BICYCLE
TRANSPORTATION PLAN

THE CITY OF RALEIGH | NORTH CAROLINA | APRIL 2009

Prepared for:
The City of Raleigh,
The North Carolina Department of Transportation (NCDOT),
NCDOT Division of Bicycle and Pedestrian Transportation,
and NCDOT Division 5

Division of Bicycle & Pedestrian Transportation

Prepared by:
Greenways Incorporated,
Alta Planning + Design
CLH Design
Parsons Brinckerhoff

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ACKNOWLEDGEMENTS

RALEIGH RESIDENTS

More than 700 City of Raleigh residents contributed to this plan through public workshops, volunteer activities, comment forms, direct dialogue, and public outreach.

RALEIGH MAYOR AND CITY COUNCIL

Mayor Charles Meeker
James West, Mayor Pro Tempore
Mary-Ann Baldwin, Council Member
Thomas Crowder, Council Member
Philip Isley, Council Member
Rodger Koopman, Council Member
Nancy McFarlane, Council Member
Russ Stephenson, Council Member

RALEIGH BICYCLE PLAN STEERING COMMITTEE

STAFF OVERSIGHT TEAM

Fleming El-Amin II, AICP, Public Works Department, Project Manager
Eric J. Lamb, PE, Public Works Department
Lynn Raynor, PE, Public Works Department
Victor Lebsock, ASLA, Parks and Recreation Department
Jed Niffenegger, PE, Public Works Department
Dan Becker, Department of City Planning
Brad Amstutz, Raleigh Police Department

APPOINTED CITIZENS

Julie Woosley, Chair
David Jerose
Jennifer Lewis
Randy Mundt
Sig Hutchinson
Timothy Lee
Laura Loyek
JJ Walter

RALEIGH BICYCLE PLAN VOLUNTEERS

Paul Bailey
Wayne Clark
Liz Guzynski
Will Ivey
Jerry McMahon
David G. Roberts
Andrew Stewart
Chet Buell
Zach Cox
Leiza Hall
Brian McCrodden
Michael J. Mueller
George Shanko
Cynthia Van Der Wiele

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Robert F. Mosher, ASLA, AICP, Bicycle and Pedestrian Transportation Division
Local NCDOT Division 5

PROJECT CONSULTANTS

Greenways Incorporated
Alta Planning and Design
Parsons Brinckerhoff
CLH Design

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BICYCLE TRANSPORTATION PLAN EXECUTIVE SUMMARY

Division of Bicycle & Pedestrian Transportation

A COMMITMENT TO BICYCLE TRANSPORTATION

The City of Raleigh is making a strong statement through this Plan to increase mode share and safety for bicyclists. Raleigh is one of the fastest growing cities in the United States. Planning today is necessary to meet the community and facility needs of tomorrow. As Raleigh continues to evolve and expand, the Comprehensive Bicycle Transportation Plan will provide one of the building blocks for the future to aid in improving the quality of life and offer alternative transportation options for the area. By offering choices and improved safety, the City of Raleigh can overcome its traditional shortfalls in bicycle facility development to create an integrated, safe, and convenient multi-modal transportation system.

The goal of this plan is to increase mode share and safety for all levels of bicyclists, and provide a bicycle friendly environment, that all citizens of Raleigh can benefit from. This Plan included significant levels of public input. The range of input included two public workshops and presentations, four meetings with the project Steering Committee, focused appeals for input from low-income communities, minority populations, downtown stakeholders and a citywide survey of bicycle interests and needs with over 800 respondents.

The City of Raleigh and a specially constituted project Steering Committee worked closely with the public to support the vision and preparation of this Comprehensive Bicycle Transportation plan. The North Carolina Department of Transportation provided funding to support bicycle planning.

This Plan provides a comprehensive approach toward identifying existing bicycle needs and deficiencies, presents recommendations to address those deficiencies, examines optimal design and policy improvements, and identifies implementation strategies for the development of quality bicycle facilities and programs. The plan provides a program of action for addressing the immediate and long-term needs for bicyclists and bicycle facilities. *There are several primary visions and goals for this plan:*

- Provide bicycle connectivity to destinations throughout Raleigh and the region.
- Provide a viable alternative to driving by developing bicycle facilities.
- Create an environment where all types of bicyclists including beginners and experts choose to bicycle to work, school, for shopping, for exercise, and for fun.
- Quadruple the 2000 census bicycle commute rate by 2015.
- Become designated as a "Bicycle-Friendly Community" by 2010 by the League of American Bicyclists.
- Complete the Top 25 bicycle network projects within the first five years of implementation.
- Launch new education, encouragement, enforcement, and bicycle facility development programs.

BENEFITS OF BICYCLING

For many years, small and large communities across the United States and throughout the world have been implementing strategies for serving the bicycle needs of their residents. They do this because of their obligations to promote health, safety and welfare, and also because of the growing awareness of the many benefits of bicycling. These benefits can include increased health and physical activity, reduced traffic congestion, affordable mobility, improved quality of life, reduced auto dependency, conservation of fossil fuels, increased economic vitality, increased community connections, and recreation.

EXISTING CONDITIONS ANALYSIS

The consultant team conducted an in-depth analysis and evaluation of current conditions for bicycling in the area. An evaluation of the roadway network, including field measurements, was conducted to identify roadways that could accept the retrofit of bicycle facilities in their current state.

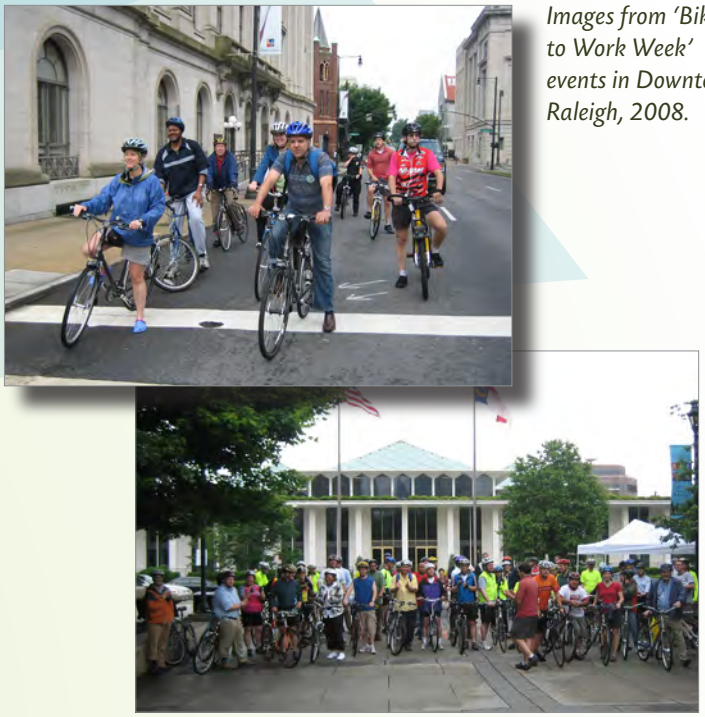
Special consideration was given to current community plans, policies, and documents to better integrate the Comprehensive Bicycle Transportation Plan into the fabric of area planning efforts including the *Raleigh Comprehensive Plan*, and to incorporate the insights, visions, and findings of other plans as appropriate.

USE OF GIS

Geographic Information Systems (GIS) data was collected by the consultant from the City of Raleigh and Wake County. The consultant team inventoried both the existing on-road bicycle and greenway facilities, creating new GIS databases for each. This information was supplemented with aerial photography, transportation data, trip attractors, schools, parcels, hydrology, etc., to provide a comprehensive map and tool for developing the recommended bicycle network. Over 500 sites of bicycle crashes since 2008 were geocoded, mapped, and analyzed.

PUBLIC INPUT

Public input was gathered through two public workshops meetings, community outreach sessions and a public opinion form. Input at the public meetings was gathered in the form of map markups, comment collection and through discussion between the citizens, consultant team, and City staff. In addition to



Images from 'Bike to Work Week' events in Downtown Raleigh, 2008.

the online public opinion form, a significant number of paper copies were solicited at workshops and outreach sessions. Participants expressed that they would like more bicycle and greenway facilities, especially in underserved areas, that would provide connectivity to major destinations such as Downtown, Umstead Park, local colleges and universities. A combined total of 838 people completed the public opinion form during the planning process.

NEEDS ANALYSIS

The need and demand for a more accessible, safe and functional bicycle network is paramount throughout Raleigh. Health and wellness issues, bicycle crash data, levels of service, and community input all point towards the need for safe, functional accessibility for bicyclists. These needs can be met with a comprehensive system of on-road and greenway bicycle facilities along with the programs, policies, and funding to support this endeavor.

BICYCLE LEVEL OF SERVICE (BLOS)

A BLOS was developed for the Raleigh area to evaluate bicycle suitability on existing roadways. The BLOS is a scientifically-calibrated method of evaluating the comfort level of bicyclists on a roadway segment, given existing bicycling conditions in relation to motor vehicle traffic. Model inputs include volume and speed of vehicular traffic, percentage of heavy trucks, presence of on-street parking, pavement condition,

lateral separation between bicyclists and adjacent motor traffic, and presence and width of paved shoulder or bicycle lane. With a scoring system of "A" (best) to "F" (worst), 89% of roadways scored a "D" or worse indicating the need to improve conditions for bicyclists.

RECOMMENDED BICYCLE NETWORK

Approximately 447 miles of bicycle facilities are recommended for the Raleigh area. Developed through public input, field measurements, locations of trip attractors, connections to the greenway system, and projects listed in previous plans, the recommended bicycle network is comprehensive and will be developed over the next 20 years. Several facility types are recommended and determined based on route type, roadway characteristics, land use, and traffic. The bicycle lane was chosen as the preferred facility by Steering Committee members and is the most common recommendation. Paved shoulders, shared-lane markings, multi-use greenways, and sidepaths were also recommended.

Please note: the 447 miles of recommended routes is in no way expected to be completed in the short-term, or even medium-term. This Plan carefully prioritizes recommendations for a rational and achievable implementation process.

Total Recommended Network: 447 miles

Bicycle Lanes: 332 miles
(Restripe: 101 miles)
(Stripe: 37 miles)
(Road Diet: 30 miles)
(New Construction: 164 miles)

Shared Lane Markings: 30 miles

Paved Shoulder: 7 miles

Wide Outside Lane: 78 miles

IDENTIFYING PROJECTS PRIORITIES

The steps taken to select priority projects were: 1) prioritization through public input and weighted criteria; 2) equity across council districts; and 3) ease of construction and cost-effectiveness. The prioritization method ranked recommended bicycle facilities by both their public input ranking and their ability to satisfy criteria developed by the project Steering Committee. Also, 140 miles of bicycle lane recommendations identified in the network would not require roadway reconstruction because of adequate, existing roadway width. The top bicycle network segment recommendations that do not require new construction were identified as the Top 25 projects, and the plan provides individual cost estimates and project 'cut-sheets' for each.

The total estimated cost for construction of the top 25 projects is approximately **$1.2 million**.

See Appendix B: Prioritization and Appendix C: Cost Estimates for details.

FACILITY DEVELOPMENT

Roadway re-construction and repaving projects offer excellent opportunities to incorporate facility improvements for bicyclists. It is much more cost-effective to provide a bicycle facility when these road projects are implemented than to initiate the improvement as a "retrofit." In order to take advantage of upcoming opportunities to incorporate bicycle facilities into routine transportation projects, the City should continue to track repaving schedules, and other lists of projects. As the long-range transportation plan is updated in future years, bicycle improvements should be included in appropriately programmed projects.

There are also many ways to develop bicycle facilities without waiting for roadway reconstruction projects. The simplest type of bicycle facility development is the addition of bicycle lanes, edgelines, or shoulder stripes without making any other changes to the roadway (restriping). Bicycle lanes, edgelines and shoulder stripes can also be added by narrowing the existing travel lanes or removing one or more travel lanes (road diet). If 'road diets' or 'restriping' are not practical for certain roadways, then shared lane markings may be considered (sharrows). For more on these and other facility types, please see Chapter 4: Network Plan and Chapter 7: Design Guidelines.

BICYCLE FACILITY MAINTENANCE

Additional maintenance costs for bicycle facilities (striping, sweeping, etc) are relatively small incremental costs relative to the City's overall public works budget. The recommended strategy is to integrate maintenance into ongoing City programs, with an emphasis for maintenance crews to sweep all the way to the curb or edge of shoulder (where many bicyclists often ride).

BICYCLE AND PEDESTRIAN COORDINATOR

The City of Raleigh should create and fund the full-time dedicated position of Bicycle and Pedestrian Coordinator to handle the day-to-day implementation of recommended policies, programs and activities described within this plan. The Coordinator will lead efforts to apply for funding, oversee planning, mapping, design and development of bicycle projects. The Coordinator will assist with programming, public outreach, and monitoring of implementation. The Coordinator will report to the manager of Transportation Services Division of the Public Works Department. Winston-Salem, Greensboro, Charlotte, and Durham all benefit from having a dedicated position for bicycle and pedestrian coordination.

BICYCLE + PEDESTRIAN ADVISORY COMMISSION

The City of Raleigh should encourage the establishment of a Bicycle and Pedestrian Advisory Commission (BPAC) to assist in the implementation of this Plan. The BPAC would be comprised of both commuting and recreational cyclists, and should work in cooperation with the newly establish Raleigh Bicycle and Pedestrian Coordinator, to champion the recommendations of this Plan. The BPAC's role would be to provide a communications link between the citizens of the community and City government. Models for such a group exist throughout North Carolina. Each BPAC member could represent one key functional area: planning, design, safety, maintenance, education, health, recreation, etc. Raleigh would greatly benefit by supporting the creation of such an organization.

PROGRAMS

It will be critical for Raleigh and NCDOT to educate bicyclists and motorists about safe behaviors in a multi modal roadway environment, to enforce laws that make bicycle travel safer, and to encourage people of all ages and abilities to use the bicycle and greenway routes. It will be equally important to promote and develop activities that encourage physical activity and healthy living. Programs can include Safe Routes to School, community-wide messages encouraging physical activity, bicycle rodeos and Bike to Work Days.

BECOMING A BICYCLE FRIENDLY COMMUNITY

One of the goals for this Bicycle Plan is to transform Raleigh into a "Bicycle Friendly Community" (BFC). The Bicycle Friendly Community Campaign is an awards program that recognizes municipalities that actively support bicycling. A Bicycle Friendly Community provides safe accommodation for cycling and encourages its residents to bike for transportation and recreation. Communities that are bicycle-friendly are seen as places with a high quality of life. In North Carolina, only two communities are currently designated as "bicycle friendly," Cary and Carrboro. Raleigh will need to make significant strides in accomplishing the goals of this Plan prior to applying for BFC status. If the short term work program is accomplished, the City should be in a position to apply for an receive BFC status within three years.

FUNDING

Implementing the recommendations of this plan will require a combination of funding sources that include local, state, federal, and private money. It will be necessary for Raleigh and the NCDOT to secure funding to undertake the short-term, top priority projects and develop a long-term funding strategy. This Plan identifies 30 funding sources to be referenced for implementation, but these state and local sources are key:

- Local Capital Improvements Program (CIP)
- Local Bond
- Local Fees
- State Transportation Improvement Program (TIP)
- State Powell Bill Funds
- State Safe Routes to School Program
- State Health and Wellness Trust Fund
- Private Sources

ACTION STEPS

The Action Steps Table (in Chapter 8) includes over 50 tasks to be accomplished to ensure successful implementation of the Plan. For each task, a lead agency and support agencies and project phasing are identified and the task is explained in more detail. Altogether, the resources within this plan will provide the City of Raleigh, North Carolina with the necessary means to set the standard for a safe, accessible, and efficient bicycle network.

CHAPTER 1 OUTLINE:
Introduction to the Bicycle Plan
Vision Statement
Measurable Goals
The Planning Process
The Value of Bicycle Transportation

CHAPTER 1: INTRODUCTION

INTRODUCTION TO THE BICYCLE PLAN

In spring 2008, the City of Raleigh and the North Carolina Department of Transportation (Division of Bicycle and Pedestrian Transportation) began developing a citywide comprehensive bicycle plan for the Capital City. Raleigh's original bicycle plan was adopted in 1991 and was long overdue for an update, especially considering that the City has grown beyond the study area of the 1991 plan. Nationally, such issues as rising gas prices, environmental concerns, and a growing interest in health and wellness are demonstrating the need for bicycle-friendly cities. On a local level, this Bicycle Plan aims to take on such issues, translating them into affordable personal mobility, carbon-free transportation, and healthy, active lifestyles for Raleigh residents.

The development of this Plan included an open, participatory process, with residents of Raleigh providing input through public workshops, volunteer activities, focus group meetings, the project Steering Committee, and an online comment form.

This Plan features:

- A thorough analysis of current conditions for bicycling in Raleigh
- Standards and guidelines for the development of bicycle facilities
- A prioritized list of recommended strategic improvements
- Integration of bicycle policy into codes and ordinances
- Recommendations for programming, operations, maintenance, and funding

The goal of this Plan is to create an integrated, seamless transportation framework to facilitate bicycling as a viable transportation alternative throughout Raleigh.

VISION STATEMENT

Vision statements and project goals were collected through public workshops, project steering committee meetings, input from City staff, and an online survey of local residents. These were combined, condensed, and crafted into the vision statement for this Plan. The statement (on the following page) expresses the desired outcome of the plan, rather than the current conditions.

Raleigh Bicycle Transportation Plan Vision Statement

We see all types of cyclists—beginners to experts—out riding to work, to school, for fun, for shopping, and for exercise.

The streets of Raleigh will accommodate bicycling within the existing street network, with bicycle safety as a goal for all roadway projects.

Bicycle projects will be strategically placed, with connections to major destinations, trailheads, and transit as priorities for overall multi-modal transportation.

Connectivity to other cities, towns, and their bicycle route networks will provide access to regional destinations.

Institutional support, staffing, and resources will be available for Plan implementation and facility maintenance.

Education programs and enforcement of laws will increase safety and build courtesy between drivers and cyclists.

Bicycle policy will be integrated into City codes, and bicycle culture will be integrated into City life.

Land use in Raleigh will accommodate bicycling with increased density, thereby reducing the distance between destinations.

Bicycle facilities provide a viable alternative to driving, thereby reducing overall motor vehicle traffic congestion and improving the health of residents and the environment.

When bicycle facilities and increased density are combined with services (such as covered parking, bicycle stations, showers at employment centers, wayfinding amenities and bicycle rentals), bicycling in Raleigh becomes more comfortable, convenient and efficient than driving.

MEASURABLE GOALS

The purpose of this Bicycle Plan is to make this vision a reality. Measurable goals, derived from this vision, are listed below. While the City of Raleigh must lead this effort, overall success will also require continued, active participation and encouragement from local residents and community organizations. The ultimate goal is for this Plan to be fully implemented within a 30-year time frame.

The City should conduct an annual meeting for the evaluation of progress on each of the following goals, including an official plan update in 2012. During each evaluation, City staff and members of a citizen's advisory board should identify steps to be taken before the next evaluation.

1. Quadruple the 2000 Census bicycle commute rate by 2015.

2. Complete this plan's top five priority bicycle projects by 2011 and complete the top twenty by 2015.

3. Become designated as a 'Bicycle-Friendly Community' by 2010 by the League of American Bicyclists.

4. Launch/participate in three new programs in three years (see Chapters 5 and 8 for details):

A) Bicycle Education and Encouragement Program

- Create a citizens Bicycle and Pedestrian Advisory Commission to meet on a regular basis and support implementation of this plan.
- Foster the creation of a Bicycle Mentor Program for new bicycle commuters to learn from experienced bicycle commuters.
- Produce online and hardcopy bicycle maps and obtain a variety of educational materials for distribution that cover bicycle safety, etiquette, and rules and regulations.

B) Bicyclist and Motorist Enforcement Program

- Establish an easy-to-use and well publicized bicycle and pedestrian enforcement hot line.
- Provide officers with an educational handout to be used during bicycle-related citations and warnings
- Training for law enforcement and law enforcement programs that focus on bicycling-related issues

C) Bicycle Facility Development Program

- Hire a full-time multi-modal planner at the City-level
- Establish regular CIP funding for roadway retrofits and restriping
- Integrate bicycle-related improvements with scheduled roadway maintenance and restriping projects
- Initiate programs aimed at developing regional and countywide connections

THE PLANNING PROCESS

The planning process began in April 2008 and concluded in January 2009. This diagram illustrates the main steps taken throughout the planning process. Public participation (through workshops, steering committee meetings, and the online survey) played a key role in plan development.

THE VALUE OF BICYCLE TRANSPORTATION

Given the extensive commitment of time and resources needed to fulfill the goals of this plan, it is also important to assess the immense value of bicycle transportation. As stated in comments from nearly 700 City of Raleigh residents, bicycling will help to improve people's health and fitness, enhance environmental conditions, decrease traffic congestion, and contribute to a greater sense of community.

Scores of studies from experts in the fields of public health, urban planning, urban ecology, real estate, transportation, sociology, and economics have supported such claims and affirm the substantial value of supporting bicycling as it relates to active living and alternative transportation. Communities across the United States and throughout the world are implementing strategies for serving the bicycle needs of their residents, and have been doing so for many years. They do this because of their obligations to promote health, safety and welfare, and also because of the growing awareness of the many benefits of bicycling.

Images from 'Bike to Work Week' events in Downtown Raleigh, 2008.

Increased Health and Physical Activity

A growing number of studies show that the design of our communities—including neighborhoods, towns, transportation systems, parks, trails and other public recreational facilities—affects people's ability to reach the recommended daily 30 minutes of moderately intense physical activity (60 minutes for youth). According to the Centers for Disease Control and Prevention (CDC), "physical inactivity causes numerous physical and mental health problems, is responsible for an estimated 200,000 deaths per year, and contributes to the obesity epidemic." [1] The increased rate of disease associated with inactivity reduces quality of life for individuals and increases medical costs for families, companies, and local governments.

The CDC determined that creating and improving places to be active could result in a 25 percent increase in the number of people who exercise at least three times a week.[2] This is significant considering that for people who are inactive, even small increases in physical activity can bring measurable health benefits. Establishing a safe and reliable bicycle network in Raleigh will positively impact the health of local residents. The Rails-to-Trails Conservancy puts it simply: "Individuals must choose to exercise, but communities can make that choice easier." [3]

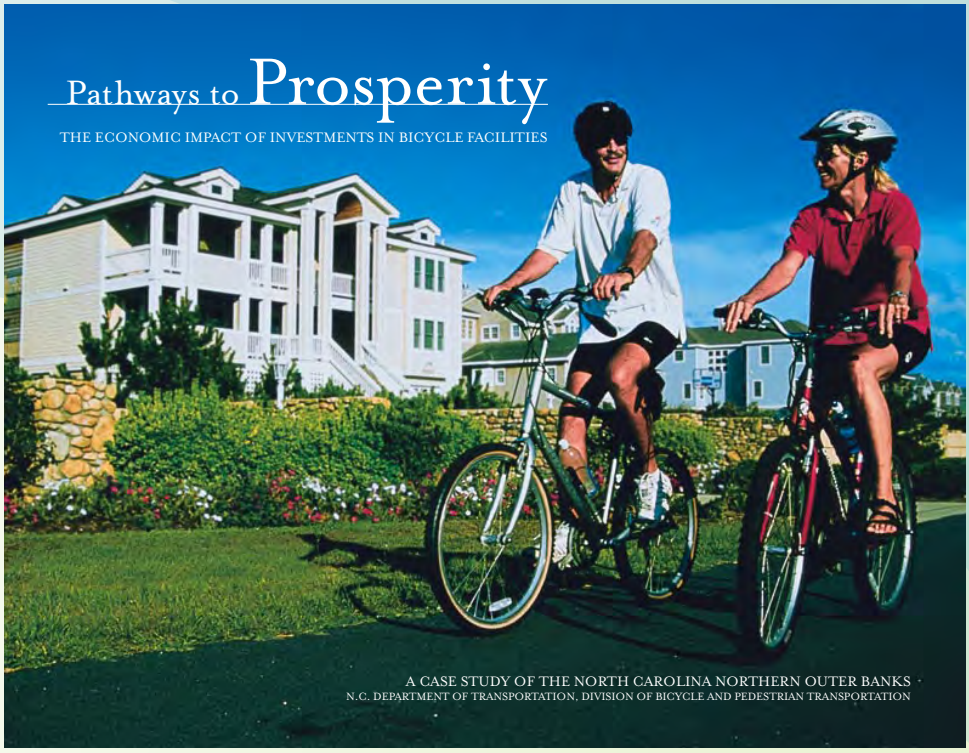
Economic Benefits

Bicycling is an affordable form of transportation. According to the Pedestrian and Bicycle Information Center (PBIC), of Chapel Hill, NC, the cost of operating a bicycle for a year is approximately $120, compared to $7,800 for operating a car over the same time period.[4] Bicycling becomes even more attractive from an economic standpoint when the rising price of oil (and decreasing availability) is factored into the equation. Since 2000, oil prices have more than quadrupled. As of summer 2008, gasoline prices have topped $4 a gallon and are generally forecast to continue to increase.[5] The rising cost of fuel reinforces the idea that local communities should be built to accommodate people-powered transportation, such as walking and biking. Raleigh's current focus on density and bringing residents downtown, combined with new strategies for improving bicycle transportation, could facilitate a substantial local reduction in auto- and oil-dependency.

Apex, NC: The Shepard's Vineyard housing development added $5,000 to the price of 40 homes adjacent to the regional greenway – and those homes were still the first to sell. (Rails to Trails Conservancy, 2005)

From a real estate standpoint, consider the positive impact of trails and greenways, which are essential components of a complete bicycle network. According to a 2002 survey of recent homebuyers by the National Association of Home Realtors and the National Association of Home Builders, trails ranked as the second most important community amenity out of a list of 18 choices.[6] Additionally, the study found that 'trail availability' outranked 16 other options including security, ball fields, golf courses, parks, and access to shopping or business centers. Findings from the American Planning Association (How Cities Use Parks for Economic Development, 2002), the Rails-to-Trails Conservancy (Economic Benefits of Trails and Greenways, 2005), and the Trust for Public Land (Economic Benefits of Parks and Open Space, 1999) further substantiate the positive connection between trails and property values across the country.

Finally, from a tourism perspective, cyclists can add real value to local economies. For example, in the Outer Banks, NC, bicycling is estimated to have an annual economic impact of $60 million; 1,407 jobs are supported by the 40,800 visitors for whom bicycling was an important reason for choosing to vacation in the area. The annual return on bicycle facility development in the Outer Banks is approximately nine times higher than the initial investment.[7] Similarly, Damascus, VA, the self-proclaimed 'Friendliest Trail Town', features 34-miles of trail where approximately $2.5 million is



Download the full report, "Pathways to Prosperity", from: http://ncdot.org/transit/bicycle/safety/safety_economicimpact.html

spent annually related to recreation visits. Of this amount, non-local visitors spend about $1.2 million directly into the economies of Washington and Grayson counties.[8] While these examples feature beach and mountain destinations, the City of Raleigh also has key bicycling advantages, such as a model greenway system, connections to the Mountains-to-Sea Trail and the East Coast Greenway, and a large population of potential riders.

Environmental Improvements

As demonstrated by the Southern Resource Center of the Federal Highway Administration, when people get out of their cars and onto their bicycles, they reduce measurable volumes of pollutants.[9] Other environmental impacts include a reduction in overall neighborhood noise levels and improvements in local water quality as fewer automobile-related discharges wind up in the local rivers, streams, and lakes.

Trails and greenways are also part of any bicycle network, conveying unique environmental benefits. Greenways protect and link fragmented habitat and provide opportunities for protecting plant and animal species. Aside from connecting places without the use of air-polluting automobiles, trails and greenways also reduce air pollution by protecting large areas of plants that create oxygen and filter air pollutants such as ozone, sulfur dioxide, carbon monoxide and airborne particles of heavy metal. Finally, greenways improve water quality by creating a natural buffer zone that protects streams, rivers and lakes, preventing soil erosion and filtering pollution caused by agricultural and road runoff.

Transportation Benefits

In 2001, the National Household Travel Survey found that roughly 40% of all trips taken by car are less than 2 miles. By taking these short trips on a bicycle, rather than in a car, citizens can substantially impact local traffic and congestion. Additionally, many people do not have access to a vehicle or are not able to drive. According to the National Household Travel Survey (NHTS), one in 12 U.S. households does not own an automobile and approximately 12 percent of persons 15 or older do not drive.[10] An improved bicycle network provides greater and safer mobility for these residents.

Traffic congestion is often a major problem in fast growing areas such as Wake County (Wake County is the 33rd fastest-growing county in the United States, among those with populations over 10,000).[11] Congestion reduces mobility, increases auto-operating costs, adds to air pollution, and causes stress. Bicycle users can help alleviate overall congestion because each cyclist is one less car on the road. Incidentally, cyclists take up significantly less space on the road (see images at left). While some may argue over the degree to which overall congestion is alleviated by cyclists, one aspect of the argument is particularly difficult to challenge: for the individuals who choose to ride a bike rather than drive, the negative impacts of congestion (stress, operating costs, and sometimes even mobility) are greatly reduced.

Source: The Association for the Advancement of Sustainability in Higher Education, 2007.

Quality of Life

Many factors go into determining quality of life for the citizens of a community: the local education system, prevalence of quality employment opportunities, and affordability of housing are all items that are commonly cited. Increasingly though, citizens claim that access to alternative means of transportation and access to quality recreational opportunities such as parks, trails, greenways, and bicycle routes, are important factors for them in determining their overall pleasure within their community. Communities with such amenities can attract new businesses, industries, and in turn, new residents. Furthermore, quality of life is positively impacted by bicycling through the increased social connections that take place by residents being active, talking to one another and spending more time outdoors and in their communities.

According to the Brookings Institution, the number of older Americans is expected to double over the next 25 years.[10] All but the most fortunate seniors will confront an array of medical and other constraints on their mobility even as they continue to seek both an active community life, and the ability to age in place. Trails built as part of the bicycle transportation network generally do not allow for motor vehicles. However, they do accommodate motorized wheelchairs, which is an important asset for the growing number of senior citizens who deserve access to independent mobility.

Children under 16 are another important subset of our society who deserve access to safe mobility and a higher quality of life. According to the U.S. Environmental Protection Agency, fewer children walk or bike to school than did so a generation ago. In 1969, 48 percent of students walked or biked to school, but by 2001, less than 16 percent of students between 5 and 15 walked or biked to or from school.[13]

According to the National Center for Safe Routes to School, "Walking or biking to school gives children time for physical activity and a sense of responsibility and independence; allows them to enjoy being outside; and provides them with time to socialize with their parents and friends and to get to know their neighborhoods."[14] In a 2004 CDC survey, 1,588 adults answered questions about barriers to walking to school for their youngest child aged 5 to 18 years.[15] The main reasons cited by parents included distance to school, at 62%, and traffic-related danger, at 30%. Strategic additions to Raleigh's trail system could shorten the distance from homes to schools, and overall bicycle improvements can improve the safety of our roadways.

Footnotes from, "*The Value of Bicycle Transportation*":

1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (1996). Physical Activity and Health: A Report of the Surgeon General.

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3. Rails-to-Trails Conservancy. (2006) Health and Wellness Benefits.

4. Pedestrian and Bicycle Information Center. (2008). Economic Benefits: Money Facts. Retrieved 8/8/2008 from www.bicyclinginfo.org/why/benefits_economic.cfm

5. King, Neil. The Wall Street Journal: Another Peek at the Plateau. (2/27/08): In February 2008, the Wall Street Journal quoted industry experts, stating, "supply constraints could push the price of oil to $150 a barrel by 2010".

6. National Association of Realtors and National Association of Home Builders. (2002). Consumer's Survey on Smart Choices for Home Buyers.

7. NCDOT and ITRE. (2006). Bikeways to Prosperity: Assessing the Economic Impact of Bicycle Facilities.

8. Virginia Department of Conservation. (2004). The Virginia Creeper Trail: An Assessment of User Demographics, Preferences, and Economics.

*9. Federal Highway Administration, Southern Resource Center. (1999). Off-Mode Air Quality Analysis: A Compendium of Practice. To calculate air quality benefits of bicycling, first calculate the Daily VMT reduction. VMT Reduction = PD * Area * L * BMS, where PD = Population density, persons/mile; Area = Project length * 1 mile radius, mile; L = Round trip length, one-half of the project length times 2 daily trips, miles; BMS = Bike mode share, %. Last, calculate the Daily Emission reductions for a pollutant. Ed = EFx * VMT Reduction, where Ed = Daily Emissions, grams/day; EFx = Emission factor for pollutant x, grams/mile; VMT = vehicle mile/day.*

10. U.S. Department of Transportation (DOT), Bureau of Transportation Statistics (BTS) and the Federal Highway Administration (FHWA). (2002). National Household Travel Survey.

11. WRAL. (2008) 8 N.C. Counties Among Nation's Fastest-Growing.

12. Brookings Institution. 2003. The Mobility Needs of Older Americans: Implications for Transportation Reauthorization.

13. US EPA. (2003). Travel and Environmental Implications of School Siting.

14. National Center for Safe Routes to School. (2006). National Center for Safe Routes to School Talking Points.

15. Centers for Disease Control and Prevention. The Importance of Regular Physical Activity for Children. Accessed 9/16/05 at http://www.cdc.gov/nccdphp/dnpa/kidswalk/health_benefits.htm.

CHAPTER 2 OUTLINE:

Overview
History of Bicycling In Raleigh
Bicycling Conditions
Trip Destinations
Demographics
Land Use and Development Patterns

CHAPTER 2: EXISTING CONDITIONS

OVERVIEW

In order to propose a comprehensive bicycle system for the City of Raleigh, it is critical to examine the existing environment. The area's geographic and population characteristics significantly affect transportation, the environment, and everyday decisions by bicyclist, pedestrians, and motorists.

A comprehensive approach consisting of intensive research, analysis, fieldwork, GIS analysis, existing plan review, and Committee meeting discussion was conduct-ed to examine existing conditions. This work lays the foundation for the recom-mendations found later in this Plan. The findings are presented below.

HISTORY OF BICYCLING IN RALEIGH

The City of Raleigh has studied bicycle issues and worked to promote bicycling and facility construction since the late 1960s with the City Council appointment of bicycle committees. The Raleigh Bicycle and Bikeway Ordinance of 1974 was the first effort to produce policies and procedures for designing and constructing bicycle facilities. Three bicycle plans, as elements of comprehensive plans, were generated in 1979, 1983, and 1991. The 1983 plan was not adopted, but citizen interest continued to increase during that time.

The 1991 Raleigh Bicycle Plan is the most recent bicycle plan which is being superseded by this Plan. The plan sought to increase ridership, provide facilities, enhance the greenway system, provide a safer bicycling environment, and put forward basic standards for bicycle facilities. This plan focused on developing bicycle systems for both transportation and recreation.

Since 1991, the City of Raleigh has been slowly pursuing the goals of the last Bicycle Plan. The greenway system has developed dramatically increasing the opportunities for bicycling in the off-road environment. A number of roadways were constructed with wide outside lanes to provide additional space for bicyclists. In 2008, three stretches of bicycle lanes can be found in the entire City.

During the time of this planning process, the City of Raleigh is facing a number of challenges with rapid population and development increases, rising costs including gas prices, and a transportation system that is overburdened. The

Raleigh Comprehensive Plan update is occurring simultaneously with this Plan and is focused on sustainable development, which includes a focus on bicycle transportation. With rising gas prices, more and more bicyclists can be found throughout Raleigh for transportation, utilitarian, and recreational purposes. A summary of existing bicycling conditions is provided in the remainder of this chapter.

BICYCLING CONDITIONS

Friendliness

While the majority of the City of Raleigh is not bicycle-friendly today, the City does feature a number of areas and corridors that are somewhat bicycle-friendly. Generally speaking, these friendly corridors are greenways and streets featuring wide outside lanes. A map of existing facilities can be found in Map 2.1.

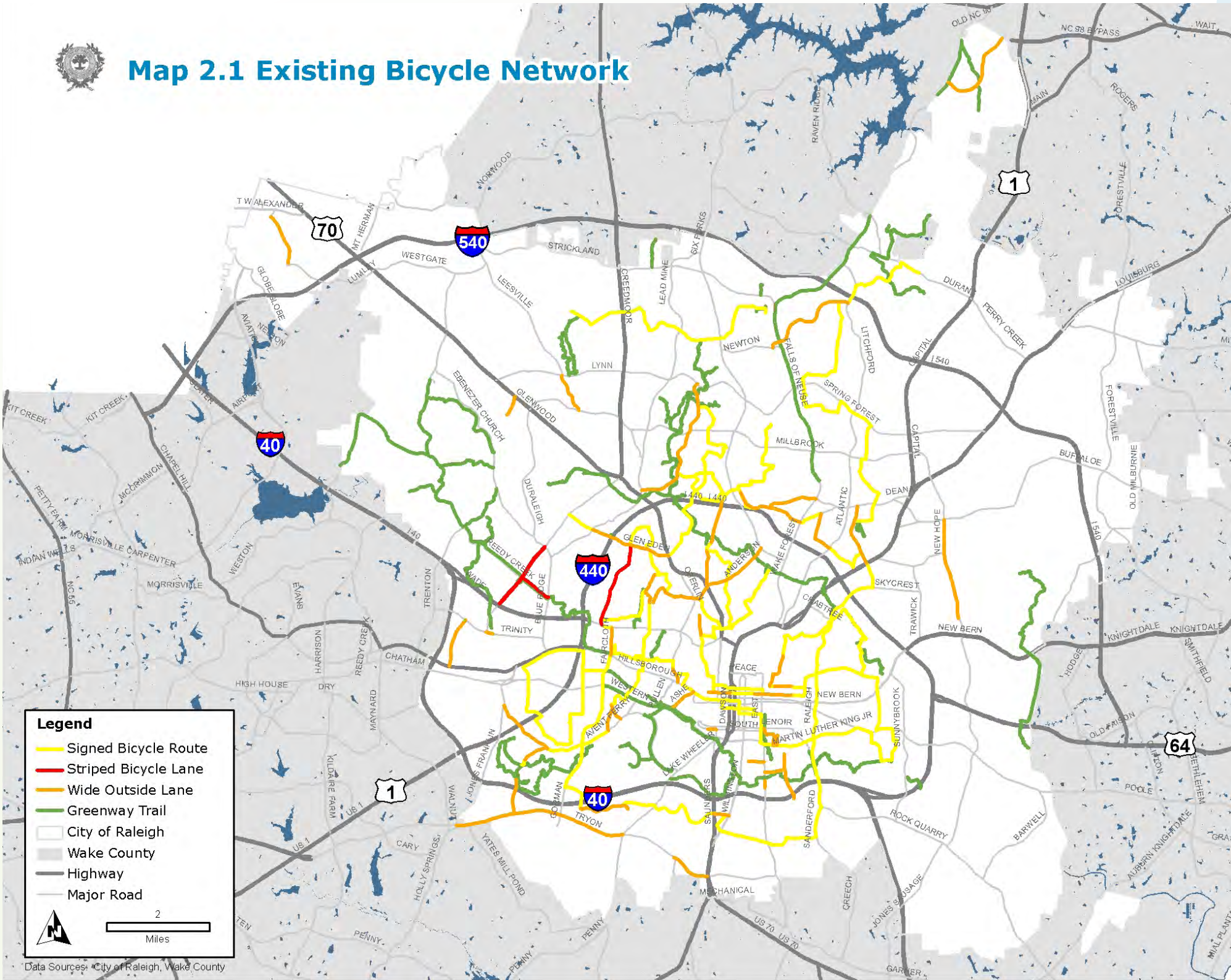
Above: Signs along trails in Raleigh indicate which ones are part of the Capital Area Greenway network.

The Raleigh greenway system is a tremendous resource, covering dozens of miles throughout the City. During the time of this planning effort, additional greenways are proposed and being developed.

Greenways in Raleigh (as of Fall 2008):

Alleghany Trail
Baileywick Trail
Beaver Dam Trail
Bent Creek Trail
Brentwood Trail
Buckeye Trail
Chavis Way
Crabtree-Oak Park Trail
Crabtree Creek - Umstead Trail
Crabtree Valley Trail
Durant Connector Trail
Durant Trail
Fallon Creek Trail
Falls River Connector trail
Falls River Trail
Gardner Street Trail
Glen Eden Park Trail
Honeycutt Creek Trail
Inman Connector Trail
Ironwood Trail
Lake Johnson Trail
Lake Lynn Trail
Lake Park Trail
Little Rock Trail
Loblolly Trail
Lower Walnut - Walnut Creek Park Trail
Lower Walnut - Worthdale Trail
Lower Walnut Creek Trail
Middle Crabtree Creek Trail
Neuse River Trail
North Hills Trail
Reedy Creek Trail
Rocky Branch Trail
Sawmill Trail
Shelly Lake Trail
Umstead Trails
Upper Walnut Trail
Wakefield Trail
Wes Millbrook Trail

Map 2.1 Existing Bicycle Network



Bicycle Lanes in Raleigh (as of Fall 2008):

Edwards Mill Road (Wade Ave to Duraleigh)
Reedy Creek Road (Edwards Mill Road to Blue Ridge Road)
Ridge Road (Wade to Blenheim)

The bicycle lanes have minimal bicycle lane markings and Ridge Road, because of on-street parking issues, has no bicycle lane marking at all.

Wide outside lanes are commonplace across the City of Raleigh, offering opportunities for striping for bicycle lanes. Wide outside lanes are lanes considered wide enough for bicyclists to ride outside the flow of automobile traffic. These are typically 13-14 feet wide. The following roadways contain segments of *wide outside lanes*:

Tryon Road	Edwards Mill Road
Faircloth Street	Glen Eden
North Hills Drive	Leesville Road
New Hope Road	Durant Road
Gorman Street	Glascock Street
Garner Road	Highwoods Boulevard
Lassiter Mill Road	St. Mary's Street

Deficiencies

Overall, conditions for bicycling have been negatively affected by the sprawling nature of development in Raleigh. The prevalence of service-oriented commercial development along nearly all of the major roadway corridors has produced an environment that is inconvenient and in many cases dangerous for cyclists. While the county roads and rural areas surrounding Raleigh serve as routes for some experienced cyclists, most cyclists and 'would-be' cyclists are not comfortable on the roadways, particularly in more developed areas. Even more experienced cyclists express safety concerns as traffic volumes and speeds increase with the growth and development of Raleigh and the surrounding region.

The main problems with the current roadway environment for cyclists in this area stem from four main sources:

- *The lack of on-road bicycle facilities:* When busy roadways are designed for cars only, cyclists are subject to automobiles passing too closely, and many times at higher speeds. Roadway corridors such as Six Forks Road, Wade Avenue, Capital Boulevard and Western Boulevard, are exclusively designed for the automobile. Only three bicycle lanes, totaling 5 miles in distance, can be found in the City of Raleigh. Otherwise, wide outside lanes and paved shoulders are a minority in the overall roadway system.

Above, from top: Bicycle lanes along Edwards Mill Road; bicycle lane and route along Ridge Road; and a bicyle lane and sidepath along Reedy Creek Road.

Above, from top: Connectivity of greenways and bicycle facilities is an important goal of this plan; Hillsborough Street is an example of a high-volume roadway that makes cycling in traffic difficult.

• *The high frequency of driveways and parking lot curb-cuts:* When automobiles are frequently entering and exiting the roadway, they present repeated hazards to cyclists as the automobile crosses the cyclists' path of travel. Regardless of whether or not a roadway has bicycle facilities, constantly turning vehicles will present dangers. Hazards are limited by diverting access points to side streets, combining them for adjacent businesses, and closing all redundant access points. Roadway segments with particularly high numbers of curb-cuts include Glenwood Avenue (US Hwy 70), Six Forks Road, and New Bern Avenue.

• *Improve bicycle access to greenways:* The City of Raleigh has an excellent greenway network, with all greenways eventually connecting into the street network. However, at public workshops, many greenway users noted that they could not ride their bicycle to nearby greenways because of unsafe on-road bicycling conditions. Improving on-road connections to greenways is especially important for less experienced cyclists, who prefer places to ride that are completely separated from automobile traffic, but need to be able to access the greenway network in the first place. Wayfinding signage to and from the greenway system are also in need of improvement.

• *Automobile traffic:* With rapidly increasing population and multiple-lane arterials serving a number of land uses, automobile traffic poses significant issues for bicyclists. High volumes and high speeds make bicycling in the on-road environment difficult on many roadways. Also, the mentality of motorists is one against bicyclists in the roadway. Education is a key issue for motorists who often do not realize that a bicycle is a legal roadway vehicle and the safety hazards that are created.

The Bicycle Level of Service (BLOS) Model

Note: For information on the background, development, and validity of the BLOS model, see Appendix F: Bicycle Level of Service Analysis (BLOS) →

The BLOS Model was used to evaluate bicycle suitability on roadways in the Raleigh area. The BLOS is a scientifically-calibrated method of evaluating the comfort level of bicyclists on a roadway segment, given existing bicycling conditions in relation to motor vehicle traffic. It uses objective, quantitative data to produce a measure of the level of service perceived by a typical bicyclist. Model inputs include measurable traffic and standard roadway factors such as:

- Lateral separation between bicyclists and adjacent motor vehicle traffic
- Presence and width of a paved shoulder or bicycle lane
- Volume and speed of motor vehicle traffic
- Percentage of heavy trucks
- Number of travel lanes
- Presence of on-street parking
- Pavement condition

The BLOS model should be used with the following considerations in mind:

- BLOS grades represent the perceived level of comfort experienced by a typical bicyclist.
- BLOS grades are not associated with safety or reported crashes.
- The BLOS model is a roadway segment analysis; it does not apply to intersections.
- Errors are inherent with data inputs and changing roadway and traffic characteristics.

For Raleigh, the BLOS model was used for most major arterial and collector roadways and encompassed 425 miles. These roadways were chosen because they serve the most traffic and provide the best connectivity between neighborhoods and destinations such as shopping centers, offices, and schools. Many of the minor roadways, including residential streets, that were not included in the analysis are more conducive to bicycling (and would likely have higher BLOS grades) because of lighter traffic volumes and speeds. Also, controlled access highways and interstates were not included because bicycling is illegal on these roadways. Appendix C provides a detailed description of the BLOS model used for Raleigh. The existing data and new measurements for the model are described in Appendix C.

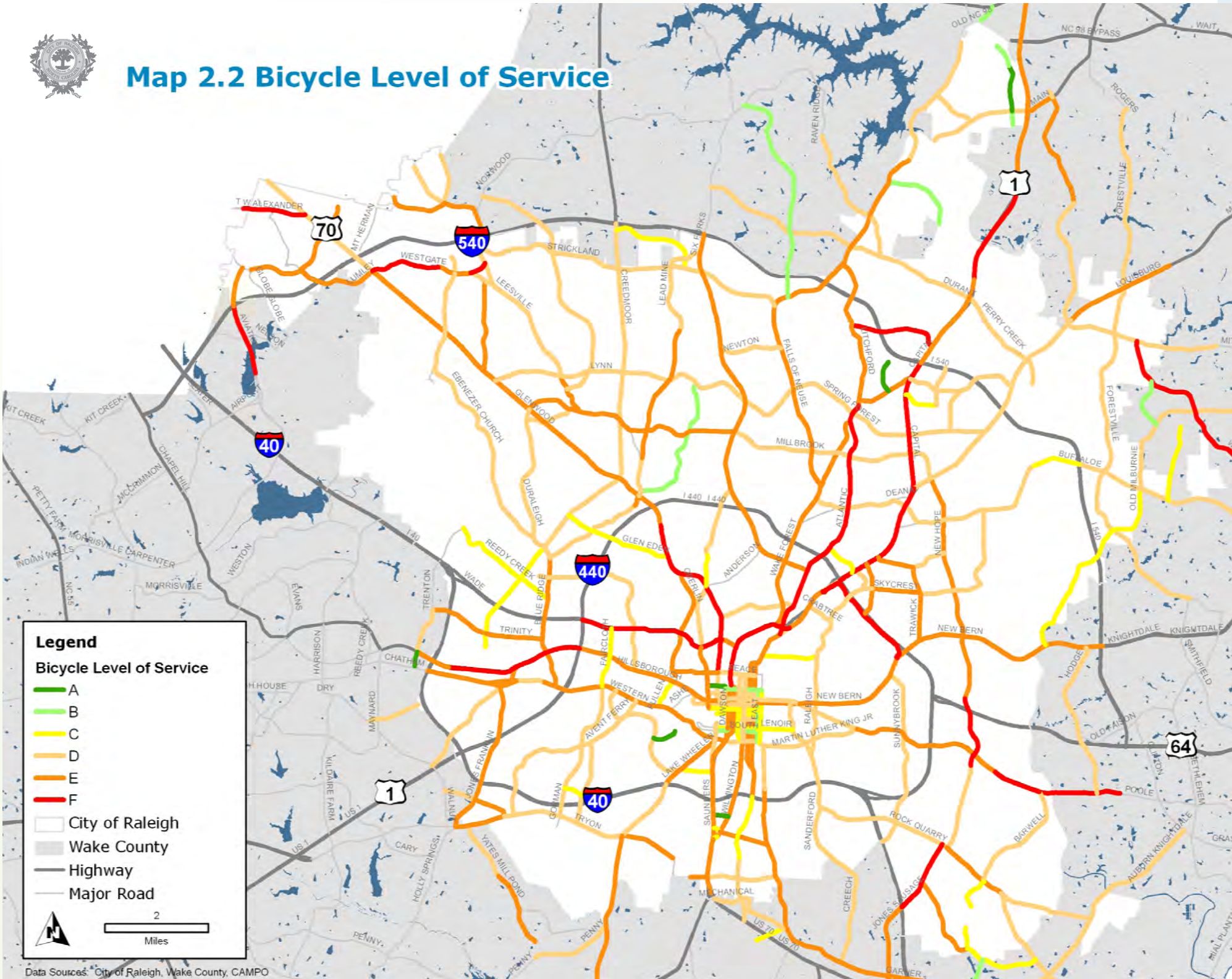
The BLOS model uses letter grades to describe existing conditions. Level "A" reflects the best conditions for bicyclists. This was a rare case for Raleigh roadways. Level "F" represents the worst conditions. The most common letter grade for Raleigh's arterials and major collectors was a "D." 89% of the measured roadways received a BLOS score of "D" or below. Only 0.7% received a score of "A." See Map 2.2 for the BLOS mapping, Chart 2.1 for the BLOS graph, and Table 2.1 for the BLOS summary.

Table 2.1 Raleigh Bicycle Level of Service (BLOS) Summary for Study Network Roadways

BLOS Grade	Miles	% Measured Miles	Segments
A	3.0	0.7%	11
B	14.0	3.3%	11
C	30.5	7.2%	34
D	198.5	46.7%	129
E	138.5	32.6%	106
F	40.5	9.5%	27
No grade*	184.2	N/A	131
Total	425.0	100.0%	449

**Segments with no grade include controlled access highways, interstates, and certain roadways lacking sufficient data at the time of this study.*

Map 2.2 Bicycle Level of Service



One application of BLOS is to test alternative roadway cross-sections and traffic scenarios. The example of the Hillsborough Street redesign project is utilized here. Currently, the section of Hillsborough Street between Horne Street and Logan Court is four lanes, no center turn lane, with on-street parking on one side. The new design features two lanes of travel, on-street parking on both sides, with a center median. This new design will likely divert traffic, thus reducing traffic volume and speeds. The graphic below shows the improvement in BLOS grade as these changes occur.

BLOS Alternative Comparisons Example: Existing Conditions on Hillsborough St.

BLOS Alternative Comparisons Example: Proposed Redesign of Hillsborough St.

Table 2.2: Comparison of Existing Conditions and Redesign of Hillsborough St.

Scenario	Through Lane	ADT	%Heavy Vehicle	Posted Speed	Wt	WI	Wps	Parking Occ.	Pavement Rating	BLOS Score (Grade)
Existing Condition	4	24,000	5	35	14	0	0	25	3	4.92 (E)
Redesign Enhancements without traffic diversion	2	24,000	5	25	23.5	12.5	7.5	100	5	3.6 (D)
Redesign Enhancements with 30% traffic diversion	2	17,080	5	25	23.5	12.5	7.5	100	5	3.4 (C)

Table 2.3: Comparison of BLOS Score for Different Cross-sections on Westgate Road (from Glenwood Ave to Leesville Road)

Roadway Cross-section	Scenario	Through Lanes	ADT	% Heavy Vehicle	Posted Speed	W_t	W_l	BLOS Score (Grade)	% Improvement in BLOS Score (compared to Future No-Build)
Two-lane undivided 24-ft cross-section with 12-ft lanes	Existing	2	14,700	6%	45	12	0	5.40 (E)	N.A.
Two-lane undivided 24-ft cross-section with 12-ft lanes	2015 No-Build	2	19,000	6%	45	12	0	5.53 (F)	N.A.
Five-lane 60-ft cross-section with 12-ft lanes	2015 TIP*	4	19,000	6%	45	12	0	5.18 (E)	6%
Five-lane 64-ft cross-section with 14-ft wide outside lanes	2015 TIP*	4	19,000	6%	45	14	0	4.92 (E)	11%
Five-lane 60-ft cross-section with 11-ft/13-ft lanes	2015 TIP*	4	19,000	6%	45	13	0	5.05 (E)	9%
Five-lane 60-ft cross-section with 10-ft/14-ft lanes	2015 TIP*	4	19,000	6%	45	14	0	4.92 (E)	11%
Five-lane 60-ft cross-section with 10-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	6%	45	14	4	4.28 (D)	23%
Five-lane 68-ft cross-section with 12-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	6%	45	16	4	3.90 (D)	29%
Five-lane 68-ft cross-section with 12-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	3%	45	16	4	3.09 (C)	44%
Five-lane 68-ft cross-section with 12-ft lanes and 4-ft striped bike lanes	2015 TIP*	4	19,000	3%	35	16	4	2.90 (C)	48%

** TIP U-2918: SR 1837 (Westgate Road) from East of US 70 to SR 1822 (Leesville Road), 2.8 Miles -Widen to Multi-Lanes (CAMPO 2009-2015 TIP)*

Note: BLOS analysis assumed a pavement condition rating of 4.5, no on-street parking, directional traffic factor (D) of 0.51, peaking factor (K) of 0.1, and peak hour factor (PHF) of 0.92 for all scenarios

Crash Data

A central goal of this plan is to increase the safety of bicycle activity in the Raleigh area. To assess the current level of safety for non-motorized transportation, information about bicyclist crashes was gathered for the City of Raleigh (Data from NCDOT Traffic Safety Unit). Bicycle crash reports were analyzed for a 7-year period, 2000-2006. A total of 365 bicycle crashes occurred during this time period. 356 of the 365 were accurately geocoded and mapped as part of this planning process. Key findings about bicycle crashes in Raleigh are listed below. It should be noted that not all bicycle crashes are reported.

Above: In addition to using crash data to determine dangerous locations for bicyclists, public workshops were also held to receive direct input from the public (see Appendix A for more information).

- Out of the 365 total crashes, 102 or 28% occurred in the overnight hours (6pm-6am). 263 total incidences (or 72% of the incidences) occurred during the daytime hours (6am-6pm).

- There was a yearly average of roughly 52 crashes in the City of Raleigh.

- There were 5 bicyclists killed on Raleigh streets during the time period. An additional 12 bicycle-related crashes resulted in a disabling injury.

Map 2.3 (page 2-11) displays sites of the bicycle crashes along with a density surface indicating clusters of incidences. In general, bicycle crashes were concentrated in parts of the City with higher levels of bicycle activity, such as the major roadway and commercial corridors, near NC State University (where a number of students travel by bicycle), and near lower-income areas

where fewer people have access to automobiles. More specifically, these non-motorized crashes tended to occur more often on multi-lane roadways with high volumes of traffic, especially at intersections. Therefore, many of the bicycle facility improvements listed in the recommendations chapter are for these roadway corridors.

