Regional Bicycle Suitability Study




Phase II

Roanoke Valley Alleghany Regional Commission

Prepared by the
Roanoke Valley Area Metropolitan Planning Organization

2004

This report was prepared by the Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) in cooperation with the U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), and the Virginia Department of Transportation (VDOT). The contents of this report reflect the views of the staff of the Roanoke Valley Metropolitan Planning Organization (MPO). The MPO staff is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the FHWA, VDOT, or RVARC. This report does not constitute a standard, specification, or regulation. FHWA or VDOT acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement/approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.

The MPO would like to thank members of the Regional Bicycle Suitability Study Planning Committee their assistance in completing this study and continued support of efforts to improve the region's bicycling infrastructure and encourage bicycling as a viable means of transportation.

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Note: For bicycle accommodations to be considered as part of roadway improvements using Federal and State funding, the roadway must be included in an approved bikeway plan. The *Bikeway Plan for the Roanoke Valley Area* (RVAMPO, 1997) is the approved bikeway document for the MPO, thereby fulfilling this requirement. As such, the 1997 Bikeway Plan should be referenced when specific roadways are cited for bicycle accommodations. The *Regional Bicycle Suitability Study* (Phase I and II) is not intended to supercede or replace the 1997 Plan in this capacity. Instead it should complement the efforts and goals of the 1997 Plan and facilitate the provision of bicycle accommodations in the MPO. The 1997 *Bikeway Plan for the Roanoke Valley* will be updated, using work products and data from the *Regional Bicycle Suitability Study* (Phase I and II).

Roanoke Valley Area MPO Metropolitan Planning Organization

Roanoke Valley Alleghany Regional Commission

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List of Acronyms

AADT	Average Annual Daily Traffic
ASSHTO	American Association of State Highway and Transportation Officials
BCI	Bicycle Compatibility Index Model
BL	Bike Lane
BLOS	Bicycle Level of Service
CBD	Central Business District
CL	Corporate Limit
CTPP	Census Transportation Planning Package
EAC	Early Action Compact
EAP	Early Action Plan
HV%	Heavy Vehicle Percentage
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
LOS	Level of Service
LRTP	Long Range Transportation Plan
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
NPTS	National Personal Transportation Survey
NHTS	National Household Transportation Survey
RVAMPO	Roanoke Valley Area Metropolitan Planning Organization
RVARC	Roanoke Valley Alleghany Regional Commission
TEA-21	Transportation Enhancement Act for the 21st Century
TIP	Transportation Improvement Plan
VDOT	Virginia Department of Transportation
WCL	Wide Curb Lane

Project Overview

The *Regional Bicycle Suitability Study –Phase II* is a component of the *FY 2004 Unified Transportation Work Program* for the Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) and the *FY 2004 Rural Transportation Planning Program* for the Roanoke Valley-Alleghany Regional Commission (RVARC). The *Regional Bicycle Suitability Study*, consisting of Phase I and Phase II, and the companion website, are intended to be resources to facilitate development of a regionally significant bikeway network in the RVARC service area. The *Phase I Final Report,* which provides a complete overview of the *Study,* and associated work products are available online at the *Regional Bicycle Suitability Study* website (http://www.rvarc.org/bike/home.htm). The *Phase II Final Report* will be available online upon completion.

Phase II represents continued efforts to develop an integrated transportation infrastructure that promotes and encourages alternative transportation options in the region. The primary objective of Phase II is to facilitate development of a regionally significant bikeway network for transportation and recreational uses through the application and continued development of work products from Phase I of the *Regional Bicycle Suitability Study*. These planning tools utilize the level of service (LOS) concept to identify, evaluate, and recommend improvements to the regional surface transportation infrastructure to better accommodate bicyclists.

Study Area

The Phase II study area covers the nine localities served by the RVARC (Figure 1) and encompasses the MPO service area, as well as the rural portions of the district. The MPO service area covers the urbanized portions of Botetourt and Roanoke counties, the cities of Roanoke and Salem, and the town of Vinton (Figure 2). The rural portion of the study area includes Alleghany and Craig Counties, the City of Covington, the town of Clifton Forge, and the non-urbanized portions of Botetourt County. The spatial and demographic characteristics for the Phase I study area were presented in Chapter 4, Existing Conditions, of the Phase I Final Report. These characteristics for the rural portions of the Phase II study are included in Chapter 5, Regional Study Area Bicycling Network, of this study. Corridors comprising the regional study area bicycling network were selected based on a variety of considerations. Many of the corridors evaluated as part of the regional study area bicycling network are representative of corridors not evaluated, with similar geometric and operational configurations. Development of the regional study area bicycling network is discussed in detail in Chapter 3. Also, as discussed in Chapter 4, additional corridors in the region can be evaluated, as dictated by future planning efforts.

Project Scope and Activities

To achieve the overall objective of study, Regional Commission staff, working with the Study Planning Committee, developed the following project scope and activities. Each of these activities are discussed in detail in subsequent sections of this report.

- Conduct fieldwork to collect data required for LOS modeling of corridors comprising the regional study area bicycling network. Additional data, beyond what is required for LOS modeling, was also collected. This data was compiled to develop a comprehensive database of roadway design parameters in the study area network. This database is available for reference to assist the planning efforts for bicycle accommodations in the region.

- Evaluate the LOS of the study area network using the Bicycle Compatibility Index (BCI) model and the Bicycle Level of Service (BLOS) model
- Using the BCI model, recommend design alternatives to better accommodate bicyclists for selected portions of the regional network.
- Using GIS technology, produce compatibility/suitability maps for corridors comprising the regional study area network based on the LOS scores received from both models.
- Review possible alternative design and operational options for segments in the regional study area network and LOS achieved by various options, as provided by the models.
- Compare the LOS results provided by both the BCI and LOS models.
- Using data and work products from the *Regional Bicycle Suitability Study*, prepare to update the *Bikeway Plan for the Roanoke Valley Area* (1997) as outlined in the Regional Commission's FY 2005 Comprehensive Work Program and FY 2005 Unified Transportation Program.

Work Products

Work products from Phase I and II will be available on the Regional Bicycle Suitability Study website (http://www.rvarc.org/bike/home.htm)

- Level of service worksheets for all roadways and corridors comprising the regional study area network
- Suitability maps indicating the LOS provided by corridors in the regional study area network
- Alternative design parameters for selected segments/corridors based on the BCI model, with emphasis on segments in which LOS improvements to better accommodate bicyclists can be achieved with minimal improvements to existing conditions (i.e., restriping or reconfiguring existing travel lanes, medians, and shoulders)

Work products will assist stakeholders in establishing consistency and connectivity along travel corridors, developing crucial linkages with the greenway system and public transit, and developing other components of a regional bicycling study area network.

Figure 1.1: Phase II Study Area - Roanoke Valley-Alleghany Regional Commission Service Area - Regional Bicycle Suitability Study

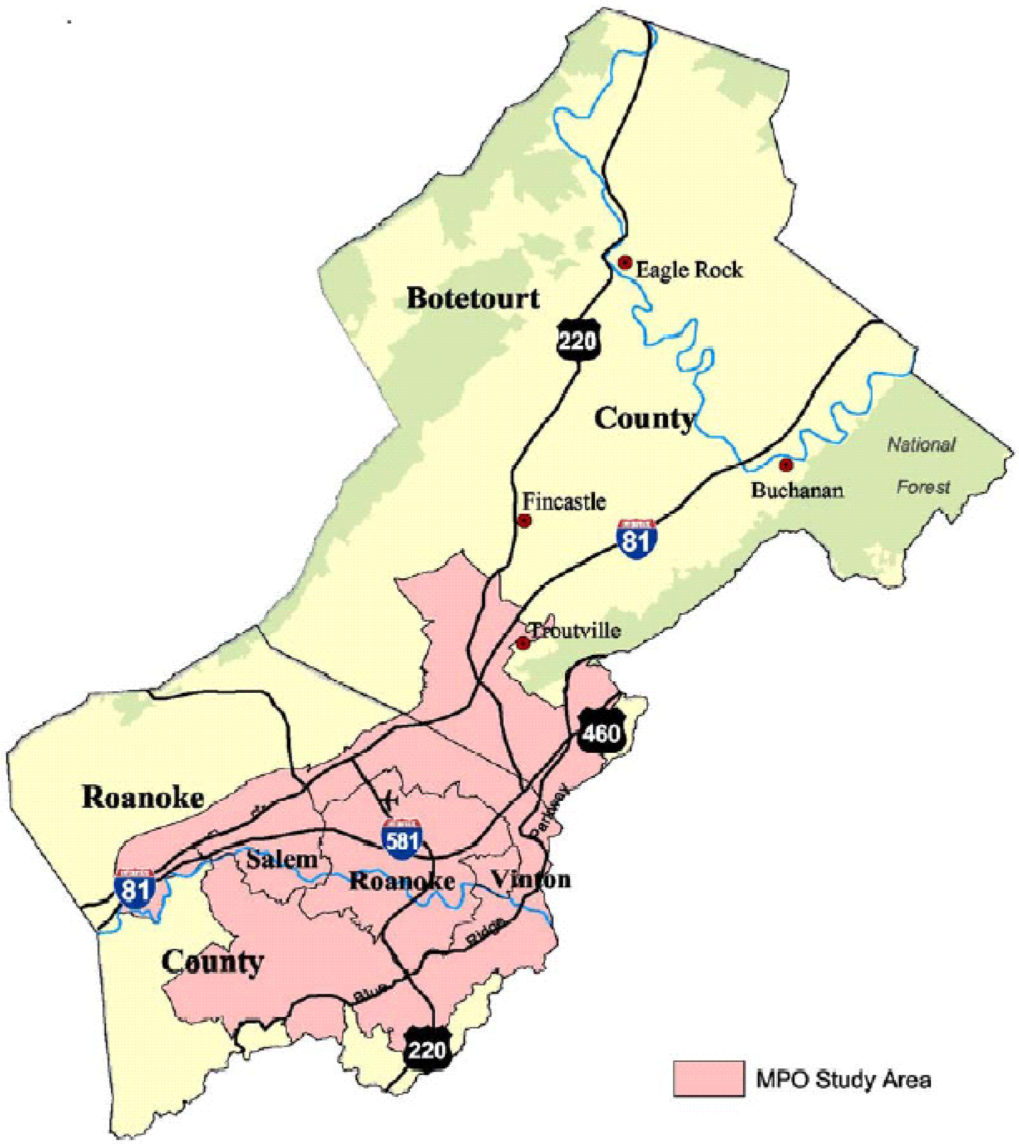


Figure 1.2: Phase I Study Area - Roanoke Valley Area Metropolitan Planning Organization Study Area

VDOT Policy for Integrating Bicycle and Pedestrian Accommodations

VDOT recently conducted a comprehensive review of its policies and procedures relating to bicycle and pedestrian accommodations. This review looked at planning, funding, design, construction, maintenance, and operation of the transportation network in Virginia. The new bicycle and pedestrian policy was adopted by the Commonwealth Transportation Board on March 18, 2004, and will apply to projects that reach the scoping phase after its adoption. This new policy will guide the department's coordinated implementation of equal consideration of transportation modes in existing and future policies and procedures. The Policy for Integrating Bicycle and Pedestrian Accommodations is included in Appendix A**.** Additional information concerning the comprehensive review is available online at VDOT's Program & Info website (www.virginiadot.org/infoservice/bk-policyinfo.asp).

VTrans2025 Statewide Bicycle and Pedestrian Plan

The *Statewide Bicycle and Pedestrian Plan* carries forward the purpose and intent of the previously referenced *Policy for Integrating Bicycle and Pedestrian Accommodations* as a tool to use in establishing a consistent approach to integrating the consideration of bicycling and walking accommodations into the transportation network. This plan is a component of *VTrans2025*, Virginia's statewide multimodal long-range transportation plan. The most recent draft of the *Statewide Bicycle and Pedestrian Plan* (May 2004) and additional information are available online at the *Vtrans2025* website (http://www.virginiadot.org/projects/multi-default.asp).

Utilization of the State Policies and Plans

The Regional Commission and the Regional Bicycle Suitability Study Planning Committee will review, reference and/or integrate applicable components of the *Policy for Integrating Bicycle and Pedestrian Accommodations* and the *VTrans2025 Statewide Bicycle and Pedestrian Plan* in planning bicycle accommodations in the region. These documents, along with the complete *Regional Bicycle Suitability Study,* will serve as guides to be utilized, as needed, in updating the *Bikeway Plan for the Roanoke Valley (1997)* (http://www.rvarc.org/work/Bike97.pdf), as well as the Rural Bikeway Plan (1997). These plans are scheduled to be updated by the Regional Commission in FY 2005 and FY 2006, respectively.

Phase II of the *Regional Bicycle Suitability Study* consists primarily of the application of work products and data developed in Phase I of the study to facilitate development of a regional bicycle network. Development of the regional study area bicycling network is detailed in Chapter 3. A detailed overview of the BCI and BLOS models, as well as data requirements and data collection techniques, are provided in the *Regional Bicycle Suitability Study Phase I Final Report.* This document, as well as additional work products from Phase I, are available online at the *Regional Bicycle Suitability Study* website (http://www.rvarc.org/bike/Workshop.htm).

Data Requirements and Collection

Data for the *Regional Bicycle Suitability Study* was collected using both primary and secondary research methods. Primary methods included fieldwork to measure roadway design and operational parameters, surrounding land use and other characteristics of the corridor and surrounding area. Secondary methods involved compiling and reviewing existing data regarding the corridor and surrounding area, such as traffic counts and demographic information. Data collected for each street or segment in the study network were entered into field data collection spreadsheets. It should be noted that the data collection spreadsheets contain additional data beyond what is required by either the BLOS or BCI models. Also, not all data columns on the spreadsheet are applicable to all roadway conditions, thus all columns on the spreadsheet do not require completion for all road segments. Field data collection spreadsheets will serve as a database of roadway characteristics for the network. To ensure consistency in data collection, general guidelines specific to this study, as outlined below, were followed when conducting fieldwork.

- **Street Segments and Traffic Counts**

Street segments and traffic counts for each corridor in the network are based on *2002 Virginia Department of Transportation Daily Traffic Volume Estimates Including Vehicle Classification Estimates.* Prior to fieldwork, on the data collection sheet, the annual average daily traffic (AADT) and heavy vehicle percentage (HV%) columns were completed using VDOT traffic estimates. Heavy vehicles include all buses, vehicles with three (3) or more axles, and vehicles with one or more trailer, as classified by VDOT traffic counts. It should be noted that throughout the study VDOT numbers were used unless other numbers were provided by VDOT or the localities. When roadway conditions dictated the inclusion of a new segment (i.e., significant change in roadway characteristics occurs within segments from the VDOT traffic counts), a new segment was established on the data collection sheet the proper columns were completed. All *2002 Virginia Department of Transportation Daily Traffic Volume Estimates Including Vehicle Classification Estimates* are available Online at http://www.virginiadot.org/projects/pr-traffic-DATA-2002-jurisdictions.asp. VDOT Jurisdiction Reports detailing traffic count information utilized in this study include:

Jurisdiction Report 03 (Alleghany County)
Jurisdiction Report 11 (Botetourt County)
Jurisdiction Report 22 (Craig County)
Jurisdiction Report 80 (Roanoke County)
Special Locality Report 107 (City of Covington)
Special Locality Report 128 (City of Roanoke)
Special Locality Report 129 (City of Salem)

- **Fieldwork and Measurements**

Commission staff conducted fieldwork to collect a variety of geometric and operational parameters for each roadway segment in regional study area network. Both the BCI and BLOS models require measurements to be rounded to the nearest half foot. Therefore, when conducting fieldwork, all roadway measurements are rounded to the nearest half-foot. To ensure consistency in data collection, all measurements were rounded as follows:

- 0-3 inches, round down to the nearest foot (i.e., 10 ft., 2 in. rounds to 10 ft)
- 4-9 inches, round to the half-foot (i.e., 10 ft., 8 in. rounds to 10.5 ft)
- 10-12 inches, round up to the nearest foot (i.e., 10 ft., 10 in. rounds to 11 ft.)

Additionally, if the marked shoulder of a roadway was not consistently at least one (1) foot in width (i.e., useable pavement width), the width of the shoulder was entered as zero (0) feet in the LOS model spreadsheets. However, the width of the shoulder is included in the total pavement width measurement, when applicable. This practice reduces the number of measurements required, thereby expediting fieldwork, while still providing a sufficient level of detail required by the models. It also lessens the chance of overestimating the LOS of a street segment. Based on preliminary analysis of the scores given by both models, when the total shoulder width is one foot or less, changes in the shoulder width do not significantly affect LOS scores.

Every attempt was made by staff to accurately identify and record the existing roadway characteristics. However, given the level of detail needed, inconsistency in roadway conditions, and availability of data, it was imperative for data collectors to employ some level of generalization. Some situations that may dictate generalization include, but are not limited to, the following:

- a street segment has excessively frequent changes in geometric design characteristics
- a street segment has changes in operational characteristics over a short or limited portion of the segment
- the shoulder widens to accommodate a turning lane

Level of Service Modeling

All roadway segments of the regional study area network were modeled using both the BCI and BLOS models. When the roadway characteristics of a segment varied on opposing direction travel lanes, the characteristics for both travel directions (i.e., North/South and East/West) were recorded in separate rows in the worksheet denoting the proper travel direction. For segments in which the geometric characteristics are the same in both travel directions, only one entry was recorded on the LOS worksheets. A master list of LOS scores and grades for each corridor or roadway segment evaluated during the study is also presented in Appendix D. Additionally, level of service worksheets for every roadway evaluated are provided in Appendix E.

Level of Service Mapping

The regional study area network, upon completion of LOS modeling, was mapped based on LOS letter grade each segment received in the BCI model. When mapping the network, some level of cartographic generalization was employed. When a street or segment received a different LOS grade in each travel direction, the segment will be mapped using special symbolization explained in a separate table on the map. Level of service mapping is discussed in more detail in Chapter 4 and Chapter 5.

Design Alternatives for Selected Corridors

As referenced in the Introduction, possible alternative design parameters to better accommodate bicyclists were developed for selected segments/corridors in the regional study area bicycling network. Although both the BCI and BLOS models were used in analysis of the existing level of service for the network, design alternatives and resulting LOS are based on the Bicycle Compatibility Index (BCI). In selecting the corridors an emphasis was placed on corridors along which LOS improvements can be achieved with minimal improvements to existing conditions (i.e., restriping or reconfiguring existing travel lanes, medians, and shoulders). Possible design alternatives are presented and discussed in Chapter 4, Level of Service Analysis. It should be noted that alternative designs suggested are intended to be examples of possible scenarios and are not intended to be design recommendations. BCI worksheets for possible alternatives are also presented in Appendix E. Additionally, BCI and BLOS worksheets are available for download online and may be used to model other alternatives for corridors, as desired or needed, to facilitate improved bicycle accommodations.

Observations on Level of Service (LOS) Models

Observations on the BCI and BLOS models are included throughout the study. Tables in Chapter 4 list the LOS scores for individual corridors evaluated as part of the regional study area bicycling network using both the BCI and BLOS models. Additional aspects of the LOS models are discussed in more detail in Chapter 5. A master list of LOS scores and grades for each corridor or roadway segment evaluated during the study is also presented in Appendix D.

As outlined in the Introduction, the Phase II study area covers the nine localities served by the RVARC (Figure 1.1). This area includes the MPO service area, which was the area of focus for Phase I, as well as the rural portions of the district. The MPO service area includes the urbanized portions of Botetourt and Roanoke counties, the cities of Roanoke and Salem, and the Town of Vinton (Figure1.2). The rural portions of the study area include the counties of Alleghany and Craig, the City of Covington, the Town of Clifton Forge, and the non-urbanized portions of Botetourt and Roanoke County.

Overview of the Study Area

The study area for Phase II includes the rural portions of the RVARC service area, as well as the MPO areas covered in Phase I. As previously referenced, various spatial and demographic characteristics for the Phase I study area were presented in Chapter 4, Existing Conditions, of the Phase I Final Report. This section provides a brief demographic overview of the entire Phase II study area.

The rural portions of the study area have significantly less population, and lower population densities than the urbanized portions of the study area. As such, transportation demands, infrastructure, and resulting bicycle accommodations vary considerably in comparison to the Phase I study area. As illustrated in Table 3.1, several rural localities experienced population declines or nominal increases in the overall population. The City of Covington and the Town of Clifton Forge experienced population declines of 37.3 and 22.0 percent, respectively, between 1970 and 2000. Although Alleghany County saw a net growth in population during this period, the increase was nominal at 3.7 percent. Craig County had the greatest population increase at 44.5 percent, however, the total population in 2000 was only 5,091, up from 3,524 in 1970.

Table 3.1
Phase II Study Area
Population Change 1970-2000

Locality	2000 Total Population	1990 Total Population	1980 Total Population	1970 Total Population	1970-2000 Percent Change
Alleghany County	12,926	12,815	14,333	12,461	3.7%
Botetourt County	30,496	24,992	23,270	18,193	67.6%
Clifton Forge City	4,289	4,679	5,046	5,501	-22.0%
Covington City	6,303	7,352	9,063	10,060	-37.3%
Craig County	5,091	4,372	3,948	3,524	44.5%
Roanoke County*	85,778	79,278	72,945	53,817	59.4%
Roanoke City	94,911	96,487	100,220	105,637	-10.2%
Salem City	24,747	23,835	23,958	21,982	12.6%
Region	264,541	253,810	252,783	231,175	14.4%

Source: US Census Bureau, 2001
* includes Vinton

As with the Phase I study area, bicycle accommodations in the rural portions of the Phase II study area are limited. Additionally, given the spatial characteristics of the rural area, activity centers and destinations are more dispersed, thereby impeding bicycling as a major means of transportation. However, there are population centers such as the City of Covington and the town of Clifton Forge, with greater development densities of activity centers within biking distance. The U.S. Census "Journey-to-Work" data for 1990, and 2000 for the region is presented in Table 3.2. Covington had the highest percentage, 0.3 percent, of bicycle commuters in the Alleghany Highlands as well as the region. As discussed in the Phase I final report, "Journey-to-Work" data are limited because they do not adequately account for all potential bicycle trips. These data only account for people (workers 16 years and over) indicating bicycling as their *primary* means of transportation to work. Bicycling can often be a *secondary* or *linked* mode to transit. In addition, bicycle trips to schools are not counted in this data set, though they directly replace vehicle trips. Complete 2000 Census Transportation Planning Package (CTPP) data for the Alleghany County, Craig County, and the City of Covington are included in Appendix B. It should be noted that the numerous rural roads offer many scenic and recreational bicycling opportunities.

Table 3.2
Workers 16 Years and Over Using Bicycle as Primary
Means of Commuting to Work, 1990 and 2000

	1990			2000		
Locality	Total Workers Commuting to Work**	Bicycle Commuters	Percent Bicycle Commuters	Total Workers Commuting to Work**	Bicycle Commuters	Percent Bicycle Commuters
Alleghany County	5,861	6	0.1	5,365	0	0
Clifton Forge	1,631	0	0	2,285	0	0
Covington City	2,756	6	0.2	2,536	8	0.32
Botetourt County	12,943	0	0	15,040	12	0.08
Craig County	1,956	0	0	2,285	2	0.09
Roanoke City	44,221	86	0.19	42,868	85	0.20
Roanoke County	41,116	14	0.03	42,239	21	0.05
Salem City	11,734	49	0.42	11,998	5	0.04
Virginia	2,177,521	9,068	0.42	3,481,820	7,930	0.23

Source: 1990 and 2000 Census Bureau
** Does not include those working at home

Due in part to its spatial extent, the study area (Figure 1.1) has a diverse and scenic topography. As such, development of a regionally significant bicycling network should consider the specific spatial attributes of the region. Land use, topography, transportation infrastructure, socioeconomic levels, population distribution, and numerous other factors can influence bicycle usage and other transportation decisions. Transportation characteristics and demands vary from place-to-place, thereby affecting alternative transportation choices. By considering and better understanding these spatial attributes and the region, decision makers will be better able to build on opportunities and overcome constraints, thereby making bicycling a practical, healthy, and environmentally sensitive form of transportation and recreation.

Development of the Regional Study Area Bicycling Network

Table 3.3 lists all of the roads, or portions thereof, that were modeled as part of the regional study area bicycling network. As illustrated in Table 3.3, in many instances corridors traverse more than one locality. The network is not intended to be a comprehensive collection of all roadways in the region. Instead, an effort was made to include corridors that are representative of the various urban and rural roadways found in the study area and to illustrate the application and usefulness of the LOS models. As discussed in Chapter 4, additional roadways beyond those included in study area network can be evaluated, as needed, in future planning efforts.

The regional bicycling network for Phase II of the *Regional Bicycle Suitability Study* is composed of selected roadways and corridors within the study area and was developed based on input and involvement from a variety of interested stakeholders. The Regional Bicycle Suitability Study Planning Committee, representing a range of stakeholders, was instrumental not only in developing the network, but also guiding the initial and continuing development of *Regional Bicycle Suitability Study*. Moreover, as outlined in the *Phase I Final Report*, a bicycling survey was distributed to obtain public input on a variety of bicycling issues. Route priorities identified in the results of the Bicycling Survey conducted in Phase I were also included in the network.

In developing the regional bicycling study area network for Phase II, numerous factors and concepts were considered. The network was developed to include transportation, as well as recreational uses, and focuses on connectivity and linkages between the existing transportation infrastructure, the Roanoke Valley Greenway system, activity centers and destinations, commuting and transit routes, and recreational or scenic corridors. Additionally, local comprehensive and neighborhood plans and other bicycle-related literature was consulted. These concepts were central to network development and are reflected in the streets and corridors comprising the study area network and will be considered in updating the 1997 *Regional Bikeway Plan for the Roanoke Valley Area.*

Table 3.3
Corridors Comprising the Regional Study Area Bicycling Network

Road/Corridor	Localities
10th Street	Roanoke City
Route 18	Alleghany County, Covington, Craig County
Route 24	Roanoke City, Vinton
Route 60	Alleghany County, Covington
US 220	Botetourt County, Alleghany County
Route 311	Craig County, Salem, Roanoke County
Route 419	Roanoke County, Salem
US 460/ W. Main St.	Salem
Route 629	Alleghany County, Clifton Forge
Route 779	Botetourt County, Roanoke County
Apperson Drive / State Route 11	Roanoke City, Salem
Blue Ridge Parkway	Botetourt County, Roanoke County
Brambleton Avenue / US Route 221*	Roanoke City, Roanoke County
Buck Mountain Road	Roanoke County
Colonial Avenue*	Roanoke City, Roanoke County
Cotton Hill Road	Roanoke County
Dale Avenue	Vinton
Franklin Road*	Roanoke City
Garst Mill Road	Roanoke County
Grandin Road	City of Roanoke
Hardy Road (bike lane)	Roanoke County, Vinton
Hershberger Road	Roanoke County
Hollins Road	Roanoke County
Jamison Avenue	Roanoke City
Kessler Mill Road	Salem
King Street	Roanoke City
McVitty Road	Roanoke County
Memorial Drive (bike lane)	Roanoke City
Merriman Road	Roanoke County
Old Cave Spring Road	Roanoke County
Plantation Road	Roanoke County, Roanoke City
Pollard Street	Vinton
Riverland Road*	Roanoke City
Salem Avenue	Roanoke City
Shenandoah Avenue*	Roanoke County, Salem City
Virginia Avenue	Vinton
Walnut Avenue	Vinton
Washington Avenue	Vinton
Wise Avenue	Roanoke City

* Design alternatives for corridor are provided in Chapter 4

Table 3.4
Corridors Comprising the Regional Study Area Bicycling Network, by Locality

Locality	Road/Corridor
Alleghany County	State Route18, State Route 60, Secondary Route 629
Botetourt County	US Route 220, Secondary Route 779, Blue Ridge Parkway
Craig County	Secondary Route 311, State Route18
Roanoke County	State Route 221, State Route 311, Secondary Route 419/Electric Road, Secondary Route 779, Blue Ridge Parkway, Brambleton Avenue(221), Buck Mountain Road, Colonial Avenue, Cotton Hill Road , Garst Mill Road, Hollins Road, Merriman Road, Plantation Road
City of Covington	State Route18, State Route 60
City of Roanoke	10th Street , Brambleton Avenue, Colonial Avenue, Franklin Road, Grandin Road, Hershberger Road, Hollins Road, Jamison Avenue, King Street, Memorial Avenue, Plantation Road, Riverland Road, Salem Avenue, Shenandoah Avenue, Williamson Road
City of Salem	Secondary Route 311, Secondary Route 419, Apperson Drive, Colorado Street, College Avenue, Main St./460, Thompson Memorial Drive
Town of Vinton	State Route 24, Hardy Road/ 634 (bike lane), Dale Avenue, Virginia Avenue, Washington Avenue

Activity Centers and Destinations

In developing the network and during the data collection process, activity centers, destinations, points of interest, and transit concerns were considered and noted. Activity centers may serve as a hub or node for economic or social interaction conducive to cycling. As discussed in a latter section, the presence and availability of ancillary facilities and accommodations for cyclist at activity centers can impact the transportation choices of many cyclists.

- **Public Areas**

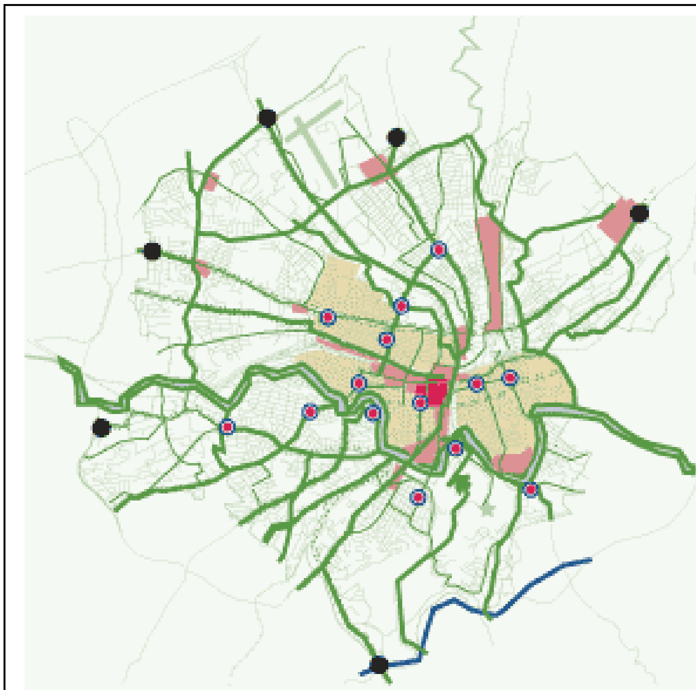
Examples of public areas are libraries, administrative buildings, schools, parks, community centers, sports and recreation venues, and others. Many of these areas are destinations for significant numbers of people, many of whom live within easy biking distance. Safe and efficient routes to these destinations, as well as sufficient ancillary facilities, would likely encourage people to bike to these destinations.

- **Downtown Areas**

Downtown areas are often more conducive to bicycling than areas outside of downtown. Increased density, more intensive land use, and associated roadway design and operational parameters often result in decreased traffic speeds, especially within the central business district (CBD) and more developed areas of downtown. As illustrated the map of downtown Roanoke (Figure 3.1) numerous activity centers are concentrated in a smaller area making bicycling a viable means of alternative transportation. In many instances bicyclists can reasonably keep up with the traffic flow and operate safely in downtown areas, thereby decreasing the need for on-street bicycle accommodations. As such, in developing the regional bicycle network, significant attention was given to connectivity and linkages to downtown areas and activities as well as ancillary facilities as integral components of a successful bicycle network.

Bicyclist and pedestrians in downtown Roanoke. CBD's often provide environments more suitable for walking and biking.

Within the MPO portions of the study area the cities of Roanoke and Salem have the most well defined and vibrant downtowns with shops, restaurants, public buildings and other destinations. Additionally, localities in the rural portions of the study area have defined and compact downtown areas with various activity centers to include the City of Covington, the town of Clifton Forge, and to a lesser extent the town of New Castle in Craig County.



City of Roanoke Village centers and gateways, and other elements of the Strategic Development Plan. Source: City of Roanoke Comprehensive Plan, 2001

- **Village Centers**

Village centers and traditional neighborhood designs that employ neo-tradition or New Urbanism concepts are often more compatible with alternative means of transportation such as walking or bicycling. The City of Roanoke has cited these and several other design approaches in its Vision 2020 Comprehensive Plan. Many of the City's Neighborhood Plans call for transportation improvements to better accommodate bicyclists and pedestrians. Comprehensive plans in other localities in the study area also cited needed transportation improvements. A summary of excerpts from localities in the study area is available in Appendix F of the Phase I Final Report.

- **Commercial Centers**

There are numerous commercial centers in the region. These centers vary in size, ranging from large malls such as Valley View and Tanglewood to smaller strip malls and stand-alone establishments. Many of these establishments are major activity centers and trip generators, regularly attracting large numbers of customers and creating many automobile trips each year. Figure 3.2 show the distribution of many of the shopping centers and commercial areas in the Roanoke Valley.

- **Employment Concentrations**

Certain businesses in the region employ large numbers of employees creating employment concentrations. Numerous businesses and economic activities are often located in close proximity to one another in densely developed areas (e.g., downtowns or commercial and industrial parks). Major employment concentrations along or in close proximity to the corridors comprising the regional network are noted in Chapter 4 of the study. The largest employers in the Roanoke Valley region are listed in Appendix C.

- **Educational Institutions**

Educational institutions are major activity centers and represent concentrations of potential bicyclists. Improved bicycle accommodations at these destinations may encourage bicycling to and from these destinations. Educational institutions in the study area include public and private K-12 schools, as well as institutions of higher education, many of which are within biking distance for many students. These include Roanoke College, Hollins University, the Roanoke Higher Education Center, Virginia Western Community College, Dabney Lancaster Community College, National College Business and Technology, and the Jefferson College of Health Sciences.

Greenways

Greenways provide numerous and diverse benefits to a community and contribute greatly to the overall quality of life. The Roanoke Valley Greenway system is an important component of the recreational infrastructure in the area, providing open space, natural areas, and recreational opportunities for area residents. Area greenways also offer transportation benefits. In addition to area greenways serving as recreational activity centers, they are becoming increasingly important components of the transportation infrastructure by providing alternative transportation routes, linkages between streets and corridors, and connectivity to activity centers and other destinations. The *Conceptual Greenway Plan* (Figure 3.3) shows the proposed network of Roanoke Valley Greenways and effectively illustrates the potential of greenways to facilitate alternative transportation in the region. Throughout the study, the importance of Greenways to recreational, open space, and transportation concerns is considered, and incorporated into the discussion of bicycling in the region. More information on the Roanoke Valley Greenway System is available at http://www.greenways.org/.

Entrance to Murray Run Greenway near Brambleton Avenue.

Transit Facilities

The federal Transportation Equity Act for the 21st Century (TEA-21), enacted in 1998, calls for integrating all modes of transportation - cars, buses, trains, trucks, walking and biking - into a single, multi-modal, efficient transportation system. Multimodalism is an important concept in the integration of all modes of transportation, of which bicycling and public transit are important components. The bicycling survey, conducted as part of Phase I, incorporated several transit-related questions. As shown in Figure 3.4, Valley Metro, the Roanoke Valley's public transit provider, has numerous routes throughout the Roanoke Valley. Transit stops and routes along corridors in the study area were noted during data collection fieldwork. Currently, few Valley Metro stops have ancillary facilities to accommodate bicyclists. Although none of the Valley Metro buses are equipped with bicycle racks, bicyclists are allowed to bring their bicycles on the bus as needed, provided there is sufficient space on the bus to do so. Additional information on Valley Metro, is available at http://www.valleymetro.com/home.htm.

Beginning in the Summer of 2004, The Smart Way Commuter Bus will begin providing a commuter service between the New River and Roanoke Valleys. This service, operated Roanoke's Valley Metro, will link the City of Roanoke, Salem, Christiansburg, and Blacksburg. The current policy regarding transporting bicycles on the bus is consistent with Valley Metro's policy – bicycles may be brought onto the bus provided there is sufficient room, with passengers taking precedence. More information on the Smart Way bus is available at http://www.smartwaybus.com/index.htm. Additionally, Ride Solutions, a regional ridesharing program, is another service to be considered in discussion of bicycling as a viable alternative transportation option. Ride Solutions provides free carpool and vanpool matching services for citizens of the Roanoke Valley and surrounding areas within southwestern Virginia. Ride Solutions also provides directions to area park and ride lots, and information about alternative modes of transportation, such as public transit service, walking, and bicycling. For more information, visit the Ride Solutions home page at http://www.ridesolutions.org/.

Scenic Corridors

Given the diverse topography and vegetation, the study area has several scenic corridors and cycling routes that are popular with cycling enthusiasts. As such, these corridors provide transportation as well as recreational benefits to the region. Such corridors in the regional study area network include the Blue Ridge Parkway and Interstate Bicycle Route 76 (TransAmerican Bicycle Trail or the Bikecentennial Trail) in Roanoke and Botetourt Counties, Route 311, a scenic Byway in Roanoke and Craig counties, and Route 18 in the City of Covington, and Alleghany and Craig counties. Figure 3.5 shows Virginia's Interstate Bicycle Routes.

Bike racks at the Williamson Road parking garage. Note the different types of racks.

Ancillary Facilities

Ancillary facilities are the supporting facilities and accommodations located at the bicyclists' destination or along the intended route. Ancillary facilities are often important components of a bicycle network and contribute directly to the overall success and usefulness of the bicycle system. Examples of ancillary facilities include, but are not limited to, bike racks, benches, water fountains, bike/storage lockers, signage, curb cuts, public rest rooms, information kiosks, signage, showers and changing rooms, bike racks on public transit, and other accommodations.

Bike rack and benches at the Cave Springs Corners shopping center in Roanoke County.

Bicycle rack at the City of Roanoke Library main branch.

As discussed in Phase I, few of the activity centers in the region had sufficient ancillary bicycle facilities (i.e., bike racks) to encourage and support bicycling as a viable means of transportation and recreation. Most of the bike racks in the study area are located in public areas located in the downtowns of the study area, such as parking garages, libraries, and other points of interest. The City of Roanoke has placed bike racks at destinations throughout downtown, many of which are in areas other than parking garages, thereby making them more convenient and accessible for cyclists. Currently, only one shopping center in the region has bike parking facilities. Cave Springs Corner shopping center in Roanoke County, not only has a bike rack, but also several benches for public use. None of the larger commercial centers, such as the Valley View, Tanglewood, or Towers malls, have bike racks available.

Bicycle rack located near the City of Roanoke Library main branch and the Mill Mountain Greenway in Elmwood Park.

Curb cut leading to bike rack at the Transportation Museum.

The availability of various ancillary bicycle facilities at activity centers and destinations throughout the region would complement on-street and other bicycle and pedestrian accommodations, possibly encouraging bicycling as a viable means of transportation and recreation. Ancillary facilities are discussed in further detail in Chapter 5.

