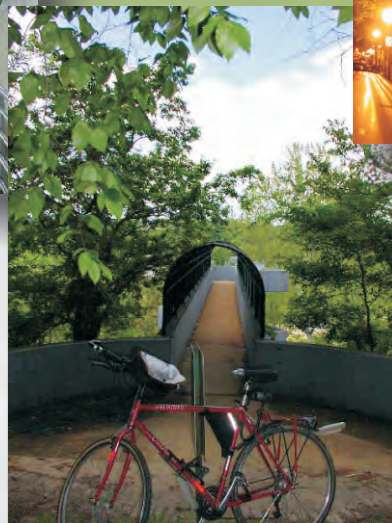




Sharing the Vision



Richmond Regional Bicycle and Pedestrian Plan





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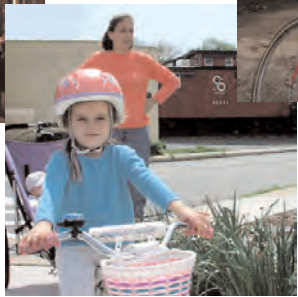
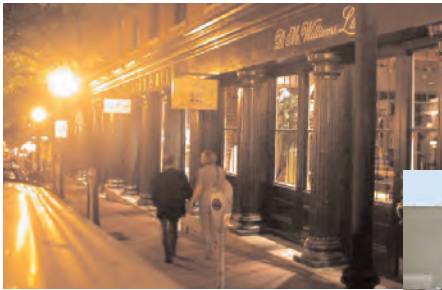
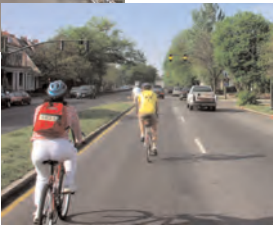
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Executive Summary: Richmond Regional Bicycle and Pedestrian Plan



The purpose of the Richmond Regional Bicycle and Pedestrian Plan is tied closely to the 2023 Long Range Transportation Plan’s aim “to ensure adequate access and multiply mobility choices for the residents of the region.”

Introduction

In March 2001, a new framework for transportation planning in the Richmond region was created with the Metropolitan Planning Organization’s (MPO) adoption of the 2023 Long-Range Transportation Plan (LRTP). The purpose of the *Richmond Regional Bicycle and Pedestrian Plan* is derived from that framework and is rooted in the following excerpt from the 2023 LRTP:

“The development of a sound transportation network is an important component of any metropolitan area’s social, economic, and physical framework. Basic mobility needs of the local population cannot be accomplished without a network of roadways, transit routes, pedestrian and bicycle paths, paratransit services, transportation demand management options, and other systems that enhance movement of people. Often these ways, routes, paths, services, options, and systems can be contained on the same facility, providing local residents multimodal options to make all types of work, social, recreational, and educational trips. As the population and composition of the Richmond region becomes more diverse, the transportation system must diversify to ensure adequate access and multiple mobility choices for the residents of the region¹.”

Study Purpose

The purpose of the *Richmond Regional Bicycle and Pedestrian Plan* is tied closely to the 2023 LRTP’s aim “to ensure adequate access and multiply mobility choices for the residents of the region,” and is summarized as follows:

To develop a bicycle and pedestrian plan for the Richmond region that shall be available for use by local, regional, and state agencies as a guide in developing and promoting safe and convenient facilities and services oriented toward bicycling and walking.

Background

Beginning in the 1990s, significant events related to transportation planning took place to facilitate the development of this study. Chief among those events were the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and its successor, the Transportation Equity Act of the 21st Century (TEA-21) in 1998. These acts opened the door for the use of federal funds tailored to meet local needs, whether for transit, bicycle and pedestrian facilities, highways, rideshare programs, safety projects, intermodal connections, or other improvements. Beginning in 2000, VDOT began seeking to sponsor a regional study of bicycle and pedestrian transportation to demonstrate how TEA-21 could be used to benefit the citizens of Virginia by developing and promoting safe and convenient facilities and services oriented toward bicycling and walking. VDOT identified the Richmond region as the study area, developed a study scope, and then selected a consultant to perform the work.

At the beginning of this planning process (early 2001), VDOT policy stipulated that only bicycle projects that are included in an adopted bicycle plan will be considered for inclusion in a highway project by VDOT. This pre-requisite along with VDOT’s substantial control of the state’s roadway system contributed to the initialization of this planning process.

Since the inception of this study, VDOT has completed a comprehensive review of its policies related to bicycle and pedestrian facilities, which has led to the development of VDOT’s *Policy for Integrating Bicycle and Pedestrian Accommodations*. This policy meshes well with the *VTrans2025* statewide multimodal planning process that is currently underway, as both efforts involve a focus on bicycle and pedestrian mobility. Similar to VDOT’s previous policies, the new *Policy for Integrating Bicycle and Pedestrian Accommodations* stipulates that an “adopted transportation or related plan” ranks as a leading factor to support the need to provide bicycle and pedestrian accommodations on highway construction projects.

VDOT does not distinguish between various types of local adoption methods, as long as the local governing body or an MPO adopts the plan. VDOT recommends that bicycle and pedestrian plans be adopted as a component of the comprehensive plan because it is truly a locality’s “blueprint” for community development and furthers opportunities to blend with land use and zoning policies. Specific requirements set by Virginia statutes specify procedures for comprehensive plan adoption, amendment, and review. Adoption with the comprehensive plan ensures the bicycle plan is tailored to meet the locality’s expectations.

Tasks of this study included:

- formation of a study advisory committee
- region-wide data collection
- public outreach and participation
- technical analysis
- development of recommendations for a regional bicycle and pedestrian plan.

Study Area

The delineation of the project study area was driven by VDOT’s desire for this plan to be accepted by the Richmond Area MPO and then by each of the following

Similar to VDOT’s previous policies, the new *Policy for Integrating Bicycle and Pedestrian Accommodations* stipulates that an “adopted transportation or related plan” ranks as a leading factor to support the need to provide bicycle and pedestrian accommodations on highway construction projects.

¹ 2023 Long-Range Transportation Plan, March 8, 2001, p. 12.

nine local jurisdictions which are represented on the MPO:

- Town of Ashland
- Charles City County
- Chesterfield County
- Goochland County
- Hanover County
- Henrico County
- New Kent County
- Powhatan County
- City of Richmond

The initial review of the study area included a total of 2,300 miles of roadway and 300 miles of trails (off-road).

Study Advisory Committee (SAC)

In order to facilitate the development of a plan that could be made available for use by local, regional, and state agencies, Richmond Area MPO staff and VDOT organized and facilitated a study advisory committee (SAC), which consisted of the following groups (each of whom held voting privileges):

- Town of Ashland
- Charles City County
- Chesterfield County
- Goochland County
- Hanover County
- Henrico County
- New Kent County
- Powhatan County
- City of Richmond

- Richmond Area Bicycling Association (RABA)
- GRTC Transit System

- RideFinders
- Sierra Club, Virginia Chapter
- Citizens Transportation Advisory Committee (CTAC)

Bicycle and Pedestrian Plan Goals

During initial project meetings, the SAC developed a series of goals to guide the development and planning of the *Richmond Regional Bicycle and Pedestrian Plan*. These goals are listed below in no particular order:

- increase the overall number of people who regularly bicycle and/or walk in the Richmond region
- increase public awareness of bicycling and walking as viable modes of transportation
- promote rights and responsibilities of pedestrians, bicyclists, and motorists in a shared transportation network while improving safety and enforcement.
- ensure bicycle and pedestrian accommodations are considered in a balanced approach to planning and funding transportation improvements
- create additional physical activity opportunities in our community, increasing physical and mental wellness, as well as improving air quality for all
- provide improved opportunity and access for walking and bicycling to all residents
- encourage the design, finance, and construction of transportation facilities that provide safe, secure, and efficient linkages for bicyclists and pedestrians throughout the Richmond region
- stimulate local economies by providing safe and efficient bicycle and pedestrian connectivity between businesses, tourism, and recreation destinations
- encourage safe riding and walking practices on roads, byways, and trails in the Richmond region
- promote the development of seamless transitions for all bicycle and pedestrian facilities, which cross over jurisdictional boundaries (i.e. county, city, or town)

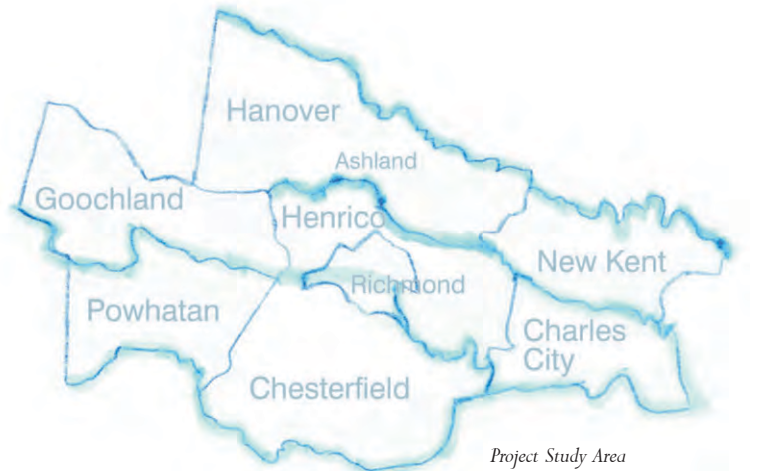
Public Participation

A cornerstone of the planning process has been the involvement of hundreds of citizens of the Richmond region through an extensive public outreach and participation process. With a consistent and clear voice, citizens told the study team they want more facilities and services to improve safety, comfort, convenience, and connectivity. More than 5,000 comments were provided through a variety of means including a one-day regional symposium, five public workshops, and a project web site (www.letsgebikeandwalk.com) which hosted a virtual public workshop and included a comment form to receive public input.

Scientific Approach

Citizen suggestions, extensive field data collection, and research of regional land uses were collected by the study team for use in a scientific evaluation of bicycle level of service, pedestrian level of service, and latent demand along study area roadways. These methods are based on sound scientific principles which have been peer-reviewed by the Transportation Research Board, a division of the National Research Council. Bicycle level of service is used to rate existing corridors based on a variety of factors important to bicyclists. Pedestrian level of service is used to rate existing corridors based on a variety of factors important to the typical pedestrian’s need for safety, security, and convenience. The latent demand model provides a relative comparison of projected use by bicyclists and pedestrians among alternate routes before they are built.

The combination of a broad-based study advisory committee, extensive public input, and the use of a peer-reviewed scientific approach greatly enhance the validity of the study recommendations.



A cornerstone of the planning process has been the involvement of hundreds of citizens of the Richmond region through an extensive public outreach and participation process.



EXECUTIVE SUMMARY: Richmond Regional Bicycle and Pedestrian Plan

Air Quality

Air quality has increased in importance in the Richmond region, as the Richmond-Petersburg Area was recently designated as a non-attainment area under the Environmental Protection Agency’s (EPA) new 8-hour ozone standard. Because automobiles are a significant contributor to ground-level ozone, alternative modes of transportation - including bicycling and walking - will take on increased importance as area planners begin developing ozone attainment plans, which must be in place by 2007.



Interchanges pose a significant barrier to cyclists because of weaving vehicles between on- and off-ramps.

Bicycling and Walking in the Richmond Region Today

Chapters 2 and 3 of this plan combine to provide a general overview of current bicycle- and pedestrian-related planning efforts along with existing barriers (both physical and philosophical), in the Richmond region.

General Overview

It is generally agreed that the Richmond region lags well behind other regions (i.e. northern Virginia) in the pace of bicycle and pedestrian improvements. The extent of existing facilities and services together with planned projects are well-documented in Chapter 2. Not surprisingly, “journey-to-work” surveys conducted in conjunction with the 2000 U.S. census show a disparity within the Richmond region with higher reported walking and bicycling to work in areas with denser networks of sidewalks, such as portions of the City of Richmond. Suburban areas report well below the national average of 3.3 percent of workers walking or bicycling to work on a typical day. There is a strong desire among study participants to dramatically increase those figures before the next census is taken.

Air quality has increased in importance in the Richmond region, as the Richmond-Petersburg Area was recently designated as a non-attainment area under the Environmental Protection Agency’s (EPA) new 8-hour ozone standard. Five of the nine study area jurisdictions lie within this non-attainment area, including the City of Richmond and the counties of Charles City, Chesterfield, Hanover, and Henrico. Because automobiles are a significant contributor to ground-level ozone, alternative modes of transportation - including bicycling and walking - will take on increased importance as area planners begin developing ozone attainment plans, which must be in place by 2007.

Special attention is given in Chapter 2 to the issue of natural and man-made barriers such as the James River and other waterways, access-controlled highways, interchanges, and railways that crisscross our region. To aid in establishing priorities, barriers are categorized into major and minor problems according to the latent demand analysis, which is generally based on nearby population and activity densities, as well as the availability of alternate routes.

While it’s fine to begin allocating funds to tackle the retrofit of existing problems, it’s equally important to ensure policies are in place to slow the backlog of new transportation corridors that are built without bicycle or pedestrian accommodations. VDOT’s new policy distinguishes projects already in the preliminary design phase so that any new projects entering preliminary design will be approached under the assumption that bicycle and pedestrian facilities will be provided. Policies established and enforced by the nine local governmental agencies serving the region were surveyed to evaluate a need for changes to become bicycle- and pedestrian-friendly. It is expected that this study will be used by local governments to respond with appropriate changes to their ordinances deemed to be in the best interest of citizens.

Levels of Service and Latent Demand

Bicycle and Pedestrian Level of Service models provide an evaluation of bicyclist and pedestrian perceived safety with respect to motor vehicle traffic and comfort in using the roadway corridor. The models identify the quality of service for bicyclists or pedestrians that currently exists within the roadway environment by computing level of service values ranging from A (best or highest level of service) to F (worst). This ranking measure is similar to that used by transportation planners and engineers for highway travel conditions. Using statistical methods, the model reflects the effect on bicycling or walking suitability due to factors such as roadway width, bike lane width, sidewalk width, roadway striping, traffic volume and

speed, pavement surface roughness, percentage of trucks and other large vehicles, and the presence of vehicles parked on the street.

More than 2,300 miles of Richmond area roadways were tested in the LOS models. The Bicycle LOS model results show that about 20 percent of the tested mileage is currently at acceptable levels of LOS C or better. The Pedestrian LOS model results show that about 10 percent of the tested mileage is currently at acceptable LOS C or better. Results for each jurisdiction are shown in Chapter 3. It is not only the realization there is much to improve upon, but it also is the availability of this new tool that will help decision-makers prioritize their investments in bicycling and walking facilities.

The Latent Demand Analysis Method is used to estimate the relative potential for pedestrian and bicycle activity on a roadway and trail network. The analysis considers land uses and the probability that walking and bicycling trips will be generated given the availability of safe and convenient facilities. The analysis does not predict a volume of bicycle or pedestrian activity; rather, it shows the relative potential of one route compared with another. In this way, investments and priorities can be established such that new facilities will have a great chance of being used right away. Latent demand scores were developed independently for each jurisdiction and were computed using qualitative rankings ranging from High to Low. These scores are illustrated on mapping in Chapter 3.

Summary of Recommendations

Change is not always easy. To “prime the pump,” 15 demonstration projects are recommended that are of great interest to the region because of the promise to demonstrate new ideas to solve old problems in bicycle and pedestrian transportation (see **Appendix B.1**). The list of projects is topped by the Virginia Capital Trail, which should be the top priority because of its long

history, its status in the project development pipeline, and its potential to serve as a showcase when the world focuses on Virginia for the 2007 quadricentennial celebration of the Jamestown settlement.

The 27 recommendations outlined below are steps toward the creation of a regional network of bikeways and walkways in the Richmond region. These recommendations are divided into the following four categories:

A. Bicycle and Pedestrian Network Recommendations

B. Policy Recommendations

C. Planning Recommendations

D. Program Recommendations

In order to successfully implement these recommendations, a cooperative effort on behalf of the state, MPO, and local jurisdictions will be necessary.

A. Bicycle and Pedestrian Network Recommendations

The locations of the recommended 1,441-mile regional network are shown in Chapter 4. The order in which recommendations are listed below follow the order of presentation in the report where greater detail and explanation are provided.

- Establish a regional network of roadways, sidewalks, and shared use paths that will serve bicycling and walking needs in the Richmond region
- Use the pedestrian nodes and corridors identified in the plan to guide and focus pedestrian improvements and planning in the region
- Develop a regional sign system for select network routes that is easily and quickly understood by bicyclists and pedestrians, and serves both transportation and recreation oriented trips
- Establish connected routes within the regional network for development as bicycle touring routes

- Continue and complete development of the planned Virginia Capital Trail
- Integrate Interstate Bicycle Routes 1 and 76 within the region
- Develop plans to upgrade, extend, and study existing and proposed shared use paths that are identified to be part of the regional network
- Implement a series of demonstration projects in high impact areas within this network to feature a variety of bicycle and pedestrian facility types and emerging design treatments, and to build support for plan implementation among elected officials, business leaders, and the public
- Provide bicycle and pedestrian access across major barriers by improving existing crossings and developing new crossings at key locations
- Establish a regional bicycle parking equipment procurement and installation program
- Fully integrate bicycle and pedestrian accommodations into existing bus transit services, park and ride lots, and transportation demand management programs
- Coordinate maintenance activities for bicycle and pedestrian facilities to ensure a safe and high quality experience for every user of the roadway

B. Policy Recommendations

The following actions are recommended to ensure that future land use regulations, transportation planning activities, and roadway design policy supports and enables implementation of this plan.

- Encourage the use of context sensitive roadway design that facilitates adequate accommodation of bicyclists and pedestrians in the design of all roads in each jurisdiction
- Adopt bicycle facility selection considerations
- Adopt pedestrian facility selection considerations
- Encourage each jurisdiction within the region to make changes to land use and development policies to ensure

that future development facilitates and encourages safe and increased levels of bicycle and pedestrian travel

C. Planning Recommendations

The following actions are recommended to ensure that sufficient regional and local organizational bodies are established and maintained in order to foster future planning and funding efforts for both regional and local bicycle and pedestrian network facilities.

- Establish permanent regional bicycle and pedestrian committee to provide oversight of plan implementation and enable on-going public involvement and interagency and inter-jurisdictional coordination on bicycle and pedestrian issues
- Establish and ongoing bicycle and pedestrian program at the regional level to provide staff support for plan oversight and coordination, and to facilitate select implementation tasks
- Encourage the individual jurisdictions within the region to develop and/or regularly update local bicycle, pedestrian, and trail plans
- Identify federal, state, regional, and local funding mechanisms and sources to begin development of the regional bicycle and pedestrian network
- Undertake small area and corridor studies in key locations
- Ensure that all planning studies for new transit systems and TDM services fully consider bicycle and pedestrian integration issues and opportunities

D. Program Recommendations

- Develop and implement on-going encouragement programs to promote increased bicycling and walking for transportation purposes, including commuting and other utilitarian trips
- Include target-audience, safety, and use-promotion activities with the completion of each demonstration project and opening of a major new bicycle, pedestrian, or share-us path facility



Regional coordination may one day allow seamless travel for the bicycle commuter who begins on Ridge Road in Henrico...



...and crosses the Huguenot Bridge into the City of Richmond...



...before eventually entering Chesterfield County.



EXECUTIVE SUMMARY: Richmond Regional Bicycle and Pedestrian Plan

- Develop and implement targeted safety education and enforcement programs
- Adopt, pilot and begin phased-implementation of a bicycle and pedestrian safety education curriculum targeted to elementary school students
- Develop and implement a bicycle licensing program

Implementation

Chapter 5 of this plan describes seven items that will play an important role in implementing the recommendations listed in Chapter 4.

Policy for Integrating Bicycle and Pedestrian Accommodations

VDOT's new *Policy for Integrating Bicycle and Pedestrian Accommodations* is the most prominent of these since it provides for the equitable consideration of bicycle and pedestrian accommodations for all new highway construction projects. The policy serves as a paradigm shift in the way the inclusion of bicycle and pedestrian accommodations is approached in Virginia. This change should provide unprecedented momentum for the development of bicycle and pedestrian facilities within the Richmond region.

Virginia Capital Trail - A Signature Project

Completion of the Virginia Capital Trail will give the Richmond region a bicycle and pedestrian use facility of regional preeminence and beyond. The project will connect the City of Richmond with historic Jamestown and Williamsburg, linking the two former capitals of colonial Virginia while traversing three of the nine study area jurisdictions: City of Richmond, Henrico County, and Charles City County.



Completion of the Virginia Capital Trail along Route 5 will give the Richmond region a bicycle and pedestrian use facility of regional preeminence and beyond.

Demonstration Projects

Appendix B.1 contains a list of demonstration projects which are also of significant interest to the region because of the promise to demonstrate new ideas to solve old problems in bicycle and pedestrian transportation. The list of projects addresses problems relating to crossing barriers, retrofitting places that are designed primarily for vehicular traffic to be pedestrian- and bicycle-friendly, and a myriad of other issues.

Funding

The continued identification of funding streams will be critical to the implementation of further bicycle and pedestrian improvement projects. Numerous public and private grants are available to assist with implementation.

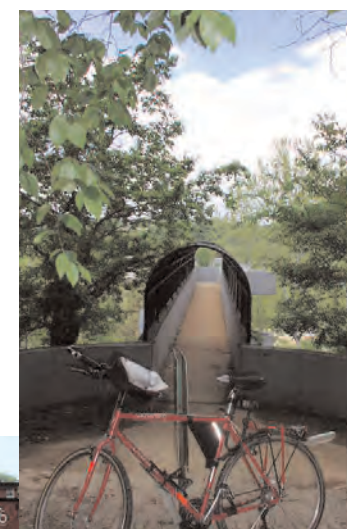
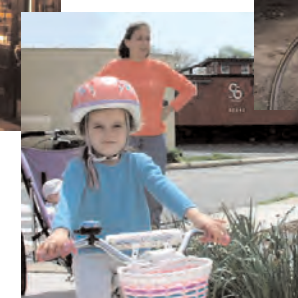
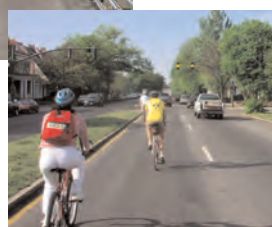
Planning Process and Plan Updates

This plan will provide long-term benefits to the Transportation Improvement Program (TIP) planning process through project implementation. The plan update process will operate on a three-year cycle, consistent with the long-range transportation planning process.

Partnership Approach and Activities

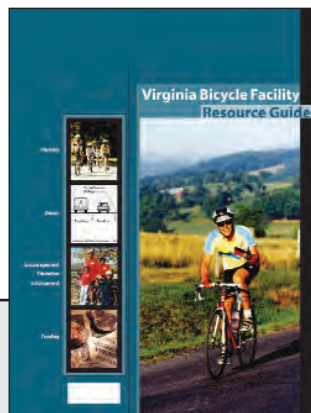
For the development of a regional transportation planning to be successful, partnership between local, regional, and state agencies must occur. For bicycle and pedestrian projects, it is suggested that the ring of partnership be expanded to include additional interested agencies and organizations to insure a broad, consensus-based approach. The recommendation for adoption by the Richmond MPO is the most important partnership activity.

SEPTEMBER
2004



Chapter 1: Introduction

Greater Richmond was recently ranked fifth in the “Top 20 Best Places to Live and Work in America” by *Employment Review*¹ magazine. Recreational activities and facilities that contributed to the high ranking include numerous historic sites; Richmond Canal Walk; Kings Dominion theme park; Richmond International Raceway; Pocahontas State Park and Forest; Richmond Marathon; Richmond Braves; Xterra mountain bike racing; and over 90 parks and recreational facilities, which feature such activities as whitewater rafting, golf, swimming, auto and truck racing, and riverfront recreation. While national rankings such as those by *Employment Review* magazine contribute to sustained job growth and migration of new workers into the region, they may not account for the inaccessibility of many of these recreational amenities to pedestrians and bicyclists.



Completed in 2002, the Virginia Bicycle Facility Resource Guide reported survey results showing only one in five Virginia communities had an adopted bicycle plan as of early 2000.

Introduction

A new framework for transportation planning in the Richmond region was created with adoption of the 2023 *Long-Range Transportation Plan* (LRTP) by the Richmond Area Metropolitan Planning Organization (MPO) in March 2001. The purpose of the Richmond Regional Bicycle and Pedestrian Plan is derived from that framework and is rooted in the following excerpt from the 2023 LRTP:

“The development of a sound transportation network is an important component of any metropolitan area’s social, economic, and physical framework. Basic mobility needs of the local population cannot be accomplished without a network of roadways, transit routes, pedestrian and bicycle paths, paratransit services, transportation demand management options, and other systems that enhance movement of people. Often these ways, routes, paths, services, options, and systems can be contained on the same facility, providing local residents multimodal options to make all types of work, social, recreational, and educational trips. As the population and composition of the Richmond region becomes more diverse, the transportation system must diversify to ensure adequate access and multiple mobility choices for the residents of the region.”²

Study Purpose

As provided for in the 2023 LRTP, the purpose of this study is derived from the desire to diversify the transportation system “to ensure adequate access and multiply mobility choices for the residents of the region.”

The purpose of this study is to develop a bicycle and pedestrian plan for the Richmond region. The resulting plan shall be a planning document that is available for use by local, regional, and state agencies as a guide in developing and promoting safe and convenient facilities and services oriented toward bicycling and walking.

Background

The 1990s brought major change to the way the nation and state and local jurisdictions addressed transportation needs. The federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, followed by its successor, the Transportation Equity Act of the 21st Century (TEA-21) in 1998, promoted the ideal of shifting transportation decision-making to the state and metropolitan levels of government. Furthermore, TEA-21 gave states and communities an opportunity to select a broad range of transportation facilities and services that best met local transportation priorities and contributed to making communities more livable. Use of federal funds can be tailored to meet local needs, whether for transit, bicycle and pedestrian facilities, highways, rideshare programs, safety projects, intermodal connections, or other improvements.

In 1999, the Virginia Department of Transportation (VDOT) initiated the development of a statewide bicycle resource guide for Virginia. Completed in 2002, the *Virginia Bicycle Facility Resource Guide* reported survey results showing only one in five Virginia communities had an adopted bicycle plan as of early 2000.³ “Faced with growing interest and demands for bicycling facilities, the vast majority of those localities without a plan indicated interest in developing one.” At the beginning of this planning process (early 2001), VDOT policy stipulated that only bicycle projects that are included in an adopted bicycle plan will be considered for inclusion in a highway project by VDOT. With so much of the state’s roadway system operated by VDOT and with the state’s pre-requisite for locally-adopted bicycle plans, there was a compelling argument to prepare and adopt bicycle plans at the local and regional levels of government. Since the inception of this study, VDOT has completed a comprehensive review of its policies related to bicycle and pedestrian facilities. As a result of this review process, VDOT developed a *Policy for Integrating Bicycle and Pedestrian Accommodations*. This policy was adopted by the

Commonwealth Transportation Board on March 18, 2004, and it notes a project’s identification in an “adopted transportation or related plan” as a leading factor that supports the need to provide bicycle and pedestrian accommodations on highway construction projects.

VDOT does not distinguish between various types of local adoption methods, as long as the local governing body or an MPO adopts the plan. In Virginia, for purposes of funding, bicycle plans can take various forms and are commonly seen as:

- a stand-alone bicycle plan or bicycle and pedestrian plan
- a component of a transportation plan
- a component of a parks and recreation plan
- a component of a comprehensive plan

VDOT recommends that bicycle and pedestrian plans be adopted as a component of the comprehensive plan because it is truly a locality’s “blueprint” for community development and furthers opportunities to blend with land use and zoning policies. Specific requirements set by Virginia statutes specify procedures for comprehensive plan adoption, amendment, and review. Adoption with the comprehensive plan ensures the bicycle plan is tailored to meet the locality’s expectations.

In 2000, VDOT sought to sponsor a regional study of bicycle and pedestrian transportation to demonstrate how TEA-21 could be used to benefit the citizens of Virginia by developing and promoting safe and convenient facilities and services oriented toward bicycling and walking. VDOT identified the Richmond region as the study area, developed a study scope, and then selected a consultant to perform the work. Tasks of the study included the formation of a study advisory committee, region-wide data collection, public outreach and participation, technical analysis, and the development of recommendations for a regional bicycle and pedestrian plan.

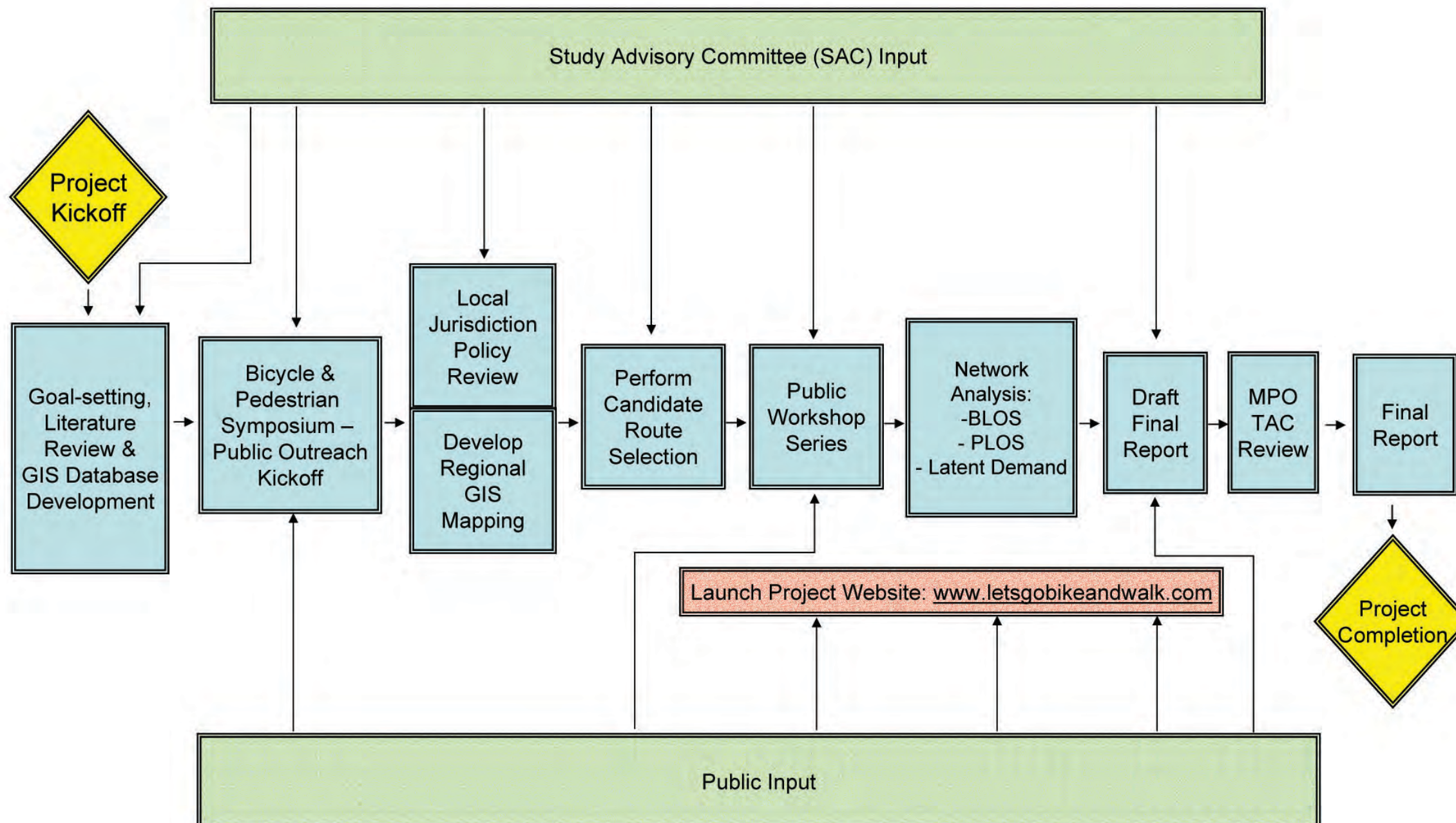
Figure 1.1 illustrates a general overview of the study process.

¹ *Employment Review*, June 2002.

² 2023 *Long-Range Transportation Plan*, March 8, 2001, p. 12.

³ *Virginia Bicycle Facility Resource Guide*, Commonwealth of Virginia, 2002.

Richmond Regional Bicycle and Pedestrian Plan
Figure 1.1: Study Process Diagram



Chapter 1: Introduction



Study advisory committee members and interested parties work together at a 2003 workshop in Henrico County.



The GRTC Transit System is the primary transit service provider in Richmond, serving a portion of the study area.

Study Area

The delineation of the project study area was driven by VDOT's desire for the *Richmond Regional Bicycle and Pedestrian Plan* to be accepted by the Richmond Area MPO and then by each of the counties, city and town that comprise the MPO. Therefore, the study area selected by VDOT is coincident with the jurisdictional boundaries of the member organizations of the MPO. These are shown in **Figure 1.2** and listed below:

- Town of Ashland
- Charles City County
- Chesterfield County
- Goochland County
- Hanover County
- Henrico County
- New Kent County
- Powhatan County
- City of Richmond

The initial review of the study area included a total of 2,300 miles of roadway and 300 miles of trails (off-road). This 2,600-mile network is described further in Chapter 4.

Study Advisory Committee (SAC)

As stated earlier, the purpose of this study is to develop a regional bicycle and pedestrian plan to be made available for use by local, regional, and state agencies. To effect this outcome, Richmond Area MPO staff and VDOT organized and facilitated a study advisory committee (SAC). All of the organizations listed below were voting members of the SAC and provided active participation in the development of the *Richmond Regional Bicycle and Pedestrian Plan*.

Town of Ashland	Richmond Area Bicycling Association (RABA)
Charles City County	GRTC Transit System
Chesterfield County	RideFinders
Goochland County	Sierra Club, Virginia Chapter
Hanover County	Citizens Transportaion Advisory Committee (CTAC)
Henrico County	
New Kent County	
Powhatan County	
City of Richmond	

Not coincidentally, the broad objectives listed below sought with this plan mirror the combined missions of the organizations that comprise the SAC:

- to promote healthy communities and citizens
- to provide transportation services
- to advocate for safe and efficient facilities and services for citizens who choose to walk, to ride a bicycle, or to use any other form of human-powered transportation

Following is a brief description of the mission of several organizations whose representatives were instrumental in developing this regional plan.

Bicycle and Pedestrian Advocacy Organization

The Richmond Area Bicycling Association (RABA) organizes regularly scheduled on- and off-road bicycle rides, publishes a monthly newsletter pertaining to all bicyclists, conducts monthly meetings, maintains a website, and pursues governmental advocacy contributing to safe and convenient facilities and services oriented toward bicycling in Central Virginia. Representatives of RABA contributed significantly to this study effort through their knowledge of the study network from the bicyclists' (and pedestrians') perspective. RABA also boosted

participation in various public outreach events hosted for this study.

Transportation Service Providers

The GRTC Transit System is the primary transit service provider in Richmond, serving a portion of the study area. Safe and convenient bicycle and pedestrian access to transit stops is critical to the mission of the GRTC Transit System.

RideFinders is the central Virginia region's transportation demand management/rideshare agency. The organization's primary goal is to work to improve the region's air quality, transportation efficiency, and economic vitality by providing shared-ride services to assist citizens and employers with their commuting needs. Besides promoting carpool and vanpool activities, RideFinders' extensive program also includes the support of public transportation, bike and pedestrian, and other alternative commute mode options.

Sierra Club

The Sierra Club is a national environmental organization which works to protect communities and the planet. The Falls of the James Group of the Virginia Chapter of the Sierra Club provides local leadership for the Richmond region.

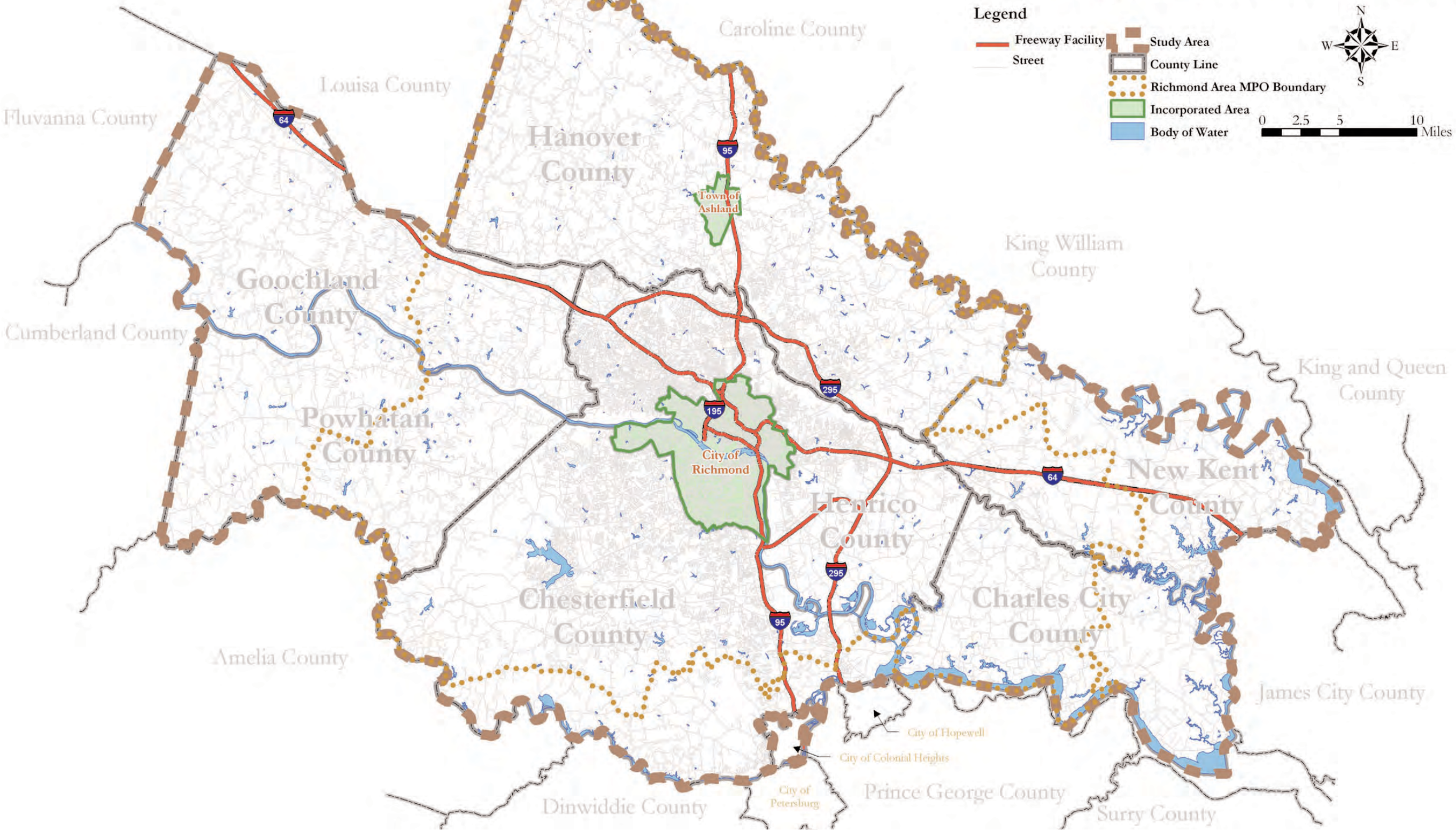
Citizens Transportation Advisory Committee

The Citizens Transportation Advisory Committee (CTAC) is comprised of citizen-leaders from around the Richmond region. On behalf of the region's citizenry, the CTAC provides input and feedback to decision-making bodies (such as the Richmond Area MPO) on transportation-related issues such as transportation funding priorities, public participation, and long range planning activities.

Healthy Communities

The Virginia Department of Public Health's Division of Chronic Disease is pursuing a healthy communities project. This project, which is one of 11 projects

Richmond Regional Bicycle and Pedestrian Plan
Figure 1.2: Study Area



Chapter 1: Introduction

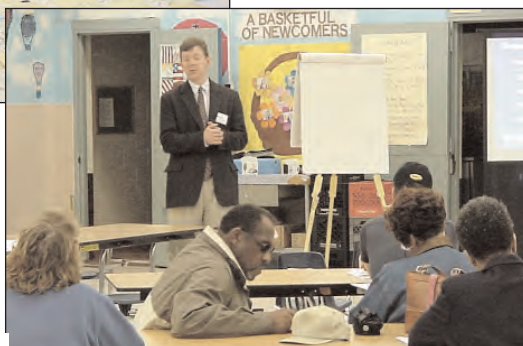


Discussions and mapping exercises by members of the community at a public outreach meeting in Henrico County (Mills E. Godwin High School, March 2003).



Citizens mark up a map and complete a survey at a public outreach meeting held at the Children's Museum of Richmond (March 2003).

Meeting attendees listen to a presentation at a public outreach meeting at John M. Gandy Elementary School in Ashland (March 2003).



nationwide being supported by the Center for Disease Control, focuses on making the places where people live, work, and go to school healthier by introducing physical activity into the community environment. Although they did not hold voting membership on the SAC, several Virginia Department of Public Health representatives actively participated at study meetings.

Bicycle and Pedestrian Plan Goals

Early in the study process, members of the SAC developed a set of goals to use as a guide throughout the course of the study. The goals address a wide range of issues related to bicycle and pedestrian planning and are listed below in no particular order:

- increase the overall number of people who regularly bicycle and/or walk in the Richmond region
- increase public awareness of bicycling and walking as viable modes of transportation
- promote rights and responsibilities of pedestrians, bicyclists, and motorists in a shared transportation network while improving safety and enforcement.
- ensure bicycle and pedestrian accommodations are considered in a balanced approach to planning and funding transportation improvements
- create additional physical activity opportunities in our community, increasing physical and mental wellness, as well as improving air quality for all
- provide improved opportunity and access for walking and bicycling to all residents
- encourage the design, finance, and construction of transportation facilities that provide safe, secure, and efficient linkages for bicyclists and pedestrians throughout the Richmond region
- stimulate local economies by providing safe and efficient bicycle and pedestrian connectivity between businesses, tourism, and recreation destinations

- encourage safe riding and walking practices on roads, byways, and trails in the Richmond region
- promote the development of seamless transitions for all bicycle and pedestrian facilities, which cross over jurisdictional boundaries (i.e. county, city, or town)

Public Participation

A cornerstone of this planning process has been to determine the desires of the citizens of the Richmond area for walking and bicycling facilities through an extensive public outreach and participation process. The result of these efforts has been to validate previous studies indicating a desire for more walking and bicycling facilities in the Richmond region along with improvements in the safety and convenience of these facilities through the development of a coordinated system of facilities. Techniques used to obtain and develop public input included user surveys and various mapping exercises made available at public outreach workshops and on the Internet. The objective of these activities was to allow citizens to identify areas of deficiency and indicate locations where they would use walking and bicycling facilities if they were available and safe.

The following is a summary of the public outreach efforts conducted for this study:

- launch of web site: www.virginiadot.org/projects/constrich-bike-ped.asp
- literature search: outreach to local, regional, and state agencies, February, 2002
- regional bicycle and pedestrian symposium: May 8, 2002 at Virginia Commonwealth University
- policy survey: outreach to local governmental agencies, September 2002
- launch of new web site: www.letsgebikeandwalk.com for March-April 2003 outreach
- public workshops: March 22 - 27, 2003 at five locations throughout the region
- virtual workshops on project web site: March - April 2003

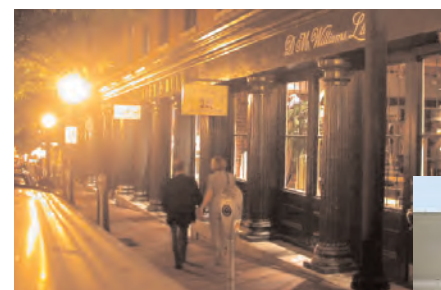
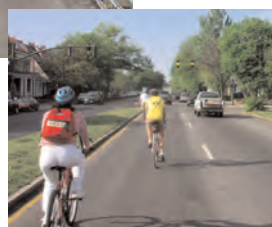
- presentation of draft plan to public: May 2004
- presentation to Richmond Area MPO Technical Advisory Committee: May 20, 2004
- presentation to local councils and boards: June 2004
- presentation to Richmond Area MPO: July 21, 2004

Scientific Approach

Over time, planning throughout the United States has adopted a “build it and they will come” approach regarding bicycle and pedestrian facilities. However, a growing number of metropolitan areas are using new analytical methods to evaluate the demand for and levels of service of bicycle and pedestrian facilities. The Richmond Regional Bicycle and Pedestrian Plan uses analytical methods to evaluate bicycle level of service, pedestrian level of service, and latent demand for bicycle and pedestrian trips along study area roadways. These methods are based on sound scientific principles which have been peer-reviewed by the Transportation Research Board, a division of the National Research Council, which serves as an independent advisor to the federal government and others on scientific and technical questions of national importance. Bicycle level of service is used to rate existing corridors based on a variety of factors important to bicyclists. Pedestrian level of service is used to rate existing corridors based on a variety of factors important to the typical pedestrian’s need for safety, security, and convenience. The latent demand model provides a relative comparison of projected use by bicyclists and pedestrians among alternate routes before they are built.

The scientific approach relied heavily on map review and a vetting process through active participation and input at SAC meetings, public events, and comments registered via the project web site. More than 5,000 comments were received from the public, primarily map-based suggestions for new facilities and safety improvements for bicyclists and pedestrians. The comments received from the public and SAC representatives greatly enhanced the reliability of the scientific methods used in this study.

SEPTEMBER
2004





Chapter 2: Bicycling and Walking in the Richmond Region Today - Overview

Chapter 2 presents a general overview of bicycle and pedestrian planning efforts and facilities found in the Richmond region today. The information contained in this chapter was generated from:

- field observations and data collection
- document review, stakeholder interviews with study advisory committee members and staff of the participating jurisdictions
- citizen input gathered at public meetings

Air Quality

Air quality has increased in importance in the Richmond region, as the Richmond-Petersburg Area was recently designated as a non-attainment area under the Environmental Protection Agency's (EPA) new 8-hour ozone standard. Because automobiles are a significant contributor to ground-level ozone, alternative modes of transportation - including bicycling and walking - will take on increased importance as area planners begin developing ozone attainment plans, which must be in place by 2007.

This chapter and the following chapter prepare a foundation for the final study recommendations and include descriptions of five major aspects of existing conditions:

- general evaluation of bicycling and walking conditions
- status of bicycle and pedestrian planning in the region
- status of bicycle and pedestrian facility development in each jurisdiction
- policy analysis
- specific assessment of bicycling and walking levels of service on 2,500 miles of arterial and collector roads

General Evaluation

The automobile is the predominant mode of travel for most people living in the Richmond Area. Public bus transit (GRTC Transit System) serves the core of the region, and there are some opportunities to use car or vanpools, primarily through RideFinders. Light rail and commuter rail services are being studied, but have not been developed. While car ownership in the region is typical of similar sized southern cities, there are significant

differences within the region. According to socioeconomic data¹ compiled by the Richmond Regional Planning District Commission, the ratio of total population to automobiles in Hanover and Powhatan counties is 1.2:1; in Henrico and Chesterfield counties, it is 1.4:1; and in the city of Richmond, it is 2:1. From these statistics, it is apparent that the city has a significant number of people that are without regular access to a car. For these people, access to transit, walking, and safe bike routes is especially important because their routine transportation for employment, education, shopping, and health care depends on non-automobile access.

With the exception of some of the rural portions of the study area, conditions are generally not conducive to bicycling and walking outside of Richmond's older neighborhoods. Many suburban neighborhood streets lack sidewalks, and many arterial and collector roads outside of older town centers were built with little or no accommodations for bicyclists or pedestrians, including people with physical disabilities. Off-road trails are not as prevalent or well developed in the Richmond region, unlike urban areas such as Northern Virginia. Walkers and hikers in the Richmond area have more off-road opportunities than bicyclists since many of the trails that do exist are primarily unpaved hiking and walking trails.

Population in the Richmond region increased 17 percent from 739,735 in 1990 to 865,941 in 2000. With the exception of Richmond, each of the localities in the region experienced double-digit growth during that period. Richmond's population has experienced declines in past years but is now beginning to see some increase owing to urban revitalization projects.

The rapid growth of suburban areas surrounding Richmond has generated higher traffic volumes and, in general, less suitable conditions for bicycling and walking. Conditions for bicycling and walking in the Richmond region are highly variable. Sections of the City of Richmond, such as Monument Avenue and the James River waterfront, represent some of the most scenic

walking environments in the country. Richmond is a walkable city due to its compact neighborhoods and consistent grid street system. Many of Richmond's older neighborhoods have good sidewalk coverage and beautiful tree-lined streets. Bicycling is also popular throughout the Richmond area. Rural roads and landscapes in Charles City, Chesterfield, Goochland, Hanover, New Kent, Powhatan, and Henrico counties provide some very popular recreational bicycling routes.

Regional Air Quality

On April 15, 2004, the Environmental Protection Agency (EPA) designated the Richmond-Petersburg Area as a non-attainment area under its new 8-hour ozone standards. Five of the nine study area jurisdictions lie within this non-attainment area, including the City of Richmond and the counties of Charles City, Chesterfield, Hanover, and Henrico. The EPA's non-attainment designation indicates that an area has violated, or has contributed to violations of the national 8-hour ozone standard over a three-year period. The non-attainment designation will officially take effect on June 15, 2004, at which time communities will be required to prepare a plan to reduce ground-level ozone (plans due to EPA by June 2007). June 2010 will be the deadline for the Richmond-Petersburg Area to meet the attainment limits for this new standard. Because automobiles are a significant contributor to ground-level ozone, alternative modes of transportation - including bicycling and walking - will take on increased importance as area planners begin developing ozone attainment plans.

Current Levels of Bicycling and Walking

In the United States, transportation data on bicycling and walking is sparse. One set of statistics available through the U.S. Census is *journey to work by travel mode*. Year 2000 census data indicates that about 3.3 percent of Americans travel to work by bicycle or on foot. In Virginia, the state average is 2.5 percent. **Table 2.1** shows how the larger population jurisdictions in the Richmond region compare to the state and national averages.

¹ *Richmond Area MPO Socioeconomic Data Report for 1998 and 2003*, Richmond Regional Planning District Commission, May 18, 2000.

Another national survey, The Nationwide Personal Transportation Survey, finds that in the U.S., as many as 8 percent of all types of trips are made by bicycle or on foot. In addition to work trips, this statistic counts trips to school, recreation sites, social events, shopping, and all other individual and family trips.

Table 2.1: Journey to Work (by Travel Mode)

Source: U.S. Census 2000

Jurisdiction	Bicycle to Work	Walk to Work	Combined
United States	0.4 %	2.9 %	3.3 %
Virginia	0.2 %	2.3 %	2.5 %
Richmond	1.1 %	4.4 %	5.5 %
Hanover	0.0 %	1.3 %	1.3 %
Henrico	0.1 %	0.9 %	1.0 %
Chesterfield	0.0 %	0.8 %	0.8 %

Bicyclist and Pedestrian Safety

Another factor affecting bicycle and pedestrian travel is safety in traffic. Input received from the public and from members of the study advisory committee indicate that people perceive the streets and roads in the Richmond region to be particularly unsafe for bicycling or walking. Numerous individuals reported frequent occurrences of motorist aggression towards bicyclists.

Meanwhile, pedestrian safety is often compromised by transportation designs which favor increased throughput for motor vehicles (i.e. large turning radii at intersections), while ignoring pedestrian needs (i.e. lack of crosswalks). According to



Mean Streets 2002, a national report produced by the Surface Transportation Policy Project, based on year 2000-2001 traffic fatality data kept by the National Highway Traffic Safety Administration, Virginia ranked 20th as “most dangerous” among all the states with an annual average of 1.4 pedestrian deaths per 100,000 population. In 2001, there were 104 pedestrian fatalities in Virginia.

Based on the Pedestrian Danger Index developed for the *Mean Streets 2002* report, the Richmond region ranked 31st “most dangerous” among the 50 largest metropolitan regions. There were 10 pedestrian fatalities in 2001 in the combined Richmond and Petersburg metro areas. (Orlando, Florida topped the list as the “most dangerous” place to walk, followed by Tampa, West Palm Beach, Memphis, and Miami.)

Status of Bicycle and Pedestrian Planning in the Region

In general, the Richmond region is in the early stages of planning for the bicycle and pedestrian modes of transportation. Several jurisdictions have performed more planning and implementation than others. This chapter provides a brief status report of planning and design activities in the regions that have been completed or are underway.

Virginia Department of Transportation

The Virginia Department of Transportation (VDOT) is currently updating its Statewide Intermodal Long Range Transportation Plan, which is being referred to as *VTrans2025*. The plan sets forth goals and strategies to provide a seamless multimodal transportation system in Virginia by encouraging connectivity among all modes of transportation, including bicycle/pedestrian, transit, highways, air, passenger rail, freight, ports, and ferry.

In 2002, VDOT completed its *Virginia Bicycle Facility Resource Guide*, which was developed to provide a bicycle planning primer for citizens, local jurisdictions and regional agencies, and its district offices and residencies. It

contains chapters addressing planning; design; encouragement, education, and enforcement; and funding.

