

# Bike

# Blacksburg



Town of Blacksburg  
Bicycle Master Plan  
2015

**Preface and Acknowledgements**

Developing the Blacksburg Bicycle Master Plan (“Plan”) was no small effort, and this document is a rich resource and foundation indicating the way for future bicycle accommodations in the Town of Blacksburg (“Town”). The high quality of the effort can be seen in the following pages. In January 2011, the Town of Blacksburg’s Greenway/Bikeway/Sidewalk Corridor Advisory Committee initiated the volunteer effort that went into this Plan. No one would have imagined the extent of time and energy committed by over 100 volunteers, Town staff, and interns with limited financial resources. Support for this Plan has been enormous. Volunteers have contributed to the formulation of the vision, collected data on street conditions, analyzed those findings, identified infrastructure options and routes, and drafted chapters. As a result, the original plan established well-considered standards for the continual improvement of alternative transportation options for all ages and styles of bicyclists and pedestrians. Two individuals were responsible for coordinating well over 2500 hours of volunteer time; Elizabeth Lohman, citizen leader, and Priscilla Cygielnik, former Assistant Director of Public Works. The following committees contributed to making this plan a success. A special thanks to Adam Lind, a graduate student in Urban Affairs and Planning from Virginia Tech, for his extraordinary efforts in providing maps and content for this plan. The efforts of the Corridor Committee and the citizen’s subcommittee have provided the basis for the recommendations contained in this Plan and are documented in the March 16, 2012 Report to Town Staff.

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### Executive Summary

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The Town of Blacksburg, Virginia is recognized nationally as one of the best places to live. Notable characteristics often cited include the size of the Town, the Huckleberry Trail, bike lanes and good public transportation. The bicycling culture is strong in Blacksburg.

The Town of Blacksburg's 1996-2046 Comprehensive Plan and the Town's zoning code have served as the guiding documents for implementation of bicycle-related infrastructure. Specifically, the Paths to the Future Map, contained in the Comprehensive Plan's Land Use Chapter, has been used as the primary planning document. The map was moved to the Land Use chapter of the Comprehensive Plan in 2012 as part of the Land Use Map Series to accentuate its importance in future land use planning.

The Paths to the Future Map is a conceptual guide to the future bikeways network envisioned for the Town. However, the map lacks the necessary detail to effectively implement a bicycle network that embodies the vision of the Town's citizens.

In 2009, the Town of Blacksburg's Greenway/Bikeway/Sidewalk Corridor Advisory Committee ("Corridor Committee") identified the need for a bicycle master plan to complement the Town's Comprehensive Plan and to guide the expansion of the bicycle network and facilities. After evaluating resources for hiring professional consulting services it was determined that the planning process would be a community grass roots effort.

This Plan was developed with extensive input from the public and key community stakeholders. The planning process included formation of a subcommittee by open invitation to the community, bicycle counts, electronic bicycle route surveys, comprehensive survey of existing conditions, and public meetings for draft master plan.

The information contained herein is the result of this multi-year effort. The Blacksburg Bicycle Master Plan 2015 contains the following sections:

- 1.0 Introduction
- 2.0 Existing Conditions
- 3.0 Needs Analysis
- 4.0 Proposed Network Routes
- 5.0 Design Guidelines
- 6.0 Infrastructure Recommendations
- 7.0 Non-Infrastructure Recommendations

Below is an overview of information presented within the Plan.

#### Vision of the Plan

The vision of the Bicycle Master Plan is to create a bicycle friendly community.

We envision Blacksburg as a place where:

- Bicycling and walking become primary choices for local trips.
- Environmental, social and economic sustainability are encouraged.
- Laws and ordinances encourage alternative forms of transportation.
- Alternative transportation options induce a culture that reinforces a calm and courteous lifestyle.

## **Existing Conditions**

The existing conditions section of the plan includes information on crash data, bicycle counts, online bike route survey, physical survey of existing roadway conditions, and public input.

## **Proposed Bikeway Network Improvements – Infrastructure Recommendations**

The bikeway recommendations include multiple types of infrastructure improvements. The specific improvements are identified in the maps and matrices in Section 6.0 and illustrated in the Design Guidelines in Appendix A. The bikeway recommendations include designations of routes for cross-town connections and connections to popular destinations. The routes will be designated by pavement markings and signs, which will be incorporated into a way-finding system. The recommendations for network improvements include multiple types of bicycle facilities. In many cases, further study may be necessary prior to implementation in order to determine the best treatment for different locations within Town. These recommendations are proposed with a bicycle-centric view, intentionally giving less consideration to other modes of transportation and recreation. Therefore, bicycle needs may need to be balanced with other identified needs when additional analysis is completed.

## **Non-infrastructure Recommendations**

The master plan contains recommendations that address the Five E's of the League of American Bicyclists' Bicycle Friendly Communities:

- Engineering (through Proposed Bikeway Network Improvements)
- Education
- Encouragement
- Enforcement
- Evaluation & Planning

## **Implementation**

Further coordination between the Town's Planning, Engineering & GIS, and Public Works departments will be necessary to ensure implementation of proposed network improvements and non-infrastructure recommendations is successful. The recommendations should be reviewed and updated regularly as conditions and needs change.

## 1.0 Introduction

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The Town of Blacksburg's Bicycle Master Plan is intended to serve as the guiding document for the development of an integrated network of bicycle facilities and supporting programs, linking neighborhoods and activity centers throughout the Town. The network will not only make bicycling a more viable mode of transportation but will contribute to enhanced quality of life for residents and visitors.

The Plan will support the goals adopted in the Town's 1996-2046 Comprehensive Plan, Climate Action Plan and the New River Valley Metropolitan Planning Organization's (NRVMPO) Bicycle and Pedestrian Master Plan 2014, as well as other plans and policies adopted by the Town and regional partners, by creating an environment that supports bicycling for transportation and recreation, reduces vehicle trips, and supports active lifestyles. This plan supports both active transportation and alternative transportation. Active transportation includes non-motorized transport, primarily biking and walking. Alternative transportation encompasses active transportation in the form of non-motorized transport as well as motorized transportation other than single occupancy vehicles, primarily transit and carpooling. Active transportation is frequently linked to key elements of sustainability such as enhanced community health, improved social equity, and reduced greenhouse gas levels.

This Plan includes an inventory of the existing network of streets and bikeways, a bicycle lane gap analysis, a proposed bike route system, and an implementation plan. The Plan identifies optimal bicycling routes, preferred roadway treatments, design guidelines, and current best practices. It serves as an important reference document that will ensure that bicycle facilities are considered during routine road maintenance, reconstruction, construction, and land development. This Plan also contains recommendations for programs and policies that will support bicycling, which will enable Blacksburg to be recognized as one of the most bicycle-friendly towns in the country.

This Plan was developed with extensive input from the community and seeks to meet Blacksburg's vision for a pleasant, enjoyable and safe place to bicycle. The primary focus of the Plan is a series of routes and facility improvements for cyclists more comfortable riding on the street. Future consideration should be given to a bikeway system that is geared towards children and riders seeking a more secure off-street system. With this vision in mind, the Plan is bicycle-centric intentionally giving less consideration to other modes of transportation and recreation. The efforts of the Corridor Committee and the citizen's subcommittee have provided the basis for the recommendations contained in this Plan and are documented in the March 16, 2012 Report to Town Staff.

### 1.1 Vision and Goals

The vision of the Blacksburg Bicycle Master Plan is to create a bicycle friendly community, expand the existing bikeway network, complete network gaps, and provide greater connectivity while educating and encouraging bicycling. This Plan provides four broad visions and supporting goals for the improvement of the bicycling environment in Blacksburg.

#### **We envision Blacksburg as a town where:**

##### **Bicycling and walking become primary choices for local trips.**

- Bicycling becomes a fundamental pillar of Blacksburg's transportation system.
- Multimodal transportation options are provided in complete streets design.
- Bicycle lanes follow main routes where shops, mode transfer points and people exist.
- The bicycle network is designed to provide confidence to all levels of bicyclists.
- Residents have access to safe, pleasant and continuous bicycle corridors taking to them desired destinations.
- The bicycle network serves all ages and abilities of users for: shopping, dining, working, socializing, exercising or simply the enjoying the outdoors.

### Environmental, social and economic sustainability are encouraged.

- The transportation system reduces Blacksburg's carbon footprint and congestion, improves air quality, and enhances public health.
- An incentive program encourages alternative modes of commuting.
- Blacksburg becomes a bicycling destination; raising Town revenues and business incomes.
- The built environment encourages the selection of bicycling and walking as more attractive modes of transportation for trips of three miles or less.
- Blacksburg's transportation grid is re-imagined to welcome and integrate pedestrians, bicyclists, mass transit, freight use, and sustainable landscaping.
- Blacksburg becomes a center for alternative transportation research, teaching, and learning in sustainable urban planning, design, architecture and engineering.
- A funding mechanism supports alternative transportation.
- Bike commute days continue to increase.

### Laws and ordinances encourage alternative forms of transportation.

- Established laws and policies encourage bicycle and pedestrian safety, comfort, and connectivity.
- Law enforcement encourages bicycling and walking as a principle form of transportation.
- Enforcement practices contribute to the safety and attractiveness of bicycling. These practices include bicycle patrols.
- Blacksburg recognizes the distinctive nature of bicycles as vehicles.

### Alternative transportation options induce a culture that reinforces a calm and courteous lifestyle.

- Bicycles and pedestrians increase local courtesy and friendliness.
- Infrastructure and accommodations ensure that walking and bicycling are the norm in a downtown commercial and recreations center.
- Visitors to Town are afforded full access to alternative transport (bus, bike, pedestrian) for all their needs.

## 1.2 Objective: Bicycle Friendly Community Designation

A key objective of this Plan is achieving the League of American Bicyclists' ([www.bikeleague.org](http://www.bikeleague.org)) bronze-level Bicycle Friendly Community (BFC) designation within two to three years following adoption of the Plan. Following designation, the Town should continue to strive to achieve higher levels of BFC designation. Further information on achieving this objective is included in the section regarding Non-Infrastructure Recommendations. The Plan also includes recommendations categorized by "The Five E's" that characterize a bicycle friendly community as listed below:

- *Engineering*: Creating safe and convenient places to ride and park.
- *Education*: Giving people of all ages and abilities the skills and confidence to ride.
- *Encouragement*: Creating a strong bike culture that welcomes and celebrates bicycling.
- *Enforcement*: Ensuring safe roads for all users.
- *Evaluation & Planning*: Planning for bicycling as a safe and viable transportation option.

## 1.3 Planning Process

In 2009, the Corridor Committee identified the need for a bicycle master plan to complement the Town's Comprehensive Plan and to guide the expansion of the bicycle network.

This Plan was developed with extensive input from the public and key community stakeholders. The planning process included formation of the Bicycle Master Plan Subcommittee (“the Subcommittee”) by open invitation to the community. The Subcommittee met at least once per month over a 16-month period.

The decision-making process was supported by data collected through several efforts by the New River Valley Bicycle Association (NRVBA), the Virginia Tech Center for Geospatial & Information Technology (CGIT), and the Virginia Tech Department of Urban Affairs & Planning.

- *Bicycle Counts.* The NRVBA conducted bicycle counts at various locations in 2009 and 2011. The counts took place during a 12-hour period on a Wednesday in September and a four-hour period on the following Saturday.
- *Electronic bicycle route surveys.* CGIT created an online interactive web survey where bicyclists could plot their preferred routes for trips around town. The survey was opened in 2009 and 2011 for a two-month period each time. Over two hundred responses were received.
- *Comprehensive survey of existing conditions.* In 2010, Dr. Diane Zahm lead a Virginia Tech undergraduate class in a comprehensive survey of existing roadway conditions, documenting features that relate to a bicyclist’s travel experience. The class also pulled together recommendations for bicycle master plan elements.

Over 70 volunteers and 2000 hours of volunteer time resulted in the Report on the Draft Bicycle Master Plan dated March 16, 2012 by the Subcommittee. This Plan is informed by the Subcommittee’s report and the original data has been retained for reference.

Following the completion of the draft Bicycle Master Plan, the Plan was presented to Town Council in summer 2015 with community outreach beginning in the fall. The Plan will be incorporated into the 2016 cycle of Comprehensive Plan amendments.

## 2.0 Existing Conditions

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One of the first tasks in the creation of a bicycle master plan is to complete an inventory of existing conditions. The initial efforts to inventory the Town's existing network of streets and bikeways began with work performed by Virginia Tech students enrolled in an Urban Affairs and Planning course. The students were tasked with assessing the bicycle conditions on every street segment within Town limits. The Subcommittee field verified the data collected by these students and corrected errors in the data set. Between initial data assessment and final Plan preparation, it was necessary for Town staff to update some of the data.

### 2.1 Existing Road Conditions

As of 2014, the Town's internal street network consists of approximately 350 lane-miles of local, collector and arterial streets.

- **Local streets** provide direct access to adjacent land and make up approximately 75.6 percent (or 264.8 lane miles) of the total street mileage while carrying a relatively small proportion of the vehicle miles traveled. These streets serve primarily residential and neighborhood traffic. Speed limits on these streets in the Town are 25 miles per hour, and may be posted as low as 15 miles per hour in areas with high pedestrian activity or hazardous terrain.
- **Collector roads** connect the local street system to the arterial roads and thus carry a higher level of traffic than local streets. These roads comprise approximately 11 percent (or 38.2 miles) of the Town's total street mileage. Collector roads may provide direct access to adjacent land. However, they primarily route traffic from neighborhoods to major employment and commercial centers. Speed limits on these roads range from 25 to 35 miles per hour.
- **Arterial roads** are major routes for traffic movement within an urban area and serve traffic movement to and from interstates. These roads make up approximately 13.4 percent (or 47.4 miles) of the Town's total street mileage. Arterial roads connect the principal traffic generators within the urban area, as well as major rural routes. Speed limits on these roads range from 25 to 55 miles per hour in Town. Main Street and Prices Fork Road, traversing Town North/South and East/West respectively, are two of Blacksburg's major arterial roads.

Additional information regarding existing road conditions and the classification system can be found in the Transportation Chapter of the Comprehensive Plan.

### 2.2 Existing Bikeways

The information below applies to existing bicycle facilities along designated routes as defined in Section 4.0 Proposed Network Routes. While bicycle facilities exist on non-designated routes, this Plan focuses on improvements for the Designated Routes as identified in Section 4.0. As noted in Sections 3.0 and 4.0, these designated routes were user-identified where cyclists prefer to ride. The maps following this section depict existing bicycle facilities including multi-purpose trail, bicycle lanes, sharrows, contraflow lanes, and share the road signage and existing Blacksburg Transit bus stop locations.

#### 2.2.1 On-Street Facilities

Currently, bicyclists use wide travel lanes, shoulders and bike lanes as they travel around town. Bike lanes are the most common bicycle facility provided on designated routes in Town. A standard bike lane measuring 5 feet can be found on approximately 1.96 miles of street. Historical bicycle lanes (less than five feet in width) currently account for 10.53 miles with approximately 3 miles of those bike lanes on Virginia Tech's campus. Existing and



proposed on-street facilities are constrained by right-of-way limitations. Bicycle lane mileage is calculated using the summation of one-way bicycle lane segments to allow for equivalent comparison with vehicle lane miles.

**2.2.2. Off-Street Facilities**

Off-street bicycle facilities in Blacksburg consist of public and private multi-use paths that include the Huckleberry Trail. Public multi-purpose trails are found within Heritage Community Park, Shenandoah Bike Trail and Park, along sections of Givens Lane, North Main Street, Prices Fork Road, and Patrick Henry Road. Privately maintained multi-purpose trails exist in the Hethwood, Woodbine, and Wyatt Farms neighborhoods. Virginia Tech also has an extensive network of multi-purpose paths. The Town estimates that these multi-purpose paths provide approximately 115 miles of off-street bikeways. Multi-purpose trails along designated routes total approximately 17.11 miles. Multi-purpose trail mileage is calculated using the summation of all trail segments regardless of width.

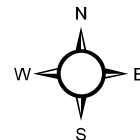
Table 2-1 Existing Bikeway Mileage on Designated Routes

Facility Type	Length (miles)
Multi-Purpose Trail	17.11
Bike Lane	1.96
Shared Lane Marking (Sharrow)	0.35
Share the Road Signage	1.12
Contraflow Lane	0.35

**2.3 Existing Bicycle Parking**

The Blacksburg Code of Ordinances contains requirements for bicycle parking in Section 5213 of the Zoning Ordinance. The Town recently completed a Downtown Bicycle Parking Study to inventory and assess existing bicycle parking conditions in the downtown and identify opportunities for installing additional bicycle parking. Suggested revisions to the Town’s bicycle parking requirement are included in Section 7.5.1.

# Existing Blacksburg Bike and Trail Map



## Legend

- Designated Route
- Multi-Use Trail
- Bike Lane
- Sharrow
- Contra-Flow Lane
- Share-the-Road
- VT Campus & Properties
- US HWY 460 Bypass
- Mild Slope
- Steep Slope

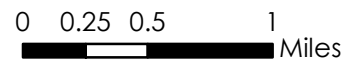
## Reference Points

- ① Heritage Community Park
- ② Blacksburg Community Center
- ③ University City Mall
- ④ Future Multi-Modal Transit Facility
- ⑤ Center for the Arts
- ⑥ Drillfield
- ⑦ Farmers Market
- ⑧ First and Main Shopping Center
- ⑨ Corporate Research Center

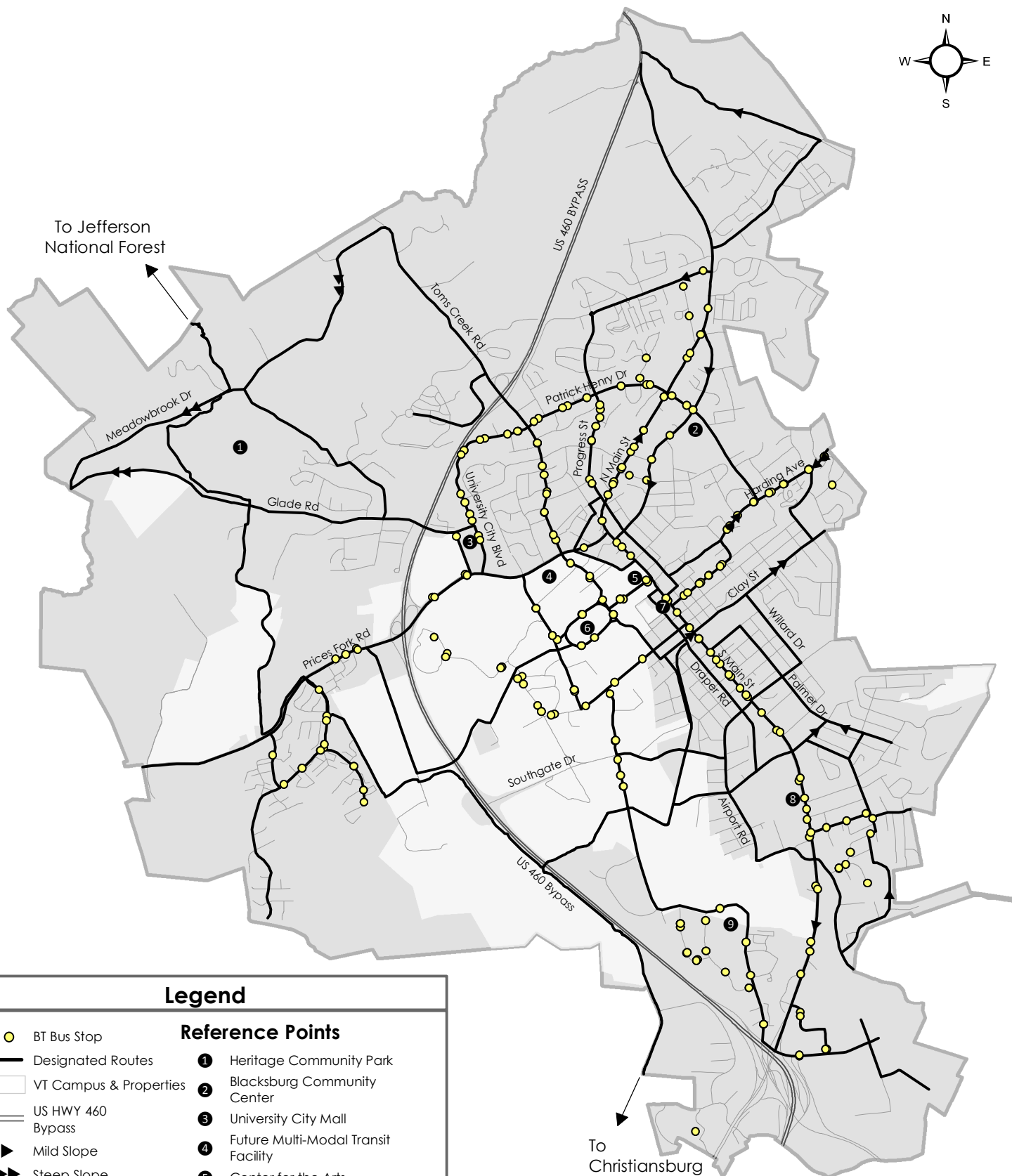
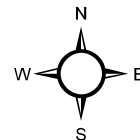
Date: August 2015

Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



# Blacksburg Transit Bus Stops



## Legend

- BT Bus Stop
- Designated Routes
- VT Campus & Properties
- US HWY 460 Bypass
- Mild Slope
- Steep Slope

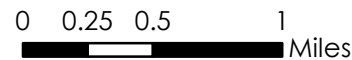
## Reference Points

- 1** Heritage Community Park
- 2** Blacksburg Community Center
- 3** University City Mall
- 4** Future Multi-Modal Transit Facility
- 5** Center for the Arts
- 6** Drillfield
- 7** Farmers Market
- 8** First and Main Shopping Center
- 9** Corporate Research Center

Date: August 2015

Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



## 2.4 Existing Barriers

Bicyclists face many barriers to confidently and safely bicycle through Blacksburg. The following list represents barriers identified during community meetings, through the Virginia Tech Center for Geospatial Information & Technology Bike Survey, from field observations, and through research. The goals and strategies in this plan aim to mitigate or eliminate these barriers.