The top nine locations of repeated bicycle crashes are shown in Table 2.3 on the following page. The top 20 corridors of repeated bicycle crashes are shown in the following table, Table 2.4. Clearly, the top crash corridor is Hillsborough Street, with a number of incidences occurring on major Raleigh arterials.

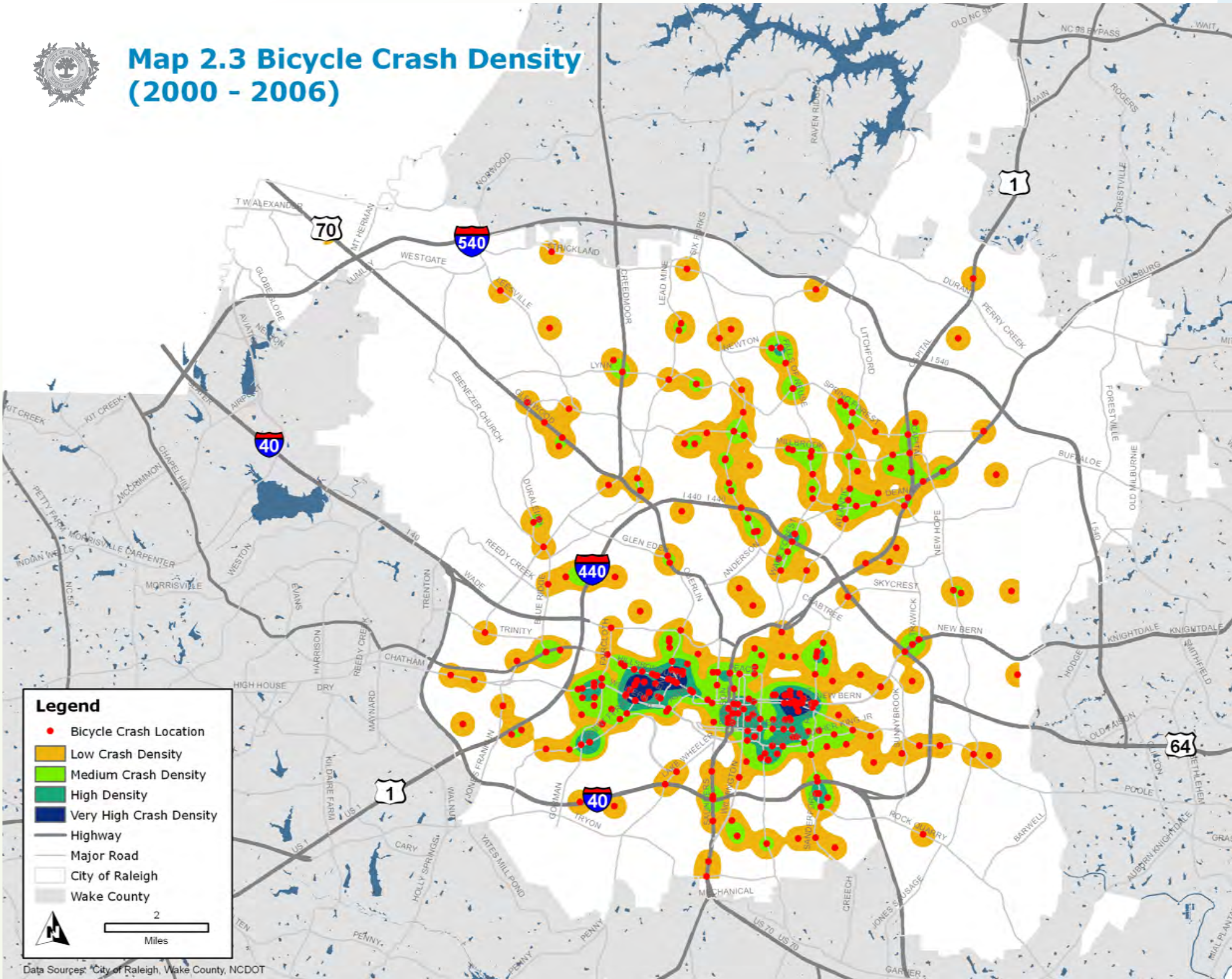
Table 2.4 Top Nine Locations of Repeated Bicycle Crashes, 2000-2006:

Road	*Cross Road*	*# of Crashes*
Avent Ferry Road	Trailwood Drive	6
Hillsborough Street	Enterprise Street	4
Dan Allen Drive	Cates Avenue	4
Avent Ferry Road	Western Blvd.	3
Hillsborough Street	Oberlin Road	3
Hillsborough Street	Blue Ridge Road	3
Edenton Street	Pettigrew Street	3
Falls of Neuse Road	Newton Road	3
Wake Forest Road	Navajo Drive	3

Table 2.5 Top Twenty Corridors of Repeated Bicycle Crashes, 2000-2006:

Corridor	*# of Crashes*	*Corridor*	*# of Crashes*
Hillsborough Street	26	Atlantic Avenue	9
New Bern Avenue	16	Cates Avenue	9
Avent Ferry Road	13	Glenwood Avenue	7
Dan Allen Drive	13	New Hope Church Rd	7
Falls of Neuse Road	12	Trailwood Drive	7
Six Forks Road	12	Wake Forest Road	7
Spring Forest Road	11	Jones Street	6
Capital Blvd	10	Oberlin Road	6
Rock Quarry Road	10	Leadmine Road	5
Western Blvd.	10	Lynn Road	5
		MLK Jr Blvd	5

Map 2.3 Bicycle Crash Density (2000 - 2006)



TRIP DESTINATIONS

People currently drive, walk, or bike to a variety of destinations across Raleigh for vari-ous purposes. These destination points are referred to in this document as trip attractors. Map 2.4 shows important trip attractors across the City. The most common categories of bicycle trip attractors in Raleigh include:

- Downtown
- Universities (NC State University, Meredith College, Shaw University, Peace College, Wake Technical Community College, St. Augustine's College)
- Shopping locations (grocery stores, shopping centers, restaurants, downtown)
- Parks and greenways
- Community and recreation centers
- Historic and other points of interest
- Places of employment (Downtown, office centers, hospitals, retail areas)

Each of these categories of bicycle trip attractors was considered when determining locations for the physical bicycle improvements recommended in Chapter 4. They represent important starting and ending points for bicycle travel and provide a good basis for planning ideal routes.

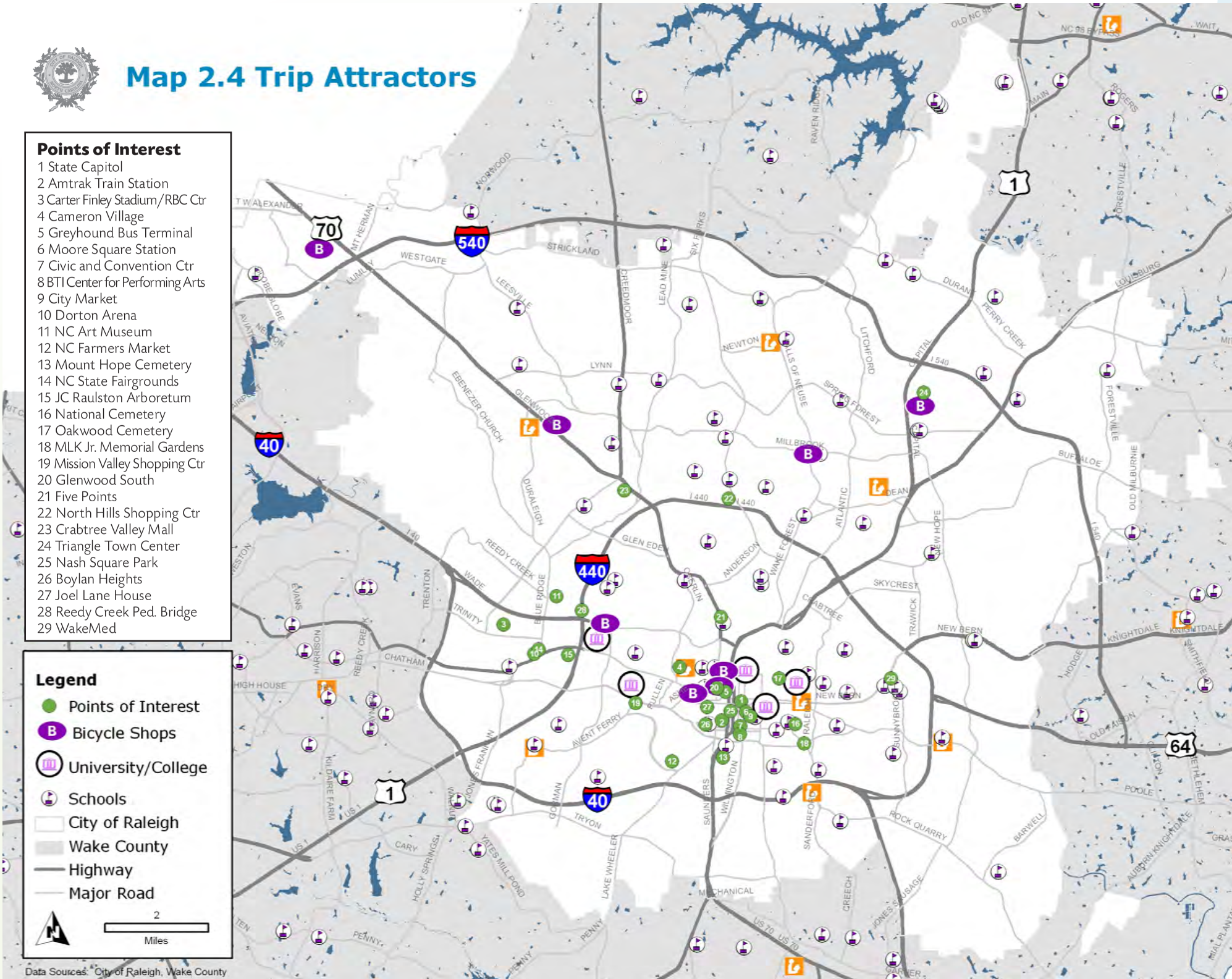
Bicycling Conditions at Destinations

As part of this planning process, major destinations in Raleigh were examined to determine both strengths and weaknesses of sites in terms of providing adequate end-trip facilities such as bicycle parking, storage facilities, and showers. Overall trends of these areas were examined.

Destinations studied were:

North Carolina State University
Peace College
Meredith College
Cameron Village
North Hills Shopping Center
Wake Medical Center
Raleigh Museums
Raleigh Convention Center
Shaw University
Saint Augustine's College
Wake Technical Community College
Ridgeway Shopping Center
Crabtree Valley Mall
Downtown Raleigh Districts
Pullen Park

Map 2.4 Trip Attractors



In general, additional bicycle parking is needed throughout the City of Raleigh, especially in the Downtown and NC State areas and at other destinations. A number of examined destinations featured bicycle racks and other amenities at sites including NC State University, Cameron Village, and the North Carolina Museum of Art. Destinations such as Ridgewood Shopping Center and Downtown Raleigh continue to draw bicycle riders despite a low number of bicycle facilities. One of the destinations observed with apparent deficiencies in the facilities offered to bicyclists was Downtown Raleigh, where many people resort to securing their bikes to tree grates or light poles due to insufficient and/or inconvenient bicycle racks.

For a complete summary report of bicycle facilities at major destinations, see Appendix G.

DEMOGRAPHICS

From 2000 to 2006, Wake County was the 14th fastest growing county in the United States. The population of the City of Raleigh in 2000 was 276,093 persons and the July 2008 estimate was 380,173. This tremendous growth presents need and opportunity for providing multi-modal transportation options to address smart growth and sustainability. While it is clear that population growth is a key issue that needs addressing, more specific census data allows for an analysis of population characteristics for the City of Raleigh as it portrays bicycling conditions and need.

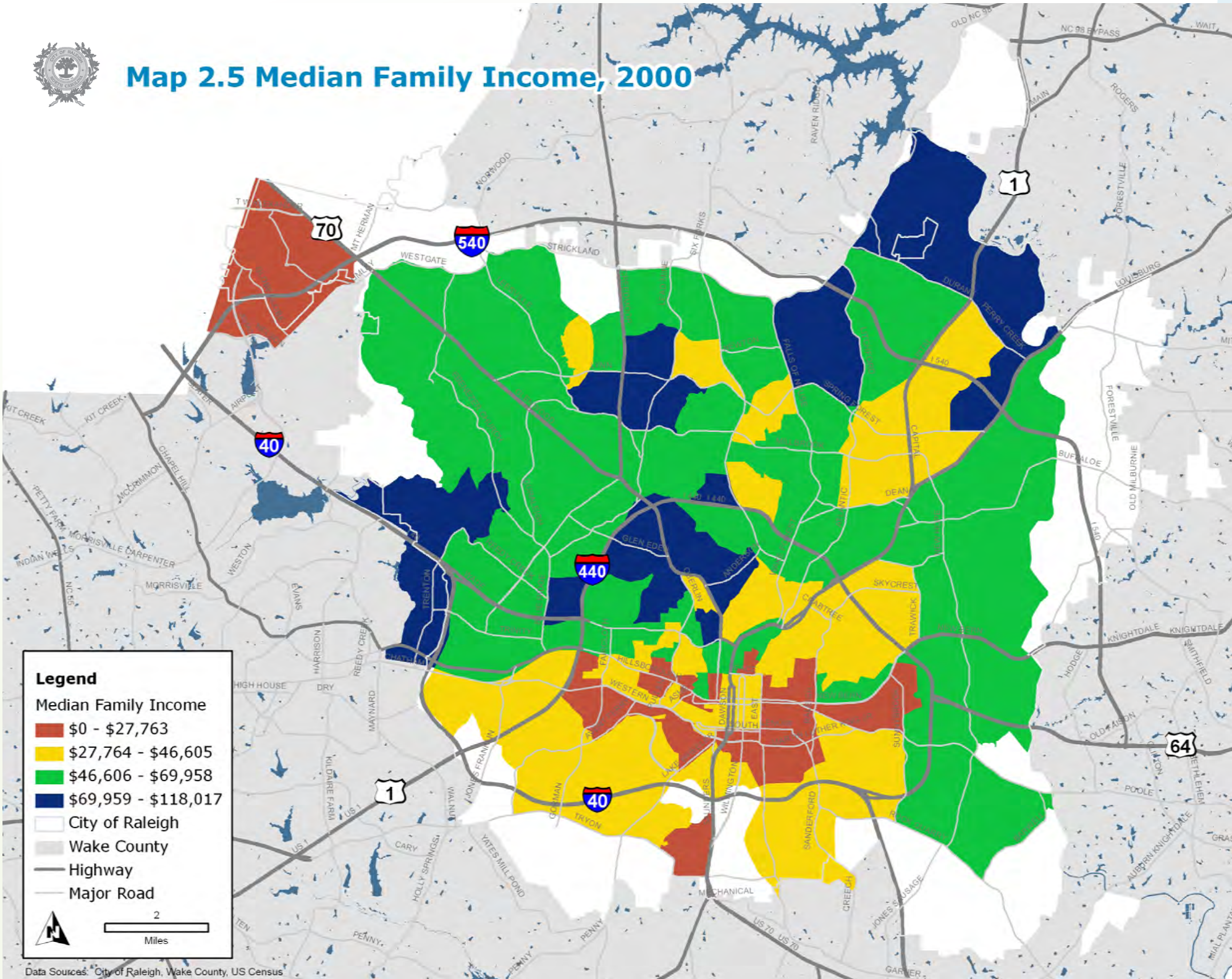
Considering more specific items such as population density, median family income, vehicle ownership, and bicycle mode share in a geographic framework provides a means for recommending facility and programmatic needs described later in this Plan.

Map 2.5 presents 2000 median familiy income by census block group. Areas of lower income may represent areas of increased need and dependence on a bicycle for transportation.

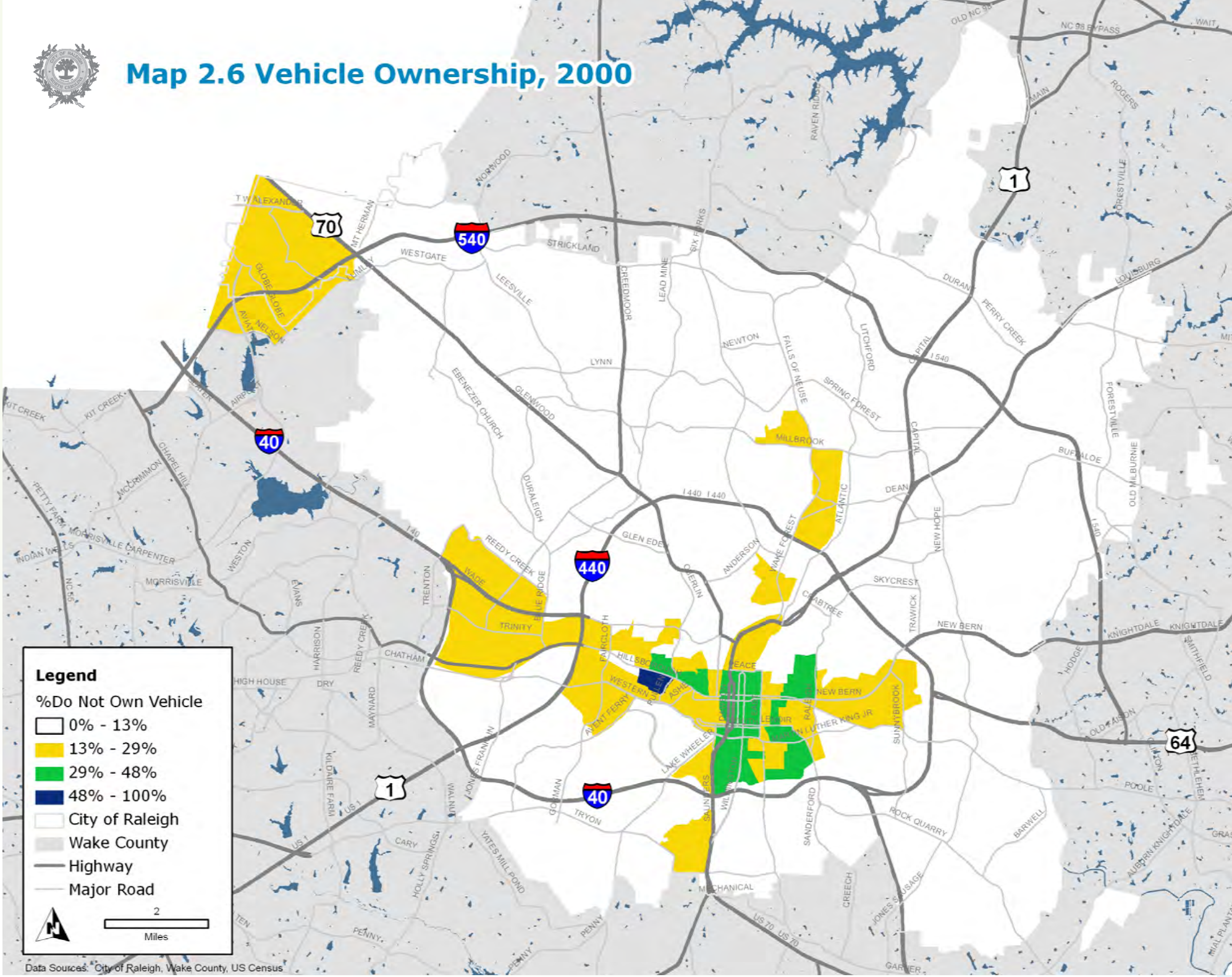
Map 2.6 shows 2000 vehicle ownership by census block group. This is another surrogate for locating lower-income areas, multi-use areas, and college populations and more specificically presents areas in greater need of bicycle facilities. Because of these economic circumstances , these groups are more likely to be in need of a modernized bicycle and pedestrian networks to access activities.

Map 2.7 shows 2000 bicycle mode share by census block group. While the City of Raleigh as a whole has a low bicycle mode share (0.3%), there are locations in which bicycle commuting is more commonplace. These areas may again present greater demand and need for bicycle facilities.

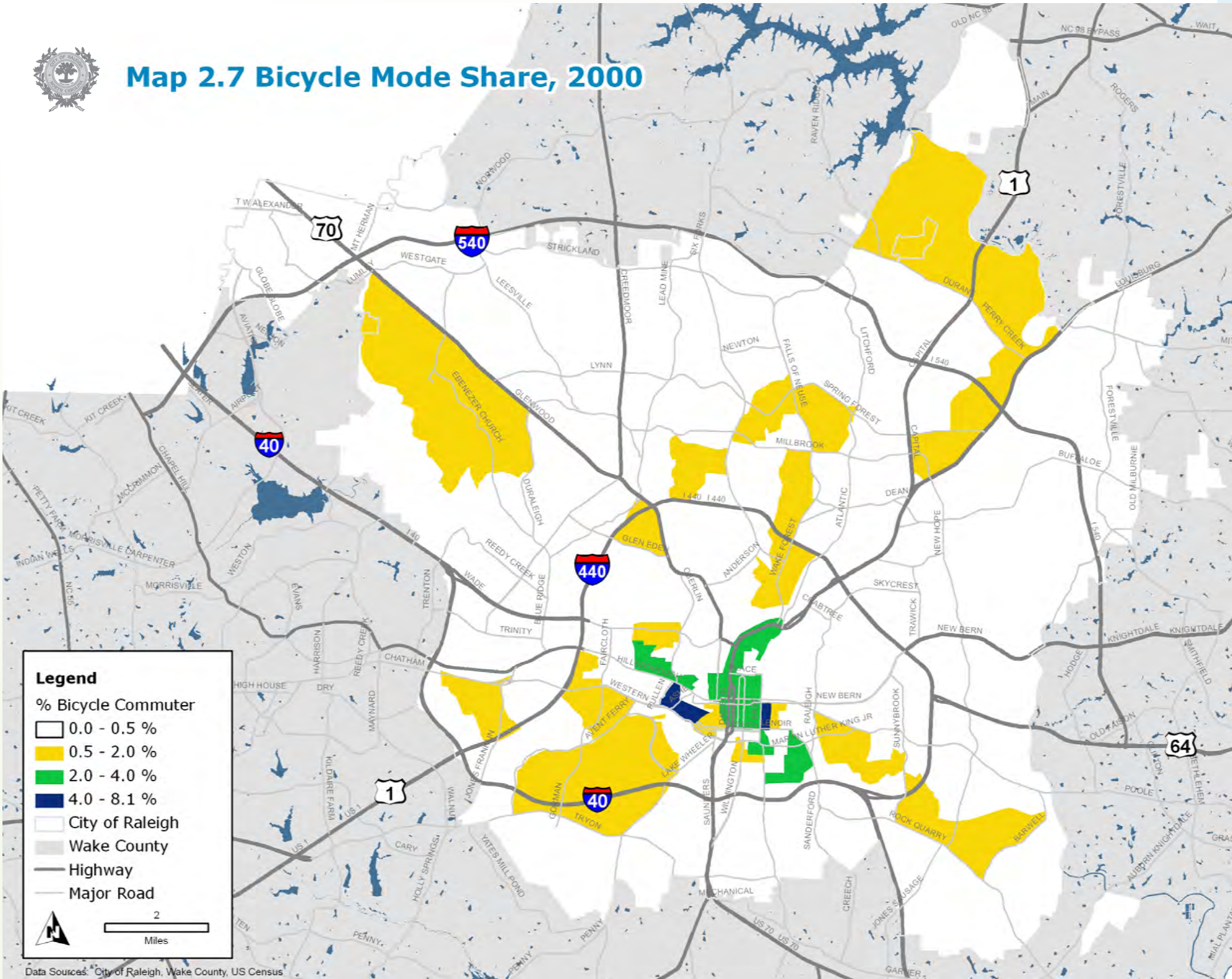
Map 2.5 Median Family Income, 2000



Map 2.6 Vehicle Ownership, 2000



Map 2.7 Bicycle Mode Share, 2000

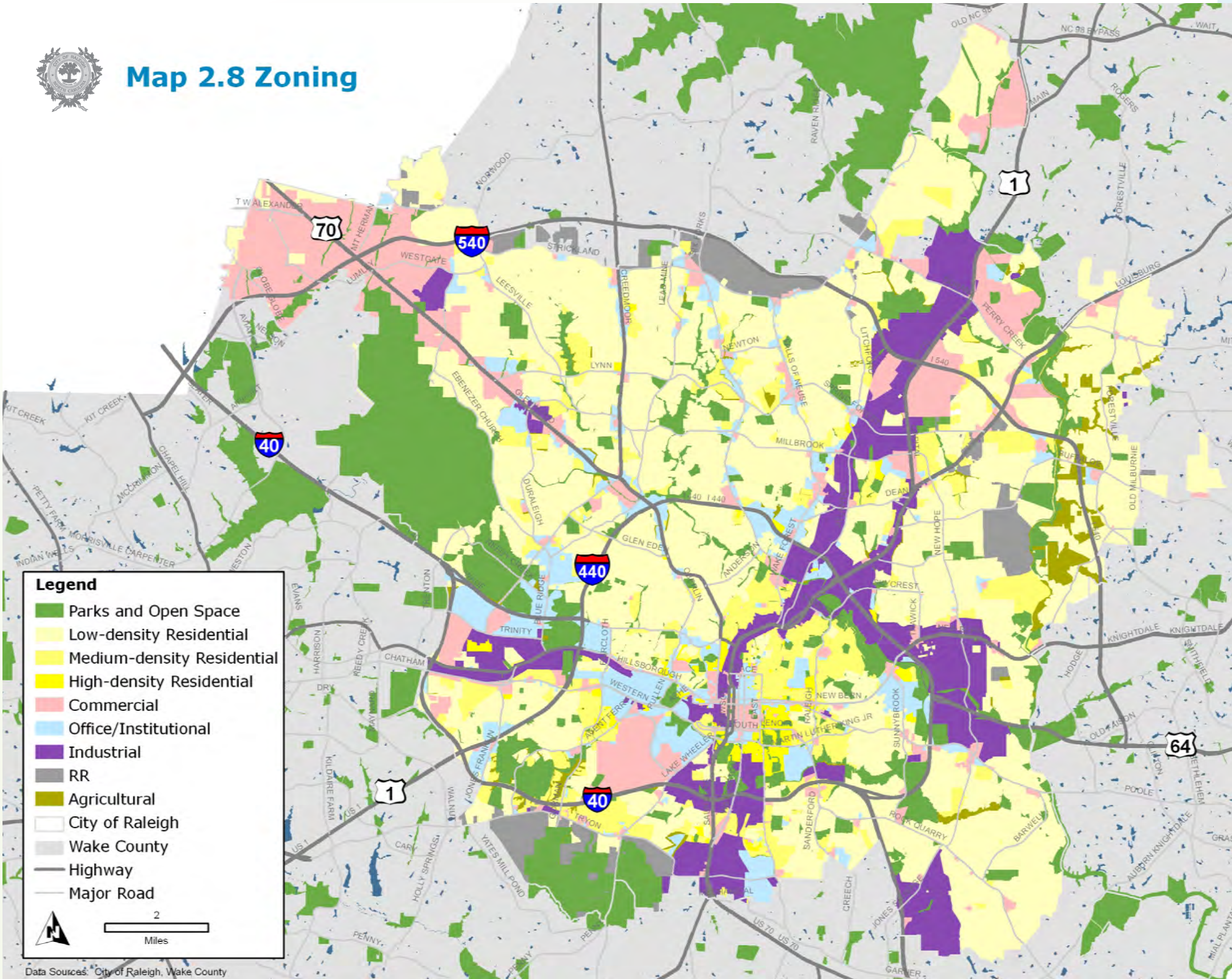


LAND USE AND DEVELOPMENT PATTERNS

Current land use and zoning (zoning shown in Map 2.8) is a result of development activity over the past few decades. Multiple land uses can be found throughout Raleigh with distinct patterns emerging, especially along roadways. These patterns and characteristics have a major influence on bicycle transportation. Proximity of uses and types of uses matter in a person's choice to bicycle, along with the quality of environment, ease of access, and safety.

Land use was considered and analyzed during this process to determine bicycle connectivity needs between multiple land uses, and to establish bicycle network priorities.

Map 2.8 Zoning



CHAPTER 3 OUTLINE:
Overview
Current Bicycle Use
Demand
Demand Analysis
Summary of Public Input
Benefits Analysis

CHAPTER 3: DEMAND + BENEFIT ANALYSIS

OVERVIEW

The need and demand for a more accessible, safe and functional bicycle system is paramount throughout the Raleigh urban area. This is clearly articulated by community residents who attended open house meetings, and is becoming increasingly important given today's climate of increasing gas prices. Deficiencies in the current bicycle network and bicycle crash information are described in Chapter 2, presenting another case for needed improvements. The benefits of a more bicycle-friendly community with an increased number of bicyclists is also clear because of positive impacts on public health, air quality, transportation, and recreation.

This chapter presents current bicycle use, demand analysis, a summary of public input, and a benefits analysis. All of these elements support the development and implementation of this Plan within the broader context of Raleigh's vision for the future.

CURRENT BICYCLE USE

Regardless of the availability or condition of existing bicycle facilities, a number of residents bicycle throughout Raleigh to destinations such as work, shopping centers, parks, and neighbors' homes. Census data provides information regarding the means of transportation to work and an important starting point to understanding current use.

Raleigh Mode Share Statistics

Regarding commuting patterns, the mean travel time to work for Raleigh residents is about 19 minutes, four minutes lower than the State average. While a number of people live and work in Raleigh, there are a number of commuters to RTP. Here's how Raleigh residents get to work:

Table. 3.1 Means of Transportation to Work, Raleigh, NC (2000)

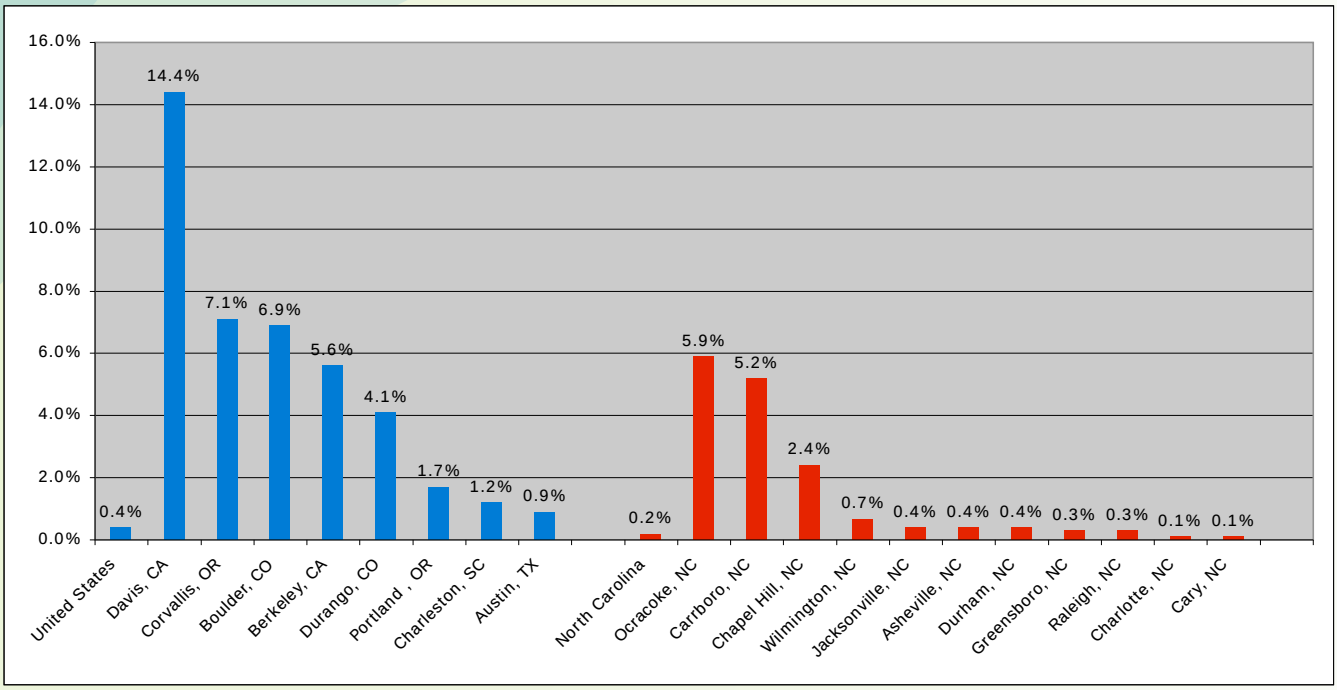
Workers over age of 16, 2000 Census:	151,655	(100%)
Drove alone	119,290	(78.7%)
Carpooled	17,417	(11.5%)
Worked at home	4996	(3.3%)
Walked	4383	(2.9%)
Bus or trolley bus	3,077	(2.0%)
Other means	1215	(0.8%)
Taxi	517	(0.3%)
Bicycle	**508**	**(0.3%)**
Motorcycle	176	(0.1%)

Source: U.S. Census Bureau, Census 2000 Summary File 3, Table P30 Means of Transportation to Work. 'Scooters' and 'mopeds' were technically part of the 'Motorcycle' category for the 2000 Census, however, according to the individual respondent's interpretation, they may have been reported in the 'Other means' category.

There is a significant difference between the numbers of people bicycling/ walking to work as compared to driving to work. This is very typical across the United States (see graphs below). At 0.3%, Raleigh has a slightly higher percentage of bicycle commuters compared to the State average.

The graphs below show how Raleigh stacks up locally, statewide, and nationally in terms of bicycle commuting. As demonstrated above, bicycle-commuting statistics can serve as an indicator for total number of bicyclists, and is one of the most reliable benchmarks available from which to compare between communities.

Percentages for Bicycle Commuting (2000):
Comparison of National, Statewide, and Local Examples



Source: U.S. Census Bureau, Census 2000 Summary File 3, Table P30 Means of Transportation to Work.

When compared to cities and towns that represent model bicycling communities, the City of Raleigh still appears to have plenty of room for improvement. Nevertheless, the City is right on the State and national average. Two of Raleigh's neighbors (Chapel Hill and Carrboro) rank in the Top 10 in the State in bicycle percentage mode share.

DEMAND

A variety of demand models are often used to quantify usage of existing bicycle facilities, and to estimate potential usage of new facilities. The purpose of these models is to provide an overview of the demand and benefits of bicycling in Raleigh. As with all models, the results show a range of accuracy that can vary based on a number of assumptions and available data. The models used for this study incorporate information from existing publications as well as data from the U.S. Census. All data assumptions and sources are noted in the tables following each section of the analysis.

U.S. Census data provides a useful baseline for quantifying demand. In the 1990 Census, Raleigh's combined bicycle/pedestrian mode share was 2.3%, with 5,769 people walking or bicycling to work. In the year 2000, the number of bike/walk commuters had increased to 6,535, but the overall mode share had been reduced to 1.8% due to increased use of other forms of transportation. The 1990 – 2000 US Census trend data is shown in the Table 3.2 below.

Table 3.2 Selected Characteristics by Place Of Work (1990 and 2000)

Selected Characteristics (Universe: All Workers)	1990		2000		Change 1990 to 2000	
	Number	Percent	Number	Percent	Number	Percent
Workers 16 years or over	**249,943**	**100**	**360,165**	**100**	**110,222**	**44.1**
Sex						
Male	133,480	53.4	195,945	54.4	62,465	46.8
Female	116,463	46.6	164,225	45.6	47,762	41.0
Mode to work						
Drove alone	196,816	78.7	287,165	79.7	90,349	45.9
2-person carpool	28,103	11.2	33,040	9.2	4,937	17.6
3-or-more-person carpool	8,253	3.3	14,100	3.9	5,847	70.8
Bus or trolley bus	3,302	1.3	3,280	0.9	-22	-0.7
All other transit[1]	23	0.0	85	0.0	62	269.6
Bicycle or walked	**5,769**	**2.3**	**6,535**	**1.8**	**766**	**13.3**
Taxicab, motorcycle, or other mode	2,343	0.9	3,225	0.9	882	37.6
Worked at home	5,334	2.1	12,735	3.5	7,401	138.8

Source: U.S. Census Bureau, Census 2000 Census Transportation Planning Package (CTPP 2000) Geographic Area: Working in Wake County, North Carolina

More recent data is available from the 2005 American Community Survey (ACS), which shows separate data for walking and bicycling. The ACS shows a 0.3 bicycling mode share for Raleigh in 2005, with 540 people bicycling to work. It is important to note that the Census and ACS data only counts trips to work, and does not capture Raleigh's significant amount of travel to schools, other utilitarian travel or recreation. The model in the following section uses Census data as a baseline, along with documented sources to incorporate the full range of bicycle mobility in Raleigh.

DEMAND ANALYSIS

The Raleigh bicycle demand model consists of several variables including commuting patterns of working adults, and predicted travel behaviors of area college students and school children. For modeling purposes, the study area included all residents within the city of Raleigh in 2000. The information was ultimately aggregated to estimate the total existing demand for bicycle facilities in the city. Table 3.3 identifies the variables used in the model. Data regarding the existing labor force (including number of workers and percentage of bicycle commuters) was obtained from the 2000 U.S. Census. In addition to people commuting to the workplace via bicycle, the model also incorporated a portion of the labor force working from home. Specifically,

it was assumed that about half of those working from home would make at least one bicycling or walking trip during the workday. The 2000 Census was also used to estimate the number of children in Raleigh. This figure was combined with data from National Safe Routes to School surveys to estimate the proportion of children riding bicycles to and from school. College students constituted a third variable in the model due to the presence of numerous higher education institutions such as NC State University, Shaw University, Meredith College, Peace College, St. Augustine's College, and Wake Technical Community College. Data from the Federal Highway Administration regarding bicycle mode share in university communities was used to estimate the number of students bicycling to and from campus. Finally, data regarding non-commute trips was obtained from the 2001 National Household Transportation Survey to estimate bicycle trips not associated with traveling to and from school or work.

Table 3.3 summarizes estimated existing daily bicycle trips in Raleigh. The table indicates that over 55,000 trips are made on a daily basis, with most trips made by college students. The model also shows that non-commuting trips comprise the vast majority of existing bicycle demand.

Table 3.3 Aggregate Estimate of Existing Daily Bicycling Activity in Raleigh

Variable	Figure	Calculations
Employed Adults, 16 Years and Older		
a. Study Area Population (1)	276,579	
b. Employed Persons (2)	151,655	
c. Bicycle Commute Percentage (2)	0.3%	
d. Bicycle Commuters	455	(b*c)
e. Work-at-Home Percentage (2)	3.3%	
f. Work-at-Home Bicycle Commuters (3)	2,502	[(b*e)/2]
School Children		
g. Population, ages 6-14 (4)	28,807	
h. Estimated School Bicycle Commute Share (5)	2%	
i. School Bicycle Commuters	576	(g*h)
College Students		
j. Full-Time College Students (6)	39,251	
k. Bicycle Commute Percentage (7)	10%	
l. College Bicycle Commuters	3,925	(j*k)
Work and School Commute Trips Sub-Total		
m. Daily Commuters Sub-Total	7,459	(d+f+i+l)
n. Daily Commute Trips Sub-Total	14,917	(m*2)
Other Utilitarian and Discretionary Trips		
o. Ratio of "Other" Trips in Relation to Commute Trips (8)	2.73	ratio
p. Estimated Non-Commute Trips	40,723	(n*o)
Total Estimated Bicycle Trips	55,641	(n+p)

Notes:
Census data collected from 2000 U.S. Census for City of Raleigh.

(1) 2000 U.S. Census, STF3, P1.
(2) 2000 U.S. Census, STF3, P30.
(3) Assumes 50% of population working at home makes at least 1 daily bicycle trip.
(4) 2000 U.S. Census, STF3, P8.
(5) Estimated share of school children who commute by bicycle, as of 2000 (source: National Safe Routes to School Surveys, 2003).
(6) Source: Citytowninfo.com for City of Raleigh.
(7) Review of bicycle commute share in 7 university communities (source: National Bicycling and Walking Study, FHWA, Case Study #1, 1995).
(8) 27% of all trips are commute trips (source: National Household Transportation Survey, 2001).

SUMMARY OF PUBLIC INPUT

Another expression of need and demand comes from public input throughout this planning process. Input received in this Plan clearly shows a desire for bicycle improvements in Raleigh. Public input was obtained through two chief methods: public workshops and comment form (available online and as hardcopy). A complete, graphic summary of public input may be found in Appendix A.

During public workshops, attendees spoke with City and consultant staff and marked on maps indicating their visions and ideas for bicycle facilities in Raleigh. Through map markups and discussion, it was clear that there was a desire for improved bicycle facilities, especially along a few major routes:

Hillsborough Street
Glenwood Avenue
Six Forks Road
Avent Ferry Road

Covering a larger breadth of bicycle issues, the comment form was completed by more than 700 people. Selected questions and most common responses are presented below, along with a brief statement of expressed need:

Question: How do you rate present bicycling conditions in the Raleigh area?

53% described current bicycling conditions in Raleigh as poor
46% described current bicycling conditions in Raleigh as fair
1% described current bicycling conditions in Raleigh as excellent

Expressed Need: A comprehensive approach to bicycle facility, program, and policy development is needed.

Question: What bicycling destinations would you most like to get to?

80% would like to bicycle to existing trails and greenways;
72% would like to bicycle to Downtown;
70% would like to bicycle to work;
70% would like to bicycle to parks.

Expressed Need: A bicycle network that connects multiple land uses and destinations is important. Connectivity to the Downtown area, office centers, and existing greenways and parks is particularly needed.

Question: Which statement best describes your comfort level on a bicycle.

44% preferred riding off-road paths or clearly designated bicycle lanes
41% were comfortable in any on-road situation
15% preferred only riding in an off-road path

Expressed Need: An on-road and off-road bicycle network composed of multiple facilities is needed for different types of bicyclists.

Question: Which of the following factors prevent you from bicycling or from bicycling more often?

77% said a lack of bicycle lanes, shoulders, or paths
67% said 'inconsiderate motorists'
62% said high-speed traffic
63% said narrow lanes
53% said heavy traffic

Expressed Need: There is a need for better bicycle facilities in the on-road environment and a need for off-road facilities to avoid traffic issues. Also, a traffic calming and educational effort should be considered for motorists and bicyclists.

Question: Which of the following changes would encourage you to bike more often?

84% said more bicycle lanes
67% said more off-road bicycle paths

Expressed Need: Bicycle lanes and off-road bicycle paths are critical for encouraging people to bicycle more often.

Question: How do you feel drivers in your area typically behave around bicyclists?

70% felt that motorists pass bicyclists too closely
60% felt that motorists drive too fast

Expressed Need: A traffic calming, law enforcement, and an educational campaign should address motorist behavior.

Question: How do you feel bicyclists in your area typically behave?

57% felt that bicyclists were courteous, obeying all traffic laws
39% felt that bicyclists fail to comply with traffic laws

Expressed Need: An educational and law enforcement effort should address bicyclist behavior.

Question: What do you think are the top three roadway corridors (in Raleigh City limits) most needing bicycling improvements?

Top 10 Roadways were:

1. Hillsborough Street
2. Glenwood Avenue
3. Capital Blvd.
4. Six Forks Road
5. Falls of Neuse Road
6. Wade Avenue
7. Blue Ridge Road
8. Atlantic Avenue
9. Western Blvd.
10. Avent Ferry Road

Expressed Need: Major arterials were identified as the top roadway corridors for improvements. This is likely because of their ability to connect multiple, major destinations and because of their poor bicycling conditions at the time of this study. Hillsborough Street and Glenwood Avenue were the clear leaders for this question.

BENEFITS ANALYSIS

In addition to models quantifying demand for non-motorized facilities, a variety of models can also quantify the benefits of such facilities. Models were used in this analysis to estimate the positive air quality, public health, transportation, and recreation benefits associated with existing and future bicycle travel in Raleigh.

Air Quality Benefits

Non-motorized travel directly and indirectly translates into fewer vehicle trips, and an associated reduction in vehicle miles traveled and auto emissions. The variables used as model inputs generally resemble the variables used in the demand model discussed earlier. Data including population, employed persons and commute mode share were used for this analysis. In terms of daily bicycle trips, assumptions regarding the proportion of persons working at home reflect those used in the demand model. Other inputs included data regarding college student and school children commuting patterns.

Additional assumptions were used to estimate the number of reduced vehicle trips and vehicle miles traveled, as well as vehicle emissions reductions. In terms of reducing vehicle trips, it was assumed that roughly 73 percent of bicycle trips would directly replace vehicle trips for adults and college students. For school children, the reduction was assumed to be about 53 percent. To estimate the reduction of existing and future vehicle miles traveled, a bicycle roundtrip distance of eight miles was used for adults and college students; and one mile for school children. These distance assumptions are used in various non-motorized benefits models. The vehicle emissions reduction estimates also incorporate calculations commonly used in other models, and are identified in the footnotes of Table 3.4.

Estimating future benefits required additional assumptions regarding Raleigh's population and anticipated commuting patterns. According to the U.S. Census, approximately 151,000 people were employed in Raleigh in 2000. A workforce population of 212,000 was used for the 2009-10 base year, to reflect growth projections that are consistent with the City's Draft Comp Plan Update. In terms of commuting patterns, the bicycling mode share was increased to address anticipated higher use generated by the addition of new non-motorized facilities and enhancements to the existing system. The estimated proportion of residents working from home was also grown slightly.

Table 3.4 summarizes existing and potential future air quality improvements associated with bicycling in Raleigh. Bicycling currently removes over 5,300 weekday vehicle trips, thus eliminating nearly 40,500 vehicle miles traveled. Bicycling also prevents nearly 24,000 tons of vehicle emissions from entering the ambient air each weekday. Bikeway network enhancements are expected to generate more bicycling in the future. This growth is expected to improve air quality by further reducing the number of vehicle trips, vehicle miles traveled and associated vehicle emissions.

It should be noted that this model only addresses commute-related trips. Unlike the demand models, this model does not account for air quality improvements associated with recreational non-motorized travel. Quantifying the benefits of recreational travel could further improve the air quality benefits of bicycling.

Table 3.4 Existing and Potential Future Air Quality Benefits

Vehicle Travel Reductions	*Existing*	*Future*
Reduced Vehicle Trips per Weekday (1)	5,329	13,841
Reduced Vehicle Trips per Year (2)	1,390,996	3,612,517
Reduced VMT per Weekday (3)	40,498	104,748
Reduced VMT per Year (2)	10,570,085	27,339,218

Vehicle Emissions Reductions	*Existing*	*Future*
Reduced PM10 (tons per weekday) (4)	745	1,927
Reduced NOX (tons per weekday) (5)	20,201	52,248
Reduced ROG (tons per weekday) (6)	2,940	7,605
Reduced PM10 (tons per year) (7)	194,490	503,042
Reduced NOX (tons per year) (7)	5,272,358	13,636,802
Reduced ROG (tons per year) (7)	767,388	1,984,827

Note: VMT means Vehicle Miles Traveled

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Assumes average round trip of 8 miles for adults/college students; 1 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile.

(7) Weekday emission reduction multiplied by 261 weekdays per year.

Other Benefits

Bicycling generates benefits beyond air quality improvements. Non-motorized transportation can also serve recreational purposes, enhance mobility and improve health. The "BikeCost" model, made available by the National Pedestrian and Bicycle Information Center, quantifies these benefits and provides a starting point for identifying the potential cost savings of improving Raleigh's bikeway network.

Several modeling assumptions should be discussed. First, the BikeCost model is project-specific, requiring specific information regarding project type, facility length and year of construction. Because this study focuses on a larger study area, several variables were used. The model is based on a 100-mile network of on-street bike lanes, with an expected 2017 "mid year" of construction. The model also requires other inputs obtainable from the 2000 U.S. Census, including bicycle commute mode share, average population density and average household size.

Based on the variables described above, the BikeCost model estimates annual recreational, mobility and health benefits. The benefits were quantified based on a combination of research from previous studies as well as other factors (identified in the footnotes of Table 3.5).

Table 3.5 summarizes the estimated benefits of an enhanced bikeway system in Raleigh. Except for mobility benefits, the model outputs are represented on an aggregate basis. Potential annual recreational benefits range from a low estimate of about $7.9 million to a high estimate of over $175 million. Annual health benefits range from about $311,000 to almost $6.2 million. Mobility benefits were estimated on a per-trip, daily and annual basis. The roughly $3 per-trip benefit of an expanded network could translate to an annual benefit of over $757,000. Decreased auto usage could also generate monetary benefits. As Raleigh is generally urban in character, the enhanced network could generate about $1.7 million in annual savings from reduced vehicle trips.

(1) Recreational benefit estimated at $10 per hour (based on previous studies). Assumes one hour of recreation per adult. $10 value multiplied by the number of new cyclists minus the number of new commuters. This value multiplied by 365 days to estimate annual benefit.

(2) Assumes an hourly time value of $12. This value multiplied by 20.38 minutes (the amount of extra time bicycle commuters are willing to travel on an off-street path). Per-trip benefit then multiplied by the daily number of existing and induced commuters. This value then doubled to account for roundtrips, to reach daily mobility benefit. Daily benefit then multiplied by 50 weeks per year and 5 days per week.

Annual per-capita cost savings from physical activity of $128 based on previous studies. This value then multiplied by total number of new cyclists.

Table 3.5 Estimated Aggregate Annual Benefits of an Enhanced Bikeway Network

Recreational Benefits (1)	Low Estimate	Mid Estimate	High Estimate
	$7,877,339	$118,248,217	$175,119,297

Mobility Benefits (2)	Per-Trip	Daily	Annually
	$3.17	$3,222	$757,065

Health Benefits (3)	Low Estimate	Mid Estimate	High Estimate
	$311,019	$4,181,559	$6,175,942

Decreased Auto Use	Urban	Suburban	Rural
	$1,659,839	$1,021,439	$127,680

Source: Benefit-Cost Analysis of Bicycle Facilities ("BikeCost") Model, Pedestrian and Bicycle Information Center.

CHAPTER 4 OUTLINE:

Overview
Methodology for Network Design
Recommended Facility Types
Bicycle Stations and Parking
Raleigh's Signed Bicycle Routes
Regional Connections
Recommended Bicycle Facility Network Maps

CHAPTER 4: BICYCLE FACILITY NETWORK

OVERVIEW

The City of Raleigh's Bicycle Facility Network represents a comprehensive set of existing and proposed bicycle transportation facilities. The network includes shared roads, paved shoulders, bicycle lanes, side paths and greenways. In total, there are approximately 435 miles of recommended bicycle facilities, all of which are shown on pages 4-15 to 4-19.

The following sections of this chapter include 1) how the network was designed; 2) brief descriptions of the types of facilities that make up the network; and, 3) network maps.

METHODOLOGY FOR NETWORK DESIGN

The bicycle facility network was designed by first assembling all existing bicycle-related recommendations and information from current plans and studies (as outlined in Chapters 2 and 3, and in Appendices E, F, and G). The assembled information was then presented to the public, City staff, the Steering Committee, and various project stakeholders. Together, the input from these groups helped to inform the overall network design; through writing and drawing on input maps, filling-out comment forms, direct dialogue, and e-mailed comments. These and other key inputs are shown in the diagram below:

This diagram illustrates the many inputs and levels of analysis used to design the Bicycle Facility Network.

Key Factors for Network Design

• *Online Survey/Comment Forms* - Locations most in need of improvements for bicyclists (intersections and high speed/high volume roadways) were identified by over 700 people through the online survey and were discussed during public meetings (see Chapter 2 and Appendix A: Public Input Summary for more information).

• *Existing Facilities and Current Recommendations* - Locations of existing and planned facilities were verified both in the field and by City of Raleigh Transportation staff and Steering Committee members. Current recommendations were also taken into consideration, such as matching recommendations for Raleigh's Green Streets (see the Comprehensive Plan Update) and the future plans Hillsborough Street.

• *Connectivity/Gap Analysis* - Gaps in existing facilities or deficiencies in facilities were highlighted by participants in public workshops and analyzed by project consultants.

• *Trip Attractors/Destinations* - Places which are likely to attract bicyclists were identified and ranked through the online survey and during meetings with the public and project committees (see Map 2.4 Trip Attractors). The draft network was analyzed to ensure that it served local and regional trip attractors.

• *Staff and Committee Work-Sessions* - City staff met with the Steering Committee and consultants several times throughout the planning process to discuss progress on the development of the plan, the overall bicycle facility network, and to offer critical input to its design.

• *Public Workshops / Input Maps*- Participants at two public open-house Bicycle Plan workshops (with over 200 people in attendance), a Southeast Raleigh Assembly meeting, a Downtown Raleigh Alliance meeting, and a meeting for Raleigh Bike Plan Volunteers, provided suggestions, comments, and concerns about Raleigh's current conditions for bicyclists and potential improvements. Most input from these meetings was recorded through public input maps (see Appendix A Public Input Summary for more information)

• *Analysis of Current Conditions* - Field analysis by project consultants and project volunteers was also used to assess bicycling conditions on roads and intersections throughout Raleigh. Further analysis of current conditions was conducted through research and data collection from secondary sources (see Chapter 2 for more information).

RECOMMENDED FACILITY TYPES

A variety of bicycle facilities are recommended due to 1) the range of skill and comfort levels involved in bicycling, and 2) the range of conditions for bicycling on different roadway environments. These recommendations are at a planning level only and will require further analysis before implementation.

Raleigh's bicycle route network is made up seven core types of bicycle facilities. Descriptions and standards for each type are described in *Chapter 4: Bicycle Facility Standards*. The images and descriptions below are provided for a quick reference when viewing the *Bicycle Facility Network Maps* (pages 4-15 through 4-19).

Note: Bicycle lanes are the preferred type of on-road bicycle facility as determined by the Bicycle Plan Steering Committee and supported by the public input into this process. It was judged that bicycle lanes create clearly designated separated spaces that would encourage more bicycling among all user groups.

Bicycle Lane

See pages 7-12 to 7-16 for details.

A bicycle lane is a portion of the roadway that has been designated by striping, signing, and pavement markings for the preferential and exclusive use of bicyclists. Bicycle lanes are always located on both sides of the road (except one way streets), and carry bicyclists in the same direction as adjacent motor vehicle traffic. The minimum width for a bicycle lane is four feet; five- and six-foot bike lanes are typical for collector and arterial roads.

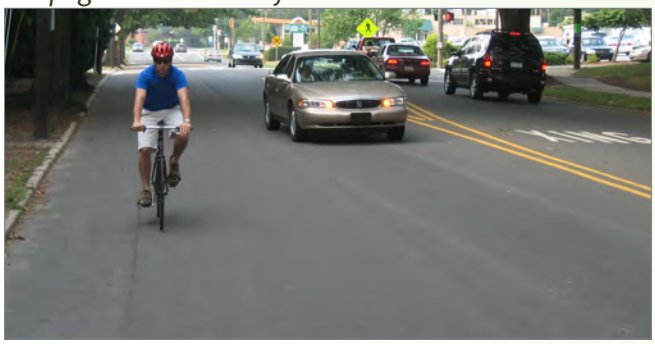
Shared Lane Marking ("Sharrow")

See page 7-11 for details.

It is recommended that bicycle shared lane markings (or 'sharrows') be approached incrementally as a new facility treatment. Shared lane markings are used on roadways where dedicated bicycle lanes are desirable but are not possible due to physical or other constraints. Placed in a linear pattern along a corridor (typically every 100-250 feet), shared lane markings make motorists more aware of the potential presence of cyclists; direct cyclists to ride in the proper direction; and remind cyclists to ride further from parked cars to avoid 'dooring' collisions.

Wide Outside Lanes

See page 7-8 and 7-10 for details.