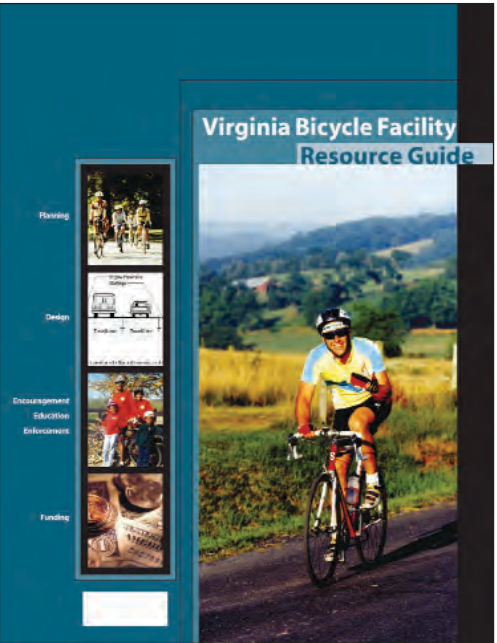
VDOT has also conducted an inventory study of Interstate Bicycle Routes 1 and 76, which assesses these long-standing on-road interstate bicycle routes that date back to the late 1970’s and the early 1980’s. A feasibility study of the Virginia Capital Trail was completed by VDOT, and design of sections of the trail is currently underway.

Other important bicycle and pedestrian planning resources developed by VDOT include the Six Year Program lists of funded projects, the list of Transportation Enhancement project awards, and a guide to bicycling laws in Virginia, all of which can be found on the VDOT web site.

The Richmond Area MPO

The Richmond Area MPO addressed bicycling and walking in its *2023 Long-Range Transportation Plan* and noted its cooperation in and support for this planning process. In addition to a summary of bicycle planning in the jurisdictions of the region and a map of existing and planned facilities, the long range plan offers nine strategic recommendations to guide the region’s future efforts in this area:

- planning for transportation programs needs to proactively consider the potential bicycle/walking link
- direct scarce resources toward settings with the greatest payoff
- place emphasis on conventional facilities (e.g. sidewalks and bicycle lanes)
- consider linkages which promote continuity
- think in terms of packages of actions
- consider the linkage with transit
- private sector involvement and support
- financial encouragements
- marketing and education

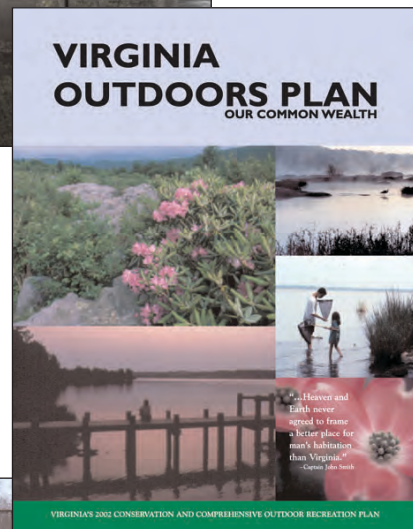


VDOT recently completed the Virginia Bicycle Facility Resource Guide, which serves as a bicycle planning primer for use statewide.

Chapter 2: Bicycling and Walking in the Richmond Region Today - Overview



A portion of the Belle Isle pedestrian bridge, hanging below the Robert E. Lee bridge.



The 2002 Virginia Outdoors Plan provides a recent assessment of potential trails and greenways in the Richmond region.



The entrance to the Trolley Line Trail in Hanover County, just south of Ashland.

Regional Trails and Greenways Planning

In 1993, the *Metro Richmond Greenways* draft report was produced by the Metro Richmond Greenways Committee, in cooperation with the National Park Service's Rivers, Trails, and Conservation Assistance Program. While it was not formally adopted by a regional organization or by many local governments, it provides a solid body of information about potential trails and greenways in the region. The 2002 *Virginia Outdoors Plan*¹ provides a more recent assessment of potential trails and greenways.

From these sources and other information provided by SAC members, the following list of proposed off-road greenways and trails was developed (Table 2.2). It focuses

on only those greenways and trails that were determined to be of a regional scope or significance.

Table 2.2: Proposed Greenways and Trails of Regional Scope or Significance

Greenway/Trail Name	Component of a Larger Trail System:	Location
East Coast Greenway (ECG)		Hanover, Henrico, Richmond, Charles City, Chesterfield
Trolley Line Trail		Ashland, Hanover, Henrico
Boulevard Bikeway		Richmond
James River Trails (JRT)		
Belle Isle trails and bridges, Riverside Trail, Pony Pasture, Floodwall Walk, Slave Trail, etc.		Richmond, Henrico, Chesterfield, Goochland
James River and Kanawha Canal Towpath (north shoreline)		Richmond, Henrico, Goochland
Canal Walk extension		Downtown Richmond
Riverside trail extension (connecting, extending and upgrading the trails along the south shore of the James River)	potential ECG	Richmond
Riverside trail—south (from James River Park Ancarrows Landing to Dutch Gap/Henricus Historical Park)	potential ECG	Richmond, Chesterfield
Other Greenways and Trails		
Virginia Capital Trail (Route 5)	ECG alternate route	Charles City, Richmond, Henrico
Swift Creek Greenway		Chesterfield
Southeast Chesterfield Rail-Trail—Chester Linear Park Extension	potential ECG route	Chesterfield, Colonial Heights
Appomattox River Trail	potential ECG route	Chesterfield, Colonial Heights, Petersburg
Rail with trail, Norfolk Southern Railroad		Chesterfield, Powhatan
Falling Creek Greenway		Chesterfield, Richmond
Pamunkey Trail		Hanover
Route 301 bikeway		Hanover
Highland Springs/Chickahominy Trail		Henrico, Charles City
Four Mile Creek Trail		Henrico, Chesterfield
Old Richmond Grade/Mattaponi Trail (Tappahannock route of the Richmond and Rappahannock Railroad)		Henrico, Hanover
Upham Brook/Chickahominy Trail		Henrico, Hanover
Newport News branch of CSX Railroad		New Kent, Charles City, Henrico, Richmond
Rail with trail, Norfolk Southern Railroad		New Kent, Henrico
Reedy Creek Greenway		Richmond, Chesterfield
Powwhite Creek Trail		Richmond, Chesterfield
Gillies Creek Greenway		Richmond, Henrico
Various utility rights-of-way		all jurisdictions

¹ 2002 *Virginia Outdoors Plan*, Commonwealth of Virginia, February, 2002.

Planning and Implementation Progress

Following is a progress report of bicycle and pedestrian related planning, design, and implementation efforts listed by jurisdiction.

Town of Ashland

- completed and adopted a town *Bicycle and Pedestrian Plan* (1998)
- recently adopted a comprehensive town plan which further expresses support for the analysis and recommendations developed in the *Bicycle and Pedestrian Plan*
- built a 0.7-mile section of a rail with trail facility (Railside Trail) and built short trail section on N. James Street
- planned and partially funded section of Trolley Line Trail and supports further development of this trail corridor linking Ashland and Richmond
- installed two short walking path segments: one on N. James Street and one on Hill-Carter Parkway Extension
- installed one 0.5-mile section of bike lane along Archie Cannon Drive
- implemented orange flag crossing program
- developed brochures about local trails
- is destination of a weekly bicycle tour organized by the Richmond Area Bicycling Association
- developed an off-road mountain biking trail at a town park
- hosted Dan Burden of Walkable Communities, Inc. for a town walkability audit

Charles City County

- minimal bicycle or pedestrian planning has been completed
- a map in the comprehensive plan identifies four roadways in the county as greenways (corridors of restricted development):
 - Route 5
 - Route 155
 - Route 106
 - Route 600
- VDOT’s Virginia Capital Trail project is the most significant bicycle/pedestrian planning activity in county
- the county has no dedicated bicycle facilities or shared use pathways and few sidewalks

Chesterfield County

- is implementing a bikeway master plan adopted in 1989, which grew out of bikeway planning efforts dating back to 1975 and is incorporated into the county comprehensive plan
- has constructed or has under design various bicycle facilities, including bike lanes and paved shoulders
- has built a few small greenway trails, such as Chester Linear Park (a rail trail) and has plans to include trails as a part of other park development projects
- is actively involved in making pedestrian improvements such as the Halloway Avenue and Route 60 sidewalk projects
- has been successful in securing VDOT Transportation Enhancements funds and Virginia Recreational Trail funds for bicycle, pedestrian, and trail projects in the county
- has completed a number of sub-area studies calling for trails, such as the Riverfront Plan

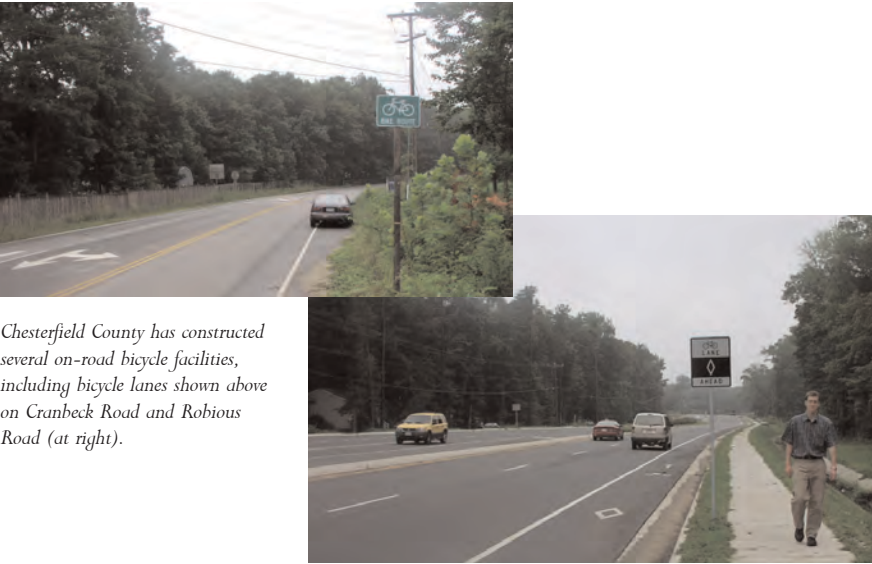
- features planned subdivisions: (i.e.: Brandermill) with extensive off-road bike trail system
- has a local greenway organization, Friends of Chesterfield Riverfront
- owns a portion of abandoned CSX railroad in southeast Chesterfield (rail trail opportunity)
- the park and recreation master plan identifies potential greenway corridors and calls for development of a greenway master plan

Goochland County

- no dedicated bicycle or pedestrian planning has been performed
- no dedicated bicycle facilities or shared-use paths exist, and only a few sidewalks are present along select streets
- Motor vehicle traffic connectivity issues have been raised in the East County Area around the West Creek Development. Currently only four roads connect Goochland and Henrico: I-64, Route 250, Route 6, and Route 650. Limited access on I-64 and high traffic volumes on Route 250 and Route 6 seriously limit bicycle and pedestrian connectivity today, and conditions are likely to become worse in the future. No paved shoulders on River Road in Henrico County seriously limit bicycle access along this key route to (i.e. Route 650) Goochland County.

Hanover County

- completed a modest bikeway plan developed as a student project (not formally adopted); it identifies three specific opportunities for bicycle and pedestrian improvement:
 - Sub Area Plan for Kings Charter
 - Sub Area Plan for Route 54 Corridor
 - recreational bike route plan of Civil War Trails



Chesterfield County has constructed several on-road bicycle facilities, including bicycle lanes shown above on Cranbeck Road and Robious Road (at right).



Existing sidewalk near Goochland County Courthouse.

Chapter 2: Bicycling and Walking in the Richmond Region Today - Overview



Existing Share the Road sign along Route 13 in western Powhatan County.



Existing brick sidewalk near Powhatan County Courthouse.

- recently adopted a comprehensive plan that includes a map of potential bicycle facilities and calls for increasing the options available for bicycling and walking for transportation, designing new roads to accommodate bicycling and walking, and development of greenway trails
- has no existing greenway trails, but the parks and recreation master plan identifies the Trolley Trail as a potential greenway corridor
- currently, there are no dedicated on-road bicycle facilities in existence; however, a portion of Atlee Station Road (from Route 301 to Honey Meadows Road) is currently under design with striped bike lanes

Henrico County

- the county does not currently have a bicycle and pedestrian plan
- no dedicated bikeways exist
- sidewalks exist in some areas of the county and are installed with new road construction and most reconstruction projects
- the update of the 2015 park master plan:
 - projects a 2015 bike path facility deficit of 56 miles
 - projects a 2015 walking path facility deficit of 44 miles
 - does not retain references to trails listed in previous plan (see below)
- the update of the 2005 park master plan identified five potential greenway trails:
 - Tuckahoe Creek/Kanawha
 - Upham Brook
 - Highland Springs/Chickahominy
 - Almond Creek Basin
 - Four Mile Creek Basin

New Kent County

- a bicycle and pedestrian improvement map together with implementing strategies is contained in the Vision 2020 Comprehensive Plan adopted in August 2003 and identifies the following elements:
 - roads needing improved surface for bicycling
 - roads suggested for bike lanes or paved shoulders
 - potential off-road corridors
 - roads and areas that need attention to pedestrian accommodations
 - potential intersections for roundabout
- the county has designated six villages in its comprehensive plan; one of the required village development components is an advanced pedestrian network
- the county has no dedicated bicycle facilities or shared use pathways, and few sidewalks
- the county has proposed several bikeway and pedestrian projects for funding with Regional STP and Transportation Enhancements Program funding

Powhatan County

- no dedicated bicycle or pedestrian planning has been completed
- “Share the Road” signs have been installed on Route 711 (Huguenot Trail) and parts of Route 13 (Old Buckingham Road)
- a draft map of high priority and secondary priority routes in the county has been developed by a local bicycle touring company (Old Dominion Bicycle Tours)
- bike tour cue sheets have been developed by Old Dominion Bicycle Tours for a Powhatan County to Louisa County Ride
- the county has no dedicated bicycle facilities or shared use pathways and few sidewalks

City of Richmond

- the 1997 city transportation plan identified current conditions and needs, and recommended the following improvements:
 - eastern-western transect (on road)
 - northern-southern transect (on road)
 - greenway trails along the James River shorelines
 - a signed bike route system for the remaining areas of the city
 - improved commuter bike parking
- completed a map of existing and proposed facilities in 2001: *City Bike Routes*
- completed city-wide master plan (2000-2020):
 - provides strong policy support for bicycling and walking
 - identifies potential on-street bikeways in citywide and sub-area plans and maps
- built a number of pedestrian pathway facilities along and across the James River:
 - Canal Walk (bicycles are not allowed)
 - Belle Isle bridges (bicycle accessible)
 - various paths along the south shoreline of the James River: Pony Pasture, Flood Wall Trail, Reedy Creek (mostly bicycle accessible for off-road bicycles only)
 - various access paths on the north shoreline (primarily pedestrian)
- existing bike lane on Broad Rock Road (Route 10)
- built a few roadways with paved shoulders for bicycling, including the Robert E. Lee Bridge and Jahnke Road, and has additional projects in planning and design
- Using paved shoulders and “Share the Road” signs on Riverside Drive. Currently, a scenic on-road bike route is being marked to connect the Lee Bridge to the Huguenot Bridge via Riverside Drive. This route is expected to be marked and operational in May 2004 and will provide connections to numerous elements of the James River Park system as well as to Powhite Park.

- spends about \$1 million annually on sidewalk repair and maintenance
- The newly renovated Main Street Station was opened to Amtrak service in December 2003. It is slated to become the new Amtrak station for the city and an intermodal urban hub. There is community interest in developing this station as a pedestrian hub, and ensuring that it is well linked, for bicyclists and pedestrians, to neighborhood walkways and greenways, as well as the James River waterfront
- formal planning documents have been developed for bicycle and pedestrian routes in the Southampton area of southwest Richmond, and the *Vision for the Boulevard* plan includes bikeways and walkways
- created a series of public service video announcements (aired on city’s cable TV channel) and a website to educate both pedestrians and drivers about pedestrian safety

Status of Bicycle and Pedestrian Facility Development in the Region

Designated Bike Routes, Lanes, and Paved Shoulders

The primary designated bike routes (routes signed as bicycle routes) in the Richmond region are Interstate Bicycle Routes 1 and 76. Use of the *Manual on Uniform Traffic Control Devices* (MUTCD)¹ green and white bike route signs is occurring in some jurisdictions, such as Chesterfield County. “Share the Road” signs are being used in a variety of jurisdictions within the region. For example, these signs can be found on some rural roads in Powhatan County and on Riverside Drive in Richmond. A few designated bike lanes exist in Richmond, Chesterfield, and Ashland (see **Table 2.3**), and new bike lanes are planned along a portion of Atlee Station Road in Hanover County. A number of paved shoulders, without bike use designation, have been designed for bike use and

Table 2.3: Examples of Existing Bike Lanes and Share the Road Signs

Jurisdiction	Facility Location	Facility Type
City of Richmond	Broad Rock Road	bike lanes
	Riverside Drive (inner segment)	paved shoulder and “Share the Road” signs
	Riverside Drive (outer segment)	“Share the Road” signs
	Tredegar Street	“Share the Road” signs
Town of Ashland	Archie Cannon Drive	bike lanes
Chesterfield County	Iron Bridge Road (Route 10)	bike lanes
	Courthouse Road	bike lanes
	Robious Road	bike lanes
	Cranbeck Road	bike lanes
Powhatan County	Huguenot Trail (Route 711)	“Share the Road” signs
	Old Buckingham Road (Route 13)	“Share the Road” signs

constructed in the City of Richmond and Chesterfield County. Chesterfield County has been expanding its system of both designated bikeways and paved shoulders.

Shared Use Paths and Trails

Over twenty miles of shared use paths exist in the region, although most exist as loop trails within park facilities or on parklands. **Table 2.4** contains examples of the region’s shared use paths and trails. Many of these trails are not paved. One of the few paved trails in the region is the Railside Trail in Ashland, which primarily serves recreational uses, but also connects residential neighborhoods with an elementary school.

Pedestrian Facilities

Sidewalks: The City of Richmond has the most extensive sidewalk system in the region. Sidewalks are most prevalent in the older sections of the city, which is built around a grid street system. In some areas of the Fan, such as around Virginia Commonwealth University, brick sidewalks exist, and the streetscape retains a strong historic character. In Henrico County, sidewalk coverage is

less extensive. Frequently, sidewalks lack continuity, such as gaps that make it difficult for pedestrians to continue walking through a community, even in the oldest neighborhoods close to Richmond. Sidewalk coverage in Chesterfield County is also less extensive than in Richmond and is generally correlated with the age of the neighborhoods. Similarly, the Town of Ashland has its best sidewalk coverage in the older sections of town. Sidewalks in Hanover County are also less frequent, and the rural and less densely populated counties of Powhatan, Goochland, New Kent, and Charles City have relatively small developed areas and few sidewalks.

Crosswalks and Curb Ramps: Throughout the city and suburban jurisdictions, marked crosswalks are seen at relatively few intersections. Marked crosswalks and demand-activated pedestrian “walk/don’t walk” signal equipment are lacking at many intersections. Frequently, crosswalks are severely worn by traffic and in need of maintenance. At wide intersections, raised-curb medians (helpful as pedestrian refuges) are seldom found. In downtown Richmond, the stop bar is often the only, or primary, mark seen on the pavement at an intersection. Except in a few school zones, use of a striping pattern other than the standard parallel lines is rarely seen. Outside of the center city and a few other neighborhoods in Richmond, the presence of curb ramps is not typical. It is not uncommon to see intersections where one corner has a sidewalk without a curb ramp, and another has a curb ramp, but no sidewalk. Where new development throughout the region includes sidewalks, curb ramps are almost always included as well. In general, however, the condition of sidewalks in neighborhoods is poor. Travel by wheelchair between many neighborhoods is difficult due to poorly maintained sidewalks.



A view of the entrance bridge leading to Brown’s Island (City of Richmond).



Existing “Share the Road” sign along Riverside Drive in the City of Richmond.

Table 2.4: Examples of Existing Shared Use Paths and Trails

Jurisdiction	Path Name and Location	Length and Surface
City of Richmond	Belle Isle and Riverside Trail James River Park: Tredegar St. - Belle Isle - Reedy Creek - Nickel Bridge	3.25 miles, crushed stone, concrete
City of Richmond	Riverside Trail at Pony Pasture, James River Park	1.0 mile, crushed stone
City of Richmond	Floodwall Walk, south shore of James River (includes a midpoint staircase)	1.25 miles, asphalt, crushed stone
City of Richmond	Canal Walk, North shore of James River (bikes are not allowed)	0.5 miles, crushed stone and asphalt
City of Richmond	various other locations along the James River and in city parks	packed dirt, crushed stone, and asphalt
City of Richmond	path near Oakwoods Cemetery	asphalt
Chesterfield County	Chester Linear Park, Town of Chester	1.0 mile; crushed stone and packed dirt
Chesterfield County	Dutch Gap Conservation Area	4.0 miles, natural surface
Chesterfield County	Pocahontas State Park	15.0 + miles, stone dust, crushed stone, and nat. surface
Town of Ashland	N. James Street Trail	0.25 miles, asphalt
Town of Ashland	Railside Trail	0.7 miles, asphalt
Town of Ashland	Stony Run Trail	0.5 miles, unpaved

¹ *Manual for Uniform Traffic Control Devices*, Federal Highway Administration, December, 2000.

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Streetscaping in Highland Springs (Eastern Henrico County).

There are a number of older interchanges (such as I-64 and Glenside Drive) where the sidewalks along the arterial (Glenside in this case) carry through the on and off ramps to the interstate highway. While crosswalks are not always striped, curb ramps are often in place and the continuity of the sidewalk carries across each ramp and over the arterial's bridge. This type of pedestrian service continuity is not usually present at more recently constructed interchanges.

Medians: Many of the longest arterials in the region, such as Laburnum Avenue and Parham Road, are divided highways with wide, raised medians. In many instances, no special pedestrian signing, striping, or accommodations are provided. The 10- to 14-foot medians provide refuge, allowing pedestrians to cross one direction of travel at a time.

Streetscapes: The community of Highland Springs in Eastern Henrico County is one of a handful of neighborhoods where public efforts are underway to improve the visual quality of their "main street" (Route 33) to revitalize local businesses and increase community pride. Historic-style lamp poles have been installed along a 5- to 8-block stretch, colorful banners announce the community, and sidewalks and the road pavement have been upgraded.

Innovative Features to Enhance Bicycle and Pedestrian Activity

Signage: The City of Richmond has given special attention to signing along Riverside Drive between the Huguenot Bridge and the Pony Pasture area. In addition to "Share the Road" signs, the City has installed supplemental signage to discourage through traffic and to direct motorized vehicles to reduce their speed and to yield to bicyclists and pedestrians. These measures serve to enhance the safety and experience of the many bicyclists and pedestrians who traverse this road.

Traffic Calming: When appropriately applied, traffic calming measures can enhance the bicyclist's and pedestrian's experience along streets which see significant motorized vehicle traffic. Henrico County, for example, has recently developed a traffic calming program intended to be applied on certain residential streets which have a speed limit of 35 miles per hour or less and have traffic volumes of no more than 4,000 vehicles per day.

The program uses a combination of measures from physical devices, such as speed humps and traffic circles, to supplement signs that indicate increased fines for speeding. The goal is to slow motorists and, where appropriate, direct traffic to more appropriate routes, while improving safety for pedestrians and cyclists.

Bicycle and Pedestrian Links to Bus Stops

GRTC Transit System: Purple and white signs along the roadways mark GRTC bus stops. Presently, GRTC has a fleet of approximately 180 buses. The route system consists of 41 routes and is almost entirely radial, centered on downtown Richmond. It serves many Richmond neighborhoods and parts of Chesterfield and Henrico counties. Goochland, Hanover, New Kent, Charles City, and Powhatan counties are not presently served. Henrico County recently developed and funded four cross-town bus routes.

In recent years, GRTC reports spending about \$100,000-200,000 per year on amenities such as bus shelters, benches, and trash cans. For example, along Route 1 in south Richmond, modern covered bus shelters have been installed. The staff has also prepared a proposal to install bike racks on the front of GRTC buses, system-wide, and hopes to receive approval to implement the project in 2004.

GRTC has electronic Geographic Information System (GIS) information, which maps the locations of bus routes and bus stops throughout its system. This information can be useful in determining where transit-bound pedestrian traffic is likely to occur on the street system.

Park and Ride Lots: There are 12 park and ride lots in operation in the Richmond region. Four of the lots have bicycle parking racks, and none of the lots provide bike storage lockers. Each of the lots with bike racks is in Henrico County and provides connections to GRTC transit routes, as well as carpool and vanpool opportunities.

Transportation Demand Management

RideFinders provides transportation demand management services in the region. Its extensive program includes promotion of carpooling and vanpooling, and other employer-based trip reduction and single occupant vehicle-diversion activities. RideFinders promotes use of park and ride lots provided by VDOT or local jurisdictions, runs a guaranteed-ride-home program, and is interested in promoting bicycling and walking as a part of its multimodal program approach.

Bike Parking

Bicycle parking is lacking throughout the region. Street signs and parking meters are most commonly used by bicyclists for secure parking. Adequate levels of bicycle parking equipment are provided at some universities. Virginia Commonwealth University, located just northwest of downtown Richmond, provides a large number of bicycle parking racks throughout the campus. Also, RideFinders is currently performing a feasibility study and seeking funding for the installation of up to twelve bike



Bicycle parking racks on the campus of Virginia Commonwealth University.

banks to be located in the City of Richmond and in portions of the surrounding counties.

Generally, at public schools and parks, the type of bike parking equipment provided is the “Comb,” or “Toast Rack,” which only supports one wheel of the bicycle and makes it difficult to lock both frame and wheels without a long cable. The *Bicycle Parking Guide*, published by the Association of Pedestrian and Bicycle Professionals (2002), recommends against use of these rack styles and instead recommends use of the “Inverted U,” “A,” or “Post and Loop” rack styles.

Biking to Work

A survey of office building managers in the region focused on assessing bicycle commuting levels and the extent of support facilities, such as bike parking and changing facilities provided in office buildings. This survey found extremely low levels of regular bike commuting and confirmed that bike racks, lockers, or storage rooms are rarely provided at office buildings. Bike commuters usually store their bicycle in or near their work area. Interestingly, a large number of the major employers offer showers, lockers, and changing rooms in conjunction with on-site fitness and exercise facilities provided at their office buildings.

A coalition of organizations working together as the Transportation Initiatives for a Greater Richmond (TIGR) recently published *Biking to Work in the Greater Richmond Area*, a bicycle commuting guide that is geared to both employees and employers. The booklet provides a comprehensive set of resources to enable employers to better accommodate and encourage bicycle commuting, as well as helpful tips for the bicycle commuter.

National, Regional, and Local Bicycle Touring Routes

The Richmond region is traversed by a number of existing and emerging national, regional, and local bicycle touring routes.

Interstate Bicycle Routes 1 and 76: Interstate Bicycle Route 1 is an American Association of State Highway and Transportation Officials (AASHTO) designated on-road route in Virginia and North Carolina. It follows a route similar to a long established commercial route between Maine and Florida. It traverses the region, passing through parts of Hanover, Henrico, Chesterfield, and Powhatan counties, as well as the City of Richmond. Interstate Bicycle Route 76 is an AASHTO designated route linking Virginia to Kentucky and Illinois, following portions of the TransAmerica Route which extends to Astoria, Oregon. On the east side of the region, it enters into Charles City County and passes through Henrico and Hanover counties, bypassing the City of Richmond.

A June 1999 VDOT study found that both bicycle routes have a number of problems, including missing and inconsistent signing, discrepancies between mapped routes and signed routes, poor road and shoulder conditions, and other operational traffic and safety issues. Detailed study of this report and feedback received from SAC members confirms that the sections of Interstate Bicycle Routes 1 and 76 in the Richmond region are representative of problems these routes have throughout the state. Specifically, there are a number of sections in Hanover, Chesterfield, and Henrico counties, as well as Richmond, where current traffic and road conditions suggest that alternate routes might be safer. There are also a number of areas where route signs are missing or the signed route does not match the mapped route.

Regional Routes: The East Coast Greenway is a recent initiative of an alliance of trail advocates to establish a primarily off-road multi-use trail from Maine to Florida. The East Coast Greenway Alliance has made significant strides over the past five years and now documents that over 30 percent of the route is built or in planning, design, or construction phases. At the same time that an off-road trail route is identified, designated, and built, an interim “on-road route” is also being identified. In the Richmond region, and Virginia as a whole, East Coast

Greenway planning and development is lagging behind the efforts of New England and mid-Atlantic states, and Florida. A spine route has been identified, roughly following the Route 1/I-95/Amtrak corridor through Hanover, Henrico, and Chesterfield counties, and the City of Richmond. Progress on the Virginia Capital Trail has generated interest for an alternate East Coast Greenway route, which would include historic Jamestown, Williamsburg, and the Hampton Roads region.

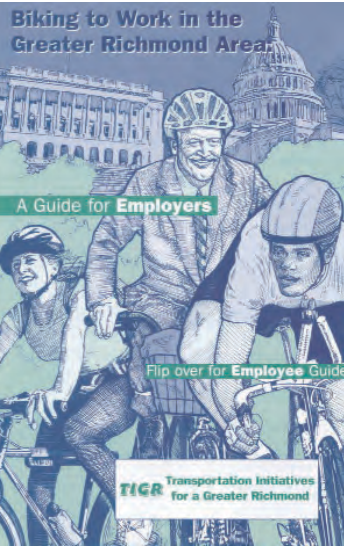
The Virginia Capital Trail between Richmond and Williamsburg will provide a multi-purpose transportation facility along Route 5 that will accommodate bicyclists, pedestrians, and other non-motorized users. A feasibility study has been finalized for the facility that will cross portions of Henrico, Charles City, and James City counties. All three localities have supported the concept project. VDOT received a grant from the National Scenic Byways Program of the Federal Highway Administration for preliminary engineering and environmental analysis. Environmental analysis and design will be conducted for all portions of the trail, with design already underway for a 1.8 mile section of the project in Charles City County between the courthouse and Wilcox Wharf Road (Rte. 618) and for portions of the trail which lie within James City County. VDOT is pursuing construction funding opportunities with the goal of having portions of the facility built by 2007.

Local Routes—Bicycle Tourism and Civil War Routes: The Richmond Area Bicycling Association (RABA) has published *Rides Around Richmond: A Cyclist’s Guide to the Richmond Area*, which includes a number of recreational routes based on various sightseeing themes. RABA also leads a weekly tour, the Ashland Breakfast Club, on the same route from north central Henrico County to Ashland. The Williamsburg Area Bicyclists (WAB) group has mapped various routes in New Kent and Charles City counties. Moreover, tour operators in the area, such as Old Dominion Bicycle Tours, have mapped touring routes in the region, but for safety reasons, use only a few on a

regular basis. While these routes are not formally signed or designated in the field, many have been mapped and/or documented in cue sheets, and are used by individual bicyclists. Because the Richmond region includes a number of Civil War battlefields and other historic sites related to the Civil War, formal and informal touring routes focused on this theme are evolving. In this region, as throughout Virginia, many local communities promote visitation to Civil War and other historic sites as a main

feature of tourism efforts, and many are recognizing that bicycle touring is a significant economic development strategy.

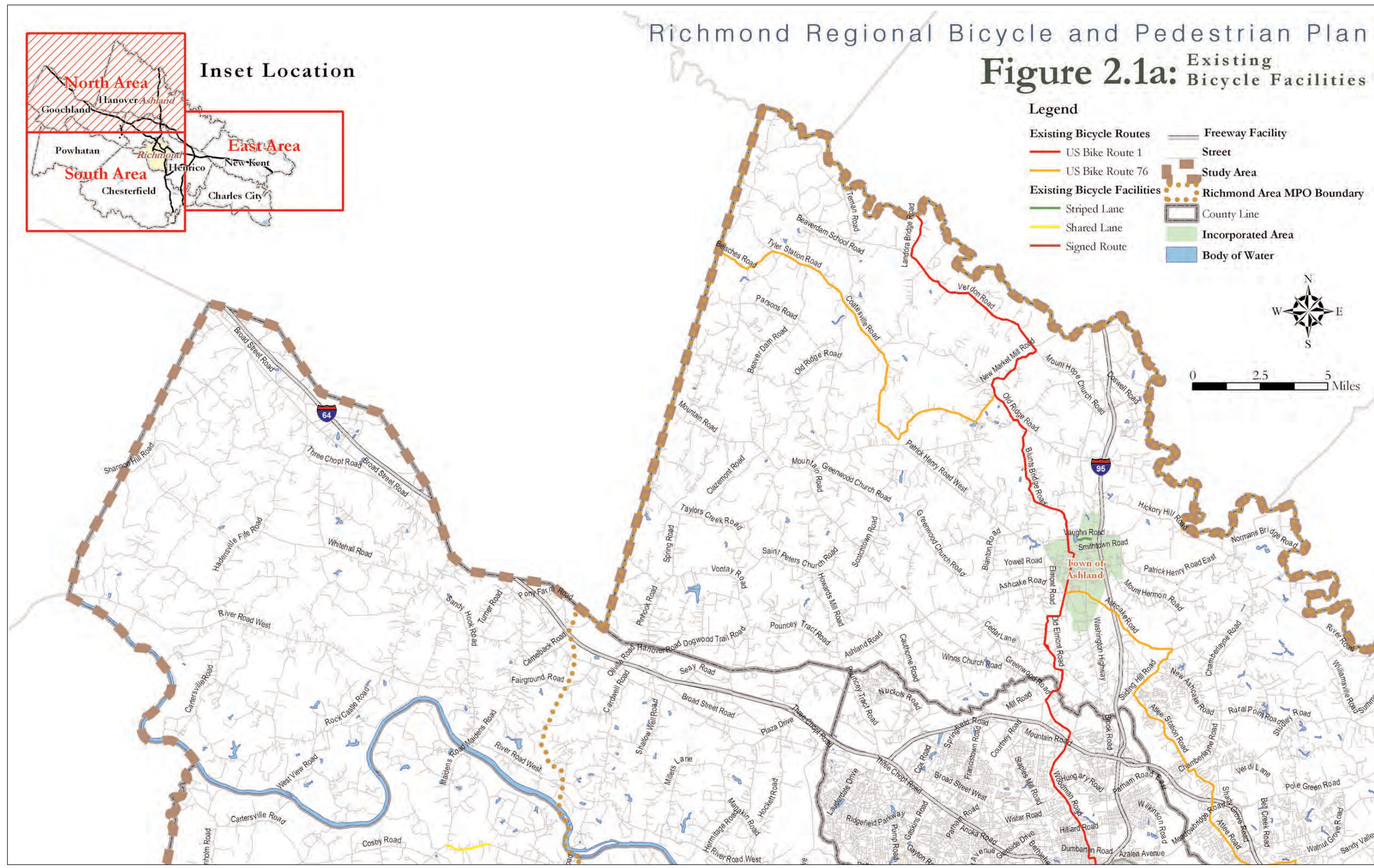
Figures 2.1a through **2.1d** illustrate existing planned and proposed bicycle facilities within the study area, along with major pedestrian facilities.



Biking to Work in the Greater Richmond Area is a bicycle commuting guide geared toward both employees and employers.

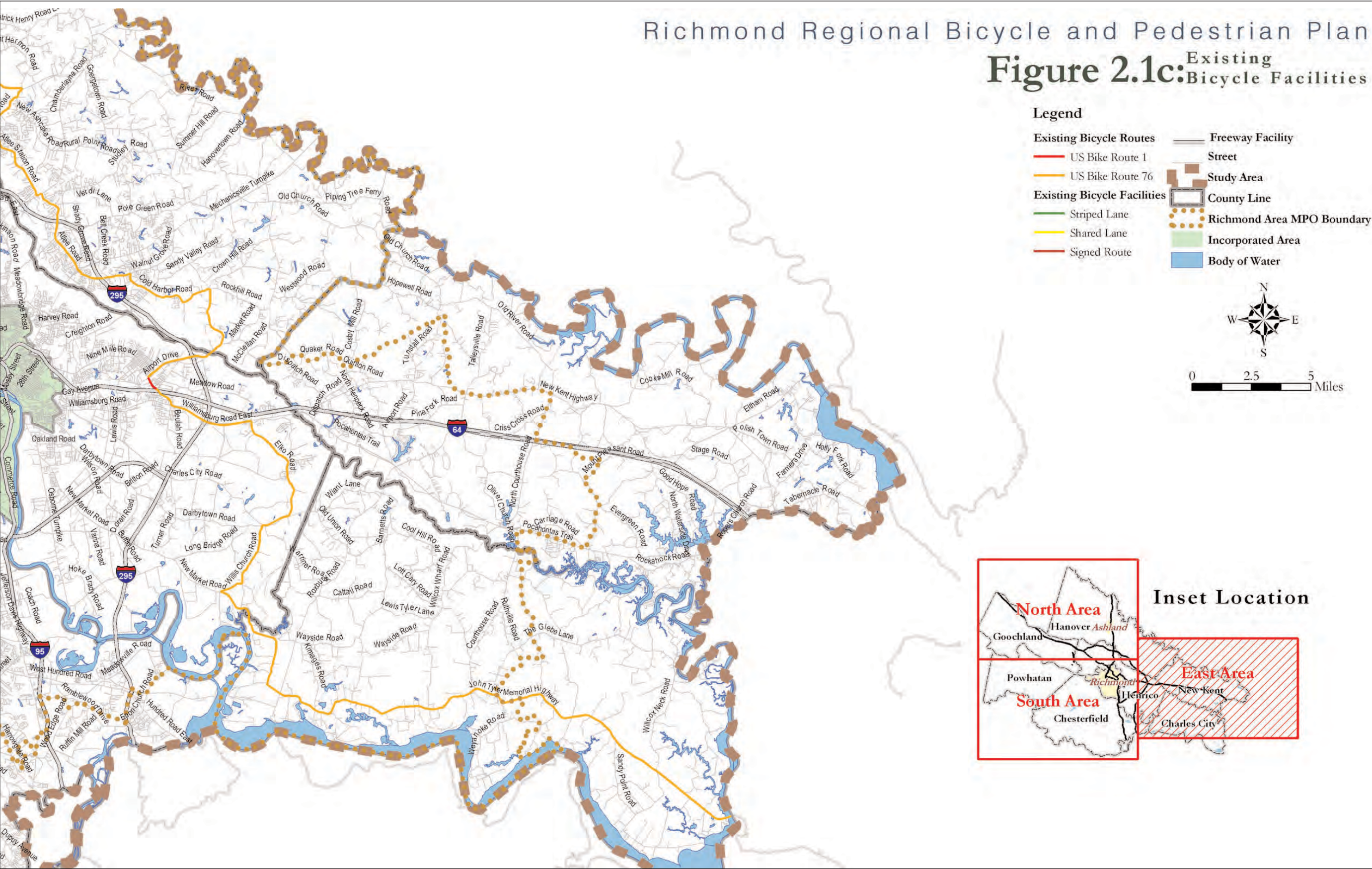


A portion of the Interstate Bike Route 76 along Route 5 (Charles City County).



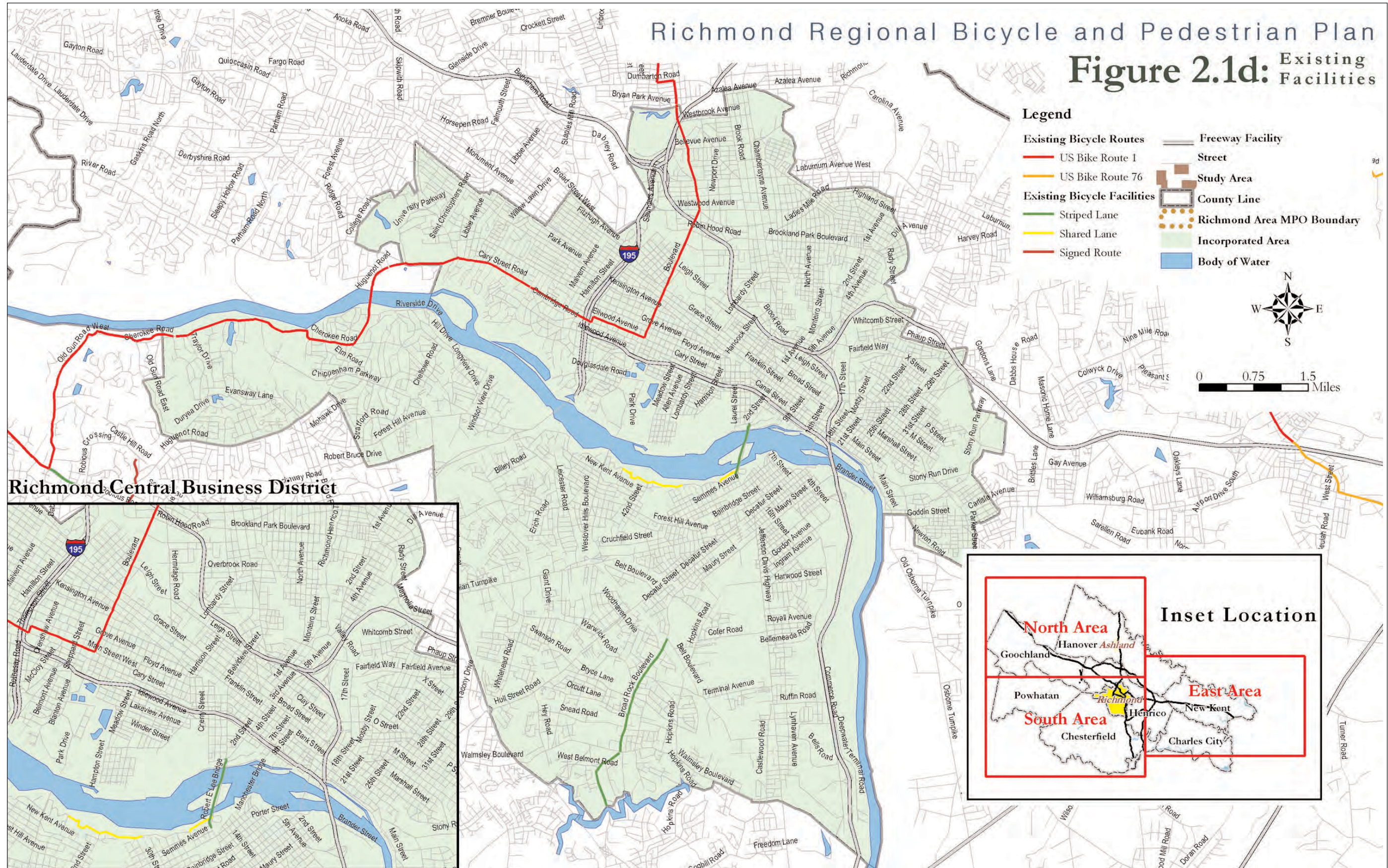
Richmond Regional Bicycle and Pedestrian Plan

Figure 2.1c: Existing Bicycle Facilities



Richmond Regional Bicycle and Pedestrian Plan

Figure 2.1d: Existing Facilities



Status of Bicycle and Pedestrian Planning in Adjacent Regions

At the time of this study, several adjacent planning district commissions (PDC’s) were currently undergoing bicycle and pedestrian planning efforts. A status of the current planning efforts for each of these planning district commissions follows (jurisdictions bordering the Richmond PDC are noted in parentheses):

- Thomas Jefferson PDC (Fluvanna County and Louisa County) - *Jefferson Area Bicycle, Pedestrian and Greenways Plan*, July 24, 2001
- Piedmont PDC (Amelia County and Cumberland County) - *Piedmont Regional Bike Plan*, June 2000
- Rappahannock Area Development Commission (RADCO, Caroline County and Spotsylvania County) -

No current plan (Fredericksburg Area MPO (FAMPO) has a plan, but FAMPO boundaries do not extend to Richmond Regional PDC boundary)

- Middle Peninsula PDC (King and Queen County) - Several bike routes established, but no plan
- Hampton Roads PDC (James City County) - None (James City County Comprehensive Plan has a discussion of sidewalks and bikeway elements)
- Crater PDC (Prince George County, Surry County, City of Hopewell and City of Colonial Heights) - *Tri-Cities Area Bikeway Plan Update*



The James River and the City of Richmond downtown skyline. The James is the region’s most significant natural barrier to bicycle and pedestrian mobility.

Barriers to Bicycling and Walking

Over the years, barriers to bicycling and walking in the Richmond region have existed both in physical forms (rivers, highways, etc.) as well as in institutional forms.

Physical Barriers

The primary physical barriers affecting bicycling and walking at a regional level include major rivers, limited access highways, railroad lines, and large-scale development tracts. These types of barriers create significant obstacles for bicyclists and pedestrians because they have few or infrequent crossings (bridges or tunnels). Meanwhile, crossing facilities which do exist are often inadequate or unsafe for bicyclists or pedestrians. When faced with an inadequate or unsafe crossing, or the prospect of a significant detour from the most direct possible route, most potential bicyclists and pedestrians will use the route infrequently or simply choose a different mode of travel.

Table 2.5 lists the most significant physical barriers to regional bicycle and pedestrian connectivity and rates them as major or minor with regard to their impact on bicycle and pedestrian travel. The process of evaluating the barrier effect of these facilities included examination of the frequency of crossings, the quality of bicycle and pedestrian accommodations on the crossing facilities, the design of highway interchanges, and other factors.

It should be noted that a regional assessment of barriers to bicycle and pedestrian connectivity should also consider which preferred routes, also known as “desire lines,” are blocked by each barrier. The analysis presented in Table 2.5 takes into account regional population density and distribution, likely bicycle and pedestrian trip origins and destinations, and the travel routes that bicyclists and pedestrians would likely use. As such, a number of additional barriers were judged to be minor in nature and are not listed in Table 2.5. Examples include the railroad lines that radiate east of the City of Richmond and some

other larger developments including the Richmond International Airport and office parks.

The James River is the region’s most significant natural barrier. It divides the study area into north and south. Because of the limited number of bridges across the James, the quality of bicycle and pedestrian accommodations on them is critical for regional non-motorized travel.

Table 2.6a provides a detailed assessment of the bridges that cross the James River within the Richmond region.

Other rivers within the study area also create barriers to bicycle and pedestrian mobility (see Table 2.6b). For instance, the Eltham Bridge along Route 33, is the only crossing along the Pamunkey River (between New Kent County and King and Queen/Gloucester counties) in nearly 50 miles between Route 360 in Richmond and the Coleman Bridge on Route 17 in York County. The Eltham Bridge currently does not have bicycle or pedestrian accommodations. Meanwhile, the Route 5 bridge across the Chickahominy River (connecting New Kent and James City counties) is an important crossing between the Richmond region and the Williamsburg area. This bridge lacks both sidewalks and shoulders and has a dangerous steel grid deck on its swing span. Opportunities for improvement exist, however, as both bridges are slated for replacement in VDOT’s current Six-Year Program.

Figure 2.2 depicts the key existing physical barriers to bicycle and pedestrian mobility within the Richmond

Table 2.5: Regional Barriers

Barrier Types and Names	Impact	Level of Impact	Jurisdictions Impacted
<i>Rivers</i>			
James River	South of Richmond, between the City and the Route 156 bridge in Charles City, there are no bicycle or pedestrian accessible bridges or regular ferry services across the James River. Similar conditions exist to the west of downtown Richmond with limited pedestrian access and no bicycle access across the river's bridges.	Major	Charles City, Chesterfield, Goochland, Henrico, Powhatan, Richmond
Chickahominy River	The extent of wetlands and forests along this waterway from I-95 to the James River means that crossings are infrequent and mostly on major roads, which have few bicycle and pedestrian accommodations along them. The Chickahominy River and I-295 run parallel for almost 20 miles, making a formidable barrier between the city/inner Henrico suburbs and the outer Hanover suburbs.	Major	Ashland, Hanover, Henrico, Charles City, New Kent, Richmond
Tuckahoe Creek	Tuckahoe Creek and its considerable associated wetlands limit access between Henrico County and Goochland County due to its location along the jurisdictional boundary. The development of Route 288 as a limited access freeway parallel to Tuckahoe Creek has the potential to compound the barrier effect. Currently, only four roads cross Tuckahoe Creek to connect Henrico and Goochland Counties: I-64, Route 250, Route 6, and Route 650. I-64 has no bicycle and pedestrian access; Routes 250 and 6 have large interchanges at Route 288 that make bicycle and pedestrian access difficult.	Major	Goochland, Henrico, Richmond
Pamunkey River	The Pamunkey River precludes access between New Kent County and its northeastern neighbors. By extension, the Pamunkey separates the entire Richmond region from the counties along the York and Rappahannock rivers.	Major	Hanover, New Kent
Appomattox River	The Appomattox River limits access from Chesterfield County to other parts of Virginia south of the region. However, a number of highway bridges provide access for bicyclists and pedestrians.	Minor	Chesterfield, Powhatan



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Table 2.5: Regional Barriers, continued

Barrier Types and Names	Impact	Level of Impact	Jurisdictions Impacted
<i>Limited Access Highways</i>			
I-295	I-295 has only 6 non-interchange crossings along its 23 miles between I-64 west and I-64 east. Large cloverleaf intersections, where bicyclists and pedestrians must cross high-speed ramps, are typical at the arterial interchanges and compound the barrier effect of the highway. Conditions are very similar south of the James River, in Chesterfield County.	Major	Charles City, Chesterfield, Hanover, Henrico, Richmond
Route 150/Chippenham Parkway	The Chippenham Parkway was built on the Richmond/Chesterfield border, creating a major bicycle and pedestrian divide between the city and close-in suburbs. While the interchanges at arterials are smaller than those along I-295, bicyclists and pedestrians are afforded only one ramp-free crossing point in the 10-mile stretch between Forest Hill Avenue and I-95.	Major	Chesterfield, Richmond
Route 288	As this new highway is extended north, it will continue to be a major barrier to bicycle access between developed areas along the southern and western fringe of the suburban areas.	Major	Chesterfield, Goochland, Henrico, Powhatan
I-64 (Center City-East)	By itself, this highway is a modest barrier, but in combination with railroad lines and I-95, it isolates some Richmond neighborhoods and divides Highland Springs in Henrico County from the southeast section of the county.	Major	Henrico, Richmond
I-95 (Center City-South)	This highway separates residential communities from the James River waterfront, a significant regional bicycling and hiking draw.	Major	Chesterfield, Richmond
Route 76/Powwhite Parkway	This limited access highway divides northern and southern Chesterfield County and includes a number of large interchanges with arterial roads. This highway also has some grade-separated crossings of minor roads as well.	Major	Chesterfield, Richmond
I-95 (Center City-North)	This highway creates a more modest barrier; a number of arterial roads and city streets provide crossing access.	Minor	Ashland, Hanover, Henrico, Richmond
I-64 (Center City-West)	While this highway splits a variety of Henrico County neighborhoods, there are a number of arterials and minor roads that create potential for connectivity.	Minor	Henrico
I-195 and Route 195	These two highways divide a number of neighborhoods in the City of Richmond, but the roadways are depressed and include frequent street crossings, which minimize its barrier effect.	Minor	Richmond
Route 895	This highway traverses the less-developed area of southeast Henrico County, connecting I-95 with the airport.	Minor	Henrico

Table 2.5: Regional Barriers, continued

Barrier Types and Names	Impact	Level of Impact	Jurisdictions Impacted
<i>Railroads</i>			
Railroad lines along the James River (City Center-West)	The railroad lines along and across the James River further complicate and block access to, and across, the river for bicyclists and pedestrians. In particular, the CSX line that follows the old James River and Kanawha Canal to the west is a barrier to river access along its north shoreline.	Major	Henrico, Goochland, Richmond
CSX railroad lines (City Center -South)	These railroad lines and yards compound the barrier effect of I-95, further reducing the access of residents to the James River waterfront.	Major	Chesterfield, Richmond
Railroad line (City Center-West, thru Chesterfield County)	Like the Powhite Parkway, this rail line tends to divide urban and suburban neighborhoods into small isolated pods. However, it is more crossable for bicyclists and pedestrians than a large highway. Part of this line blocks access to the southern shoreline of the James River in Richmond.	Major	Chesterfield, Richmond
CSX railroad line (City Center-North)	This line and adjacent industrial development creates a division among northside Henrico County, Hanover Coutny, and Ashland neighborhoods. However, it is relatively easy to traverse on a number of at-grade bicycle and pedestrian accessible crossing points.	Minor	Ashland, Hanover, Henrico, Richmond
CSX railroad line (City Center-East)	This line between Richmond and Newport News creates a division within Henrico and New Kent counties. There are several crossings in Henrico, but few in New Kent.	Major	Henrico, New Kent, Richmond



While easily traversed at grade crossings, railroad lines radiating from the center of Richmond into the surrounding jurisdictions often create barriers to neighborhood connectivity for bicyclists and pedestrians. The line shown above separates the Greenfield and Settlers Landing subdivisions from the nearby Woodmont and Brookwood Estates subdivisions (all in northern Chesterfield County).

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Existing sidewalk terminii and signage at the Huguenot Bridge.



The Edward E. Willey Memorial Bridge, which crosses the James and links the Chippenham Parkway (Richmond) to Parham Road (Henrico County).