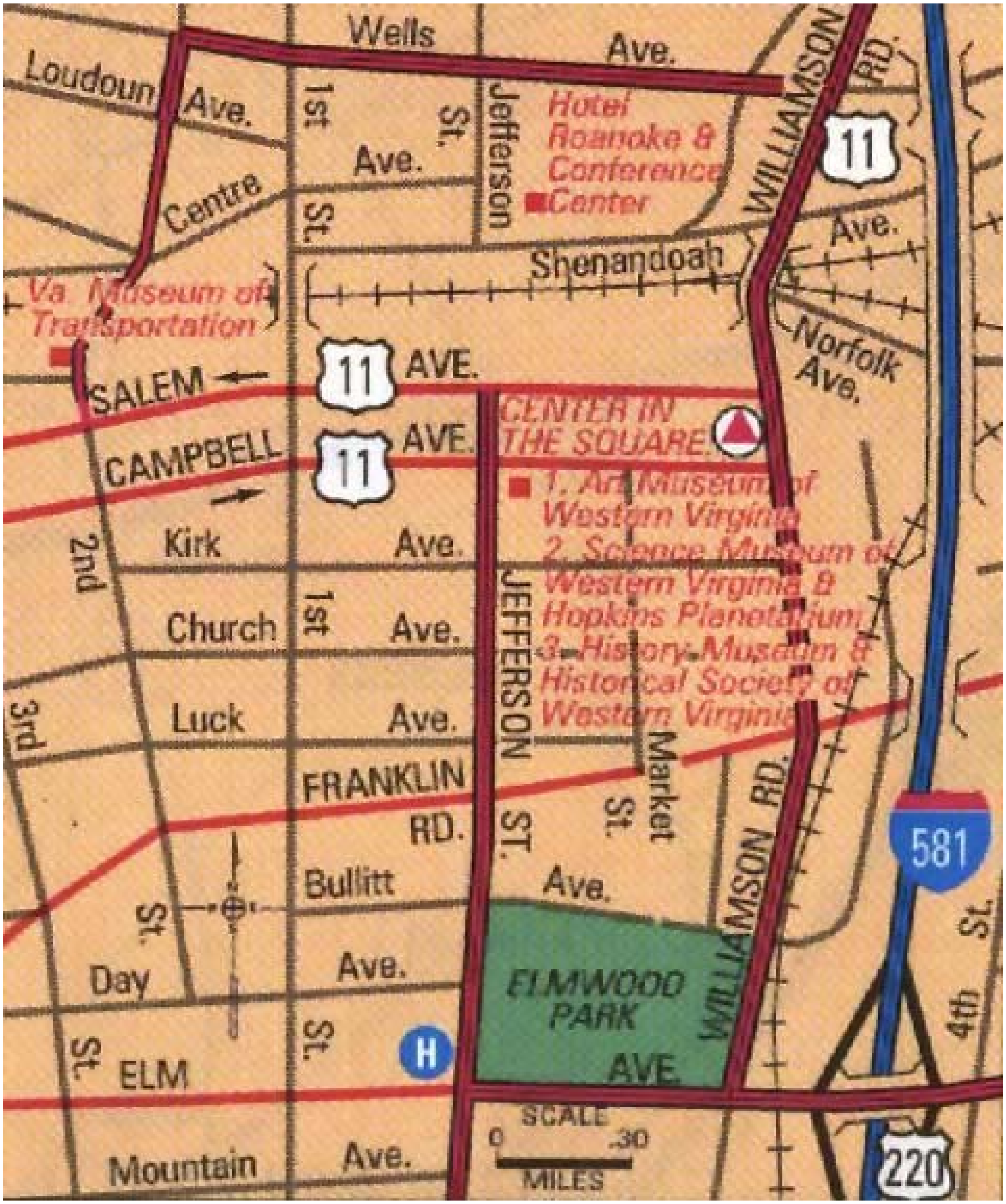


Figure 3.1: Downtown Roanoke
Source: www.virginiadot.org/ comtravel/maps-road.asp

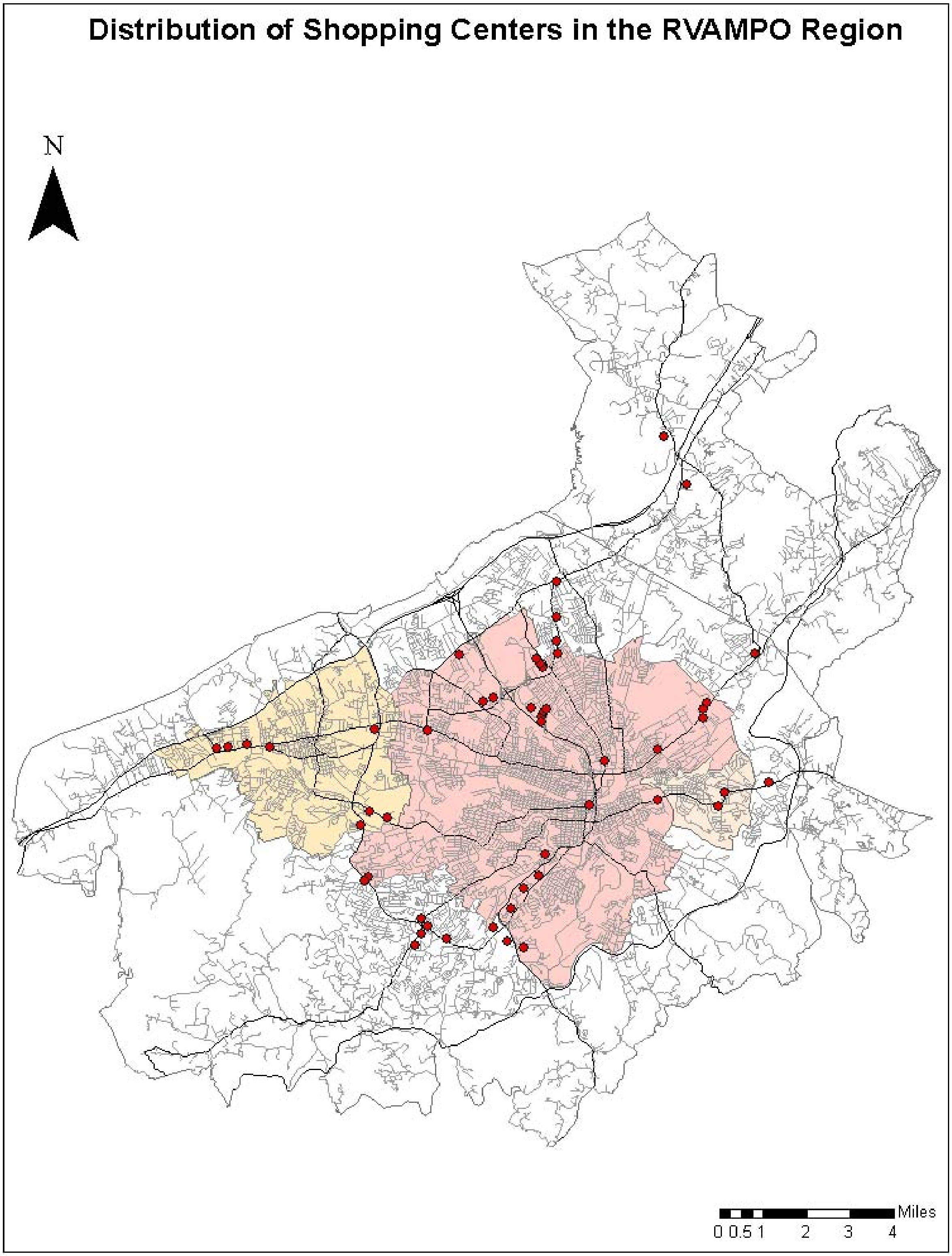


Figure 3.2: Commercial Shopping Centers in the Roanoke Valley Are MPO Study Area

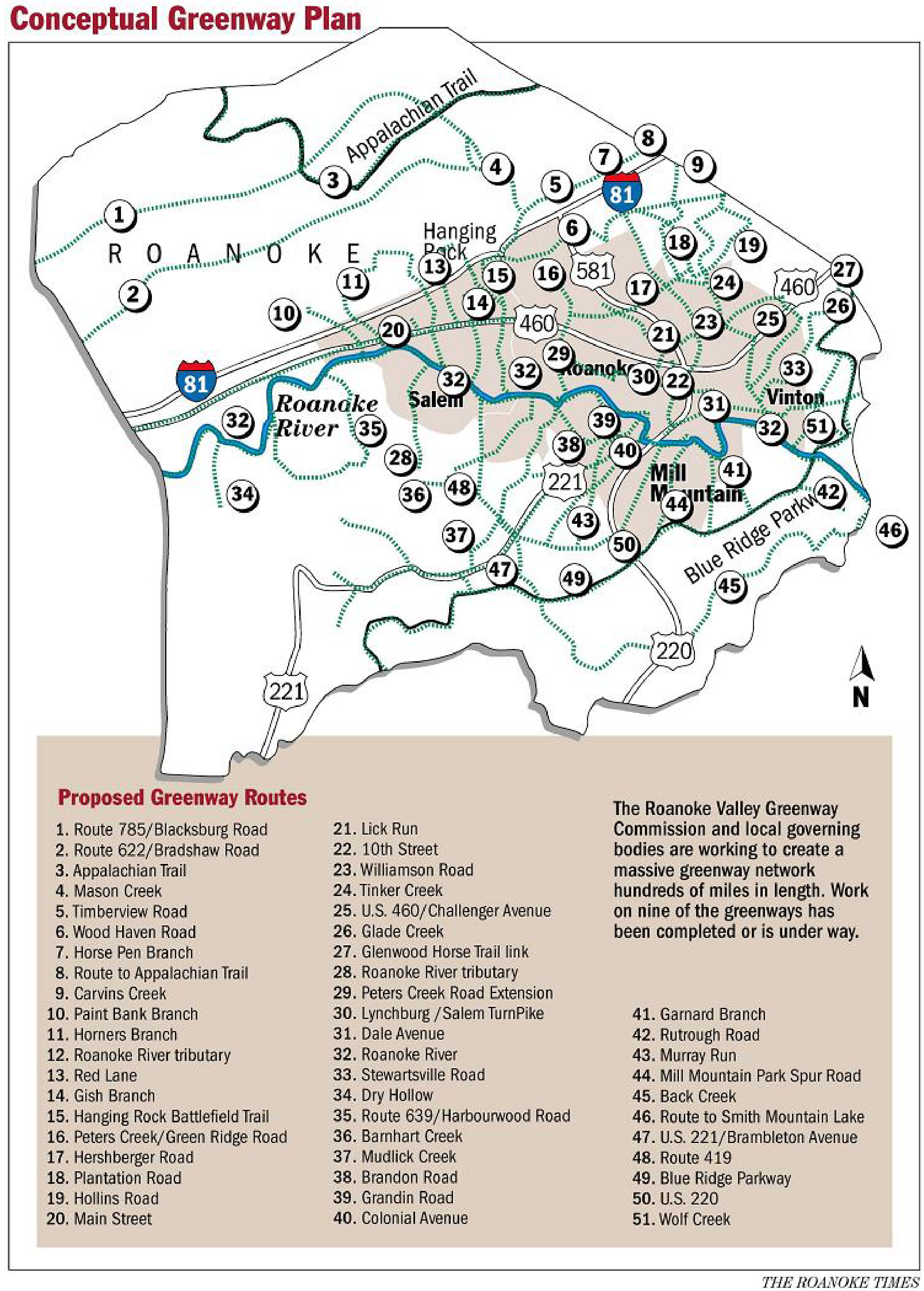


Figure 3.3: Conceptual Greenway Plan (1995)
Source: http://www.greenways.org/concept.html.

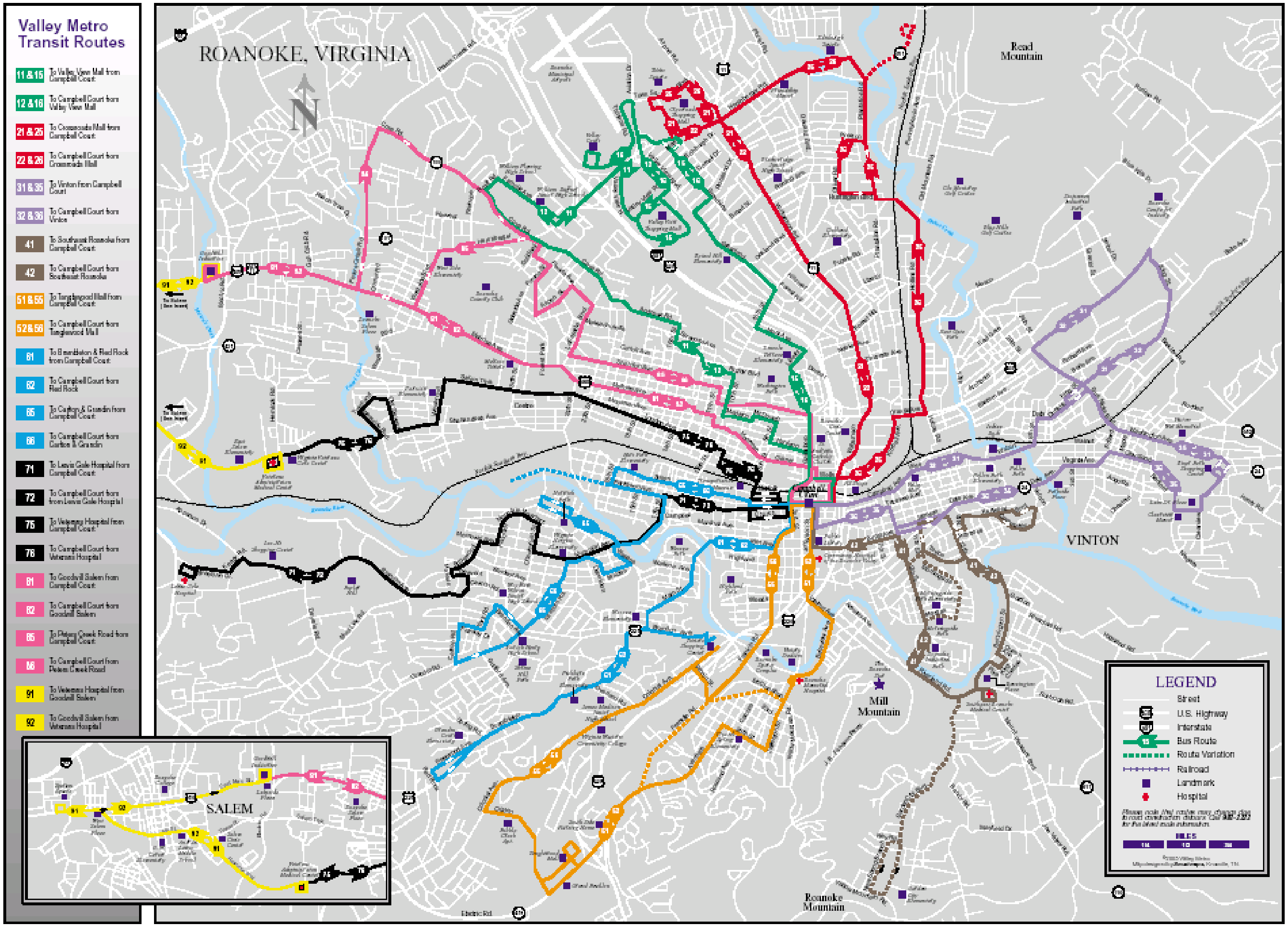


Figure 3.4: Valley Metro Routes

Source: http://www.valleymetro.com/VAInt.pdf

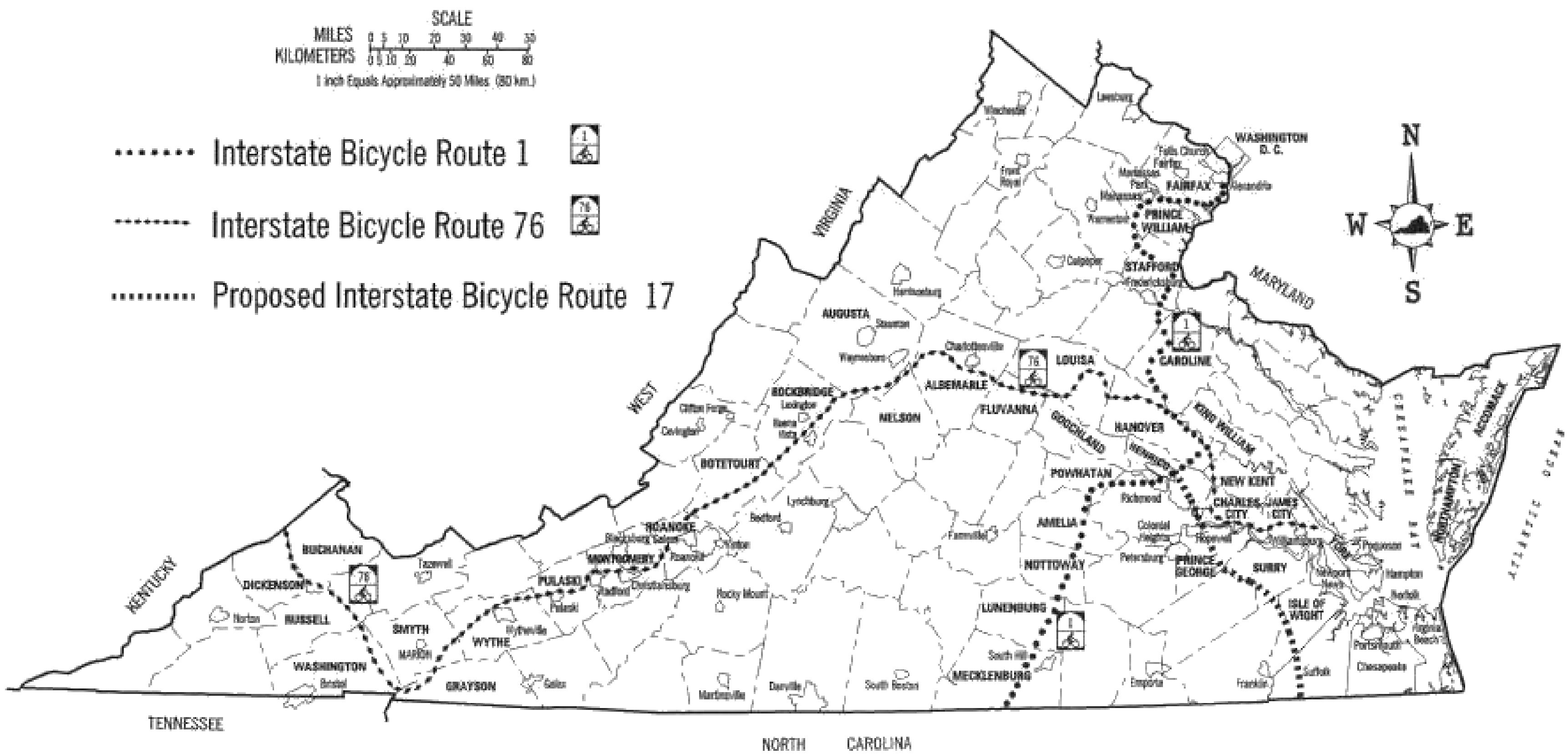


Figure 3.5:Virginia Interstate Bicycle Routes Source: VDOT

This section provides an analysis of the regional study area bicycling network. As previously discussed, the corridors comprising the regional network were developed by the Bicycle Study Planning Committee and surveys completed by area cyclists as part of Phase I of the *Regional Bicycle Suitability Study.* This analysis includes tables listing the level of service (LOS) scores for all corridors and segments of the regional bicycling network measured as part of Phase II of the *Regional Bicycle Suitability Study,* using both the BCI and BLOS models. A detailed overview of the BCI and the BLOS models is available in Appendix C of the *Phase I Final Report*. Additionally, a brief description of each segment/corridor is also presented in the analysis. This description provides information on the various inputs and factors affecting the LOS scores for each corridor. Information included for each corridor varies but generally includes the geographic setting (i.e., adjacent land use), geometric and operational parameters, activity centers, destinations and points of interest along the corridor, and other information to facilitate a better understanding of the regional network. BCI and BLOS model worksheets for each corridor, listing the geometric and operational data required by the respective models, are included in Appendix E.

Table 4.1
Bicycle Compatibility Index (BCI) Categories

LOS	BCI Range	Compatibility Level
A	≤ 1.50	Extremely High
B	1.51 – 2.30	Very High
C	2.31 – 3.40	Moderately High
D	3.41 – 4.40	Moderately Low
E	4.41 – 5.30	Very Low
F	> 5.30	Extremely Low

Table 4.2
Bicycle Level of Service (BLOS) Categories

Level of Service	Bicycle Level of Service (BLOS)
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

Alternative Geometric and Operational Designs to Improve Bicycle Level of Service

Also included in this analysis are possible design alternatives to better accommodate bicyclists for selected corridors, or portions thereof, within the study area network. In selecting corridors for which to provide design alternatives, an emphasis was placed on corridors along which LOS improvements can be achieved with minimal improvements to existing conditions (i.e., restriping or reconfiguring existing travel lanes, medians, and shoulders). It should be noted that alternative designs are intended to be examples of possible scenarios to better accommodate cyclists, based on the BCI model calculations, and are not intended to be design recommendations. BCI worksheets used in evaluating possible alternatives are presented in Appendix E. Design alternatives are provided for selected corridors, or segments thereof, within the study area bicycling network as denoted in Table 3.3. Corridors include Brambleton Avenue and Colonial Avenue in Roanoke County; and Brambleton Avenue, Colonial Avenue, Franklin Road, Riverland Road, and Shenandoah Avenue in the City of Roanoke.

Level of Service Analysis and Design Alternatives for Additional Corridors

Given the large number of corridors and segments in the regional study area network, as well as the scope of the study, alternative designs were not provided for all evaluated corridors within the study area network. Although only a limited number of corridors were included in the study area network, LOS or design alternatives for other corridors may be evaluated or developed, as desired or needed, by interested stakeholders to facilitate the planning of bicycle accommodations in the region. BCI and BLOS worksheets and other materials are available online at the Regional Bicycle Suitability Study homepage (http://www.rvarc.org/bike/home.htm).

Level of Service Mapping

As referenced in Chapter 2, the regional study area bicycling network was mapped based on the level of service letter grade each segment received using the BCI model. The resulting bicycle “compatibility” or “suitability” maps indicate the level at which the corridor or segment can accommodate both of motorists and bicyclists. The LOS grade (i.e., A, B, C, D, E, F) is represented on the map by the color assigned to each LOS grade, as outlined in Table 4.3. Although every effort has been made to accurately reflect the existing conditions in evaluating and mapping the study area bicycling network, some level of generalization was employed. As referenced in Chapter 2, when a street or segment received a different LOS grade in each travel direction, the segment is denoted in black and the grade for each direction is provided in a separate table on the map. A map indicating the LOS grades for corridors within the MPO portions of the study area is provided in the cover of this study. A map showing LOS grades for corridors within the rural portions of the study area is presented in Figure 4.6.

Table 4.3
Level of Service Grade and Corresponding Map Legend Color

BCI Level of Service Grade	Corresponding Map Legend Color	Compatibility Level
A	NA*	Extremely High
B	NA*	Very High
C	Green	Moderately High
D	Blue	Moderately Low
E	Purple	Very Low
F	Orange	Extremely Low
Grade Varies by Direction	Black	See Map Table

* No corridors in the study area network received grades of A or B in the BCI.

10th Street (City of Roanoke)

Tenth Street, in the City of Roanoke, was measured from Ferdinand Avenue to Williamson Road. This corridor consists of two and four lane configurations with primarily residential land use. Curb lane width varies from 12-feet between Campbell to Orange Avenue, to 10.5-feet from Orange Avenue to Williamson Road. This segment received grades of D and E in the BCI model, indicating a low level of bicycle compatibility. The BLOS model graded sections of the corridor considerably higher with grades ranging from B to D.

Table 4.4
BCI and BLOS Grades and Comparisons
10th Street (City of Roanoke)

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
10th St. – Ferdinand to Campbell	D	B
10th St. - Campbell to Salem	D	C
10th St. - Salem to Loudon	D	D
10th St. - Loudon to Fairfax	E	D
10th St. - Fairfax to Orange	E	D
10th St. - Orange to Rugby	D	D
10th St. - Rugby to I-581 Overpass	D	D
10th St. - I-581 Overpass to Williamson Road	D	D

- **Activity Centers**

Activity centers and destinations along this corridor include West End Park, Brown Robertson Park, numerous residential neighborhoods and apartment complexes, Oakland Elementary School, and numerous commercial establishments along Williamson Road. There are also several village centers and significant development at the intersection of 10th Street and Orange Avenue. Additionally, a section of Lick Run Greenway in Brown Robertson Park is scheduled for completion in FY 2005.

Route 18

Route 18 was measured from the City of Covington through Alleghany County into Craig County. This corridor is a two-lane rural route, consisting of primarily residential land use. The corridor measurements of 9.5 feet and no shoulder are consistent along the length of the corridor. As shown in Table 4.5, Route 18 received grades of E and D in the BCI model. The higher grade of D was primarily due to low AADT along portions of the corridor. AADT is highest nearer to Covington and decreases southward into Alleghany and Craig counties. In the BLOS model this corridor received similar grades along sections with higher AADT but scored considerably higher along sections with a very low AADT.

Table 4.5
BCI and BLOS Grades and Comparisons
Route 18

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
18/S. Carpenter Dr. - Edgemont Dr. to East Gordon St.	E	D
18/S. Carpenter Dr. - East Gordon St. to S. Pitzer Ridge	E	D
18/Indian Valley Rd. - S. Pitzer Ridge to SCL Covington	E	C
18 - SCL Covington to 657	E	B
18 - 657 to 614	E	B
18 - 614 to 608	D	A
18 - 608 to 607 Potts Creek	D	A
18 - 608 Potts Creek to Craig County Line	D	A

- **Activity Centers**

With the exception of the segment closest to the City of Covington, the measured portions of Route 18 are primarily very rural in nature with low-density development. As such, it is likely to be of most use to recreational cyclists. Activity centers along or in close proximity to this corridor include Jefferson National Forest, Paint Bank Depot Lodge, Paint Bank General Store and the fish hatchery.

Route 24

Route 24 is divided into one-way segments running west and east that connect the City of Roanoke, the Town of Vinton and Roanoke County. To accurately reflect the one-way design of this corridor, this analysis divided the corridor into east and west travel directions in two sections (the corresponding Route 24 West corridor was measured as Washington Avenue in Vinton). Route 24 East, connecting the City of Roanoke and the Town of Vinton, includes portions of Jamison Avenue, Dale Avenue, and Virginia Avenue. The roadway ranges from 2 to 4 lanes in various sections. As shown in Table 4.6, most of this corridor received low LOS grades, primarily E and F in the BCI model, while it received higher grades of C and D in the BLOS model. However, both models gave the Hardy Road (634) bike lane a grade of C.

Table 4.6
BCI and BLOS Grades and Comparisons
Route 24 (Jamison, Dale, and Virginia Avenues)

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
24/Jamison Ave. - Elm to 6th	E	C
24/Jamison Ave. - 6th to 13th	E	C
24/Jamison Ave. - 13th to Dale	F	D
24/Dale Ave. - Jamison to ECL Roanoke City	E	D
24/Virginia Ave. - WCL Vinton to Pollard	F	D
24/Virginia Ave. - Pollard to Clearview	E	D

- **Activity Centers**

Activity centers and destinations along this corridor include Fallon Park, Fallon Park Elementary School, Tinker Creek Greenway, and numerous commercial centers and establishments.

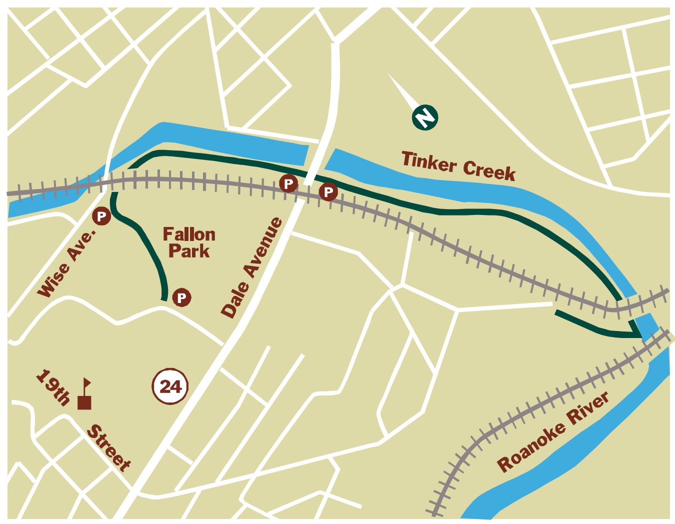


Figure 4.1: Tinker Creek Greenway connects several roadways in the study area network.

Route 60

US Route 60 was measured in two sections in the City of Covington and Alleghany County. As shown in Table 4.7, LOS grades ranged from C to F. The first section, leading into the eastern portion of Covington, consists of 4-lanes, which are undivided, with a 6 foot paved shoulder. This segment is adjacent to I-64 and has considerable commercial development. The outside travel lane is 12-feet wide and the AADT is 14000. This section received grades of D and C in the BCI and BLOS models, respectively. The other evaluated segment, leading out of Covington into Alleghany County, consists of two lanes and is rural in character with 10.5-foot travel lanes and a 1-foot paved shoulder. This segment has a considerably lower AADT of 2300, of which 11 percent is heavy vehicles. This segment received a grade of C in the BCI model, but received a grade of F in the BLOS.

Table 4.7
BCI and BLOS Grades and Comparisons
Route 60

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
60 - US 220 to Covington ECL	D	C
60 - Covington WCL to E I-64	D	F

US 220 (I-81 to Route 779 in Daleville)

US Route 220 was measured from I-81 to Secondary Route 779 in Daleville, which is within the MPO boundaries. This portion of US 220 consists of 4 lanes with a wide median and paved shoulders. The outside travel lane is 12-feet wide and the paved shoulder which is 4-feet wide and deteriorated in places. This segment is intensely developed with numerous commercial establishments resulting in a high AADT of 23,000. As shown in Table 4.8, this portion of US 220 received a LOS grade of D in both the BCI and BLOS models.

Table 4.8
BCI and BLOS Grades and Comparisons
US Route 220 (I-81 to Route 779 in Daleville)

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
220 - I-81 to 779 (Daleville)	D	D

- **Activity Centers**

As previously referenced, this portion of US 220 is intensively developed and is within the MPO boundaries. As such, there are several activity centers along or in close proximity to this segment of the corridor. Activity centers include Lord Botetourt High School, numerous commercial establishments, and a park and ride lot. Additionally, this segment intersects with Route 779, which is part of the Interstate Bicycle Route 76

Route 311 (Thompson Memorial Avenue /Catawba Valley Road)

The Route 311 corridor connects the City of Salem, Roanoke County, Craig County, and the town of New Castle. This corridor was measured from Main Street/460 in Salem to Catawba Valley Road, and then into Craig County. The corridor includes areas within the MPO as well as rural transportation planning areas. The portion of the Route 311 corridor in Salem is also Thompson Memorial Avenue and becomes Catawba Valley Road at the intersection of Route 419 in Roanoke County near Hanging Rock. This portion of Route 311 is also a Virginia Scenic Byway.

The Thompson Memorial portion of the corridor is a four-lane, divided roadway with 13-foot curb lanes and a two-foot curb and gutter. This section received a LOS grade of D in both models. The portion between the Salem NCL to the 419 intersection consists of two-lanes, 10.5 feet in width with a 2.5-foot shoulder. This segment also received a LOS grade of D in both models. The Catawba Valley Road Section of the corridor is best described as a rural residential. This segment was primarily composed of two undivided lanes, with the lane width being 10.5 with a 2.5-foot should for most of the segment until near the Craig County line. The posted speed limit is 55 mph. This two-lane section of the 311 has recently been repaved and striped, thus shoulders are in good condition. The 311 corridor received primarily grades of D and E in the BCI model and slightly higher grades in the BLOS model.

Table 4.9
BCI and BLOS Grades and Comparisons
Route 311 (Thompson Memorial and Catawba Valley Road)

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
311/Thompson Memorial - E. Main St. I-81	D	D
311/Thompson Memorial - I-81 to Catawba Valley Rd.	D	D
311/Catawba Valley Dr. - 419 to Catawba Creek Rd.	E	D
311/Catawba Valley Dr. - Catawba Creek Rd. to Blacksburg Road	D	C
311/Catawba Valley Dr. - Blacksburg Road to Craig County line	D	C
311/Catawba Valley Dr. - Craig County line	E	D

- **Activity Centers**

Route 311 in Roanoke County. Note paved shoulder, which ranges from 1 to 3 feet in width.

Route 311 is of special interest in that it is not only a popular route for recreational cyclists, it also provides a connection to many popular mountain bike trails and open space surrounding the Carvins Cove reservoir. Route 311, a Scenic Byway, was cited as one of the top responses for several survey questions concerning corridors for which accommodations are needed on the survey conducted as part of Phase I. Route 311 also connects numerous activity centers and point of interests including Roanoke College, Hanging Rock Battlefield Trail Greenway, Appalachian Trail, Jefferson National Forest, McAfee Knob, Carvins Cove, Havens Wildlife Refuge, a park and ride lot, and an alternate route to Blacksburg. Route 311 also intersects several other corridors in the study area network.

Route 419/Electric Road

Route 419/Electric Road is a four lane divided roadway, connecting portion of the City of Roanoke (via Franklin Road), Roanoke County, and the City of Salem. Land use along the corridor includes commercial and residential uses. Geometric parameters include a 12-foot wide outside travel lanes, and a 7-foot wide paved shoulder along much of its length (shoulder ends at approximately the City of Salem corporate limit near Lewis Gale). This corridor also has a wide median along much of its course.

Table 4.10
BCI and BLOS Grades and Comparisons
Route 419/Electric Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
419/Electric - Franklin Rd. to Roanoke County line	F	D
419/Electric - Roanoke County line to Starkey Road	F	D
419/Electric - Starkey Rd. to Brambleton/US 221	D	B
419/Electric - Brambleton to Salem City line	E	B
419/Electric - Salem City line to Apperson/US 11	F	D
419/Electric - Apperson/US 11 to Roanoke Blvd.	F	D
419/Electric - Roanoke Blvd. to Alt US 60/Texas Street	E	D
419/Electric - Alt US 60/Texas St. to US 460/E.Main	E	E
419/Electric - US 460/E.Main to RCL (0.88)	E	E
419/Electric - RCL to I-81	E	E
419/Electric - I-81 to 311/Catawba Valley Dr.	E	D

Although the roadway has a paved shoulder, high traffic counts and travel speeds, resulted in most segments receiving relatively low LOS scores in both models. Route 419/Electric Road received mostly a level of service of E along the measured sections from the BCI Model; six segments with a level of service E, four F and one D. The BLOS Model gave slightly higher results with most levels of service at D; six segments with level of service D, two E and two B.

Cyclist on 419/Electric Road. Note the wide paved shoulder, shoulder pavement quality, and high traffic volume.

Additionally, the pavement condition of the shoulder is inconsistent and of lesser quality than the road surface in most places. Other impediments include the shoulder becoming a right-turn lane at most intersections and commercial areas. However, for experienced cyclists, Route 419 provides significant separation from traffic, as well as connectivity between other portions of the regional network.

- **Activity Centers**

Given the length of the 419/Electric corridor, it can potentially connect numerous activity centers, places of employment, and other roadways in the bicycling network. There are numerous commercial and retail centers adjacent or in close proximity to the corridor including Tanglewood Mall, Promenade Shopping Center, and Cave Spring Corners, Oak Grove Plaza, Southwest Plaza, and Ridgewood Farms Shopping Center. Other activity centers along its course include the Roanoke County administration building, North Cross School, Roanoke County Public Library headquarters, Hidden Valley High School, and Lewis Gale hospital. Additionally, there are numerous office parks and other places of employment with large concentrations of workers, such as Allstate and Atlantic Mutual, as well as numerous apartment and housing complexes.

- **Design Alternatives**

Based on the BCI model, increases in the shoulder width or the addition of a bike lane would not significantly increase the overall LOS of the corridor, again, due to high traffic volume and relatively high travel speeds along the corridor. However, increased signage along the roadway (i.e., Share the Road) and shoulder maintenance and improvements would likely benefit cyclists, as well as motorists.

US 460 (Wildwood Road to 4th Street, Salem)

US 460 in the City of Salem was evaluated from Wildwood Road to 4th Street (460 Alt.). This 1.3-is mile segment is a 4-lane roadway with a center turn lane. The outside travel lane is 12.5-feet wide, and the speed limit is 35 mph. This section of 460 serves not only as a major thoroughfare, but also provides access to a major commercial area of the City of Salem. As such, this segment of Route 460 has a high AADT and right turn percentage, both of which negatively impact bicycle compatibility. Table 4.11 provides level of service comparisons for this segment of US 460. Both models gave a low LOS grade for this section of 460. The BCI gave a score of E, and the BLOS gave it a D.

Table 4.11
Level of Service Comparisons
US 460 (Wildwood Road to 4th Street, Salem)

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
US 460 (Wildwood Road to 4th Street, Salem)	E	D

- **Activity Centers**

There are numerous activity centers along this portion of US 460, including numerous the shopping centers, and restaurants. Lakewood Park is also adjacent to this corridor. East of 4th Street, along US 460 enters downtown Salem and has lower posted speed limits. Downtown Salem which has numerous activity centers including the farmers market, library, numerous shops and restaurants, and Roanoke College.

Route 629

This corridor serves as the entrance to Douthat State Park and connects Bath County, Alleghany County and Clifton Forge. The corridor was measured from I-64 to the Bath County line. The travel lane width is 11-feet with no shoulder. However, due to relatively low traffic volume the segment leading into the park received a grade of D and C in the BCI model. Additionally, this segment has numerous curves and limited slight distance in places. Inside of the park the LOS improves with a grade of C, due primarily to the very low AADT of 370 and slower speeds.

Table 4.12
BCI and BLOS Grades and Comparisons
Route 629

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
629 - 1408 to Douthat State Park entrance	D	C
629 - Douthat State Park entrance to Bath County Line	C	A

- **Activity Centers**

Douthat State Park is a popular destination for outdoor and recreation enthusiasts. Also there are several eateries and a campground along this corridor prior to entering Douthat State Park that receive a number of visitors during the tourist season. This corridor is also in close proximity to the Town of Clifton Forge.

Route 779 (US 220 to State Route 311)

Route 779, also marked as Catawba Creek Road, connects Botetourt and Roanoke counties and was measured from Route 311 to US 220. This roadway is part of the Interstate Bicycle Route 76, also known as the TransAmerican Bicycle Trail or the Bikecentennial Trail, which runs through portions of the study area. This corridor is undivided, primarily rural residential in nature, with 10-foot travel lanes and no shoulders. As shown in Table 4 the LOS grades varied considerably between the BCI and the BLOS models. However, the Roanoke County portions of 779 received higher grades in both models due to lower overall traffic counts and heavy vehicle percentages.

Table 4.13
BCI and BLOS Grades and Comparisons
Secondary Route 779

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
779 - 311 to 600	D	C
779 - 600 South to Botetourt County Line	D	B
779 - Botetourt County Line to 600	D	F
779 - 600 North to 672	E	F
779 - 672 to 675	E	F
779 - 675 to US 220	E	F

- **Activity Centers**

As previously referenced, this portion of 779 is part of the Interstate Bicycle Route 76. As such, it is of interest primarily as a recreational and scenic corridor. Given the rural nature of this segment of 779, activity centers are limited, with most development located in closer proximity to US 220. Additional development is located near the intersection with State Route 311 in Roanoke County including the Catawba Community Center, Catawba post office, a convenience store and a restaurant.

Apperson Drive/ US Route 11 (College Avenue, Colorado Avenue)

The Apperson Drive corridor, as measured, included Apperson Drive, and portions of Colorado Street, College Avenue, and Thompson Memorial. This corridor connects Roanoke County and the City of Salem. The area proximate to the measured segments is mostly commercial in nature along Apperson Drive with many retail and commercial establishments, becoming more residential along College Avenue. This corridor consists of between two and four lanes, which are divided at times with total roadway widths of 33 to 58.5 feet (including medians, shoulders, and inside lanes). As shown in Table 4.14, the LOS range from C to F with the BCI model and from A to D with the BLOS model. The segment of College Street between Colorado Street and Thompson Memorial received the highest grade in both models with a C and A for the BCI and BLOS models, respectively. Wide curb lanes (outside travel lanes) of 20 and 15 feet, with low AADT, along these sections provided for a high LOS. Although not modeled, several streets with similar geometric and operational characteristics run parallel to the College Avenue portion of the corridor would likely offer similarly high LOS and additional routes to many of the activity centers in the City of Salem.

Table 4.14
BCI and BLOS Grades and Comparisons
Apperson Drive/ US Route 11

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Apperson/11 - Salem ECL to 419/Electric Rd. (westbound)	E	D
Apperson/11 - Salem ECL to 419/Electric Rd. (eastbound)	E	D
Apperson/11 - 419/Electric Rd. to Colorado St. (westbound)	F	D
Apperson/11 - 419/Electric Rd. to Colorado St. (eastbound)	E	D
Apperson/11 - Colorado St. to College Ave (westbound)	D	C
Apperson/11 - Colorado St. to College Ave. (eastbound)	D	C
College Ave. - Colorado St. to 4th St. (westbound)	C	A
College Ave. - 4th St. to Thompson Memorial (westbound)	C	A
Apperson/11 - Thompson Memorial to US 460/Main St.	D	B

- **Activity Centers**

There are numerous activity centers and destinations proximate to Apperson Drive/Route 11/College Avenue corridor, including recreational, commercial, civic and educational centers. The portion of Apperson east of 419 has the largest number commercial and retail establishments. Other activity centers and destinations along or close to this corridor (west of 419) include numerous retail and commercial establishments, the American Legion, Moyers Sports Complex, the Roanoke River Greenway, Andrew Lewis Elementary School, GW Carver Middle School. Portions of this corridor are also in close proximity to Roanoke College and intersect with Main Street near downtown Salem.

