Bike Providence:
A Bicycling Master Plan for Providence

SUBMITTED TO **City of Providence Department of Planning and Development**

SUBMITTED BY

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1.0 Purpose of Master Plan

1.1 Existing Plan

In the late 1990's, the City of Providence identified bicycling as an important component of improving transportation and mobility options in the city, prompting the *Providence Bicycle Network* plan. The implementation of Phase I of the *Network* plan consisted of installing standard green MUTCD Bike Route signs with destination information and directional arrow plaques on selected roadways. The intent was to establish signed bike routes to and from the center of downtown Providence from/to surrounding communities and/or regional off-road shared-use paths that terminated just outside city limits.

While these improvements did provide some improved bike accommodations, the City found that initiatives beyond signing existing roadways as bike routes are needed to increase the numbers of residents that ride bicycles. Additionally, elements beyond infrastructure improvements are needed to have bicycling accepted as a safe, efficient and practical transportation option for all residents and visitors.

1.2 The Need to Update the Plan

The 2010 report, *The Providence Campaign for Active Transportation*, noted that Providence is a car-dominated city. The 2006 Census Bureau American Community Survey (ACS) found that 63% of commuters drove to work, 16% carpooled, 8% used public transportation, 6% walked, and less than 1% used other means (bicycles). While the 2011 ACS found the cycling number had doubled to 2%, reliance on the automobile still dominates as the primary means of transportation in the city. Nationally, the 2010 *National Bicycling and Walking Study: 15-Year Status Report* and the *2009 National Household Travel Survey (NHTS)* found that while bicycling trips had doubled since 1990, still only 1% of all trips were taken by bike.

Despite the low numbers for mode share (or transportation choice), support for bicycling and walking has grown due to the recognition of the numerous benefits of these modes. The health benefits include reduced risk of heart disease, stroke, diabetes, and other chronic diseases, and lower health care costs. The Alliance for Biking and Walking *2012 Benchmarking Report* found that states with the lowest levels of biking and walking to work had the highest levels of obesity.

Transportation benefits in the city of Providence could be realized from increased bicycle use by reducing the number of car trips in the City. Given the City's relatively small geographic size, the distances from residential neighborhoods to business districts and schools are easily covered by a bicycle. Providence Station also provides access to the AMTRAK Northeast Corridor and MBTA commuter rail trains connecting north to Boston and south to T.F. Green Airport and Wickford Junction.

From an economic standpoint, the cost of car ownership can account for 18% of a typical household's income according to the AAA's *Your Driving Costs 2009* compared to the $120 per year for bicycle operation as calculated by the League of American Bicyclists. Bicycling can provide options for those who cannot afford car ownership or transit passes.

1.3 Plan Approach

Active Living Research (ALS), a national program of the Robert Wood Foundation, researched strategies to increase the levels of cycling in cities (*How to Increase Bicycling for Daily Travel, May* 2013). The research found that the level of bicycling in a city is strongly associated with the extent of bicycling infrastructure; however, it is less clear what type of infrastructure is most effective at increasing bicycling for daily travel. ALS also found that educational and marketing (or encouragement) programs can also affect the levels of bicycling. Further, the ALS research found that a broad front approach consisting of bicycle infrastructure, programs and policies that support cycling can significantly increase levels of daily travel bicycling. The research showed…*the most compelling evidence comes from communities that have implemented a fully integrated package of strategies to increase bicycling. The evidence reviewed …suggests that a comprehensive approach produces a much greater impact on bicycling than individual measures that are not coordinated."*

The Providence plan will use a comprehensive approach to identify those strategies. Of course, additional bicycle infrastructure improvements are needed throughout the City. This infrastructure, combined with education, encouragement, enforcement, and evaluation (the "5E's"), will be the backbone for the continued development of a complete bicycle network, as well as providing implementation strategies that encourage cycling. The Plan is intended to be a "living" document that can be adapted to changing conditions while guiding decisions for improving bicycle accommodation. As noted in the City's Request for Proposals, *"A bike plan can no longer be solely about signing and striping bike lanes and bike routes."*

Figures showing current design treatments, network conditions and proposed low-cost, mid-cost and higher-cost conditions are placed in the Appendices to facilitate periodic updating.

2.0 Plan Objectives and Goals

The purpose of the Bike Providence Master Plan is to provide the framework to identify, prioritize and implement bicycle facilities in the City of Providence. All new developments and redevelopments are encouraged to follow the recommendations of the Plan, in addition to requirements set forth by other federal, state, and local regulations. It is anticipated that the plan will be used primarily by the City's agencies (including the Department of Planning & Development, Department of Public Works and Mayor's Office of Sustainability, among others) as a guide to developing bicycle facilities in concert with other City development and/or maintenance projects.

2.1 Objectives

The objectives of this plan are to build on the successes of the existing plan, while

- Creating a lasting bicycle transportation program that includes engineering (and planning), education, encouragement, and enforcement components.
- Addressing the needs of all ages, abilities, and skill levels.
- Guiding the City to improve the existing bicycle system in order to expand bicycle travel throughout the community.
- Identifying connections that will fill gaps in the existing system and connect to other modes of transit.
- Prioritizing the next layer of convenient and attractive on-road and off-road facilities for bicycling to important nodes and destinations.
- Addressing maintenance needs.
- Developing consistency with current and future plans for bicycle facilities in adjacent communities.
- Providing opportunities for continuous public input.

2.2 Goals

The goals for each of the 5E's are:

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2.2.1 Engineering

- Expand the existing bicycle infrastructure for every level of cyclist by constructing a comprehensive network consisting of shared-use paths, cycle tracks, bike lanes, paved shoulders, marked shared lanes, shared lanes, and bicycle parking facilities.
- Include consideration of bicycle accommodation in all projects.
- Update City design standards to include current best practices and emerging national standards and guidance.

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2.2.2 Education

- Educate motorists and cyclists on the rules of the road and cyclists' rights to utilize a public way in a lawful manner.
- Debunk the perception that bicycling is a dangerous activity.

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2.2.3 Encouragement

- Promote the benefits of daily bicycle travel.
- Promote the use of existing facilities.
- Increase participation via special events, outreach and media coverage.

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2.2.4 Enforcement

- Improve driver and bicyclist behavior by creating a culture in which both motorists and bicyclists understand the traffic rules apply to everyone.

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2.2.5 Evaluation

- Set defined measurable goals and conduct a periodic "checkup" on the progress toward achieving them.

2.3 Public Input

Public input on existing conditions and suggestions for improvements were solicited via a Public Workshop held on December 13, 2012. Additionally, a project website was set up (www.vhb.com/bikeprovidence) and a Facebook page opened (https://www.facebook.com/BikeProv). Comments from the Bicycle Pedestrian Advisory Commission (BPAC) and Project Steering Committee were also incorporated into the plan.

3.0 Bikeway Planning and Design

3.1 Laws, Regulations & Policies

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3.1.1 Current Laws and Policies

US Department of Transportation Policy- In March 2010, the US Department of Transportation (DOT) provided a Policy Statement to reflect the DOT's support for the development of fully integrated active transportation networks. The statement noted that it is the DOT policy to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every Transportation agency, including state level Departments of Transportation, have the responsibility to improve conditions and opportunities for walking and bicycling, and to integrate walking and bicycling into their transportation systems. The DOT policy is based on various sections of the US Code and Code of Federal Regulations in Title 23-Highways, Title 49-Transportation and Title 42-The Public Health and Welfare.

3.1.1.1 Rhode Island General Laws

RI General Law Chapter 31-19 "Operation of Bicycles" grants every person riding an electric personal assistive mobility device ("EPAMD"), riding an electric motorized bicycle, or propelling a vehicle by human power, all of the rights and all of the duties applicable to the driver of any other vehicle. Additional laws covering operation of bicycles on sidewalks and crosswalks, turning maneuvers, parking, and required equipment are also covered in Chapter 31-19. RI General Laws regarding bike lanes are also covered in Chapter 31. As in every state, laws are subject to change. The Rhode Island Department of Transportation (RIDOT) maintains a website which includes links to the status of RI General Laws, safe riding tips, bicycle facility maps, and status of construction on RI bikeways http://www.dot.ri.gov/bikeri/index.asp.

R.I. General Law Section 31-13-3 permits municipalities to install traffic control devices (TCD's) such as markings, signs and signals on roadways under local jurisdiction, provided they conform to the RI state standard, which is the Manual on Uniform Traffic Control Devices (MUTCD) (see below).

3.2 Design Standards and References

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3.2.1 Current Standards and References

Advances in the bikeway design standards and reference are expanding at an ever increasing rate. At the time of this report (September 2013), a multi-office Federal Highway Administration (FHWA) Workgroup is implementing several initiatives to improve safety and accommodations for pedestrians and bicyclists. The FHWA Workgroup will conduct research, enlist contractor support, leverage cooperative agreements, and partner with stakeholders in order to accomplish the following:

- Synthesize and provide information and outreach about design flexibility.
- Describe the Manual on Uniform Traffic Control Devices experimentation process, projects being evaluated, and the schedule for updating the Manual.
- Develop cycle tracks planning and design information through case studies and a research project. (Refer to Section 3.3.2. for definition of cycle track)
- Develop case studies for improving pedestrian and bicyclist safety and accommodation with a focus on intersections, bike signals and boxes, and appropriate designs for various street contexts.
- Revise and update regulations relating to pedestrians and bicyclists.
- Promote the Department of Justice/Department of Transportation Joint Technical Assistance on the Title II of the Americans with Disabilities Act Requirements to Provide Curb Ramps when Streets, Roads, or Highways are Altered through Resurfacing, released by the U.S. Department of Justice and FHWA on June 28, 2013.

The following is a summary of the current (as of September 2013) national and state accepted standards and references. However, it is noted that these standards and references may be updated and revised in the near future. The applicable websites noted below should be reviewed on a regular basis to verify the status of these references.

3.2.1.1 AASHTO Guide for the Development of Bicycle Facilities 2012 Fourth Edition

The intent of the American Association of State Highway Transportation Officials (AASHTO) Guide *is "… to provide guidance to designers and planners by referencing a recommended range of design values and describing alternative design approaches. Good Design practice involves engineering cost-effective solutions that balance safety and mobility for all transportation modes….This guide is therefore not intended to be a detailed design or traffic engineering manual that could supersede the need for application of sound principles by the knowledgeable design or traffic engineering professional."*

The Guide provides information on bicycle planning, operation and safety, and guidance on design of on-road bikeways, off-road shared-use paths and bicycle parking as well as maintenance of bicycle facilities. Hardcopies of the Guide are available for purchase from the AASHTO on-line bookstore.

3.2.1.1 Manual on Uniform Traffic Control Devices 2009 Edition (MUTCD)

Traffic control devices (TCDs) for both on-road and off-road bikeways are defined in the *Manual on Uniform Traffic Control Devices 2009 Edition*. The Manual is the national and Rhode Island state standard for the signs, markings and signals installed on our streets and bikeways. Part 9 of the Manual details devices specifically related to bicycle facilities. FHWA has issued two (2) revisions to the 2009 edition; the latest dated May 2012, available as a PDF free-of-charge at http://mutcd.fhwa.dot.gov

FHWA also periodically issues Interim Approvals allowing the interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the MUTCD.

As noted above, R.I. General Law Section 31-13-3 permits municipalities to install TCDs on roadways under local jurisdiction provided they conform to the RI state standard which is the MUTCD. Permission to use non-standard "experimental" TCDs can be obtained from the Federal Highway Administration (FHWA) and RI State Traffic Commission (STC). The process is outlined in Part 1 of the MUTCD.

FHWA maintains a website with links to PDF versions of the current Manual and latest revisions, Interim Approvals and examples of experimental TCDs currently under evaluation at http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm

3.2.1.2 Standard Highway Signs and Markings (SHSM) 2012 Supplement, FHWA

The new edition contains the details for all signs and pavement markings in the 2009 MUTCD, expanded sign design guidelines, and details for symbolic traffic and lane-control signal indications. It is available as a PDF free of charge at the FHWA website noted above.

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3.2.2 Emerging Design Guides and References

The following publications provide useful guidance and options for construction of bikeways particularly at intersections:

- *Institute of Transportation Engineers (ITE) Traffic Control Devices Handbook, 2nd Edition* has an expanded chapter on TCD's related to bikeways. Chapter 14, *Bicycle Facilities,* contains expanded discussions regarding the installation of bicycle related TCD's. The Handbook is available for purchase from the ITE on-line bookstore.

  Complete Streets Initiatives – The Complete Streets program seeks to implement bicycle transportation systems in US cities. These initiatives are part of a national movement to provide equal consideration for all modes of transportation. As such, planners, designers and bicycling advocates are looking for new and innovative ideas to make our streets and neighborhoods more welcoming to cyclists. Additional information on Complete Streets design can be found at http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/resources

- *NACTO Urban Bikeway Design Guide 2nd Edition (UBDG)* contains easy to understand graphics and dimensions for various emerging design treatments particularly at intersections. The Guide is available for purchase from NACTO on-line.

- *CROW Design manual for bicycle traffic 2007* – CROW is the Netherlands' national information and technology platform for infrastructure, traffic, transport and public space. The manual is intended as a guide that provides designers standards and guidance to make the bicycle a fully-fledged participant in the traffic and transport system. The CROW manual is available for purchase on-line.

- *APBP Bicycle Parking Guidelines, 2nd Edition, 2010* is produced by the Association of Pedestrian and Bicycle Professionals and contains best practices for planning and design of short and long-term bicycle parking. The Guidelines are available for purchase from APBP on-line.

Note that while these publications contain useful information and guidance, they have not been accepted as standards by any state level transportation department or the FHWA. Numerous design treatments from the Netherlands have been implemented on an experimental basis in the US and are showing promise of operational and safety benefits. Differences in driver and cyclist education/licensing, enforcement and traffic/vehicle laws are also a factor in the effectiveness of the European designs. One should not expect the same results in the

US from these treatments until our national bicycling education and enforcement components are correspondingly improved.

Several treatments have shown promise of operational and safety benefits under some conditions. However, studies of some installations have shown a tendency to increase the likelihood of a crash under certain conditions. If the City feels a non-standard treatment will provide benefits, then the process to obtain permission from FHWA (as noted above) should be followed.