Table 2.6a: James River Bridges

Bridge Name	Route No.	Accessibility	Jurisdictions Linked/Affected
Robert E. Lee Bridge	Route 1	This bridge has striped shoulders that provide generous space for bicyclists, sidewalks for pedestrians, and an additional bike/pedestrian bridge hanging below the super-structure that provides access to Belle Isle and the James River Park System (see below). More frequent sweeping is needed to remove debris from the bridge’s striped shoulders.	Richmond
Belle Isle Pedestrian Bridge	James River Park System	This eight-foot-wide bridge hangs beneath the Robert E. Lee Bridge and provides suitable bike and pedestrian access between downtown Richmond, the Canal Walk, and Belle Isle. Good access continues across the southern channel of the river on another bridge, but leaves users on the south shoreline, between the river’s edge and a major multi-track rail corridor. Pathways of varying condition lead to two large concrete staircases and bridge structures over the railroad tracks to Riverside Drive at 22nd and 42nd Streets. These staircases are difficult for bicyclists; they require carrying bikes up/down more than ten flights of stairs. There is an at-grade bike crossing midway between the two structures at Reedy Creek.	Richmond
Manchester Bridge	Route 60	This bridge has less than ideal accommodations, but the raised center median is well protected from vehicle traffic and is fairly well used by pedestrians. On the downtown end, access is isolated in the middle of a large intersection at 9th and Canal Streets. On the south end, the only access is up a stairwell from beneath the bridge at 7th and Semmes, which is difficult for bicyclists.	Richmond
Edward E. Willey Memorial Bridge	Route 150	This bridge facilitates a river crossing for the Chippenham Parkway and Parham Road. By a resolution of the Commonwealth Transportation Board, bicycle and pedestrian use of this facility is prohibited. A breakdown lane is provided for motor vehicles. Vehicle travel speeds are posted at 45 mph, but are often much higher.	Chesterfield, Henrico, Richmond
Huguenot Memorial Bridge	Route 147	Sidewalk passageways on each side of the roadway are narrow and not well maintained; access at either end of the bridge is difficult due to design and poor maintenance. No ramps are provided to connect the roadway shoulders with the sidewalk on the bridge. Bicyclists can either ride in travel lanes or walk bicycles on sidewalks. This bridge has been identified for replacement in VDOT’s Six-Year Improvement Program.	Chesterfield, Henrico, Richmond
Boulevard Bridge (Nickel Bridge)	Route 161	This bridge has a railing-protected sidewalk on the west side, but no accommodations on the east side. The passageway is narrow, and bicycle access is difficult; bicycles are “required” to be walked. City of Richmond transportation planners have identified the need for safe bicycle and pedestrian accommodations between the parks on either side of the river. This bridge is owned and operated by the Richmond Metropolitan Authority.	Richmond
Mayo Bridge (Hull Street Bridge)	Route 360	Access across this bridge is possible. The bridge has sidewalks, but they are in poor condition and are not suitable for bicycles. The bridge cannot easily be widened. It has been suggested that the entire bridge be rebuilt with a promenade.	Richmond
Benjamin Harrison Memorial Bridge	Route 156/106	This is a long bridge with narrow shoulders and no sidewalks. Bikes are allowed on the bridge. Traffic volumes are low and the speed limit is 55 mph.	Charles City, Henrico, Prince George

Table 2.6a: James River Bridges, continued

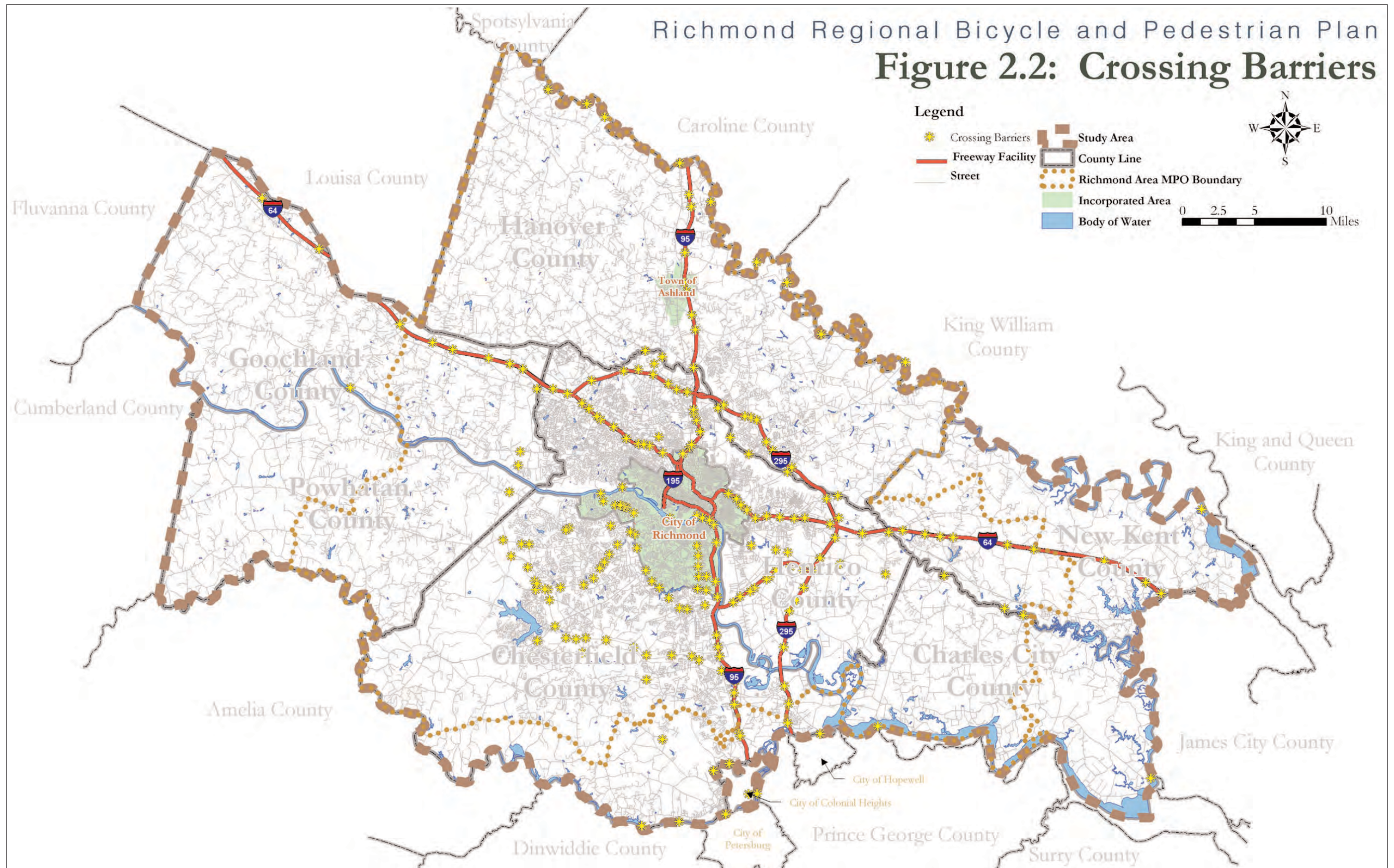
Bridge Name	Route No.	Accessibility	Jurisdictions Linked/Affected
Maidens Bridge	Route 522	This bridge has no sidewalks. The roadway shoulders offer some space for bicycles, but there are dangerous drainage grates in the shoulder alignment. The speed limit is 55 mph, and there are many trucks.	Goochland, Powhatan
James River Bridge	I-95	By a resolution of the Commonwealth Transportation Board, bicycle and pedestrian use of this facility is prohibited.	Richmond
Powhite Parkway Bridge	Route 76	By a resolution of the Commonwealth Transportation Board, bicycle and pedestrian use of this facility is prohibited.	Chesterfield, Richmond
Varina-Enon Bridge	I-295	By a resolution of the Commonwealth Transportation Board, bicycle and pedestrian use of this facility is prohibited.	Chesterfield, Henrico
Route 288 (under construction)	Route 288	Under construction (limited access facility; bicycle and pedestrian access prohibited).	Chesterfield, Goochland, Powhatan
Vietnam Veterans Memorial Bridge	Route 895	By a resolution of the Commonwealth Transportation Board, bicycle and pedestrian use of this bridge is prohibited.	Chesterfield, Henrico

Table 2.6b: Other Regional Bridges

Bridge Name	Route No.	Accessibility	Jurisdictions Linked/Affected
Eltham Bridge (Pamunkey River)	Route 33	The only crossing of the Pamunkey River in nearly 50 miles between Route 360 in Richmond and US 17 in Yorktown. There are currently no bicycle or pedestrian accomodations on this bridge.	New Kent, King and Queen, Gloucester
Route 5 Bridge (Chickahominy River)	Route 5	This is an important crossing between the Richmond region and the Williamsburg area, and it serves as a critical element for the proposed Virginia Capital Trail. Currently, this bridge has no sidewalks or sholders, and it possesses a dangerous (for bicyclists) steel grid deck on its swing pan.	Charles City and James City

Richmond Regional Bicycle and Pedestrian Plan

Figure 2.2: Crossing Barriers



region.

Institutional Barriers

While physical features such as rivers, bridges, and railroads form more visible barriers, additional barriers to bicycling and walking in the Richmond region have existed in more subtle, but equally significant institutional forms. If traditional ways of administering transportation programs at the local, regional, and state levels have been slow to change in the past, the Commonwealth's transportation leaders are now recognizing the importance of using "out-of-the-box" thinking to move people from one place to another in more efficient and cost-effective manners. During the recent formation of the *VTrans2025* initiative, for example, Virginia's Secretary of Transportation, Whittington Clement, called attention to the need for (highway) management to "think differently" and "to be innovative." VDOT's Policy for Integrating Bicycle and Pedestrian Accommodations is strong evidence of the department's effort to take a leadership role in providing more equitable consideration of bicyclists and pedestrians on Virginia's roadways.

At the local level, the City of Richmond has seen recent precedents set for the innovative delivery of bicycle and pedestrian projects. The James River Park system, for instance, has benefited from donations and significant volunteer efforts to construct numerous trails and to install trail signage. In present day government's environment of reduced budgets and limited resources, local, regional, and state transportation officials will have to resort more and more to innovative and creative methods to arrive at successful transportation solutions, including those for bicyclists and pedestrians.

Policy Analysis

To achieve the goal of “increasing the number of people who regularly bicycle and/or walk in the Richmond region,” a concerted effort will be necessary to retrofit established neighborhoods and corridors that have few, if any, bicycle- or pedestrian-friendly facilities. This effort will take time and resources. A concurrent effort is equally vital; that is, for VDOT and all nine local governments to adopt policies that will ensure that all future corridor projects and all new developments include facilities that provide for safe and convenient travel for pedestrians and bicyclists. To this end, Virginia’s Secretary of Transportation, Whittington Clement, said, “It’s clear to most people that we can’t just keep on doing business the way we’ve been doing business in the past without making some changes.” Those changes, he said, would move Virginia’s Department of Transportation toward a vision for truly multimodal transportation as part of the governor’s *VTrans 2025* conceptualization. “The challenge is how to bring greater responsibility and how can we press (highway) management to think differently, to be innovative,” Clement said.¹

As part of this study process, a review was performed of the existing comprehensive plan, annual budget, and land development policy for each of the nine jurisdictions participating in this study. The purpose of this review was to provide a summary of policies currently in place that support the development of bicycle- and pedestrian-related facilities and mobility. **Table 2.7** summarizes the results of this policy review.

As a supplement to **Table 2.7**, the following brief summary and assessment is provided for existing policies and programs that will affect bicycling and walking in the Richmond region. This section is divided into two sections, one related to local governmental policies on land development and, where applicable, the construction, operation, and maintenance of local streets, and a second

section describing VDOT policies on building, operating, and maintaining transportation facilities.

Local Government

Each of the nine jurisdictions addressed in this study approaches the development of bicycle- and pedestrian-friendly facilities differently. Some governments look to VDOT to offer leadership while others have provided their own initiatives. The following are examples of local government leadership in developing programs to make travel safer or more convenient for pedestrians and bicyclists.

Town of Ashland Sidewalk Program

The older section of Ashland retains the feel of a quaint small town. Its citizens contribute by frequenting the places that are located here and walking or riding a bicycle from one place to another. While traffic congestion is a significant concern on Route 54 and high vehicle speeds are a concern on Route 1, many other streets in the older section of Ashland are safe and convenient for pedestrians and bicyclists. The Town of Ashland continues to extend and improve the condition of its sidewalk system through annual allocations of funding from its general fund and through the administration of grants, when available.

City of Richmond Sidewalk and Bikeway Program

The City of Richmond has the most extensive network of sidewalks in the region. This system is most prevalent in the older sections of the city where the grid system of streets is small enough to create short blocks that provide multiple routes for pedestrians to travel. In the Fan district, near Virginia Commonwealth University, and in Shockoe Slip, the use of brick surfaces (instead of concrete) provides added interest for pedestrians. In addition, the streetscape elements such as benches and lightposts retain a strong historic character in these areas. The public investments here contribute to the economic success of not only the local businesses, but also the region. The City of Richmond’s Public Works department

To achieve the goal of “increasing the number of people who regularly bicycle and/or walk in the Richmond region,” a concerted effort will be necessary to retrofit established neighborhoods and corridors that have few, if any, bicycle- or pedestrian-friendly facilities.

¹ Taken from the Virginia Department of Transportation’s web site: www.virginiadot.org/info/service/bk-policyinfo.asp.

Table 2.7: Policy Review

POLICIES	TOWN OF ASHLAND	CHARLES CITY COUNTY	CHESTERFIELD COUNTY	GOOCHLAND COUNTY	HANOVER COUNTY	HENRICO COUNTY	NEW KENT COUNTY	POWHATAN COUNTY	CITY OF RICHMOND
Comprehensive Plan									
Comprehensive Plan supports improvements to bicycle/pedestrian (b/p) mobility									
Comprehensive Plan supports greenways or trails									
Comprehensive Plan identifies areas where mixed uses are suggested									
Budget									
Annual budget (local funds) includes funding for sidewalk improvements							local match for fed. \$		
Annual budget (local funds) includes funding for trails			in parks				publicly-owned land		
Annual budget (local funds) includes funding for on-road bikeways									case basis
Land Development Policies									
Zoning Ordinance identifies areas where mixed uses are required									
Zoning Ordinance identifies areas where mixed uses are permitted				[1]					
Zoning Ordinance permits densities that are compact / pedestrian-friendly				villages			villages	villages	
Zoning Ordinance requires a pedestrian access plan with development applications			case basis						
Transit-oriented Development Ordinance									
Traditional Neighborhood Development Ordinance					non-conforming [2]				
Residential LD Ordinance addresses street design (most have all-VDOT roads)				VDOT	VDOT			VDOT	
Residential LD Ordinance requires sidewalks					higher densities only				
Planning Department recommends garages facing side or back of building			case basis						
Commercial LD Ordinance requires sidewalks on both sides of the roadway									
Commercial LD Ordinance requires sidewalk on one side of the roadway			case basis						
Commercial LD Ordinance requires b/p connections (on-site) between parcels			case basis	encourages		[4]		encourages	
Commercial LD Ordinance requires b/p connections to adjacent sites			case basis	recommends				encourages	
Parking Ordinance allows side lot and rear lot parking in lieu of front lot parking									
Parking Ordinance requires installation of bike racks									
Parking Ordinance requires bike racks be provided in parking garages									
Parking Ordinance requires sidewalk connections along street and front entrances			case basis						
Street Design Standards include sidewalks						[5]			
Street Design Standards include bike lanes			VDOT		Bike Rtes. 1 & 76 [3]				
Street Design Standards allow traffic calming			under review						
Completed ADA Transition Plan identifying locations needing curb ramps				few curbs			few curbs	few curbs	

Note: Shaded boxes above indicate the agency answered yes, or a *qualified* yes.

Additional Comments:

[1] Goochland County - Mixed uses permitted are residential and office classifications.

[2] Hanover County - Some districts that can be described as "traditional" exist, but are non-conforming uses.

[3] Hanover County - Bike lanes required on Interstate Bicycle Routes 1 and 76.

[4] Henrico County - The planning office requests sidewalks for all new development and most redevelopment, but it is not necessarily required. Final decision is made by Board of Supervisors.

[5] Henrico County - Sidewalks are required by policy within 3/4 of a mile of all public schools and other county facilities. Sidewalks and paths are proffered with developments when appropriate.

Source:

Agency information provided October 2002 (Henrico County is valid as of March 27, 2003).

has also taken steps to develop a city-wide bicycle plan and to install striped shoulders and bicycle-related signage along such corridors as Riverside Drive.

Chesterfield County Bikeway Program

Chesterfield County adopted a countywide bikeway program as a part of its comprehensive plan. Since adopting the policy, Chesterfield County and VDOT have built bike lanes in conjunction with roadway widening projects along such corridors as Iron Bridge Road (Route 10), Courthouse Road, and Robious Road. In total, there are 27 miles of bike lanes in Chesterfield County.

Efforts by Other Groups

Other groups such as the GRTC Transit System, the City of Richmond’s James River Park System, and the Virginia Department of Health have successfully implemented improvements that make it safer or more convenient for pedestrians and bicyclists.

Virginia Department of Transportation

The *Virginia Bicycle Facility Resource Guide* states the philosophy of VDOT as it relates to leadership in developing bicycle-friendly facilities:

“VDOT also plays a very important role in terms of bicycle accommodation as it directly funds or administers programs that fund a large portion of the state’s bicycle facilities. With few exceptions, the appropriation of funding is largely driven by the locality. With limited highway construction funds available throughout the state to satisfy overall transportation needs, VDOT relies heavily on local governments to make decisions on how transportation money will be spent within their jurisdiction, including which modes of transportation should receive funding and how projects should be prioritized. When awarding funds, VDOT gives preference to projects in localities with a bicycle plan adopted by the local governing body.”¹

VDOT Policy for Integrating Bicycle and Pedestrian Accommodations

During the course of this planning process, VDOT developed and finalized a new comprehensive planning policy entitled *Policy for Integrating Bicycle and Pedestrian Accommodations*. This policy was formally adopted by the Commonwealth Transportation Board on March 18, 2004. The policy's purpose states that VDOT will provide a framework to "accommodate bicyclists and pedestrians, including pedestrians with disabilities, along with motorized transportation modes in the planning, funding, design, construction, operation, and maintenance of Virginia's transportation network to achieve a safe, effective, and balanced multimodal transportation system." The purpose specifically cites such items as bike lanes, sidewalks, signs, traffic calming measures (curb extensions), and paved shoulders as examples of possible bicycle and pedestrian accommodations.

The policy states that VDOT will initiate all highway construction projects under the presumption that the projects shall accommodate bicycling and walking. A list of factors are cited which support the need to provide such accommodations. These factors include, but are not limited to, the following:

- project is identified in an adopted transportation or related plan
- project accommodates existing and future bicycle and pedestrian use
- project improves or maintains safety for all users
- project provides a connection to public transportation services and facilities
- project serves areas or population groups with limited transportation options
- project provides a connection to bicycling and walking trip generators such as employment, education, retail, recreation, and residential centers and public facilities

- project is identified in a Safe Routes to School program or provides a connection to a school
- project provides a regional connection or is of regional or state significance
- project provides a link to other bicycle and pedestrian accommodations
- project provides a connection to traverse natural or man-made barriers
- project provides a tourism or economic development opportunity

Additional topics addressed by VDOT's policy include:

- accommodations built as independent construction projects
- access-controlled corridors
- additional improvement opportunities (i.e.: operation and maintenance, long distance bicycle routes, and tourism/economic devlopment)
- exceptions to the provision of accommodations
- decision process on whether or not to include bicycle and pedestrian accommodations
- discipline participation in project development (including planning, funding, design, construction, operation, and maintenance)

VDOT's entire *Policy for Integrating Bicycle and Pedestrian Accommodations* is contained in **Appendix C.3**.

Community Interest

2000 Virginia Outdoors Survey

The Department of Conservation and Recreation’s (DCR) 2000 Virginia Outdoors Survey shows significant demand for walking and bicycling in the Richmond region. Richmond area residents who responded to the survey put the activities included in **Table 2.8** at the top of their list.

Table 2.8: Virginia Outdoors Survey Results	
Activity	Number of Activity Days ²
walking for pleasure	30,000,000
jogging/running	13,000,000
bicycling	9,600,000
drive for pleasure	6,300,000
use a football or soccer field	5,700,000
use a playground	5,400,000

¹ *Virginia Bicycle Facility Resource Guide*, Commonwealth of Virginia, 2002. Pg 4-3.

² According to the Virginia Outdoors Plan, “An activity day is the participation by one person in any recreational activity during any part of one day. If an individual swims, picnics, and plays baseball during the day, that individual has generated three activity days (occasions) of recreation, one each for swimming, picnicking, and baseball.” Virginia Outdoors Plan, p. 394.



Chapter 2: Bicycling and Walking in the Richmond Region Today - Overview

Walking for pleasure is by far the most popular and desired activity for Richmond area residents, followed by jogging and running. All of these activities require sidewalks and pathways protected from automobile traffic. Bicycling came in third on the list of desired recreation activities for Richmond area residents. The DCR's *2002 Virginia Outdoors Plan* estimates that the Richmond region requires 682 miles of bikeways in order to meet current demand.¹

Another significant finding of this study is that in addition to time and money, Virginians cite two major limitations to participating in outdoor recreation opportunities: distance to the desired facility (42.5%) and availability of the desired facility (40.8%). The results of this survey indicate the need for walking and bicycling facilities close to home, particularly for Richmond area residents who live in populated areas.

The demand evidenced by the Virginia Outdoors Survey is further supported by other efforts to gauge public opinion on these questions.

User Survey: Richmond Regional Bicycle and Pedestrian Plan

As part of the public outreach efforts for this planning process, a User Survey was developed to collect responses from the walking and bicycling community in the Richmond region. The survey was made available to attendees of the March 2003 public workshops and was also posted on the project website (www.letsgebikeandwalk.com). A total of over 675 responses were received during the public participation period, which was open for approximately 60 days.

Responses were received from each of the nine jurisdictions within the study area, as well as from numerous respondents who live outside of the study area.

The following key findings were identified by the User Survey:

- 96% of respondents indicated they bicycle for fitness/recreation, while 28% indicated they bicycle to work
- 91% of respondents indicated they walk for fitness/recreation, while 12% indicated they walk to work
- 86% of respondents indicate that comfort/personal safety in traffic was their primary concern when deciding to ride
- personal safety/security (31%) and comfort/separation in traffic (28%) were identified as the top two factors affecting the respondents' decision to walk
- the amount of vehicular traffic (84%) and the presence of bike paths or shoulders (72%) were identified as the top two factors affecting the respondents' decision to ride a bicycle
- respondents rated the bicycling conditions in their community as poor (56%), fair (37%), and good (7%)
- respondents rated the walking conditions in their community as fair (49%), poor (27%), and good (24%)
- 98% of respondents were in favor of increased spending on walkway and bikeways, with state transportation funds (96%), federal transportation funds (81%) and local transportation funds (80%) being named as the three most supported sources of funding for bicycle and pedestrian improvements

A copy of the User Survey along with graphic and tabular results for each of the questions are contained in

Appendix A.4.

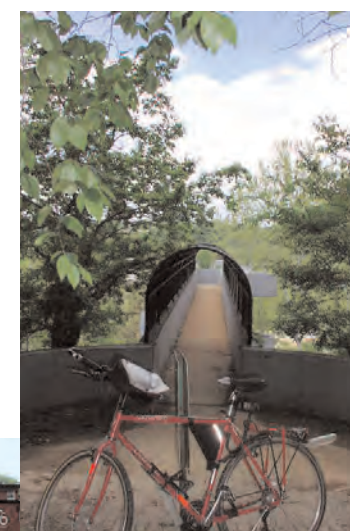
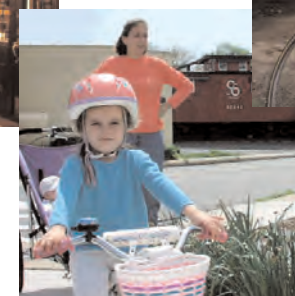
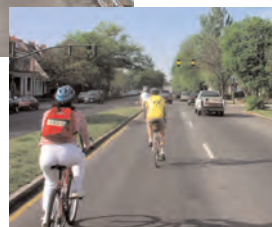
2023 Long-Range Transportation Plan

The regional long-range transportation plan includes further documentation of public desire for bikeways, trails, and pedestrian improvements. The public participation process for this plan documented thousands of comments from area citizens who expressed a nearly universal desire for more bicycle and pedestrian facilities, safer streets and roads, and improved bicycle and pedestrian access to transit.²

¹ *2002 Virginia Outdoors Plan*, Commonwealth of Virginia, February, 2002.

² *2023 Long-Range Transportation Plan*, March 8, 2001, pp. 57–66.

SEPTEMBER
2004



Chapter 3: Bicycling and Walking in the Richmond Region Today - Levels of Service and Latent Demand



Heavy traffic volumes and a lack of available space cause Bicycle Level of Service (BLOS) to deteriorate.

This chapter builds upon the overview of the region’s bicycle and pedestrian conditions provided in Chapter 2 by presenting analytical data for the study area network. This analytical data was computed with specialized modeling techniques which evaluate bicycle and pedestrian levels of service and latent demand along roadway segments.

Levels of Service

Bicycle and Pedestrian Level of Service models provide an evaluation of bicyclist and pedestrian perceived safety with respect to motor vehicle traffic and comfort in using the roadway corridor. The models identify the quality of service for bicyclists or pedestrians that currently exists within the roadway environment by computing level of service values ranging from A to F, with A being the best level of service and F being the worst. Both the Bicycle and Pedestrian Level of Service models are based on the validated research documented in Transportation Research Record 1773 published by the Transportation Research Board of the National Academy of Sciences. The data requirements and data collection and compilation guidelines for these models are provided in **Appendix A.3**.

Bicycle Level of Service Model

The statistically calibrated mathematical equation entitled the Bicycle Level of Service (BLOS) model is used in the evaluation of bicycling conditions in the Richmond region. This model is an accurate method of evaluating the bicycling conditions of shared roadway environments. It uses a similar ranking measure (i.e. LOS) of traffic and roadway factors used by transportation planners and engineers for highway travel conditions. Using statistical regression, the model reflects the effect on bicycling

suitability or “compatibility” due to factors such as roadway width, bike lane widths and striping combinations, traffic volume, pavement surface conditions, motor vehicle speed and type, and on-street parking.

Pedestrian Level of Service Model

Similar to the evaluation procedure used for the BLOS model, the Pedestrian Level of Service (PLOS) model provides evaluation of pedestrians’ perceived safety with respect to motor vehicle traffic and comfort in using the roadway corridor. It identifies the quality of service for pedestrians that currently exists within the roadway environment.

The PLOS model is used for the evaluation of walking conditions on road and street corridors in the Richmond region. This model is an accurate method of evaluating the walking conditions within shared roadway environments. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for highway travel conditions. Using statistical regression, the model reflects the effect on walking suitability or “compatibility” due to factors such as roadway width, presence of sidewalks and intervening buffers, barriers within those buffers (i.e. landscaping), traffic volume, motor vehicles speed, and on-street parking.

BLOS and PLOS Analysis Summary

A total of over 2,300 miles of roadway corridors were included in the bicycle and pedestrian study network area and were analyzed for bicycle and pedestrian levels of service. Of this mileage, approximately 1,440 miles were included in the proposed bicycle and pedestrian network. The proposed study network bicycle and pedestrian levels of service (A through F) for each of the nine study area jurisdictions are summarized in **Tables 3.1** and **3.2**, respectively. It is noted that levels of service X were generated for a small number of miles (< 10) on the study network. (Level of service X results are for study

network mileage that had insufficient data to generate an accurate LOS measurement.)

The BLOS results summarized in **Table 3.1** indicate that approximately 20% (293 +/- miles) of the total proposed network mileage currently functions at BLOS C or better, while the remaining 80% (1,148 +/- miles) functions at BLOS D or lower. Factors that contribute to BLOS D or lower are similar across the region, and are primarily due to high heavy vehicle (trucks) percentages, a lack of available space for bicyclists (infrequent shoulders), and overall volume of vehicular traffic (AADT volumes). For the region, the most common BLOS result is E (32% +/- of network mileage) with BLOS D being the second most common level of service computed (29% +/-). Of the region’s 300 +/- miles of network roadways which function at BLOS C or better today, approximately 83 of those miles (28%) lie within in the City of Richmond, with the next highest amount (57 miles, 19%) lying within Chesterfield County. These results reflect the generally lower speed limits and higher frequency of wide roads and/or low traffic volumes prevalent in the City of Richmond, as well as the growing number of bike lane miles present in Chesterfield County.

The PLOS results summarized in **Table 3.2** indicate that approximately 10% (150 +/- miles) of the total proposed network mileage currently functions at PLOS C or better, while the remaining 90% (1,291 +/- miles) functions at PLOS D or lower. Factors that contributed to PLOS D or lower were similar to those driving BLOS D or lower, and they include high heavy vehicle (truck) percentages, a lack of sidewalks or other space for pedestrians (infrequent shoulders), and overall volume of vehicular traffic (AADT volumes). For the region, the most common PLOS result is D (50% +/- of network mileage) with PLOS E being the second most common level of service computed (36% +/-). Of the region’s 150 +/- miles of network roadways which function at PLOS C or better today, approximately 123 of those miles (82%) lie within in the City of Richmond, with the next highest amount (15 +/-

miles, 10%) residing in Henrico County. These results clearly reflect the influence of the sidewalk system prevalent throughout much of the City of Richmond along with the relative lack of sidewalks in the remaining eight study area jurisdictions.

Figures 3.1a, b, c, and d and Figures 3.2a, b, c, and d illustrate a graphical depiction of the respective BLOS and PLOS results for the proposed route network.

Level of Service may be described as variables that bicyclists or pedestrians typically use to assess the “friendliness” of a roadway or facility.

Table 3.1: Richmond Region Bicycle Level of Service Results per Jurisdiction

Bicycle Level of Service	Bicycle Level of Service - Proposed Network Mileage Totals																			
	City of Richmond		Charles City County		Chesterfield County		Goochland County		Hanover County		Henrico County		New Kent County		Powhatan County		Town of Ashland		Region Total	
	Miles	% Study	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%
A	7.17	4.25%	0	0.00%	0.75	0.23%	1.41	1.31%	3.65	1.23%	1.74	0.64%	0	0.00%	0	0.00%	0.86	7.96%	15.58	1.08%
B	18.27	10.82%	0	0.00%	8.9	2.77%	0	0.00%	2.27	0.76%	5.02	1.84%	0.42	0.43%	9.29	8.68%	0.97	8.97%	45.14	3.13%
C	58.02	34.37%	7.51	12.75%	47.12	14.64%	10.04	9.36%	36.69	12.32%	37.02	13.60%	23.88	24.64%	12.45	11.64%	0.61	5.64%	233.34	16.19%
D	57.56	34.10%	6.35	10.78%	88.31	27.44%	33.22	30.96%	91.97	30.89%	83.37	30.62%	29.76	30.71%	20.12	18.81%	1.16	10.73%	411.82	28.57%
E	18.5	10.96%	1.41	2.39%	123.84	38.48%	32.63	30.41%	105.26	35.35%	119.34	43.83%	22.07	22.77%	38.34	35.84%	2.74	25.35%	464.13	32.20%
F	8.75	5.18%	43.65	74.08%	50.12	15.57%	29.99	27.95%	55.86	18.76%	25.81	9.48%	20.78	21.44%	26.79	25.04%	4.47	41.35%	266.22	18.47%
X*	0.53	0.31%	0	0.00%	2.77	0.86%	0	0.00%	2.04	0.69%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	5.34	0.37%
	168.8	100.00%	58.92	100.00%	321.81	100.00%	107.29	100.00%	297.74	100.00%	272.3	100.00%	96.91	100.00%	106.99	100.00%	10.81	100.00%	1441.57	100.00%

* Note: Level of service X results are for study network mileage that had insufficient data to generate an accurate LOS measurement. These network links are shown as Ungraded Links on Figures 3.1a, b, c, and d.

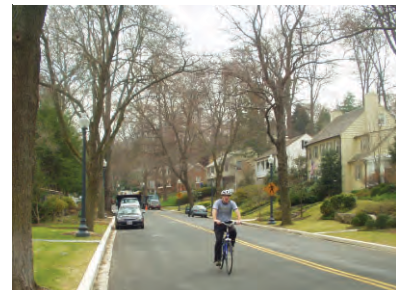
Table 3.2: Richmond Region Pedestrian Level of Service Results per Jurisdiction

Pedestrian Level of Service	Pedestrian Level of Service - Proposed Network Mileage Totals																			
	City of Richmond		Charles City County		Chesterfield County		Goochland County		Hanover County		Henrico County		New Kent County		Powhatan County		Town of Ashland		Region Total	
	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY	Miles	% STUDY
A	6.83	4.05%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0.35	0.33%	0	0.00%	7.18	0.50%
B	62.83	37.22%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0.51	0.19%	0	0.00%	0	0.00%	0	0.00%	63.34	4.39%
C	52.94	31.36%	0	0.00%	6.6	2.05%	0.8	0.75%	0	0.00%	14.96	5.49%	0	0.00%	1.08	1.01%	2.55	23.59%	78.93	5.48%
D	32.24	19.10%	27.4	46.50%	184.41	57.30%	39.04	36.39%	214.94	72.19%	129.39	47.52%	46.96	48.45%	44.45	41.55%	6.45	59.67%	725.28	50.31%
E	9.33	5.53%	31.52	53.50%	114.44	35.56%	64.72	60.33%	75.31	25.29%	116.53	42.79%	49.96	51.55%	61.11	57.12%	1.81	16.74%	524.73	36.40%
F	4.12	2.44%	0	0.00%	15.79	4.91%	2.72	2.54%	5.46	1.83%	10.91	4.01%	0	0.00%	0	0.00%	0	0.00%	39	2.71%
X*	0.53	0.31%	0	0.00%	0.58	0.18%	0	0.00%	2.04	0.69%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	3.15	0.22%
	168.82	100.00%	58.92	100.00%	321.82	100.00%	107.28	100.00%	297.75	100.00%	272.3	100.00%	96.92	100.00%	106.99	100.00%	10.81	100.00%	1441.61	100.00%

* Note: Level of service X results are for study network mileage that had insufficient data to generate an accurate LOS measurement. These network links are shown as Ungraded Links on Figures 3.2a, b, c, and d.

Sample Levels of Service

Bicycle



BLOS A



BLOS C



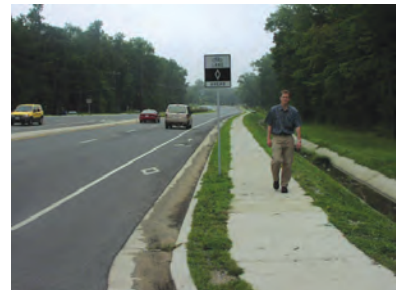
BLOS F

Photos by: Toole Design Group, Laurel, MD.

Pedestrian



PLOS A



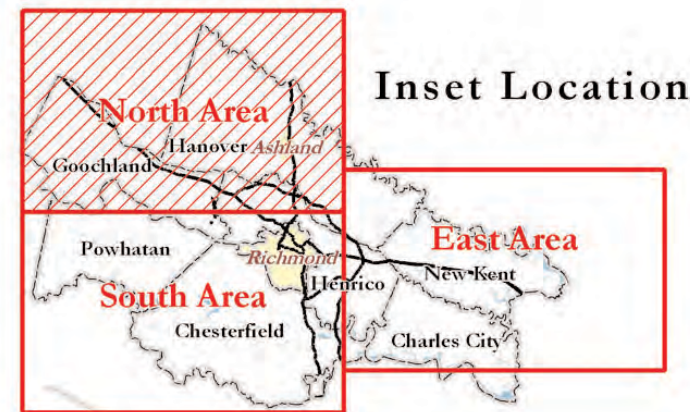
PLOS C



PLOS F

Richmond Regional Bicycle and Pedestrian Plan

Figure 3.1a: Bicycle Level of Service

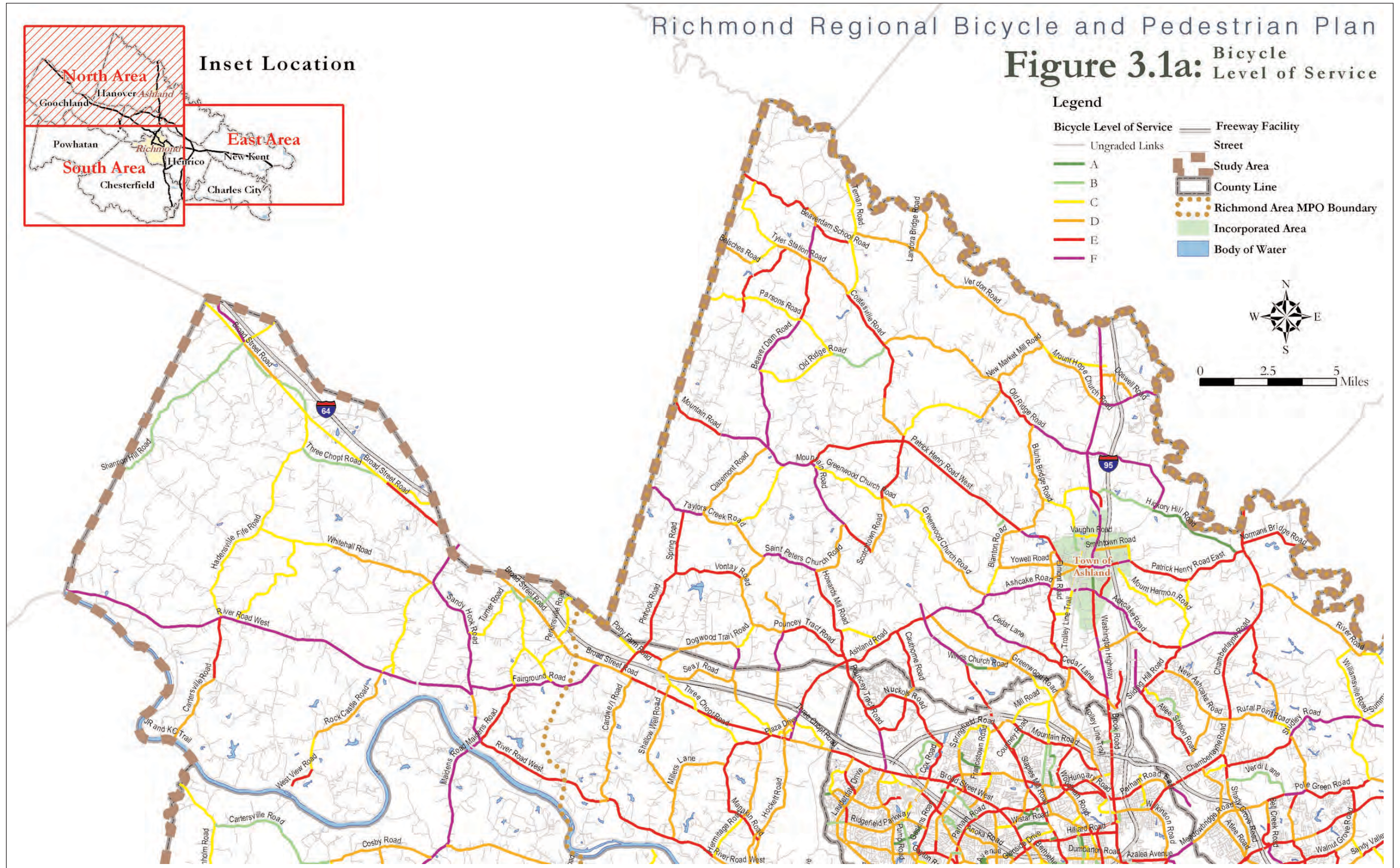


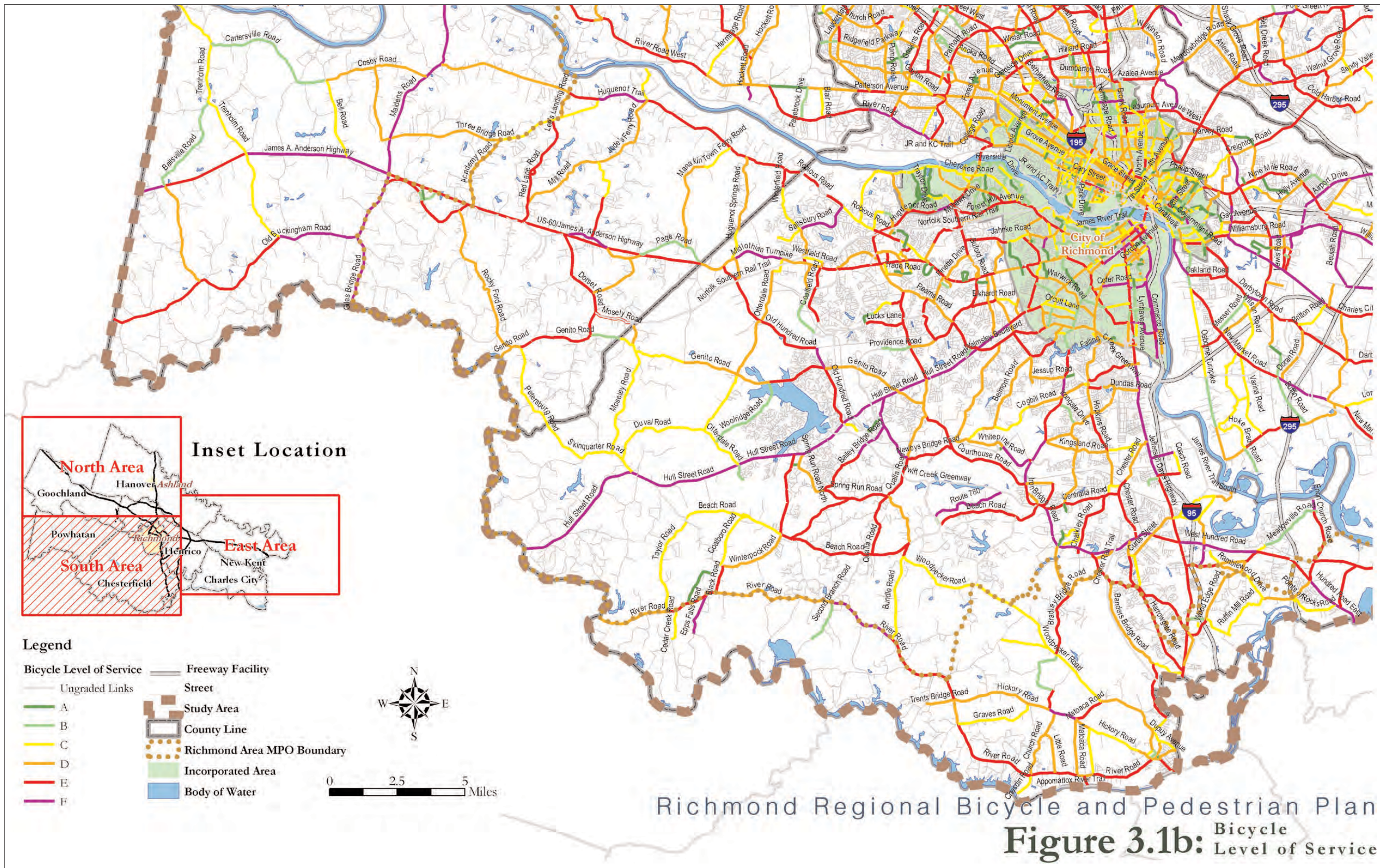
Legend

- | | |
|---------------------------------|----------------------------|
| Bicycle Level of Service | Freeway Facility |
| Ungraded Links | Street |
| A | Study Area |
| B | County Line |
| C | Richmond Area MPO Boundary |
| D | Incorporated Area |
| E | Body of Water |
| F | |



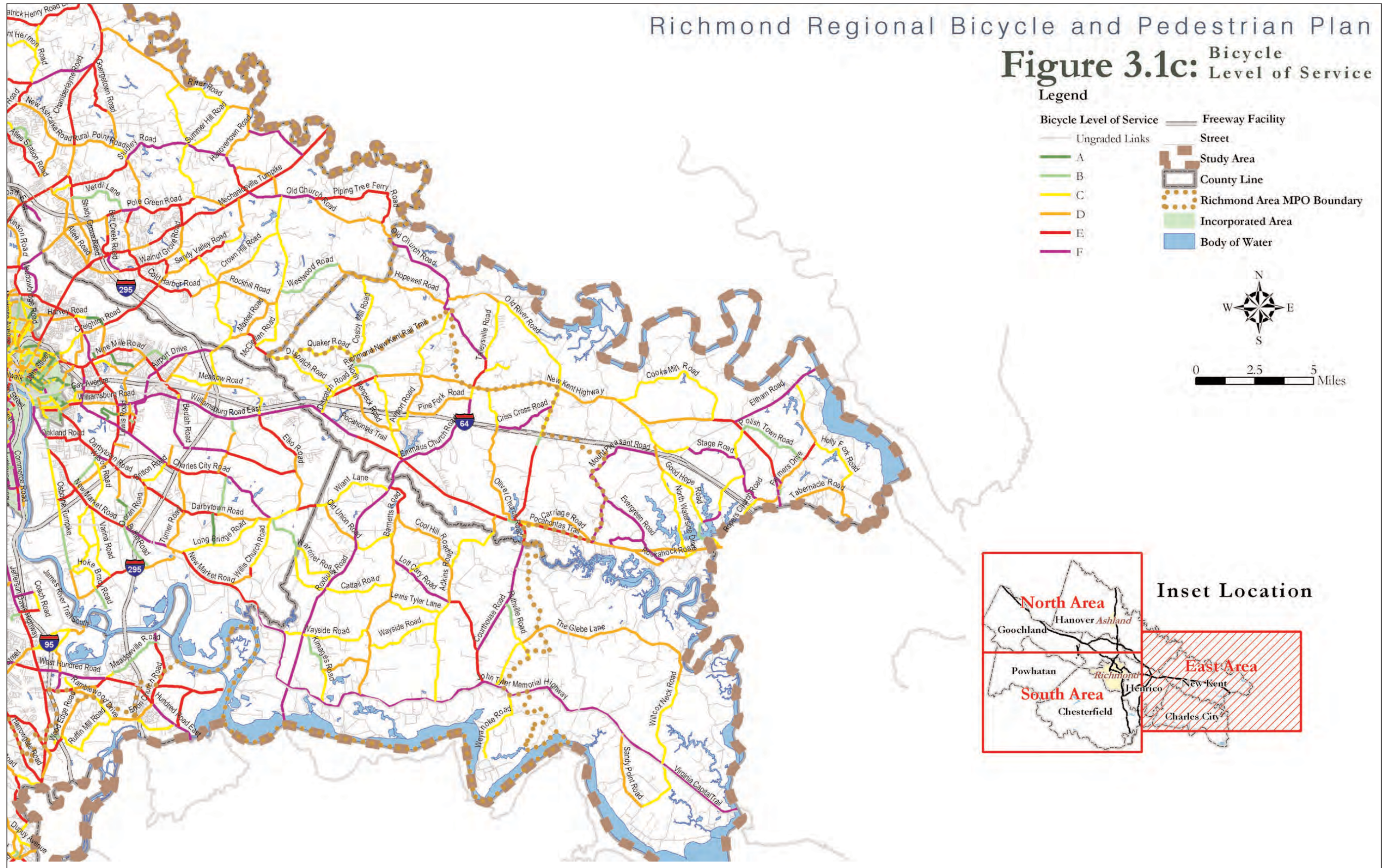
0 2.5 5 Miles





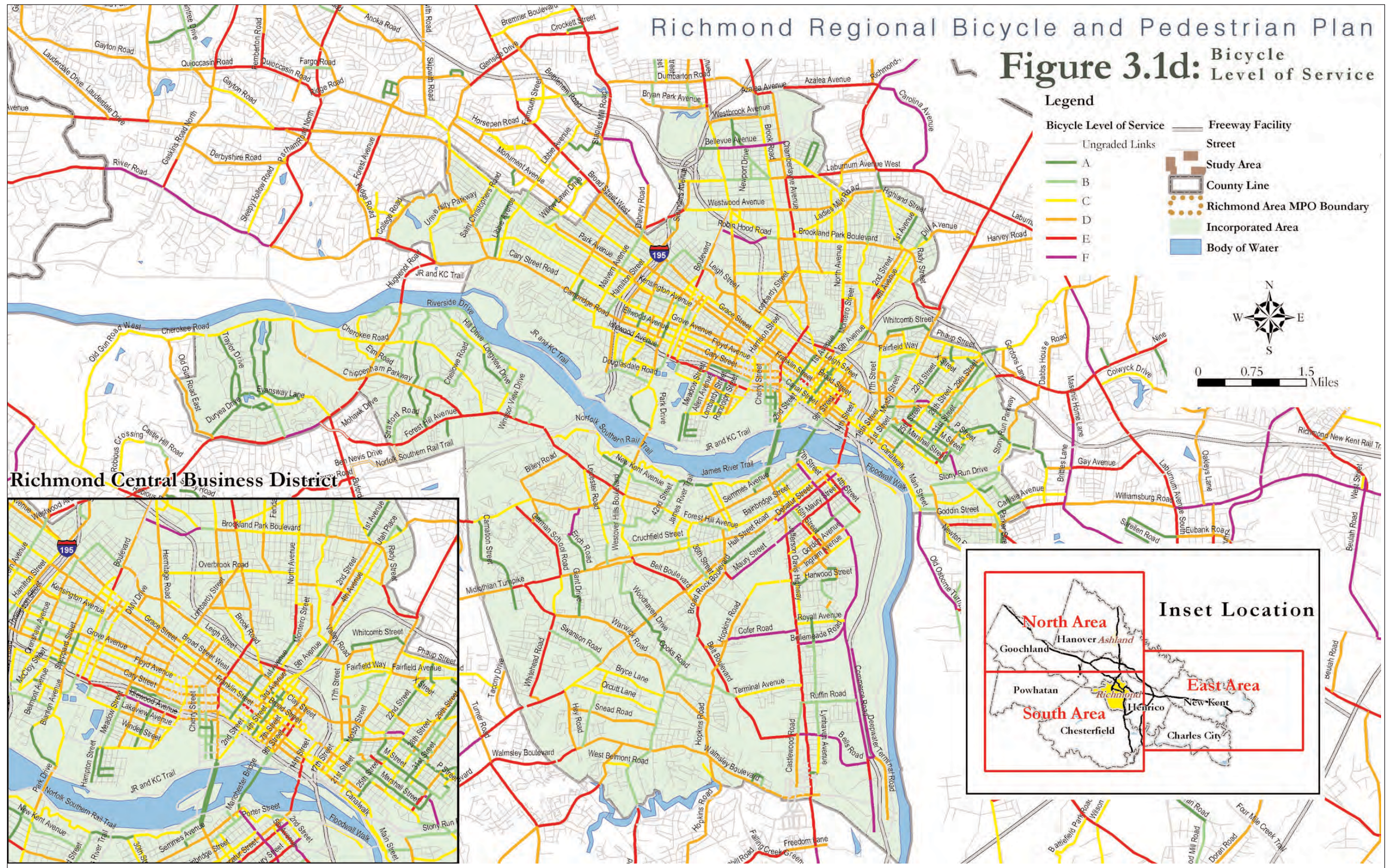
Richmond Regional Bicycle and Pedestrian Plan

Figure 3.1c: Bicycle Level of Service



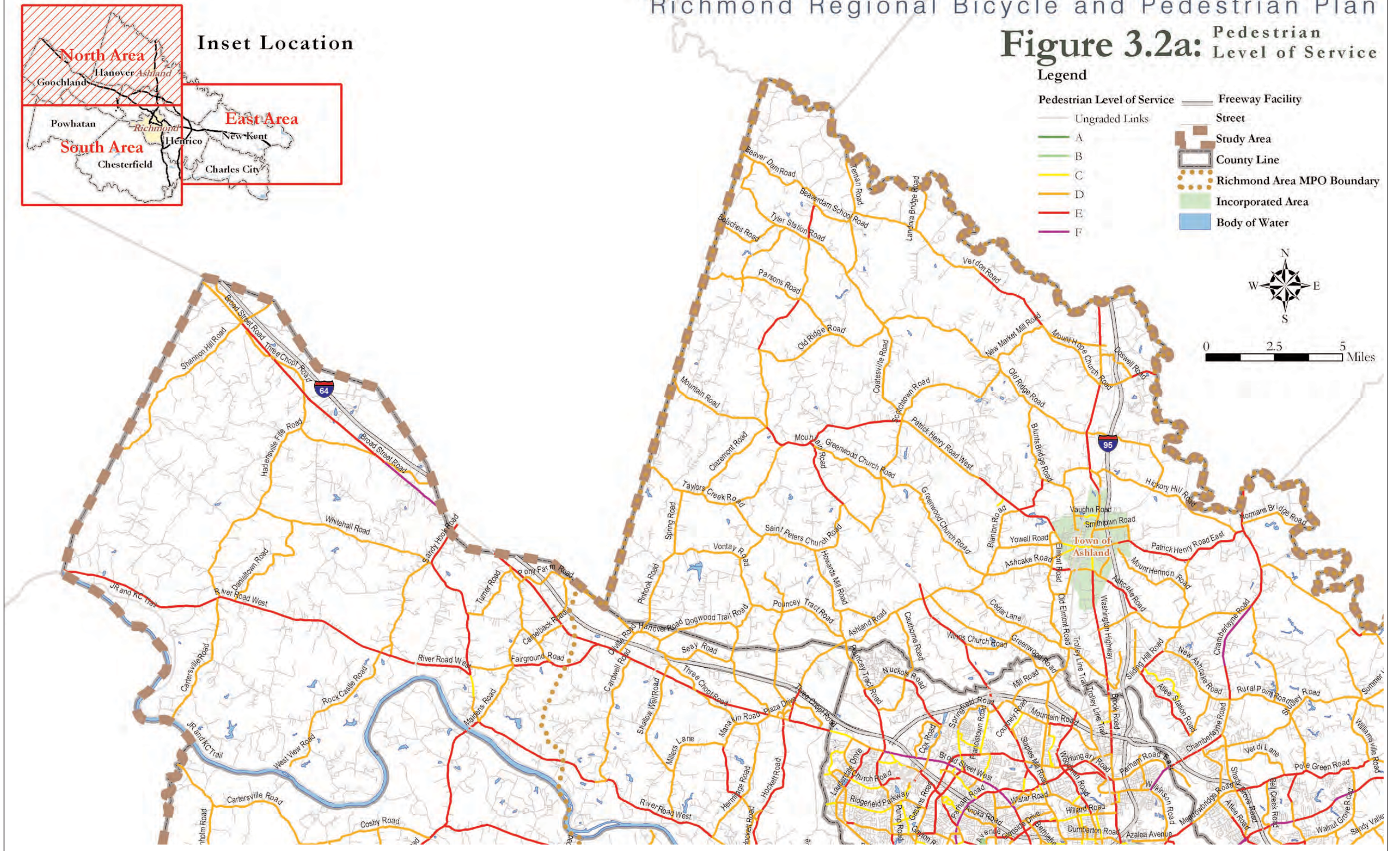
Richmond Regional Bicycle and Pedestrian Plan