1. High number of accidents: Areas with high number of accidents indicate a poor design and require a heightened awareness to pass through safely.
2. Intersection crossings: At intersections, cars making turns fail to yield the right-of-way. Passing through a series of traffic signals requires additional effort for the cyclist to speed up again.
3. Crossing arterials: Riding across major roads (including making turns across) is dangerous; particularly when car speeds are high enough that a large gap in traffic is required to have enough time to cross.
4. Signal timing and actuation: A traffic signal that does not detect bicycles requires a cyclist to either wait for a car to trip the actuator or to treat the light as malfunctioning. This means entering the intersection against a red light.
5. Driveway connections: Driveways are dangerous due to cars pulling or backing out into the cyclist's path without seeing.
6. Poor lighting: In areas with poor lighting, there are problems with bicycles being visible to other vehicles.
7. No bike facilities: A lack of bicycle lanes requires a cyclist to ride with motor vehicle traffic while keeping a safe distance from the doors of parked cars, debris and poor pavement near the edge of the road, and other obstacles. For substandard width lanes (lanes that are too narrow for a car to safely pass the bicycle), bicyclists should take the lane<sup>1</sup>.
8. No parking: A lack of bicycle racks near a destination requires a search for a safe alternative for securing the bicycle.
9. Lack of connections or continuity of facilities: Bicycle lanes that end abruptly are confusing for both the cyclist and motor vehicle operator; particularly at intersections. Discontinuities in facilities can make it difficult for a cyclist to plan a route.
10. Poor surface conditions: Potholes, uneven pavement, patchwork repairs, loose gravel, and debris can easily cause a crash or damage the bicycle wheels or tires. Post-winter plowing gravel accumulation along the roadway is especially dangerous.
11. Faded or non-compliant markings: Lane markings that are missing or incorrect can be confusing and can lead to dangerous interactions. In many situations, non-compliant markings can be more dangerous than no markings at all. Faded markings can also indicate areas where cars usually drive in the bicycle lane.
12. Edge drops: Abrupt changes in pavement in the direction of the bicycle's movement can easily cause a crash; particularly where asphalt of the road meets a cement gutter or drops to the ditch.
13. Sidewalk discontinues: For cyclists who are more comfortable riding on a sidewalk or for children who are not experienced enough to ride in the road; when a sidewalk ends they must continue on the road with car traffic.
14. On-street parking: Cars parked next to the roadway require a cyclist to ride far enough away from them to avoid running into a door if one is opened suddenly. Riding too close to the cars and suddenly swerving to miss an opening door can be dangerous if a car is overtaking.
15. Sharp turns: Sharp turns can be difficult to navigate at speed; particularly if there are debris in the turn. Sharp turns with limited sight distance can also be dangerous.
16. Vehicular speed: Large differences in speed between the bicycle and motor vehicle traffic can be dangerous; particularly where most motor vehicles are speeding.
17. Steep grades: Climbing a steep grade requires much more energy than riding on a level road and leads to a larger mismatch in speed with car traffic. Many cyclists will choose a considerably longer but more level path to go around a steep climb. Descending a steep grade can be dangerous; particularly if there are debris, turns, or intersections. Bike lanes provide important space on uphill grades. Sharrows can be appropriate for downhill grades if lane widths are restricted.

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<sup>1</sup> **Take the lane** is a cycling term where the cyclist may use the full travel lane when necessary for safety.

18. Traffic volume: When there is a high volume of auto traffic, drivers can be impatient or not looking for bicycles. Maneuvering to make turns, for example crossing lanes to make a left turn from a bike lane in traffic, requires considerable skill and caution.
19. No shoulders: Roads with no shoulders require the cyclist to travel in the traffic lane; which requires considerable caution when there is a high traffic volume, cars are speeding, or both.
20. Long crosswalk distances: Bicyclists crossing wide streets with multiple lanes have a difficult time getting across safely if there is considerable traffic.
21. Debris in road: Loose debris in the road can cause a cyclist to suddenly lose balance or to swerve into passing car traffic to avoid the debris. Debris near the edge of the road are especially a problem in the wintertime after the roads have been treated for snow.
22. Cul-de-sacs: Planning a route through areas with many cul-de-sacs can be difficult; particularly if there are a limited number of through-routes that carry most of the traffic.

### 3.0 Needs Analysis

Blacksburg’s bicycling population is highly diverse in its level of confidence and purpose for cycling. We have beginning riders – young and not so young, commuters, recreational bicyclists, and even amateur (and sometimes professional) racers. Given the diversity of the riders’ skills and purpose, the network should be designed to increase the confidence of all bicyclists to make trips by bicycle.

The Town of Blacksburg and various stakeholders such as the New River Valley Bicycle Association and the VT Center for Geospatial Information & Technology conducted bike counts (Section 3.1) and an online bicycle survey to capture preferred bicycling routes (Section 3.2). The Subcommittee used the data from these efforts to inform the network improvement process.

#### 3.1 Bike Counts

In 2009 and 2011, the NRVBA conducted bike counts in conjunction with the National Bicycle and Pedestrian Documentation (NBPD) Project. The NBPD project is designed to generate “accurate and consistent demand usage figures” to help local planning bodies to plan and design appropriate bicycle and pedestrian facilities and to measure the positive benefits of those new facilities. The bike count data will be used as baseline data for average daily ridership to evaluate the need for bicycle accommodations and the effectiveness of future enhancements. Additional bike count data is currently being gathered by Virginia Tech students led by Assistant Professor of Urban Affairs and Planning Steve Hankey with the goal of assessing patterns of bicycle and pedestrian traffic across Town as well as providing Average Daily Traffic (AADT) for selected locations. This data will help the Town and university monitor bicycling activity and focus resources on improvements in key areas.

##### 3.1.1. Bike Count Summary 2009

The NRVBA conducted bike counts on Wednesday, September 9, 2009 (7 am – 7 pm) and Saturday, September 12, 2009 (12 pm – 2 pm). The NRVBA conducted count surveys at four locations; documenting number of riders, direction of travel, and certain behaviors such as wrong-way riding, sidewalk riding, and riding without a helmet. The survey documented 1753 riders on Wednesday and 280 riders on Saturday. Of all riders; 11% rode on the sidewalk, 1% rode against traffic, and 74% rode without a helmet.

Table 3-1: 2009 Bike Count

Locations	No. of Riders (Wed.)	No. of Riders (Sat.)
Kent St – Washington St	668	99
Progress St – Giles St	248	48
Prices Fork Rd – Tom’s Creek Rd	469	64
Plantation Road (at entrance to Smithfield Plantation)	368	69
<b>TOTAL</b>	<b>1753</b>	<b>280</b>

**3.1.2. Bike Count Summary 2011**

The NRVBA conducted bike counts on Wednesday, September 28, 2011 (7 am – 7 pm) and Saturday, October 1, 2011 (12 pm – 2 pm). The NRVBA conducted count surveys at five locations; documenting number of riders, direction of travel, and certain behaviors such as wrong-way riding, sidewalk riding, and riding without a helmet. The survey documented 1377 riders on Wednesday and 178 riders on Saturday.

Table 3-2: 2011 Bike Count

Locations	Total No. of Riders	% of Total
S Main St – Ellett Rd	84	5.4
College Ave – Draper Rd	373	23.8
Progress St – Giles St	338	21.6
Price Ford Rd – Turner St	244	22.2
Prices Fork Rd - UCB	423	27.0

**3.2 Online Bicycle Survey**

The staff at CGIT created an online bicycle route survey where bicyclists could access a map of Blacksburg streets and plot their preferred bicycle routes around town. The survey ran in 2009 and again in 2011 for two months each time. At the close of the survey, CGIT generated maps that illustrated rider density on each segment identified by users in the survey.

Bicyclists participating in the survey preferred to travel on arterial roads and parallel alternatives. For example, respondents rode on Main Street and/or Draper Road or Palmer Drive as alternatives.

**3.2.1. Trip Generators**

In addition to identifying preferred routes; the survey identified trip generators, such as VT, shopping centers, and schools.

**3.2.2. Bike Network**

In addition to the electronic survey in 2011, printed paper maps were given to community members who regularly commute by bicycle. These participants were asked to identify their ideal bicycle network. In all cases, the responses in this group matched the electronic survey responses.

**3.3 Crash Analysis**

Reports for vehicular crashes are managed by the Blacksburg Police Department. Currently, it is difficult to isolate reporting information to determine if a bicycle has been involved in a crash. This Plan recommends working with the Police Department on improvements to better evaluate future crashes to be able to extract information about incidents involving bicycle.

## 4.0 Proposed Network Routes

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One of the key goals of the Bicycle Master Plan is to create a network of designated routes throughout Town. The selection process for proposed network routes began with an analysis of the existing conditions. Each street in Town was evaluated for pavement conditions, the presence of on-street parking, bicycle continuity, roadway width, terrain, and activity generators. Survey data was also collected to determine frequently used routes and key origin and destination points. Routes were user-identified where cyclists preferred to ride as determined by the process described in Section 3.2.

Based on the existing road characteristics, each segment was evaluated against the possible types of approved facilities. This chapter contains a description of each route of the proposed bicycle network. The route names are currently color-coded but the Town may wish to include key streets and neighborhoods in the route names to increase user-friendliness. Suggestions for name revisions are included in parentheses.

### 4.1 Azure Route (Harding/Catawba Valley)

Roanoke Street and Harding Avenue divide the eastern part of Town into northeastern and southeastern quadrants. Owens Street connects the two roads at the cemetery. Harding and Roanoke are the main arterial streets in this section of Town, which connects multi-family and single-family residential to downtown and the university. Harding Avenue Elementary is located on the route and Harding Avenue Elementary has received Safe Routes to School funding for sidewalk and multi-purpose paths. Recreational bicyclists use Harding Avenue to access Catawba and Ellett valleys.

### 4.2 Blue Route (Main Street)

The Blue Route follows Main Street, which bisects the Town into western and eastern halves. Main Street's characteristics change several times from its northern terminus at the Route 460 Bypass and its southern limit at the Town's corporate limit. The road transitions between two and four lanes, undivided and divided, 25 to 45 mph, and no bike and pedestrian facilities to bike lanes and sidewalks. This route is a major corridor connecting people with various commercial, civic, office, and residential uses. The principal focal point lies in the center of downtown where there is a concentration of retail stores and restaurants. LewisGale Hospital Montgomery, the Industrial Park, and the Corporate Research Center are large regional employers located at the southern end of Main Street. The Virginia Tech campus is another large employer, just off of this corridor, adjacent to downtown.

### 4.3 Brown Route (Clay/Downtown Connector)

The Brown Route begins at the Town limits on Clay Street and continues on Clay to downtown and includes Miller Street as a connection to the Huckleberry Trail. Clay Street connects to the Green Route via Roanoke Street. This route is important for connecting Montgomery County residents beyond the eastern end of Clay Street to the downtown commercial areas.

### 4.4 Green Route - Huckleberry Trail

The Huckleberry Trail is a Rails-to-Trails multi-use path that runs between Blacksburg and Christiansburg. Trail extensions to connect to an existing trail in Heritage Park on Glade Road and then connect to the Gateway Trail will make a continuous off-road path from Christiansburg to the Jefferson National Forest. Christiansburg has recently completed trail extensions in an effort to connect the Huckleberry Trail to downtown Christiansburg. A bridge connection is currently under construction and two additional future extensions to complete the trail are in the design process. When complete, this trail will improve access and connectivity between downtown Blacksburg and downtown Christiansburg.



#### **4.5 Lilac Route (UCB/Patrick Henry)**

The Lilac Route consists of Patrick Henry Drive and University City Boulevard. The area served by these two road segments consists of high-density residential housing. Additionally, the route serves destinations such as the Blacksburg Community Center and associated facilities, Food Lion shopping center, Shawnee Swim Club, and University City shopping center.

The Lilac Route intersects with the Purple, Pink, Lime, Blue, and Azure routes to provide connectivity to the eastern, northern, and western parts of Town as it bypasses downtown to the north.

#### **4.6 Lime Route (Progress/Main Street Alternative)**

The Lime Route serves the northern section of Town and is a somewhat segmented route. The route begins on Bishop Lane and follows Mount Tabor Road where it intersects with the Blue Route. Givens Lane, Giles Road, and Progress Street provide alternate north/south routes paralleling North Main Street (Blue Route). The route serves almost exclusively single-family and multi-family residential.

#### **4.7 Orange Route (Virginia Tech/Hokie Bikeways)**

The Orange Route goes through the Virginia Tech Campus and includes the Corporate Research Center and the Blacksburg Industrial Park. These routes consist mostly of campus roads, but also include multi-purpose off-street paths. Coordination and cooperation between the Town and Virginia Tech is essential for a continuous bike route through campus. Revisions to this route will occur with changes to the configuration of Research Center Drive.

#### **4.8 Pink Route (Toms Creek Basin)**

The Pink Route includes Glade Road, Old Glade Road, Shadow Lake Road, Toms Creek Road, and Meadowbrook Drive. This area is mostly residential and makes up the Toms Creek basin. Glade Road is a popular recreational route that connects to Prices Fork Road outside of Town limits and to other county roads that parallel Prices Fork Road and McCoy Road that lead to the New River.

#### **4.9 Purple Route (Hethwood)**

The Purple Route follows Prices Fork Road from North Main Street to the western Town limit and divides the western side of Town into the northwestern quadrant and the southwestern quadrant. Heather Drive, Hethwood Boulevard, and Tall Oaks Drive also make up the Purple Route; and provide access to Hethwood, Foxridge, and other multi-family and single-family neighborhoods.

#### **4.10 Red Route (Airport Neighborhoods)**

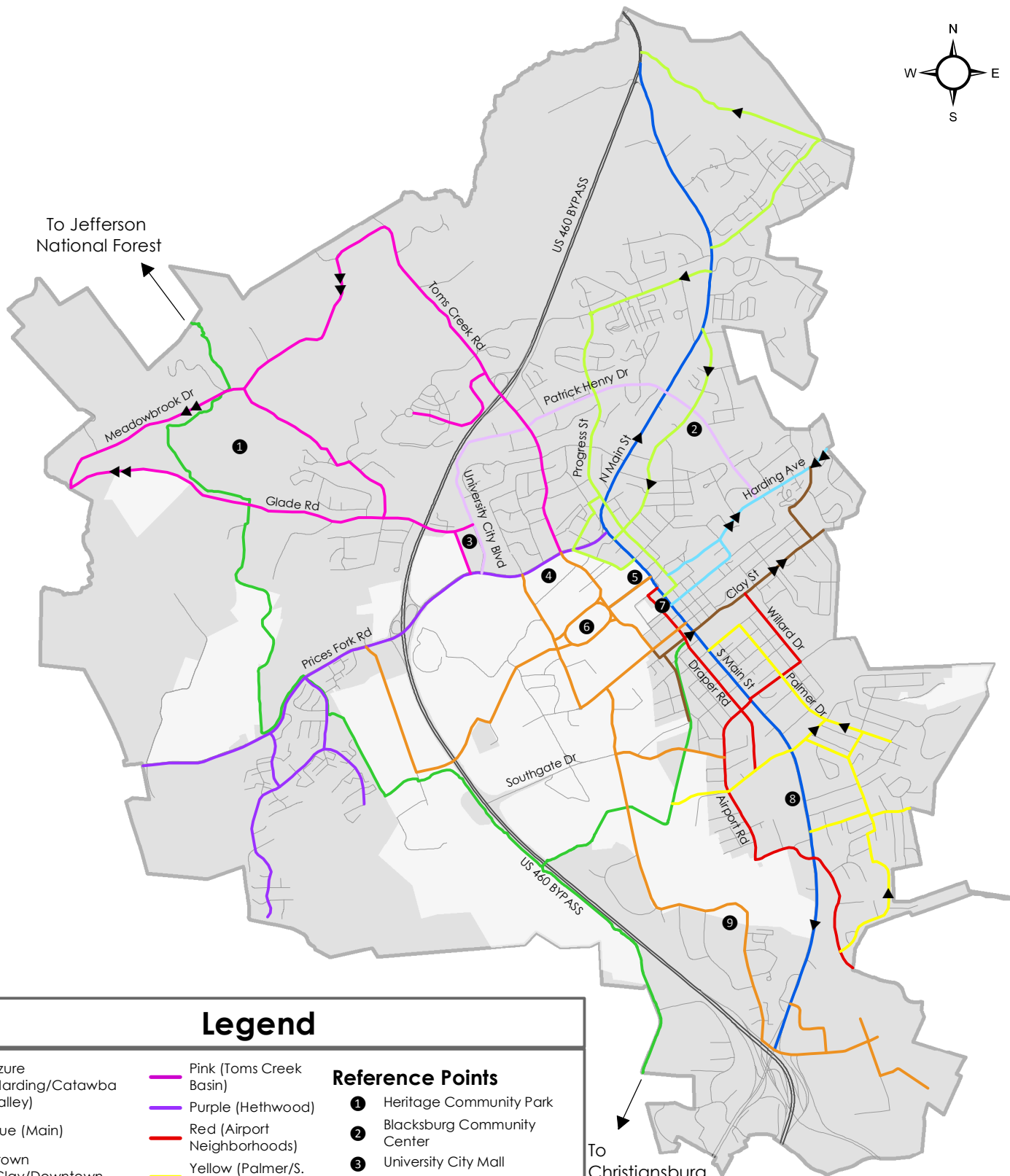
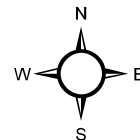
The Red Route uses Ellett Road, Hubbard Street, Airport Road, Draper Road, Graves Avenue, and Willard Drive as it passes through the Miller-Southside, Airport Acres, and other residential neighborhoods.

#### **4.11 Yellow Route (Palmer/South Main)**

The Yellow Route is found in the southeastern part of Town and consists of Cedar Hill Drive, Sussex Road, Marlinton Street, New Kent Road, Grissom Lane, Nellies Cave Road, Park Drive, Palmer Drive, and Country Club Drive. This area is predominantly single-family and multi-family residential and connects the residential areas to restaurants, groceries stores, retail, and various other businesses and offices along South Main Street.

The following maps depict the designated routes as detailed above and the designated routes by difficulty. The difficulty levels were classified according to a Virginia Tech course project using factors including traffic volume, road hazards, street and lane width, existing bicycle facilities, and slope.

# Blacksburg Designated Bicycle Routes



## Legend

- |                                  |                             |
|----------------------------------|-----------------------------|
| Azure (Harding/Catawba Valley)   | Pink (Toms Creek Basin)     |
| Blue (Main)                      | Purple (Hethwood)           |
| Brown (Clay/Downtown Connector)  | Red (Airport Neighborhoods) |
| Huckleberry Trail                | Yellow (Palmer/S. Main)     |
| Lilac (UCB/Patrick Henry)        | VT Campus & Properties      |
| Lime (Progress/Main Alternative) | US HWY 460 Bypass           |
| Orange (VT/Hokie Bikeways)       | Mild Slope                  |
|                                  | Steep Slope                 |

## Reference Points

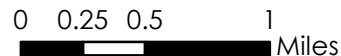
- 1 Heritage Community Park
- 2 Blacksburg Community Center
- 3 University City Mall
- 4 Future Multi-Modal Transit Facility
- 5 Center for the Arts
- 6 Drillfield
- 7 Farmers Market
- 8 First and Main Shopping Center
- 9 Corporate Research Center

To Christiansburg

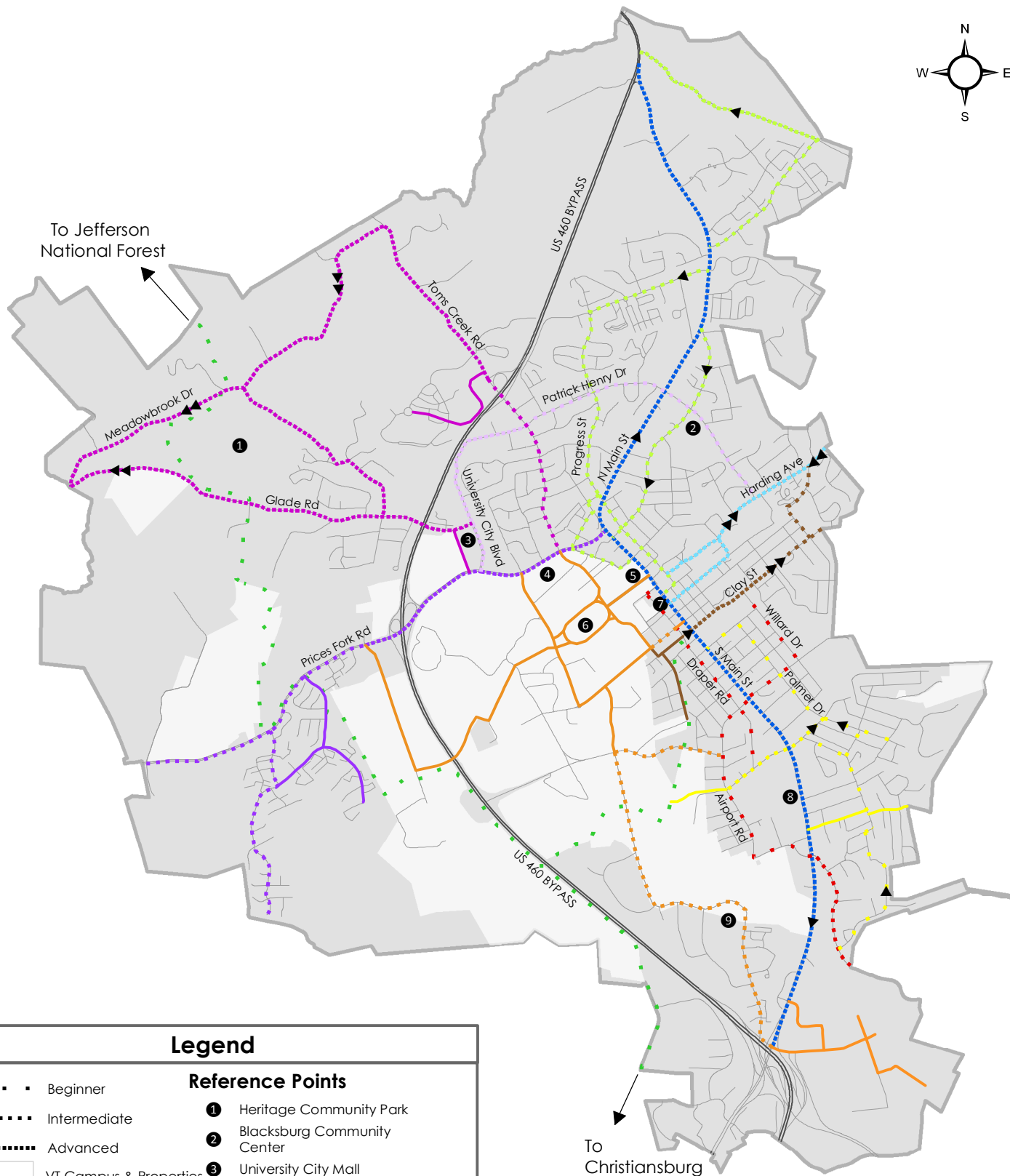
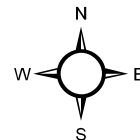
Date: August 2015

Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



# Designated Bicycle Route by Difficulty



To Jefferson National Forest

To Christiansburg

## Legend

- • • Beginner
- Intermediate
- Advanced
- VT Campus & Properties
- == US HWY 460 Bypass
- ▶ Mild Slope
- ▶▶ Steep Slope

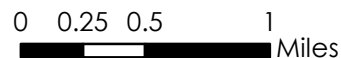
## Reference Points

- ① Heritage Community Park
- ② Blacksburg Community Center
- ③ University City Mall
- ④ Future Multi-Modal Transit Facility
- ⑤ Center for the Arts
- ⑥ Drillfield
- ⑦ Farmers Market
- ⑧ First and Main Shopping Center
- ⑨ Corporate Research Center

Date: August 2015

Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



## 5.0 Resources

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There are a number of organizations and agencies with manuals detailing best practices for bicycle facilities as described below. There are also a number of different types of treatments for road segments and intersections for bicycle facilities which are illustrated in Appendix A.

