Cliff Street; an eastbound sharrow should be placed just

west of Cliff Street and a westbound sharrow just east of Cliff Street.

Again, supplemental signage should include two (2) 'Bike Route Parks' signs, in this case both with right arrows – one on the right side of the street approximately 50 feet in advance of Forest River Park facing eastbound bike traffic and the second on the right side of the street approximately 50 feet in advance of Summit Avenue.

Summit Avenue looking north to Meservey Street

Summit Avenue between Clifton Avenue and Leach Street

Summit Avenue is a local classified two-way two- lane street with a typical curb-to-curb width of approximately 30 feet with intermittent on-street parking on both sides. Its pavement is in fair to good condition. It is four-way stop controlled at its intersections with Ocean and Willow Avenues and stop controlled at its intersection with Leach Street It has 'SLOW' pedestrian logos marked approximately 75 feet north of Clifton Avenue and 120 feet south of Willow Street.

Summit Avenue Recommendations

It is recommended that a total of seven (7) sharrows be installed on Summit Avenue including northbound and southbound ones just north of Clifton Avenue, a northbound one just south of Ocean Avenue, a southbound one just south of Willow Avenue, a northbound one just south of Eden Street, and both northbound and southbound ones just south of Leach Street.

Supplemental signage should be provided at six locations. Northbound and southbound 'Bike Route Parks' signs with a supplemental straight ahead arrow should be provided approximately 50 feet in advance of the Summit Avenue approaches to the Ocean and Willow Avenues, both 4-way stop-controlled intersections. A southbound 'Bike Route Parks' sign with a supplemental left arrow should be provided on the south side of Clifton Avenue facing southbound Summit Avenue bicycle traffic; a northbound 'Bike Route Parks' sign with a supplemental right arrow should be provided approximately 50 feet south of Leach Street on Summit Avenue.

Leach Street between Summit Avenue and Lafayette Place

Leach Street is a local two-lane two- way street with parking on the north side only. The curb-to-curb paved width of Leach Street is approximately 26 feet and its pavement is in fair to poor condition.

Leach Street Recommendations

Leach Street looking east to Salem Street

It is recommended that the pavement on Leach Street be improved or resurfaced. A total of six (6) sharrows should be installed on Leach Street including eastbound ones just east of Summit Avenue just east of Green Street and Avenue and just west of Lafayette Place. Westbound ones should be installed just east of Summit Avenue (angled slightly to the southwest), just west of Green Street and just west of Lafayette Place.

Supplemental signage should be provided at two (2) locations. Eastbound and westbound 'Bike Route Parks' signs with a supplemental left arrows should be provided approximately 50 feet in advance of the Leach Street westbound approach to the Summit Avenue and the eastbound approach to Lafayette Place.

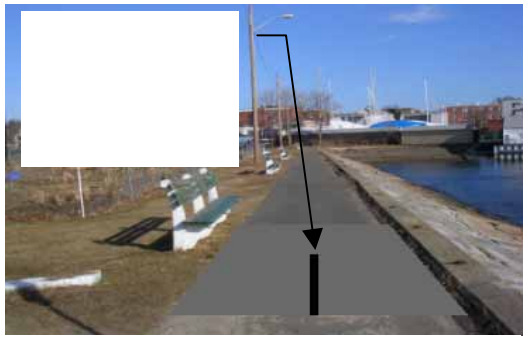
Lafayette Place & Palmer Cove between Leach Street and Congress Street Parking Lot

Lafayette Place has a 26-foot curb-to-curb paved width between Leach Street and its split to Pioneer Street and Palmer Cove. Its pavement is generally in good condition. Once the pavement reaches Palmer Cove park area, it narrows to six (6) – seven (7) feet in width for a distance of approximately 500 feet between the end of Lafayette Place and a parking lot on the south end of Congress Street. A new connection, approximately 175 feet in length was recently added to connect Palmer Cove Park to the Congress Street parking lot.

Lafayette Place looking north to Palmer Cove Entrance

Lafayette Place and Palmer Cove Recommendations

It is recommended a total of four (4) sharrows be installed along with six (6) supplemental sign assemblies.



Northbound sharrows should be installed on Lafayette Place just north of

Leach Street and just east of the Palmer Cove entrance. Southbound sharrows should be installed just south of the narrow Palmer Cove park boulder and just east of the Lafayette Place facing to the southeast.

One of the three (3) southbound 'Bike Route Parks' sign assemblies should be posted at the new parking lot entrance to Palmer Cove along with restriping of the entrance with transverse white markings the dimensions of a typical parking space (9'X18') to discourage parking on the entranceway.

The other southbound sign assemblies should be placed on the southside of Lafayette Place with a left arrow and on the approach to Leach Street with a right arrow. One of the northbound sign assemblies should be placed at the turn to Palmer Cove with a right arrow at the same location as the existing Dead End sign with the second showing a straight arrow to Palmer Cove at the new entrance and at the corner where the new path takes a sharp turn to the right.

Ideally, the existing six (6) to seven (7) foot wide path should be at least 8 feet wide for two-way bicycle traffic.

Congress Street from Palmer Cove to Ward/Peabody Streets

Looking north on Congress Street

This segment of Congress Street is classified a local street with a very wide curb-to-curb paved cross section of 52-53 feet with parallel parking on both sides between Leavitt and Ward/Peabody Streets and approximately 65 feet at the parking lot

between Palmer Cove and Leavitt Street. It is uncontrolled at its all of its intersections and its pavement is generally in good to fair condition, and it carries low-moderate traffic volumes.

Congress Street - Palmer Cove to Ward/Peabody Recommendations

Looking North on Congress Street at Lynch Street

The segment of Congress Street between Palmer Cove and Leavitt Street should have a total of four (4) sharrows, two (2) in each direction between the transverse marked pavement entrance and Leavitt Street on each side of the road plus ten (10) bike lane pavement logos. Two (2) 'Bike Route Parks' sign assemblies with straight ahead arrows, *one in each direction*, should be installed within 50 feet of the approaches to Dow Street. The center of the directional sharrows should be offset from the parking spaces by approximately six (6) feet and the west side parking spaces and offset approximately six (6) feet from the east side edge line. The segment between Leavitt Street and Ward/Peabody Streets has sufficient width to support bike lanes in both directions with two (2) white lines spaced five feet apart and offset 9 feet from the curb, such that the outer line is offset approximately 14 feet from the curb. This will allow the remaining space to be used for a 12-foot lane in each direction. Skipping intersections, the bike lane logo should be added to the lane at just beyond each intersection crossing at the entry to each bike lane only at Leavitt, Palmer, Dow, Lynch, and Harbor Streets northbound and at Ward, Harbor, Lynch, Dow, and Palmer Streets southbound (see example to the left). The pavement surface in this area should be resurfaced prior to the installation of bike lanes.

Congress Street and Hawthorne Boulevard from Ward/Peabody Streets to Washington Square

Congress Street looking north to Derby Street
Continues as Hawthorne Boulevard
(intersection to be signalized in the near future)

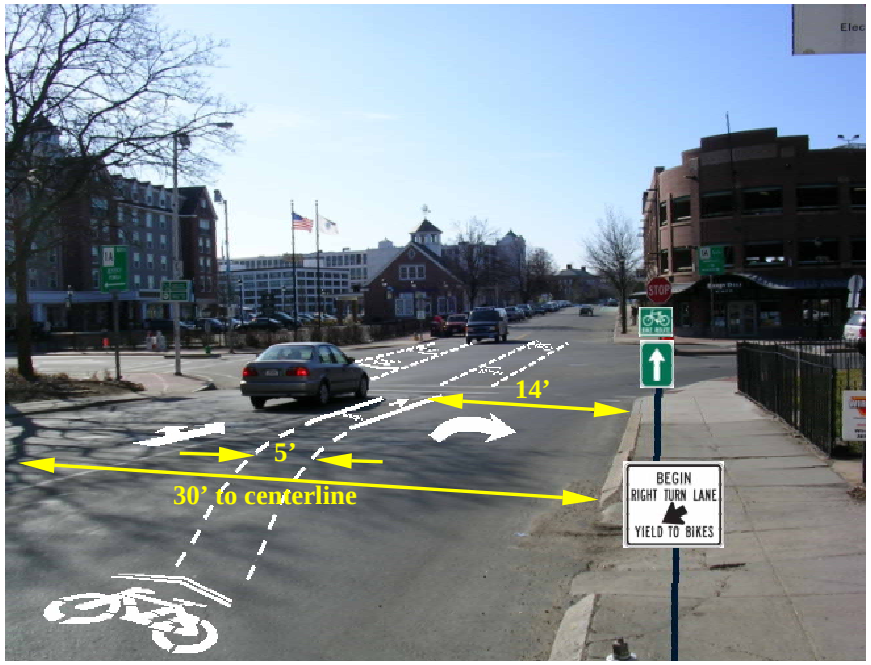
The northernmost segment of Congress Street between Ward/Peabody Streets and Derby Street is classified as an urban collector street with a narrower curb-to-curb paved cross section of approximately 42 feet with parallel parking on both sides.