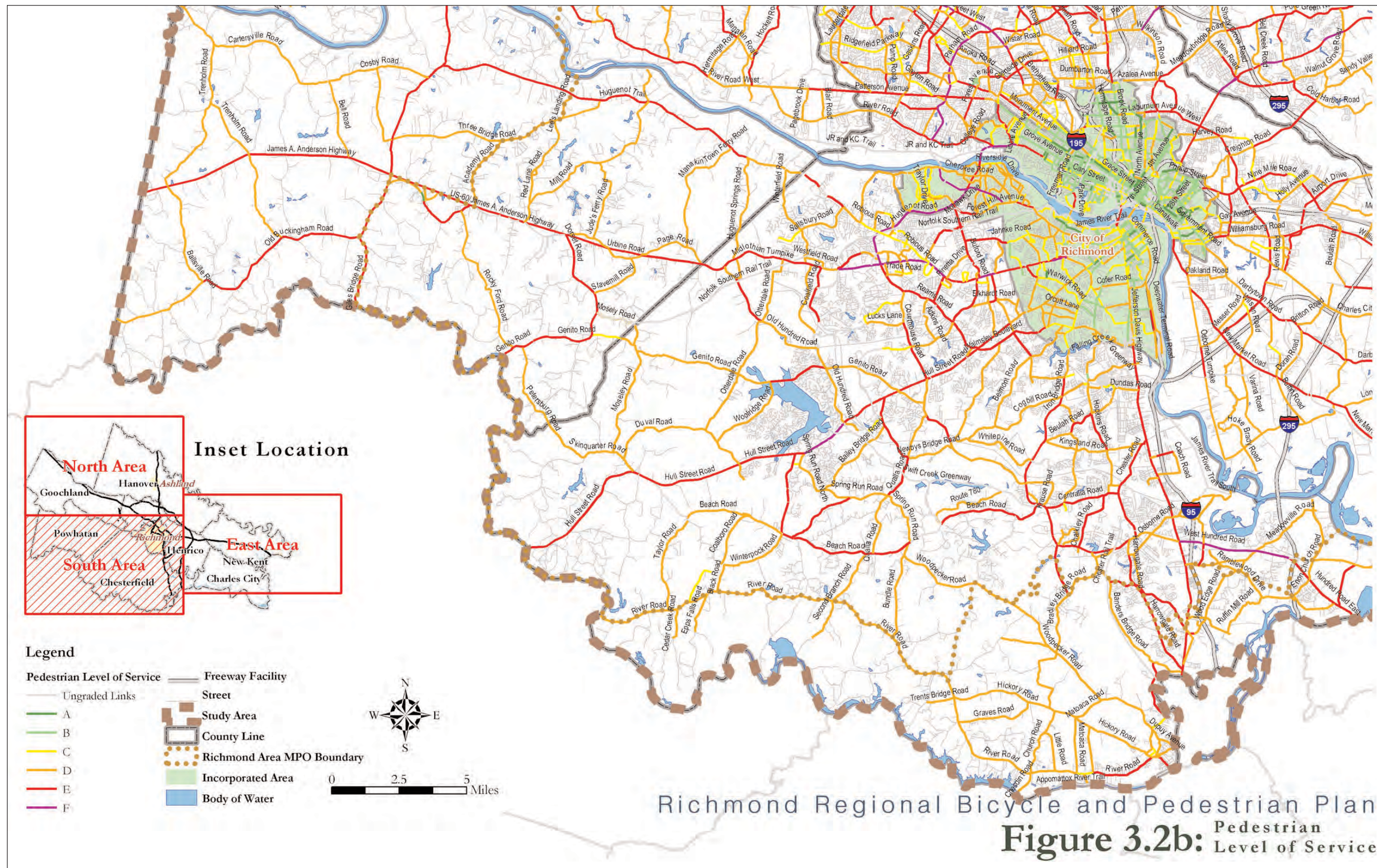
Figure 3.1d: Bicycle Level of Service



Richmond Regional Bicycle and Pedestrian Plan

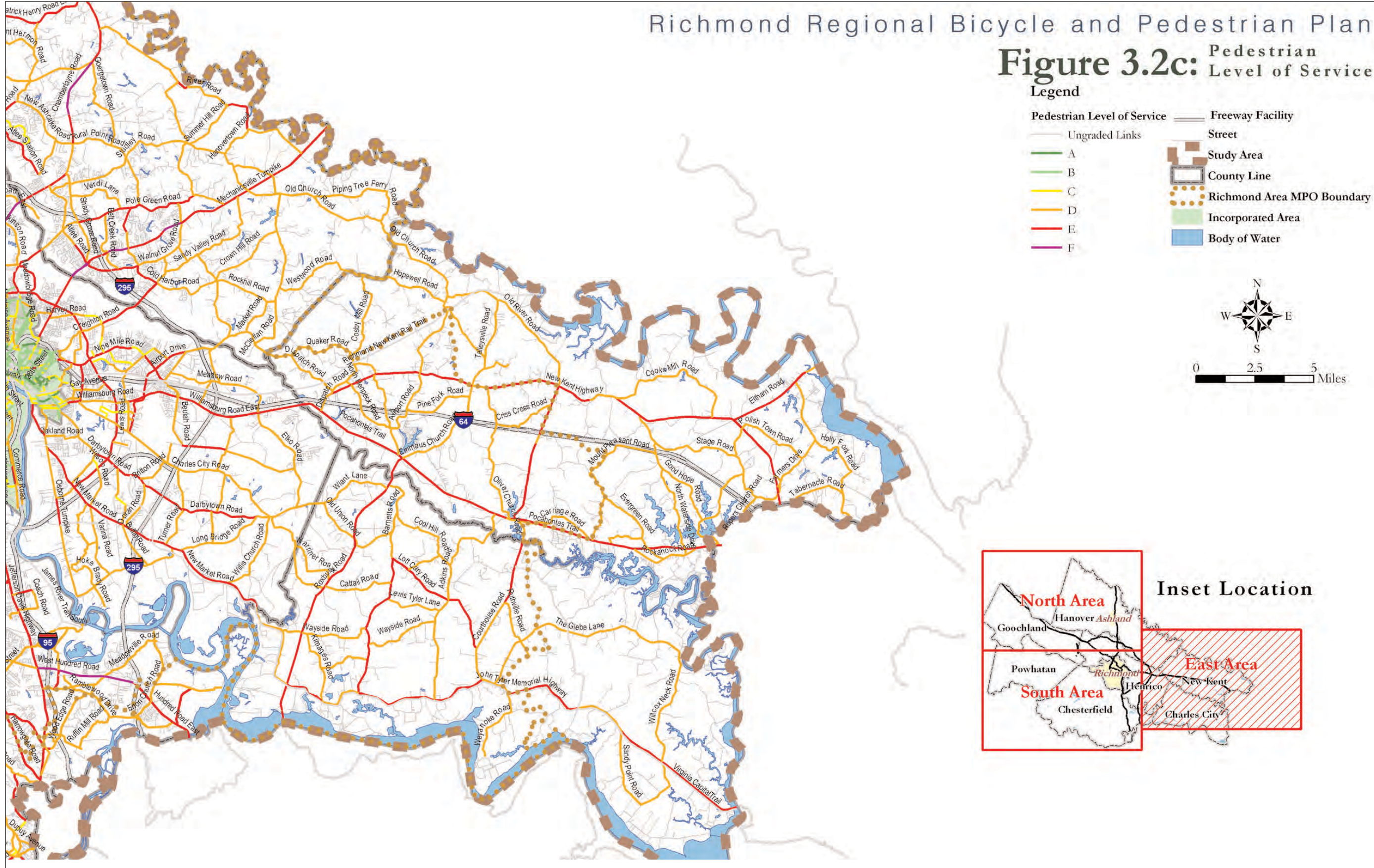
Figure 3.2a: Pedestrian Level of Service

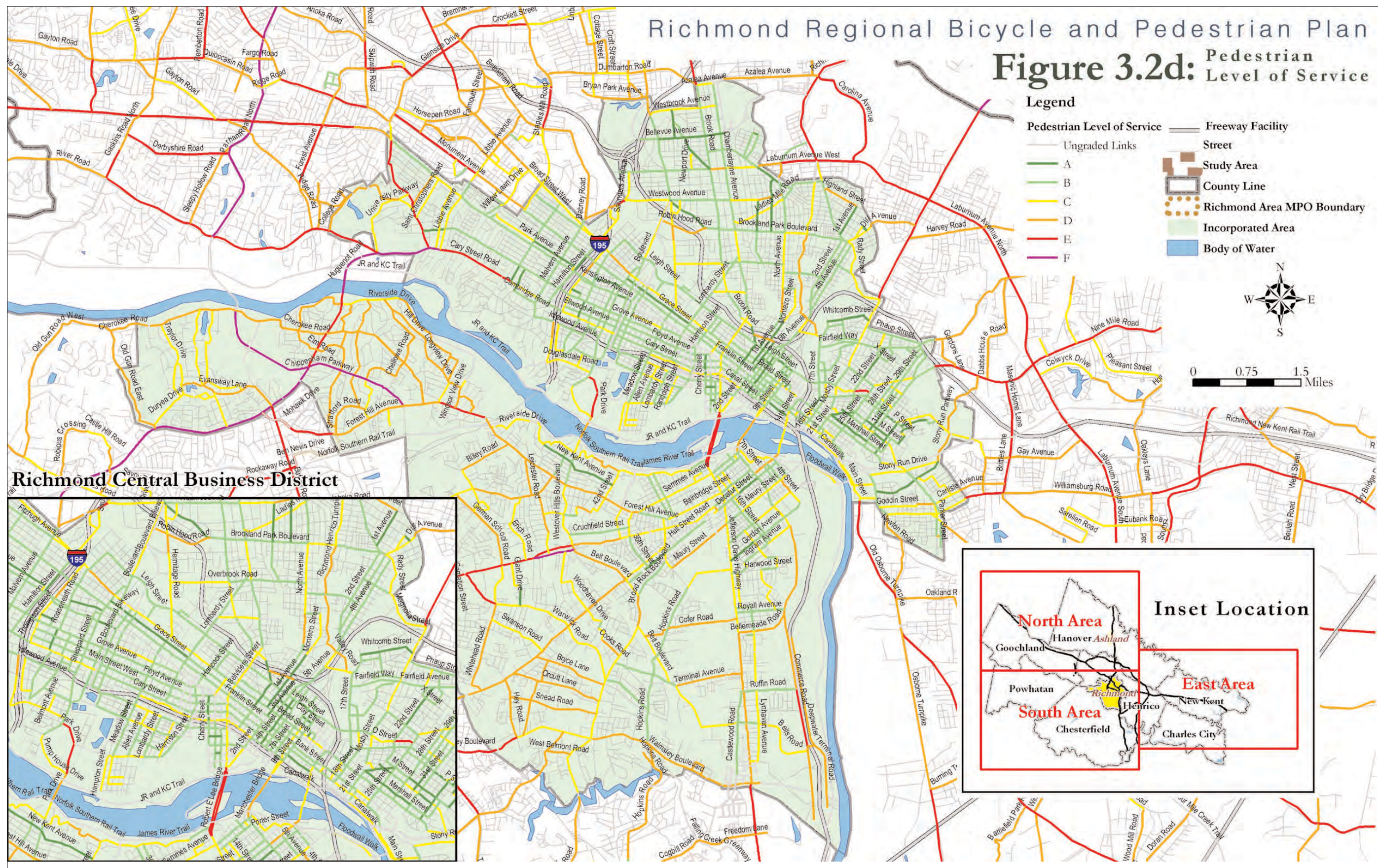




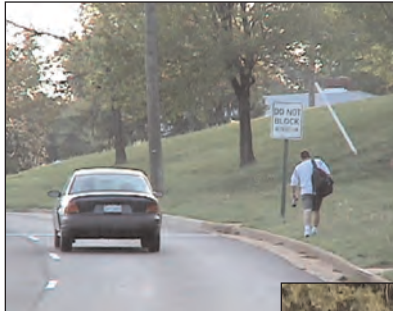
Richmond Regional Bicycle and Pedestrian Plan

Figure 3.2c: Pedestrian Level of Service Legend





Chapter 3: Bicycling and Walking in the Richmond Region Today - Levels of Service and Latent Demand



Bicycle and pedestrian activity near the Parham Road/ Ridge Road intersection in Henrico County. Latent Demand Model results indicate this area to have a medium level of latent demand.



Latent Demand Analysis Method

Purpose

The Latent Demand Analysis Method is used to estimate the relative potential for pedestrian and bicycle activity on a roadway and/or trail within a defined study network. It uses existing population, employment, and land use data to determine where non-motorized trips are likely to occur, assuming that ideal pedestrian and bicycle infrastructure is available. The methodology is based on a gravity model concept, commonly used by transportation planners for predicting overall travel demand on a regional transportation network. Gravity models assume that the number of trips between any origin/destination pair will increase under any of three conditions:

- the number of people at an origin is higher (higher population density)
- the destination is more attractive (more jobs, more retail space, more park activities, etc. in a location)
- the distance between the origin and destination is shorter

General Explanation

The Latent Demand Analysis Method evaluates the potential to serve non-motorized trips on a segment-by-segment basis. For each segment, nearby trip generators (residential areas) and attractors (parks, schools, employment areas, etc.) are analyzed in a Geographic Information System (GIS). The computerized process evaluates the types and proximity of generators and attractors in the area surrounding each segment. This process generates an overall score for potential demand for each segment. When this GIS analysis is complete, each segment is compared to other segments and ranked in terms of latent demand for non-motorized trips.

It is important to note that the Latent Demand Analysis Method does not estimate a particular quantity of non-motorized trips that can or will be made on a particular

road or trail segment, rather it shows the relative potential of one segment to serve non-motorized trips as compared to another segment based upon the potential for origins and destinations in the vicinity of that segment to generate non-motorized trips.

Application in the Richmond Region

By taking into account a variety of land uses in the Richmond region, the Latent Demand Analysis Method shows which of the regional study network segments are ranked in the following non-motorized trip demand categories (categories are divided evenly: highest 20% of segments, next highest 20% of segments, etc.):

- High
- Medium-High
- Medium
- Medium-Low
- Low

Latent demand scores were calculated using bicycle trip distances by trip purpose. Destinations for trips, such as parks, transit stations, and schools, were entered into a GIS from sources throughout the region to account for different trip purposes. The data used to derive trip distance by purpose came from the 2001 National Household Transportation Survey (NHTS).

Because of the substantial difference in population density and trip destination characteristics between the study area's more developed, urban sectors (i.e. downtown Richmond) and the outlying rural jurisdictions (i.e. Goochland, Powhatan, etc.), the latent demand scores were ranked using a separate scale for each individual jurisdiction. Each network segment's latent demand score was ranked only in relation to other segments within that jurisdiction. This jurisdiction-by-jurisdiction approach provides more useful results and eliminates a methodological bias that would result from comparing demand on a segment in Powhatan County with one in the City of Richmond which have dramatically different population and employment densities. Scaling the Latent Demand scores separately within each jurisdiction is better suited

to making comparisons and prioritizations within each jurisdiction, which is where these tasks happen anyway. It is important to note that for this reason, on the study maps latent demand scores often change abruptly where network routes cross jurisdictional boundaries (for instance, at the border of Henrico County and Charles City County), and these changes are not indicative of an actual change in latent demand, but rather a change in the scale upon which the demand for these segments are ranked.

Figures 3.3a, b, c and d present a summary of the Latent Demand Analysis for the study network. A more detailed explanation of the Latent Demand Analysis Method is provided in **Appendix A.3**.

Latent Demand Analysis Summary

The more intense, red lines depicted on **Figures 3.3a, b, c and d** indicate areas of highest calculated latent demand in each of the nine study area jurisdictions. These areas are generally located as follows:

- *Town of Ashland* - west of I-95 along England Street (Route 54) and the portions of Route 1 and Center Street directly north and south of England Street
- *Charles City County* - in the northwesternmost portion of the county along Route 600 (Charles City Road), along the western portion of Route 5, and along Routes 5, 155, and 615 in the vicinity of the courthouse area
- *Chesterfield County* - in the Bon Air area and adjacent areas to the west (to Huguenot Road) and to the south (to the Pocoshock area between Routes 60 and 360)
- *Hanover County* - in the southern, central portion of the county, including portions of Cedar Lane, Route 1, Atlee Station Road and areas of Mechanicsville to the north and south of Route 360 (Shady Grove Road, Atlee Road, Cold Harbor Road, Lee Davis Road, and Creighton Road)
- *Henrico County* - in the near west end area, bounded by Parham Road (to the west), Monument Avenue (to the south) and the City of Richmond and Route 1 (to the east); also, limited portions of the county lying along the northeast and east limits of the city

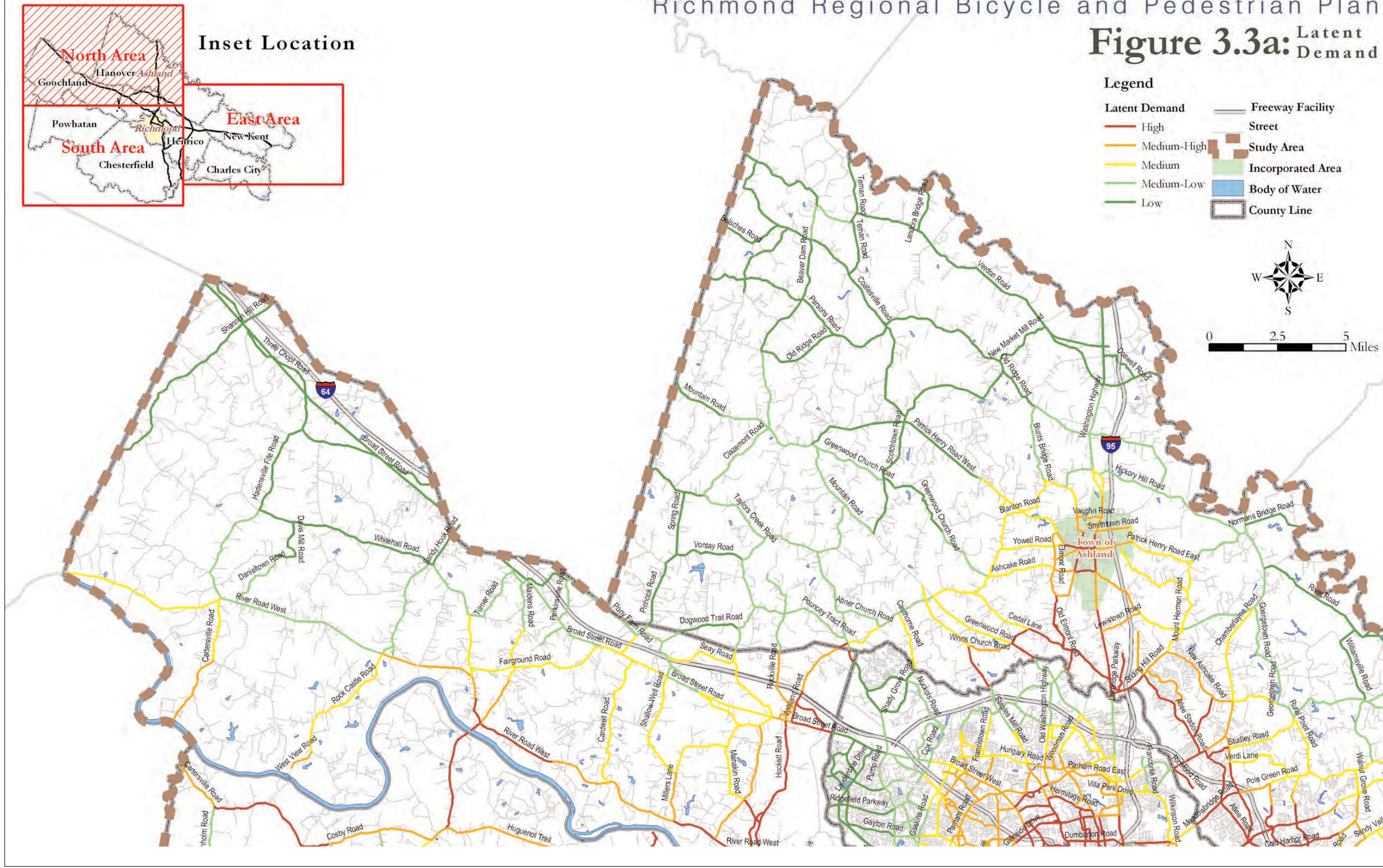
- *Goochland County* - in the easternmost portions of the county near the western limit of Henrico County, as well as portions of River Road West to the west of Route 522 (courthouse area) and to the east of Route 522
- *New Kent County* - in the westernmost area of the county closest to the eastern limit of Henrico County and in the vicinity of Interstate 64 Exit 205 (Route 249), as well as a portion of Route 60 in the Providence Forge area
- *Powhatan County* - in the easternmost portion of the county (near the western limit of Chesterfield County) along Huguenot Trail (Route 711) and Route 60, as well as along the portion of Route 522 directly south of the James River and a portion of Cartersville Road in the northwestern part of the county
- *City of Richmond* - in the city's downtown and Fan (directly west of downtown) areas

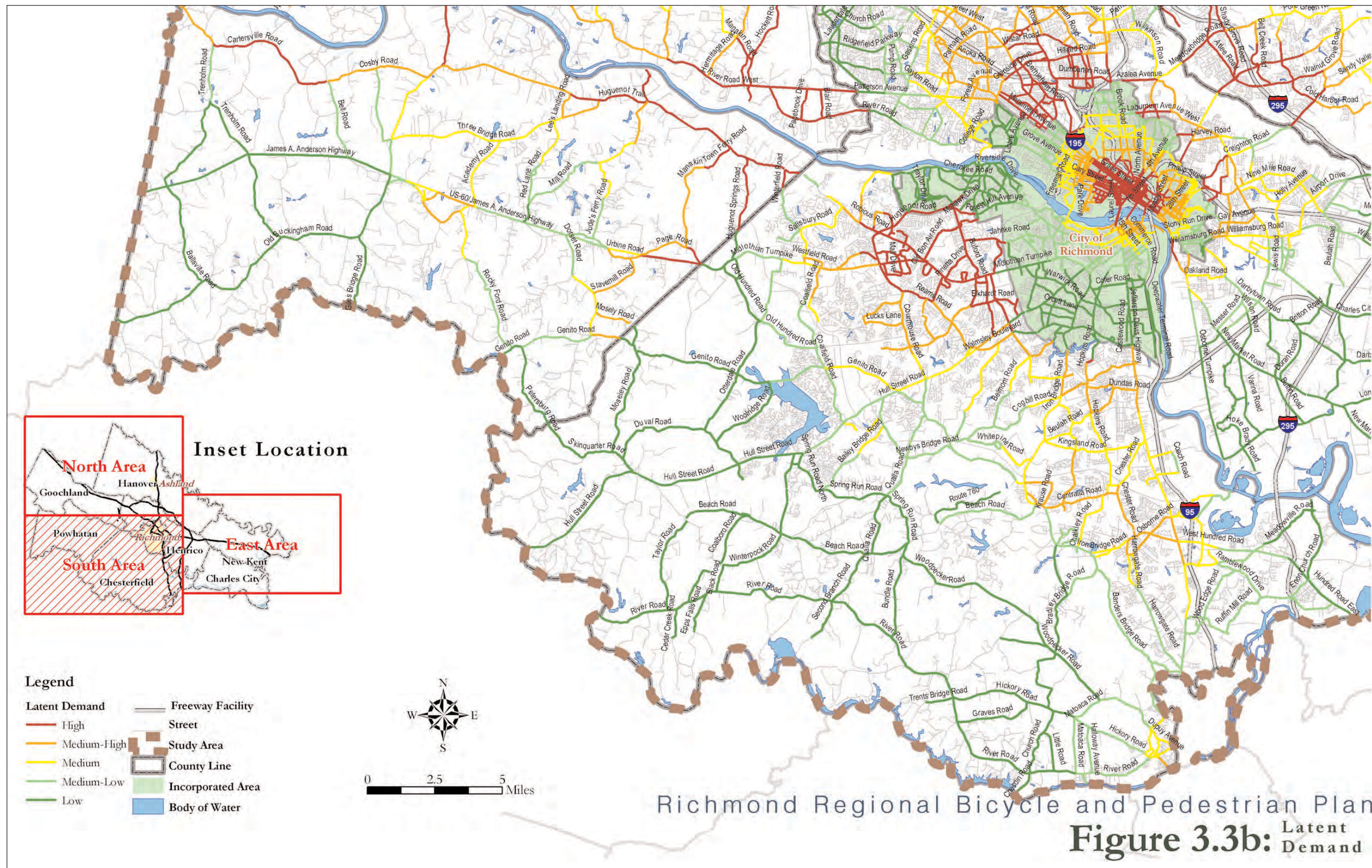
Future Use of Models

As part of this planning process, VDOT and local agency staff will be trained in the use of the BLOS and PLOS models along with the Latent Demand Analysis Method. After gaining familiarity with these tools, it is envisioned that VDOT and local agencies will continue to maintain and use them to assist with performing future local and regional bicycle and pedestrian planning activities.

Richmond Regional Bicycle and Pedestrian Plan

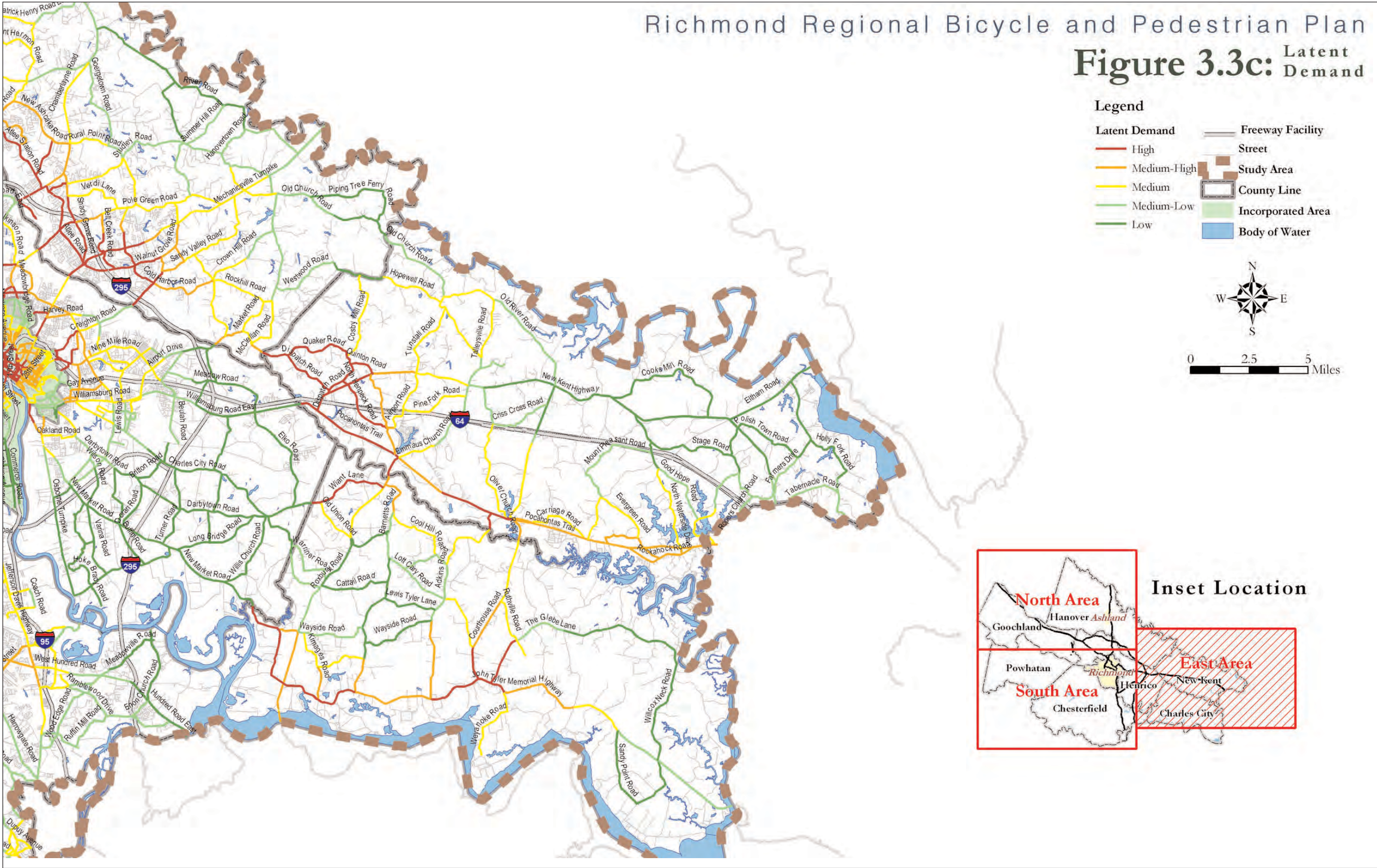
Figure 3.3a: Latent Demand





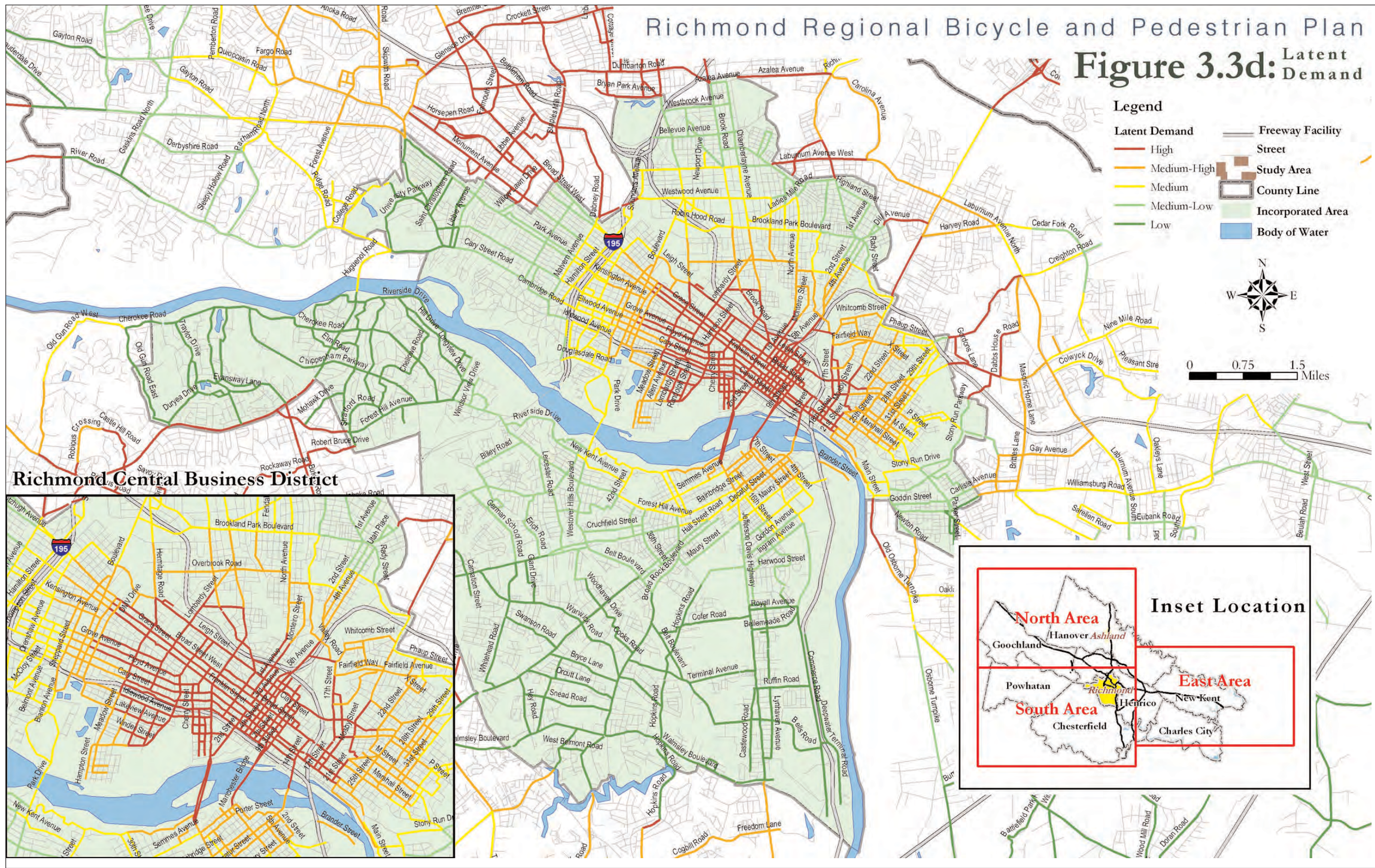
Richmond Regional Bicycle and Pedestrian Plan

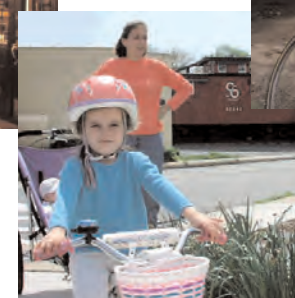
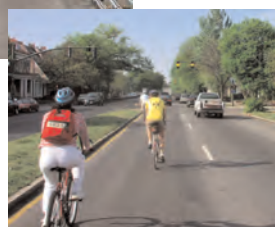
Figure 3.3c: Latent Demand



Richmond Regional Bicycle and Pedestrian Plan

Figure 3.3d: Latent Demand







Chapter 4: Creating a Bicycle and Pedestrian Network for the Richmond Region - Recommendations

This chapter presents 27 recommended actions that will enable the Richmond region to create and provide ongoing support of a safe and effective regional network for bicycle and pedestrian transportation. These actions are divided into the four categories of:

- bicycle and pedestrian network recommendations
- policy recommendations
- planning recommendations
- program recommendations

The order in which the recommendations appear does not indicate importance or priority. The successful implementation of these recommended actions will require a cooperative effort among local, regional, and state agencies.

Bicycle and Pedestrian Network Recommendations

The development of a physical network of bicycle and pedestrian facilities is needed to provide safe and effective transportation for people who choose to bicycle and walk. Components of this network will include roadways, sidewalks, shared use paths, public bicycle parking, safe accommodations on bridges that cross rivers and highways, and seamless access to transit services. This plan recommends a select set of roads and pathways that will constitute that regional network. Specific recommendations follow.

Recommended Strategy A-1. Establish a regional network of roadways, sidewalks, and shared use paths that will serve bicycling and walking needs in the Richmond region

This plan identifies a select set of collector and arterial roads, sidewalks, and potential shared use path corridors as the Richmond Regional Bicycle and Pedestrian Plan network (hereafter referred to as the network). The network also includes trails, bridge accommodations, and other facilities listed in **Table 4.1** and shown for **Figures 4.1 a, b, c, d**.

Table 4.1: Components of the Physical Network
<ul style="list-style-type: none">■ on-road bike lanes■ paved shoulders■ shared use roadways■ sidewalks and pedestrian paths■ bicycle touring routes■ bicycle commuter routes■ pedestrian nodes and corridors■ pedestrian crossings■ shared use paths■ road marking treatments■ bike racks on buses■ bus shelters■ barrier crossing accommodations (for bridges and underpasses)■ bicycle parking■ bike stations or bike banks■ route signs and mapping■ other multimodal facilities

Selecting the Network

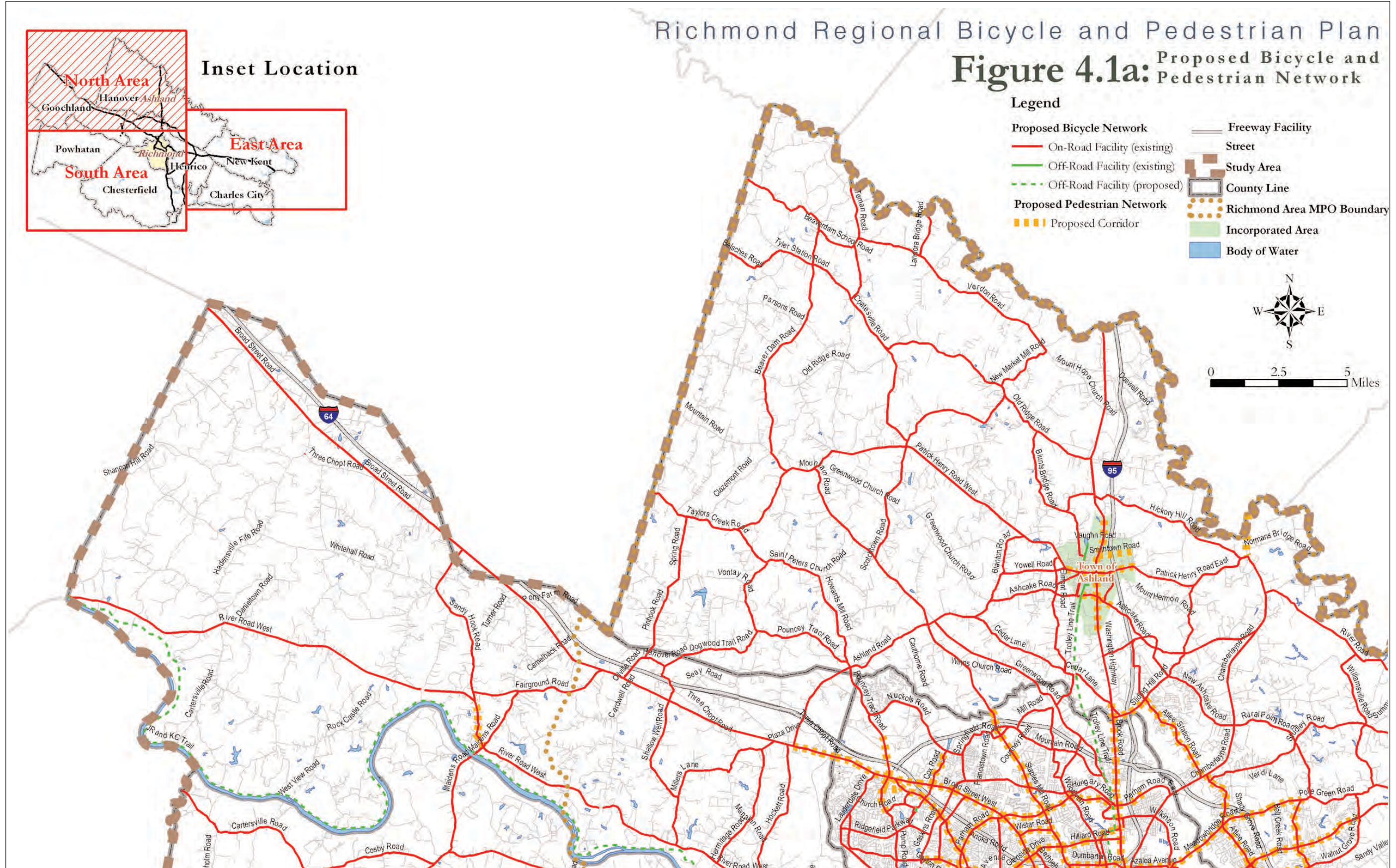
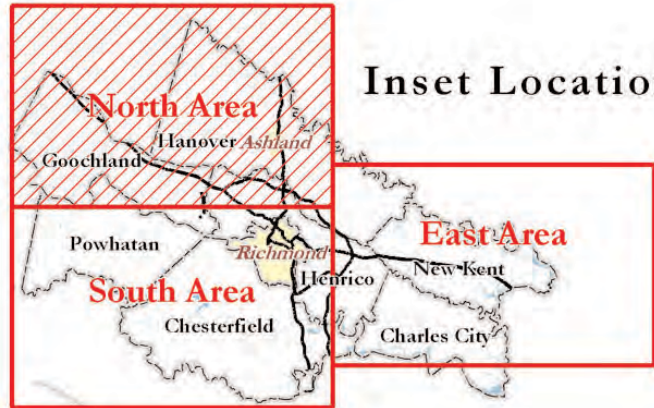
The regional network includes 1,500 miles of the primary and secondary road system. Limited access highways where bicycle and pedestrian activity is not permitted are

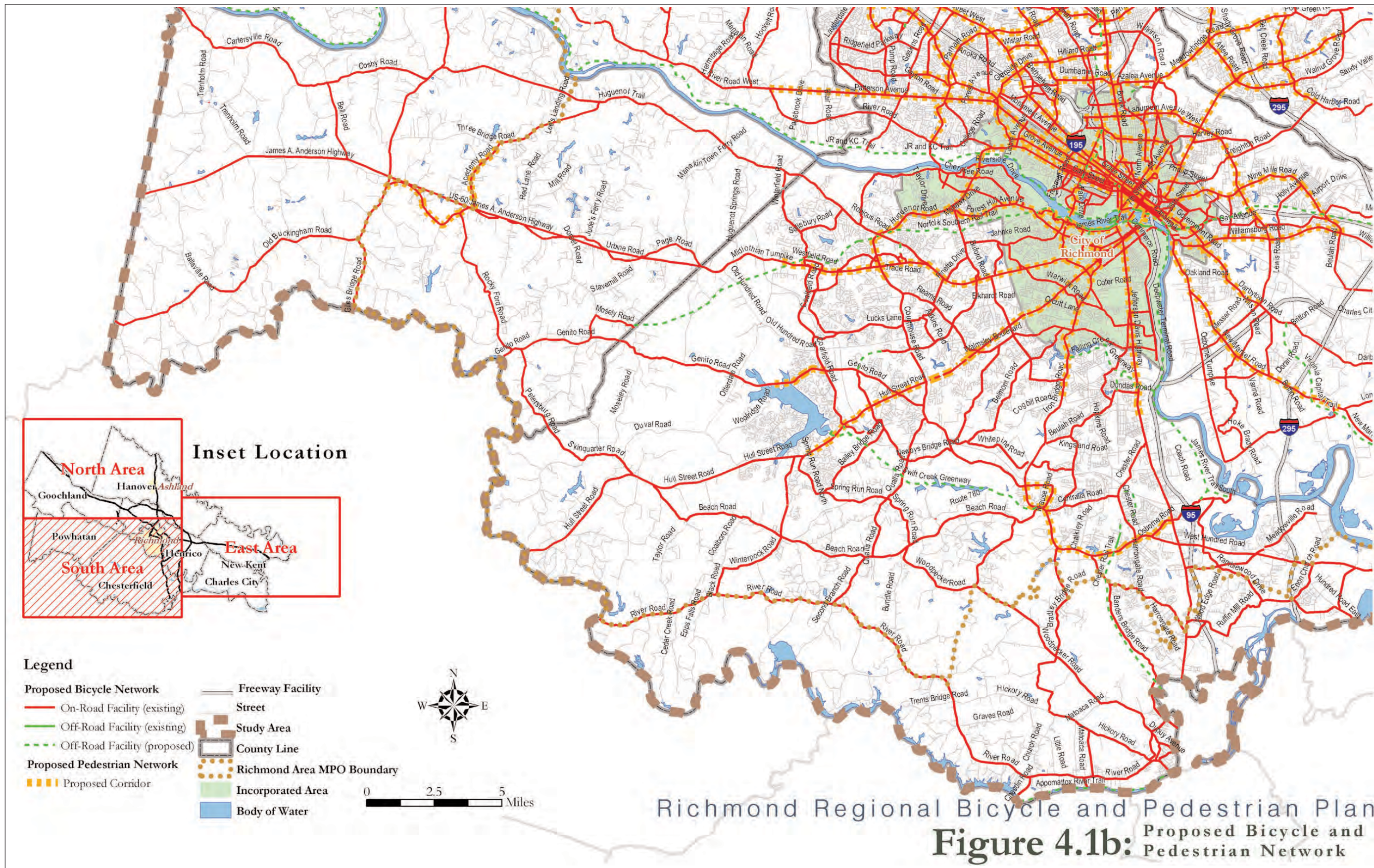
not included in the network. Network roads were primarily selected from among 2,300 miles of road that were included in the initial study network. The 202 miles of shared use paths selected for the regional network were chosen from among 300 miles of existing, planned, and proposed paths and trails. The set of criteria and planning factors that were used to select the regionally significant routes are listed below in **Tables 4.2** and **4.3**, respectively.

Table 4.2: Network Selection Criteria for Roads and Trails
<ul style="list-style-type: none">■ provide connectivity between important activity centers within each jurisdiction and within the region■ provide service to existing areas of the greatest population and employment density, as well as areas of expected growth■ provide service to residents making bicycle and pedestrian trips outside their home jurisdiction■ serve the primary connectivity needs between jurisdictions within the region and neighboring jurisdictions outside the region■ provide key crossings of the major highway, river, and/or railroad barriers that make regional bicycle and pedestrian connectivity difficult or impossible■ include many of the roadways and other corridors with the greatest potential to serve pedestrian trips

Richmond Regional Bicycle and Pedestrian Plan

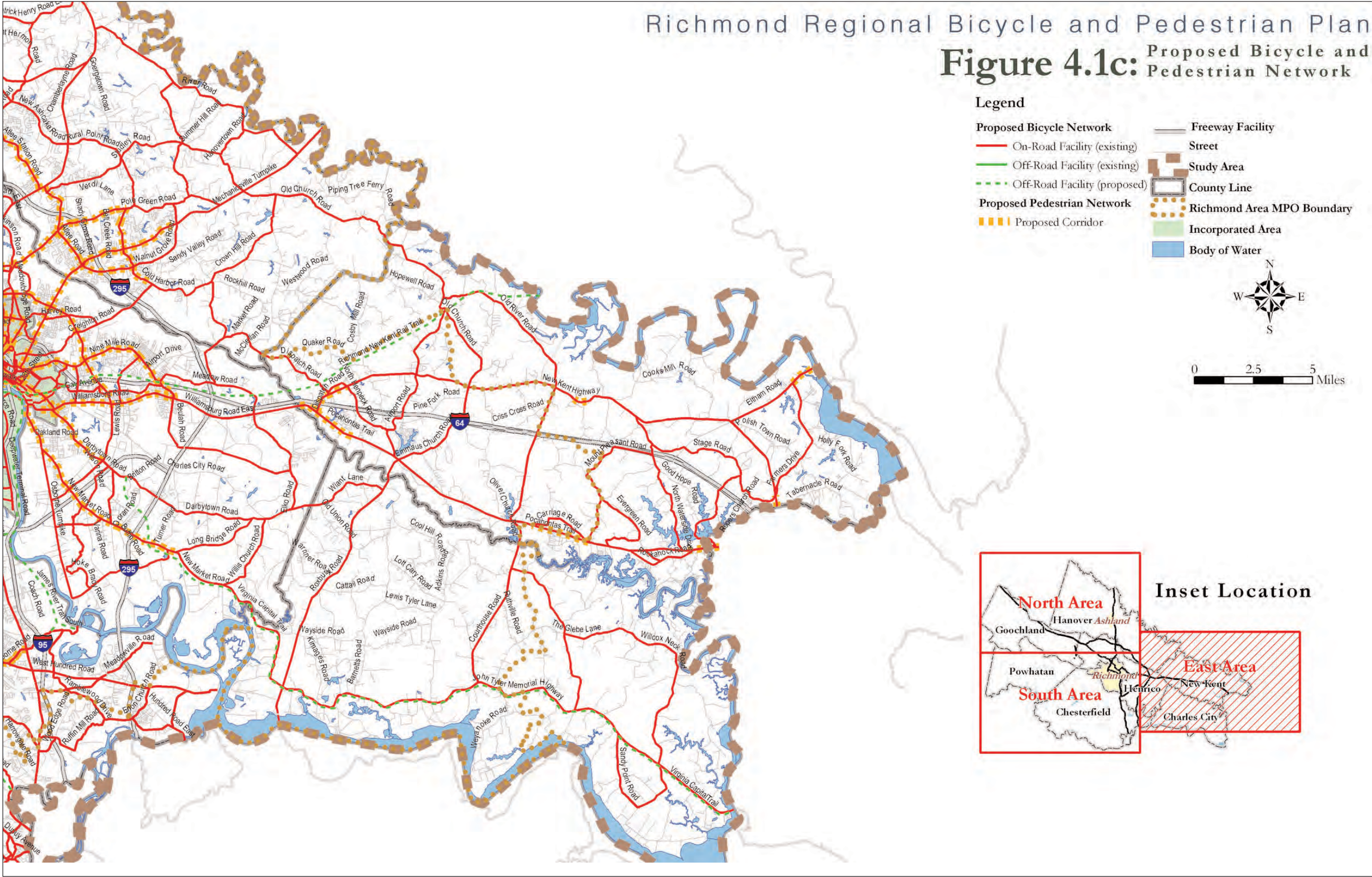
Figure 4.1a: Proposed Bicycle and Pedestrian Network





Richmond Regional Bicycle and Pedestrian Plan

Figure 4.1c: Proposed Bicycle and Pedestrian Network



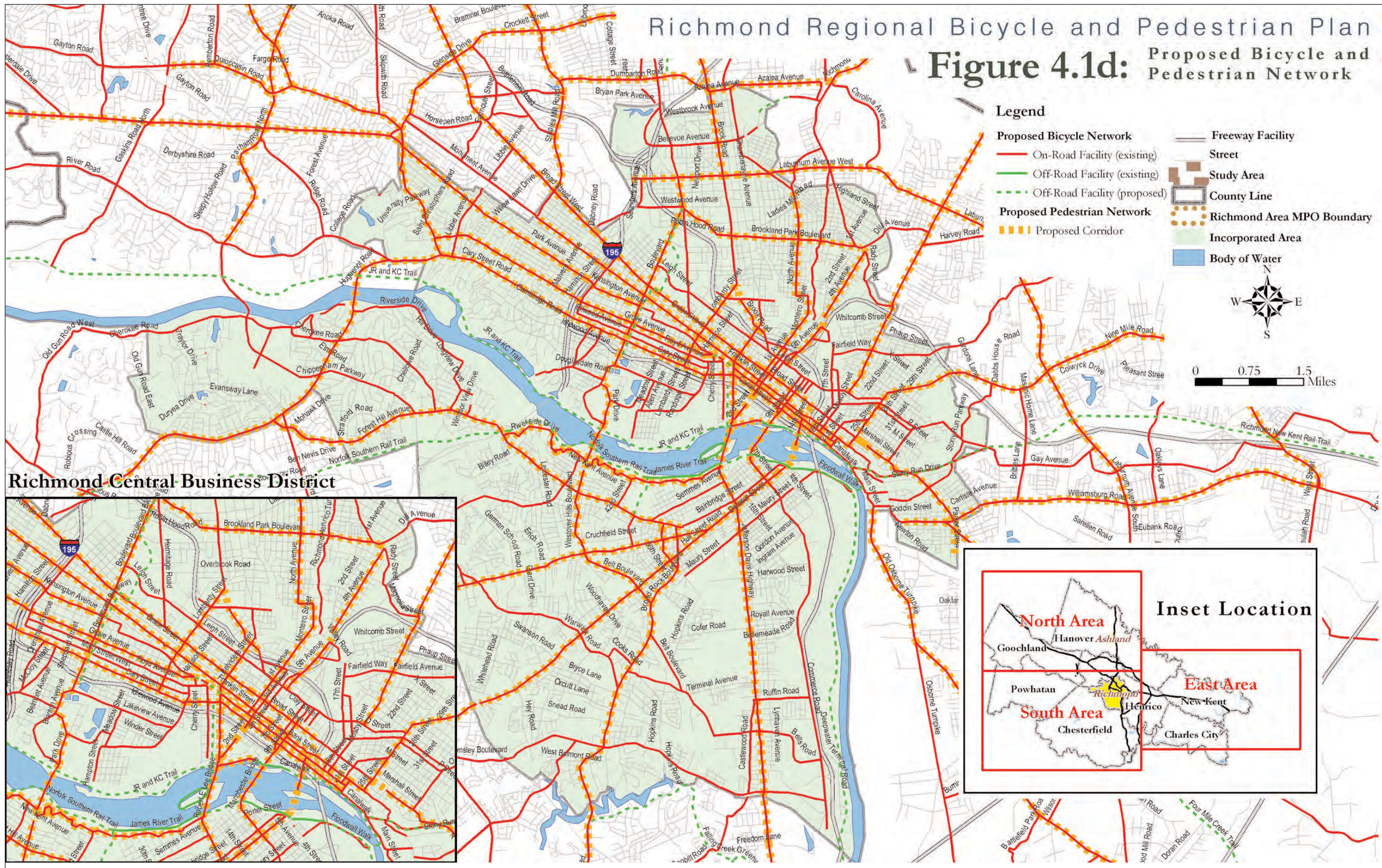


Table 4.3: Planning Factors Used in Network Selection

- existing bicycle and pedestrian level of service
- bicycle and pedestrian latent demand analysis
- public comments
- recommendations of jurisdiction and public representatives on the study advisory committee
- existing local plans and proposals
- planned future road improvements or other bicycle and pedestrian improvement projects
- existing barriers and barrier crossings
- existing transit routes and park and ride lot locations

Implications of Network Selection

The primary purpose of establishing this network is to identify the key roads, trails, and other accommodations that are regionally significant and should receive the highest levels of attention from local, regional, and state agencies.

It is specifically noted that the inclusion of certain transportation elements in the plan network is not intended to recommend the exclusion of all other roadways from future consideration of bicycle and pedestrian facilities or enhancements. The following are key actions for roads and paths identified as part of the regional network:

1. Jurisdictional routes should be presented to their respective local governments for adoption.
2. Along these routes, any public or private entity that makes an alteration to the road will:
 - preserve and/or enhance existing bicycle and pedestrian accommodations as a part of these improvement projects

- provide appropriate and feasible bicycle and pedestrian accommodations to improve level of service (to the extent possible) where no facilities exist and levels of service are poor
3. To ensure that bicycle and pedestrian continuity and service functionality is realized in the shortest possible timeframes, independent bicycle/pedestrian improvement projects should be planned and developed along these routes to complement improvements made as a part of routine roadway improvement projects.
 4. Stand-alone bicycle and pedestrian improvement projects directly related to these routes should receive consideration for competitive funding priority (federal, state, or regional) over stand-alone bicycle and pedestrian projects located off of the network. Bicycle and pedestrian improvement projects planned by jurisdictions (or other local entities) but not in complete agreement with this plan may also receive consideration for competitive funding on a case-by-case basis.