### 5.1 Resources

On September 20, 2013, the U.S. Department of Transportation Federal Highway Administration issued a Memorandum on Bicycle and Pedestrian Facility Design Flexibility.<sup>2</sup> The memorandum states the following:

*“[T]he Federal Highway Administration’s (FHWA) [expresses] support for taking a flexible approach to bicycle and pedestrian facility design. The American Association of State Highway and Transportation Officials (AASHTO) bicycle and pedestrian design guides are the primary national resources for planning, designing, and operating bicycle and pedestrian facilities. The National Association of City Transportation Officials (NACTO) [Urban Bikeway Design Guide](#) and the Institute of Transportation Engineers (ITE) [Designing Urban Walkable Thoroughfares](#) guide builds upon the flexibilities provided in the AASHTO guides, which can help communities plan and design safe and convenient facilities for pedestrian and bicyclists. FHWA supports the use of these resources to further develop non-motorized transportation networks, particularly in urban areas.”*

The **Manual on Uniform Traffic Control Devices**, or MUTCD is published by the FHWA and defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel. It is updated periodically to accommodate the nation's changing transportation needs and address new safety technologies, traffic control tools, and traffic management techniques. The majority of the bicycle facilities discussed in Appendix A and identified in the NACTO guide are approved treatments according to the MUTCD.

#### AASHTO Guide

AASHTO publishes a manual that addresses bicycle facilities:

- [Guide for the Development of Bicycle Facilities](#) 2012, Fourth Edition (AASHTO Bike Guide) provides detailed planning and design guidelines on how to accommodate bicycle travel and operation in most riding environments. It covers the planning, design, operation, maintenance, and safety of on-road facilities, shared use paths, and parking facilities. Flexibility is provided through ranges in design values to encourage facilities that are sensitive to local context and incorporate the needs of bicyclists, pedestrians, and motorists.

#### NACTO Guide

NACTO first released the [Urban Bikeway Design Guide](#) (NACTO Guide) in 2010 to address more recently developed bicycle design treatments and techniques. It provides options that can help create "complete streets" that better accommodate bicyclists. While not directly referenced in the AASHTO Bike Guide, many of the treatments in the NACTO Guide are compatible with the AASHTO Bike Guide and demonstrate new and innovative solutions for the varied urban settings across the country.

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<sup>2</sup> [http://www.fhwa.dot.gov/environment/bicycle\\_pedestrian/guidance/design\\_guidance/design\\_flexibility.cfm](http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design_flexibility.cfm)

## 6.0 Infrastructure Recommendations

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Bicycle facilities can be located both within and outside of roadway rights-of-way. Within roadway rights-of-way, potential facilities include bicycle lanes or cycle tracks that provide dedicated space for bicyclists or 'share the road' routes that may include improved shoulders, signage, and pavement markings. Outside the roadway, bicycle facilities are commonly referred to as "trails" and are often part of "Shared Use" or "Multi-Use" facilities where cyclists share the facility with pedestrians and other non-motorized modes of travel. Multi-Use facilities are mostly found within community parks or regional trails such as the Huckleberry Trail.

The appropriate type of bicycle facility is often determined by factors such as roadway cross-section elements, vehicle traffic characteristics, and bicyclist skill level. Based on the existing road characteristics, each road segment within the Town was evaluated against the possible approved facilities. This chapter maps the proposed network improvements and provides the street by street options according to road classification and route. The specific facilities proposed in this section are recommendations from the Corridor Committee. These recommendations may change as existing conditions and other factors not considered herein come to light. Additional consideration should be given to future connections with Virginia Tech, Christiansburg, Montgomery County, and the larger region to ensure consistency for bicyclists.

This chapter includes 11 maps (in alphabetical order) showing the specific roadway segments with potential facility improvements for each Designated Route. It also includes one map showing intersections for potential facility improvements within Town. This chapter also contains Tables 6-1, 6-2, and 6-3 which show specific facility recommendations for segments by Designated Route (in alphabetical order). These tables are separated by road classification as detailed in Section 2.1. Some facilities require further study to determine the most optimal treatment for cyclist safety as noted in the tables. Innovative design treatments that are less familiar to road users should be tested in pilot locations and studied prior to broad implementation. Cycle tracks, for example, require a continuous road treatment to create a functional system. In order to implement any type of cycle track facility, the Town should consider locations where a continuous network can be created. Many recommendations will also require ongoing coordination with the Virginia Department of Transportation (VDOT) and Virginia Tech to create smooth transitions. In addition to these transition areas, the Town should coordinate with Virginia Tech for implementation of bicycle facilities on university streets. Cooperation and consistent standards between the Town and Virginia Tech will create the most complete bicycle network for all users.

In addition to the tables for road segment recommendations, Table 6-4 details recommendations for intersection improvements by route. Intersections require special attention due to increased conflict points for all users. Due to these conflict points and the wide variety of road conditions at intersections, additional study is recommended prior to implementation of facility recommendations. Following the tables, maps showing the specific roadway segments with proposed improvements are included by route.

In addition to implementing new infrastructure, maintaining existing bicycle facilities is paramount. Coordination among Town departments will be vital to ensure that maintenance standards are set and met for bicycle facilities.

# Azure Route: Road Segments for Potential Facility Improvements



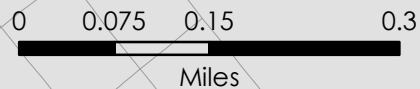
## Legend

- Designated Route
- Designated Route with Improvement
- Town Limits
- VT Campus & Properties
- Mild Slope
- Steep Slope
- 1 Harding Ave (Progress St - Bennett St)
- 2 Harding Ave (Bennett St - Owens St)
- 3 Harding Ave (Owens St - Town Limit)
- 4 Owens St (Harding Ave - E Roanoke St)
- 5 E Roanoke St (Main St - Owens St)

Date: August 2015

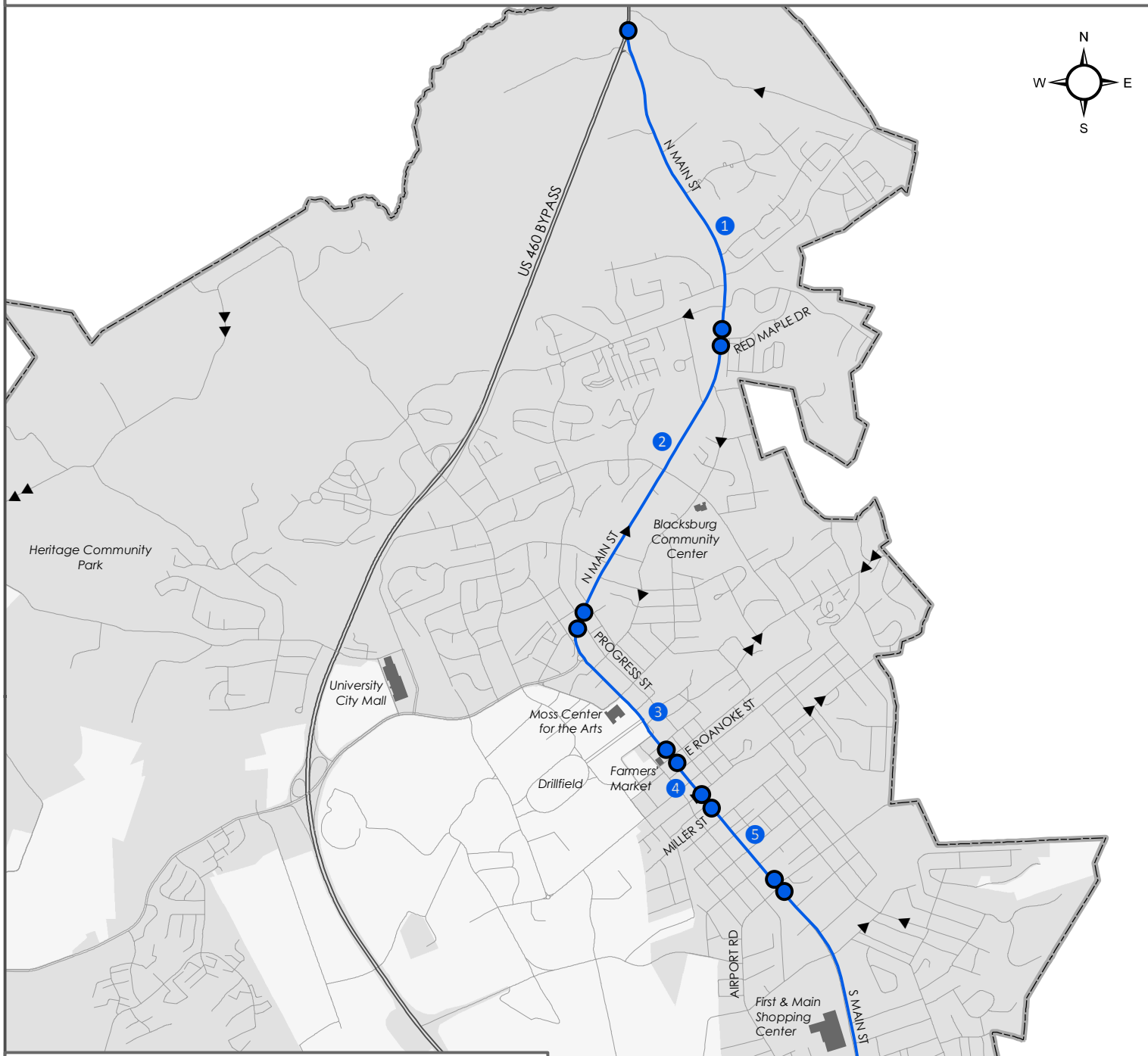
Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Blue Route: Road Segments for Potential Facility Improvements



## Legend

- Designated Route
  - Designated Route with Improvement
  - Town Limits
  - VT Campus & Properties
  - Mild Slope
  - Steep Slope
- |  |  |
|--|--|
|  | 1 N Main St<br>(Route 460 - Red Maple Dr)        |
|  | 2 N Main St<br>(Red Maple Dr - Progress St)      |
|  | 3 N Main St<br>(Progress St - Roanoke St)        |
|  | 4 S Main St<br>(Roanoke St - Miller St)          |
|  | 5 S Main St<br>(Miller St - Airport Rd)          |
|  | 6 S Main St<br>(Airport Rd - Industrial Park Rd) |

Date: August 2015

Created by: Blacksburg GIS Services

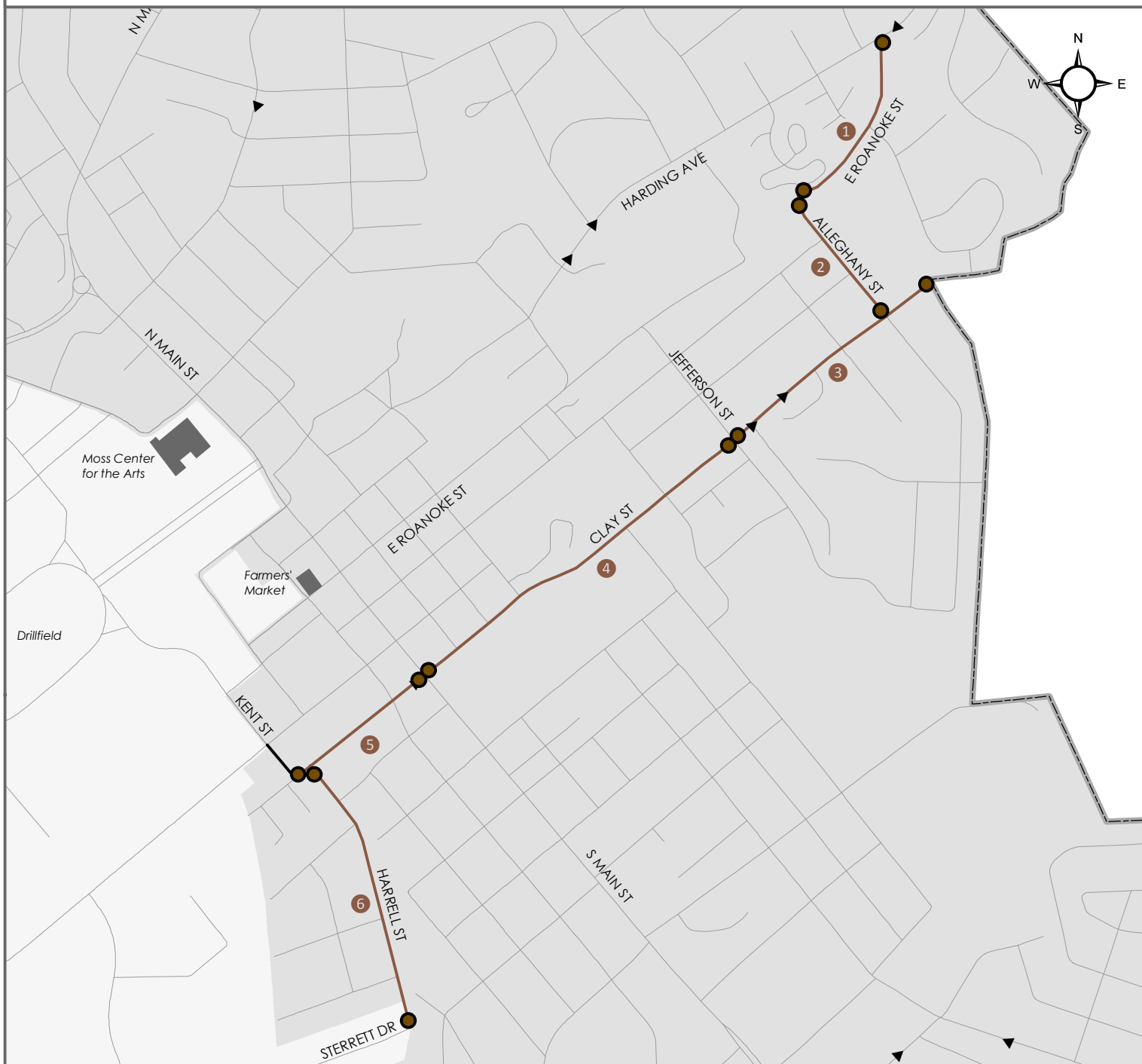
Sources: Town of Blacksburg;  
Blacksburg Transit; Virginia Tech;  
CGIT at Virginia Tech;  
Blacksburg Corridor Committee













For more information on facility improvements, see Tables 6-1, 6-2, & 6-3



# Brown Route: Road Segments for Potential Facility Improvements



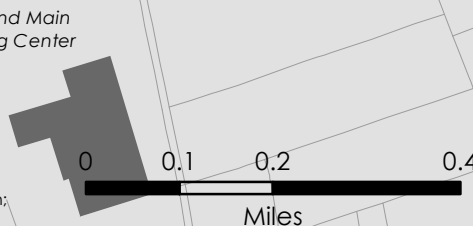
## Legend

- |  |                                   |   |   |
|--|-----------------------------------|---|---|
|  | Designated Route                  |  | 1 Roanoke St (Harding Ave - Alleghany St) |
|  | Designated Route with Improvement |  | 2 Alleghany St (Roanoke St - Clay St)     |
|  | Town Limits                       |  | 3 Clay St (Town Limit - Jefferson St)     |
|  | VT Campus & Properties            |  | 4 Clay St (Jefferson St - S Main St)      |
|  | Mild Slope                        |  | 5 Clay St (S Main St - Kent St)           |
|  | Steep Slope                       |  | 6 Harrell St (Clay St - Sterrett Dr)      |

Date: August 2015

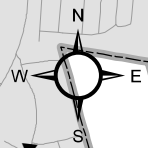
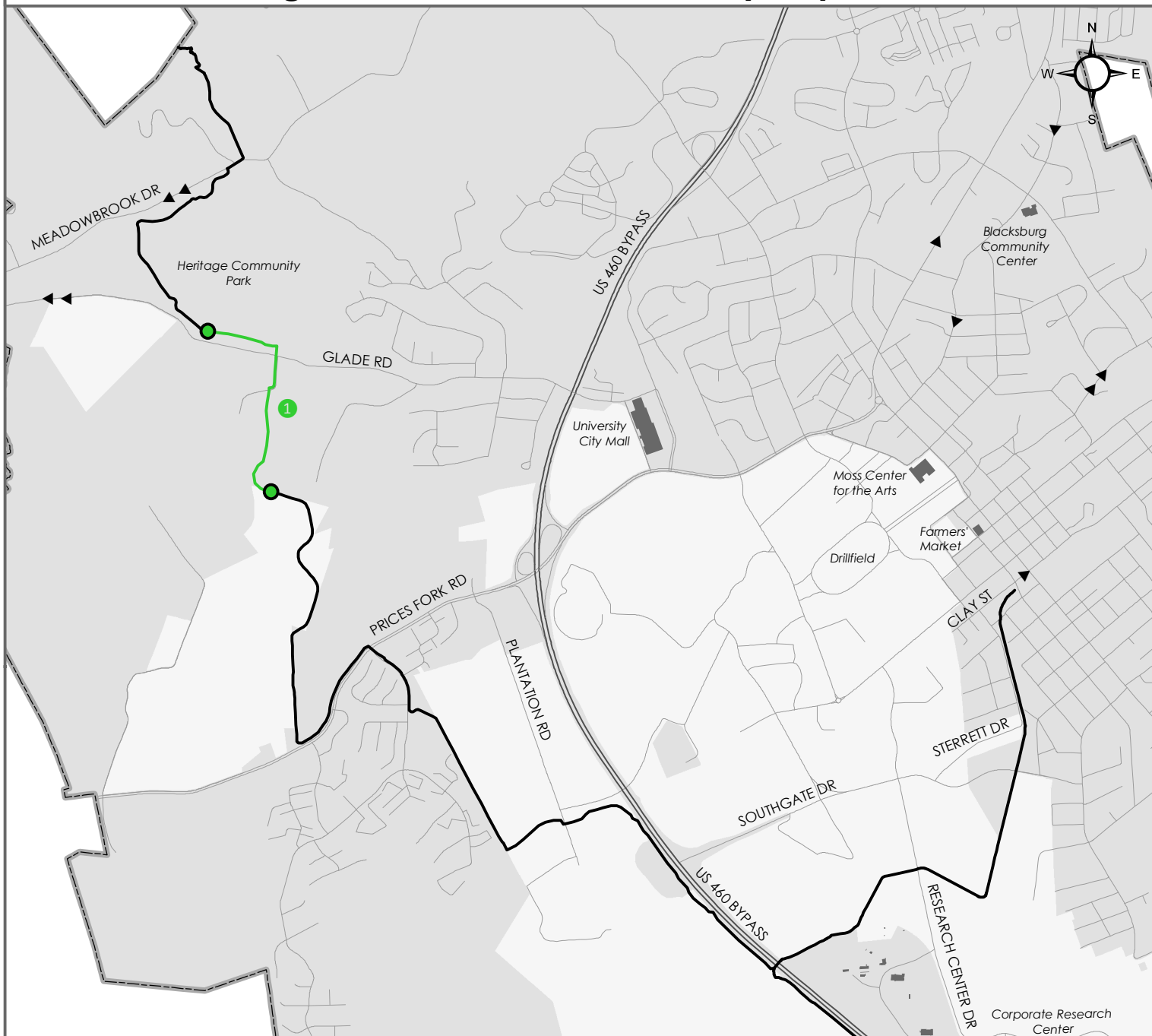
Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Green Route - Huckleberry Trail: Road Segments for Potential Facility Improvements