Hawthorne Boulevard, north of Congress Street Between Derby and Charter Streets, has a curb to curb pavement width of approximately 45 feet and no parking with three (3) marked lanes – two southbound and one northbound. Hawthorne Boulevard between Derby and Washington Street north is classified as an urban minor arterial. Between Charter and Washington Square, the typical 44-foot wide pavement has parallel parking on both sides. The four (4)-way stop controlled intersection of Congress at Derby Street and Hawthorne Boulevard is to be converted to traffic signal control in the near future and coordinated with the traffic signal at Essex Street at Hawthorne Boulevard . The remainder of the intersections in this portion of the Pilot Route are uncontrolled. The pavement is in good condition.

Congress Street and Hawthorne Boulevard from Ward/Peabody Streets to Washington Square Recommendations

Bicyclists using this segment of the on-street Pilot Route need to deal with relatively high traffic volumes and bicycle travel should be integrated into the intersection that will be converted to traffic signal control. Depending on how the intersection is redesigned, additional sharrows may be needed in this area to add visibility to the bike route. A total of 14 sharrows are assumed, seven (7) in each direction of travel. Sharrows should be placed on both sides of Congress Street approximately 50 feet north of Ward Street, on the both sides of Congress Street just north of the Congress Street bridge, on both sides of Hawthorne Boulevard approximately 50 feet north of Charter Street, and on both sides of Congress Street at Washington Square, with the northbound sharrow angled slightly right toward Washington Square. A new crosswalk will be needed on the north leg of Hawthorne Boulevard at Washington Square South

A total of four (4) 'Bike Route Parks' signs will be needed. A *southbound* assembly should be placed on the west side of Hawthorne Boulevard with a left facing arrow opposite Washington Square. A second sign is needed with a straight-ahead arrow on the right side of Congress Street just south of Hawthorne Boulevard beyond Derby Street. One of the *northbound* assemblies should be placed on the right side of Congress Street approaching Derby Street with a straight ahead arrow. The second should be provided on the right side of Hawthorne Boulevard with a right arrow approximately 50 feet south of the right turn to Washington Square.



Hawthorne Boulevard approach to Derby Street showing concept of striping to and through to Congress Street

When the intersection is converted to full traffic signal control, bicycle detectors should be placed on its Congress and Hawthorne Boulevard approaches. Four (4) sharrows might be considered through the intersection with six (6)-inch wide skip-dash lines two (2) feet in length spaced six (6) feet apart in each direction of the corridor to highlight the bicycle route. A five (5)-foot wide bike lane should be provided adjacent to the through/left lane with skip dash lines and a warning sign for southbound motorists on Hawthorne Boulevard making right turns onto Derby Street (see below for not-to-scale visual illustration). Like all other signs and markings along the Pilot Route, all intersection work should be done in accordance with the MUTCD. This intersection is programmed to be signalized in the near future, which should benefit the safety of bike traffic through it assuming bike markings are included in the design.

Washington Square looking east from Hawthorne Boulevard

Looking south on Washington Square to Hawthorne Boulevard

Washington Square to Andrew Street

Washington Square and Washington Square East are two-way two-lane streets classified as an urban collector between Hawthorne Boulevard and Andrew Street. Washington Square's curb-to-curb pavement is approximately 31 feet wide, while Washington Square East's pavement varies from 35-37 feet between Washington Square and Andrew Street. Washington Square is uncontrolled at its intersection with Hawthorne Boulevard and stop controlled at its intersection with Washington Square East. On-street parking for autos and buses is provided on both sides of Washington Square and Washington Square East.

Washington Square to Andrew Street Recommendations

With parking on both sides, Washington Square will be a shared roadway with a total of six (6) sharrows needed. Sharrow would include an eastbound sharrow just east of Hawthorne Boulevard, another eastbound sharrow angled slightly to the north

just west of Washington Square East, and a third eastbound sharrow angled slightly to the right approaching Andrew Street. In the westbound direction, three (3) are recommended including a southbound sharrow just south of Andrew Street and just north of Washington Square angled slightly to the right on Washington Square east, and a westbound sharrow approaching a proposed stop sign on Washington Square's approach to Hawthorne Boulevard. Five (5) sign assemblies of 'Bike Route Parks' signs will be needed including two (2) generally eastbound and three (3) generally westbound. An eastbound sign with a left arrow is needed on the approach to Washington Square east and with a right arrow on the approach to Briggs Street as discussed on the next page. Westbound signs are needed with a left arrow opposite Andrew Street, a right arrow on the approach to Washington Square, and a left arrow on the approach to Hawthorne Boulevard.

Additionally, a stop sign is recommended on the approach to Hawthorne Boulevard.

Briggs Street eastbound to Webb Street and Andrew Street from Webb Street to Washington Square

Andrew Street is a one-way, one-lane street with a curb-to-curb width of approximately 24-28 feet. It is a quiet, tree-lined east-west local residential street with parking on the north side only. Andrew Street provides an outbound connection from the Peter Tracy Multiuse Path adjacent to Collins Cove via a paved area open to the public on the east side of Webb Street and a crossing of Webb Street. Salem Bike Path Committee members expressed an interest in the viability of Andrew Street to support a contraflow bicycle lane in the eastbound direction and a westbound sharrowed bike lane in the westbound direction. The idea was to add new bicycle only stop control to eastbound bicycle traffic only approaching Webb Street.

Looking northeast on Andrew Street to Webb Street

Looking southeast on Webb Street to Andrew Street

Due to the Washington Square use, Briggs Street provides a better inbound alternative to Collins Cove than an Andrew Street contra-flow lane. There are two competing issues to accommodate bike travel between the Peter Tracy Multiuse Path and Washington Square East around Salem Common. Prior to the Salem Historical

Commission's finding that bicyclists should not be using Salem Common, *the notion was that Andrew Street could serve both directions of bike travel with the installation of a contra-flow bike lane*, as a direct connection across Salem Common was initially proposed by the Salem Bike Path Committee. Because the Salem Historical Commission has voted that bike travel *not* be permitted *or* encouraged on Salem Common, the Pilot Route will traverse the exterior of Salem Common via Washington Park East.

Briggs Street eastbound to Webb Street and Andrew Street from Webb Street to Washington Square Recommendations

On one hand, installation of a contra-flow lane on Andrew Street would have minimized the need for cyclists to use Webb Street as a means of travel between Briggs and Andrew Streets, a distance of approximately 220 feet. Webb Street is an urban minor arterial approximately 26-29 feet wide that carries moderately high traffic volumes. The westbound direction of Webb Street is wider than the eastbound direction due to on street parking, which allows cyclists and motorists some flexibility when parked vehicles are not present.

Installation of a contra-flow bike lane on Andrew Street would have created an unconventional condition for cyclists and Andrew Street motorists and is contrary to the requirement that bicyclists obey the rules of the road as if they were operating a motor vehicle. While contra-flow bike lanes *have been* successfully implemented in Massachusetts in the City of Cambridge, Salem Ward Councilor Mike Sosnowski attended a Salem Bike Path Committee meeting to express his concern about the potential bicycle contra-flow lane and how it would operate, as have some members of the Salem Bike Path Committee. Limited sight lines of Andrew Street approaching Webb Street by both motorists and cyclists are his primary concern. Buildings are set back approximately five (5)-six (6) feet from the edge of Webb Street intersection and bicyclists must come to a full and complete stop in order to cross Webb Street safely.

Consequently, because Washington Square is now part of the Pilot Route around Salem Common rather than through Salem Common, it is recommended that Briggs Street be used to accommodate bicyclists traveling toward Collins Cove. The use of Briggs Street for inbound movement (and Andrew Street for the outbound movement) will still require bicyclists to a full and complete stop on the Briggs Street approach to Webb Street. While Briggs Street has no better sight line approaching Webb Street than Andrew Street, the fact that bicyclists must turn left rather than head straight across in a single movement, should strongly encourage cyclists to come to a complete stop. An existing stop is already required.

Installation of eight (8) sharrows will be needed including:

- Three (3) westbound on Andrew Street including one at the entrance just west of Webb Street, one at mid-block and the last angled slightly the left on the approach to Washington Park East.
- Three (3) eastbound on Briggs Street including one just west of the entrance from Washington Park East, a second at mid-block and a third on the approach to Webb Street
- Two (2) north-westbound on Webb Street including one just west of Briggs Street and a second at the entrance to the Peter Tracy Multiuse Path opposite Andrew Street.

It is also recommended that four (4) 'Bike Route Parks' sign assemblies will be installed including one (1) with a left arrow opposite the Briggs Street intersection, one (1) with a right arrow on the far side of the entrance access to the Peter Tracy Multiuse Path facing Webb Street westbound bike traffic, and one (1) on at the Andrew Street entrance opposite Webb Street with a straight ahead arrow, and one with a left arrow opposite Andrew Street at Washington Park East.