Recommended Strategy A-2. Use the pedestrian nodes and corridors identified in this plan to guide and focus pedestrian improvements and planning in the region.

Pedestrian nodes and corridors are locations where existing or future pedestrian activity is expected to be significant and physical conditions should be improved, either to provide basic accommodations or to provide greater safety and higher levels of service. **Figures 4.2 a, b, c, and d** show locations that can be described as pedestrian nodes and corridors. Improvements may be made as a part of scheduled road improvement projects, as part of independent pedestrian projects, or combined bicycle and pedestrian improvement projects.

These pedestrian nodes and corridors were selected primarily based on public and local jurisdiction staff

comments, the pedestrian level of service analysis, limited field study, and information from maps identifying typical pedestrian activity centers. The selected locations represent areas where pedestrian access and safety improvements are needed. Either traditional or innovative treatments may be applicable at these locations.¹ Following are examples of pedestrian improvements and treatments that should be considered to provide basic and/or enhanced accommodations in these nodes and along these corridors:

- sidewalk construction and gap elimination
- curb ramp construction and reconstruction
- high visibility crosswalk striping
- mid-block crossings
- median refuge islands
- sidewalk, buffer, and streetscape enhancement
- countdown and audible pedestrian signals
- curb extensions, pedestrian-friendly slip lanes, reduced corner radii
- in-roadway lighted crosswalks
- raised crosswalks
- in-street “Yield to Pedestrian” signs²

Recommended Strategy A-3. Develop a regional sign system for select network routes that is easily and quickly understood by bicyclists and pedestrians, and serves both transportation and recreation oriented trips.

The Richmond region has an opportunity to develop a sign system and protocol to serve the whole region, thus relieving each jurisdiction from having to undertake this task individually. It can be based on the national bicycle sign package (green bike route signs) and protocols offered in the MUTCD, but customized (within the allowable



Example of a pedestrian countdown signal.



Example of a mid-block crossing with a median refuge.



Example of an in-roadway lighted crosswalk.



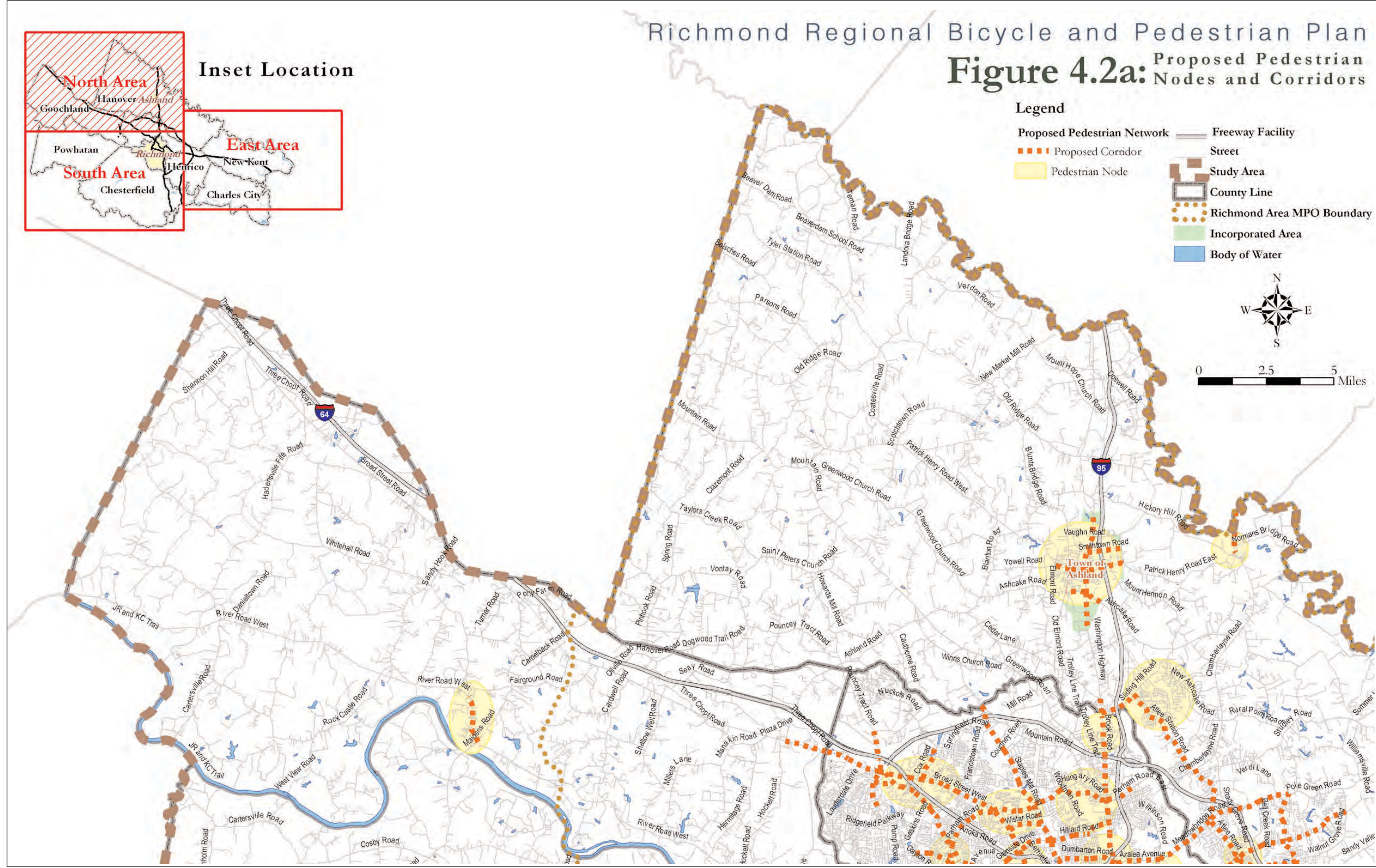
Example of a raised pedestrian crosswalk.

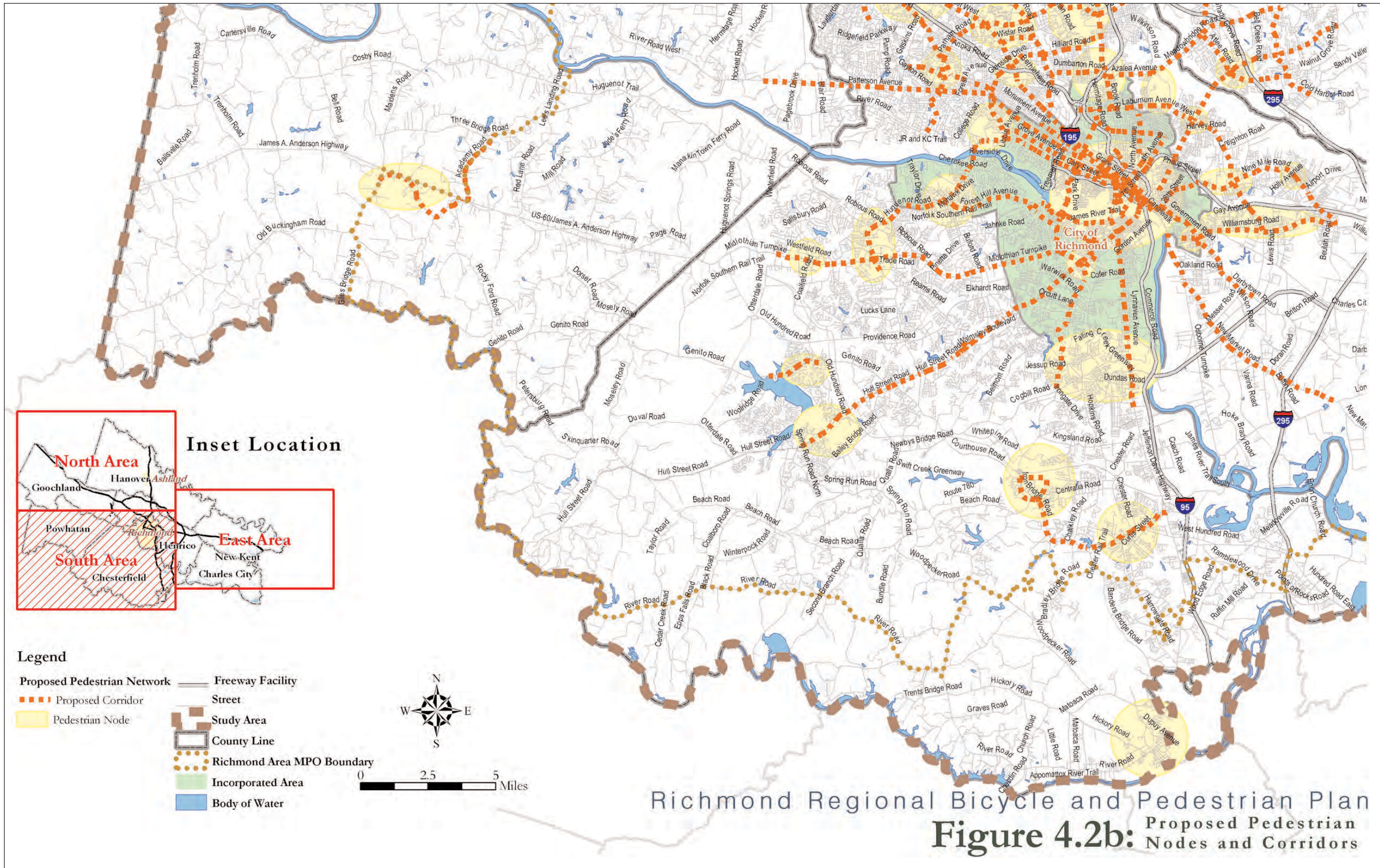


Example of in-street yield to pedestrian sign.²

¹ The scope of work for this regional plan did not permit an exhaustive survey of the region at the pedestrian level. As a result, this set of locations should not be viewed as finite or exclusive.

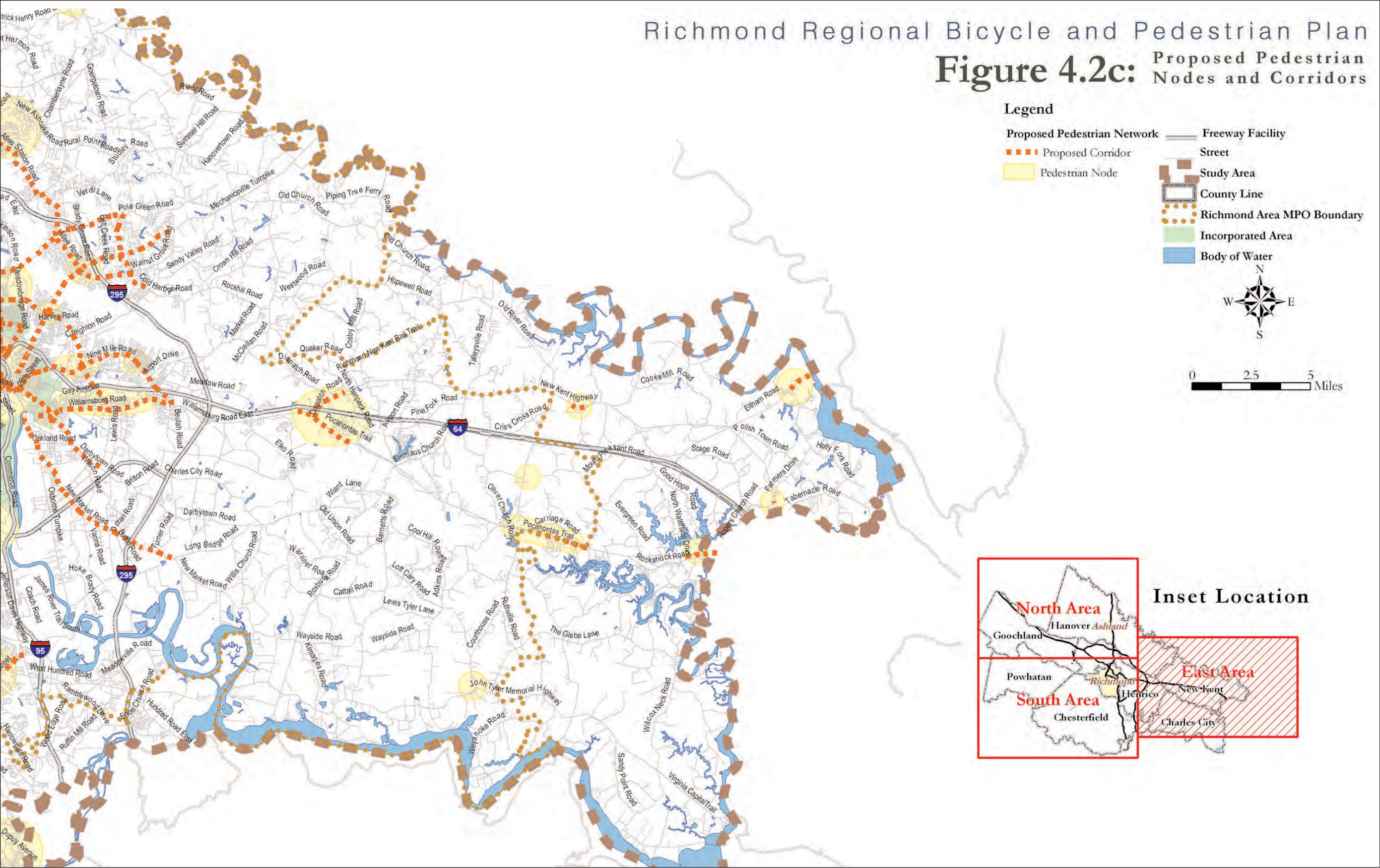
² The use of in-street “Yield to Pedestrian” signs is currently regulated by the Code of Virginia (see section 46.2-294).





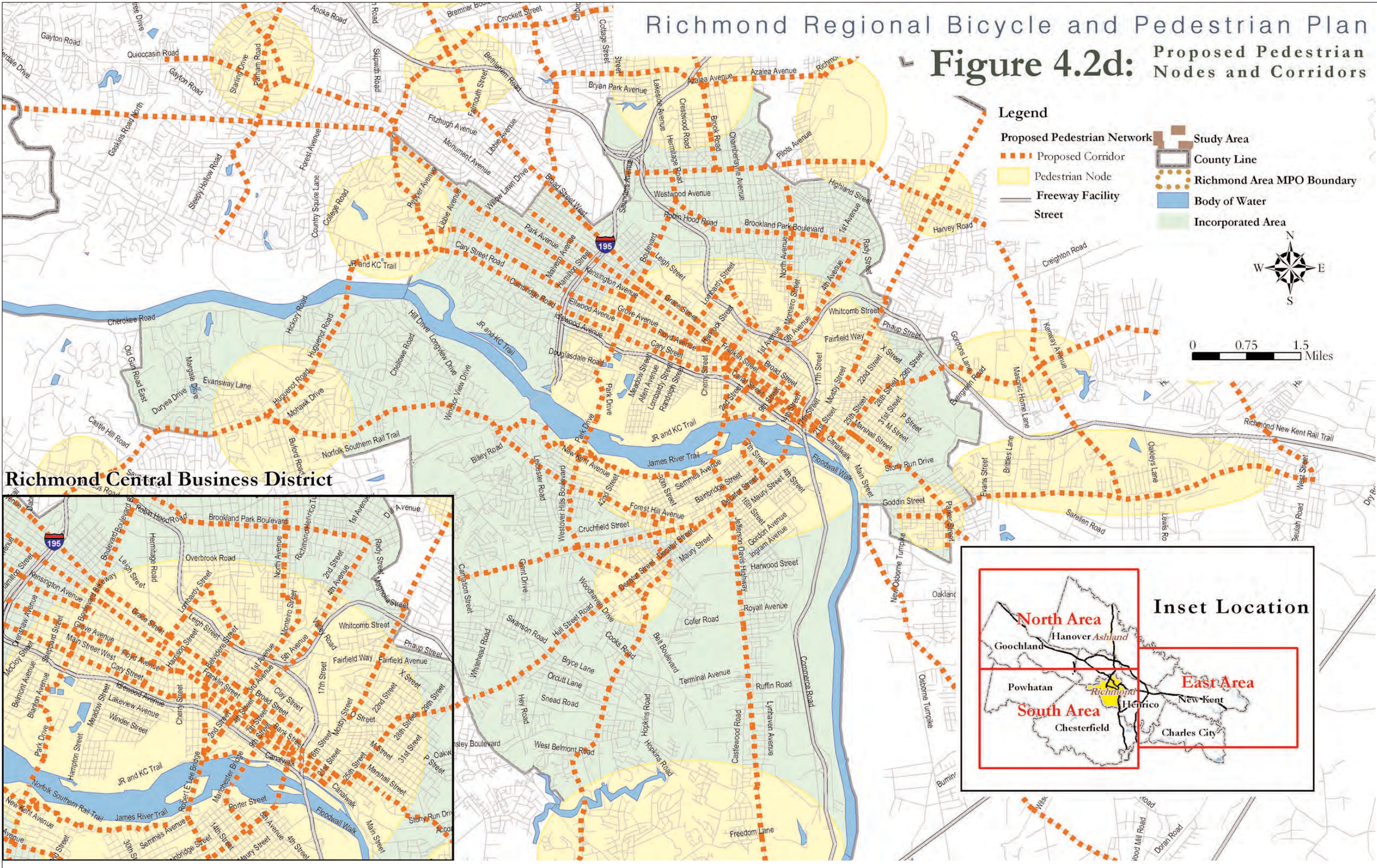
Richmond Regional Bicycle and Pedestrian Plan

Figure 4.2c: Proposed Pedestrian Nodes and Corridors



Richmond Regional Bicycle and Pedestrian Plan

Figure 4.2d: Proposed Pedestrian Nodes and Corridors



Chapter 4: Creating a Bicycle and Pedestrian Network for the Richmond Region - Recommendations



M1-8

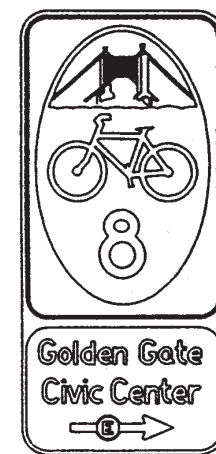
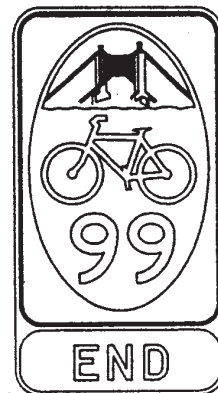


M1-9

Sample guide signs for bicycle facilities (source: 2003 MUTCD).

limits stipulated by the MUTCD) to make it “uniquely Richmond.”¹ The following images provide a simple example of the bike route signage system used in San

Francisco, California where the MUTCD bike route sign was



Typical bike route signs for San Francisco, California (based on MUTCD bicycle route signs).

customized with a unique logo.² The primary purpose for developing a bicycle route signage system and protocol is to highlight preferred routes and serve as a navigational aid that helps both commuting and recreational bicyclists find and stay on the best routes to their desired destinations. Furthermore, such a system alerts the motoring public to be additionally careful of bicyclists. A regional bicycle route signage system also serves a secondary purpose of indicating to both the bicycling and motoring public that the Richmond region is committed to developing a whole system of bicycle routes that connect important origins and destinations. It is noted that not every route that has been selected for the network will need to be signed as a regional bike route.

The first step in implementing a bicycle route signage system is to develop a set of criteria that can be used to determine what routes should be signed. The following criteria are recommended:

1. The route connects significant origins and destinations for which bicycle access is already desired, or for which significant latent demand exists.

2. The route has been upgraded with paved shoulders or designated bicycle facilities or offers a level of service “C” or higher. (Exceptions may be considered on a case-by-case basis for facilities that operate predominantly at level of service “C” or better with small portions falling below “C.”)
3. In areas where multiple routes may serve the same origins and destinations, the candidate signed route provides a higher level of service, avoids problem locations, has less hills, or otherwise is preferred over the other routes.
4. The route provides continuity between or connections to other bicycle facilities, such as bike lanes and shared use paths.
5. There is a need to guide bicyclists away from a particularly unsafe location and to a better through route that is within a reasonable distance.
6. The route extends along local neighborhood streets to an important destination that might be hard to locate without signs.
7. The route uses local streets and may have a series of turns where signing is the only way to ensure bicyclists can follow the preferred through route.

The second step is to develop a route signage package and set of protocols that guide sign production and installation. The following general protocols are recommended:

1. Develop an attractive Richmond region logo that can be used to customize the MUTCD green route signs in accordance with allowable MUTCD criteria.
2. Include destination and mileage information at regular intervals along the route.
3. Use arrows and confirmation signs when turns are required.
4. Use both pavement markings and roadside signs to ensure visibility and continuity.

5. Include signage where appropriate to slow traffic and to promote safety in areas of high bicycle traffic.
6. Include informational signs to alert riders of locations which provide food, rest room, air, and repair facilities.
7. Integrate with a comprehensive map product or series of maps.
8. Use “Share the Road” signs under the following conditions:
 - where bicyclists must share narrow travel lanes (less than 12 feet) with motorists
 - where bicycle safety is a concern for other reasons such as hills or curves that create poor sight distances, the route passes intersections that are difficult for bicyclists to negotiate, or has segments with very low BLOS
 - where the route is regularly used by bicyclists

“Share the Road” signs may be used on short segments (less than 1 mile) of a network route where such conditions exist, or over longer distances (1 to 10 miles) on popular routes where these conditions persist. They should also be used on short roadway segments where bike lanes or paved shoulders are discontinuous, to alert bicyclists and motorists of the change in conditions and need to share the travel lanes.

The region has some routes that could be signed with regional bicycle route signage in the near future, with little or no improvement necessary. These include existing bicycle facilities and routes such as Broad Rock Road, Robious Road, and Riverside Drive, and some inner city routes such as Grove Avenue, North Avenue, and others that offer BLOS “C” in their current conditions.

As they are developed, the bicycle touring routes identified in recommendation A-4 and Interstate Bicycle Routes 1 and 76, addressed in recommendation A-5, should be signed using this protocol. Once a critical mass of routes has been developed and signed and a regional map has

¹ The *Manual on Uniform Traffic Control Devices* (MUTCD) provides basic bike route color and symbol graphic, and a basic set of signs. It can be customized and enhanced in certain ways to tailor it to the needs of the Richmond region.

² Gubser, Adam, Manito Velasco, and Virginia Summerell. Implementing San Francisco’s Bicycle Route and Sign System.

been produced, outdoor information kiosks can be installed at major activity centers to publicize and inform the public about the network. Locations for such kiosks could include Belle Isle on the James River waterfront, downtown Richmond, local university and high school campuses, Ashland, and Pocahontas State Park.

Recommended Strategy A-4. Establish connected routes within the regional network for development as bicycle touring routes.

Recreational bicycling along the region’s scenic roads and streets is popular with local residents and visiting bicyclists. Protection and enhancement of the resources that support this activity is important both to ensure bicyclists’ safety and to realize potential economic benefits, as well as to promote health. **Figures 4.3 a, b, c, and d** show the location of 45 existing and potential routes that should be explored further as bicycle touring routes.

The factors considered in selecting these routes included the following:

- comments from local recreational bicyclists
- identification in local bicycle plans
- analyzing the needs of established and planned long distance routes through the region (Interstate Bicycle Routes 1 and 76, and the East Coast Greenway)
- input from the Study Advisory Committee
- existing trails
- future trail development opportunities
- providing access to popular scenic, historic, and natural resources
- bicycle level of service scores
- latent demand

Candidate routes were also selected with the special needs of recreational cycling in mind:

- accessible and logical ride starting points where parking and services may be found
- access to commercial services along the route
- ability to develop loops of varying lengths to serve a wide range of users and trip experiences

Candidate touring routes in urban, suburban, and rural areas have been identified, including key radial routes that connect the city with its rural surroundings. The current level of service grades vary on these candidate routes. Fifty-five percent are BLOS “C” or above; many of these segments are currently used by touring bicyclists. The remaining forty-five percent are BLOS “D” or lower but provide other values that are essential for a functional, effective, and marketable touring route system.

Before a particular route is designated (signed, mapped, and promoted) for recreational riding, it should receive further study, field review, and safety and accommodation upgrades as needed. Complete identification and analysis of scenic and historic resources and opportunities for parking, food, lodging, and bike service along these routes should be conducted and may result in route modifications or refinement. The regional agency or individual jurisdictions may consider setting a minimum acceptable bicycle level of service, such as BLOS “C,” before signing and promoting a touring route. Alternatively, in lieu of signing routes, maps may be made available to provide users with level of service and other helpful information to guide them.

Bicycle touring route development and marketing activities should include the following:

- route specific review and resource identification, cataloging, and mapping
- development of time, distance, and loop options
- completion of a maintenance and management plan

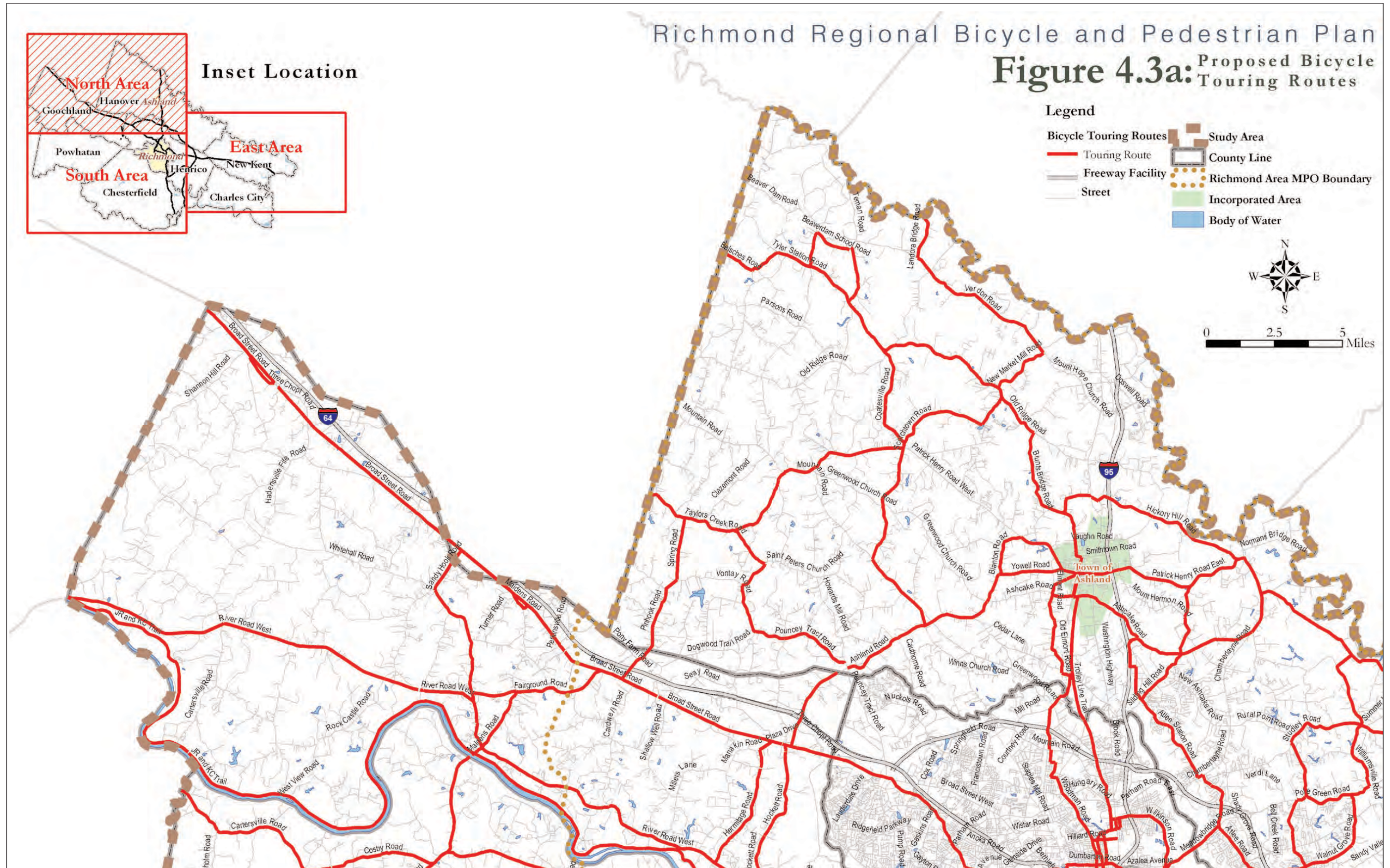
- changes to raise bicycle level of service, as appropriate, (likely requires facility improvement)
- route signs, including destination and mileage signs
- use of safety signage such as “Share the Road” signs
- brochure and map development, publication, and distribution
- web-based and other marketing efforts
- information signs/kiosks at key locations

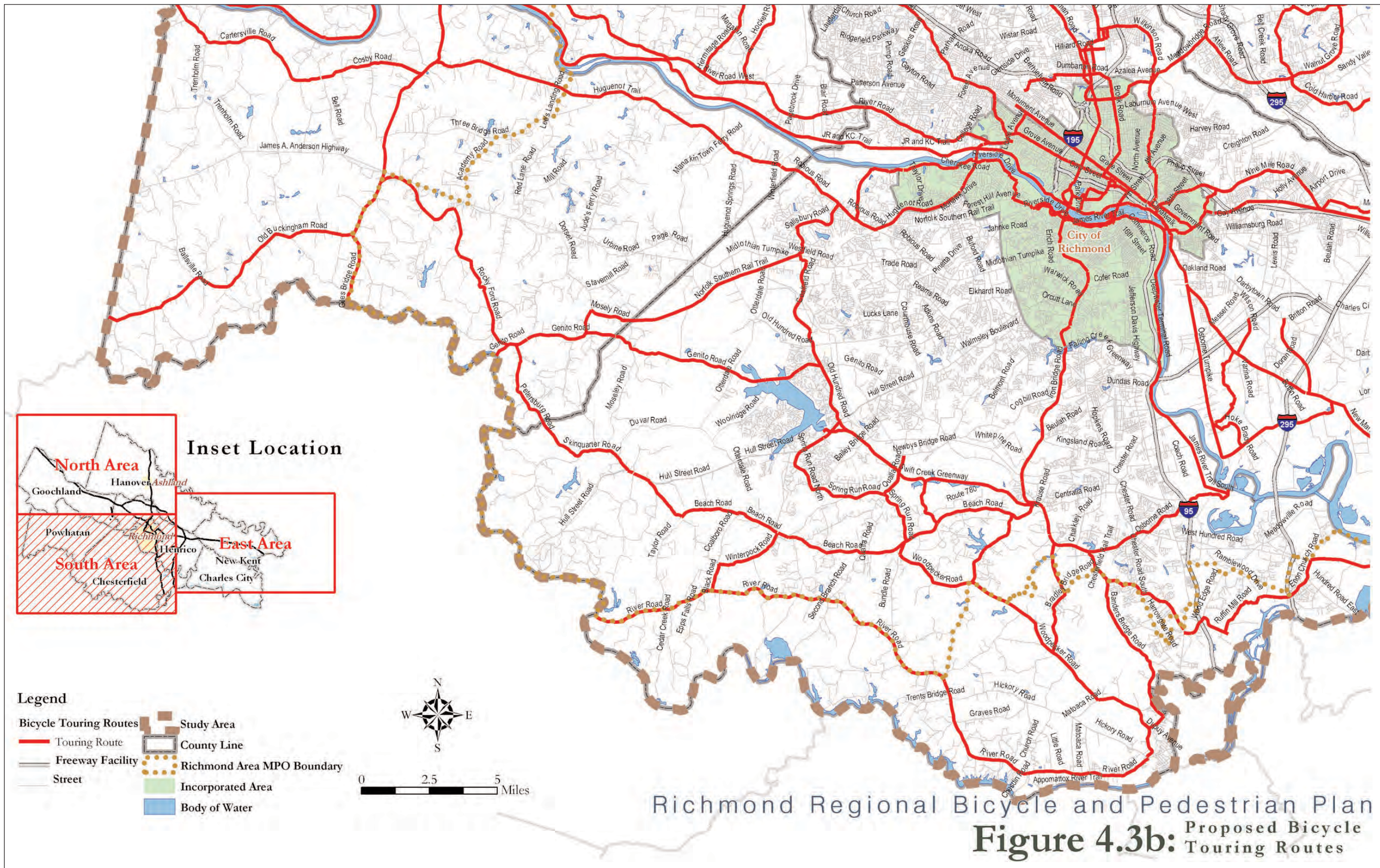
Recommended Strategy A-5. Continue and complete development of the planned Virginia Capital Trail.

The planned Virginia Capital Trail is a prominent bicycle and pedestrian improvement project in the region and enjoys strong support from the public as well as from the state and local governments. In 1999 VDOT completed a feasibility study (*Route 5 Capital to Capital Bikeway Feasibility Study*) which describes the bikeway facility types recommended to accomplish the project. These include:

- 6-foot paved shoulders from Richmond to Long Bridge Road in Henrico County
- a 10-foot shared use path from that point to Jamestown, accompanied by minor road widening (11-foot travel lanes with 2-foot paved shoulders)
- use of existing pavement on the Colonial Parkway from Jamestown to Williamsburg

This plan supports these recommendations and encourages a phased approach to facility development. Funds should be identified to ensure that portions of the facility are built by the Jamestown quadricentennial celebration in 2007. Development of major sections of the shoulder bikeway sections in Henrico County and implementation of the minor roadway widening in Henrico and Charles City County should be included in





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Figure 4.3c: Proposed Bicycle Touring Routes

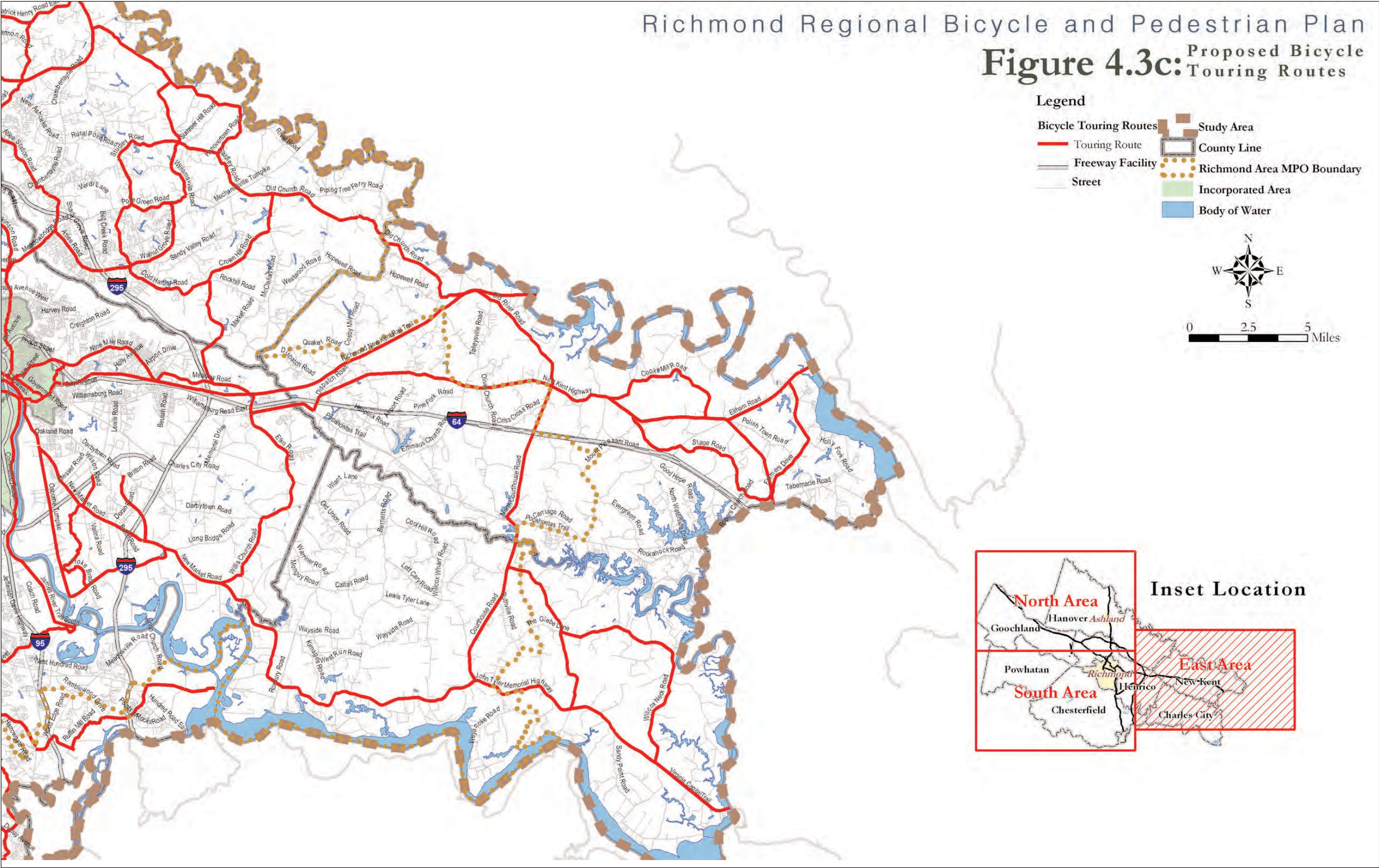


Figure 4.3d: Proposed Bicycle Touring Routes





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early phases of project implementation. In Charles City and Henrico counties, construction of the off-road shared use path should be included in later phases of project implementation. While available funding and cost may be a limiting factor, the length and location of phased improvements should be determined such that they result in logical and usable segments. Trailheads and parking should be made available, as well as access to popular visitation sites that are ready to receive bicycle tourists.

Recommended Strategy A-6. Integrate Interstate Bicycle Routes 1 and 76 within the region.

Two long distance bicycle routes pass through the region, Interstate Bicycle Routes 1 and 76. Both were created through a formal interstate bicycle route designation process managed by the American Association of State Highway and Transportation Officials (AASHTO). Conditions along these routes have changed significantly since they were first designated, and the existing roads used by the routes are often no longer the most direct or most bicycle-friendly. However, commercial/recreational routes which often coincide with portions of Interstate Bicycle Routes 1 and 76 are still marketed by national organizations and remain popular among bicycle tourists across the country. Local recreational and commuting cyclists also use portions of these routes.

Over the course of this plan, new route options have been identified through public comment and consultant review, and modifications to both routes should be made. Using information developed by this plan and previous statewide analysis of these routes, new alignments within this region should be developed and proposed to AASHTO for approval. With approval of the new alignments, new signs can be installed. Sign systems developed for these routes should utilize the development process and protocols

recommended in A-3 above and should follow AASHTO and MUTCD guidance.

Recommended Strategy A-7. Develop plans to upgrade, extend, and study existing and proposed shared-use paths that are identified to be part of the regional network.

The Richmond region has few hard surface shared use pathways and none of any length or having high volume of transportation use. There are a number of soft surface trails and pedestrian-oriented pathways that should be considered on a case by case basis for up-grading to full-service shared use trails due to their potential to contribute significantly to bicycle and pedestrian transportation. In certain areas, soft surface trails may provide a user experience which should be protected. Additionally, there are a number of potential off-road shared use path corridors that warrant further study for their possible role in providing linkages for regional bicycle and pedestrian transportation.

Upgrades and Extensions

The upgrading of existing trails is primarily a matter of developing consistent surface quality and widths; eliminating stair segments, gates, and other access barriers; and making minor extensions to logical connections. AASHTO¹ standards call for surfaces to be concrete, asphalt, or well built gravel and stone dust paths. The travel surface should be 10 feet wide, with 2-feet of clear space on each side. Installation of distance and destination signs, trail etiquette signs, and appropriate network route signage should also be implemented as a part of upgrade projects. Priority upgrade and extension projects include the following:

- James River Trail, from Forest Hill Park across Belle Island to Brown's Island (Richmond)
- Canal Walk and Brown's Island path, from Tredegar Street to Dock and Pear Streets (Richmond)

- flood wall walk, from Belle Island to Ancarrows Landing (Richmond)
- Byrd Park Trails (Richmond)
- Appomattox River Trail, from central Matoaca (Chesterfield County) to Virginia State University (located south of study area, in Petersburg)
- Falling Creek Greenway Trail, from the James River to Cogbill Road (Chesterfield County)
- Chester Linear Park, from Route 10 to Old Centralia Road (Chesterfield County)

(Note: With the completion of the James River Trail upgrades noted above and the addition of a new bridge across the James River at Ancarrows Landing or the institution of a bicycle and pedestrian ferry between Ancarrows Landing and Great Shiplock Park, the City of Richmond will have a premier waterfront trail system (James River Waterfront loop) with a complete loop and full access to destinations on each shoreline. This waterfront trail network would be similar to what has been successfully developed in Chattanooga, Tennessee; Portland, Oregon; Pittsburgh, Pennsylvania; and Burlington, Vermont.)

Trail Corridor Studies

Before new corridors can be implemented, feasibility studies and/or master plans should be conducted to determine land ownership, evaluate topographical and environmental conditions and development constraints, and to seek/receive input from the trail-using public. In addition, it is strongly recommended that partnering opportunities be pursued with land owners along potential trail corridors (i.e. railroads). As a part of this regional plan, a number of potential trail and greenway corridors were given an initial review, primarily from the point of view of available space, environmental constraints, and potential bicycle/pedestrian transportation value. The following regional corridors scored very high in the latent demand analysis and were determined to merit further formal study:

¹ Guide for the Development of Bicycle Facilities, American Association of State Highway and Transportation Officials, 1999.

- Trolley Line Trail/Boulevard Bikeway from Ashland to Byrd Park in Richmond
- a rail-with-trail or rail-trail conversion along all or portions of the Norfolk Southern (NS) railroad line from Shockoe Bottom to, and across, the Pamunkey River along the northern border of New Kent County
- a rail-with-trail along the Norfolk Southern railroad line, from Genito Road in Powhatan County to the intersection of Robious Road and Huguenot Road
- a rail-trail conversion along the same Norfolk Southern line mentioned above, from the Robious Road/Huguenot Road intersection to Forest Hill Park
- the Swift Creek Greenway Trail from the Chesterfield County Courthouse through Pocahontas State Park to the Brandermill community
- Providence Road Connector Trail from the east end of Providence Road in Chesterfield County, across Falling Creek, to Clarendon Park, Oak Lake Business Center, and Genito Road
- The James River Trail South, along the west shore of the James River from Ancarrows Landing in Richmond south to Commerce Road, the Richmond National Battlefield Park and Dutch Gap Conservation Area in Chesterfield County
- Chester Rail-Trail from Old Centralia Road south to the City of Colonial Heights
- Dorey Park/Four Mile Creek Trail through Henrico County parkland from Darbytown Road south to the Virginia Capital Trail on Route 5
- James River and Kanawha Canal Trail from the Richmond waterfront to Goochland County along the north shore of the James River

East Coast Greenway: The East Coast Greenway (ECG) is an emerging regional trail that is planned to connect

Maine to Florida using shared use pathways and bicycle-compatible roadways that link the major cities of the eastern seaboard. The project’s goal is to create a route that is at least 80 percent off-road. In Virginia, the proposed route is south from Washington, D.C. to Richmond, where two routes to North Carolina are possible: south along the I-95 or US Route 1 corridor, or southeast to Jamestown and the Hampton Roads region, then to the Outer Banks of North Carolina. The primary on-road routes being considered in Virginia include Route 1, Route 5, and Interstate Bike Route 1. Throughout the state, only a few off-road corridor opportunities have been identified. However, a number of these are in the Richmond region.

While a specific ECG route has not yet been identified through the Richmond region, the following proposed shared use pathways are strong candidates to serve as significant components of the route:

- the Trolley Line Trail/Boulevard Bikeway
- the existing Belle Island and James River trails
- the proposed James River Trail South (to connect with the Chester Rail-Trail)
- the Chester Rail-Trail

To facilitate future ECG route development in the region, an interim on-road route and future off-road route should be identified as a part of these routes.

Recommended Strategy A-8. Implement a series of demonstration projects in high impact areas within this network to feature a variety of bicycle and pedestrian facility types and emerging design treatments and to build support for plan implementation among elected officials, business leaders, and the public.

Development of 15 demonstration projects is recommended as a way to initiate implementation of this plan. **Appendix B.1** provides a list of proposed projects and locations. A minimum of one project is recommended for each jurisdiction, with additional projects offered in the study area’s more populous jurisdictions. A variety of these projects can be implemented at low cost, which may accelerate their ability to meet current needs while fostering support for future expanded services; others will require identification of funding sources and further project development activities. Many can be implemented as a part of improvement projects that are already programmed. Through changes in the project scope or modification of traditional approaches to roadway design, significant bicycle and pedestrian improvements can be accomplished within the current program as funding is available and project schedules allow. Before and after studies should be conducted to document results. Example facility types and treatments that should be demonstrated include, but are not limited to, the following:

Multimodal Improvements

- bicycle/pedestrian ferry
- streetscape improvement with bike lanes, sidewalks, and buffers

Bicycle Facilities

- paved shoulders
- bike lanes



Example of advanced stop bar bike box.



Example of bicycle/pedestrian ferry.



Example of bicycle rolling tray on public stairways.



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The eastbound approach to the Route 5 bridge over the Chickahominy River. This bridge connects Charles City County to James City County and is difficult for bicyclists to traverse because of its steel grid deck and lack of shoulders.

- re-stripe existing urban street to include bike lanes
- colored bike lanes through merge area
- advanced stop bar bike box
- bicycle rolling tray on public stairways

Intersection Crossing Measures

- countdown and audible pedestrian signals
- in-street “Yield to Pedestrian” signs
- high visibility crosswalk striping
- curb extensions
- pedestrian-friendly slip lanes
- reduced corner radii

Mid-block Crossing Measures

- in-pavement flashing crosswalk
- median refuge islands
- raised crosswalks

Criteria used to develop the list of demonstration projects included:

- geographic breadth
- a mix of low and medium cost projects
- a mix of basic and innovative facilities and treatments
- a mix of bicycle and pedestrian facilities
- projects that provide immediate benefits
- projects in prominent locations
- projects that build support with the public and elected officials

- applicable to projects in other locations throughout the region
- projects to be completed within a five-year timeframe

Recommended Strategy A-9. Provide bicycle and pedestrian access across major barriers by improving existing crossings and developing new crossings at key locations.

Waterways, such as the James River and Falling Creek, and highways, such as I-295, Route 288, and I-64, create major barriers for bicycle and pedestrian travel within the region. Roads and bridges that cross these barriers are typically spaced a mile or more apart. Because it is difficult and inconvenient for pedestrians to detour more than a quarter mile and bicyclists more than a half mile from a direct route, most network routes provide only one realistic crossing option for any single barrier. And in many cases, existing conditions make these crossing locations difficult and/or unsafe to use. Many of the bridges over waterways, for example, do not include adequate bicycle and pedestrian accommodations. In some cases, bicycle/pedestrian facilities may exist, but they are poorly maintained. Upgrades and improved maintenance practices are needed.

Other barrier examples include network crossings of major highways where large interchanges exist. Interchanges create potential conflicts for bicyclists and pedestrians who must cross paths with high speed motor vehicle traffic merging to and from ramps. To avoid this situation as much as possible, many of the roads that cross limited access highways at locations without interchanges have been assigned to the network. These crossing locations are more likely to be adequate as they exist today or to be easily upgraded at costs much lower than interchange retrofits. Unfortunately, the number and spacing of these crossings are not sufficient to provide for all network crossing needs. Over time, a number of interchanges will need to be retrofitted to provide

improved bicycle and pedestrian access and safety along the proposed network.

In addition to improving access through interchanges, and upgrading existing bridges over waterways, new locations where bicycle and pedestrian river crossings can be made need to be identified and studied in order to increase connectivity. Some new crossing locations are needed to connect areas that are completely isolated today; others are needed to meet future demand.

The treatments needed to improve crossing accommodations and conditions will vary greatly from site to site. In some cases, better maintenance, concrete “jersey” barriers, new access ramps, and walkway surfaces may be all that is needed. In others, new sidewalks, bike lanes, ramp crosswalks, and warning signs may be sufficient. At other locations, railing modifications, signal improvements, median passageways, grade separations, and innovative treatments will be needed.

Appendix B.2 lists a variety of locations where network crossings of regional barriers need to be improved or created. Four crossing location types are addressed:

- existing and future interchanges
- existing James River crossings
- other waterway and railroad crossings
- potential new river crossings

Each crossing location is assigned to a priority group—tier 1, 2, or 3.¹ The priority tiers represent projects of high (1), medium (2), and low (3) priorities.

Recommended Strategy A-10. Establish a regional bicycle parking equipment procurement and installation program.

As a whole, the Richmond region has a notable lack of secure bicycle parking. There is a need for short term

¹ Note: the existing VDOT process for selecting interchanges and bridges for rehabilitation or replacement may create improvement opportunities which should be considered, regardless of the priority ranking in this plan.

parking (racks) on public streets in downtown Richmond and in other commercial and shopping districts. Some VDOT park and ride lots provide bike racks; however, most major employment centers or parking garages do not offer bicycle lockers or other secure long term storage accommodations. There is also a need to provide sheltered long term storage, such as covered, unreserved bike racks, for bicyclists who do not ride to a destination frequently enough to justify reservation or rental of a locker.

To make provision of bicycle parking efficient and cost effective, one entity should be selected to create and manage a bicycle parking procurement and installation program for the entire region. This could be RideFinders, GRTC Transit System (GRTC), or the transportation and public works office of one of the jurisdictions. If an agency without public works forces and equipment manages the program, installation may need to be handled through private contractors.

The key to a successful bicycle parking program is to establish a single and easily accessible lead entity for the many public agencies, businesses, schools, and bicyclists to contact when they have identified a need to acquire and install bicycle parking or get bicycle parking acquisition guidance. The guidebook *Bicycle Parking Guidelines* (2002), published by the Association of Bicycle and Pedestrian Professionals, should be used to ensure that quality equipment is selected, siting and installation is done properly, and the proper equipment types and quantities are provided to meet the particular parking needs that are identified.

Recommended Strategy A-11. Fully integrate bicycle and pedestrian accommodations into existing bus transit services, park and ride lots, and transportation demand management programs.

Currently, GRTC’s buses are the primary mode of public transit available in the region. Park and ride lots, carpools, vanpools, and Amtrak are the other primary public transportation services. Better integration of bicycling with public transit services is already underway. However, more can be done. The following list of recommendations provides guidance for future multimodal improvements:

- continue planned implementation of bike rack installation on all GRTC buses and market these services concurrently with making them operational
- select a pilot set of GRTC bus routes for a pedestrian access study and inventory of pedestrian accommodations within one block of the route; develop improvement plans and implement improvements such as filling small gaps in the sidewalk system, improving crossings, upgrading streetscape amenities, adding curb ramps, or installing bus shelters
- provide long-term bicycle parking racks and lockers at urban and suburban park and ride lots and market these services
- provide bicycle racks for carpools and vanpools (through RideFinders) to serve riders who can bicycle to their rendezvous point and wish to take their bicycle with them to work
- provide long-term bicycle parking racks and lockers at the three intercity passenger rail stations (Amtrak) in the region: Ashland, Henrico-Staples Mill, and Main Street Station in Richmond; and market these services

- study the potential for providing a full service bicycle station at the newly opened Main Street Station that would include bicycle commuter facilities like bicycle storage, showers, clothing lockers, and other services such as a bicycle repair shop, bicycle rentals, bicycle route information, and food

Recommended Strategy A-12. Coordinate maintenance activities for bicycle and pedestrian facilities to ensure a safe and high quality experience for every user of the roadway.

In the Richmond region, the lead agency responsible for road maintenance will vary by jurisdiction. In Charles City, Chesterfield, Goochland, Hanover, New Kent, and Powhatan Counties, VDOT is responsible for road maintenance of those roads which have been accepted into its system. In the Town of Ashland, Henrico County, and City of Richmond, the local jurisdiction shares maintenance of public roads with VDOT. Trails are typically owned and managed by local park agencies.

Recommended maintenance practices include:

1. Sweeping bicycle lanes and shoulders, and bridge sidewalks regularly to remove debris, especially after major storm events.
2. Completing roadway surface, roadway edge, and sidewalk repairs to ensure a continuous and accessible facility.
3. Carefully repairing utility cuts to prevent rough surfaces for bicyclists and sidewalk interruptions for pedestrians in accordance with the VDOT *Land Use Permit Manual*. For pavement, the same standards of repair and maintenance for motor vehicles should be used to ensure equitability for bicyclists and pedestrians.



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4. Vegetation trimming, including overhanging limbs and foliage, adjacent turf grass, and intrusive tree roots, to prevent encroachment and maintain facility safety and access.
5. Maintaining bicycle and pedestrian signs, striping, and markings, and replacing signs that are damaged by vehicle crashes and other incidents.
6. Maintaining drainage facilities including catch basins and drainage grates.

In addition to regular maintenance, it is important that bicycle and pedestrian access be safely and adequately maintained during road and development construction activities. It is routine that road and landside construction plans include details in accordance with the *Virginia Work Area Protection Manual* describing how motor vehicle access will be maintained using signs, detours, and other measures, and if closures are necessary, how they will be publicized and timed to minimize negative impacts to traffic flow. The same care should be taken with regard to accommodating bicycle and pedestrian traffic on regional network and other bicycle and pedestrian routes during construction activities.

Policy Recommendations

The following actions are recommended to ensure that future land use regulations, transportation planning activities, and roadway design policy supports and enables implementation of this plan.