A wide outside lane refers to the through lane closest to the curb and gutter of a roadway. The American Association of State Highway and Transportation Officials (AASHTO) standard lane width to accommodate both motorists and bicyclists is 14'. This facility type allows motorists to more safely pass slower moving bicyclists without changing lanes. Wide outside lanes are intended for bicyclists with traffic-handling skills.

Paved Shoulders

See page 7-17 for details.

Paved shoulders are the part of a roadway which is contiguous and on the same level as the regularly traveled portion of the roadway. There is no minimum width for paved shoulders, however a width of at least four feet is preferred. Ideally, paved shoulders should be include in the construction of new roadways and/or the upgrade of existing roadways, especially where there is a need to more safely accommodate bicycles.

Signed Bicycle Routes

See pages 4-11 and 7-10 for details.

This designation refers to the City of Raleigh's original signed bicycle routes. Rather than a specific a bicycle facility type, these routes contain combinations of facilities, if any. This Plan recommends discarding the current system (the reasoning behind this recommendation is outlined on page 4-11). In the future, signed bicycle routes may emerge from the newly developed bicycle facility network for the City that have greater function, utility, and safety.

Multi-Use Paths/Greenways

See pages 7-32 to 7-34 for details.

Multi-use paths are completely separated from motorized vehicular traffic and are constructed in their own corridor, often within an open-space area. Multi-use paths include bicycle paths, rail-trails or other facilities built for bicycle and pedestrian traffic. The term 'greenway' is used only for those multi-use paths and sidepaths that are indicated on the Capital Area Greenway map and included in the City's Comprehensive Plan.

Sidepaths

See page 7-18 for details.

Multi-use paths located within the roadway corridor right-of-way, or adjacent to roads, are called 'Sidepaths'. Sidepaths are most appropriate in corridors with few driveways and intersections. Bicycle routes where side paths are recommended should also have adequate on-road bicycle facilities (such as paved shoulders or bicycle lanes) wherever possible.

Network Map Sub-Category Definitions

As indicated in the legend of the Bicycle Facility Network Map, some facilities are broken down into sub-categories for method of development. Those for bicycle lanes are explained below:

Bicycle Lane - Road Diet: Road diets typically involve reducing the number of travel lanes (from a four-lane road to a two-lane road with center turn lane, for example) allowing adequate space for bicycle lanes. Road diets also have traffic calming benefits.

Bicycle Lane - Stripe: Refers to projects that require only the striping of a bicycle lane, with no other changes needed to the roadway or existing roadway striping.

Bicycle Lane - Restripe: Refers to projects that require restriping travel lanes (often to a more narrow width) allowing adequate space for bicycle lanes. Narrowing the widths of travel lanes has been demonstrated to have no affect on overall roadway capacity (for more on this topic, refer to the following page, 4-6).

Bicycle Lane - New Construction: Refers to projects that require adding additional pavement width to the roadway to allow adequate space for bicycle lanes. These were determined based on future roadway reconstruction schedules and/or lack of opportunity with the current roadway environment.

Other facilities also have sub categories shown on the maps, indicating whether they are existing, planned, or proposed. These are defined as follows:

Proposed: Bicycle facilities labeled as 'proposed' are recommendations that came out of the Bicycle Plan planning process.

Planned: Bicycle facilities labeled as 'planned' already appear in previously adopted City of Raleigh plans.

Existing: Bicycle facilities labeled as 'existing' are already constructed and in use.

Table 4.1 Mileage of Recommended Bicycle Facilities

Recommended Facility	Method	Mileage
Bicycle Lane	Stripe	37
Bicycle Lane	Restripe	101
Bicycle Lane	New Construction	164
Bicycle Lane	Road Diet	30
Shared Lane Markings	Stripe	30
Paved Shoulder	New Construction	7
Wide Outside Lane	New Construction	78
Total		447

Recommended Off-Road Facilities	Method	Mileage
Greenways	New Construction	65
Sidepath	New Construction	9
Total		94

Signed Bicycle Routes	N/A

Grand Total	*541 miles*

Bicycle Lane Development Through Travel Lane Narrowing

One means of developing bicycle lanes is through restriping or travel lane narrowing. In laying out the bicycle network facility recommendations and methods, it was determined that 10' travel lanes were acceptable in order to fit bicycle lanes into the existing roadway environment. For example, an existing five lane cross section with 12' lanes (Total roadway width of 60') could be altered to 10' lanes with 5' bicycle lanes (Total roadway width of 60'). This methodology used in developing recommendations is supported by research in both automobile traffic safety and bicycle level of service improvements.

Current AASHTO literature, research, and precedent examples support the notion of reducing 12' travel lanes to 10' lanes. The 2004 AASHTO Green Book states that travel lanes between 10 and 12 feet are adequate for urban collectors and urban arterials. (1) "On interrupted- flow operating conditions at low speeds (45 mph or less), narrow lane widths are normally adequate and have some advantages." At the 2007 TRB Annual Meeting, a research paper using advanced statistical analysis, supported the AASHTO Green Book in providing flexibility for use of lane widths narrower than

1) American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, Washington, DC 2004.

Decision Tree for Recommending Bicycle Facilities

In order to determine what type of facility to recommend for individual roadways, a methodology was developed for the City of Raleigh. Utilizing such information as future roadway reconstruction schedules, existing roadway widths, existing roadway speed limits, and existing traffic volumes, the decisions were made through a decision-tree, as presented below.

12 feet on urban and suburban arterials. The paper indicates there is no difference in safety on streets with lanes ranging from 10 to 12 feet. "The research found no general indication that the use of lanes narrower than 12 feet on urban and suburban arterials increases crash frequencies. This finding suggests that geometric design policies should provide substantial flexibility for use of lane widths narrower than 12 feet." The research paper goes on to say "There are situations in which use of narrower lanes may provide benefits in traffic operations, pedestrian safety, and/or reduced interference with surrounding development, and may provide space for geometric features that enhance safety such as medians or turn lanes. The analysis results indicate narrow lanes can generally be used to obtain these benefits without compromising safety." and "Use of narrower lanes in appropriate locations can provide other benefits to users and the surrounding community including shorter pedestrian crossing distances and space for additional through lanes, auxiliary and turning lanes, bicycle lanes, buffer areas between travel lanes and sidewalks, and placement of roadside hardware." (2)

2) Relationship of Lane Width to Safety for Urban and Suburban Arterials, Ingrid B. Potts, Harwood, D., Richard, K, TRB 2007 Annual Meeting

Precedent examples also show the large number of communities around the United States that have narrowed travel lanes to enable the development of bicycle lanes. The Missoula Institute for Sustainable Transportation accumulated a list of these communities by asking members of the Association of Pedestrian and Bicycle Professionals. The webpage titled "Accommodating Bike Lanes in Constrained Rights-of-Way (http://www.strans.org/travellanessurvey.htm) lists the community, their methods, and contact information. Cities such as Arlington, VA, Cincinnati, OH, Charlotte, NC, Houston, TX, and Portland, OR have regularly narrowed travel lanes to 10' or even commonly use them in new roadway development. Arlington, VA has been installing bicycle lanes on streets when they are repaved and have a number of streets with 10' lanes and bicycle lanes that have been functioning well without operational issues and complaints. Cincinnati, OH uses a policy that 10 foot lanes on collections and arterials are always permitted. New installations of 10 foot lanes with bicycle lanes require a speed limit of 35mph or under. By restriping 12 foot lanes to 10 feet, the City of Houston, TX has converted 30 miles of arterial streets.

Lane narrowing and the addition of bicycle lanes will require further analysis beyond this planning effort. Changing the roadway design may also require a reduction in speed limit and consideration of traffic calming designs such as median islands. For roadways with higher speed limits and traffic volumes, wider bicycle lanes may be warranted. Further analysis of bicycle lane restriping projects is warranted to determine appropriateness of lane narrowing, bicycle lane widths, and speed limits that impact both motorists and bicyclists.

BICYCLE STATIONS AND PARKING

Bicycle parking is an essential component of the bicycle network by providing increased convenience and accessibility. During this planning process, City of Raleigh staff, Downtown Raleigh Alliance members, and the Consultant determined sites for bicycle stations and bicycle racks. An analysis of bicycle conditions at major destinations was also conducted and shown in Appendix G, leading to recommendations found in this chapter.

Bicycle stations are recommended at future transit hubs sited throughout the Raleigh area and are displayed in the network maps. Integrating bicycle facilities with transit modes allows bicyclists to expand their range of travel through "trip chaining." Bicycle racks are recommended at strategic locations in the downtown area such as parking garages. These locations are listed below and displayed in the Downtown Network map (Map 4.6).

Bicycle Stations (Future Transit Hubs)

- City Bus Terminal - Moore Square Station (Downtown)
- Cameron Village
- Crabtree Valley Mall
- Triangle Town Center
- WakeMed
- Avent Ferry Rd./Gorman St.
- NC State - Varsity Dr.
- Western/Jones Franklin
- Pecan Rd./S. Saunders St.

Right: An example bicycle station (by Paul Zykofsky, 2004). The first facility of its kind in the U.S., Bikestation Long Beach is strategically located on a nexus for light rail, buses, pedestrians, and a local shuttle that services neighborhoods and key attractions. This example station offers attended indoor bicycle parking (free during regular business hours), professional repair services, and a bike shop.

Bicycle Parking

- Downtown Sites
  - Moore Square area
  - Caswell Square
  - Convention Center
  - Lane St. (Dawson to Salisbury)
  - N.C. Museums - State Capitol area
  - Morgan/McDowell Parking Deck
  - Market Plaza - Fayetteville Street
- Local colleges and universities
- Ridgeway Shopping Center

It is recommended that further analysis be conducted to place bicycle racks at key destinations such as bus stops, shopping centers, and office complexes across the city. Bicycle parking should also be made available with new development. Further information about bicycle parking and stations can be found in Chapter 7: Design Guidelines.

Below are photos of where some people in Raleigh are currently locking their bicycles, demonstrating a need for proper bicycle parking.

RALEIGH'S SIGNED BICYCLE ROUTES

Raleigh's signed bicycle route system was discussed at public workshops and was field-evaluated by a volunteer group of local bicyclists. The results of these informal evaluations, in concert with consultant consideration, led to the recommendation that the current route system be discarded. The reasoning behind this recommendation is outlined in the following points:

- First and foremost, the Plan now defines a Bicycle Level of Service for the entire City. Since bicycles are considered vehicles, they are entitled to use the roadways as constructed.

- Second, there are many bicyclists that are not going to feel comfortable using the City's roadways as currently constructed. The Plan recommends a number of improvements that over time will make the entire community more bicycle friendly, and this includes substantial physical improvements to the roadway environment.

- Third, the current bicycle route system does not have substantial function nor utility. Bicyclists at public workshops, including commuter bicyclists, rarely used the existing signed and marked route system.

- Fourth, as the existing system evaluation revealed, many of the routes are missing essential signage and contain many awkward turns, street crossings, and directional issues that cause bicyclists not to follow the intended routes. This system of route designation is an outdated method of accommodating bicyclists.

- Fifth, a route system may imply falsely where bicyclists can bicycle in the City. It is a goal of this plan to encourage more people to bicycle and that should be done through facility development.

- Sixth, the City would be better served to direct its resources into the production of an updated Bicycle Map that provides current, updated information for bicyclists.

- Seventh, in the future, bicycle commuting routes may emerge from the newly developed bicycle facility network for the City that have greater function, utility, and safety. In upcoming years, the City can explore once again the use and utility of a signed route for commuters.

REGIONAL CONNECTIONS

The City of Raleigh should look beyond its city limits and link bicycle facilities to neighboring and regional destinations. It is recommended that the City of Raleigh coordinate efforts with surrounding communities such as Wake Forest, Cary, Durham, Wake County, Johnston County, and others to create long distance connections for alternative transportation and recreation. Recently, Wake Forest, Cary, and Durham completed Bicycle Plans. It will be critical to ensure compatibility and connectivity with these planning efforts and actual bicycle facilities that meet at municipality borders.

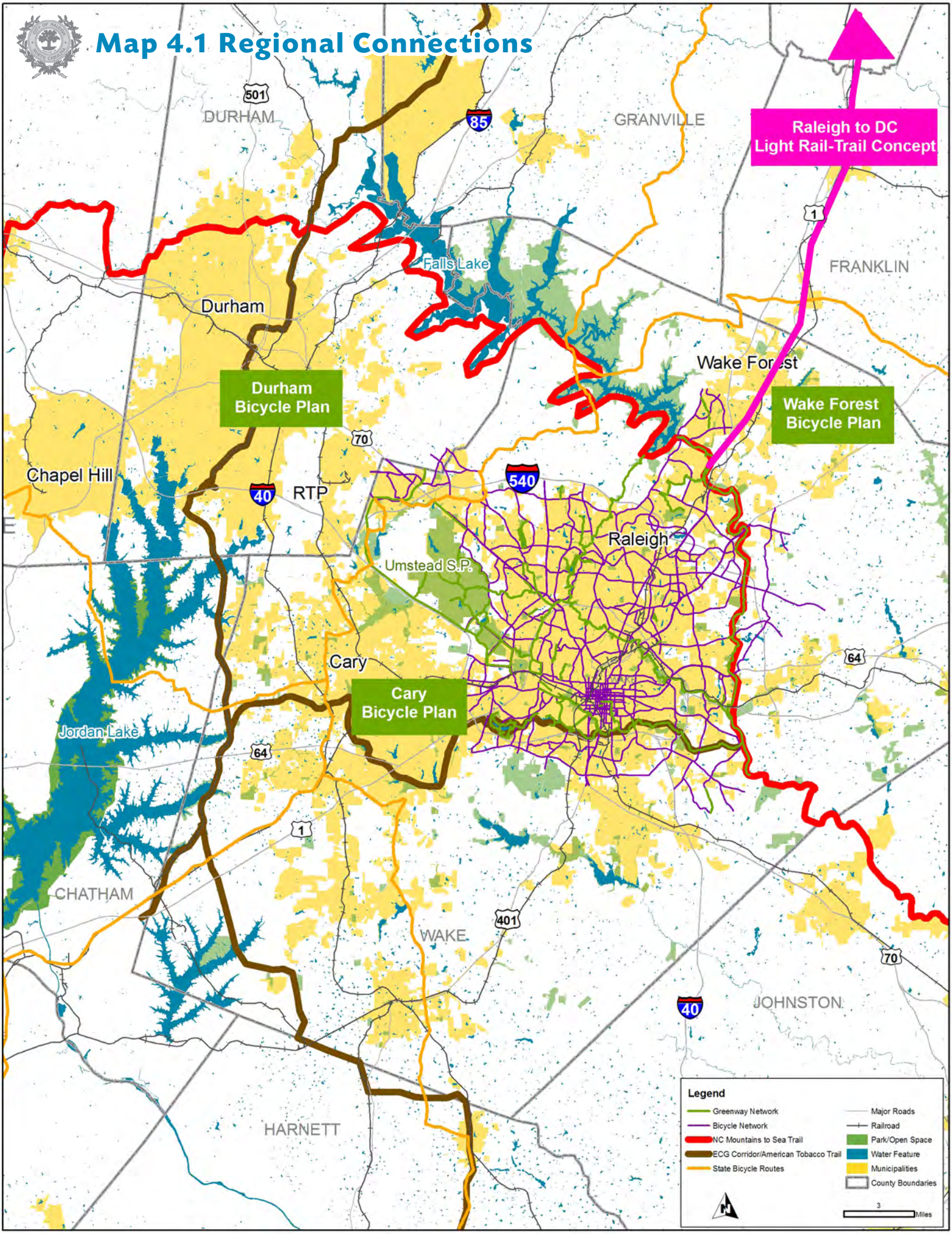
Regional greenway corridors such as the Mountains-to-Sea Trail, East Coast Greenway, and American Tobacco Trail will encourage and draw users from all over the Triangle into the area and to other locations, boosting tourism and interest in trail expansion (see regional connections in Map 4.1). Long-range efforts should be made to connect Raleigh to this regional network. For instance, the Neuse River Greenway will be a segment of the Mountains-to-Sea Trail. Also, the City of Raleigh should be positioned to cooperate and assist with future light-rail/trail corridors such as the potential corridor to Washington DC.

Additionally, NCDOT State Bike Routes #1 and #2 (http://www.ncdot.org/transit/bicycle/maps/ maps_highways .html) already traverse the Raleigh and Triangle area. Connections to these state routes will help bring bicyclists into and out of the Raleigh area.

BICYCLE FACILITY NETWORK MAPS

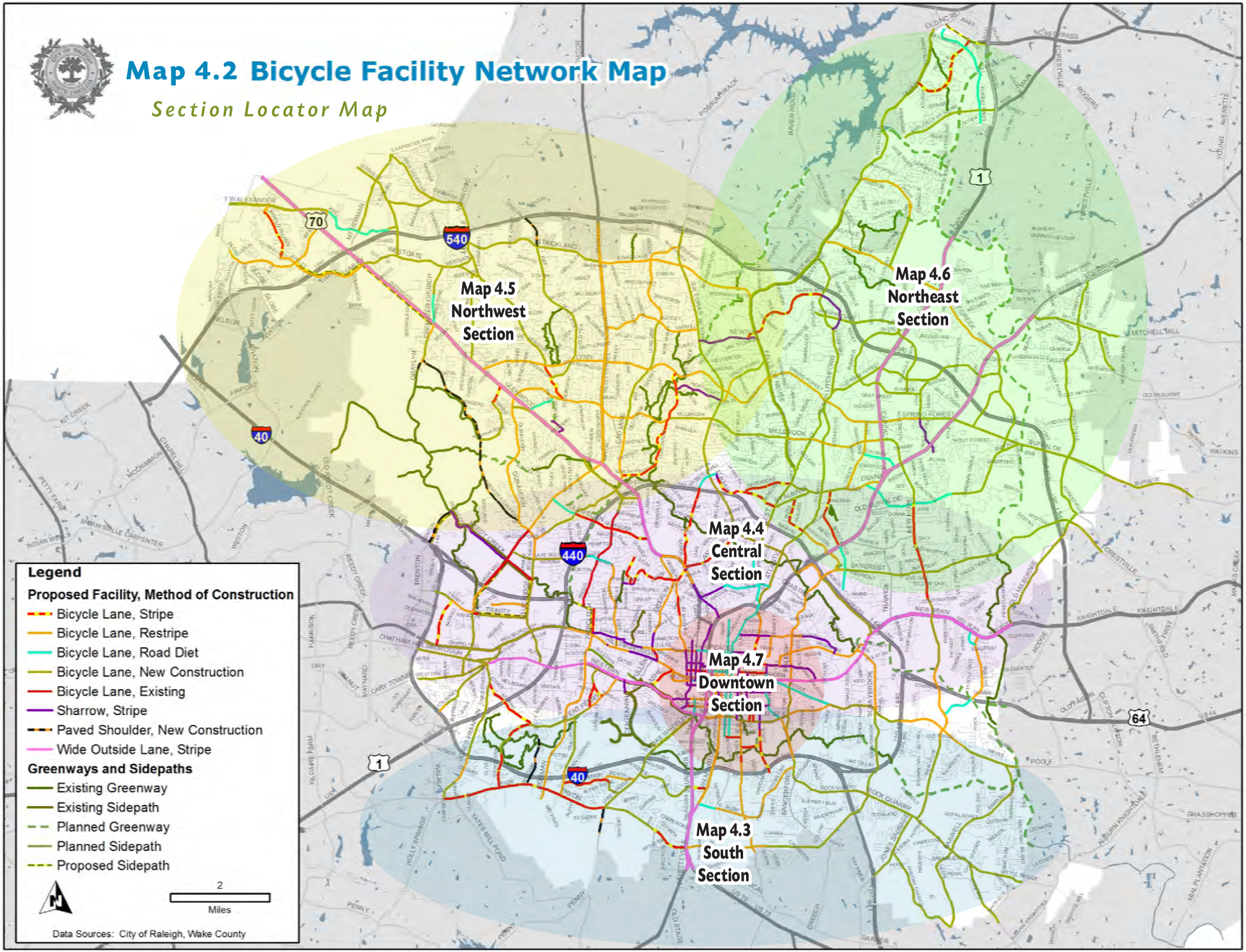
The *Bicycle Facility Network Map* is too large to be legible on a single page for this document and is therefore provided in sections. Map 4.2 (on page 4-14) shows the general areas in Raleigh covered by the three sectional maps on pages 4-15 to 4-19.

Map 4.1 Regional Connections



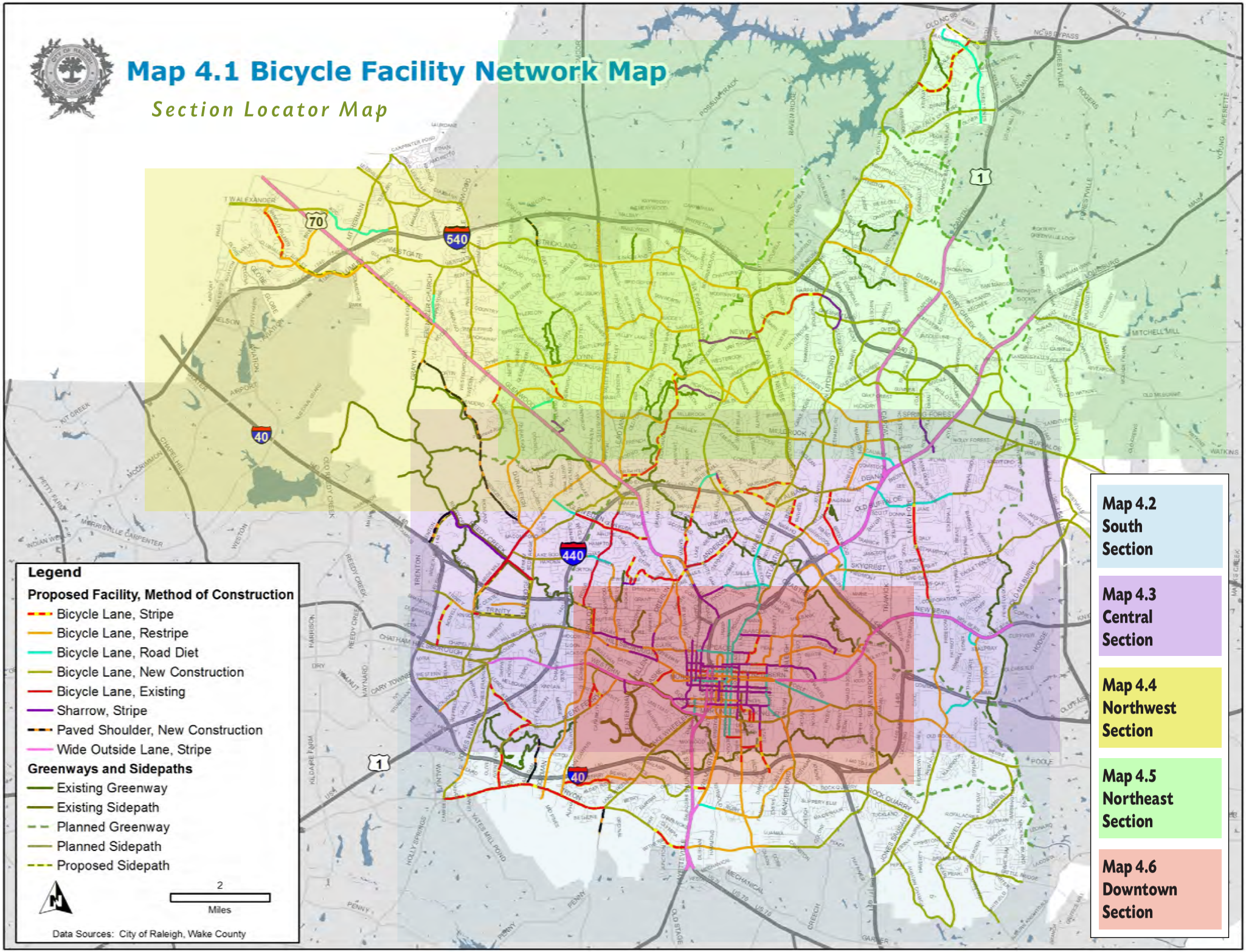
Map 4.2 Bicycle Facility Network Map

Section Locator Map

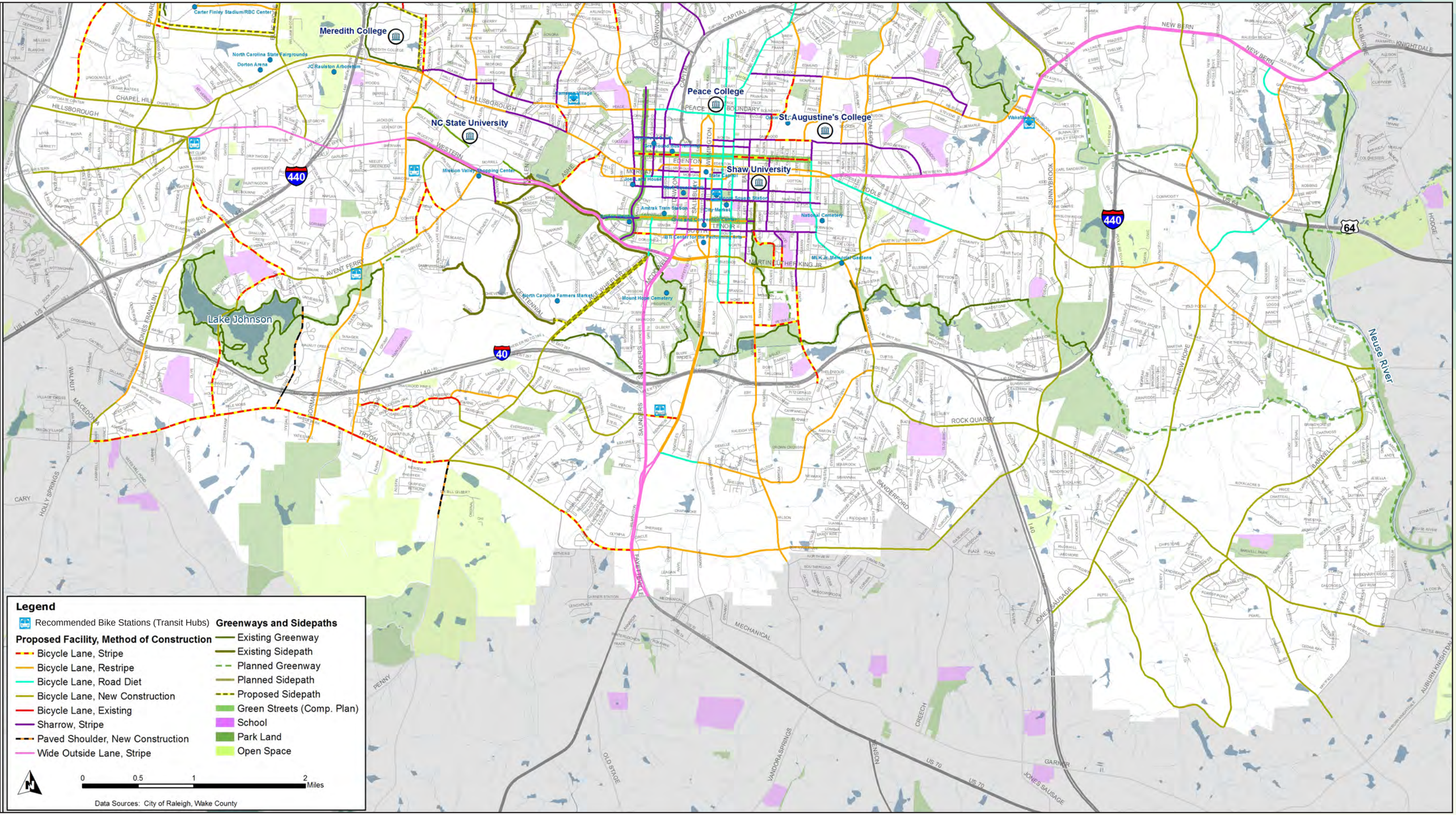


Map 4.1 Bicycle Facility Network Map

Section Locator Map

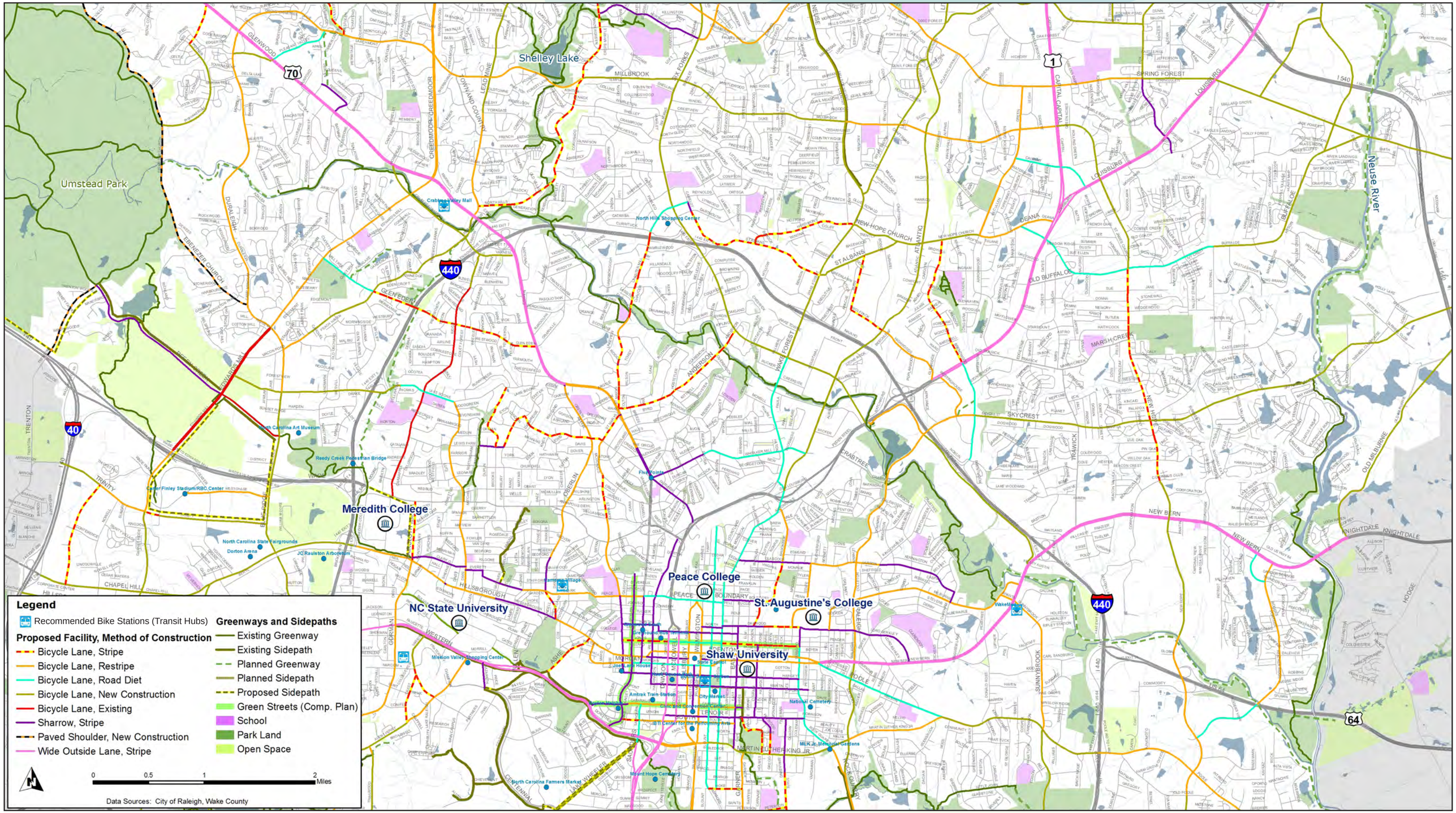


MAP 4.3 RECOMMENDED BICYCLE FACILITIES - South Section



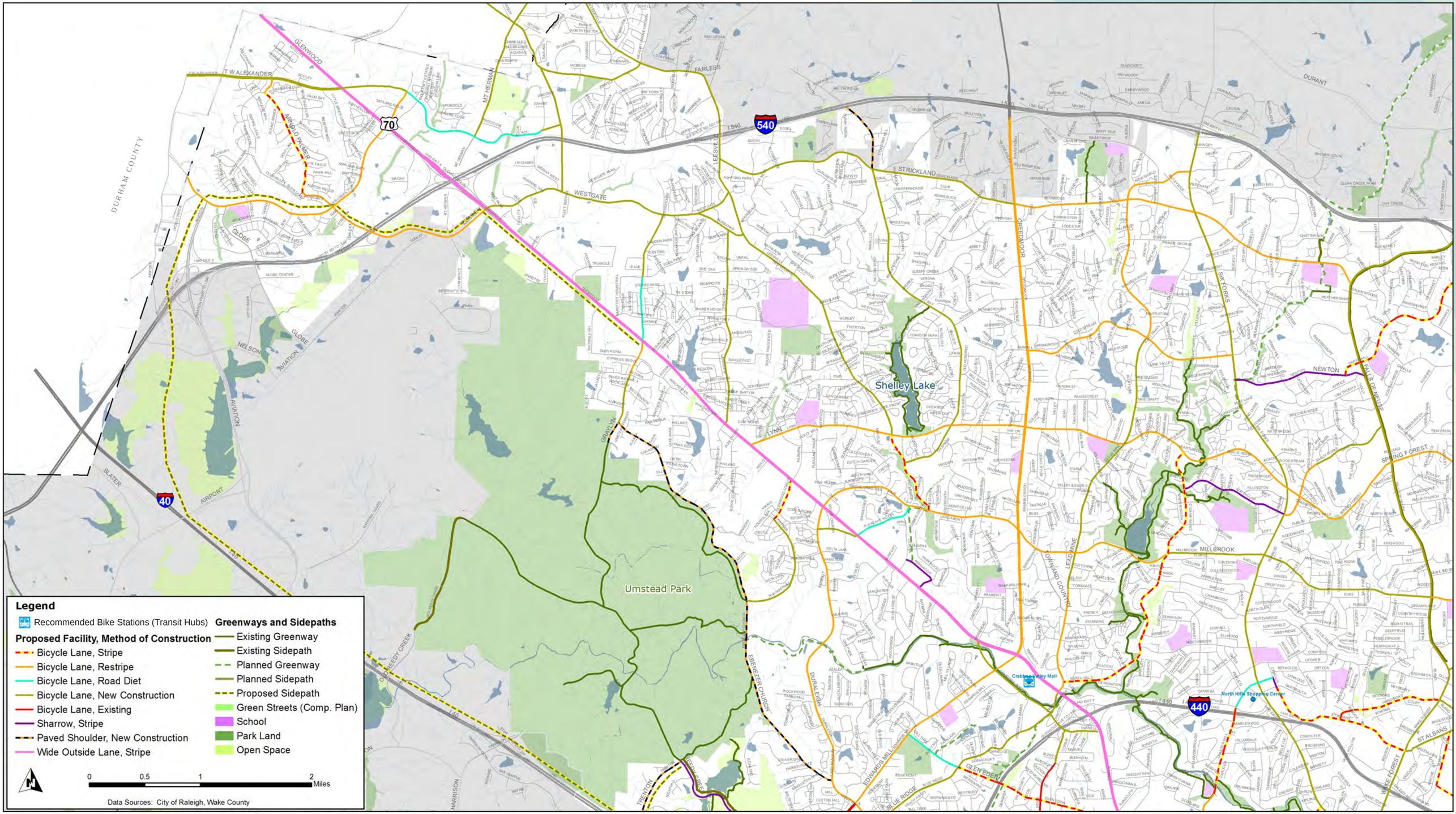
Locator Map Color

MAP 4.4 RECOMMENDED BICYCLE FACILITIES - *Central Section*



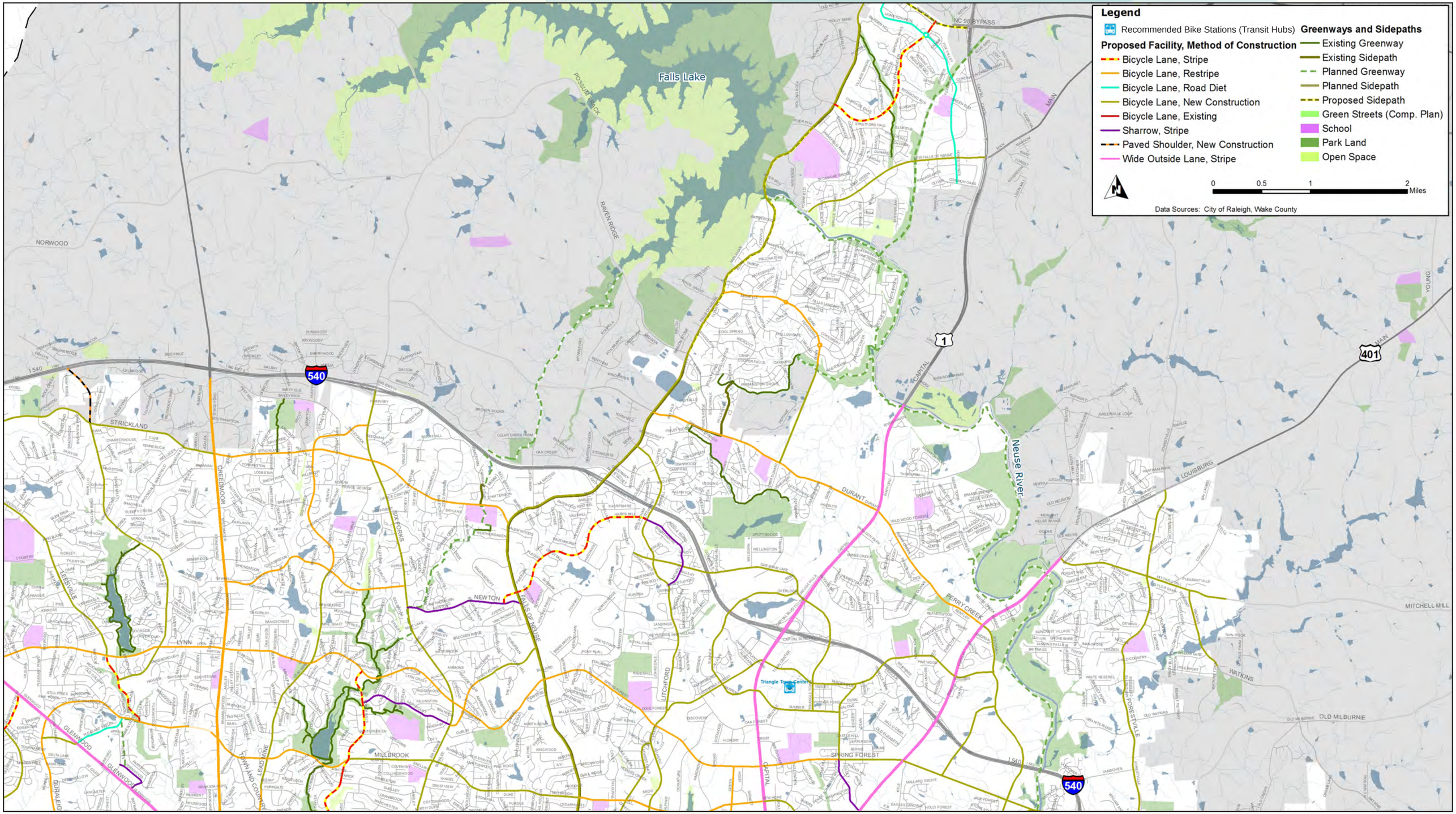
Locator Map Color

MAP 4.5 RECOMMENDED BICYCLE FACILITIES - *Northwest Section*



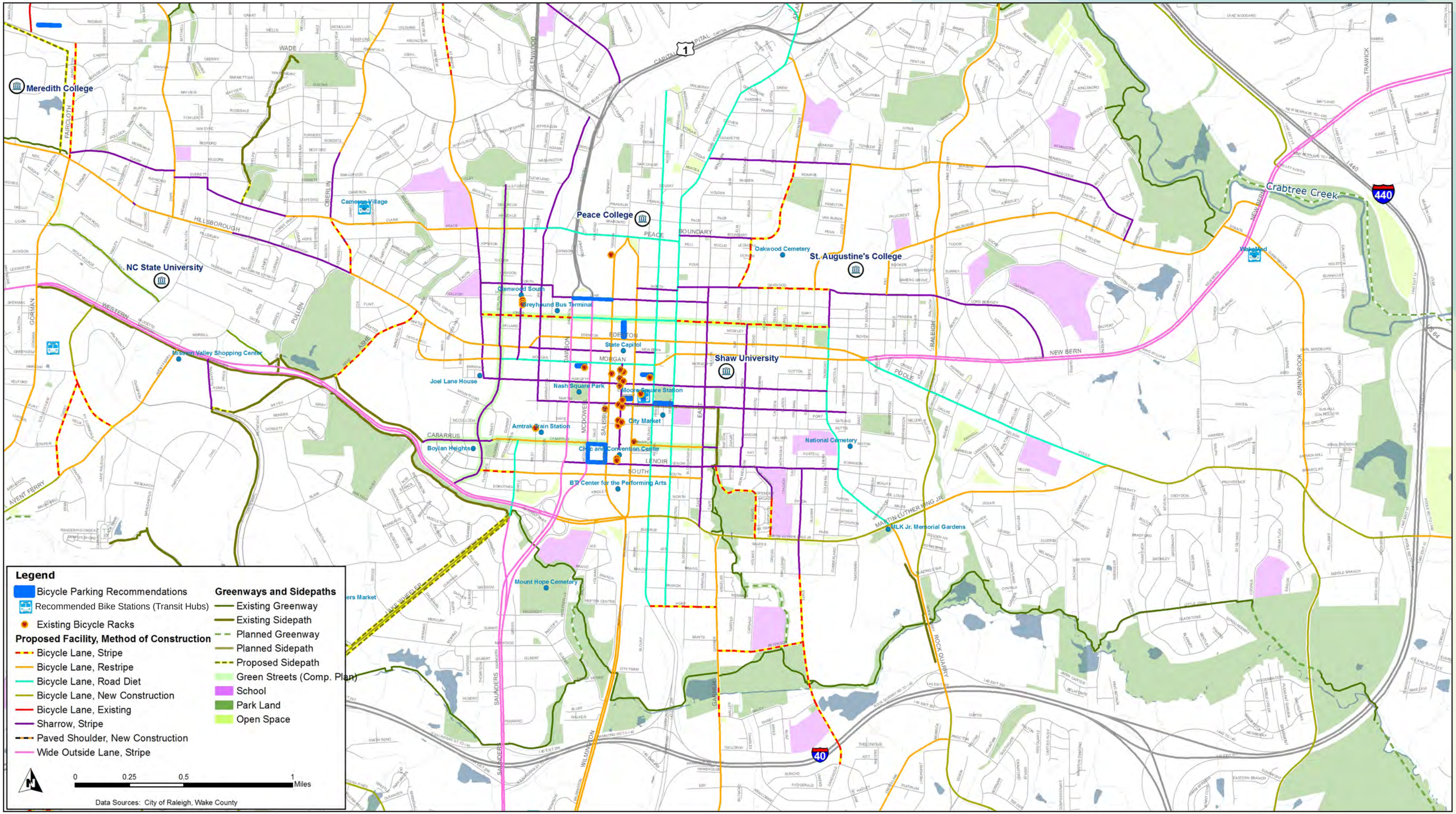
Locator Map Color

MAP 4.6 RECOMMENDED BICYCLE FACILITIES - *Northeast Section*



Locator Map Color

MAP 4.7 RECOMMENDED BICYCLE FACILITIES - *Downtown Section*



Locator Map Color

CHAPTER 5 OUTLINE:

Overview
Becoming a Bicycle Friendly Community
Bicycle and Pedestrian Advisory Commission
Program Recommendations and Resources
Education
Encouragement
Enforcement

CHAPTER 5: PROGRAM RECOMMENDATIONS

OVERVIEW

Meeting the goals of the City of Raleigh Bicycle Transportation Plan will require more than construction and installation of recommended bicycle facilities. It will also require the initiation and continued support of bicycle-related programs from local officials, local residents, and community organizations. In addition, the implementation of these facilities and programs will require the adoption of new bicycle-related policies. This chapter outlines recommended programs, policies, and in some cases, policy changes for the City of Raleigh to meet the needs of bicyclists that cannot be met through facility construction alone.

BECOMING A BICYCLE FRIENDLY COMMUNITY

The League of American Bicyclists (LAB) promotes the national Bicycle Friendly Communities (BFC) Program. Awards are given are twice a year to Bronze, Silver, Gold and Platinum level BFC's (with applications due every March and August). The program application includes a detailed review of all aspects of a comprehensive bicycling program: engineering, education, enforcement and encouragement. The application can be used as a set of benchmarks for measuring Raleigh's program against the most successful communities in the U.S. This has proven to be a powerful tool for communities such as Portland, OR – which formed a Mayor's "GO PLATINUM" committee after it was designated as a Gold BFC, with a goal of improving all required program areas in order to achieve Platinum status within two years. If Raleigh wants to become a great place for bicycling, it should strive to implement programs that other BFC communities have completed.

BICYCLE AND PEDESTRIAN ADVISORY COMMISSION (BPAC)

Due to the significant interest in this planning process at the City staff level and resident level and the tremendous amount of implementation necessary within Raleigh as part of this Plan, a permanent Bicycle and Pedestrian Advisory Commission (BPAC) should be formed on the citizen level. The BPAC would be a beneficial resource for promoting both bicycle and pedestrian safety, providing feedback on opportunities and obstacles within the City, educating bicyclists and motorists about sharing the road, mobilizing support for bicycle and pedestrian issues, and assisting in the coordination of events and outreach campaigns. BPAC subcommittees could take on specific tasks (for example, BPAC's outreach and education could be led through an 'Ambassador' program, as described on page 5-4). The group should meet quarterly to encourage and evaluate the progress of overall plan implementation.

The City of Raleigh is fortunate to have the active involvement of the Parks, Recreation, and Greenway Advisory Board and the CAMPO Bicycle and Pedestrian Stakeholders Group (BPSG) with tremendous interest in expanding the greenway system, supporting bicycle improvements and programs, and supporting this Plan. The BPSG meets once a month and focuses on Triangle bicycle planning and programming. The BPAC should work in close communication with the BPSG and the Greenway Advisory Board to ensure regional connectivity and overall connectivity between the greenway and on-road network. There should be liaisons between all groups.

PROGRAM RECOMMENDATIONS AND RESOURCES

Bicycle-related programs fall into three main categories: education, encouragement, and enforcement. The programs listed in this chapter are provided to demonstrate the variety of opportunities available for promoting bicycling and active lifestyles in Raleigh. The City should work closely with local volunteers and community organizations to implement events and activities, research new program ideas, and improve upon existing programs.

EDUCATION

Public Education and Educational Devices

Raleigh should build on its existing programs by continuing to develop a variety of safety materials and distribute them widely throughout the community. Educational materials focus on safe behaviors, rules, and responsibilities. Information may include important bicycle laws, bulleted keys for safe bicycle travel, helmet requirements, safe motor vehicle operation around bicycles, and general facility rules and regulations. This safety information is often available for download from national pedestrian advocacy organizations, such as the Pedestrian and Bicycle Information Center website, www.pedbikeinfo.org. The BPSG, in cooperation with other agencies, developed a Triangle Motorist Guide to Bicycle Safety Brochure. This brochure is an excellent example of an educational brochure. Information can be distributed through brochures, newsletters, newspapers, bumper stickers, and other print media that can be inserted into routine mailings. It can also be posted on municipal websites and shown on local cable access television.

Local programs such as earn-a-bike programs, bicycle commuter mentoring, and summer camps can be organized by the City and the newly formed BPAC and can be utilized to distribute information using a booth to display related print media (these programs could be modeled after existing programs, such as Raleigh's Bicycle Rodeos). Brown-bag events and clinics are also excellent means to provide education, especially for adults. Local events, such as ArtExplosure, should be utilized to distribute information using a booth to display related print media. A representative from the newly formed BPAC could volunteer at the booth to answer questions related to bicycling in Raleigh.

Above: The educational brochure available at the CAMPO website which educates motorists on the rights of bicyclists.

Motorist Education

Equally important as bicyclist education is motorist education. Many motorists do not recognize the simple fact that a bicycle is a vehicle by North Carolina state law. Several examples of safety materials have already been developed. As previously mentioned, the BPSG in cooperation with other Triangle agencies, has drafted a Triangle Motorist Guide to Bicycle Safety Brochure which is available for download on the CAMPO website: http://www.campo-nc.us/BPSG/BPSG_Home.htm.

The North Carolina Driver's Handbook has an entire section devoted to bicycles, bicyclists' rights and responsibilities, and how motorists should behave. Programs to promote bicycle and pedestrian safety should be included in high school driver education classes. (Resource:http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/share.html). The Town of Cary, NC has produced a digital bicycling video that can be used as a model. Resource http://www.townofcary.org/depts/dsdept/P&Z/bicycleplan/bicycleplanoverview.htm.

The StreetSmart public awareness campaign in the Washington, DC region is another example of a Public Service Agency educating residents about pedestrian and bicycle safety.

Raleigh should also build on programs that distribute safety devices throughout the community. For example, nearby Guilford County is involved in the distribution of safety materials and devises through the Helmet Promotion Program. This program is funded by NCDOT's federal safety funds, which were used to purchase bicycle helmets for distribution at local bicycle safety events in communities across the state. (Resource: http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/helmets_promotions.html)

Internal Training

'Internal' education refers to the training of all people who are involved in the actual implementation of the Bicycle Transportation Plan. Internal training will be essential to institutionalizing bicycle issues into the everyday operations of public works, planning, and parks and recreation departments. In addition to relevant City staff, members of the local planning commission, NCDOT Division 5 staff, and Wake County staff should also be included in training sessions whenever possible. This training should cover all aspects of the transportation and development process, including planning, design, development review, construction, and maintenance. This type of 'inreach' can be in the form of brown bag lunches, professional certification programs and special sessions or conferences. Even simple meetings to go over the Bicycle Plan and communicate its strategies and objectives can prove useful for staff and newly elected officials that may not have otherwise learned about the plan. Bicycle planning and design issues are complex, and state-of-the-art research and guidelines continue to evolve. Therefore, training

sessions need to be updated and repeated on a regular basis.

The NCDOT Division of Bicycle and Pedestrian Transportation hosts bicycle planning and design workshops quite often in Raleigh and Charlotte. The City of Raleigh should send City staff including engineers, planners, and transportation professionals regularly to both bicycle workshops and also pedestrian workshops to integrate a more multi-modal and Complete Streets approach.

Local law enforcement should be trained in accurate reporting of bicycle crashes involving automobiles. In many communities, police do not always adequately understand the rights of bicyclists. Proper interpretation of individual circumstances and events is critical for proper enforcement and respect between motorists and bicyclists. Special training sessions should be instituted and occur annually for new employees within the Police Department that focus on laws relating to bicycle travel. Every effort should be made for representation from the Police Department on the BPAC.

LCI Training / Bike ED

The League of American Bicyclists (LAB) has a national bicycle education program (Bike ED) that includes training to become certified League Cycling Instructors (LCI's). LCI's are trained to teach local bicycle skills training courses. Ideally, all BPAC members and key City staff would take LCI courses, or even become LCI instructors themselves. The Capital Area Metropolitan Planning Organization (CAMPO) Bicycle and Pedestrian Stakeholders Group (BPSG) is currently working with the LAB to conduct LCI courses for transportation professionals. This effort should continue with expansion to other state, federal and municipal agencies.

Bicycle Ambassador Program

The newly formed BPAC should begin this program as an early initiative. The Bicycle Ambassadors Program would be the bicycle outreach and education component of the BPAC, promoting bicycle safety and awareness. Programs around the country promote safety for all road users, bicyclists, motorists, and pedestrians. Members of the BPAC may volunteer to be ambassadors as well as recruiting community members to be ambassadors. Ambassadors host and attend programs, demonstrations, and activities at events, summer camps, and schools. One very successful model program is Mayor Daley's Bicycling Ambassadors in Chicago (http://www.bicyclingambassadors.org/) where the group includes adult and junior ambassadors, hosts a number of educational events, and gives presentations that promote bicycling. Local bicycle shops and groups in Raleigh should be involved.

Bicycle Helmets Program

The City of Raleigh and the BPAC should form a charity program aimed to ensure young cyclists are educated and equipped to take part in bicycling. The main objective would be to increase helmet wearing among children.

Strategies should start by expanding this component of Raleigh's existing Bicycle Rodeo Program.

North Carolina School Crossing Guard Training Program

As traffic continues to increase on North Carolina's streets and highways, concern has grown over the safety of our children as they walk and bike to and from school. At the same time, health agencies, alarmed at the increase in obesity and inactivity among children, are encouraging parents and communities to get their children walking and biking to school. In response, the Division of Bicycle and Pedestrian Transportation funded a study on pedestrian issues, including school zone safety, and decided to establish a consistent training program for law enforcement officers responsible for school crossing guards. According to the office of the North Carolina Attorney General, school crossing guards may be considered traffic control officers when proper training is provided as specified in GS 20-114.1.
Resource:http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/crossing.html

Environmental, Cultural and Historic Education/Interpretation

Educational programs and interpretative signage could be developed along greenways. Greenways provide opportunities for learning outside the classroom. Specific programs that focus on water quality and animal habitat are popular examples. Simple educational signage would offer interactive learning opportunities for people who use the trails. Brochures can be used to supplement signage with more detailed information and a map of the interpretive system.

Interactive Tours

An educational component to Raleigh's bicycle network could be added by developing historical, cultural, and environmental themes for the facilities, particularly on the off-road trails. The Reedy Creek Greenway, for example, could elaborate more on its history through enhanced interpretive signage. This idea can be adapted to create biking tours throughout the City, using signage, to identify the events, architecture, and habitats that make Raleigh unique. These tours should be simple to navigate and should stand alone as an amenity. However, brochures can be used to supplement signage with more detailed information and a map of the tour. Other ideas to supplement the signage could be organized "talks" or lectures by local experts.

Bicycle Map Education

The City of Raleigh should develop an updated bicycle map that includes new bicycle facilities and updated bicycle routes. This map is an opportunity for the City of Raleigh to present education and safety materials in a foldable map.

Events

Bike Rodeos / Safety Town

The City of Raleigh and the BPAC should continue to work with local bicycle clubs, groups, and law enforcement agencies to provide bicycle safety training to area children. Bicycling rodeos, training sessions, summer camps, and other educational activities should be created and promoted (and in the case of bicycle rodeos, continued) so that safety skills can be taught on an ongoing basis.

Above and left: Images from 'bicycle rodeo' events.

Teaching

Basics of Bicycling Curriculum

This elementary school-level course was developed in 1990 by the North Carolina Department of Transportation Division of Bicycle and Pedestrian Transportation and the Bicycle Federation of America (now the National Center for Bicycling and Walking). More than half of the 120 school systems across North Carolina have used the program, which currently reaches approximately 60,000 fourth and fifth graders annually. This complete curriculum package includes a clearly written and easy-to-use Instructor's Guide. A video provides an overview and tips on teaching the program as well as two instructional modules for the students. The Guide offers step-by-step instructions so that interested adults of differing cycling abilities can teach the course, using outside resources where necessary to augment their own skills. (Resource: http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/curriculum.html)

Bike Repair Video

Having a bicycle in good repair is an important part of bike safety. Yet every year, a large percentage of bike crashes are caused by mechanical problems and poor maintenance. For this reason, the NCDOT funded the production of a bicycle repair video in collaboration with the North Carolina 4-H program. The video, which can function as a stand-alone education tool, coordinates with the 4-H Cooperative Curriculum entitled Bicycle Adventures for children aged 11 to 15. Don't Get Stuck: FIX IT! Bike Repair Video. Common problems, such as a flat tire, brakes that don't work, or a missing or broken part, make a bike unrideable and unsafe. This 38-minute video is designed to stand alone or be used by an adult to help a child learn to make 10 basic bicycle repairs. All the tools, parts, and equipment needed to make the repairs are listed in each section. Information on properly fitting a helmet and sizing a bike are also included. Most importantly, the repairs that are best left to an experienced mechanic are discussed. (Resource: http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/video.html)

Top Education Actions for the City of Raleigh

- Create Citizens Bicycle and Pedestrian Advisory Commission to meet on a regular basis.