Looking north at access from Webb Street to Peter Tracy Multiuse Path at Collins Cove

Webb Street access lot to Collins Cove

This small public layout provides a two-way access to the Peter Tracy Multiuse Path abutting Collins Cove. A roughly 45'X40' square paved public layout provides access to a access to a 30 foot by five (5) foot paved path to the Peter Tracy Multiuse Path located about 70 feet north of Webb Street through a series of bollards, as seen in the photo below. At present, there are no trailblazing signs to guide cyclists as to which way to go.

To the right is Winter Island and Salem Willows; to the left, the path eventually will allow cyclists access to the City of Beverly.

Webb Street access lot to Collins Cove Recommendations

Provide trail-blazing signage to Salem Willows and Winter Island and Beverly /Route 1A using Salem's sign standards for informational signage (see example right). On the land side of the path, provide a sign assembly that shows 'Bike Route Parks' in three (3) directions – for bicyclists coming from the west with a right arrow pointing toward Webb Street directions of the walkway and facing bike traffic approaching from the access. While the hazard *should be obvious* to most cyclists, the southbound approach from the access to the Webb Street southbound crossing should have stop control and a stop line with markings indicating a stop is needed prior to entering Webb Street.

Collins Cove – from Webb Street Access to Szetela Lane

This segment of Collins Cove involves use of the existing six (6) to seven (7) foot paved walkway as noted previously.

Collins Cove – from Webb Street Access to Szetela Lane Recommendations

This portion of the Pilot Route, as shown on the previous page, only requires routine maintenance for the initial Pilot Route installation plus one sign assembly that shows 'Bike Route Parks'

Looking north just west of Szetela Lane from east end of Peter Tracy Multiuse Path

with a left arrow at the end of the paved segment to let cyclists know the path continues unpaved to the left and, using the same pole, a sign facing southbound bicyclists that the route continues to the right.

Collins Cove looking east from Webb Street Access

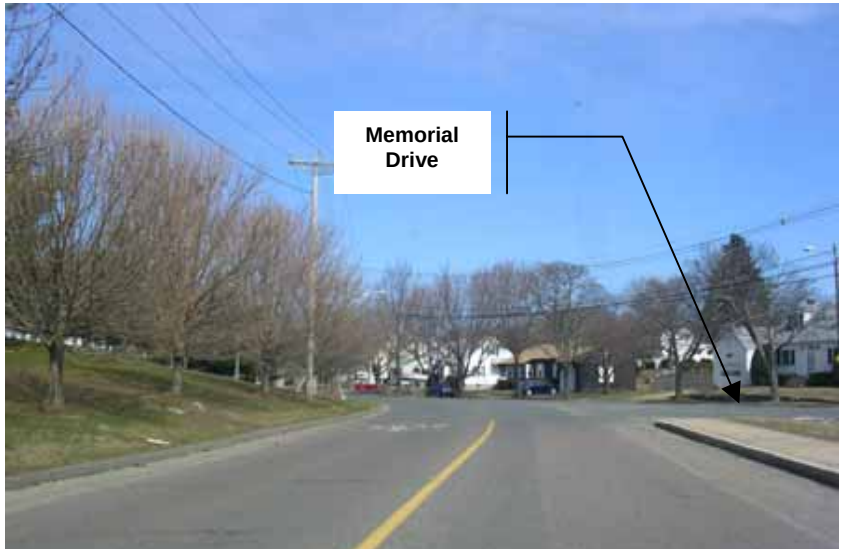
Collins Cove – from Szetela Lane to Bentley School Crosswalk

This unpaved narrow pathway, seen in the photo to the left, can be used by two- way bicycle traffic as long as they use the available shoulders to stay right in either direction.

Collins Cove – from Szetela Lane to Bentley School Recommendations

Install a single pole with two (2) sign assemblies for 'Bike Route Parks' at the Bentley School crossing. Signs should be facing eastbound bike traffic with a left arrow approaching Szetela Lane on the facing southbound Szetela Lane traffic indicating the bike route continues to the right. If funds become available, the unpaved path should be paved to at least be consistent with the other paved portion of the Peter Tracy Multiuse Path, but preferably to a 10-foot width to accommodate multiuse path users.

Looking north on Szetela Lane at Pilot Route crossing



Looking north on Szetela Lane approaching its uncontrolled intersection with Memorial Drive

Szetela Lane from Bentley School crosswalk to Memorial Drive

Szetela Lane is a two-lane, two-way local street with intermittent on street parking which is heavily used during Bentley school openings and closings. It has a variable curb-to-curb width of 31-40 feet. As can seen in the photo below and to the left, it merges with Memorial Drive, another local street, at an uncontrolled 'Y' intersection and its pavement is generally in good condition.

Szetela Lane from Bentley School crosswalk to Memorial Drive Recommendations

A total of four (4) sharrows are recommended on Szetela Lane, including two (2) southbound sharrows, one approximately 100 feet south of Memorial Drive and the second approximately 50 feet north of the path angled slightly to the right. The proposed northbound sharrows should be provided approximately 50 feet north of the crosswalk and within 50 feet of the Memorial Drive intersection. It is recommended that all approaches to the Memorial Drive and Szetela Lane intersection be yield controlled with a 'Yield' sign and yield markings, which will apply to all motorists and bicyclists approaching the intersection. On the northbound Memorial Drive approach, the yield markings should be placed approximately 4 feet north from the existing crosswalk (shown on the aerial on the next page) across Memorial Drive at Szetela Lane. A total of two (2) sign assemblies of 'Bike Route Parks' are recommended, both located within 50 feet of the intersection between Szetela Lane and Memorial Drive. One sign, opposite the Szetela Lane should advise cyclists to the left, and on the northwest corner facing southbound traffic with a right arrow.

Aerial View of Szetela Lane at Memorial Drive – not to scale
(Base Source: Salem GIS Department, April, 2008 Aerial)

Looking north on Memorial Drive approach to Restaurant Row (to Salem Willows)

Memorial Drive from Szetela Lane to Restaurant Row (to Salem Willows)

Again, the curb-to-curb pavement on Memorial Drive, a quiet residential local street, varies from 31-40 feet. Intermittent on-street parking is permitted. Its pavement is generally in good condition.

Memorial Drive from Szetela Lane to Restaurant Row (to Salem Willows) Recommendations

Provide a total of eight (8) sharrows between Szetela Lane and Restaurant Row (to Salem Willows). Northbound sharrows should start as shown on the previous page spaced approximately 550 feet apart. Southbound sharrows should be offset from the northbound sharrows by approximately 275 feet, so motorists will see them regularly in both directions.

Looking north on Memorial Drive
approximately 600 feet north of Szetala Lane intersection

A total of four (4) sign assemblies of 'Bike Route Parks' are recommended. One of the assemblies should be provided at the Restaurant Row intersection with Memorial Drive, and should include a trailblazing sign pointing left to Salem Willows and right to Winter Island below a 'Bike Route Parks' sign pointing in both directions.

Looking north on Restaurant Row (to Salem Willows)

Looking north on Restaurant Row (Salem Willows) to speed bump and uncontrolled intersection with Fort Avenue

A second assembly should be provided facing southbound cyclists and northbound cyclists from Memorial Drive indicating Bike Route Parks with a straight ahead arrow and left arrow, respectively. The two (2) other sign assemblies should be provided on both sides of Memorial Drive just north of Szetela Lane. The northbound sign assembly should show a left arrow facing cyclists from Szetela Drive and the southbound sign assembly should show a right arrow facing southbound cyclists noting the direction of Winter Island.

Recommended sign location
At north corner of Restaurant Row with Memorial Drive

Restaurant Row (to Salem Willows) from Memorial Drive to Fort Avenue

The curb-to-curb pavement on Restaurant Row varies considerably due to adjacent perpendicular parking spaces. On-street parking, both parallel and perpendicular, is intermittent on this local street that is directly adjacent to beach parks and picnicking areas on the approach to the Salem Willows entertainment district. Its pavement is generally in fair to good condition, but it has an unmarked speed bump traversing the entire

width of the road near Fort Avenue that presents a hazard to cyclists. Its intersection with Fort Avenue is uncontrolled.

Restaurant Row (to Salem Willows) from Memorial Drive to Fort Avenue Recommendations

Provide a total of four (4) sharrows between Memorial Drive and Fort Avenue, two (2) in each direction offset by approximately 250 feet. A southbound sharrow should be located approximately 250 feet north of Memorial Drive and approximately 500 feet northerly just before the easterly bend of Restaurant Row. A northbound should be located just west of the intersection with Fort Avenue and approximately 500 feet further to the west on Restaurant Row (to Salem Willows).

Looking east on Memorial Drive across Fort Avenue to Columbus Square and the access to Winter Island Drive

A total of two (2) sign assemblies of 'Bike Route Parks' are recommended plus one stop sign. One of the assemblies should be provided on the northwest corner of the Restaurant Row intersection with Fort Avenue facing southbound Fort Avenue cyclists. It should include a trailblazing sign pointing right to Collins Cove and straight ahead to Winter Island. A second assembly should be provided facing eastbound cyclists on Restaurant Row to Salem Willows. Restaurant Row should be stop-controlled at its intersection with Fort Avenue, which is classified as an urban collector. It is recommended that the existing speed bump be removed with the installation of a stop sign and stop bar facing the Restaurant Row eastbound traffic headed to Salem Willows. The stop will apply to all vehicles, including cyclists.