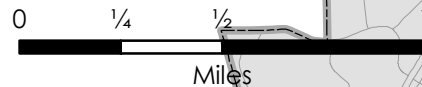
### Legend

- Designated Route
- Designated Route with Improvement
- Town Limits
- VT Campus & Properties
- Mild Slope
- Steep Slope
- Under Construction

Date: August 2015

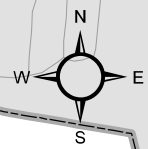
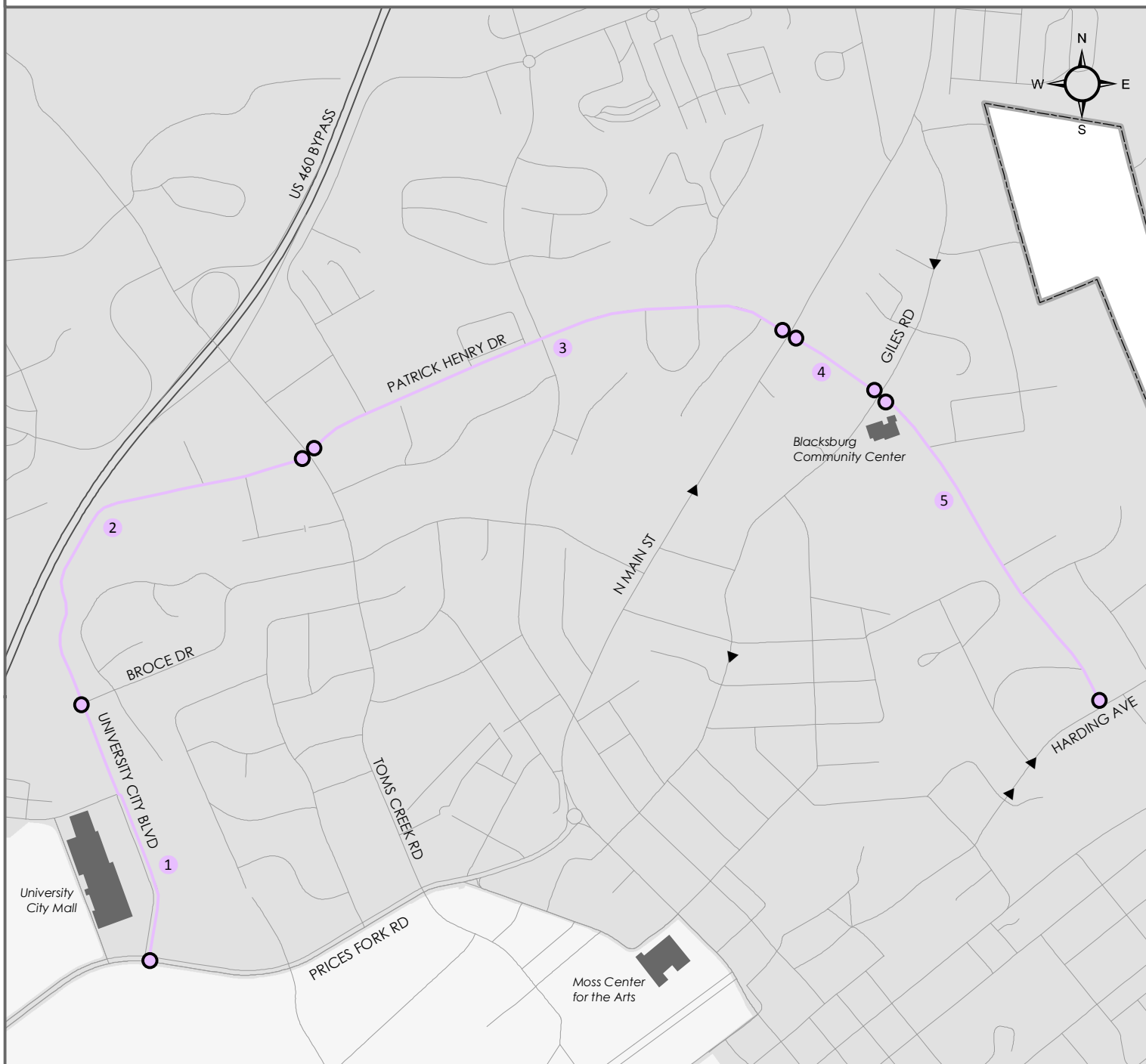
Created by: Blacksburg  
GIS Services

Sources: Town of Blacksburg;  
Blacksburg Transit; Virginia Tech;  
CGIT at Virginia Tech;  
Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Lilac Route: Road Segments for Potential Facility Improvements



## Legend

- Designated Route
  - Designated Route with Improvement
  - Town Limits
  - VT Campus & Properties
  - Mild Slope
  - Steep Slope
- |   |   |
|---|---|
| 1 | University City Blvd<br>(Prices Fork Rd - Broce Dr) |
| 2 | University City Blvd<br>(Broce Dr - Toms Creek Rd)  |
| 3 | Patrick Henry Dr<br>(Toms Creek - N. Main St)       |
| 4 | Patrick Henry Dr<br>(N. Main St - Giles Rd)         |
| 5 | Patrick Henry Dr<br>(Giles Rd - Harding Ave)        |

Date: August 2015

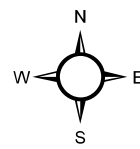
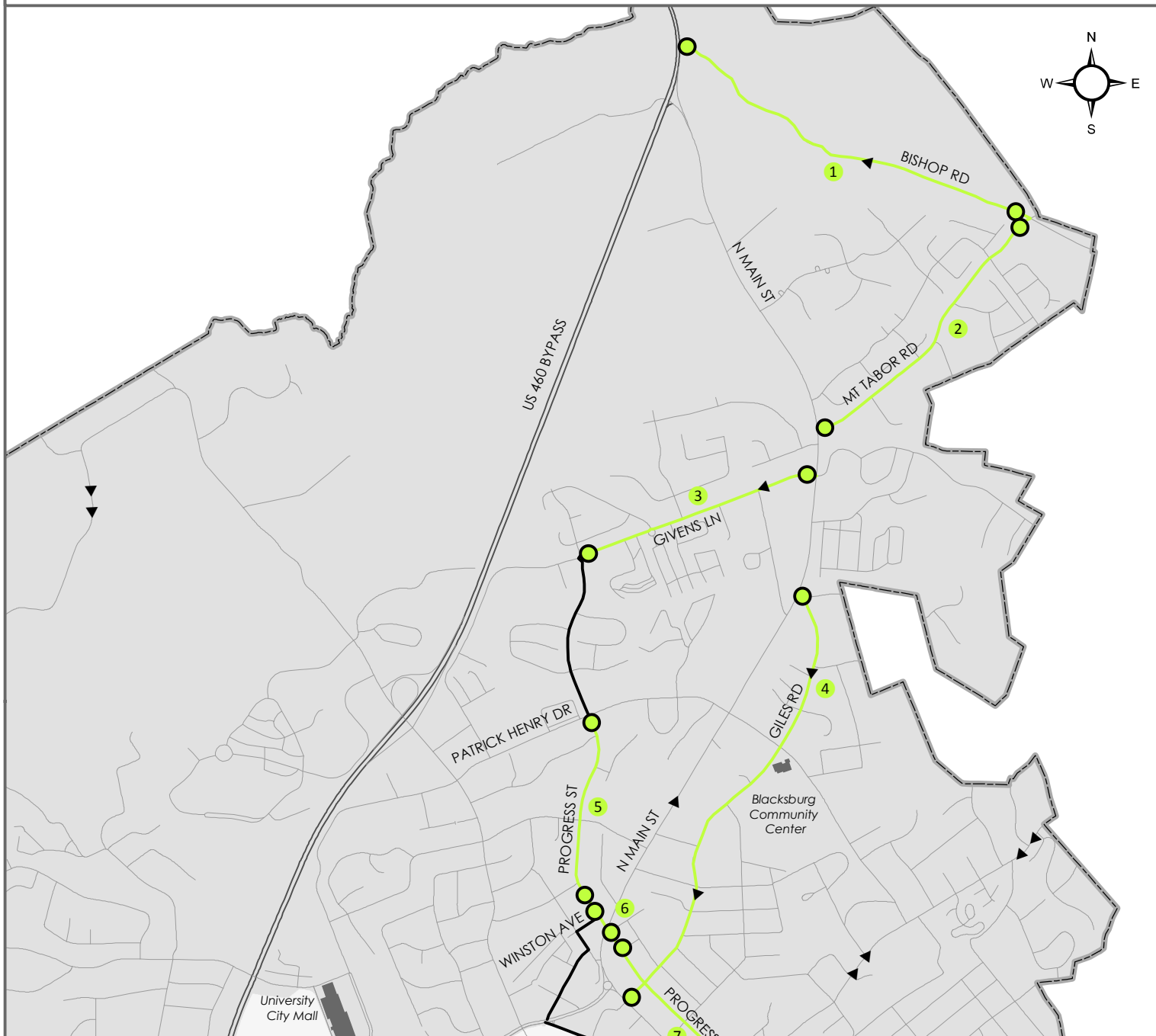
Created by: Blacksburg GIS Services

Sources: Town of Blacksburg;  
Blacksburg Transit; Virginia Tech;  
CGI at Virginia Tech;  
Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Lime Route: Road Segments for Potential Facility Improvements



## Legend

- Designated Route
- Designated Route with Improvement
- Town Limits
- VT Campus & Properties
- Mild Slope
- Steep Slope
- 1** Bishop Rd (Route 460 - Mt Tabor Rd)
- 2** Mt Tabor Rd (Bishop Rd - N Main St)
- 3** Givens Ln (N Main St - Progress St)
- 4** Giles Rd (N Main St - N Main St)
- 5** Progress St (Patrick Henry Dr - Winston Ave)
- 6** Progress St (Winston Ave - N Main St)
- 7** Progress St (N Main St - Jackson St)

Date: August 2015

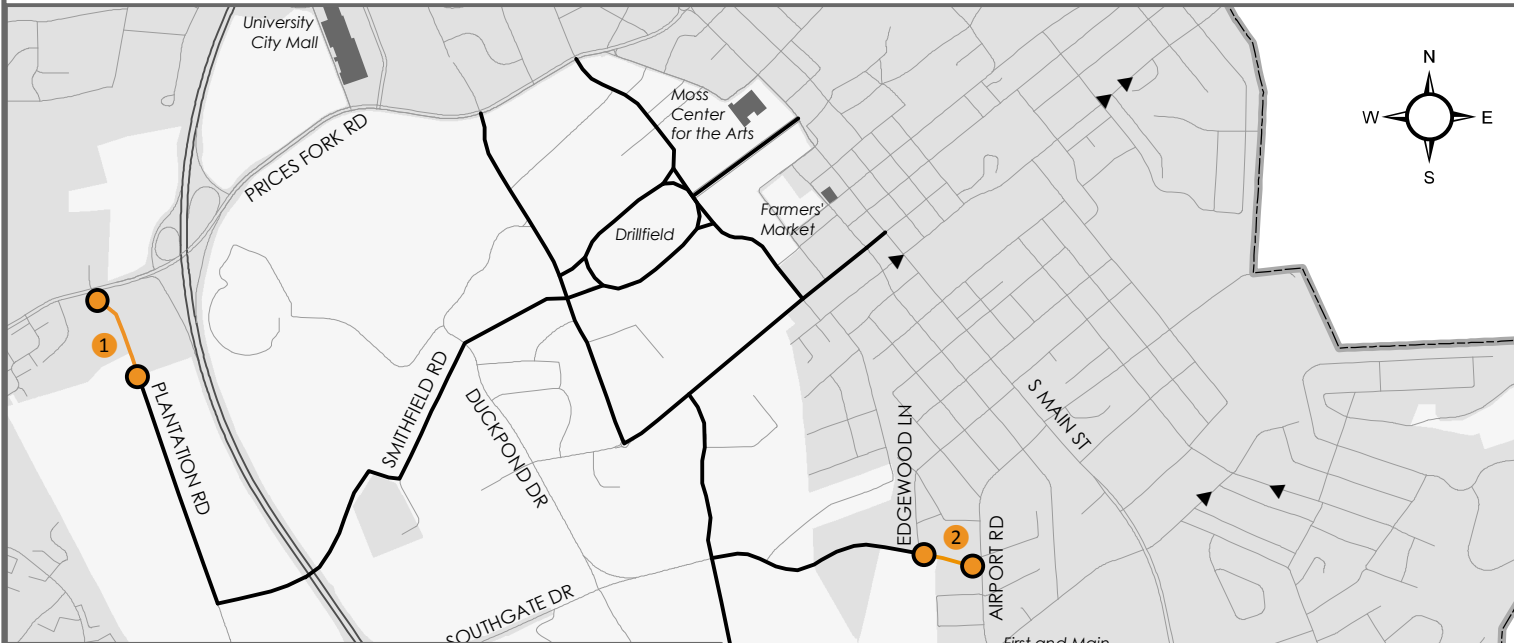
Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGJI at Virginia Tech; Blacksburg Corridor Committee



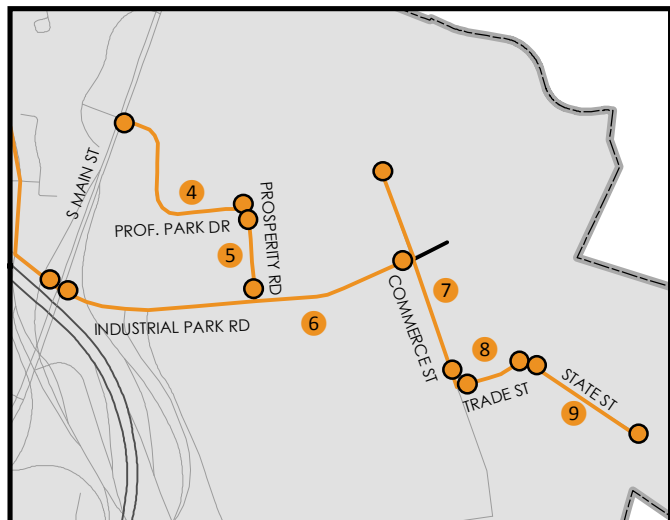
For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Orange Route: Road Segments for Potential Facility Improvements



## Legend

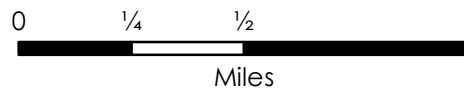
- Designated Route
  - Designated Route with Improvement
  - Town Limits
  - VT Campus & Properties
  - Mild Slope
  - Steep Slope
- 1 Plantation Rd (Prices Fork Rd - VT Boundary)
  - 2 Southgate Dr (Edgewood Ln - Airport Rd)
  - 3 Research Center Dr (VT Boundary - Industrial Park Rd)
  - 4 Professional Park Dr (S Main St - Prosperity Rd)
  - 5 Prosperity Rd (Prof Park Dr - Industrial Park Rd)
  - 6 Industrial Park Rd (S Main St - Commerce St)
  - 7 Commerce St (North End - Trade St)
  - 8 Trade St (Commerce St - State St)
  - 9 State St (Trade St - End of State St)



Date: August 2015

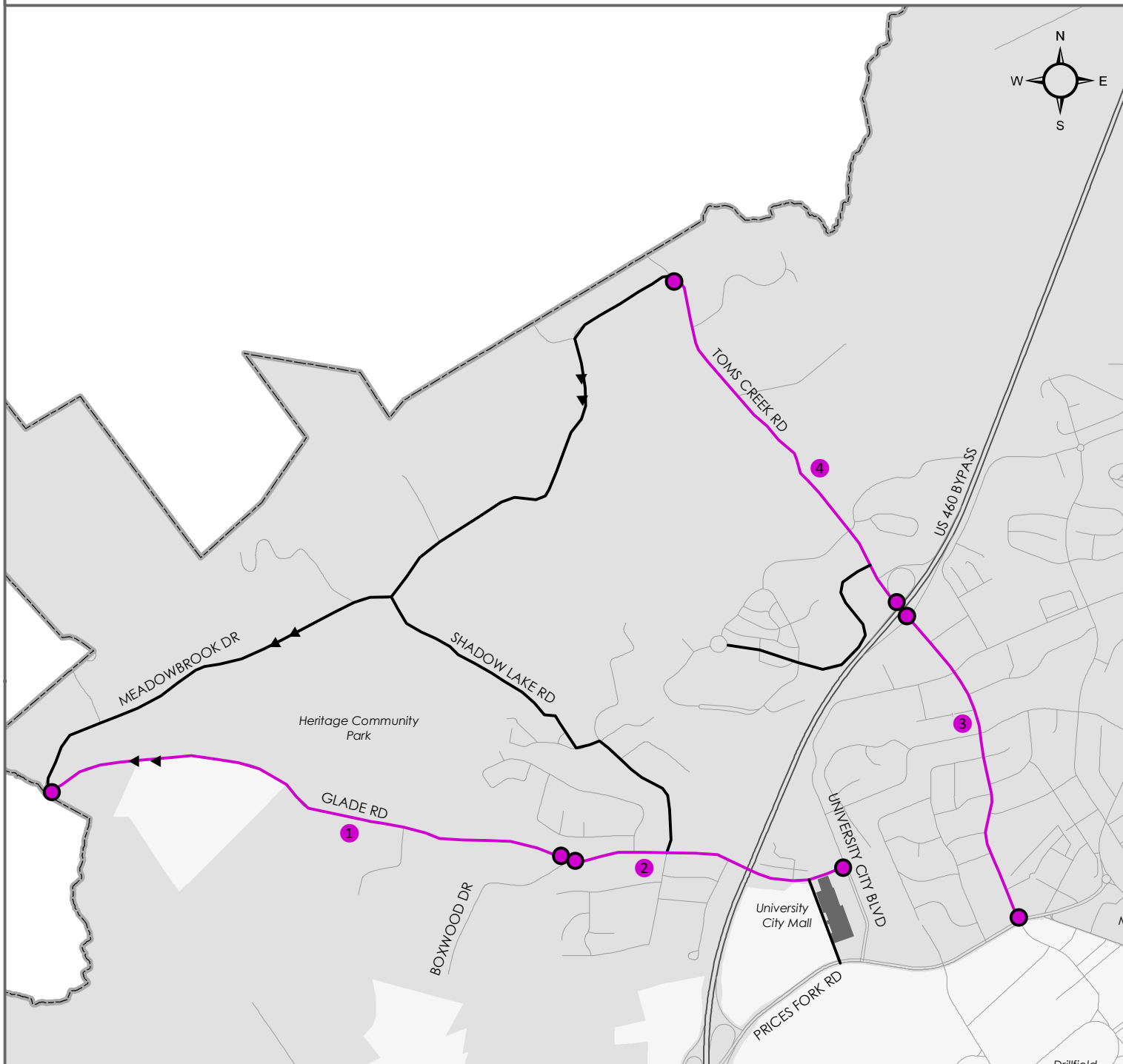
Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee












For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Pink Route: Road Segments for Potential Facility Improvements



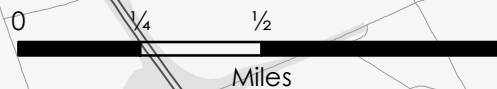
## Legend

-  Designated Route
  -  Designated Route with Improvement
  -  Town Limits
  -  VT Campus & Properties
  -  Mild Slope
  -  Steep Slope
-  1 Glade Rd (Meadowbrook Dr - Boxwood Dr)
  -  2 Glade Rd (Boxwood Dr - University City Blvd)
  -  3 Toms Creek Rd (Prices Fork Rd - Route 460)
  -  4 Toms Creek Rd (Route 460 - Meadowbrook Dr)