- With support of the Bicycle and Pedestrian Advisory Commission, focus on education strategies for both motorists and bicyclists.

- City staff and the new BPAC should work in collaboration with the Parks, Recreation, and Greenway Advisory Board and CAMPO BPSG.

- Sponsor and/or participate in annual training sessions for bicycle design/review.

- Sponsor and/or participate in a session for law enforcement focusing on bicycle issues.

- Create a self-guided bicycling tour of Raleigh's environmental/historical/cultural sites, featuring interpretive signage in open space, parks, greenways, and downtown areas.

- Produce and/or obtain a variety of safety materials for distribution to various age groups and at various events/locations.

- Encourage members of the BPAC, City staff, and/or local bicycle club members to become League Cycling Instructors.

- Begin Bicycle Ambassador Program.

- Implement Bicycle Helmets Program.

- Develop bicycle rodeos and summer camps for children.

- Create bicycle maps that provide educational and safety information. Bicycle maps should include basic safety information, commuting information, trail etiquette, transit information, and a list of local resources on the back side of the map.

- Launch traffic calming public education campaigns with brochures and involving media, accompanied with increased enforcement.

- Begin monthly brown-bag events and clinics for adult education, involving local bicycle clubs and shops.

Education Resources

This section of the *Pedestrian and Bicycle Information Center* website provides important messages for a range of different audiences that can be part of an educational campaign or program. It also offers links for finding more information related to bicycling education: http://www.bicyclinginfo.org/education/

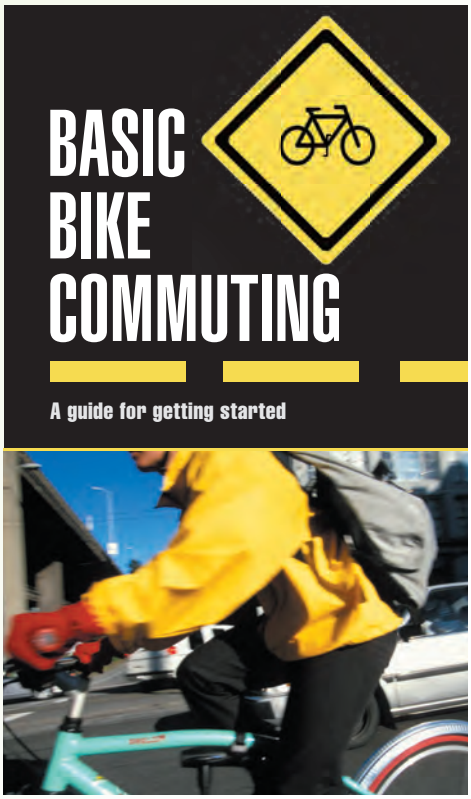
The *League of American Bicyclists* has been working for better cycling in America since 1880. They do this by promoting bicycling, educating cyclists and motorists, and advocating on behalf of cyclists on Capitol Hill and with state legislators across the United States. This web page has information on some of their programs: http://www.bikeleague.org/programs/index.php

The mission of the *National Center for Bicycling and Walking (NCBW)* is to help create bicycle-friendly and walkable communities across North America by encouraging and supporting the efforts of individuals, organizations, and agencies. This section of the website provides information on the workshops they offer for the general public as well as for training professionals: http://www.bikewalk.org/workshops.php

NCDOT Division of Bicycle and Pedestrian Transportation provides significant information related to bicycle programming. http://www.ncdot.org/transit/bicycle/safety/safety_programs.html . Also, they list print material that is available for download: http://www.ncdot.org/transit/bicycle/safety/safety_materials.html#posters

Safe Communities is a project of the National Highway Traffic Safety Administration (NHTSA). Nine agencies within the U.S. Department of Transportation are working together to promote and implement a safer national transportation system by combining the best injury prevention practices into the Safe Communities approach to serve as a model throughout the nation. http://www.nhtsa.dot.gov/safecommunities

Below: The cover of an informational brochure available through NCDOT that outlines the basics of bicycle commuting.



Safe Kids Worldwide is a global network of organizations whose mission is to prevent accidental childhood injury, a leading killer of children 14 and under. More than 450 coalitions in 15 countries bring together health and safety experts, educators, corporations, foundations, governments and volunteers to educate and protect families. Visit their website to receive information about programs, involving media events, device distribution and hands-on educational activities for kids and their families. http://www.usa.safekids.org/

Rules of the Road for Grandchildren: Safety Tips is an information website for grandparenting. If you are a grandparent, you can play an important role in teaching your grandchildren the "rules of the road." AARP. http://www.aarp.org/confacts/grandparents/rulesroad.html

Eat Smart, Move More is a statewide movement that promotes increased opportunities for healthy eating and physical activity wherever people live, learn, earn, play and pray. http://www.eatsmartmovemorenc.com/

American Trails supports local, regional, and long-distance greenways and trails, whether in backcountry, rural, or urban areas. This page of the website contains studies and reports that can be referenced in educational materials related to trails and greenways: http://www.americantrails.org/resources/

Worldcarfree.net is a clearinghouse of information from around the world on how to revitalize towns and cities and create a sustainable future. In addition to serving the carfree movement, Worldcarfree.net offers resources for architects, planners, teachers/professors, students, decision-makers and engaged citizens: http://www.worldcarfree.net/

ENCOURAGEMENT

Employer Programs

To encourage bicycling and walking to work, employers can provide programs and incentives. When bicycling is encouraged, the employer benefits from improved employee health and morale along with an enhanced community perception when protecting the environment and being active in the community. Promotions could include a Bike to Work Day or a morning Pit-Stop where employees can receive free refreshments. Employers can provide educational workshops, bicycle parking options, and employee incentives. Incentives may include prize drawings, t-shirts, free tune-ups at a local bicycle shop, and bicycle maps.

The Smart Commute Challenge, actively supported and encouraged in the Triangle area by Triangle Transit and CAMPO, is an excellent means of having residents pledge to commute to work by bicycle. Prizes are available and educational information on commuting to work are available at http://www.smartcommutechallenge.org/. This campaign should be supported during implementation of this Bicycle Plan.

The Bicycle Commuter Act was recently passed into law and becomes effective on January 1, 2009. This legislation, enacted as part of the Emergency Economic Stabilization Act of 2008 (HR 1424), allows employers to offer their employees a tax-exempt transportation fringe benefit of $20 per month for purchasing, maintaining, or storing a bicycle. Based on how the employer chooses to offer the benefits, the employee may bring receipts to be reimbursed, may sign up for regular monthly payments, or devise some sort of voucher system with their employer. Employers sensitive to tax savings, employee morale, improved recruitment and reduced turnover are likely to provide this benefit. All types of employers from single person offices to large businesses with multiple locations and from every industry category in the private, public and non-profit sectors have the option to offer qualified transportation fringe benefit to their employees. BPAC members should encourage local employers to offer this benefit.

RTI INTERNATIONAL | *On Earth Day and Every Day – RTI Cares*

Biking to Work

RTI International's Bike Commuting Group

RTI support for bike commuters

- Provides showers, lockers, bike racks
- Participates in RTP Bike to Work week
- Has bike commuting group, founded by staff

RTI bike commuting group

- Supported by RTI Recreation & Wellness Committee
- Holds monthly meetings to promote ridership, discuss topics of interest
- Organized month-long Bike Challenge

RTI Bike Challenge results

- 1,370 miles ridden
- 57 gallons of fuel saved
- 1,107 pounds (or 0.5 metric ton) of CO_2 prevented from release into air

Bike commuting group goals for 2008

- Conduct workshops (e.g., bike safety 101, repairing a flat tire)
- Implement buddy-system, group caravans for new riders
- Create map with rider locations
- Build intranet page for bike commuting
- Consider motivational group rides (e.g., for charity)
- Establish bike rider listserv for communications

RTI International is a trade name of Research Triangle Institute.

Above: RTI International of Research Triangle Park is an example of an employer that actively supports bicycling.

Showers at Work

Some employees will not consider biking to work without the assurance that they can shower when they arrive. Showers also allow employees to exercise at lunch. In buildings with 50-100 employees, one shower should be sufficient. In buildings with 100- 250 employees, one shower for each sex should be provided. Buildings housing over 250 employees should provide at least four showers with two of them being accessible to the disabled.

Clothes Lockers

Ideally, there should be one lockable gym locker for every long-term bicycle parking space provided. The regular bicycle commuter can store work clothes. In addition to providing a locker to each regular bicycle commuter, other lockers should be available to encourage potential new bike commuters. These facilities will also encourage lunch-time fitness activities which benefit both the employee and the employer.

School Programs

Many programs exist to aid communities in developing safer pedestrian facilities around schools. Programs can be adopted by parents or the schools to provide initiatives for biking. Information is available to encourage group travel, prevent bicycle-related injuries, and sponsor commuter-related events. After-school programs, summer Bike Camps, bicycle rodeos, and Family Fun Rides can be created to provide a supportive environment for children to learn how to ride a bike comfortably and safely with friends, learn how to repair and maintain a bicycle, and tour their city and its destinations.

Safe Routes to School

The City of Raleigh should seek programming and facility funding from the Safe Routes to School program, administered by the NCDOT Bicycle and Pedestrian Transportation Division. Funding is available for school workshops and action plans. The Safe Routes to School program also provides implementation and construction funding for facilities near schools.

Awareness Days/Events

A specific day of the year can be devoted to a theme to raise awareness and celebrate issues relating to that theme. A greenway and its amenities can serve as a venue for events that will put the greenway on display for the community. Major holidays, such as July 4th, and popular local events serve as excellent opportunities to distribute bicycling information. The following are examples of other national events that the City of Raleigh can use to improve usage of bicycle facilities:

Bike-to-Work Day (Third Friday in May)

Bike-to-Work Day is an annual event held on the third Friday of May across the United States that promotes the bicycle as an option for commuting to work. Leading up to Bike-to-Work Day, national, regional, and local bicycle advocacy groups encourage people to try bicycle commuting as a healthy and safe alternative to driving by providing route information and tips for new bicycle commuters. On Bike-to-Work Day, these groups often organize bicycle-related events, and in some areas, pit stops along bicycle routes with snacks.

In 2008, a very successful Community Leader and Public Bicycle Ride occurred on Bike-to-Work Day through Downtown Raleigh. A Bike to Work Week Breakfast occurred as well. The City of Raleigh, with help from the newly formed BPAC, should work to make this a more significant event, increasing participation. Triangle Transit placed signs on trails reminding citizens of Bike-to-Work Week. The City should continue to work with CAMPO, Triangle Transit, and the Smart Commute Challenge to continue and improve these events.

May is also *National Bike Month*. Events can include proclamations, marketing campaigns, commuter contests and worksite events.

Car-Free Day (September 22)
Car Free Day is an international day to celebrate getting around without cars. This fall event coincides with the begining of the school year and is the perfect way to kick-off programs that promote bicycling and raise awareness for environmental issues. Car-Free events can last for an entire week or month, featuring alternative transportation promotional activities, fitness expos, transit-use incentives, walking and jogging group activities, running and bicycling races and rides, etc.

"Strive Not to Drive Day"
This event example, from the Town of Black Mountain, North Carolina, is an annual event to celebrate and promote the Town's pedestrian achievements for the year throughout their region. Awards for pedestrian commuters, as well as booths, contests, and other events are organized through their local MPO Bicycle and Pedestrian Task Force and the Land-of-Sky Regional Council. A similar event could be held in Raleigh to focus on bicycling issues, as the Bicycle Transportation Plan is implemented.

National Trails Day
This event is held every year in June. Other events, competitions, races, and tours can be held simultaneously to promote trail use within Raleigh. For example, in Greensboro, North Carolina, the Parks and Recreation-Trails Division sponsors events for National Trails Day, and it has become a huge event for the entire city.

Earth Day
Earth Day is April 22nd every year and offers an opportunity to focus on helping the environment. Efforts can be made to encourage people to help the environment by bicycling to destinations and staying out of their automobiles. This provides an excellent opportunity to educate people of all ages in Raleigh.

Use Facilities to Promote Other Causes

Bicycle facilities could be used for events that promote other causes, such as health awareness. Not only does the event raise money/publicity for a specific cause, but it encourages and promotes healthy living and an active lifestyle, while raising awareness for bicycling activities. Non-profit organizations such as the American Cancer Society, American Heart Association, and the Red Cross sponsor events such as the Tour de Cure, a series of cycling events held in more than 80 cities nationwide to benefit the American Diabetes Association.

Bicycle Activities/Promotion within Local Organizations

The City of Raleigh has numerous organizations that could be utilized to promote bicycling activities (e.g. the local bicycle stores, North Carolina Bicycle Club, local cycling groups, local schools/PTAs, neighborhood groups, homeowners associations, etc). Education, enforcement, and encouragement programs can be advertised and discussed in local organization newsletters, seminars, and meetings. Such organizations could even organize and cross-promote their own group rides, trail clean-ups, and other activities listed in this section.

Cycling Clubs/Bicycle-Commuting Groups

Neighborhoods, local groups, or businesses could promote cycling clubs for local residents or employees to meet at a designated area and exercise on certain days before or after work (or even to work), during lunch breaks, or anytime that works for the group. This informal group could be advertised on local bulletin or information boards. These clubs could be specialized to attract different interest groups. For example, in the Durham's Research Triangle Park, several work places (Such as RTI International) have organized their own riding groups to promote cycling and active, healthy lifestyles (see example promotional poster).

Clubs and bicycle shops provide opportunities for group rides. These rides should be promoted by the City of Raleigh and the BPAC, reaching out to bicyclists of all abilities.

1304Bikes

1304 Bikes is a local volunteer organization that helps repair donated bicycles and teaches local residents how to repair and earn one of the bicycles. Organizations, such as 1304Bikes play a major role in the encouragement of bicycle riding and need support.

Art in the Landscape

The inclusion of art along bikeable greenway corridors and trails would encourage use of facilities and provide a place for artwork and healthy expression to occur. An existing example is the Reedy Creek Greenway. Artwork could be displayed in a variety of ways and through an assortment of materials. Living artwork could be "painted" through the design and planting of various plant materials. Sculpture gardens could be arranged as an outdoor museum. Art through movement and expression could be displayed during certain hours during the day or during seasonal events. Artwork can be provided by local schools, special interest clubs and organizations, or donated in honor or memory of someone.

Raleigh Public Bicycle Map

The current Raleigh bicycle map should be updated and subsequently distributed widely throughout the community, through municipal governments, schools, advocacy groups, and other organizations throughout

Raleigh. Maps should be made available at parks and recreation centers, libraries, municipal buildings, the transit center, on transit buses, and at tourism information centers. The map should be updated every 3 to 5 years to reflect the bicycle and greenway improvements that will be implemented through this Plan. The map should be made available in hardcopy format and online and contain educational and safety information as well.

Special University-Based Programs

The City of Raleigh should work with local colleges and universities, such as NC State and Meredith College, to develop a comprehensive network of campus bicycle routes that are connected with bicycle facilities in the surrounding areas. Integration with colleges and universities will allow greenway and bike facilities to cater to one of the network's largest user groups.

Adopt-A-Trail

Local clubs and organizations provide great volunteer services for maintaining and patrolling trails. This idea could be extended to follow tour routes or specified streets/sidewalks. A sign to recognize the club or organization could be posted as an incentive to sustain high quality volunteer service. The Boy Scouts of America serve as a good model for participation in this type of program.

Revenue Generating Programs

The City of Raleigh should be proactive in increasing revenue from programs and events that can help fund the building, management, and maintenance of future facilities. Fees could be increased in events annually or biannually to increase revenue. Specific program and event ideas that are being used to generate revenue across the country include:

- Races/triathlons (fees and/or donations)
- Concessions
- Educational/Nature/Historic tours (fees and/or donations)
- Fund-raisers including dinners/galas
- Moonlight bike rides and walks (fees and/or donations)
- Greenway parade (fees and/or donations)
- Concerts (fees and/or donations)
- Art events along greenway (fees and/or donations)
- Events coincident with other local events such as fairs, festivals, historic/folk events, etc.
- Media events and ribbon-cuttings for new trails and bicycle facilities (donations)

Top Encouragement Actions

- Foster the creation of a Bicycle Mentor Program for new bicycle commuters to learn from experienced bicycle commuters.

• Encourage Raleigh employers to provide programs and incentives for their employees to bicycle to work.

• Encourage children to walk and bike to school safely, through a combination of programs including monthly family rides and bicycle rodeos.

• Apply for Safe Routes to School funding and conduct and implement Safe Routes toSchool workshops and action plans.

• Develop online and hardcopy bicycle maps

• Encourage the expansion of cycling clubs and bicycle-commuting groups.

• Use bicycle facilities, particularly trails, to promote causes and hold special events for causes

• Utilize greenways for artwork and plantings

• Reach out to Spanish-speaking population with bicycle-related events

• Expand and promote awareness day activities and establish new events, such as Bike to Work Day and Bike to Work Month events

Encouragement Resources

Safe Routes to School is a national program with $612 million dedicated from Congress from 2005 to 2009. Local Safe Routes to School programs are sustained by parents, community leaders, and citizens to improve the health and well-being of children by enabling and encouraging them to walk and bicycle to school. Recently, the state of North Carolina has started the NC Safe Routes to School Program based off of the national program. The state has $15 million over the next 5 years for infrastructure improvements within 2 miles of schools. This funding can also be used towards the development of school related programs to improve safety and walkability initiatives. The state requires the completion of a competitive application to apply for funding and a workshop at the school to determine what improvements are needed. http://www.saferoutesinfo.org

BikeIowa provides a good resource, the "Employer's Bike to Work Guide," providing ideas for encouraging bicycle commuting: http://www.bikeiowa.com/asp/bike/EmployerGuide.asp

This web page from the League of American Bicyclists has information on encouraging bicycle commuting: http://www.bikeleague.org/resources/better/commuters.php

The role of the *Active Living Resource Center (ALRC)* web site is to provide resources and tools to help make walking and bicycling part of your community's healthy lifestyle. This page of the website has encouraging success stories from other communities: http://www.activelivingresources.org/stories_directory.php

Bikes Belong is sponsored by the U.S. bicycle industry with the goal of putting more people on bicycles more often. From helping create safe places to ride to promoting bicycling, they carefully select projects and partnerships that have the capacity to make a difference. Their work concentrates on four main areas: federal policy and funding, national partnerships, community grants, and promoting bicycling. In addition, they operate the Bikes Belong Foundation to focus on kids and bicycle safety. http://www.bikesbelong.org/

1304Bikes repairs donated bicycles. More information can be found at their website: http://www.1304bikes.org.

ENFORCEMENT

Motorist Enforcement

Based on crash data analysis and observed patterns of behavior, law enforcement can use targeted enforcement to focus on key issues such as motorists speeding, passing too closely to cyclists, parking in bicycle lanes, etc. These issues should be targeted and enforced consistently. The goal is for bicyclists and motorists to recognize and respect each other's rights on the roadway.

As traffic continues to increase on North Carolina's streets and highways, concern has grown over the safety of children as they walk or bike to and from school. At the same time, health agencies, alarmed at the increase in obesity and inactivity among children, are encouraging parents and communities to get their children walking and biking to school. In response, the Division of Bicycle and Pedestrian Transportation funded a study on school zone safety and decided to establish a consistent training program for law enforcement officers responsible for school crossing guards. According to the office of the North Carolina Attorney General, school crossing guards may be considered traffic control officers when proper training is provided as specified in GS 20-114.1.

Bicyclist Enforcement

Observations made by local trail and bicycle facility users can be utilized to identify any conflicts or issues that require attention (see online public comment form results). To maintain proper use of trail facilities, volunteers could be used to patrol the trails, particularly on the most popular trails and on days of heavy use. The volunteer patrol can report any suspicious or unlawful activity, as well as answer any questions a trail user may have.

Bicycle Laws of North Carolina (NCDOT, 2008)

In North Carolina, **the bicycle has the legal status of a vehicle**. This means that bicyclists have full rights and responsibilities on the roadway and are subject to the regulations governing the operation of a motor vehicle. North Carolina traffic laws require bicyclists to:

- **Ride on the right in the same direction as other traffic**
- **Obey all traffic signs and signals**
- **Use hand signals to communicate intended movements**
- **Equip their bicycles with a front lamp visible from 300 feet and a rear reflector that is visible from a distance of 200 feet when riding at night.**

In addition, the *Child Bicycle Safety Act of 2001* requires that:

- **All bicycle operators under 16 years of age must wear a bicycle helmet on public roads, public paths and public rights-of-way**
- **All child passengers under 40 pounds or 40 inches must be seated and secured in a child seat or a bicycle trailer.**

Although the new law does not require adult bicyclists to wear helmets, they are strongly encouraged to do so. Some localities within the state have enacted ordinances requiring cyclists to wear helmets.

Legal Issues Related to Bicycling: Laws pertaining to the operation of a bicycle vary from state to state. Below are three areas of North Carolina law that need clarification.

- **Bicycling on Interstate or fully controlled limited access highways, such as beltlines, is prohibited by policy, unless otherwise specified by action of the Board of Transportation. Currently, the only exception to the policy is the US 17 bridge over the Chowan River between Chowan and Bertie Counties.**
- **There is no law that requires bicyclists to ride single file, nor is there a law that gives cyclists the right to ride two or more abreast. It is important to ride responsibly and courteously, so that cars may pass safely.**
- **There is no law that prohibits wearing headphones when riding a bicycle; however, it is not recommended. It is important to use all your senses to ensure your safety when riding in traffic.**

Retrieved on 9/4/2008, from http://ncdot.org/transit/bicycle/laws/laws_bikelaws.html

When users of the bicycle network witness unlawful activities, they should have a simple way of reporting the issue to police. A hot line should be created, which would compliment trail patrol programs. People could call in and talk to a live operator or to leave a voice mail message about the activity they witnessed. Accidents could also be reported to this hot line. Accident locations could then be mapped to prioritize and support necessary facility improvements.

Additionally, unsafe cycling (e.g. riding on the wrong side of the street, without lights at night, or children riding without helmets) should be addressed by local law enforcement through warnings, with an understanding that there may be a learning curve for new or inexperienced cyclists. Again, the goal is for bicyclists and motorists to recognize and respect each other's rights on the roadway.

Police on Bikes

Raleigh already has Police Bike Patrols in the Downtown area. Increased use of police on bikes is a significant benefit for community policing and quality of life. This idea should be coordinated with and extended to include enforcement within the college campuses. Police on bicycles should be models for other cyclists by wearing helmets and riding accordingly.

Above: A police officer patrols a trail by bicycle.

Local Police Input

An appointed member of the Raleigh Police Department should serve on the BPAC if possible to understand issues in the Raleigh area and contribute to the process. The Police Department speaks with local bicycling enthusiasts and the general public and participated in the development of this Plan.

Mandatory Helmet Law

The City of Raleigh should consider enacting a new mandatory helmet law for City residents. The State of North Carolina law already requires children under the age of 16 to wear helmets. The City should consider options such as mandatory helmet laws for all ages or possibly increasing to ages above 16. The National Highway Traffic Safety Administration (NHTSA) supports the enactment of bicycle helmet usage laws by states and municipalities. This is due to statistics that prove bicycle helmets provide protection (Example: Helmets are 85 to 88% effective in mitigating head and brain injuries). Over 20 states, including North Carolina, have laws requiring helmet usage for persons under age 16. A number of communities throughout the country have made helmet usage mandatory for all ages especially in the states of Missouri and Washington. In North Carolina, the towns of Black Mountain and Boone require helmets for all ages. For more information, visit http://helmets.org/mandator.htm and http://www.bikeleague.org/media/facts/pdf/BicycleHelmetUseLaws.pdf

As an enforcement/education measure, a partnership between the City of Raleigh, local shops and groups, and the BPAC could distribute prizes to children seen wearing a helmet. Enforcement should not be heavy-handed bur rather an opportunity to educate and encourage helmet usage.

Top Enforcement Actions

• Work with the Raleigh Police Department to establish an easy-to-use and well publicized bike and pedestrian enforcement hot line. Complaints that include license numbers should result in a letter to the owner of the vehicle that includes the complaint as well as a handout that outlines the rules of the road and rights for both cyclists and motorists. Reportable incidents include:

- Collisions with motorists, other cyclists, or pedestrians
- Getting "doored"
- Being side swiped or having a close call with a vehicle
- Road rage and harassment property damage
- Bike lane obstructions such as parked cars, yard waste, or trash cans

• Target and enforce all illegal motorist and bicyclist behavior that may jeopardize the success of the Bicycle Network. Base targeted enforcement areas on reported incidents from the hotline.

• Require all crossing guards to complete an NCDOT Crossing Guard Training Program

• Establish a crossing guard program for peak school hours

• Establish a local "Trail Patrol"

• Include a representative from Raleigh's police department on the BPAC

• Create bicycle patrol positions for the department to increase bike presence and enforcement

• Increase speed enforcement along common bicycle recreational routes and Downtown.

• Provide officers with a handout to be used during bicycle-related citations and warnings (see example hand-out card at right; the opposite side of the card has rules for motorists).

• Consider expanding bicycle helmet law for City of Raleigh (beyond current State law of under 16). This could be an early action item for the Bicycle and Pedestrian Advisory Commission and City Council.

Below: An example wallet-sized plastic card that could be handed out to cyclists and motorists that explains the rules of the road.

Cyclists

In North Carolina, bicyclists have the same rights and duties as motorists. For a complete list of NC bike laws, visit www.ncdot.org/transit/bicycle

Ride on the right
- Always ride in the same direction as traffic
- Ride as far to the right as practicable

Follow traffic laws
- Obey all traffic control devices, such as stop signs
- Always use hand signals when turning

Always wear a properly fitting helmet
- Children below the age of 16 are required by NC law to wear a helmet
- Make sure that the helmet fits snugly on top of the head, not tipped back
- Replace your helmet after any crash or impact

Ride predictably
- Ride in a straight line and don't swerve between parked cars
- Check for traffic before entering any street or intersection
- Give an audible warning to pedestrians before approaching from behind on a multi-use path

Be visible
- Wear brightly colored clothing
- At night, the law requires cyclists to use a white front light and a red rear light or reflector
- Make eye contact with motorists

www.bikewalkdurham.org

Enforcement Resources

The *National Highway Traffic Safety Administration (NHTSA)* awarded a grant to *MassBike* to develop a national program to educate police departments about laws relating to bicyclists. The program is intended to be taught by law enforcement officers to law enforcement officers as a stand-alone resource. The link contains downloads for presentations, videos, and other resources that are useful for police officers and everyday cyclists alike: http://www.massbike.org/police/

This webpage of the *Pedestrian and Bicycle Information Center* has a wealth of resources regarding enforcement issues, ranging from training for local law enforcement to procedures for handling violators, to enforcement example case studies: http://www.bicyclinginfo.org/enforcement/

NCDOT School Crossing Guard Program
http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/crossing.html

NCDOT's A Guide to North Carolina Bicycle and Pedestrian Laws. For an online resource guide on laws related to pedestrian and bicycle safety (provided by the National Highway Traffic Safety Administration), visit www.nhtsa.dot.gov/people/injury/pedbimot/bike/resourceguide/index.html

CHAPTER 6 OUTLINE:
Overview
Comprehensive Plan
Zoning and Local Codes
Mode Share, Health and Safety Goals
Complete Streets Policy

CHAPTER 6: CODE + POLICY ANALYSIS

OVERVIEW

The purpose of this task is to evaluate existing federal, NCDOT and Raleigh policies, codes and ordinances to determine how these documents support bicycling. Existing land use policies, codes and other documents were reviewed to identify areas where conflicts exist or new concepts can be adopted. This report summarizes these findings and makes recommendations for the City on which local codes, ordinances and policies should be strengthened to better support bicycling. These items can be either integrated into the Bicycle Master Plan and included by reference in the Comprehensive Plan, or specifically included in the Comprehensive Plan and city codes.

It is also important to note that there are 10 planning districts within the City of Raleigh. For each planning district there is a district plan that provides details on existing conditions including land use, zoning, and demographic projections. The system plans and urban form guidelines are also provided in greater detail for each district. District-based Streetscape Plans include standards for improvements to street right-of-ways, vehicular areas and building facades that reinforce the unique character and pedestrian orientation of an area. Streetscape standards may address unifying design features for sidewalks, paving, curbing, street trees, building facades, setbacks, vehicular parking areas, building heights, bicycle parking, signage, awnings, street furniture, overhead utilities, streetlights, and other elements of a streetscape. The general recommendations of this report can be integrated into the district planning process.

COMPREHENSIVE PLAN

The Raleigh Comprehensive Plan is an official long range policy document adopted and amended by formal resolution of the City Council. The plan is currently being updated under the title "Planning Raleigh 2030" (www.planningraleigh2030.com). The plan guides the long-range, comprehensive decision making process involving primarily physical development and those city actions expected to influence development in the long-term. The comprehensive plan contains goals, objectives, policies and guidelines for growth and redevelopment for the city.

The Plan Overview includes an introduction and a summary of the population and employment characteristics of the City of Raleigh. The Plan Framework provides an explanation of Comprehensive Plan goals, objectives, policies, and guidelines as well as a discussion of the urban form principles upon which the plan is based. The Systems Plans include goals and policies for

pubic infrastructure systems such as the water and wastewater systems, stormwater management, parks and recreation, and transportation systems. The Raleigh Comprehensive Plan contains significant references to bicycling throughout the document, including the elements for Transportation and Parks and Recreation. A review of the document provides the following analysis and recommendations:

Part 4: Parks, Recreation and Greenways Plan

This chapter has a direct connection to bicycling, especially in terms of promoting physical activity, bicycle touring, mountain biking and shared-use paths. The Parks, Recreation and Greenways Plans can also help to achieve some of the goals of the Transportation Plan so long as the facilities are accessible to non-motorized travel. The access points to the parks and greenways should be designed so that local users can travel to the facilities without needing to travel by car Specific notes include:

Recommendation – Capital Area Greenways: set goals to complete the facility as a connected multi-use path for recreation and transportation use.

Recommendation - Equitable Distribution of Facilities Across the Community: include having a bicycle facility within 1 mile of all residences in Raleigh.

Recommendation – Parks Classification: include mountain bike trails and other natural surface trails as part of the "Natural Areas" designation.

Recommendation - Encourage Public Involvement / Provide Environmental Education Opportunities: include physical activity promotion, support of bicycle clubs, National Bike Month events, Share-the-Road safety programs, community bike programs, summer bike camps, etc.

Part 5: Economic Development Strategy

This section provides good references to diverse transportation systems, including bicycle and pedestrian facilities.

Recommendation – Financial and Community Resources: bicycle tourism can play a role in attracting visitors to the area and providing non-motorized tourism options within the city and along planned greenways.

Recommendation - Maintain and Improve the City's Physical Environment: an increased emphasis on multi-modal transportation choices or the promotion of a city-bike program can help to achieve targets in the reduction of air pollution.

Recommendation - Institutional Resources / Economic Development Program: recycle-a-bicycle programs offer the opportunity for entry level jobs which teach the needed and valuable skill of bicycle repair. The program can be geared as a youth development program or as a tool to provide skills to unemployed workers looking for jobs.

Part 8: Transportation Plan

The *Roadway System Plan* serves as a basis for the coordinated implementation of roadway improvements to protect the integrity and safety of the street and highway network and provide an acceptable level of mobility to the citizens of Raleigh. There is an opportunity to include a "Complete Streets" policy approach that integrates bicycle and pedestrian facilities into all roadway, transit and public works projects.

The *Public Transportation Plan* serves as a guide for the provision of desirable transit and paratransit modes of travel. This section could include intermodal connections for pedestrians and bicyclists – such as bike stations /rental / repair locations, bicycle lockers, bike racks, transit shelters and amenities.

The *Pedestrian and Bicycle Circulation Plan* provides for increased walking opportunities as an alternative to the automobile and for recreational purposes. Additional topics such as Context Sensitive Design and Public Art and Design Overlay Districts could be included.

The *Bicycle Plan* also provides recreational and alternative opportunities for non-automotive travel. The Bicycle Plan is a detailed bicycle element that provides the basis for the Comprehensive Bicycle Master Plan. It is carefully written and includes a wide range of important references to bicycling. However, there are a number of key issues that could be strengthened as part of the Bicycle Master Plan process. A core issue is that the Transportation Plan does not include specific mode share or safety goals. This is an important opportunity to provide a primary benchmark for the City's quality of life. In addition, health and physical activity are not adequately addressed, and this is important in light of the national obesity epidemic and the prominence of the health industry in the Research Triangle area. Another area that is not addressed in the plan is people working at home, which represents a rapidly growing sector of transportation in the region, and can have a significant effect on walking and bicycling. Additional facility types that need to be considered include: high crash locations, intersection improvements, traffic signal actuation, bicycle parking, bike stations / rental shops, and intermodal / transit connections.

Recommendation: Include a mode share and safety goal, based on the USDOT national goal of doubling the amount of walking and bicycling in the U.S. and improving safety by 10%.

Recommendation: Include health and physical activity as a priority element in the Comprehensive Plan, with a goal of having all Raleigh residents meet or exceed the U.S. Surgeon General's recommendations for daily physical activity.

Recommendation: Include working from home as a planning element, specifically to address the potential changes in bicycle and pedestrian transportation that can result from more people working at home.

Recommendation: Proposed New Section on Bicycle Friendly Communities (BFC) Program – Raleigh will participate in the League of American Bicyclists BFC Program with a goal of earning official designation within the next 5 years. The program provides a useful set of benchmarks for implementing a comprehensive bicycle program.

Recommendation: Raleigh has an important opportunity to adopt a "Complete Streets" policy approach that integrates bicycle and pedestrian facilities into all roadway, transit and public works projects. This type of policy has been adopted by numerous communities throughout the U.S. Model policy language is provided by the NCDOT (based on North Carolina statutes) and the US Department of Transportation design guidelines. Copies of the NCDOT and USDOT policies are provided in the appendix of this report.

Additional Topics to be Included in Future Revisions of the Comprehensive Plan:

Conservation and Environment: presents an opportunity to capitalize on the energy savings, fossil fuel reductions and air quality benefits that can be attributed to bicycle and pedestrian transportation. The number of trips made by bicyclists and pedestrians is a fundamental benchmark of the quality of the City's environment. Raleigh should participate annually in the National Bicycle and Pedestrian Documentation Project to standardize a bicycle traffic count program.

Schools: The national Safe Routes to Schools (SR2S) Program provides funding to increase opportunities for children to walk or bicycle to school (or to the school bus, or during the day at school). Mode share data for the number of children who walk, bike, ride the bus or are driven to school should be collected as part of the annual data collected for school transportation. School site location should be considered a priority factor with reference to the potential for children to walk or bike to school.

Public Safety: Consider including a chapter on "Public Health and Safety" to provide an appropriate role for issues ranging from cardiovascular disease prevention, increased physical activity and reductions in traffic injuries and fatalities.

ZONING AND LOCAL CODES

Raleigh has adopted zoning ordinances, subdivision regulations, transportation codes, and design guidelines for land use and transportation modes within the city. In general the zoning ordinances are good, but they need to emphasize a stronger connection between land use and transportation, especially bicycle and pedestrian travel. Ongoing efforts to integrate form-based codes and improved guidelines for the City's public realm will support this process. The current Raleigh Code of Ordinances is available on-line at: http://www.municode.com/resources/gateway

General Recommendation: Modify the local ordinances to provide a balanced approach to both on and off-street bicycling, transportation, recreation and support facilities including a stronger connection between mixed use zoning, compact land use and a more detailed guideline for bicycle parking and amenities at large work sites.

Individual sections of the Code of Ordinances are reviewed as follows:

Code of Ordinances, Part 9: Parks, Recreation and Cultural Affairs

This section of the code includes the goals of the Recreation Division, which are stated as follows:

> "The recreation division of the Department of Parks and Recreation shall have as its objectives the planning, administering and supervising of a wide variety of recreation program opportunities and the fulfilling of the leisure needs of all ages and skill levels including programs for youth, the elderly, the mentally retarded, and the physically and visually handicapped." (Sec. 9-3001)

With an increased emphasis on the need for physical activity and outdoor recreation, bicycling can play a significant role in supporting these objectives. Programs for utilitarian cycling, competitive racing, BMX, mountain biking, greenways, bicycle touring and local club programs can all be part of this effort.

Part 9 also includes the following section regarding bicycles and the use of greenways:

> *Sec. 9-2027. Regulation of the Use of Bicycles and Other Non-motorized Vehicles on the Greenway System*
>
> (a) *Definitions*. As used in this section, except where the context clearly requires otherwise, the words and terms used in this section shall have the following meanings:
>
> > (1) *Bicycle*. A non-motorized vehicle with two (2) or three (3) wheels tandem, a steering handle, one (1) or two (2) seats, and pedals by which the vehicle is propelled, and also bicycles with helper motor rated less than one (1) brake horsepower which produce only ordinary pedaling speed up to twenty (20) miles per hour.
>
> (b) *Use of the Greenway System*. Non-motorized vehicles as defined herein may use the system of Greenway trails designated as such by the City so long as any user of such a vehicle complies with all traffic regulations applicable and so long as the operator shall stop or otherwise yield the right-of-way to pedestrian traffic. No non-motorized vehicle shall exceed a speed of ten (10) miles per hour while being operated on the Greenway Trail system.
>
> (Ord. No. 1993-249, §1, 8-3-93)

Code of Ordinances, Part 10: Planning and Development

Chapter 2: Zoning Ordinances; Article A. General Provisions

This section is important because it sets the tone for planning and development in Raleigh. Health, safety, and convenience are significant issues for bicycling; these requirements are explicitly mentioned in the first paragraph of the Raleigh zoning code under the declaration of necessity as follows:

> *"It is deemed necessary in order to preserve and promote the health, comfort, convenience, good order, better government, safety and morals and in order to promote the systematic future development of the City"*

The declaration of necessity further calls out the need to prevent congestion:

> *"prevent or relieve congestion, either of population or traffic"*

In addition to relieving traffic congestion, the general provisions should be amended to provide high-quality bicycle and pedestrian facilities. Further, traffic should be specifically defined to include "pedestrians, bicyclists, public transit, and motorized vehicles."

Sec. 10-2002. Definitions:
Consider making the following changes to definitions of words and terms within the zoning codes to ensure that bicyclists, pedestrians, and transit are emphasized in any reference to traffic, transportation, or mode of travel (changes underlined):

Modify:

> *Passenger transit station or stop*. "The location of a passenger transit station or stop and its associated automobile or bicycle parking, all under the control of a public entity."

New Definitions:

> *Traffic:* "Pedestrians, motor vehicles, bicycles, and other conveyances either singly or together using any highway, street, or public right-of-way for purposes of travel."
>
> *Traffic Impact Analysis:* "Traffic engineering analysis which considers all modes of travel, including motor vehicles, walking, bicycling, and transit."

This language is based on a combination of the Uniform Vehicle Code (UVC), the national model code which forms a basis for most state codes, and the North Carolina General Statues. The NC Statutes do not include a definition of the term traffic, but they do define a bicycle as a vehicle. The UVC includes a broad definition of traffic, but does not explicitly mention bicycles. The text of these two sections of code is provided below:

> *Uniform Vehicle Code § 1-207 Traffic*
> Pedestrians, ridden or herded animals, vehicles, streetcars and other conveyances either singly or together while using any highway for purposes of travel.
>
> *NC General Statues, Chapter 20, §.20.4.01 (49) Vehicle*
> Every device in, upon, or by which any person or property is or may be transported or drawn upon a highway, excepting devices moved by human power or used exclusively upon fixed rails or tracks; provided, that for the purposes of this Chapter bicycles shall be deemed vehicles and every rider of a bicycle upon a highway shall be subject to the provisions of this Chapter applicable to the driver of a vehicle except those which by their nature can have no application.

This term shall not include a device which is designed for and intended to be used as a means of transportation for a person with a mobility impairment, or who uses the device for mobility enhancement, is suitable for use both inside and outside a building, including on sidewalks, and is limited by design to 15 miles per hour when the device is being operated by a person with a mobility impairment, or who uses the device for mobility enhancement. This term shall not include an electric personal assistive mobility device as defined in G.S. 20-4.01(7a).

Chapter 2: Zoning Ordinances; Article B. Establishment of Zoning Districts
This section defines general and conditional use zoning districts and establishes specific zoning districts adopted by the city. The section further calls out overlay districts and defines the purpose of each overlay area. These sections should be evaluated to highlight their provisions for or impact on bicycle and pedestrian traffic.

Overlay districts are defined as "special districts that are created to achieve unique physical characteristics or promote specific planning or urban design objectives." These districts should make special provisions for promoting bicycle or pedestrian travel.

Section 10-2011 (b) (3) b. Downtown Overlay District: The ordinance currently highlights the need for "reductions in peak hour commuter congestion." Consider adding statements such as "support all modes of transportation, including pedestrians, bicycles, and transit" and "provide bicycle parking."

Section 10-2011 (b) (3) c. Historic Overlay District: This district promotes "education, pleasure and enrichment" of residents. Consider adding "health" to this list to further encourage walking and cycling within historic districts.

Section 10-2011 (b) (3) f. Pedestrian Business Overlay District: This district is good and the objectives of the pedestrian areas, including "respecting and improving the pedestrian environment," should be applied throughout city zoning codes to help promote walking throughout the city. Also the bicycle parking requirements found here should be considered for other districts as well: "*Bicycle parking spaces shall be provided for all new uses, new buildings, and for existing buildings and uses whenever those existing buildings and uses undergo any one (1) or more of the expansions, expenditures, or changes listed in subsections a. through c. of §10-2055(e)(2) ....Bicycle spaces shall be provided at a rate of at least one (1) bicycle space for every twenty (20) required automobile spaces. Bicycle parking facilities shall be located within easy access from the street right-of-way, and shall be designed in*

accordance with the Streetscape Plan or Streetscape and Parking Plan." (Ord. No. 1992-111-TC-42, §21, TC-19-92, 12-8-92; Ord. No. 2000-740-TC-190, TC-1-99, §5, 2-18-00).

Section 10-2011 (b) (3) i, j, k, l Special Highway Overlay District: The Special Highway Overlay Districts currently cite "protect and preserve the natural scenic beauty" and "encouraging tourism and trade" as primary goals of the districts. Bicycling travel should be recognized as a means to protect the natural areas and attract tourism to the city and surrounding areas. Consider adding provisions for bikeable shoulders, bicycle lanes, shared-use paths, or off-road cycling facilities to allow for safe and efficient bicycle travel along major road and highway corridors.

Section 10-2011 (b) (3) m. Transit Oriented Development Overlay District: The ordinance currently highlights "pedestrian oriented land uses"; consider changing to "pedestrian and bicycling oriented uses" in this definition. Consider changing "provides convenient pedestrian and vehicular access" to "provides convenient pedestrian, bicycling, and motor vehicle access." In addition, consider calling out bicycle parking as a support service for transit station users.

Chapter 2: Zoning Ordinances; Article C. Summary of Requirements by Zoning District

The notes above outline changes to descriptions of specific overlay districts. All zoning districts should be closely examined to ensure that they are consistent with the above descriptions and specifically provide facilities or amenities for bicyclists and pedestrians. Bicycle parking requirements should be provided in all commercial, office, and recreational areas.

Chapter 2: Zoning Ordinances; Article D. Use, Residential Density, Setback, Height Regulations, and Summary Schedules

This section includes important references to home occupations and accessory apartments, both of which are important elements of affordable, walkable/bikeable neighborhoods. Accessory Dwellings and Home Occupations are referenced in Section 10-2072 (b).

Suggestions for modification include the section on school site selection. This section is important for the development of Safe Routes to Schools (SR2S) programs, and for ensuring that pedestrian and bicyclist accessibility is part of the schools site decision process. The section calls for large land lots to be required for school sites; the minimum square feet regulation should be reconsidered to provide for smaller schools located within existing urban areas, thereby providing for more opportunities for walking and cycling by children. The following modification is recommended:

Section 10-2072 (b): School - private or parochial

A school, private or parochial shall meet all of the following:

(1) Meet the curricular teaching certification of instruction approved by the State Board of Education.

(2) Be located on a lot(s) with a total land area of five hundred (500) square feet area per enrolled pupil. (*Note: Review the square footage requirement to allow for smaller schools within existing urban areas)*

(3) Be located outside any Airport Overlay District and a primary reservoir watershed protection area.

(4) School site plans shall be designed to ensure that children have the choice to walk or bike to school where appropriate. *(New Item)*

Chapter 2: Zoning Ordinances; Article E. Supplementary Regulations and Exceptions - Off-street Parking, Landscaping, Signage, Fences and Walls, and Other Regulations.

The zoning ordinances regulate additional aspects of land development, including off-street parking, landscaping, signage, and other development standards. Off-street parking is the most applicable regulation directly affecting bicycling.

Sec. 10-2081 Off-Street Parking. The current off-street parking regulations only provide for automobile parking and do not take bicycle parking into consideration. Bicycle parking is provided for in specific overlay districts (including Pedestrian Business District and Transit Oriented Development overlays see page 6-8 to 6-9). However bicycle parking should be considered in all off-street parking situations and included in all commercial or overlay zoning districts.

Bicycles should receive equal consideration when calculating parking needs with specific calculations provided for determining the amount of bicycle parking provided by district type. Design and location standards for bicycle parking should be clearly stated to provide for safe and convenient access to all commercial areas. Sample text is provided below:

Multi-family residential uses shall provide bicycle parking at the rate of 1 bicycle parking space for each 20 motorized vehicle spaces but no more than 50 total bicycle parking spaces are required for any single development. Non-residential uses with an off-street parking requirement for motorized vehicles of at least 15 spaces

For more information on Bicycle Parking (including "Guidelines for Bicycle Parking Locations and Quantities", "Bicycle Facilities at Transit Stops", "Bicycle Stations and Repair Stands", and "Attended Bike Parking"), see Chapter 7: Design Guidelines, pages 7-37 to 7-41.

Also, for links to model bicycle parking ordinances from other cities, go to the MassBike website:http://www.massbike.org/bikelaw/parking.htm

Note: These recommendations (at left) are complimentary to the City of Raleigh's 'Right Sizing' parking study, and provide addional detail on specific quantity, type and location of bicycle parking.

and not more than 40 spaces shall provide a minimum of 2 bicycle parking spaces. Non-residential uses with an off-street parking requirement greater than 40 spaces shall provide bicycle parking spaces equal to 5% of the total number of spaces required up to 100 spaces.

Bicycle parking should be located in secure, visible areas, sheltered from rain if possible. At long-term parking locations (transit stations, parking garages, park ride lots, university campuses, etc.) bicycle lockers or secured areas should be provided in addition to racks. Short term bicycle parking should also be included as a routine element in streetscape design for all commercial, institutional and mixed-use streetscapes. All schools should provide secure bicycle parking for a minimum of 10% of the student / faculty population.

Chapter 2: Zoning Ordinances; Article F. Planned Residential Development Regulations; and Article G. Planned Nonresidential Development Regulations.

Densely clustered development is a critical factor for ensuring that new developments contain the scale and vitality to support walking and bicycling. These two sections detail the regulations for large planned developments.

Consider adding the following language for all planned developments: "Land development and roadway design will support walkable and bicycle-friendly communities to encourage active lifestyles, environmental conservation and quality of life. Based on the national Trails for All Americans study, all residential areas will be within a 15 minute walk of a trail or bikeway."

Chapter 2: Zoning Ordinances; Article H. Approval Procedures.
This is an important section for ensuring that bicycling and walking are fully integrated into the development review process. This section includes required plans for review and regulations for submitting plot and site plans. This section should be amended to include traffic impact analysis (TIA) and development review criteria tailored to bicycle and pedestrian access.

A multi-modal TIA will address the needs of all modes of transportation, including walking, bicycling, transit and automobiles. The level of service methods used for analysis will include motor vehicle, transit, bicycle and pedestrian level of service as performance measures, where applicable. This means that when the impacts of a proposed project are assessed, the analysis will include both motorized and non-motorized transportation.

Subdivision review should also include criteria for pedestrian and bicycle circulation.

Chapter 3: Subdivision/Site Plan Standards
The subdivision ordinance for Raleigh details the "procedures and standards for site development, subdivision of real estate, and the surveying and platting of land." The following sections were identified for potential modifications:

Chapter 3: Subdivision/Site Plan Standards; Article A. General Provisions

Sec. 10-3002. Declaration of Purpose

i. Provide for efficient, adequate and sufficient streets, sidewalks, and greenways with adequate capacities to move pedestrian, bicycle, transit, and automobile traffic and with proper alignment and grades, and curbs and gutters to promote the public safety and adequate drainage;

ii. Save unnecessary expenditures of funds by requiring the initial proper construction of transportation networks, sidewalks, bikeways, greenway trails, drainage facilities and utilities;

Sec. 10-3003. Definitions

Modify:

Connective street: A street within a particular development, other than a dead-end or loop street, which will allow <u>pedestrian, bicycle, public transportation, and automobile</u> circulation to adjoining developments to provide for community-wide circulation.

New Definitions:

Traffic: "Pedestrians, motor vehicles, bicycles, and other conveyances either singly or together using any highway, street, or public right-of-way for purposes of travel."

Bicyclist Facilities : "On and off-street improvements including shared-use paths, bicycle lanes, shared land markings, paved shoulders, wide curb lanes, signals, crossings, transit connections and bicycle parking designed to facilitate travel by bicycle. "

Consider adding: Safe Routes to School, ADA and Crosswalks. Note that all of the definitions of "Streets" are automobile-centric; suggest modifying with multi-modal, "complete streets" language.

Chapter 3: Subdivision/Site Plan Standards; Article B. Procedures

Sec. 10-3012. Preliminary subdivision plan approval and final plat certification required.
Public Works staff should be responsible for reviewing subdivision site plans to ensure that bicycle and pedestrian facilities are integrated in all facility construction and renovation projects. (Note: this concept should also be applied to Site Plan review and the Building Permit application process to ensure that bicycle and pedestrian access as well as on site amenities are considered before plan approval and construction begin)

Chapter 3: Subdivision/Site Plan Standards; Article C. Reimbursement and Design Standards for Subdivisions and Site Plans
Add a section detailing sidewalk, bikeway and trail construction: include bicycle facilities, crosswalks, SR2S corridors, and link this section to the Bicycle Master Plan. Also consider including: neighborhood cul-de-sac connectors for walking/bicycling/emergency vehicle access between subdivisions.

Sec. 10-3020. Conformity to City Plans
Include review by citywide Pedestrian and Bicycle Commission to reference existing city plans, including this Bicycle Master Plan, in consideration for design standards

Sec. 10-3041. Street Design Standards
Consider adding AASHTO Bicycle and Pedestrian Guidelines as for constructing on-street and off-street bicycle facilities, in addition to the Street, Sidewalk, and Driveway Access Handbook as adopted by the city.

Chapter 7 : Driveway Access, Sidewalks and Streets
This section and its related subsections should be updated to include specification for bicycle facilities in addition to the sidewalks and driveways. The title should be modified to read, "*Driveway Access, Sidewalks, Bicycle Facilities and Streets*". This chapter includes the following section:

Sec. 10-7001. Sidewalk and Driveway Construction Specifications
This section currently states, "All sidewalks and driveways constructed in the City shall be constructed under the specifications as set out in this section." Add, "...and bicycle facilities shall be constructed according to the Design Guidelines of the adopted Bicycle Transportation Plan."

Code of Ordinances, Part 11: Transportation

The City's transportation ordinances (Code of Ordinances, Part 11) detail regulations for motor vehicles, traffic, bicycles, pedestrians, public transportation, private bus service, and street maintenance. The sections below address specific sections regarding bicycle and pedestrian elements of the ordinances.

Chapter 3: Bicycles

This chapter is generally good, but was adopted as the City of Raleigh Bicycle and Bikeway Ordinance of 1974. Some of the language is outdated and should be reconsidered in light of current best-practices. The full text of the chapter is provided in the appendix of this report.

The chapter should be cross referenced to the streets maintenance chapter to specifically detail additional maintenance standards for bike lanes and paths. This chapter should also explicitly detail bicycle parking guidelines, standards, and be cross referenced to applicable zoning ordinances to routinely require new bicycle parking facilities in commercial, office, or recreational areas. Comments on specific sections below:

> *Sec. 11-3002. Purpose*
>
> The stated purpose of the chapter is good but should be amended to provide for the implementation, maintenance, and operation of facilities and amenities, such as bicycle parking, in addition to bikeways.
>
> The purpose of this chapter is to adopt policies, procedures and standards for planning, designing, constructing, maintaining, marking and operating bikeways and bicycle parking in the City of Raleigh's jurisdiction for the safety of bicyclists, motorists and the public.
>
> *Sec. 11-3003. Definitions*
>
> The definitions should be amended to recognize bicycles as vehicles on par with motorized traffic. Specifically, references to bicycle lanes should not allow for automobile parking
>
> *Sec. 11-3003 (2) (b) Bicycle Lanes*
>
> Vehicular parking may or may not be allowed or it may be restricted to certain hours of each day.
>
> *Sec. 11-3007. Bicycle Lanes Established/Sec. 11-3008. Bicycle Paths Established*
>
> The sections establishing specific bicycle lanes, routes and paths should be reexamined for consistency with more recent plans as well as current development and future goals of transportation within the city. The section should be rewritten to highlight high-

priority commuter or recreational routes within the city, but further outline "complete streets" language that promotes bicycle facilities or accommodations along any street within the city that is deemed feasible or appropriate for bicycle travel. Bicycle facilities should not be limited to specific streets, but considered routinely throughout the city whenever new construction is planned along city streets.

The following language should be applied within the bicycle chapter to ensure that bicycle facilities and amenities are designed and implemented consistently.

- Either wide outside travel lanes, paved shoulders, bicycle boulevards, shared use paths, cycle tracks, bicycle lanes, or other bikeway facilities, as determined by the City Public Works Department or the North Carolina Department of Transportation, shall be a part of any road improvements made on roadways which are indicated as bicycle routes facilities on either the City's Raleigh Urban Trails and Greenways Master Plan, the City of Raleigh Bicycle Master Plan or the Metropolitan Planning Organization's Regional Bicycle Plan.

- In addition to linear bikeways, new and modified traffic signals, roadway crossings, trailheads, transit stops and other improvements will be designed to be accessible to bicyclists.

- All bicycle facilities shall be designed in compliance with the AASHTO Guidelines for the Development of Bicyclist Facilities, the Manual of Uniform Traffic Control Devices, NCDOT design guidelines, and the City of Raleigh Bicycle Transportation Plan.

- At worksites with more than 50 employees, lockers and showers will be provided for people who walk or bike to work or during the workday.

Chapter 5: Street Maintenance

The street maintenance chapter should add bicycle lanes and paths in addition to sidewalks for receiving specific treatments during roadway improvement. The city should consider adding "complete streets" language that routinely examines the feasibility of implementing bikeways during any regularly scheduled roadway maintenance.

Specific language should be inserted detailing a schedule for implementing regular sweeping, repainting, and repaving along bicycle lanes, paths, and sidewalks. Bike lanes regularly collect road debris and need sweeping more often than adjacent roadways. Likewise, off-street paths or greenways need specific maintenance schedules to clean, repair cracks, and remove overgrowing brush. These maintenance schedules should be included officially in the city's street maintenance chapter of the transportation ordinances.

MODE SHARE, HEALTH AND SAFETY GOALS

To be a truly national leader in alternative transportation policy, Raleigh will need to set clear goals and benchmarks for achieving them. In 1993, the National Bicycling and Walking Study set a goal for the United States to *"double the amount of bicycling and walking, and increase the safety of these modes by 10%."* Numerous communities have adopted versions of this combined mode share and safety goal. As shown in the table below from the U.S. Census, Wake County experienced a 13.3% increase in walking and bicycling over the past decade but the total percentage of walking and bicycling trips decreased from 2.3% to 1.8%.