Looking south on Fort Avenue south of Restaurant Row

Fort Avenue from Salem Willows to Winter Island Drive

The curb-to-curb pavement on Fort Avenue varies from 45-48 feet. Parallel on-street parking is allowed on this urban collector street that provides access and egress from both Salem Willows and beach parks and picnicking areas on the approach to the Salem Willows entertainment district. It carries low-moderate traffic volumes.

Fort Avenue from Salem Willows to Winter Island Drive Recommendations

Provide a total of six (6) sharrows between Restaurant Row and Winter Island Drive, three (3) in each direction offset by approximately 350 feet. The northernmost southbound sharrow should be located approximately 50 feet south of Restaurant Row. Sharrows should be every 350 feet alternating between southbound and northbound directions to a distance of approximately 50 feet north of Columbus Square.

A total of two (2) sign assemblies of 'Bike Route Parks' and one stop sign are recommended. One of the assemblies should be provided on the northwest corner of the Memorial Drive intersection with Fort Avenue facing southbound Fort Avenue cyclists. It should include a trailblazing sign pointing right to Collins Cove and left to Winter Island. A second assembly should be provided facing eastbound cyclists on Memorial Drive and southbound cyclists on Fort Avenue pointing toward Winter Island with an arrow straight ahead. Memorial Drive should be stop-controlled at its intersection with Fort Avenue, which is classified as an urban collector. Again, the stop will apply to all vehicles, including cyclists.

Columbus Square and Winter Island Drive from Fort Avenue to Winter Island Park

Columbus Square is approximately 20 feet wide between Fort Avenue and Winter Island Drive. It is uncontrolled at both of its intersections with Winter Island Drive and Fort Avenue and intermittent parking is permitted on the north side only.

The curb-to-curb pavement on Winter Island Drive varies from 20-28 feet. On-street parking is not allowed on this local street that provides access and egress from both Salem Willows and beach parks and picnicking areas on the approach to the Salem Willows entertainment district. It carries low traffic volumes, but its pavement quality is fair with intermittent potholes (see below). Its posted speed limit is 15 miles per hour. A multiuse path is proposed to be constructed on the periphery of Winter Island which should greatly enhance bicycle and non-auto access to the park under the Salem Harbor Plan.

Looking west on Columbus Square to Fort Avenue intersection

Looking east on Columbus Square to uncontrolled Winter Island Drive intersection

Looking east on Winter Island Drive near sea wall

Looking south on Winter Island Drive to Winter Island Park Entrance Booth

Columbus Square and Winter Island Drive from Fort Avenue to Winter Island Park Recommendations

Provide a total of eight (8) sharrows between Fort Avenue and Winter Island Park, four (4) in each direction. Two (2) sharrows, including an eastbound one approximately 50 feet east of Fort Avenue, and a westbound one approximately 50 feet west of Winter Island Drive should be provided. The remaining six sharrows should be provided on Winter Island Drive east of Columbus Square, or approximately every 350 feet alternating between southbound and northbound directions to a distance of approximately 50 feet north of the Winter Island Park entrance booth gate.

A total of four (4) sign assemblies of 'Bike Route Parks' plus one stop sign are recommended. One of the 'Bike Route Parks' assemblies should be provided on the east corner opposite the Columbus Square intersection with Winter Island Drive facing eastbound Columbus Square cyclists. It should include a trailblazing sign pointing left to Winter Island. A second assembly should be provided facing northbound cyclists on the east side of Winter Island Drive as they exit the Park. A third should be located on the southwest corner of Winter Island Drive at Columbus Square with a right arrow facing westbound cyclists on Winter Island Drive. The fourth should be opposite the Columbus Square intersection on the northwest corner of Memorial Drive at Fort Avenue facing the Columbus Square westbound cyclists advising Collins Cove with a straight ahead arrow. A stop sign and stop line is recommended on the northbound approach of Columbus Square to Winter Island Drive.

Yield signs with yield pavement marking triangles similar to those recommended at the Szetela Lane intersection with Memorial Drive, are recommended on the four (4) approaches to the intersection of Fort Avenue with Columbus Avenue and Columbus Square (refer to aerial on the next page for the existing intersection configuration).

Aerial View of Fort Avenue at Memorial Drive, Columbus Square and Winter Island Drive

C. Pilot Route Action Plan Cost Summary

Implementation of the Pilot Route Action Plan should be undertaken as soon as possible, possibly in two distinct phases. Table IV-2 provides a summary of estimated implementation and maintenance costs associated with two potential phases of the Pilot Route Action Plan. The second phase involves longer range costs, should the City decide to move forward with more than the Phase I sign and marking improvements to the Pilot Route and enhance the quality of riding surfaces observed in the field and bring them up to current standards.

From Table IV-2, implementation of the Action Plan is expected to involve approximately $62,000 with annual maintenance costs of approximately $12,000.

Again, the users of the Phase I Pilot Route do so at their own risk, as bicycle riding in mixed traffic inherently involves risks, as can be seen on the 5-year bicycle/vehicle crash map presented in Chapter III and discussed in the Chapter I, the Introduction. Users of the Pilot Route should understand that the Congress Street/Hawthorne Boulevard and short Webb Street components are along busy streets that must share the road with bike riders.

Summary of Critical Pilot Route Crossing Treatments

Intersection	Treatment
Lafayette St (Rte 114) at West Ave.	Bikes share the road on the northbound approach; reconfigure to create a 5-foot bike lane if signals are to be upgraded. Retain two northbound lanes, including a left only and through/right lanes
Congress St at Derby St. and Hawthorne Blvd.	2 Sharrows through intersection in both directions with skip dash parallel lines. Transition southbound approach sharrows to left-lane. 3 bike signs
Memorial Drive at Szetela Lane	Consider yield signs and diamond yield lines on all approaches at the Memorial Drive/Szetala Lane intersection
Fort Ave at Memorial Dr. & Columbus Ave	Consider yield signs and yield bars on all approaches to the pedestrian and bike crossings
Webb Street at Andrew and Briggs Streets	Warn Webb Street approaching motorists of bike crossing. Install stop bar and stop line at Briggs Street intersection with Webb Street with Bike Route Parks left sign assembly

Table IV-2

Pilot Route Preliminary Cost Estimate

PREPARED BY: FAY, SPOFFORD & THORNDIKE

PRELIMINARY ESTIMATE OF QUANTITIES
CITY OF SALEM BIKE PLAN - 4.85-MILE PILOT ROUTE

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
PHASE I					
	PAVEMENT MARKING REMOVAL - THERMOPLASTIC	SF	200	$1.60	$320.00
	6 INCH REFLECTORIZED WHITE OR YELLOW LINE (THERMOPLASTIC)	LF	9200	$1.10	$10,120.00
	12 INCH WHITE GORE, CROSSWALK, AND STOP LINE	LF	25	$1.45	$36.25
	BICYCLE AND ARROW - PREFORMED THERMOPLASTIC	EA	106	$315.00	$33,390.00
	SIGN POLE	EA	50	$76.00	$3,800.00
	STREET SIGN WITHOUT POST	EA	66	$55.00	$3,630.00
	SUBTOTAL				**$51,296.25**
	20% CONTINGENCY				**$10,259.25**
	TOTAL				**$61,555.50**
		SAY	**$62,000**		
OPTIONAL PHASE II*					
	HOT MIX ASPHALT - PATCHING LEACH STREET	TON	130	$78.00	$10,140.00
	HOT MIX ASPHALT - PATCHING WINTER ISLAND DRIVE	TON	120	$78.00	$9,360.00
	BIKE TRAIL ENHANCEMENTS - PALMER COVE	MI	0.1	$700,000.00	$70,000.00
	BIKE TRAIL ENHANCEMENTS - COLLINS COVE	MI	0.18	$700,000.00	$126,000.00
	SIGNAL ADJUSTMENTS	EA	2	$2,000.00	$4,000.00
	SUBTOTAL				**$215,500.00**
	20% CONTINGENCY				**$43,100.00**
	TOTAL				**$258,600.00**
		SAY	**$259,000**		
TOTAL					
	SUBTOTAL				**$266,796.25**
	20% CONTINGENCY				**$53,359.25**
	TOTAL				**$320,155.50**
		SAY	**$321,000**		
ANNUAL MAINTENANCE (PHASE I ONLY)					
	ANNUAL SHARROW MAINTENANCE (REPLACE EVERY 5 YEARS)	EA	106	$63.00	$6,678.00
	ANNUAL THERMOPLASTIC LINE MAINTENANCE (EVERY 5 YEARS)	LF	9200	$0.25	$2,300.00
	ANNUAL SIGN MAINTENANCE (EVERY 10 YEARS)	EA	66	$5.50	$363.00
	ANNUAL POST MAINTENANCE (EVERY 10 YEARS)	EA	50	$7.60	$380.00
	SUBTOTAL				**$9,721.00**
	20% CONTINGENCY				**$1,944.20**
	TOTAL				**$11,665.20**
		SAY	**$12,000**		

*** NOTE: IF AT ALL POSSIBLE, INSTALL NEW SHARROW OR BIKE LANE MARKINGS ON RECENTLY OR NEWLY RESURFACED ROADS.**

Chapter V
Citywide Bike Routes and Priorities

Chapter V – Citywide Bike Routes and Priorities

A. STRATEGIC OVERVIEW

ROUTE EVALUATIONS PROCESS

The Salem Bike Path Committee members drawing upon years of work and through an iterative process with the City Planning Department, identified individual and group visions of citywide cycling enhancements. The Pilot Route detailed in Chapter IV is the Committee's consensus highest priority for implementation.