Blue Ridge Parkway

The National Parks Service administers the Blue Ridge Parkway, a scenic byway running through the Blue Ridge Mountains of Virginia and North Carolina. Therefore, state and local agencies have little input into bicycle accommodations along its length. However, the Parkway is a popular route for many recreational cyclists and for this reason was included in the regional study area network. The portion of the Parkway in the region is primarily a two-lane, undivided roadway with 11-foot travel lanes and no shoulders. The AADT is low varying from 1000 to 1200 in the section between US 220 and SR 24. As shown in Table 4.15, the LOS grades varied considerably between the two models, receiving a grade of D in the BCI model and a B in the BLOS model. It should be noted that although the Parkway has low AADT, portions of the Blue Ridge Parkway are used daily by area commuters, resulting in higher traffic volumes at certain times during the day. Traffic volumes also increase during certain times of year as tourists travel the Parkway.

Table 4.15
BCI and BLOS Grades and Comparisons
Blue Ridge Parkway

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Blue Ridge Parkway - Floyd County Line to US 220	D	B
Blue Ridge Parkway - US 220 to SR 24	D	B
Blue Ridge Parkway - SR 24 to Botetourt County Line	D	B
Blue Ridge Parkway - Botetourt CL to US 221, US 460	D	B
Blue Ridge Parkway - US 221, US 460 to Bedford CL	D	B

- **Activity Centers**

The Blue Ridge Parkway has limited access and most development is prohibited directly on the Parkway. As such, activity centers are relatively limited. However, on or in close proximity to the portions of the Parkway in the region there are some activity centers or destinations of interest. These include Explore Park and numerous scenic overlooks. Others destinations located just off of the Parkway in the City of Roanoke include Mill Mountain Zoo, the Roanoke Star and Roanoke Mountain campground. Access to the Parkway at US 220 is also in close proximity to a wide variety of commercial establishments and other corridors in the study area network.

Brambleton Avenue/ US Route 221

Brambleton Avenue/221 connects portions of Roanoke County and the City of Roanoke. Portions of the corridor modeled include segments within the MPO as well as rural segments outside of the MPO. The land use along this corridor includes residential as well as commercial zones. Sections outside of the MPO are primarily residential and rural in nature (i.e., 221 South) with one travel lane in each direction. The most commercial segment of the corridor is located between Route 419/Electric Road and the City of Roanoke WCL, with other commercial areas just south of Route 419/Electric Road. The commercial segments have numerous entrances to businesses, creating a high number of conflict points, and high traffic volumes. It should be noted that there are no sidewalks along any portion of this roadway, which ranges from two to four lanes, however, curb cuts are in place at many intersections along the curb and gutter sections.

The total road widths range from 22 feet along the rural portions of the corridor (i.e., Ran Lyn to Crystal Dr.) to 71.5 feet in the more developed areas (includes 4 lanes and a 13.5-foot wide center turn lane). The curb (outside) lane width ranges from 11 feet in the rural sections in Roanoke County to 20 feet between Woodlawn Drive and Montgomery Drive in the City of Roanoke (northbound).

Table 4.16
BCI and BLOS Grades and Comparisons
Brambleton Avenue/221

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Brambleton - Ran Lyn to Crystal Dr.	F	F
Brambleton - Crystal Dr. to 419/Electric Rd.	F	F
Brambleton - 419/Electric Rd. WCL/Wedgewood Dr. (northbound)	E	E
Brambleton - 419/Electric Rd. WCL/Wedgewood Dr. (southbound)	E	E
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr. (northbound)	D	E
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr. (southbound)	D	D
Brambleton - Woodlawn Dr. to Montgomery Dr. (northbound)	D	C
Brambleton - Woodlawn Dr. to Montgomery Dr. (southbound)	C	A
Brambleton - Montgomery to Overland Dr. (northbound)	E	D
Brambleton - Montgomery to Overland Dr. (southbound)	D	D
Brambleton - Overland Dr. to Brandon Dr.	E	D

Brambleton (southbound) between WCL and Route 419. Curb lane is 12.5 ft. with a 13.5 ft. center turn lane.

Brambleton Avenue ranks in the moderately low to very low (D and E) using the BCI model on a majority of the road segments. There is, however, one segment ranks moderately high with a level of service C and is discussed later. The measured road segments of Brambleton Avenue received level of service ranks that range from A to F based on BLOS calculations. Due to differences in roadway characteristics northbound and southbound travel directions received different scores along many of the segments evaluated. The segments receiving the lowest scores in both models are the rural portions with relatively narrow lanes (11 feet) and no shoulders.

The segment of Brambleton Avenue between Woodlawn and Montgomery offers cyclist the highest LOS. The northbound travel direction lane of this segment, with a 20-foot curb lane and no shoulder, received a Level of Service C from the BCI and a D from the BCI model. The southbound direction, with a curb lane width of 12-feet and a shoulder width of 7.5-feet received an A and C from the BCI and BLOS respectively. With minimal improvements, and using existing pavement, the LOS of this segment could be significantly raised in both Brambleton between Montgomery Drive (Greenway connection) and Overland Drive which received LOS score of D and E, due in part steep gradients on either side of the stream, its sinuous route, and lack of shoulder.

- Activity Centers

Activity centers along the sections north of 419 include Cave Springs Middle School, Cave Spring Corners, Brambleton Center, Fishburn Park, Murray Run Greenway, and numerous commercial establishments. Additionally, the Murray Run Greenway (Figure 4.2) connects five area schools and other activity centers including VWCC, the Community Arboretum, the Gator Aquatic Center, Madison Elementary School, Fishburn Park, and Patrick Henry High School and several neighborhoods. Additionally, Brambleton intersects Garst Mill Road, providing a potential link to the Garst Mill Greenway and Grandin Road. Additionally, a Valley Metro route runs along the city portion of Brambleton Avenue up to the City of Roanoke WCL and has several stops along the route.

ed shoulder on Brambleton Avenue/221 South between Montgomery Drive and Woodlawn Drive in the City of Roanoke. Note adequate to shoulder (7.5 ft.) and curb lane idth (12 ft.) to accommodate cyclist and automobiles.

Wide travel lane on Brambleton Avenue/221 North between Montgomery Drive and Woodlawn Drive in the City of Roanoke.

- **Design Alternatives**

Utilizing existing pavement to reconfigure the existing roadway design could raise the LOS of several segments of Brambleton. Table 4.17 provides various design alternatives for selected segments of Brambleton Avenue and the resulting LOS.

As previously referenced, currently the section of Brambleton between Montgomery Drive and Woodlawn Drive provides a moderately high LOS in both travel directions due to a wide shoulder in the southbound direction and a wide travel lane in the northbound direction. In the northbound direction installing a 4-foot bike lane, using existing pavement, would raise the LOS from D to C. Likewise, designating the existing 7.5 ft. paved shoulder along the southbound travel direction, or portion thereof, as a bike lane would also raise the LOS, albeit only slightly. However, the current LOS of C is sufficient for most bicyclists.

Brambleton Avenue (southbound) between Overland and Montgomery.

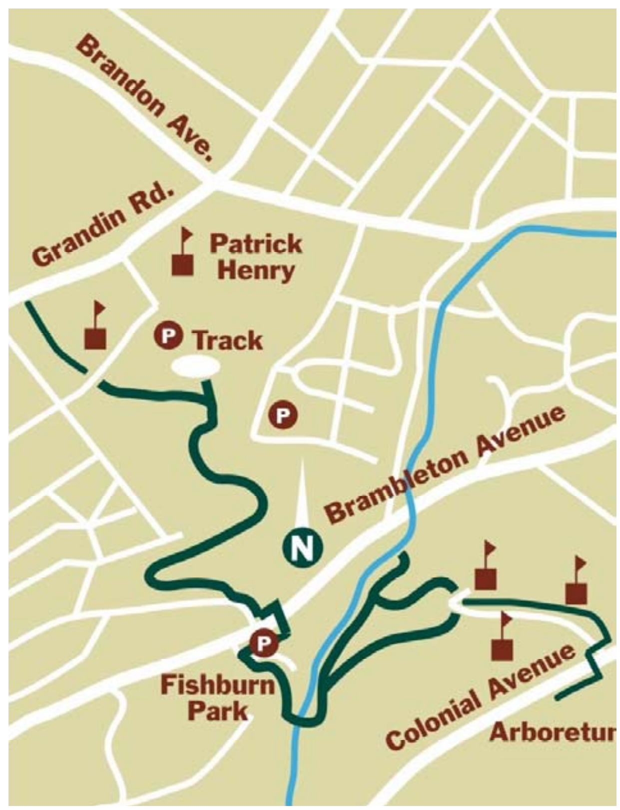


Figure 4.2: Murray Run Greenway connects several corridors in the study area network.

Using improved on-street accommodations along portions of Brambleton and the Murray Run Greenway, a link between Colonial Avenue, Brambleton Avenue, and Grandin Avenue can be established. This link would enable cyclists and pedestrians to bypass the segment of Brambleton between Overland Road and Montgomery Avenue. However, it should be noted that sections of the Murray Run Greenway are steep, single track, natural surface trails that may not be suitable for all bicyclists and bicycle types. Additionally, improved accommodations on sections of Colonial Avenue and Grandin Road would provide increased connectivity within the regional network.

Although the commercial areas between Route 419/Electric Road and the WCL received a LOS grade of E in both models, it should be noted that there is adequate total pavement width for possible reconfiguration of lanes to better accommodate bicyclists, using existing pavement. Currently, the outside travel lane width varies between 11.5 to 12.5-feet and the center turn lane is 13.5-feet wide. Increasing the curb lane width to 15 feet by decreasing the center turn lane and inside travel lanes raises the LOS from an E to a D. Such reconfiguration could also be possible along the 4-lane portion just south of Route 419/Electric Road where roadway characteristics are similar. However, given the high AADT along these segments, significant increases in LOS may not be possible using existing pavement.

Table 4.17
Design Alternatives for Selected Segments
Brambleton Avenue/ US Route 221

Brambleton - Woodlawn to Montgomery (northbound)	**BCI Level of Service Grade**
Existing Parameters: 20 ft. curb lane, no bike lane, 35 mph	D
Alternative A: 16 ft. curb lane, 4 ft. paved shoulder	C
Alternative B: 16 ft. curb lane, 4 ft. bike lane	C
Alternative C: 15 ft. curb lane, 5 ft. bike lane	C
Brambleton - Woodlawn to Montgomery (southbound)	**BCI Level of Service Grade**
Existing Parameters: 12 ft. curb lane, 7.5 ft. paved shoulder, 35 mph	C
Alternative A: 12 ft. curb lane, 7.5 ft. bike lane	C
Alternative B: 13 ft. curb lane, 6.5 ft. bike lane	C
Alternative C: 14 ft. curb lane, 5.5 ft. bike lane	C
Alternative D: 15 ft. curb lane, 4.5 ft. bike lane	C
Brambleton - 419/Electric Road to WCL/Wedgewood Dr.	**BCI Level of Service Grade**
Existing Parameters: 12 ft. curb lane, 35 mph	E
Alternative A: 15 ft. curb lane	D

Buck Mountain Road

Buck Mountain Road in Roanoke County consists of four measured segments from Starkey Road to US 220. The roadway is consistently two lanes measuring 21 feet in width (10 feet travel lanes) and is surrounded by residential areas, in a primarily rural setting. The LOS using both the BCI and BLOS models for Buck Mountain Road is E, very low. Options for better accommodating bicyclists on Buck Mountain Road are limited without increasing the width of the travel lanes or adding shoulders. Either option would entail additional pavement width. Given its location and surrounding land use, users of this road are likely primarily recreational cyclist, with considerable experience. However, based on the BCI model, adding two feet to the travel lane or shoulder would raise the LOS to a D, while the addition of 3 feet would raise the LOS to a C. However, it should be noted that the tunnel under the Blue Ridge Parkway would limit additional pavement width.

Table 4.18
BCI and BLOS Grades and Comparisons
Buck Mountain Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Buck Mountain Rd. - Starkey Rd. to 1960	E	E
Buck Mountain Rd. - 1960 to 917	E	E
Buck Mountain Rd. - 917 to Blue Ridge Parkway	E	E
Buck Mountain Rd. - Starkey Rd. to 1963	E	E

Colonial Avenue

Colonial Avenue was measured from Brandon Avenue to Penn Forest Road. Colonial Avenue has numerous changes in the geometric and operational parameters along its length resulting is LOS ranging from C to E using the BCI model, and from A to D with the BLOS model. Colonial Avenue includes both commercial and residential land uses, resulting in high daily traffic counts and lower LOS grades.

Table 4.19
BCI and BLOS Grades and Comparisons
Colonial Avenue

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Colonial - Brandon to Wonju	D	C
Colonial – Wonju to Broadway	E	D
Colonial – Broadway to Persinger	C	B
Colonial - Persinger to Overland Dr. (eastbound)	E	A
Colonial - Persinger to Overland Dr. (westbound)	C	D
Colonial - Overland Dr. to Dogwood (westbound)	E	C
Colonial - Overland Dr. to Dogwood (eastbound)	D	D
Colonial - Dogwood to WCL	E	D
Colonial - WCL to 419/Electric Rd.	E	D
Colonial - 419/Electric Rd. to Penn Forest	D	D

Colonial Avenue between Wonju Street and Persinger Road in the City of Roanoke. Note wide travel lane.

As shown in Table 4.19, both models gave most of Colonial Avenue a grade of D or E. However, some segments scored considerably higher. The segments of Colonial Avenue between Broadway Street and Persinger Road in the City of Roanoke with offered the highest LOS on both models. This segment between Broadway Street and Persinger Road received LOS grades of C and B in the BCI and BLOS models, respectively. This is due primarily to wide travel lanes. The total roadway width, including shoulders, ranges from 20 to 60.5 feet. Most of the segments evaluated with the BLOS model received LOS grades of D, while a few were ranked A to C.

Activity Centers

Activity centers in close proximity to Colonial Avenue include Towers Shopping Center, Virginia Western Community College, Fishburn Elementary School, Montessori School, Green Valley Elementary School, Promenade Shopping Center, and North Cross School. Additionally there are numerous residential areas along or adjacent to the corridor.

Colonial Avenue between WCL and 419/Electric Road. Note insufficient lane width to accommodate cyclist and auto traffic, and steep gradient.

- **Design Alternatives**

Design alternatives for three segments of Colonial Avenue were evaluated. As shown in Table 4.20, significant improvements could be achieved with the addition of a bike lane or paved shoulder along each segment of this corridor. From Wonju Street to Persinger Road the addition of a 4-foot bike lane would raise the LOS from a C to a B. Likewise, the addition of a 2-foot or 3-foot paved shoulder along segment from Dogwood to the WCL would raise the LOS from a grade of E to D. The LOS of this segment could be further improved to a grade of C with the addition of a 4-foot bike lane or paved shoulder. Although the roadway design of the segment from WCL to Route 419 are the same as those of Dogwood to WCL, this segment has a lower AADT. As a result the LOS could be improved from the current grade of E to a grade of C in a number of ways, as shown in Table 4.20.

Table 4.20
Design Alternatives for Selected Segments
Colonial Avenue

Colonial (8001) - Wonju to Persinger	**BCI Level of Service Grade**
Existing Parameters: 22 ft. curb lane, no bike lane, 30 mph	C
Alternative A: 18 ft. curb lane, 4 ft. bike lane	B
Colonial (8001) – Dogwood to WCL	**BCI Level of Service Grade**
Existing Parameters: 10 ft. curb lane, 0-ft paved shoulder, 35 mph	E
Alternative A: 10 ft. curb lane, 4 ft. bike lane	C
Alternative B: 10 ft. curb lane, 2 ft. paved shoulder	D
Alternative C: 10 ft. curb lane, 3 ft. paved shoulder	D
Alternative D: 10 ft. curb lane, 4 ft. paved shoulder	C
Colonial (8001) – WCL to 419	**BCI Level of Service Grade**
Existing Parameters: 10 ft. curb lane, 0-ft paved shoulder, 35 mph	E
Alternative A: 10 ft. curb lane, 4 ft. bike lane	C
Alternative B: 10 ft. curb lane, 2 ft. paved shoulder	C
Alternative C: 10 ft. curb lane, 3 ft. paved shoulder	C
Alternative D: 10 ft. curb lane, 4 ft. paved shoulder	C
Alternative D: 12 ft. curb lane	D

Cotton Hill Road

The two-lane Cotton Hill Road has numerous curves and areas of steep gradient. The roadway width ranges from 17 to 19 feet, including shoulders. The area surrounding Cotton Hill Road is mostly residential with a high right turn volume. The BCI Model gave most of the measured segments of Cotton Hill Road LOS of D and the remaining segments a grade of E. The BLOS Model ranked the roadway slightly higher than the BCI with most segments receiving a grade of B.

Table 4.21
BCI and BLOS Grades and Comparisons
Cotton Hill Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Cotton Hill - Merriman Rd. to Shingle Ridge Rd. (northbound)	D	B
Cotton Hill - Merriman Rd. to Shingle Ridge Rd. (southbound)	D	B
Cotton Hill - Shingle Ridge Rd. to 889 (northbound)	D	B
Cotton Hill - Shingle Ridge Rd. to 889 (southbound)	D	B
Cotton Hill - 889 to US 221	E	C

Franklin Road

Franklin Road in the City of Roanoke was measured in three segments, mostly consisting of four travel lanes and a center turn lane. Franklin Road ranges in width from 34 feet near Elm Avenue to 83 feet in the four lane sections. Two of the three measured segments have a LOS (very vow) and the remaining segment has a Level of Service D (Moderately Low) in the BCI model. The BLOS model ranked the measured segments C and D. The measured segment, US 220 to Penarth Road, ranked a C in the southbound direction and a D in the northbound direction. The higher LOS grades (D) for the short section between 220 and Penarth Street is due primarily to the presence of a 9-ft wide paved shoulder. The longest and most consistent segment measured, Penarth Road to 220, has a 13-foot curb lane and an 11.5-foot center turn lane (center turn lane disappears at the Roanoke River bridge) and a two-foot curb and gutter. North of the 220 Expressway, which is primarily residential, the roads narrow to one lane in each travel direction until Elm Avenue. Along this section there are numerous ingress and egress points into commercial establishments, creating potential conflict points for bicyclists and motorists alike.

Table 4.22
BCI and BLOS Grades and Comparisons
Franklin Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Franklin Rd. - US 220 to Penarth Rd. (northbound)	D	C
Franklin Rd. - US 220 to Penarth Rd. (southbound)	D	D
Franklin Rd. - Penarth Rd. to US 220/Roy Weber Expressway	E	D
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (northbound)	E	C
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (southbound)	E	C

- **Activity Centers**

Cyclist on Franklin Road. Note the high number of commercial establishments and conflict points.

There are numerous activity centers and destinations along or in close proximity to Franklin Road including commercial establishments, residential neighborhoods, and public areas. Specific activity centers include the Roanoke River Greenway, Rivers Edge Sports Complex, and numerous shopping centers and other commercial establishments. Tanglewood Mall is also located near the intersection of Franklin Road and US Route 220 near the City of Roanoke/ Roanoke County boundary. Franklin Road also connects to other corridors in the study area including Colonial Avenue, Grandin Road, and 419/Electric Road. Franklin Road is also on a Valley Metro bus route and serves as a bicycle-commuting corridor for the area.

- **Design Alternatives**

Franklin Road characteristics are consistent from Penarth Road (220 Frontage Road) north to the Roanoke River bridge at Wiley Drive. Based on the BCI model, an increase in LOS can be achieved using various design alternatives to better accommodate cyclists. Each of the design alternatives listed in Table raise the LOS from an E to a D and may be possible using area from the center turn lane and inside travel lanes. Given the traffic volume of the corridor, improvement beyond a D is likely not possible, without significant alteration of existing parameters.

Table 4.23
Design Alternatives for Selected Segments
Franklin Road

	BCI Level of Service Grade
Existing Parameters: 13-ft. curb lane, 35 mph	E
Alternative A: 16-ft. curb lane, 35 mph	D
Alternative B: 12-ft. curb lane, 4-ft bike lane, 35 mph	D
Alternative C: 12-ft. curb lane, 4 ft paved shoulder, 35 mph	D
Alternative D: 11-ft. curb lane, 5 ft bike lane, 35 mph	D
Alternative E: 10-ft. curb lane, 6 ft bike lane, 35 mph	D

Garst Mill Road

Garst Mill Road was evaluated from Brambleton Avenue in Roanoke County to the City of Roanoke SCL where it becomes Grandin Road in the City of Roanoke. This two-lane corridor is undivided, primarily residential, with more development located near the intersection with Brambleton Avenue.

Table 4.24
BCI and BLOS Grades and Comparisons
Garst Mill Road

	BCI Level of Service Grade	BLOS Level of Service Grade
Garst Mill Road (682) - US 221 S to Crest Hill Dr.	E	D
Garst Mill Road (682) - Crest Hill Dr. to 1361	E	D
Garst Mill Road (682) - SCL Roanoke City	E	D

- **Activity Centers**

Activity Centers along this corridor include Garst Mill Park, Garst Mill Greenway, Cave Spring Corners shopping center, and numerous neighborhoods and apartment complexes. Garst Mill also intersects Grandin Avenue, Brandon Avenue and Brambleton Avenue and associated activity centers including the Murray Run Green Way and the bike lane on Memorial Avenue.

Figure 4.3: Garst Mill Greenway is located off of Garst Mill Road in Roanoke County.

Grandin Road

Grandin Road was evaluated from the SCL to Memorial Avenue. This corridor contains both commercial and residential areas. Additionally, it also intersects other roads in the study area network including Brandon Avenue, Memorial Avenue, and Garst Mill Road. The roadway configuration is varied along this corridor with the highest LOS along sections with wider travel lanes.

Table 4.25
BCI and BLOS Grades and Comparisons
Grandin Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Grandin - 419/Electric Rd. to Mudlick (northbound)	D	D
Grandin - 419/Electric Rd. to Mudlick (southbound)	D	D
Grandin – Mudlick to Beverly	D	D
Grandin – Beverly to Guilford (northbound)	C	B
Grandin – Beverly to Guilford (southbound)	D	C
Grandin - Guilford to Brandon (northbound)	C	C
Grandin - Guilford to Brandon (southbound)	C	C
Grandin - Brandon to Memorial (northbound)	E	C
Grandin - Brandon to Memorial (southbound)	D	C

- **Activity Centers**

Activity centers include Grandin Village, Patrick Henry High School, and Virginia Heights Elementary School. As previously discussed, the Murray Run Greenway also links Grandin Road, Brambleton Avenue and Colonial Avenue. Grandin Road is also on a Valley Metro transit route with numerous stops along the corridor.

Hardy Road (bike lane portion)

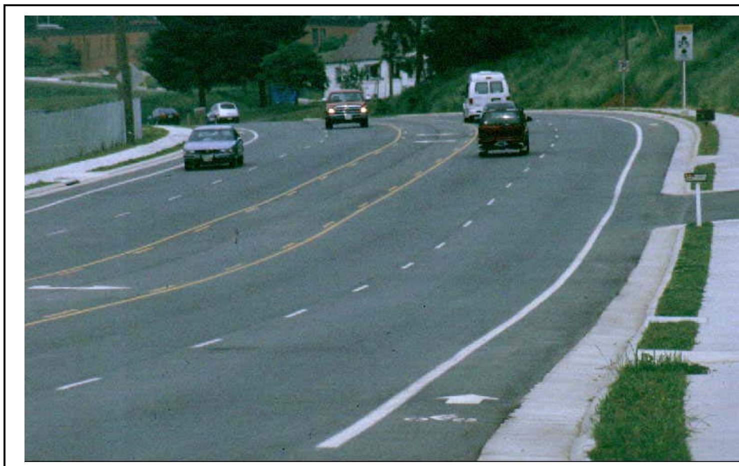
The bike lane along a 0.5-mile section of Hardy Road was the first bike lane in the Roanoke Valley. This section of Hardy Road has a total of four travel lanes, a center turn lane, bike lanes, a 2-foot gutter pan, and sidewalks. The curb lane width is 10.5-feet, the bike lane width is 4-feet. Table 4.26 shows that the BCI and BLOS models gave this bike lane a LOS grade of C and A, respectively, indicating a high level of bicycle compatibility. Although the roadway characteristics of the bike lane along Memorial Avenue in the City of Roanoke varied considerably compared to that of the bike lane on Hardy Road, the bike lanes scored similarly in both models.

Table 4.26
BCI and BLOS Grades and Comparisons
Hardy Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Hardy Road (bike lane portion)	C	A

- **Activity Centers**

Activity centers along this corridor include W.E. Cundiff Elementary School and residential areas. The bike lane is also in close proximity to commercial establishments and shopping centers on Bypass Road and Virginia Avenue.



Bike lane along Hardy Road in the Town of Vinton.

Hershberger Road

Hershberger Road is measured in four segments, which are split by east and westbound directions due to differences in each side. From Peters Creek Road to Cove Road, Hershberger is a two-lane road surrounded by residential areas, the corridor then increases to six lanes. At its widest, Hershberger measures 101.5 feet in width, including all lanes, medians and shoulders; while at its narrowest the roadway is 23.5 feet. The corridor has sidewalks on 50 percent of the segments evaluated from Cove Road to I-581 and from Rutgers to Williamson Road. Most of the evaluated segments received a LOS grade of F in the BCI model. The remaining segment received a grade of D. The BLOS model gave all measured segments of Hershberger a grade of D.

Table 4.27
BCI and BLOS Grades and Comparisons
Hershberger Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Hershberger Rd. - Peters Creek to Cove Rd. (eastbound)	D	D
Hershberger Rd. - Peters Creek to Cove Rd. (westbound)	D	D
Hershberger Rd. - Cove Rd. to I-581 (eastbound)	F	D
Hershberger Rd. - Cove Rd. to I-581 (westbound)	F	D
Hershberger Rd. - I-581 to Rutgers (eastbound)	F	D
Hershberger Rd. - I-581 to Rutgers (westbound)	F	D
Hershberger Rd. - Rutgers to Williamson Rd. (eastbound)	F	D
Hershberger Rd. - Rutgers to Williamson Rd. (westbound)	F	D

- **Activity Centers**

Activity centers along this corridor include Westside Park, Westside Elementary School, and the Crossroads Shopping Center, as well as the other commercial establishments along the road.

Hollins Road

The BCI and BLOS Models ranked Hollins Road in a similar manner, but with different levels of service. Both models ranked the non-residential area that was measured lower than the residential segment. Hollins Road received a level of service E for the residential area and an F for the non-residential area with the BCI Model. With the BLOS Model, the road received a D for the residential area and a level of service E for the non-residential. The roadway was consistently 20.5 feet in total width, including shoulders, and consists of two, undivided lanes with no sidewalks.

Table 4.28
BCI and BLOS Grades and Comparisons
Hollins Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Hollins Rd. (601) - NCL Roanoke SR 115 to Beaumont Rd. (northbound)	F	E
Hollins Rd. (601) - NCL Roanoke SR 115 to Beaumont Rd. (southbound)	F	E
Hollins Rd. (601) - Beaumont Rd. to Shadwell Dr. (northbound)	E	D
Hollins Rd. (601) - Beaumont Rd. to Shadwell Dr. (southbound)	E	D

Kessler Mill

Kessler Mill Road in Salem runs parallel to Route 419 before they meet at Route 311. This corridor was measured from Main St./460 to 311 in Salem. The majority of the segment received a grade of D, due primarily to the lack of shoulders and narrow travel lane especially the portion of the road north of Garst Drive. However, the Hanging Rock Battlefield Greenway parallels Kessler Mill for much of this same length, providing cyclist an alternative to the narrow shoulder.

Table 4.29
BCI and BLOS Grades and Comparisons
Kessler Mill Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (northbound)	D	D
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (southbound)	C	C
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr. (northbound)	D	D
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr. (southbound)	D	D
Kessler Mill Rd. - Garst Dr. to Route 311	D	D

- **Activity Centers**

As previously referenced, the Hanging Rock Battlefield Greenway is located adjacent to much of Kessler Mill. Other activity centers and points of interest near the intersection of Kessler Mill and Route 311 include a park and ride lot, commercial establishments, the Civil War monument and a connection to Route 311 and Carvins Cove.

King Street

King Street was evaluated in one segment between Gus Nicks Boulevard and US 460. The roadway consists of two undivided lanes for a total width 22.5-feet including shoulders. Residential areas with a high right turn volume surround King Street. Table 4. shows that King Street a received a LOS grade of E in the BCI and a grade of D fro the BLOS model.

- **Activity Centers**

Activity centers near King Street include a Kroger shopping center on US 460, Vineyard Park, and a local church.

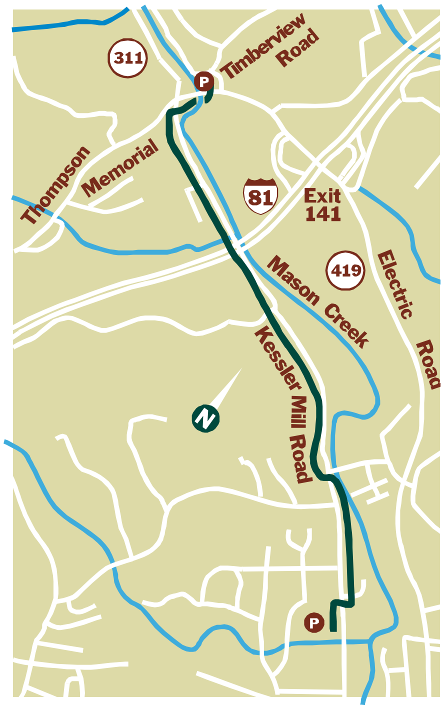


Figure 4.4: Hanging Rock Greenway located on Kessler Mil Road connects Kessler Mill, Route 311 and Route 419.

Table 4.30
BCI and BLOS Grades and Comparisons
King Street

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
King Street. - Gus Nicks Blvd. To US 460	E	D

McVitty Road

McVitty Road is located in Roanoke County and connects Brambleton/221, via Old Cave Spring Road, with Route 419/Electric Road. Travel lanes along this corridor ranged from 12.5-feet in the northbound direction and 11.5-feet in the southbound travel direction. This corridor received low LOS grades in both models, with grades of E and D in the BCI and BLOS models, respectively.

Table 4.31
BCI and BLOS Grades and Comparisons
McVitty Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
McVitty (Old Cave Spring to stream) - North	E	D
McVitty (Old Cave Spring to stream) - South	E	D
McVitty (stream to 419) - North	E	D
McVitty (stream to 419) - South	E	D

Memorial Avenue (bike lane portion)

Currently, the bike lane along an approximately 0.5-mile portion of Memorial Avenue between Campbell Avenue and Grandin Road, is the only designated bike lane in the City of Roanoke and one of two in the study area. The bike lane, which runs from approximately Campbell Avenue to Grandin Road, scored well in both LOS models receiving scores of B and C. The bike lane is 5-feet in width with parking along portions of the northbound travel lane.

Table 4.32
BCI and BLOS Grades and Comparisons
Memorial Avenue (bike lane)

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Memorial Avenue - Grandin Rd. to Campbell Ave. (northbound)	C	B
Memorial Avenue - Grandin Rd. to Campbell Ave. (southbound)	C	C

- **Activity Centers**

This corridor connects activity centers such as Grandin Village, Virginia Heights Elementary School, Ghent Hill Park, downtown Roanoke, and numerous neighborhoods and public areas. Additionally, there are numerous Valley Metro stops along this route.

Bicyclists using the bike lane along Memorial Avenue in the City of Roanoke.

Merriman Road

Merriman Road, from the Franklin County Line to Colonial Avenue, is a two-lane, undivided roadway with a total width ranging from 22.5 to 26 feet (including shoulders). The speeds in this residential area range from 45 to 25 miles per hour. There are no sidewalks along the measured segments of Merriman Road. In the BCI model, the roadway received a level of service ranging from C to E. Overall, most of the scores are C and D. Using the BLOS Model, two of the measured segments received a B and two segments received a C. The segments scoring the highest LOS had various characteristics consisting of one or a combination of the following treatments; wider outside travel lanes, a shoulder, a lower speed limit, or a lower AADT.

Table 4.33
BCI and BLOS Grades and Comparisons
Merriman Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Merriman Rd. (613) - Franklin to Cotton Hill Rd.	C	B
Merriman Rd. (613) - Cotton Hill Rd. to Blue Ridge PW	C	C
Merriman Rd. (613) - Blue Ridge PW to Star Light	D	C
Merriman Rd. (613) - Star Light to Starkey (northbound)	D	C
Merriman Rd. (613) - Star Light to Starkey (southbound)	D	D
Merriman Rd. (613) - Starkey Rd. to Chaparral	E	D
Merriman Rd. (613) - Chaparral to 907	D	D
Merriman Rd. (613) - 907 to Colonial Ave.	C	B

The section of Merriman Road, from the Franklin County line to the Blue Ridge Parkway, scored well on both models. Roadway characteristics for this section include an 11.5-foot travel lane, 1.5-foot paved shoulder and a 45 mph speed limit. Likewise, the section from 907 to Colonial Avenue also received a grade of C, with the following roadway characteristics: 13-foot wide travel lane, no paved shoulders and a speed limit of 25 in the school speed zone near Penn Forest Elementary School.

- **Activity Centers**

Activity centers and destinations along Merriman Road include Penn Forest Elementary School and Cave Spring Middle School.

Old Cave Spring Road

This corridor is located in Roanoke County and connects Brambleton Avenue/ Route 221 with McVitty Road. Travel lane width varies slightly from 11 to 10.5-feet in opposite travel direction along portions of the corridor. All segments along this corridor received LOS grades of E and D in both models.

Table 4.34
BCI and BLOS Grades and Comparisons
Old Cave Spring Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Old Cave Spring (Brambleton to McVitty) - North	E	D
Old Cave Spring (Brambleton to McVitty) - South	E	D

- **Activity Centers**

The primary land use adjacent to this corridor is residential. Old Cave Spring Road connects McVitty Road to Brambleton Avenue providing access to the activity centers and development along Brambleton Avenue.

Plantation Road

Plantation Road ranges from two lane, undivided configuration to four travel lanes and a center turning lane. The total width of the roadway varies between 23 and 69 feet including the shoulder, center turning lane and inside lanes. The area along Plantation Road is mostly residential and has no sidewalks. Both the BCI model and the BLOS model gave most of the evaluated segments LOS grades of E and D, although some segments received higher grades, primarily areas with paved shoulders.

Table 4.35
BCI and BLOS Grades and Comparisons
Plantation Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Plantation Rd. - Liberty Rd. to Whiteside	E	D
Plantation Rd. - Whiteside to Hollins (northbound)	E	E
Plantation Rd. - Whiteside to Hollins (southbound)	D	D
Plantation Rd. - Hollins to NCL Roanoke	D	C
Plantation Rd. - NCL Roanoke Hershberger Rd.	D	D
Plantation Rd. - Hershberger Rd. to 1855	C	C
Plantation Rd. - 1855 to 834	C	C
Plantation Rd. - 834 to US 11	D	C
Plantation Rd. - US 11 to 1801 (northbound)	C	A
Plantation Rd. - US 11 to 180 (southbound)	E	B

Riverland Road

Riverland Road in the City of Roanoke was evaluated from Mount Pleasant Boulevard to Piedmont Street. This corridor is a two lane, undivided roadway that parallels the Roanoke River and provides vistas of the river along portions of its length. LOS scores were primarily E and D, due in part to lack of shoulders, although the travel lanes ranged from 12 to 13 feet along the segments receiving the lowest scores. The section scoring highest in both models was the residential section between Whitman Street and Piedmont Street (westbound), which has 18-foot travel lanes and on-street parking. Given the steep topography, significantly increasing the width of the roadway may be difficult.

Table 4.36
BCI and BLOS Grades and Comparisons
Riverland Road

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Riverland Rd. - Mt. Pleasant to 9th St.	E	E
Riverland Rd. - 9th St. to Whitman (westbound)	E	D
Riverland Rd. - 9th St. to Whitman (eastbound)	E	D
Riverland Rd. - Whitman to Piedmont St. (westbound)	D	C
Riverland Rd. - Whitman to Piedmont St. (eastbound)	E	D

- **Activity Centers**

Activity Centers and additional connections in close proximity to Riverland Road include the Mill Mountain Greenway, Roanoke River Greenway, Rivers Edge Sports Complex, Roanoke Memorial Hospital, and downtown (via Mill Mountain Greenway), Mill Mountain Star Trail, and the Roanoke Industrial Center.

- **Design Alternatives**

Raising the LOS of this corridor to a grade of C would require an increase in pavement width. As shown in Table 4.37, to accomplish this LOS increase, a 12-foot curb lane and a 5-foot bike lane or paved shoulder would be required.

Table 4.37
Design Alternatives for Selected Segments
Riverland Road

Riverland Road – 9th to Whitman	BCI Level of Service Grade
Existing Parameters: 12 ft curb lane, no shoulder	E
Alternative A: 9 ft. curb lane, 4 ft bike lane	D
Alternative B: 10 ft. curb lane, 4 ft paved shoulder	D
Alternative C: 12 ft. curb lane, 4 ft bike lane/shoulder	D
Alternative D: 15 ft. curb lane, no bike lane/shoulder	E
Alternative E: 12 ft curb lane, 5 ft bike lane/shoulder	C

Salem Avenue

Salem Avenue in the City of Roanoke was measured from 13th Street to Jefferson Street. The scores varied considerably between the LOS models and ranged from E to B, with the highest scores coming from the BLOS model. The eastbound travel direction between 13th and 9th Street received the highest scores in both models. This section has a 13-foot travel lane plus 7-foot on street parking along portions of the road. In areas without on-street parking, the travel lane width varies from 10 to 15 feet. The area is primarily residential between 13th and 9th Streets becoming increasingly commercial and industrial closer to downtown. Most of its length is paralleled by sidewalk and the posted speed limit is 25 mph. There are numerous Valley Metro stops along this corridor.

Table 4.38
BCI and BLOS Grades and Comparisons
Salem Avenue

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Salem Ave. - 13th St. to 9th St. (eastbound)	D	B
Salem Ave. - 13th St. to 9th St. (westbound)	E	C
Salem Ave. - 9th St. to 5th St. (eastbound)	D	C
Salem Ave. - 9th St. to 5th St. (westbound)	E	C
Salem Ave. - 5th St. to 2nd St. (eastbound)	E	B
Salem Ave. - 5th St. to 2nd St. (westbound)	E	B
Salem Ave. - 2nd St. to Jefferson St. (eastbound)	E	B
Salem Ave. - 2nd St. to Jefferson St. (westbound)	E	B

- **Activity Centers**

There are numerous activity centers and destinations in close proximity to Salem Avenue. These include Hurt Park, Hurt Park Elementary School, the Salvation Army shelter, and numerous light manufacturing establishments. Additionally, Salem Avenue connects to downtown, the Mill Mountain Greenway, Lick Rum Greenway, the pedestrian bridge at the Hotel Roanoke, and the passenger station. Demographically, sections of Salem Avenue run through lower income areas, as well as the CBD. Bicycle accommodations along this corridor may provide benefits to a relatively diverse cross-section of users and associated uses.

Salem Avenue looking toward the City of Roanoke's CBD. Note wide travel lane.

Shenandoah Avenue/Roanoke Boulevard

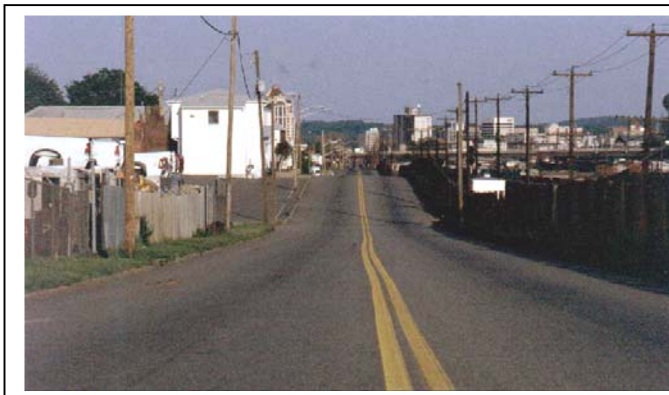
Shenandoah Avenue was evaluated from 5th Street to Texas Street in Salem. Shenandoah Avenue is primarily a two-lane, undivided road that serves as a primary thoroughfare connecting the cities of Salem and Roanoke, with 4-lane segments in the Salem portion of the corridor. Development along this corridor is primarily non-residential. The total road width ranges from 25 to 51.5 feet, with travel lanes ranging from 10 to 18.5 feet in width. LOS scores range from C to F (Moderately High to Extremely Low), with the majority receiving a score of D, using the BCI model. The BLOS model also ranks most of the segments LOS of D.