Recommended Strategy B-1. Encourage the use of context sensitive roadway design that facilitates adequate accommodation of bicyclists and pedestrians in the design of all roads in each jurisdiction.

Within the Richmond region, all roads where bicycling and walking is allowed should be designed to safely accommodate bicyclists and pedestrians. New residential streets should include sidewalks, with the exception of cul-de-sacs or streets with extremely low AADT volumes, each of which should be evaluated by the locality on a case-by-case basis. Where cul-de sacs or other dead-end streets are constructed, consideration should be given to provide a connection for bicycles and pedestrians to access roadways beyond the end of such streets. Collector and arterial roads should include appropriate bicycle and pedestrian accommodations when newly built or when other road improvements are undertaken. Jurisdictions within the region are encouraged to consider adopting bicycle- and pedestrian-level of service targets or other facility selection standards, to guide bicycle and pedestrian facility selection and roadway design for new and upgraded roads.

Recommended Strategy B-2. Adopt bicycle facility selection considerations.

The BLOS model should be used to guide the planning and selection of road improvements along network routes. Additionally, the following general considerations, which are organized by basic road type, could be applied:

1. Open-graded shoulder section roads (referred to in this plan as *open-section* roads), with current and/or projected annual average daily traffic (AADT) volumes of less than 3,000 vehicles:
 - a. A 3- to 4-foot paved shoulder is recommended, depending on available right of way, and vehicle speeds.

- b. Paved shoulders of four feet or greater can be designated, signed, and striped as shoulder bike lanes at VDOT and local government discretion.
 - c. In general, any amount of striped and paved shoulder is better than none. However, if only 1- to 2.5-foot shoulder widths can be achieved, it is recommended that “Share the Road” signs be considered.
2. Open-section roads, with current and/or projected AADT volumes of 3,000 to 20,000 vehicles:
 - a. A 4- to 6-foot shoulder is recommended, depending on available right of way, overall traffic volume, truck volumes, and vehicle speeds.
 - b. Shoulders of 5 feet or greater can be designated, signed, and striped as a shoulder bike lane at VDOT and local government discretion.
 - c. In general, any amount of striped and paved shoulder is better than none. However, on roads of three or more lanes, with speed limits of 35 mph or less, in urban and suburban settings, if only 1- to 2.5-foot shoulder widths can be achieved, it is recommended that the outside lane width be maximized for a shared use facility, edge striping be placed one foot from the edge of pavement, and “Share the Road” signs be considered.
3. Open-section roads with current and/or projected AADT volumes of more than 20,000 vehicles:
 - a. 8-foot shoulders are recommended.
 - b. Shoulders of 6 feet or greater can be designated, signed, and striped as shoulder bike lanes at VDOT and local government discretion.
 - c. An adjacent shared use path may need to be considered (see next section).
4. In certain situations, on open-section roads with current and/or projected AADT volumes of 20,000 or

<p>greater, provision of an 8-foot shoulder may not improve BLOS above “D.” High vehicle speeds, high percentages of trucks in the traffic mix, and large AADT volumes can create situations that are difficult to make comfortable for bicyclists. Additionally, there may be situations where shoulders wider than 6 feet are undesirable for other reasons, including their potential to increase traffic speeds, to be used as passing lanes, or to create a roadway footprint with more environmental impacts or that is out of character with the surroundings. In these situations, a shared use path on one or both sides of the roadway should be considered.</p> <p>5. Closed-section roads (roads with curb and gutter):</p> <p>a. Road planners and designers should provide minimum width bike lanes—at least 5-feet-wide (including a one foot gutter pan) or at least 6-feet-wide (including a 1.5- or 2-foot gutter pan); minimum of 5-feet-wide adjacent to parking lane.</p> <p>b. Closed-section roads where physical and right-of-way constraints may not permit bicycle lanes:</p> <p>i. Where appropriate, consider narrower travel lanes to enable space to be made available for designated bicycle accommodations or wider shoulder widths. Paved shoulders of three or more feet provide additional comfort and safety for bicyclists.</p> <p>ii. If 3-foot paved shoulder widths cannot be achieved, it is recommended that the outside lane width be maximized for a shared use facility, edge striping be placed one foot from the edge of pavement, and “Share the Road” signs considered.</p> <p>6. For each road type described above, it is important to note that right-of-way used for paved shoulders or bike lanes should be deducted from the amount of unpaved shoulder required in the design of a roadway project.</p>	<p>7. VDOT and local jurisdictions are encouraged to ensure that minimum or greater design standards are achieved for bicycle facilities included in the construction of new roadways on new right-of-way. It is understood that facilities included as a part of road reconstruction projects or provided as independent retrofit projects will be designed subject to right-of-way or other constraints that may not be surmountable.</p> <p>8. On bridges serving network roads, bicycle and pedestrian facilities and shoulders should be carried across the bridge at least at the same width they are provided on the roadway sections on either end of the bridge. Bridge cross-sections usually do not include buffers, and medians are sometimes reduced or eliminated. When bicycle and pedestrian travel space (shoulders and sidewalks or bike lanes and sidewalks) is combined on bridges, curb or barrier separation from traffic should be considered along with a minimum of 10 feet of combined travel width on each side of the physical separator.</p> <p>9. Signals should be evaluated for bicycle-friendly characteristics and upgraded. Vehicle actuated signals should provide the same response for bicyclists; signal cycles and phases should be timed to allow bicycle movements, and where bicyclists should use pedestrian crossing phases, pedestrian actuators should be positioned to be easily accessible to bicyclists.</p> <p>10. As bicycle facilities and accommodations are added to the network with road improvement and other capital development projects, care should be taken to provide bicyclists and motorists using the network with forewarning of the imminent termination of these facilities or improved conditions. User safety, confidence, and satisfaction are greatly enhanced when expectations are made clear by appropriately placed signs. Users should know where they have an opportunity to change course to avoid an unimproved area. When a route or stretch of route will receive</p>	<p>improvements over a period of years, as a multi-phased project is implemented, users shall also be made aware, earlier in their trip, rather than later, that the route will include segments of discontinuity or widely variable conditions until it is completed.</p> <p><i>Recommended Strategy B-3. Adopt pedestrian facility selection considerations.</i></p> <p>The PLOS model should be used to guide the planning and selection of road improvements along network routes. In general, facility design should achieve a PLOS of “C” or higher. In some situations, such as along rural roads where existing usage and future demand is low and environmental constraints may be significant, a “D” may be sufficient. In other situations, such as high-use urban and suburban areas, the PLOS design goal might be “A” or “B”. The following general guidelines apply:</p> <p>1. Sidewalks and buffers (i.e. landscape) should be provided along segments of the network in urban and suburban areas, and rural areas that are in transition to suburban development. In urban and suburban communities where conversion to curb and gutter is not feasible or desired, either of the following facilities should be provided:</p> <p>a. 6-foot asphalt or concrete pathways located outside drainage ditches</p> <p>b. paved shoulders of 6 feet or greater.</p> <p>In rural areas, pedestrian facilities should be provided along road segments where residential or commercial activities are clustered, and where zoning or expected future development suggests that increased pedestrian activity can be expected. If the provision of sidewalks and buffers is not feasible or desired, the two options above should be considered. Along rural roads, between settlements and clusters of existing and future development, paved shoulders will typically be adequate for the infrequent pedestrian.</p>
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2. In general, where sidewalks are provided, they should be a minimum of 5-feet-wide and provided on both sides of the road. Sidewalks should be wider in urban and high use areas.¹ Sidewalks should be kept horizontally and vertically level through driveways. Sidewalks can be provided on only one side of a road if adjacent land uses on one side and in the surrounding area are such that pedestrian activity would not be generated from, or drawn to, that side of the road. When pedestrian passage is provided on only one side, enhanced crossing opportunities should be provided at appropriate locations. In rural areas, where development tends to be clustered more on one side of the roads, sidewalks or sidepaths may be provided on that side, and a roadway shoulder provided on the other side.
3. A preferred buffer width should be a minimum of 3-feet-wide. Narrowing the center median can sometimes create space for buffers. Wide center medians are common on many major roads in the region. It is recommended that consideration be given to planting buffers with street trees in urban and suburban settings.
4. Wherever pedestrian facilities are provided, it is important to note that right-of-way used for buffers, sidewalks, pathways, or shared use sidepaths should be deducted from the amount of unpaved shoulder required in the design of a roadway project.
5. VDOT and local jurisdictions are encouraged to ensure that minimum or greater design standards are achieved for pedestrian facilities included in the construction of new roadways on new right-of-way. It is understood that facilities included as a part of road reconstruction projects or provided as independent retrofit projects will be designed subject to right-of-way or other constraints that may not be surmountable.

6. In all road improvement projects undertaken on network roads, intersection designers should seek to minimize corner radii, minimize crossing distances, and utilize pedestrian-friendly slip lane design. Designers will comply with all Americans with Disabilities Act (ADA) requirements.
7. On multi-lane divided roadways with medians, median refuges should be provided at intersections. In urbanized areas, at signalized intersections where existing or desired pedestrian demand is high, grade separated refuge islands should be provided, especially as a part of scheduled road improvements along the corridor. Pedestrian signals and pushbuttons located in median refuge areas should also be considered to further guide the safe crossing of pedestrians by serving as a supplement to pedestrian signals mounted in the corners of an intersection.
8. Existing and future signalized intersections in urban, suburban, and village settings should include pedestrian signal heads, pedestrian actuators, crosswalk markings and/or other pedestrian crossing safety treatments. High visibility marking patterns should be used in school zones, along walk-to-school routes, where shared use paths cross roads and in other locations where added visibility is needed. The length of green and walk phases should be adjusted to ensure all pedestrians will be able to clear the intersection within the time allotted.
9. As pedestrian facilities and accommodations are added to the network with road improvement and other capital development projects, care should be taken to provide pedestrians and motorists using the network with forewarning about the imminent termination of these facilities or improved conditions. This is especially important when the quality and level of service downgrades significantly. User safety, confidence, and satisfaction are greatly enhanced when expectations are made clear by appropriately placed

signs. Users should know where they have an opportunity to change course to avoid an unimproved area. When a route or stretch of route will receive improvements over a period of years, as a multi-phased project is implemented, users shall also be made aware, earlier in their trip rather than later, that the route will include segments of discontinuity or widely variable conditions until it is completed.

Recommended Strategy B-4. Encourage each jurisdiction within the region to make changes to land use and development policies to ensure that future development facilitates and encourages safe and increased levels of bicycle and pedestrian travel.

Land use and development regulation is a major factor influencing the potential activity levels for bicycling and walking. Higher levels of bicycling and walking for daily transportation result when development is designed at a human scale, land uses are mixed and sited in proper proximity, and bikeways and walkways are provided. Reforming zoning, land use, subdivision, and site planning policies are key pieces to realizing the ultimate potential for bicycling and walking in the region. These pieces are under the jurisdiction of local governments. This plan encourages each jurisdiction within the region to study its current regulations and consider making changes in these areas to local code and comprehensive plans. Of particular importance is the adoption of language which would minimize the potential for future land development activities to hinder the progress of implementing the proposed network components of the bicycle and pedestrian plan. Such a "do-no-harm" policy would be intended to prevent the addition - for example - of frontage improvements with curb, gutter, and drainage that fail to provide additional pavement width necessary for a future bike lane.

¹ Shared use sidepaths are not recommended for street or road segments in urbanized areas with frequent cross streets and/or driveway crossings.

Table 2.8 provides a summary of each jurisdiction’s status related to a range of land use regulatory topics that can contribute to increased levels of bicycling and walking.

Planning Recommendations

The following actions are recommended to ensure that sufficient regional and local organizational bodies are established and maintained in order to foster future planning and funding efforts for both regional and local bicycle and pedestrian network facilities.

Recommended Strategy C-1. Establish a permanent regional bicycle and pedestrian committee to provide oversight of plan implementation and enable on-going public involvement and interagency and inter-jurisdictional coordination on bicycle and pedestrian issues.

Communities that have been most successful making improvements for bicycling and walking have found that having an ongoing and active group of people committed to this task is essential. For a regional bicycle and pedestrian committee, it is important that state, regional, and local transportation agencies are represented. It is also critical that members of the public and representatives of public-interest organizations committed to bicycling and walking also be involved. Increasingly, communities are finding that representatives from public health, public safety, and park agencies are also useful. Representatives from special authorities charged with managing toll transportation facilities or urban revitalization initiatives can also be key. For the Richmond region, the study advisory committee, created to assist with development of this plan, provides a good starting point for an ongoing regional committee.

For a regional committee to be effective, it needs formal

sanction, a clear role in the regional transportation planning process, and discrete tasks around which its core agenda is organized. The following tasks should be considered:

- oversee plan implementation and assist with plan updates
- coordinate with the VDOT Richmond District office and its local residency offices on matters related to plan implementation, signing, maintenance of bicycle and pedestrian facilities, and facility design
- determine regional bicycle and pedestrian priorities and make funding recommendations to the Richmond Area Metropolitan Planning Organization
- be involved in the regional long range transportation planning (LRTP) process
- act as liaison between state and regional agencies and the local jurisdictions
- act as liaison between bicycle and pedestrian interest groups, the public, and various levels of government
- provide leadership for promotion, education, and enforcement campaigns
- provide support for regional air quality conformance planning related to the EPA’s new 8-hour ozone standard

Recommended Strategy C-2. Establish an ongoing bicycle and pedestrian program at the regional level to provide staff support for plan oversight and coordination, and to facilitate select implementation tasks

In addition to providing a committee focused on regional bicycle and pedestrian issues, the region will benefit from

providing staff support for bicycle and pedestrian activities. Given sufficient additional funding resources, staff could support the regional committee as well as coordinate the implementation of select tasks which can most effectively be carried out at the regional level. Establishing a bicycle and pedestrian program at the regional level will communicate an intention on the part of the region to ensure plan implementation. The most important task will be continuing ongoing coordination among the various jurisdictions and agencies involved in implementing this plan. Regular and centralized communication and information sharing is vital to ongoing success. This staff support could be provided through RRPDC or another agency, and can be funded from a variety of sources. Potential tasks include the following:

- staffing the regional bicycle and pedestrian committee
- facilitating regular communication and information sharing through an email list, list serve, web site, and/or newsletter
- maintaining communication with each jurisdiction and each VDOT residency regarding the status of plan implementation
- maintaining communication with and coordinating with bicycle and pedestrian committees/contacts in neighboring planning district commissions in order to foster inter-regional bicycle and pedestrian connectivity
- providing the bicycling and walking public with a point of contact for bicycle and pedestrian concerns and issues
- coordinating implementation of select promotion, education, or enforcement recommendations described in this plan
- managing plan updates
- managing updates to the data and GIS information developed as a part of this plan and ensuring access to it for local jurisdictions



Regional coordination may one day allow seamless travel for the bicycle commuter who begins on Ridge Road in Henrico...



...and crosses the Huguenot Bridge into the City of Richmond...



...before eventually entering Chesterfield County.



Chapter 4: Creating a Bicycle and Pedestrian Network for the Richmond Region - Recommendations

- managing implementation of selected recommendations in this plan, such as:
 - a. regional parking procurement and installation program
 - b. special small area or corridor studies
 - c. assistance to local jurisdictions with local bicycle and pedestrian planning initiatives
 - d. research on possible program initiatives that might be applicable in the Richmond region

Recommended Strategy C-3. Encourage the individual jurisdictions within the region to develop and/or regularly update local bicycle, pedestrian, and trail plans.

Bicycling and walking are highly localized transportation activities, and a significant share of bicycle and pedestrian trips take place on local and collector streets. For this reason, the ultimate impact of a regional bicycle and pedestrian plan depends on its integration with and support from local plans. Some jurisdictions within the Richmond region have already developed local plans. Each of the counties, cities, and towns within the region are encouraged to prepare local plans if they have not already done so or update plans that have not been updated in the past five years.

Recommended Strategy C-4. Identify federal, state, regional, and local funding mechanisms and sources to begin development of the regional bicycle and pedestrian network.

The establishment of a regional network will require a partnership among local jurisdictions, the MPO, and the state. Since the majority of programmed improvements outlined in the Six-Year Improvement Program are in

response to requests made by the MPO and local jurisdictions, it will be necessary to continue to advance high priority regional bicycle and pedestrian projects forward for MPO and CTB review and funding consideration.

A cost-effective way to begin implementation of this plan is to identify the roadway improvement projects already included in the Six-Year Improvement Program that are located on the network identified by this plan. Addition of bicycle and pedestrian components to these already planned and budgeted projects will ensure that the next program of highway construction will not result in any missed opportunities. It is noted that the addition of such components will be dependent upon such factors as project location, influence on delivery scheduling, and impact on project budget. An initial review conducted as a part of this planning process identified 83 VDOT planned projects on the regional network where bicycle and pedestrian facilities could be included if they are not already. A list of these projects is provided in **Appendix B.3.**

Having completed development of its *Policy for Integrating Bicycle and Pedestrian Accommodations*, VDOT is currently undergoing a review of more detailed procedures related to the planning, funding, design, construction, operation, and maintenance of bicycle and pedestrian accommodations.

VDOT, working with the Richmond Area Metropolitan Planning Organization, can help the local jurisdictions understand better how federal funding programs administered by the state can also be used for bicycle and pedestrian projects. These programs include:

- Surface Transportation Program
- Congestion Mitigation and Air Quality Improvement Program
- Hazard Elimination Safety Program
- Scenic Byways Program

Local governments should continue to develop bicycle, pedestrian, and trail project proposals for transportation enhancements funds (TE) and the recreational trails program (RTP) administered by VDOT and the Virginia Department of Conservation and Recreation (DCR), respectively.

Local jurisdictions should continue to provide matching funds for projects they advance for TE and RTP funding. Local jurisdictions should also consider pooling local funds on a pro rata share basis, in order to help support the regional activities identified in this plan, such as the bicycle parking initiative, ongoing regional planning activities, and promotion and education programs. Through cost sharing, the financial impacts of funding these relatively low cost activities can be further minimized.

Local jurisdictions may also consider local or a combined regional bond initiative to raise new funds specifically dedicated to development of the shared use path and bicycle touring initiatives in this plan. These programs have tremendous economic development potential for both the urban and rural jurisdictions in the region and have proven popular among voters when tried in other communities across the nation.

Recommended Strategy C-5. Undertake small area and corridor studies in key locations.

Additional study will be necessary in certain local areas and along select network corridors where multiple route options exist, where regional route selection should be combined with local route preferences, or where coordination with other local planning issues is needed. In each of these cases, factors that could not be fully investigated or known as a part of this planning process

were determined to be critical in ultimate regional route selection and development. In most cases, the network map included in this plan includes each of the multiple routes that should be studied.

These studies can be grouped as follows:

1. Compare the advantages and disadvantages of on-road and off-road routes in the same corridor to determine if one or more routes should be pursued.
 - a. Ashland to Richmond Corridor: Trolley Line Trail/Boulevard Bikeway and various parallel on-road routes
 - b. James River Corridor West: JRK Canal Trail, Route 6/Patterson Avenue, and River Road routes
2. Compare the advantages and disadvantages of two or more parallel on-road routes that largely serve the same trip origins and destinations.
 - a. Route 60 east Corridor: Williamsburg Road and various parallel side routes
 - b. Route 60 in Powhatan: J. Anderson Highway and parallel side roads
 - c. Route in the inner Fan: Floyd Avenue and Grove Avenue
 - d. Pemberton Road and Gaskins Road between Hungary and Quioccasin Roads in Henrico County
3. Determine what bicycle and pedestrian facility types are feasible and/or most appropriate in various sections of a particular corridor.
 - a. Route 60 west of Richmond: Midlothian Turnpike in Chesterfield County
 - b. Route 360 west of Richmond: Hull Street Road
 - c. Route 360 east of Richmond: Mechanicsville Turnpike

- d. Route 301 north of Richmond: Chamberlayne Avenue
 - e. Route 1 south of Richmond: J. Davis Highway
 - f. Chippenham Parkway/Parham Road: Forest Hill Avenue to Patterson Avenue, including the Willey Bridge
4. Study local connectivity issues that will contribute to resolving regional route issues.
 - a. Virginia Center Commons/Kings Charter area
 - b. Villa Park/Ginter Botanical Gardens/Bryan Park area
 - c. West Creek Corporate Center
 - d. Downtown Richmond and Main Street Station areas

Recommended Strategy C-6. Ensure that all planning studies for new transit systems and TDM services fully consider bicycle and pedestrian integration issues and opportunities

According to the *Richmond Area MPO 2023 Long-Range Transportation Plan* and other sources, studies have already begun looking at a variety of new transit systems and technologies to meet Richmond’s future transit needs, including streetcars, light rail, commuter rail, and high speed intercity rail. As various agencies and jurisdictions conduct additional transit studies, they should ensure issues and opportunities related to bicycle and pedestrian access to and integration with these services are fully addressed, including the aspects listed below:

1. New transit systems often include opportunities to create new transportation rights-of-way, or significantly expand existing ones. Even if it is only for a short segment in a city, new transit corridors should be considered for inclusion of parallel shared-use paths. New transit projects can result in making a bicycle and pedestrian connection that is crucial, but would never

be made without being part of a much larger infrastructure project. Moreover, parallel paths act as linear collectors on each side of a transit way, and should be strongly considered as a means of increasing bicycle and pedestrian access to station stops and ensuring high transit ridership.

2. In a similar way, bicycle and pedestrian crossings of the transit way should be considered in early planning efforts. Some transit technologies can result in the closure of corridor crossings previously open to bicyclists and pedestrians. Conversely, new transit systems can also open up opportunities for new barrier crossings that serve the non-motorized modes. For example, a bridge across a major river being built as a part of a large transit infrastructure project could be retrofitted to provide bicycle and pedestrian access as well, while a bicycle and pedestrian only bridge may be too costly to consider as a stand alone project and would not be considered without being part of the larger transit investment. Coordination with the bicycle and pedestrian plan is important to avoid loss of critical points of bicycle and pedestrian access and connectivity.
3. New non-motorized transportation technologies and service concepts are continually emerging. Future transit studies should address those technologies and services that can increase the convenience and efficiency of multimodal connections and opportunities for multimodal trips. These include new designs for bicycle parking/storage equipment and on-vehicle bicycle transport equipment; development of multi-service bicycle stations, innovation in transit station design, and real-time transit user information systems. Moreover, planning should address the wide variety of non-motorized users and trip types that can be served with these technologies, not just the regular bicycle commuter.



Chapter 4: Creating a Bicycle and Pedestrian Network for the Richmond Region - Recommendations

4. Future planning efforts should also consider the implications of new and emerging transport equipment, such as electric scooters and bicycles, personal mobility assistive devices (i.e. Segway[™]), push scooters, folding bicycles, and in-line skates.

Program Recommendations

Recommended Strategy D-1. Develop and implement on-going encouragement programs to promote increased bicycling and walking for transportation purposes, including commuting and other utilitarian trips.

The following actions are recommended to ensure that programs are initiated and carried out in order to directly encourage and educate citizens of the region toward more and safer bicycle and pedestrian activity.

Building upon current advertising and promotional activities already undertaken by RideFinders, additional promotional events and campaigns should be developed and funded. Richmond has five primary bicycling and walking markets with latent demand that can be targeted. Promotion strategies should be designed for each of these constituencies:

- low income residents who bicycle and walk more out of necessity than by choice
- advanced recreational bicyclists and enthusiasts
- student and family bicyclists (children, youth, and novice adults) who want to bicycle for recreational and short utilitarian trips such as to school, the video store, or local parks
- bicycle and pedestrian commuters

- exercise walkers, in-line skaters, joggers, and runners

A wide variety of promotional strategies have proven effective in other communities. The Richmond area should draw from their experiences. The following strategies should be considered:

- implement general advertising, such as television, radio and newspaper (RideFinders is already running some television ads)
- organize and promote a mass ride or walk for the whole region
- organize local or neighborhood bicycle or pedestrian events—purposes can vary from local bicycle tours that may promote inner-regional tourism and local economic development to neighborhood pedestrian safety events that focus on promoting street smarts and safe driving habits
- continue to organize existing grassroots participation in annual events such as National Bike Month, Bike to Work Week, or International Walk to School Day and promote organization of new events to promote bicycling and walking
- establish a bike commuter assistance program
- Work with local businesses and employers to develop consumer and employee incentive programs. In Northern Virginia, for example, Arlington Transportation Partners assists Arlington County employers in establishing and administering biking and walking programs to encourage increased biking and walking to work.
- organize special accommodations for biking or walking to select cultural events or popular venues
- host a stage event for a regionally or nationally recognized bicycle race (similar to the former Tour DuPont) in order to help catalyze implementation of strategies listed above

- Work with local high schools' drivers education/health curriculum to emphasize the "Share the Road" ethic and the environmental and health values of choosing alternative transportation. Provide up-to-date bike/ped maps to students enrolled in this curriculum.

Recommended Strategy D-2. Include target-audience, safety, and use-promotion activities with the completion of each demonstration project and opening of a major new bicycle, pedestrian, or shared-use path facility.

Until bicycling and walking accommodations are more widespread and general conditions begin to improve, facility-specific marketing and advertising will be the most effective approach to promoting increased levels of bicycling and walking. As each new demonstration project and other major new bicycle and pedestrian facility or road improvement is implemented, it is critical that the potential users are aware of the improvement or new facility and understand what origins and destinations now have better bicycling and/or walking connections. The following actions could be undertaken in conjunction with each bicycle/pedestrian improvement project and the opening of each new facility:

1. Erect signs at the project site that include the name of bicycle and pedestrian accommodations included in the project, source of public and/or private funding for these accommodations, and acknowledgement that this project flows from the regional bicycle and pedestrian plan and contributes to the regional network.
2. Distribute announcements to local civic/homeowner/tenant associations, neighborhood organizations, business associations, elected officials, and others in the facility service area.
3. Distribute press releases to regional, local, and neighborhood media outlets, as well as print and web-based media that serve bicycling, walking, and running enthusiasts.

- 4. Hold a ribbon-cutting event with local officials, neighborhood representatives, and regional bicycle and pedestrian advocates.
- 5. Use outreach tools (such as a website or newsletter) that explain the project, as well as use maps and text to illustrate and enumerate the new trip origins and destinations served by the new facility.

Recommended Strategy D-3. Develop and implement targeted safety education and enforcement programs.

Safety education programs need to be targeted to specific audiences and specific road user problems and combined with enforcement activities that are coordinated with the appropriate law enforcement agencies.

The primary bicycle safety issue identified by this study is motor vehicle operators’ general lack of respect for bicyclists as legitimate users of the roadways. There is a need to educate motorists regarding safe driving behavior related to bicyclists and that bicyclists have a legal and legitimate right to the road. Bicyclists also need to be educated about safe and legal bicycling habits and “share the road” ethics.

A second need is to educate pedestrians, bicyclists, and drivers regarding pedestrian safety. Safe crossing behavior, pedestrian right-of-way, motorist yielding, nighttime visibility, and speeding are topics that should be addressed. This campaign should be targeted to neighborhoods and communities with the largest pedestrian volumes, areas with the highest pedestrian crash rates, and demographic groups that rely more heavily on bicycling, walking, and public transit for transportation. There will be a need to conduct this campaign in at least one language other than English and ensure that intercultural communication issues are fully understood when planning messages, translating text, and selecting media formats and venues.

Combining education with well-publicized and focused enforcement operations has proven effective in other communities and should be considered as an approach when planning and implementing the initiatives above.

Recommended Strategy D-4. Adopt, pilot and begin phased-implementation of a bicycle and pedestrian safety education curriculum targeted to elementary school students.

Although current standards of learning (SOEs) in Virginia incorporate some exposure to cycling and pedestrian safety, a more targeted, focused curriculum should be developed for the Richmond region, particularly given VDOT’s new balanced policy toward integrating bicycle and pedestrian facilities with roadway design. A bicycle and pedestrian safety education curriculum (K-5) has recently been developed and successfully field-tested by the state of Maryland in four elementary schools in Rockville. It was developed using the best elements of a variety of state and local programs throughout the nation. This program is currently being reviewed in Richmond as part of a Virginia bike education curriculum development project. This curriculum should be customized for Virginia and piloted in selected schools in the Richmond region. Upon approval by the appropriate state and local authorities, it can be offered to elementary schools or phased into their curriculums throughout the region.

It is noted that the City of Charlottesville and Arlington County (both in Virginia) have each implemented Safe Routes to School programs in their jurisdictions. It is recommended that a pilot Safe Routes to School project be started in elementary schools in the Richmond area either as a stand-alone project or in conjunction with the development of the Virginia bike education program.

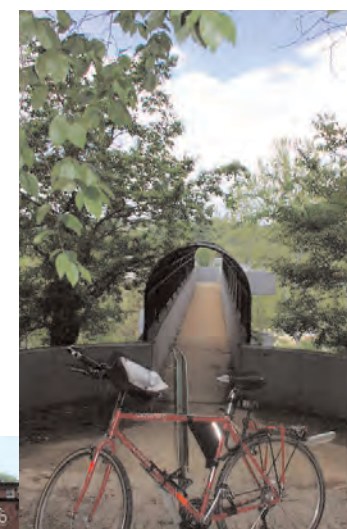
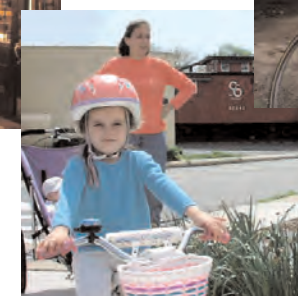
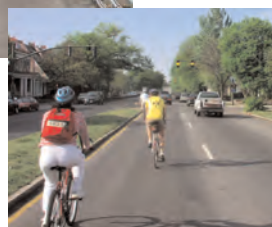
Recommended Strategy D-5. Develop and implement a bicycle licensing program.

To further promote safety and to deter theft, the implementation of a regional bicycle licensing program should be considered. A bicycle license tag could be permanently affixed to the bike(s) of registered bicyclists.

The primary goal of this program is to improve safety for bicyclists, particularly children, who may be unresponsive after an accident and are not able to be quickly identified. A bicycle license tag may enable rescue personnel to more quickly determine an accident victim’s identity, leading to improved decision-making for emergency medical treatment.

A secondary goal of a bicycle licensing program is to deter bicycle theft and to increase the opportunity for stolen bicycles to be returned to their proper owners.

SEPTEMBER
2004



Chapter 5: Implementation

Sample Before/After Sidewalk Improvement



Before (Unimproved)



After (without landscaping)



After (with landscaping)

Background

In the Richmond region, bicycle and pedestrian strategies are included in the planning process within the context of other travel demand management (TDM) strategies. In the 2023 *Long-Range Transportation Plan*, adopted March 2001, there is one recommendation related to bicycle and pedestrian transportation that states:

“Upon completion, carefully review and consider partial or full adoption of the VDOT-funded Regional Bicycle and Pedestrian Plan.”¹

Later in the TDM section (Chapter XII) of the report, local governments in the Richmond region are encouraged to “consider how they want to improve linkages of these (bicycle and pedestrian) facilities, improve safety, and make the decision to increase road construction costs to accommodate bicycle and pedestrian facilities.”²

VDOT Policy for Integrating Bicycle and Pedestrian Accommodations

VDOT's new *Policy for Integrating Bicycle and Pedestrian Accommodations* provides for the equitable consideration of bicycle and pedestrian accommodations for all new highway construction projects. In addition, this policy addresses methods for planning and funding independent construction projects (separate from VDOT's highway construction program) that include bicycle and pedestrian treatments. The policy also opens the door for the use of limited access facility right-of-way for parallel bicycle and pedestrian facilities (provided physical separation is maintained) while protecting against the creation of new barriers at limited-access facilities by mandating that crossing of such facilities "must be provided to establish or maintain connectivity of bicycle and pedestrian accommodations." The policy goes on to discuss VDOT's leadership role in promoting the incorporation of bicycle and pedestrian accommodations in transportation planning projects at local and regional levels.

In summary, VDOT's *Policy for Integrating Bicycle and Pedestrian Accommodations* serves as a paradigm shift in the way the inclusion of bicycle and pedestrian accommodations is approached in Virginia. This change should provide unprecedented momentum for the development of bicycle and pedestrian facilities within the Richmond region as well as across the state.

Virginia Capital Trail - A Signature Project

To date, considerable efforts have been made to implement the Richmond region's signature bicycle/pedestrian project, the Virginia Capital Trail, that will link the outskirts of downtown Richmond with the Varina district of Henrico County, and then roughly follow the north side of the James River as it courses its way through Charles City County. The Virginia Capital Trail will traverse past Jamestown and end in historic Williamsburg, linking the two former capitals of colonial Virginia with the present capital. Extensive citizen and stakeholder outreach, planning, engineering, and design efforts have led to the current need for additional funds to build the project. It is the intent of the *Richmond Regional Bicycle and Pedestrian Plan* to aid in all efforts to complete this signature project.

Demonstration Projects

Beyond the Virginia Capital Trail, there are other projects that are of great interest to the region because of the promise to demonstrate new ideas to solve old problems in bicycle and pedestrian transportation. These new ideas are labeled “demonstration projects” and are listed in **Appendix B.1**. The list of projects addresses problems relating to crossing barriers, retrofitting places that are designed primarily for vehicular traffic to be pedestrian- and bicycle-friendly, and a myriad of other issues.

Funding

There are various means through which bicycle and pedestrian strategies can be implemented, including:

- highway construction funds
- Transportation Enhancement Program

- Congestion Mitigation and Air Quality (CMAQ) funds
- Recreational Access Program
- Hazard Elimination Safety Program
- Revenue Sharing Program
- Scenic Byways Program
- Public Lands Highways Program
- Transportation and Community System Preservation Program
- State Aid Transit Grants
- Virginia Recreational Trails Fund Program (RTP)
- 402 Highway Safety Program

Additional information for the programs listed above can be found on VDOT's web site (www.virginiadot.org).

Other funding opportunities include:

- small grants
- gifts from local businesses
- donations, from churches, community groups, etc.
- cost-sharing with other agencies and volunteer groups

Lastly, it is noted that the Richmond-Petersburg Area's non-attainment status for the EPA's new 8-hour ozone standard may make available additional funding opportunities for alternative transportation modes such as bicycling and walking.

Planning Process and Plan Updates

The Transportation Improvement Program (TIP) documents decisions by the MPO, state/regional agencies, and local governments for funding transportation projects and programs using state and federal monies. The planning process coordinates the strategic recommendations of this plan into the transportation

¹ p. 177

² p. 179

plan. The planning process also leads to decisions on which projects are programmed for implementation.

This plan supports long-term transportation goals established by the planning process and provides guidance on how these goals can be achieved through strategies to build bicycle and pedestrian facilities. As a result, this plan will provide long-term benefits to the planning process through project implementation. The plan update process will operate on a three-year cycle, consistent with the long-range transportation planning process.

State and Local Partnership Approach

As demonstrated through this study, a partnership approach involving not only state and local governments, but also all of the interested agencies and organizations who participate in this study is needed to maintain the cooperative approach to implementing the study recommendations. A few of the roles are listed below:

- VDOT has an important role to provide expertise in securing funding for bicycle and pedestrian projects, along with an intrinsic role in providing leadership and vision to connect this region with neighboring regions and ultimately the entire state of Virginia.
- As the core of the region and home to most of the universities and many social, recreational, cultural and employment destinations, the City of Richmond has a role to push for even better access and to advocate strongly for bicycle and pedestrian-friendly facilities at all gateways linking the city with its neighbors.
- As home to a large percentage of the region’s population, the counties of Chesterfield, Hanover, and Henrico have a role in starting or expanding programs to link their citizens from neighborhood to parks, schools, shops, community centers, recreation centers, office buildings, and historic sites.
- As immediate neighbors of the City of Richmond, the counties of Chesterfield and Henrico have a role in

providing safer and more convenient bicycle routes for residents of other Virginia communities to travel to and from on their way to Richmond.

- As a destination in its own right, Ashland has a role in accelerating the pace of its program to truly serve as a demonstration site for the well-designed, small-town, walkable environment that is within its grasp.
- As a destination for organized rides by groups of advanced bicyclists, the rural counties of Charles City, Goochland, New Kent, and Powhatan have a role in convincing the public and elected officials of the value of transportation improvements that enhance the safety of not only bicyclists, but also pedestrians. Such improvements would also enhance the safety of motorists and create economic returns for the counties.

Partnership Activities

The following are activities the above mentioned partners can pursue to support the recommendations in the *Richmond Regional Bicycle and Pedestrian Plan*.

1. In 2004, present the *Richmond Regional Bicycle and Pedestrian Plan* to and recommend it for adoption by the Richmond Area Metropolitan Planning Organization.
2. Present and recommend to local governing boards and councils acceptance of the *Richmond Regional Bicycle and Pedestrian Plan* and the use of it as a guide in making decisions that will lead to improved safety, convenience, and connectivity for citizens who choose to walk or bicycle. Compatible connections between jurisdictions will be a cornerstone of the regional plan.
3. Amend the comprehensive plan for local jurisdictions with specific statements that emphatically support improvements to pedestrian and bicycle mobility.
4. Follow through on implementation of the Americans with Disabilities Act (ADA) “Transition Plan” for jurisdictions with streets that have curbs.

5. Advocate for the inclusion of high-priority pedestrian- and bicycle-related improvements in the annual budget of local governments.
6. Conduct studies as needed that lead to changes in local zoning ordinances to require the construction of sites and buildings that contain a mix of residential, commercial, and workplace uses. By mixing these land uses, the distances that would be required to travel would be short enough for convenient pedestrian trips.
7. Amend the zoning ordinance of local governments to require the construction of pedestrian ways on both sides of streets in new development. Model code language below is excerpted from the Code of Ordinances adopted by Chesterfield County: “Pedestrian ways shall be incorporated into each development to minimize conflicts with vehicle traffic. Pedestrian ways shall be extended to adjacent property and shall connect uses within individual developments.” Exceptions in such ordinance language may be considered on a case-by-case basis for residential streets with very low AADT volumes or which are cul-de-sacs.
8. Amend parking ordinances to require the installation of suitable bicycle racks and lockers in all parking garages and commercial developments, as well as the provision of sidewalks between all streets and parking lots and side lot and rear lot parking in lieu of building parking in the front of buildings.
9. Conduct studies, as needed, to identify opportunities for traffic calming on residential collector and local streets.



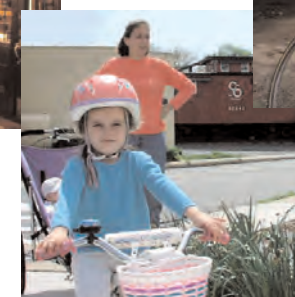
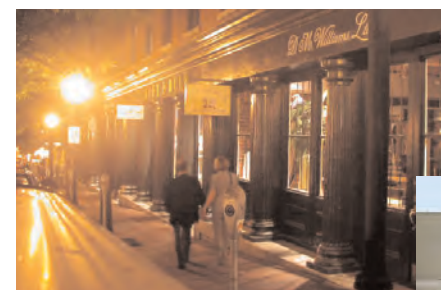
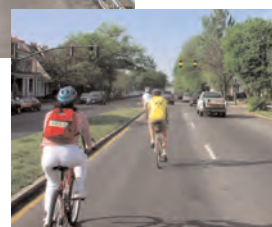
Before (Unimproved)



After

Sample Before/After Sidewalk and Bicycle Lane Retrofit Improvement

SEPTEMBER
2004



Appendices



Appendices

Appendix A: Study Terms and Methods

1. Definition of Terms
2. Bicycle and Pedestrian Level of Service Model and Methods
3. Bicycle and Pedestrian Latent Demand Analysis Method
4. Public Involvement User Survey and Findings

Appendix B: Network Recommendations

1. Recommended Demonstration Projects
2. Recommended Barrier Crossing Improvement Locations
3. VDOT Six-Year Improvement Program (FY 2004-2009) Candidate Projects for Including Bicycle and Pedestrian Improvements

Appendix C

1. Policy Checklist
2. Interstate Bicycle Routes 1 and 76
3. VDOT Policy for Integrating Bicycle and Pedestrian Accommodations

A.1 Definition of Terms

advanced stop bar bicycle box - A right-angle extension to a bike lane located at the head of an intersection. Also known as a "bike box." The box allows bicyclists to proceed to the head of a stopped queue of vehicles (i.e. at a red traffic signal) and move laterally across the approach lanes of traffic in order to make a left-turn at the intersection. Also, the box allows bicyclists making a right-turn to be ahead of queued vehicles, thus making them more visible, which helps reduce the risk of conflict/collision with right-turning vehicles.

annual average daily traffic (AADT) - the estimate of typical daily traffic on a road segment for all days of the week, Sunday through Saturday, over the period of one year

arterial roadway - A classification of roadway that serves the major centers of activity of urbanized areas, the highest traffic volume corridors, and the longest trip desires and carries a high proportion of total urban area travel. Expressed in vehicles per day (vpd).

bicycle bank - an enhanced bicycle rack which provides increased security for bicycles by protecting the bicycle’s lock from vandalism and weather

bicycle/pedestrian ferry - a boat used to carry bicyclists and/or pedestrians but not cars or trucks across a body of water

bicycle lanes - A portion of the roadway which has been designed by striping, signing, or pavement marking for the preferential or exclusive use of bicyclists

Bicycle Level of Service (BLOS) - A rating system (A to F) used to describe the bicyclist’s perceived safety with respect to motor vehicle traffic and comfort in using the roadway corridor. As with school grades, an "A" indicates the best conditions while an "F" indicates the worst.

Factors that influence the BLOS are roadway width, bike lane widths and striping combinations, traffic volume, pavement surface conditions, motor vehicle speed and type, and on-street parking.

bicycle rolling tray - a smooth, inclined surface located adjacent to a staircase which a bicyclist can use to move a bicycle (up or down) a flight of stairs in lieu of having to physically carry the bike

bicycle touring route - a generally longer, on-road route suitable for long-distance bicycle rides, often taking a cyclist to multiple locations of interest along the way (i.e. scenic views, historic sites, etc.)

collector roadway - A classification of roadway that provides both land access service and traffic circulation within residential neighborhoods, commercial, and industrial areas. Collector roads are shorter and carry less high speed vehicular traffic than arterials.

greenway - a conservation corridor that may include provisions for bicycle and pedestrian travel

latent demand model - A mathematical model predicting the level of present or potential demand for some event or attractiveness to occur. For bicycle and pedestrian planning purposes, a latent demand model predicts the likelihood of bicycle or pedestrian trips to take place based on the proximity and relative size of potential trip origins (i.e. residential neighborhoods) and potential trip destinations (i.e. parks, retail centers, etc.).

multimodal - a transportation system that serves different modes of travel including bus transit, rail, bicycling, walking, and driving a vehicle with convenient connections from one mode of travel to another

paratransit - Demand-responsive transit, providing service to rural and urban areas where fixed route service is not provided. This service’s largest rider base is typically elderly citizens as well as the physically impaired.

Pedestrian Level of Service (PLOS) - A rating system (A to F) used to describe a pedestrian’s perceived safety with respect to motor vehicle traffic and comfort in using the roadway corridor. As with school grades, an "A" indicates the best conditions while an "F" indicates the worst. Factors that influence the PLOS are roadway width, presence of sidewalks and intervening buffers (i.e., landscaping), barriers within those buffers, traffic volume, motor vehicle speed, and on-street parking.

pedestrian node - a focused area (non-linear) of pedestrian activity

rail to trail - see “rail trail”

rail trail - A former railroad line which has been converted to a shared use path. Also known as “rail to trail.”

rail with trail - see “railside trail”

railside trail - A 10-foot-wide pathway that is shared by bicyclists and pedestrians, parallel to or within the same right-of-way of the existing or abandoned railroad lines. Also known as “rail with trail.”

right-of-way - a general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation corridor improvements

roundabout - circular intersections with carefully designed features to slow traffic, without the long delays that are typical of traffic signals or traffic circles

shared use pathway - A 10-foot-wide pathway that is shared by bicyclists and pedestrians, typically parallel to, but separated from, a roadway. Sometimes referred to in this report as a “trail.”

shoulder - the portion of the roadway bordering the travel way to accommodate stopped vehicles, emergency use, and driver recovery from error


streetscape - as referenced in this plan, an urban street that has been designed to safely accommodate pedestrians

and bicyclists as well as providing an aesthetic corridor through use of landscaping, benches, and textured sidewalks or crosswalks

trail - A pathway of varying width that is usually unpaved and suitable for shared use. See also “shared use path.”

transit - any type of local public transportation (i.e. bus system, passenger rail, shuttle services, etc.)

walkability audit - a study of a pedestrian corridor or area to assess barriers to more and safer walking



Appendices

A.2 Bicycle and Pedestrian Level of Service Model and Methods

prepared by Toole Design Group

Bicycle and Pedestrian Level of Service models (BLOS / PLOS) are evaluations of bicyclist and pedestrian perceived safety with respect to motor vehicle traffic and comfort in using the roadway corridor. It identifies the quality of service for bicyclists or pedestrians that currently exists within the roadway environment. The data requirements and data collection and compilation guidelines are provided in the following companion document: *Richmond Regional Bicycle and Pedestrian Plan Data Collection and Inventory Guidelines, February 2003*. This document is available upon request from VDOT (see contact information at the front of this plan).

Bicycle Level of Service Model

The statistically calibrated mathematical equation entitled the *Bicycle Level of Service (Bicycle LOS)¹ Model (Version 2.0)* was used for the evaluation of bicycling conditions in the Richmond region. This model is the most accurate method of evaluating the bicycling conditions of shared roadway environments. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for other travel modes. With statistical precision, the model clearly reflects the effect on bicycling suitability or “compatibility” due to factors such as roadway width, bike lane widths and striping combinations, traffic volume, pavement surface conditions, motor vehicle speed and type, and on-street parking.

The Bicycle Level of Service Model is based on the proven peer-reviewed research documented in *Transportation Research Record 1578* published by the Transportation Research Board of the National Academy of Sciences. It was developed with a background of over 150,000 miles of evaluated urban, suburban, and rural roads and streets across North America. Many urban planning agencies and state highway departments are using this established method of evaluating their roadway networks. These include Anchorage AK, Baltimore MD, Birmingham AL, Buffalo NY, Gainesville FL, Houston TX, Philadelphia PA,

Lexington KY, Sacramento CA, Springfield MA, Tampa FL, as well as the Delaware Department of Transportation (DelDOT), Florida Department of Transportation (FDOT), New York State Department of Transportation (NYDOT), Maryland Department of Transportation (MDOT).

Widespread application of the original form of the Bicycle LOS Model has provided several refinements. Application of the Bicycle LOS Model in the metropolitan area of Philadelphia resulted in the final definition of three effective-width cases for evaluating roadways with on-street parking. Application of the Bicycle LOS Model in the rural areas surrounding the greater Buffalo region resulted in refinements to the “low-traffic volume roadway width adjustment”. A 1997 statistical enhancement to the model (during statewide application in Delaware) resulted in better quantification of the effects of high-speed truck traffic [see the $SP_t(1 + 10.38HV)^2$ term]. As a result, Version 2.0 has the highest correlation coefficient ($R^2 = 0.77$) of any form of the Bicycle LOS Model.

Version 2.0 of the Bicycle LOS Model has been employed to evaluate secondary roads and collector and arterial roadways within the Richmond region. Its form is shown on the following page as Equation A-1:

¹ Landis, Bruce W. et.al. “Real-Time Human Perceptions: Toward a Bicycle Level of Service” Transportation Research Record 1578, Transportation Research Board, Washington DC 1997.

Equation A-1

Bicycle LOS = a₁ln (Vol₁₅/L_n) + a₂SP_t(1+10.38HV)² + a₃(1/PR₅)² + a₄(W_e)² + C

Where:

Vol₁₅ = Volume of directional traffic in 15 minute time period

Vol₁₅ = (AADT x D x K_d) / (4 x PHF)

where:

AADT = Annual Average Daily Traffic on the segment or link

D = Directional Factor (assumed = 0.565)

K_d = Peak to Daily Factor (assumed = 0.1)

PHF = Peak Hour Factor (assumed = 1.0)

L_n = Total number of directional *through* lanes (includes shared through/turn lanes)

SP_t = Effective speed limit

SP_t = 1.1199 ln(SP_p - 20) + 0.8103

where:

SP_p = Posted speed limit (a surrogate for average running speed)

HV = percentage of heavy vehicles (as defined in the 1994 Highway Capacity Manual)

PR₅ = FHWA’s five point pavement surface condition rating

W_e = Average effective width of outside through lane:

where:

W_e = W_v - (10 ft x % OSPA) and W_l = 0
W_e = W_v + W_l (1 - 2 x % OSPA) and W_l > 0 & W_{ps} = 0
W_e = W_v + W_l - 2 (10 x % OSPA) and W_l > 0 & W_{ps} > 0
and a bikelane exists

where:

W_t = total width of outside lane (including shoulder) pavement
OSPA = percentage of segment with occupied on-street parking
W_l = width of paving between the outside lane stripe and the edge of pavement
W_{ps} = width of pavement striped for on-street parking
W_v = Effective width as a function of traffic volume

and:

W_v = W_t if AADT > 4,000veh/day
W_v = W_t (2-0.00025 x ADT) if AADT ≤ 4,000veh/day,

and if the street/ road is undivided and unstriped

a₁: 0.507 a₂: 0.199 a₃: 7.066 a₄: - 0.005 C: 0.760

(a₁ - a₄) are coefficients established by the multi-variate regression analysis.



Appendices

The Bicycle LOS score resulting from the final equation is pre-stratified into service categories “A, B, C, D, E, and F”, according to the ranges shown in **Table A-1**, reflecting users’ perception of the road segments level of service for bicycle travel. This stratification is in accordance with the linear scale established during the referenced research (i.e., the research project bicycle participants’ aggregate response to roadway and traffic stimuli). The model is particularly responsive to the factors that are statistically significant. An example of its sensitivity to various roadway and traffic conditions is shown on the following page.

Bicycle Level of Service Categories	
Table A-1	
LEVEL OF SERVICE	Bicycle LOS Score
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

The Bicycle LOS Model is used by planners, engineers, and designers throughout the US and Canada in a variety of planning and design applications. This can be used to conduct a benefits comparison among alternate bikeway/roadway cross-sections, identify roadway restriping or reconfiguration candidates for bicycle improvements, and to prioritize and program roadways for bicycle improvements.

Bicycle LOS Model Sensitivity Analysis

Equation A-1:					
Bicycle LOS = $a_1 \ln(\text{Vol}_{15}/\text{Ln}) + a_2 \text{SP}_t(1+10.38\text{HV})^2 + a_3(1/\text{PR}_5)^2 + a_4(W_e)^2 + C$					
where:	a_1 : 0.507	a_2 : 0.199	a_3 : 7.066	a_4 : -0.005	C: 0.760
T-statistics:	(5.689)	(3.844)	(4.902)	(-9.844)	
Baseline inputs:					
AADT	=	12,000 vpd	% HV	=	1
SP _p	=	40 mph	W _e	=	12 ft
			L	=	2 lanes
			PR ₅	=	4 (good pavement)
				<u>BLOS</u>	<u>% Change</u>
Baseline BLOS Score (Bicycle LOS)				3.98	not applicable
Lane Width and Lane striping changes					
W _t	=	10 ft		4.20	6% increase
W _t	=	11 ft		4.09	3% increase
W _t	=	12 ft	-- (baseline average) - - - - -	3.98 - - - -	no change
W _t	=	13 ft		3.85	3% reduction
W _t	=	14 ft		3.72	7% reduction
W _t	=	15 ft (W ₁ = 3 ft)		3.57 (3.08)	10%(23%) reduction
W _t	=	16 ft (W ₁ = 4 ft)		3.42 (2.70)	14%(32%) reduction
W _t	=	17 ft (W ₁ = 5 ft)		3.25 (2.28)	18%(43%) reduction
Traffic Volume (AADT) variations					
AADT	=	1,000 Very Low		2.75	31% decrease
AADT	=	5,000 Low		3.54	11% decrease
AADT	=	12,000 Average	-- (baseline average) - -	3.98 - - - -	no change
AADT	=	15,000 High		4.09	3% increase
AADT	=	25,000 Very High		4.35	9% increase
Pavement Surface conditions					
PR ₅	=	2 Poor		5.30	33% increase
PR ₅	=	3 Fair		4.32	9% increase
PR ₅	=	4 -- Good	-- (baseline average) - - -	3.98 - - - -	no change
PR ₅	=	5 Very Good		3.82	4% reduction
Heavy Vehicles in percentages					
HV	=	0 No Heavy Vehicles		3.80	5% decrease
HV	=	1 - - - Very Low	-- (baseline average) - -	3.98 - - - - -	no change
HV	=	2 Low		4.18	5% increase
HV	=	5 Moderate		4.88	23% increase _a
HV	=	10 High		6.42	61% increase _a
HV	=	15 Very High		8.39	111% increase _a

_a Outside the variable’s range (see Reference (1))

Pedestrian Level of Service Model

Similar to the evaluation procedure used for the bicycle model, this is an evaluation of pedestrians’ perceived safety with respect to motor vehicle traffic and comfort in using the roadway corridor. It identifies the quality of service for pedestrians that currently exists within the roadway environment.

The *Pedestrian Level of Service (Pedestrian LOS) Model* was used for the evaluation of walking conditions on road and street corridors in the Richmond region. This model is the most accurate method of evaluating walking conditions within shared-roadway environments. Like the *Bicycle Level of Service Model*, it is based on proven research documented in *Transportation Research Record 1773* published by the Transportation Research Board of the National Academy of Sciences¹. It uses the same measurable traffic and roadway factors that transportation planners and engineers use for other travel modes. With statistical precision, the model clearly reflects the effect on walking suitability or “compatibility” due to factors such as roadway width, presence of sidewalks and intervening buffers, barriers within those buffers, traffic volume, motor vehicles speed, and on-street parking. The form of the Pedestrian Level of Service Model and the definition of its terms are shown in Equation A-2.