Attached Figure V-1 in the attached map pocket summarizes the December 2009 status of the Salem Bike Path Committee's vision for citywide bike routes and facilities, with initial emphasis on implementation of:

- The 4.85-mile Pilot Route connecting Salem's waterfront parks, historic sites, open spaces, and several schools, beaches, etc.;
- Construction of a missing connection between Palmer Cove and the Bridge Street Bypass Road Multiuse Path; and
- The Phase II multiuse Salem Bike Path connecting the northerly end of the Lafayette-Canal Phase I Bike Path to Downtown Salem. Besides providing a direct route between downtown Marblehead and downtown Salem, the Phase II multiuse path will provide tranquil views of Rosie's Pond and the surrounding wetlands.

Winter view looking west to Rosie's Pond from future Phase II Bike Path Rail-to-Trails Corridor

PLAN ELEMENTS

Key elements of the Salem Bike Path Committee's citywide bike circulation vision include:

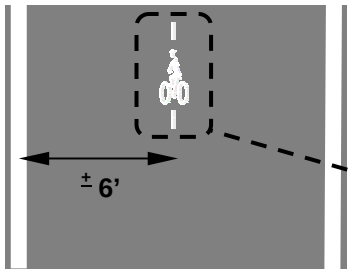
- *Designation of bike routes* along all of Salem's major roads that have adequate right of way for supporting bike use.
- *Installation of road crossing safety measures at critical bicycle crossings* where existing or projected bicycle/vehicle conflicts will be highest and where necessary crossings have constricted sight lines.
- *Creation of a new pedestrian at-grade railroad connection* between the bike path serving the Jefferson at Salem Station and Salem Station to provide walkers and bicyclists with a far shorter and more convenient connection to the northeast Salem neighborhoods that avoids the use of the Route 114 overpass with its steep grades and high traffic volumes.

- *Creation of at least two bike share stations at the MBTA Salem Commuter Rail Station and the City of Salem Ferry Terminal*. Bike share stations provide a way for commuters to rent bikes at transit change-of-mode stations. These privately owned and operated facilities provide people accessing the City via rail or the ferry with a greater range of travel options than walking to and from Salem's tourist and recreational resources as well as options for reverse commuting to and from downtown Salem employment centers.

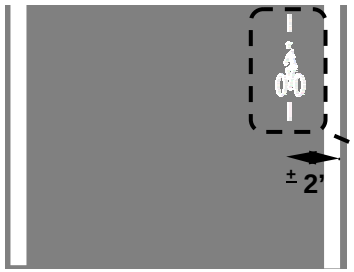
- *Identification of Mountain Bike Trails at Salem Woods* for off-road cyclists who enjoy challenging terrains for bicycle travel.

- *Identification of Salem components of the East Coast Greenway (ECG)*, a proposed 2,900 mile long corridor between communities along the eastern seaboard from Florida to Maine. The Google® ECG Massachusetts map indicates that the ECG, as envisioned,would traverse Salem via the Phase I and future Phase II Bike Paths, temporarily along Canal Street. From downtown Salem, it follows Route 1A into Beverly. Based on the description of the ECG's mission, we conclude the Pilot Route serves as a better interim alternative for the ECG through Salem than Canal Street prior to the construction of the Phase II Salem Bike Path. With the Pilot Route, as shown in Chapter IV, through cyclists will be able to turn left at the Peter Tracy Multiuse Path to access Beverly via its connection to Route 1A. The Pilot Route also affords through bicyclists far more scenic opportunities than the suggested route along Canal Street. When the Phase II path is completed, the suggested Google® ECG route will provide a greater percentage of exclusive trails than the Pilot Route, should that be the most important criteria to the East Coast Greenway riders. The Pilot Route will still provide more exposure to Salem's parks, beaches, attractive open spaces, etc. and avoids several difficult intersections associated with bicycle use of Route 1A between the end of the Phase II Bike Path and the City of Beverly. We believe the ECG map would be better served if it showed the Pilot Route as the Preferred Route through Salem to Beverly, with the Phases I and II Salem Bike Paths as a recommended side route that connecting downtown Salem to downtown Marblehead.

- *Provision of right side loops and logos for bike riders at traffic signals*. The existing practice of locating bicycle detectors in the middle of traffic lanes presents a potential hazard for cyclists. While motor vehicle detectors should remain where placed, it is recommended that high sensitivity bicycle loop detectors be placed where bicycle riders typically arrive at a signalized intersections, either on the right side of the right lane or the right side of the left lane, because cyclists do not have the same acceleration characteristics as motor vehicles, even though they are to comply with the rules of the road.



Typical Existing Bicycle Detector Locations



Proposed Bicycle Detector Locations

B. SUMMARY, IMPLEMENTATION PRIORITIES AND COSTS

Following is a citywide overview summary of the plan components by facility type.

Existing* and Proposed Bike Treatments - Salem, MA				
	Existing (ft)	Proposed (ft)	Total (ft)	Total (mi)
Class I - separate	12,375	10,085	22,460	4.3
Class II - bike lanes	2,000	31,305	33,305	6.3
Class III - designated shared ways	none	119,165	119,165	22.6
	14,375	**160,555**	**174,930**	**33.1**
	2.70	**30.41**	**33.13**	**MILES**
* Bicycles are permitted on all City streets except Essex Street pedestrian mall.				

The Salem Bike Path Committee recommends implementation of the Pilot Route as the highest priority for its on-street bike circulation plan illustrated on Figure V-1. At this time, it is envisioned that separate multiuse paths will represent approximately 13% of the City's total mileage of bike routes, while bike lanes and shared routes will represent 19% and 68% of the mileage, respectively.

Table V-1 provides a street-by-street priority evaluation of existing and proposed bike routes in the City of Salem with the exception of the Pilot Route which was detailed in Chapter IV. Priorities were on the areas served, the potential benefit to riders based on the historic bike/vehicle crash patterns, and the connectivity of elements.

Table V-2 summarizes estimated construction and maintenance costs for the Citywide plan. Implementation will depend on the availability of funds to construct and maintain plan segments as well as opportunities that may emerge with the private sector.

Table V-1
Proposed City of Salem Bike Facilities Excluding Pilot Route

Street link	*Limits*	*Distance (ft.)*	*Type*	*Comments*
POTENTIAL OFF STREET MULTI-USE PATHS				
Phase II Salem Bike Path	Canal St to Washington St	5800	Class I	Former rail corridor with pond views; City is actively pursuing right-of-way and permitting for construction
Connection between Peter Tracy Walkway and Bridge Street path	Connects Bridge St and T Station path	1260	Class I	Path will be the first to connect two separate bike paths and provides a direct connection to the Pilot Route; its connection to Bridge Street path is best made as a southerly 'Y' to minimize grade changes
Connection between Jefferson at Salem Station and north Salem	Connects Collins Cove with T station path	770	Class I	This is an important connection requiring coordination with the MBTA. It provides a missing link from two neighborhoods and should be a very high priority for implementation.
Subtotals		**7,830** **1.48**	**FEET** **MILES**	
POTENTIAL ON-STREET BIKE ROUTE - BIKE LANE				
First St	Swampscott Rd to Highland Ave	4380	Class II	Moderately busy street; shoulders exist and can readily be converted to bike lanes
Loring St	Jefferson Ave to Swampscott Line	6870	Class II	Busy street; shoulders exist and can readily be converted to bike lanes
Lafayette Street	Salem State lot to West Avenue	1620	Class II	Very busy street is wide enough to accommodate SB lane
Lafayette Street	West Ave to Derby St	5270	Class II	Very busy street is wide enough to accommodate bike lanes in both directions
Lafayette Street	Derby Street to Essex St	780	Class II	Very busy street is wide enough to accommodate bike lanes in both directions
North St	Peabody Line to Mason St	3990	Class II	Very busy street has shoulders convertible to bike lanes in both directions
Boston St	Peabody Line to Safford St	780	Class II	Very busy street. Except for a 42-46 foot wide segment approximately 650 feet in length between Bridge and Hanson Streets, it has a typical curb to curb width of 52+ feet capable of being striped for bike lanes in both directions from Highland Avenue to the City of Peabody inclusive of on-street parking.
Bridge St	March St to Beverly Line	1525	Class II	Very busy street has shoulders convertible to bike lanes in both directions
Willson St	Highland Ave to Laurent St	2210	Class II	Busy street is generally wide enough to accommodate bike lanes except near Jefferson Avenue where bike traffic could divert to Champlain Street via Horton and Arthur Streets
Subtotals		**27,425** **5.19**	**FEET** **MILES**	