Table 6.1: Selected Characteristics By Place Of Work (1990 and 2000, Including Travel Time)

Selected Characteristics (Universe: All Workers)	1990		2000		Change 1990 to 2000	
	Number	Percent	Number	Percent	Number	Percent
Workers 16 years or over	**249,943**	**100**	**360,165**	**100**	**110,222**	**44.1**
Sex						
Male	133,480	53.4	195,945	54.4	62,465	46.8
Female	116,463	46.6	164,225	45.6	47,762	41.0
Mode to work						
Drove alone	196,816	78.7	287,165	79.7	90,349	45.9
2-person carpool	28,103	11.2	33,040	9.2	4,937	17.6
3-or-more-person carpool	8,253	3.3	14,100	3.9	5,847	70.8
Bus or trolley bus	3,302	1.3	3,280	0.9	-22	-0.7
All other transit[1]	23	0.0	85	0.0	62	269.6
Bicycle or walked	5,769	2.3	6,535	1.8	766	13.3
Taxicab, motorcycle, or other mode	2,343	0.9	3,225	0.9	882	37.6
Worked at home	5,334	2.1	12,735	3.5	7,401	138.8
Travel time to work (Universe = Workers who did not work at home)						
Less than 5	6,664	2.7	7,155	2.1	491	7.4
5 to 9	24,466	10.0	27,455	7.9	2,989	12.2
10 to 14	38,336	15.7	42,965	12.4	4,629	12.1
15 to 19	47,125	19.3	53,050	15.3	5,925	12.6
20 to 29	58,421	23.9	78,110	22.5	19,689	33.7
30 to 44	45,214	18.5	80,185	23.1	34,971	77.3
45- 59	14,698	6.0	31,220	9.0	16,522	112.4
60 or more	9,685	4.0	27,290	7.9	17,605	181.8
Mean travel time (minutes)	21.7	(X)	27.6	(X)	5.9	(X)
Median travel time (minutes)	20.7	(X)	20.8	(X)	0.1	(X)

Source: U.S. Census Bureau, Census 2000 Census Transportation Planning Package (CTPP 2000) Geographic Area: Working in Wake County, North Carolina; Source: http://ctpp.transportation.org/part2/37183.htm

As part of the effort to reverse this trend, potential goals for Raleigh could include:

- Increase bicycling / pedestrian mode share to 5% of all trips by 2020, and 10% of all trips by 2030.

- Improve pedestrian and bicyclists crash rate by 10% by 2015, and 25% by 2020.

- Ensure that all residents meet or exceed the U.S. Surgeon General's recommendations for daily physical activity, including at least 30 minutes of exercise 5 days a week.

Measuring these goals can be accomplished by routine travel surveys, systematic data collection and annual reporting on objectives derived from these goals.

COMPLETE STREETS POLICY

There is a growing national trend towards integrating bicycling, walking and transit as a routine element in highway and transit projects. This movement has developed under the name of "Complete Streets," which is defined by the Complete the Streets Coalition as follows:

> *"Complete Streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and bus riders of all ages and abilities are able to safely move along and across a complete street."*
> (http://www.completethestreets.org/)

While the Raleigh Comprehensive Plan and Zoning Codes address non-motorized transportation in a number of important ways, Complete Streets could be a new framework for integrating the Bicycle Master Plan into a more systematic approach to implementation. A number of similar cities, including Columbia, MO; Santa Barbara, CA; Ft. Collins, CO and others have taken this approach to non-motorized transportation policy. One interesting example is the DuPage County Healthy Roads initiative (Illinois), which links public health with roadway improvements for pedestrians and bicyclists. A review of Complete Streets policies from throughout the U.S. is provided in the appendix of this report.

See Appendix E: Related Planning Efforts for more information on related plans and polices.

CHAPTER 7 OUTLINE:

Design Principles
On-Road Bicycle Facilities
Bicycle-Friendly Intersections
Shared Use Paths/Greenways
Signage
Ancillary Facility Standards
Facility Maintenance Standards

CHAPTER 7: BICYCLE FACILITY STANDARDS

DESIGN PRINCIPLES

This chapter provides guidelines to both public and private entities for the future development of various types of bicycle facilities in the City of Raleigh. The guidelines noted herein are based on the best practices in use throughout the United States, as well as accepted national standards for bicycle and greenway facilities.

The guidelines should be used with the understanding that design adjustments will be necessary in certain situations in order to achieve the best results. Facility installation and improvements should be evaluated on a case-by-case basis, in consultation with local or state bicycle coordinators, and/or a qualified engineer and landscape architect. Should national standards be revised in the future and result in discrepancies with this chapter, the national standards should prevail for all design decisions.

On facilities maintained by NCDOT, the State's design guidelines will apply. The City of Raleigh has the potential to exceed minimum guidelines where conditions warrant (within its jurisdiction).

According to the City of Raleigh Planning Department website, (http://www.raleigh-nc.org/Strategic_Planning/Streetscape_Plans.html) Streetscape Plans are a key element of the urban development process. The City describes these plans as follows:

> "Streetscape Plans or Streetscape and Parking Plans are required to be adopted as part of a Pedestrian Business Overlay zoning classification. See Section 10-2055 of the City of Raleigh Planning and Development Regulations. Streetscape Plans include standards for improvements to street right-of-ways, vehicular areas and building facades that reinforce the unique character and pedestrian orientation of an area. Streetscape standards may address unifying design features for sidewalks, paving, curbing, street trees, building facades, setbacks, vehicular parking areas, building heights, bicycle parking, signage, awnings, street furniture, overhead utilities, streetlights, and other elements of a streetscape. In addition to the aforementioned standards, Streetscape and Parking Plans also address the provision of adequate vehicular and bicycle parking for a Pedestrian Business Overlay District."

Streetscape Plans have been developed for the following areas:

Cameron Village Streetscape and Parking Plan
Glenlake Office Park Streetscape and Parking Plan
Glenwood South Streetscape and Parking Plan
Oakwood Mordecai Business District Streetscape Plan
Peace Streetscape and Parking Plan
Promenade at Crabtree Streetscape and Parking Plan
Southeast Raleigh Streetscape Master Plan
Stanhope Center Streetscape and Parking Plan
University Village Streetscape Plan on Hillsborough Street

In reviewing these streetscape plans, they appear to be highly focused on the pedestrian realm. Bicycle parking is provided as a streetscape element, but most street cross sections only show 11' to 14' shared curb lanes. Bike lanes, bicycle boulevards and other on-street bike lanes could be integrated into these streetscape concepts and cross sections. On-street bikeways will help the City connect greenways with the pedestrian-oriented Streetscape Plans. This will allow people to travel by bicycle to all destinations safely.

The following are key design principles for these guidelines:

1. All streets in Raleigh (except for limited access highways) are legal for the use of bicyclists. Therefore, most streets are bicycle facilities and will be designed, built (or retrofitted) and maintained accordingly. 'Complete Streets' is a term used for streets that are designed and operated to enable safe access for all users. On such streets, pedestrians, bicyclists, motorists and bus riders of all ages and abilities are able to safely move along and across the roadway environment. The Complete Streets concept is recommended for the design and maintenance of all City of Raleigh Streets. See *Chapter 5: Programs and Policies* for additional information.

2. Raleigh will have both a complete network of on-street bicycling facilities and a complete network of greenway trails. These two systems will be interconnected to make it possible for all destinations in Raleigh to be accessible by bicycle.

3. Bicyclists have a range of skill levels, from Type "C"/*beginners* (especially children and seniors), to Type "B"/*intermediate* (occasional commuters and recreational cyclists), to Type "A"/*experienced* (regular commuters and recreational cyclists, including any adults comfortable sharing the road with motor vehicles). These groups are not always exclusive- some elite-level athletes still like to ride on shared-use paths with their families, and some recreational bicyclists will sometimes use their bicycles for utilitarian travel.

4. Bicycle facility design should take into account the needs of all levels. At a minimum, facilities will be designed for the use of Type "A" cyclists, with a goal of providing for Type "B" cyclists to the greatest extent possible. In areas where specific needs have been identified (for example, near schools) the needs of appropriate types of bicyclists will be accommodated.

5. Design guidelines are intended to be flexible and can be applied with professional judgment by designers. Specific national and state guidelines are identified in this document, as well as design treatments that may exceed these guidelines. Some new treatments may require formal applications to NCDOT and FHWA for approval as experimental uses.

Additional Design Considerations and Resources

Facility design is a broad topic that covers many issues. Additional design considerations include the Americans with Disabilities Act, sustainable design, Context Sensitive Solutions, and many other topics that are covered in greater detail within the resources listed on the following page.

Americans with Disabilities Act: requires that portions of Raleigh's greenways be accessible to persons with varying motor skills and abilities. Perhaps the best way to comprehend the importance of ADA is to understand that most of us, at some time in our life, will experience a temporary disability that affects the way in which we make use of outdoor resources. ADA benefits all Americans by making the outdoor environment more accessible.

Sustainable Design :The use of recycled materials and products is recommended in the construction of bicycle and trail facilities whenever feasible. Recycled materials offer design versatility, often have a long life span, and require less long-term maintenance than similar products constructed from natural materials. Recycled plastic lumber and or concrete can be used for the construction of posts and poles, and recycled aluminum can be used for signs. Whenever possible, local materials should be used for construction.

Context Sensitive Solutions: A collaboration between the Congress for New Urbanism and the Institute of Transportation Engineers produced the report *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities: An ITE Proposed Recommended Practice*. It advances the successful use of what are often called context sensitive solutions (CSS) in the planning and design of major urban thoroughfares. It provides guidance and demonstrates for practitioners how CSS concepts and principles may be applied in roadway improvement projects that are consistent with their physical settings. Although the main focus is on walkability, the majority of concepts and principles outlined are also highly applicable for the design of bicycle-friendly communities. The design and construction of all streets in the City of Raleigh should follow CSS concepts whenever possible. Go to www.ite.org/css for more information.

Resources: Information in this chapter is not a substitute for professional, site-specific design and engineering work. For more in-depth information and design development standards, the following publications should be consulted:

Bicycle Facility Selection: A Comparison of Approaches
Michael King, for the Pedestrian and Bicycle Information Center Highway Safety Research Center, 2002
http://www.bicyclinginfo.org/pdf/bikeguide.pdf

Bicycle Parking Design Guidelines
http://www.bicyclinginfo.org/pdf/bikepark.pdf

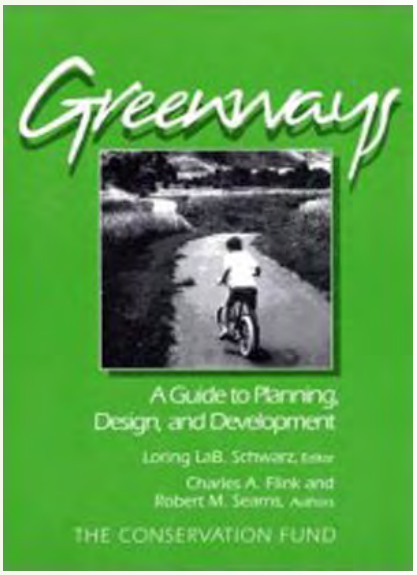
Bike Lane Design Guide
City of Chicago
http://www.bicyclinginfo.org/pdf/bike_lane.pdf

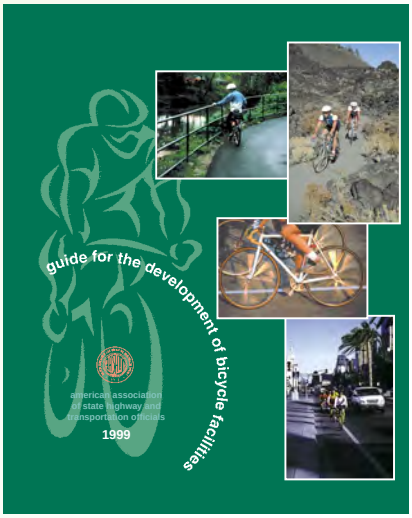
Engineer Bicycle Facilities
Bicycle and Pedestrian Information Center, 2008
http://www.bicyclinginfo.org/engineering/

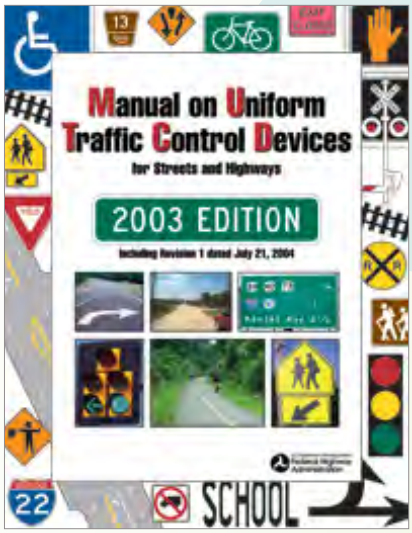
Greenways: A Guide to Planning, Design and Development
Island Press, 1993. Authors: Charles A. Flink and Robert Searns

*Guide for the Development of Bicycle Facilities**
American Association of State Highway Transportation Officials , 1999
http://www.transportation.org

**Once available, the City of Raleigh should use the updated AASHTO Bicycling Guide scheduled for release in 2009.*







Manual on Uniform Traffic Control Devices (MUTCD)
U. S. Department of Transportation, Washington, DC, 2003
http://mutcd.fhwa.dot.gov

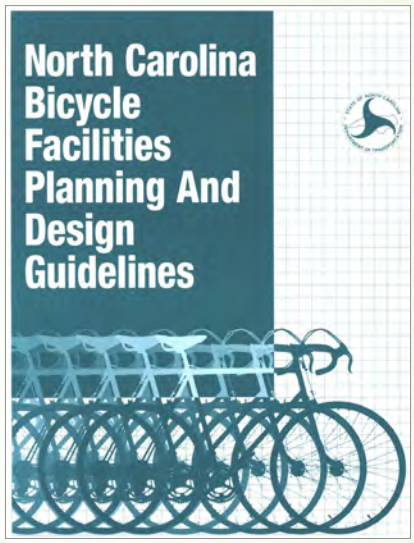
North Carolina Bicycle Facilities Planning and Design Guidelines
NCDOT Office of Bicycle and Pedestrian Transportation, Raleigh, NC, 1994
http://www.ncdot.org/transit/bicycle/projects/resources/projects_facilitydesign.html

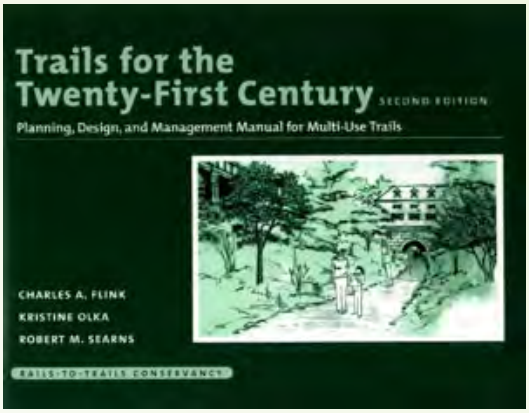
Policy on Geometric Design of Streets and Highways
American Association of State Highway Transportation Officials , 2001
http://transportation.org

Raleigh Capital Area Greenway Map
http://www.raleighnc.gov/portal/server.pt/gateway/PTARGS_0_2_109824_0_0_18/Capital_Area_Greenway_Map.pdf

Trails for the Twenty-First Century
Island Press, 2nd ed. 2001. Authors: Charles A. Flink, Robert Searns, Kristine Olka

Universal Access to Outdoor Recreation: A Design Guide
PLAE, Inc., Berkeley, CA, 1993.





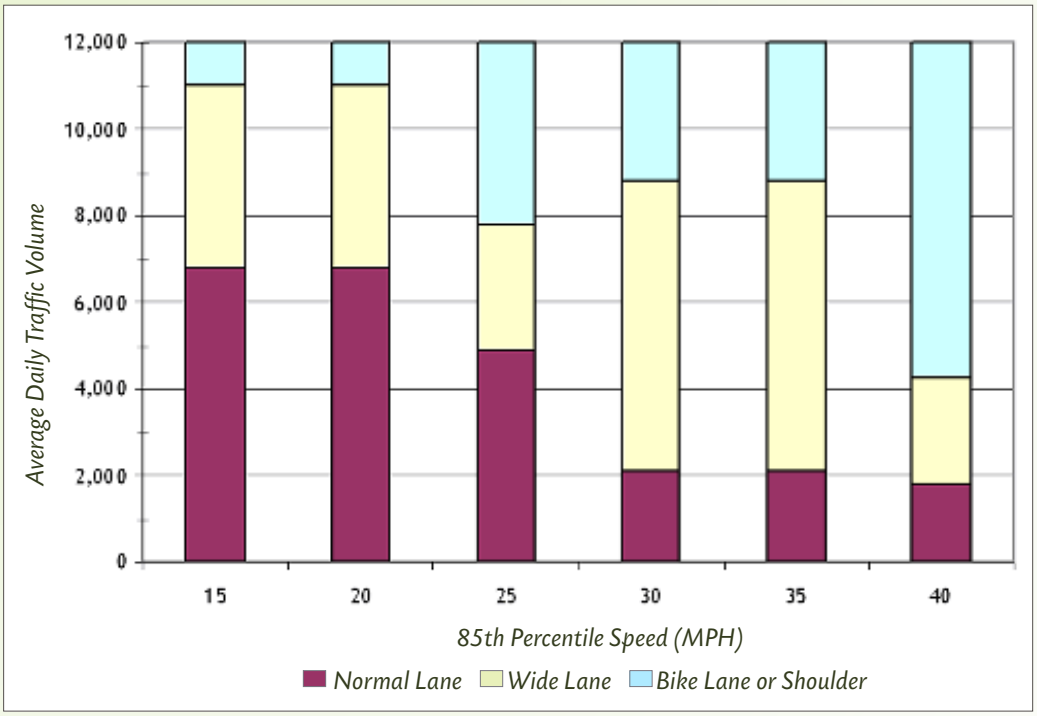
ON-ROAD BICYCLE FACILITIES

A complete street in Amsterdam includes wide sidewalks with landscaping and bicycle parking, bicycle lanes, transit lanes and vehicle lanes.

Bicycle facility design is often included within a larger design philosophy called "Complete Streets." The concept of a complete street is based on the principle that all streets should include basic amenities that consider and include features that facilitate the use of all forms of transportation, not just motor vehicles. If planned thoughtfully, non-vehicular amenities can serve more than one mode of transportation. For example, landscaped median strips can separate and buffer automobile traffic from pedestrians and cyclists and can create a zone with furnishings for both.

A wide variety of on-road bicycle facilities have been developed to meet different transportations needs in different roadway situations. The appropriate bicycle facility for any particular roadway, whether new or existing, should be dictated primarily by vehicle volume and speed of the roadway. Figure 7.2 below provides a matrix for evaluating bicycle facilities. The speed of the travel lane is shown along the x-axis and total traffic volumes per day are shown along the y-axis. The different colors represent the type of bikeway facility prescribed given the volume and speed of the travel lane.

North American Speed-Volume Chart



Source: M. King: Bicycle Facility Selection: A Comparison of Approaches

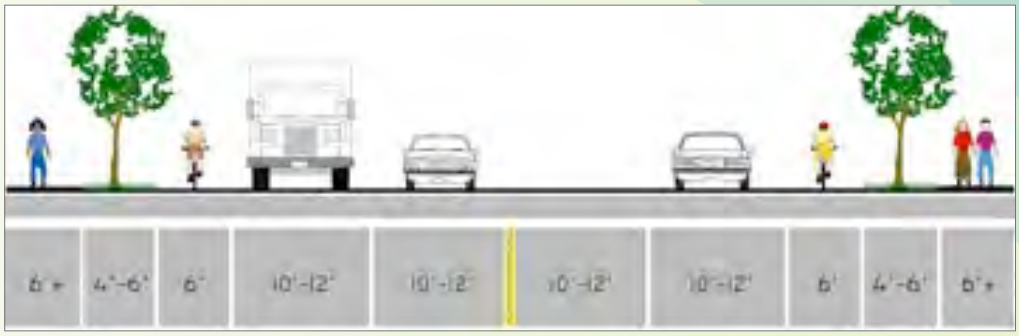
The following diagrams show how these recommendations could translate into roadway/facility configurations:

Multi-Lane Roadways

Note 1: MUTCD offers that roadways with 4,000 vpd or greater should have pavement marking (rather than 3,000, as stated at right). However, the MUTCD is primarily concerned with motor vehicles. The research cited in the document indicates that bicyclists safety and comfort are improved at lower thresholds - especially when encouraging less experienced cyclists to use on-street facilities, hence the use of 3,000 vpd as the threshold for this Plan.

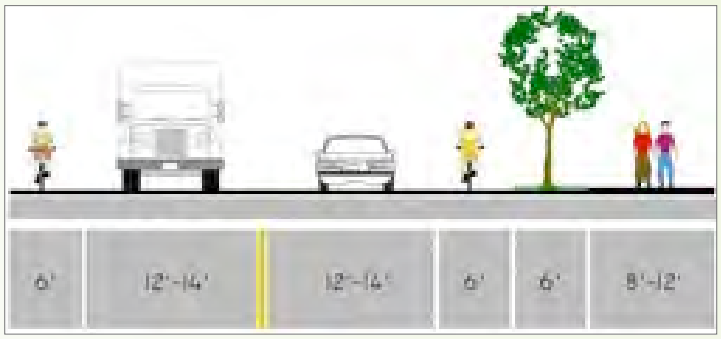
Note 2: For information related to the adequacy of 10-foot lanes in a restriping scenario, see Chapter 4, pages 4-6 to 4-8 .

On roadways with 3,000 or more vehicles a day, bicycle lanes should be used to improve bicyclist safety and comfort. A buffer or curb must separate the shared use path or sidewalk from the roadway for pedestrian safety. The width of the bicycle lane, buffer, and sidewalk or path should appropriately reflect the volume and speed of the vehicles using the roadway. Figure 7.3 illustrates typical bicycle accommodation in urbanized areas. The minimum bike facility width is 4 ft on open shoulders and 5 ft from the face of a curb, guardrail, or parked cars, while 6 ft the preferred width in urbanized areas.[1]



Option 1: Bicycle Lane on a Multi-lane Roadway

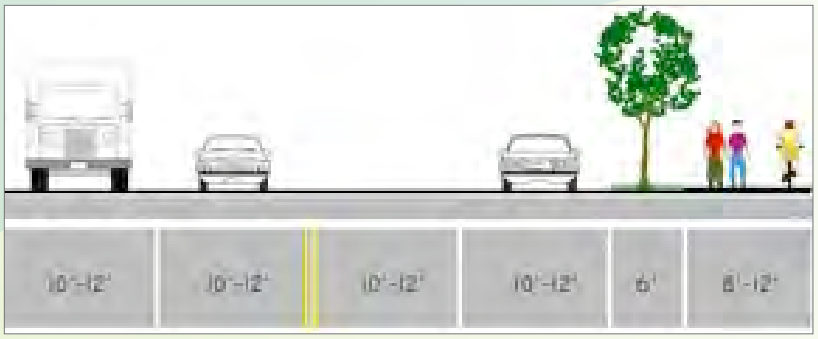
Some arterials and major collectors can accommodate a shared use path on one side of the roadway and on-street bicycle lanes for more experienced bicyclists (Figure 7.4). The shared use path provides a comfortable walking space for pedestrians and enables children and recreational bicyclists to ride without the discomfort of riding in a busy street. This configuration works best along roadways with limited driveway crossings and with services primarily located on one side of the roadway, or along a riverfront or other natural feature.



Option 2: Shared Use Path with Bike Lanes on a Multi-lane Roadway

1 AASHTO and MUTCD

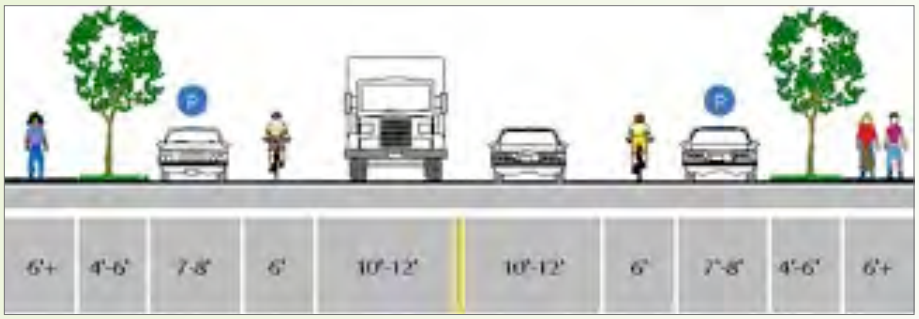
Sometimes a shared use path can provide accommodation on high-volume, high-speed roadways (Figure 7.5). This type of trail works best in corridors where there are limited driveway/intersection crossings and more desirable destinations along one side of the roadway, or where no roadway space is available to provide bike lanes, yet the road travels past a number of desirable locations. The trail should be at least 10' wide (preferable 12-15') with a 6' or greater vegetated buffer where possible.



Option 3: (Shared Use Path) on a Multi-lane Roadway

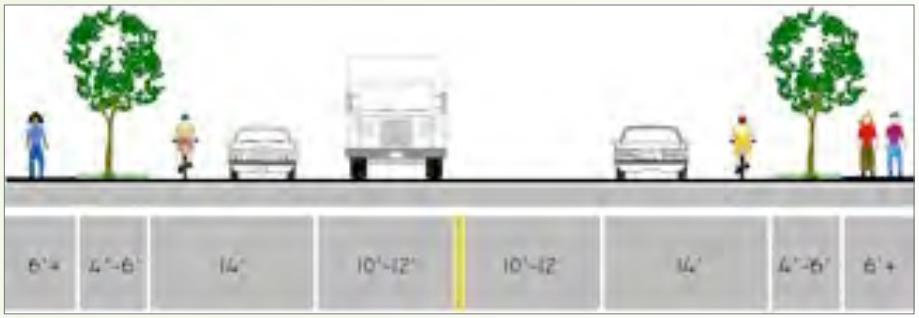
Two Lane Roadways

On moderate volume roadways, such as minor collectors, on-street parking is often permitted. Where on-street parking is permitted, and a bike lane is provided, the bike lane must be between parking and the travel lane (Figure 7.6).



Option 1: Bike Lane with On-Street Parking on a Two Lane Roadway

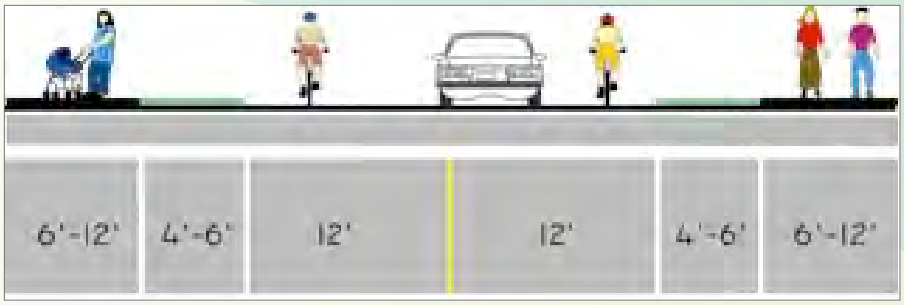
If no bicycle lane is striped, the outside travel lane in either direction may be widened to provide enough roadway space so that bicyclists and motor vehicles can share the roadway without putting either in danger (Figure 7.7).



Option 2: Wide Outside Lane on a Two Lane Roadway

Neighborhood Streets

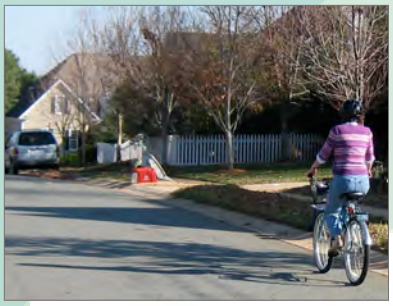
On a low volume, low speed roadway (e.g., a residential or neighborhood street); many bicyclists can safely share the road with vehicles. Pedestrians should be separated from the roadway with a buffer or, if there is insufficient space for a buffer, a curb. The width of the sidewalk or trail should depend on the traffic volume and speeds of the adjacent roadway (Figure 7.8).

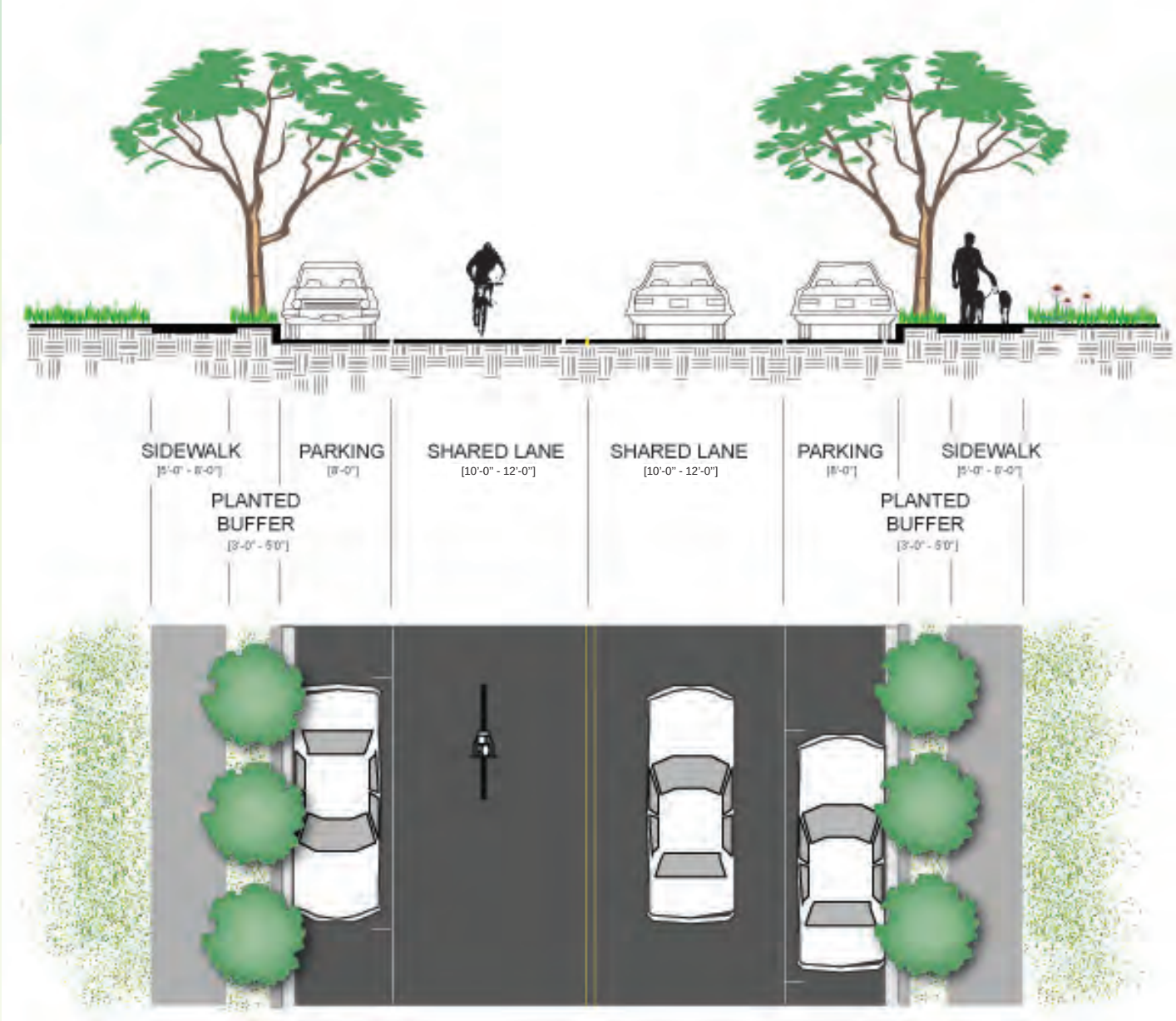


Neighborhood Streets

Signed/Shared Roadway

• May either be a low volume (less than 3000 cars per day) roadway with traffic calming and signage to create a safe shared use environment, *OR* a higher volume roadway with wide (14') outside lanes.





Shared Lane Marking

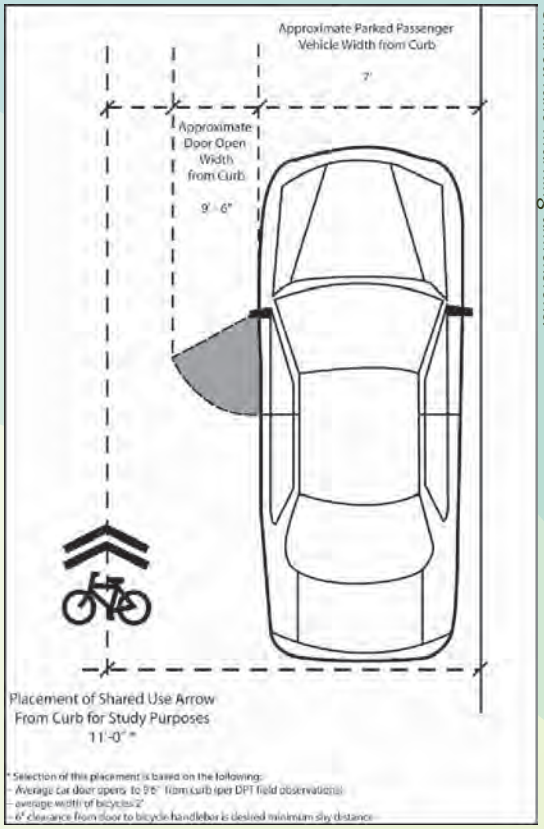
A bicycle shared lane marking (or 'sharrow') can serve a number of purposes, such as making motorists aware of bicycles potentially traveling in their lane, showing bicyclists the appropriate direction of travel, and, with proper placement, reminding bicyclists to bike further from parked cars to prevent "dooring" collisions. The shared lane marking stencil is used:

- Where lanes are too narrow for striping bike lanes
- Where the speed limit does not exceed 35 MPH
- With or without on-street parking

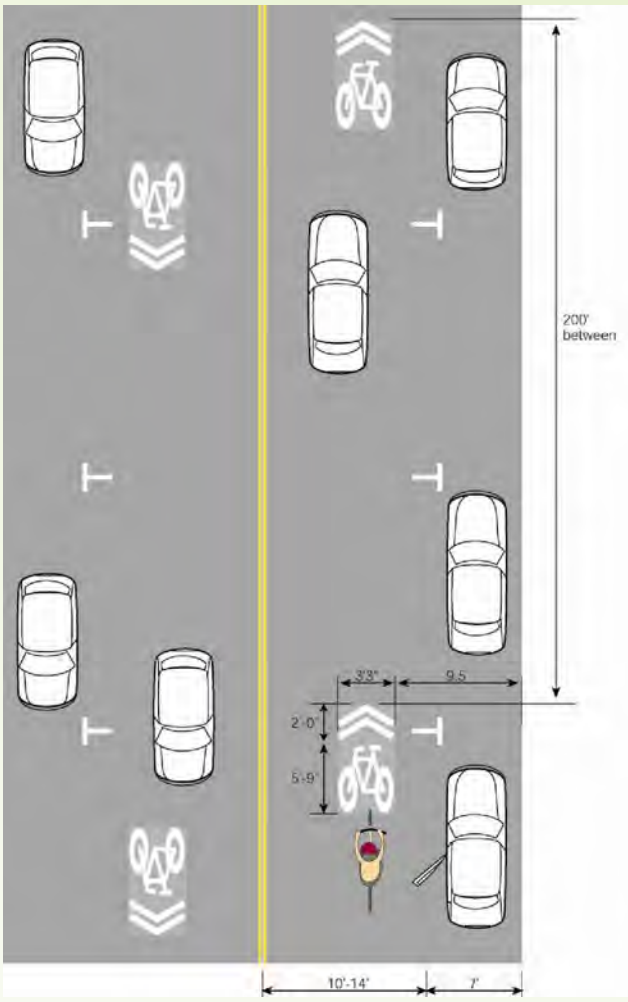
Cities such as Denver, San Francisco, Portland, Los Angeles, and Gainesville have effectively used this treatment for several years. In North Carolina, cities such as Chapel Hill and Carrboro have also begun using the shared lane marking (as well as college campuses, such as NC State in Raleigh). As of this writing, the sharrow treatment is being considered in the 2009/2010 update of the MUTCD.

A number of shared lane markings are recommended in this Plan, especially in the Downtown area where there is on-street parking and little room for bicycle lanes. Shared lane markings should also be considered for use on suburban roadway segments that connect bicycle lanes on either side, but do not have width for bicycle lanes.

It is recommended that shared lane markings be approached incrementally as a new facility treatment. Precedent studies and guidelines should also be examined, such as the City of Missoula's (MT) guidelines on the application of sharrows that was developed in 2007-2008.



Shared lane marking dimensions.



Shared lane marking placement.

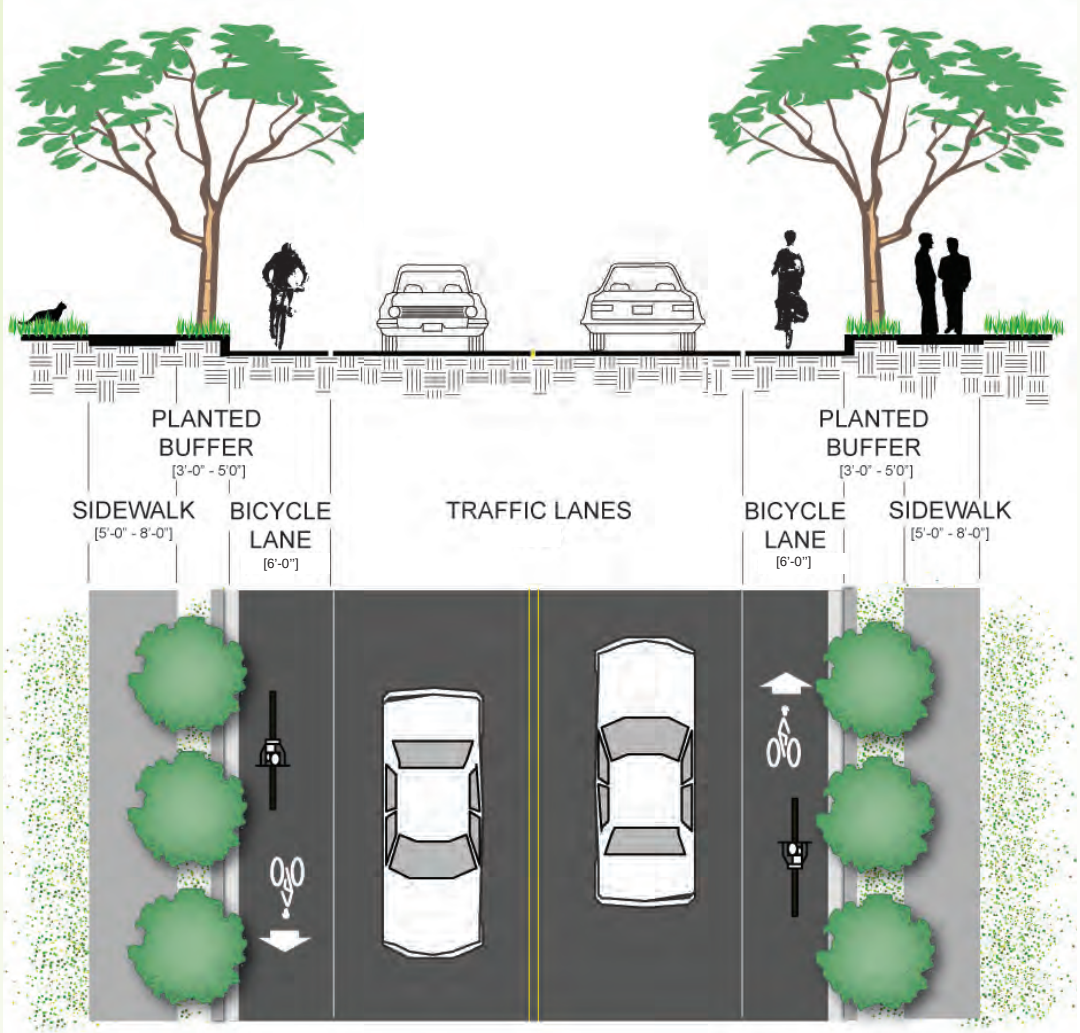
Shared lane markings installed on lanes that are too narrow for striping designated bike lanes.

Bicycle Lane

A bicycle lane is a portion of the roadway that has been designated by striping, signing, and pavement markings for the preferential and exclusive use of bicyclists. Bicycle lanes are always located on both sides of the road (except one way streets), and carry bicyclists in the same direction as adjacent motor vehicle traffic. The minimum width for a bicycle lane is four feet; five- and six-foot bike lanes are typical for collector and arterial roads (greater width is needed for bicycle lanes where traffic volume and speed are higher).

NCDOT recommends a bike lane width of:

- 6' from the curb face when a gutter pan is present (or 4' from the edge of the gutter pan)
- 4' from the curb face when no gutter pan is present
- Should be used on roadways with 3,000 or more ADT
- Not suitable where there are a high number of commercial driveways
- Suitable for 2-lane facilities and 4-lane divided facilities

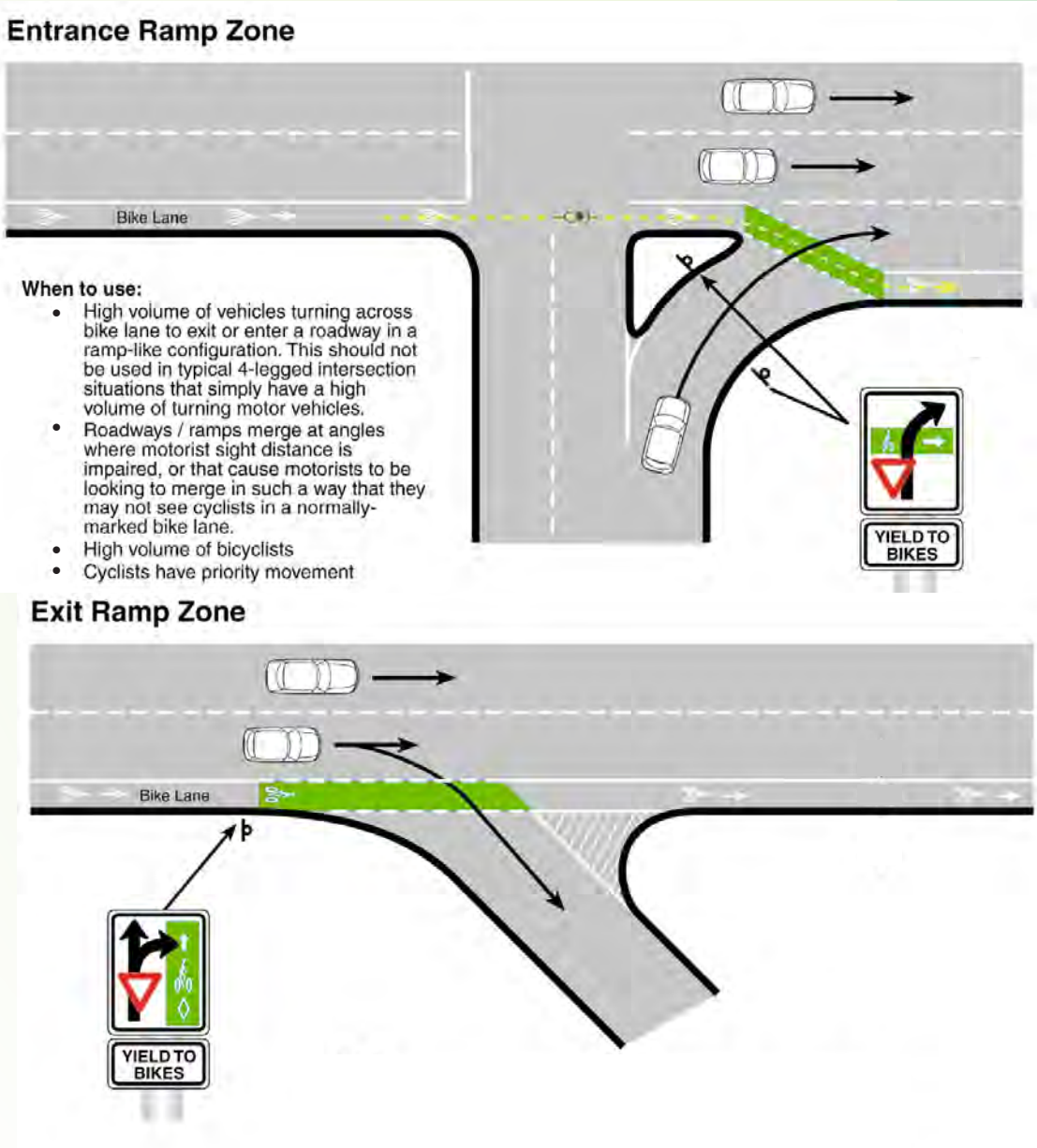


Colored Bike Lanes

In addition to markings presented in the MUTCD, the following experimental pavement markings may be considered. European countries have used colored pavement in bike lanes that tend to have a higher likelihood for vehicle conflicts. Examples of such locations are freeway on- and off-ramps and where a motorist may cross a bike lane to move into a right turn pocket. In the United States, the City of Portland and New York City have colored bike lanes and supportive signing with favorable results. Studies after implementation showed more motorists slowing or stopping at colored lanes and more motorists using their turn signals near colored lanes. Green is the recommended color (some cities that have used blue are changing to green, since blue is associated with handicapped facilities).

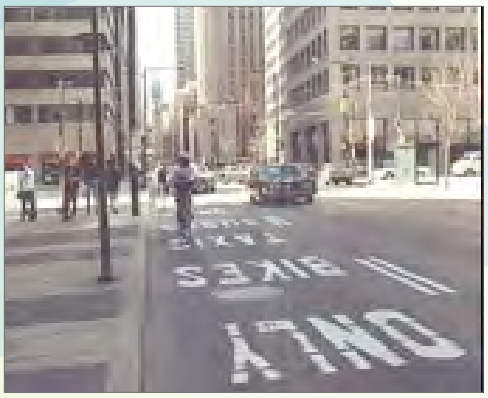
This colored bike lane in Portland is used to warn motorists approaching the on-ramp that bicyclists have a through lane.

Colored bicycle lane use in Denmark



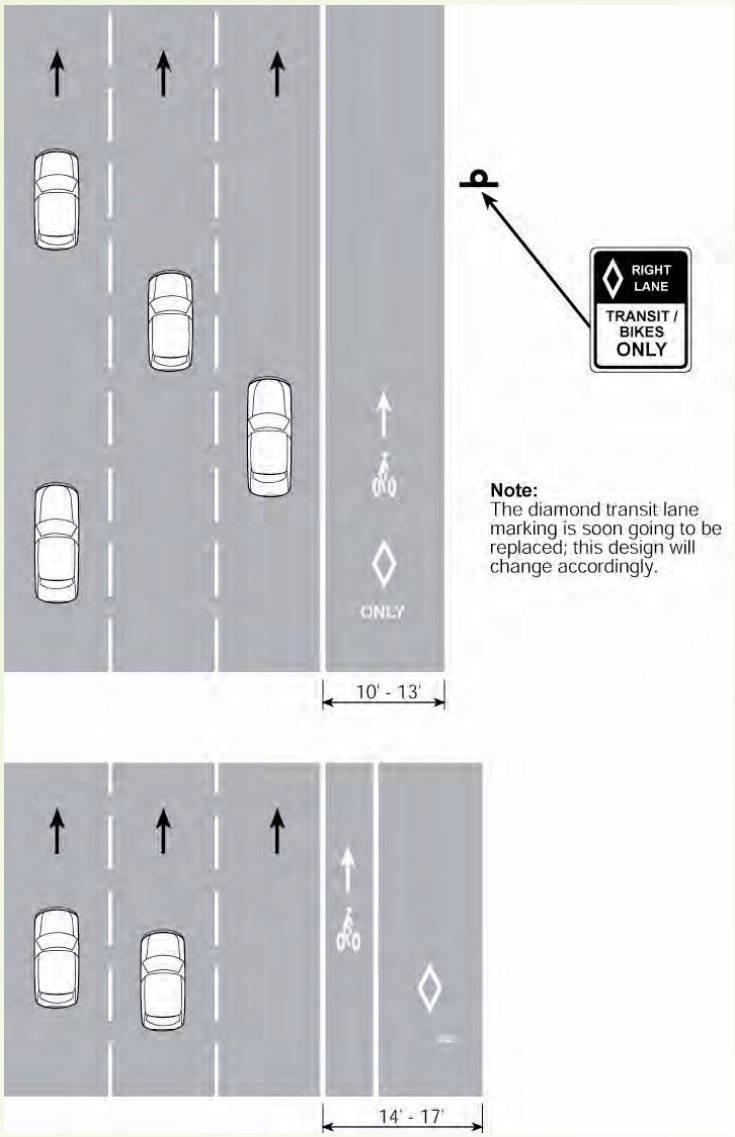
Shared Bus/Taxi/Bicycle Lane

Many cities have created multi-use lanes that accomodate bicycles and transit vehicles within the street. This innovative bikeway treatment is utilized in Phoenix, AZ; Philadelphia, PA; and Toronto, Canada.



Potential applications include:

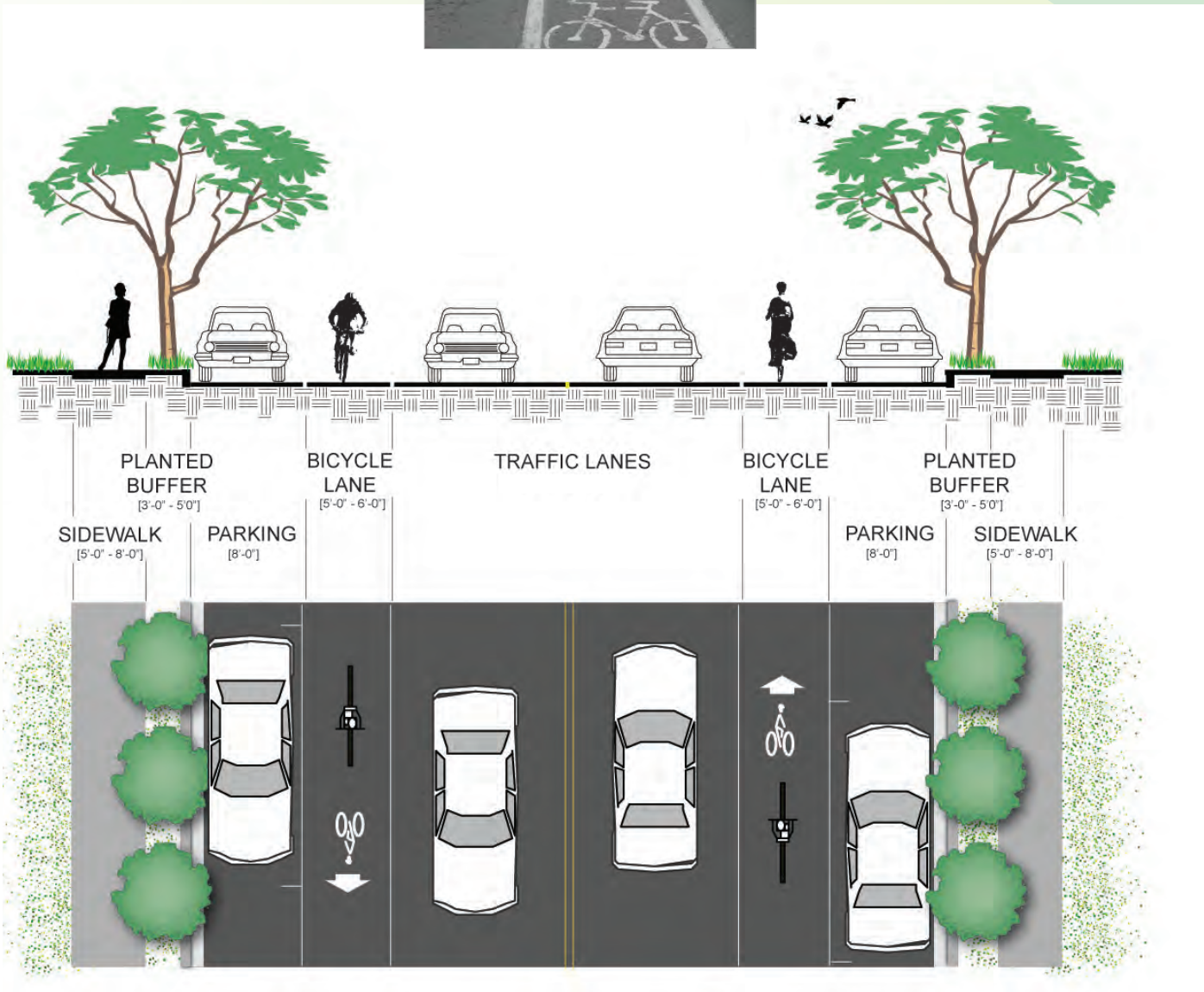
- On auto-congested streets with moderate or long bus headways
- Moderate bus headways during peak hour
- Areas with limited alternative routes



Note:
The diamond transit lane marking is soon going to be replaced; this design will change accordingly.

Bicycle Lane + Parking

- On moderate volume roadways, such as minor collectors, where on-street parking is permitted and a bike lane is provided, the bike lane must be between parking and the travel lane.
- Appropriate space must be allocated to allow passing cyclists room to avoid open car doors.
- For lanes with combined vehicle parking and bike use (as shown below, in the photo at left), NCDOT recommends a minimum width of 12′ to 13′ and AASHTO recommends 11′ to 13′.



Contra-flow Bicycle Lane

The contra-flow bicycle lane provides a striped lane going against the flow of automobile travel. The lanes should be separated by a double yellow line.