Also, FHWA maintains a website on the status of various emerging bicycle facility design treatments and examples of current experiments using non-standard devices at http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm

3.3 Definition of Facility Types

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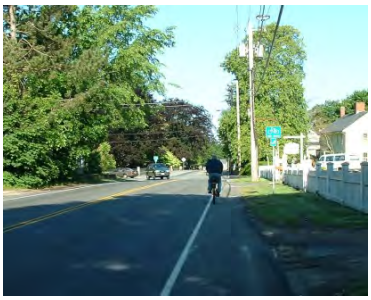
3.3.1 Current Facility Types

The AASHTO Guide defines a bikeway as any road, street, path, or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for exclusive use of bicycle or are to be shared with other transportation modes. The AASHTO Guide describes six (6) types of bikeway facilities:

- **Shared Lanes** – On-road bikeways on roadways where bicycles may be operated unless prohibited by statue or regulation. Usually bicycles and motor vehicles share the same travel lane.
- **Marked Shared Lane** – A shared lane marked with Shared Lane Markings (SLMs) or "Sharrows." The marking is intended to assist bicyclists with lateral positioning in a shared travel lane. The marking also encourages bicyclists to ride outside of the door zone of parked cars and to discourage wrong way riding. The marking also alerts road users to the lateral position bicyclists are likely to occupy in the travelled way.

Minimum offset from the face of curb or pavement edge to the center of the SLM is 4 feet without on-street parking and 12 feet with on-street parking. SLMs can be used to connect short gaps between sections of bike lanes. SLMs can also be used in a right-turn only lane to assist bicyclists traveling straight through an intersection. Note that the MUTCD prohibits the use of SLMs in bike lanes or marked shoulders. As per the Standards and guidance contained in the MUTCD, SLMs should not be used on roadways with speeds greater than 35 mph. However, it is recommended the City refer to the guidance in the ITE TCD Handbook for additional information on the placement of SLMs. Refer to **Figure 1** in the attached appendix for details and typical section of marked shared lane bikeways.

- **Paved Shoulders** – A shoulder is the portion of the roadway contiguous with the travelled way that accommodates stopped vehicles, emergency use and support of the roadway pavement. The AASHTO Guide notes that a shoulder should be at least 4 feet wide to be considered a suitable width for bicycle travel.



Paved Shoulder Bikeway

- **Bike Lanes** – A portion of the roadway designated for preferential or exclusive use by bicyclists by pavement markings and signs. Bike lanes are typically located on the right side of the roadway but can be located along the left side of one-way streets. Bike lanes that allow bicycle travel against traffic flow on one-way streets (known as contra-flow bike lanes) can also be installed with appropriate signage and markings. Bike lanes may be adjacent to travel lanes or separated by a striped buffer. Cyclists in a bike lane adjacent to on-street parking are typically riding in the "door zone" of parked vehicles. For this reason it is recommended that a striped buffer be installed between the bike lane and parking lane. The layout of bike lanes on the approach to intersections is critical to encouraging predictable and consistent operation by both motorists and bicyclists. Bike lanes can be extended up to the STOP line or ended some distance before the STOP line. Factors such as the speed, total volume and turning volume of both motor vehicles and bicycles should be considered when evaluating the bike lane approach to an intersection. The MUTCD prohibits installation of a bike lane on

Buffered Bike Lane

Standard Bike Lane

Buffered Bike Lane

the right side of a right-turn only lane. Typical treatments are shown in the AASHTO Guide, MUTCD, ITE Handbook and NACTO UBDG. Also refer to **Figure 2** in the appendix for details and typical sections of bike lanes.

- **Shared Use Paths** – An off-road facility physically separated from motorized vehicular traffic by an open space or barrier. Shared-use paths can be used by pedestrians (including skaters, wheelchairs and joggers). Standards and guidance for the design of shared use paths are contained in the AASHTO Guide and MUTCD.


Shared Use Path

- **Bicycle Boulevards** – A local street or series of contiguous street segments that have been modified to function as a through way for cyclists, while discouraging through motor vehicle traffic.

A table of the general conditions and guidance for the installation of each type of bikeway as per the AASHTO Guide is included in the Appendix.

Signed bicycle routes are not a type of facility because they represent a designation rather than a facility type. A bicycle route can consist of a combination of facility types. Standards and guidance for the signing of bike routes are contained in the AASHTO Guide and MUTCD.

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3.3.2 Emerging Facility Designs


Street level cycle track,
9th Avenue, New York City


Sidewalk level cycle track
Binney St., Cambridge, MA

- **Cycle Tracks** –A cycle track is physically separated from motor vehicle traffic travel lanes and parking lanes, and distinct from sidewalks. Unlike a shared-use path, cycle tracks are intended for exclusive use of bicyclists. Cycle tracks can be one-way or two-way and can be at street level, sidewalk level or at an intermediate level between the street and sidewalk. Cycle track installations in numerous cities throughout the US have shown an increase in the number of cyclists on that specific roadway corridor. The likelihood of vehicle/bike collisions on the roadway is obviously decreased by the physical separation of motor vehicles and bicycles; however, experience has shown that crashes of vehicle/bike, pedestrian/bike and bike/bike can increase at intersections. Reports from Europe (*Bicycle Tracks and Lanes: a Before –After Study, S. U. Jensen Traftec ApS, Denmark August 2007* and *Endangerment of Pedestrians and Bicyclists at Intersections by Right Turning Trucks, Niewoehner (DEKRA), Berg (DEKRA), DEKRA Automobil GmbH Paper Number 05-344*) indicate that designs that ended the cycle track some distance before the intersection experienced less crashes than those designs that kept cyclists completely separated up to the stop line. Recommended treatments at intersections include transitioning the cycle track to a bike lane prior to the intersection, eliminating on-street parking to increase sight distances and visibility of cyclists, and, in some cases, installation of


Bicycle box

bicycle-specific traffic signals. Guidance for the design of cycle tracks is included in the NACTO UBDG and the CROW Manual.

Other emerging designs include treatments at intersections such as bike boxes and bicycle-specific traffic signals. Bike boxes create a space in front of one or more traffic lanes, but outside of pedestrian crosswalks, for bicyclists to wait for a green signal ahead of queuing motorists. The bike box can improve bicyclist visibility; provide a start ahead of vehicle traffic to reduce conflicts with turning vehicles and crossing pedestrians. As of the date of this report, bike boxs have been installed in several locations around the US and have shown promise of operational benefits; however, increased bike crashes have occurred at intersections with steep roadway grades.

As previously noted, as of September 2013, FHWA is evaluating existing installations and seeking to develop appropriate standards for their design. However, at the time of this report, bike boxes and bicycle-specific signals are still considered experimental and require approval from FHWA under the experimental process outlined in the MTUCD. The FHWA website previously mentioned should be checked periodically to verify the status of these emerging designs.

4.0 Engineering

4.1 Existing Conditions

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4.1.1 Inventory of Existing Bikeways

In 2007 the City established a network of signed bicycle routes on existing City roadways. The Phase I improvements sought to establish routes on major roadways that radiated out from the center of downtown Providence. The standard green and white "Bike Route" sign was supplemented with destination and arrow plaques noting direction of the intended destination such as "Downtown" or a neighboring community (Pawtucket). Directional information was also provided to existing off-road shared-use paths that terminate at the city outskirts. A Phase II was intended to provide additional signed routes that would circumvent the City center, crossing through the surrounding City neighborhoods. The Phase II signs were not installed.

The inventory of existing bikeways in the City as of October 2012 is listed in Table 1 below.

Table 1: Inventory Facilities by Type

Miles	Type
24.3 Miles	Shared Lanes, Marked Shared Lanes, and Paved Shoulders (Phase 1 Routes)
10.8 Miles	Bike Lanes (Blackstone Boulevard, Allens Avenue, Broadway)
3.0 Miles	Shared Use Paths (Woonasquatucket River Greenway)
38.1 Miles	Total Existing Bikeways

The current bike network and roadway system are shown on Figure 3 (Current Bike Network October 2012) in the attached appendix.

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4.1.2 Inventory of Existing Informal Bikeways

Bicyclists many times will develop their own individual "bikeways" for a variety of purposes regardless of whether it is an "official" bikeway or not. Their route choices may depend on intended destination, directness to that destination, grade or terrain,

traffic volume and speed, pavement surface condition, lighting (for riding during periods of darkness), and personal security. Often, information about these routes is shared only in the close-knit world of urban cyclists. Obtaining information on these informal routes could provide valuable guidance in the City's decisions regarding which roadways to officially designate as part of the bike network.

To aid in obtaining this route information, a mobile smart phone app was deployed in January 2013. *VHB Bikeways* is a free iPhone or android application that uses a smart phone's GPS capability to log a cyclist's route when riding. The app also allows the cyclist to input additional information such as trip purpose and any comment the user wishes to provide. The GPS coordinates of each route can then be plotted on the City's GIS database roadway network map. The information can also be used to determine the number of trips along each roadway, providing some indication of cyclists' preference to use that roadway on a regular basis. The app is available at (http://www.vhb.com/bikeprovidence/app.asp).

The app does have some limitations, as it requires the user to have a phone with GPS capability and the discipline to use the app on regular basis. Review of the logged routes for the period January to the end of May 2013 showed few routes in January and February of 2013 probably due to the unusually large number of winter storms in the winter of 2012-2013. Activity did show a marked increase in March and April with a subsequent drop-off in May. It is suspected that the end of college classes contributed to the drop in the number of logged trips. Refer to **Figure 4** and **Figure 5** in the attached appendix for maps of the logged routes.

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4.1.3 Reported Bicycle Crashes

Crash data involving bicycles was obtained from the Providence Police Department and the RIDOT statewide crash database for the three-(3) year period from 2008 to 2010. Results are tabulated below.

Table 2: Bicycle Crashes 2008 to 2010

Bicycle Crashes by Type	
Complaints	109
Bruising/Bleeding	34
Incapacitating	18
Property Damage	14
Fatalities	0
Total	**175**

Bicycle Crashes on Designated Bikeways/Routes	
Woonasquatucket Greenway	4
Blackstone River Bikeway	5
Bike Lane Roads	16
Phase 1 Bike Routes	31
Total	**83**

There are no recorded bicycle crash fatalities within the recorded three (3) periods. Crash locations are shown on **Figure 6** (Traffic Stress Map October 2012) in the attached appendix.

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4.1.4 Ongoing Bicycle Related Projects

4.1.4.1 Ongoing Planning Projects

The following projects are bicycle-related or have major bicycle facility components and are currently in the planning phase:

- Olneyville Circulator
- Kennedy Plaza
- I-195 Corridor Reuse
- Route 6/Route 10 Connector
- Thayer Street Corridor Study

4.1.4.2 Ongoing Design Projects

The following projects are bicycle related or have major bicycle facility components and are currently in the final design stages:

Blackstone River Bikeway Segment 1 from India Point Park to Richmond Square

The bikeway will consist of an off-road path along the bank of the Seekonk River. A portion is being constructed as part of the Providence Parks Department East Transit Street Boat Ramp. The Bikeway design has been coordinated with the proposed Narragansett Bay Commission Abatement project also proposed along the Seekonk River. The Bikeway will be constructed along a portion of the NBC easement. Final design and environmental permitting will commence in later 2013 with construction in 2015.

Woonasquatucket River Greenway/Pleasant Valley Parkway/Dean Street Bridge

RIDOT currently has the reconstruction of this bridge over the Woonasquatucket River under design. The bridge provides a vital connection from the northwest neighborhoods of the city to Providence Place and Federal Hill neighborhood and is

a main route for access to and from the Route 6/Route 10 connector. The Greenway route crosses Pleasant Valley Parkway along the Promenade and Providence Place. The Greenway is currently designated as a bike lane facility from Eagle Square to Providence Place Mall. RIDOT, the City and the Woonasquatucket River Watershed Council (WRWC) have agreed to convert the Greenway to an off-road facility from Eagle Square to Providence Place Mall. The bridge design has been modified to accommodate future conversion. Construction of the bridge is expected to commence in 2014 and extend to 2016. Greenway design and construction could commence shortly thereafter.

Downtown Circulation Improvements Phase 3

The City has continued to implement traffic circulation improvements on downtown streets. Phase 3 improvements will include resurfacing, minor roadway widening/narrowing, sidewalk improvements, traffic signal improvements, and converting several one-way roadways to two-way roadways. Bicycle accommodation improvements are being incorporated into the project.

Providence Station Surface Improvements

The Providence Train Station (PVD) is the 18th largest AMTRAK station in terms of annual passenger volume in the US. Additionally, a substantial number of Massachusetts Bay Transportation Authority (MBTA) passengers use the station on a daily basis. RIDOT has undertaken design to improve the surface conditions (pavement surfaces and ADA accommodation) and intermodal connections at the Station. These improvements will include replacement of deteriorated walking surfaces, additional security measures, new planters and landscaping, better connections for taxi and RIPTA access, and expanded bicycle parking.

Exchange Street Bus Livability

The intent of this project is to better promote a multi-modal environment for pedestrians, cyclists and users of RIPTA buses and trolleys. The objectives for site improvements include construction of ADA-compliant sidewalk, signal and crosswalk improvements, street furnishings, plantings, pavement graphics in the Exchange Street roadway, features complementary to the proposed new RIPTA bus shelter at the plaza south of Providence Station, and coordination of wayfinding signage (designed by others). A shared bus/bike lane is under consideration for this project.

RIPTA Rapid Bus Route (R-Line)

Access to multimodal facilities, such as major bus routes, is important to the development of a comprehensive bike plan for the City; however, a route with heavy bus traffic could compromise bicyclist comfort and safety.

RIPTA recently prepared a Conceptual Design Report (CDR) to serve as the framework for conceptual design plans and preliminary construction cost estimates

for proposed rapid bus signal priority and corridor improvements along two major RIPTA routes in Providence, Route 11 and Route 99. Route 11 extends from Kennedy Plaza along Fulton Street, Dorrance Street, Washington Street and Empire Street to Broad Street south to the Providence/Cranston city line. Route 99 extends from Kennedy Plaza north along Washington Street/Washington Place to North Main Street, then north to the RIPTA Transit Center in Pawtucket. Together these two routes carry a significant portion of the daily RIPTA passenger volume. The R-Line route is shown on **Figure 6** (Traffic Stress Map) in the appendix.

4.1.4.3 Ongoing Construction Projects

The following projects are bicycle-related or have major bicycle facility components and are under currently under construction:

Washington Bridge #200 Bicycle Pedestrian Conversion

Currently under construction by RIDOT, this project rehabilitates the remaining portion of the original Washington Bridge I-195 Bridge for a separated bicycle and pedestrian connection from the East Bay Bike Path to India Point Park. The Providence side is also the southern terminus of the Blackstone River Bikeway. Construction is projected to be finished by the end of 2014.

City-wide Street Paving program

As a result of a voter-approved bond referendum, the City DPW is embarking on a $40 million program to resurface 65 miles of city streets. The DPW has agreed to include shared lane markings and signage on designated roadways as part of the paving program. The paving program began in the summer of 2013 and is scheduled for completion in 2014. Refer to **Figure 7** (Bond Paving Map April 2013) in the attached appendix for a map of the city streets scheduled for resurfacing and associated bike network improvements.

Providence Viaduct

RIDOT has embarked on a multiphase project to replace the 50± year old Providence Viaduct, which carries I-95 over the Capital Center Interchange, the AMTRAK Northeast Corridor, the Woonasquatucket River Greenway and several city streets. The work will progress in multiple phases, some of which are still under design at the time of this report. It is anticipated that improved bicycle and pedestrian accommodation will be incorporated into the Woonasquatucket River Greenway connection to Providence Place Mall and the streets under the Viaduct.