Table V-1
Proposed City of Salem Bike Facilities Excluding Pilot Route

Street link	*Limits*	*Distance (ft.)*	*Type*	*Comments*
POTENTIAL ON-STREET BIKE ROUTE - SHARED ROADWAY				
Washington St	Lafayette St to Essex St	2190	Class III	Busy street, only way to downtown core; has relatively slow speeds
Willson St	Laurent St to Jefferson Ave	860	Class III	Can provide bike lane except at Jefferson/Willson Intersection
Jefferson Ave	Wilson St to Canal St	2950	Class III	Busy street, mainly signs and shoulders. Bridge over railroad has steep grades for cyclists
Marlborough Rd	Peabody Line to First Street	6450	Class III	Busy street, just bike route signs & shoulders
Swampscott Rd	Peabody Line to Highland Ave	6660	Class III	Busy 35+ mph speeds street, just use bike route share the road signs vegetation trimming needed, lots of truck use and narrow shoulders
Highland Ave	Lynn Line to Marlborough Rd	5290	Class III	Busy street with 35+ mph speeds, only show bike route signs if 6+ feet available on shoulder throughout
Highland Ave	Marlborough Rd to Willson St	4930	Class III	Busy street with 35+ mph speeds, only show bike route signs except where 6+ feet available on shoulder - repair drainage grate hazard at Marlborough Road
Highland Ave	Willson St to Jackson St	2910	Class III	Busy street with 35+ mph speeds, only show bike route signs if 6+ feet available on shoulder throughout
Highland Ave	Jackson St to Flint St	1430	Class III	Busy street with 35+ mph speeds, only show bike route signs if 6+ feet available on shoulder throughout
Derby Street	Congress St to Fort Ave	3760	Class III	one-way EB Only
Fort Ave	Webb St. to Winter Island Dr	3510	Class III	Intermittent parking, share the road
Essex St	Flint St to Washington St	2480	Class III	EB Only
Federal St	Washington St to Flint St	2660	Class III	WB only
East Collins St	Webb St to Planters St	1680	Class III	sharrows only
Planters St	East Collins St to Bridge St	580	Class III	WB sharrows only
Osgood St	Bridge St to East Collins St	520	Class III	EB sharrows only
Bridge St/ Washington St	St Peter St to Essex St	1580	Class III	Busy street sharrows only
Jefferson Ave	Willson St to Washington St	4860	Class III	Busy street sharrows and shoulders only
Loring Ave	Canal St to Lafayette St	2220	Class III	Busy street with shoulders that are wide enough for bike lanes
Canal St	Loring Ave to Train Tracks	930	Class III	Busy street with shoulders and lots of truck traffic
Leggs Hill Rd	Loring Ave to Marblehead Line	1350	Class III	Narrow street with regional YMCA
Valley St	Highland Ave to Cherry Hill Ave	1040	Class III	Steep street with onstreet parking
Valley St	Cherry Hill Ave to Gallows Head Rd	1960	Class III	Steep street with onstreet parking
Gallows Head Rd	Valley St to Rockdale Ave	1920	Class III	Steep street with onstreet parking
Rockdale Ave	Gallows Head Rd to Marlborough Rd.	1305	Class III	Steep street with onstreet parking

Table V-1
Proposed City of Salem Bike Facilities Excluding Pilot Route

Street link	*Limits*	*Distance (ft.)*	*Type*	*Comments*
POTENTIAL ON-STREET BIKE ROUTE - SHARED ROADWAY (Continued)				
Cherry Hill Ave	Valley St to Highland Ave	1070	Class III	Steep street EB only Class III
Belleview Ave/Orn/Aburn Rd	Rockdale Ave to Boston St	4100	Class III	sharrows only
Puritan Rd	Gallows Head Rd to Orn St	1850	Class III	sharrows only
Broad St	Highland Ave to Margin St	2930	Class III	sharrows only
Margin St	Endicott St to Chestnut St	680	Class III	sharrows only
Harmony Grove Rd	Peabody Line to Flint St	3380	Class III	sharrows only
Flint St	Harmony Grove Rd to Essex St	1600	Class III	SB only sharrows
Grove/ Tremont St	Harmony Grove Rd to School St	1730	Class III	sharrows only
School St	Tremont St to North St	1830	Class III	sharrows only
Buffum St	School St to Bryant St	1970	Class III	sharrows only
Liberty Hill Ave	Appleton St to Sargent St	1260	Class III	sharrows only
Appleton St	Liberty Hill Ave to Orne St	950	Class III	sharrows only
Kernwood St	Sargent St to Beverly Line	2020	Class III	sharrows only
Sargent St	Kernwood St to Rand Rd	1500	Class III	sharrows only
Orne St	North St to Sargent St	2100	Class III	sharrows only
Franklin St	North St to Life St	1670	Class III	sharrows only
Life St	Franklin St to Orne St	1440	Class III	sharrows only
Commercial St	North St to Bike Trail	1230	Class III	sharrows only
March St	Bike Trail to Bridge St	550	Class III	sharrows only
Salem High School Loop	Wilson St	2760	Class III	sharrows only
Subtotals		**102,645**	**FEET**	
		19.44	**MILES**	

Table V-2
City of Salem Bike Facility Costs
- Exclusive Multiuse Paths -

August 2009

PRELIMINARY
ENGINEERS ESTIMATE OF QUANTITIES
PROPOSED CLASS I - CITY OF SALEM, MASSACHUSETTS

PREPARED BY: FAY, SPOFFORD & THORNDIKE

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
REQUIRED					
	BIKE TRAIL NEW PLUS ENHANCEMENTS	MI	1.5	$700,000.00	$1,050,000.00
	SIGN SUPPORT (NOT GUIDE) AND ROUTE MARKER W/1	EA	40	$76.00	$3,040.00
	STREET SIGN WITHOUT POST	EA	80	$55.00	$4,400.00
	SUBTOTAL				**$1,057,440.00**
	20% CONTINGENCY				**$211,488.00**
	TOTAL				**$1,268,928.00**
		SAY	**$1,269,000**		
MAINTENANCE					
	ANNUAL PATH MAINTENANCE	MI	3.5	$35,000.00	$122,500.00
	ANNUAL SIGN MAINTENANCE	EA	80	$5.50	$440.00
	ANNUAL POST MAINTENANCE	EA	40	$7.60	$304.00
	SUBTOTAL				**$123,244.00**
	20% CONTINGENCY				**$24,648.80**
	TOTAL				**$147,892.80**
		SAY	**$148,000**		

Table V-2
City of Salem Bike Facility Costs
- Bike Lanes -

August 2009

PRELIMINARY
ENGINEERS ESTIMATE OF QUANTITIES
PROPOSED ON-STREET BIKE LANES - CITY OF SALEM, MASSACHUSETTS

PREPARED BY: FAY, SPOFFORD & THORNDIKE

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT	
REQUIRED						
	6 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC)	LF	111980	$0.55	$61,589.00	
	BICYCLE AND ARROW - PREFORMED THERMOPLASTIC	EA	110	$315.00	$34,650.00	*
	SIGN SUPPORT (NOT GUIDE) AND ROUTE MARKER W/1	EA	110	$76.00	$8,360.00	*
	STREET SIGN WITHOUT POST	EA	220	$55.00	$12,100.00	
	SUBTOTAL				**$116,699.00**	
	20% CONTINGENCY				**$23,339.80**	
	TOTAL				**$140,038.80**	
		SAY	**$141,000**			
MAINTENANCE						
	ANNUAL BIKE LOGO MAINTENANCE (5 years)	EA	110	$63.00	$6,930.00	
	ANNUAL THERMOPLASTIC LINE MAINTENANCE (5 years)	LF	111980	$0.11	$12,317.80	
	ANNUAL SIGN MAINTENANCE	EA	220	$5.50	$1,210.00	
	ANNUAL POST MAINTENANCE	EA	110	$7.60	$836.00	
	SUBTOTAL				**$21,293.80**	
	20% CONTINGENCY				**$4,258.76**	
	TOTAL				**$25,552.56**	
		SAY	**$26,000**			

***NOTE: PREFER INSTALLATION OF MARKINGS ON NEW OR RECENTLY COMPLETED RESURFACING. OTHERWISE, MAINTENANCE COSTS INCREASE**