Table 4.39
BCI and BLOS Grades and Comparisons
Shenandoah Avenue/Roanoke Boulevard

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Shenandoah Ave. – Williamson Rd. to 5th St. (westbound)	D	C
Shenandoah Ave. – Williamson Rd. to 5th St. (eastbound)	C	B
Shenandoah Ave. - 5th St. to 15th St. (westbound)	D	B
Shenandoah Ave. - 5th St. to 15th St. (eastbound)	D	C
Shenandoah Ave. -15th St. to 24th St. (westbound)	D	B
Shenandoah Ave. -15th St. to 24th St. (eastbound)	D	C
Shenandoah Ave. - 24th St. to 30th St.	D	C
Shenandoah Ave. - 30th St. to Peters Creek (westbound)	D	D
Shenandoah Ave. - 30th St. to Peters Creek (eastbound)	D	D
Shenandoah Ave. - Peters Creek to ECL Salem (westbound)	D	D
Shenandoah Ave. - Peters Creek to ECL Salem (eastbound)	D	D
Roanoke Blvd. - ECL Salem to Easton Rd. (westbound)	E	D
Roanoke Blvd. - ECL Salem to Easton Rd. (eastbound)	F	D
Roanoke Blvd. - Easton Rd. to 419/Electric Rd.	F	D
Roanoke Blvd. - 419/Electric Rd. to Pearl St.	F	D
Roanoke Blvd. - Pearl St. to Texas St. (westbound)	E	C
Roanoke Blvd. - Pearl St. to Texas St. (eastbound)	E	C

- **Activity Centers**

Activity centers along this corridor include AR Burton Technology Center, East Salem Elementary School, the Salem Civic Center, Memorial Stadium, and Salem Stadium. Employment concentrations include the Veterans Hospital, General Electric and numerous smaller establishments.



Wide lanes along Shenandoah Avenue, a direct corridor connecting the City of Salem and the City of Roanoke.

- **Design Alternatives**

As referenced in Phase I, Shenandoah Avenue is an example of a corridor that, with minimal improvements, could better accommodate bicyclists. Many segments of this corridor have travel lanes sufficiently wide (up to 18.5 feet) to accommodate a bike lane or other on-road facilities. However, it should be noted that travel lane and shoulder widths along this corridor are not consistent, with some segments having significantly less separation, thereby presenting obstacles to accommodating bicyclists.

Table 4.40
Design Alternatives for Selected Segments
Shenandoah Avenue

Shenandoah - Williamson Rd. to 5th St. (westbound)	**BCI Level of Service Grade**
Existing Parameters: 16 ft. travel lane, 25 mph	D
Alternative A: 12 ft. curb lane, 4 ft. bike lane	C
Shenandoah - Williamson Rd. to 5th St. (eastbound)	**BCI Level of Service Grade**
Existing Parameters: 17.5 ft. travel lane, 25 mph	C
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	C
Shenandoah - 5th St. to 15th St. (westbound)	**BCI Level of Service Grade**
Existing Parameters: 16 ft. travel lane, 30 mph	D
Alternative A: 12 ft. curb lane, 4 ft. bike lane	C
Shenandoah - 5th St. to 15th St. (eastbound)	**BCI Level of Service Grade**
Existing Parameters: 17.5 ft. travel lane, 30 mph	D
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	C
Shenandoah - 15th St. to 24th St. (westbound)	**BCI Level of Service Grade**
Existing Parameters: 17.5 ft. travel lane, 35 mph	D
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	C
Shenandoah - 15th St. to 24th St. (eastbound)	**BCI Level of Service Grade**
Existing Parameters: 18.5 ft. travel lane, 35 mph	D
Alternative A: 14.5 ft. curb lane, 4 ft. bike lane	C
Shenandoah - 24th St. to 30th St.	**BCI Level of Service Grade**
Existing Parameters: 18.0 ft. travel lane, 35 mph	D
Alternative A: 14 ft. curb lane, 4 ft. bike lane	D

Washington Avenue (Route 24 West)

Washington Avenue connects Roanoke County and the Town of Vinton. The portion of the corridor evaluated, from the Vinton ECL to Bypass Road, consists of four travel lanes and a center turning lane. Although this portion has 12.5-foot curb lanes, it received the lowest LOS in both models due to a high AADT of 24,000.

Table 4.41
BCI and BLOS Grades and Comparisons
Washington Avenue

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Washington Ave. - ECL Vinton to Bypass Road	F	D
Washington Ave. - Bypass Road to Pollard St.	F	D

- **Activity Centers**

Activity centers include the Vinton War Memorial, Jaycee field, and numerous commercial establishments. This section is also in close proximity to downtown Vinton and offers connections to other corridors in the study area network.

Walnut/Wise Avenue

The Walnut/ Wise Avenue corridor, was evaluated from 1st Street in Vinton to Norfolk Avenue in the City of Roanoke. As shown in Table 4.42, most sections received a LOS grade of D. However, one section of the corridor, from approximately First Street to Wise Avenue, has 15-foot travel lanes, as reflected by a higher LOS (C) in the BLOS model.

Table 4.42
BCI and BLOS Grades and Comparisons
Walnut Avenue/Wise Avenue

Road/Segment	BCI Level of Service Grade	BLOS Level of Service Grade
Walnut Ave. - First St. to Wise Ave.	F	D
Walnut Ave. - First St. to Wise Ave.	D	C
Wise Ave. - Wise to Indian Village Ln.	D	D
Wise Ave. - Indian Village Ln. to 18th	D	D
Wise Ave. - 18th St. to Norfolk Ave.	D	D

- **Activity Centers**

There are numerous activity centers and destinations along this corridor including Tinker Creek Greenway, the Vinton farmers market, downtown Vinton, and residential areas. Also, the Wise Avenue portion of this corridor connects with Norfolk Avenue, which leads to the City of Roanoke's downtown area. Improved bicycle accommodations along portions of this corridor would likely provide better access to the Tinker Creek Greenway.

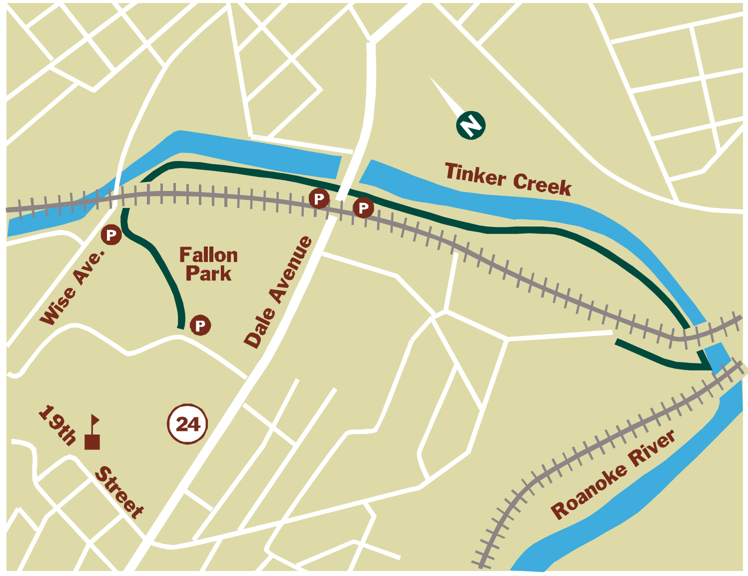


Figure 4.5: Tinker Creek Greenway connects several corridors and activity centers in the study area bicycling network.

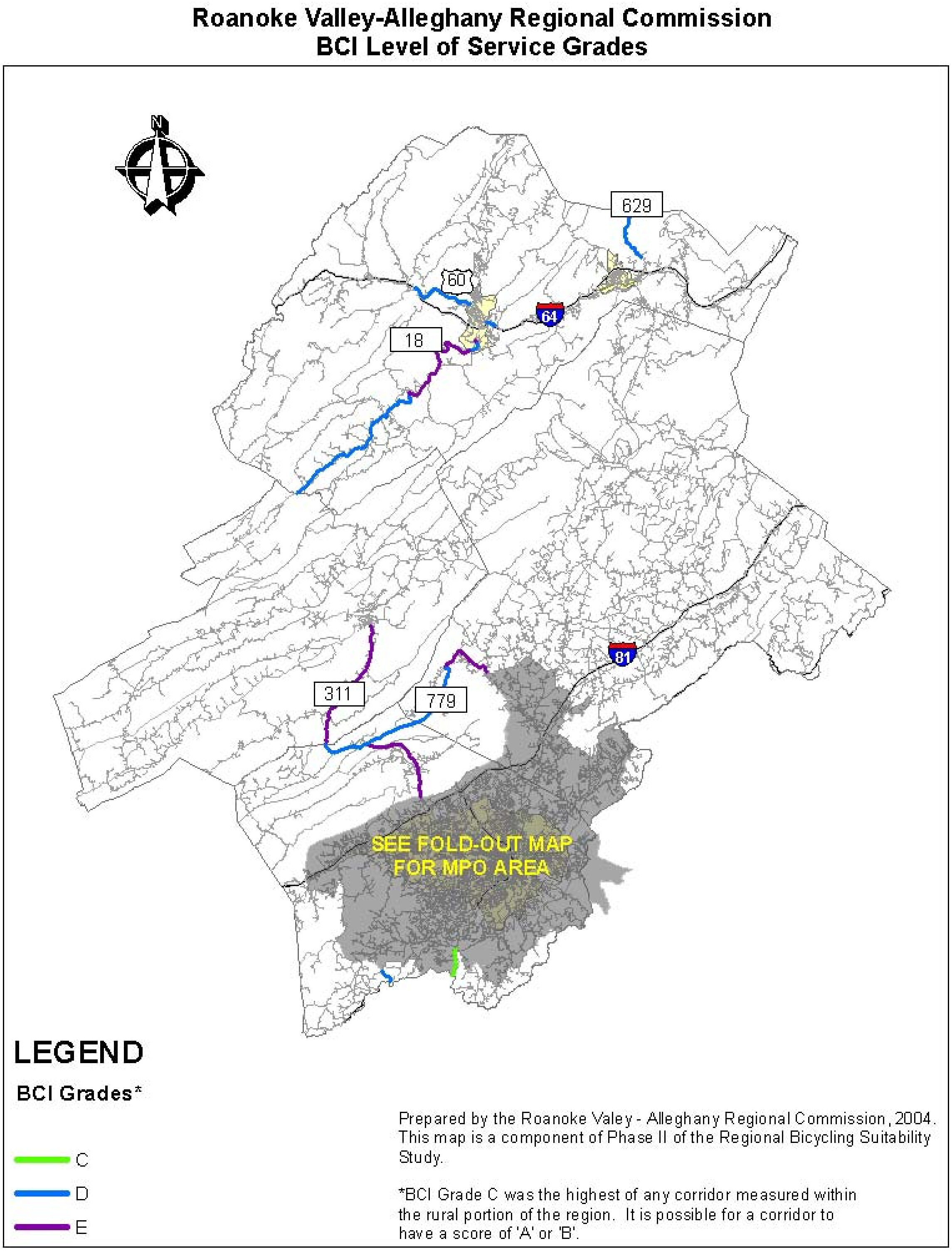


Figure 4.6: LOS Grades for Corridors within the Rural Portion of the Study Area Network

The *Regional Bicycle Suitability Study* (Phase I and Phase II) is intended to serve as a resource document to facilitate development of a regionally significant bikeway network in the RVAMPO service area. As discussed in the *Phase I Final Report*, the primary purpose of the *Regional Bicycle Suitability Study* is to develop ***planning level data and tools*** to assess the current level of service (LOS) offered by the existing roadway network in regards to bicycle travel in the region and to analyze possible design alternatives intended to better accommodate bicyclists. Data and tools developed as part of the study are useful in identifying current and future problems facing the bicycling public, facilitating the planning and design of a bicycle-friendly transportation system, and determining possible options regarding operational and design requirements for new facilities. The *Regional Bicycle Suitability Study* can be used by planners, transportation engineers, bicycle coordinators and enthusiasts, and citizens in developing facilities and other accommodations to enhance safe bicycle travel in the region.

Application of Level of Service Models

As part of the *Regional Bicycle Suitability Study* (Phase I and Phase II), the BCI and the BLOS models were utilized to evaluate the capability of a variety of roadways in the region to accommodate both motorists and bicyclists using geometric and operational characteristics such as lane widths, speed, and volume. An overview of both the BCI and the BLOS model is available in Appendix C of the Phase I Final Report. Additionally, worksheets for both the BCI and BLOS models are available on the *Regional Suitability Study* website (http://www.rvarc.org/bike/Workshop.htm).

The BCI model was used in level of service mapping as well as evaluating possible design alternatives to better accommodate bicyclist on existing corridors. As discussed on the *BCI Implementation Manual* website (http://www.hsrc.unc.edu/research/pedbike/98095/index.html), the BCI methodology was developed for urban and suburban roadway segments (i.e., midblock locations that are exclusive of major intersections) and incorporated those variables that bicyclists typically use to assess the "bicycle friendliness" of a roadway (e.g., curb lane width, traffic volume, and vehicle speeds). The BCI model developed and the subsequent level of service (LOS) designations provide practitioners the capability to assess their roadways with respect to compatibility for shared-use operations by motorists and bicyclists and to plan for and design roadways that are bicycle compatible. As outlined *BCI Implementation Manual* website, specifically, the BCI model can be used for the following applications:

- **Operational Evaluation**

Existing roadways can be evaluated using the BCI model to determine the bicycle LOS present on all segments. First, a bicycle compatibility map can be produced to indicate the LOS bicyclists can expect on each roadway segment. Compatibility maps may assist bicyclists in making informed decisions regarding route selection. Second, roadway segments or "links" being considered for inclusion in the bicycle network system can be evaluated to determine which segments are the most compatible for bicyclists. Once identified, the most appropriate routes can be designated as part of the community bicycle network. Additionally, "weak links" in the bicycle network system can be determined, and prioritization of sites needing improvements can be established on the basis of the index values. Once identified, these areas can be addressed in future planning efforts. Finally, alternative treatments (e.g., addition of a bicycle lane vs. removal of parking) for improving the bicycle compatibility of a roadway can be evaluated using the BCI model.

- **Design**

New roadways or roadways that are being re-designed or retrofitted can be assessed to determine if they are bicycle compatible. The planned geometric parameters and predicted or known operational parameters can be used as inputs in the model to produce the BCI value and determine the bicycle LOS and compatibility level that can be expected on the roadway. If the roadway does not meet the desired LOS, the model can be used to evaluate changes in the design necessary to improve the bicycle LOS.

- **Planning**

Data from long-range planning forecasts can be used to assess the bicycle compatibility of roadways in the future using projected volumes and planned roadway improvements. The model provides the user with a mechanism to quantitatively define and assess long-range bicycle transportation plans and needed roadway improvements to maintain or enhance bicycle compatibility levels. The model can also be used to assess the impact of proposed developments or changes in land use that may change traffic volumes and/or patterns.

Examples of the applications of the BCI, as discussed, are found throughout Chapter 4 of this study.

Bicycle Compatibility Mapping

As part of the *Regional Bicycle Suitability Study*, compatibility maps were produced for the regional study area network using the BCI. As previously discussed, compatibility maps can be produced for the bicycling public to indicate the LOS to be expected on a specific roadway segment. Given the limited number of roadways evaluated as part of the study, the compatibility maps may likely be of limited use to cyclists, until more corridors are mapped. However, these maps will be of considerable use to planners, traffic engineers and other stakeholders in assessing the existing conditions, links, opportunities and deficiencies. As more roadways in the region are evaluated, compatibility maps can be updated as part of an ongoing planning effort. All maps from the study will be available online at the *Regional Bicycle Suitability Study* website.

Other Considerations in Bicycle Facilities Planning

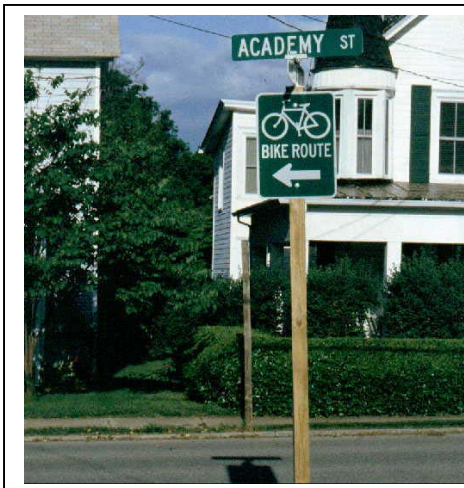
Although a significant component of the Regional Bicycle Suitability Study was the application of the level of service concept, in which specific models are used to quantitatively assess the capability of a variety of roadways in the region to accommodate both motorists and bicyclists, numerous other data, tools, and practices should be considered in planning and implementing bicycle accommodations in the region. This section briefly touches on several other topics and concepts to be considered and discussed in an effort to make localities in the region more bicycle-friendly and to encourage bicycling as a viable means of transportation and recreation.

Share the Road sign with symbol and written message.

Signage and Ancillary Facilities

Proper signage is an integral part of the transportation system. Signs can convey a variety of messages and instructions. There are examples of different on-street bicycle-related signage throughout the region. *Share the Road* signs are among the most common type of bicycle-related signage. *Share the Road* signs are intended to serve as a reminder to automobile drivers to be aware of bicyclists. There are numerous *Share the Road* signs in place throughout the study area; however, there are significant variations in the design of the signs between localities. Other on-street bicycle related signage in the region includes *Bike Crossing, Bike Route,* and *Bike Lane.* To assist is creating consistency in signage throughout the region, uniform bicycle-related signage should be encouraged between the localities and related agencies.

Bike crossing sign in Salem.



Bike Route sign in Salem. Signs are placed intermittently along the bike route.

Improving signage can be a cost-effective way to improve safety, increase driver awareness of the presence of bicyclists, and encourage bicycling as a means of transportation in the region. For signage to be most effective in facilitating bicycle usage it should convey information regarding on-street bicycle facilities, as well as ancillary bicycle facilities.

As discussed in Chapter 3, ancillary facilities are the supporting facilities and accommodations located at the bicyclists' destination or along the intended route. These facilities can contribute directly to the overall success and usefulness of the bicycle system, while encouraging and facilitating bicycle usage. Ancillary facilities should be located in areas convenient to bicyclists, with proper signage conveying information regarding these facilities (i.e., bike racks in a parking garage). In the absence of conveniently located and visible bicycle parking facilities, fixed objects, such as street signs and trees, are used as bike racks. As referenced in Chapter 3, the City of Roanoke has placed bike racks throughout the downtown area.

Cyclist carrying bike up steps to reach bike rack at the City of Roanoke's municipal building. Note sign directing bicyclist to bike rack.


Bicycle chained to a guardrail near the Noel C. Taylor municipal building in the City of Roanoke.

Additionally, signage indicating activity centers and other components of the bicycling network can provide considerable benefits to bicyclists. Sufficient signage indicating area Greenways, transit facilities, points of interest, and other topics discussed in development of the regional study area bicycle network (Chapter 3) should be improved or installed to complement or enhance existing facilities and assets within the region. Although signage is an important component of the transportation infrastructure, it should be noted that too much signage can have potentially negative impacts. The over use of signage can detract from the aesthetics of a roadway and create potential safety hazards. To ensure that bicyclists and motorists understand all bicycle-related signage it should be included in discussion of bicycle education. For more information, reference the Manual on Uniform Traffic Control Devices (MUTCD).

Bicyclists and other stakeholders should work to identify locations in which ancillary facilities and bicycle-related signage (including transit and pedestrian) are lacking or insufficient within the region and incorporate this information into future planning efforts to better accommodate bicyclists in the region.

Bicycle Education and Awareness

Bicyclist riding on sidewalk in downtown Roanoke. Riding bikes on sidewalks is prohibited.

An effective and comprehensive bicycle education program can assist in reducing bicyclist and pedestrian injuries and conflict between the various transportation modes. As such, bicycle education and awareness programs should have components covering traffic laws, bicycle safety, as well bicycle facility design training to ensure that facilities are properly designed and built. In developing and implementing a bicycle education and awareness program, a cross-section of stakeholders, target audiences, and media should be included in the process. Public service announcements, public meetings, bicycle rodeos, workshops, and other public outreach vehicles could be employed to increase awareness of the benefits of bicycling. Where possible this effort should be coordinated with existing programs, events, and projects (i.e., Ride Solutions).

Bicyclist riding in wrong direction.

- **Traffic Laws**

The behavior of both cyclists and motorists can contribute to unpleasant and unsafe riding conditions, thereby potentially reducing the use of bicycling as a viable means of transportation. Often such behavior may stem from cyclists and drivers not being aware of, or understanding, traffic laws. Bicyclist and motorists should be familiar with, and abide by, all pertinent traffic laws. By doing so potential conflict between motors and bicyclists, associated safety risks, can be reduced. Although enforcement of traffic laws is beyond the purview of this study, traffic speed as related to roadway design and level of service is briefly discussed in later sections. More information on bicycling and traffic laws in Virginia is available at VDOT's Bicycling and Walking in Virginia website.

- **Bicycle Safety**

The extent to which cyclist (and motorists) practice bicycle safety is an important part of cyclist behavior. Although understanding and abiding by all pertinent traffic laws is a major component, bicycle safety extends beyond traffic laws and considers many bicycling-related topics. Included in these are topics such as where to ride, proper clothing and equipment (i.e., bike helmet), bicycle maintenance, cycling ability, fitness level, and other considerations. Tips for bicycle safety are included in Appendix F. More information on bicycle safety is also available at Bicycling and Walking in Virginia website. Additional bicycle safety material developed by the FHWA is available Online at http://www.fhwa.dot.gov/environment/bikeped/index.htm.

- **Facility Design**

Beyond traffic laws and bicycle safety, facility design is also an important component of bicycle education and awareness. Facility design education should cover on-street and ancillary accommodations and involve a variety of stakeholders; Planners, traffic engineers and other staff, bicycle advocates, decision-makers, citizens and others. Additionally, major employers and businesses in the region should also be included in future planning efforts, as such entities can be integral in the provision ancillary facilities that promote bicycle usage such as bike racks, storage, showers, changing rooms, and other accommodations. As part of the *Regional Bicycle Suitability Study*, the Roanoke Valley Area Metropolitan Planning Organization hosted a bicycle facility design workshop and a bicycle suitability analysis training seminar. Material from the workshop and seminar are available at the *Regional Bicycle Suitability Study* homepage. Additionally, Chapter 3 of the Phase I Final Report provides a detailed overview of bicycle facilities.

The reference most often used in the design of a highway project is *A Policy on the Geometric Design of Highways and Streets* (Green Book) published by the American Association of State Highway and Transportation Officials (AASHTO). Additional reference materials include *Guide for the Development of Bicycle Facilities* (AASHTO) and the *Virginia Bicycle Facility Resource Guide (2002).* Links to many of these documents and other useful bicycling related websites are provided on the *Regional Bicycle Suitability Study* homepage (http://www.rvarc.org/bike/home.htm).

Observations on Level of Service (LOS) Models

One component of the *Regional Bicycle Suitability Study* is a comparison of the BCI and BLOS models in assessing the capability of roadways to accommodate both bicycle and motor vehicle traffic. A total of 192 individual roadway segments were evaluated. As shown in Table 5.1, considerable differences exist between the LOS the models assign for evaluated segment. A master list of LOS scores and grades for each corridor or roadway segment evaluated during the study is presented in Appendix D.

Table 5.1
Comparison of Level of Service Grades for Evaluated Segments – BCI and BLOS

LOS Grade for Evaluated Segments	BCI Total	BLOS Total
A	0	10
B	0	30
C	21	45
D	80	86
E	69	14
F	22	7

Model Input Sensitivities

In Chapter 4, a "significant improvement" in LOS was described as an increase of one (1) letter grade (i.e., D to C). Working with the LOS models it was noted that certain aspects of the models are weighted differently, thereby exert greater influence on the LOS score of a given section. It should be noted that although an increase in a LOS letter grade (i.e., A, B, etc.) may not be realized, a measurable improvement in the LOS score (i.e., numerical score in model) is likely if geometric and operational characteristics are changed. In an attempt to better understand the impacts of various data inputs on the LOS the following observations were noted:

- the BLOS model consistently gave higher LOS grades to measured segments than did the BCI model
- traffic volume and speed limit significantly impacted LOS in both models
- the BLOS model is more sensitive to higher vehicle traffic (AADT) than the BCI model
- the BLOS model is more sensitive to higher percentages of heavy vehicles (HV%)
- once a road reaches a certain traffic volume or speed, increases in lane or shoulder width have minimal impacts on LOS (i.e. 419/Electric Road)
- on corridors where traffic volume and speed have not reached conditions referenced above, considerable improvement in LOS can be achieved by increasing the separation between the cyclist and traffic; this may be achieved by increasing the width of the shoulder or curb lane or addition of a bike lane
- paved shoulders and bike lanes give identical LOS improvements in the BCI.
- paved shoulders and bike lanes give a slightly higher LOS than wide curb lanes
- right turn percentages had minimal impact on the LOS score

- significant increases in LOS can be achieved via a reduction in the 85^{th} percentile speed

Traffic Speed, Roadway Design, and Level of Service

A data requirement of the BCI is the 85^{th} percentile speed, which is the speed that 85 percent of the vehicles travel on a given roadway. As the 85^{th} percentile speed is always higher than the posted speed limit, the LOS of a segment is lower than could be expected if the posted speed limit was equal to the 85^{th} percentile speed. When the 85^{th} percentile speed is not known, the model suggests a default speed of nine (9) mph above the posted speed limit be entered in the worksheet (this was the case for all segments evaluated in the study area). Based on the BCI, a reduction the 85^{th} percentile speed very often results in significant increases (i.e., one letter grade) in the LOS, especially at slower speeds. In short, if posted speed limits were more closely obeyed significant increases in the LOS of many roadways in study area could be achieved.

Driving at rates beyond the posted speed limit is a common traffic safety concern and can greatly impact the compatibility between motor vehicles and cyclists. There are several practices available to reduce traffic speeds closer to the posted speed limit. Among these are education, enforcement, and engineering. If used in concert, these approaches may assist in making many roadways in the region more bicycle-friendly.

- **Education/Awareness**

As previously discussed, motorists as well as bicyclist behavior can greatly influence the capability of a roadway to accommodate both uses, especially driving faster than the posted speed limit. If motorists are aware of and better understand the negative impacts of driving faster than the posted speed limit on bicycle compatibility many would likely be more inclined to adhere to posted speed limits. The environmental and safety benefits of following posted speed limits could also be stressed.

- **Enforcement**

As stated previously, enforcement of traffic laws is beyond the purview of this study. However, given the relationship between traffic speed and the level of service for a roadway, enforcement of posted speed limits should be considered. More stringent enforcement of speed limits could improve bicycling conditions in the region by reducing traffic speed to the posted speed limit.

- **Engineering**

Roadways are the major component of the transportation infrastructure and impact our lives on a daily basis. Roadway designs are primarily automobile oriented, the result of which are many roadways

Wide outside travel lane on Peters Creek Extension. Although such accommodations provide room for bicyclist and motorist, the design can encourage speeding.

that are not compatible with safe and efficient bicycle or pedestrian travel. The design of many roadways allow, if not encourage, motorists to travel at speeds greater than the posted speed limit. This can significantly reduce the LOS and increase conflict between motorists and bicyclists. Several design approaches and concepts have emerged to address the need for roadway design that better matches the natural and cultural environments of the communities they serve community.

The concept of context sensitive design is based on a growing interest in the improvement of highways and their integration into the communities they serve, thereby reducing the social and environmental impacts of highways. Context sensitive design seeks new and better ways of designing highways that simultaneously advance the objectives of safety, mobility, enhancement of the natural environment, and preservation of community values. For context sensitive design to be implemented, a certain level of flexibility in highway design is required. As stated in the FHWA publication, Flexibility in Highway Design (FHWA Pub. No. FHWA-PD-97-062), the setting and character of the area, the values of the community, the needs of the highway users, and the challenges and opportunities are unique factors that designers must consider with each highway project. More information on this concept is available at the FHWA's Context Sensitive Design website http://www.fhwa.dot.gov/csd/basic.htm.

Traffic Calming is another approach to bicycle/pedestrian-friendly design. Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users. Examples of traffic calming measures include landscaping, medians, narrower travel lanes, and raised intersections. Where appropriate, traffic calming measure can be effective in reducing traffic speed and create safe and attractive streets that are more compatible with bicycle travel. More information on traffic calming is available on the Traffic Calming for Communities website (http://www.ite.org/traffic/index.html) developed by the Institute of Transportation Engineers.

Another design approach is the practice of "Road Diets" in which existing pavement is reallocated, changing the roadway configuration to include fewer travel lanes and converted the remaining space to bicycle lanes, sidewalks, and/or on-street parking. In other words, the overall area remains the same. *Summary Report: Evaluation of Lane Reduction "Road Diet" Measures and Their Effects on Crashes and Injuries* is available at http://www.tfhrc.gov/safety/hsis/pubs/04082/meth. An example of this practice is the reconfiguration of Memorial Avenue in the City of Roanoke. The existing design was reconfigured to a two-lane undivided roadway with on-street parking and bike lanes. As discussed in Chapter 4, this reconfiguration resulted in a moderately high compatibility level, a significant improvement over the former configuration.

Next Steps and Application of Work Products

As previously discussed, the primary purpose of the *Regional Bicycle Suitability Study* (Phase I and II) is to develop ***planning level data and tools*** to use in bicycle facility planning in the Roanoke Valley-Alleghany Regional Commission's service area. Work products developed will be available to stakeholders to assist in developing facilities and other accommodations to enhance safe and efficient bicycle travel within the region. With the completion of the *Regional Bicycle Suitability Study,* the next step in the planning process is the application of work products and other information developed as part of the Study. These work products, and their application in facilitating improvements in the bicycle-friendliness of the transportation infrastructure, have been discussed throughout the Study. This section suggests and reiterates several ways in which work products from the *Regional Bicycle Suitability Study* can be utilized to better accommodate bicyclists in the region. These suggestions are intended as examples of long-range and short-range planning applications and are not intended to be a comprehensive listing of all potential applications of work products. Additionally, although listed separately, considerable overlap exists between the items and activities listed.

- **Update Regional Bicycle Plans**

One of the major applications of work products from the *Regional Bicycle Suitability Study* will be updates to *Bikeway Plan for the Roanoke Valley Area MPO* and the *Rural Bikeway Plan*. These plans are scheduled to be updated by the Regional Commission in FY 2005 and FY 2006, respectively. As discussed earlier in this chapter, level of service models have operational evaluation, design, and planning applications. These applications can be invaluable in the update process by allowing proposed bicycle accommodations to be evaluated for bicycle-friendliness. Additionally, other work products and data from the beyond the LOS models should also be useful in the updates.

- **Increase Bicycle Compatibility With Minimal Improvements**

As discussed in Chapter 4, the *Regional Bicycle Suitability Study* identified several corridors along which significant increases in bicycle compatibility can be achieved with minimal improvements to these corridors. Often, reconfiguring roadway design, using existing pavement, can be a cost-effective way to better accommodate bicyclists. Such improvements should be coordinated with resurfacing, restriping, and maintenance schedules. Examples of such corridors discussed in Chapter 4 include Brambleton Avenue and Shenandoah Avenue.

- **Link Activity Centers and Destinations**

In evaluating the study area bicycling network, activity centers, destinations, and points of interest along or in close proximity to network corridors were noted. This information should be considered as part of the upcoming updates the *1997 Bikeway Plan for the Roanoke Valley* and the *Rural Bikeway Plan*, as previously discussed. Additionally, the provision of ancillary facilities at activity centers and destinations should be encouraged. Activity centers and destinations are discussed in detail in Chapter 3.

- **Improve Bicycle-Related Signage and Ancillary Bicycle Facilities**

Bicycle-related signage and ancillary bicycle facilities are important components of the alternative transportation infrastructure. The availability of ancillary bicycle facilities and accommodations for cyclists at activity centers and destinations can impact the transportation choices of many cyclists. Ancillary facilities are discussed in more detail in Chapter 3. Additionally, adequate bicycle-related signage should not only convey important information regarding the roadway operation parameter (i.e., speed limit) and on-street bicycle accommodations (i.e., bike lane) to drivers and bicyclists, but should also provide information regarding ancillary bicycle facilities, alternative routes, and activity centers. As such should be present along all parts of the bicycle network including roadways, greenways, and other parts of the alternative transportation networks, as well as at activity centers. Bicycle-related signage is discussed earlier in this Chapter.

- **Incorporate Greenways into the Alternative Transportation Network**

As discussed in Chapter 3, the greenway system is becoming an increasingly important component of the transportation infrastructure by providing alternative transportation routes, linkages between streets and corridors, and connectivity to activity centers and other destinations. As such, area greenways should continue to be considered and incorporated into bicycle facilities planning. In addition to facilitating the implementation of the *Conceptual Greenway Plan*, improvements to existing greenways to better accommodate bicyclists and encourage the use of greenways in alternative transportation corridors should be considered and encouraged. Such improvements may include, but are not limited to improved signage and the provision of ancillary bicycle facilities.

- **Increase Public Outreach, Education, and Advocacy**

Increased public outreach, bicycle education, and advocacy can be effective in encouraging bicycle usage in the region. Public involvement in transportation planning is an important element of the planning process. Stakeholder participation is needed to make sure that projects, plans and decisions are being developed to meet the needs of the region. As such, stakeholders should be encouraged to participate and provide input in bicycle planning in the region. In updating the *Bikeway Plan for the Roanoke Area MPO*, stakeholders will have opportunities to provide input into the planning process. Additionally, as discussed earlier in this chapter, bicycle education and awareness are important and potentially effective public outreach tools and should be incorporated in the planning process. In an attempt improve public outreach, work products and other bicycle-related data are available at the *Regional Bicycle Suitability Study* website (http://www.rvarc.org/bike/home.htm). This website will be updated periodically to reflect ongoing planning efforts and other bicycle-related information. Additionally, the Regional Commission's library houses numerous bicycle-related publications and documents and is open to the public. For more information visit the Library and Planning Resources Center website at http://www.rvarc.org/library/library.htm.

Appendix A

Virginia Department of Transportation
Policy for Integrating Bicycle and Pedestrian Accommodations

1. Introduction

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

2. Purpose

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

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

3. Project Development

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

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

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

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

3.1 Accommodations Built as Independent Construction Projects

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

3.2 Access-Controlled Corridors

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

3.3 Additional Improvement Opportunities

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

3.3.1 Operation and Maintenance Activities

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

3.3.2 Long Distance Bicycle Routes

Long distance bicycle routes facilitate travel for bicyclists through the use of shared lanes, bike lanes, and shared use paths, as well as signage. All projects along a long distance route meeting the criteria for an American Association of State Highway and Transportation Officials (AASHTO) or *Manual on Uniform Traffic Control Devices* (MUTCD) approved numbered bicycle route system should provide the necessary design features to facilitate bicycle travel. Independent construction projects and other activities can be utilized to make improvements for existing numbered bicycle routes. Consideration should be given to facilitating the development of other types of long distance routes.

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

3.4 Exceptions to the Provision of Accommodations

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

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

3.5 Decision Process

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

recommendation to the chief engineer for program development. Local resolutions must be forwarded to the chief engineer for program development for consideration during the project design approval or to the Commonwealth Transportation Board for consideration during location and design approval, if needed for a project. The resolution and supporting information related to the recommendation must be included in the project documentation.

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

4. Discipline Participation in Project Development

VDOT will provide the leadership to implement this policy. Those involved in the planning, funding, design, construction, operation, and maintenance of the state's highways are responsible for effecting the guidance set forth in this policy. VDOT recognizes the need for interdisciplinary coordination to efficiently develop, operate, and maintain bicycle and pedestrian accommodations. Procedures, guidelines, and best practices will be developed or revised to implement the provisions set forth in this policy. For example, objective criteria will be prepared to guide decisions on the restriction of bicycle and pedestrian use of access-controlled facilities. VDOT will work with localities, regional planning agencies, advisory committees, and other stakeholders to facilitate implementation and will offer training or other resource tools on planning, designing, operating, and maintaining bicycle and pedestrian accommodations.

4.1 Planning

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

4.2 Funding

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

Other state and federal funding sources eligible for the development of bicycle and pedestrian accommodations may be used, following program requirements established for these sources. These sources include, but are not limited to, programs for highway safety, enhancement, air quality, congestion relief, and special access.

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

4.3 Design and Construction

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

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

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

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

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

4.4 Operations

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

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

VDOT will enforce the requirements for the continuance of bicycle and pedestrian traffic in work zones, especially in areas at or leading to transit stops, and in facility replacements in accordance with the MUTCD, *VDOT Work Area Protection Manual*, and *VDOT Land Use Permit Manual* when construction, utility, or maintenance work, either by VDOT or other entities, affects bicycle and pedestrian accommodations.