4.2 Assessment of Existing Conditions

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4.2.1 Current Evaluation Tool-BLOS

In order to enhance a bicycle network and promote a bicycle-friendly community, potential users need to be identified. Several methods of correlating roadway conditions to bicycling compatibility exist. A popular method developed in recent years is the Bicycle Level of Service (BLOS) method. The BLOS measures bicycling compatibility (an on-road bicyclist's "comfort level") as a function of a roadway's geometry and traffic conditions. Factors considered include the number and width of travel lanes, presence (or not) of a paved shoulder or bike lane, traffic volume, posted speed, number of heavy vehicles, pavement condition, and presence of on-street parking. The BLOS model uses these factors to generate a number ranging from 1.50 (LOS A-high compatibility) to 6.0 (LOS F-extremely low compatibility). The BLOS method has two main drawbacks. First, to assess the City's roadway network for bicycle compatibility, the calculation has to be completed for every roadway in the City, which can be quite laborious. Second, it is based on the assumption that all cyclists will have the same level of comfort for any given roadway condition. For example, Broadway is a wide two-lane roadway on the west side of the City with bike lanes, high turnover on-street parking and an average daily traffic volume (ADT) of 24,000 vehicles per day. Dexter Street is a two-lane roadway without bike lanes but with lightly used on-street parking and an ADT of only 5600. Dexter Street, even without bike lanes, would obviously seem to be a roadway with much less "traffic stress" than Broadway, given the sparsely used on-street parking and much lower traffic volumes, yet the BLOS model yields a level of service A for both roadways.

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4.2.2 Level of Traffic Stress (LTS)

A recent study by the Mineta Transportation Institute (MTI), *Low-Stress Bicycle Network and Connectivity, MTI Report 11-19 May 2012)* proposed a new method of classification of bicycling conditions on roadways that allows for the assessment of bike routes and cyclists abilities simultaneously.

Unlike the BLOS method, the MTI Level of Traffic Stress (LTS) method uses available data to classify a roadway based on different levels of cyclist skill, experience and tolerance to cycling in traffic. Similar to the BLOS model, the volume and speed of traffic on a given roadway are primary factors. Roadway width also has considerable influence on the LTS, as a wider roadway usually has more lanes, complicated intersections and is also likely to have on-street parking, which can increase the stress a cyclist encounters along that corridor due to parking turnover and door zones.

The LTS rating system has four classification levels in terms that are easily understood:

- Level 1 – non-driving teens who are capable of riding on off-road shared-use paths and low speed/low volume (LS/LV) neighborhood streets, negotiating simple intersections.
- Level 2 – driving teens/adult casual cyclists capable of riding on off-road shared-use paths, LS/LV neighborhood streets and some collector roadways.
- Level 3 – adult cyclists tolerant to riding on off-road shared-use paths, collector roadways, and on arterial roadways with bike lanes.
- Level 4 – confident and experienced cyclists capable of riding on any roadway open to bicycle travel.

4.2.2.1 LTS Criteria

The City's Pavement Management Program includes a Geographic Information System (GIS) database that provides an inventory of existing roadway elements. These elements include roadway classification (neighborhood street, collector roadway, or arterial roadway), roadway width, presence of a bike lane, and ADT. Table 3 lists the specific metrics for each level. By filtering the City roadway database through these criteria, every roadway in the City's database can quickly and easily be classified into one of the four LTS levels as follows:

Table 3: Level of Traffic Stress (LTS) Criteria

	Residential Roadways	Collector Roadways	Arterial Roadways	Bike Lane Collectors	Bike Lane Arterials	Off-Road Paths
LTS 1	ADT<2000 width < 28 feet	XX	XX	XX	XX	All
LTS 2	ADT<4000 width < 32 feet	ADT<6000 width < 38 feet	XX	XX	XX	All
LTS 3	All residential	All Collector	ADT<10,000 width < 40 feet	All	XX	All
LTS 4	All residential	All Collectors	All arterials	All	All	All

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4.2.3 Network Gaps

The results of "filtering" the City's roadway network database through the LTS criteria levels are shown graphically in **Figure 6** (Traffic Stress Map, October 2012) in the attached appendix. Review of this figure shows that the majority of signed bike routes established as the Phase I improvements in 2007 are LTS 4 roadways. Thus, the current bike routes leading to/from downtown Providence and surrounding neighborhoods are generally suitable for experienced and confident cyclists. **Figure 6** also shows a citywide interconnected network of LTS 1 and LTS 2 roadways. These

networks are basically "islands" of bike-friendly roadways isolated by LTS 3and LTS 4 roadways and other barriers such as Interstate highways, limited access arterials, railroads, or natural barriers such as rivers. While there is much to be done to improve bicycle accommodation to and from the City's downtown core, Figure 6 shows that, with minor improvements, it is possible to travel by bicycle between the neighborhoods surrounding the downtown core using these LTS 1 and LTS 2 roadways.

Figure 3 (Current Bike Network) also shows gaps in connections to the regional bikeways leading into the City including the East Bay Bike Path, Cranston Washington Secondary Bike Path, the off-road section of the Woonasquatucket River Greenway, and the Blackstone River Bikeway. Connections to these regional paths require cyclists to negotiate LTS 3 and 4 roadways, which may be challenging to LTS 1 and 2 cyclists accustomed to riding on off-road paths.

4.3 Evaluation of Alternatives

The City of Providence dates its beginnings back to the initial European settlement of the eastern US. Many roadways have existed since those times. The roadways are narrow and the fronts of many existing buildings are located at the back of the sidewalk, leaving sidewalk widths at ADA minimums. These conditions do not provide many realistic opportunities to construct separated bikeways (bike lanes, cycle tracks or off-road shared-use paths) that require widening of existing roadways or relocation of on-street parking for significant lengths. Major transportation and/or redevelopment projects in the City can provide the opportunity to make large scale improvements to the cycling infrastructure, such as off-road shared-use paths, bike lanes or cycle tracks, but these major projects are usually very expensive and take years of permitting and approvals before construction can begin.

On the other hand, the density of the City's neighborhoods and their proximity to destinations mean bicycling distances are relatively short. Designating low-speed/low-volume neighborhood streets that are parallel to high-speed/low-volume roads, as on-road bikeways can provide routes for cyclists trying to reach the same destinations at vehicular traffic at a much lower cost. Bicycle boulevards take this one step further by creating a continuous route for cyclists, while limiting the through movement of vehicles.

Experience in the US has shown that most bicyclists prefer riding on separated bikeways such as bike lanes, cycle tracks or off-road, shared-use paths because of the universal perception that bicycling in traffic is dangerous. As a result, communities are faced with a decision: should they prioritize the construction of separated facilities that are expensive and difficult to implement but are popular with bicyclists or emphasis non-separated facilities that are easily implemented but less popular with bicyclists?

The approach to evaluating and prioritizing proposed improvements must take into account various factors including implementation, likelihood of use and cost.

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4.3.1 Performance Criteria for Alternative Evaluation Score

In order to evaluate the effectiveness of a route and prioritize it against other alternatives, several factors must be taken into consideration and scored appropriately (also see Table 4).

- **LTS Rating** – As mentioned previously, a route is defined by the highest LTS encountered along that route. The higher the LTS, the lower the performance score.

- **Connectivity** – Looks at destinations along that project corridor. What attractions (schools, libraries, and shopping centers) are within a quarter-mile, or a two-minute ride, of the route? Does the project connect with other projects?

- **Ease of Implementation** – Considers the amount of work required to accommodate a bicycle facility. Restriping a corridor is obviously easier than full roadway reconstruction. The number of intersections and their complexity can be accounted for under this metric as well.

- **Directness** – A route may excel in many categories across the board; however, if as a whole the route is a significant distance out of the way, it can impede the decision to use that route.

- **Safety** – How well a neighborhood or street is maintained directly affects a rider's comfort level along a route. What are the pavement conditions of the roadway? Would a cyclist feel comfortable if he/she got a flat tire at dusk? Will the facility appeal to the widest range of users (LTS 1 and above) or will it be used by only the competent and confident bicyclists? Is there some other feature that makes this route more desirable than another?

Table 4: Benefits Evaluation Table

Weight	Criteria	Measure	Rating
20%	**LTS Rating** The Level of Traffic Stress classifies roadways into 4	**Traffic Stress** The lower the LTS, the wider the range of users it will serve. The overall LTS of a route should be determined by the highest LTS along the route.	LTS 1 = 20 points LTS 2 = 15 points LTS 3 = 10 points LTS 4 = 5 points
20%	**Connectivity** Connectivity considers potential trip purpose based on the type of destination (schools, libraries, etc.) along a route. It also evaluates the effectiveness of connecting the city through a bicycle network.	**Trip Purpose** Potential trip purposes fall into one of 5 categories: school, shopping, commuting, recreation, and errands/social use.	5 Uses = 10 points 4 Uses = 8 points 3 Uses = 6 points 2 Uses = 4 points 1 Use = 2 points
		Connecting Routes Does the proposed route connect to other marked bicycle routes and/or facilities?	2+ Connections = 5 points 1 Connection = 2.5 points 0 Connections = 0 points
		Route Function Is the function of the route to create a more desirable route that parallels an existing arterial, or to provide lateral connections between routes?	Parallels an Arterial = 5 Points Lateral Connector = 0 Points
20%	**Ease of Implementation** This category looks at how easily a route can be installed based on the complexity of design, right-of-way impacts, and permitting.	**Corridor** Can the proposed route be implemented quickly and easily with signing and striping, or does it require additional design, permitting, heavy construction, and/or removal of parking.	Signing and Striping = 10 points Minor Reconstruction = 5 points Full Reconstruction/Parking Removal = 0 points
		Intersections How much work will need to be done at the intersections along a route to make it bike-friendly? Intersections with lower LTS ratings require less work to accommodate cyclists than those intersections with higher LTS rankings.	Using the attached matrix, an average score should be determined for the route. 10 points maximum
15%	**Directness** The presence of destinations along a route directly influences the generation of cyclists.	**Destination** Where do people want to go? How many schools, libraries, shopping centers or other "destinations" are within 1/4 mile of the proposed route?	1 point per destination 15 point maximum
25%	**Safety** In order to generate users, cyclists need to feel comfortable with both the roadway and the environment along a route.	**Pavement** What is the condition of the pavement along the route?	New = 10 points Deteriorated = 0 Points
		Security Is the route isolated?	No =3 points Yes = 0 points
		Lighting Is the route well lit?	Yes = 2 points No = 0 points
		Facility Type Does the design treatment address existing bicycle crash causes	Off-Road SUP = 10 Cycle track = 8 points Buffered Bike lane = 7 points Bike lane = 6 points Marked Shared Lane = 4 points Shared lane = 2 points

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4.3.2 Cost Criteria for Alternative Evaluation Score

Linear foot costs should be developed from recent City of Providence and/or RIDOT construction bids. Using these unit costs, one can calculate the cost of a specific project by multiplying the project length x dollars per linear foot.

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4.3.3 Overall Alternative Evaluation Score

An overall evaluation score is determined by combining the Benefits score and the Cost score in Table 5.

Table 5: Potential Bicycle Projects – Results of Benefits Evaluation

#	Road Name	From	To	Jurisdiction	Benefits Points Score	Benefits Letter Score	Construction Cost $$*	City Cost	Cost Letter Score	Total Project Score
	Lloyd Avenue SLM	Hope Street	Blackstone Blvd.	City	61	C	$11,600.00	$11,600.00	A	C+**
	Hartford Avenue Bike Lanes	Broadway	Killingly Street	State	58	C	$1.5 mil	$300,000.00	C	C

* If construction cost includes non-city funds, include only City's share of costs.
** Signing and striping only.
*** Full reconstruction, removal of parking.

Bikeway Scoring Matrix

City Share Cost		Benefit Score => 80 (A)	65 - 79 (B)	50 - 64 (C)	35 - 49 (D)	< 35 (F)
Cost < $100k	A	A	B+	C+	D	D
$100k <= Cost < $400k	B	A-	B	C+	D	F
$400k <= Cost < $700k	C	B+	B-	C	D	F
$700k <= Cost < $1M	D	B+	C+	D	D	F
Cost >= $1M	F	B	C+	D	F	F

4.4 Implementation Recommendations

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4.4.1 General Engineering Recommendations/Policies

General recommendations for the Engineering component should be incorporated into the City's process and procedures for construction and maintenance of public works infrastructure and into development policies and regulations. These recommendations include:

- Modify the current City roadway design standards and regulations to include a Complete Streets approach. Examples can be found at http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/resources
- Modify the City pavement management program to include consideration for City streets that are on the bike network. Evaluations of pavement surface conditions should take into account defects that may impact bicycles such as longitudinal cracks and unsafe drainage grates.
- Include provisions in the City's utility/roadway opening permit process to consider roadways in the bike network. For example, utility patches must not create a hazard for bicycles, and temporary road closures and detours must accommodate bicyclists. Bikeways pavement markings that are covered over or damaged by road/utility repairs must be replaced.
- Modify the City's current zoning and development regulations to include provisions for a Complete Streets approach and for bicycle parking in new and redevelopment projects.
- Develop a policy and designs to permit commercial establishments to replace on-street parking with on-street bike parking stalls/bike corrals.

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4.4.2 General Engineering Recommendations-Projects

General engineering recommendations are grouped into three categories:

- **Low cost action items** (these include implementing bicycle infrastructure such as):
  - Shared Lane (bicycle wayfinding signs only).
  - Marked shared lanes (shared lane markings and wayfinding signs. The current 2013-2014 City-wide resurfacing program provides an ideal opportunity for these improvements.

- Bike lanes that do not require roadway widening or significant loss of on-street parking. An example of this improvement is the restriping of Broadway and Blackstone Boulevard. The City should also consider implementing "road diets" that reduce the number of travel lanes on multi-lane roadways.
- Update the Phase I Network Bike Route signs to reflect current traffic circulation.

- **Medium cost action items** (these improvements include):
  - Paved shoulder bikeways where bike lanes may not be acceptable (striping and signing only)
  - Bike lanes where minor roadway widening and minor loss of on-street parking are required
  - Bicycle boulevards where minor "spot" improvements would fill the gap between higher levels of bicycle facilities such as off-road paths. For example, the City should consider implementing bicycle boulevards along neighborhood streets that extend out from the Woonasquatucket River Greenway and the Broadway and Blackstone Boulevard bike lanes. These would provide direct neighborhood connections allowing residents easy access to an off-road "spine" bicycle route that extends into the downtown core.
  - Insure length of phases on existing traffic signals accommodate bike travel.
- **Higher cost action items** (these improvements include higher cost facilities that could be incorporated into larger projects, such as):
  - Buffered bike lanes and/or cycle tracks as a component of a roadway reconstruction
  - Improved bicycle accommodations on bridges that convey City streets over major barriers such as rivers and state/interstate highways. Although several structures that convey city streets over or under these barriers have recently been reconstructed, there are many more in need of major rehabilitation or even replacement. Some bridges are City owned while others are owned by the RI Department of Transportation. Basic bicycle accommodations should not be limited to those bridges on roadways that are designated bikeways but should be included on bridges on any roadway that is open to bicycle travel. These basic accommodations include bicycle compatible bridge joints and railings. Adequate pavement width on the bridge to provide paved shoulders or bike lanes should be provided to accommodate possible future roadway widening.