Potential applications:

- Provide direct access to key destination
- Improve safety
- Infrequent driveways on bike lane side
- Bicyclists can safely and conveniently re-enter traffic at either end
- Sufficient width to provide bike lane
- No parking on side of street with bike lane
- Existing high bicycle usage of street
- Less than three blocks in length
- No other reasonable route for bicyclists

Contra-flow bicycle lanes utilized in Scotland (top) and Burlington, VT (below)

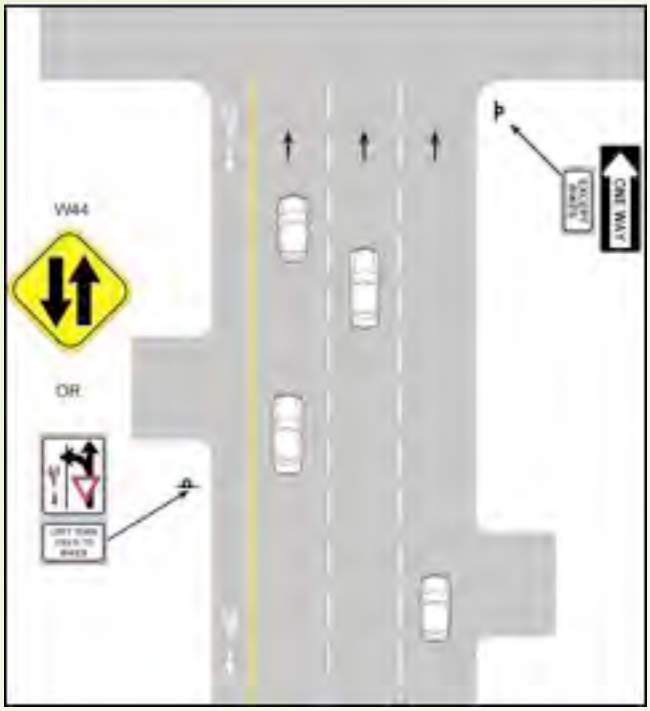
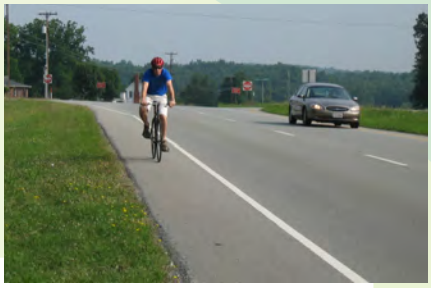


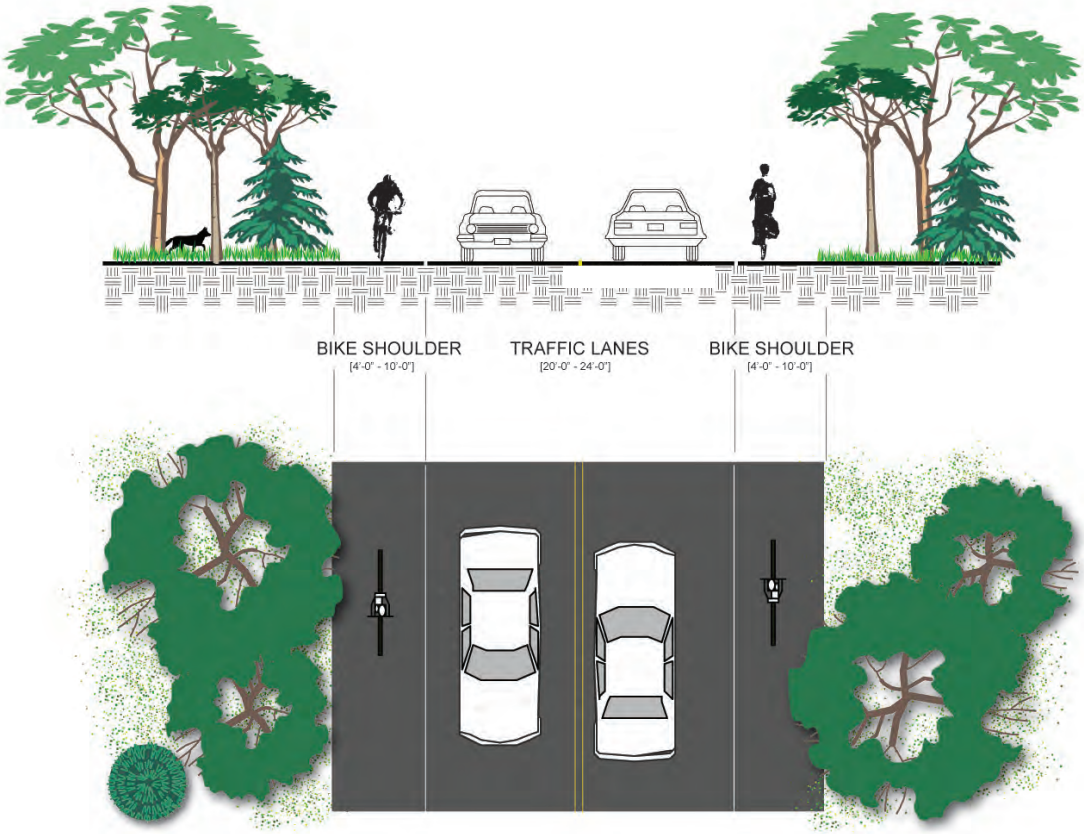
Fig. 7.15. Plan view of contra-flow bicycle lane

Paved Shoulder

Paved shoulders are the part of a roadway which is contiguous and on the same level as the regularly traveled portion of the roadway. There is no minimum width for paved shoulders, however a width of at least four feet is preferred. Ideally, paved shoulders should be include in the construction of new roadways and/or the upgrade of existing roadways, especially where there is a need to more safely accommodate bicycles.

- Most often used in rural environments, although not confined to any particular setting
- Should be delineated by a solid white line, and provided on both sides of the road
- Should be contiguous and on the same level as the regularly traveled portion of the roadway
- 4' minimum width; however for speeds higher than 40 MPH with high ADT, a shoulder width of more than 4' is recommended.
- Rumble strips should be avoided, but if used, then a width of more than 4' is needed.
- Paved shoulders should not be so wide as to be confused with a full automobile travel lane





Sidepath

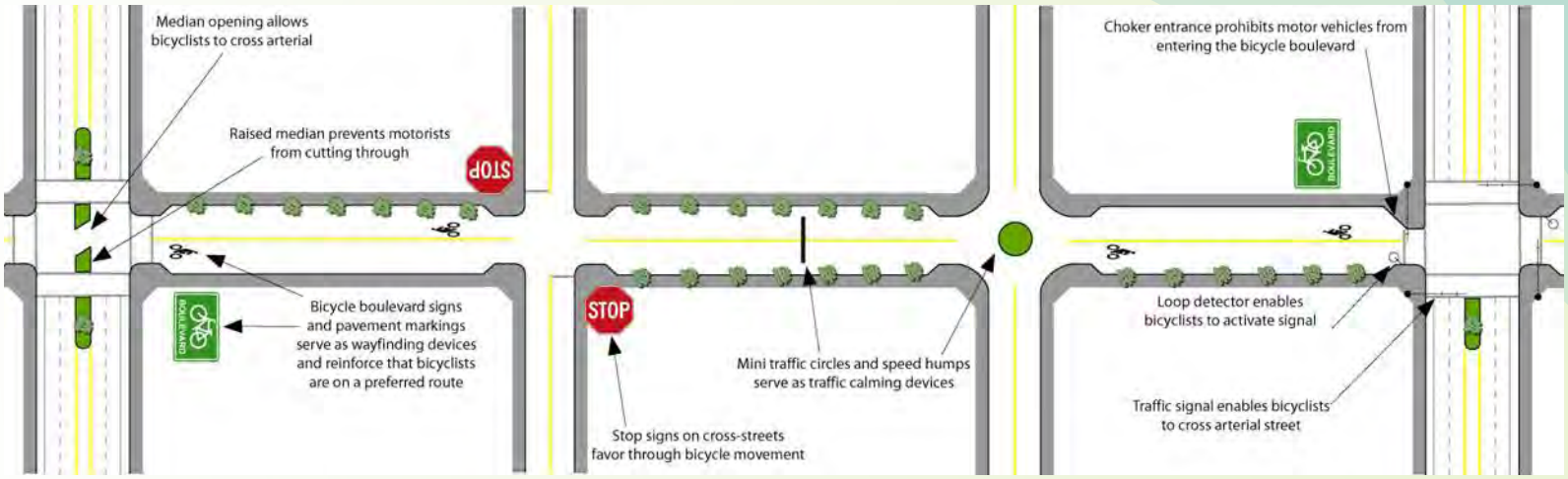
Multi-use paths located within the roadway corridor right-of-way, or adjacent to roads, are called 'Sidepaths'. Sidepaths are most appropriate in corridors with few driveways and intersections. Bicycle routes where side paths are recommended should also have adequate on-road bicycle facilities (such as paved shoulders or bicycle lanes), so that all types of users are accommodated.

• This type of facility works best in corridors where there are limited driveway/intersection crossings and more desirable destinations along one side of the roadway, or where no roadway space is available to provide bike lanes.
• A !0' minimum width is necessary on sidepaths for bicyclists to pass one another safely (12' for areas expecting high use)
• A 3-5' (preferably 6') vegetated buffer between the sidepath and the roadway should be provided where possible.
• Well-designed transitions from sidepaths to on-road facilities will direct bicyclists to the correct side of the roadway (see pages 7-28 and 7-29 for information on trail-roadway intersections)

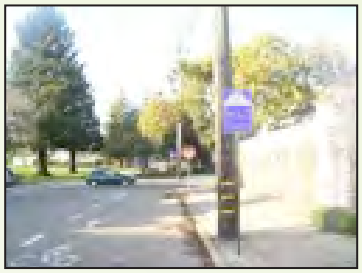
Bicycle Boulevards

To further identify preferred routes for bicyclists, the operation of lower volume roadways may be modified to function as a through street for bicycles while maintaining local access for automobiles. Traffic calming devices reduce traffic speeds and through trips while limiting conflicts between motorists and bicyclists, as well as give priority to through bicycle movement.

Bike boulevards are often located on roadways that parallel a major roadway.



A bicycle boulevard.



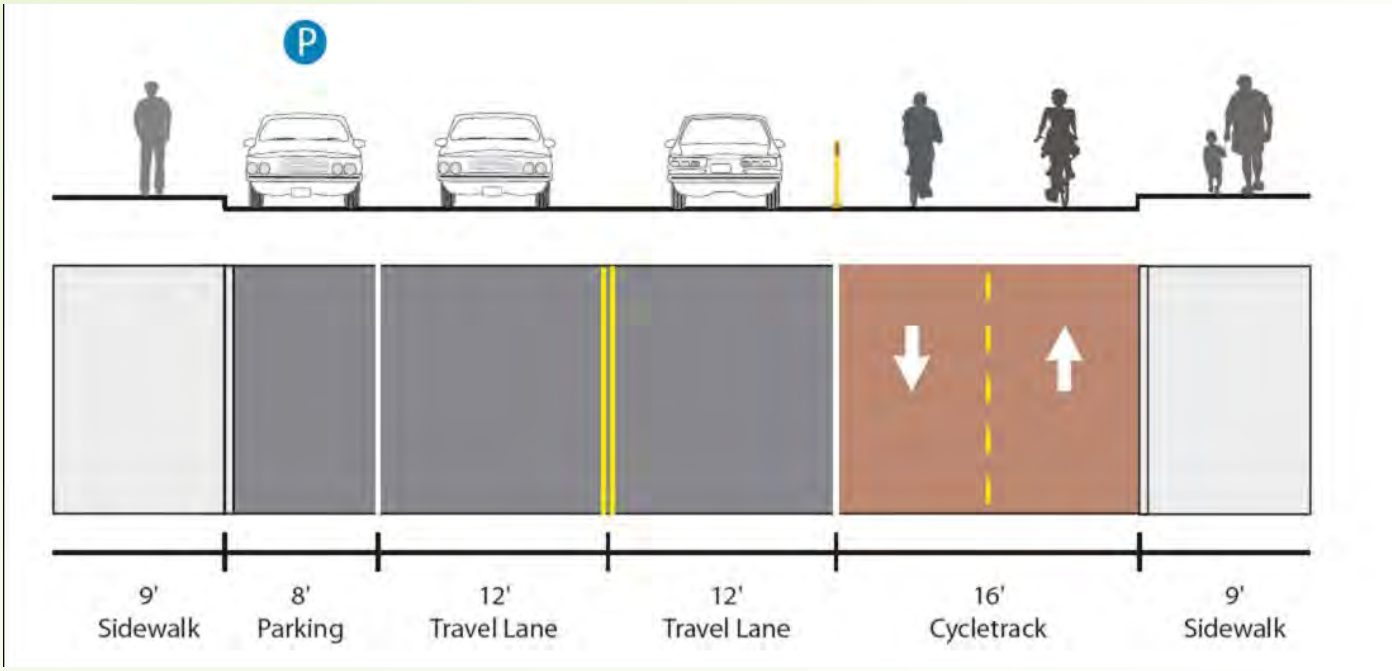
Bike boulevard route signs and/or pavement markings can be used to direct bicyclists.

Cycle Tracks

Cycle tracks are a hybrid type of bicycle facility that combines the experience of a separated path with the on-street infrastructure of a conventional bike lane. This type of facility is widely used in European cities and was recently introduced on 9th Ave. in New York City. The cycle track can provide for either one- or two-way traffic depending on the road conditions. This facility is generally used under certain conditions, such as along a waterfront, as part of an urban "road diet," and in limited locations where cross traffic and turning movement can be controlled.

The cycle track concept has been used to form a core urban bikeway loop in Montreal. Crossings at roadways include pedestrian priority markings and bicyclist actuated signals..

A small section of cycle track was provided by Arlington County, Virginia, as a connector to Gateway Park in Rosslyn.



Cycle track on a road with 66-foot right-of-way section.

Bicycle Access on Transit

Integrating bicycle facilities with transit modes allows bicyclists to greatly expand the area accessible. Below are examples of commuter trains and bus services with customized facilities allowing for simple and secure storage of bicycles without hindering or impeding other passengers. The City of Raleigh should continue to accommodate bikes on all buses, and should support similar options when light-rail or similar transit options become available.

1. Have your bike ready to load—always approach the bus from the curbside. Remove water bottles or other loose items.

2. Make eye contact with the driver to alert him/her to your presence.

3. If the rack is empty, lift the metal handle and pull the folded bike rack down flat.

4. Load the bike in the space nearest the bus.

If another bike is on the rack, load your bike in the open position. You are responsible for loading and securing your bike on the rack. Drivers are not allowed to load or unload bicycles.

5. Lift the support arm and hook it over the front tire.

Make sure the support arm clamps the tire and not the fender or frame. Your bike now is securely fastened in the rack.

6. Hop on and pay your fare.

7. When you reach your stop, tell the driver before you exit the bus that you'll be removing your bike.

Raise the support arm, lower it into place and lift your bike off the rack.

Fold up the rack if it is empty, and step onto the sidewalk with your bike.

NEVER cross in front of the bus—wait until the bus has left the stop.

If the rack is full, please wait for the next bus.

Instructions on how to load a bicycle onto a bus equipped with a bicycle rack, developed for a bicycle user map by Fremont, CA

BICYCLE-FRIENDLY INTERSECTIONS

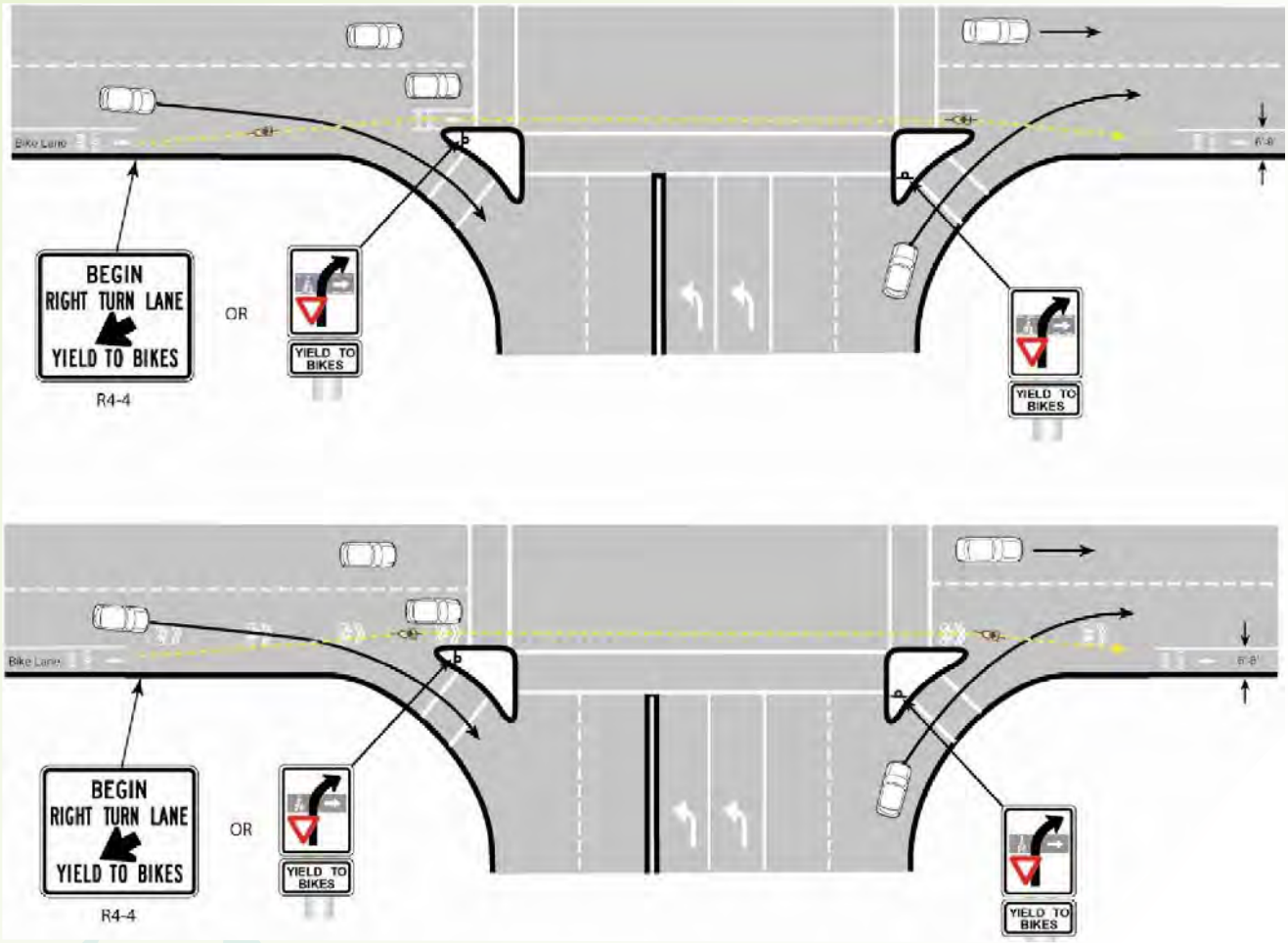
Intersections represent one of the primary collision points for bicyclists, with many factors involved:

- Larger intersections are more difficult for bicyclists to cross.
- On-coming vehicles from multiple directions and increased turning movements make it more difficult for motorists to notice non-motorized travelers.
- Most intersections do not provide a designated place for bicyclists.
- Bike lanes and pavement markings often end before intersections, causing confusion for bicyclists.
- Loop and other traffic signal detectors, such as video, often do not detect bicycles.
- Bicyclists making a left turn must either cross travel lanes to a left-turn lane, or dismount and cross as a pedestrian.
- Bicyclists traveling straight may have difficulty maneuvering from the far right lane, across a right turn lane, to a through lane of travel.

Solutions to these problems include bicycle-friendly intersection treatments. (Note: the following diagrams are from Caltrans, thus there is a discrepancy with what is recommended in this Plan regarding bike lane widths.)

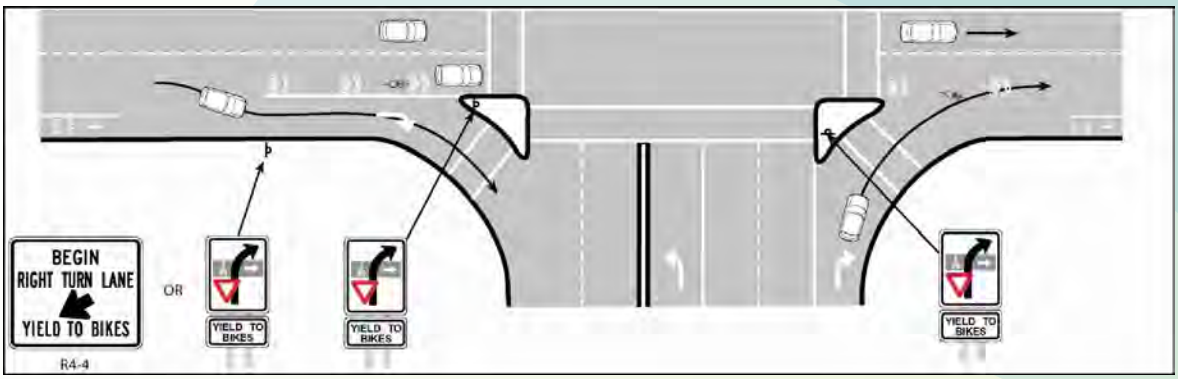
- Bike Lane Through 'Right Turn Island' Intersections
- Shared Travel Lane Through 'Right Turn Island' Intersection
- Bicycle Lane Adjacent to a 'Right Turn Only' Lane

Bike Lane Through 'Right Turn Island' Intersections *(Caltrans)*

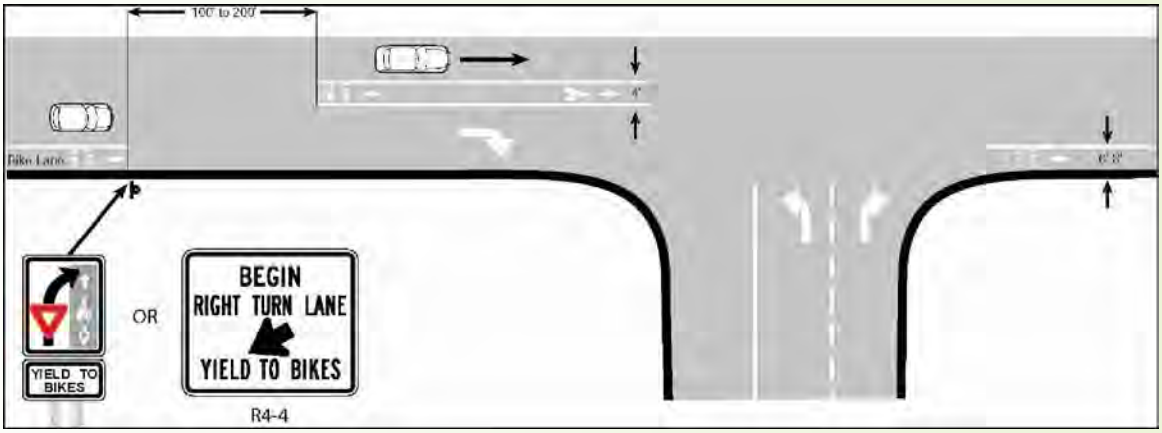


Shared Travel Lane Through 'Right Turn Island' Intersection

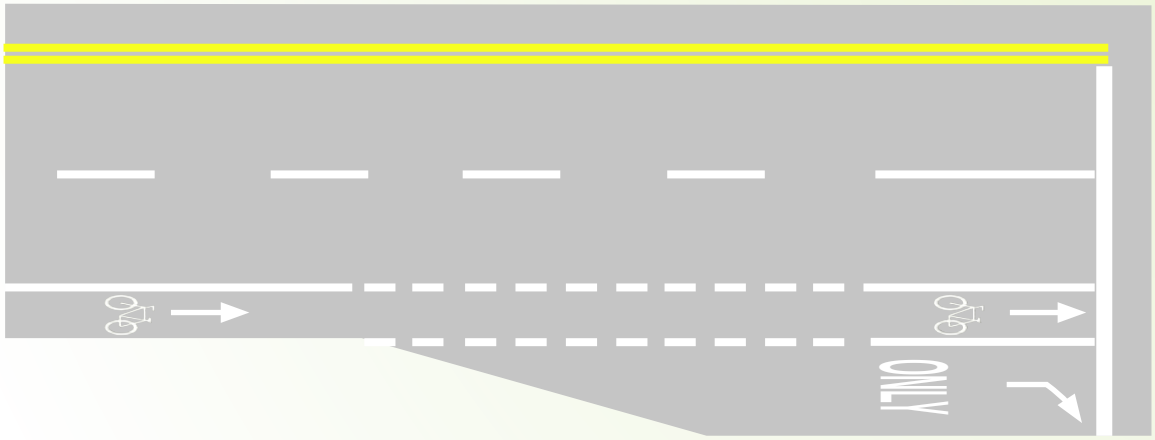
(with exclusive right turn lanes) (Caltrans)



Bicycle Lane Adjacent to a 'Right Turn Only' Lane *(Caltrans)*

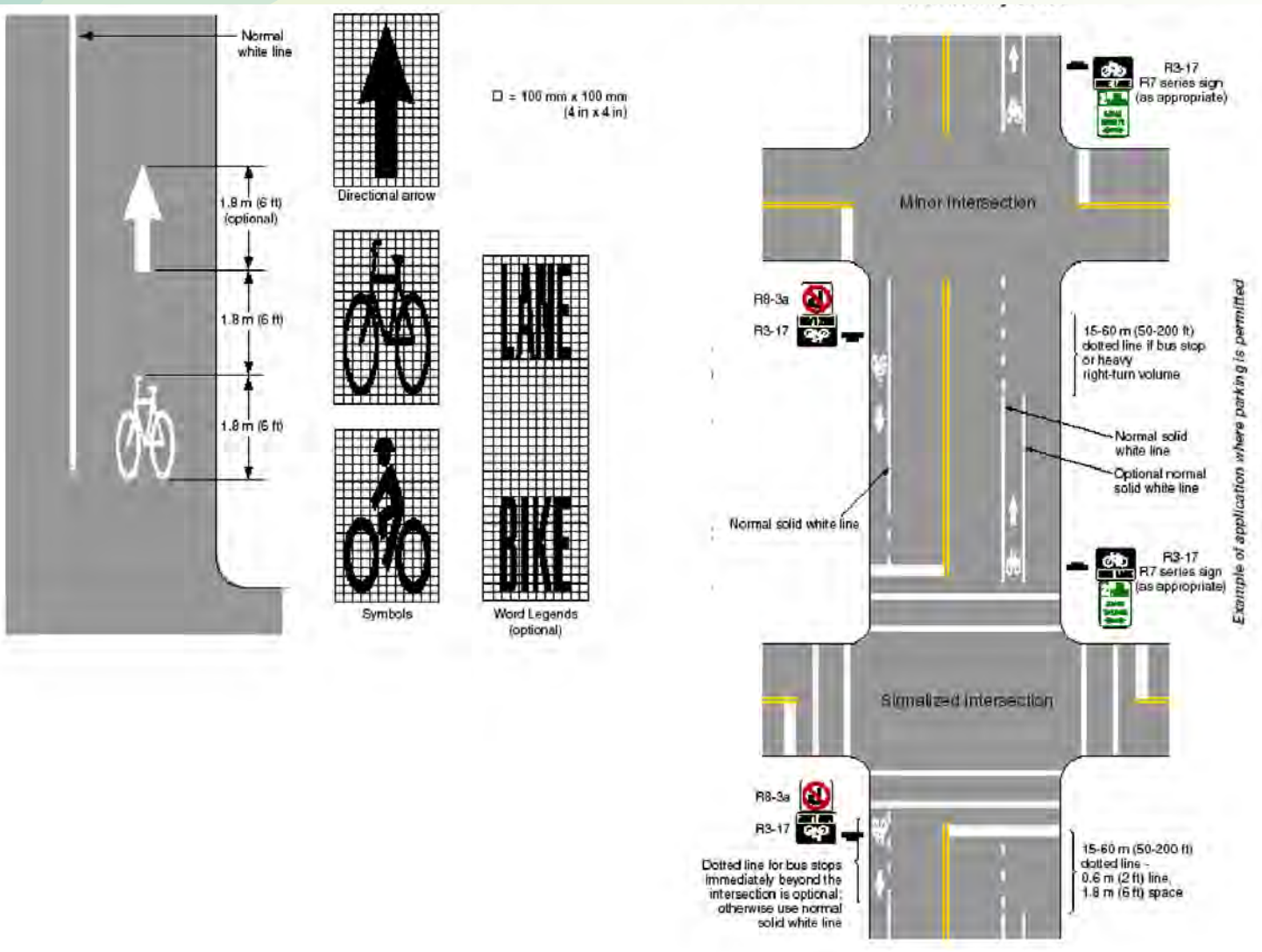


Bicycle Lane Adjacent to a 'Right Turn Only' Lane



Typical Pavement Markings and Intersection Configuration for Bike Lanes

The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance for lane delineation, intersection treatments, and general application of pavement wording and symbols for on-road bicycle facilities and off-road paths (http://mutcd.fhwa.dot.gov/pdfs/millennium/12.18.00/9.pdf).

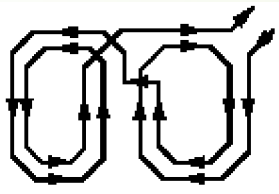


MUTCD examples of optional word and symbol pavement markings for bicycle lanes.

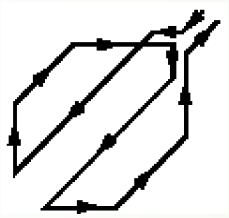
Bicycle-Activated Detector Loop

Changing how intersections operate can help make them more "friendly" to bicyclists. Improved traffic signal timing for bicyclists, bicycle-activated loop detectors, and camera detection make it easier and safer for cyclists to cross intersections. Bicycle-activated loop detectors are installed within the roadway to allow the weight of a bicycle to trigger a change in the traffic signal. This allows the cyclist to stay within the lane of travel and avoid maneuvering to the side of the road to trigger a push button, which ultimately provides extra green time before the light turns yellow to make it through the light. Current and future loops that are sensitive enough to detect bicycles should have pavement markings to instruct cyclists on how to trip them. These common loop detector types are recommended:

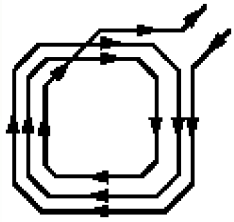
Use pavement marking to aid bicyclists in locating loop detectors at intersections.



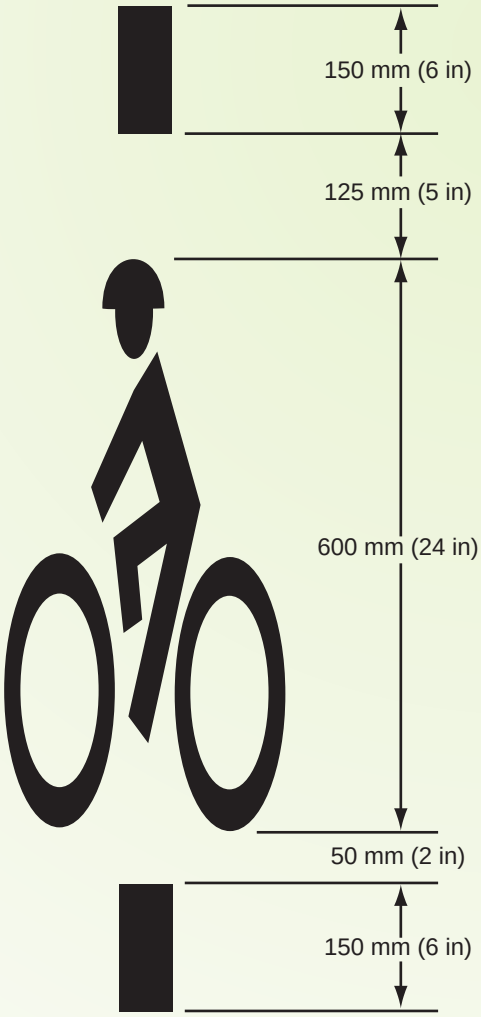
Quadruple Loop
(Recommended for bike lanes)
- Detects most strongly in center
- Sharp cut-off sensitivity



Diagonal Quadruple Loop
(Recommended for shared lanes)
- Sensitive over whole area
- Sharp cut-off sensitivity



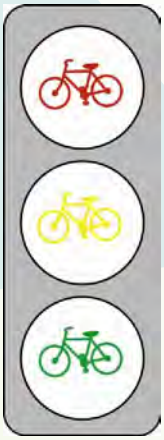
Standard Loop
(Recommended for advanced detection)
- Detects most strongly over wires
- Gradual cut-off



(See: Implementing Bicycle Improvements at the Local Level, FHWA, 1998, p. 70)

Bicycle Specific Traffic Control Signals

A bicycle signal is an electrically-powered traffic control device that may only be used in combination with an existing traffic signal. Bicycle signals direct bicyclists to take specific actions and may be used to address an identified safety or operational problem involving bicycles. A separate signal phase for bicycle movement will be used. Alternative means of handling conflicts between bicycles and motor vehicles shall be considered first. When bicycle traffic is controlled, green, yellow or red bicycle symbols are used to direct bicycle movement at a signalized intersection. Bicycle signals shall only be used at locations that meet MUTCD warrants. A bicycle signal may be considered for use only when the volume and collision, or volume and geometric warrants have been met:



1. Volume. When W = B x V and W > 50,000 and B >50.

Where:
W is the volume warrant.
B is the number of bicycles at the peak hour entering the intersection.
V is the number of vehicles at the peak hour entering the intersection.
B and V shall use the same peak hour.

2. Collision. When 2 or more bicycle/vehicle collisions of types susceptible to correction by a bicycle signal have occurred over a 12-month period and the responsible public works official determines that a bicycle signal will reduce the number of collisions.

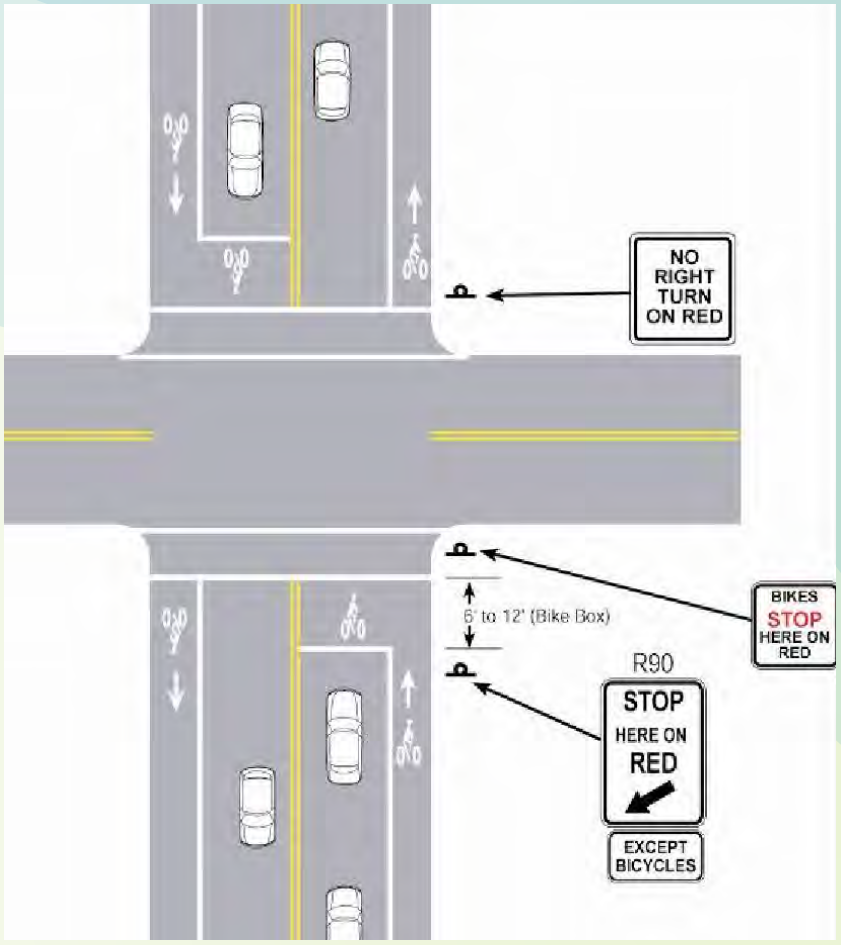
3. Geometric.
(a) Where a separate bicycle/multi use path intersects a roadway.
(b) At other locations to facilitate a bicycle movement that is not permitted for a motor vehicle.

See: MUTCD 2003 and MUTCD 2003 California Supplement (May 20, 2004), Sections 4C.103 and 4D.104 - www/dot.ca.gov/hq/traffopps/signtech/mutcdsupp/

Bicycle traffic signal used to bring bicycles leaving the UC Davis campus back into the road network.

Bike Box / Advance Stop Line

A bike box is a relatively simple innovation to improve turning movements for bicyclists without requiring cyclists to merge into traffic to reach the turn lane or use crosswalks as a pedestrian. The bike box is formed by pulling the stop line for vehicles back from the intersection, and adding a stop line for bicyclists immediately behind the crosswalk. When a traffic signal is red, bicyclists can move into this "box" ahead of the cars to make themselves more visible, or to move into a more comfortable position to make a turn. Bike boxes have been used in Cambridge, MA; Eugene, OR; and European cities.



Plan view of a bike box.

Potential Applications:

- At intersections with a high volume of bicycles and motor vehicles
- Where there are frequent turning conflict and/or intersections with a high percentage of turning movements by both bicyclists and motorists
- At intersections with no right turn on red (RTOR)
- At intersections with high bicycle crash rates
- On roads with bicycle lanes
- Can be combined with a bicycle signal (optional)

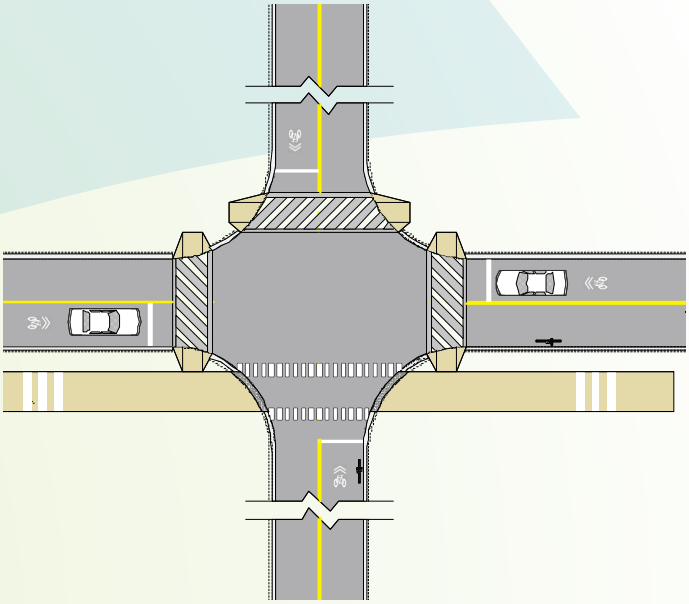
Considerations:

- Bike boxes are not currently included in the MUTCD but there are provisions for jurisdictions to request permission to experiment with innovative treatments (and thus with successful application, future inclusion of bike boxes in the MUTCD could occur).
- If a signal turns green as a cyclist is approaching an intersection, they should not use the bike box.
- Motorists will need to be educated to not encroach into the bike box.

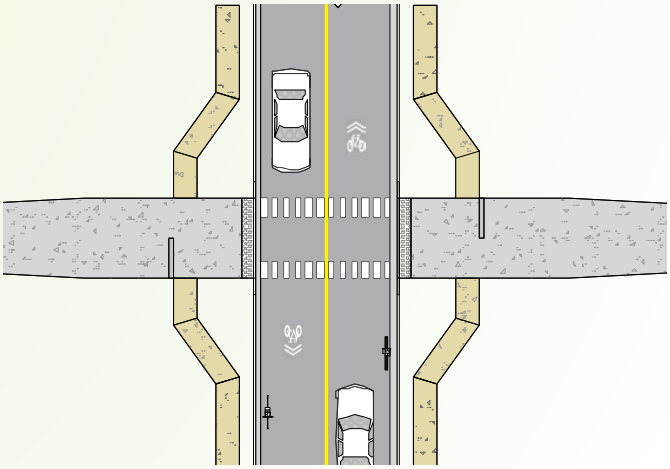
Above and below: Bike boxes filled in with color to emphasize allocation of space to bicycle traffic.

Trail-Roadway Intersections

- Site the crossing area at a logical and visible location; the crossing should be a safe enough distance from neighboring intersections to not interfere (or be interfered) with traffic flow; crossing at a roadway with flat topography is desirable to increase motorist visibility of the path crossing; the crossing should occur as close to perpendicular (90 degrees) to the roadway as possible.
- Warn motorists of the upcoming trail crossing and trail users of the upcoming intersections; motorists and trail users can be warned with signage (including trail stop signs), changes in pavement texture, flashing beacons, raised crossings, striping, etc.
- Maintain visibility between trail users and motorists by clearing or trimming any vegetation that obstructs the view between them.
- Intersection approaches should be made at relatively flat grades so that cyclists are not riding down hill into intersections.
- If the intersection is more than 75 feet from curb to curb, it is preferable to provide a center median refuge area; a refuge is needed in conditions exhibiting high volumes/speeds and where the primary user group crossing the roadway requires additional time, such as school children and the elderly.
- If possible, it may be desirable to bring the path crossing up to a nearby signalized crossing in situations with high speeds/ADT and design and/or physical constraints.
- In 4-Way Intersection Crossing with Shared Use Path (diagram at right) – This is also a depiction of a "sidepath" intersecting a roadway. Trail users would navigate this crossing like a common pedestrian.

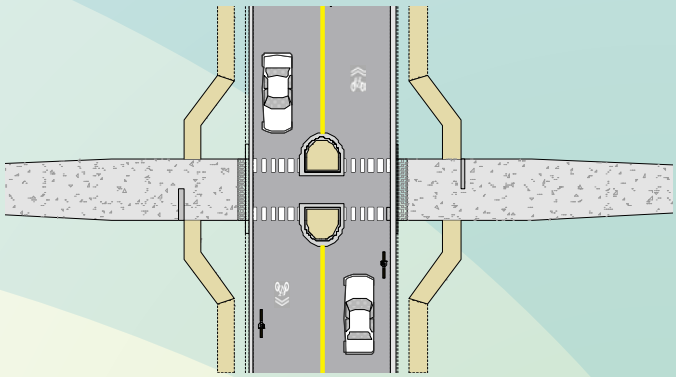


4-Way Intersection Crossing
Shared Use Path

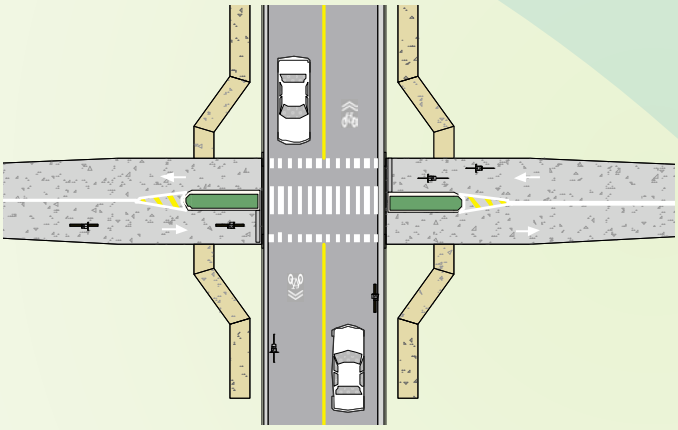


Mid-block Intersection
Shared Use Path with Sidewalks

Trail-Roadway Intersections (Continued)



Median Refuge
Shared Use Path with Sidewalks



Mid-block Crossing
Shared Use Path with Sidewalks and Medians

Trail-Roadway Intersections (Signalized)

• Signalized crossings may be necessary on trails with significant usage when intersecting with demanding roadways, but MUTCD warrants must be met for the installation of a signalized crossing. Consult the MUTCD or NCDOT Division of Bicycle and Pedestrian Transportation for signal, sign and light placement.

• FHWA issued an interim approval for the optional use of rectangular rapid flashing beacons (RRFBs, shown at left) as warning beacons supplementing pedestrian crossing or school crossing warning signs at crossings across uncontrolled approaches. An analysis by the Center for Education and Research in Safety found them to have much higher levels of effectiveness in making drivers yield at crosswalks than the standard over-head and side-mount round flashing beacons.

Trail Underpass

- Typically utilize existing overhead roadway bridges adjacent to steams or culverts under the roadway that are large enough to accommodate trail users
- Vertical clearance of the underpass should be at least 10'; NCDOT only requires 8' minimum vertical clearance.
- Width of the underpass should be at least 12'
- Proper drainage must be established to avoid pooling of stormwater.
- Lighting is recommended for safety.

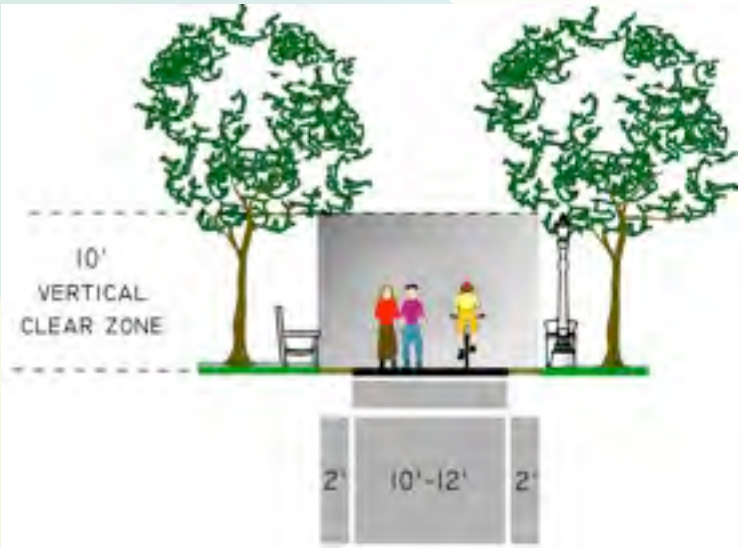
Trail Overpass

- Safety should be the primary consideration in bridge/overpass design.
- Specific design and construction specifications will vary for each bridge and can be determined only after all site-specific criteria are known.
- Always consult a structural engineer before completing bridge design plans, before making alterations or additions to an existing bridge, and prior to installing a new bridge.
- A 'signature' bridge should be considered in areas of high visibility, such as over major roadways. While often more expensive, a more artistic overpass will draw more attention to the trail system in general, and could serve as a regional landmark.
- For shared-use facilities, a minimum width of 14' is recommended.
- Trail overpasses are prohibitively expensive and should only be placed in areas of substantial need.

SHARED USED PATHS, GREENWAYS, AND TRAILS

Multi-Use Paths

Multi-use paths are completely separated from motorized vehicular traffic and are constructed in their own corridor, often within an open-space area. Multi-use paths include bicycle paths, rail-trails or other facilities built for bicycle and pedestrian traffic. In the City of Raleigh, the term 'greenway' is used only for those multi-use paths and sidepaths that are indicated on the Capital Area Greenway map.



Typical multi-use path design

Local Trail Accessway

Accessways provide direct connections for trail users to schools, parks, community centers, retail areas, neighborhoods, and other trails. They are intended to be short, direct connections to reduce unnecessary out-of-direction travel for bicyclists and pedestrians. Accessways in parks, greenways, or other natural resource areas may have a 5' wide gravel path with wooden, brick or concrete edgings. "Neighborhood Entrance Trails" (page 7-33) represent a type of local trail accessway.

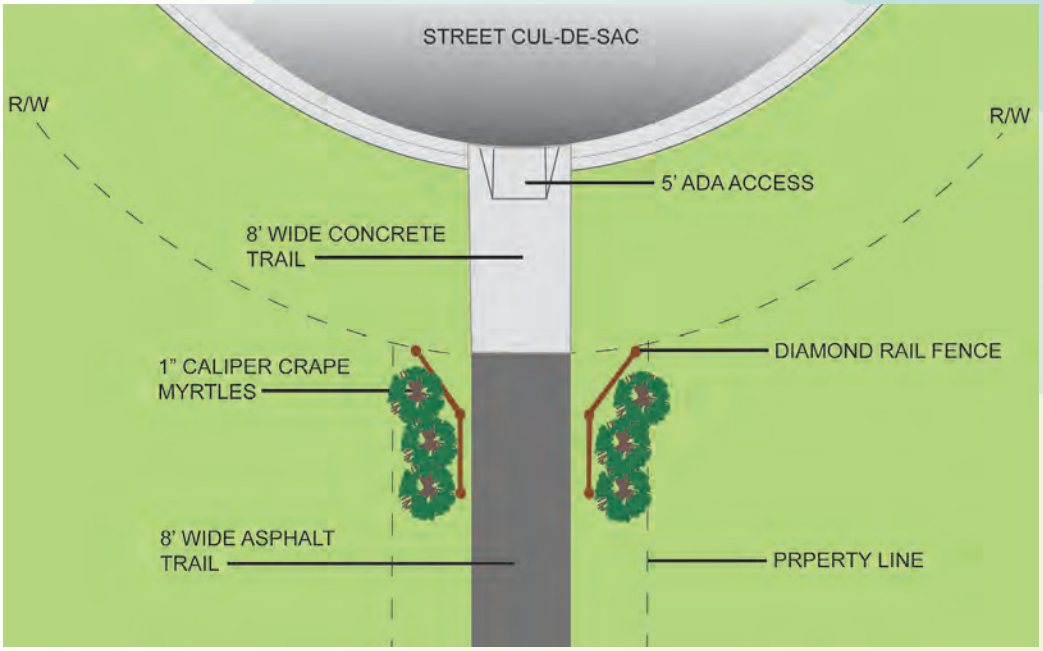
Bicycle and Pedestrian Accessway

Innovative Accessways

There are also other innovative ways to provide direct access, particularly in topographically constrained areas (e.g., on steep hills, over waterways, etc.) Stairs, alleyways, bridges, and elevators can provide quick and direct connections throughout the city and can be designed so they are safe, inviting, and accessible to most trail users. For example, stairways can have wheel gutters so that bicyclists can easily roll their bicycles up and down the incline and boardwalks can provide access through sensitive wet areas and across small waterways.

Bicycle wheel gutters on stairs and boardwalk bridge

Neighborhood Entrance Trail



Neighborhood entrance trail diagram.

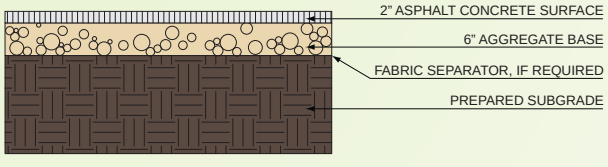
Neighborhood trails provide access for most, if not all, trail users within neighborhoods, parks, greenspaces, and other recreational areas. They are similar to regional trails in that they typically have their own right-of-way and serve only non-motorized users. These trails should be at least at least 8' wide if bicycle use is anticipated. All efforts should be made so that at least one ADA accessible trail is available and serves the most desirable parts of the area (i.e., picnic areas, viewpoints, playground equipment, etc.). Neighborhood and homeowner association groups are encouraged to identify potential areas for neighborhood entrance trails. For new developments, neighborhood entrance trails should be created upon development. The following "Neighborhood Entrance Trail' guidelines are adapted from Mecklenburg County, NC. In any instance that an access trail is developed in a residential area to link to a greenway, the trail should remain open to the public and, the following standards shall be applied:

- Trail pavement shall be at least 8' wide to accommodate emergency and maintenance vehicles, meet ADA requirements and be considered suitable for multi-use.
- Trail widths should be designed to be less than 8' wide only when necessary to protect large mature native trees over 18" in caliper, wetlands or other ecologically sensitive areas.
- Access trails should meander whenever possible.
- All landscape materials shall be installed during the appropriate planting season for the particular species.
- Other ornamental landscape shall be included at the street frontage of the access trail based upon input from the residents of the cul-de-sac. If the access is not in a cul-de-sac, the adjacent property owners and property owners directly across from the access trail will be invited to provide landscape design input.
- Two sections of diamond rail fencing shall be included on each side of the trail near the street frontage. Diamond rail will not be included if the respective neighborhood deeds and covenants do not permit it.

Paved Multi-use Trail (10' wide typ.)

- Typically composed of asphalt or concrete, paved multi-use trails should be designed to withstand the loading requirements of occasional maintenance and emergency vehicles.
- In areas prone to frequent flooding, it is recommended that concrete be used for its excellent durability.
- As a flexible pavement, asphalt should be considered when installing a paved multi-use trail on slopes.
- A concern for the use of asphalt is the deterioration of trail edges. Installation of geotextile fabric beneath a layer of aggregate base course (ABC) can help to maintain the edge of the trail. It is also important to provide a 2 foot wide graded shoulder to prevent edges from crumbling.
- Most often, concrete is used for intensive urban applications. It is the strongest surface type and has the lowest maintenance requirement if it is installed properly.
- Centerline stripes should be considered for trails that generate substantial amounts of traffic. Centerline stripes are particularly useful along curving sections of trail.
- Trail landscaping and maintenance should enhance conditions for wildlife by planting only native species in the trail corridor, removing invasive species when possible, and avoiding harmful pesticides and herbicides. The overall shape of protected natural landscapes along trail corridors also influences wildlife: single, large, contiguous natural areas are more beneficial to wildlife than the same acreage split into smaller segments.

ASPHALT PAVING ON AGGREGATE BASE



SIGNAGE

A comprehensive system of signage ensures that information is provided regarding the safe and appropriate use of all facilities, both on-road and on greenways. The bicycle network should be signed seamlessly with other alternative transportation routes, such as bicycle routes from neighboring jurisdictions, trails, historic and/or cultural walking tours, and wherever possible, local transit systems.

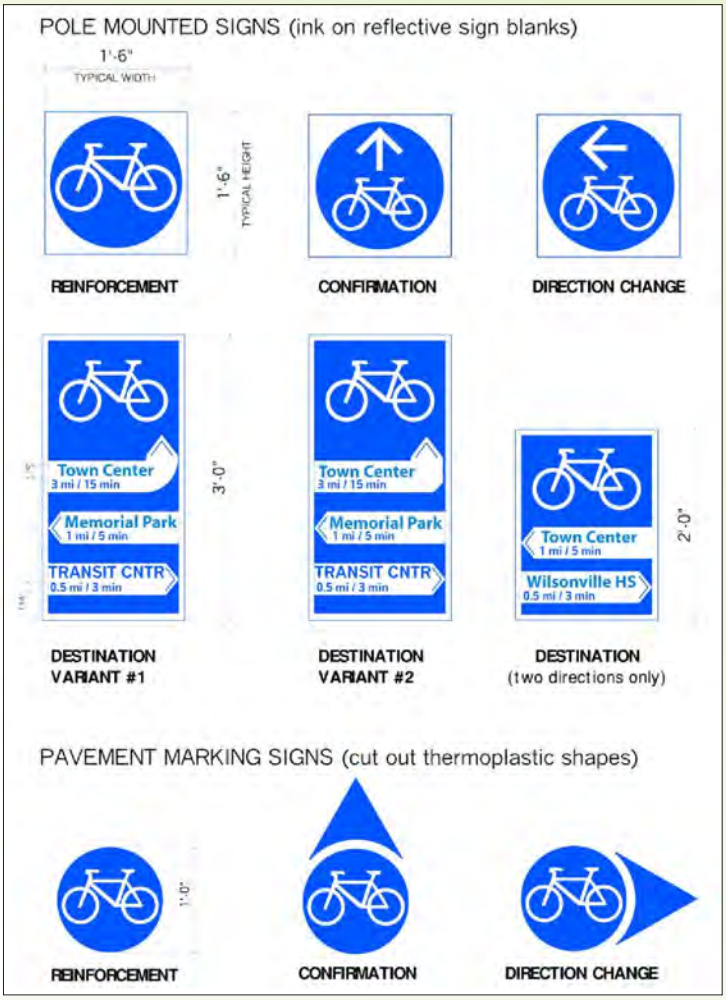
Signage includes post- or pole-mounted signs and pavement striping. Signage is further divided into information signs, directional/wayfinding signs, regulatory signs and warning signs. Trail signage should conform to the (2001) Manual on Uniform Traffic Control Devices and the American Association of State Highway Transportation Official Guide for the Development of Bicycle Facilities. Bicycle signage should also be coordinated with local colleges and universities.

Directional Signs

Implementing a well-planned and attractive system of signing can greatly enhance bikeway facilities by signaling their presence and location to both motorists and existing or potential bicycle users. Effective signage can encourage more bicycling by leading people to bikeways, and by creating a safe and efficient transportation option for local residents and visitors.

The signage examples at right show a number of different signs and markings, both on poles and on the roadway, that the City of Portland has adopted for their new bicycle signage program. The signs have been approved by the Oregon DOT, and will be installed around Portland in the near future. Wayfinding signs such as these improve the clarity of travel direction while illustrating that destinations are only a short ride away. The signs shown are provided only as a point of reference for the purposes of these guidelines and are not being adopted by Raleigh.