The AADT and percentage of heavy truck values used in the analysis were provided by VDOT. Some of the roadways in the Richmond field study network are minor roads for which AADT or percent heavy truck data were not available. Assumptions were made for these roadway segments so that BLOS and PLOS could be calculated. AADT assumptions were estimated broadly on the functional classification of the roadway and the intensity of the surrounding land use. Collector and arterial roadways and roads in more urbanized areas were given higher assumed values. Percent heavy truck assumptions were made based on the intensity of the surrounding land use. Assumed values of 3.0, 5.0, 7.0, and 9.0 percent trucks were assigned to segments, with higher percentages in rural areas. Roadway segments in the field database with assumed AADT values and percent heavy truck values have AADT numbers ending in “99”.

¹ Landis, B.W., V.R. Vattikuti, R. M. Ottenberg, D.S. McLeod, M. Guttenplan. “Modeling the Roadside Walking Environment: Pedestrian Level of Service,” *Transportation Research Record 1773*, Transportation Research Board, National Academy of Sciences, 2001.

Equation A-2

Pedestrian LOS = - 1.2021 ln (W_{ol} + W_l + f_p x %OSP + f_b x W_b + f_{sw} x W_s) + 0.253 ln (Vol₁₅/L) + 0.0005 SPD² + 5.3876

Where:

- W_{ol} = Width of outside lane (feet)
- W_l = Width of shoulder or bike lane (feet)
- f_p = On-street parking effect coefficient (= 0.20)
- %OSP = Percent of segment with on-street parking
- f_b = Buffer area barrier coefficient (= 5.37 for trees spaced 20 feet on center)
- W_b = Buffer width (distance between edge of pavement and sidewalk, feet)
- f_{sw} = Sidewalk presence coefficient = 6 – 0.3W_s
- W_s = Width of sidewalk (feet)
- Vol₁₅ = average traffic during a fifteen (15) minute period
- L = total number of (through) lanes (for road or street)
- SPD = Average running speed of motor vehicle traffic (mi/hr)

The Pedestrian LOS score resulting from the final equation is pre-stratified into service categories “A, B, C, D, E, and F”, according to the ranges shown in **Table A-2** below and reflect users’ perception of the road segments level of service for pedestrian travel. This stratification is in accordance with the linear scale established during the research (i.e., the research project participants’ aggregate response to roadway and traffic stimuli). An example of the model’s sensitivity to various roadway and traffic conditions is shown at right.

Pedestrian Level of Service Categories	
Table A-2	
LEVEL OF SERVICE	Pedestrian LOS Score
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

Pedestrian LOS Model Sensitivity Analysis

Equation A-2:

Ped LOS = a₁ln (Vol₁₅/L) + a₂SPD² + a₃ln (W_{ol} + W_l + f_p x %OSP + f_b x W_b + f_{sw} x W_s) + C

where:	a ₁ : 0.253	a ₂ : 0.0005	a ₃ : -1.2021	C: 5.3876
T-statistics:	(3.106)	(2.763)	(-10.072)	(11.094)
Baseline inputs:				
AADT	= 12,000 vpd	% HV = 1	L = 2 lanes	%OSP = 50%
Speed	= 40 mph	W _t = W _{ol} + W _l = 12 ft	W _b = 2 ft	W _s = 4 ft
Tree Spacing = 20 ft.				

	PLOS	% Change
Baseline PLOS Score (Pedestrian LOS)	3.08	not applicable
Sidewalk Width changes		
W _s = no sidewalk	4.88	58% increase
W _s = 3	3.17	3% increase
W _s = 4 ----- (baseline average) -----	3.08 -----	no change
W _s = 5	3.00	3% decrease
W _s = 6	2.94	5% decrease
Buffer Width changes		
W _b = 0	3.36	9% increase
W _b = 2 ----- (baseline average) -----	3.08 -----	no change
W _b = 4	2.84	8% decrease
W _b = 6	2.65	14% decrease
Lane and Shoulder Width changes		
W _t = 10 ft	3.12	1% increase
W _t = 11 ft	3.10	1% increase
W _t = 12 ft ----- (baseline average) -----	3.08 -----	no change
W _t = 13 ft	3.05	1% decrease
W _t = 14 ft	3.03	2% decrease
W _t = 15 ft 3.00		3% decrease
W _t = 16 ft	2.98	3% decrease
Tree Spacing changes		
f _b = 20 ft ----- (baseline average) -----	3.08 -----	- no change
f _b = 40 ft	3.17	3% increase
f _b = no trees	3.30	7% increase
Traffic Volume (AADT) variations		
AADT = 1,000 Very Low	1.97	36% decrease
AADT = 5,000 Low	2.48	19% decrease
AADT = 12,000 Average --- (baseline average) ---	3.08 -----	- no change
AADT = 15,000 High	3.39	10% increase
AADT = 25,000 Very High	4.41	43% increase
Automobile Speed changes		
SPD = 25	2.69	13% decrease
SPD = 35	2.93	5% decrease
SPD = 40 ----- (baseline average) -----	3.08 -----	- no change
SPD = 45	3.25	6% increase
SPD = 55	3.65	19% increase

Data Assumptions for Roadway Segments for which VDOT Data was Unavailable

A.3 Bicycle and Pedestrian Latent Demand Analysis Method

prepared by Toole Design Group

Purpose

The Latent Demand Analysis Method is used to estimate the relative potential for pedestrian and bicycle activity on a roadway and/or trail study network. It uses land use data to determine where utilitarian trips (trips to a destination) are likely to occur, assuming that ideal pedestrian and bicycle infrastructure is available. The methodology is based on a gravity model concept, commonly used by transportation planners for predicting overall travel demand on a regional transportation network. Gravity models assume that the number of trips between any origin/destination pair will increase under any of three conditions: 1) the number of people at an origin is higher (higher population density), 2) the destination is more attractive (more jobs, more retail space, more park activities, etc. in a location), and 3) the distance between the origin and destination is shorter. Recreational and training trips are not accounted for in the Latent Demand Method Analysis.

General Explanation

The Latent Demand Analysis Method evaluates the potential to serve non-motorized trips on a segment-by-segment basis. For each segment, nearby trip generators (residential areas) and attractors (parks, schools, employment areas, etc.) are analyzed in a Geographic Information System (GIS). The computerized process evaluates the types and proximity of generators and attractors in the area surrounding each segment. This

process generates an overall score for potential demand for each segment. When this GIS analysis is complete, each segment is compared to other segments and ranked in terms of latent demand for non-motorized trips.

It is important to note that the Latent Demand Analysis Method does not estimate a particular quantity of non-motorized trips that can or will be made on a particular road or trail segment, rather it shows the relative potential of one segment to serve non-motorized trips as compared to another segment based upon the potential for origins and destinations in the vicinity of that segment to generate non-motorized trips.

Application in the Richmond Region

By taking into account a variety of land uses in the Richmond Region, the Latent Demand Analysis Method shows which of the regional study network segments are ranked in the following non-motorized trip demand categories (categories are divided evenly: highest 20% of segments, next highest 20% of segments, etc.):

- High
- Medium-High
- Medium
- Medium-Low
- Low

Latent demand scores were calculated using bicycle trip distances by trip purpose. Destinations for trips, such as parks, transit stations, and schools, were entered into a GIS from sources throughout the region to account for different trip purposes. The data used to derive trip distance by purpose came from the 2001 National Household Transportation Survey (NHTS)¹.

Geographic Information Systems (GIS) Data

Geographic data were collected from jurisdictions throughout the Richmond region, including areas within a

four-mile buffer outside the boundary of the region (such as Petersburg) to evaluate potential demand. The data from surrounding jurisdictions is included because some bicyclists living on the edges of the region are likely to access nearby activities outside of the regional boundary because they are closer than activities within the study area. Geographic Information Systems (GIS) data were collected for the following characteristics:

- 1) Estimated future population. This input comes from traffic analysis zones. The bicycle trips produced in the analysis are weighted by the residential population density that is projected 20 years in the future.
- 2) Estimated future employment. This input comes from traffic analysis zones. The bicycle trips attracted in the analysis are weighted by the employment density that is projected 20 years in the future. Shopping trip attraction is also included in this input.
- 3) Parks. This input includes the location of each existing and planned park and whether the park has a regional, community, or neighborhood draw.
- 4) Public schools. This input includes the location of each existing public school and whether it is an elementary, middle, or high school.
- 5) Colleges/universities. This input includes the location of each college/university and its full time enrollment.
- 6) Park and ride lots. This input includes the location of each park and ride lot and its number of parking spaces.
- 7) Train stations. This input includes the location of each train station and its estimated number of daily boardings. It includes the existing Main Street Station in downtown Richmond.
- 8) Bus routes. This input includes the location of each bus route.

¹ Bureau of Transportation Statistics. 2001 National Household Travel Survey. Online: <http://nhts.ornl.gov/2001/index.shtml>.

9) Shared use pathways. This input includes the location of existing and proposed shared use paths.

10) Community centers, museums, cultural attractions, sports facilities. This input includes the location of each community center, information center, library, museum, post office, cultural attraction, sports facility, or other special attractor. The locations of these features were taken from the ADC Greater Richmond Map Book¹.

2001 National Household Transportation Survey (NHTS)

The data used to derive bicycle trip distances for the analysis came from the 2001 NHTS. The NHTS was conducted between March 2001 and May 2002. There are 1,851 one-way bicycle trips reported in the NHTS database for the whole country. The bicycle trip category includes bicycles of all speeds and sizes that do not have a motor.

Trip Purpose

Trip purposes are used in the latent demand analysis to determine how far bicyclists would be willing to travel to get to different types of destinations. According to the NHTS survey documentation, a trip purpose is the main reason that motivates a trip. The NHTS considers 36 purposes, contained in the variable “WHYTRP01” (travel day trip purpose). These trip purposes are combined into 13 categories contained in the variable “WHYTRP1S” (travel day trip purpose-summary). The following list shows how we combined the thirty-six trip purposes into five basic trip purposes categories; the five for which we have average bicycle trip lengths:

- 1) **Earning a Living** (Go to work, attend business meeting/trip, other work related)
- 2) **School** (Go to school as student, go to library, school related)

- 3) **Personal Business/Shopping** (Go to religious activity, day care, medical/dental services, shopping/errands, buy goods: groceries/clothing/hardware store, buy services: video rentals/dry cleaner/post office/car service/bank, buy gas, family personal business/obligations, use professional services: attorney/accountant, attend funeral/wedding, use personal services: grooming/haircut/nails, pet care: walk the dog/vet visits, attend meeting: PTA/home owners association/local government, meals, social event, get/eat meal, coffee/ice cream/snacks)

- 4) **Social/Recreational** (Social/recreational, go to gym/exercise/play sports, rest or relaxation/vacation, visit friends/relatives, go out/hang out: entertainment/theater/sports event/go to bar, visit public space: historical site/museum/park/library)
- 5) **Other** (Return home, return to work, school/religious activity, transport someone, pick up someone, take and wait, drop someone off, other reason)

NHTS trips with the purpose of “return home” and “return to work” were included in the “other” category because the destination from which the pedestrian or bicyclist traveled is unknown (i.e. the overall trip purpose is unknown). “School/religious activity” was assigned to the “other” category because this is how it was represented in the NPTS.

By dividing the trip purposes into these categories we can make assumptions about trips to destinations such as employment centers, parks, transit stations, schools, and

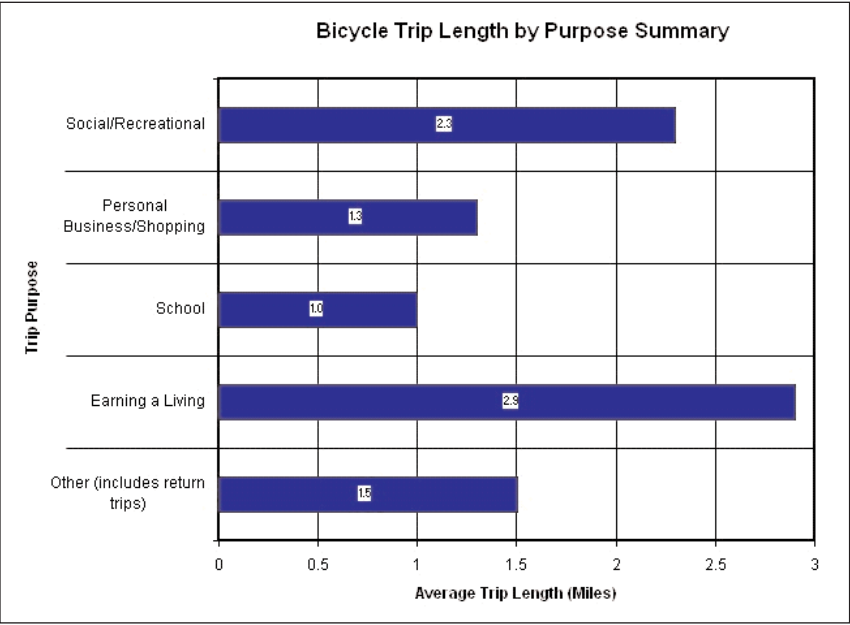


Figure A-1. Bicycle Trip Length by Purpose Summary

universities in the Richmond region. For example, the NHTS data on bicycle trips to school was used to estimate the potential for residents to bike from different distances to the Richmond area schools.

Bicycle Trip Length²

Figure A-1 shows how bicycle trip lengths vary by trip purpose. Bicycle trips made to places of employment tend to be longer than other types of bike trips. Based on 2001 NHTS data, the average length of a bicycle trip is 1.9 miles. Table A-1 shows the number of bicycle trips by purpose and the average, median and standard deviation lengths. Understanding the variable relationship between bicycle trip length and purpose is central to accurately estimating demand. Demand for bike trips to work sites will extend across more road segments because this demand extends a greater distance from employment areas than demand generated from other types of trip destinations.

Table A-3: Bicycle Trip Length by Purpose

Trip Purpose	# of bike trips in Survey	Bicycle Trip Length (miles)		
		Average	Median	St. Dev.
Earning a Living	71	2.9	2.0	3.7
School	52	1.0	1.0	0.7
Personal Business/Shopping	201	1.3	0.6	1.9
Social/Recreational	829	2.3	1.0	5.1
Other (includes return trips)	698	1.5	0.6	2.7
Total	1,851	1.9	1.0	3.9

Source: 2001 National Household Travel Survey

¹ Alexandria Drafting Company (ADC). Greater Richmond, Virginia Street Map Book, 3rd Edition, 2002.

² The Richmond latent demand analysis uses bicycle trip lengths as a surrogate for all non-motorized trip lengths because the relative ranking of segments for bicycle demand is likely to be very similar to that for pedestrian demand. This is because pedestrian demand is based on the same traffic analysis zone household density and employment assumptions and the same land use destinations that are used in the bicycle analysis. The only significant differences between bicycle and pedestrian based-assumptions are the different trip lengths. According to the 2001 NHTS, the average length of a pedestrian trip is 0.7 miles (pedestrian trips are defined to include walking and jogging). The median length of a pedestrian trip is 0.5 miles, compared to 1.0 mile for a bicycle trip. While differences in trip length can result in a score that is too high to accurately describe pedestrian demand (for example, when a destination is accessible by bike but too far to walk), because latent demand uses a relative scale, it is only likely to change the final results on the fringes of the urbanized area, and even there, not to a great degree. Our analysis of the model suggests that the demand scores for each segment are influenced more by the surrounding population density and land use features, than by the difference between bicycle vs. pedestrian trip distances.

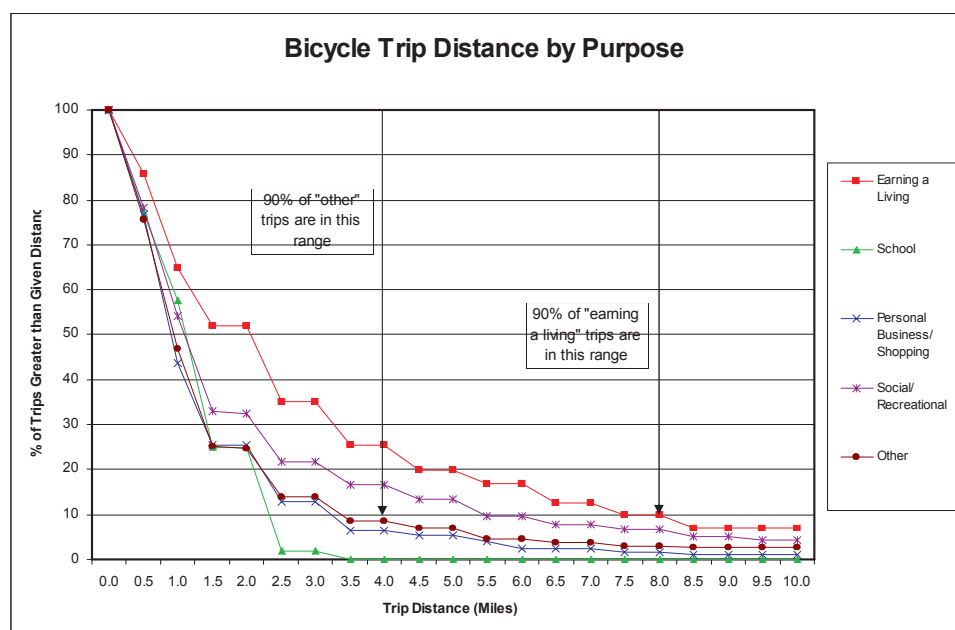


Figure A-2.

Using Trip Purpose and Length to Assess Bicycle Demand

The latent demand method considers the complete distribution of all trip lengths, not just the average trip length. It evaluates the percentage of bicycle trips that are made for each purpose at various distances from a destination (see **Figure A-2**). This trip distribution is used to calculate the potential for bicycle trips at 0.5 mile, 1.0 mile, 1.5 mile, 2.0 mile, etc. distance buffers around specific destinations (or trip attractors). The buffers extend to a distance that would capture the origins of at least 90 percent of all the trips made for each purpose. Buffer distances extend to 8.0 miles for work, 6.0 miles for social/recreational, 4.0 miles for personal business/shopping, and 3.0 miles for school trips. Buffers extend to 6.0 miles for the composite of all bike trip purposes. Once delineated, each buffer is assigned a weight, based on the NHTS trip length by purpose distribution. The roadways and trail segments closest to a destination have the highest potential to serve bicycle trips, and latent demand diminishes as distances from destinations increase (**Figure A-3** shows how higher demand is assigned to network segments near a trip attractor). Overlaying the buffers for all types of destinations results in an overall latent demand potential for each roadway segment in the analysis network (**Figure A-4** shows how the demand associated with many destinations is combined).

Figure A-3. Potential bicycle trip activity near a workplace.

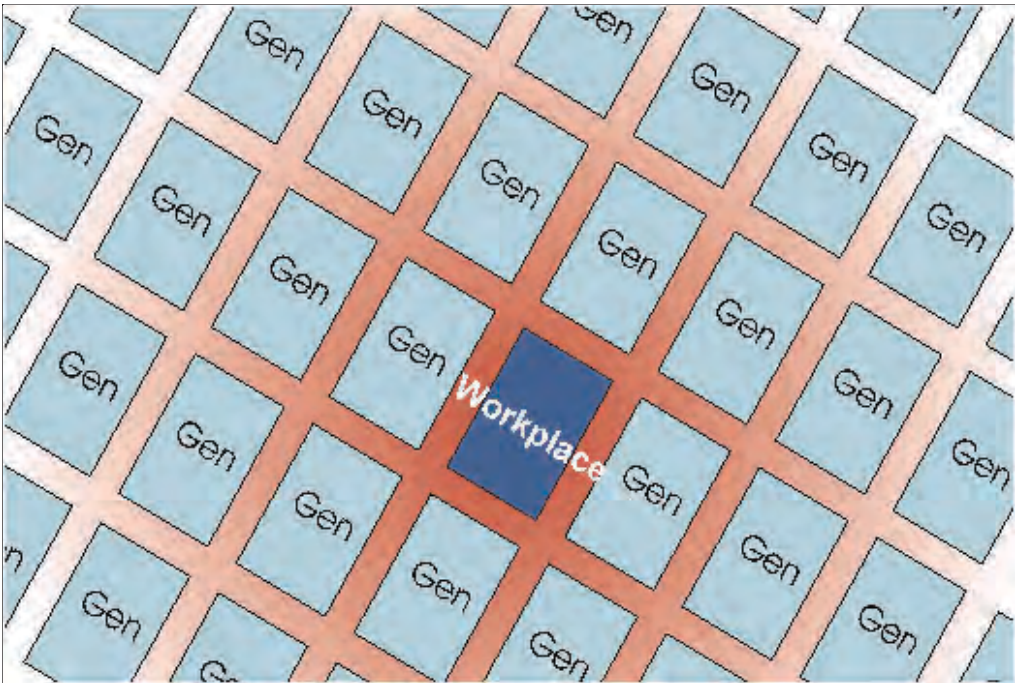
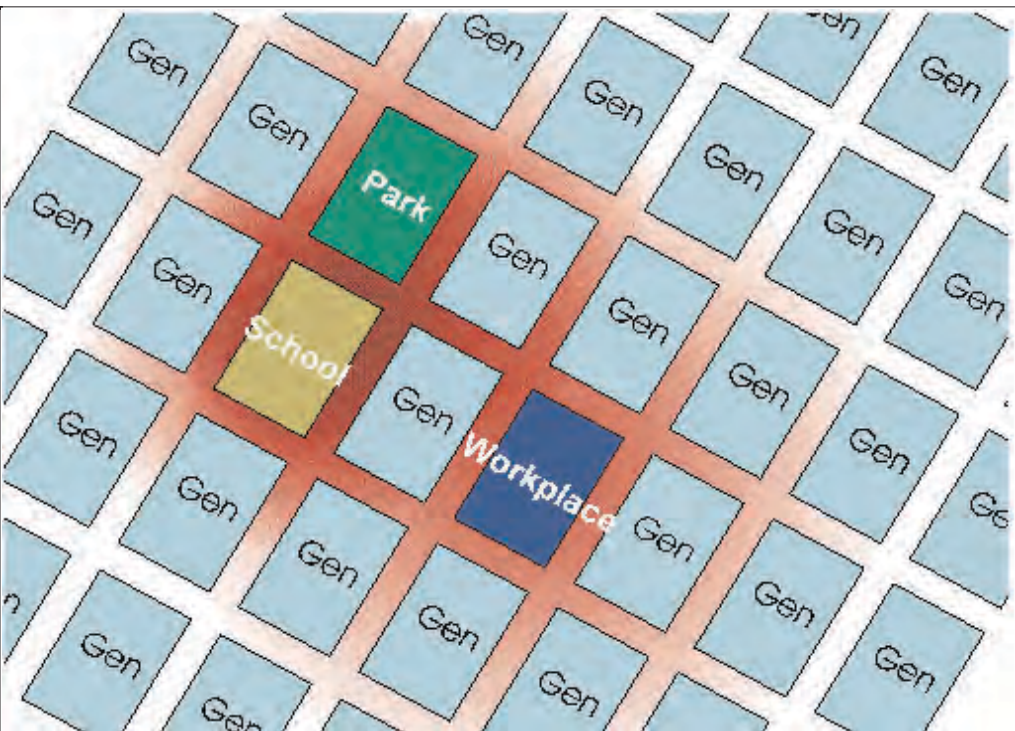


Figure A-4. Combined potential bicycle trip activity near a park, school, and workplace.



Trip Distance Assumptions by GIS Data Input

The typical trip length distributions for each of the five trip purposes (earning a living, school, personal business/shopping, social/recreational, and other) are applied to the GIS land use features in the region in the following way:

- 1) Population. These data are used to estimate the overall number of bicycle trips that can be generated from an area.
- 2) Employment. This input uses “earning a living” trip lengths to estimate the probability of trips being attracted to the traffic analysis zone from different distances.
- 3) Parks. This input uses “social/recreational” trip lengths.
- 4) Public schools. This input uses “school” trip lengths.
- 5) Colleges/universities. This input uses “earning a living” trip lengths.
- 6) Park and ride lots. This input uses the composite of all trip lengths because bicycle and pedestrian trips to park and ride lots can be made for many purposes.
- 7) Train stations. This input uses the composite of all trip lengths because bicycle and pedestrian trips to train stations can be made for many purposes.
- 8) Bus stops. This input uses the composite of all trip lengths because bicycle and pedestrian trips to bus stops can be made for many purposes.
- 9) Recreational trails. This input uses “social/recreational” trip lengths, and each trail is treated like a linear community park.
- 10) Community centers, information centers, libraries, museums, post offices, cultural attractions, sports facilities. This input uses “social/recreational” trip lengths.

2001 NHTS Data Considerations

The 2001 NHTS has a large sample size, providing an excellent picture of travel patterns throughout the United States. Yet, there may be regional variations that do not represent specific areas perfectly. Trip patterns in Richmond may be different than a region such as San Diego, CA, Madison, WI, or Austin, TX because of differences in climate, university population, socioeconomic characteristics, topography, and the quality and type of existing transportation infrastructure. Further, the residents in an urban area like the City of Richmond are likely to make different types of trips and travel different distances than people living in more rural parts of the region. However, in lieu of a regional transportation survey specifically designed to find information about pedestrian and bicycle trips in the Richmond region, the NHTS is the best data source available. It provides trip purpose and trip length information that is specific to non-motorized travel modes.

The 2001 NHTS is designed to collect information on trips made by a variety of modes, including personal automobile, transit bus, train, taxi, bicycle, pedestrian, and more. However, it is less accurate for trips of distances less than one mile, many of which are taken on foot or by bicycle. The raw trip length data were collected in either blocks or miles, where 9 blocks were assumed to equal 1 mile. If a trip length was not reported in blocks, it was rounded to the nearest 0.5 mile (trip lengths of 0 miles were rounded up to 0.5 miles).

Furthermore, according to the survey documentation, the NHTS does not include trips that are made within the same address (such as walking through a parking lot or within a shopping center) or when the sole purpose of the trip is to get to another vehicle or mode of transportation in order to continue to the destination. This ignores trips to cars in parking lots and transit access and egress trips. Many of these uncounted trips are made by pedestrians and bicyclists.

Appendices

A.4 Public Involvement User Survey and Findings

The project Study Advisory Committee developed the User Survey shown here for use during public outreach efforts during March and April of 2003. The surveys were made available at a series of five public workshops held around the Richmond region at the end of March 2003, and were also made available via a virtual workshop on the project website (www.lets gobikeandwalk.com). A total of over 675 surveys were completed during the public participation time period. The results of these surveys are displayed graphically and in spreadsheet format on the following pages.

Richmond Regional Bicycle and Pedestrian Plan

User Survey

Questions about Bicycling

1. Please indicate your **zip code**:

2. What **kind of bicycling** do you do? (check all that apply)

☐ To work
☐ To school
☐ To visit friends or family
☐ For fitness/recreation
☐ To the bus stop

3. How **often** do you ride a bicycle?

☐ Daily
☐ Once or twice a week
☐ Once every 2-3 weeks
☐ 2-3 times a year
☐ I don't ride a bicycle

4. What is your general **skill level**?

☐ advanced
☐ basic
☐ child (under 12)

5. What is your **primary concern** when deciding where to ride? (check one)

☐ Shortest route to destination
☐ Pleasant route/scenic value
☐ Comfort/personal safety in traffic
☐ Safe/convenient bicycle parking
☐ Other

6. What affects your **decision to ride**? (check all that apply)

☐ Presence of bike paths or shoulders
☐ Amount of traffic on the road
☐ Speed of traffic
☐ Amount of large trucks and/or buses
☐ Number of major intersections
☐ Weather/time of day
☐ Bicycle parking at destinations

7. What are the **bicycling conditions** in your community:

☐ Good
☐ Fair
☐ Poor

8. Do you go on **organized** recreational bike rides?

☐ Yes
☐ No

9. Would **bike lanes or trails** in your community encourage you to make more short trips?

☐ Yes
☐ No

10. Where would you like to see **bicycle racks** installed? (check all that apply)

☐ Workplace
☐ Parks
☐ Public bus stops
☐ Mounted on public buses
☐ Other

11. Do you have **children** under the age of 16 in your household that ride bicycles?

☐ Yes
☐ No

12. (If the answer to Question 11 is Yes) **where do you allow** them to ride (either supervised or unsupervised)?

☐ Bike trails or paths
☐ Residential streets
☐ Major roads
☐ Other

13. Where would you like to see **new or improved bikeways**?

Questions about Walking

14. What **kind of walking** do you do? (check all that apply)

☐ To work
☐ To school
☐ To visit friends or family
☐ For fitness/recreation
☐ To the bus stop

15. What makes you **decide where to walk**? (check one)

☐ Shortest route to destination
☐ Soenic value of route
☐ Comfort/separation in traffic
☐ Personal safety/security
☐ Other

16. What affects your **decision to go on a walk**? (check all that apply)

☐ Availability of sidewalks or trails
☐ Amount of traffic on the adjacent road
☐ Speed of traffic
☐ Presence of crosswalks/pedestrian signals
☐ Number of major intersections
☐ Weather/time of day
☐ Other

Additional Questions

20. Are you in favor of **increased spending** on walkways and bikeways?

☐ Yes
☐ No

21. Which **sources of funding** for bicycle and pedestrian improvements would you support (check all that apply)?

☐ Federal transportation funds
☐ State transportation funds
☐ State general funds
☐ Local transportation funds
☐ Local general funds
☐ New taxes
☐ Area businesses
☐ Developers (new developments only)
☐ Other ideas?

17. What are the **walking conditions** in your community:

☐ Good
☐ Fair
☐ Poor

18. Where do you have **trouble crossing the street**?

19. Where would you like to see **new or improved walkways**?

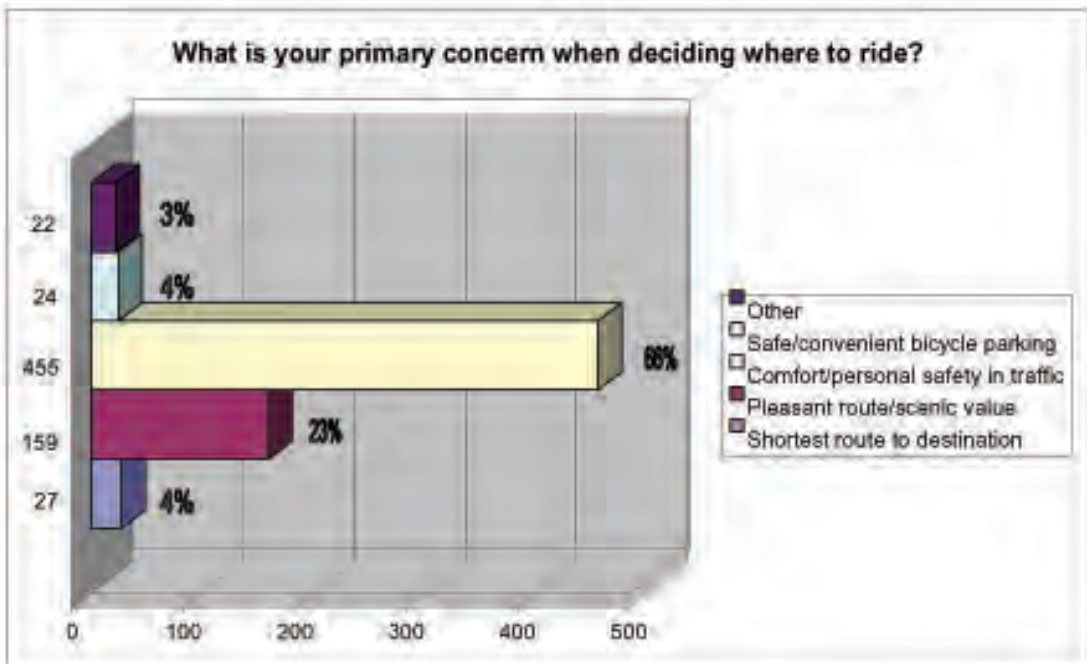
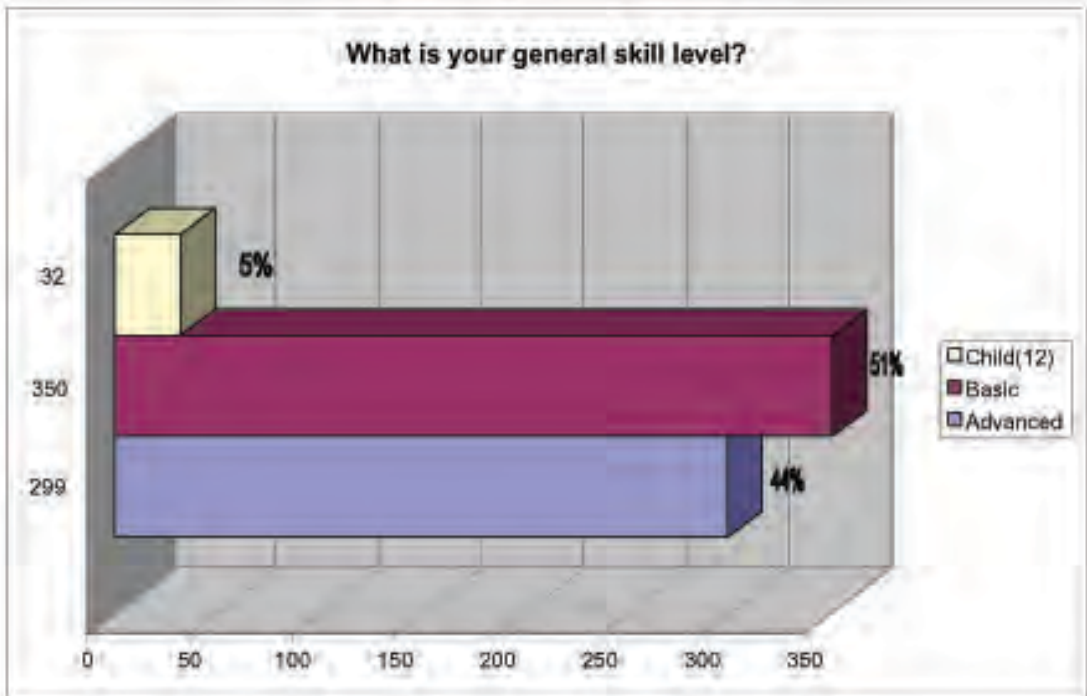
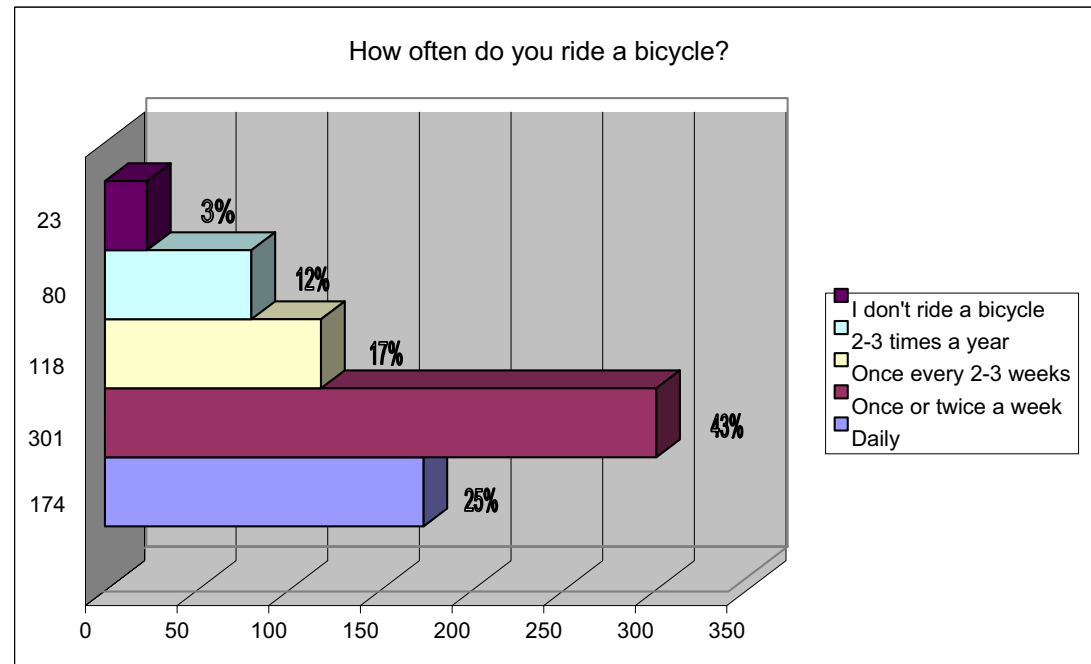
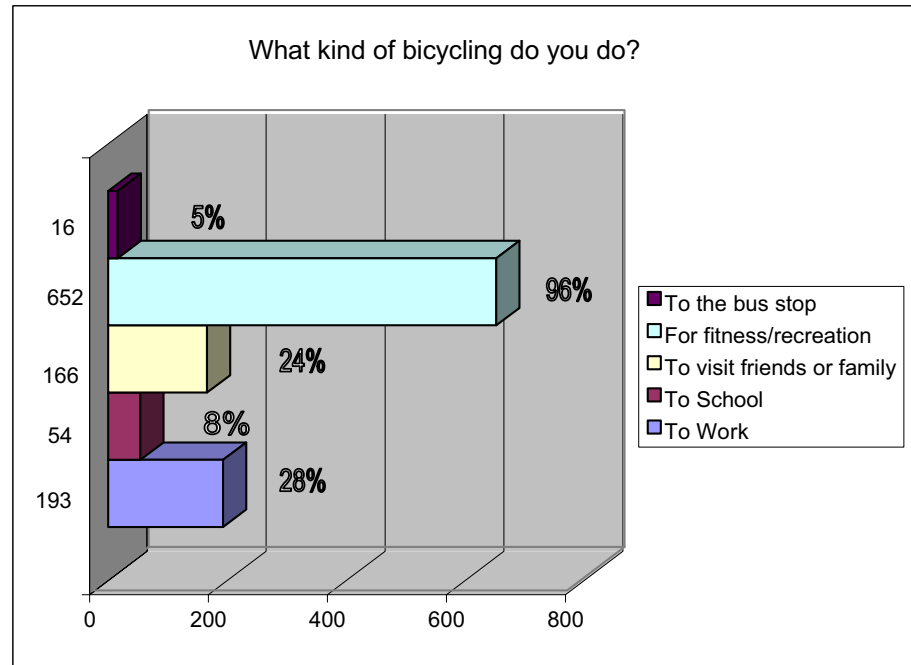
22. What is your **age**? (optional):

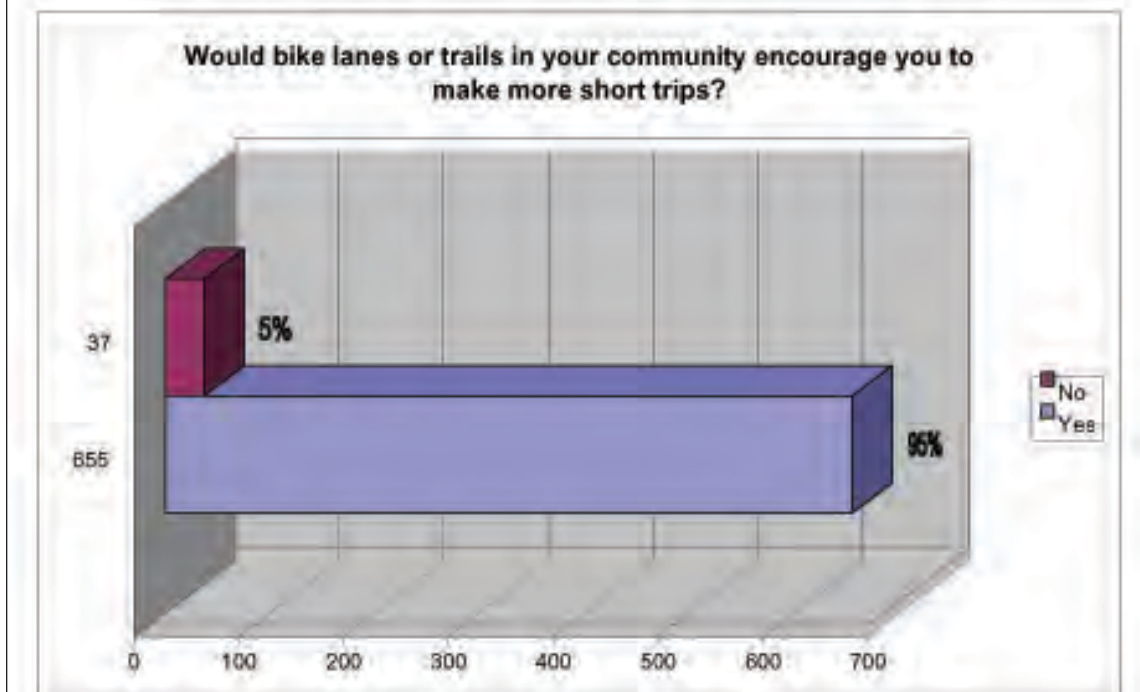
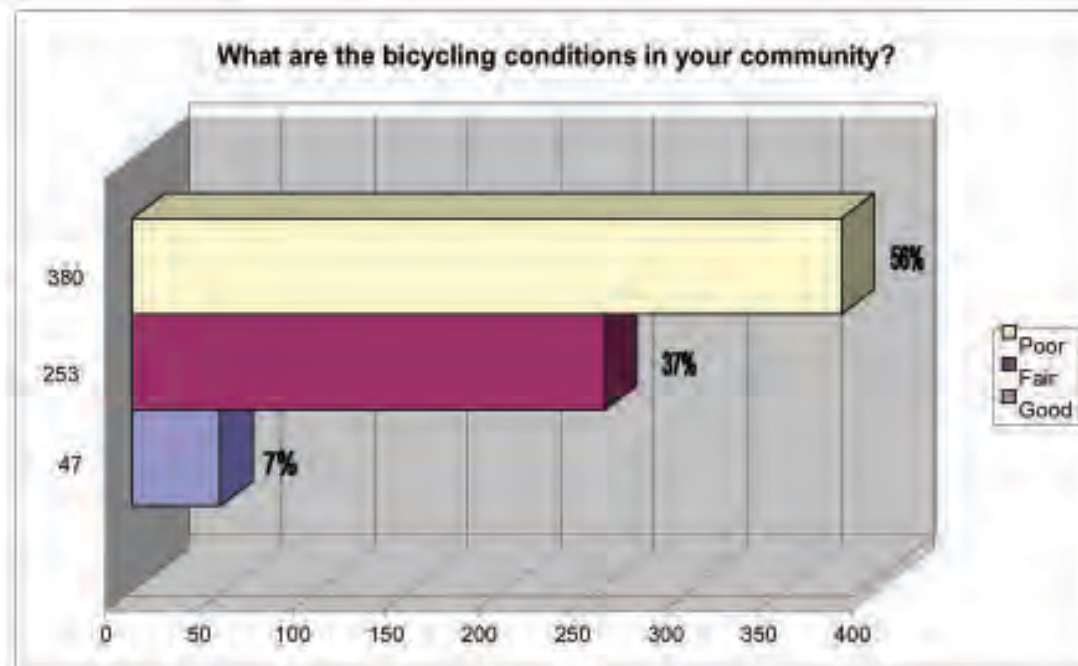
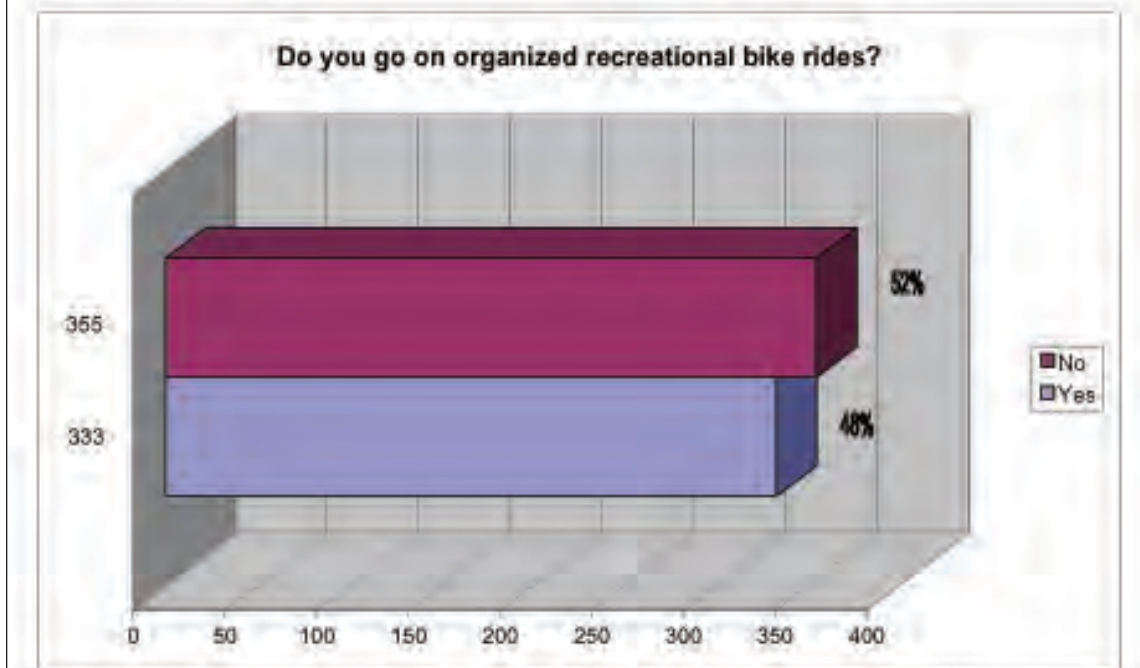
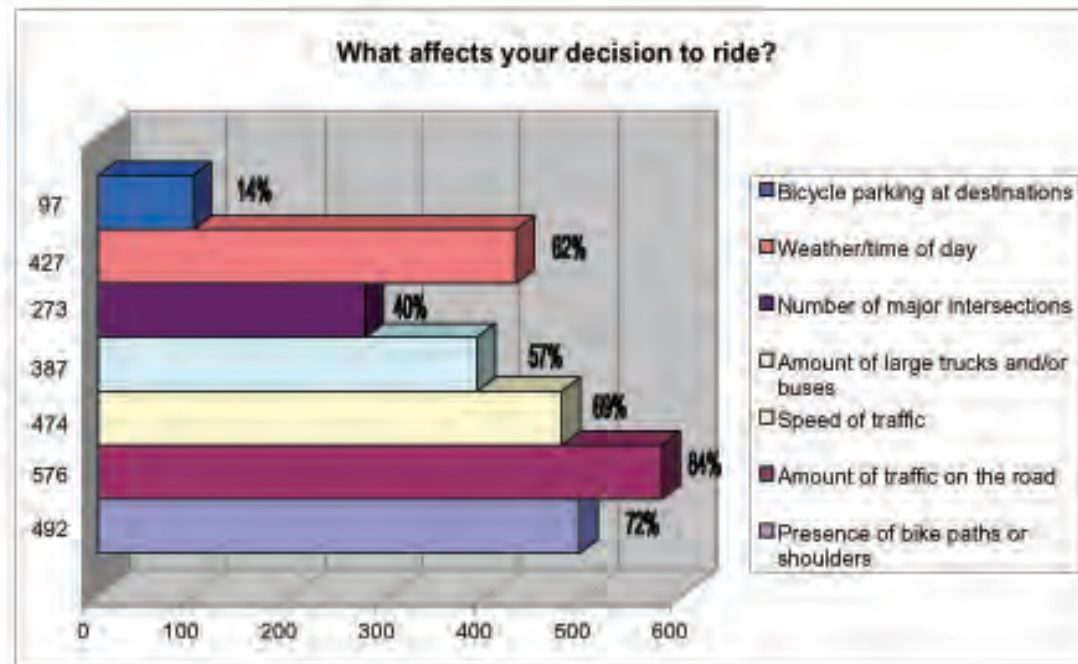
23. What is the **most important message** you would like to send to the study team?