Unit costs for the various types of bikeway construction area included in the Appendix. These costs are based on recent construction bids and should be updated periodically.

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4.4.3 Specific Engineering Recommendations-Projects

Recommendations for specific projects are shown on corresponding Figures in the Appendix. These Figures should be periodically updated as projects are completed and new planning efforts come on line.

- Incorporate accommodations into traffic signals as existing equipment is updated and/or replaced.

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5.0 Education

5.1 Existing Conditions-Education

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5.1.1 The Need for Bicycling Education

The reason US residents most frequently cite for not bicycling is fear of riding on roadways with moving traffic. Conversely, most bicyclists say they "feel" safer riding on bikeways separated from traffic. There is an ingrained belief that bicycling in the US is a dangerous activity. In reality, it is simply not feasible to connect all destination points with separated bikeways. So, even with an extensive network of separated facilities, bicyclists, at some point, must interact with vehicles.

Many residents of low-income or non-English speaking neighborhoods currently rely on bicycles to meet their daily transportation needs. Due to a lack of familiarity with US traffic laws or English language skills, they may not fully understand standard US signs and markings. This puts them at additional risk of a crash and injury.

In fact, when considering injuries per hour of actual activity, bicycling ranks second only to walking in terms of safety (Data from Failure Analysis Associates in *Design News* magazine October 4, 1993). For more than 20 years, the League of American Bicyclists (LAB) has conducted bicycling education programs taught by certified League Cycling Instructors (LCI's). These "Traffic Skills" courses are similar to the traditional drivers education courses consisting of classroom instruction, basic bicycle "driving" skill drills conducted in a parking lot, followed by actual on-road bicycling in traffic. Instead of riding on the far right edge of the roadway outside of drivers' vision field, the LAB program encourages bicyclists to position themselves on roadway sections and at intersections so that they are visible to motorists. Graduates of these programs have universally expressed increased confidence to bicycle more often and along routes they previously considered too "dangerous." W. Moritz, *1996 Survey of League of American Bicyclists*, showed that bicyclists who ride in a predictable manner consistent with traffic laws experience far fewer crashes than those bicyclists that ride at the extreme right edge of the roadway.

While many advocates look to European countries for inspiration regarding bicycle infrastructure design, they overlook the importance of the European bicycling

education programs. In Denmark, bicycling education in schools begins at the kindergarten level and culminates with a national standard written exam and road test for students entering high school.

There is no question that a vigorous bicycling education program can produce tangible increases in the level of bicycling activity.

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5.1.2 Current Programs

The current programs in Providence are provided by a number of sponsors and include:

- R.I. Hospital Injury Prevention Center provides bicycle safety programs and bike rodeos along with free helmets for elementary and middle school children.
- The RI Department of Health, R.I. Department of Transportation and the Providence YMCA provide free youth bike helmets at bicycle events.
- R.I. Cyclecross Festival runs a "Divine Youth" program teaching cycling skills to City elementary and middle schools students.
- Participation by Bicycle Pedestrian Advisory Commission (BPAC) members in public service announcements, panels and programs such as R.I. National Public Radio (NPR) programs.
- Support of the RI Bicycle Coalition's general education outreach program
- Appointment of a League of American Bicyclist (LAB) League Cycling Instructor (LCI) to the BPAC.
- Volunteer organizations such as Recycle-A-Bicycle and the Woonaquatucket River Greenway Council (WRGC) conduct bicycle repair and cycling classes for City youth from low income and recent immigrant neighborhoods.

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5.1.3 Gaps in the Education Program

- In addition to elementary, middle and high schools, Providence is home to several institutions of higher learning, including Brown University, Johnson & Wales University, and Providence College. None of these institutions have a formal bicycling education program or have been awarded a Bicycle Friendly University designation from the LAB.
- Although there are several LAB LCI's in the area, there is no formal coordinated adult bicycling education program for City residents.
- There is no formal Safe-Routes-to-School education initiative in the City school curriculum.

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5.1.4 Education Program Recommendations

General goals of the education program should be to increase the use of bicycles for daily transportation and to inform motorists and bicyclists of the rights and responsibilities of bicycling in a public way. Specific goals of the education program should include:

- A targeted number of children completing bicycle education courses.
- A targeted number of adults completing bicycle education courses.

It is recommended that efforts be led by the BPAC and developed as a cooperative effort between the School Department, volunteer groups and the organizations noted above. Specific recommendations include:

- Continue the current helmet giveaways and other programs currently taking place.
- Establish a formal bicycle education program in the elementary and middle school curriculum, perhaps as a component of the physical education program. Given the realities and financial constraints of developing school curriculums, perhaps initial efforts could be limited to instruction designed to teach children about traffic safety, pedestrian and bicycle skills and basic traffic decision-making when biking and walking.
- Offer the full LAB Traffic Skills course in City High Schools to pre-driving aged students so that when they do obtain a driver's license they will have an appreciation for bicyclists operating on roadways.
- Work with volunteer organizations and area LCI's to conduct adult LAB Traffic Skills courses in the City neighborhoods. Focus on developing LCI's from non-English speaking neighborhoods such that they in turn can provide the benefits of safe and effective bicycling techniques to those that presently use a bicycle for their daily transportation needs.
- Implement a traffic ticket diversion program to reduce traffic fines or replace traffic citations. Motorists, bicyclists and pedestrians can learn about traffic laws related to bicycling. For example, a traffic citation could be eliminated or fine reduced if the offender (either motorist or bicyclist) completes the LAB Traffic Skills course. Partnerships between the City and bicycling advocacy groups such as the RI Bike Coalition could be developed to conduct the training. Consultation with the City's attorney will also be necessary.
- Develop a Public Service Announcement (PSA) pamphlet explaining the intent of bicycle-related signs and markings for general circulation. Examples include trifold pamphlets explaining the meaning of shared-lane markings or the BIKES MAY USE FULL sign and distributed by parking enforcement officers on car windshields. Consider printing Spanish language brochures for distribution to the Hispanic population of the City. See Appendix for sample designs.

- Provide an online version of a City Bike Map showing on-road and off-road bikeway. Include information illustrating safe bicycling techniques (e.g. how to make a left turn at a signalized intersection) on city bike maps.
- Expand media outreach via PSAs on local university radio and RI NPR programs.
- Collaborate with local universities and colleges to conduct bicycle Traffic Skills courses on their campuses.
- Coordinate with RIPTA for driver training regarding new bicycle-related design treatments including shared-lane markings.

6.0 Encouragement

6.1 Existing Conditions-Encouragement

As previously noted, a major hurdle to increasing the number of people using a bicycle for daily transportation is the perception that bicycling is a dangerous activity.

Also, the non-cyclist may have a negative image of bicycling, thinking that it is a recreational activity only or a transportation option used by the young and physically fit, or economically disadvantaged segments of the population.

The encouragement component is vital to the success a of a bicycle program. Support from community residents and civic leaders is needed to ensure that the full benefits of the other E's are actually realized. There are many challenges to constructing a bicycle network (financial, political and social) which can only be overcome with long-term broad-based support.

The most important current Encouragement activity of the City has been the establishment and activity of the Bicycle Pedestrian Advisory Commission (BPAC). Other current initiatives include:

- Annual Bike to Work day event led by the RI Bicycle Coalition.
- Neighborhood Cyclovias.
- Hosting regional and national level bike events such as the New England Bike Walk Summit, Bike Fest RI, the Providence Cyclo-Cross Festival and Gran Fondo New England events, and the Bike Builders Ball.
- Award of an honorable mention from the League of American Bicyclists Bike Friendly Community (BFC) program.
- Availability of bike racks on many RIPTA system buses and bike/transit commuter information.

6.2 Gaps in the Encouragement Program

The annual short-term events like Bike to Work Day and the Cyclo-Cross festival are well organized, popular, well-attended, and should continue however they are short duration one-or two-day events. A more sustained daily encouragement program is needed to build community support.

The Cyclovia events are also very popular, providing neighborhood residents the opportunity to walk, bike and socialize. However, entire sections of roadway are shut down and do not provide a realistic experience of bicycling in an urban environment.

There is currently no active encouragement for local businesses or colleges/universities to participate in the Bike Friendly America campaign.

6.3 Encouragement Program Recommendations

The general goal of the encouragement program is to get more people to think that using a bike to go more places more often is a "normal" transportation option.

Specific measures include:

- Continue to support special annual events currently taking place, such as Bike to Work Day, the Cyclo-Cross Festival, RI Gran Fondo, and neighborhood Cyclovias.
- Modify the Cyclovia events to create an opportunity for a low-stress urban cycling experience. This can be achieved by temporarily closing one traffic lane on a multi-lane roadway or temporarily relocating on-street parking to create a temporary bike lane.
- Follow up with recommendations from the BFC application process to achieve a higher ranking.
- Apply for Fall 2013 Community Grant for the People for Bikes or the Bikes Belong Greenlane Program.
- Encourage local businesses to participate in the Bike Friendly Business (BFB) campaign and recognize those businesses or organizations that support a better quality of life for the City by promoting bicycling for transportation, recreation and exercise as "good neighbors".
- Work with local bike shops to participate in the Bike Friendly Community program to offer discounts for purchases and repairs to employees of BFB's in exchange for advertising space on City fixtures such as trash receptacles, bus shelters, etc.
- Work with local business to offer cash incentives to employees to avoid driving into the city by utilizing the RIPTA Park-n-Ride system and bike racks on buses.

- Establish a formal collaboration effort with local non-profit advocates and organizations such as Recycle-A-Bike Program and the Woonasquatucket River Watershed Council.
- Hold monthly Bike to Work days or bike trains of group rides led by knowledgeable volunteers. Vary the origins of the rides to use existing outlying bikepaths that currently end at city limits
- Create bike commuter challenges between City businesses and colleges/universities to encourage bike commuting.
- Post on-line versions of the City's bike network map and post hard copies at various locations in the City.

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7.0 Enforcement

To increase the numbers of bicyclists in the City, infrastructure, education and encouragement improvements must be accompanied by enforcement of traffic laws by bicyclists and motorists. Enforcement of traffic laws related to bicycling can also serve as an education tool as some individuals may simply not understand that breaking the laws can put themselves and others at risk.

7.1 Existing Conditions-Enforcement

From general observations of current cyclist behavior and comments submitted by the public, compliance with even the basic bicycle-related traffic laws is the exception rather than the rule. Basic traffic rules such as stopping and yielding at STOP signs, compliance with traffic lights at signalized intersections, riding with traffic, using lights at night, and yielding to pedestrians are not followed by the majority of bicyclists. While this unlawful behavior has not resulted in increased bicycle crashes and injuries to date, it does result in contempt of bicyclists by the public in general and lends to a disregard for bicyclists' rights to use a public roadway.

7.2 Existing Gaps-Enforcement

There does not appear to be a visibly consistent enforcement component related to bicycling in the City. Current enforcement programs are minimal. It is our understanding that there are only two full-time officers assigned to the Police Department's Bike Patrol. They generally patrol the core downtown area. Uniformed members of the Downtown Improvement District have also been seen on bicycles in the core downtown area; however, these private contractors cannot carry out law enforcement activities.

7.3 Enforcement Program Recommendations

Recommendations include:

- Initiate intense periodic enforcement campaigns in City neighborhoods preceded by public service announcements noting the hazards of unlawful behavior such as red light running by bicyclists. This would be particularly effective at the beginning of the school year when the City experiences an influx of new college students. Enforcement of the basic traffic laws such as compliance with STOP signs and traffic signals would demonstrate that the City is serious about bicycling.
- A more visible bike patrol presence in the core Downtown area and in city neighborhoods, particularly in the vicinity of schools.
- Have Bike Patrol officers escort bike-to-school trains on a periodic basis. This would provide an excellent opportunity for teaching lawful and safe bicycling by example.
- Make training available to the Police Department, such as that run by the International Police Mountain Bike Association (IPMBA). Courses are held on a regular basis in Connecticut.
- Bike theft sting: the Town of Brookline, Mass has initiated a bike thief sting operation using a bicycle implanted with a GPS tracking device. The "sting" bike is locked in a visible high theft area and thieves area apprehended using the GPS device. This could deter incidences of high thief areas such as schools. This would discourage bike theft and encourage students to bike to school.

8.0 Evaluation

8.1 Keeping Track of Our Progress

The transportation needs of City residents will undoubtedly change over the coming years, as will the design treatments to accommodate bicycling as a transportation choice. As such, this plan is intended to be a "living document" consisting of a "snapshot" of current conditions in the fall of 2013 and a guide to developing the recommendations for improvements of the 5 E's of a bike-friendly community. While setting a general overall goal as a measure of our "bike friendliness" (i.e. a silver level BFC designation) may be helpful, setting specific goals for each "E," and monitoring the City's progress towards achieving those goals may prove to be more effective and sustainable in the long run. Besides, if the City does make consistent and determined progress towards achieving the specific goals for each "E," recognition and accolades from others will naturally follow.

8.2 Evaluation Program Recommendations

- Include the Bike Providence: A Bicycling Master Plan for Providence as a formal component of the City's Comprehensive Plan.
- Include "implementation" of the Bicycle Master Plan as an action item in the City's upcoming Sustainability Plan

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Appendices

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Tables

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2012 AASHTO Guide for the Development of Bicyclist Facilities – General Considerations for Different Bikeway Types

Type of Bikeway	Best Use	Motor Vehicle Design Speed	Traffic Volume	Classification for Intended Use	Other Considerations
Shared lanes (no special provisions)	Minor roads with low volumes, where bicyclists can share the road with no special provisions.	Speeds vary based on location (rural or urban).	Generally less than 1,000 vehicles per day.	Rural roads, or neighborhood or local streets.	Can provide an alternative to busier highways or streets. May be circuitous, inconvenient, or discontinuous.
Shared lanes (wide outside lanes)	Major roads where bike lanes are not selected due to space constraints or other limitations.	Variable. Use as the speed differential between bicyclist and motorists increases. Generally any road where the design speed is more than 25 mph.	Generally more than 3,000 vehicles a day.	Arterials and collectors intended for major motor vehicle traffic movements.	Explore opportunities to provide marked shared lanes, paved shoulder, or bike lanes for less confident bicyclists.
Marked shared lanes	Space-constrained roads with narrow travel lanes, or road segments upon which bike lanes are not selected due to space constraints or other limitations.	Variable. Use where the speed limit is 35 mph or less.	Variable. Useful where there is high turnover in on-street parking to prevent crashes with open car doors.	Collectors or minor arterials.	May be used in conjunction with wide outside lanes. Explore opportunities to provide parallel facilities for less confident bicyclists. Where motor vehicles allowed to park along shared lanes, place markings to reduce potential conflicts with opening car doors.
Paved shoulders	Rural highways that connect town centers and other major attractors.	Variable. Typical posted rural highway speeds (generally 40-45 mph).	Variable.	Rural roadways; intercity highways.	Provides more shoulder width for roadway stability. Shoulder width should be depend on characteristics of the adjacent motor vehicle traffic, i.e. wider shoulders on higher-speed and/or higher-volume roads.