Date: August 2015

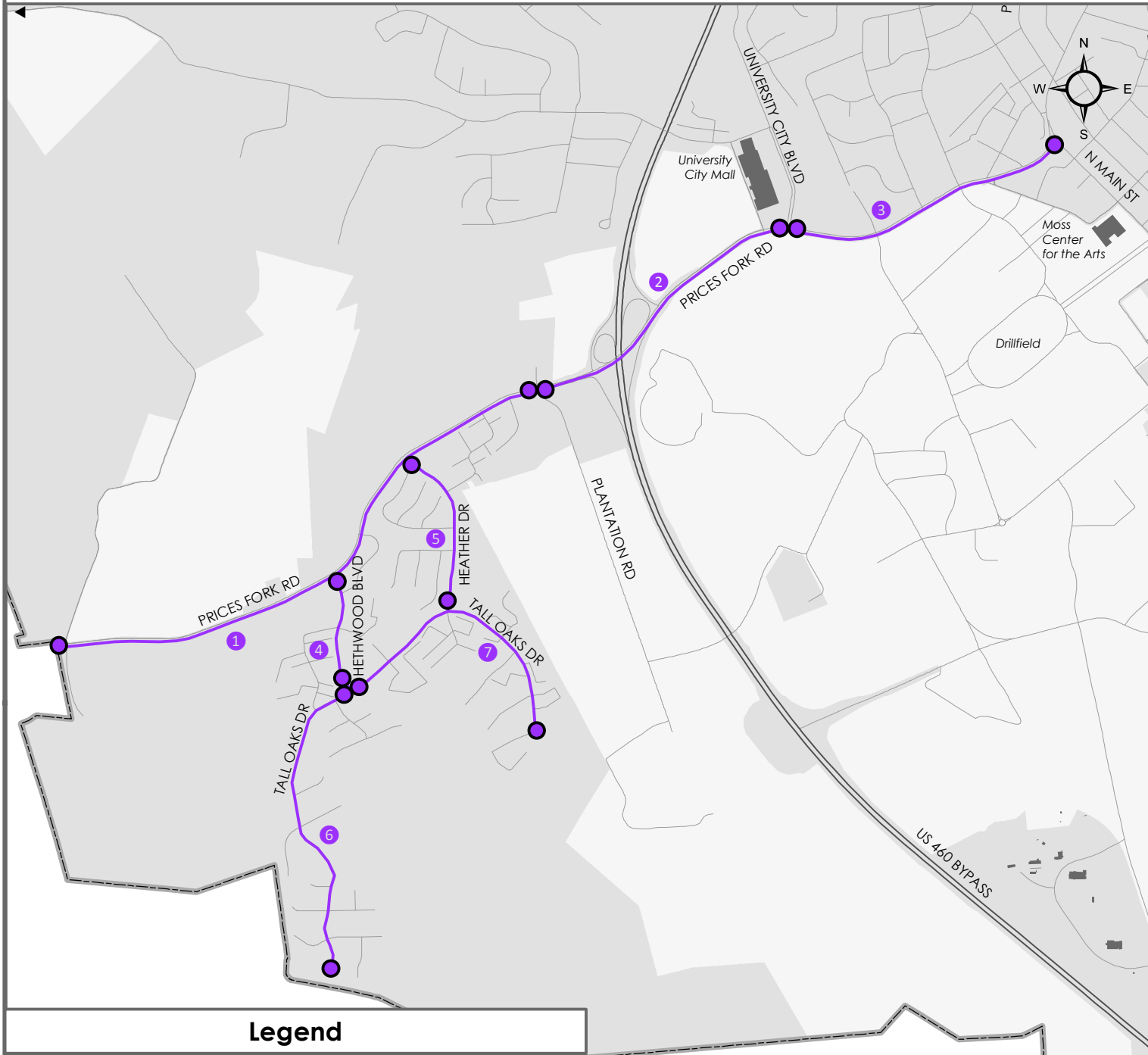
Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Purple Route: Road Segments for Potential Facility Improvements



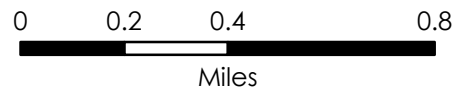
## Legend

- Designated Route
- Designated Route with Improvement
- Town Limits
- VT Campus & Properties
- Mild Slope
- Steep Slope
- 1** Prices Fork Rd (Town Limit - Plantation Rd)
- 2** Prices Fork Rd (Plantation Rd - University City Blvd)
- 3** Prices Fork Rd (University City Blvd - N Main St)
- 4** Hethwood Blvd (Prices Fork Rd - Tall Oaks Dr)
- 5** Heather Dr (Prices Fork Rd - Tall Oaks Dr)
- 6** Tall Oaks Dr (Hethwood Blvd - W end of Tall Oaks Dr)
- 7** Tall Oaks Dr (Hethwood Blvd - E end of Tall Oaks Dr)

Date: August 2015

Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Red Route: Road Segments for Potential Facility Improvements



## Legend

- Designated Route
- Designated Route with Improvement
- Town Limits
- VT Campus & Properties
- Mild Slope
- Steep Slope
- 1 Willard Dr (Clay St - Graves Ave)
- 2 Draper Rd (College Ave - Airport Rd)
- 3 Graves Ave (Willard Dr - S. Main St)
- 4 Airport Rd (S Main St - Hubbard St)
- 5 Hubbard St (Airport Rd - S Main St)
- 6 Ellett Rd (S Main St - Town Limit)

Date: August 2015

Created by: Blacksburg GIS Services

Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3



# Yellow Route: Road Segments for Potential Facility Improvements



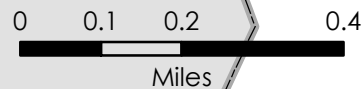
## Legend

- |  |                                   |  |    |   |
|--|-----------------------------------|--|----|---|
|  | Designated Route                  |  | 1  | Palmer Dr<br>(Eheart St - Sunrise Dr)         |
|  | Designated Route with Improvement |  | 2  | Country Club Dr<br>(Palmer Dr - S. Main St)   |
|  | Town Limits                       |  | 3  | Park Dr<br>(Palmer Dr - Grissom Ln)           |
|  | VT Campus & Properties            |  | 4  | Country Club Dr<br>(S. Main St - Airport Rd)  |
|  | Mild Slope                        |  | 5  | Grissom Ln<br>(Country Club Dr - New Kent Rd) |
|  | Steep Slope                       |  | 6  | Marlington St<br>(Grissom Ln - S. Main St)    |
|  |                                   |  | 7  | Nellies Cave Rd<br>(Grissom Ln - Town Limits) |
|  |                                   |  | 8  | New Kent Rd<br>(Grissom Ln - Sussex Rd)       |
|  |                                   |  | 9  | Sussex Rd<br>(New Kent Rd - Cedar Hill Dr)    |
|  |                                   |  | 10 | Cedar Hill Dr<br>(Sussex Rd - Ellett Rd)      |

Date: August 2015

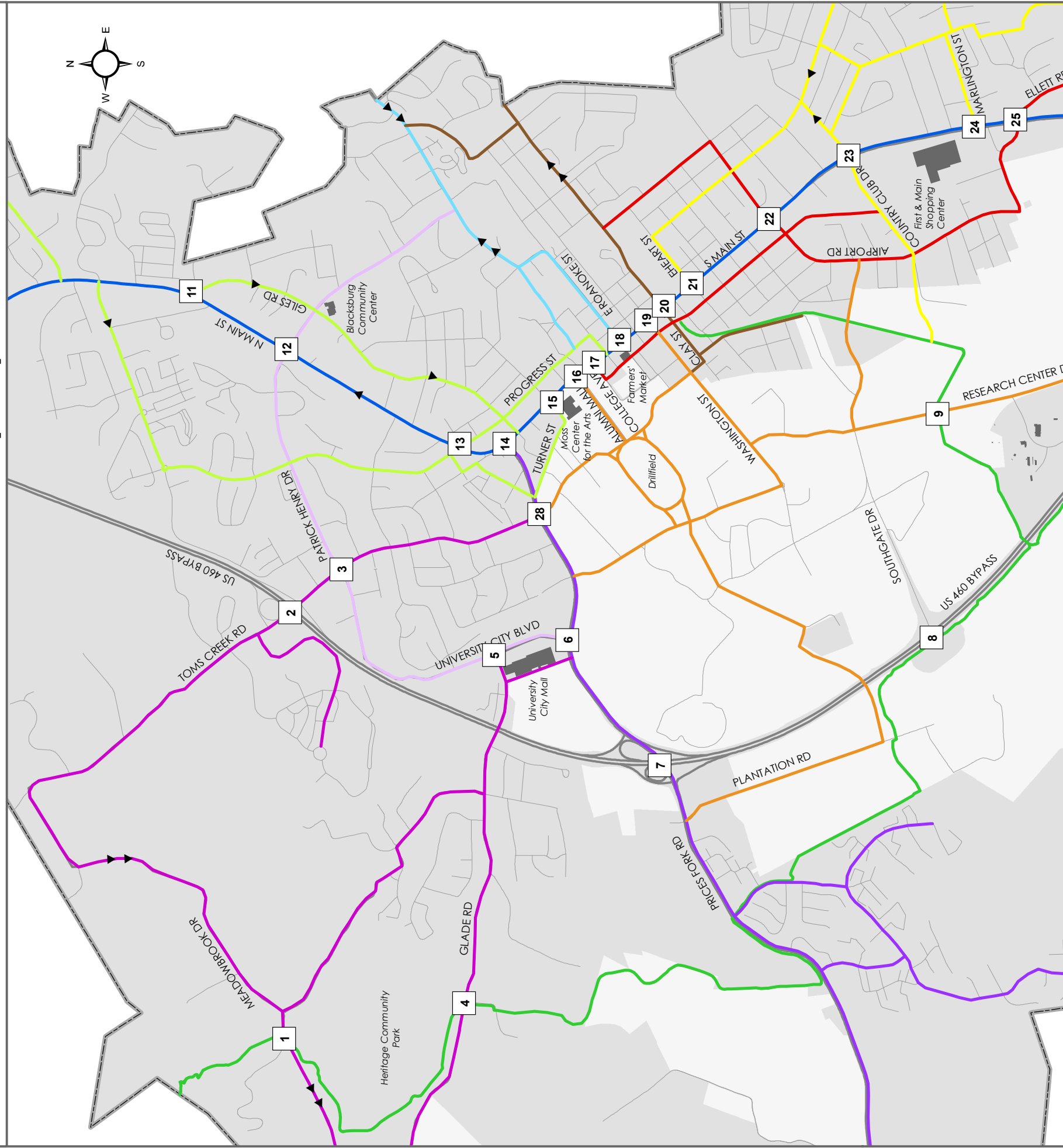
Created by: Blacksburg GIS Services

Sources: Town of Blacksburg;  
Blacksburg Transit; Virginia Tech;  
CGIT at Virginia Tech;  
Blacksburg Corridor Committee



For more information on facility improvements, see Tables 6-1, 6-2, & 6-3

# Intersections for Potential Facility Improvements



### Legend

	Town Limits		1 Green/Pink (Huckleberry Tr - Meadowbrook Dr)		15 Blue/Lime (N Main St - Turner St)
	VT Campus & Properties		2 Pink (Toms Creek Rd - Route 460)		16 Blue/Orange (N Main St - Alumni Mall)
	Mild Slope		3 Pink/Lilac (Toms Creek Rd - Patrick Henry Dr)		17 Blue/Red (N Main St - College Ave)
	Steep Slope		4 Green/Pink (Huckleberry Tr - Glade Rd)		18 Blue/Azure (Main St - E Roanoke St)
	<b>Designated Routes</b>		5 Pink/Lilac (Glade Rd - University City Blvd)		19 Blue/Orange (S Main St - Washington St)
	Azure		6 Purple/Lilac (Prices Fork Rd - University City Blvd)		20 Blue/Brown (S Main St - Clay St)
	Blue		7 Purple (Prices Fork Rd - Route 460)		21 Blue/Yellow (S Main St - Eheart St)
	Brown		8 Green - Future Improvement (Huckleberry Tr - Route 460)		22 Blue/Red (S Main St - Airport Rd)
	Green		9 Green/Orange (Huckleberry Tr - Research Center Dr)		23 Blue/Yellow (S Main St - Country Club Dr)
	Lilac		10 Green (Huckleberry Tr - Mabry Lane)		24 Blue/Yellow (S Main St - Marlington St)
	Lime		11 Blue/Lime (N Main St - Giles Rd)		25 Blue/Red (S Main St - Ellett Rd)
	Orange		12 Blue/Lilac (N Main St - Patrick Henry Dr)		26 Blue/Orange (S Main St - Prof. Park Dr)
	Pink		13 Blue/Lime (N Main St - Progress St)		27 Blue/Orange (S Main St - Industrial Park Rd)
	Purple		14 Blue/Purple (N Main St - Prices Fork Rd)		28 Pink/Purple/Orange (Toms Creek Rd - Prices Fork Rd - Stanger St)
	Red				
	Yellow				

For more information on facility improvements, see Table 6-4

Date: August 2015  
 Created by: Blacksburg GIS Services  
 Sources: Town of Blacksburg; Blacksburg Transit; Virginia Tech; CGIT at Virginia Tech; Blacksburg Corridor Committee

## Recommendations on Facility Type by Route and Segment

Corridor Committee Recommendation	
Blank	Not Recommended
●	Recommended

For locations where multiple recommendations are included, further study is needed to determine the most optimal treatment for cyclist safety. In some locations, shared road signage (such as, “Bicycles May Use Full Lane” signage) may be appropriate without narrow pavement markings. Innovative design treatments including bike boxes and colored bike facilities should be tested with pilot locations and studied before broader implementation. The Prices Fork Road corridor requires further study prior to facility improvements since space is limited, transitions are important, and safety is paramount. Many recommendations require further coordination with VDOT and Virginia Tech to create a well-functioning bicycle network with smooth transitions regardless of ownership.

**Table 6-1 - Arterial Roadway Segments**

Segment Number	Route	Street	From	To	Conventional Bike Lanes	Buffered Bike Lanes	Contra-flow Bike Lanes	Road Diet	Sharrows	Bike Paths and Shared Paths	Bicycle Boulevard	Colored Bike Facilities	Bike Route Signage	Comments
1	Azure	Harding Avenue	Progress Street	Bennett Street					●				●	
2	Azure	Harding Avenue	Bennett Street	Owens Street	●				●				●	Westbound segment of Harding Avenue is a steep descent and should be a shared lane. The uphill segment should have a conventional bike lane for climbing.
3	Azure	Harding Avenue	Owens Street	Town Limit	●				●				●	Westbound segment of Harding Avenue is a steep descent and should be a shared lane. The uphill segment should have a conventional bike lane for climbing.

Segment Number	Route	Street	From	To	Conventional Bike Lanes	Buffered Bike Lanes	Contra-flow Bike Lanes	Road Diet	Sharrows	Bike Paths and Shared Paths	Bicycle Boulevard	Colored Bike Facilities	Bike Route Signage	Comments
1	Blue	North Main Street	Route 460	Red Maple Drive	●					●			●	Path is existing but incomplete.
2	Blue	North Main Street	Red Maple Drive	Progress Street	●			●		●			●	Too many cross-accesses for conventional bike lanes; Road diet not feasible as 4 lanes are needed.
3	Blue	North Main Street	Progress Street	Roanoke Street					●				●	
4	Blue	South Main Street	Roanoke Street	Miller Street					●				●	
5	Blue	South Main Street	Miller Street	Airport Road	●			●					●	Conventional bike lanes would require a resolution for conflict over on-street parking.
6	Blue	South Main Street	Airport Road	Industrial Park Road					●				●	
3	Brown	Clay Street	Town Limit	Jefferson Street	●				●				●	Westbound segment of Clay Street is a steep descent and should be a shared lane. The uphill segment should have a conventional bike lane for climbing.
4	Brown	Clay Street	Jefferson Street	South Main Street					●				●	
1	Green	Huckleberry Trail	N/A	N/A						●				Remaining segment to connect to Heritage Park.
1	Lilac	University City Blvd	Prices Fork Road	Broce Drive	●				●	●			●	Lack of space for conventional bike lanes without reconstruction. Consider sharrows. Existing sidewalk.
2	Lilac	University City Blvd	Broce Drive	Toms Creek Road	●					●			●	Remove existing conventional bike lanes that are substandard in width. Existing sidewalk.

Segment Number	Route	Street	From	To	Conventional Bike Lanes	Buffered Bike Lanes	Contra-flow Bike Lanes	Road Diet	Sharrows	Bike Paths and Shared Paths	Bicycle Boulevard	Colored Bike Facilities	Bike Route Signage	Comments
3	Lilac	Patrick Henry Drive	Toms Creek Road	North Main Street	●			●		●			●	
4	Lilac	Patrick Henry Drive	North Main Street	Giles Road	●					●			●	
5	Lilac	Patrick Henry Drive	Giles Road	Harding Avenue	●					●			●	Remove existing conventional bike lanes that are substandard in width. One roadway section allows for on-street parking.
1	Orange	Plantation Road	Prices Fork Road	Virginia Tech Boundary						●			●	Some segments are existing.
2	Orange	Southgate Drive	Edgewood Lane	Airport Road					●	●			●	
3	Orange	Research Center Drive	Virginia Tech Boundary	Industrial Park Road						●			●	Road network improvements include shared use/bike path.
6	Orange	Industrial Park Road	South Main Street	Commerce Street	●					●			●	
1	Pink	Glade Road	Meadowbrook Drive	Boxwood Drive	●				●	●			●	Preference for conventional bike lanes.
2	Pink	Glade Road	Boxwood Drive	University City Boulevard						●			●	Conventional bike lanes exist.
3	Pink	Toms Creek Road	Prices Fork Road	Route 460 Bypass	●								●	
4	Pink	Toms Creek Road	Route 460 Bypass	Meadowbrook Drive	●					●			●	
1	Purple	Prices Fork Road	Town Limit	Plantation Road	●			●		●			●	Lack of space for conventional bike lanes without reconstruction.

Segment Number	Route	Street	From	To	Conventional Bike Lanes	Buffered Bike Lanes	Contra-flow Bike Lanes	Road Diet	Sharrows	Bike Paths and Shared Paths	Bicycle Boulevard	Colored Bike Facilities	Bike Route Signage	Comments
2	Purple	Prices Fork Road	Plantation Road	University City Boulevard	●			●		●		●	●	Lack of space for conventional bike lanes without reconstruction.
3	Purple	Prices Fork Road	University City Boulevard	North Main Street	●				●	●			●	Remove existing conventional bike lanes that are substandard in width. Consider sharrows.

Table 6-2 – Collector Roadway Segments

Segment Number	Route	Street	From	To	Conventional Bike Lanes	Buffered Bike Lanes	Contra-flow Bike Lanes	Road Diet	Sharrows	Bike Paths and Shared Paths	Bicycle Boulevard	Colored Bike Facilities	Bike Route Signage	Comments
4	Azure	Owens Street	Harding Avenue	Roanoke Street					●				●	
5	Azure	Roanoke Street	Main Street	Owens Street					●				●	
1	Lime	Bishop Road	Route 460	Mt Tabor Road					●	●			●	
2	Lime	Mt Tabor Rd	Bishop Road	North Main Street					●	●			●	
3	Lime	Givens Lane	North Main Street	Progress Street	●								●	Existing shared use path.
4	Lime	Giles Road	North Main Street (northern intersection)	North Main Street (southern intersection)					●				●	
5	Lime	Progress Street	Patrick Henry Drive	Winston Avenue	●				●				●	Need to resolve conflict with parking for conventional bike lane. Consider sharrows for downhill. Consider uphill climbing lane.
6	Lime	Progress Street	Winston Avenue	North Main Street					●				●	
7	Lime	Progress Street	North Main Street	Jackson Street					●				●	
4	Purple	Hethwood Blvd	Prices Fork Road	Tall Oaks Drive	●					●	●		●	
5	Purple	Heather Drive	Prices Fork Road	Tall Oaks Drive						●			●	
6	Purple	Tall Oaks Drive	Hethwood Boulevard	western end of Tall Oaks Drive					●	●	●		●	

Segment Number	Route	Street	From	To	Conventional Bike Lanes	Buffered Bike Lanes	Contra-flow Bike Lanes	Road Diet	Sharrows	Bike Paths and Shared Paths	Bicycle Boulevard	Colored Bike Facilities	Bike Route Signage	Comments
7	Purple	Tall Oaks Drive	Hethwood Boulevard	eastern end of Tall Oaks Drive	●					●	●		●	
1	Red	Willard Drive	Clay Street	Graves Avenue					●				●	
2	Red	Draper Road	College Avenue	Airport Road					●		●		●	
3	Red	Graves Avenue	Willard Drive	South Main Street			●		●				●	Graves Avenue is one-way from Main Street to Palmer Drive. Consider contra-flow lane or other parallel route.
4	Red	Airport Road	South Main Street	Hubbard Street	●				●		●		●	Monitor for increased bicycle traffic due to First and Main.
5	Red	Hubbard Street	Airport Road	South Main Street					●	●	●		●	
6	Red	Ellett Road	South Main Street	Town Limits	●				●	●			●	Consider transition between bike lanes & shared road signage without sharrow pavement markings.
1	Yellow	Palmer Drive	Eheart Street	Sunrise Drive					●		●		●	
2	Yellow	Country Club Drive	Palmer Drive	South Main Street					●				●	Consider Cohee Road as alternative.
4	Yellow	Country Club Drive	South Main Street	Airport Road	●					●			●	Some segments of trail are existing.
5	Yellow	Grissom Lane	Country Club Drive	New Kent Road					●	●			●	
8	Yellow	New Kent Road	Grissom Lane	Sussex Road					●	●			●	
9	Yellow	Sussex Road	New Kent Road	Cedar Hill Drive					●	●			●	
10	Yellow	Cedar Hill Drive	Sussex Road	Ellett Road					●	●			●	



Table 6-3 – Local Roadway Segments

Segment Number	Route	Street	From	To	Conventional Bike Lanes	Buffered Bike Lanes	Contra-flow Bike Lanes	Road Diet	Sharrows	Bike Paths and Shared Paths	Bicycle Boulevard	Colored Bike Facilities	Bike Route Signage	Comments
1	Brown	Roanoke Street	Harding Avenue	Alleghany Street					●				●	
2	Brown	Alleghany Street	Roanoke Street	Clay Street					●				●	
5	Brown	Clay Street	South Main Street	Kent Street					●	●			●	
6	Brown	Harrell Street	Clay Street	Sterrett Drive					●	●			●	Not shown on designated routes
4	Orange	Professional Park Drive	South Main Street	Prosperity Road	●					●			●	Consider Industrial Park as an overall area.
5	Orange	Prosperity Road	Professional Park Drive	Industrial Park Road	●					●			●	Consider Industrial Park as an overall area.
7	Orange	Commerce Street	Northern End	Trade Street	●					●			●	Consider Industrial Park as an overall area.
8	Orange	Trade Street	Commerce Street	State Street	●					●			●	Consider Industrial Park as an overall area.
9	Orange	State Street	Trade Street	End of State Street	●				●	●			●	Consider Industrial Park as an overall area.
3	Yellow	Park Drive	Palmer Drive	Grissom Lane					●				●	
6	Yellow	Marrington Street	Grissom Lane	South Main Street					●				●	
7	Yellow	Nellies Cave Road	Grissom Lane	Town Limits					●	●			●	

## Recommendations on Facility Type by Intersection and Route

Corridor Committee Recommendation	
Blank	Not Recommended
●	Recommended

Intersections are particularly difficult for areas with increased conflicts points for bicycles, pedestrians, and vehicles. Due to these conflict points and the wide variety of road conditions at intersections, additional study is recommended prior to facility improvements. Innovative design treatments including bike boxes and colored bike facilities should be tested with pilot locations and studied before broader implementation. The Prices Fork Road corridor requires further study prior to facility improvements since space is limited, transitions are important, and safety is paramount. Many recommendations require further coordination with VDOT and Virginia Tech to create a well-functioning bicycle network with smooth transitions regardless of ownership.