Table V-2
City of Salem Bike Facility Costs
- Shared Roadways -

AUGUST 2009

PRELIMINARY
ENGINEERS ESTIMATE OF QUANTITIES
PROPOSED SHARED ROADWAYS - CITY OF SALEM, MASSACHUSETTS

PREPARED BY: FAY, SPOFFORD & THORNDIKE

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
REQUIRED					
	BICYCLE AND ARROW - PREFORMED THERMOPLASTIC	EA	280	$315.00	$88,200.00
	SIGN SUPPORT (NOT GUIDE) AND ROUTE MARKER W/1	EA	140	$76.00	$10,640.00
	STREET SIGN WITHOUT POST	EA	840	$55.00	$46,200.00
	SUBTOTAL				**$145,040.00**
	20% CONTINGENCY				**$29,008.00**
	TOTAL				**$174,048.00**
		SAY	**$175,000**		
MAINTENANCE					
	ANNUAL SHARROW MAINTENANCE	EA	280	$63.00	$17,640.00
	ANNUAL SIGN MAINTENANCE	EA	840	$5.50	$4,620.00
	ANNUAL POST MAINTENANCE	EA	140	$7.60	$1,064.00
	SUBTOTAL				**$23,324.00**
	20% CONTINGENCY				**$4,664.80**
	TOTAL				**$27,988.80**
		SAY	**$28,000**		

***NOTE:** **PREFER INSTALLATION OF MARKINGS ON NEW OR RECENTLY COMPLETED RESURFACING. OTHERWISE, MAINTENANCE COSTS INCREASE**

APPENDIX

HISTORY OF THE SALEM WOODS NATURE TRAIL IN HIGHLAND PARK

In 1976 a nature trail was built in Highland Park by Salem High School students directed by teacher Julia Yoshida with the assistance of Sally Ingalls, then Curator of Natural History at the Peabody Museum. Points of interest were marked on the trail and an accompanying self-guiding handbook was prepared. The Salem Girl Scouts repainted the original trail numbers in 1990.

In 1991 The Friends of Salem Woods reprinted a condensed version of the handbook along with a map prepared by Salem State College student Colleen Donahue, Julia Yoshida's drawings and an introduction written by Rob Moir, then Curator of Natural History at the Peabody Museum.

In 1993 Salem State College student Russ Almstrom and biology professor Alan Young more accurately determined the position of the trail, and a revised map was produced by Kym Pappathanasi of the Salem State College Digital Geography Laboratory. The Friends of Salem Woods constructed and installed a trailhead sign, marked new points of interest and trail junctions with cedar posts, and prepared a revised Trail Guide which again incorporated some of Julia Yoshida's drawings from the first handbook.

In 2005 & 2006 some sections of the trail were relocated to avoid badly eroded or wet areas, and a new short side loop trail was established. The main trail and long 1.6-mile loop comprise the "Yellow Trail" marked with yellow paint blazes that provides a 2.3-mile walk; a short side loop designated as the "Blue Trail" marked with blue blazes affords a shorter 3/4-mile walk. Boy Scouts re-painted the blazes in 2006. Side trails are not marked with blazes.

In 2007 Salem State College geography graduate student Jennifer Sumael and professor Marcos Luna created the most accurate map to date using GPS technology, and professor Alan Young revised the text portions of the Guide with assistance from Jeanne Stella. The result is this new full-color Trail Guide.

The Friends of Salem Woods encourage you to enjoy and respect the beauty of this small remnant of the wilderness that once covered the North Shore region.

Please do not cut, pick, remove, or plant any wildflowers or other plants.

TRAIL GUIDE

START (Trailhead Sign)

1: Next to the trail by the small swamp on the left grows Poison Ivy (3 leaves) climbing a Willow tree. Jewelweed growing next to the Poison Ivy is said to relieve its itch. The vine to the right of the tree is Virginia Creeper or Five-leaved Ivy, whose foul-tasting berries are important food source for birds, but whose leaves, which contain oxalic acid, may produce a burning, itching rash and blisters in people who are allergic. Sensitive Fern grows throughout the swamp and is so-named because it wilts soon after being picked. Another common small plant in this swamp is Horsetail, a descendant of tree-sized specimens during the age of dinosaurs. This is a good area to spot House Wrens, Gray Catbirds, Woodpeckers, and frogs.

2: Just the swamp, there is a large, overhanging Winged Euonymus and several more along the left side of the trail. This species, whose stems have ridges or "wings" along their length, is native to Asia but is often used locally for landscaping (sold as Burn- ing Bush. On the right side of the trail, note the stand of Star-Flowered Solomon's Seal, which re-sprouts readily from underground rhizomes after a fire, and the common Hayscented Fern (look for sori or spore clusters on the undersides of fronds). Right next to the trail is a Bigtooth Aspen tree, whose leaves turn bright yellow in the fall, and behind it is a Tupelo or Sourgum tree, whose leaves turn bright red.

3: To the right of the boardwalk is a Cattail marsh that is being overtaken by invasive Purple Loosestrife and Red Maples. Try to spot Red-Winged Blackbirds, and listen for Tree Frogs and Spring Peepers. This is also a good location to see Eastern Screech-Owls in pre-dawn hours. Highbush Blueberry and Sweet Pepperbush are common along the trail after the boardwalk.

4: At end of a very short side trail on the right are several characteristic wetland fern species -- Marsh, Sensitive, Cinnamon, and Royal, in addition to Arrowwood Viburnum, and Red Maples, whose leaves turn red in the fall. On the left side of the main trail, growing on the site of 1975 forest fire, is a clonal colony of Poplar or Quaking Aspen, whose leaves quake or tremble in even the slightest breeze.

FIRST BRIDGE: Common plants include Creeping Buttercup, Wild Iris, Golden Ragwort, and Skunk Cabbage, whose flowers are able to sprout in the early spring by generating heat to thaw the frozen ground. The unpleasant smell of the leaves attracts insects that pollinate the flowers.

Just after the first stream crossing is the beginning of the 0.3-mile side loop "Blue Trail" for a 3/4 mile total walk. The main "Yellow Trail" continues straight ahead. Along the Blue Trail are a large stand of club moss and a patch of Greenbrier (see Yellow Trail sites 8 and 10 for more information on these species).

SECOND BRIDGE: Joe Pye-weed, Boneset, and Purple-Flowering Raspberry grow here.

5: There is a short side trail on the left to golf hole #5 tee. As you climb "Bittersweet Hill" on the main trail, note the invasive Asiatic Bittersweet vines covering and smothering the trees, and another Winged Euonymus on the right side of the trail.

6: Opposite a large boulder with the number "10" (an earlier site designation) is where the long Yellow Trail loop returns. Two ferns, Common Polypody and a hybrid Woodfern grow on the hillside. In this area grows False Solomon's Seal, with reputed medicinal value; Cranberry Viburnum, whose white flowers in the summer become scarlet red berries in the fall, and Barberry, with its three-spined thorn-leaves. Chipmunks are common in this area.

At the "T" intersection, the Yellow Trail proceeds to the LEFT. The ¼-mile trail to the right is badly eroded but rejoins the Yellow Trail after site 18 if you want a shorter (1.3 mile) walk.

7: As you climb the hill, note the much drier, upland soil and associated plant species, including trees such as Black and White Oaks, White Pine (with needles in bundles of 5), Eastern Red Cedar (which is actually a Juniper, not a Cedar), and Black Cherry; and low-growing plants such as Lowbush Blueberry, Canada Mayflower (Wild or False Lily-of-the-Valley), and Common Cinquefoil (related to the strawberry). On the large "Lichen Rock" at the top of the hill are a variety of lichens, which grow very slowly and can live in seemingly inhospitable places but are susceptible to air pollution. Field Hawkweed, with flowers that resemble dandelions on long hairy stems, and Dyer's Greenweed. with dark shiny leaves and yellow flowers, also grow here. The latter plant was brought over from England in 1628 by Governor John Endicott at the request of our first settlers, who needed the flowers to dye their wool and flax. There is a large expanse of primitive common moss on the right side of the trail. Maple, whose leaves turn red in the fall.

8: As you descend from this high ground there is an even more ancient plant, the small, low-growing clubmoss, Lycopodium (known locally as Princess Pine), a remnant species of the plants which, like Horsetails, grew to tree size during the Carboniferous Period some 300 million years ago, and were main contributors to the coal deposits we have today.

9: To the right is a high cliff face with a variety of plants growing out of the crevices, including Common or Rock Polypody, mosses, and small trees (whose expanding roots, together with freezing water in the winter, enlarge the cracks and break chunks of rock off the cliff). Amid this rock debris at the base of the cliff grow several fern species, including Cinnamon, New York, and Marginal Woodfern. Ahead and to the left is a large grove of Paper Birch trees, whose leaves turn bright yellow in the fall.

Note: Trail ahead is steep and slippery when leaf or ice-covered.

At the top of the hill is a short trail to the left which provides a scenic overlook to the "Valley of the Birches." Due to erosion problems, the main trail has been relocated so that it proceeds to the right around the rocky outcrop.

10: On the hillside just before the "trip-trap" boardwalk, note the evergreen Common Greenbrier or Catbrier vines with their glossy, green, heart-shaped leaves and thorny stems, of great benefit as food and shelter to small mammals and birds, but rather an unpleasant experience for anyone who falls into such a brier patch. In Massachusetts, Greenbrier once was called "Biscuit Plant" because a juice obtained from the fresh roots was used to make bread. Flowers such as Bluets, Great-Spurred Violets, and Wild Irises, as well as Green Frogs, can be found in the wet areas near the boardwalk.