Type of Bikeway	Best Use	Motor Vehicle Design Speed	Traffic Volume	Classification for Intended Use	Other Considerations
Bike lanes	Major roads that provide direct, convenient, quick access to major land uses. Also can be used on collector roads and busy urban streets with slower speeds.	Generally, any road where the design speed is more than 25 mph.	Variable. Speed differential is generally a more important factor in the decision to provide bike lanes than traffic volumes.	Arterials and collectors intended for major motor vehicle traffic movements.	Where motor vehicles are allowed to park adjacent to bike lane, provide a bike lane of sufficient width to reduce probability of conflicts due to opening vehicle doors and objects in the road. Analyze intersections to reduce bicyclist/motor vehicle conflicts.
Bicycle boulevards	Local roads with low volumes and speeds, offering an alternative to, but running parallel to, major roads. Still should offer convenient access to land use destinations.	Use where the speed differential between motorists and bicyclists is typically 15 mph or less. Generally, posted limits of 25 mph or less.	Generally less than 3,000 vehicles per day.	Residential roadways.	Typically only an option for gridded street networks. Avoid making bicyclists stop frequently. Use signs, diverters, and other treatments so that motor vehicle traffic is not attracted from arterials to bicycle boulevards.
Shared use path: independent right-of-way	Linear corridors in greenways, or along waterways, freeways, active or abandoned rail lines, utility rights-of-way, unused rights-of-way. May be a short connection, such as a connector between two cul-de-sacs, or a longer connection between cities	N/A	N/A	Provides a separated path for non-motorized users Intended to supplement a network of on-road bike lanes, shared lanes, bicycle boulevards, and paved shoulders.	Analyze intersections to anticipate and mitigate conflicts between path and roadway users. Design path with all users in mind, wide enough to accommodate expected usage. On-road alternatives may be desired for advanced riders who desire a more direct facility that accommodates higher speeds and minimizes conflicts with intersection and drive-way traffic, pedestrians and young bicyclists.

Type of Bikeway	Best Use	Motor Vehicle Design Speed	Traffic Volume	Classification for Intended Use	Other Considerations
Shared use path: adjacent to roadways (i.e., sidepath)	Adjacent to roadways with no or very few intersections or driveways. The path is used for a short distance to provide continuity between sections of path on independent rights-of-way.	The adjacent roadway has high-speed motor vehicle traffic such that bicyclists might be discouraged from riding on the bicycle.	The adjacent roadway has very high motor vehicle traffic volumes such that bicyclists might be discouraged from riding on the roadway.	Provides a separated path for non-motorized users. Intended to supplement a network of on-road bike lanes, shared lanes, bicycle boulevards, and paved shoulders. Not intended to substitute or replace on-road accommodations for bicyclists, unless bicycle use is prohibited.	Several serious operational issues are associated with this facility type. See Sections 5.2.2 and 5.3.4 for additional details.

Potential Bicycle Projects – Results of Benefits Evaluation

#	Road Name	From	To	Jurisdiction	Benefits Points Score	Benefits Letter Score	Construction Cost $$*	City Cost	Cost Letter Score	Total Project Score

* If construction cost includes non-city funds, include only City's share of costs.

Bikeway Scoring Matrix

City Share Cost		Benefit Score => 80 (A)	65 - 79 (B)	50 - 64 (C)	35 - 49 (D)	< 35 (F)
Cost < $100k	A	A	B+	C+	D	D
$100k <= Cost < $400k	B	A-	B	C+	D	F
$400k <= Cost < $700k	C	B+	B-	C	D	F
$700k <= Cost < $1M	D	B+	C+	D	D	F
Cost >= $1M	F	B	C+	D	F	F

2013
PROVIDENCE BIKEWAY COSTS DATABASE
BASED ON RHODE ISLAND WUAP

	TYPE	BIKEWAY TYPE/BIKEWAY FEATURE	UNIT COST	UNIT	NOTES
BIKEWAY	A	SHARED LANE	$0.63	LF	Low speed roads
	B	MARKED SHARED LANE	$2.65	LF	
	C	PAVED SHOULDER	$0.63	LF	
	D	BIKE LANE	$8.00	LF	
	E	BICYCLE BOULEVARD	$2.65	LF	Assume SLM, add int. improvements
	F	SHARED USE PATH		LF	
ROADWAY IMPROVEMENTS	1	RESURFACING w/ STRIPING	$95.60	LF	
	2	FULL RECONSTRUCTION	$190.00	LF	
INTERSECTION IMPROVEMENTS	a	MAJOR INTERSECTION	$50,000.00	EA	
	b	MINOR INTERSECTION	$50,000.00	EA	

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Figures

Lane width (no parking)	Curb offset to center of SLM centered in lane
14.0 ft. (4.3 m)	7.0 ft. (2.1 m)
13.5 ft. (4.1 m)	6.75 ft. (2.1 m)
13.0 ft. (4.0 m)	6.5 ft. (2.0 m)
12.5 ft. (3.8 m)	6.25 ft. (1.9 m)
12.0 ft. (3.6 m)	6.0 ft. (1.8 m)
11.5 ft. (3.5 m)	5.75 ft. (1.8 m)
11.0 ft. (3.3 m)	5.5 ft. (1.7 m)
10.5 ft. (3.2 m)	5.25 ft. (1.6 m)
10.0 ft. (3.0 m)	5.0 ft. (1.5 m)

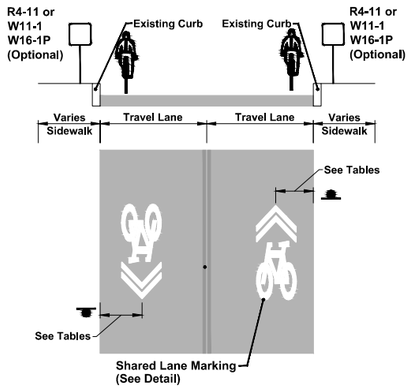
Source: John Ciccarelli, ITE Traffic Control Devices Hardbook Second Edition.

Suggested Shared Lane Marking
Offset Where On-Street Parking is Prohibited

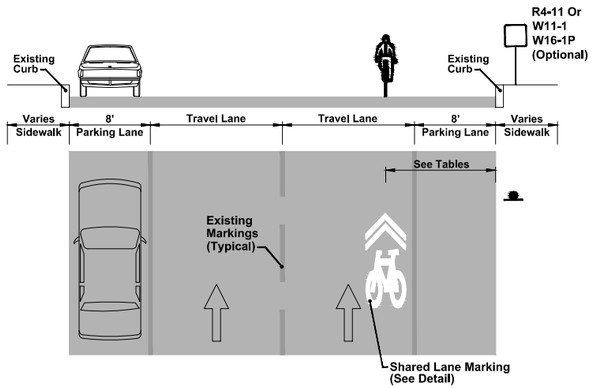
Physical lane width (parallel parking)	Usable Lane (subtracting 11 ft. (3.3 m) unsafe riding area)	Curb offset to center of SLM centered in usable lane width
24.5 ft. (7.5 m)	13.5 ft. (4.1 m)	17.75 ft. (5.4 m)
24.0 ft. (7.3 m)	13.0 ft. (4.0 m)	17.5 ft. (5.3 m)
23.5 ft. (7.2 m)	12.5 ft. (3.8 m)	17.25 ft. (5.3 m)
23.0 ft. (7.0 m)	12.0 ft. (3.6 m)	17.0 ft. (5.2 m)
22.5 ft. (6.9 m)	11.5 ft. (3.5 m)	16.75 ft. (5.1 m)
22.0 ft. (6.7 m)	11.0 ft. (3.3 m)	16.5 ft. (5.0 m)
21.5 ft. (6.6 m)	10.5 ft. (3.2 m)	16.25 ft. (5.0 m)
21.0 ft. (6.4 m)	10.0 ft. (3.0 m)	16.0 ft. (4.9 m)
20.5 ft. (6.3 m)	9.5 ft. (2.9 m)	15.75 ft. (4.8 m)
20.0 ft. (6.1 m)	9.0 ft. (2.7 m)	15.5 ft. (4.7 m)
19.5 ft. (5.9 m)	8.5 ft. (2.6 m)	15.25 ft. (4.7 m)
19.0 ft. (5.8 m)	8.0 ft. (2.4 m)	15.0 ft. (4.6 m)
18.5 ft. (5.6 m)	7.5 ft. (2.3 m)	14.75 ft. (4.5 m)
18.0 ft. (5.5 m)	7.0 ft. (2.1 m)	14.5 ft. (4.4 m)

Source: John Ciccarelli, ITE Traffic Control Devices Hardbook Second Edition.

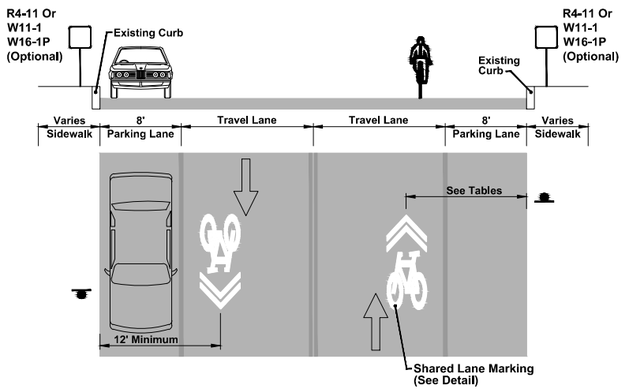
Suggested Shared Lane Marking
Offset Adjacent to On-Street Parallel Parking



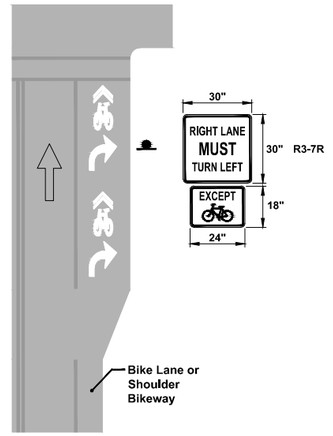
Marked Shared Lane Roadway
Two Way Two Lane Street with No Parking



Marked Shared Lane Roadway
One Way Multi-Lane Street with Parking



Marked Shared Lane Roadway
Two Way Two Lane Street with Parking



Shared Lane Markings
In A Right Turn Only Lane

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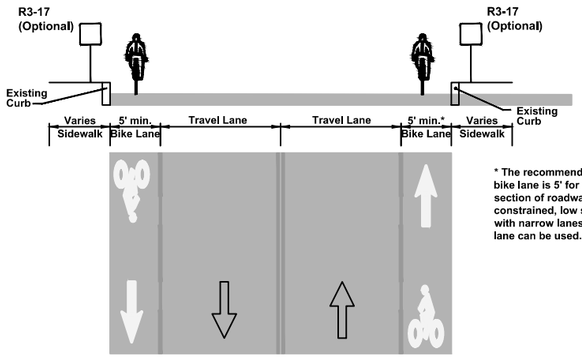
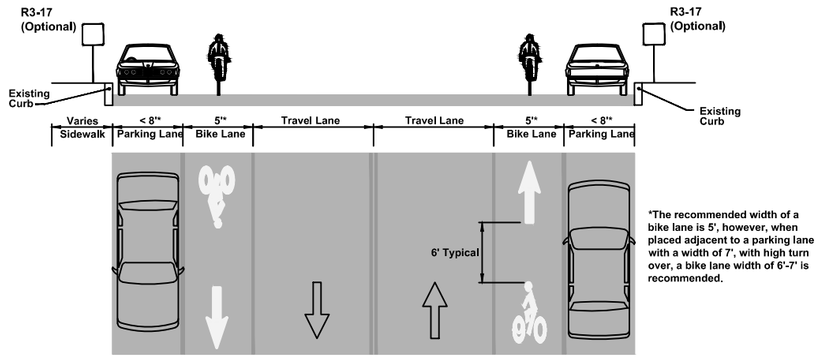
Figure 1

Typical Sections and Details for
On Road Bikeways
Bike Providence - Bicycle Master Plan
Providence, Rhode Island
November 2013



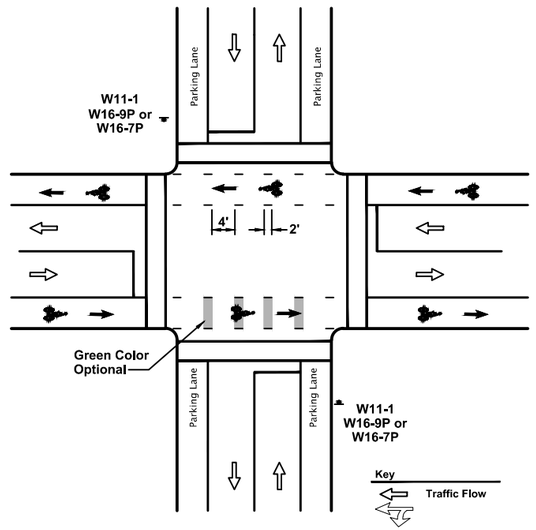
* The recommended width of a bike lane is 5' for a curbed section of roadway, however on constrained, low speed roads with narrow lanes (10'), a 4' bike lane can be used.

Bike Lane Roadway
Two Way Street with No Parking

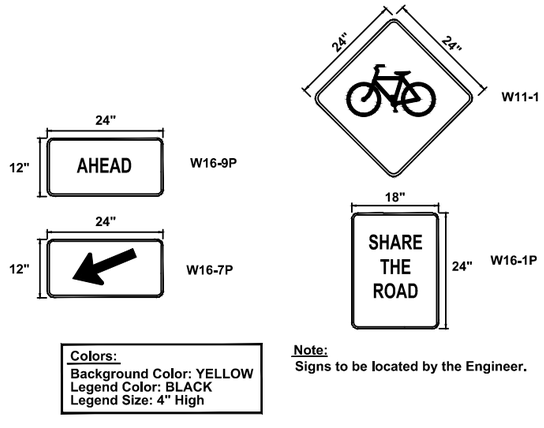


*The recommended width of a bike lane is 5', however, when placed adjacent to a parking lane with a width of 7', with high turn over, a bike lane width of 6'-7' is recommended.