**Table 6-4 – Intersections**

Intersection Number	Route(s)	Cross-Street 1	Cross-Street 2	Through Bike Lanes	Bike Boxes	Two-stage Turn-queue Boxes	Median Refuge Island	Cycle Track	Cycle Track Intersection Approach	Bicycle Signal Heads	Signal Detection and Actuation	Active Warning Beacons at Unsignalized Intersection	Colored Bike Facilities	Bike Route Signage	Comments
1	Green/ Pink	Huckleberry Trail	Meadowbrook Drive					●				●	●	●	
2	Pink	Toms Creek Road	Route 460 Bypass									●	●	●	This is a VDOT controlled bridge.
3	Pink/Lilac	Toms Creek Road	Patrick Henry Drive	●							●		●	●	
4	Green/ Pink	Huckleberry Trail	Glade Road					●				●	●	●	Future intersection.
5	Pink/Lilac	Glade Road	University City Boulevard			●					●		●	●	

Intersection Number	Route(s)	Cross-Street 1	Cross-Street 2	Trough Bike Lanes	Bike Boxes	Two-stage Turn-queue Boxes	Median Refuge Island	Cycle Track	Cycle Track Intersection Approach	Bicycle Signal Heads	Signal Detection and Actuation	Active Warning Beacons at Unsignalized Intersection	Colored Bike Facilities	Bike Route Signage	Comments
6	Purple/Lilac	Prices Fork Road	University City Boulevard		●	●					●		●	●	
7	Purple	Prices Fork Road	Route 460 Bypass					●				●	●	●	
8	Green	Huckleberry Trail	Route 460 Bypass – Future Southgate Interchange					●				●	●	●	This intersection will change with completion of the Southgate Interchange.
9	Green/Orange	Huckleberry Trail	Research Center Drive					●				●	●	●	This is a shared intersection with Virginia Tech requiring coordination for any improvements. The recommendations may change with future changes to the configuration of Research Center Drive.
10	Green	Huckleberry Trail	Mabry Lane					●					●	●	
11	Blue/Lime	North Main Street	Giles Road										●	●	
12	Blue/Lilac	North Main Street	Patrick Henry Drive		●	●					●		●	●	
13	Blue/Lime	North Main Street	Progress Street		●						●		●	●	
14	Blue/Purple	North Main Street	Prices Fork Road										●	●	
15	Blue/Lime	North Main Street	Turner Street								●			●	
16	Blue/Orange	North Main Street	Alumni Mall								●		●	●	
17	Blue/Red	North Main Street	College Avenue								●		●	●	

Intersection Number	Route(s)	Cross-Street 1	Cross-Street 2	Through Bike Lanes	Bike Boxes	Two-stage Turn-queue Boxes	Median Refuge Island	Cycle Track	Cycle Track Intersection Approach	Bicycle Signal Heads	Signal Detection and Actuation	Active Warning Beacons at Unsignalized Intersection	Colored Bike Facilities	Bike Route Signage	Comments
18	Blue/ Azure	Main Street	Roanoke Street								●		●	●	
19	Blue/ Orange	South Main Street	Washington Street								●		●	●	
20	Brown/ Blue	South Main Street	Clay Street								●		●	●	
21	Blue/ Yellow	South Main Street	Eheart Street										●	●	
22	Blue/Red	South Main Street	Airport Road			●					●		●	●	
23	Blue/ Yellow	South Main Street	Country Club Drive			●					●		●	●	
24	Blue/ Yellow	South Main Street	Marlington Street		●						●		●	●	
25	Blue/Red	South Main Street	Ellett Road		●	●					●		●	●	Consider as pilot location for bike box.
26	Blue/ Orange	South Main Street	Professional Park Drive		●	●					●		●	●	
27	Blue/ Orange	South Main Street	Industrial Park Road		●	●					●		●	●	This is a VDOT controlled intersection.
28	Pink/Purple /Orange	Toms Creek Rd & Stanger St	Prices Fork Road												This intersection was included as a suggestion from Virginia Tech staff as an opportunity for the Town and university to coordinate on formulating recommendations to maximize safety for all users.

## 7.0 Non-Infrastructure Recommendations

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Education, Encouragement, Enforcement and Evaluation (& Planning) make up four program areas that complement Engineering improvements such as multi-purpose trails, bike lanes, and bike routes that together comprise the “Five Es”. Tables 6-1, 6-2, 6-3, and 6-4 address facility improvements to achieve the Engineering component of a Bicycle Friendly Community. These four additional program areas provide residents with the necessary resources to understand the rules of the road and confidently use the bicycle network.

These programs also serve to increase bicycle ridership levels in Blacksburg and has the additional benefit of meeting the goals set forth in the Climate Action Plan (CAP). The CAP has set a goal of reducing the Town’s greenhouse gas levels by 80% of 1990 levels by 2050. A significant portion of greenhouse gas emissions is derived from automobile use. Increasing bicycle ridership can aid in reducing the total number of automobile vehicle miles traveled and thus reduce greenhouse gas emissions. There are a growing number of links between planning and public health. This plan seeks to improve community health with the provision of wide-ranging opportunities for bicycling.

In addition to supporting the CAP, this Plan will also assist in achieving goals from the US Department of Transportation’s “Mayors’ Challenge for Safe People, Safer Streets”. The Town of Blacksburg is a participant in this year-long challenge that began in March 2015 as a means to advance safety and accessibility in the community. More information can be found at: <http://www.transportation.gov/mayors-challenge>.

The following sections present recommended programs and policies to support the vision and the goals of this plan according to the categories: Education, Encouragement, Enforcement, and Evaluation & Planning.

### 7.1 Education

Creating a connected bicycle network with proper bicycle infrastructure is not enough to increase ridership and safety for bicyclists. Programs that are focused on education, safety and encouragement are essential elements of a successful bicycle program.

While a strong bicycle community exists in Blacksburg; information collected from the bike counts, crash history, and anecdotal evidence shows a lack of understanding of traffic principles and/or widely varying levels of comfort for bicyclists riding on the road with motorized vehicles. The goal of the education program will be to increase confidence of bicyclists to ride with traffic and to encourage bicyclists to follow basic traffic principles when riding on the road. The education and safety programs will target four specific groups: adults, children, motorists, and law enforcement.

#### 7.1.1. Adults

Education can assist in increasing the comfort level for bicyclists riding in Town. Education programs for adults will be geared towards explaining and teaching basic traffic principles such as lane positioning and signaling. Such programs could be designed to encourage helmet use among adults who have not grown up wearing helmets. These programs will consist of in-class teaching, parking lot drills and on-the-road riding. Additional classes focused on different levels of bicyclists as well as refresher classes for updates to bicycling law can be offered.

The League of American Bicyclists has created a series of **Smart Cycling** courses that are taught by **League Certified Instructors** (LCIs). A dozen LCIs live in the Roanoke and New River Valley regions and are certified to teach the Smart Cycling courses. This Plan recommends the Smart Cycling courses be promoted and offered through the Parks and Recreation Department.

### 7.1.2. Children

- Promote the **Bike Smart Virginia Schools Program**, which is a collaborative project with the Virginia Departments of Education, Health and Motor Vehicles and the non-profit organization, Bike Walk Virginia. Bike Smart teaches bicycle safety and bicycle maintenance in bike safety programs at elementary, middle or high schools. ([www.vahealth.org/injury/bike/BikeSmartVaSchools.htm](http://www.vahealth.org/injury/bike/BikeSmartVaSchools.htm))
- **Safe Routes to School:** Improving children’s safety while walking and bicycling is a central mission of Safe Routes to School (SRTS). Program benefits stretch beyond the school day. SRTS resources and activities help communities by: building sidewalks, bicycle paths and pedestrian-friendly infrastructure; reducing speeds in school zones and neighborhoods; and addressing distracted driving among drivers of all ages.
- The Town has actively sought and received SRTS funding for projects at three elementary schools - Gilbert Linkous Elementary, Margaret Beeks Elementary and Harding Avenue Elementary. This Plan recommends the Town continue to seek SRTS funding for travel improvements around the elementary schools. It should be noted, however, that this program is not as robustly funded as in previous years and the funding has been combined with other programs.
- The plan also recommends using SRTS non-infrastructure funds to bring other bicycle-related programs to the elementary schools. Community partners such as the school Parent Teacher Associations (PTAs) and the New River Valley Bicycle Association may deliver programs.

### 7.1.3. Motorists

Many motor vehicle drivers do not know how to interact with bicyclists and without any training on how to interact, automobile drivers represent a serious threat to the safety of bicyclists. This Plan recommends the following programs and activities.

- **Require Bicycle Education Courses for Town Employees and Blacksburg Transit Bus Drivers.** The Town can require its employees to take a bicycle awareness course. While this may not be important for all Town positions, it shows a commitment to becoming a bicycle friendly community, and does have direct importance to Town staff who operate Town vehicles. This program could also be expanded to target local high employment industries.
- **Share The Road Campaign.** The Town can run a public awareness campaign that targets motorists’ awareness of bicyclists on the road. The campaign may include videos, signs, and banners on buses. The campaign can be used to promote new bicycle infrastructure such as sharrows, bicycle symbols, bike boxes, and other bicycle designations on the road, and how drivers should properly interact with bicyclists.
- **Motorist Education Classes.** The Town can assist in providing refresher classes for new laws regarding interactions between bicyclists and motorists. For example, classes could highlight the new law enacted by the Virginia General Assembly in March 2015 that allows for vehicles to cross the double yellow traffic lines in order to safely pass bicycles.

### 7.1.4. Bicycle Resource Webpage

In addition to targeting specific users with educational campaigns, this Plan recommends creating a consolidated location for bicycle related information through a **Bicycle Resource Webpage**.

Specifically, this plan recommends the following elements be included:

- Bicycle routes
- Interactive bike route selection map
- Interactive bike parking maps

- Multi-purpose trail locations
- Bicycle Master Plan
- Advertisement of all bikeways before and after implementation
- Bicycle events calendar
- Rules of the road
- Education and skill class information
- Reference to related portions of the Code of Virginia

The following examples of webpages from around the country can be used as a guide in modeling the Town's webpage:

- Greenville, South Carolina ([www.greenvillesc.gov/ParksRec/Trails/bikeville.aspx](http://www.greenvillesc.gov/ParksRec/Trails/bikeville.aspx))
- Cincinnati, Ohio ([www.cincinnati-oh.gov/bikes/](http://www.cincinnati-oh.gov/bikes/))
- Austin, Texas ([www.austintexas.gov/department/bicycle-program-0](http://www.austintexas.gov/department/bicycle-program-0))
- Fairfax County, Virginia ([www.fairfaxcounty.gov/fcdot/bike](http://www.fairfaxcounty.gov/fcdot/bike))
- Arlington, Virginia ([www.bikearlington.com/pages/maps-rides/](http://www.bikearlington.com/pages/maps-rides/))

For this resource to be the most useful, Town staff time will need to be dedicated to content creation and routine updates. The Town's Parks & Recreation, Public Works, and Engineering & GIS departments will collaborate to continuously update the webpage so residents and visitors have access to the most current information about the bicycle network. The Town may coordinate with the clubs, organizations and planning bodies to keep the content updated and accurate.

## 7.2 Encouragement

The following programs are designed to create a strong bike culture that welcomes and celebrates bicycling. Each program identifies the responsible entities and includes examples from other communities where appropriate.

### 7.2.1. Maps

The Parks and Recreation Department periodically prints a bicycle and greenway map which identifies on- and off-street bicycle facilities. With the adoption and implementation of this Plan, a new map will be printed and distributed.

### 7.2.2. Corridor Committee

The Greenway/Bikeway/Sidewalk Corridor Advisory Committee promotes the preservation, use, and expansion of Blacksburg's greenways, corridors, and bikeways and sidewalks. The Committee periodically reviews and recommends courses of action for existing systems, plans and policies to identify areas which may need amendment in order to address current and future needs by the Town. The Committee also serves to facilitate the coordination between the bike-walkway, greenway, and sidewalk systems of the Town and with those of neighboring communities.

### 7.2.3. Bicycle Shops

The retail bicycles shops in Blacksburg serve as a resource for bike selection and fitting and advice on riding. The shops lead group rides and provide basic bike maintenance classes.

### 7.2.4. Organizations

- The *New River Valley Bicycle Association* (NRVBA) is a regional non-profit that promotes bicycle recreation, education and advocacy. The NRVBA leads rides for bicyclists of all skill levels and offers smart cycling classes. The NRVBA often partners with Blacksburg on special events such as Clean Commute Friday, seasonal parades and with Downtown Blacksburg Inc. to provide bike valet service for downtown events. ([www.nrvbike.com](http://www.nrvbike.com))

- The *New River Valley Bike Kitchen* is a community resource hub for people to access essential neighborhood services on a recycled bicycle. The Bike Kitchen allows people to purchase their own recycled bicycle and receive follow up maintenance support on a fee schedule that they can afford. The Bike Kitchen also provides bike education training so that people can confidently ride in traffic and perform minor maintenance, wayfinding assistance to access economic and social support agencies, and other services. (<http://www.nrvbikekitchen.com/>)
- *Bike the US for MS* is a non-profit organization based in Blacksburg that raises funds for multiple sclerosis research and treatment through cross country cycling trips. In addition to funding research, cyclists volunteer for MS patients as they pass through communities and a portion of the funds are used for home modification projects like accessible ramps and bathrooms. (<http://www.bikettheusforms.org/>)
- *Ride Solutions* provides alternative transportation options – ridesharing (carpooling and vanpooling), biking, public transit, walking, and guaranteed ride home services – to residents living within the greater New River and Roanoke Valleys and Region 2000 regions of southwestern Virginia. Ride Solutions partners with Blacksburg and the NRVBA on events that promote bike commuting. ([www.ridesolutions.org](http://www.ridesolutions.org))
- The Virginia Tech *Center for Geospatial Information & Technology* (CGIT) is an interdisciplinary center that partners with university researchers, government agencies, and the private sector to research and develop advanced uses of geospatial technologies. CGIT supported bike-planning efforts by providing electronic mapping surveys and analysis of the survey data. ([www.cg.it.vt.edu](http://www.cg.it.vt.edu))

### 7.2.5. Sports Clubs and Racing Teams

- *Rogues Racing* is Blacksburg's only non-collegiate cycling team composed of riders ranging in various skill levels. Their focus is racing and supporting various cycling events in the New River Valley area. ([www.roguesracing.com](http://www.roguesracing.com))
- The *Virginia Tech Cycling Team* is a club team focused on improving the cycling community in the Blacksburg area and competing in the Atlantic Collegiate Cycling Conference (ACCC) and at the national level. (<http://www.virginiatechcycling.com/>)

### 7.2.6. Bike Activities

In partnership with community organizations, the Town is already co-hosting activities and programs during April and May – which is National Bike Month. The Town should continue to explore other activities to promote cycling during National Bike Month and beyond.

- **Fix Fest** – A program that was put on through a partnership with the New River Valley Bicycle Association (NRVBA), Ride Solutions, and the Blacksburg Farmers Market. The event, which was held in April of each year, brought local bicycle shops together at Market Square Park to provide bicycle tune-ups for community members. The event encouraged those community members who had not used their bike recently to get their bikes out and ready to ride. This former program provides an opportunity for renewed partnership in the future.
- **Clean Commute Day** – This program is put on through a partnership with the Town, Ride Solutions, and the NRVBA for the purpose of promoting and encouraging people to walk, bike, or ride the bus to school or work. Ride Solutions challenges individuals and teams to competitively track and log their total miles using alternative transportation. Clean Commute Day typically falls on one Friday in May. The program may be expanded to include more than one or all Fridays in the month.



As part of Clean Commute Day, an “Energizer Station” is located in a prominent location where free coffee and baked goods are offered to participants. Bumper stickers, buttons, and certificates could be provided for anyone who wanted to promote their participation in Clean Commute Day. Additional Clean Commute Days could be promoted during Virginia Tech’s Sustainability Week *Active Commuter Celebration* and the Earth Week *Dump the Pump Day*.

- **Bike Valet** – The Bike Kitchen, NRVBA and Ride Solutions coordinate with Downtown Blacksburg Inc. to offer bike valet services during downtown street festivals. The bike valet service is advertised with festival information and festival participants are encouraged to bike to events.

This Plan recommends the following additional activities:

- Annual Mayor’s bike ride during the month of May
- Mayor’s proclamation to kick off Bike Month
- “Commuter” class
- Bike parking education program for the Apartment Council and development community

### 7.2.7. Bike Repair Stations

To encourage bicycling, install self-service bicycle repair stations throughout Town. The stations typically include wrenches, screwdrivers, tire levers, and tire pumps attached to the stand for minor bike repair and maintenance. Using these tools bicyclists can adjust their brakes and derailleur and fix a flat tire.

Virginia Tech has installed multiple fix stations on campus and the NRVBA donated a Dero Fixit station to the Town which has been installed at the Blacksburg Public Library along an off-street multi-use path.

### 7.2.8. Local Employer Encouragement

Studies show that employers who promote Bike to Work Programs experience reduced health care costs, decreased absenteeism, increased productivity, and reduced parking costs. This plan recommends the Town promote the following programs or activities or other equivalents.

The Town will partner with the New River Valley Regional Commission (NRVRC – see section 7.4.4), Ride Solutions, and other organizations to host bicycle-related educational programs for local employers and businesses. Specific programs include workshops that promote regional and national programs and workshops that recognize local businesses that have implemented programs to support bicycle commuting.

The League of American Bicyclists’ **Bicycle Friendly Business (BFB)** program recognizes employers’ efforts to encourage a more bicycle friendly atmosphere for employees and customers. The program honors innovative bike-friendly efforts and provides technical assistance and information to help companies and organizations become even better for bicyclists.

The Town should serve as a role model for local employers by initiating such programs in-house.

### 7.2.9. Car-Free Street Events

Based on the popular Ciclovía events originating in South America; Car-Free Streets or Open Streets events allow families and friends to get some exercise and enjoy a festival atmosphere as streets are opened up to bicyclists, pedestrians, skaters, fitness classes, and other activities. The Town may partner with Downtown Blacksburg Inc., the Bike Kitchen, the NRVBA, and Ride Solutions to hold such events on an annual or more frequent basis.

The Open Streets Project is a partnership between the Alliance for Biking & Walking and The Street Plans Collaborative for promoting car-free events. The Open Streets Project offers resources on organizing and promoting such events. (<http://openstreetsproject.org/resources/>)

Examples of car-free street events include:

- Charlottesville, Virginia (<http://bikewalkplay.com>)
- Boulder, Colorado (<http://bouldergreenstreets.org/event-schedule/>)
- Carrboro, North Carolina (<http://bikecarrboro.com/home-page/carrboro-open-streets>)
- Minneapolis, Minnesota (<http://openstreetsmpls.com>)

### 7.2.10. Bicycle Share Program

A bike share program allows community members access to a fleet of bicycles located at stations strategically placed around Town. Users pick up a bicycle at a station and drop it off at another station. Virginia Tech is exploring a bike share program. Partnership with the Town of Blacksburg will increase the success of such a program. Stations can be placed around Town and campus. Two examples of college towns that have successfully implemented a bike share include Boulder, Colorado and Madison, Wisconsin.

## 7.3 Enforcement

Enforcement programs enforce legal and respectful use of the transportation network. Information collected from the bike counts, crash history, and anecdotal evidence shows a lack of understanding of traffic principles. Consequently, the following enforcement programs are recommended or where already implemented are encouraged to continue.

### 7.3.1 Bicycle Patrol

Police bicycle patrols not only increase the mobility of officers but also provides law enforcement officers with the opportunity to display safe and legal bicycle skills.

### 7.3.2. Speed Feedback Signs

Speed feedback signs display the speed of passing motor vehicles with the expectation that motorists will slow down if they are aware of their speed. Information about the availability of speed feedback signs can be located on the Bicycle Resource webpage.

### 7.3.3. Targeted Enforcement

Conduct targeted enforcement efforts at locations where bicycle and motorist conflicts exist. This plan recommends targeted enforcement at locations known for non-compliance with traffic laws and at high conflict or high bicycle-related crash areas.

## 7.4 Evaluation and Planning

Evaluation programs help the Town measure how well it is meeting the goals of the Bicycle Master Plan and the Comprehensive Plan.

### 7.4.1. Incident Analysis

Following significant crashes involving bicyclists and/or following the installation or construction of a new bicycle-related facility, the Town will conduct an incident analysis and make recommendations based on the findings of the analysis.

- When such an incident occurs, the Town will convene a special meeting that includes staff from the Police Department, Parks & Recreation, Public Works, and Engineering, and a representative from the Corridor Committee to review available information related to the incident.

- The analysis will evaluate cause and existing bicycle facilities and make recommendations based on the findings. These recommendations may include infrastructure improvements, signage, education or other appropriate measures.
- Recommendations will be implemented and evaluated after a defined period of time. Additional improvements may be required following this evaluation. Re-evaluation will continue until all concerns are addressed.
- If the incident analysis and recommended improvements affect the content of this plan, the plan shall be amended to reflect the changes.