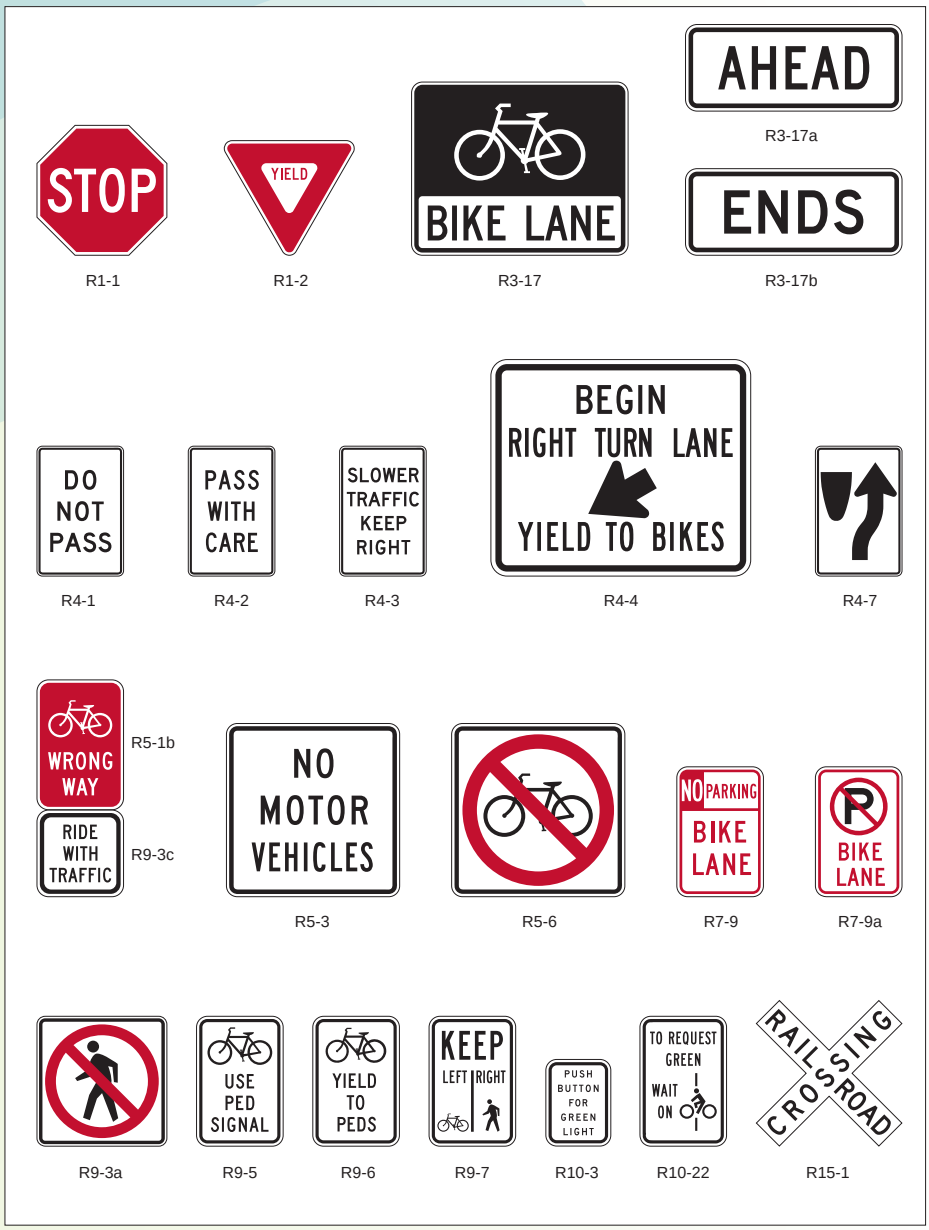
Some national examples of high-quality wayfinding include those in Centre City Philadelphia (left), the City of Greenville, SC (below/left), and Grand Forks Greeway, ND (below).



Innovative On-Road Facilities Signage used in Portland

Regulatory/Warning Signs

Regulatory and warning bicycle signage should conform to the Manual on Uniform Traffic Control Devices (MUTCD). The signs to the right are examples of regulatory signs for bicycle (their labels are sign reference numbers for the MUTCD).



Special Purpose Signage

The "Share the Road" sign (below), is designed to advise motorists that bicyclists are allowed to share and have the right to cycle on narrow roadways with motor vehicles. For more on the "Share the Road Initiative" go to: http://ncdot.org/transit/bicycle/safety/programs_initiatives/share.html

Innovative signage is often developed to increase bicycle awareness and improve visibility (such as 'Bikes Allowed Use of Full Lane', bottom right). Special purpose signs to be installed on public roadways in North Carolina must be approved by NCDOT's Traffic Control Devices Committee and/or the City of Raleigh. New designs can be utilized on an experimental basis with NCDOT approval.

Share the Road signs remind motorists that bicyclists have the right to ride on the roadway

The "Bikes Allowed Use of Full Lane" sign is currently used on an experimental basis in several cities.

ANCILLARY FACILITY STANDARDS

Bicycle Parking

As more bikeways are constructed and bicycle usage grows, the need for bike parking will climb. Long-term bicycle parking at transit stations and work sites, as well as short-term parking at shopping centers and similar sites, can support bicycling. Bicyclists have a significant need for secure long-term parking because bicycles parked for longer periods are more exposed to weather and theft, although adequate long-term parking rarely meets demand. These bicycle parking standards should also be shared with NC State and Shaw Universities and Meredith, St. Augustine's and Peace Colleges.

When choosing bike racks, there are a number of things to keep in mind:

- The rack element (part of the rack that supports the bike) should keep the bike upright by supporting the frame in two places allowing one or both wheels to be secured.
- Install racks so there is enough room between adjacent parked bicycles. If it becomes too difficult for a bicyclist to easily lock their bicycle, they may park it elsewhere and the bicycle capacity is lowered. A row of inverted "U" racks should be installed with 15" minimum between racks.
- Empty racks should not pose a tripping hazard for visually impaired pedestrians. Position racks out of the walkway's clear zone.
- When possible, racks should be in a covered area protected from the elements. Long-term parking should always be protected.

The table below provides basic guidelines on ideal locations for parking at several key activity centers as well as an optimum number of parking spaces.

Table 7.1: Recommended Guidelines for Bicycle Parking Locations and Quantities

Use Category	Specific Use	Required Long-term Parking Spaces	Required Short-term Parking Spaces
Residential	Boarding houses	2, or 1 per ten sleeping rooms	None
	Hotels, motels	2, or 1 per 50 employees	None
Commercial / Industrial	Retail sales, service operations *	2, or 1 per 50,000 square feet of gross floor area	2, or 1 per 25,000 square feet of gross floor area
	Office buildings **	2, or 1 per 50,000 square feet of gross floor area	2, or 1 per 50,000 square feet of gross floor area
	Museums, libraries	2, or 1 per 50 employees	4, or 1 per 25,000 square feet of gross floor area
	Movie theaters	2, or 1 per 50 employees	4, or 1 per 50 seats
	Restaurants, ice cream shops, coffee shops	2, or 1 per 50 employees	4, or 1 per 50 seats
	Recreation centers	2, or 1 per 50 employees	4, or 1 per 25,000 square feet of gross floor area
	Major event entertainment (e.g., stadiums, arenas)	2, or 1 per 50 employees	8, or 1 per 500 seats
	Manufacturing	2, or 1 per 50 employees	None
	Warehousing	2, or 1 per 50 employees	None
Institutional	Medical centers	2, or 1 per 50 employees	2, or 1 per 25,000 square feet of gross floor area
	Transit park and ride lots	1 per 50 daily boardings	None

* Retail businesses below 3,000 square feet of gross floor area are exempt from bicycle parking requirements
** Office buildings below 10,000 square feet of gross floor area are exempt from bicycle parking requirements

The rack element should:

- Support the bicycle upright by its frame in two places
- Prevent the wheel of the bicycle from tipping over
- Enable the frame and one or both wheels to be secured
- Support bicycles without a diamond-shaped frame with a horizontal top tube (e.g. a mixte frame)
- Allow front-in parking: a U-lock should be able to lock the front wheel and the down tube of an upright bicycle
- Allow back-in parking: a U-lock should be able to lock the rear wheel and seat tube of the bicycle

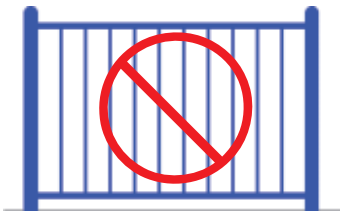
Comb, toast, school-yard, and other wheel-bending racks that provide no support for the bicycle frame are NOT recommended.

The rack element should resist being cut or detached using common hand tools, especially those that can be concealed in a backpack. Such tools include bolt cutters, pipe cutters, wrenches, and pry bars.

INVERTED "U"
One rack element supports two bikes.

"A"
One rack element supports two bikes.

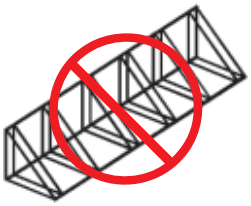
POST AND LOOP
One rack element supports two bikes.



COMB
One rack element is a vertical segment of the rack.

Not recommended

WAVE
One rack element is a vertical segment of the rack.
(see additional discussion on page 3)



TOAST
One rack element holds one wheel of a bike.

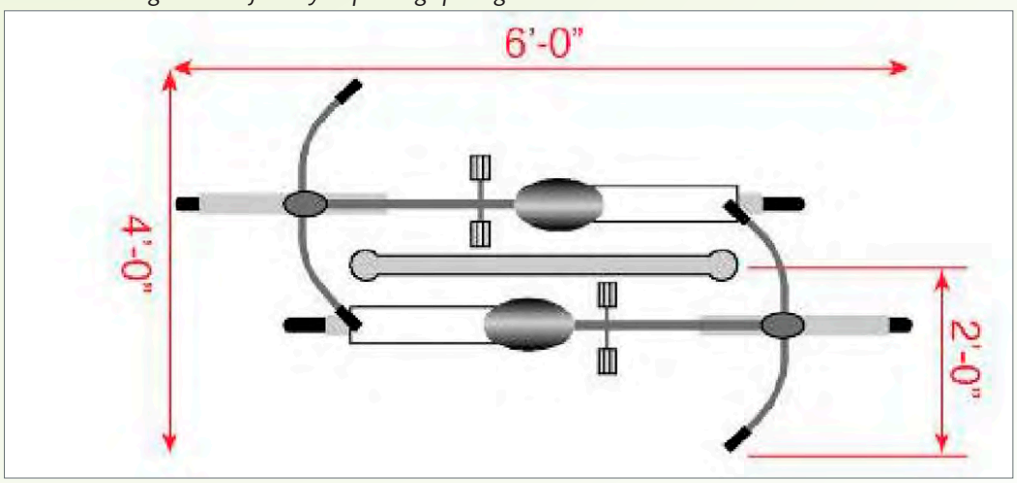
Recommended guidelines for bicycle parking from the Association of Pedestrian and Bicycle Professionals, 2002, www.apbp.org.

Bicycle racks that incorporate advertising can be sponsored by local merchants.

Provision of shelter from rain greatly increases usefulness of this bicycle parking facility during inclement weather.

A single inverted "U" rack can accommodate two bicycles.

Recommended guidelines for bicycle parking spacing dimensions.



Example of a bicycle rack in Durham, NC, serving as a piece of utilitarian public art.

Below: An example of replacing on-street vehicular parking with bicycle parking (in Portland, OR).

Bicycle lockers are a crucial component of the bicycle system. They offer safe and secure storage at transit centers and destinations. Parking rates are reasonable at about 3-5 cents per hour (www.bikelink.org).

Bike lockers should be constructed of opaque materials and be clearly labelled as bicycle parking. Rental management can be either under contract or provided as a service by transit operators or other agencies. *(photos from www.cyclesafe.com/LockerPhotos.tab.aspx).*

Bicycle Parking and the Public vs. Private Right-of-Way

Bicycle parking can be located either in the public right of way or on private property, depending on the adjacent land uses and streetscape. For example, an office park may provide short-term bicycle parking racks near building entrances, and may also provide secure indoor parking for employees. For on street bike parking, the following text is from the Portland, OR city policy.

Example On-Street Bicycle Parking Requirements:

- *Sidewalk racks at capacity on a recurring basis:*
- *City staff and applicant jointly determine time of day and day of week for highest bicycle use. This assessment must be independent of any special event that may inflate the average daily use.*
- *City staff visits site to assess bicycle use, based on the formula listed below, and whether or not it can be met by normal sidewalk rack installations. Due to seasonal variations and weather dependence, determination of bicycle use may need to be delayed pending suitable conditions to assess actual needs.*
- *Formula used to determine supply and demand for the areas:*
  1. *Bicycles parked within 50 feet of proposed site multiplied by 1.5*
  2. *Bicycles parked more than 50 feet, but less than 150 feet, of proposed site multiplied by 1.0*
  3. *Bicycles parked more than 150 feet, but less than 200 feet, of proposed site multiplied by 0.5*
- *City staff inventories parked bicycles and available bicycle racks within 200 feet of the site, measured using marked and unmarked crosswalks, including street crossing distances. City staff also will assess the possibilities for additional sidewalk racks.*
- *If sidewalk bicycle parking cannot be installed to meet 80 percent of inventoried, parked bicycles, then a bicycle corral is warranted. City staff will determine this.*
- *At a minimum there must be 100 percent agreement with adjacent property owners, established through petition.*
- *A Maintenance Agreement must be signed by the requestors and the City and kept on file with the City.*
- *If the business owner that originally requested the bicycle parking closes, sells or transfers ownership the new owner must give written approval of the bicycle parking to the City within 30 days of taking ownership.*

(Source: City of Portland, OR, Administrative Rule for On-Street Bicycle Parking, Draft 12/17/2008)

Bicycle Facilities at Transit Stops

Integrating bicycle facilities with transit modes allows bicyclists to greatly expand their range of travel or "trip chain". Integration of facilities with transit modes allows cyclists to use their bicycles on one or both ends of their daily commute, allowing greater flexibility.

- Although the current buses that serve Raleigh are equipped with bicycle racks, the bus *stops* should incorporate bicycle racks, and local-area bicycle maps.

- Improve overall design of current and future bus and light-rail stops by providing amenities such as bicycle racks, bicycle lockers, water fountains, bicycle air compressors, local bicycle maps, transit maps, bikes-on-buses, and other amenities.

Right and below: bike racks, air compressor (for bicycle tires), maps, and water fountains should be included at bus stops and light-rail stops to encourage multi-modal transportation.

Bicycle Stations and Repair Stands

Bicycle repair stands and bicycle stations are fixtures in highly successful bicycle-friendly communities. Popular locations include farmer's markets or public areas that are centers for activity, easily accessible by foot or bicycle. Local bike shops and local events in Raleigh could provide similar services. The presence of smaller scale operations that primarily provide maintenance and repair functions within semi-permanent structures like the tent and tarp shown below allow for a lower cost operation, thereby passing on savings to the customer in terms of lower repair and maintenance costs.

A bicycle stand in Copenhagen, Denmark.

In North Carolina communities (Durham and Carborro, for example), local, volunteer-run bicycle non-profit organizations offer maintenance training and space for local residents to work on their bikes. The City of Durham, for example, granted funding to their local bicycle co-op for their provision of this important bicycle support facility.

A bicycle maintenance stand at a farmers' market in Durham, NC.

Attended Bike Parking

Attended bike parking is analogous to a coat check – your bike is securely stored in a supervised location. An organization called The Bikestation Coalition is promoting enhanced attended parking at transit stations.

The Bikestation concept is now in use in Palo Alto, Berkeley and San Francisco and Seattle. Bikestations offer secured valet bicycle parking near transit centers. What makes Bikestations distinctive are the other amenities that may be offered at the location – bicycle repair, cafes, showers and changing facilities, bicycle rentals, licensing, etc. Bikestations become a virtual one-stop-shop for bicycle commuters.

Attended bicycle parking can be offered at some special events. For example, the Marin County Bicycle Coalition sponsors valet parking at many festivals in the county, the Sonoma County Bicycle Coalition sponsors valley parking at the downtown Santa Rosa Farmer's Market, and secured bicycle parking is offered at Pac Bell Park in San Francisco.

A bicycle station with attended parking in Long Beach, CA.

Bike Sharing Programs

Many cities including Washington, DC, Montreal and Louisville are implementing innovative bike-sharing programs using a variety of revenue generating and fee-for service programs. Copenhagen, Denmark, pioneered the concept of providing a fleet of bicycles for free public use throughout the urban center. Paris has made this concept popular with the development of the city-wide Velib system of credit-card operated bike rentals. The Danish free bikes are subsidized by advertising sales on the bicycles, and they require a coin or credit card deposit for use. The bicycles are single speed, durable and suitable only for short trips. Their design makes them less likely to be stolen. They can be picked up and dropped off at a variety of destinations – making them an easy choice for in-town travel by residents and visitors. A variety of similar programs utilize recycled bicycles or bicycles painted in a common color for free public use.

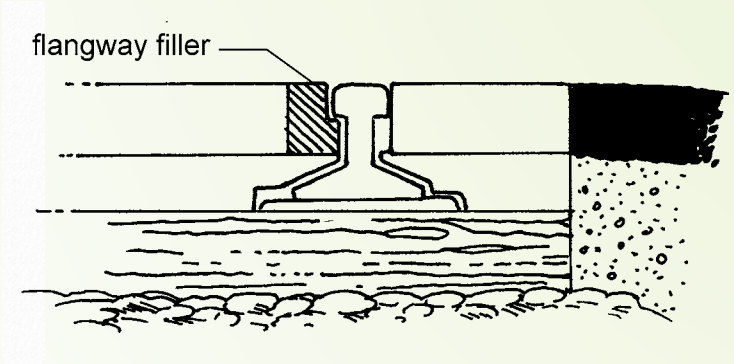
Lousiville's "Freewheelin" bike sharing system is supported by Humana Healthcare. The City is working with public private partnerships to provided a fleet of shared bicycles.

Bicycle Facilities at Railroad Crossings

Railroad crossings are particularly hazardous to those who rely on wheeled devices for mobility (railroad crossings have flangeway gaps that allow passage of the wheels of the train, but also have the potential to catch wheelchair casters and bicycle tires). In addition, rails or ties that are not embedded in the travel surface create a tripping hazard. Recommendations:

- Make the Crossing Level: Raise approaches to the tracks and the area between the tracks to the level of the top of the rail.
- Bikes Should Cross RR at Right Angle
- When bikeways or roadways cross railroad tracks at grade, the roadway should ideally be at a right angle to the rails. When the angle of the roadway to the rails is increasingly severe, the approach recommended by Caltrans (Highway Design Manual, Section 1003.6) and AASHTO (Guide for the Development of Bicycle Facilities, 1999, p.60) is to widen the approach roadway shoulder or bicycle facility, allowing bicycles to cross the tracks at a right angle without veering into the path of passing motor vehicle traffic.
- Use Multiple Forms of Warning: Provide railroad crossing information in multiple formats, including signs, flashing lights, and audible sounds.
- Clear Debris Regularly: Perform regular maintenance to clear debris from shoulder areas at railroad crossings.
- Fill Flangeway with Rubberized Material or Concrete Slab: Normal use of rail facilities causes buckling of paved-and-timbered rail crossings. Pavement buckling can be reduced or eliminated by filling the flangeway with rubberized material, concrete slab, or other treatments. A beneficial effect of this is a decrease in long-term maintenance costs.

Installing a rubber surface rather than asphalt around railroad flangeways reduces changes in level and other maintenance problems.

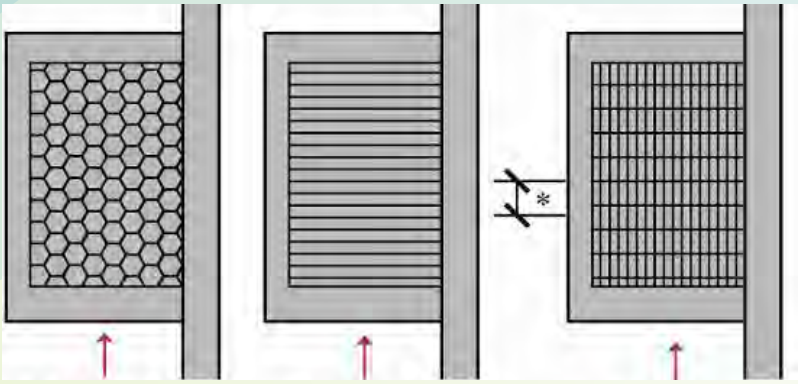


The "flangeway filler" eliminates the gap in the path of travel for pedestrians crossing railroad tracks. The filler, consisting of a rubber insert, will deflect downward withe the weight of a train and does not affect railway function.

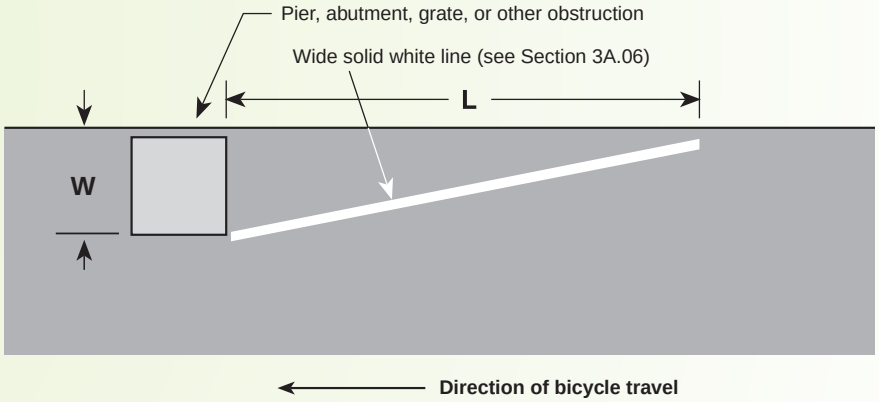
Bicycle Friendly Drainage Grates

Drainage grates usually occupy portions of roadways, such as bicycle lanes, where bicycles frequently travel. Often drainage grates are poorly maintained or are of a design that can damage a bicycle wheel or in severe circumstances, cause a bicyclist to crash. Improper drainage grates create an unfriendly obstacle a cyclist must navigate around, often forcing entrance into a motor vehicle lane in severe cases. Bicycle friendly drainage grates should be installed in all new roadway projects and problem grates should be identified and replaced.

Right: Bicycle Friendly Drainage Grate Designs



Right: MUTCD example of obstruction pavement marking; if dangerous drainage grates (or other obstructions) are not to be fixed in the short term, then this pavement marking should direct cyclists away from the obstruction.



Dangerous Drainage Grate Condition; this example is dangerous due to the grate running parallel to the roadway, creating a trap for bicycle tires.

Dangerous Drainage Grate Condition; this example is dangerous due to the surrounding paving condition (when the road was resurfaced the drainage grate remained at the same height).

Bicycle-Friendly Drainage Grate

BICYCLE FACILITY MAINTENANCE STANDARDS

Shared-Use bike path maintenance costs are based on $18,000 per mile (East Bay Regional Parks District estimate) which includes cleaning, resurfacing and re-striping the asphalt path, repairs to crossings, cleaning drainage systems, trash removal, and landscaping. Underbrush and weed abatement should be performed once in the late spring and again in mid-summer.

In addition, these same maintenance treatments should be performed on Bike Lanes. These facilities should be prioritized to include an accelerated maintenance plan that is already a part of on-going street maintenance. A maintenance task list is provided in Table 7.2 below.

A City of Raleigh staff member should be designated as the main contact for the maintenance of pedestrian and bicycle facilities in the roadway right-of-way. This staff member should coordinate with the appropriate departments to set up a free maintenance hotline and conduct maintenance activities in the field. Funding for an ongoing maintenance program should be included in the City's operating budget. The City of Raleigh should make immediate repairs to any on-road bicycle facilities that are damaged or have hazardous conditions.

On page 7-46, two bicycle facility maintenance case studies are provided from communities that have been very successful in routine maintenance: Portland OR, and Jackson WY. These are provided as model standards for the City of Raleigh to work towards.

Table 7.2 Bicycle Facility Maintenance Checklist and Schedule.

Maintenance Task	Frequency
Inspections	Seasonal – at both beginning and end of summer
Signage replacement	1-3 years
Site furnishings; replace damaged components	As needed
Fencing repair	Inspect monthly for holes and damage, repair immediately
Pavement markings replacement	1-3 years
Pavement sweeping/blowing	As needed; before high use season
Pavement sealing; pothole repair	5-15 years
Lighting repair	Annually
Introduced tree and shrub plantings, trimming	1-3 years
Shrub/tree irrigation for introduced planting areas	Weekly during summer months until plants are established
Shoulder plant trimming (weeds, trees, branches)	Twice a year; middle of growing season
Major damage response (fallen trees, washouts, flooding)	Schedule based on priorities
Culvert inspection	Before rainy season; after major storms
Maintaining culvert inlets	Inspect before onset of wet season
Waterbar maintenance (earthen trails)	Annually
Trash disposal	Weekly during high use; twice monthly during low use
Litter pick-up	Weekly during high use; twice monthly during low use
Graffiti removal	Weekly; as needed

Bicycle Facility Maintenance Case Studies

(Source: The League of American Bicyclists)

Case Study 1: Portland, OR

Most bikeways within the City of Portland are the responsibility of the Portland Office of Transportation (PDOT). Other responsible jurisdictions include the Oregon Department of Transportation (ODOT), and Multnomah County. All roadway facilities receive regular routine maintenance (sweeping, vegetation trimming, pothole repair, etc) on a regular cycle (daily to quarterly, depending on the roadway). More pertinent to bikeway maintenance is a long-established system within the City of Portland that allows cyclists to inform the responsible jurisdiction when maintenance is needed immediately, typically for sweeping glass/gravel, filling potholes, or trimming encroaching vegetation. Portland's practice is to respond to bikeway maintenance requests as immediately as possible, as noted below. Cyclists noting a repair need can contact the city in one of several different ways: 1) through an on-line "facility maintenance request form" on the city's web site, 2) through the bicycle "hot line" (823-CYCL), 3) through a 24-hour maintenance number, 4) through a pothole repair number (823-BUMP). The first two options are routed directly to PDOT bicycle staff who forward the request to the appropriate response team. Sweeping requests on bikeways generally result in service within 12 hours; pothole requests typically result in filled potholes within 24 hours; vegetation trimming requests generally result in trimmed vegetation within 1-7 days, depending on the extent of required trimming. Requests coming to the City of Portland that are the responsibility of another jurisdiction are immediately forwarded to the appropriate contact at those jurisdictions and are typically addressed within several days. Information about how to contact the city about such maintenance requests is widely distributed. Such contact information is included on Portland's most widely distributed free bike maps, included in information outreach to more than 50,000 residents a year, distributed on "bicycle contact" refrigerator magnets, and included in "bicycle maintenance/contact information" cards that are also widely distributed through the city's outreach programs.

Case Study 2: Jackson, WY

The Town of Jackson Public Works and Teton County Road and Levee Departments sweep the on-street bike lanes and street shoulders once every two weeks or as needed from May until mid-October. Annual routine maintenance includes re-painting pavement markings, checking signage and repairing asphalt pavement as necessary during spring and summertime. Jackson Hole Community Pathways has a full resealing program for its pathway system, just completing approximately 6 miles of resealing in 2008. High level maintenance is provided on the 33 mile pathway system. Friends of Pathways provides volunteer assistance in spot sweeping pathway intersections, sign maintenance, painting, and other routine maintenance. Volunteers use specially equipped Bob bike trailers to carry tools. FOP also conducts on-going advocacy campaigns to encourage Jackson Hole Agencies all continue to complete high quality maintenance as promised in management plans.

CHAPTER 8 OUTLINE:

Overview
Opportunities and Strategies
Adopting This Plan
Key Steps in Implementation
Becoming a Bicycle Friendly Community
Staffing Recommendations
Establish a BPAC
Performance Measures
Physical Project Priorities
Facility Development
Action Plan Strategies

CHAPTER 8: IMPLEMENTATION

OVERVIEW

The text and images in this chapter describe how the City of Raleigh and its partners can turn the vision of a connected network of safe bicycle routes into a reality. The strategy for doing so involves some physical changes to the roadway environment and other landscapes, as well as new local government policies and programs. The bulk of this chapter deals with specific recommended physical changes and includes several maps. Following the physical recommendations are the policy and program considerations. All of these fit together to form the implementation program. Key recommendations are summarized on Table 6.1: Action Plan Strategies (page 8-9), which defines recommended actions, responsible agency, resources, keys to success and listing of stakeholders.

OPPORTUNITIES AND STRATEGIES

Improving bicycle transportation in the City of Raleigh will build on previous efforts to build bicycle facilities and greenways. Three main opportunities available to the Raleigh are 1) taking advantage of land use patterns that have placed many residents within bicycling distance of activities and destinations, 2) working with NCDOT to make necessary improvements to roads to improve safety and efficiency for bicycle transportation and 3) building on the success of the Capital Area Greenway System to add more miles of off-road routes that support bicycling.

ADOPTING THIS PLAN

Before any other action takes place, the City of Raleigh should adopt this plan as an element of the Comprehensive Plan. This should be considered the first step in implementation. Through adoption of this document and its accompanying maps as the City's official bicycle plan, Raleigh will be better able to shape transportation decisions so that they fit with the goals of this plan. The City will more appropriately shape future land development so that the resulting built form achieves the goals and vision of this plan. Most importantly, adoption is key to securing funding from NCDOT and other state and federal agencies in support of implementing the recommendations of this plan.

KEY STEPS IN IMPLEMENTATION

Other key implementation steps may begin after the plan is adopted, some occurring simultaneously:

1) Implement priority bicycle projects in accordance with the recommendations of this plan. Specifically, these recommendations are broken into bicycle and greenway improvements.

2) Create the necessary administration capability to oversee the implementation of this plan and the proper maintenance of the facilities that are developed. Specifically, it is recommended that a full-time dedicated bicycle and pedestrian coordinator be hired to oversee the day-to-day implementation of this plan.

3) Secure the funding necessary to immediately begin the first year's work, and start working on a funding strategy that will allow the City to incrementally complete each of the suggested physical, policy and program modifications over a 5-10 year period.

4) Produce a new user-friendly Raleigh Bicycle Map that shows the suitability of roadways for cycling throughout the community, including all existing bicycle facilities, major destinations, and information about bicycle safety and local bicycle organizations.

For example maps, visit this website and see the links for the City of Greensboro and the Town of Cary: http://www.ncdot.org/transit/bicycle/maps/maps_urban.html

5) Start the process of education and awareness building by holding a public event to announce the adoption of the bicycle plan and upcoming projects.

6) Coordinate the policy recommendations in this plan with the Comprehensive Plan being prepared by City Planning Department and HNTB to ensure that full integration is achieved.

7) Ensure that bicycle planning is integrated with other transportation planning efforts in the community as well as long-range and current land use planning, economic development planning, and environmental planning.

BECOMING A BICYCLE FRIENDLY COMMUNITY

One of the goals for this Bicycle Plan is to transform Raleigh into a "Bicycle Friendly Community" (BFC). The Bicycle Friendly Community Campaign is an awards program that recognizes municipalities that actively support bicycling. A Bicycle Friendly Community provides safe accommodation for cycling and encourages its residents to bike for transportation and recreation. The League of American Bicyclists (LAB) administers the Bicycle Friendly Community Campaign. Communities that are bicycle-friendly are seen as places with a high quality of life. The League represents the interests of the nation's 57 million cyclists. With a current membership of 300,000 affiliated cyclists, including 40,000 individuals and 600 affiliated organizations, the League works to bring better bicycling to your community.

Becoming a bicycle friendly community often translates into increased property values, business growth and increased tourism. Bicycle-friendly communities are places where people feel safe and comfortable riding their bikes for fun, fitness, and transportation. With more people bicycling, communities experience reduced traffic demands, improved air quality and greater physical fitness. A committee of the LAB reviews and scores the BFC application and consults with local cyclists in the community. An award of platinum, gold, silver or bronze status is designated for a period of four years. The LAB and technical assistance staff continue to work with awardees and those communities that do not yet meet the criteria to encourage continual improvements. The League of American Bicyclists recognizes newly designated Bicycle Friendly Communities with an awards ceremony, a Bicycle-Friendly Community road sign, and a formal press announcement.

The development and implementation of this Bicycle Plan is an essential first step in Raleigh eventually becoming a Bicycle Friendly Community. In North Carolina, currently only two communities are designated as "bicycle friendly," Cary and Carrboro. Raleigh will need to make significant strides in accomplishing the goals of this Plan prior to applying for BFC status, if the short term work program is accomplished, the City should be in a position to apply for an receive BFC status within three years.

STAFFING RECOMMENDATIONS

The following are recommendations for increasing the staff within the City of Raleigh.

Bicycle and Pedestrian Coordinator

The City of Raleigh will need to create and fund the full-time dedicated position of Bicycle and Pedestrian Coordinator to handle the day-to-day implementation of recommended policies, programs and activities described within this plan. The Coordinator will lead efforts to apply for funding, oversee planning, mapping, design and development of bicycle projects. The Coordinator will assist with programming, public outreach, and monitoring of implementation. The Coordinator will report to the manager of Transportation Services Division of the Public Works Department.

Note: Providing at least one bicycle and pedestrian coordinator is critical. Most major NC cities have a coordinator, including Charlotte, Winston-Salem, Greensboro, and Durham. For comparison, another example is the City of Austin, TX, which lists seven bike/ped program staff on their website, while other cities use a combination of staff, contract employees, consultants, partnerships with advocacy organizations, and inter-department teams.

Bicycle Facility Maintenance

Additional maintenance costs for bicycle facilities (striping, sweeping, etc) are relatively small incremental costs relative to the City's overall public works budget. The recommended strategy is to integrate maintenance into ongoing City programs, with an emphasis for maintenance crews to sweep all the way to the curb or edge of shoulder (where many bicyclists often ride). Additional efforts can be made to establish 'adopt a bikeway' programs to provide routine litter pickup and to notify maintenance staff of supplemental improvements (for more on maintenance see pages 7-45 and 7-46).

ESTABLISH A BICYCLE AND PEDESTRIAN ADVISORY COMMISSION

The City of Raleigh should encourage the establishment of a bicycle and Pedestrian Advisory Commission (BPAC) to assist in the implementation of this Plan. The BPAC would be comprised of both commuting and recreational cyclists, and should work in cooperation with the newly establish Raleigh Bicycle and Pedestrian Coordinator, to champion the recommendations of this Plan. Formation of BPAC will also represent a significant step in becoming a Bicycle Friendly Community. The BPAC's role would be to provide a communications link between the citizens of the community and City government. The BPAC should meet periodically, be tasked with assisting the City staff in community outreach, marketing and educational activities recommended by this Plan.

Models for such a group exist throughout North Carolina. Durham has had in place their own Bicycle and Pedestrian Advisory Commission (www.bikewalkdurham.org) for many years. In Charlotte, The Charlotte Area Bicycle Alliance (http://charlottebikes.org) is working with the City of Charlotte and Mecklenburg County to make the region more bicycle friendly. In Greensboro, 'Bicycling in Greensboro' has been working the Greensboro Department of Transportation to implement the recently adopted Bi-Ped Plan. These organizations, and others like them, traditionally focus on education, advocacy, partnerships, events and community service. Each BPAC member could represent one key functional area: planning, design, safety, maintenance, education, health, recreation, etc. Raleigh would greatly benefit by supporting the creation of such an organization.

PERFORMANCE MEASURES (EVALUATION AND MONITORING)

The City of Raleigh should establish performance measures to benchmark progress toward achieving the goals of this plan. These performance measures should be stated in an official report, prepared by the Bicycle and Pedestrian Coordinator, and filed with the City's Public Works Department, within one year after this plan is officially adopted by the City. The performance measures should address the following aspects of bicycle facility development.

1) *Safety* – measure the number of bicycle crashes on an annual basis.

2) *Usage* – target specific facilities and take measurements to determine use by cyclists.

3) *Facilities* – measure how many facilities are constructed, in accordance with the recommendations of this plan. Also report on the quality of these facilities.

4) Education and Enforcement – work with local law enforcement to measure the number of people that participate in education programs and the number that are ticketed for violations of motor vehicle and bicycle laws.

5) Institutionalization – measure the total budget spent by local governments on bicycle projects and programs.

When establishing performance measures, the City should consider utilizing data that can be collected cost effectively and reported at regular intervals, such as in a performance measures report that is published annually or biannually.

PHYSICAL PROJECT PRIORITIES

The entire Raleigh Bicycle Facility Network is described in Chapter 4. However, the system will be developed incrementally. Development will occur piece-by-piece, in a coordinated effort between the City and NCDOT. For a complete overview of priority projects (including the process used for prioritization and cut-sheets for the top 25 projects) refer to Appendix B.

FACILITY DEVELOPMENT

This section describes types of transportation facility construction and maintenance projects that can be used to create new bicycle facilities. Note that roadway re-construction projects offer excellent opportunities to incorporate facility improvements for bicyclists. It is much more cost-effective to provide a bicycle facility when these road projects are implemented than to initiate the improvement as a "retrofit."

In order to take advantage of upcoming opportunities to incorporate bicycle facilities into routine transportation projects, the City should continue to track repaving schedules, and other lists of projects. As the long-range transportation plan is updated in future years, bicycle improvements should be included in appropriately programmed projects.

Restriping

The simplest type of restriping project is the addition of bicycle lanes, edgelines, or shoulder stripes to streets without making any other changes to the roadway. Bicycle lanes, edgelines and shoulder stripes can also be added by narrowing the existing travel lanes or removing one or more travel lanes. In some locations where the existing lanes are 12- or 13-feet wide, it may be possible to narrow them to 10 feet. This requires changing the configuration of the roadway during a resurfacing project.

Removing Parking

Some neighborhood collector roadways are wide enough to stripe with bike lanes, but they are used by residents for on-street parking, especially in the evening. In locations like this, removing parking is likely to create considerable controversy and is not recommended unless there is no other solution (unless the parking is never used). In the rare case that removing parking is being considered, the parking should not be removed unless there is a great deal of public support for the bike lanes on that particular roadway, and a full public involvement process with adjacent residents and businesses is undertaken prior to removing parking.

If it is not practical to add a bike lane, edgelines and shared lane markings may be considered. On roads where the outside lane and parking area combined are more than 17-feet-wide, 10-foot-wide travel lanes can be striped with an edgeline, leaving the rest of the space on either side for parking. The stripe would help slow motor vehicles and provide extra comfort for bicyclists, especially during the daytime when fewer cars would be parked along the curb. On roads with outside lane and parking areas that are narrower than 17-feet-wide, shared lane markings can be provided every 100 to 200 meters on the right side of the motor vehicle travel lane to increase the visibility of the bike route.

Repaving

Repaving projects provide a clean slate for revising pavement markings. When a road is repaved, the roadway should be restriped to create narrower lanes and provide space for bike lanes and shoulders, where feasible. In addition, if the spaces on the sides of non-curb and gutter streets have relatively level grades and few obstructions, the total pavement width can be widened to include paved shoulders.

Installing Shared Lane Markings

Raleigh should adopt the use of shared lane markings, or "sharrows" as one of its bicycle facility types. Shared lane markings are a new, experimental, pavement marking that takes the place of traditional bicycle lanes where lanes are too narrow for striping, where speeds do not exceed 35 mph and can occur where there is on-street parking. The intent of the shared lane marking is three fold: First, they draw attention to the fact that the roadway is accommodating bicycle use and traffic; second, they clearly define direction of travel for both bicyclists and motorists; and third, with proper placement, they remind bicyclists to bike further from parked cars to prevent "dooring" collisions.

Note: Shared-lane markings are pending adoption in the 2009 update of the MUTCD and It is recommended that their use in Raleigh be approached incrementally (See page 7-11 of Chapter 7 for more information on this facility type.)

Roadway Construction and Reconstruction

Bicyclists should be accommodated any time a new road is constructed or an existing road is reconstructed. In the long-term, all roadways should have on-road bicycle facilities. However, sidepaths can be an acceptable solution in the short-term when a road has few driveways and high-speed, high-volume traffic.

Bridge Replacement

All new or replacement bridges should accommodate bicycles with on-road facilities on both sides of the bridge. If the bridge is in a developed area or an area that may experience development in the future, it should also have wide sidewalks on both sides to accommodate all types of bicyclists and pedestrians.

Federal law, as established in the Transportation Equity Act for the 21st Century (TEA-21), makes the following statements with respect to bridges:

"In any case where a highway bridge deck is being replaced or rehabilitated with Federal financial participation, and bicyclists are permitted on facilities at or near each end of such bridge, and the safe accommodation of bicyclists can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations." (23 U.S.C. Section 217)

On urban and suburban bridge projects, bridge shoulders should be a minimum of 5.5-feet wide and sidewalks should be a minimum of 5.5-feet wide if traffic volumes are projected to be less than 15,000 vehicles per day. If traffic volumes are projected to be 15,000 or more vehicles per day, the shoulders should be at least 6.5-feet wide and sidewalks should be at least 7-feet wide. (NCDOT Bridge Policy; http://www.ncdot.org/doh/preconstruct/altern/value/manuals/bpe2000.doc)

Bridge replacement projects on controlled access freeways where pedestrians and bicyclists are prohibited by law will generally not include facilities to accommodate bicyclists and pedestrians. In cases, however, where a bridge replacement project on a controlled access freeway impacts a non-controlled access roadway (i.e., a new overpass over an arterial roadway), the project should include the necessary access for pedestrians and bicyclists on the non-limited access roadway (i.e., paved shoulders, sidewalks, and pedestrian/bicycle crossing improvements). Existing and planned greenway crossings, both at-grade and below new bridges, should be similarly accommodated during bridge replacement projects.

Retrofit Roadways with New Bicycle Facilities

There may be critical locations in the Bicycle Route Network that have bicycle safety issues or are essential links to destinations. In these locations, it may be justified to add new bicycle facilities before a roadway is scheduled to be repaved or reconstructed.

In some places, it may be relatively easy to add extra pavement for shoulders, but others may require removing trees, moving landscaping or fences, or regrading ditches or hills. Retrofitting roadways with sidepaths

creates similar challenges. Improvements in these locations are typically recommended in the long-term.

Some roads may require a "road diet" solution in order to accommodate bicycle facilities. Road diets involve removing vehicle travel lanes and replacing these lanes with on-road bicycle facilities and sidewalks or sidepaths. Further study may be necessary for recommended road diets to ensure that capacity and level-of-service needs are balanced against bicycle level of service needs.

Signage and Wayfinding Projects

Signage along specific routes or in an entire community can be updated to make it easier for people to find destinations. Bicycle route signs are one example of these wayfinding signs, and they should be installed along routes independently of other signage projects or as a part of a more comprehensive wayfinding improvement project.

Future Bicycle and Pedestrian Facility Development

The Raleigh City Council should allocate sufficient resources on an annual basis to regularly expand the bicycle network and maintain the facilities as they are completed. This will ensure that the bicycle facilities recommended in this Plan and requested by the residents of the City will come to fruition. There must be commitment to a phased time line of roadway modification and facility construction must be adopted and followed.

Regarding bicycle facilities on state maintained roads, it will be important to understand how NCDOT and the City are involved in the approval process for reconstruction, repaving, and restriping projects on different roads in Raleigh. In some cases, the recommended facilities in the bicycle plan will not match the cross-sections recommended by the long-range transportation plan. If NCDOT or the City has the authority to deny a recommendation from this Plan, it will be important to discuss controversial issues with them during the planning process. The issues could potentially include:

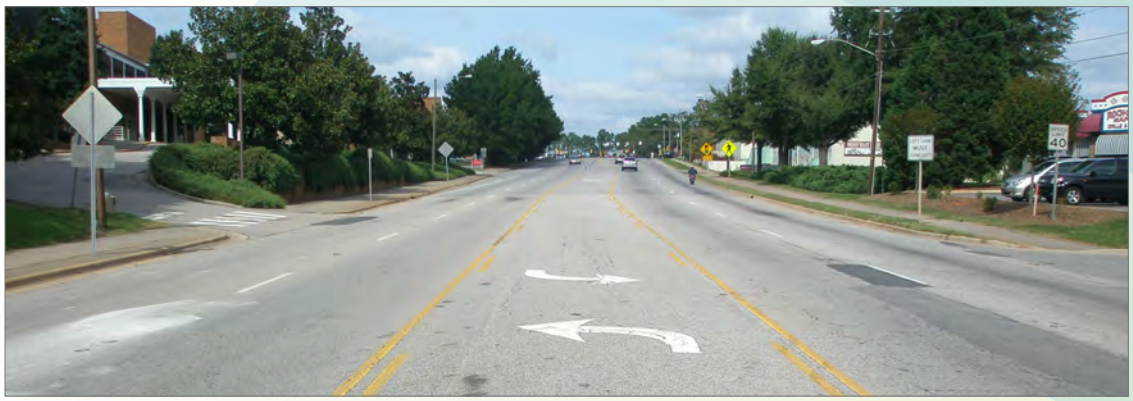
- Striping 10-foot-wide motor vehicle travel lanes to slow traffic and provide space for bicycle lanes

- Striping bicycle lanes instead of providing wide outside motor vehicle travel lanes

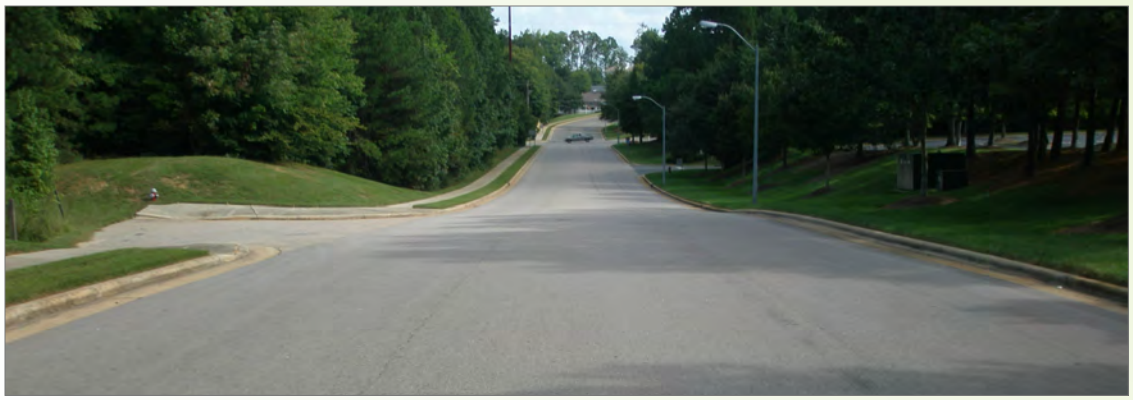
- Adding shoulders to roads, which will require regrading the shoulder/ditch area and relocating existing mailboxes

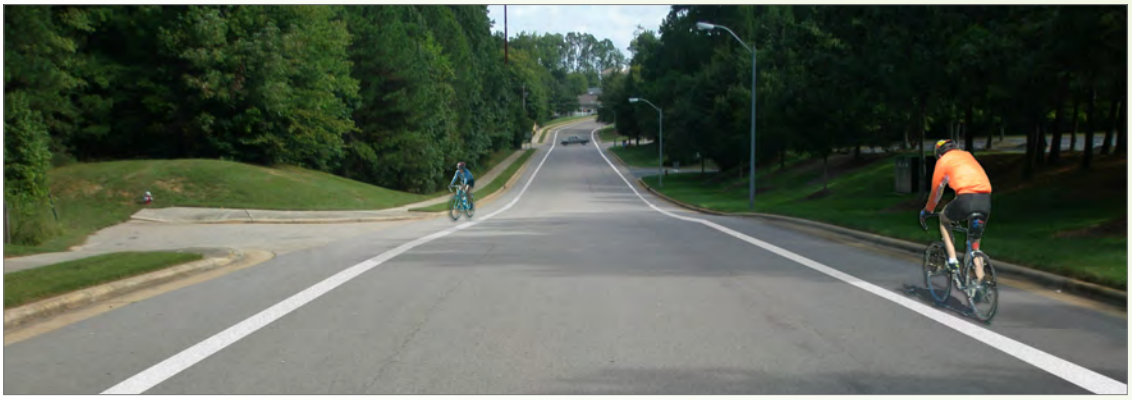
Photo Renderings of Bicycle Facility Development

Existing conditions (top) and photo rendering (bottom) for Avent Ferry Rd

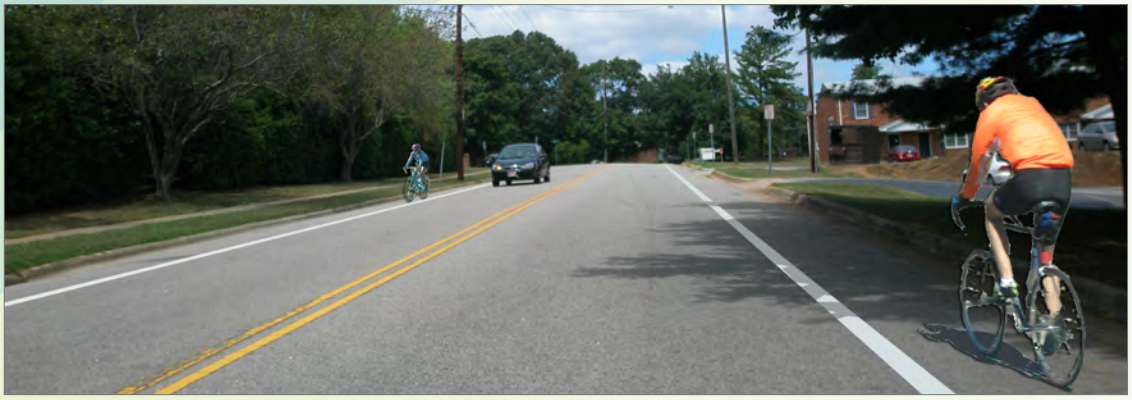


Existing conditions (top) and photo rendering (bottom) for Corporate Center Drive





Existing conditions (top) and photo rendering (bottom) for Crest Road

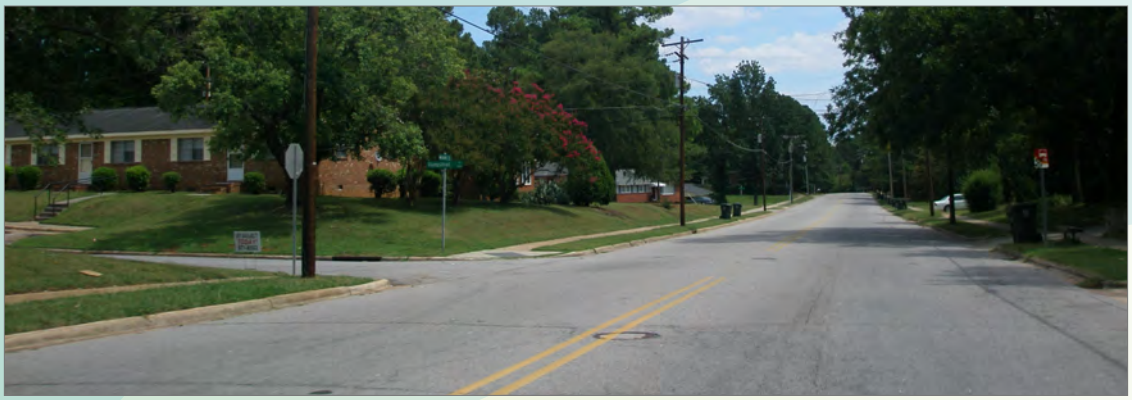


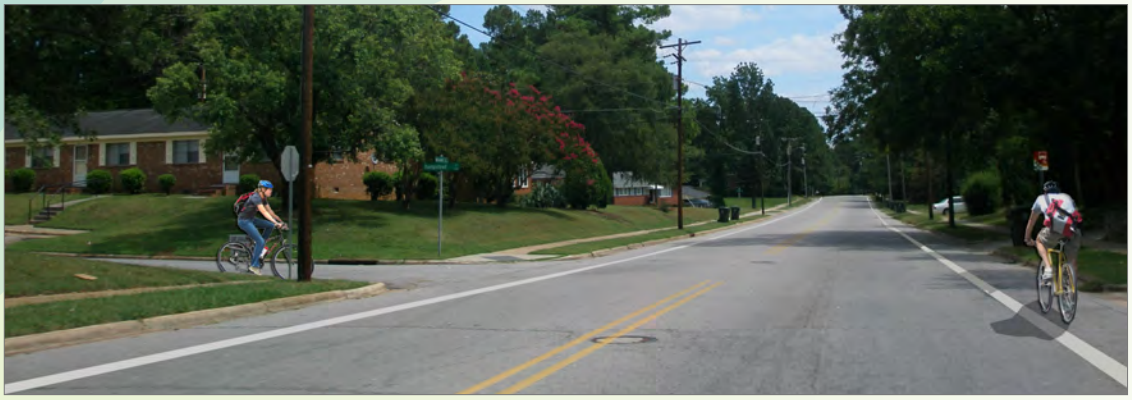
Existing conditions (top) and photo rendering (bottom) for Duraleigh Road

Existing conditions (top) and photo rendering (bottom) for Faircloth Street

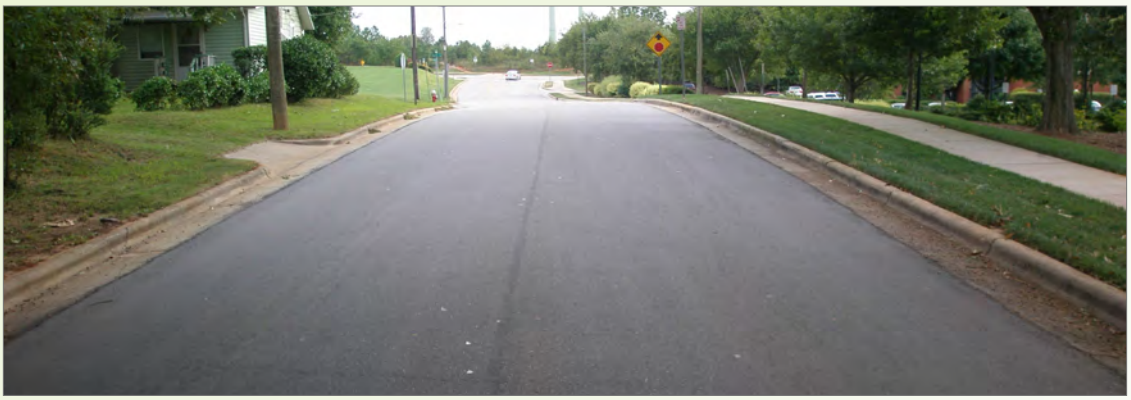
Existing conditions (top) and photo rendering (bottom) for a sidepath near Hillsborough St.