Bike Lane Roadway
Two Way Street with Parking



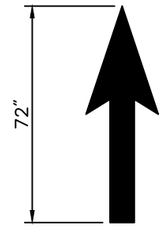
Bike Lane Extension at Intersections with Limited Sight Distance



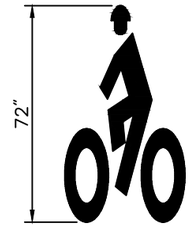
Colors:
Background Color: YELLOW
Legend Color: BLACK
Legend Size: 4" High

Note:
Signs to be located by the Engineer.

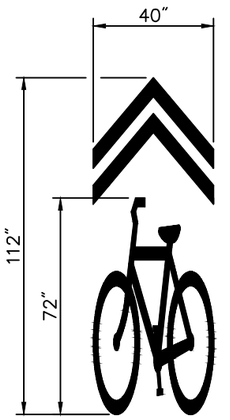
Bicycle Warning Sign with Share the Road Plaque



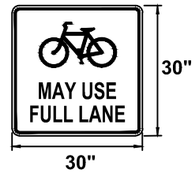
Bike Lane Arrow
Pavement Marking Detail
(NOT TO SCALE)



Bicycle Symbol
Pavement Mariking Detail
(NOT TO SCALE)



Shared Lane Marking
Pavement Marking Detail
(NOT TO SCALE)



Colors:
Background Color: WHITE
Legend Color: BLACK
Legend Size: 4" High

Note:
Signs to be located by the Engineer.

R4-11
Bicycles May Use Full Lane Sign

Note:
Refer to Details and Dimensions of Sign and Markings.

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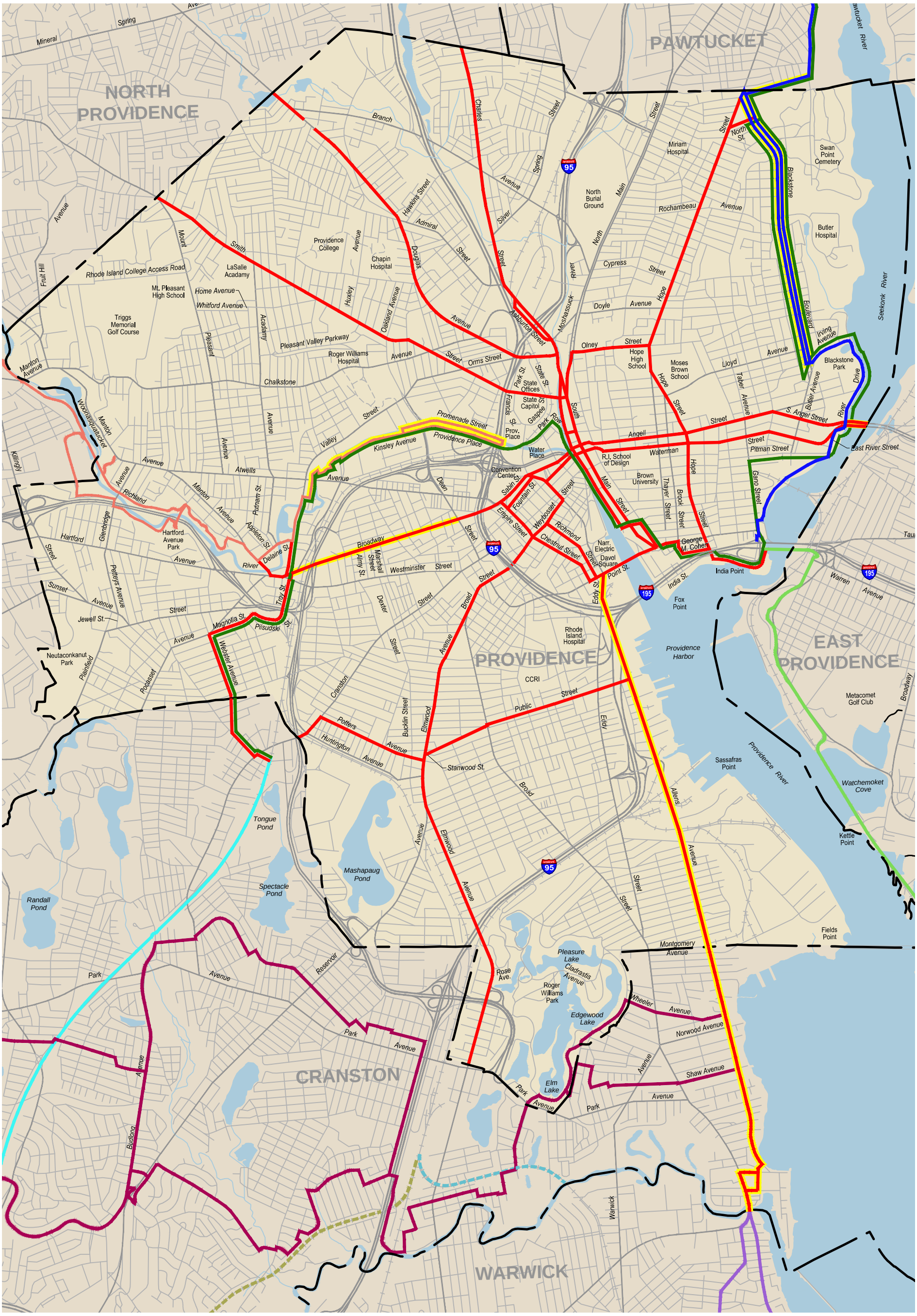
Figure 2

Typical Sections and Details for
On Road Bikeways
Bike Providence - Bicycle Master Plan
Providence, Rhode Island
November 2013

\\ri-data\projects\72467.00\graphics\figures\report_figures\fig3 - current bike network (72467).dwg



Legend

- Phase I Bicycle Signed Route
- Phase II Bicycle Route (Old)
- Striped Bicycle Lane
- East Coast Greenway
- Blackstone River Bikeway
- Cranston Cross-City Bicycle Corridor
- Cranston Washington Secondary Bike Path
- East Bay Bike Path
- Northwest Trail-woonasquatucket River Bikeway
- Proposed Pontiac Secondary Bikepath
- Proposed South Elmwood Spur
- Warwick-East Greenwich Bicycle Network

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Figure 3

Current Bike Network
October 2012
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

Path: \\Ri-data\projects\72467.00\graphics\FIGURES\Report_Figures\FIG4 - GPS Bike Trips 2013 March-April (72467).mxd

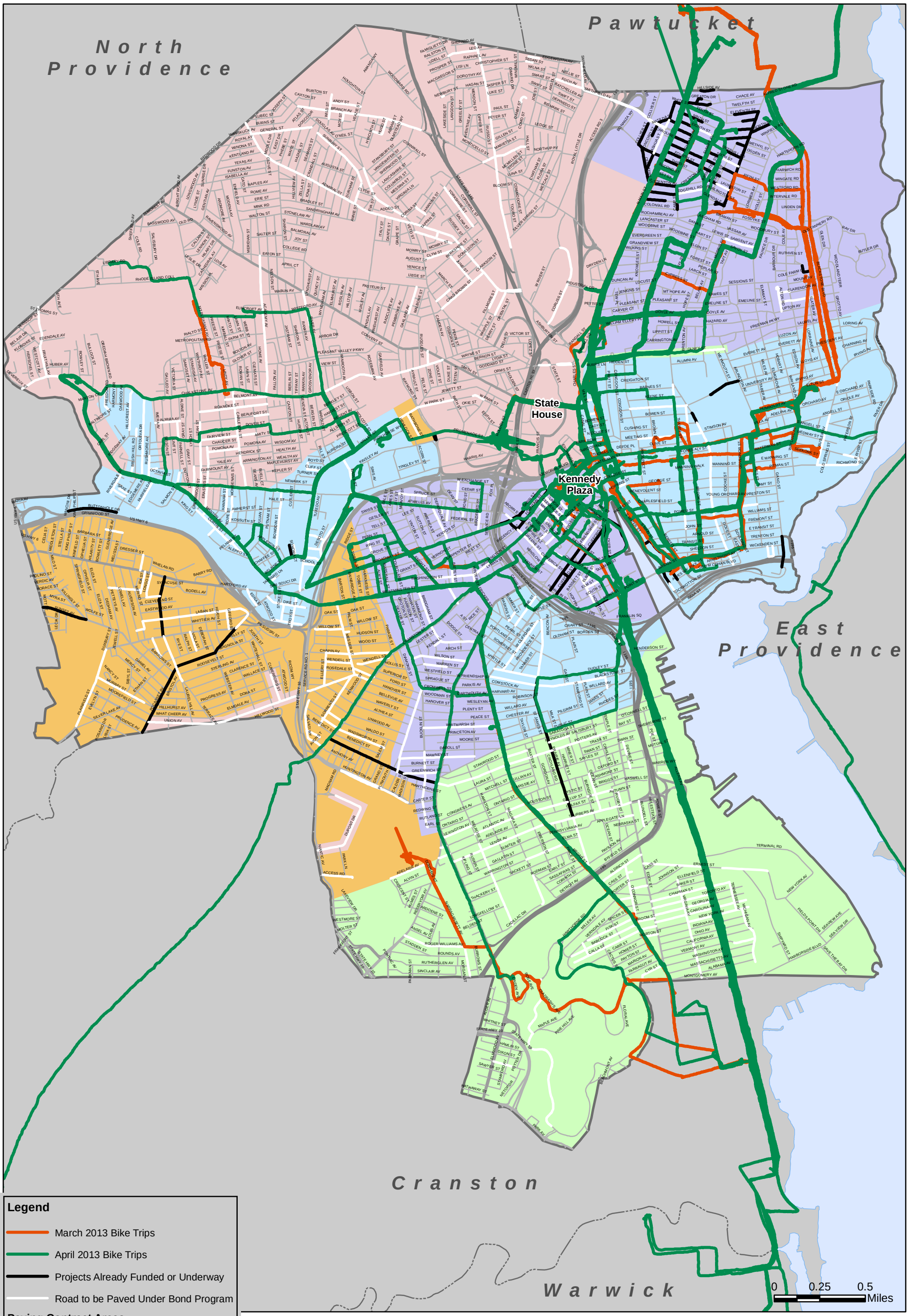

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Figure 4

March and April 2013
Bike App Charted Trips
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

Path: \\Ri-data\projects\72467.00\graphics\FIGURES\Report_Figures\FIG5 - GPS Bike Trips 2013 May (72467).mxd

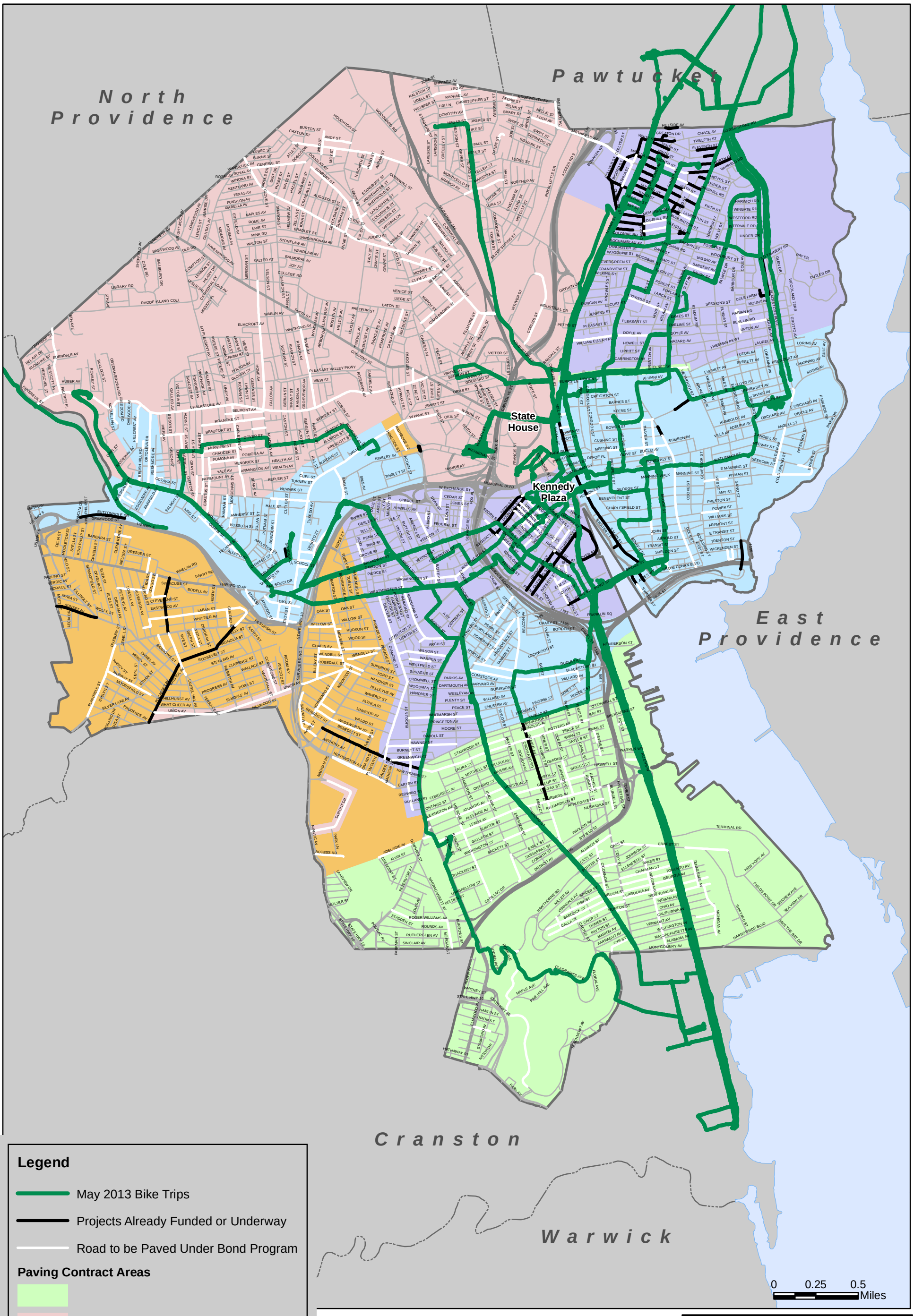

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Figure 5

May 2013
Bike App Charted Trips
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

Path: \\Ri-data\projects\72467.00\graphics\FIGURES\Report_Figures\FIG6 - Traffic Stress Map (72467).mxd