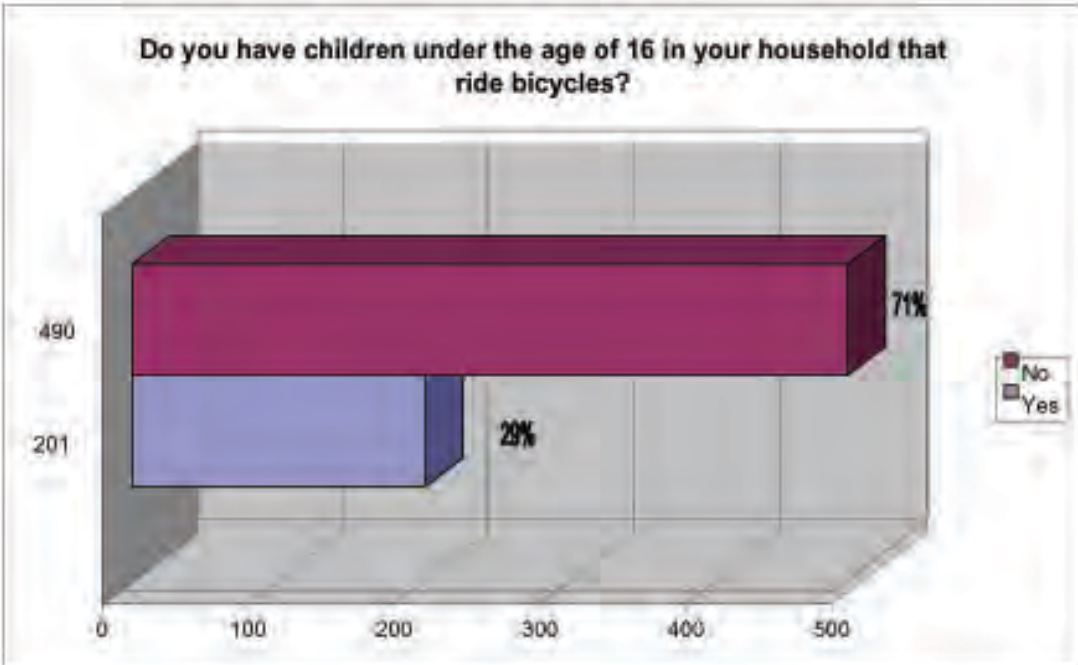
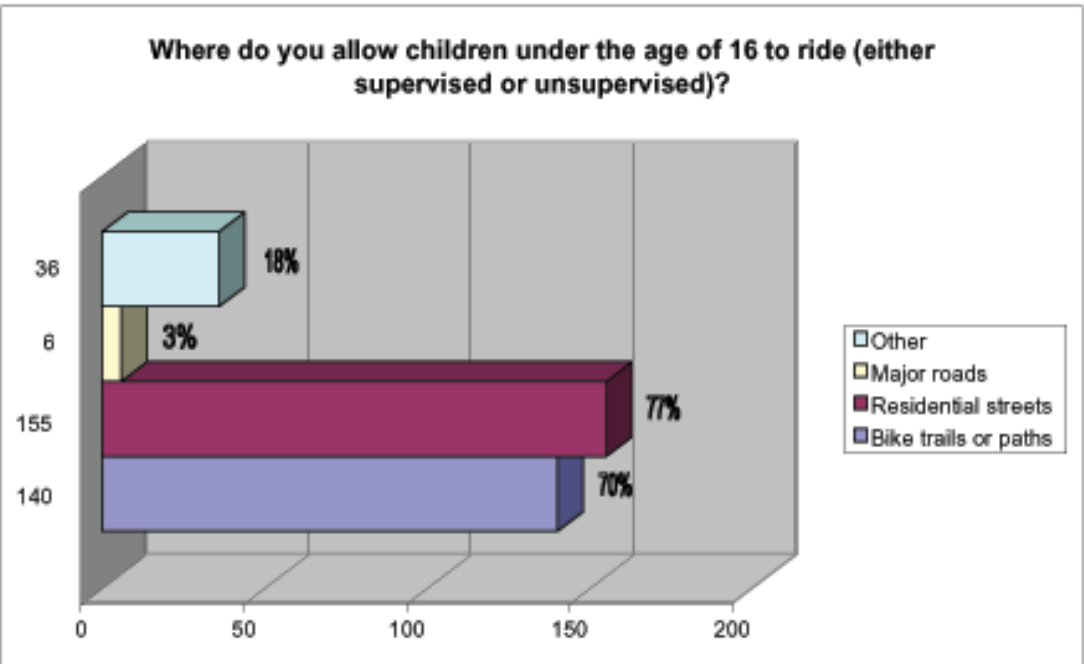
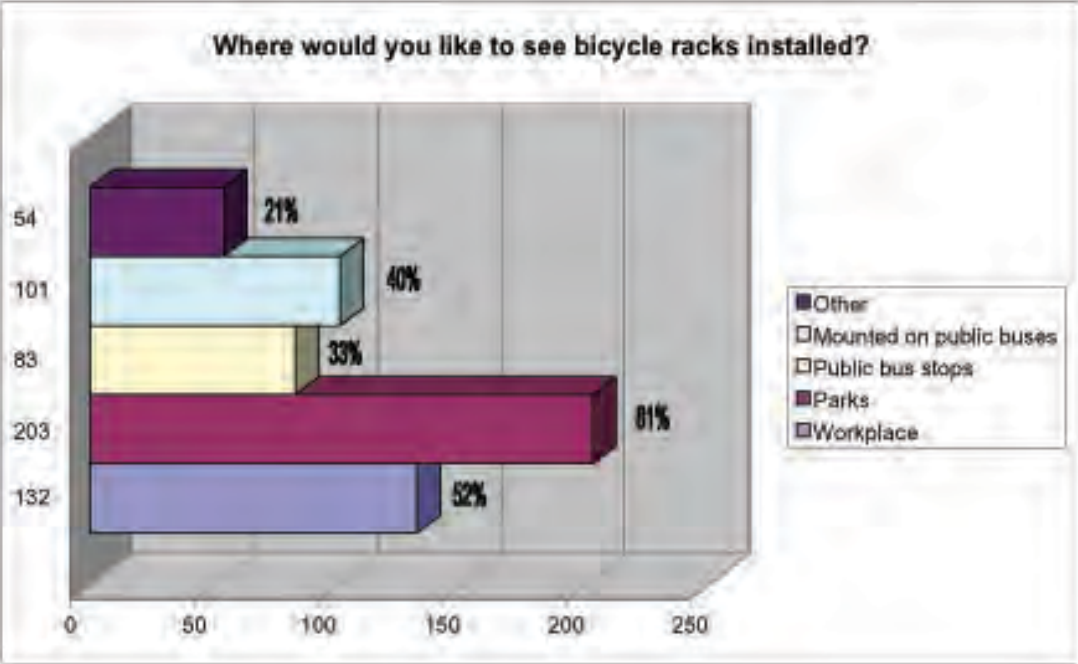
Richmond Regional **Bicycle and Pedestrian Plan**

Bar Graphs to accompany Survey Results

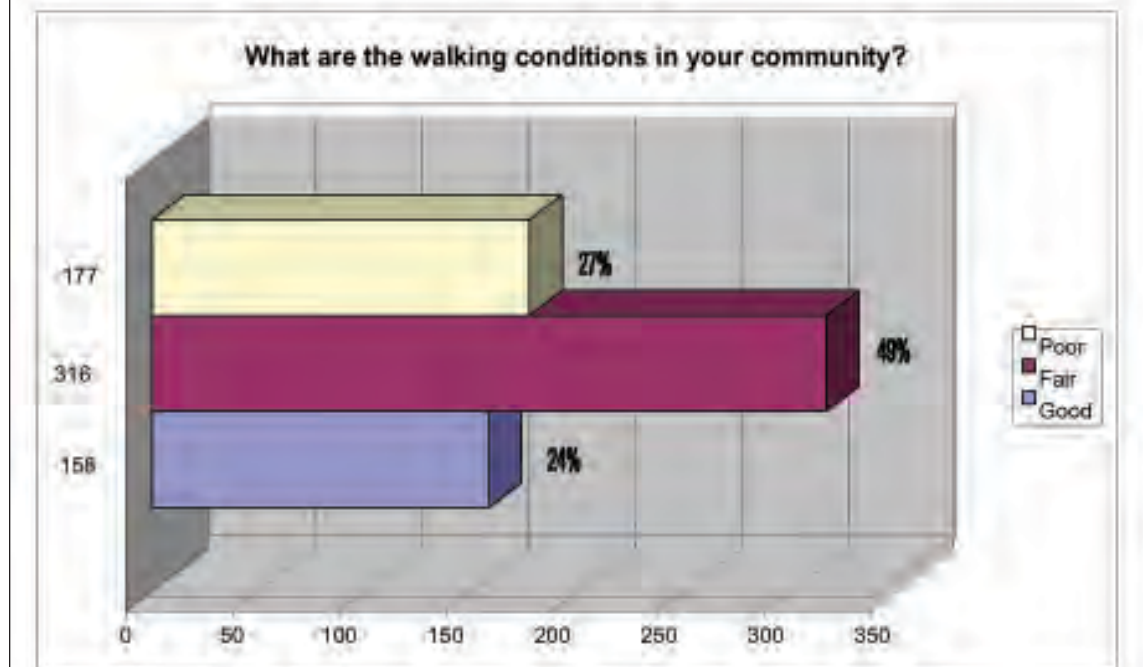
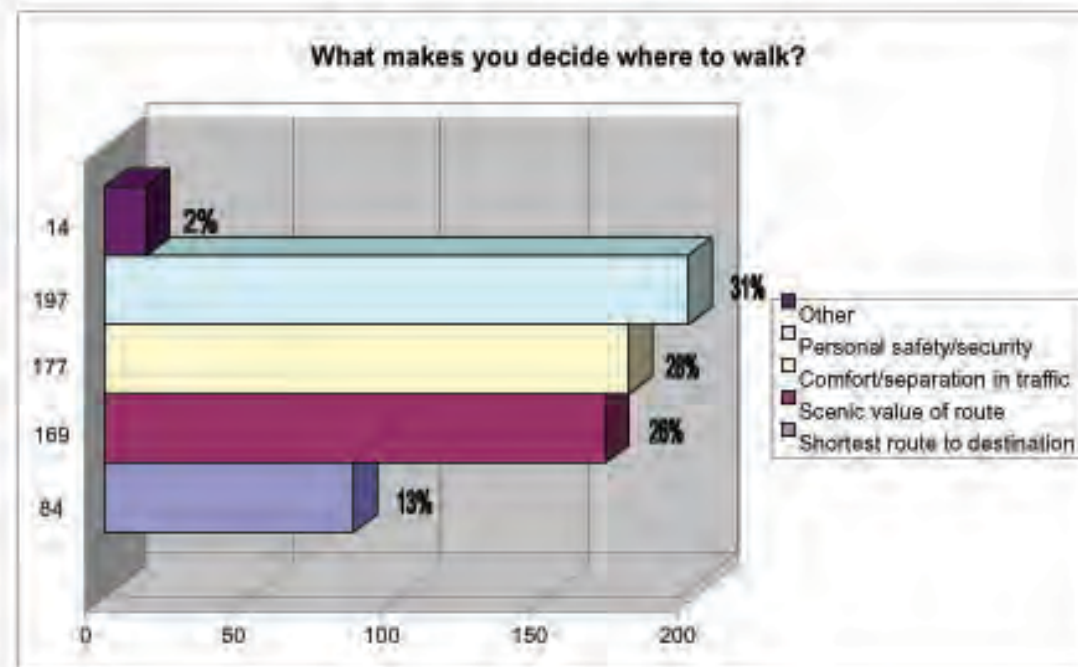
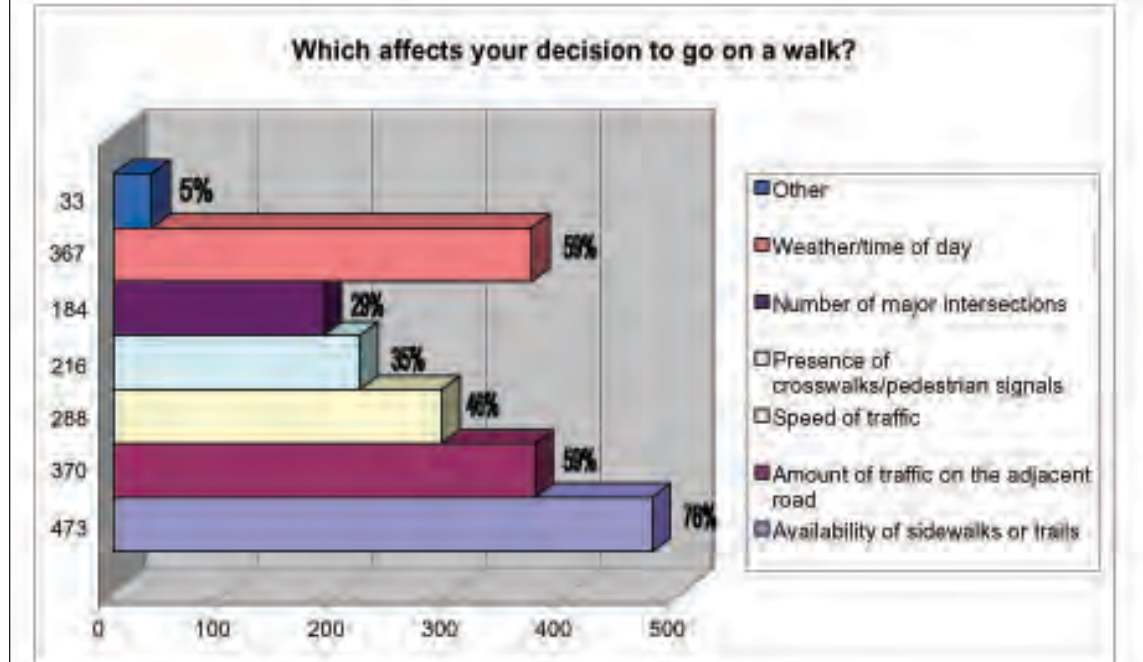
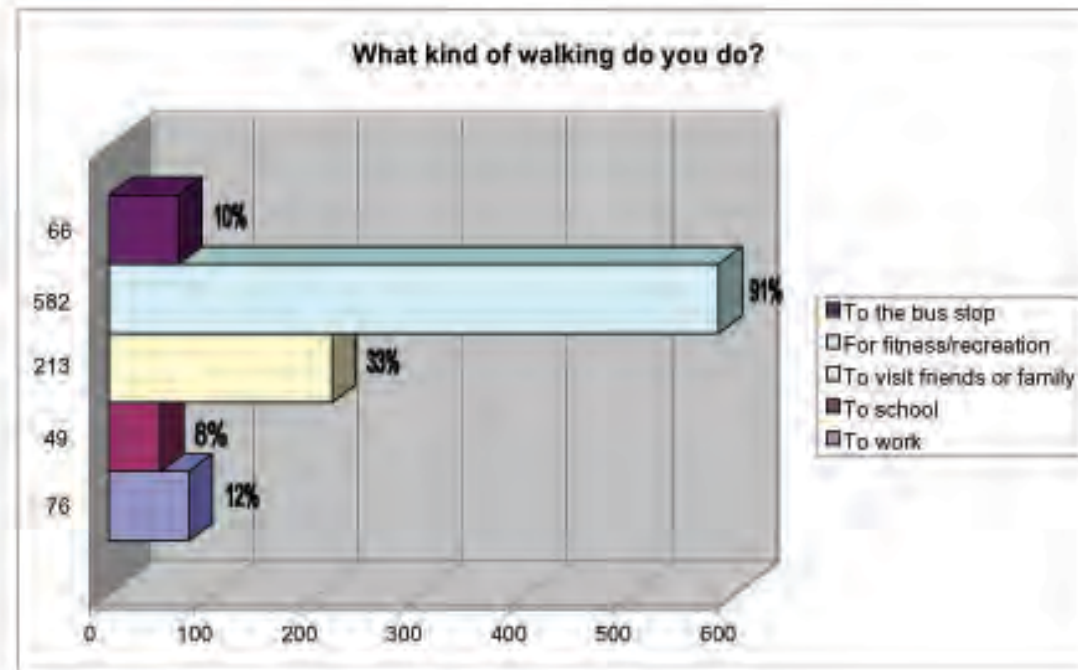
Questions about Bicycling



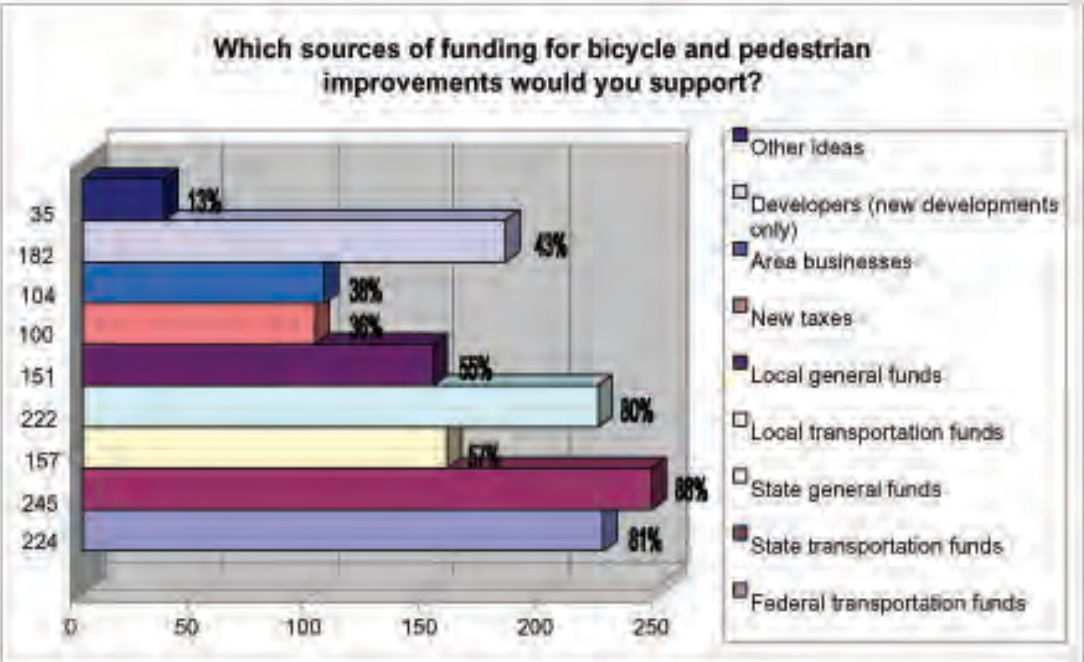
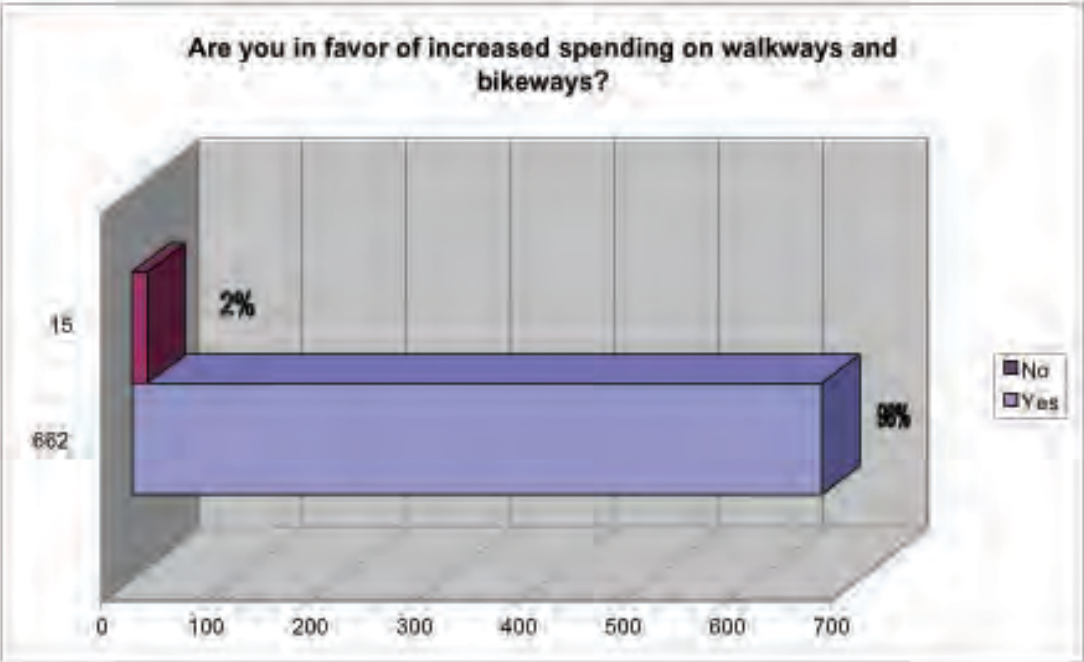




Questions about Walking



Additional Questions





Appendices

Note: Totals under “All Surveys” column may be greater than the sum of the region’s nine jurisdictions due to responses received from citizens whose addresses lie outside of the study area. Totals for each jurisdiction are based on zip code information provided by survey participants.

SURVEY RESPONSE SUMMARY RICHMOND REGIONAL BICYCLE AND PEDESTRIAN PLAN

What kind of bicycling do you do?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
To work	3	3	35	11	11	64	1	0	127	193
To school	1	2	7	2	1	4	0	0	44	54
To visit friends or family	5	2	31	14	12	48	3	1	100	166
For fitness/recreation	11	13	188	43	80	241	8	14	278	652
To the bus stop	0	0	5	1	1	6	0	0	10	16

How often do you ride a bicycle?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Daily	4	5	40	9	13	48	3	0	98	174
Once or twice a week	5	5	88	18	42	114	1	9	119	301
Once every 2-3 weeks	2	3	40	9	13	48	3	3	46	118
2-3 times a year	0	0	26	6	9	34	0	2	33	80
I don't ride a bicycle	4	2	3	3	7	10	1	0	9	23

What is your general skill level?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
advanced	6	7	81	17	35	109	5	5	123	299
basic	5	6	103	27	43	130	3	7	159	350
child(12)	0	0	8	1	3	10	0	2	17	32

What is your primary concern when deciding where to ride?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Shortest route to destination	0	0	5	1	0	10	0	0	16	27
Pleasant route/scenic value	4	4	47	13	24	53	3	3	61	159
Comfort/personal safety in traffic	8	7	139	31	51	159	3	8	205	455
Safe/convenient bicycle parking	0	0	3	2	4	14	1	2	7	24
Other	0	3	2	0	4	11	1	1	10	22

What affects your decision to ride?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Presence of bike paths or shoulders	6	8	149	33	57	180	4	6	217	492
Amount of traffic on the road	9	10	163	40	75	207	7	9	243	576
Speed of traffic	7	8	136	35	62	168	5	8	208	474
Amount of large trucks and/or buses	7	10	98	31	52	150	7	5	166	387
Number of major intersections	6	2	65	21	35	113	3	4	118	273
Weather/time of day	7	8	117	32	54	159	5	9	192	427
Bicycle parking at destinations	0	1	22	10	8	29	1	1	60	97

What are the bicycling conditions in your community?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Good	2	1	12	5	10	20	1	1	12	47
Fair	8	5	70	15	26	81	2	8	122	253
Poor	3	6	108	24	50	144	4	5	161	380

SURVEY RESPONSE SUMMARY

RICHMOND REGIONAL BICYCLE AND PEDESTRIAN PLAN

Do you go on organized recreational bike rides?	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Yes	6	8	91	24	38	121	6	11	138	333
No	8	6	105	20	44	126	1	3	161	355

Would bike lanes or trails in your community encourage you to make more short trips?	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Yes	13	11	189	45	80	235	6	11	285	655
No	1	2	7	2	6	13	2	3	13	37

Where would you like to see bicycle racks installed?	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Workplace	3	3	39	6	19	47	0	3	61	132
Parks	7	2	68	13	27	71	1	8	82	203
Public bus stops	4	0	23	3	10	26	0	3	46	83
Mounted on public buses	2	3	26	7	10	36	0	5	54	101
Other	1	2	12	2	5	18	0	4	21	54

Do you have children under the age of 16 in your household that ride bicycles?	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Yes	5	5	66	15	40	72	2	4	57	201
No	9	9	127	32	45	180	6	10	241	490

Where do you allow children under the age of 16 to ride (either supervised or unsupervised)?	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Bike trails or paths	3	1	49	10	24	44	1	4	42	140
Residential streets	4	3	49	11	31	61	1	3	39	155
Major roads	0	1	3	0	0	2	0	0	4	6
Other	2	1	12	1	7	8	1	1	14	36

What kind of walking do you do?	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
To work	2	1	8	4	3	15	1	1	60	76
To school	3	0	7	0	3	9	0	0	30	49
To visit friends or family	9	0	42	17	23	64	1	3	126	213
For fitness/recreation	15	11	176	40	75	217	8	11	250	582
To the bus stop	1	1	13	5	4	20	0	0	46	66

Note: Totals under “All Surveys” column may be greater than the sum of the region’s nine jurisdictions due to responses received from citizens whose addresses lie outside of the study area. Totals for each jurisdiction are based on zip code information provided by survey participants.



Appendices

Note: Totals under “All Surveys” column may be greater than the sum of the region’s nine jurisdictions due to responses received from citizens whose addresses lie outside of the study area. Totals for each jurisdiction are based on zip code information provided by survey participants.

SURVEY RESPONSE SUMMARY RICHMOND REGIONAL BICYCLE AND PEDESTRIAN PLAN

What makes you decide where to walk?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Shortest route to destination	1	1	19	4	4	19	1	3	52	84
Scenic value of route	5	4	54	12	21	63	2	2	69	169
Comfort/separation in traffic	8	2	49	13	29	68	1	3	73	177
Personal safety/security	2	3	59	13	19	76	4	5	84	197
Other	1	1	3	0	1	6	0	0	11	14

Which affects your decision to go on a walk?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Availability of sidewalks or trails	14	7	128	31	59	178	5	9	221	473
Amount of traffic on the adjacent road	10	6	113	25	52	131	6	8	162	370
Speed of traffic	7	4	89	21	38	104	5	6	121	288
Presence of crosswalks/pedestrian signals	4	2	62	12	19	78	2	3	112	216
Number of major intersections	4	4	51	14	20	78	2	2	85	184
Weather/time of day	6	9	101	27	38	128	5	9	175	367
Other	2	2	11	0	2	7	1	1	19	33

What are the walking conditions in your community?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Good	4	2	37	8	13	51	2	2	90	158
Fair	7	7	89	24	31	116	2	1	157	316
Poor	8	2	55	13	35	69	3	10	42	177

Are you in favor of increased spending on walkways and bikeways?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Yes	17	11	186	45	82	237	8	14	293	662
No	1	1	5	1	1	5	0	0	6	15

Which sources of funding for bicycle and pedestrian improvements would you support?

	Ashland	Charles City	Chesterfield	Goochland	Hanover	Henrico	New Kent	Powhatan	Richmond	All Surveys
Federal transportation funds	11	5	65	17	37	80	0	10	93	224
State transportation funds	13	5	71	18	41	87	1	9	102	245
State general funds	11	3	41	14	31	59	0	5	71	157
Local transportation funds	14	4	61	18	40	84	1	6	97	222
Local general funds	9	4	44	12	28	55	1	4	71	151
New taxes	5	1	29	10	18	38	0	2	45	100
Area businesses	4	1	22	11	19	45	1	4	46	104
Developers (new developments only)	9	4	50	17	32	73	1	7	70	182
Other ideas	2	1	7	2	6	15	0	2	18	35

B.1 Recommended Demonstration Projects

Recommended Strategy A-8 - Demonstration Projects			
Jurisdiction	Project Name & Location	Description	Potential to Integrate with programmed VDOT Project at Same Location (Six-Year Plan)
Ashland	Route 1: multi-modal streetscape and road-diet	include bike lanes, sidewalks, buffers, streetscape improvements in Route 1 improvement project	Yes
	Route 1/Hill Carter Parkway: pedestrian crossing improvements	consider reduced corner radii, high visibility crosswalk striping and countdown pedestrian signals	Yes
Charles City County	Route 5 bikeway segments	develop bike lanes between two or three of the major plantations along Route 5	No
Chesterfield	Robious Road bike lane striping	complete and extend bike lanes on Robious Road; carry through the intersection with Huguenot Road	No
	town center midblock crossings	demonstrate town center midblock crossing treatments along Route 60 in village of Midlothian or Route 10 in village of Chester	No
Goochland	Route 522/6: rural pedestrian crossing improvements	include appropriate rural pedestrian crossing improvements in VDOT intersection improvement project	Yes
Hanover	Atlee Station Road bike lanes	include striped bike lanes from Rte. 301 to Honey Meadow Road (in the vicinity of Cool Spring Elementary School, Chickahominy Middle School, and Atlee High School)	Yes
Henrico [Pick one of two bicycle projects.]	Parham Road & Homeview: J. R Tucker High School pedestrian crossings	include pedestrian crossing improvements such as enhanced visibility crosswalks, median refuge islands, and pedestrian activated signals	Yes
	Mechanicsville Road: pedestrian crossing improvements	include pedestrian crossing improvements such as enhanced visibility crosswalks, median refuge islands, mid-block crossings, and pedestrian activated signals	Yes
Henrico [Pick one of two bicycle projects.]	Three Chopt Road: bike lanes and sidewalks or sidepath	demonstrate bike lanes and sidewalks, or sidepath, in this road widening project in the Short Pump area	Yes
	Meadowbridge Road: bike lanes	include bike lanes in Meadowbridge Road widening project	Yes



Appendices

Recommended Strategy A-8 - Demonstration Projects *continued*

<u>Jurisdiction</u>	<u>Project Name & Location</u>	<u>Description</u>	<u>Potential to Integrate with programmed VDOT Project at Same Location (Six-Year Plan)</u>
New Kent	Route 249: roundabout	design and construct a roundabout at a Route 249 intersection in western New Kent County	Maybe
Powhatan	Route 711: bike lanes	pave shoulders to improve bicycle safety and access	Yes
Richmond	Forest Hill Avenue: bicycle and pedestrian facilities through the Powhite interchange	improve bicycle and pedestrian access and safety as a part of VDOT project at this location, consider various facilities such as sidewalks, crosswalks, bike lanes and sidepaths, and other amenities to reduce vehicle and bicycle/pedestrian conflicts	Yes
	First and Fifth Street bridges: restripe bridges with bike lanes	restripe these new bridges with bike lanes	No
	Central Richmond mid-block crossing	identify a high use mid-block crossing location in Central Richmond where mid-block pedestrian crossing treatments can be demonstrated	Maybe
Multi-jurisdictional	Huguenot Bridge: bicycle and pedestrian access improvement	demonstrate bridge retrofit project: add ramps and paved shoulders for bicycle/pedestrian access to the sidewalk on the Huguenot Bridge	No

B.2 Recommended Barrier Crossing Improvement Locations

Recommended Strategy A-9: Barrier Crossing Improvements

A. Highway Interchanges Along Network Roads: Bicycle/Pedestrian Access and Safety Improvements Needed at These Locations

1. High Priority

Note: Item numbers are not intended for prioritization.

Item No.	Barrier Highway	Crossing Network Road	Jurisdiction	Interchange Type
1	150, Chippenham Parkway	147, Huguenot Road	Richmond	Cloverleaf
2	I-64	356, Glenside Drive	Henrico	Urban
3	I-64	250, W. Broad Street	Henrico	Cloverleaf
4	I-64	1/301, Chamberlayne and Belvidere	Richmond	Urban
5	I-64	360, Mechanicsville Turnpike	Henrico/ Richmond	Cloverleaf
6	I-64	33, Nine Mile Road	Henrico/ Richmond	Cloverleaf
7	I-64	249, New Kent Highway	New Kent	Cloverleaf
8	I-295	Nuckols Road	Henrico	Cloverleaf
9	I-295	627, Meadowbridge Road	Hanover	Cloverleaf
10	I-295	5, New Market Road	Henrico	Cloverleaf
11	288	6, Patterson Avenue	Goochland	Cloverleaf
12	288	711, Huguenot Trail	Powhatan	Urban
13	288	Lucks Lane	Chesterfield	Urban
14	288	10, Iron Bridge Road	Chesterfield	Cloverleaf
15	150, Chippenham Parkway	60, Midlothian Turnpike	Chesterfield/ Richmond	Cloverleaf
16	76, Powwhite Parkway	60, Midlothian Turnpike	Chesterfield	Cloverleaf
17	76, Powwhite Parkway	Forest Hill Avenue	Richmond	Urban
18	I-95	54, England Street/Patrick Henry Road	Ashland	Cloverleaf

2. Medium High Priority

Item No.	Barrier Highway	Crossing Network Road	Jurisdiction	Interchange Type
1	I-64	250, W. Broad Street	Goochland	Cloverleaf
2	I-64	73, Parham Road	Henrico	Cloverleaf
3	I-64	33, Staples Mill Road	Henrico	Cloverleaf
4	I-64	Laburnum Avenue S.	Henrico	Urban
5	I-295	360, Mechanicsville Turnpike	Hanover	Cloverleaf
6	I-295	60, Williamsburg Road E.	Henrico	Cloverleaf
7	288	250, W. Broad St	Goochland	Urban

Recommended Strategy A-9: Barrier Crossing Improvements, *continued*

2. Medium High Priority, *continued*

<u>Item No.</u>	<u>Barrier Highway</u>	<u>Crossing Network Road</u>	<u>Jurisdiction</u>	<u>Interchange Type</u>
8	288	60, Midlothian Turnpike	Chesterfield	Cloverleaf
9	288	360, Hull Street Road	Chesterfield	Cloverleaf
10	288	145, Chester Road	Chesterfield	Urban
11	150, Chippenham Parkway	683, Forest Hill Avenue	Richmond	Urban
12	150, Chippenham Parkway	360, Hull Street Road	Chesterfield/ Richmond	Cloverleaf
13	150, Chippenham Parkway	10, Iron Bridge Road	Chesterfield	Cloverleaf
14	150, Chippenham Parkway	1, Jefferson Davis Highway	Chesterfield	Cloverleaf
15	76, Powhite Parkway	653, Courthouse Road	Chesterfield	Cloverleaf
16	I-95	623, Sliding Hill Road (old crossing)	Hanover	Urban

3. Medium Priority

<u>Item No.</u>	<u>Barrier Highway</u>	<u>Crossing Network Road</u>	<u>Jurisdiction</u>	<u>Interchange Type</u>
1	I-64	617, Oilville Road	Goochland	Urban
2	I-64	623, Ashland Road	Goochland	Urban
3	I-64	157, Gaskins Road	Henrico	Cloverleaf
4	I-64	106	New Kent	Rural Diamond
5	I-64	155	New Kent	Rural Diamond
6	I-295	33, Staples Mill Road	Henrico	Cloverleaf
7	I-295	Woodman Road	Henrico	Cloverleaf
8	I-295	1, Brook Road	Henrico	Cloverleaf
9	I-295	301, Chamberlayne	Hanover	Cloverleaf
10	I-295	615, Creighton Road	Hanover	Cloverleaf
11	288	Woolridge Road	Chesterfield	Future Interchange
12	288	1, Jefferson Davis Highway	Chesterfield	Cloverleaf
13	150, Chippenham Parkway	686, Jahnke Road	Chesterfield/ Richmond	Urban
14	150, Chippenham Parkway	651, Belmont Road	Chesterfield	Urban
15	76, Powhite Parkway	360, Hull Street Road	Chesterfield	Future Interchange
16	76, Powhite Parkway	604, Genito Road	Chesterfield	Future Interchange
17	76, Powhite Parkway	754, Charter Colony Parkway	Chesterfield	Future Interchange
18	76, Powhite Parkway	686, Jahnke Road	Chesterfield	Urban
19	I-95	73, Parham Road	Henrico	Cloverleaf
20	I-95	10, W. Hundred Road	Chesterfield	Cloverleaf

Recommended Strategy A-9: Barrier Crossing Improvements, *continued*

B. James River Crossing Improvements

Priority	Route Number/Bridge Name	Jurisdiction	Comments
1	522, Michaux Bridge	Goochland/Powhatan	Highway bridge with poor bicycle/pedestrian access.
1	147, Huguenot Bridge	Henrico/Richmond	Sidewalks present on bridge, but no ramps from road shoulders to sidewalks.
1	Manchester Bridge	Richmond	Bicycle/pedestrian access present on bridge, but poor access at each end; most problematic for bicyclists.
1	Ancarrows Landing	Richmond	Proposed location for new crossing—bridge or bicycle/pedestrian ferry
2	150, Willey Bridge	Henrico/Richmond	Highway bridge with no bicycle/pedestrian access; access policy change and physical changes should be considered.
2	161, Nickel Bridge	Richmond	Highway bridge with very poor bicycle/pedestrian access.
2	360, Mayo Bridge	Richmond	Street bridge with poor bike access; slightly better pedestrian access.
2	Dutch Gap	Chesterfield	Proposed location for new crossing—seasonal bicycle and pedestrian ferry
3	288	Goochland/Powhatan	Future demand suggests a crossing in this area will be needed; existing bridge may offer opportunity for a bridge retrofit, like what was done at Belle Isle.
3	156, B. Harrison Bridge	Charles City	Highway bridge with poor bicycle/pedestrian access.

C. Other Waterway and Railroad Crossing Improvements

Priority	Waterway Name	Crossing Location	Jurisdiction	Comments
1	Falling Creek	East End of Providence Road	Chesterfield	New creek crossing needed as a park of a new connector trail.
1	Swift Creek	Many along proposed Swift Creek Greenway	Chesterfield	New creek crossings will be needed as a part of this greenway trail.
1	Chickahominy River	627, Meadowbridge Road	Hanover/ Henrico	Narrow highway bridge, replace with upcoming road widening project.
1	Chickahominy River	5, J. Tyler Highway	Charles City	Highway bridge with poor bicycle/pedestrian access.
2	Appomattox River	600 Bridge	Chesterfield	Old bridge, scheduled for replacement soon; consider retaining old bridge for exclusive bicycle/pedestrian crossing.
2	Appomattox River	36 Bridge	Chesterfield	
2	Pamunkey River	30 & 33	New Kent	
2	Railroads	Crossings of CSX and Norfolk Southern lines along the James River	Richmond	Maintain and improve bicycle/pedestrian access at various locations on both the north and south shorelines.
3	Appomattox River	10 Bridge	Chesterfield	

Appendices



B.3 VDOT Six-Year Improvement Program (FY 2004 - FY 2009) Candidate Projects for Including Bicycle and Pedestrian Improvements

Recommended Strategy C-4 - VDOT Six-Year Improvement Program (FY 2004 - 2009) Funding Strategies

Consider including bicycle and pedestrian improvements as a part of already programmed roadway improvements.

<u>Jurisdiction</u>	<u>Location</u>	<u>Project Type</u>	<u>UPC No.</u>
Ashland	Rte. 1		8652
	Rte. 1		8651
	Rte. 1 & England St.	Intersection	13461
	Rte. 1 & England St.	Intersection	13463
	England St. & Hill Carter Pkwy.	Intersection	14651
Charles City	Route 5		17763
	Rte. 5, Barretts Ferry Br.		T1057
Chesterfield	Rte. 1		62148
	Salem Church Rd.		1489
	Halloway Ave.		50113
	Matoaca Rd.		58657
	Hickory Rd.		52980
	Branders Bridge Rd.		60637
	Rte. 1		15988
	Exter Mill Rd.		16409
	Spring Run Rd.		60641
	Spring Run Rd.		60640
	Spring Run Rd.		60639
	Courthouse Rd.		58641
	Belmont Rd.		17184
	Courthouse Rd.		19066
	Route 10 & Lewis Rd.	Intersection	50017
	Chester Rd & Kingsdale	Intersection	50026
	Courthouse Rd.		58644
	Hull St Rd.		50029

Note: UPC stands for Universal Project Code. The Universal Project Code (UPC) is a number assigned by VDOT to each project at its inception and remains with the project until completion.

Recommended Strategy C-4 - VDOT Six-Year Improvement Program (FY 2004 - 2009) Funding Strategies, *continued*

<u>Jurisdiction</u>	<u>Location</u>	<u>Project Type</u>	<u>UPC No.</u>
Goochland	Broad St. Rd.		52448
	Rte. 522 & Rte. 6	Intersection	18424
Hanover	Cold Harbor & Walnut Gr. Dr.	Intersection	17527
	Pouncey Tract Rd.		4412
	Lee Davis Rd.		58168
	Lewistown Rd. & I-95	Interchange	58928
	Rte. 33 & Rte. 54	Intersection	18948
	Rte. 360		17768
	Rte. 360		13551
	Cold Harbor & Lee Davis Rds.	Intersection	17866
	Pole Green Rd.		58187
	Atlee Station Rd.		11273
	Sliding Hill Rd.	Intersection	16925
	Rte. 360		18963
	Meadowbridge Rd.		17861



Appendices

Recommended Strategy C-4 - VDOT Six-Year Improvement Program (FY 2004 - 2009) Funding Strategies, *continued*

<u>Jurisdiction</u>	<u>Location</u>	<u>Project Type</u>	<u>UPC No.</u>
Henrico	Huguenot Bridge		16519
	Three Chopt Rd.		50529
	Three Chopt Rd.		50525
	Three Chopt Rd.		50528
	Parham Rd. & Homeview	Intersection	52507
	Brook Rd., In Villa Park Area		50021
	Meadowbridge Rd.		18122
	Rte. 360		50022
	Pemberton Rd.		50427
	Laburnum Ave.		16153
New Kent	Rte. 30/33 Eltham Rd.		18204
	234 & Airport Rd.	Intersection	52414
	234 & Emmaus Church	Intersection	56358
Powhatan	Old Buckingham & Rocky Ford	Intersection	19049
	Huguenot Trail		50521
Richmond	Jahnke Rd.		19035
	New Market Rd.		3944,15653
	Commerce Rd.		15958
	Rte. 1		15955
	Hull St. Rd.		15959
	Midlothian Tpk.		15834
	Midlothian Tpk. & Belt Rd.	Intersection	19001
	Rte. 1 & 301		52504
	Commerce Rd.		50023
	Main St. Station Area		16577
	Main St. Station Area		66857
	Main St. Station Area		64219
	Gillies Creek Bridge at Scher Rd.		17777
	Forest Hill Ave.		19036

Policies Checklist

Richmond Regional Bicycle and Pedestrian Plan

May 16, 2002

A policy framework that supports better bicycling and walking conditions involves each level of government and all aspects of land development. This checklist has been developed to help identify “where we are today” with respect to policies in the Richmond region. For the jurisdiction you represent, please check the items that apply (if your jurisdiction does not have a policy or document that addresses a topic, please indicate this):

General Issues

- ☐ Our Comprehensive Plan supports improvements to bicycle and pedestrian mobility.
- ☐ Our Comprehensive Plan expresses support for greenways and/or trails.
- ☐ Our annual budget includes funding for sidewalk improvements.
- ☐ Our annual budget includes funding for trails.
- ☐ Our annual budget includes funding for on-road bikeways.
- ☐ We have completed an ADA Transition Plan which identifies locations needing curb ramps.

Land Development Issues

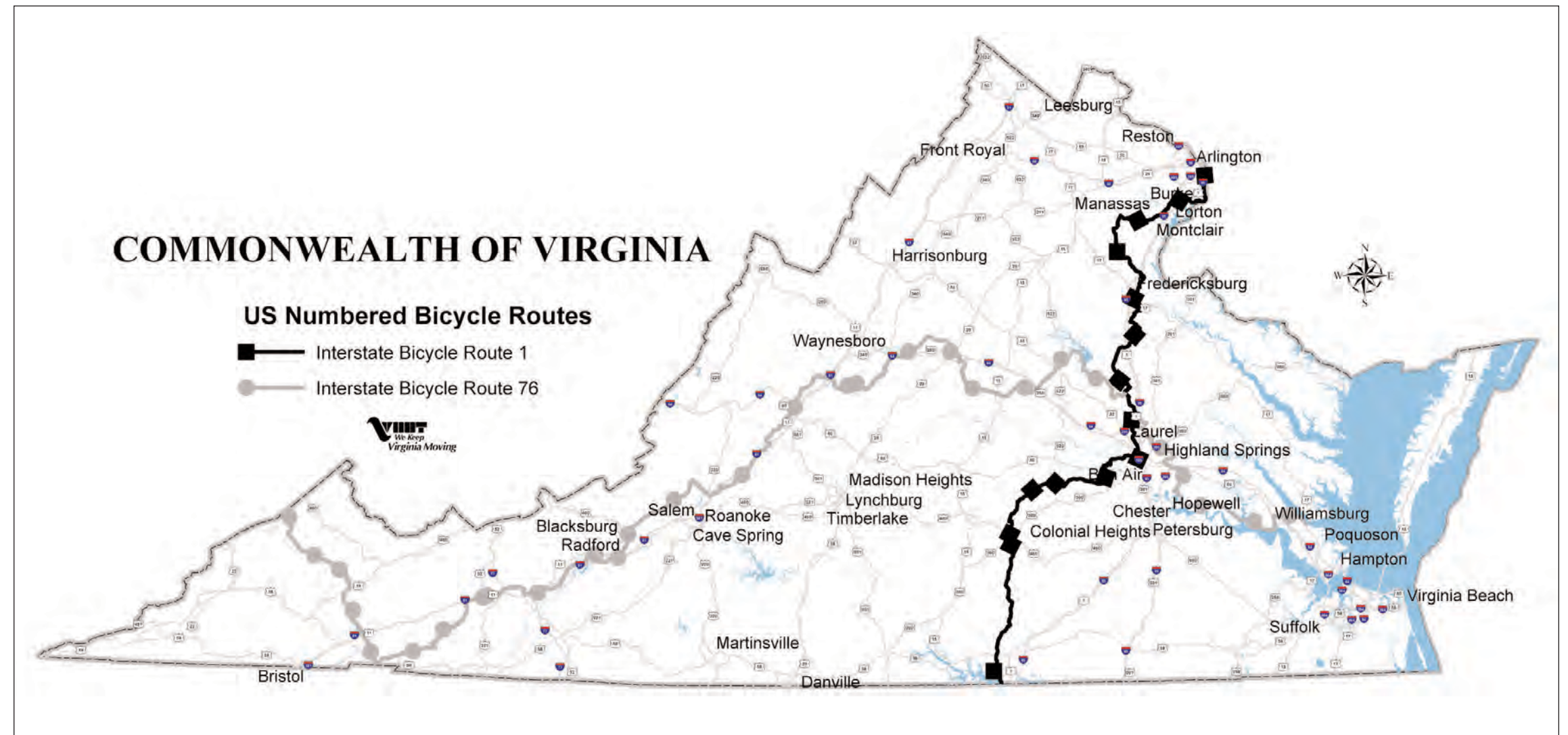
Our zoning ordinance identifies areas where mixed uses are (circle one):

- ☐ Required
- ☐ Permitted
- ☐ Does not allow mixed use
- ☐ Our zoning ordinance permits residential and commercial densities that encourage a compact, pedestrian-friendly design
- ☐ We have a Transit-Oriented Development ordinance
- ☐ We have a Traditional Neighborhood Development ordinance
- ☐ Our residential land development ordinance addresses street design
- ☐ Our residential land development ordinance requires sidewalks
- ☐ Our commercial land development ordinance requires sidewalks on both sides of the road.
- ☐ Our residential land development ordinance discourages homes with garages that face the street.
- ☐ Our commercial lot development standards require on-site (inter-parcel) connections
- ☐ Our commercial lot development standards require pedestrian and/or bicycle connections to adjacent developments and residential areas.
- ☐ Our parking ordinance allows for side lot and rear lot parking in lieu of front lot parking.
- ☐ Our parking ordinance includes a requirement to install bike racks



Appendices

C.2 Interstate Bicycle Routes 1 and 76



Virginia Department of Transportation
Policy for Integrating Bicycle and Pedestrian Accommodations

1. Introduction

Bicycling and walking are fundamental travel modes and integral components of an efficient transportation network. Appropriate bicycle and pedestrian accommodations provide the public, including the disabled community, with access to the transportation network; connectivity with other modes of transportation; and independent mobility regardless of age, physical constraints, or income. Effective bicycle and pedestrian accommodations enhance the quality of life and health, strengthen communities, increase safety for all highway users, reduce congestion, and can benefit the environment. Bicycling and walking are successfully accommodated when travel by these modes is efficient, safe, and comfortable for the public. A strategic approach will consistently incorporate the consideration and provision of bicycling and walking accommodations into the decision-making process for Virginia’s transportation network.

2. Purpose

This policy provides the framework through which the Virginia Department of Transportation will accommodate bicyclists and pedestrians, including pedestrians with disabilities, along with motorized transportation modes in the planning, funding, design, construction, operation, and maintenance of Virginia’s transportation network to achieve a safe, effective, and balanced multimodal transportation system.

For the purposes of this policy, an accommodation is defined as any facility, design feature, operational change, or maintenance activity that improves the environment in which bicyclists and pedestrians travel. Examples of such accommodations include the provision of bike lanes, sidewalks, and signs; the installation of curb extensions for traffic calming; and the addition of paved shoulders.

3. Project Development

The Virginia Department of Transportation (VDOT) will initiate all highway construction projects with the presumption that the projects shall accommodate bicycling and walking. Factors that support the need to provide bicycle and pedestrian accommodations include, but are not limited to, the following:

- project is identified in an adopted transportation or related plan
- project accommodates existing and future bicycle and pedestrian use
- project improves or maintains safety for all users
- project provides a connection to public transportation services and facilities
- project serves areas or population groups with limited transportation options
- project provides a connection to bicycling and walking trip generators such as employment, education, retail, recreation, and residential centers and public facilities
- project is identified in a Safe Routes to School program or provides a connection to a school
- project provides a regional connection or is of regional or state significance
- project provides a link to other bicycle and pedestrian accommodations

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- project provides a connection to traverse natural or man-made barriers
- project provides a tourism or economic development opportunity

Project development for bicycle and pedestrian accommodations will follow VDOT’s project programming and scheduling process and concurrent engineering process. VDOT will encourage the participation of localities in concurrent engineering activities that guide the project development.

3.1 Accommodations Built as Independent Construction Projects

Bicycle and pedestrian accommodations can be developed through projects that are independent of highway construction, either within the highway right-of-way or on an independent right-of-way. Independent construction projects can be utilized to retrofit accommodations along existing roadways, improve existing accommodations to better serve users, and install facilities to provide continuity and accessibility within the bicycle and pedestrian network. These projects will follow the same procedures as those for other construction projects for planning, funding, design, and construction. Localities and metropolitan planning organizations will be instrumental in identifying and prioritizing these independent construction projects.

3.2 Access-Controlled Corridors

Access-controlled corridors can create barriers to bicycle and pedestrian travel. Bicycling and walking may be accommodated within or adjacent to access-controlled corridors through the provision of facilities on parallel roadways or physically separated parallel facilities within the right-of-way. Crossings of such corridors must be provided to establish or maintain connectivity of bicycle and pedestrian accommodations.

3.3 Additional Improvement Opportunities

Bicycle and pedestrian accommodations will be considered in other types of projects. Non-construction activities can be used to improve accommodations for bicycling and walking. In addition, any project that affects or could affect the usability of an existing bicycle or pedestrian accommodation within the highway system must be consistent with state and federal laws.

3.3.1 Operation and Maintenance Activities

Bicycling and walking should be considered in operational improvements, including hazard elimination projects and signal installation. Independent operational improvements for bicycling and walking, such as the installation of pedestrian signals, should be coordinated with local transportation and safety offices. The maintenance program will consider bicycling and walking so that completed activities will not hinder the movement of those choosing to use these travel modes. The maintenance program may produce facility changes that will enhance the environment for bicycling and walking, such as the addition of paved shoulders.

3.3.2 Long Distance Bicycle Routes

Long distance bicycle routes facilitate travel for bicyclists through the use of shared lanes, bike lanes, and shared use paths, as well as signage. All projects along a long distance route meeting the criteria for an American Association of State Highway and Transportation Officials

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(AASHTO) or *Manual on Uniform Traffic Control Devices* (MUTCD) approved numbered bicycle route system should provide the necessary design features to facilitate bicycle travel. Independent construction projects and other activities can be utilized to make improvements for existing numbered bicycle routes. Consideration should be given to facilitating the development of other types of long distance routes.

3.3.3 Tourism and Economic Development

Bicycling and walking accommodations can serve as unique transportation links between historic, cultural, scenic, and recreational sites, providing support to tourism activities and resulting economic development. Projects along existing or planned tourism and recreation corridors should include bicycle and pedestrian accommodations. In addition, the development of independent projects to serve this type of tourism and economic development function should be considered and coordinated with economic development organizations at local, regional, and state levels, as well as with other related agencies. Projects must also address the need to provide safety and connectivity for existing and planned recreational trails, such as the Appalachian Trail, that intersect with the state's highway system.

3.4 Exceptions to the Provision of Accommodations

Bicycle and pedestrian accommodations should be provided except where one or more of the following conditions exist:

- scarcity of population, travel, and attractors, both existing and future, indicate an absence of need for such accommodations
- environmental or social impacts outweigh the need for these accommodations
- safety would be compromised
- total cost of bicycle and pedestrian accommodations to the appropriate system (i.e., interstate, primary, secondary, or urban system) would be excessively disproportionate to the need for the facility
- purpose and scope of the specific project do not facilitate the provision of such accommodations (e.g., projects for the Rural Rustic Road Program)
- bicycle and pedestrian travel is prohibited by state or federal laws

3.5 Decision Process

The project manager and local representatives will, based on the factors listed previously in this section, develop a recommendation on how and whether to accommodate bicyclists and pedestrians in a construction project prior to the public hearing. The district administrator should confirm this recommendation prior to the public hearing. Public involvement comments will be reviewed and incorporated into project development prior to the preparation of the design approval recommendation. When a locality is not in agreement with VDOT's position on how bicyclists and pedestrians will or will not be accommodated in a construction project, the locality can introduce a formal appeal by means of a resolution adopted by the local governing body. The resolution must be submitted to the district administrator to be reviewed and considered prior to the submission of the design approval recommendation to the chief engineer for program development. Local resolutions must be forwarded to the chief engineer for program development for consideration during the project design approval or to the Commonwealth

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Transportation Board for consideration during location and design approval, if needed for a project. The resolution and supporting information related to the recommendation must be included in the project documentation.

The decisions made by VDOT and localities for the provision of bicycle and pedestrian travel must be consistent with state and federal laws regarding accommodations and access for bicycling and walking.

4. Discipline Participation in Project Development

VDOT will provide the leadership to implement this policy. Those involved in the planning, funding, design, construction, operation, and maintenance of the state's highways are responsible for effecting the guidance set forth in this policy. VDOT recognizes the need for interdisciplinary coordination to efficiently develop, operate, and maintain bicycle and pedestrian accommodations.

Procedures, guidelines, and best practices will be developed or revised to implement the provisions set forth in this policy. For example, objective criteria will be prepared to guide decisions on the restriction of bicycle and pedestrian use of access-controlled facilities. VDOT will work with localities, regional planning agencies, advisory committees, and other stakeholders to facilitate implementation and will offer training or other resource tools on planning, designing, operating, and maintaining bicycle and pedestrian accommodations.

4.1 Planning

VDOT will promote the inclusion of bicycle and pedestrian accommodations in transportation planning activities at local, regional, and statewide levels. These planning activities include, but are not limited to, corridor studies, small urban studies, regional plans, and the statewide multimodal long-range transportation plan. To carry out this task, VDOT will coordinate with local government agencies, regional planning agencies, and community stakeholder groups. In addition, VDOT will coordinate with the Virginia Department of Rail and Public Transportation (VDRPT) and local and regional transit providers to identify needs for bicycle and pedestrian access to public transportation services and facilities.

4.2 Funding

Highway construction funds can be used to build bicycle and pedestrian accommodations either concurrently with highway construction projects or as independent transportation projects. Both types of bicycle and pedestrian accommodation projects will be funded in the same manner as other highway construction projects for each system (i.e., interstate, primary, secondary, or urban). VDOT's participation in the development and construction of an independent project that is not associated with the interstate, primary, secondary, or urban systems will be determined through a negotiated agreement with the locality or localities involved.

Other state and federal funding sources eligible for the development of bicycle and pedestrian accommodations may be used, following program requirements established for these sources.

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These sources include, but are not limited to, programs for highway safety, enhancement, air quality, congestion relief, and special access.

VDOT may enter into agreements with localities or other entities in order to pursue alternate funding to develop bicycle and pedestrian accommodations, so long as the agreements are consistent with state and federal laws.

4.3 Design and Construction

VDOT will work with localities to select and design accommodations, taking into consideration community needs, safety, and unique environmental and aesthetic characteristics as they relate to specific projects. The selection of the specific accommodations to be used for a project will be based on the application of appropriate planning, design, and engineering principles. The accommodations will be designed and built, or installed, using guidance from VDOT and AASHTO publications, the MUTCD, and the *Americans with Disabilities Act Accessibility Guidelines (ADAAG)*. Methods for providing flexibility within safe design parameters, such as context sensitive solutions and design, will be considered.

During the preparation of an environmental impact statement (EIS), VDOT will consider the current and anticipated future use of the affected facilities by bicyclists and pedestrians, the potential impacts of the alternatives on bicycle and pedestrian travel, and proposed measures, if any, to avoid or reduce adverse impacts to the use of these facilities by bicyclists and pedestrians.

During project design VDOT will coordinate with VDRPT to address bicyclist and pedestrian access to existing and planned transit connections.

Requests for exceptions to design criteria must be submitted in accordance with VDOT's design exception review process. The approval of exceptions will be decided by the Federal Highway Administration or VDOT's Chief Engineer for Program Development.

VDOT will ensure that accommodations for bicycling and walking are built in accordance with design plans and VDOT's construction standards and specifications.

4.4 Operations

VDOT will consider methods of accommodating bicycling and walking along existing roads through operational changes, such as traffic calming and crosswalk marking, where appropriate and feasible.

VDOT will work with VDRPT and local and regional transit providers to identify the need for ancillary facilities, such as shelters and bike racks on buses, that support bicycling and walking to transit connections.

VDOT will enforce the requirements for the continuance of bicycle and pedestrian traffic in work zones, especially in areas at or leading to transit stops, and in facility replacements in accordance with the MUTCD, *VDOT Work Area Protection Manual*, and *VDOT Land Use*

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Permit Manual when construction, utility, or maintenance work, either by VDOT or other entities, affects bicycle and pedestrian accommodations.

VDOT will continue to research and implement technologies that could be used to improve the safety and mobility of bicyclists and pedestrians in Virginia's transportation network, such as signal detection systems for bicycles and in-pavement crosswalk lights.

4.5 Maintenance

VDOT will maintain bicycle and pedestrian accommodations as necessary to keep the accommodations usable and accessible in accordance with state and federal laws and VDOT's asset management policy. Maintenance of bike lanes and paved shoulders will include repair, replacement, and clearance of debris. As these facilities are an integral part of the pavement structure, snow and ice control will be performed on these facilities.

For sidewalks, shared use paths, and bicycle paths built within department right-of-way, built to department standards, and accepted for maintenance, VDOT will maintain these bicycle and pedestrian accommodations through replacement and repair. VDOT will not provide snow or ice removal for sidewalks and shared use paths. The execution of agreements between VDOT and localities for maintenance of such facilities shall not be precluded under this policy.

5. Effective Date

This policy becomes effect upon its adoption by the Commonwealth Transportation Board on March 18, 2004, and will apply to projects that reach the scoping phase after its adoption.

This policy shall supersede all current department policies and procedures related to bicycle and pedestrian accommodations. VDOT will develop or revise procedures, guidelines, and best practices to support and implement the provisions set forth in this policy, and future departmental policies and procedural documents shall comply with the provisions set forth in this policy.