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

4.5 Maintenance

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

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

5. Effective Date

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

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

Source: http://virginiadot.org/infoservice/resources/Policy on Integrating BP Accommodations.pdf

Appendix B

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)

Table 1. Profile of Selected 1990 and 2000 Characteristics

Geographic Area: Alleghany County, Virginia

Subject	1990 Census		Census 2000		Change 1990 to 2000	
	Number	Percent	Number	Percent	Number	Percent
POPULATION						
Total population	13,176	100.0	12,926	100.0	-250	-1.9
In households	12,970	98.4	12,677	98.1	-293	-2.3
In group quarters	206	1.6	249	1.9	43	20.9
HOUSEHOLD SIZE						
Total households	4,992	100.0	5,145	100.0	153	3.1
1-person household	1,011	20.3	1,140	22.2	129	12.8
2-person household	1,711	34.3	1,984	38.6	273	16.0
3-person household	1,010	20.2	956	18.6	-54	-5.3
4-person household	828	16.6	726	14.1	-102	-12.3
5-or-more-person household	432	8.7	339	6.6	-93	-21.5
Mean number of persons per household	2.60	(X)	2.46	(X)	-0.13	(X)
VEHICLES AVAILABLE[1]						
Total households	4,992	100.0	5,145	100.0	153	3.1
No vehicle available	359	7.2	301	5.9	-58	-16.2
1 vehicle available	1,229	24.6	1,106	21.5	-123	-10.0
2 vehicles available	2,088	41.8	2,179	42.4	91	4.4
3 vehicles available	963	19.3	1,127	21.9	164	17.0
4 vehicles available	259	5.2	329	6.4	70	27.0
5 or more vehicles available	94	1.9	103	2.0	9	9.6
Mean vehicles per household	1.97	(X)	2.08	(X)	0.11	(X)
WORKERS BY SEX[1]						
Workers 16 years and over	5,941	100.0	5,490	100.0	-451	-7.6
Male	3,522	59.3	3,170	57.7	-352	-10.0
Female	2,419	40.7	2,320	42.3	-99	-4.1
MEANS OF TRANSPORTATION TO WORK						
Workers 16 years and over	5,941	100.0	5,489	100.0	-452	-7.6
Drove alone	4,844	81.5	4,684	85.3	-160	-3.3
Carpooled	801	13.5	581	10.6	-220	-27.5
Public transportation (including taxicab)	21	0.4	4	0.1	-17	-81.0
Bicycle or walked	135	2.3	61	1.1	-74	-54.8
Motorcycle or other means	60	1.0	35	0.6	-25	-41.7
Worked at home	80	1.3	124	2.3	44	55.0
TRAVEL TIME TO WORK						
Workers who did not work at home	5,861	100.0	5,365	100.0	-496	-8.5
Less than 5 minutes	221	3.8	164	3.1	-57	-25.8
5 to 9 minutes	715	12.2	482	9.0	-233	-32.6
10 to 14 minutes	1,142	19.5	1,113	20.7	-29	-2.5
15 to 19 minutes	1,158	19.8	916	17.1	-242	-20.9
20 to 29 minutes	1,346	23.0	1,285	24.0	-61	-4.5
30 to 44 minutes	791	13.5	832	15.5	41	5.2
45 or more minutes	488	8.3	573	10.7	85	17.4

Mean travel time to work (minutes)	19.7	(X)	24.6	(X)	4.9	(X)
TIME LEAVING HOME TO GO TO WORK						
Workers who did not work at home	5,861	100.0	5,365	100.0	-496	-8.5
5:00 a.m. to 6:59 a.m.	1,806	30.8	1,917	35.7	111	6.1
7:00 a.m. to 7:59 a.m.	1,407	24.0	1,370	25.5	-37	-2.6
8:00 a.m. to 8:59 a.m.	1,086	18.5	806	15.0	-280	-25.8
9:00 a.m. to 9:59 a.m.	320	5.5	171	3.2	-149	-46.6
10:00 a.m. to 11:59 a.m.	119	2.0	75	1.4	-44	-37.0
12:00 p.m. to 11:59 p.m.	990	16.9	859	16.0	-131	-13.2
12:00 a.m. to 4:59 a.m.	133	2.3	167	3.1	34	25.6

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

Household Size by Vehicles Available[1]

Household Size	Mean vehicles per household	Vehicles available					
		Total households	No vehicle	1 vehicle	2 vehicles	3 vehicles	4 or more vehicles
Total households	**2.08**	**5,145**	**300**	**1,105**	**2,180**	**1,125**	**430**
Row percent	(X)	100.0	5.8	21.5	42.4	21.9	8.4
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0
1-person household	**1.27**	**1,140**	**165**	**615**	**280**	**50**	**25**
Row percent	(X)	100.0	14.5	53.9	24.6	4.4	2.2
Column percent	(X)	22.2	55.0	55.7	12.8	4.4	5.8
2-person household	**2.18**	**1,985**	**70**	**285**	**1,045**	**425**	**160**
Row percent	(X)	100.0	3.5	14.4	52.6	21.4	8.1
Column percent	(X)	38.6	23.3	25.8	47.9	37.8	37.2
3-person household	**2.34**	**955**	**50**	**110**	**350**	**350**	**90**
Row percent	(X)	100.0	5.2	11.5	36.6	36.6	9.4
Column percent	(X)	18.6	16.7	10.0	16.1	31.1	20.9
4-or-more-person household	**2.52**	**1,065**	**15**	**95**	**500**	**300**	**155**
Row percent	(X)	100.0	1.4	8.9	46.9	28.2	14.6
Column percent	(X)	20.7	5.0	8.6	22.9	26.7	36.0

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)

Table 2. Profile of Selected 2000 Characteristics

Geographic Area: Alleghany County, Virginia

Subject	Census 2000	
	Number	Percent
POPULATION BY AGE		
Total population	12,926	100.0

Under 16 years	2,604	20.1
16 to 20 years	703	5.4
21 to 24 years	451	3.5
25 to 44 years	3,485	27.0
45 to 64 years	3,653	28.3
65 years and over	2,030	15.7
Mean age (years)	39.9	(X)
HOUSEHOLD INCOME IN 1999[1]		
Total households	5,145	100.0
Less than $15,000	823	16.0
$15,000 to 19,999	341	6.6
$20,000 to 24,999	417	8.1
$25,000 to 49,999	1,601	31.1
$50,000 to 74,999	1,265	24.6
$75,000 to 99,999	400	7.8
$100,000 or more	298	5.8
Mean household income (dollars)	49,041	(X)
Median household income (dollars)	38,545	(X)

Household Size by Vehicles Available[1]

Household Size	Mean vehicles per household	Vehicles available					
		Total households	No vehicle	1 vehicle	2 vehicles	3 vehicles	4 or more vehicles
Total households	**2.08**	**5,145**	**300**	**1,105**	**2,180**	**1,125**	**430**
Row percent	(X)	100.0	5.8	21.5	42.4	21.9	8.4
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0
1-person household	**1.27**	**1,140**	**165**	**615**	**280**	**50**	**25**
Row percent	(X)	100.0	14.5	53.9	24.6	4.4	2.2
Column percent	(X)	22.2	55.0	55.7	12.8	4.4	5.8
2-person household	**2.18**	**1,985**	**70**	**285**	**1,045**	**425**	**160**
Row percent	(X)	100.0	3.5	14.4	52.6	21.4	8.1
Column percent	(X)	38.6	23.3	25.8	47.9	37.8	37.2
3-person household	**2.34**	**955**	**50**	**110**	**350**	**350**	**90**
Row percent	(X)	100.0	5.2	11.5	36.6	36.6	9.4
Column percent	(X)	18.6	16.7	10.0	16.1	31.1	20.9
4-or-more-person household	**2.52**	**1,065**	**15**	**95**	**500**	**300**	**155**
Row percent	(X)	100.0	1.4	8.9	46.9	28.2	14.6
Column percent	(X)	20.7	5.0	8.6	22.9	26.7	36.0

Means of Transportation to Work by Travel Time to Work[1]

Means of Transportation	Mean travel time to work (minutes)	Travel time to work					
		Workers who did not work at home	Less than 10 minutes	10 to 19 minutes	20 to 29 minutes	30 to 44 minutes	45 or more minutes

Workers who did not work at home	**24.6**	**5,365**	**645**	**2,030**	**1,285**	**830**	**575**
Row percent	(X)	100.0	12.0	37.8	24.0	15.5	10.7
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0
Drove alone	**23.1**	**4,685**	**555**	**1,815**	**1,180**	**715**	**420**
Row percent	(X)	100.0	11.8	38.7	25.2	15.3	9.0
Column percent	(X)	87.3	86.0	89.4	91.8	86.1	73.0
Carpooled	**36.3**	**580**	**55**	**180**	**105**	**95**	**140**
Row percent	(X)	100.0	9.5	31.0	18.1	16.4	24.1
Column percent	(X)	10.8	8.5	8.9	8.2	11.4	24.3
Public transportation (including taxicab)	**2.5**	**4**	**4**	**0**	**0**	**0**	**0**
Row percent	(X)	100.0	100.0	0.0	0.0	0.0	0.0
Column percent	(X)	0.1	0.6	0.0	0.0	0.0	0.0
Bicycle or walked	**11.5**	**60**	**25**	**25**	**0**	**10**	**0**
Row percent	(X)	100.0	41.7	41.7	0.0	16.7	0.0
Column percent	(X)	1.1	3.9	1.2	0.0	1.2	0.0
Motorcycle or other means	**49.9**	**35**	**4**	**10**	**0**	**4**	**10**
Row percent	(X)	100.0	11.4	28.6	0.0	11.4	28.6
Column percent	(X)	0.7	0.6	0.5	0.0	0.5	1.7

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)

Table 1. Profile of Selected 1990 and 2000 Characteristics

Geographic Area: Craig County, Virginia

Subject	1990 Census		Census 2000		Change 1990 to 2000	
	Number	Percent	Number	Percent	Number	Percent
POPULATION						
Total population	4,372	100.0	5,091	100.0	719	16.4
In households	4,346	99.4	5,049	99.2	703	16.2
In group quarters	26	0.6	42	0.8	16	61.5
HOUSEHOLD SIZE						
Total households	1,682	100.0	2,063	100.0	381	22.7
1-person household	313	18.6	494	23.9	181	57.8
2-person household	605	36.0	759	36.8	154	25.5
3-person household	351	20.9	373	18.1	22	6.3
4-person household	275	16.3	284	13.8	9	3.3
5-or-more-person household	138	8.2	153	7.4	15	10.9
Mean number of persons per household	2.58	(X)	2.45	(X)	-0.14	(X)
VEHICLES AVAILABLE[1]						
Total households	1,682	100.0	2,063	100.0	381	22.7
No vehicle available	99	5.9	128	6.2	29	29.3
1 vehicle available	345	20.5	511	24.8	166	48.1
2 vehicles available	625	37.2	713	34.6	88	14.1
3 vehicles available	414	24.6	460	22.3	46	11.1
4 vehicles available	153	9.1	185	9.0	32	20.9
5 or more vehicles available	46	2.7	66	3.2	20	43.5
Mean vehicles per household	2.21	(X)	2.13	(X)	-0.08	(X)
WORKERS BY SEX[1]						
Workers 16 years and over	2,061	100.0	2,340	100.0	279	13.5
Male	1,181	57.3	1,320	56.4	139	11.8
Female	880	42.7	1,020	43.6	140	15.9
MEANS OF TRANSPORTATION TO WORK						
Workers 16 years and over	2,061	100.0	2,340	100.0	279	13.5
Drove alone	1,286	62.4	1,847	78.9	561	43.6
Carpooled	593	28.8	379	16.2	-214	-36.1
Public transportation (including taxicab)	6	0.3	0	0.0	-6	-100.0
Bicycle or walked	58	2.8	40	1.7	-18	-31.0
Motorcycle or other means	13	0.6	19	0.8	6	46.2
Worked at home	105	5.1	55	2.4	-50	-47.6
TRAVEL TIME TO WORK						
Workers who did not work at home	1,956	100.0	2,285	100.0	329	16.8
Less than 5 minutes	108	5.5	45	2.0	-63	-58.3
5 to 9 minutes	143	7.3	162	7.1	19	13.3
10 to 14 minutes	69	3.5	94	4.1	25	36.2
15 to 19 minutes	143	7.3	140	6.1	-3	-2.1
20 to 29 minutes	186	9.5	182	8.0	-4	-2.2
30 to 44 minutes	640	32.7	911	39.9	271	42.3
45 or more minutes	667	34.1	751	32.9	84	12.6
Mean travel time to work (minutes)	34.2	(X)	34.7	(X)	0.5	(X)

TIME LEAVING HOME TO GO TO WORK						
Workers who did not work at home	1,956	100.0	2,285	100.0	329	16.8
5:00 a.m. to 6:59 a.m.	967	49.4	931	40.7	-36	-3.7
7:00 a.m. to 7:59 a.m.	500	25.6	684	29.9	184	36.8
8:00 a.m. to 8:59 a.m.	161	8.2	225	9.8	64	39.8
9:00 a.m. to 9:59 a.m.	72	3.7	68	3.0	-4	-5.6
10:00 a.m. to 11:59 a.m.	2	0.1	34	1.5	32	1,600.0
12:00 p.m. to 11:59 p.m.	214	10.9	239	10.5	25	11.7
12:00 a.m. to 4:59 a.m.	40	2.0	104	4.6	64	160.0

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)

Table 2. Profile of Selected 2000 Characteristics

Geographic Area: Craig County, Virginia

Subject	Census 2000	
	Number	Percent
POPULATION BY AGE		
Total population	5,091	100.0
Under 16 years	1,093	21.5
16 to 20 years	261	5.1
21 to 24 years	176	3.5
25 to 44 years	1,519	29.8
45 to 64 years	1,346	26.4
65 years and over	696	13.7
Mean age (years)	38.3	(X)
HOUSEHOLD INCOME IN 1999[1]		
Total households	2,063	100.0
Less than $15,000	314	15.2
$15,000 to 19,999	161	7.8
$20,000 to 24,999	204	9.9
$25,000 to 49,999	784	38.0
$50,000 to 74,999	390	18.9
$75,000 to 99,999	107	5.2
$100,000 or more	103	5.0
Mean household income (dollars)	42,019	(X)
Median household income (dollars)	37,314	(X)

Household Size by Vehicles Available[1]

Household Size	Mean vehicles per household	Vehicles available					
		Total households	No vehicle	1 vehicle	2 vehicles	3 vehicles	4 or more vehicles
Total households	**2.13**	**2,065**	**130**	**510**	**715**	**460**	**250**
Row percent	(X)	100.0	6.3	24.7	34.6	22.3	12.1
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0
1-person household	**1.16**	**495**	**110**	**230**	**120**	**20**	**10**
Row percent	(X)	100.0	22.2	46.5	24.2	4.0	2.0

Row percent	(X)	100.0	22.2	46.5	24.2	4.0	2.0
Column percent	(X)	[illegible]	84.6	[illegible]	[illegible]	[illegible]	[illegible]
2-person household	**2.10**	**760**	**10**	**200**	**320**	**170**	**55**
Row percent	(X)	100.0	1.3	26.3	42.1	22.4	7.2
Column percent	(X)	36.8	7.7	39.2	44.8	37.0	22.0
3-person household	**2.66**	**375**	**4**	**45**	**105**	**145**	**70**
Row percent	(X)	100.0	1.1	12.0	28.0	38.7	18.7
Column percent	(X)	18.2	3.1	8.8	14.7	31.5	28.0
4-or-more-person household	**2.84**	**435**	**4**	**35**	**165**	**120**	**115**
Row percent	(X)	100.0	0.9	8.0	37.9	27.6	26.4
Column percent	(X)	21.1	3.1	6.9	23.1	26.1	46.0

Means of Transportation to Work by Travel Time to Work[1]

Means of Transportation	Mean travel time to work (minutes)	Travel time to work					
		Workers who did not work at home	Less than 10 minutes	10 to 19 minutes	20 to 29 minutes	30 to 44 minutes	45 or more minutes
Workers who did not work at home	**34.7**	**2,285**	**205**	**235**	**180**	**910**	**750**
Row percent	(X)	100.0	9.0	10.3	7.9	39.8	32.8
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0
Drove alone	**34.2**	**1,845**	**170**	**205**	**150**	**740**	**585**
Row percent	(X)	100.0	9.2	11.1	8.1	40.1	31.7
Column percent	(X)	80.7	82.9	87.2	83.3	81.3	78.0
Carpooled	**40.6**	**380**	**4**	**25**	**30**	**155**	**165**
Row percent	(X)	100.0	1.1	6.6	7.9	40.8	43.4
Column percent	(X)	16.6	2.0	10.6	16.7	17.0	22.0
Bicycle or walked	**4.5**	**40**	**35**	**4**	**4**	**0**	**0**
Row percent	(X)	100.0	87.5	10.0	10.0	0.0	0.0
Column percent	(X)	1.8	17.1	1.7	2.2	0.0	0.0
Motorcycle or other means	**30.5**	**20**	**0**	**4**	**0**	**20**	**0**
Row percent	(X)	100.0	0.0	20.0	0.0	100.0	0.0
Column percent	(X)	0.9	0.0	1.7	0.0	2.2	0.0

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)

Table 1. Profile of Selected 1990 and 2000 Characteristics

Geographic Area: Covington city, Virginia

Subject	1990 Census		Census 2000		Change 1990 to 2000	
	Number	Percent	Number	Percent	Number	Percent
POPULATION						
Total population	6,991	100.0	6,303	100.0	-688	-9.8
In households	6,962	99.6	6,292	99.8	-670	-9.6
In group quarters	29	0.4	11	0.2	-18	-62.1
HOUSEHOLD SIZE						
Total households	2,990	100.0	2,835	100.0	-155	-5.2
1-person household	924	30.9	962	33.9	38	4.1
2-person household	1,013	33.9	959	33.8	-54	-5.3
3-person household	528	17.7	445	15.7	-83	-15.7
4-person household	333	11.1	295	10.4	-38	-11.4
5-or-more-person household	192	6.4	174	6.1	-18	-9.4
Mean number of persons per household	2.33	(X)	2.22	(X)	-0.11	(X)
VEHICLES AVAILABLE[1]						
Total households	2,990	100.0	2,835	100.0	-155	-5.2
No vehicle available	476	15.9	446	15.7	-30	-6.3
1 vehicle available	1,101	36.8	1,032	36.4	-69	-6.3
2 vehicles available	1,035	34.6	908	32.0	-127	-12.3
3 vehicles available	321	10.7	326	11.5	5	1.6
4 vehicles available	31	1.0	85	3.0	54	174.2
5 or more vehicles available	26	0.9	38	1.3	12	46.2
Mean vehicles per household	1.48	(X)	1.54	(X)	0.06	(X)
WORKERS BY SEX[1]						
Workers 16 years and over	2,787	100.0	2,640	100.0	-147	-5.3
Male	1,550	55.6	1,445	54.7	-105	-6.8
Female	1,237	44.4	1,195	45.3	-42	-3.4
MEANS OF TRANSPORTATION TO WORK						
Workers 16 years and over	2,787	100.0	2,640	100.0	-147	-5.3
Drove alone	2,064	74.1	2,011	76.2	-53	-2.6
Carpooled	448	16.1	386	14.6	-62	-13.8
Public transportation (including taxicab)	16	0.6	8	0.3	-8	-50.0
Bicycle or walked	190	6.8	92	3.5	-98	-51.6
Motorcycle or other means	38	1.4	36	1.4	-2	-5.3
Worked at home	31	1.1	107	4.1	76	245.2
TRAVEL TIME TO WORK						
Workers who did not work at home	2,756	100.0	2,533	100.0	-223	-8.1
Less than 5 minutes	217	7.9	208	8.2	-9	-4.1
5 to 9 minutes	806	29.2	727	28.7	-79	-9.8
10 to 14 minutes	672	24.4	537	21.2	-135	-20.1
15 to 19 minutes	583	21.2	345	13.6	-238	-40.8
20 to 29 minutes	225	8.2	270	10.7	45	20.0
30 to 44 minutes	87	3.2	154	6.1	67	77.0
45 or more minutes	166	6.0	292	11.5	126	75.9
Mean travel time to work (minutes)	13.5	(X)	19.2	(X)	5.7	(X)

TIME LEAVING HOME TO GO TO WORK						
Workers who did not work at home	2,756	100.0	2,533	100.0	-223	-8.1
5:00 a.m. to 6:59 a.m.	730	26.5	817	32.3	87	11.9
7:00 a.m. to 7:59 a.m.	571	20.7	578	22.8	7	1.2
8:00 a.m. to 8:59 a.m.	573	20.8	415	16.4	-158	-27.6
9:00 a.m. to 9:59 a.m.	166	6.0	113	4.5	-53	-31.9
10:00 a.m. to 11:59 a.m.	87	3.2	72	2.8	-15	-17.2
12:00 p.m. to 11:59 p.m.	570	20.7	456	18.0	-114	-20.0
12:00 a.m. to 4:59 a.m.	59	2.1	82	3.2	23	39.0

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)

Table 2. Profile of Selected 2000 Characteristics

Geographic Area: Covington city, Virginia

Subject	Census 2000	
	Number	Percent
POPULATION BY AGE		
Total population	6,303	100.0
Under 16 years	1,215	19.3
16 to 20 years	324	5.1
21 to 24 years	279	4.4
25 to 44 years	1,717	27.2
45 to 64 years	1,479	23.5
65 years and over	1,289	20.5
Mean age (years)	40.8	(X)
HOUSEHOLD INCOME IN 1999[1]		
Total households	2,835	100.0
Less than $15,000	630	22.2
$15,000 to 19,999	276	9.7
$20,000 to 24,999	255	9.0
$25,000 to 49,999	1,009	35.6
$50,000 to 74,999	489	17.2
$75,000 to 99,999	115	4.1
$100,000 or more	61	2.2
Mean household income (dollars)	36,262	(X)
Median household income (dollars)	30,325	(X)

Household Size by Vehicles Available[1]

Household Size	Mean vehicles per household	Vehicles available					
		Total households	No vehicle	1 vehicle	2 vehicles	3 vehicles	4 or more vehicles
Total households	**1.54**	**2,835**	**445**	**1,030**	**910**	**325**	**125**
Row percent	(X)	100.0	15.7	36.3	32.1	11.5	4.4
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0

1-person household	**0.94**	**960**	**275**	**520**	**135**	**4**	**20**
Row percent	(X)	100.0	28.6	54.2	14.1	0.4	2.1
Column percent	(X)	33.9	61.8	50.5	14.8	1.2	16.0
2-person household	**1.71**	**960**	**105**	**285**	**390**	**145**	**30**
Row percent	(X)	100.0	10.9	29.7	40.6	15.1	3.1
Column percent	(X)	33.9	23.6	27.7	42.9	44.6	24.0
3-person household	**1.82**	**445**	**40**	**105**	**230**	**50**	**25**
Row percent	(X)	100.0	9.0	23.6	51.7	11.2	5.6
Column percent	(X)	15.7	9.0	10.2	25.3	15.4	20.0
4-or-more-person household	**2.15**	**470**	**25**	**120**	**150**	**125**	**45**
Row percent	(X)	100.0	5.3	25.5	31.9	26.6	9.6
Column percent	(X)	16.6	5.6	11.7	16.5	38.5	36.0

Means of Transportation to Work by Travel Time to Work[1]

Means of Transportation	Mean travel time to work (minutes)	Travel time to work					
		Workers who did not work at home	Less than 10 minutes	10 to 19 minutes	20 to 29 minutes	30 to 44 minutes	45 or more minutes
Workers who did not work at home	**19.2**	**2,535**	**935**	**880**	**270**	**155**	**290**
Row percent	(X)	100.0	36.9	34.7	10.7	6.1	11.4
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0
Drove alone	**16.5**	**2,010**	**800**	**750**	**205**	**85**	**165**
Row percent	(X)	100.0	39.8	37.3	10.2	4.2	8.2
Column percent	(X)	79.3	85.6	85.2	75.9	54.8	56.9
Carpooled	**29.0**	**385**	**90**	**95**	**65**	**35**	**100**
Row percent	(X)	100.0	23.4	24.7	16.9	9.1	26.0
Column percent	(X)	15.2	9.6	10.8	24.1	22.6	34.5
Public transportation (including taxicab)	**31.9**	**10**	**0**	**4**	**0**	**0**	**4**
Row percent	(X)	100.0	0.0	40.0	0.0	0.0	40.0
Column percent	(X)	0.4	0.0	0.5	0.0	0.0	1.4
Bicycle or walked	**16.2**	**90**	**45**	**20**	**0**	**20**	**10**
Row percent	(X)	100.0	50.0	22.2	0.0	22.2	11.1
Column percent	(X)	3.6	4.8	2.3	0.0	12.9	3.4
Motorcycle or other means	**75.7**	**35**	**0**	**10**	**0**	**15**	**10**
Row percent	(X)	100.0	0.0	28.6	0.0	42.9	28.6
Column percent	(X)	1.4	0.0	1.1	0.0	9.7	3.4

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)						
Table 1. Profile of Selected 1990 and 2000 Characteristics						
Geographic Area: Clifton Forge city, Virginia						
Subject	1990 Census		Census 2000		Change 1990 to 2000	
	Number	Percent	Number	Percent	Number	Percent
POPULATION						
Total population	4,679	100.0	4,289	100.0	-390	-8.3
In households	4,400	94.0	4,084	95.2	-316	-7.2
In group quarters	279	6.0	205	4.8	-74	-26.5
HOUSEHOLD SIZE						
Total households	1,949	100.0	1,838	100.0	-111	-5.7
1-person household	667	34.2	634	34.5	-33	-4.9
2-person household	599	30.7	605	32.9	6	1.0
3-person household	323	16.6	314	17.1	-9	-2.8
4-person household	225	11.5	174	9.5	-51	-22.7
5-or-more-person household	135	6.9	111	6.0	-24	-17.8
Mean number of persons per household	2.26	(X)	2.22	(X)	-0.04	(X)
VEHICLES AVAILABLE[1]						
Total households	1,949	100.0	1,838	100.0	-111	-5.7
No vehicle available	340	17.4	337	18.3	-3	-0.9
1 vehicle available	711	36.5	702	38.2	-9	-1.3
2 vehicles available	627	32.2	537	29.2	-90	-14.4
3 vehicles available	210	10.8	208	11.3	-2	-1.0
4 vehicles available	46	2.4	42	2.3	-4	-8.7
5 or more vehicles available	15	0.8	12	0.7	-3	-20.0
Mean vehicles per household	1.46	(X)	1.43	(X)	-0.03	(X)
WORKERS BY SEX[1]						
Workers 16 years and over	1,660	100.0	1,655	100.0	-5	-0.3
Male	924	55.7	820	49.5	-104	-11.3
Female	736	44.3	835	50.5	99	13.5
MEANS OF TRANSPORTATION TO WORK						
Workers 16 years and over	1,660	100.0	1,657	100.0	-3	-0.2
Drove alone	1,352	81.4	1,232	74.4	-120	-8.9
Carpooled	221	13.3	272	16.4	51	23.1
Public transportation (including taxicab)	15	0.9	0	0.0	-15	-100.0
Bicycle or walked	30	1.8	103	6.2	73	243.3
Motorcycle or other means	13	0.8	7	0.4	-6	-46.2
Worked at home	29	1.7	43	2.6	14	48.3
TRAVEL TIME TO WORK						
Workers who did not work at home	1,631	100.0	1,614	100.0	-17	-1.0
Less than 5 minutes	50	3.1	133	8.2	83	166.0
5 to 9 minutes	371	22.7	262	16.2	-109	-29.4
10 to 14 minutes	468	28.7	369	22.9	-99	-21.2
15 to 19 minutes	258	15.8	241	14.9	-17	-6.6
20 to 29 minutes	194	11.9	194	12.0	0	0.0
30 to 44 minutes	138	8.5	122	7.6	-16	-11.6
45 or more minutes	152	9.3	293	18.2	141	92.8
Mean travel time to work (minutes)	17.2	(X)	23.7	(X)	6.5	(X)

TIME LEAVING HOME TO GO TO WORK						
Workers who did not work at home	1,631	100.0	1,614	100.0	-17	-1.0
5:00 a.m. to 6:59 a.m.	463	28.4	540	33.5	77	16.6
7:00 a.m. to 7:59 a.m.	423	25.9	320	19.8	-103	-24.3
8:00 a.m. to 8:59 a.m.	277	17.0	316	19.6	39	14.1
9:00 a.m. to 9:59 a.m.	87	5.3	38	2.4	-49	-56.3
10:00 a.m. to 11:59 a.m.	16	1.0	83	5.1	67	418.8
12:00 p.m. to 11:59 p.m.	342	21.0	262	16.2	-80	-23.4
12:00 a.m. to 4:59 a.m.	23	1.4	55	3.4	32	139.1

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

CENSUS TRANSPORTATION PLANNING PACKAGE (CTPP 2000)

Table 2. Profile of Selected 2000 Characteristics

Geographic Area: Clifton Forge city, Virginia

Subject	Census 2000	
	Number	Percent
POPULATION BY AGE		
Total population	4,289	100.0
Under 16 years	779	18.2
16 to 20 years	250	5.8
21 to 24 years	150	3.5
25 to 44 years	1,062	24.8
45 to 64 years	1,027	23.9
65 years and over	1,021	23.8
Mean age (years)	42.8	(X)
HOUSEHOLD INCOME IN 1999[1]		
Total households	1,838	100.0
Less than $15,000	498	27.1
$15,000 to 19,999	211	11.5
$20,000 to 24,999	193	10.5
$25,000 to 49,999	580	31.6
$50,000 to 74,999	218	11.9
$75,000 to 99,999	56	3.0
$100,000 or more	82	4.5
Mean household income (dollars)	33,967	(X)
Median household income (dollars)	26,090	(X)

Household Size by Vehicles Available[1]

Household Size	Mean vehicles per household	Vehicles available					
		Total households	No vehicle	1 vehicle	2 vehicles	3 vehicles	4 or more vehicles
Total households	**1.43**	**1,840**	**335**	**700**	**535**	**210**	**55**
Row percent	(X)	100.0	18.2	38.0	29.1	11.4	3.0
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0

1-person household	**0.96**	**635**	**165**	**365**	**85**	**15**	**4**
Row percent	(X)	100.0	26.0	57.5	13.4	2.4	0.6
Column percent	(X)	34.5	49.3	52.1	15.9	7.1	7.3
2-person household	**1.50**	**605**	**90**	**215**	**225**	**75**	**4**
Row percent	(X)	100.0	14.9	35.5	37.2	12.4	0.7
Column percent	(X)	32.9	26.9	30.7	42.1	35.7	7.3
3-person household	**1.92**	**315**	**35**	**60**	**130**	**85**	**10**
Row percent	(X)	100.0	11.1	19.0	41.3	27.0	3.2
Column percent	(X)	17.1	10.4	8.6	24.3	40.5	18.2
4-or-more-person household	**1.79**	**285**	**50**	**70**	**105**	**30**	**30**
Row percent	(X)	100.0	17.5	24.6	36.8	10.5	10.5
Column percent	(X)	15.5	14.9	10.0	19.6	14.3	54.5

Means of Transportation to Work by Travel Time to Work[1]

Means of Transportation	Mean travel time to work (minutes)	Travel time to work					
		Workers who did not work at home	Less than 10 minutes	10 to 19 minutes	20 to 29 minutes	30 to 44 minutes	45 or more minutes
Workers who did not work at home	**23.7**	**1,615**	**395**	**610**	**195**	**120**	**295**
Row percent	(X)	100.0	24.5	37.8	12.1	7.4	18.3
Column percent	(X)	100.0	100.0	100.0	100.0	100.0	100.0
Drove alone	**19.6**	**1,230**	**300**	**500**	**155**	**110**	**160**
Row percent	(X)	100.0	24.4	40.7	12.6	8.9	13.0
Column percent	(X)	76.2	75.9	82.0	79.5	91.7	54.2
Carpooled	**47.0**	**270**	**30**	**70**	**35**	**10**	**125**
Row percent	(X)	100.0	11.1	25.9	13.0	3.7	46.3
Column percent	(X)	16.7	7.6	11.5	17.9	8.3	42.4
Bicycle or walked	**6.4**	**105**	**65**	**40**	**0**	**0**	**0**
Row percent	(X)	100.0	61.9	38.1	0.0	0.0	0.0
Column percent	(X)	6.5	16.5	6.6	0.0	0.0	0.0
Motorcycle or other means	**85.0**	**4**	**0**	**0**	**0**	**0**	**4**
Row percent	(X)	100.0	0.0	0.0	0.0	0.0	100.0
Column percent	(X)	0.2	0.0	0.0	0.0	0.0	1.4

1See the entry for this item in the Technical Notes in the root directory or state subdirectories (filename: tech_notes.txt).

(X)Not applicable.

Source:U.S. Census Bureau. Census of Population and Housing, 1990 and 2000 long-form (sample) data.

Appendix C

Major Employers in the Roanoke Valley Region
Fourth Quarter, 2002

EMPLOYER	# EMPLOYEES
Carilion Health System	7,680
Roanoke County Public Schools	2,705
Roanoke City Public Schools	2,477
City of Roanoke	2,360
Wachovia	2,146
Commonwealth of Virginia	2,046
Wal-Mart Stores	1,997
Norfolk Southern	1,970
Kroger	1,553
ITT	1,516
Advance Stores Co Inc	1,489
Veterans Administration Hospital	1,436
Lewis Gale Hospital	1,398
Allstate	1,338
Franklin County Public Schools	1,326
M W Manufacturers Inc	1,253
Home Shopping Network	1,226
United States Postal Service	1,164
City of Salem	1,079
County of Roanoke	1,077
United States Government	1,071
General Electric	970
Yokohama Tire Corp	933
Manpower Temporary Services	919
Anthem Blue Cross/Blue Shield	856
Lewis Gale Clinic	846
Medical Facilities of America	842
United Parcel Service	818
Food Lion	760
Botetourt County Public Schools	754
Orvis	671
Salem City Schools	658
Atlantic Mutual Insurance	628
Newroads Fulfillment	611
Richfield	552
Hanover Direct Inc	543
Virginia Western Community College	528
Friendship Manor	519
Verizon	517
AARP Pharmacy Services	500
B B & T	496
Roanoke College	485
Valleydale Foods	463

Roanoke Electric Steel	449
McDonalds	442
Carter Machinery	424
US Foodservice Inc	413
Hardee's	402
Landmark Communications (including *The Roanoke Times*)	394
American Electric Power	389
Elizabeth Arden	380
Precision Fabrics Group	377
Waste Management of Virginia Inc	377
Pizza Hut	364
Burger King	363
Hollins University	363
Famous Anthony's	362
US Airways	349
Coca-Cola	346
Medeco Security Locks	337
Berglund	334
Catawba Hospital	329
Hotel Roanoke & Conference Center	327
J C Penney	324
Aramark Uniform Co	318
Goodwill Industries	313
Lowe's Home Centers Inc	313
Macados Inc	304
Total Action Against Poverty (TAP)	302
Hooker Furniture	301
CAT Communications International Inc	300
Ferrum College	298
Belk	294
Orkand Corp	294
County of Franklin	287
Branch Highways	286
G J Hopkins Inc	276
Adams Construction	274
Shenandoah Life Insurance Co	274
Western Sizzlin	272
Advantage Staffing Resources	271
CS Integrated Services	269
K-Mart	268
Wendy's	268
Bright Personnel & Business Services	265
R R Donnelly & Sons Co	263
Grand Home Furnishings	262
Gevity HR	262
John W Hancock Jr Inc	252
SunTrust	244

Sears	242
Hecht's	235
Ruxton Health Care Inc	234
Charles Levy Circulating Co	232
GE/Toshiba	231
County of Botetourt	224
VA Truck Center Inc	222
Dynax America Corp	220
CVS	219
Oak Hall Industries	219
American Red Cross	218
AT PAC Inc	217
National Diabetic Pharmacies	217
Uttermost Co	214
Graham-White Manufacturing Co	213
Varney Electric Co Inc	212
HoneyTree Early Learning Centers	208
Hayes Seay Mattern & Mattern	207
Diabetes Self Care Inc	206
Virginia Transformer	206
Valcom	204

Source: City of Roanoke, Economic Development Department
http://www.roanokegov.com/WebMgmt/ywbase61b.nsf/vwContentFrame/N254FPNB939LBASEN

Appendix D

Regional Study Area Bicycling Network
Level of Service Grades and Scores, BCI and BLOS

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
10th St. – Ferdinand to Campbell	D	B	3.49	2.16
10th St. - Campbell to Salem	D	C	4.15	3.47
10th St. - Salem to Loudon	D	D	4.21	3.51
10th St. - Loudon to Fairfax	E	D	4.65	3.86
10th St. - Fairfax to Orange	E	D	4.47	3.64
10th St. - Orange to Rugby	D	D	3.61	3.70
10th St. - Rugby to I-581 Overpass	D	D	3.61	3.70
10th St. - I-581 Overpass to Williamson Road	D	D	4.30	3.58
Route 24/Jamison Ave. - Elm to 6th	E	C	5.00	3.23
Route 24/Jamison Ave. - 6th to 13th	E	C	5.00	3.23
Route 24/Jamison Ave. - 13th to Dale	F	D	5.33	4.01
Route 24/Dale Ave. - Jamison to ECL Roanoke City	E	D	5.26	3.99
Route 24/Virginia Ave. - WCL Vinton to Pollard	F	D	5.46	3.98
Route 24/Virginia Ave. - Pollard to Clearview	E	D	5.13	3.86
Route 24/Hardy Road (634) - bike lane	C	C	3.41	3.25
Route 18/S. Carpenter Dr. - Edgemont Dr. to East Gordon St.	E	D	4.41	3.52
Route 18/S. Carpenter Dr. - East Gordon St. to S. Pitzer Ridge	D	C	4.27	3.41
Route 18/Indian Valley Rd. - S. Pitzer Ridge to SCL Covington	D	C	4.07	2.63
Route 18 - SCL Covington to 657	E	B	4.56	2.33
Route 18 - 657 to 614	E	B	4.53	1.74
Route 18 - 614 to 608	D	A	4.35	0.48
Route 18 - 608 to 607 Potts Creek	D	A	4.32	0.00
Route 18 - 608 Potts Creek to Craig County Line	D	A	4.07	0.00
Route 60 - US 220 to Covington ECL	D	C	3.54	3.16
Route 60 - Covington WCL to E I-64	D	F	3.71	5.99
US 220 - I-81 to 779 (Daleville)	D	D	4.39	3.70
311/Thompson Memorial - E. Main St. I-81	D	D	4.30	3.98
311/Thompson Memorial - I-81 to Catawba Valley Rd.	D	D	3.63	3.53
311/Catawba Valley Dr. - 419 to Catawba Creek Rd.	E	D	4.45	3.68
Route 311/Catawba Valley Dr. - Catawba Creek Rd. to Blacksburg Road	D	C	3.92	3.45
Route 311/Catawba Valley Dr. - Blacksburg Road to Craig County line	D	C	3.77	3.45
Route 311 - Craig County line	E	D	4.98	3.93
Route 419/Electric - Franklin Rd. to Ronaoke County line	F	D	7.42	4.45
Route 419/Electric - Roanoke County line to Starkey Road	F	D	7.42	4.45
Route 419/Electric - Starkey Rd. to Brambleton/US 221	D	B	4.41	1.63
Route 419/Electric - Brambleton to Salem City line	E	B	4.87	1.74
Route 419/Electric - Salem City line to Apperson/US 11	F	D	6.51	4.36
Route 419/Electric - Apperson/US 11 to Roanoke Blvd.	F	D	6.25	4.15
Route 419/Electric - Roanoke Blvd. to Alt US 60/Texas Street	E	D	5.31	4.35
Route 419/Electric - Alt US 60/Texas St. to US 460/E.Main	E	E	5.24	4.54
Route 419/Electric - US 460/E.Main to RCL	E	E	5.26	4.61
Route 419/Electric - RCL to I-81	E	E	5.26	4.61

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Route 419/Electric - I-81 to 311/Catawba Valley Dr.	E	D	4.90	4.44
US 460 - Wildwood Road to 4th Street	E	D	4.25	3.89
Route 629 - 1408 to Douthat State Park entrance	D	C	3.93	2.60
Route 629 - Douthat State Park entrance to Bath County Line	D	A	3.71	1.34
Route 779 - 311 to 600	D	C	3.50	2.63
Route 779 - 600 to Botetourt County Line	D	B	3.45	2.02
Route 779 - Botetourt County Line to 600	D	F	4.33	6.13
Route 779 - 600 to 672	E	F	4.65	6.94
Route 779 - 672 to 675	E	F	4.90	7.28
Route 779 - 675 to US 220	E	F	5.04	7.28
Apperson/11 - Salem ECL to 419/Electric Rd. (westbound)	E	D	4.80	4.80
Apperson/11 - Salem ECL to 419/Electric Rd. (eastbound)	E	D	5.18	5.18
Apperson/11 - 419/Electric Rd. to Colorado St. (westbound)	F	D	5.65	5.65
Apperson/11 - 419/Electric Rd. to Colorado St. (eastbound)	E	D	4.69	4.69
Apperson/11 - Colorado St. to College Ave. (westbound)	D	C	3.46	3.46
Apperson/11 - Colorado St. to College Ave. (eastbound)	D	C	3.95	3.95
Apperson/11 - College Ave. - Colorado St. to 4th St. (westbound)	C	A	2.54	2.54
Apperson/11 - College Ave. - 4th St. to Thompson Memorial (westbound)	C	A	2.77	2.77
Apperson/11 - Thompson Memorial to US 460/Main St.	D	B	3.68	3.68
Blue Ridge Parkway - Floyd County Line to US 220	D	B	3.59	1.56
Blue Ridge Parkway - US 220 to SR 24	D	B	3.59	1.56
Blue Ridge Parkway - SR 24 to Botetourt County Line	D	B	3.62	1.77
Blue Ridge Parkway - Botetourt County Line to US 221, US 460	D	B	3.62	1.77
Blue Ridge Parkway - US 221, US 460 to Bedford County Line	D	B	3.62	1.77
Brambleton - Ran Lyn to Crystal Dr.	F	F	5.54	6.00
Brambleton - Crystal Dr. to 419/Electric Rd.	F	F	5.79	5.84
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (northbound)	E	E	4.92	4.93
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (southbound)	E	E	4.77	4.81
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(northbound)	D	E	3.52	4.64
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(southbound)	D	D	3.45	4.30
Brambleton - Woodlawn Dr.to Montgomery Dr. (northbound)	D	C	3.49	2.80
Brambleton - Woodlawn Dr. to Montgomery Dr.(southbound)	C	A	2.80	0.58
Brambleton - Montgomery to Overland Dr. (northbound)	E	D	4.53	3.78
Brambleton - Montgomery to Overland Dr. (southbound)	D	D	4.37	3.66
Brambleton - Overland Dr. to Brandon Dr.	E	D	4.73	3.78
Buck Mountain Rd. - Starkey Rd. to 1960	E	E	4.66	4.59
Buck Mountain Rd. - 1960 to 917	E	E	4.58	4.62
Buck Mountain Rd. - 917 to Blue Ridge Parkway	E	E	4.88	4.58
Buck Mountain Rd. - Starkey Rd. to 1963	E	E	4.89	4.59
Colonial Ave. - Brandon to Wonju	D	C	3.61	3.25
Colonial Ave. - Wonju to Broadway	E	D	4.53	3.71
Colonial Ave. - Broadway to Persinger	C	B	2.63	1.74
Colonial Ave. - Persinger to Overland Dr. (westbound)	E	A	4.52	1.49
Colonial Ave. - Persinger to Overland Dr. (eastbound)	C	D	2.72	3.76
Colonial Ave. - Overland Dr. to Dogwood (westbound)	E	C	4.96	3.25