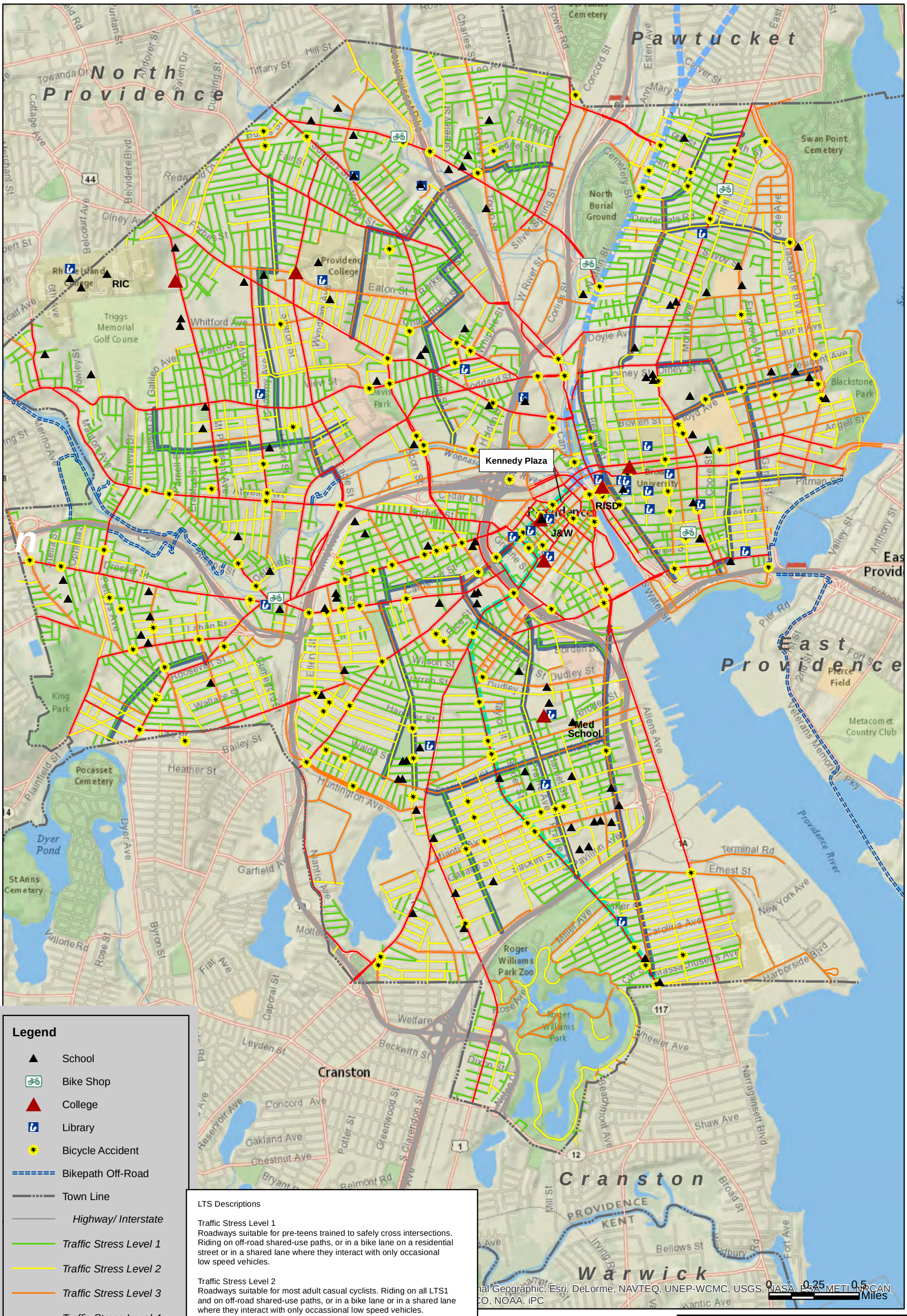

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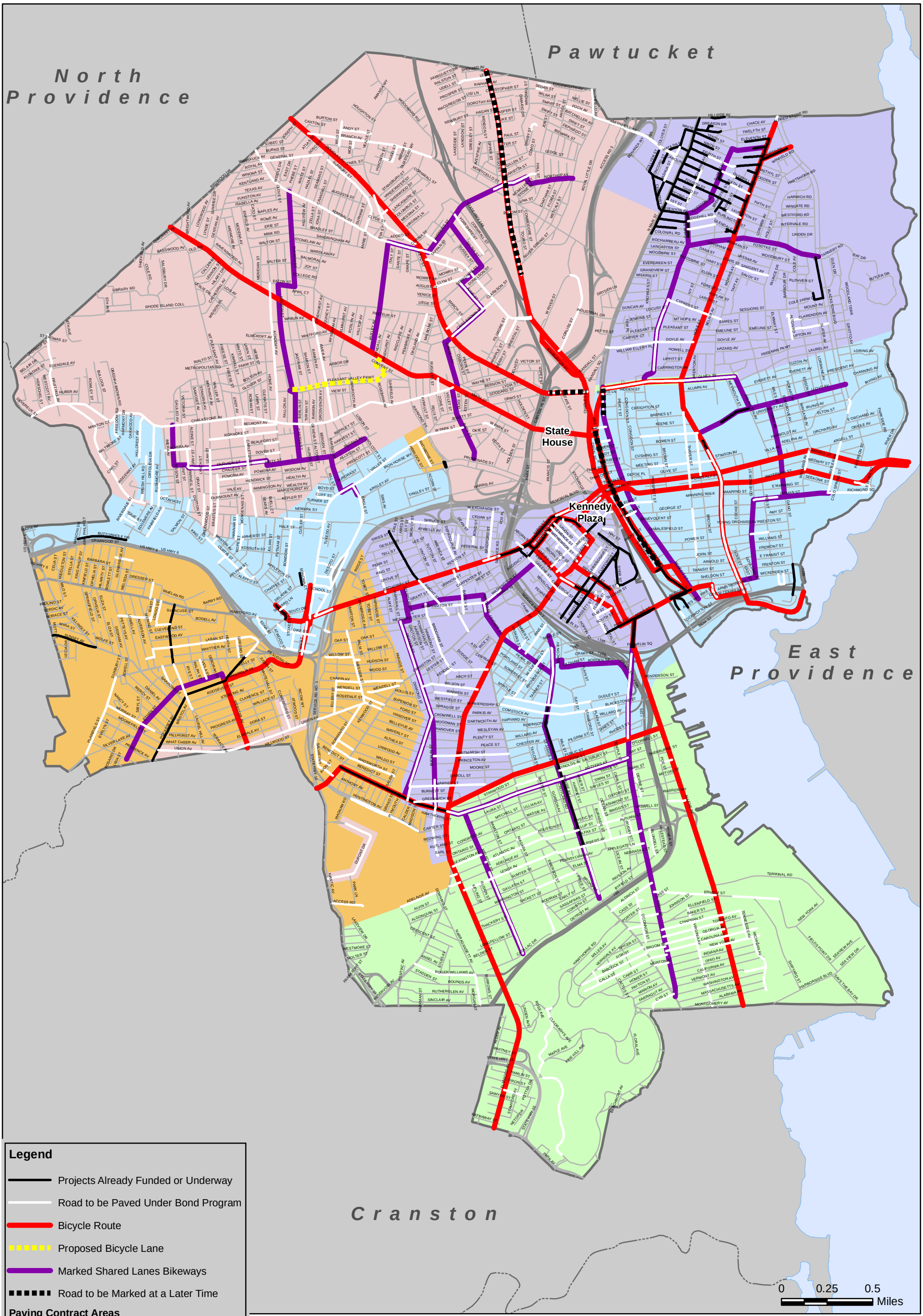
Figure 6

Traffic Stress Map
May 2013
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

Path: \\Ri-data\projects\72467.00\graphics\FIGURES\Report_Figures\FIG7 - Bond Paving Map (72467).mxd



Vanasse Hangen Brustlin, Inc.

Figure 7

Bond Paving Map
April 2013
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

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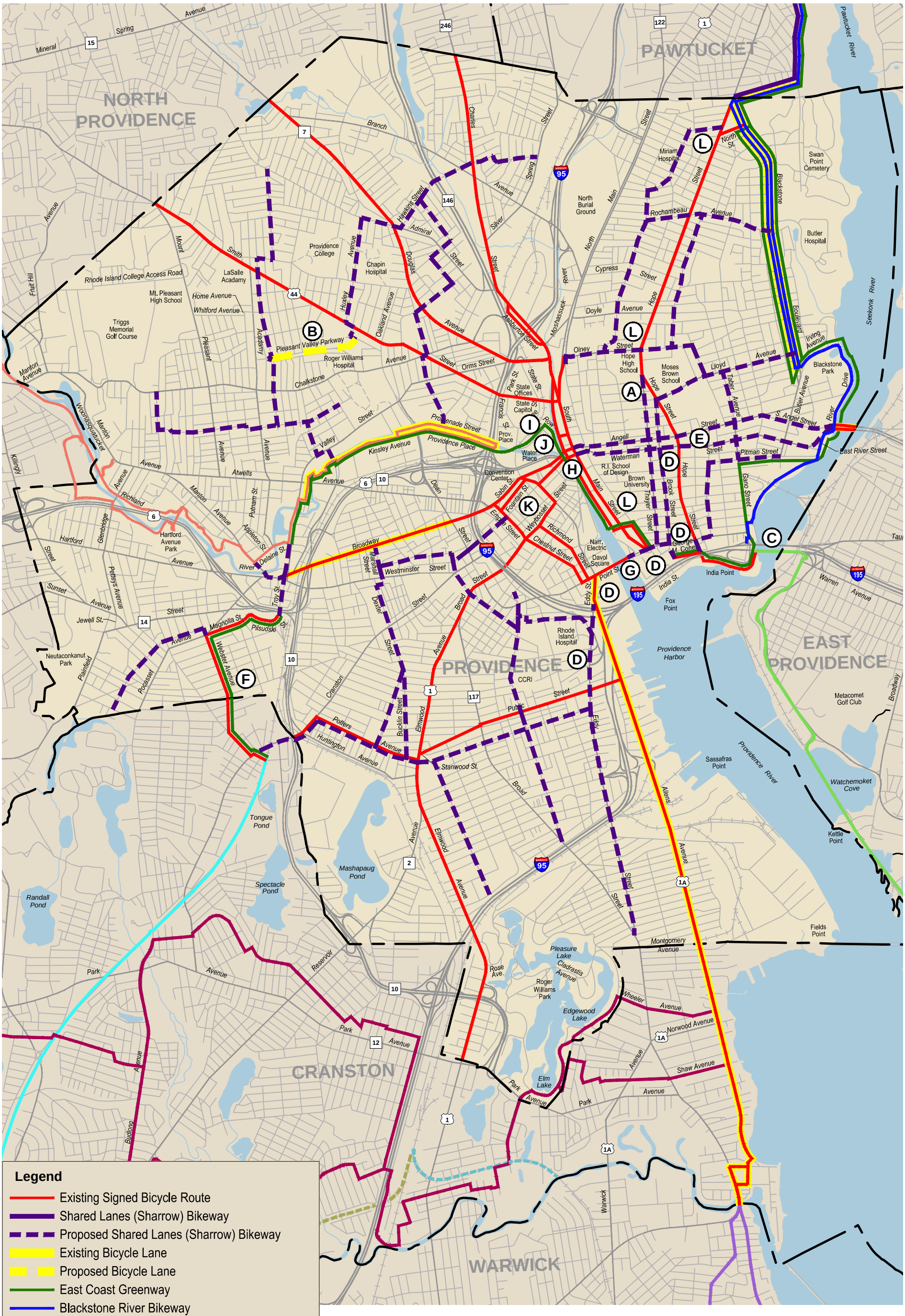
Figure 8
Bike Providence Plan
Low Cost Specific Improvements
0-2 Years

A. Install marked shared lanes (sharrows) on Thayer Street from Hope Street to Transit Street.	
B. Install bike lanes on Pleasant Valley Parkway.	Currently in City Paving Program.
C. Complete the Washington Bridge bike/ped connection between East Bay Bikepath and India Point/BRBW.	By RIDOT, currently under way.
D. Implement a bikeway connection between Brown University and RI Hospital (see G below).	
E. Install marked shared lanes (sharrows) on Angell Street and Waterman Street for improved connection between downtown and East Providence via the Henderson Bridge.	
F. Improve connection from the Woonie Greenway and East Coast Greenway to the Cranston Washington Secondary Bikepath.	Via wayfinding signage, shared-lane markings.
G. Improve bike accommodation on the Point Street Bridge via a marked shared lane westbound and a bike lane east bound.	
H. Install a two-way cycle track along Canal Street and/or South Main Street to provide an off-road connection from downtown to the Roger Williams National Monument.	
I. Include additional bike parking at PVD Train station.	By RIDOT, currently in design.
J. Improve bike connection from PVD Train Station to Kennedy Plaza.	By RIPTA and RIDOT, currently in design.
K. Install bike lanes on Fountain Street and shared lane markings on Sabin Street as part of the Downtown Circulation project.	Currently in design.
L. Incorporate Complete Streets design for the I-195 Parcels Redevelopment Project.	Currently under design by RIDOT and the City.

\\ri-data\projects\72467.00\graphics\figures\report_figures\fig8 – low cost improvements (72467).dwg



Vanasse Hangen Brustlin, Inc.

Figure 8

Low Cost Improvements (0-2 Years)
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

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Figure 9
Bike Providence Plan
Mid Cost Specific Improvements
3-5 Years

A. Construct Elmwood neighborhood connection under I-95 to Roger William Park using existing RR tunnel.	
B. Extend the Blackstone River Bikeway Segment 1 along the Seekonk River to the Washington Bridge.	Design and Construction by RIDEM and RIDOT
C. Install marked shared lanes to new Fountain Street bike lanes from Broadway bike lanes.	
D. Install shared lane markings and/or bike lanes on Elmwood Avenue from the Cranston line to Broad Street to provide cyclists an alternative to Broad Street (RIPTA R line bus route). Route bike traffic around Broad Street to downtown.	
E. Upgrade current signed bike route roadways with shared lane markings and/or bike lanes including - Smith Street - Douglas Avenue - Charles Street	
F. Install shared lane markings and/or bike lanes on roadways currently utilized by cyclists including: - Hartford Avenue - Cranston Street - Westminster Street - Manton Avenue - Chalkstone Avenue - Valley Street from Olneyville Square to Pleasant Valley Parkway - Harris Avenue from Broadway to Providence Place	
G. Extend the off-road Woonasquatucket River Greenway along the River from Eagle Square to Waterplace Park.	