### 7.4.2. Annual Count and Survey Programs

Bicycle counts and community surveys serve as a method to evaluate the impacts of specific bicycle improvement projects and can function as a way toward measuring the Town's Climate Action Plan goals such as reducing greenhouse emissions and increasing number of trips made by bicycle. Through the Master Plan process, the Town has already developed baseline data and methodology for collecting bicycle counts. This plan recommends the following:

- Before and after bicycle counts on all roadway and bikeway projects.
- Annual (or biennial) bicycle counts conducted at previously counted and new locations.
- Community survey to evaluate bicycling activity, impacts of bicycle programs, and facilities and to measure the Town's progress toward reaching goals.

### 7.4.3. Apply to Become a Bronze-Level Bicycle Friendly Community

As previously mentioned, the League of American Bicyclists has a nationally recognized [Bicycle Friendly Communities \(BFC\)](#) award program. Communities complete a detailed application that covers bicycle-related facilities, plans, education efforts, promotion initiatives, and evaluation work. The award is designed to recognize progress and to assist communities in identifying priority projects to improve bicycling conditions. Many of the top-rated places to live, raise children, and/or retire have received the League's BFC awards.

The following Virginia localities have been recognized under the BFC Program.

- Alexandria – Silver
- Arlington – Silver
- Charlottesville– Silver
- Harrisonburg– Bronze
- Portsmouth – Bronze
- Reston - Bronze
- Richmond – Bronze
- Roanoke – Bronze
- Williamsburg - Bronze

Virginia Tech was awarded Bronze-Level Bicycle Friendly University status.

This plan recommends the Town apply for Bronze-Level Bicycle Friendly Community status within two to three years of adoption of this plan. According to the League of American Bicyclists, there are multiple routes to achieving Bicycle Friendly Community status. The Town can implement recommendations by choosing from its

strengths in the 5 E's to achieve this designation. Once this designation is achieved, the Town should publicize this important accomplishment.

**7.4.4. Planning Support**

- *New River Valley Regional Commission (NRVRC)* is one of twenty-one planning districts in the state. NRVRC encompasses the counties of Floyd, Giles, Montgomery, and Pulaski, and the City of Radford. The commission provides planning assistance to local governments that includes assistance to Blacksburg in support of this plan. ([www.nrvrc.org](http://www.nrvrc.org))

**7.5 Other Policy Recommendations**

Some policy recommendations do not fit neatly into one of the previous categories and are included below.

**7.5.1. Blacksburg Municipal Code**

All of the Town's ordinances are codified into one reference called the Blacksburg Municipal Code. As part of the Bike Master Plan, the Town Code has been evaluated to determine where changes could be considered to promote bike activity within the Town. To continue to improve the bicycle-friendly nature of Blacksburg, the Town will need to codify its support for bicyclists on the road, on trails and at end-of-trip facilities. Examples include requirement or encouragement for increased bicycle parking, provisions for bicycle commuters, better intermodal connections, and bicycle education programs across all institutions and organizations.

The following table lists all of the bicycle-related code sections that were reviewed with recommended revisions highlighted in grey.

Table 7-1: Recommended Code Revisions

Code Section	Description	Revision Recommended
12-101.1	Bicycle Contraflow Lanes	No
12-106	Riding bicycle	No
12-107	Bicycle trails and operation of other vehicles thereon	No
12-108	Bicycle helmets	No
14-302	Illustrative enumeration	Yes
15.5-105	Bicycles	No
15-101	Special events; permit required	No
15-102	Permit processing fee	No
17-110	Sale of unclaimed bicycles	No
21-115	Skating, skateboards, and bicycles	Yes
21-116	Skating, skateboards, and bicycles	Yes
21-610	In general	No
21-612	Street festivals	No
Appendix A - 1162(b)(7)	Planned zoning districts	No
Appendix A - 2103	Definitions of terms and use types	No
Appendix A - 3140	Purpose	No
Appendix A - 3232	Permitted uses	No
Appendix A - 3303	Additional site development standards	No
Appendix A - 4225	Special housing	Yes
Appendix A - 5213	Minimum parking for bicycles	Yes
Appendix A - 5750	Maintenance of required features	No
Appendix B - 3-100	Definitions	Yes
Appendix B - 4-600	Surety in lieu of completion	No
Appendix B - 5-321	Bicycle lanes	Yes

Virginia's bike laws can be reviewed at VDOT's website. ([www.vdot.virginia.gov/programs/bk-laws.asp](http://www.vdot.virginia.gov/programs/bk-laws.asp))

**Proposed Changes to Municipal Code Sections**

The following text shows the existing Municipal Code in plain text with specific recommended revisions in strikethrough and recommended additions in italics. General recommendations for review of standards are noted immediately following the associated code section in bulleted italics.

**Section 14-302 – Illustrative enumeration.**

The existence of any of the following activities or conditions is hereby declared to be a public nuisance, provided, however, that this enumeration shall not be deemed or construed to be conclusive, limiting or restrictive:

(7) Any action which unlawfully interferes with, obstructs or tends to obstruct or renders dangerous for passage any public or private street, highway, sidewalk, stream, ditch or drainage area.

- *Clarify how this pertains to bicycles attached to Town amenities in public spaces. Attaching bicycles to Town amenities (such as lamp posts and trash cans) should be prohibited. The Town should focus on expanding bicycle parking; especially in key areas including downtown. The Town has completed an inventory and assessment of bicycle parking within the downtown and the study includes opportunities for installing additional parking.*

**Section 21-115 – Skating, skateboards, and bicycles on downtown streets, sidewalks and parking areas.**

(a) The purpose of this section is to promote the health, safety, and welfare of all visitors to the Central Downtown District of Blacksburg. The combination of roller skate, in-line skate, and skateboard traffic with automobile and pedestrian traffic poses an unreasonable risk of harm in this heavily traveled district. Likewise, the combination of bicycle traffic with pedestrians using downtown sidewalks poses an unreasonable risk of harm.

(b) For the purposes of this section, the term "downtown street" shall be defined to include the following streets...

- *Clarify ownership and enforcement of Virginia Tech owned property in the downtown district; specifically the north side of College Avenue between Main Street and Otey Street and the west side of Main Street between College Avenue and Turner Street.*

**Section 21-116. – Skating, ~~and skateboards, and bicycles~~ on pedestrian walkways.**

(a) No person shall use roller skates, in-line skates, ~~or skateboards, or bicycles~~ on the pedestrian walkway known as the Bicentennial Greenway.

(b) Any person violating this section shall be liable to the town for a civil penalty of fifteen dollars (\$15.00).

- *This recommendation by the Corridor Committee is not unanimous.*

**Appendix A: Sec. 4225 - Special housing.**

(b)(1)d. Storage. There shall be no outside storage of bicycles or other equipment, except a bike rack is permitted behind the front building line *as consistent with Section 5213(b) and (c).*

**Appendix A: Section 5213 – Minimum parking for bicycles.**

(a) For developments that require a site development plan as set forth in article V, division 1 of this ordinance, facilities for the off-street parking of bicycles shall be provided as follows:

Use Type	Required Number of Bicycle Spaces
Residential units (except single-family detached)	Twenty-five (25) percent of the total number of bedrooms

or duplexes)	
Commercial retail	Five (5) spaces or one (1) space per one thousand (1,000) square feet of floor space devoted to retail sales for first fifteen thousand (15,000) square feet and one (1) space for each additional five thousand (5,000) square feet, whichever number is greater
For civic, office or any other use not listed above	Minimum of five (5) bicycle spaces

(b) Required bicycle stands must be permanently anchored.

(c) Required bicycle stands must be of inverted U construction adequately spaced to accommodate multiple bicycles. Other types of construction are allowed as approved by the Administrator provided they meet the intent to allow the secure attachment of multiple bicycles. Ribbon style bicycle racks are not allowed. Required bicycle stands must be located in a safe, accessible area near a public entrance.

(d) In any case, the Administrator may waive or reduce the bicycle space requirement if the proposed use is in a location not easily accessible to a bicyclist or of a nature such that it is not conducive to bicycling.

- *The Association of Pedestrian and Bicycle Professional (APBP) has produced Bicycle Parking Guidelines, Second Edition (2012), which provides guidance on the following:*
  - *General bicycle parking principles*
  - *Definitions of bicycle parking terms,*
  - *Elements of a good rack or locker that include specific performance criteria*
  - *Site design and layout that includes guidance by land use type*
  - *Maintenance best practices*
  - *Innovative practices such as sheltered parking and in-street bicycle corrals*
  - *Sample bicycle parking policies and ordinances*
- *This Plan recommends the Town evaluate its current parking ordinance and practices against the newly published APBP guidance and revise ordinances and policies that improve bicycle parking across Town to include parking considerations for cargo-type bikes where dimensions are too large for the conventional bike rack, the placement of racks, and in response to shortages of racks. The Town should also consider bicycle parking for transit stops.*
- *Amend language in paragraph (c) to ensure it is broad enough to allow and encourage long-term bike parking or storage options such as bike lockers, closets, and rooms.*
- *Insert language that encourages developers to install self-service bike repair stations as part of a private development, particularly along multi-purpose paths within the development.*
- *Encourage dual-purpose parking meters that allow bike parking.*

**Appendix B: Section 3-100. – Definitions.**

**Bikeway:** Any facility which provides for bicycle travel as described and contained in the MUTCD and AASHTO Guides. and may be one (1) of the two (2) following types:

(1) **Bike trail:** A completely separate right-of-way designed for alternative transportation use. Cross flows by pedestrians and motorists are minimized. This may also be referred to as a multi-use trail.

(2) **Bike lane:** A restricted right-of-way integrated with a vehicular roadway and designed for the exclusive use of bicycles. Through travel by motor vehicles is not permitted, but crossflows may be allowed.

**Appendix B: Section 5-321. – Bicycle lanes.**

All proposed collector and arterial streets within a subdivision shall be constructed with bicycle lanes. The bike lane width and intersection configuration shall meet current VDOT standards. Bike lanes may also be required on local streets as provided for in the Comprehensive Plan and detailed further in the Bicycle Master Plan.

### 7.5.2. Funding Policy

One of the most important aspects of this Plan will be to seek a variety of traditional and innovative funding strategies to implement the bicycle network and supporting programs. Once the plan is adopted, the Town will be able to apply for funds and grants from a variety of federal transportation programs such as the Recreational Trails Program and Transportation Alternatives Program. Additionally, the Virginia Department of Transportation administers several funding programs that include the Transportation Enhancement Program (TEA-21) and Recreational Access Program that the Town may consider applying for after the Plan is adopted. Other state agencies provide funding through grants for pedestrian and bicycle projects that include trails for hiking and mountain biking.

At the local level, both public and private funding options are available for improving bicycle and pedestrian conditions and safety. Blacksburg's Capital Improvement Program is the main source of funding for sidewalk improvements.


This Plan also recommends the Town pursue private grants and private donations from citizens, organizations, and businesses that support bicycling in Blacksburg. For example, the People for Bikes organization administers a Community Grant Program that supports bicycle infrastructure projects and advocacy initiatives to improve the local bicycling environment.

**APPENDIX A – Design Guidelines**

The following tables and descriptions represent the on-street and off-street facilities recommended in the Blacksburg Bicycle Master Plan. Additional facilities are provided as possible alternatives.

**A.1 Bicycle Lanes**

Bike Lanes comprise a portion of a roadway, which has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists.

<b>A.1.1 Conventional Bike Lane</b>	
	
Blacksburg	
<p><b>Description</b></p> <p>Bike lanes comprise a portion of a roadway, which has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. They are located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge, or parking lane.</p>	
<p><b>Benefits (NACTO, 2011)</b></p> <ul style="list-style-type: none"> <li>● Increases comfort/confidence on busy streets for all levels of bicyclists.</li> <li>● Creates separation between bicyclists and autos</li> <li>● Increases predictability of cyclist and motorist positioning</li> <li>● Increases total capacity for streets carrying mixed mode traffic</li> </ul>	<p><b>Typical Applications (NACTO, 2011)</b></p> <ul style="list-style-type: none"> <li>● Bike lanes are most helpful on streets with <math>\geq 3,000</math> motor vehicle average daily traffic.</li> <li>● Bike lanes are most helpful on streets with a posted speed <math>\geq 25</math> mph. On roads with <math>\geq 35</math> mph speed limits, consider buffered bike lanes or cycle tracks to provide greater separation between bicycles and vehicles</li> <li>● On streets with high transit vehicle volume.</li> </ul>
<p><b>Guidance and Concerns</b></p> <p>Bicycle lanes must provide 5-6' of usable space for cyclists. Usable space does not include the gutter pan area as the joint between the gutter pan and pavement edge is a hazard for cyclists. Inadequate widths for bicycle lanes or auto travel lanes serve neither the bicyclist nor the auto. Minimum width and symbol/signage guidance must be followed. Refer to accepted publications such as MUTCD or NACTO Design Guide for required specifications. Intersections require special consideration to limit potential conflict between drivers of motor vehicles, bicyclists, and pedestrians.</p>	



A.1.2. Buffered Bike Lane

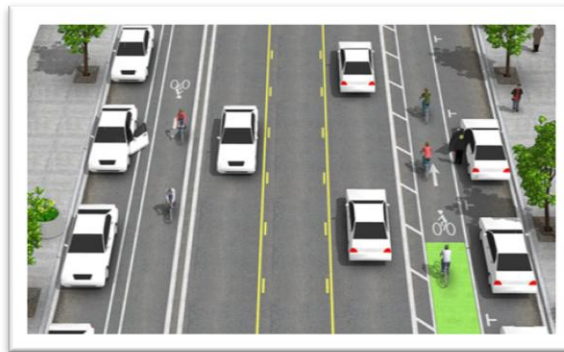


Image Credit: NACTO

**Description**

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.

**Benefits (NACTO, 2011)**

- Provides additional passing distance between vehicles and bicyclists
- Provides space for cyclists to pass slower cyclists, without encroaching on vehicle travel lane
- Buffer can be used to keep cyclists out of the door zone in areas with street parking
- Provides greater space to cyclists without lane being mistaken for a motor vehicle travel lane+
- Appeals to a wider cross-section of bicycle users and contributes to perception of safety
- Increases total capacity for streets carrying mixed mode traffic

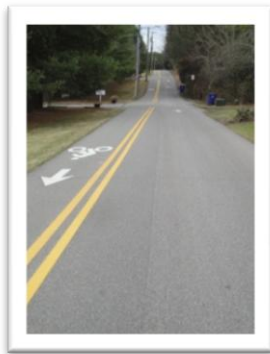
**Typical Applications (NACTO, 2011)**

- Anywhere a conventional bike lane is being considered.
- On streets with higher traffic volume, speed, or truck traffic.
- On streets with extra lanes or extra lane width
- Special consideration must be given at transit stops to manage bicyclist/pedestrian interactions with transit

**Guidance and Concerns**

“Where buffers are used, bike lanes can be narrower because the shy distance function is assumed by the buffer. For example, a 3-foot buffer and 4 foot bike lane next to a curb can be considered a 7-foot bike lane. For travel side buffered lanes next to on street parking, a 5-foot minimum width is recommended to encourage bicyclists to ride outside of the door zone... Buffers should be at least 2 feet wide because it is impractical to mark a zone narrower than that...Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.” (NACTO, 2011). Intersections require special consideration to limit potential conflict between drivers of motor vehicles, bicyclists, and pedestrians. Refer to NACTO Urban Bikeway Design Guidelines for recommendations.

A.1.3. Contra-Flow Bike Lane



Blacksburg

**Description**

Contra-flow bike lanes are designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic.

**Benefits (NACTO, 2011)**

- Provides connectivity to cyclists travelling in both direction and decreases trip distance
- Reduces dangerous wrong-way riding and sidewalk riding
- Influences motorists' choice of route without limiting bicycle traffic
- Allows cyclists to use low-traffic streets

**Typical Applications (NACTO, 2011)**

- On one-way streets where bicyclists are already riding wrong way or on the sidewalk
- On corridors where alternate routes require excessive out-of-direction travel
- On corridors where alternative routes include streets with high traffic volumes or no bicycle facilities
- Where two-way bicycle facility connections are needed along one way streets
- On low-speed, low-volume roads to minimize risk of interactions between cyclists and turning motor vehicles

**Guidance and Concerns**

Cross-street intersection treatments may need to be considered to reduce dangerous conflicts between users when motorists do not anticipate contra-flow bicyclists. (e.g., No right-turn on red or similar). Bicycle lanes or combination of contra-flow lane and shared road markings should be used to prevent wrong way riding in the contra-flow lane. Small traffic signs may be used for bike-only traffic. Specific signage is required on these routes and planners should refer to NACTO Urban Bikeway Design Guide and MUTCD.

A.1.4. Left Side Bike Lane

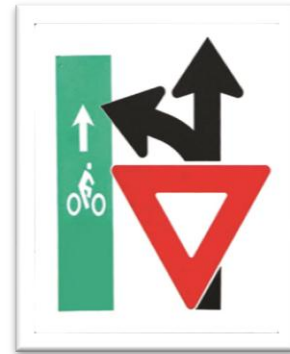


Image credits: NACTO

**Description**

Left-side bike lanes are placed on the left side of one-way streets or two-way median divided streets. They offer advantages along streets with heavy delivery or transit use, frequent parking turnover on the right side, or other potential conflicts that could be associated with right-side bicycle lanes.

**Benefits (NACTO, 2011)**

- Avoids potential right-side bike lane conflicts on streets
- Improves cyclist visibility to motorists (driver's side)
- In locations with rush-hour parking restriction or other flexible use, it provides a consistent facility configuration for cyclists
- Minimizes door-zone, transit, and truck conflicts (avoids parking zones, loading zones, bus stops)

**Typical Applications (NACTO, 2011)**

- On one-way streets or median divided streets with transit stops or truck loading zones on the right side
- On streets with high parking turnover, rush hour parking restrictions, high volume right turn activity
- On streets with significant number of left-turning bicyclists
- On streets where traffic enters into an add lane on the right (e.g., freeway off-ramp)
- For best alignment to connect a path, two-way cycle track, or other bicycle facility

**Guidance and Concerns**

Cross-street intersection treatments may need to be considered to reduce conflicts between cyclists and left-turning vehicles. This includes through-lane placement to the right of left turn lane, presence of bike boxes to align cyclists to connecting bicycle facilities, and thorough signage for cyclists and motorists.

## A.2 Cycle Tracks

A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. In situations where on-street parking is allowed cycle tracks are located to the curb-side of the parking (in contrast to bike lanes).

### A.2.1. One Way Cycle Tracks



Image credit: NACTO

#### Description

On street bike paths are at street level and use a variety of methods for physical protection from passing traffic.

#### Benefits (NACTO, 2011)

- Dedicates and protects space for bicyclists in order to improve perceived comfort and safety
- Eliminates risk and fear of collisions with over-taking vehicles
- Prevents double-parking, unlike a bike lane
- Low implementation cost by making use of existing pavement and drainage and by using parking lane as a barrier
- More attractive for bicyclists of all levels and ages

#### Typical Applications (NACTO, 2011)

- Streets with parking lanes.
- Streets on which bike lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high speed traffic, high demand for double parking, and high parking turnover
- Streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments

#### Guidance and Concerns

Cross-street intersection treatments may need to be considered to reduce conflicts between cyclists and left-turning vehicles. Cycle Track recommended lane width is 5' with 7' widths on uphill grades. Special consideration should be given at transit stops to manage bicycle & pedestrian interactions.

A.2.2. Two-Way Cycle Track



Image credits: NACTO

**Description**

Two-way cycle tracks allow bicycle movement in both directions on one side of the road. This facility may require additional considerations at driveway and side-street crossings.

**Benefits (NACTO, 2011)**

- Dedicates and protects space for bicyclists in order to improve perceived comfort and safety
- Eliminates risk and fear of collisions with over-taking vehicles
- Reduces dooring risk. Eliminates risk of a doored cyclist landing in motor-vehicle travel lane.
- Provides contra-flow travel option on one-way streets
- More attractive for bicyclists of all levels and ages
- Low implementation cost when making use of existing pavement and drainage and using parking lane or other barrier for protection from traffic.

**Typical Applications (NACTO, 2011)**

- On streets with few conflicts such as driveways or cross-streets on one side of the street and on streets where there is not enough room for a one-way cycle track on both sides of the street
- On one-way streets where contra-flow bicycle travel is desired and on streets where more destinations are on one side thereby reducing the need to cross the street
- On streets with extra right-of-way on one side
- To connect with another bicycle facility, such as a second cycle track on one side of the street.
- Along streets on which bike lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high speed traffic, and high incidence of double parking and parking turnover.
- On streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments
- Along streets with high bicycle volumes, motor vehicle volumes or speeds.

**Guidance and Concerns**

Minimum width constraint is 8' feet, with a preferred 12' width. Specific signage and markings are required for this treatment; refer to AASHTO, 2010 or NACTO, 2011 for guidance. Intersection and parking design needs to be carefully integrated to avoid cyclist/motorist conflict. Special consideration should be given at transit stops to manage bicycle & pedestrian interactions.

**A.2.3. Raised Cycle Track**



Image credits: NACTO

**Description**

Raised cycle tracks comprise bicycle facilities that are vertically separated from motor vehicle traffic. Many are paired with a furnishing zone between the cycle track and motor vehicle travel lane and/or pedestrian area. A raised cycle track may allow for one-way or two-way travel by bicyclists.

**Benefits (NACTO, 2011)**

- Dedicates and protects space for bicyclists in order to improve perceived comfort and safety
- Prevents motorists from entering the cycle-track
- Encourages bicyclists to use the bikeway, rather than sidewalks
- Visually reduces street width, from perspective of travel lane (traffic calming)
- Can be less expensive than a standard bicycle lane in new roadway construction

**Typical Applications (NACTO, 2011)**

- Can be considered anywhere a conventional bike lane would be standard recommendation
- On higher speed streets with few driveways and cross streets
- On streets where bike lanes would cause cyclists to feel stress because of factors such as multiple lanes, high traffic volumes, high speed traffic, high demand for double parking, and high parking turnover.
- On streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments
- On streets with numerous curves where vehicle encroachment into bike lanes may be a concern
- To connect with another bicycle facility, such as a second cycle track on one side of the street
- Along streets with high bicycle volumes

**Guidance and Concerns**

The cycle track is vertically separated from the street at an intermediate or sidewalk level. Driveways and minor street crossings are a unique challenge to cycle track design. Minimum width requirements vary with proximity to travel/parking lane and one-way versus two-way. Refer to NACTO Urban Bikeway Design Guide for guidance.