11: At the top of the hill beyond the boardwalk, note the native woody shrub, Staghorn Sumac, with its large fuzzy brownish-red fruits at the top. Although the leaves are similar in appearance to those of Poison Sumac, Staghorn Sumac is not poisonous and in fact belongs to a different genus than Poison Sumac and Poison Ivy.

A side trail to the left passes through a swampy area and ends at golf hole #3 green. In the swamp, a secondary side trail to the right leads to a nice overlook of Ducks Pond and continues to the railroad tracks.

A short distance past the side trail to the golf course, the main Yellow Trail veers left. The right fork is a 0.1-mile cutoff trail that rejoins the main trail after site 15, eliminating the 0.5-mile loop to the Thompson's Meadow overlook. The cutoff trail includes Pitch Pine and Black Cherry trees. Look for fox scat (droppings) in this area.

12: On the left side of the trail before crossing the stone wall property boundary, is a Mountain Ash with several rows of holes made by the Yellow-bellied Sapsucker, a medium-sized woodpecker which has a black head with a red crown and a yellow belly. When you cross the stone wall, which marks the eastern boundary of Highland Park, you will be on Salem Conservation land. Interestingly, the wall extends right through Ducks Pond visible to the left. It was built prior to the installation of the railroad tracks that blocked the flow of a stream, creating the pond. When the railroad tracks come into view, there are two side trails on the left 30 feet apart which lead to the tracks and, if you cross the tracks, to the Forest River trail.

13: Overlook of Thompson's Meadow (headwaters of the Forest River and owned by and secondary water source for Marblehead). Aggregate Industries / Lynn Sand & Stone on Swampscott Road is visible in the distance. Note the invasion into the marsh of the common reed, Phragmites. Look for Muskrats, Painted Turtles, Great Blue Herons, Wood Ducks, Canada Geese, and numerous other migratory bird species.

14: The high ground above the marsh is a nesting area for Snapping Turtles (look for bits of white eggshell left behind by hatchlings).

15: The very large Black Oak tree in the valley is estimated to be well over 100 years old and is believed to be the largest tree in Salem Woods.

Cutoff trail from before site 12 rejoins the main trail on the right.

16: Climbing the tree on the stream bank to the left is a large woody Poison Ivy vine that unfortunately was recently cut by someone. Poison Ivy flowers and produces berries only when it grows up a tree like this impressive specimen. All parts of Poison Ivy are toxic. Skunk Cabbage is prevalent in the swamp to the right.

17: Look for Bigtooth Aspen, Barberry, and Goldenrod along the trail.

18: The footings of a former Boy Scout tower are still visible. This is the highest point in Salem Woods (140 feet above sea level). The smokestacks of the power plant in Salem are visible to the northeast. On a clear day you can see over Swampscott to the Atlantic Ocean. Note the prevalence of small Pitch Pine trees (needles in bundles of 3), which can survive in dry, nutrient-poor, sandy conditions. The side trail to the southwest leads down to the Fafard condominium complex.

At a fork, the main Yellow Trail goes left. The badly eroded abandoned trail to the right leads through an old forest fire site, and rejoins the main trail between sites 6 and 7.

19: Shelf Fungi are common on fallen logs near the trail. Sphagnum moss, the ground cover in the wet areas to the left of the trail, is used by florists in wire baskets and was used to dress wounds during the Civil War, due to its ability to retain moisture.

At the next fork, the main Yellow Trail goes left. The right fork connects to the abandoned trail mentioned above.

The Blue Trail enters from the left on the high ground. The Yellow Trail descends and reconnects to the early part of the trail at site 6 near the boulder with the circled "10." You have completed the loop. Turn left to return to the trailhead sign at the START of the trail.

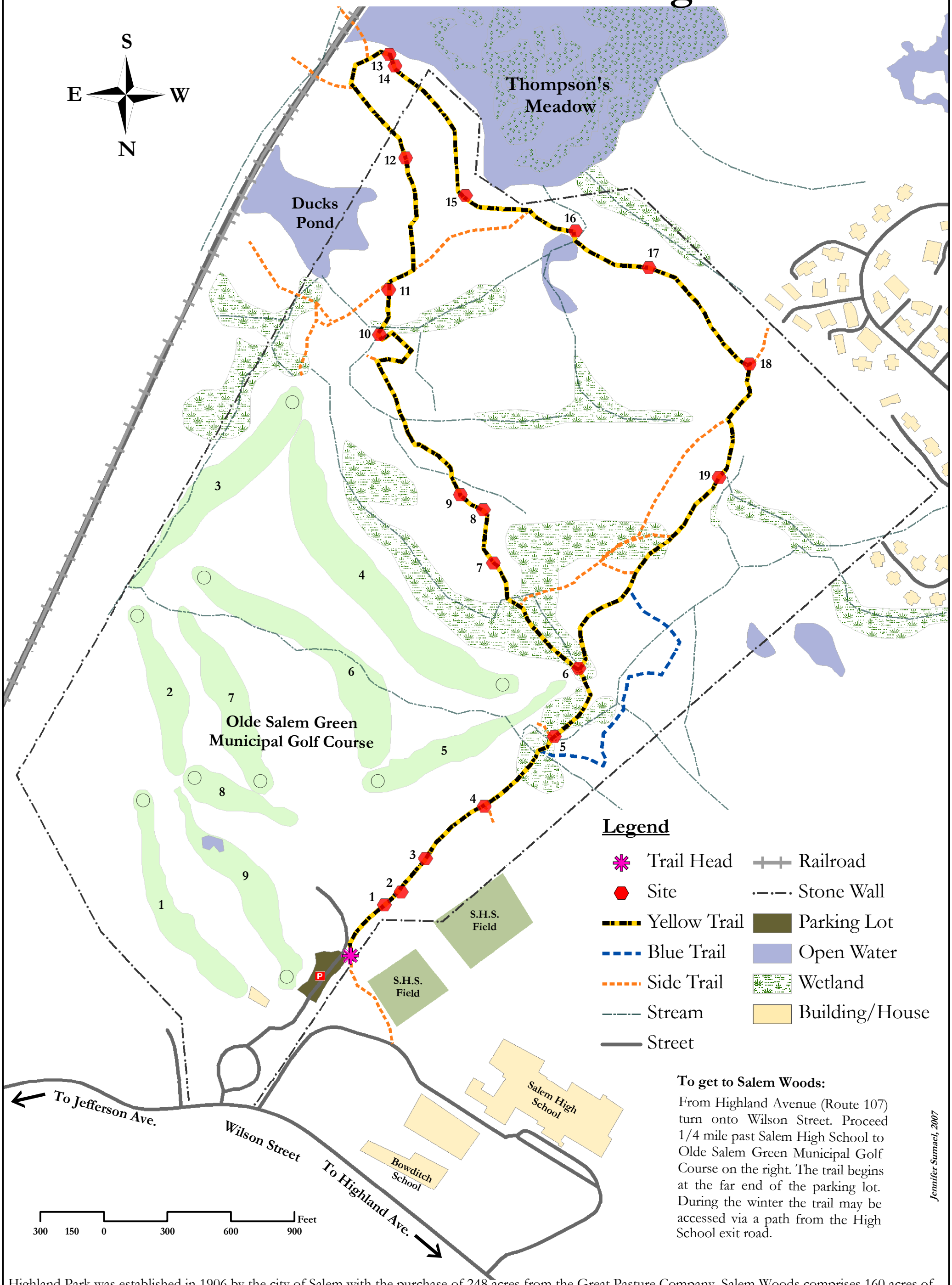
~End~

Salem Woods Nature Trail in Highland Park

Trail Guide

The Friends of Salem Woods
203 Washington Street
Suite 158
Salem, MA 01970

Salem Woods Nature Trail in Highland Park



To get to Salem Woods:

From Highland Avenue (Route 107) turn onto Wilson Street. Proceed 1/4 mile past Salem High School to Olde Salem Green Municipal Golf Course on the right. The trail begins at the far end of the parking lot. During the winter the trail may be accessed via a path from the High School exit road.

Jennifer Sumael, 2007

Highland Park was established in 1906 by the city of Salem with the purchase of 248 acres from the Great Pasture Company. Salem Woods comprises 160 acres of diverse uplands, freshwater marshes, open fields, and running water. In combination with the Forest River Conservation Area and the 70-acre Thompson's Meadow marsh, this complex ecosystem is host and home to more than 150 species of birds, dozens of mammals, reptiles, and amphibians, as well as countless varieties of plants, flowers, trees and shrubs. The Forest and South rivers flow out of this woods and wetlands into the Salem Sound.

During your visit to this urban greenspace we ask that you respect its fragility by staying on the established trails, treat all of its inhabitants with kindness and leave its beauty intact and unmarred.

The Friends of Salem Woods in cooperation with the City of Salem Department of Parks and Recreation.