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Colonial Ave. - Overland Dr. to Dogwood (eastbound)	D	D	4.27	3.85
Colonial Ave. - Dogwood to to WCL	E	D	4.77	3.90
Colonial Ave. - WCL to 419/Electric Rd.	E	D	4.58	3.96
Colonial Ave. - 419/Electric Rd. to Penn Forest	D	D	4.14	3.60
Cotton Hill Rd. - Merriman Rd. to Shingle Ridge Rd. (northbound)	D	B	3.99	1.97
Cotton Hill Rd. - Merriman Rd. to Shingle Ridge Rd. (southbound)	D	B	4.14	2.26
Cotton Hill Rd. - Shingle Ridge Rd. to 889 (northbound)	D	B	4.09	2.30
Cotton Hill Rd. - Shingle Ridge Rd. to 889 (southbound)	D	B	4.16	2.44
Cotton Hill Rd. - 888 to US 221	E	C	4.43	3.15
Franklin Rd. - US 220 to Penarth Rd. (northbound)	D	C	4.21	2.60
Franklin Rd. - US 220 to Penarth Rd. (southbound)	D	D	3.57	3.94
Franklin Rd. - Penarth Rd. to US 220/Roy Weber Expressway	E	D	4.82	3.54
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (northbound)	E	C	5.21	3.37
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (southbound)	E	C	5.29	3.30
Garst Mill Rd. - US 221 S to Crest Hill Dr.	E	D	5.08	4.15
Garst Mill Rd.- Crest Hill Dr.to 1361	E	D	4.77	4.00
Garst Mill Rd. - SCL Roanoke City	E	D	4.61	3.91
Grandin Rd. - 419/Electric Rd. to Mudlick (northbound)	D	D	4.27	3.63
Grandin Rd. - 419/Electric Rd. to Mudlick (southbound)	D	D	4.12	3.53
Grandin Rd. - Mudlick to Beverly	D	D	4.37	3.62
Grandin Rd. – Beverly to Guilford (northbound)	C	B	2.93	2.05
Grandin Rd. – Beverly to Guilford (southbound)	D	C	3.53	2.77
Grandin Rd. - Guilford to Brandon (northbound)	C	C	3.38	2.61
Grandin Rd. - Guilford to Brandon(southbound)	C	C	3.38	2.61
Grandin Rd. - Brandon to Memorial (northbound)	E	C	4.49	2.93
Grandin Rd. - Brandon to Memorial (southbound)	D	C	4.04	3.21
Hardy Rd. (bike lane portion)	C	A	3.41	0.51
Hersheberger Rd. - Peters Creek to Cove Rd. (eastbound)	D	D	3.81	3.75
Hersheberger Rd. - Peters Creek to Cove Rd. (westbound)	D	D	4.22	3.87
Hersheberger Rd. - Cove Rd. to I-581 (eastbound)	F	D	5.40	3.83
Hersheberger Rd. - Cove Rd. to I-581 (westbound)	F	D	5.48	3.89
Hersheberger Rd. - I-581 to Rutgers (eastbound)	F	D	6.06	3.83
Hersheberger Rd. - I-581 to Rutgers (westbound)	F	D	6.06	3.83
Hersheberger Rd. - Rutgers to Williamson Rd. (eastbound)	F	D	5.89	3.91
Hersheberger Rd. - Rutgers to Williamson Rd. (westbound)	F	D	5.81	3.85
Hollins Rd. - NCL Roanoke SR 115 to Beaumont Rd. (northbound)	F	E	5.61	4.55
Hollins Rd. - NCL Roanoke SR 115 to Beaumont Rd. (southbound)	F	E	5.53	4.51
Hollins Rd. - Beaumont Rd. to Shadwell Dr. (northbound)	E	D	4.47	4.24
Hollins Rd. - Beaumont Rd. to Shadwell Dr. (southbound)	E	D	4.62	4.34
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (northbound)	D	D	3.86	3.74
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (southbound)	C	C	3.02	2.76
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(norththbound)	D	D	4.05	4.14
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(southbound)	D	D	4.36	4.36
Kessler Mill Rd. - Garst Dr. to 311	D	D	4.36	4.36
King St. - Gus Nicks Blvd. To US 460	E	D	4.71	3.92

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Memorial Dr. - Grandin Rd. to Campbell Ave. (northbound)	C	B	3.28	2.05
Memorial Dr. - Grandin Rd. to Campbell Ave. (southbound)	C	C	2.78	3.09
Merriman Rd. - Franklin to Cotton Hill Rd.	C	B	3.06	1.95
Merriman Rd. - Cotton Hill Rd. to Blue Ridge PW	C	C	3.15	2.69
Merriman Rd. - Blue Ridge PW to Star Light	D	C	3.53	3.27
Merriman Rd. - Star Light to Starkey (northbound)	D	C	3.43	3.45
Merriman Rd. - Star Light to Starkey (southbound)	D	D	3.73	3.83
Merriman Rd. - Starkey Rd. to Chapparal	E	D	4.50	4.17
Merriman Rd. - Chapparal to 907	D	D	4.18	3.92
Merriman Rd. - 907 to Colonial Ave.	C	B	3.39	1.56
Old Cave Spring Rd. - Brambleton to McVitty (northbound)	E	D	4.54	3.66
Old Cave Spring Rd. - Brambleton to McVitty (southbound)	E	D	4.69	3.78
McVitty Rd. - Old Cave Spring to stream (northbound)	E	D	4.50	3.83
McVitty Rd. - Old Cave Spring to stream (northbound)	E	D	4.50	3.83
McVitty Rd. - stream to 419 (northbound)	E	D	4.58	3.89
McVitty Rd. - stream to 419 – (southbound)	E	D	4.58	3.89
Plantation Rd. - Liberty Rd. to Whiteside	E	D	4.60	4.18
Plantation Rd. - Whiteside to Hollins (northbound)	E	E	4.42	4.51
Plantation Rd. - Whiteside to Hollins (southbound)	D	D	4.04	4.07
Plantation Rd. - Hollins to NCL Roanoke	D	C	4.02	3.35
Plantation Rd. - NCL Roanoke Hershberger Rd.	D	D	3.69	3.66
Plantation Rd. - Hershberger Rd. to 1855	C	C	3.01	3.03
Plantation Rd. - 1855 to 834	C	C	3.07	3.07
Plantation Rd. - 834 to US 11	D	C	3.69	2.65
Plantation Rd. - US 11 to 1801 (northbound)	C	A	3.37	0.35
Plantation Rd. - US 11 to 180 (soutbound)	E	B	5.05	2.41
Riverland Rd. - Mt. Pleasant to 9th St.	E	E	4.93	4.56
Riverland Rd. - 9th St. to Whitman (westbound)	E	D	4.67	4.38
Riverland Rd. - 9th St. to Whitman (eastbound)	E	D	4.48	4.44
Riverland Rd. - Whitman to Piedmont St. (westbound)	D	C	3.80	3.25
Riverland Rd. - Whitman to Piedmont St. (eastbound)	E	D	4.87	4.05
Salem Ave. - 13th St. to 9th St. (eastbound)	D	B	4.21	2.03
Salem Ave. - 13th St. to 9th St. (westbound)	E	C	4.82	3.48
Salem Ave. - 9th St. to 5th St.(eastbound)	D	C	3.44	2.66
Salem Ave. - 9th St. to 5th St.(westbound)	E	C	4.71	3.29
Salem Ave. - 5th St. to 2nd St.(eastbound)	E	B	4.56	2.13
Salem Ave. - 5th St. to 2nd St.(westbound)	E	B	4.56	2.13
Salem Ave. - 2nd St. to Jefferson St.(eastbound)	E	B	4.62	2.07
Salem Ave. - 2nd St. to Jefferson St.(westbound)	E	B	4.93	2.07
Shenandoah Ave. - Williamson Rd. to 5th St. (westbound)	D	C	3.45	2.74
Shenandoah Ave. - Williamson Rd. to 5th St. (eastbound)	C	B	3.22	2.49
Shenandoah Ave. - 5th St. to 15th St. (westbound)	D	B	4.17	2.18
Shenandoah Ave. - 5th St. to 15th St. (eastbound)	D	C	3.94	2.99
Shenandoah Ave. -15th St. to 24th St. (westbound)	D	B	4.14	2.32
Shenandoah Ave. -15th St. to 24th St. (eastbound)	D	C	3.99	2.95

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Shenandoah Ave. - 24th St. to 30th St.	D	C	4.28	3.14
Shenandoah Ave. - 30th St. to Peters Creek (westbound)	D	D	4.29	4.02
Shenandoah Ave. - 30th St. to Peters Creek (eastbound)	D	D	4.37	4.09
Shenandoah Ave. - Peters Creek to ECL Salem (westbound)	D	D	4.12	3.75
Shenandoah Ave. - Peters Creek to ECL Salem (eastbound)	D	D	4.28	3.89
Shenandoah Ave. - ECL Salem to Easton Rd. (westbound)	E	D	5.19	3.93
Shenandoah Ave. - ECL Salem to Easton Rd. (eastbound)	F	D	5.34	4.06
Shenandoah Ave. - Easton Rd. to 419/Electric Rd.	F	D	5.72	4.00
Shenandoah Ave. - 419/Electric Rd. to Pearl St.	F	D	5.34	3.84
Shenandoah Ave. - Pearl St. to Texas St. (westbound)	E	C	4.77	3.41
Shenandoah Ave. - Pearl St. to Texas St. (eastbound)	E	C	4.69	3.41
Washington Ave. - ECL Vinton to Bypass Road	F	D	5.49	4.02
Washington Ave - Bypass Road to Pollard St.	F	D	5.49	4.02
Walnut Ave. - First St. to to Wise Ave.	D	C	4.39	3.28
Wise Ave. - Wise to Indian Village Ln.	D	D	4.26	3.53
Wise Ave. - Indian Village Ln. to 18th	D	D	4.26	3.81
Wise Ave. - 18th St. to Norfolk Ave.	D	D	4.34	3.85

Appendix E

Table 1
Bicycle Compatibility Index Categories

LOS	BCI Range	Compatibility Level
A	≤ 1.50	Extremely High
B	1.51 – 2.30	Very High
C	2.31 – 3.40	Moderately High
D	3.41 – 4.40	Moderately Low
E	4.41 – 5.30	Very Low
F	> 5.30	Extremely Low

Table 2
Bicycle Level of Service Categories

Level of Service	Bicycle LOS Score
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

Table 3
Bicycle Compatibility Index (BCI) Data Entry Worksheet
10th Street

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
10th St. - Campbell to Salem	2	12	0	0	y	30	39	9100	2.00	10.00	n	0.00	0.00
10th St. - Salem to Loudon	2	12	0	0	y	30	39	10000	2.00	10.00	n	0.00	0.00
10th St. - Loudon to Fairfax	1	12	0	0	y	30	39	10000	2.00	10.00	n	0.00	0.00
10th St. - Fairfax to Orange	1	12	0	0	y	25	34	10000	2.00	10.00	n	0.00	0.00
10th St. - Orange to Rugby	1	10.5	0	1	y	25	34	10000	2.00	10.00	n	0.00	0.00
10th St. - Rugby to I-581 Overpass	1	10.5	0	1	y	25	34	10000	2.00	10.00	n	0.00	0.00
10th St. - I-581 Overpass to Williamson Road	1	10.5	0	0	y	25	34	6400	2.00	10.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
10th street

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
10th St. - Campbell to Salem	0	0.0	12.0	250	250	39	0	1	0.6	4.15	D	Moderately Low
10th St. - Salem to Loudon	0	0.0	12.0	275	275	39	0	1	0.6	4.21	D	Moderately Low
10th St. - Loudon to Fairfax	0	0.0	12.0	550	0	39	0	1	0.6	4.65	E	Very Low
10th St. - Fairfax to Orange	0	0.0	12.0	550	0	34	0	1	0.6	4.47	E	Very Low
10th St. - Orange to Rugby	1	1.0	10.5	550	0	34	0	1	0.6	3.61	D	Moderately Low
10th St. - Rugby to I-581 Overpass	1	1.0	10.5	550	0	34	0	1	0.6	3.61	D	Moderately Low
10th St. - I-581 Overpass to Williamson Road	0	0.0	10.5	352	0	34	0	1	0.6	4.30	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
10th Street

Route Name	From	To	Dir. of Sur.	Traffic Data: Lanes (L) Th #	Lanes (L) Con.	(ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
10th St.	Campbell Ave.	Salem St.	N	4	D	9,100	2	30	12.0	0.0	0.0	0	0	N	4.0	0.0	**3.47**	**C**
10th St.	Salem St.	Loudon Ave.	N	4	D	10,000	2	30	12.0	0.0	0.0	0	0	N	4.0	0.0	**3.51**	**D**
10th St.	Loudon Ave.	Fairfax	N	2	D	10,000	2	30	12.0	0.0	0.0	0	0	N	4.0	0.0	**3.86**	**D**
10th St.	Fairfax	Orange	N	2	D	10,000	2	25	12.0	0.0	0.0	0	0	N	4.0	0.0	**3.64**	**D**
10th St.	Orange	Rugby	N	2	U	10,000	2	25	11.5	1.0	0.0	0	0	N	4.0	0.0	**3.70**	**D**
10th St.	Rugby	I-581 Overpass	N	2	U	10,000	2	25	11.5	1.0	0.0	0	0	N	4.0	0.0	**3.70**	**D**
10th St.	I-581 Overpass	Williamson Road	N	2	U	6,400	2	25	10.5	0.0	0.0	0	0	N	4.0	0.0	**3.58**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
State Route 18

Data Entry														
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
18/S. Carpenter Dr. - Edgemont Dr. to East Gordon St.	1	9.5	0	0	y	25	34	6000	1.00	2.00	n	0.00	0.00
18/S. Carpenter Dr. - East Gordon St. to S. Pitzer Ridge	1	9.5	0	0	y	25	34	4700	1.00	2.00	n	0.00	0.00
18/Indian Valley Rd. - S. Pitzer Ridge to SCL Covington	1	9.5	0	0	y	25	34	2900	1.00	2.00	n	0.00	0.00
18 - SCL Covington to 657	1	9.5	0	0	y	45	54	1900	2.00	2.00	n	0.00	0.00
18 - 657 to 614	1	9.5	0	0	y	45	54	1600	2.00	2.00	n	0.00	0.00
18 - 614 to 608	1	9.5	0	0	y	45	54	900	2.00	2.00	n	0.00	0.00
18 - 608 to 607 Potts Creek	1	9.5	0	0	y	45	54	600	2.00	2.00	n	0.00	0.00
18 - 608 Potts Creek to Craig County Line	1	9.5	0	0	y	45	54	200	2.00	2.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Route 18

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
18/S. Carpenter Dr. - Edgemont Dr. to East Gordon St.	0	0.0	9.5	330	0	34	0	1	0.6	4.41	E	Very Low
18/S. Carpenter Dr. - East Gordon St. to S. Pitzer Ridge	0	0.0	9.5	259	0	34	0	1	0.6	4.27	D	Moderately Low
18/Indian Valley Rd. - S. Pitzer Ridge to SCL Covington	0	0.0	9.5	160	0	34	0	1	0.6	4.07	D	Moderately Low
18 - SCL Covington to 657	0	0.0	9.5	105	0	54	0	1	0.5	4.56	E	Very Low
18 - 657 to 614	0	0.0	9.5	88	0	54	0	1	0.5	4.53	E	Very Low
18 - 614 to 608	0	0.0	9.5	50	0	54	0	1	0.4	4.35	D	Moderately Low
18 - 608 to 607 Potts Creek	0	0.0	9.5	33	0	54	0	1	0.4	4.32	D	Moderately Low
18 - 608 Potts Creek to Craig County Line	0	0.0	9.5	11	0	54	0	1	0.2	4.07	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Route 18

								Traffic Data					Occu.	Occ u.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park .	Rumb .	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	**From**	**To**	**(Mi)**	**Sur.**	**#**		**(vpd)**	**(%)**	**mph**	**(ft)**	**(ft)**	**(ft)**	**(%)**	**(%)**	**(Y/N)**	**(5..1)**	**(5..1)**		**(A..F)**
18 S. Carpenter Dr.	Edgemont Dr.	East Gordon St.		N/S	2	U	6,000	1	25	9.5	0.0	0.0	0	0	N	4.0	0.0	**3.52**	**D**
18 S. Carpenter Dr.	Gordon St.	S Pitzer Ridge		N/S	2	U	4,700	1	25	10.5	0.0	0.0	0	0	N	4.0	0.0	**3.41**	**C**
18 Indian Valley Rd.	S Pitzer Ridge	SCL Covington		N/S	2	U	2,900	1	25	11.5	0.0	0.0	0	0	N	4.0	0.0	**2.63**	**C**
18	SCL Covington	657		N/S	2	U	1,900	2	45	12.5	0.0	0.0	0	0	N	4.0	0.0	**2.33**	**B**
18	657	614 Near Arritt		N/S	2	U	1,600	2	45	13.5	0.0	0.0	0	0	N	4.0	0.0	**1.74**	**B**
18	614 Near Arritt	608		N/S	2	U	900	2	45	14.5	0.0	0.0	0	0	N	4.0	0.0	**0.48**	**A**
18	608	607 Potts Creek		N/S	2	U	240	2	45	15.5	0.0	0.0	0	0	N	4.0	0.0	**0.00**	**A**
18	607 Potts Creek	Craig County Line		N/S	2	U	200	2	45	16.5	0.0	0.0	0	0	N	4.0	0.0	**0.00**	**A**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
State Route 24

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
24/Jamison Ave. - Elm to 6th	2	11	0	0	y	30	39	12000	2.00	5.00	y	20.00	1440.00
24/Jamison Ave. - 6th to 13th	2	11	0	0	y	30	39	12000	2.00	5.00	y	20.00	1440.00
24/Jamison Ave. - 13th to Dale	2	12	0	0	y	30	39	27000	2.00	5.00	n	0.00	0.00
24/Dale Ave. - Jamison to ECL Roanoke City	2	12	0	0	y	30	39	26000	2.00	5.00	n	0.00	0.00
24/Virginia Ave. - WCL Vinton to Pollard	2	12	0	0	n	30	39	25000	2.00	10.00	n	0.00	0.00
24/Virginia Ave. - Pollard to Clearview	2	12	0	0	n	30	39	20000	2.00	10.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
State Route 24

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
24/Jamison Ave. - Elm to 6th	0	0.0	11.0	330	330	39	1	1	0.6	5.00	E	Very Low
24/Jamison Ave. - 6th to 13th	0	0.0	11.0	330	330	39	1	1	0.6	5.00	E	Very Low
24/Jamison Ave. - 13th to Dale	0	0.0	12.0	743	743	39	0	1	0.6	5.33	F	Extremely Low
24/Dale Ave. - Jamison to ECL Roanoke City	0	0.0	12.0	715	715	39	0	1	0.6	5.26	E	Very Low
24/Virginia Ave. - WCL Vinton to Pollard	0	0.0	12.0	688	688	39	0	0	0.6	5.46	F	Extremely Low
24/Virginia Ave. - Pollard to Clearview	0	0.0	12.0	550	550	39	0	0	0.6	5.13	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
State Route 24

							Traffic Data						Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	From	To	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
24/Jamison	Elm	6th		E	2	U	12,000	2	30	18.0	0.0	7.0	20	0	n	4.0	0.0	**3.23**	**C**
24/Jamison	6th	13th		E	2	U	12,000	2	30	18.0	0.0	7.0	20	0	n	4.0	0.0	**3.23**	**C**
24/Jamison	13th	Dale		E	4	D	27,000	2	30	12.0	0.0	0.0	0	0	n	4.0	0.0	**4.01**	**D**
24/Dale	Jamison	ECL Roanoke City		E	4	D	26,000	2	30	12.0	0.0	0.0	0	0	n	4.0	0.0	**3.99**	**D**
24/Virginia	WCL Vinton	Pollard		E	4	D	25,000	2	30	12.0	0.0	0.0	0	0	n	4.0	0.0	**3.98**	**D**
24/Virginia	Pollard	Clearview		E	4	D	20,000	2	30	12.0	0.0	0.0	0	0	n	4.0	0.0	**3.86**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
US 60

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
US 60 - US 220 to Covington ECL	2	12	0	6	n	45	54	14000	7.00	3.00	n	0.00	0.00
US 60 - Covington WCL to E I-64	1	10.5	0	1	y	55	64	2300	11.00	1.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
US 60

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
US 60 - US 220 to Covington ECL	1	6.0	12.0	385	385	54	0	0	0.6	3.54	D	Moderately Low
US 60 - Covington WCL to E I-64	1	1.0	10.5	127	0	64	0	1	0.5	3.71	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
US 60

							Traffic Data						Oc cu.	Occu .		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	From	To	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
US 60	US 220	Covington ECL		W	4	U	14,000	7	45	18.0	6.0	0.0	0	0	n	4.0	4.0	**3.16**	**C**
US 60	Covington WCL	E I-64		W	2	U	2,300	11	55	11.5	1.0	0.0	0	0	n	4.0	4.0	**5.99**	**F**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
US 220 (I-81-Route 779)

Data Entry														
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
US 220 - I-81 to 779	2	12	0	4	n	45	54	23000	5.00	5.00	n	0.00	0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
US 220 (I-81-Route 779)

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
US 220 - I-81 to 779	1	4.0	12.0	633	633	54	0	0	0.6	4.39	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
US 220 (I-81-Route 779)

					Traffic Data								Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	From	To	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
US 220	I-81	779		N/S	4	D	23,000	5	45	16.0	4.0	0.0	0	0	0	5.0	3.0	**3.70**	**D**

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Route 311

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
311/Thompson Memorial - E. Main St. I-81	2	13.0	0.0	0.0	Y	35	44	11000	4	2.00	n	0.00	0
311/Thompson Memorial - I-81 to Catawba Valley Rd.	1	10.5	0.0	2.5	Y	45	54	5500	2	2.00	n	0.00	0
311/Catawba Valley Dr. - 419 to Catawba Creek Rd.	1	10.5	0.0	2.5	Y	55	64	9800	2	4.00	n	0.00	0
311/Catawba Valley Dr. - Catawba Creek Rd. to Blacksburg Road	1	10.5	0.0	2.5	Y	55	64	5000	2	2.00	n	0.00	0
311/Catawba Valley Dr. - Blacksburg Road to Craig County line	1	11.5	0.0	2.5	y	55	64	5000	2	2.00	n	0.00	0
311 - Craig County line	1	11.5	0.0	0.0	y	55	64	4400	2	2.00	n	0.00	0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Route 311

Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
311/Thompson Memorial - E. Main St. I-81	0	0.0	13.0	303	303	44	0	1	0.6	4.30	D	Moderately Low
311/Thompson Memorial - I-81 to Catawba Valley Rd.	1	2.5	10.5	303	0	54	0	1	0.6	3.63	D	Moderately Low
311/Catawba Valley Dr. - 419 to Catawba Creek Rd.	1	2.5	10.5	539	0	64	0	1	0.6	4.45	E	Very Low
311/Catawba Valley Dr. - Catawba Creek Rd. to Blacksburg Road	1	2.5	10.5	275	0	64	0	1	0.6	3.92	D	Moderately Low
311/Catawba Valley Dr. - Blacksburg Road to Craig County line	1	2.5	11.5	275	0	64	0	1	0.6	3.77	D	Moderately Low
311 - Craig County line	0	0.0	11.5	242	0	64	0	1	0.6	4.98	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Route 311

			Len.	Dir.			Traffic Data						Occu.	Occu.		Pvmt	Pvmt	Bicycle	
					Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	**From**	**To**	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
311/Thompson Memorial	Main St.	I-81		N	4	D	11000	4	35	13	0.0	0.0	0	0	n	4.0	0.0	**3.98**	**D**
311/Thompson Memorial	I-81	Catawba Valley Road		N	2	U	5500	2	45	13	2.5	0.0	0	0	n	4.0	3.0	**3.53**	**D**
311/Catawba Valley Road	419	Catawba Creek Road		N	2	U	9800	2	55	13	2.5	0.0	0	0	n	5.0	4.0	**3.68**	**D**
311/Catawba Valley Road	Catawba Creek Road	Blacksburg Road		N	2	U	5000	2	55	13	2.5	0.0	0	0	n	5.0	4.0	**3.45**	**C**
311/Catawba Valley Road	Blacksburg Road	Craig County line		N	2	U	5000	2	55	13	2.5	0.0	0	0	n	5.0	4.0	**3.45**	**C**
311	Craig County line	Craig County line		N	2	U	4,400	2	55	11.5	0.0	0.0	0	0	n	5.0	4.0	**3.93**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Route 419/Electric Road

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
419/Electric - Franklin Rd. to Ronaoke County line	2	12.0	0	0	n	35	44	52000	1	20.0	n	0.0	0.0
419/Electric - Roanoke County line to Starkey Road	2	12.0	0	0	n	35	44	52000	1	20.0	n	0.0	0.0
419/Electric - Starkey Rd. to Brambleton/US 221	2	12.0	0	7	n	45	54	29000	1	10.0	n	0.0	0.0
419/Electric - Brambleton to Salem City line	2	12.0	0	7	n	45	54	36000	1	5.0	n	0.0	0.0
419/Electric - Salem City line to Apperson/US 11	2	12.0	0	0	n	45	54	33000	1	5.0	n	0.0	0.0
419/Electric - Apperson/US 11 to Roanoke Blvd.	2	12.0	0	0	n	35	54	29000	1	5.0	n	0.0	0.0
419/Electric - Roanoke Blvd. to Alt US 60/Texas Street	2	12.0	0	0	n	35	44	20000	3	5.0	n	0.0	0.0
419/Electric - Alt US 60/Texas St. to US 460/E.Main	2	12.0	0	0	n	35	44	19000	4	8.0	n	0.0	0.0
419/Electric - US 460/E.Main to RCL (0.88)	2	12.0	0	0	n	45	54	14000	4	5.0	n	0.0	0.0
419/Electric - RCL to I-81	2	12.0	0	0	n	45	54	14000	4	2.0	n	0.0	0.0
419/Electric - I-81 to 311/Catawba Valley Dr.	2	12.0	0	0	n	45	54	10000	4	0.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Route 419/Electric Road

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
419/Electric - Franklin Rd. to Ronaoke County line	0	0.0	12.0	1430	1430	44	0	0	0.6	7.42	F	Extremely Low
419/Electric - Roanoke County line to Starkey Road	0	0.0	12.0	1430	1430	44	0	0	0.6	7.42	F	Extremely Low
419/Electric - Starkey Rd. to Brambleton/US 221	1	7.0	12.0	798	798	54	0	0	0.6	4.41	D	Moderately Low
419/Electric - Brambleton to Salem City line	1	7.0	12.0	990	990	54	0	0	0.6	4.87	E	Very Low
419/Electric - Salem City line to Apperson/US 11	0	0.0	12.0	908	908	54	0	0	0.6	6.51	F	Extremely Low
419/Electric - Apperson/US 11 to Roanoke Blvd.	0	0.0	12.0	798	798	54	0	0	0.6	6.25	F	Extremely Low
419/Electric - Roanoke Blvd. to Alt US 60/Texas Street	0	0.0	12.0	550	550	44	0	0	0.6	5.31	E	Very Low
419/Electric - Alt US 60/Texas St. to US 460/E.Main	0	0.0	12.0	523	523	44	0	0	0.6	5.24	E	Very Low
419/Electric - US 460/E.Main to RCL (0.88)	0	0.0	12.0	385	385	54	0	0	0.6	5.26	E	Very Low
419/Electric - RCL to I-81	0	0.0	12.0	385	385	54	0	0	0.6	5.26	E	Very Low
419/Electric - I-81 to 311/Catawba Valley Dr.	0	0.0	12.0	275	275	54	0	0	0.5	4.90	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Route 419/Electric Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
419/Electric Rd.	Franklin Road	Roanoke County line	0.70	W	4	D	52000	1	35	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.45**	**D**
419/Electric Rd.	Roanoke County line	Starkey Road	0.77	W	4	D	52000	1	35	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.45**	**D**
419/Electric Rd.	Starkey Road	Brambleton/US 221	1.44	W	4	D	29000	1	45	19.0	7.0	0.0	0	0	N	4.0	3.0	**1.63**	**B**
419/Electric Rd.	Brambleton	Salem City line	3.16	W	4	D	36000	1	45	19.0	7.0	0.0	0	0	N	4.0	3.0	**1.74**	**B**
419/Electric Rd.	Salem City line	Apperson/US 11	0.69	W	4	D	33000	1	45	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.36**	**D**
419/Electric Rd.	Apperson/US 11	Roanoke Blvd.	0.58	W	4	D	29000	1	35	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.15**	**D**
419/Electric Rd.	Roanoke Blvd.	Alt US 60/Texas Street	0.89	W	4	D	20000	3	35	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.35**	**D**
419/Electric Rd.	Alt US 60/Texas Street	US 460/E.Main	0.53	W	4	D	19000	4	35	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.54**	**E**
419/Electric Rd.	to US 460/E.Main	RCL	0.88	W	4	D	14000	4	45	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.61**	**E**
419/Electric Rd.	RCL	I-81	0.96	W	4	D	14000	4	45	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.61**	**E**
419/Electric Rd.	I-81	311/Catawba Valley Drive	0.57	W	4	D	10000	4	45	12.0	0.0	0.0	0	0	N	4.0	3.0	**4.44**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
US 460 (Wildwood Road to 4th Street, Salem)

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
SR 112 to ALT US 460, 4th St. (1.31)	2	12.5	0	0	N	35	35	25000	2.00	25.00	N	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
US 460 (Wildwood Road to 4th Street, Salem)

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
SR 112 to ALT US 460, 4th St. (1.31)	0	0.0	12.5	688	688	35	0	0	0.6	5.25	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
US 460 (Wildwood Road to 4th Street, Salem)

							Traffic Data						Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	From	To	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
460	SR112	ALT US 460, 4th St.	1.31	W	4	U	25,000	2	35	12.5	0.0	0.0	0	0	N	5.0	0.0	**3.89**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Route 629

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
629 - 1408 to Douthat State Park	1	11	0	0	y	35	44	1400	4.00	3.00	N	0.00	0.00
629 - Douthat State Park to Bath County Line	1	11	0	0	y	25	34	370	4.00	3.00	N	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Route 629

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
629 - 1408 to Douthat State Park	0	0.0	11.0	77	0	44	0	1	0.5	3.93	D	Moderately Low
629 - Douthat State Park to Bath CoLine	0	0.0	11.0	20	0	34	0	1	0.4	3.36	C	Moderately High

Table
Bicycle Level of Service (BLOS) Calculations
Route 629

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Traffic Data: Lanes (L) Th #	Con.	(ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
629	1408	Douthat SP		E/W	2	U	1400	4	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**2.60**	**C**
629	Douthat SP	Bath County Line		E/W	2	U	370	4	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**1.34**	**A**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Route 779

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
779 - 311 to 600	1	10	0	0	y	35	44	700	0.00	2.00	n	0.00	0.00
779 - 600 to Botetourt County Line	1	10	0	0	y	35	44	230	0.00	2.00	n	0.00	0.00
779 - Botetourt County Line to 600	1	10	0	0	y	45	54	500	12.00	5.00	n	0.00	0.00
779 - 600 to 672	1	10	0	0	y	45	54	2500	12.00	5.00	n	0.00	0.00
779 - 672 to 675	1	10	0	0	y	45	54	4800	12.00	5.00	n	0.00	0.00
779 - 675 to US 220	1	10	0	0	y	45	54	6000	12.00	5.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Route 779

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
779 - 311 to 600	0	0.0	10.0	39	0	44	0	1	0	3.50	D	Moderately Low
779 - 600 to Botetourt County Line	0	0.0	10.0	13	0	44	0	1	0	3.45	D	Moderately Low
779 - Botetourt County Line to 600	0	0.0	10.0	28	0	54	0	1	0.5	4.33	D	Moderately Low
779 - 600 to 672	0	0.0	10.0	138	0	54	0	1	0.6	4.65	E	Very Low
779 - 672 to 675	0	0.0	10.0	264	0	54	0	1	0.6	4.90	E	Very Low
779 - 675 to US 220	0	0.0	10.0	330	0	54	0	1	0.6	5.04	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Route 779

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Traffic Data: Lanes (L) Th #	Lanes (L) Con.	(ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
779	311	600		E	1	U	700	0.00	35	10.0	0.0	0.0	0	0	n	4.0	0.0	**2.63**	**C**
779	600	Botetourt County Line		E	1	U	230	0.00	35	10.0	0.0	0.0	0	0	n	4.0	0.0	**2.02**	**B**
779	Botetourt County Line	600		E	1	U	500	12.00	45	10.0	0.0	0.0	0	0	n	4.0	0.0	**6.13**	**F**
779	600	772		E	1	U	2500	12.00	45	10.0	0.0	0.0	0	0	n	4.0	0.0	**6.94**	**F**
779	772	775		E	1	U	4800	12.00	45	10.0	0.0	0.0	0	0	n	4.0	0.0	**7.28**	**F**
779	775	US 220		E	1	U	6000	12.00	45	10.0	0.0	0.0	0	0	n	4.0	0.0	**7.28**	**F**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Apperson Drive/Route 11

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Apperson/11 - Salem ECL to 419/Electric Rd. (westbound)	1	13.5	0.0	0	n	35	44	14000	0.0	5.0	n	0.0	0.0
Apperson/11 - Salem ECL to 419/Electric Rd. (eastbound)	1	11.0	0.0	0	n	35	44	14000	0.0	2.0	n	0.0	0.0
Apperson/11 - 419/Electric Rd. to Colorado St. (westbound)	1	10.5	0.0	0	y	35	44	20000	0.0	2.0	n	0.0	0.0
Apperson/11 - 419/Electric Rd. to Colorado St. (eastbound)	2	11.0	0.0	0	y	35	44	20000	0.0	2.0	n	0.0	0.0
Apperson/11 - Colorado St. to College Ave.(westbound)	2	15.5	0.0	0	y	25	34	17000	0.0	2.0	n	0.0	0.0
Apperson/11 - Colorado St. to College Ave.(eastbound)	2	14.0	0.0	0	n	25	34	17000	0.0	2.0	n	0.0	0.0
College Ave. - Colorado St. to 4th St. (westbound)	1	20.0	0.0	0	n	25	34	5600	0.0	2.0	n	0.0	0.0
College Ave. - 4th St. to Thompson Memorial (westbound)	1	15.0	0.0	0	n	25	34	1700	0.0	2.0	n	0.0	0.0
Apperson/11 - Thompson Memorial to US 460/Main St.	2	11.0	0.0	0	n	35	40	2700	0.0	2.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Apperson Drive/Route 11

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Apperson/11 - Salem ECL to 419/Electric Rd. (westbound)	0	0.0	13.5	770	0	44	0	0	0.1	4.80	E	Very Low
Apperson/11 - Salem ECL to 419/Electric Rd. (eastbound)	0	0.0	11.0	770	0	44	0	0	0.1	5.18	E	Very Low
Apperson/11 - 419/Electric Rd. to Colorado St. (westbound)	0	0.0	10.5	1100	0	44	0	1	0.1	5.65	F	Extremely Low
Apperson/11 - 419/Electric Rd. to Colorado St. (eastbound)	0	0.0	11.0	550	550	44	0	1	0.1	4.69	E	Very Low
Apperson/11 - Colorado St. to College Ave.(westbound)	0	0.0	15.5	468	468	34	0	1	0.1	3.46	D	Moderately Low
Apperson/11 - Colorado St. to College Ave.(eastbound)	0	0.0	14.0	468	468	34	0	0	0.1	3.95	D	Moderately Low
College Ave. - Colorado St. to 4th St. (westbound)	0	0.0	20.0	308	0	34	0	0	0.1	2.54	C	Moderately High
College Ave. - 4th St. to Thompson Memorial (westbound)	0	0.0	15.0	94	0	34	0	0	0	2.77	C	Moderately High
Apperson/11 - Thompson Memorial to US 460/Main St.	0	0.0	11.0	74	74	40	0	0	0.1	3.68	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Apperson Drive/Route 11

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Traffic Data: Lanes (L) Th #	Lanes (L) Con.	(ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
11/Apperson Dr.	ECL	419/Electric Rd.	1.04	W	2	U	14000	0	35	13.5	0.0	0.0	0	0	N	4.0	0.0	**3.62**	**D**
11/Apperson Dr.	ECL	419/Electric Rd.		E	2	U	14000	0	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**3.93**	**D**
11/Apperson Dr.	419/Electric Rd.	Colorado St.	0.98	W	3	U	20000	0	35	10.5	0.0	0.0	0	0	N	4.0	0.0	**3.81**	**D**
11/Apperson Dr.	419/Electric Rd.	Colorado St.		E	3	U	20000	0	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**3.76**	**D**
11/Apperson Dr.	Colorado St.	College Ave.	0.51	W	4	D	17000	0	25	15.5	0.0	0.0	0	0	N	4.0	0.0	**2.83**	**C**
11/Apperson Dr.	Colorado St.	College Ave.		E	4	D	17000	0	25	14.0	0.0	0.0	0	0	N	4.0	0.0	**3.05**	**C**
College Ave.	Colorado St.	4th St.	0.48	W/E	2	U	5600	0	25	27.0	0.0	7.0	40	40	N	4.0	0.0	**1.17**	**A**
College Ave.	4th St.	SR 311/Thompson Mem.		W/E	2	U	2700	0	25	22.0	0.0	7.0	40	40	N	4.0	0.0	**0.39**	**A**
11/Apperson Dr.	SR 311, Thompson Mem.	US 460/Main St.	0.26	W/E	4	D	2700	0	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**1.78**	**B**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Blue Ridge Parkway

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Blue Ridge Parkway (48) - Floyd County Line to US 220	1	11	0	0	y	45	50	1000	0.00	0.00	n	0.00	0.00
Blue Ridge Parkway (48) - US 220 to SR 24	1	11	0	0	y	45	50	1000	0.00	0.00	n	0.00	0.00
Blue Ridge Parkway (48) - SR 24 to Botetourt County Line	1	11	0	0	y	45	50	1200	0.00	0.00	n	0.00	0.00
Blue Ridge Parkway (48) - Botetourt County Line to US 221, US 460	1	11	0	0	y	45	50	1200	0.00	0.00	n	0.00	0.00
Blue Ridge Parkway (48) - US 221, US 460 to Bedford County Line	1	11	0	0	y	45	50	1200	0.00	0.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Blue Ridge Parkway

Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Blue Ridge Parkway (48) - Floyd County Line to US 220	0	0.0	11.0	55	0	50	0	1	0	3.59	D	Moderately Low
Blue Ridge Parkway (48) - US 220 to SR 24	0	0.0	11.0	55	0	50	0	1	0	3.59	D	Moderately Low
Blue Ridge Parkway (48) - SR 24 to Botetourt County Line	0	0.0	11.0	66	0	50	0	1	0	3.62	D	Moderately Low
Blue Ridge Parkway (48) - Botetourt County Line to US 221, US 460	0	0.0	11.0	66	0	50	0	1	0	3.62	D	Moderately Low
Blue Ridge Parkway (48) - US 221, US 460 to Bedford County Line	0	0.0	11.0	66	0	50	0	1	0	3.62	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Blue Ridge Parkway

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Traffic Data: Lanes (L) Th #	Con.	(ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
Blue Ridge Parkway	Floyd County Line	US 220		N	2	U	1,000	0	45	11.0	0.0	0.0	0	0	n	4.0	0.0	**1.56**	**B**
Blue Ridge Parkway	US 220	SR 24		N	2	U	1,000	0	45	11.0	0.0	0.0	0	0	n	4.0	0.0	**1.56**	**B**
Blue Ridge Parkway	SR 24	Botetourt County Line		N	2	U	1,200	0	45	11.0	0.0	0.0	0	0	n	4.0	0.0	**1.77**	**B**
Blue Ridge Parkway	Botetourt County Line	US 221, US 460		N	2	U	1,200	0	45	11.0	0.0	0.0	0	0	n	4.0	0.0	**1.77**	**B**
Blue Ridge Parkway	US 221, US 460	Bedford County Line		N	2	U	1,200	0	45	11.0	0.0	0.0	0	0	n	4.0	0.0	**1.77**	**B**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
221/Brambleton Avenue