**A.2.4. Bicycle Boulevard**



Image credit: NACTO

**Description**

A street segment, or series of contiguous street segments, that has been modified to accommodate through bicycle traffic but discourage through motor traffic. “Bicycle boulevards are low-volume and low-speed streets that have been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments.” (PSU, 2009)

**Benefits (PSU, 2009)**

- Creates dedicated routes prioritized for bicycle use
- Provides convenient access to desired destinations with comfortable/safe intersections
- Reduces motor vehicle traffic on included roadway segments
- Encourages bicyclists to use the bikeway, rather than sidewalks.

**Typical Applications (PSU, 2009)**

- Roads with speeds at or less than 25 mph
- Roads with average daily vehicle traffic of <1500 (preferred) – 3000

**Guidance and Concerns**

Due to the need to coordinate multiple road segments, intersections, and origins/destinations, these routes should be selected to create direct, convenient connections for cyclists. (PSU, 2009). Intersections must be designed to reduce bicycle stop/starts and potential conflicts with motor vehicles. Education and outreach efforts within both the community and residential areas along proposed boulevards are essential for project success. Typical concerns encountered include access to property, impact on traffic patterns, enforcement issues with mopeds/motorcycles, and impacts to emergency response routes (PSU, 2009). When using traffic calming measures, special consideration must be given to avoid creating adverse conditions for bicyclists.

**A.3 Off-Street Facilities**

**A.3.1. Bike Path and Shared Use Path**



Blacksburg

**Description**

A bike path is a path exclusively used by bicyclists, where a separate, parallel path is provided for pedestrians and other wheeled users. Shared use path design is similar to roadway design, but on a smaller scale and with typically lower design speeds.

**Benefits**

- Provides facilities for cyclists & other non-motorists with complete separation from motor vehicles
- Can increase connectivity in areas where roadways exclude bicycles (e.g.: interstate highways and other limited use facilities)
- Can provide direct routes between destinations, exclusive of existing roadway infrastructure

**Typical Applications**

- Along right of ways (e.g., “rails to trails” or “rails with trails”)
- When an opportunity for more direct connectivity between destinations can be provided through bicycle or shared use path (reduced travel distance).

**Guidance and Concerns**

Width, clearance, grade, visibility, travel speeds, and user volumes/transportation modes must be considered in facility design. Refer to AASHTO, 2010 for guidance. *Bicycle and shared use paths should not be developed to preclude on-road bicycle facilities.*



**A.4 Intersection Treatments**

**A.4.1. Through Bike Lane**



Blacksburg

**Description**

Enables bicyclists to correctly position themselves to the left of right turn lanes or to the right of left turn lanes.

**Benefits (NACTO, 2011)**

- Enables bicyclists to correctly position themselves to the left of right turn lanes or to the right of left turn lanes.
- Reduces conflicts between turning motorists and bicycle through traffic.
- Provides bicyclists with guidance to follow the preferred travel path.
- Leads to more predictable bicyclist and motorist travel movements.
- Alerts motorists to expect and yield to merging bicycle traffic.
- Signifies an appropriate location for motorists to safely merge across the bike lane into the turn lane.

**Typical Applications (NACTO, 2011)**

- On streets with right-side bike lanes and right-turn only lanes at intersections.
- On streets with left-side bike lanes and left-turn only lanes at intersections.
- On streets with bike lanes and where the right or left travel lane terminates in a turn lane.
- On streets with bike lanes and a parking lane that transition into a turn lane at intersections.

**Guidance and Concerns**

The through bike lane shall be placed to the left of the right-turn only lane. Dotted lines signifying the merge area shall begin a minimum of 50 feet before the intersection. Dotted lines should begin 100 feet before the intersection if along a high speed/volume roadway. Dotted lane line transition areas to through bike lanes shall not be used on streets with double right turn lanes. Double right turn lanes are extremely difficult for bicyclists to negotiate. Shared lane markings may be used in the center of the inside turn lane to designate the preferred path of through bicycle travel. See MUTCD for further guidance.

A.4.2. Bike Box

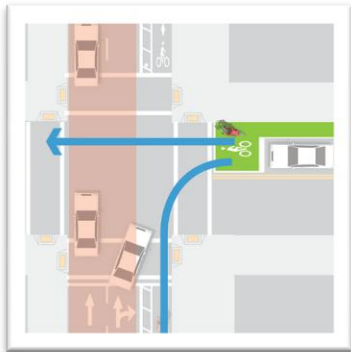


Image credits: NACTO

**Description**

A designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.

**Benefits (NACTO, 2011)**

- Increases bicyclist visibility to other roadway users
- Full intersection bike boxes facilitate appropriate lane positions (e.g.: left turn) at intersections during red signal indications
- Facilitates transition from differently positioned bicycle facilities during red signal indication
- Helps prevent ‘right hook’ conflicts with turning vehicles at the start of green signal indication
- Provides priority for bicycles at signalized crossings
- Groups cyclists together to clear an intersection quickly
- Cyclists breathe less exhaust while queued at signal
- Contributes to perception of safety and reduces vehicle encroachment into crosswalks

**Typical Applications (NACTO, 2011)**

- At signalized intersections with high volumes of bicycles and/or motor vehicles, especially those with frequent bicyclist left-turns and/or motorist right-turns.
- Where there may be right or left-turning conflicts between bicyclists and motorists
- Where there is a desire to better accommodate left turning bicycle traffic
- Where a left turn is required to follow a designated bike route, access a shared-use path, or when the bicycle lane moves to the left side of the street
- When the dominant motor vehicle traffic flows right and bicycle traffic continues through (such as a Y intersection or access ramp).

**Guidance and Concerns**

A box formed by transverse lines shall be used to hold queuing bicyclists, typically 10-16 feet deep. A “no-right turn on red” sign must be used. Specific markings and signage are required; refer to NACTO, 2011 or MUTCD for guidance.

A.4.3. Two-Stage Turn Queue Boxes



Image credits: NACTO

**Description**

A type of bike box used to make left turns at multi-lane signalized intersections from a right side cycle track or bike lane, or right turns from a left side cycle track or bike lane. Two-Stage Turn Queue Boxes facilitate the cyclist’s movement from a bicycle facility to a visible position in traffic.

**Benefits (NACTO, 2011)**

- Improves bicyclist ability to safely and comfortably make left turns
- Provides a formal queuing space for bicyclists making a two-stage turn
- Reduces turning conflicts between bicyclists and motor vehicles
- Prevents conflicts arising from bicyclists queuing in a bike lane or crosswalk

**Typical Applications (NACTO, 2011)**

- At signalized intersections
- Along multi-lane roadways or those with high traffic speeds/volumes
- Where a significant number of bicyclists turn left from a right side facility
- To assist bicyclists in navigating safely across streetcar tracks

**Guidance and Concerns**

The queue box shall be placed in a protected area. Typically this is within an on-street parking lane or between the bicycle lane and the pedestrian crossing. In cities that permit right turns on red signal indications, a “No Turn on Red” sign shall be installed overhead to prevent vehicles from entering the queuing area. See MUTCD for further guidance.

A.4.4. Cycle Track Intersection Approach



Image credit: NACTO

**Description**

Shifts the cyclist back into an adjacent lane or shared roadway by removing the buffer or raised track. Reduces turn conflicts and increases visibility for cyclists.

**Benefits (NACTO, 2011)**

- Increases visibility of bicyclists and motorists in advance of the intersection.
- Mitigates the risk of “left or right-hook” crashes with turning motorists.
- May be less expensive than using full bicycle signals.

**Typical Applications (NACTO, 2011)**

- Where cycle tracks approach intersections where turning movements across the path of the bicyclist (either left or right) is allowed.
- At intersections with a single dedicated right turn lane for motor vehicles.
- On cycle tracks protected by on street parking or otherwise removed from the travel lane.

**Guidance and Concerns**

“When the cycle track is dropped on an intersection approach, the intersection shall provide some type of bicycle facility to receive cycle track users. This may be a conventional bike lane, bike box, or combined bike lane/turn lane” (NACTO, 2011). For a transition to a bike lane, 4 feet width is required and 6 foot width is the minimum desirable width. The drop distance prior to an intersection varies by treatment and configuration. More space is required when motorists or cyclists must merge. Parking should be prohibited at least 30 feet prior to cycle track buffer termination. Maximum slope when returning a raised cycle track to street grade is 1:8.

**A.4.5. Median Refuge Islands**



Blacksburg

**Description**

Median refuge islands are protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings. Crossings of two-way streets are facilitated by allowing bicyclists and pedestrians to navigate only one direction of traffic at a time. Medians configured to protect cycle tracks can both facilitate crossings and also function as two-stage turn queue boxes.

**Benefits (NACTO, 2011)**

- Allows cyclists and pedestrians to more comfortably cross streets by providing a protected space to wait for acceptable gap in traffic.
- Provides a means to take advantage of gaps in one direction of traffic at a time
- Reduces crossing length/exposure to traffic and decreases delay time to cross
- Narrows the roadway and restricts left-turn movement, contributing to traffic calming
- Establishes/reinforces bicycle priority on bicycle boulevards by restricting vehicle through-movement
- When used with a protected cycle track, raised medians that extend into the intersection can also provide a shelter for a bicyclist making a two-stage turn across traffic.

**Typical Applications (NACTO, 2011)**

- Where a bikeway crosses a moderate to high volume or high speed street
- Along streets with high bicycle and pedestrian volumes
- Along streets with few acceptable gaps to cross both directions of traffic
- At signalized or unsignalized intersections
- Where it is desirable to restrict vehicle through movements, a median can double as a diverter to prevent cut-through traffic on a bicycle route
- With protected cycle tracks

**Guidance and Concerns**

The desirable width of the median refuge is 10 feet or greater. The absolute minimum width is 6 feet. When applied on a two-way street, the median refuge shall be placed along the centerline of the roadway between the opposing directions of travel. Pavement markings on the approach to the refuge island shall follow the guidance provided in Section 3I.02 of the MUTCD. The approach edge of the raised median shall be outlined in retroreflective white or yellow material. In areas with snow accumulation, reflective delineators shall be used to mark the island for increased visibility to snow plow crews.

## A.5. Signals

### A.5.1. Signal Detection and Actuation

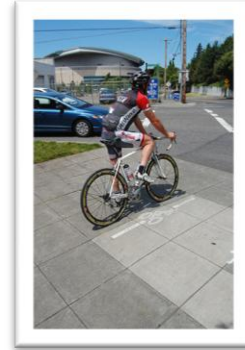


Image credits: NACTO

#### Description

Signals that are actuated to alert the signal controller of bicycle crossing demand on a particular approach. Push signals, in-pavement detection loops, video detection, etc.

#### Benefits (NACTO, 2011)

- Improves efficiency and reduces delay for bicycle travel.
- Increases convenience and safety of bicycling and helps establish bicycling as a legitimate mode of transportation on streets.
- Discourages red light running by bicyclists without causing excessive delay to motorists.
- Can be used to prolong the green phase to provide adequate time for bicyclists to clear the intersection.

#### Typical Applications (NACTO, 2011)

- In the travel lane on intersection approaches without bike lanes where actuation is required.
- At intersections with bicycle signal heads and/or bicycle-specific phasing that are actuated.
- In bike lanes on intersection approaches that are actuated.
- In left turn lanes with actuated left-turn signals where bicyclists may also turn left.
- To increase the green signal phase on intersection approaches whose combined minimum green plus yellow plus all-red is insufficient for bicyclists to clear the intersection when starting on a green signal. Advanced bicyclist detection can be applied to extend the green phase or to call the signal.
- At clearly marked locations to designate where a bicyclist should wait.

#### Guidance and Concerns

Standard detectors must be adjusted to ensure they detect bicyclists. Bicycle signal detection must be visible to cyclists, so that they know where to position themselves to activate the signal. Any push-button system must be located such that bicyclists can push the button without dismounting. Push button systems must have signs facing the bicyclists approach to increase device visibility. Refer to MUTCD for guidance on stencil marking and signage related to signal detection.

A.5.2. Bicycle Signal Heads



Image credits: NACTO

**Description**

Electronically powered traffic control device that should only be used in combination with an existing conventional or hybrid signal. (Bike traffic lights)

**Benefits (NACTO, 2011)**

- Separates bicycle movements from conflicting motor vehicle or pedestrian movements.
- Provides priority to bicycle movements at an intersection (e.g., a leading bicycle interval).
- Allows for accommodation of bicycle-only movements within signalized intersections (e.g., providing a phase for a contra-flow bike lane that otherwise would not have a phase), though bicycle signals may also occur simultaneously with auto movement if combined with right turn on red restrictions.
- Protects bicyclists in intersection, which may improve real and perceived safety at high-conflict areas.
- Improves operation and provides appropriate information for bicyclists (as compared to pedestrian signals).
- Helps to simplify bicycle movements through complex intersections and potentially improve operations or reduce conflicts for all modes.

**Typical Applications (NACTO, 2011)**

- Where a stand-alone bike path or multi-use path crosses a street, especially where the needed bicycle clearance time differs substantially from the needed pedestrian clearance time.
- To split signal phases at intersections where a predominant bicycle movement conflicts with a main motor vehicle movement during the same green phase.
- Where a bicycle facility transitions from a cycle track to a bicycle lane, if turning movements are significant.
- Where contra-flow bicycle movements that would have no signal indication and where a normal traffic signal head may encourage wrong-way driving by motorists.
- Give bicyclists an advanced green (like a leading pedestrian interval), or to indicate an “all-bike” phase where bicyclist turning movements are high.
- Make it legal for bicyclists to enter an intersection during an all-pedestrian phase (in some cities).
- At complex intersections that may otherwise be difficult for bicyclists to navigate.
- At intersections with high numbers of bicycle and motor vehicle crashes or near schools.

**Guidance and Concerns**

Signal heads require appropriate detection and actuation device. Passive actuation is preferred over push button actuation. Clearance interval must be adequate for cyclist movement. Refer to AASHTO for guidance on calculations. Bicycle signals are preferred over signage instructing bicyclists to use pedestrian signal.

A.5.3. Hybrid Signal



Image credits: NACTO

**Description**

Also known as a High-intensity Activated Crosswalk (HAWK) consists of a signal-head with two red lenses over a single yellow lens on the major street, and pedestrian and/or bicycle signal heads for the minor street.

**Benefits (NACTO, 2011)**

- Can be implemented when a conventional signal warrant is not met or where a conventional traffic signal is not desired due to the potential to increase traffic volumes on minor street approaches.
- Creates gaps for bicyclists to cross busy streets.
- Is more flexible for bicyclists than a full signal as bicyclists do not have to actuate it if they find ample crossing opportunities during off-peak conditions.
- Associated with very high driver compliance (studies show greater than 95% driver compliance with red indications).
- Improves street crossing safety.

**Typical Applications (NACTO, 2011)**

- Where bike routes intersect major streets without existing signalized crossings.
- Where off-street bicycle or pedestrian facilities intersect major streets without existing signalized crossings.
- At mid-block crossings of major roadways with high bicycle or pedestrian volumes.

**Guidance and Concerns**

Must be installed on the side of the road and be unlit when not activated. Refer to MUTCD for design guidance.



A.5.4. Active Warning Beacon at Unsignalized Intersection



Blacksburg

**Description**

User-actuated amber flashing lights that supplement warning signs at unsignalized intersections or mid-block crosswalks.

**Benefits (NACTO, 2011)**

- Offers lower cost alternative to traffic signals and hybrid signals.
- Significantly increases driver yielding behavior at crossings when supplementing standard crossing warning signs and markings.
- The unique nature of the stutter flash (RRFBs) elicits a greater response from drivers than traditional methods.

**Typical Applications (NACTO, 2011)**

- Usually implemented at high-volume pedestrian crossings, but may also be considered for priority bicycle route crossings.
- At locations where bike facilities cross roads at mid-block locations or at intersections where signals are not warranted or desired.
- At locations where driver compliance at bicycle crossings is low.

**Guidance and Concerns**

Must be installed on the side of the road and be unlit when not activated. Refer to MUTCD for design guidance.

**A.6. Signage and Markings**

**A.6.1. Shared Lane Marking/Signage**



Blacksburg

**Description**

Shared Lane Markings (SLMs), or “Sharrows,” are road markings used to indicate a shared lane environment for bicycles and automobiles. Among other benefits Sharrows reinforce the legitimacy of bicycle traffic on the street and recommend proper bicyclist positioning. The shared lane marking is not a facility type but a pavement marking with a variety of uses to support a complete bikeway network. Shared lane signage is recommended as an alternative to SLMs.

**Benefits (NACTO, 2011)**

- Helps bicyclists position themselves safely in lanes too narrow for a motor vehicle and a bicycle to comfortably travel side by side within the same traffic lane.
- Alerts motor vehicle drivers to the presence of bicyclists.
- Alerts road users of the lateral position bicyclists are likely to occupy within the street.
- Indicates a proper path for bicyclists through difficult or potentially hazardous situations such as railroad tracks.
- Advertises the presence of bikeway routes to all users.
- Provides a way-finding element along bike routes.
- Increases the distance between bicyclists and parked cars, keeping bicyclists out of the “door zone”.
- Encourages safe passing by motorists.
- Requires no additional street space.
- Reduces the incidence of sidewalk riding and wrong-way bicycling.

**Typical Applications (NACTO, 2011)**

- To indicate a shared lane situation where the speed differential between bicyclist and motorist travel speeds is very low
- As a reasonable alternative to a bike lane
- To strengthen connections in a bikeway network
- To clarify bicyclist movement and positioning in challenging environments

**Guidance and Concerns**

The shared lane marking in use within the United States is the bike-and-chevron “Sharrow,” illustrated in MUTCD figure 9C-9 below. Shared lane markings shall not be used on shoulders, in designated bicycle lanes, or to designate bicycle detection at signalized intersections. The MUTCD outlines guidance for shared lane markings in section 9C.07. Additional educational information is vital to proper implementation for shared lane markings as many auto users are unfamiliar with this usage.

A.6.2. Colored Bike Facilities



Image credits: NACTO

**Description**

Colored pavement within a bike lane. Commonly applied at intersections, along non-standard or enhanced facilities (cycle tracks), driveways, and other conflict areas such as places where illegal parking may be common.

**Benefits (NACTO, 2011)**

- Promotes multi-modal nature of a corridor, increases the visibility of bicyclists and discourages illegal parking in the bike lane.
- Used in conflict areas to raise motorist & cyclist awareness and help reduce conflicts between cyclists and turning motorists.
- Increases cyclist comfort with delineated space.
- Increases motorist yielding behavior.

**Typical Applications (NACTO, 2011)**

- Within bike lanes or cycle tracks across turning conflict areas, e.g., right turn lanes.
- Across intersections, particularly through wide or complex intersections where the bicycle path may be unclear.
- Across driveways and Stop or Yield-controlled cross-streets.
- Where vehicle movements frequently encroach into bicycle space, e.g., across ramp-style exits/entries, where prevailing speed of turning traffic at conflict point is low enough that motorist yielding behavior can be expected.
- Color may be applied along an entire corridor, with gaps in coloring to denote crossing areas.

**Guidance and Concerns**

The color green shall be used to minimize confusion with other standard traffic control markings. Facility designers should match coloring strategy to desired design outcomes of projects. Normal white markings must also be used. Color may be applied in a dashed pattern to indicate merge areas. Refer to NACTO, 2011, or City and County of San Francisco (2010) "Evaluation of Solid and Dashed Green Pavement for Bicycle Lanes." May not be applicable for crossings in which bicycles are expected to yield right of way, such as when the street with the bicycle route has Stop or Yield control at an intersection.

A.6.3. Wayfinding Signage



Image credits: NACTO

**Description**

A wayfinding system that consists of comprehensive signing and/or pavement markings to guide cyclists to their destinations along preferred bike routes.

**Benefits (NACTO, 2011)**

- Familiarizes users with the bicycle network and identifies the best routes for destinations
- Overcomes a “barrier to entry” for infrequent bicyclists.
- Signage that includes mileage and travel time to destinations may help minimize the tendency to overestimate the amount of time it takes to travel by bicycle.
- Visually indicates to motorists that they are driving along a bicycle route and should use caution.
- Passively markets the bicycle network by providing unique and consistent imagery throughout the jurisdiction.

**Typical Applications (NACTO, 2011)**

- Along all streets and/or bicycle facility types that are part of the bicycle network.
- Along corridors with circuitous bikeway facility routes to guide bicyclists to intended destination.

**Guidance and Concerns**

Follow MUTCD standards, including mounting height and lateral placement from edge of pavement. Comprehensive inventory of signage location and age should be kept for maintenance and future expansion of routes. Wayfinding signage requires additional planning steps prior to implementation to create a consistent and functional network.

## Appendix Resources

Urban Bikeway Design Guide, National Association of City Transportation Officials (NACTO). April 2011. Available Online at <http://nacto.org/cities-for-cycling/design-guide/>

Guide for the Planning, Design, and Operation of Bicycle Facilities American Association of State Highway and Transportation Officials, 2010

Fundamentals of Bicycle Boulevard Planning and Design, Portland State University, 2009. Available Online at <http://www.ibpi.usp.pdx.edu/media/BicycleBoulevardGuidebook.pdf>.

Photos by NACTO at <https://www.flickr.com/photos/nacto/>