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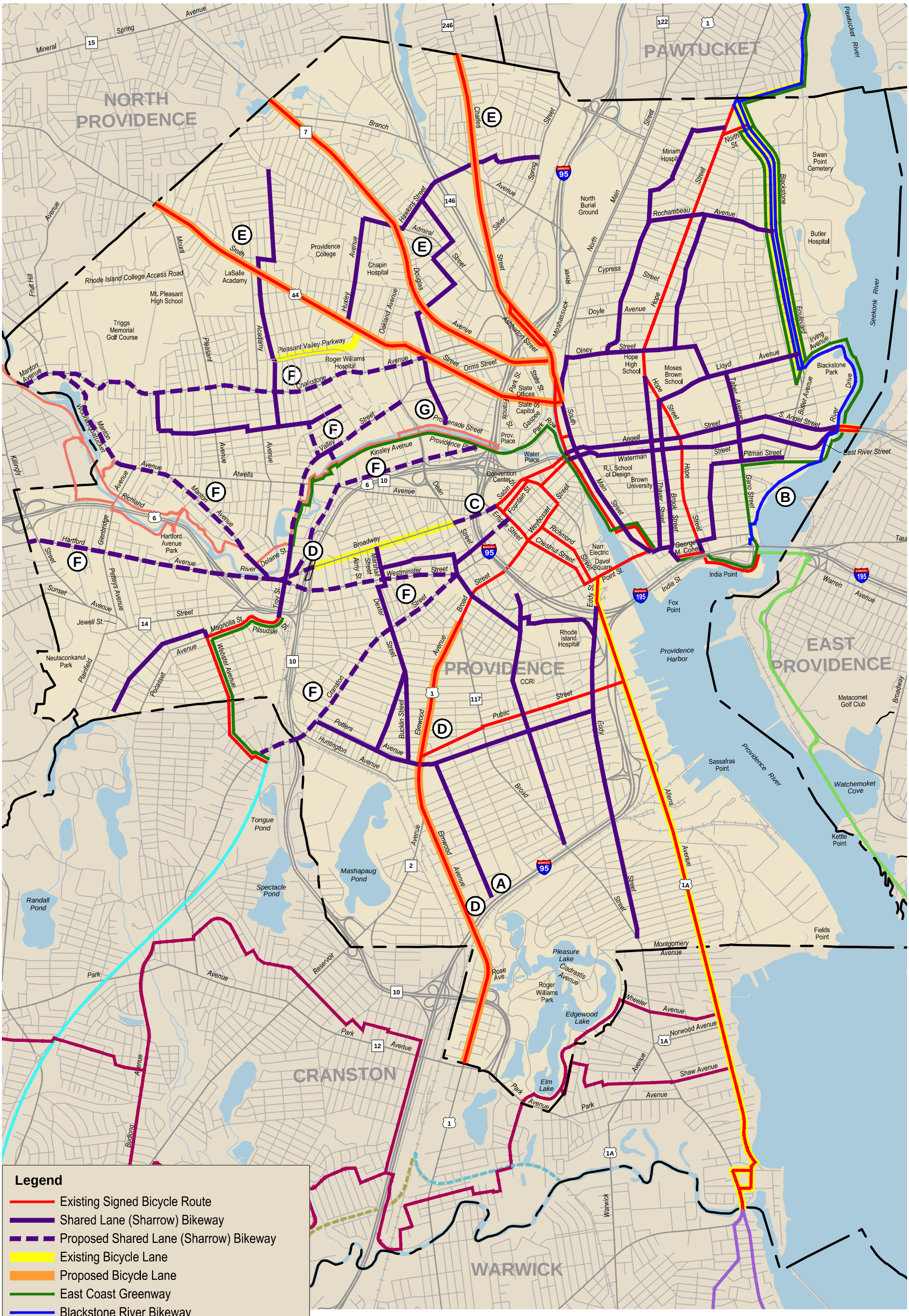

Vanasse Hangen Brustlin, Inc.

Figure 9

Medium Cost Improvements (3-5 Years)
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

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Figure 10
Bike Providence Plan
High Cost Specific Improvements
5-10 Years

A. Upgrade the existing bike lane accommodation on the Henderson Bridge as part of RIDOT repairs/rehabilitation.	Design and Construction by RIDOT
B. Extend Broadway bike lanes west to Olneyville Square and east across the I-95 frontage road to Franklin Street.	

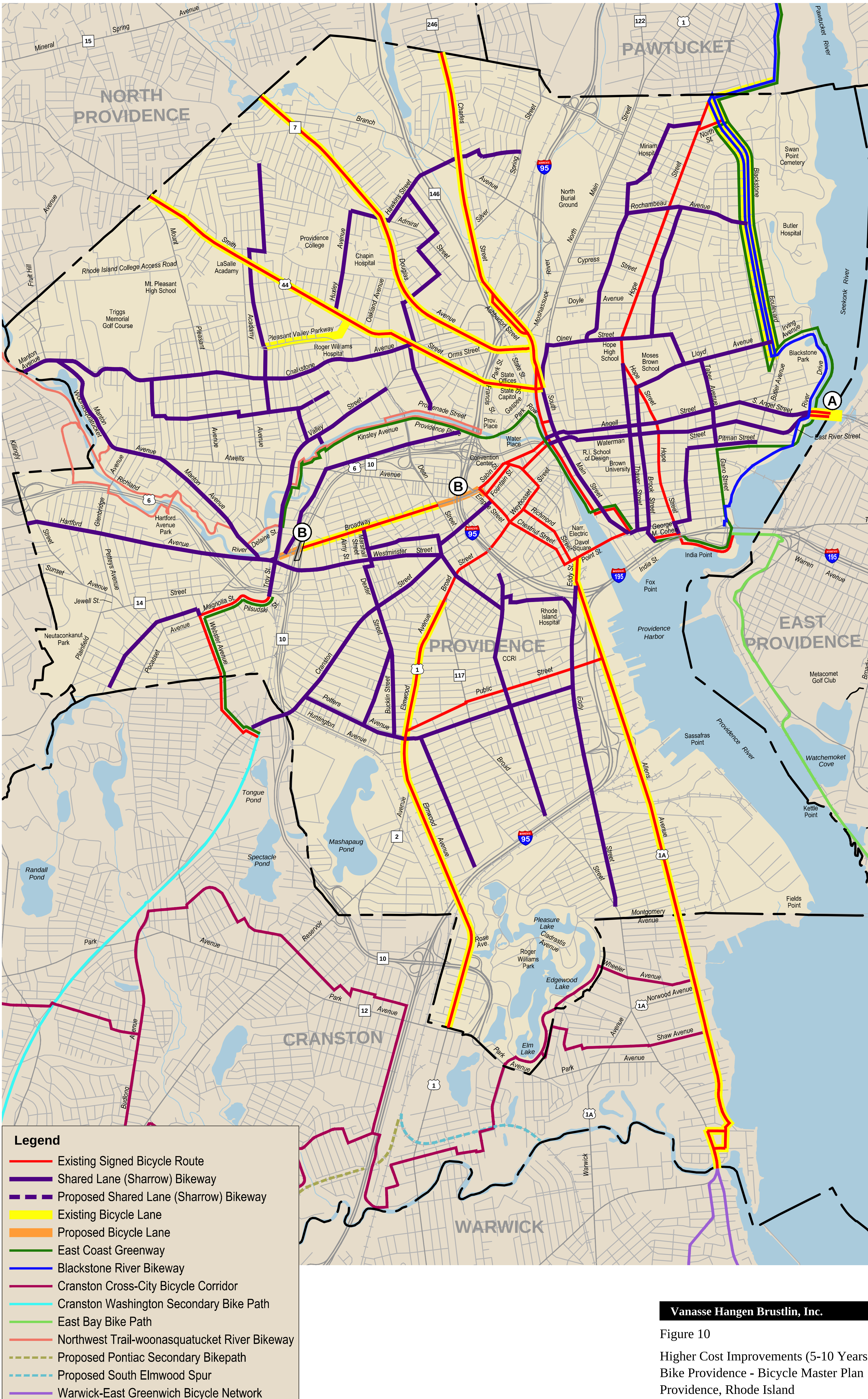

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Figure 10

Higher Cost Improvements (5-10 Years)
Bike Providence - Bicycle Master Plan
Providence, Rhode Island

Expanding the Reach of Bikeability

With the City of New Haven's Transportation, Traffic & Parking (TT&P) Department adoption of a Bike Plan, the City now has a map for the future of maintaining a bicycle friendly community. The TT&P Department has refocused its efforts on education and expansion; educating all drivers and riders on rules of the road and expanding the number of bike riders and access to biking infrastructure across the City.

With the goal of educating motorist and bicyclists, the City shares these rules of the road as well as web links for further information. ***Remember. Bicycles are vehicles too!***

- Bicyclists are allowed to ride on the roads
- Bicyclists riding on the roadway have the same rights and duties as the driver of a vehicle
- Bicyclists must ride in the same direction as traffic and must obey all traffic control devices
- Bicyclists are not allowed to ride on limited access highways
- When riding with multiple riders, bicyclists shall ride no more than two abreast in a single travel lane
- For motorists, when passing a bicyclist, allow adequate room so that the bicyclist is not endangered
- If riding on a street where there is a right turn lane and the rider intends to go straight, the rider must move into the travel lane to go straight staying to the right side of that lane
- When riding after dark, bikes must be equipped with a white front light and a red reflector or red light in the back
- When riding on a bike path and approaching other people from behind, warn them of your passing
- Recommendation: ***Always wear a helmet***

For more information on bicycle resources, please visit:

City of New Haven, CT
www.cityofnewhaven.com/trafficparking/bikenewhaven.asp

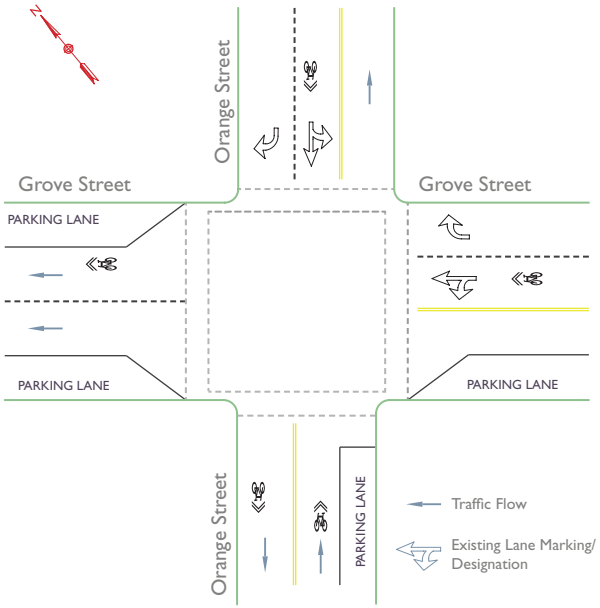
Bikes Belong
www.bikesbelong.org

League of American Bicyclists
www.bikeleague.org

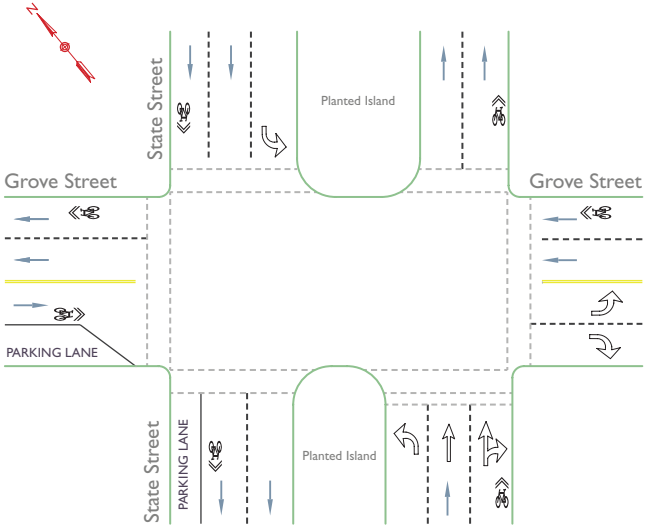
Elm City Cycling
www.elmcitycycling.org

new haven
CONNECTICUT

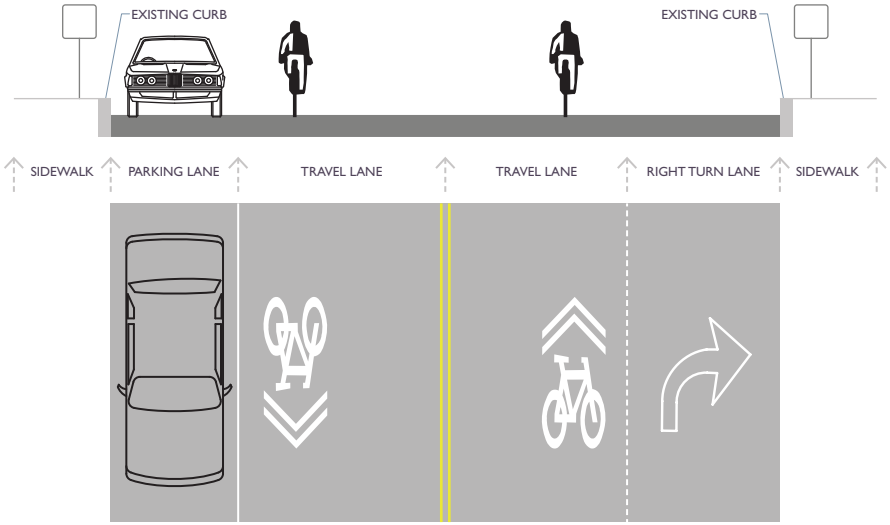
Becoming and Maintaining a Bicycle Friendly Community



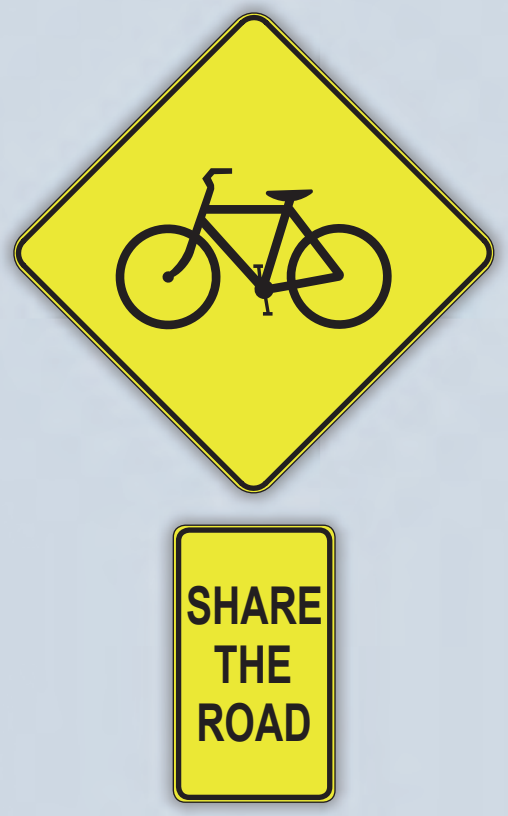
Grove Street and Orange Street



Grove Street and State Street



Shared Lane Roadway:
Two-Way Roadway with Right Turn Lane and Parking Lane



The Shared Lane Marking is used to:

- Assist bicyclists with lateral positioning in a shared lane with on-street parallel parking in order to reduce the chance of a bicyclist impacting the open door of a parked vehicle
- Assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lanes
- Alert road users of the lateral location bicyclists are likely to occupy within the traveled way
- Encourage safe passing of bicyclists by motorists
- Reduce the incidence of wrong way bicycling

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