Data Entry														
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**	
Brambleton - Ran Lyn to Crystal Dr.	1	11.0	0.0	0.0	y	45	54	12000	2.0	5.0	n	0.0	0.0	
Brambleton - Crystal Dr. to 419/Electric Rd.	2	12.0	0.0	0.0	n	45	54	22000	2.0	10.0	n	0.0	0.0	
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (northbound)	2	11.5	0.0	0.0	n	35	44	13000	1.0	10.0	n	0.0	0.0	
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (southbound)	2	12.5	0.0	0.0	n	35	44	13000	1.0	10.0	n	0.0	0.0	
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(northbound)	1	13	0.0	1.5	n	30	39	8900	1.0	2.0	n	0.0	0.0	
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(southbound)	1	11	0.0	3.5	y	30	39	8900	1.0	2.0	n	0.0	0.0	
Brambleton - Woodlawn Dr.to Montgomery Dr. (northbound)	1	20	0.0	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0	
Brambleton - Woodlawn Dr. to Montgomery Dr.(southbound)	1	12	0.0	7.5	y	35	44	8900	1.0	2.0	n	0.0	0.0	
Brambleton - Montgomery to Overland Dr. (northbound)	1	12	0.0	0.0	y	30	39	8900	1.0	2.0	n	0.0	0.0	
Brambleton - Montgomery to Overland Dr. (southbound)	1	13	0.0	0.0	y	30	39	8900	1.0	2.0	n	0.0	0.0	
Brambleton - Overland Dr. to Brandon Dr.	1	11.5	0.0	0.0	y	35	44	8500	1.0	2.0	n	0.0	0.0	
Design Alternatives														
Brambleton - Woodlawn to Montgomery (northbound)	1	20	0.0	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0	
Alternative A: 16 ft. curb lane, 4 ft. paved shoulder	1	16	0.0	4.0	y	35	44	8900	1.0	2.0	n	0.0	0.0	

Alternative B: 16 ft. curb lane, 4 ft. bike lane	1	16	4.0	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0
Alternative C: 15 ft. curb lane, 5 ft. bike lane	1	15	5.0	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0
Brambleton - Woodlawn to Montgomery (southbound)	1	12	0.0	7.5	y	35	44	8900	1.0	2.0	n	0.0	0.0
Alternative A: 12 ft. curb lane, 7.5 ft. bike lane	1	12	7.5	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0
Alternative B: 13 ft. curb lane, 6.5 ft. bike lane	1	13	6.5	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0
Alternative C: 14 ft. curb lane, 5.5 ft. bike lane	1	14	5.5	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0
Alternative D: 15 ft. curb lane, 4.5 ft. bike lane	1	15	4.5	0.0	y	35	44	8900	1.0	2.0	n	0.0	0.0
Brambleton - 419/Electric Road to WCL/Wedgewood Dr.	2	12.5	0.0	0.0	n	35	44	13000	1.0	10.0	n	0.0	0.0
Alternative A: 15 ft. curb lane	2	15.0	0.0	0.0	n	35	44	13000	1.0	10.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
221/Brambleton Avenue

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables								Results			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Brambleton - Ran Lyn to Crystal Dr.	0	0.0	11.0	660	0	54	0	1	0.6	5.54	F	Extremely Low
Brambleton - Crystal Dr. to 419/Electric Rd.	0	0.0	12.0	605	605	54	0	0	0.6	5.79	F	Extremely Low
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (northbound)	0	0.0	11.5	358	358	44	0	0	0.6	4.92	E	Very Low
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (southbound)	0	0.0	12.5	358	358	44	0	0	0.6	4.77	E	Very Low
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(northbound)	1	1.5	13.0	490	0	39	0	0	0.6	3.48	D	Moderately Low
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(southbound)	1	3.5	11.0	490	0	39	0	1	0.6	3.27	C	Moderately High
Brambleton - Woodlawn Dr.to Montgomery Dr. (northbound)	0	0.0	20.0	490	0	44	0	1	0.6	3.49	D	Moderately Low
Brambleton - Woodlawn Dr. to Montgomery Dr.(southbound)	1	7.5	12.0	490	0	44	0	1	0.6	2.80	C	Moderately High
Brambleton - Montgomery to Overland Dr. (northbound)	0	0.0	12.0	490	0	39	0	1	0.6	4.53	E	Very Low

Brambleton - Montgomery to Overland Dr. (southbound)	0	0.0	13.0	490	0	39	0	1	0.6	4.37	D	Moderately Low
Brambleton - Overland Dr. to Brandon Dr.	0	0.0	11.5	468	0	44	0	1	0.6	4.73	E	Very Low
0	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
0	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Design Alternatives	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Brambleton - Woodlawn to Montgomery (northbound)	0	0.0	20.0	490	0	44	0	1	0.6	3.49	D	Moderately Low
Alternative A: 16 ft. curb lane, 4 ft. paved shoulder	1	4.0	16.0	490	0	44	0	1	0.6	2.63	C	Moderately High
Alternative B: 16 ft. curb lane, 4 ft. bike lane	1	4.0	16.0	490	0	44	0	1	0.6	2.63	C	Moderately High
Alternative C: 15 ft. curb lane, 5 ft. bike lane	1	5.0	15.0	490	0	44	0	1	0.6	2.65	C	Moderately High
Brambleton - Woodlawn to Montgomery (southbound)	1	7.5	12.0	490	0	44	0	1	0.6	2.80	C	Moderately High
Alternative A: 12 ft. curb lane, 7.5 ft. bike lane	1	7.5	12.0	490	0	44	0	1	0.6	2.80	C	Moderately High
Alternative B: 13 ft. curb lane, 6.5 ft. bike lane	1	6.5	13.0	490	0	44	0	1	0.6	2.77	C	Moderately High
Alternative C: 14 ft. curb lane, 5.5 ft. bike lane	1	5.5	14.0	490	0	44	0	1	0.6	2.74	C	Moderately High
Alternative D: 15 ft. curb lane, 4.5 ft. bike lane	1	4.5	15.0	490	0	44	0	1	0.6	2.72	C	Moderately High
Brambleton - 419/Electric Road to WCL/Wedgewood Dr.	0	0.0	12.5	358	358	44	0	0	0.6	4.77	E	Very Low
Alternative A: 15 ft. curb lane	0	0.0	15.0	358	358	44	0	0	0.6	4.39	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Brambleton Avenue/Route 221

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle Grade (A..F)
Brambleton Ave.	Ran Lynn	Crystal Creek Dr		N/S	2	U	12000	2	45	11.0	0.0	0.0	0	0	N	4.0	0.0	**6.00**	**F**
Brambleton Ave.	Crystal Creek Rd.	419/Electric		N/S	4	S	22000	2	45	12.0	0.0	0.0	0	0	N	4.0	0.0	**5.84**	**F**
Brambleton Ave.	419/Electric	WCL (Wedgewood Dr.)		N	4	S	13000	1	35	11.5	0.0	0.0	0	0	N	4.0	0.0	**4.93**	**E**
Brambleton Ave.	419/Electric	WCL (Wedgewood Dr.)		S	4	S	13000	1	35	12.5	0.0	0.0	0	0	N	4.0	0.0	**4.81**	**E**
Brambleton Ave.	WCL (Wedgewood Dr.)	Woodlawn		N	4	S	13000	1	35	14.5	1.0	0.0	0	0	N	4.0	2.0	**4.64**	**E**
Brambleton Ave.	WCL (Wedgewood Dr.)	Woodlawn		S	4	S	13000	1	35	14.5	3.5	0.0	0	0	N	4.0	2.0	**4.30**	**D**
Brambleton Ave.	Woodlawn	Montgomery		N	2	U	8,900	1	35	20.0	0.0	0.0	0	0	N	4.0	2.0	**2.80**	**C**
Brambleton Ave.	Woodlawn	Montgomery		S	2	U	8,900	1	30	20.0	7.5	0.0	0	0	N	4.0	4.0	**0.58**	**A**
Brambleton	Montgomery	Overland Dr.		N	2	U	8,500	1	35	11.5	0.0	0.0	0	0	N	4.0	0.0	**3.78**	**D**
Brambleton	Montgomery	Overland Dr.		S	2	U	8,501	1	35	12.5	0.0	0.0	0	0	N	4.0	0.0	**3.66**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Buck Mountain Road

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Buck Mountain Rd. (679) - Starkey Rd. to 1960	1	10.0	0.0	0.0	y	35	44	5800	5	2.0	n	0.0	0.0
Buck Mountain Rd. (679) - 1960 to 917	1	10.0	0.0	0.0	y	35	44	5000	5	3.0	n	0.0	0.0
Buck Mountain Rd. (679) - 917 to Blue Ridge Parkway	1	10.0	0.0	0.0	y	45	54	4600	5	4.0	n	0.0	0.0
Buck Mountain Rd. (679) - Starkey Rd. to 1963	1	10.5	0.0	0.0	y	45	54	4700	5	5.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Buck Mountain Road

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Buck Mountain Rd. (679) - Starkey Rd. to 1960	0	0.0	10.0	319	0	44	0	1	0.6	4.66	E	Very Low
Buck Mountain Rd. (679) - 1960 to 917	0	0.0	10.0	275	0	44	0	1	0.6	4.58	E	Very Low
Buck Mountain Rd. (679) - 917 to Blue Ridge Parkway	0	0.0	10.0	253	0	54	0	1	0.6	4.88	E	Very Low
Buck Mountain Rd. (679) - Starkey Rd. to 1963	0	0.0	10.5	259	0	54	0	1	0.6	4.82	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Buck Mountain Road

Route Name	From	To	Dir. of Sur.	Lanes (L) Th #	Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
Buck Mountain Rd. (679)	Starkey Rd. (904)	1960	W	2	U	5,800	5	35	10.0	0.0	0.0	0	0	N	4.0	0.0	**4.59**	E
Buck Mountain Rd. (679)	1960	917	W	2	U	5,000	5	35	10.0	0.0	0.0	0	0	N	4.0	0.0	**4.62**	E
Buck Mountain Rd. (679)	917	Blue Ridge Parkway	W	2	U	4,600	5	35	10.0	0.0	0.0	0	0	N	4.0	0.0	**4.58**	E
Buck Mountain Rd. (679)	Blue Ridge Parkway	US 220	W	2	U	4,700	5	35	10.0	0.0	0.0	0	0	N	4.0	0.0	**4.59**	E

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Colonial Avenue

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Colonial (8001) - Brandon to Wonju	2	13.5	0.0	0.0	n	30	39	8000	0.00	15.00	n	0.00	0
Colonial (8001) - Wonju to Persinger	1	22.0	0.0	0.0	y	30	39	10000	0.00	2.00	n	0.00	0
Colonial (8001) - Persinger to Overland Dr. (eastbound)	1	11.0	0.0	0.0	y	30	39	12000	0.00	5.00	n	0.00	0
Colonial (8001) - Persinger to Overland Dr. (westbound)	1	24.0	0.0	0.0	y	35	44	12000	0.00	5.00	n	0.00	0
Colonial (8001) - Overland Dr. to Dogwood (westbound)	1	11.0	0.0	0.0	n	35	44	12000	0.00	2.00	n	0.00	0
Colonial (8001) - Overland Dr. to Dogwood (eastbound)	1	15.5	0.0	0.0	n	35	44	12000	0.00	2.00	n	0.00	0
Colonial (8001) - Dogwood to to WCL	1	10.5	0.0	0.0	y	35	44	12000	0.00	2.00	n	0.00	0
Colonial (8001) - WCL to 419/Electric Rd.	1	10.0	0.0	0.0	y	35	44	9600	0.00	2.00	n	0.00	0
Colonial (8001) - 419/Electric Rd. to Penn Forest	1	10.0	0.0	0.0	y	30	39	7200	0.00	2.00	n	0.00	0
Design Alternatives													
Colonial (8001) - Wonju to Persinger	1	22.0	0.0	0.0	y	30	39	10000	0.00	2.00	n	0.00	0
Alternative A: 18 ft. curb lane, 4 ft. bike lane	1	18.0	4.0	0.0	y	30	39	10000	0.00	2.00	n	0.00	0
Colonial (8001) - Dogwood to WCL	1	10.5	0.0	0.0	y	35	44	12000	0.00	2.00	n	0.00	0
Alternative A: 10 ft. curb lane, 4 ft. bike lane	1	10.5	4.0	0.0	y	35	44	12000	0.00	2.00	n	0.00	0
Alternative B: 10 ft. curb lane, 2 ft. shoulder	1	10.5	0.0	2.0	y	35	44	12000	0.00	2.00	n	0.00	0
Alternative C: 10 ft. curb lane, 3 ft. shoulder	1	10.5	0.0	3.0	y	35	44	12000	0.00	2.00	n	0.00	0
Alternative D: 10 ft. curb lane, 4 ft. shoulder	1	10.5	0.0	4.0	y	35	44	12000	0.00	2.00	n	0.00	0
Colonial (8001) - WCL to 419	1	10.0	0.0	0.0	y	35	44	9600	0.00	2.00	n	0.00	0
Alternative A: 10 ft. curb lane, 4 ft. bike lane	1	10.0	4.0	0.0	y	35	44	9600	0.00	2.00	n	0.00	0
Alternative B: 10 ft. curb lane, 2 ft. shoulder	1	10.0	0.0	2.0	y	35	44	9600	0.00	2.00	n	0.00	0
Alternative C: 10 ft. curb lane, 3 ft. shoulder	1	10.0	0.0	3.0	y	35	44	9600	0.00	2.00	n	0.00	0

Alternative D: 10 ft. curb lane, 4 ft. shoulder	1	10.0	0.0	4.0	y	35	44	9600	0.00	2.00	n	0.00	0
Alternative D: 10 ft. curb lane	1	12.0	0.0	0.0	y	35	44	9600	0.00	2.00	n	0.00	0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Colonial Avenue

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Colonial (8001) - Brandon to Wonju	0	0.0	13.5	220	220	39	0	0	0.1	3.61	D	Moderately Low
Colonial (8001) - Wonju to Persinger	0	0.0	22.0	550	0	39	0	1	0.1	2.63	C	Moderately High
Colonial (8001) - Persinger to Overland Dr. (eastbound)	0	0.0	11.0	660	0	39	0	1	0.1	4.52	E	Very Low
Colonial (8001) - Persinger to Overland Dr. (westbound)	0	0.0	24.0	660	0	44	0	1	0.1	2.72	C	Moderately High
Colonial (8001) - Overland Dr. to Dogwood (westbound)	0	0.0	11.0	660	0	44	0	0	0.1	4.96	E	Very Low
Colonial (8001) - Overland Dr. to Dogwood (eastbound)	0	0.0	15.5	660	0	44	0	0	0.1	4.27	D	Moderately Low
Colonial (8001) - Dogwood to to WCL	0	0.0	10.5	660	0	44	0	1	0.1	4.77	E	Very Low
Colonial (8001) - WCL to 419/Electric Rd.	0	0.0	10.0	528	0	44	0	1	0.1	4.58	E	Very Low
Colonial (8001) - 419/Electric Rd. to Penn Forest	0	0.0	10.0	396	0	39	0	1	0.1	4.14	D	Moderately Low
Design Alternatives	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Colonial (8001) - Wonju to Persinger	0	0.0	22.0	550	0	39	0	1	0.1	2.63	C	Moderately High
Alternative A: 18 ft. curb lane, 4 ft. bike lane	1	4.0	18.0	550	0	39	0	1	0.1	1.77	B	Very High
Colonial (8001) - Dogwood to WCL	0	0.0	10.5	660	0	44	0	1	0.1	4.77	E	Very Low
Alternative A: 10 ft. curb lane, 4 ft. bike lane	1	4.0	10.5	660	0	44	0	1	0.1	3.30	C	Moderately High
Alternative B: 10 ft. curb lane, 2 ft. shoulder	1	2.0	10.5	660	0	44	0	1	0.1	3.55	D	Moderately Low

Alternative C: 10 ft. curb lane, 3 ft. shoulder	1	3.0	10.5	660	0	44	0	1	0.1	3.43	D	Moderately Low
Alternative D: 10 ft. curb lane, 4 ft. shoulder	1	4.0	10.5	660	0	44	0	1	0.1	3.30	C	Moderately High
Colonial (8001) - WCL to 419	0	0.0	10.0	528	0	44	0	1	0.1	4.58	E	Very Low
Alternative A: 10 ft. curb lane, 4 ft. bike lane	1	4.0	10.0	528	0	44	0	1	0.1	3.12	C	Moderately High
Alternative B: 10 ft. curb lane, 2 ft. shoulder	1	2.0	10.0	528	0	44	0	1	0.1	3.37	C	Moderately High
Alternative C: 10 ft. curb lane, 3 ft. shoulder	1	3.0	10.0	528	0	44	0	1	0.1	3.24	C	Moderately High
Alternative D: 10 ft. curb lane, 4 ft. shoulder	1	4.0	10.0	528	0	44	0	1	0.1	3.12	C	Moderately High
Alternative D: 10 ft. curb lane	0	0.0	12.0	528	0	44	0	1	0.1	4.28	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Colonial Avenue

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Colonial (8001)	Brandon	Wonju		E/W	2	U	8000	0	30	13.5	0.0	0.0	0	0	N	4.0	0.0	**3.25**	C
Colonial (8001)	Wonju	Persinger Road		E	2	U	8000	0	30	22.0	0.0	0.0	0	0	N	4.0	0.0	**1.74**	B
Colonial (8001)	Wonju	Persinger Road		W	2	U	8000	0	30	22.0	0.0	0.0	0	0	N	4.0	0.0	**1.74**	B
Colonial (8001)	Persinger	Overland Drive		E	2	U	12000	0	30	24.0	0.0	0.0	0	0	N	4.0	0.0	**1.49**	A
Colonial (8001)	Persinger	Overland Drive		W	2	U	12000	0	30	11.0	0.0	0.0	0	0	N	4.0	0.0	**3.76**	D
Colonial (8001)	Overland	Dogwood		E	2	U	12000	0	35	15.5	0.0	0.0	0	0	N	4.0	0.0	**3.25**	C
Colonial (8001)	Overland	Dogwood		W	2	U	12000	0	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**3.85**	D
Colonial (8001)	Dogwood	WCL		E/W	2	U	12000	0	35	10.5	0.0	0.0	0	0	N	4.0	0.0	**3.90**	D
Colonial (720)	WCL	419 Electric Rd.		E/W	2	U	12000	0	35	10.0	0.0	0.0	0	0	N	4.0	0.0	**3.96**	D
Colonial (720)	419	Penn Forest Blvd.		E/W	2	U	7200	0	30	10.0	0.0	0.0	0	0	N	4.0	0.0	**3.60**	D

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Cotton Hill Road

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Developme nt (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AAD T	Large Truck % (HV)	Righ t Turn % (R)	Parkin g Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Cotton Hill (688) - Merriman Rd. to Shingle Ridge Rd. (northbound)	1	9.5	0.0	0.0	y	35	44	810	1.0	15.0	n	0.0	0.0
Cotton Hill (688) - Merriman Rd. to Shingle Ridge Rd. (southbound)	1	8.5	0.0	0.0	y	35	44	810	1.0	15.0	n	0.0	0.0
Cotton Hill (688) - Shingle Ridge Rd. to 889 (northbound)	1	9.0	0.0	0.0	y	35	44	1000	1.0	15.0	n	0.0	0.0
Cotton Hill (688) - Shingle Ridge Rd. to 889 (southbound)	1	8.5	0.0	0.0	y	35	44	1000	1.0	15.0	n	0.0	0.0
Cotton Hill (688) - 888 to US 221	1	9.0	0.0	0.0	y	35	44	2300	1.0	15.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Cotton Hill Road

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Cotton Hill (688) - Merriman Rd. to Shingle Ridge Rd. (northbound)	0	0.0	9.5	45	0	44	0	1	0.4	3.99	D	Moderately Low
Cotton Hill (688) - Merriman Rd. to Shingle Ridge Rd. (southbound)	0	0.0	8.5	45	0	44	0	1	0.4	4.14	D	Moderately Low
Cotton Hill (688) - Shingle Ridge Rd. to 889 (northbound)	0	0.0	9.0	55	0	44	0	1	0.4	4.09	D	Moderately Low
Cotton Hill (688) - Shingle Ridge Rd. to 889 (southbound)	0	0.0	8.5	55	0	44	0	1	0.4	4.16	D	Moderately Low
Cotton Hill (688) - 888 to US 221	0	0.0	9.0	127	0	44	0	1	0.6	4.43	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Cotton Hill Road

					Traffic Data								Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond		LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	From	To	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
Cotton Hill (688)	Merriman rd. (613)	Shingle Ridge Rd. (934)		N	2	U	810	1	40	9.5	0.0	0.0	0	0	N	4.0	0.0	**1.97**	**B**
Cotton Hill (688)	Merriman rd. (613)	Shingle Ridge Rd. (934)		S	2	U	811	1	40	8.5	0.0	0.0	0	0	N	4.0	0.0	**2.26**	**B**
Cotton Hill (688)	Shingle Ridge Rd. (934)	888		N	2	U	1,000	1	40	9.0	0.0	0.0	0	0	N	4.0	0.0	**2.30**	**B**
Cotton Hill (688)	Shingle Ridge Rd. (934)	888		S	2	U	1,000	1	40	8.5	0.0	0.0	0	0	N	4.0	0.0	**2.44**	**B**
Cotton Hill (688)	888	US 221		N/S	2	U	2,300	1	40	9.0	0.0	0.0	0	0	N	4.0	0.0	**3.15**	**C**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Franklin Road

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
Franklin Rd. - US 220 to Penarth Rd. (northbound)	2	11.5	0.0	0.0	n	35	44	2300	1.0	5.0	n	0.0	0.0
Franklin Rd. - US 220 to Penarth Rd. (southbound)	2	11.0	0.0	9.0	n	35	44	23000	1.0	5.0	n	0.0	0.0
Franklin Rd. - Penarth Rd. to US 220/Roy Weber Expressway (northbound)	2	13.0	0.0	0.0	n	35	44	15000	1.0	5.0	n	0.0	0.0
Franklin Rd. - Penarth Rd. to US 220/Roy Weber Expressway (southbound)	2	13.0	0.0	0.0	n	35	44	15000	1.0	5.0	n	0.0	0.0
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (northbound)	1	12.5	0.0	0.0	n	25	34	15000	1.0	2.0	n	0.0	0.0
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (southbound)	1	12.0	0.0	0.0	n	25	34	15000	1.0	2.0	n	0.0	0.0
Design Alternatives													
Franklin Rd. - Penarth Rd. to Wiley Drive	2	13.0	0.0	0.0	n	35	44	15000	1.0	5.0	n	0.0	0.0
Alternative A: 16-ft. curb lane	2	16.0	0.0	0.0	n	35	44	15000	1.0	5.0	n	0.0	0.0
Alternative B: 12-ft. curb lane, 4-ft bike lane	2	12.0	4.0	0.0	n	35	44	15000	1.0	5.0	n	0.0	0.0
Alternaitve C: 12-ft. curb lane, 4 ft paved shoulder	2	12.0	0.0	4.0	n	35	44	15000	1.0	5.0	n	0.0	0.0
Alternative D: 11-ft. curb lane, 5 ft bike lane	2	11.0	5.0	0.0	n	35	44	15000	1.0	5.0	n	0.0	0.0
Alternative E: 10-ft. curb lane, 6 ft bike lane	2	10.0	6.0	0.0	n	35	44	15000	1.0	5.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Franklin Road

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Franklin Rd. - US 220 to Penarth Rd. (northbound)	0	0.0	11.5	63	63	44	0	0	0.6	4.21	D	Moderately Low
Franklin Rd. - US 220 to Penarth Rd. (southbound)	1	9.0	11.0	633	633	44	0	0	0.6	3.57	D	Moderately Low
Franklin Rd. - Penarth Rd. to US 220/Roy Weber Expressway (northbound)	0	0.0	13.0	413	413	44	0	0	0.6	4.82	E	Very Low
Franklin Rd. - Penarth Rd. to US 220/Roy Weber Expressway (southbound)	0	0.0	13.0	413	413	44	0	0	0.6	4.82	E	Very Low
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (northbound)	0	0.0	12.5	825	0	34	0	0	0.6	5.21	E	Very Low
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (southbound)	0	0.0	12.0	825	0	34	0	0	0.6	5.29	E	Very Low
Design Alternatives	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Franklin Rd. - Penarth Rd. to Wiley Drive	0	0.0	13.0	413	413	44	0	0	0.6	4.82	E	Very Low
Alternative A: 16-ft. curb lane	0	0.0	16.0	413	413	44	0	0	0.6	4.37	D	Moderately Low
Alternative B: 12-ft. curb lane, 4-ft bike lane	1	4.0	12.0	413	413	44	0	0	0.6	3.51	D	Moderately Low
Alternaitve C: 12-ft. curb lane, 4 ft paved shoulder	1	4.0	12.0	413	413	44	0	0	0.6	3.51	D	Moderately Low
Alternative D: 11-ft. curb lane, 5 ft bike lane	1	5.0	11.0	413	413	44	0	0	0.6	3.54	D	Moderately Low
Alternative E: 10-ft. curb lane, 6 ft bike lane	1	6.0	10.0	413	413	44	0	0	0.6	3.56	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Franklin Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W	Rumb Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Franklin Rd.	US 220	Penarth Rd.		S	4	D	23000	1	35	20.0	0.0	0.0	0	0	N	4.0	0.0	**2.60**	**C**
Franklin Rd.	US 220	Penarth Rd.		N	4	D	23000	1	35	11.5	0.0	0.0	0	0	N	4.0	0.0	**3.94**	**D**
Franklin Rd.	Penarth Rd.	US 220 Roy Weber Exp.		S/N	4	D	15000	1	35	13.0	0.0	0.0	0	0	N	4.0	0.0	**3.54**	**D**
Franklin Rd.	US 220 Roy Weber Exp.	Elm Ave.		S	4	D	15000	1	25	12.0	0.0	0.0	0	0	N	4.0	0.0	**3.37**	**C**
Franklin Rd.	US 220 Roy Weber Exp.	Elm Ave.		N	4	D	15000	1	25	12.5	0.0	0.0	0	0	N	4.0	0.0	**3.30**	**C**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Garst Mill Road

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
Garst Mill Road (682) - US 221 S to Crest Hill Dr.	1	11	0	0	y	35	44	11000	2.00	3.00	n	0.00	0.00
Garst Mill Road (682) - Crest Hill Dr.to 1361	1	11	0	0	y	35	44	8100	2.00	3.00	n	0.00	0.00
Garst Mill Road (682) - SCL Roanoke City	1	11	0	0	y	35	44	6700	2.00	3.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Garst Mill Road

Bicycle Compatibility Index and Level of Service Computations												
Location										**Results**		
(Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**		**CLV**	**OLV**	**SPD**	**PKG**	**AREA**		**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Garst Mill Road (682) - US 221 S to Crest Hill Dr.	0	0.0	11.0	605	0	44	0	1	0.6	5.08	E	Very Low
Garst Mill Road (682) - Crest Hill Dr.to 1361	0	0.0	11.0	446	0	44	0	1	0.6	4.77	E	Very Low
Garst Mill Road (682) - SCL Roanoke City	0	0.0	11.0	369	0	44	0	1	0.6	4.61	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Garst Mill Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
Garst Mill Rd., 682	US 221 S, 1602 W	Crest Hill Dr., 1658	0.24		2	U	11,000	2	35	11.0	0.0	0.0	0	0	n	4.0	0.0	**4.15**	**D**
Garst Mill Rd., 682	Crest Hill Dr., 1658	1361	0.43		2	U	8,100	2	35	11.0	0.0	0.0	0	0	n	4.0	0.0	**4.00**	**D**
Garst Mill Rd., 682	1361	SCL Roanoke	0.77		2	U	6,700	2	35	11.0	0.0	0.0	0	0	n	4.0	0.0	**3.91**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Grandin Road

Data Entry														
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
Grandin (8014) - 419/Electric Rd. to Mudlick (northbound)	1	9.5	0.0	0.0	y	25	34	4700	2.00	2	n	0	0
Grandin (8014) - 419/Electric Rd. to Mudlick (southbound)	1	10.5	0.0	0.0	y	25	34	4700	2.00	2	n	0	0
Grandin (8014) - Mudlick to Guilford (northbound)	1	20.0	0.0	0.0	y	25	34	7000	1.00	2	n	0	0
Grandin (8014) - Mudlick to Guilford (southbound)	1	16.0	0.0	0.0	y	25	34	7000	1.00	2	n	0	0
Grandin (8014) - Guilford to Brandon (northbound)	1	17.0	0.0	0.0	y	25	34	7000	1.00	15	n	0	0
Grandin (8014) - Guilford to Brandon(southbound)	1	17.0	0.0	0.0	y	25	34	7000	1.00	15	n	0	0
Grandin (8014) - Brandon to Memorial (northbound)	1	15.0	0.0	0.0	y	25	34	7000	1.00	10	y	50	120
Grandin (8014) - Brandon to Memorial (southbound)	1	18.0	0.0	0.0	y	25	34	7000	1.00	10	y	50	120

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Grandin Road

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
(Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**		**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Grandin (8014) - 419/Electric Rd. to Mudlick (northbound)	0	0.0	9.5	259	0	34	0	1	0.6	4.27	D	Moderately Low
Grandin (8014) - 419/Electric Rd. to Mudlick (southbound)	0	0.0	10.5	259	0	34	0	1	0.6	4.12	D	Moderately Low
Grandin (8014) - Mudlick to Guilford (northbound)	0	0.0	20.0	385	0	34	0	1	0.6	2.93	C	Moderately High
Grandin (8014) - Mudlick to Guilford (southbound)	0	0.0	16.0	385	0	34	0	1	0.6	3.53	D	Moderately Low
Grandin (8014) - Guilford to Brandon (northbound)	0	0.0	17.0	385	0	34	0	1	0.6	3.38	C	Moderately High
Grandin (8014) - Guilford to Brandon(southbound)	0	0.0	17.0	385	0	34	0	1	0.6	3.38	C	Moderately High
Grandin (8014) - Brandon to Memorial (northbound)	0	0.0	15.0	385	0	34	1	1	0.9	4.49	E	Very Low
Grandin (8014) - Brandon to Memorial (southbound)	0	0.0	18.0	385	0	34	1	1	0.9	4.04	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Grandin Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Con.	(ADT) (vpd)	Traffic Data Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
Grandin (8014)	SR 419	Mudlick Rd.		N	2	U	4,700	2	25	9.5	9.5	0.0	0	0	N	4.0	0.0	**3.63**	**D**
Grandin (8014)	SR 420	Mudlick Rd.		S	2	U	4,700	2	25	10.5	10.5	0.0	0	0	N	4.0	0.0	**3.53**	**D**
Grandin (8014)	Mudlick Rd.	Guilford		N	2	U	7,000	1	25	20.0	20.0	0.0	0	0	N	4.0	0.0	**2.05**	**B**
Grandin (8014)	Mudlick Rd.	Guilford		S	2	U	7,000	1	25	16.0	16.0	0.0	0	0	N	4.0	0.0	**2.77**	**C**
Grandin (8014)	Guilford	Brandon Ave.		N	2	U	7,000	1	25	17.0	17.0	0.0	0	0	N	4.0	0.0	**2.61**	**C**
Grandin (8014)	Guilford	Brandon Ave.		S	2	U	7,000	1	25	17.0	17.0	0.0	0	0	N	4.0	0.0	**2.61**	**C**
Grandin (8014)	Brandon Ave.	Memorial		N	2	U	7,000	1	25	15.0	15.0	0.0	0	0	N	4.0	0.0	**2.93**	**C**
Grandin (8014)	Brandon Ave.	Memorial		S	2	U	7,000	1	25	18.0	11.0	7.0	100	0	N	4.0	0.0	**3.21**	**C**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Hardy Road (bike lane portion)

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Hardy Road (bike lane portion)	2	10.5	4	0	y	35	44	14000	2.00	5.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Hardy Road (bike lane portion)

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables								Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW		OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Hardy Road (bike lane portion)	1	4.0	10.5	385	385	44	0	1	0.6	3.41	C	Moderately High

Table
Bicycle Level of Service (BLOS) Calculations
Hardy Road (bike lane portion)

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Hardy Road	length of bike lane	length of bike lane	0.50	N	4	U	10,000	1	35	15.5	3.0	0.0	0	0	N	4.5	4.5	**0.32**	**A**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Hershberger Road

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulde r Width (ft)**	**Residential Developmen t (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Larg e Truc k % (HV)**	**Right Turn % (R)**	**Parkin g Lane (y/n)**	**Occupa (%)**	
Hersheberger Rd. - Peters Creek to Cove Rd. (eastbound)	1	11.5	0.0	1.0	y	35	44	10000	1.0	2.0	n	0.0	0.0
Hersheberger Rd. - Peters Creek to Cove Rd. (westbound)	1	10.5	0.0	1.0	n	35	44	10000	1.0	2.0	n	0.0	0.0
Hersheberger Rd. - Cove Rd. to I-581 (eastbound)	3	11.5	0.0	0.0	n	35	44	28000	1.0	0.0	n	0.0	0.0
Hersheberger Rd. - Cove Rd. to I-581 (westbound)	3	11.0	0.0	0.0	n	35	44	28000	1.0	0.0	n	0.0	0.0
Hersheberger Rd. - I-581 to Rutgers (eastbound)	3	12.0	0.0	0.0	n	40	49	37000	1.0	5.0	n	0.0	0.0
Hersheberger Rd. - I-581 to Rutgers (westbound)	3	12.0	0.0	0.0	n	40	49	37000	1.0	5.0	n	0.0	0.0
Hersheberger Rd. - Rutgers to Williamson Rd. (eastbound)	3	12.0	0.0	0.0	n	35	44	37000	1.0	5.0	n	0.0	0.0
Hersheberger Rd. - Rutgers to Williamson Rd. (westbound)	3	12.5	0.0	0.0	n	35	44	37000	1.0	5.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Hershberger Road

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Hersheberger Rd. - Peters Creek to Cove Rd. (eastbound)	1	1.0	11.5	550	0	44	0	1	0.6	3.81	D	Moderately Low
Hersheberger Rd. - Peters Creek to Cove Rd. (westbound)	1	1.0	10.5	550	0	44	0	0	0.6	4.22	D	Moderately Low
Hersheberger Rd. - Cove Rd. to I-581 (eastbound)	0	0.0	11.5	513	1027	44	0	0	0.5	5.40	F	Extremely Low
Hersheberger Rd. - Cove Rd. to I-581 (westbound)	0	0.0	11.0	513	1027	44	0	0	0.5	5.48	F	Extremely Low
Hersheberger Rd. - I-581 to Rutgers (eastbound)	0	0.0	12.0	678	1357	49	0	0	0.6	6.06	F	Extremely Low
Hersheberger Rd. - I-581 to Rutgers (westbound)	0	0.0	12.0	678	1357	49	0	0	0.6	6.06	F	Extremely Low
Hersheberger Rd. - Rutgers to Williamson Rd. (eastbound)	0	0.0	12.0	678	1357	44	0	0	0.6	5.89	F	Extremely Low
Hersheberger Rd. - Rutgers to Williamson Rd. (westbound)	0	0.0	12.5	678	1357	44	0	0	0.6	5.81	F	Extremely Low

Table
Bicycle Level of Service (BLOS) Calculations
Hershberger Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Hersheberger Rd.	Peters Creek Rd.	Cove Rd. (116)	1.34	E	2	U	10000	1	35	12.5	1.0	0.0	0	0	N	4.0	0.0	**3.75**	**D**
Hersheberger Rd.	Peters Creek Rd.	Cove Rd. (116)		W	2	U	10000	1	35	11.5	1.0	0.0	0	0	N	4.0	0.0	**3.87**	**D**
Hersheberger Rd.	Cove Rd. (116)	I-581		E	6	D	28000	1	35	11.5	0.0	0.0	0	0	N	4.0	0.0	**3.83**	**D**
Hersheberger Rd.	Cove Rd. (116)	I-581		W	6	D	28000	1	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**3.89**	**D**
Hersheberger Rd.	I-581	Rutgers Rd.		E/W	6	D	37000	1	40	12.0	0.0	0.0	0	0	N	5.0	0.0	**3.83**	**D**
Hersheberger Rd.	Rutgers Rd.	Williamson Rd. (US11)		E	6	D	37000	1	35	12.0	0.0	0.0	0	0	N	4.0	0.0	**3.91**	**D**
Hersheberger Rd.	Rutgers Rd.	Williamson Rd. (US11)		W	6	D	37000	1	35	12.5	0.0	0.0	0	0	N	4.0	0.0	**3.85**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Hollins Road

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Developme nt (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AAD T	Larg e Truc k % (HV)	Right Turn % (R)	Parkin g Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Hollins Rd.(601) - NCL Roanoke SR 115 to Beaumont Rd. (northbound)	1	9.5	0.0	0.0	n	45	54	8100	3.0	5.0	n	0.0	0.0
Hollins Rd.(601) - NCL Roanoke SR 115 to Beaumont Rd. (southbound)	1	10.0	0.0	0.0	n	45	54	8100	3.0	5.0	n	0.0	0.0
Hollins Rd.(601) - Beaumont Rd. to Shadwell Dr. (northbound)	1	10.5	0.0	0.0	y	30	39	6300	3.0	2.0	n	0.0	0.0
Hollins Rd.(601) - Beaumont Rd. to Shadwell Dr. (southbound)	1	9.5	0.0	0.0	y	30	39	6300	3.0	2.0	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Hollins Road

Bicycle Compatibility Index and Level of Service Computations												
	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG			BCI	Level of Service	Bicycle Compatibility Level
Hollins Rd.(601) - NCL Roanoke SR 115 to Beaumont Rd. (northbound)	0	0.0	9.5	446	0	54	0	0	0.6	5.61	F	Extremely Low
Hollins Rd.(601) - NCL Roanoke SR 115 to Beaumont Rd. (southbound)	0	0.0	10.0	446	0	54	0	0	0.6	5.53	F	Extremely Low
Hollins Rd.(601) - Beaumont Rd. to Shadwell Dr. (northbound)	0	0.0	10.5	347	0	39	0	1	0.6	4.47	E	Very Low
Hollins Rd.(601) - Beaumont Rd. to Shadwell Dr. (southbound)	0	0.0	9.5	347	0	39	0	1	0.6	4.62	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Hollins Road

							Traffic Data						Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.					Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	**From**	**To**	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
Hollins Rd.	NCL Roanoke, SR 115	Beaumont Rd (621)		N	2	U	8,100	3	45	9.5	0.0	0.0	0	0	N	4.0	0.0	**4.55**	**E**
Hollins Rd.	NCL Roanoke, SR 115	Beaumont Rd (621)		S	2	U	8,100	3	45	10.0	0.0	0.0	0	0	N	4.0	0.0	**4.51**	**E**
Hollins Rd.	Beaumont Rd (621)	Shadwell Dr.(627)		N	2	U	6,300	3	40	10.5	0.0	0.0	0	0	N	4.0	0.0	**4.24**	**D**
Hollins Rd.	Beaumont Rd (621)	Shadwell Dr.(627)		S	2	U	6,300	3	40	9.5	0.0	0.0	0	0	N	4.0	0.0	**4.34**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Kessler Mill Road

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (northbound)	1	15	0	0	n	35	44	3000	5.00	3.00	n	0.00	0.00
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (southbound)	1	20.5	0	0	n	35	44	3000	5.00	3.00	n	0.00	0.00
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(norththbound)	1	12	0	0	y	35	44	3000	5.00	3.00	n	0.00	0.00
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(southbound)	1	10	0	0	y	35	44	3000	5.00	3.00	n	0.00	0.00
Kessler Mill Rd. - Garst Dr. to 311	1	10	0	0	y	35	44	3000	5.00	3.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Kessler Mill Road

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (northbound)	0	0.0	15.0	165	0	44	0	0	0.6	3.86	D	Moderately Low
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (southbound)	0	0.0	20.5	165	0	44	0	0	0.6	3.02	C	Moderately High
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(norththbound)	0	0.0	12.0	165	0	44	0	1	0.6	4.05	D	Moderately Low
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(southbound)	0	0.0	10.0	165	0	44	0	1	0.6	4.36	D	Moderately Low
Kessler Mill Rd. - Garst Dr. to 311	0	0.0	10.0	165	0	44	0	1	0.6	4.36	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Kessler Mill Road

							Traffic Data						Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	**From**	**To**	**(Mi)**	**Sur.**	**#**		**(vpd)**	**(%)**	**mph**	**(ft)**	**(ft)**	**(ft)**	**(%)**	**(%)**	**(Y/N)**	**(5..1)**	**(5..1)**		**(A..F)**
Kessler Mill Rd.	E. Main St.	Forest Lawn Dr.		N	2		3000	5	35	15	0.0	0.0	0	0	n	4.0	0.0	3.74	D
Kessler Mill Rd.	E. Main St.	Forest Lawn Dr.		S	2		3000	5	35	20.5	0.0	0.0	0	0	n	4.0	0.0	2.76	C
Kessler Mill Rd.	Forest Lawn Dr.	Garst Dr.		N	2		3000	5	35	12	0.0	0.0	0	0	n	4.0	0.0	4.14	D
Kessler Mill Rd.	Forest Lawn Dr.	Garst Dr.		S	2		3000	5	35	10	0.0	0.0	0	0	n	4.0	0.0	4.36	D
Kessler Mill Rd.	Garst Dr.	311		N/S	2		3000	5	35	10	0.0	0.0	0	0	n	4.0	0.0	4.36	D

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
King Street

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)	
King St. (8055) - Gus Nicks Blvd. To US 460	1	11.5	0.0	0.0	y	30	39	9900	2.0	10.0	n	0.0	0.0	

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
King Street

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
King St. (8055) - Gus Nicks Blvd. To US 460	0	0.0	11.5	545	0	39	0	1	0.6	4.71	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
King Street

							Traffic Data						Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	**From**	**To**	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
King St. (8055)	Gus Nicks Blvd.	US 460	1.46	E/W	2	U	9900	2	30	11.5	0.0	0.0	0	0	N	4.0	0.0	**3.92**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
McVitty Road

Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
McVitty (Old Cave Spring to stream) - North	1	11	0	0	y	25	34	8900	3.00	5.00	n	0.00	0.00
McVitty (Old Cave Spring to stream) - South	1	11	0	0	y	25	34	8900	3.00	5.00	n	0.00	0.00
McVitty (stream to 419) - North	1	10.5	0	0	y	25	34	8900	3.00	2.00	n	0.00	0.00
McVitty (stream to 419) - South	1	10.5	0	0	y	25	34	8900	3.00	20.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
McVitty Road

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
McVitty (Old Cave Spring to stream) - North	0	0.0	11.0	490	0	34	0	1	0.6	4.50	E	Very Low
McVitty (Old Cave Spring to stream) - South	0	0.0	11.0	490	0	34	0	1	0.6	4.50	E	Very Low
McVitty (stream to 419) - North	0	0.0	10.5	490	0	34	0	1	0.6	4.58	E	Very Low
McVitty (stream to 419) - South	0	0.0	10.5	490	0	34	0	1	0.6	4.58	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
McVitty Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Traffic Data: Lanes (L) Th #	Con.	(ADT) (vpd)	Pct. (HV) (%)	Spd. mph	Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
McVitty (to stream) - North	Old Cave Spring	stream		N	2	U	8,900	3	25	11.0	0.0	0.0	0	0	N	4.0	0.0	**3.83**	**D**
McVitty	Old Cave Spring	stream		S	2	U	8,900	3	25	11.0	0.0	0.0	0	0	N	4.0	0.0	**3.83**	**D**
McVitty	stream	419		N	2	U	8,900	3	25	10.5	0.0	0.0	0	0	N	4.0	0.0	**3.89**	**D**
McVitty	stream	419		S	2	U	8,900	3	25	10.5	0.0	0.0	0	0	N	4.0	0.0	**3.89**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Memorial Drive (bike lane)

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Memorial Drive - Grandin to Campbell (northbound)	1	12	5	12	y	30	39	12000	0.00	2.00	Y	5.00	0.00
Memorial Drive Grandin to Campbell (southbound)	1	12	5	5	y	30	39	12000	0.00	2.00	N	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Memorial Drive (bike lane)

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Memorial Drive - Grandin to Campbell (northbound)	1	5.0	12.0	660	0	39	1	1	0.1	3.28	C	Moderately High
Memorial Drive - Grandin to Campbell (southbound)	1	5.0	12.0	660	0	39	0	1	0.1	2.78	C	Moderately High

Table
Bicycle Level of Service (BLOS) Calculations
Memorial Drive (bike lane)

							Traffic Data						Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E		Stps.	Lane	Shdr	Score	Grade
Route Name	**From**	**To**	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
US 11/Memorial Drive	Grandin Rd.	Campbell Ave.	0.84	N	2	U	12,000	0	30	24.0	12.0	7.0	25	25	N	4.0	4.0	**2.05**	**B**
US 11/Memorial Drive	Grandin Rd.	Campbell Ave.	0.84	S	2	U	12,000	0	30	16.0	5.0	0.0	0	0	N	4.0	4.0	**3.09**	**C**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Merriman Road

Data Entry														
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Developme nt (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AAD T**	**Larg e Truc k % (HV)**	**Right Turn % (R)**	**Parkin g Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
Merriman Rd. (613) - Franklin to Cotton Hill Rd.	1	11.5	0.0	1.5	Y	45	54	1500	2	2.00	n	0.00	0
Merriman Rd. (613) - Cotton Hill Rd. to Blue Ridge PW	1	11.5	0.0	1.5	Y	45	54	2300	2	2.00	n	0.00	0
Merriman Rd. (613) - Blue Ridge PW to Star Light	1	9.0	0.0	1.5	Y	45	54	2300	2	2.00	n	0.00	0
Merriman Rd. (613) - Star Light to Starkey (northbound)	1	11.0	0.0	1.0	Y	45	54	2700	3	2.00	n	0.00	0
Merriman Rd. (613) - Star Light to Starkey (southbound)	1	9.0	0.0	1.0	y	45	54	2700	3	2.00	n	0.00	0
Merriman Rd. (613) - Starkey Rd. to Chapparal	1	11.0	0.0	0.0	Y	35	44	5700	3	2.00	n	0.00	0
Merriman Rd. (613) - Chapparal to 907	1	13.0	0.0	0.0	Y	35	44	5500	3	15.00	n	0.00	0
Merriman Rd. (613) - 907 to Colonial Ave.	1	13.0	0.0	0.0	Y	25	34	1500	3	15.00	n	0.00	0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Merriman Road

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Merriman Rd. (613) - Franklin to Cotton Hill Rd.	1	1.5	11.5	83	0	54	0	1	0.5	3.06	C	Moderately High
Merriman Rd. (613) - Cotton Hill Rd. to Blue Ridge PW	1	1.5	11.5	127	0	54	0	1	0.5	3.15	C	Moderately High
Merriman Rd. (613) - Blue Ridge PW to Star Light	1	1.5	9.0	127	0	54	0	1	0.5	3.53	D	Moderately Low
Merriman Rd. (613) - Star Light to Starkey (northbound)	1	1.0	11.0	149	0	54	0	1	0.6	3.43	D	Moderately Low
Merriman Rd. (613) - Star Light to Starkey (southbound)	1	1.0	9.0	149	0	54	0	1	0.6	3.73	D	Moderately Low
Merriman Rd. (613) - Starkey Rd. to Chapparal	0	0.0	11.0	314	0	44	0	1	0.6	4.50	E	Very Low
Merriman Rd. (613) - Chapparal to 907	0	0.0	13.0	303	0	44	0	1	0.6	4.18	D	Moderately Low
Merriman Rd. (613) - 907 to Colonial Ave.	0	0.0	13.0	83	0	34	0	1	0.6	3.39	C	Moderately High

Table
Bicycle Level of Service (BLOS) Calculations
Merriman Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Traffic Data: Lanes (L) Th #	Lanes (L) Con.	(ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Merriman Rd. (613)	Franklin County Line	Cotton Hill (688)	1.05	N/S	2	U	1500	2	45	13.0	1.5	0.0	0	0	N	4.0	3.0	**2.64**	**C**
Merriman Rd. (613)	Cotton Hill (688)	Blue Ridge Parkway	0.80	N/S	2	U	2300	2	45	13.0	1.5	0.0	0	0	N	4.0	3.0	**2.64**	**C**
Merriman Rd. (613)	Blue Ridge Parkway	Starlight Lane (615)	0.08	N/S	2	U	2,300	2	45	10.5	1.5	0.0	0	0	N	4.0	3.0	**4.40**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Old Cave Spring Road

Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Old Cave Spring (Brambleton to McVitty) - North	1	12.5	0	0	n	25	34	8900	3.00	10.00	n	0.00	0.00
Old Cave Spring (Brambleton to McVitty) - South	1	11.5	0	0	n	25	34	8900	3.00	10.00	n	0.00	0.00

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Old Cave Spring Road

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Old Cave Spring (Brambleton to McVitty) - North	0	0.0	12.5	490	0	34	0	0	0.6	4.54	E	Very Low
Old Cave Spring (Brambleton to McVitty) - South	0	0.0	11.5	490	0	34	0	0	0.6	4.69	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Old Cave Spring Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Traffic Data Lanes (L) Th #	.	(ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Grade (A..F)
Old Cave Spring	Brambleton	McVitty		N	2	U	8,900	3	25	12.5	0.0	0.0	0	0	N	4.0	0.0	**3.66**	**D**
Old Cave Spring	Brambleton	McVitty		S	2	U	8,900	3	25	11.5	0.0	0.0	0	0	N	4.0	0.0	**3.78**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Plantation Road

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Developme nt (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AAD T	Larg e Truc k % (HV)	Right Turn % (R)	Parkin g Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Plantation Rd. (115) - Liberty Rd. to Whiteside	1	11.0	0.0	0.0	y	25	34	9800	4.0	5.00	n	0.0	0.0
Plantation Rd. (115) - Whiteside to Hollins (northbound)	1	14.5	0.0	0.0	y	35	44	9800	4.0	2.00	n	0.0	0.0
Plantation Rd. (115) - Whiteside to Hollins (southbound)	1	17.0	0.0	0.0	y	35	44	9800	4.0	2.00	n	0.0	0.0
Plantation Rd. (115) - Hollins to NCL Roanoke	1	15.0	0.0	3.5	y	40	49	1800 0	4.0	2.00	n	0.0	0.0
Plantation Rd. (115) - NCL Roanoke Hershberger Rd.	1	15.0	0.0	3.5	y	40	49	1500 0	4.0	2.00	n	0.0	0.0
Plantation Rd. (115) - Hershberger Rd. to 1855	1	15.0	0.0	3.5	y	40	49	8800	4.0	2.00	n	0.0	0.0
Plantation Rd. (115) - 1855 to 834	1	15.0	0.0	3.5	y	40	49	9400	4.0	2.00	n	0.0	0.0
Plantation Rd. (115) - 834 to US 11	1	15.0	0.0	3.5	y	40	49	1500 0	4.0	2.00	n	0.0	0.0
Plantation Rd. (115) - US 11 to 1801 (northbound)	2	11.5	0.0	8.5	n	45	54	1500 0	1.0	2.00	n	0.0	0.0
Plantation Rd. (115) - US 11 to 180 (soutbound)	2	12.5	0.0	0.0	n	45	54	1200 0	1.0	2.00	n	0.0	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Plantation Road

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Plantation Rd. (115) - Liberty Rd. to Whiteside	0	0.0	11.0	539	0	34	0	1	0.6	4.60	E	Very Low
Plantation Rd. (115) - Whiteside to Hollins (northbound)	0	0.0	14.5	539	0	44	0	1	0.6	4.42	E	Very Low
Plantation Rd. (115) - Whiteside to Hollins (southbound)	0	0.0	17.0	539	0	44	0	1	0.6	4.04	D	Moderately Low
Plantation Rd. (115) - Hollins to NCL Roanoke	1	3.5	15.0	990	0	49	0	1	0.6	4.02	D	Moderately Low
Plantation Rd. (115) - NCL Roanoke Hershberger Rd.	1	3.5	15.0	825	0	49	0	1	0.6	3.69	D	Moderately Low
Plantation Rd. (115) - Hershberger Rd. to 1855	1	3.5	15.0	484	0	49	0	1	0.6	3.01	C	Moderately High
Plantation Rd. (115) - 1855 to 834	1	3.5	15.0	517	0	49	0	1	0.6	3.07	C	Moderately High
Plantation Rd. (115) - 834 to US 11	1	3.5	15.0	825	0	49	0	1	0.6	3.69	D	Moderately Low
Plantation Rd. (115) - US 11 to 1801 (northbound)	1	8.5	11.5	413	413	54	0	0	0.6	3.37	C	Moderately High
Plantation Rd. (115) - US 11 to 180 (soutbound)	0	0.0	12.5	330	330	54	0	0	0.6	5.05	E	Very Low

Plantation Rd.,115	1855	834		S	4	S	9400	4	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**3.07**	C
Plantation Rd.,115	834	US 11		N	4	S	15000	1	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**2.65**	C
Plantation Rd.,115	834	US 11		S	4	S	15000	1	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**2.65**	C
Plantation Rd.,115	US 11	1801		N	4	S	12000	1	45	20.0	8.5	0.0	0	0	N	4	0.0	**0.35**	A
Plantation Rd.,115	US 11	1801		S	4	S	12,000	1	45	20.0	0.0	0.0	0	0	N	4	0.0	**2.41**	B

Table
Bicycle Level of Service (BLOS) Calculations
Plantation Road

Route Name	From	To	Len (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Plantation Rd., 115	Liberty Rd.	Whiteside		N/S	2	U	9,800	4	25	11.0	0.0	0.0	0	0	N	3.5	0.0	**4.18**	D
Plantation Rd., 115	Whiteside	Hollins Rd.		N	2	U	9800	4	35	11.0	0.0	0.0	0	0	N	4.0	0.0	**4.51**	E
Plantation Rd., 115	Whiteside	Hollins Rd.		S	2	U	9800	4	35	14.5	0.0	0.0	0	0	N	4	0.0	**4.07**	D
Plantation Rd., 115	Hollins Rd.	NCL Roanoke		N	2	U	18000	4	40	17.0	3.5	0.0	0	0	N	4.5	0.0	**3.35**	C
Plantation Rd., 115	Hollins Rd.	NCL Roanoke		S	2	U	18000	4	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**3.74**	D
Plantation Rd., 115	NCL Roanoke	Hershburger Rd., 625		N	2	U	15000	4	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**3.66**	D
Plantation Rd., 115	NCL Roanoke	Hershburger Rd., 625		S	2	U	15000	4	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**3.66**	D
Plantation Rd.,115	Hershburger Rd., 625	1855		N	4	S	8800	4	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**3.03**	C
Plantation Rd.,115	Hershburger Rd., 625	1855		S	4	S	8800	4	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**3.03**	C
Plantation Rd.,115	1855	834		N	4	S	9400	4	40	15.0	3.5	0.0	0	0	N	4.5	0.0	**3.07**	C

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Riverland Road

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
Riverland Rd. - Mt. Pleasant to 9th St.	1	12.0	0.0	0.0	n	35	44	8600	5	2	n	20	0
Riverland Rd. - 9th St. to Whitman (westbound)	1	13.0	0.0	0.0	n	35	44	7600	5	2	n	20	0
Riverland Rd. - 9th St. to Whitman (eastbound)	1	12.5	0.0	0.0	y	35	44	7600	5	2	n	20	0
Riverland Rd. - Whitman to Piedmont St. (westbound)	1	18.0	0.0	0.0	y	25	34	7600	5	2	y	20	1440
Riverland Rd. - Whitman to Piedmont St. (eastbound)	1	11.0	0.0	0.0	y	25	34	7600	5	2	y	20	1440
Design Alternatives													
Riverland Rd.	1	12.0	0.0	0.0	n	35	44	8600	5	2	n	20	0
Alternative A: 9 ft. curb lane, 4 ft bike lane	1	9.0	4.0	0.0	n	35	44	8600	5	2	n	20	0
Alternative B: 10 ft. curb lane, 4 ft paved shoulder	1	10.0	0.0	4.0	n	35	44	8600	5	2	n	20	0
Alternative C: 12 ft. curb lane, 4 ft bike lane/shoulder	1	12.0	4.0	0.0	n	35	44	8600	5	2	n	20	0
Alternative D: 15 ft. curb lane, no bike lane/shoulder	1	15.0	0.0	0.0	n	35	44	8600	5	2	n	20	0
Alternative E: 12 ft. curb lane, 5 ft shoulder	1	12.0	0.0	5.0	n	35	44	8600	5	2	n	20	0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Riverland Road

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Riverland Rd. - Mt. Pleasant to 9th St.	0	0.0	12.0	473	0	44	0	0	0.6	4.93	E	Very Low
Riverland Rd. - 9th St. to Whitman (westbound)	0	0.0	13.0	418	0	44	0	0	0.6	4.67	E	Very Low
Riverland Rd. - 9th St. to Whitman (eastbound)	0	0.0	12.5	418	0	44	0	1	0.6	4.48	E	Very Low
Riverland Rd. - Whitman to Piedmont St. (westbound)	0	0.0	18.0	418	0	34	1	1	0.6	3.80	D	Moderately Low
Riverland Rd. - Whitman to Piedmont St. (eastbound)	0	0.0	11.0	418	0	34	1	1	0.6	4.87	E	Very Low
	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Design Alternatives	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Riverland Rd.	0	0.0	12.0	473	0	44	0	0	0.6	4.93	E	Very Low
Alternative A: 9 ft. curb lane, 4 ft bike lane	1	4.0	9.0	473	0	44	0	0	0.6	3.92	D	Moderately Low
Alternative B: 10 ft. curb lane, 4 ft paved shoulder	1	4.0	10.0	473	0	44	0	0	0.6	3.77	D	Moderately Low
Alternative C: 12 ft. curb lane, 4 ft bike lane/shoulder	1	4.0	12.0	473	0	44	0	0	0.6	3.47	D	Moderately Low
Alternative D: 15 ft. curb lane, no bike lane/shoulder	0	0.0	15.0	473	0	44	0	0	0.6	4.48	E	Very Low
Alternative E: 12 ft. curb lane, 5 ft shoulder	1	5.0	12.0	473	0	44	0	0	0.6	3.34	C	Moderately High

Table
Bicycle Level of Service (BLOS) Calculations
Riverland Road

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Riverland Rd.	Mt. Pleasant	9th St.	0.62	W/E	2	U	8600	5	35	12.0	0.0	0.0	0	0	N	4.0	0.0	**4.56**	**E**
Riverland Rd.	9th St.	Whitman		W	2	U	7600	5	35	13.0	0.0	0.0	0	0	N	4.0	0.0	**4.38**	**D**
Riverland Rd.	9th St.	Whitman		E	2	U	7600	5	35	12.5	0.0	0.0	0	0	N	4.0	0.0	**4.44**	**D**
Riverland Rd.	Whitman	Piedmont		W	2	U	7600	5	25	18.0	0.0	7.0	25	0	N	4.0	0.0	**3.25**	**C**
Riverland Rd.	Whitman	Piedmont		E	2	U	7600	5	25	11.0	0.0	0.0	0	0	N	4.0	0.0	**4.05**	**D**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Salem Avenue

Data Entry													
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Salem Ave. - Shenandoah Ave. to 13th St.	1												
Salem Ave. - 13th St. to 9th St. (eastbound)	1	13.5	0.0	0.0	y	25	34	6900	0	2.00	y	10.00	120
Salem Ave. - 13th St. to 9th St. (westbound)	1	9.5	0.0	0.0	y	25	34	6900	0	2.00	y	10.00	120
Salem Ave. - 9th St. to 5th St.(eastbound)	1	15.0	0.0	0.0	n	25	34	4200	0	2.00	n	10.00	120
Salem Ave. - 9th St. to 5th St.(westbound)	1	10.0	0.0	0.0	n	25	34	4200	0	2.00	y	10.00	120
Salem Ave. - 5th St. to 2nd St.(eastbound)	1	13.0	0.0	0.0	n	25	34	7000	0	2.00	y	10.00	120
Salem Ave. - 5th St. to 2nd St.(westbound)	1	13.0	0.0	0.0	n	25	34	7000	0	2.00	y	10.00	120
Salem Ave. - 2nd St. to Jefferson St.(eastbound)	1	12.0	0.0	0.0	n	25	34	6200	0	2.00	y	10.00	120
Salem Ave. - 2nd St. to Jefferson St.(westbound)	1	10.0	0.0	0.0	n	25	34	6200	0	2.00	y	10.00	120

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Salem Avenue

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Salem Ave. - Shenandoah Ave. to 13th St.	0	0.0	0.0	0	0	9	0	0	0	3.99	D	Moderately Low
Salem Ave. - 13th St. to 9th St. (eastbound)	0	0.0	13.5	380	0	34	1	1	0.4	4.21	D	Moderately Low
Salem Ave. - 13th St. to 9th St. (westbound)	0	0.0	9.5	380	0	34	1	1	0.4	4.82	E	Very Low
Salem Ave. - 9th St. to 5th St.(eastbound)	0	0.0	15.0	231	0	34	0	0	0.4	3.44	D	Moderately Low
Salem Ave. - 9th St. to 5th St.(westbound)	0	0.0	10.0	231	0	34	1	0	0.4	4.71	E	Very Low
Salem Ave. - 5th St. to 2nd St.(eastbound)	0	0.0	13.0	385	0	34	1	0	0.4	4.56	E	Very Low
Salem Ave. - 5th St. to 2nd St.(westbound)	0	0.0	13.0	385	0	34	1	0	0.4	4.56	E	Very Low
Salem Ave. - 2nd St. to Jefferson St.(eastbound)	0	0.0	12.0	341	0	34	1	0	0.4	4.62	E	Very Low
Salem Ave. - 2nd St. to Jefferson St.(westbound)	0	0.0	10.0	341	0	34	1	0	0.4	4.93	E	Very Low

Table
Bicycle Level of Service (BLOS) Calculations
Salem Avenue

					Traffic Data							Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement			Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	**From**	**To**	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
Salem Ave. (Rt.11)	13th St.	9th St.	0.34	E	2	U	6900	0	25	20.5	0.0	7.0	10	10	N	4.0	0.0	**2.03**	**B**
Salem Ave. (Rt.11)	13th St.	9th St.		W	2	U	6900	0	25	9.5	0.0	0.0	0	0	N	4.0	0.0	**3.48**	**C**
Salem Ave. (Rt.11)	9th St.	5th St.	0.40	E	2	U	4200	0	25	15.0	0.0	0.0	0	0	N	4.0	0.0	**2.66**	**C**
Salem Ave. (Rt.11)	9th St.	5th St.		W	2	U	4200	0	25	10.0	0.0	0.0	0	0	N	4.0	0.0	**3.29**	**C**
Salem Ave. (Rt.11)	5th St.	2nd St.	0.30	E	2	U	7000	0	25	20.0	0.0	7.0	10	10	N	4.0	0.0	**2.13**	**B**
Salem Ave. (Rt.11)	5th St.	2nd St.		W	2	U	7000	0	25	20.0	0.0	7.0	10	10	N	4.0	0.0	**2.13**	**B**
Salem Ave. (Rt.11)	2nd St.	Jefferson St.	0.22	E	2	U	6200	0	25	20.0	0.0	7.0	10	10	N	4.0	0.0	**2.07**	**B**
Salem Ave. (Rt.11)	3rd St.	Jefferson St.		W	2	U	6200	0	25	20.0	0.0	7.0	10	10	N	4.0	0.0	**2.07**	**B**

Table
Bicycle Compatibility Index (BCI) Data Entry Worksheet
Shenandoah Avenue

Data Entry													
Location	**Geometric & Roadside Data**					**Traffic Operations Data**					**Parking Data**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**No. of Lanes (one direction)**	**Curb Lane Width (ft)**	**Bicycle Lane Width (ft)**	**Paved Shoulder Width (ft)**	**Residential Development (y/n)**	**Speed Limit (mi/h)**	**85th %tile Speed (mi/h)**	**AADT**	**Large Truck % (HV)**	**Right Turn % (R)**	**Parking Lane (y/n)**	**Occupancy (%)**	**Time Limit (minutes)**
Shenandoah (8010) - Williamson Rd. to 5th St. (westbound)	1	16.0	0.0	0.0	n	25	34	5100	2.0	2.0	n	0.0	0.0
Shenandoah (8010) - Williamson Rd. to 5th St. (eastbound)	1	17.5	0.0	0.0	n	25	34	5100	2.0	2.0	n	0.0	0.0
Shenandoah (8010) - 5th St. to 15th St. (westbound)	1	16.0	0.0	0.0	n	30	39	8800	2.0	2.0	n	0.0	0.0
Shenandoah (8010) - 5th St. to 15th St. (eastbound)	1	17.5	0.0	0.0	n	30	39	8800	2.0	2.0	n	0.0	0.0
Shenandoah (8010) -15th St. to 24th St. (westbound)	1	17.5	0.0	0.0	n	35	44	9000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) -15th St. to 24th St. (eastbound)	1	18.5	0.0	0.0	n	35	44	9000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - 24th St. to 30th St. (westbound)	1	18.0	0.0	0.0	n	35	44	11000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - 24th St. to 30th St. (eastbound)	1	18.0	0.0	0.0	n	35	44	11000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - 30th St. to Peters Creek (westbound)	1	11.5	0.0	1.0	n	35	44	12000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - 30th St. to Peters Creek (eastbound)	1	11.0	0.0	1.0	n	35	44	12000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - Peters Creek to ECL Salem (westbound)	1	12.5	0.0	2.0	n	35	44	13000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - Peters Creek to ECL Salem (eastbound)	1	11.5	0.0	2.0	n	35	44	13000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - ECL Salem to Easton Rd. (westbound)	1	13.5	0.0	0.0	n	35	44	13000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - ECL Salem to Easton Rd. (eastbound)	1	12.5	0.0	0.0	n	35	44	13000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - Easton Rd. to 419/Electric Rd.	1	10.0	0.0	0.0	n	35	44	13000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - 419/Electric Rd. to Pearl St.	1	10.0	0.0	0.0	n	35	44	9500	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - Pearl St. to Texas St. (westbound)	1	12.5	0.0	0.0	n	35	44	7800	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - Pearl St. to Texas St. (eastbound)	1	13.0	0.0	0.0	n	35	44	7800	2.00	2.00	n	0.00	0.0

Design Alternatives													
Shenandoah (8010) - Williamson Rd. to 5th St. (westbound)	1	16.0	0.0	0.0	n	25	34	5100	2.0	2.0	n	0.0	0.0
Alternative A: 12 ft. curb lane, 4 ft. bike lane	1	12.0	4.0	0.0	n	25	34	5100	2.0	2.0	n	0.0	0.0
Shenandoah (8010) - Williamson Rd. to 5th St. (eastbound)	1	17.5	0.0	0.0	n	25	34	5100	2.0	2.0	n	0.0	0.0
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	1	13.5	4.0	0.0	n	25	34	5100	2.0	2.0	n	0.0	0.0
Shenandoah (8010) - 5th St. to 15th St. (westbound)	1	16.0	0.0	0.0	n	30	39	8800	2.0	2.0	n	0.0	0.0
Alternative A: 12 ft. 4 ft. bike lane	1	12.0	4.0	0.0	n	30	39	8800	2.0	2.0	n	0.0	0.0
Shenandoah (8010) - 5th St. to 15th St. (eastbound)	1	17.5	0.0	0.0	n	30	39	8800	2.0	2.0	n	0.0	0.0
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	1	13.5	4.0	0.0	n	30	39	8800	2.0	2.0	n	0.0	0.0
Shenandoah (8010) -15th St. to 24th St. (westbound)	1	17.5	0.0	0.0	n	35	44	9000	2.00	2.00	n	0.00	0.0
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	1	13.5	4.0	0.0	n	35	44	9000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) -15th St. to 24th St. (eastbound)	1	18.5	0.0	0.0	n	35	44	9000	2.00	2.00	n	0.00	0.0
Alternative A: 14.5 ft. curb lane, 4 ft. bike lane	1	14.5	4.0	0.0	n	35	44	9000	2.00	2.00	n	0.00	0.0
Shenandoah (8010) - 24th St. to 30th St.	1	18.0	0.0	0.0	n	35	44	11000	2.00	2.00	n	0.00	0.0
Alternative A: 14 ft. curb lane, 4 ft. bike lane	1	14.0	4.0	0.0	n	35	44	11000	2.00	2.00	n	0.00	0.0

Table
Bicycle Compatibility Index (BCI) and Level of Service Computations
Shenandoah Avenue

Bicycle Compatibility Index and Level of Service Computations												
Location	**BCI Model Variables**									**Results**		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	**BL**	**BLW**	**CLW**	**CLV**	**OLV**	**SPD**	**PKG**	**AREA**	**AF**	**BCI**	**Level of Service**	**Bicycle Compatibility Level**
Shenandoah (8010) - Williamson Rd. to 5th St. (westbound)	0	0.0	16.0	281	0	34	0	0	0.6	3.59	D	Moderately Low
Shenandoah (8010) - Williamson Rd. to 5th St. (eastbound)	0	0.0	17.5	281	0	34	0	0	0.6	3.36	C	Moderately High
Shenandoah (8010) - 5th St. to 15th St. (westbound)	0	0.0	16.0	484	0	39	0	0	0.6	4.17	D	Moderately Low
Shenandoah (8010) - 5th St. to 15th St. (eastbound)	0	0.0	17.5	484	0	39	0	0	0.6	3.94	D	Moderately Low
Shenandoah (8010) -15th St. to 24th St. (westbound)	0	0.0	17.5	495	0	44	0	0	0.6	4.14	D	Moderately Low
Shenandoah (8010) -15th St. to 24th St. (eastbound)	0	0.0	18.5	495	0	44	0	0	0.6	3.99	D	Moderately Low
Shenandoah (8010) - 24th St. to 30th St. (westbound)	0	0.0	18.0	605	0	44	0	0	0.6	4.28	D	Moderately Low
Shenandoah (8010) - 24th St. to 30th St. (eastbound)	0	0.0	18.0	605	0	44	0	0	0.6	4.28	D	Moderately Low
Shenandoah (8010) - 30th St. to Peters Creek (westbound)	1	1.0	11.5	660	0	44	0	0	0.6	4.29	D	Moderately Low
Shenandoah (8010) - 30th St. to Peters Creek (eastbound)	1	1.0	11.0	660	0	44	0	0	0.6	4.37	D	Moderately Low
Shenandoah (8010) - Peters Creek to ECL Salem (westbound)	1	2.0	12.5	715	0	44	0	0	0.6	4.12	D	Moderately Low
Shenandoah (8010) - Peters Creek to ECL Salem (eastbound)	1	2.0	11.5	715	0	44	0	0	0.6	4.28	D	Moderately Low
Shenandoah (8010) - ECL Salem to Easton Rd. (westbound)	0	0.0	13.5	715	0	44	0	0	0.6	5.19	E	Very Low
Shenandoah (8010) - ECL Salem to Easton Rd. (eastbound)	0	0.0	12.5	715	0	44	0	0	0.6	5.34	F	Extremely Low
Shenandoah (8010) - Easton Rd. to 419/Electric	0	0.0	10.0	715	0	44	0	0	0.6	5.72	F	Extremely Low

Rd.												
Shenandoah (8010) - 419/Electric Rd. to Pearl St.	0	0.0	10.0	523	0	44	0	0	0.6	5.34	F	Extremely Low
Shenandoah (8010) - Pearl St. to Texas St. (westbound)	0	0.0	12.5	429	0	44	0	0	0.6	4.77	E	Very Low
Shenandoah (8010) - Pearl St. to Texas St. (eastbound)	0	0.0	13.0	429	0	44	0	0	0.6	4.69	E	Very Low
	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Design Alternatives	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
Shenandoah (8010) - Williamson Rd. to 5th St. (westbound)	0	0.0	16.0	281	0	34	0	0	0.6	3.59	D	Moderately Low
Alternative A: 12 ft. curb lane, 4 ft. bike lane	1	4.0	12.0	281	0	34	0	0	0.6	2.73	C	Moderately High
Shenandoah (8010) - Williamson Rd. to 5th St. (eastbound)	0	0.0	17.5	281	0	34	0	0	0.6	3.36	C	Moderately High
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	1	4.0	13.5	281	0	34	0	0	0.6	2.50	C	Moderately High
Shenandoah (8010) - 5th St. to 15th St. (westbound)	0	0.0	16.0	484	0	39	0	0	0.6	4.17	D	Moderately Low
Alternative A: 12 ft. 4 ft. bike lane	1	4.0	12.0	484	0	39	0	0	0.6	3.31	C	Moderately High
Shenandoah (8010) - 5th St. to 15th St. (eastbound)	0	0.0	17.5	484	0	39	0	0	0.6	3.94	D	Moderately Low
Alternative A: 13.5 ft. curb lane, 4 ft. bike lane	1	4.0	13.5	484	0	39	0	0	0.6	3.09	C	Moderately High
Shenandoah (8010) -15th St. to 24th St. (westbound)	0	0.0	17.5	495	0	44	0	0	0.6	4.14	D	Moderately Low
Shenandoah (8010) -15th St. to 24th St. (eastbound)	1	4.0	13.5	495	0	44	0	0	0.6	3.28	C	Moderately High
Alternative A: 14.5 ft. curb lane, 4 ft. bike lane	1	4.0	14.5	495	0	44	0	0	0.6	3.13	C	Moderately High
Shenandoah (8010) - 24th St. to 30th St.	0	0.0	18.0	605	0	44	0	0	0.6	4.28	D	Moderately Low
Alternative A: 14 ft. curb lane, 4 ft. bike lane	1	4.0	14.0	605	0	44	0	0	0.6	3.43	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Shenandoah Avenue

Route Name	From	To	Len. (Ls) (Mi)	Dir. of Sur.	Lanes (L) Th #	Lanes (L) Con.	Traffic Data (ADT) (vpd)	Pct. (HV) (%)	Spd. (SPp) mph	Pavement (Wt) (ft)	Pavement (Wl) (ft)	Pavement (Wps) (ft)	Occu. N/E	Occu. Park. S/W (%)	Rumb Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Shenandoah (8010)	Williamson Rd	5th St.		W	2	U	5,100	2	25	16.0	0.0	0.0	0	0	N	4.0	0.0	**2.74**	**C**
Shenandoah (8010)	Williamson Rd	5th St.		E	2	U	5,100	2	25	17.5	0.0	0.0	0	0	N	4.0	0.0	**2.49**	**B**
Shenandoah (8010)	5th St.	15th St.		W	2	U	8800	2	30	16.0	0.0	0.0	0	0	N	4.0	0.0	**2.18**	**B**
Shenandoah (8010)	5th St.	15th St.		E	2	U	8800	2	30	17.5	0.0	0.0	0	0	N	4.0	0.0	**2.99**	**C**
Shenandoah (8010)	15th St.	24th St.		W	2	U	9000	2	35	17.5	0.0	0.0	0	0	0	4.0	0.0	**2.32**	**B**
Shenandoah (8010)	15th St.	24th St.		E	2	U	9000	2	35	18.5	0.0	0.0	0	0	N	4.0	0.0	**2.95**	**C**
Shenandoah (8010)	24th St.	30th		W/E	2	U	11,000	2	35	18.0	0.0	0.0	0	0	N	4.0	0.0	**3.14**	**C**
Shenandoah (8010)	30th	Peters Creek		W	2	U	12,000	2	35	12.5	1.0	0.0	0	0	N	4.0	0.0	**4.02**	**D**
Shenandoah (8010)	30th	Peters Creek		E	2	U	12,000	2	35	12.0	1.0	0.0	0	0	N	4.0	0.0	**4.09**	**D**
Shenandoah (8010)	Peters Creek	ECL (Salem)		W	2	U	12,000	2	35	14.5	2.0	0.0	0	0	N	4.0	0.0	**3.75**	**D**
Shenandoah (8010)	Peters Creek	ECL (Salem)		E	2	U	12000	2	35	13.5	2.0	0.0	0	0	N	4.0	0.0	**3.89**	**D**
Roanoke Boulevard (8010)	ECL	Easton Rd.		W	2	U	13,000	2	35	13.5	0.0	0.0	0	0	N	4.0	0.0	**3.93**	**D**
Roanoke Boulevard (8010)	ECL	Easton Rd.		E	2	U	13000	2	35	12.5	0.0	0.0	0	0	N	4.0	0.0	**4.06**	**D**
Roanoke Boulevard (8010)	Easton Rd.	419/Electric Rd.		W/E	4	U	13,000	2	35	10.0	0.0	0.0	0	0	N	4.0	0.0	**4.00**	**D**
Roanoke Boulevard (8010)	419/Electric Rd.	Pearl St.		W/E	4	U	9,500	2	35	10.0	0.0	0.0	0	0	N	4.0	0.0	**3.84**	**D**
Roanoke Boulevard	Pearl St.	Texas St.		W/E	4	U	7800	2	35	13	0.0	0.0	0	0	N	4.0	0.0	**3.41**	**C**

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data			
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)
Washington Ave. - ECL Vinton to Bypass Road	2	12.5	0	0	n	35	44	24000	2.00	5.00	n	20.00	1440.00
Washington Ave - Bypass Road to Pollard St.	2	12.5	0	0	n	35	44	24000	2.00	5.00	n	20.00	1440.00
Walnut Ave. - First St. to to Wise Ave.	1	15	0	0	n	25	34	11000	2.00	5.00	n	0.00	0.00
Wise Ave. - Wise to Indian Village Ln.	1	11	0	0	y	25	34	6700	2.00	5.00	n	0.00	0.00
Wise Ave. - Indian Village Ln. to 18th	1	11	0	0	y	25	34	6700	2.00	10.00	y	0.00	1440.00
Wise Ave. - 18th St. to Norfolk Ave.	1	10.5	0	0	y	25	34	6700	2.00	10.00	y	0.00	1440.00

Table
Bicycle Level of Service (BLOS) Calculations
Washington/Walnut/Wise

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
Washington Ave. - ECL Vinton to Bypass Road	0	0.0	12.5	660	660	44	0	0	0.6	5.49	F	Extremely Low
Washington Ave - Bypass Road to Pollard St.	0	0.0	12.5	660	660	44	0	0	0.6	5.49	F	Extremely Low
Walnut Ave. - First St. to to Wise Ave.	0	0.0	15.0	605	0	34	0	0	0.6	4.39	D	Moderately Low
Wise Ave. - Wise to Indian Village Ln.	0	0.0	11.0	369	0	34	0	1	0.6	4.26	D	Moderately Low
Wise Ave. - Indian Village Ln. to 18th	0	0.0	11.0	369	0	34	0	1	0.6	4.26	D	Moderately Low
Wise Ave. - 18th St. to Norfolk Ave.	0	0.0	10.5	369	0	34	0	1	0.6	4.34	D	Moderately Low

Table
Bicycle Level of Service (BLOS) Calculations
Washington/Walnut/Wise Avenue

					Traffic Data								Occu.	Occu.		Pvmt	Pvmt	Bicycle	
			Len.	Dir.	Lanes (L)			Pct.	Spd.	Pavement				Park.	Rumb.	Cond	Cond	LOS	
			(Ls)	of	Th	Con.	(ADT)	(HV)	(SPp)	(Wt)	(Wl)	(Wps)	N/E	S/W	Stps.	Lane	Shdr	Score	Grade
Route Name	From	To	(Mi)	Sur.	#		(vpd)	(%)	mph	(ft)	(ft)	(ft)	(%)	(%)	(Y/N)	(5..1)	(5..1)		(A..F)
Washington St.	ELC Vinton	By Pass Road		W	4	D	24,000	2	35	12.5	0.0	0.0	0	0	n	4.0	0.0	**4.02**	**D**
Washington Ave.	By Pass Road	Pollard St.		W	4	D	24,000	2	35	12.5	0.0	0.0	0	0	n	4.0	0.0	**4.02**	**D**
Walnut Ave.	1st	Wise Ave.		W	2	U	11,000	2	25	15.0	0.0	0.0	0	0	n	4.0	0.0	**3.28**	**C**
Wise Ave.	Wise Ave.	Indian Village Ln.		W	2	U	6,500	2	25	11.0	0.0	0.0	0	0	n	4.0	0.0	**3.53**	**D**
Wise Ave.	Indian Village Ln.	18th St.		W	2	U	6,500	2	25	11.0	0.0	6.0	30	30	n	4.0	0.0	**3.81**	**D**
Wise Ave.	18th St.	Norfolk Ave.		W	2	U	6,500	2	25	10.5	0.0	6.0	30	30	n	4.0	0.0	**3.85**	**D**

Appendix F

Tips for Safe Bicycling

- Be a responsible bicyclist - obey all traffic control devices and use proper hand signals.
- Always ride with the flow of traffic.
- Dress safely - wear a helmet, wear bright colored clothing, and secure loose pant legs.
- Ride defensively - anticipate the actions of other road users and watch for road hazards.
- Pass vehicles with extreme care - turning vehicles may not see you.
- Be aware of motor vehicle blind spots whether while riding or when stopped at an intersection.
- Maximize your visibility at night - wear reflective clothing and apply reflective tape to your bicycle.
- Walk your bicycle when you get into traffic situations beyond your cycling abilities.
- Exercise great caution when riding in bus traffic - watch out for buses pulling to and from curbs and passengers getting on and off buses.
- Park your bicycle so you do not block sidewalks, handicap and building accesses, or emergency drives.
- Lock your bicycle - secure both wheels and the frame to a stationary object using a sturdy lock.
- Register or license your bicycle if required or provided by your community.

Source: VDOT http://virginiadot.org/infoservice/bk-laws.asp - Tips

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