Existing conditions (top) and photo rendering (bottom) for Milburnie Road

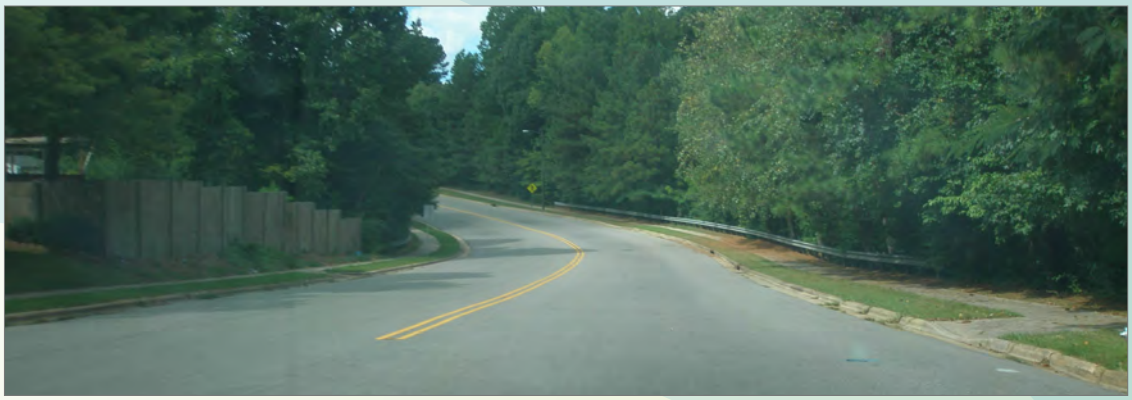


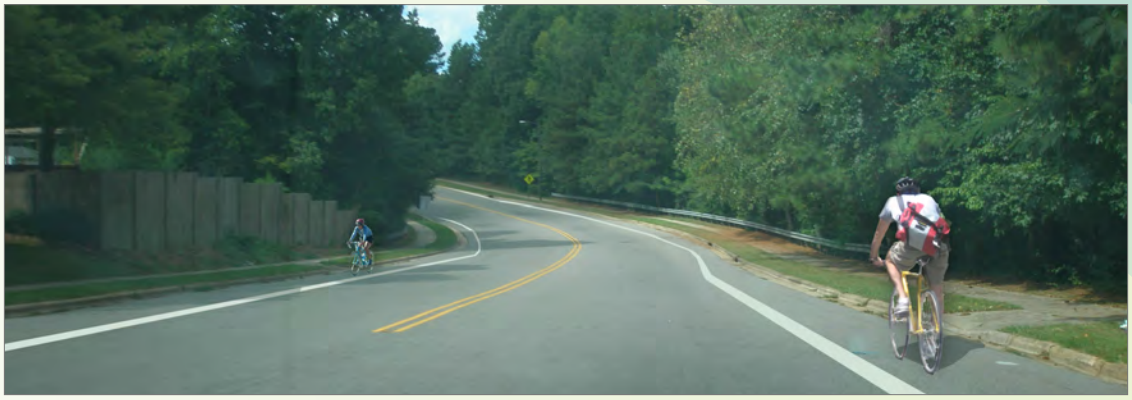


Existing conditions (top) and photo rendering (bottom) for Nazareth Sreet

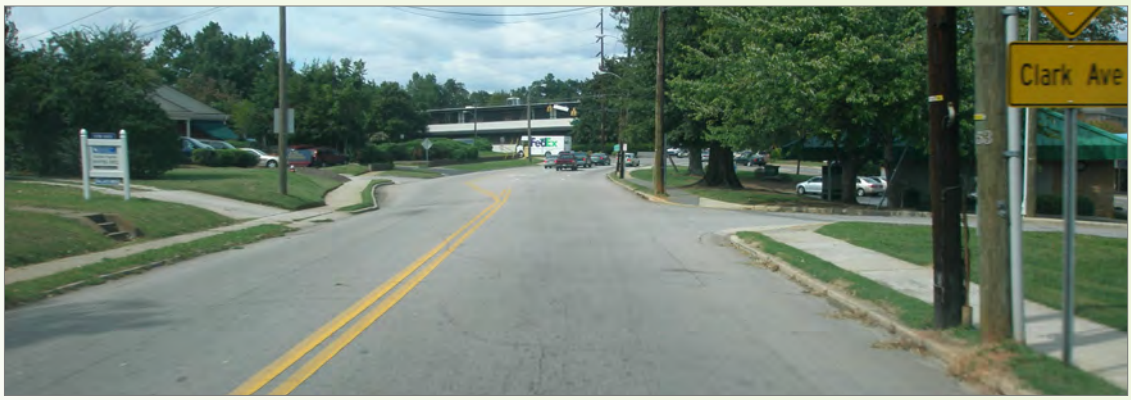


Existing conditions (top) and photo rendering (bottom) for North Hills Drive





Existing conditions (top) and photo rendering (bottom) for Oberlin Road



ACTION PLAN STRATEGIES *(Table 8.1)*

Task	Lead Agency	Support	Details	Phase	Page Reference
Present Plan to City Council	Raleigh Public Works Department	Project Consultant	Presentation to City Council - Early 2009. Focus on the benefits of bicycle transportation and key aspects of this plan	Short Term (2009)	Chapter 1, Chapter 8 and Appendix B
Approve this Plan	Raleigh City Council	NCDOT Bike-Ped/Project Consultant	Official letter of approval expected by Early 2009	Short Term (2009)	8-1
Adopt this plan	Raleigh City Council	Raleigh Planning Department	Through adoption, the Plan becomes a legitimate planning document of the City. Adoption shows that the City of Raleigh has undergone a successful, supported planning process.	Short Term (2009)	8-1
Bicycle Plan coordinated with Comprehensive Plan	Raleigh Planning Department	Raleigh Public Works Department	This step will make clear the importance of both documents working together in future development and growth decisions.	Short Term (2009)	6-1 to 6-5
Create official Bicycle and Pedestrian Advisory Commission (BPAC)	Raleigh Public Works Department	Raleigh City Council	BPAC will be instrumental in promoting bicycling and championing implementation of this Bicycle Plan. The group would play a strong role in assisting the City of Raleigh, fundraising, and establishing programs and activities.	Short Term (2009)	5-1, 8-4
Create Bicycle/Pedestrian Coordinator position	Raleigh Public Works Department/Raleigh City Council	Raleigh Planning Department, Parks and Recreation Department	The Coordinator position will handle the day-to-day implementation of recommendations within this Plan and future pedestrian planning efforts. This position would work closely with Raleigh Parks and Recreation on greenway projects and connectivity as well.	Short Term (2009)	8-3
Policy Action #1	Raleigh City Attorney's Office/Raleigh City Council	Raleigh Public Works Department	Revisions to the City of Raleigh Code of Ordinances: The changes suggested in Chapter 6 serve as recommendations for the Code of Ordinances updates, reflecting the findings and recommendations of this 2008 Bicycle Transportation Plan, and clarify some basic policy positions regarding future development and the provision of bicycle facilities. Some edits are also suggested for consistency in terminology.	Short Term (2009)	6-5 to 6-15
Identify and secure specific funding sources for phase 1 implementation	Raleigh Public Works Department	Raleigh City Council, City Manager, other City departments	Appendix B contains tables with project cost estimates and Appendix D contains nearly 30 potential funding opportunities.	Short Term (2009)	n/a
Complete top priority, phase 1 projects	Raleigh Public Works + NCDOT Division 5	NCDOT Bike/Ped Division	The prioritization of bicycle facility development provides a list of the most important projects to improve connectivity and safety. Immediate attention to the high priorities will instantly have a large impact on bicycling conditions in Raleigh. Consider a bond referendum for greenways and roadway improvements for bicycle transportation. First phase work that can be done at a low cost includes the simple bicycle lane and sharrow paint projects. At a minimum, complete this plan's top five priority bicycle projects by 2010.	Short Term (2009-2010)	B-11 to B-38 and Appendix C
Develop a long term funding strategy	Raleigh Public Works Department	City Manager, other City departments, BPAC	To allow continued development of the overall system, capital and Powell Bill funds for bicycle facility construction should be set aside every year, even if only for a small amount (small amounts of local funding can be matched to outside funding sources). Funding for an ongoing maintenance program should also be included in the City's operating budget.	Short Term (2009-2010)	Appendix D
Communicate and coordinate with NCDOT Division 5 on priority projects for NCDOT-maintained roadways.	Raleigh Public Works Department	NCDOT Division 5, NCDOT Bike/Ped Division	Ensure that when NCDOT-maintained roadways in Raleigh are resurfaced or reconstructed, that this Plan's adopted recommendations for bicycle facilities are included on those streets.	Continuous/Ongoing	Appendix B
Policy Action #2	Raleigh Public Works Department	Other Raleigh City Departments	Consider a design guideline policy to create bicycle lanes through the narrowing of travel lanes to 10' and lowering of speed limits.	Short Term (2009-2010)	4-6 to 4-8

Continue development of Raleigh greenway system - Capitol Area Greenway, Neuse River Greenway, an gaps in current system.	Raleigh Parks and Recreation Department	Raleigh Planning Department and Publi Works Department	Construct new greenway segments identified in this Plan and in ongoing City of Raleigh efforts. Provide connectivity to greenway system, enhanc greenway wayfinding signage, and provide highly visible crosswalks at roadway and driveway crossings.	Continuous/Ongoing	4-15 to 4-19
Develop updated Raleigh Bicycle Map	Raleigh Public Works Department	Project Consultant/Raleigh Parks and Recreation Department	An updated hardcopy and online map will display updated bicycle routes and facilities. This map should be updated every 2-3 years.	Short Term (2009-2010)	5-13
Remove existing City of Raleigh signe bicycle route system.	Raleigh Public Works Department	NCDOT Division 5, NCDOT Bike/Ped Division	The reasoning behind this recommendation is fully outlined in Chapter 4.	Short Term (2009-2010)	4-11
Provide bicycle parking in key locations throughout City by 2010.	Raleigh Planning Department and Raleigh Public Works Department	Downtown Raleigh Alliance, Triangle Transit, BPAC	Provide bicycle services such as covered parking, bicycle stations, showe at employment centers, and bicycle rentals. Provide bicycle parking at sites recommended in this Plan. Work with the Downtown Raleigh Alliance and BPAC to determine other key locations (including Downtown and Hillsborough Road) for future parking facilities.	Short Term (2009-2010)	4-9 to 4-10 and 7-37 to 7-41
Apply for bicycle parking/locker grant applications.	Raleigh Planning Department and Raleigh Public Works Department	Downtown Raleigh Alliance, Triangle Transit, BPAC	Apply for grant funding to provide enhanced bicycle parking and lockers.	Short Term (2009-2010)	4-9 to 4-10 and 7-37 to 7-41
Conduct evaluation of on-street automobile parking on arterial and collector roadways.	Raleigh Public Works Department	NCDOT Division 5, Raleigh Planning Department	Conduct study of existing on-street parking to determine necessity of parking. If parking should be eliminated in some locations, it would creat space and width for bicycle facilities.	Short Term (2009-2010)	4-9 to 4-10 and 7-37 to 7-41
Policy Action #3	Wake County Parks and Recreation Raleigh Parks and Recreation	Raleigh Police Department, Raleigh Public Works Department, Raleigh Planning Department	Consider extending operating hours of greenways to 6am - 11pm for commuter bicyclists. See the American Tobacco Trail in Durham, NC fo a local example of such a policy in action.	Short Term (2009-2010)	n/a
Enhance greenway wayfinding signage	Wake County Parks and Recreation Raleigh Parks and Recreation	Raleigh Public Works Department	Enhance greenway wayfinding signage to include trailhead maps and signage guiding users to and away from city greenways.	Short Term (2009-2010)	2-5 and 7-35
Continually support and evaluate implementation of this plan	Raleigh Planning Department, Raleigh Public Works Department	BPAC	The different City departments and boards and BPAC representatives should meet quarterly to assess implementation and evaluate progress.	Continuous/Ongoing	5-1, 8-4

ACTION PLAN STRATEGIES *(Table 8.1 continued)*

Education Action #1	Raleigh Parks and Recreation Department; BPAC	League of American Bicyclists and Raleigh Public Works Department	Assist in the coordination of joint adult and kids bicycle classes, to be provided in partnership between a locally certified League of American Bicyclists (LAB) instructor, the newly formed BPAC, and Raleigh Parks and Recreation Department. The actual curriculum would be developed by these groups, and could focus on personal trip coaching/promotion for non-car modes	Continuous/Ongoing	5-2 to 5-9
Encouragement Action #1	Raleigh Public Works Department, Raleigh Planning Department	BPAC	This Plan should be presented to other local and regional bodies and agencies. Possible groups to receive a presentation might include: CAMPO, local bicycle clubs, local bike store owners, regional transportation planners, health clubs and fitness facilities, schools and youth organizations, riding clubs, major employers, and large neighborhood groups.	Short Term (2009-2010)	n/a
Enforcement Action #1	Raleigh Police Department	General Public (for reporting enforcement issues/violation incidents)	Establish an easy-to-use and well-publicized bicycle and pedestrian enforcement hot line and online resource. Complaints that include license numbers should result in a letter to the owner of the vehicle that includes the complaint as well as a handout that outlines the rules of the road and rights for both cyclists and motorists.	Short Term (2009-2010)	5-18 to 5-19
Maintain bicycle facilities	Raleigh Public Works + Raleigh Parks and Recreation Department+ NCDOT Division 5	BPAC + General Public (for reporting maintenance needs)	The City of Raleigh Public Works Department and NCDOT should make immediate repairs to any on-road bicycle facilities that are damaged or have hazardous conditions. The City should make commitment to regular sweeping of bicycle lanes.	Continuous/Ongoing	7-45
Notify the City of Raleigh Public Works Department and new Bicycle/Pedestrian Coordinator of all upcoming roadway reconstruction or resurfacing/restriping projects, no later than the design phase.	Public Works Director, and NCDOT Division 5	Raleigh Planning Department	Provide sufficient time for comments; Incorporate bicycle recommendations from the planning staff.	Continuous/Ongoing	4-15 to 4-19 and Appendix B
Education Action #2	BPAC	Raleigh Public Works Department, Raleigh Planning Department	Begin bicycle ambassador program that would expand upon Downtown group.	Short Term (2009-2010)	5-4
Ensure planning efforts are integrated regionally	Raleigh Public Works Department, Raleigh Parks and Recreation Department, Raleigh Planning Department	CAMPO, Wake County, local municipalities, BPAC, NCDOT Bike/Ped Division, TJCOG	Combining resources and efforts with surrounding municipalities, regional entities, and stakeholders is mutually beneficial. Communicate and coordinate Wake County and neighboring municipalities on regional greenway corridors; partner for joint-funding opportunities. After adoption by the City, this document should also be recognized in regional transportation plans. Examples of regional projects are the East Coast Greenway, Mountains to Sea Trail, and possible rails to or with trails to Washington DC.	Short Term (2009-2010)	4-12 to 4-13
Encouragement Action #2	Raleigh Public Works Department	Local schools, BPAC, SRTS Program	Apply for Safe Routes to School funding for planning and implementation. Establish 'bike-to-school' groups and regular bicycling activities for children through the Safe Routes to School Programs through 2012.	Short Term (2009-2010)	5-15 and D-5 to D-6
Encouragement Action #3	Raleigh Planning Department, Raleigh Public Works Department	BPAC, Triangle Transit	Develop programs and incentives for employers to bicycle to work. Work with local employers to accomplish this goal. Continue to promote and expand Bike to Work Month and Bike to Work Day.	Continuous/Ongoing	5-9 to 5-12
Encouragement Action #4	Raleigh Public Works Department, Parks and Recreation Department	BPAC	Create monthly family rides, bicycle recreational rides, and hold events on bicycle facilities and greenways.	Continuous/Ongoing	5-11 to 5-15

Enforcement Action #2	Raleigh Police Department	General Public (for reporting enforcement issues/violation incidents)	Target and enforce all illegal motorist and bicyclist behavior that may jeopardize public safety and the success of the Bicycle Network, particularly speeding. Base the location of targeted enforcement areas on reported incidents from the hotline.	Continuous/Ongoing	5-16 to 5-20
Petition the NC Division of Motor Vehicles and other appropriate officials to include a bike-safety question on licensing exams by 2010.	BPAC	Local, regional, state, and national bicycle advocacy groups	Also consider challenging the current state law that requires only 2 feet of clearance when passing cyclists in a motor vehicle. Advocate for 3, or even 4 feet, as required in some other states.	Short Term (2009-2010)	n/a
Education Action #3	Raleigh Parks and Recreation Department	Raleigh Public Works Department	Develop educational materials, brown-bag events, and bicycle rodeos for adults and children.	Short Term (2009-2010)	5-2 to 5-9
Education Action #4	Raleigh Planning Department and Public Works Department	NCDOT Bike/Ped Division	Sponsor at least one planner and one engineer from the City of Raleigh to attend a bicycle planning and design training session. NCDOT, in partnership with the Institute for Transportation Research and Education (ITRE), offers bicycle planning and design workshops for practicing professionals.	Short Term (2009-2010)	5-3 to 5-4
Encouragement Action #5	BPAC	Raleigh Public Works Department	Encourage the establishment and/or expansion of cycling clubs and bicycl commuting groups.	Short Term (2009-2010)	5-13
Enforcement Action #3	Raleigh Police Department	NCDOT Bike/Ped Division, Raleigh Public Works Department	Sponsor police staff to attend in a training session for law enforcement tha focuses on bicycle issues.	Short Term (2009-2010)	5-16 to 5-20
Enforcement Action #4	City Council, Raleigh Police Department	Raleigh Planning Department, Raleigh Public Works Depatment, NCDOT Bike/Ped Division	Create a bicycle police patrol, especially for the Downtown area.	Short Term (2009-2010)	5-16 to 5-20
Policy Action #4	Raleigh Public Works Department	Raleigh Planning Department, Raleigh City Council, NCDOT Division 5	Adopt a local policy that states that all new bridges be constructed with accommodations for bicyclists and pedestrians (such as bicycle lanes, wid sidewalks, and bike and/or pedestrian safe railings).	Short Term (2009-2010)	n/a
Enforcement Action #5	BPAC	Raleigh Planning Department, Raleigh City Council	Consider mandatory helmet law for City of Raleigh that would extend the existing North Carolina law (under age 16) to more ages or all ages.	Short Term (2009-2010)	5-18
Take the necessary steps to become designated by the League of American Bicyclists as a 'Bicycle Friendly Community' by 2011.	Raleigh Public Works Department	BPAC	Download and review the application for a Bicycle Friendly Community designation. Determine which action steps of this plan would be the most strategic in terms of applying for the desired designation. Place emphasis on completing those steps, then apply.	Short- to Mid-Term (2009-2011)	5-1, 6-4, 8-2 to 8-3
Use updated AASHTO bicycle and pedestrian design guide	Raleigh Public Works Department	NCDOT Bike/Ped Division	Obtain new published AASHTO bicycle and pedestrian guidelines when published in 2009. Consider utilization of these new guidelines for facilities recommended in this Plan.	Short- to Mid-Term (2009-2011)	7-4
Education Action #5	Raleigh Public Works Department, Parks and Recreation Department, and Police Department	BPAC	Initiate a local bicycle safety, courtesy, and traffic calming educational campaign by 2011. Create brochures, develop billboards, and work with local media.	Mid Term (2011-2013)	5-8 to 5-9
Complete phase 2 projects	Raleigh Public Works + NCDOT Division 5	NCDOT Bike/Ped Division	In 2011, reevaluate priorities based on what has been completed thus far by creating a new agenda of "Phase 2" projects. Consider including phase one projects that were not completed and consider updating certain aspect of the plan's design standards, programs, and policies based on innovation and new ideas since 2009.	Mid Term (2011-2013)	n/a
Build a Bicycle Station in Downtown Raleigh and implement across City as multi-modal centers get developed.	Raleigh City Council, Raleigh Planning Board	Raleigh Planning Department, Raleigh Public Works Department, Raleigh Downtown Alliance	As an element of a multi-modal transportation system, a bicycle station near the Moore Square bus transfer station would offer residents a viable transportation option. This high visibility project will build momentum in implementation.	Mid Term (2011-2013)	7-41

ACTION PLAN STRATEGIES *(Table 8.1 continued)*

Encouragement Action #6	Raleigh Public Works Department	BPAC, local bicycle co-op	Encourage the continued operation of local bicycle co-ops in Raleigh; als see the Design Standards chapter for information on Bicycle Stations and Repair Stands	Mid Term (2011-2013)	7-41
Encouragement Action #7	Raleigh Public Works Department	BPAC	The City and the BPAC should consider teaming with local bicycle shops to advertise, promote, and provide rentals to the public. Some large U.S. cities provide multiple public bicycle rental stations, however, such a larg scale of rentals is not yet appropriate in the City of Raleigh.	Mid Term (2011-2013)	7-42
Pursue regional bicycle connections to Research Triangle Park (RTP) and Umstead State Park.	Raleigh Planning Department, Raleigh Public Works Department, Raleigh Parks and Recreation Department	RTP, NCDOT Bike/Ped Division, Umstead State Park, BPAC, TJCOG	The City of Raleigh should make efforts to develop recommended bicycle facilities that connect Umstead State Park and RTP to the City of Raleigh.	Mid Term (2011-2013)	4-12, 4-13 and 4-17
Continue to make regional bicycle connections	Raleigh Planning Department, Raleigh Public Works Department, Raleigh Parks and Recreation Department	BPAC, surrounding municipalities, NCDOT, TJCOG	In 2011, the City of Raleigh should assess the progress made in working with regional partners in the development of regional multi-use trail and bicycle networks. The City of Raleigh should remain involved to ensure connectivity through the City to regional destinations.	Mid to Long Term (2011 2019)	4-12 to 4-13
Re-evaluate possibility of signed commuter bicycle route system.	Raleigh Public Works Department	NCDOT Division 5, NCDOT Bike/Ped Division	Once bicycle network facilities are implemented across Raleigh, the City should reconsider a signed commuter route system to match the roadways in which bicycle lanes are present. If a signed route system is implemented, it should be added to an updated Bicycle Map.	Long Term (2014-2019)	4-11
Complete phase 3 projects	Raleigh Public Works Department + NCDOT Division 5	NCDOT Bike/Ped Division	In 2014, reassess projects and reevaluate priorities and phases. Consider updating the entire plan.	Long Term (2014-2019)	n/a

December 2008

TO: Eric J. Lamb, PE
Manager, Transportation Services Division
City of Raleigh Public Works Department
One Exchange Plaza, Suite 304
P.O. Box 590, Raleigh, NC 27602

FROM: Greenways Incorporated
5850 Fayetteville Road, Suite 211
Durham, North Carolina 27713

MEMO: EVALUATION OF RALEIGH'S SIGNED BICYCLE ROUTES

OVERVIEW

Recommendations within the main chapters of Raleigh's Bicycle Transportation Plan primarily addresses major roadways, rather than these 'shared road' routes. This evaluation of the current route system provides an overview of the state of the current system, including it's many challenges.

A group of local cyclists volunteered to evaluate the system. This process was inherently subjective, yet by obtaining the viewpoint of actual users of Raleigh's signed route system, this process allows for an understanding of how well the system works (or dose not work, in some cases). Furthermore, volunteers aimed for an objective evaluation by keeping in mind that there are different levels of cyclists that would like to use these routes. Concluding recommendations are on page 20 of this memo.

ROUTE EVALUATIONS

Route 1) *Reviewed by Jerry McMahon*

Generally, the route was in reasonable shape. Signage was mostly fine, the parts of the route on the "main" streets (i.e., Oakwood, Milbutnie, Brookside) were pretty clean, and the neighborhood streets wer pleasant. The greenway portion of route #1 had a fair amount of sediment on the asphalt, probably from from recent overbank flows from Crabtree Creek.

Issues:

1. The signage at the intersection of Buckeye Greenway, Raleigh Blvd, and Barksdale was poor (I was going around the route in a counter-clockwise direction). It wasn't clear (from the signage) what to do once you reched Raleigh Blvd. I turned south and noticed that there was a sign to turn left on Barksdale (wrong direction!). I turned the correct way on Barksdale and the sign for the next turn was completed blocked by branches.

Route 2) *Reviewed by Zach Cox*

The comments below pertain to evaluating the route in a clockwise direction first, and then counter-clockwise. (Note: ignore clockwise/ counterclockwise labels on the pictures, as they were incorrectly placed)

Clockwise:

This set starts on Davidson Street just before a right turn onto Pamlico. There is no signage on Yadking indicating that a left turn onto Davidson is needed.

Above: On Hyde Ready to turn Left onto Northbrook. Note: Coming the other way there is no sign for a right turn onto Hyde. In that direction (and the other on Hyde the hill is very steep.

Above: On Northbrook ready to turn right on North Hills. Note: The sign is pointing the wrong way.

Counter-clockwise:

Missing sign to turn right from Davidson onto Yadkin.

Above: Missing sign indicating right turn off Rampart onto Cranbrook.

Above: The arrow is missing indicating left onto Wimbelton.

Additional missing signs for Route 2:

- Missing sign indicating to turn righ off of Northbrook onto Hyde

- Missing sign on Davidson indicating to turn left onto Currituck

Route 3) *Reviewed by Wayne Clark*

Wayne Clark's full review with photos and maps can also be found here: http://www.mindspring.com/~wayne-clark/Bikes/Routes/RaleighBikeRoutes_3_4.html

Bike Route 3 is a 5 mile loop route through some of the most scenic neighborhoods of Raleigh's well-known "inside the Beltline" district. It is hilly but none of the climbs are overly difficult. I rode this route in the clockwise direction starting from the southwest corner. The Ridgewood Shopping Center is located only ¼ mile from the route and offers a convenient place to start and finish. This shopping center has a bike shop (All Star Bikes), the last remaining independent bookseller in Raleigh (Quail Ridge Books), as well as a Wellspring and Tripp's restaurant.

Section 1: Ridge Road

The first two miles of the route along Ridge Road has a bike lane on both sides of the street. There is no parking in the bike lane on weekdays from 7:00 am to 7:00 pm. However, I rode the route on Saturday so there cars parked along Ridge Rd. at various points. In fact, in the southern end of Ridge Rd. nearer to Wade Ave. and especially the section running in front of Martin Middle School, parking was solid. It was not until I got to Lake Boone Trail that the parked cars thinned out. I noticed that the bike lane does not appear to be cleaned very often. It was littered with debris (some gravel, but mostly pine needles, pine cones, and a few leaves). However, the first 1-2 feet to the right of the white line is blown free by automobile traffic. Unfortunately, this is pretty standard with most bike lanes in every city where I have ridden.

Ridge Rd. is downhill (in the clockwise direction) making for a very enjoyable ride. There are numerous bike route signs along the entire route and many of these signs also contain maps. Even though most of Ridge Rd. is on a hill, it is not very steep. Riding in the opposite direction would not be too difficult, though it is still a 2 mile uphill climb. This portion of Route 3 is a good route that should be preserved no matter what. It is great feeder route for both Meredith College and NC State University from the inner Beltline neighborhoods.

Route 3 leaves Ridge Rd. at Blenheim Dr. It is a right hand turn that is marked with a sign. While riding the route, I missed this ride for a few reasons: (1) it it a downhill so I was going faster than normal, (2) from a distance, the sign was obscured by tree branches, (3) I had been on Ridge Rd. for 2 miles and was lulled into continuing straight, and (4) I was dictating into a voice recorder and therefore not paying as close attention as I should have! I bring this up because having missed the turn, I found myself in a very difficult situation ... effectively on the on-ramp for I-440. If you look at the map, you will see that Ridge Rd. merges onto I-440 just north of Blenheim. I recommend painting a right hand turn sign on the bike lane so riders will not miss this important turn.

Section 2: Blenheim Estates
This is a very nice neighborhood to ride through, but there is no bike route signage. Almost immediately after turning onto Blenheim Dr. from Ridge Rd., the cyclist comes to a tee with no indication which way to turn. The correct answer is right, but I had to look at the map to determine that. On this particular, day, even the stop sign was missing!

There were no bike route signs within Blenheim Estates itself but that was not much of a problem since none of the side streets are through streets anyway. As you leave the Blenheim Estates, there was a bike route sign with a right turn arrow for Childers St.

Section 3: Lake Boone Trail Area
The first part of this section was very nice riding. The streets were mostly residential side streets with no traffic at all. There were a couple of troublesome intersections:

1. The intersection of Vick Ave. and Lubbock Dr. was missing a bike route sign and a left turn arrow. The natural tendency for cyclists is to continue going downhill onto Lubbock, but that is the wrong direction [photo]. Again, I had to rely on the map to find which way to go.

2. The intersection of Glen Eden Dr. and Sussex Rd. was very confusing. There are three bike routes that come together at this intersection, but Route 3 signage is the hardest to see. It would be nice if there was a Route 3 sign at this intersection consistent with Routes 7 and 10 which also turn at this location [photo]. (Notice also in this photo how many of the Route 3 maps are covered with moss and mildew and are very difficult to read.)

The above comments on this section are minor when compared with the next intersection. It is by far the most dangerous part of the entire of Route 3 (this location is marked with a "hazardous" marker on the Google Maps mashup). The cyclist rides on Lake Boone Trail for a very short distance (less than 100 yards) before needing to turn. Unfortunately, there are several problems:

1 .There is no bike route signage anywhere to be found telling the cyclist which way to go.

2. If the cyclist assumes they go straight, you immediately climb a hill on Lake Boone Trail that is at least a 20% grade. It is a steep, windy hill with more traffic than most of the other streets on Route 3. I climbed this hill but was not able to find any Route 3 markers anywhere. So I went back down the hill to look for the route again.

3. I pulled out the map and found a very confusing assortment of dashed and dotted lines. It looked like I turned onto a greenway, but I couldn't find a greenway entrance.

4. I finally determined that I needed to turn left off Lake Boone Trail onto Brooks Ave. This is a very dangerous left hand turn since it is at a blind curve on Lake Boone Trail where traffic is coming down the hill at a higher than average speed.

FYI, in the other direction, there is a Route 3 sign with a turn arrow telling cyclists to do a right turn from Brooks Ave. onto Lake Boone Trail.

Section 4: Windemere Beaver Dam Park Area
This is perhaps the most pleasant section of the route since it parallels a greenway on one side and nice homes on the other. There is no Route 3 right turn arrow from Brooks Ave. to Banbury Rd. (In the opposite direction, the Route 3 sign exists, but the turn arrow is absent.) This section ends with an abrupt right turn onto Leonard St. (no Route 3 sign and no turn arrow), with an uphill climb all the way back to Ridge Rd. to complete the loop.

Summary of Route 3
This is by far the better of the two routes that I rode. Route 3 is the only one with maps on numerous bike route signs. Here are my recommendations for the route:

1. Audit the entire route for missing signage. Make special not where turn arrows are missing.

2. Have the City of Raleigh regularly clean the bike lane along Ridge Rd. After all, there is no parking on weekdays so street sweeping should be much easier then (if Raleigh still has street cleaners).

3. Place a right turn sign on the bike lane pavement at Ridge Rd. and Blenheim Dr.

4. Make sure the turn from Lake Boone Trail onto Brooks Ave. is properly signed with appropriate warnings to both cars and cyclists.

Route 4) *Reviewed by Wayne Clark*
Wayne Clark's full review with photos and maps can be found here:
http://www.mindspring.com/~wayne-clark/Bikes/Routes/RaleighBikeRoutes_3_4.html

Bike Route 4 is a 5 mile loop route through Raleigh's southwest neighborhoods, including the neighborhoods that border North Carolina State University. This route is not nearly as well done as Route 3 above due to several factors (busier streets, decline roadway surfaces, transient student population, etc.). However, one of those factors (the student population) could result in this route being ridden more than Route 3. To illustrate this point, while I was riding these routes, I saw no other cyclists on Route 3 but perhaps 4 or 5 riders on Route 4. I rode this route in the counter clockwise direction starting from near Kentwood Park on the southeast side of the loop.

Unlike Route 3, Route 4 had almost no bike route markers and only 1 or 2 turn arrows throughout the entire route. I will not identify all of the places where turn arrows were missing (like I did with Route 3) since there were hardly any at all.

Section 1: NC State Neighborhoods
Kent Rd. from Kaplan Dr. to Western Blvd. is a good road. It is newly paved, is very wide, and has no parking. However, once you cross Western Blvd. and the road changes name to Method Rd., the route goes to hell. The intersection with Kent/Method and Western is very busy with lots of high speed traffic (it is right off I-440). Traffic is turning in all directions so the cyclist has to be aware and confident in order to remain safe. The good news is that there is almost always a line of cars at this intersection and, as long as the cyclist is comfortable riding in traffic, one can ride with the flow.

Just north of Western on Method, the road narrows dramatically with a lot of broken pavement on the right side of the roadway. There are several NCSU side streets entering from the right so you have to be continually aware of students in a hurry. Within 3 or 4 blocks north of Western, Method Rd. widens out and offers a good route up to the end at Beryl Rd.

Section 2: Beryl Rd.
This entire section is one of the ugliest stretches of roadway anywhere in Raleigh! It parallels the railroad tracks on one side and the other side is lined with heavy equipment operations. Nestled in the middle of this industrial armpit is NC State's JC Raulston Arborteum.

One thing to be aware of with Beryl Rd. is that it is relatively close to Carter Finley Stadium. On football Saturdays, traffic on this street is a nightmare. Fortunately, I rode this stretch during the game so all I had to contend with was an endless line of parked cars.

The most dangerous part of Route 4 is the intersection of Beryl Rd. with Blue Ridge Rd. What complicates this intersection is that it is adjacent to the railroad tracks, and immediately on the other side of the tracks is the major east-west artery for this part of Raleigh – Hillsborough St. [photo]. Getting through this intersection – no matter which way you are going – is very risky on a bicycle.

Beryl Rd. ends at Powell Dr. This intersection is always littered with sand and gravel. There is an NC-DOT maintenance lot with mountains of both sand and gravel in the southeast corner of this intersection [photo]. One has to be particularly careful with turning from Beryl onto Powell, especially in the rain. I have almost taken a spill on this turn several times.

Section 3: Southwest Raleigh Neighborhoods

After Powell Dr. crosses Western Blvd., the ride turns a lot more pleasant. You are riding through the residential neighborhood of southwest Raleigh. One feature of this neighborhood that has always tickled me is the "interchange" of Melbourne Rd. with I-440 [photo]. This is perhaps the most serene freeway interchange I have ever seen anywhere in the U.S. Melbourne is a very nice street for bike riding. Then lo and behold, there is a freeway ramp right in the middle of a quiet residential street!

There were even a few bike route signs in this section of Route 4 and, believe it or not, even a couple of turn arrows.

Summary of Route 4

Route 3 is a mess, plain and simple. I have been riding this loop ride since I moved to North Carolina in 1994 and it has continued to deteriorate over that span of time. If this route is going to be saved, here are my recommedations:

1. Audit the entire route for missing signage. This will take a tremendous effort since there are virtually no signs anywhere today. Missing signs is likely the result of vandalism. There are no signs whatsoever near NC State while the signs are spotty in the family residential neighborhoods. I would imagine the entire route used to be signed at one time.

2. At a minimum, repave Method Rd. north of Western Blvd. It should also be widened for the first 100-200 yards north of the intersection if possible.

3. There needs to be some kind of bike route signage at the intersection of Beryl Rd. and Blue Ridge Rd. As indicated, it is a very complicated intersection and the actual kind of signs (or pavement markings) need to be given a lot of thought.

4. Have NC-DOT clean up their mess at the intersection of Beryl Rd. and Powell Dr. Place a right turn sign on the bike lane pavement at Ridge Rd. and Blenheim Dr.

5. Make sure the turn from Lake Boone Trail onto Brooks Ave. is properly signed with appropriate warnings to both cars and cyclists.

Route 5) *Reviewed by Liz Guzynski and George Shanko*

North to south:

From Glen Eden to Wade Avenue, Ridge Road has a wide bicycle lane for most of the route. It disappears at the Lake Boone and Wade intersections, as well as one or two other places along the route. At the intersections, the road should probably have a bike symbol painted on it, since the lane marking is absent. The lane is mostly smooth and clean, but sports some notable sections of buckled pavement in both directions. These humps and bumps could pose a hazard to less experienced riders because several of them are as wide as the lane itself. It would be nice to see them repaved.

This is a very popular and well-used section of this bike route. However, there are always cars and service vehicles in the bike lane during "open" hours. [Note: I had never noticed this before, but the bike lane is open during different hours of the days, depending on which direction one is headed. Riding north, the lane is reserved as a bike lane from 7 AM to 7 PM Mon – Fri; but heading south, the lane is marked for bikes only during morning rush hour and from 2-4 PM. Perhaps vehicles get confused about when and where they can park and this accounts for the vehicles that are constantly parked in the northbound lane during the day.]

The Wade Ave/ Ridge Rd intersection would be nerve-wracking for an unconfident cyclist, or one riding with children. The reserved lane drops away just as one is forced to make a left turn onto Wade; there is no street sign; and the turn demands that the cyclist navigate the Whole Foods traffic and then cross 4 lanes onto Wade, which is basically an extension of I-40. What about routing bike traffic through the Whole Foods parking lot and then crossing onto Faircloth at the light? Is this feasible or safer?

The part of the route that runs along Gorman St is mostly dreadful. The road between Hillsborough and Western is freshly paved (crews were working during our ride on 9/24/08) but there were no provisions being made for bike lane signage or markings. Why not? This is a current and heavily traveled route.

Between and Western and Avent Ferry, Gorman has plenty of room for markings or even a reserved lane, but none exists. This becomes a busy, ugly road. From Avent Ferry to Thistledown, not only are we missing lane markings but the road rises over at least one blind crest. This section of the route is thoroughly unappealing and unsafe. As we were riding, we questioned why anyone would choose this route.

Route 6) *Reviewed by Liz Guzynski and George Shanko*

West to east:

This route covers suburbs that serve NCSU and older neighborhoods in southern and eastern Raleigh below the beltline. As we attempted to ride the first part of the route, we noticed that it would be impossible to follow the route without a map and/or cue sheet. There were few signs – none at the start of the route to orient a rider – and no road markings whatsoever.

The section of the route along Carolina Pines has no shoulder at all and is rather curvy. There was a fair amount of traffic on this road, even during a weekday morning; it's not at all clear why someone would voluntarily embark on this road.

As the route progressed, the twists and turns continued to be confusing as largely unmarked. The roads passed through industrial sections, neighborhoods that harbored many yards with large dogs, and again, unappealing scenery without the benefit of "destinations" (parks, shops, schools) that we could discern. At least the police presence was palpable: we noticed at least 4 patrol cars and one arrest in progress during our ride. It says a lot about this route that we chose to take a completely different route home rather than ride back along Route 6 again.

Route 7) *Reviewed by Will Ivey*

Starting at Lake Johnson:

The first section along Avent Ferry is 2 lane and there are no signs in either direction that mark this as a bike route. There isn't much of a shoulder, but along the north side of the road, there is an asphalt sidewalk (which I didn't ride on).

At the intersection with Athens Dr., Avent Ferry becomes 4 lanes. Even though the lanes aren't very wide I didn't feel unsafe as traffic wasn't very heavy. My guess is that during morning rush hour, my perceptions would change.

The route makes a left turn onto Crest Dr. There were no signs indicating the turn in the direction I was traveling.

The route then merges left onto Varsity Dr. and a right onto Fraternity Ct. to connect with Dan Allen (which runs through NC State). I would suggest here that the route continue on Varsity Dr., across Western Blvd, then use Sullivan to connect back to Dan Allen.

Along Dan Allen Dr. I saw my first sharrow but it was pretty pathetic, in my opinion. Had I not been a cyclist (or heard about sharrows) I would not have known what it was. If this section is going to be a sharrow, it should be much better marked.

Where Dan Allen dead ends into Hillsborough Rd, you have to ride a short way along Hillsborough, then get in the left turn lane to access Brooks Ave. This wasn't a big deal for me, but an experienced cyclist would have trouble accelerating across the 2 lanes of Hillsborough to make the turn.

The route along Brooks Ave. was the most pleasant even though there is on-street parking along both sides of the street. After Wade, it opens up a bit more with less on-street parking and a relatively long (1 mile?) flat section then a downhill followed by another flat section (rare in this part of Raleigh).

Brooks dead ends at Lake Boone Trail where the route turns right, then shortly, turns left onto Sussex which is part of route 10. Again, this is through a nice, older section of Raleigh.

At Glen Eden, route 7 diverges from route 10 and turns right then crosses Glenwood Ave. Fortunately, there's a light at this intersection or it would be a difficult crossing at many times of the day.

The route then runs along Granville Dr., makes a hard right onto Forsythe, then a hard left onto Alleghany. Alleghany Dr needs resurfacing badly. With the multi-million dollar homes lining this street, you'd think the city could afford to repave it, but it's been that way for as long as I can remember. About halfway along Alleghany, the route intersects the greenway which is a nice asset.

The route turn turns right onto Yadkin Dr which begins a long uphill section where the route terminates at Northbrook Dr. This section is residential and the streets are plenty wide.

I don't see why the route stops here. It could very easily continue along Yadkin, turn right onto Rampart, back left onto Cranbrook (for a short steep uphill climb) to Shelly. A right on Shelly road would put the cyclist on North Hills Dr all the way to Lynn Rd. In addition, you could access the Shelly Lake

green way system where it begins along North Hills Dr.

Overall, this was a decent N-S route through town, but the signage wasn't very good. I would really like to see some paint on the street (with arrows)!

Route 8) *Reviewed by Chet Buell*

Description:
Bike Route 8 is a West-East route through Raleigh, originating near the State Fairgrounds at the corner of Beryl Road at Blue Ridge Rd. It goes past the J.C. Raulston Arboretum.

Major Issues:

1. Most of the Bike Route 8 signs are missing. You have to consult the map frequently (every couple of blocks). Particularly notable—Meredith College area; sporadic through University Park neighborhood (Clark, Everett, Gardner); absent on Oberlin; non-existent through downtown Raleigh. This was extremely annoying.

2. The lack of signage makes it dangerous if you are unsure of the route. This is especially true around the Cameron Village area. There's no sign on Oberlin indicating that you cross Peace St/Clark Ave. and then make an immediate left on Park Drive. The traffic (even on a Sunday afternoon) is heavy and trying to make that left turn is difficult; motorists want to mow you over. Trying to turn left onto Everett Ave. from Oberlin Rd. is also tricky—the traffic is busy and most motorists are focused on trying to dive into the Post Office or thinking about shopping.

3. Cameron Park neighborhood has narrow streets with parking on both sides. You basically share the middle of the road with car(s) and that makes drivers cranky. You'd think they'd have patience through a residential neighborhood...

4. The stretch on Hillsborough St. is fairly quiet, but the pavement is very rough. Then you have to make that left to stay on Hillsborough St.; it can be a little tricky.

5. Incorrect signage at MLK Blvd. and Raleigh Blvd. going east. The signs incorrectly indicate that BR 8 follows Raleigh Blvd. (north/south) and that BR 11 goes straight. The opposite is true—BR 8 continues on MLK Blvd. and BR 11 follows Raleigh Blvd. It is correct going the opposite direction.

6. When BR 8 signs are present, they are hidden by overgrown vegetation or blocked by other signs; it's a bit of a scavenger hunt to find them.

7. The pavement along this route is very poor for the majority of the route—full of potholes, glass, etc.

8. MLK Blvd. varies in traffic; some sections have fairly heavy/busy traffic. Once past Raleigh Blvd., the BR 8 signs are mostly present.

Alternative Routing:
Instead of using Kilgore or Everett Ave., it would be better to continue on Clark Avenue/Peace St. through Cameron Village and then turn in/out of the Cameron Park neighborhood by Smallwood/Bellwood/Forest Rd. area instead of trying to tackle Oberlin Road.

Route 9) *Reviewed by Cynthia van der Wiele*

Description:
Bike Route 9 originates in Southeast Raleigh at Wilburn Elementary School. It goes through a residential area to Poole Road which is tricky to cross (not signalized; heavy traffic), then takes the 1st right onto Peartree Lane. This street is actually Donald Ross Road and doesn't become Peartree until you cross New Bern Avenue (the Raleigh Bike Map is incorrect). The route then goes to Millburnie Road to Hill Street. These roads aren't too bad generally (fairly hilly and the road surface is pretty good). However, the BR 9 signs change to just a Bike Route Symbol sign and that makes it a bit confusing. The downtown section, West Jones St, cyclists must use extreme caution as traffic is heavy during commuting times and most drivers are trying to spot parking places or enter parking decks/lots. They will fail to see you. The Lane St. section is nice, you don't have the same issues as Jones St. as it goes past the legislature buildings.

The highlight of BR 9 is the White Oak Road section, stately white oaks and elegant homes on a wide, shaded road. Lassiter Mill Road is a fine road, but novices will hate the hill up to North Hills Shopping Center. The remainder of the route goes through residential areas with fairly poor road surface, low traffic, and intact signage. The route ends at Cedar Hills Park, but there's no sign indicating it's the end of BR 9.

Major Issues:

1. No Bike Route 9 signage around the St. Augustine College area (Jones St., Hill St.), signs are missing and in some places there are bicycle route symbol signs instead, not the route number. This makes it confusing.

2. Downtown Raleigh: West Jones St. is nerve-wracking during commuting time as most drivers are looking for parking or turning into lots/decks. Use extreme caution or use during peak-rush hour times.

3. Most signs are hidden by overgrown vegetation or blocked by other signs; it's a bit of a scavenger hunt to find the BR 9 signs.

4. Five Points Area (Burton St./Duncan/Sunset), signs intact in one direction (going towards White Oak Road), but missing signs and a problematic Bike Route Sign but no arrow indicating which way to turn at the Burton St./Duncan St. T-intersection makes it confusing.

5. BR 9 signs missing in the Boylan Avenue/W. Johnson St./St. Mary_s Street area.

6. BR 9 sign missing on St. Mary's St. by the turn onto Williamson Drive.

Alternative Routing:
W. Jones St./Lane St. area: turn north onto Bloodworth St. and then right onto Oakwood Avenue to Hill St.; it's a much more pleasant ride. The turn from Jones St. to Hill St. in that area is quite busy.

Trying to turn left onto W. Johnson St. is tricky, busy, and you're going uphill. A better option is to keep going straight and cross Peace St. (there's a traffic light) and go wind through the Glenwood/Brooklyn neighborhood to turn right from Clay St. onto St. Mary's St.

Route 10) *Reviewed by David G. Roberts/Will Ivey*

Out (Kiwanis Park to Glen Eden):

1. No sign at Hudson and Pine; could easily lose the route here and end out on Whitiker Mill Rd. in heavy traffic.

2. No sign at Harvey and Cowper; much construction has taken place at this busy intersection and signage has been destroyed...must be replaced since there are too many options to getting lost.

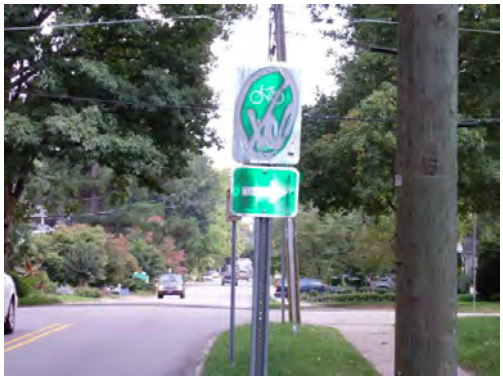
3. No sign at Cowper and Vance; (photo at right) road splits so this is an easy place to get lost.

4. Narrow road on Fairview between Cowper and St. Mary's; this is a tricky area to bike but only one block, alternatives around are not much better.

5. No sign at Fairview and Cambridge; actually got lost here myself and I knew the way!

6. Confusing sign on Glen Eden between Downey and Lubbock; (photo at left) this is a problem, sign has nothing to do with #10 but no real indication of what it does have to do with, old worn out writing indicates in could be Route #3? This should go or be clarified.

Return:



1. Bad sign at Fairview and Cowper; (photo at left) graffiti on sign makes it unclear.

2. No sign a Cowper and Harvey; again, construction has destroyed the signs and should be replaced.

General comments:
When I think of who will use these routes I generally think of a nice young couple out riding on the weekends. If that's the case, this route would be a challenge...it's very hilly. That is not to suggest it should be eliminated; the route is safe (except for one block on Fairview) and the surface is good. Honestly, I've looked at several ways around that and think its' best left alone. But, it does have some significant hills.

Route 11) *Reviewed by Leiza Hall/Paul Bailey*

We rode the complete route, north and south bound, on 9-18-08. Route 11 is approximately 17 miles long, on Raleigh's east side, beginning at the intersection of Seabrook and Sanderford Roads in southeast Raleigh and ending on Durant Rd at the intersection of Camp Durant Rd in northeast Raleigh. The route is made up of lightly traveled residential areas along with some heavily traveled commercial and industrial streets and roads. A good portion of the route is on multi lane and divided roadways. Using the commercial and industrial roadways during peak travel times, unless absolutely necessary, is not recommended.

Cross town routes 6, 8, 9 and 12 intersect with route 11. Walnut Creek, Buckeye, Middle Crabtree Creek and Durant Trails are also accessible from route 11.

Portions of the route are well marked with bike route 11 signs. Others can only be navigated with the use of a map. There is one major flaw with the signing. At the intersection of Sanderford Rd and Rock Quarry Rd heading northbound, the bike route sign has route 11 turning to the right. It needs to be changed to indicate a left turn.

Listed below are intersections where turning signs are missing.

Heading northbound:
No left turn sign on Green Rd at intersection of Brockton Rd
No right turn sign on Whitehall Ave at intersection of Millbrook Rd
No left turn sign on Volant Dr at intersection of Newmarket Way
No right turn sign on Hedgelawn Way at intersection of Pony Run Rd
No right turn sign on Litchford Rd at intersection of Scouting Tr
No right turn sign on Tenderfoot Tr at intersection of Durant Rd

Heading southbound:
No left turn sign on Durant Rd at intersection of Tenderfoot Tr
No left turn sign on Scouting Tr at intersection of Litchford Rd
No right turn sign on Litchford Rd at intersection of Harps Mill Rd
No left turn sign on North Ridge Dr at intersection of Pony Run Rd
No left turn sign on Hedgelawn Way at intersection of Newmarket Way
Right turn sign on Newmarket Way at intersection of
Volant Dr is hidden by foliage
No right turn sign on Spring Forest Rd at intersection of Departure Dr
No right turn sign on Departure Dr at intersection of Millbrook Rd
No right turn arrow with bike route sign on Brockton Dr
at intersection of Green Rd
No right turn sign on Brentwood Rd at intersection of Raleigh Blvd

There is no sign marking the beginning of route 11 at the south end and no sign marking the beginning or end of the route at the north end.

There is no consistency with straight across signs at major cross streets. Some have them, some don't. For example: on Brentwood Rd crossing Capital Blvd there is a straight across sign going south but not one going north.

There is a very dangerous area on both sides of Rock Quarry Rd and Raleigh Blvd south of New Bern Ave where a steel guard rail is built directly on the curb leaving the cyclist with no way to bail out in an emergency.

We were riding between the hours of 10 am and 3 pm so traffic was not an issue most of the time. Spring Forest Rd, however, seems to be busy all the time.

Speed of traffic is an issue on portions of Rock Quarry Rd, Raleigh Blvd and Spring Forest Rd. These are 45 mph zones but most of the traffic is going much faster.

For the most part, lanes on the roads and streets are fairly wide with enough room for cyclists to ride single file. The terrain is moderately rolling with only a few short steep inclines. Except at turning intersections, the route is

fairly straight with good visibility and sight distance.

No note was made of street lighting since this ride was during daylight hours. However, with proper lighting and safety equipment, most of the route could be safely ridden at night.

The streets were mostly clear of debris and the pavement in overall good condition, smooth in most areas.

No dangerous storm grates of other fixed objects were encountered except for the guard rail noted on Rock Quarry Rd and Raleigh Blvd (photo at left).

Some of the turning signs are located a hundred or so feet back from the intersection, which is good. Some of them are right on the corner. They are rather small and hard to read until you get close to them. If they are right on the corner and you have to make a left turn, crossing several lanes of traffic could be dangerous. All turning signs should be far enough back from the turn to allow cyclists to safely make lane changes.

There are very few 'Share the Road' signs on route 11 north of Capital Blvd. More route markings and more share the road signs would make the motoring public more aware that cyclists often use the roads and streets.

On Raleigh Blvd where Middle Crabtree Creek and Buckeye Trail intersect with route 11 there are 'Bike Route' signs that don't indicate which bike route they mark. Greenway signs do not indicate trail names. It would be nice if the signs gave the name of the trail or route.

Route 12) *Reviewed by Zach Cox*

Suggested Extension (Route 12 to Route 10)
The route should be extended from the intersection of Northbrook and North Hills Drive down North Hills Drive (toward Crabtree) to the *second* entrance to the greenway (there are two entrances one just down the hill from the corner of Northbrook and North Hills and another before you get to the end of North hills). Bike Route 12 can continue on the greenway crossing under Glenwood and Blue Ridge, past the McDonalds, still on the greenway up to the corner of Crabtree and old Edwards Mill that climbs up the hill and then right onto Blue Ridge onto an 'END' at Glen Eden, where it intersects with Bike Route 10.

Notes on Route 12:

1. On Pamlico, ready to turn left onto Lassiter Mill Road, the sign indicating turn left is missing.

2. St Albans has been re-routed and there is no sign indicating to go across Dartmouth. (The old route had Camelot continuing then turning into St Albans, now the new street begins at the corner of Camelot and Dartmouth).

3. A sign indicating to continue across Falls of the Neuse is missing.

4. Once across Falls of the Neuse there is no sign indicating to bear left about one block across Falls of the Neuse (this area has been re-routed since the bike route was created).

5. No sign indicating to continue across Atlantic Avenue is present (in either direction) Route 12 continues onto Highwoods.

6. Missing sign indicating a right turn off Glenridge and onto Highwoods

7. Missing sign indicating cross Atlantic and to continue onto Wolfpack

8. Missing sign on Wolfpack Lane indicating right turn onto Bush

9. Incorrect sign on Bush indicating straight instead of left onto St Alabans

10. Missing sign indicating bear right on St Albans and cross Wake Forest

11. Missing sign indicating turn right onto Pamlico (and that bike route 7 continues straight)

12. Missing end of route 12 at corner of Northbrook and North Hills

Note:
There is no Route 13

Route 14) *Reviewed by Andrew Stewart*

This route runs west-east connecting Lake Lynn Park with the Strickland/Falls of Neuse area. Most of the route is hilly with very few straight sections. The road surface is good through out, lane width ranges from moderate to wide, the shoulders vary from wide with good surfaces to non existent. Traffic volume and speed reflect the "suburban" and residential nature with a few exceptions. The route crosses some major streets which have heavy traffic volumes and the western section along Ray Rd while only moderate in volume has higher speeds.

The route is poorly signed. The Lake Lynn Park end and the connection to the Shelly Lake/Sawmill Connector Greenway, at Sawmill Rd, are both missing Bike Route signs. About 12 signs are missing at intersections or

turns. I only saw one sign that was not at a turn or intersection, it confirmed that one was on the route, although not particularly needy where it was.

The one spot that could use more attention is the Ray Rd/Howard Rd intersection and Bike Route turn. The eastern direction has one turning left from Ray Rd onto Howard Rd. I think many recreational cyclists will feel that Ray Rd does not have good line of sight or lane width to make this turn comfortably given the higher speeds the traffic travels at along Ray Rd. More signage at a minimum is recommended.

I rode this route on three occasions, two Sundays in the mid-afternoons and a Wednesday in the late afternoon. As an experienced rider I never felt threatened or "exposed", but less confident riders might feel nervous at the Ray/Howard turn. Overall this route is pleasant.

SUGGESTIONS FOR NEW ROUTES

Proposed Bike Route "Ray Way"

The western end of the Crabtree Creek Greenway and Bike Route 14 could have a connecting Bike Route that also could be extended to connect to two State Bike Routes.

Ray Way would start at Crabtree Creek Greenway's western end in the Oak Park neighborhood, snaking through the adjacent Glen Forrest tract, crossing Glenwood at Fairhill Rd and Rembert Rd (top of the hill above Crabtree mall) leads to the Brookhaven community and via Winthrop Rd to Ray Rd. (The Winthrop/Ray turn is at the top of the hill from Leesville Rd and 100 yards from the Lynn Rd intersection.)

About 1.5 mils further on Ray Rd is Lake Lynn Park and the western end of Raleigh Bike Route 14. This connector is about 5 miles in length. An additional aspect of Ray Way is that if continued further north on Ray Rd, State Bike Routes 1 and 2 will be connected to at Norwood Rd.

The first approximate 3.5 miles of Ray Way are through residential neighborhoods with corresponding low traffic volume and speed. The 1.5 miles to Lake Lynn Park along Ray Rd are a bit busier and faster. Lane width does narrow down along this stretch. However my concerns about the Ray/Howard turn (as told in the Bike Route 14 Report) are lessened on this proposed route as it doesn't turn onto Howard Rd. Still, more signage along this stretch of Ray Rd is a good idea. The next 3.1 miles north to Norwood Rd are much like the previous 1.5 miles with narrow and wider sections. Traffic reduces the further north you go but the traffic speeds creep up too.

I should say that the corridor that Ray Rd provides (between the busier Leesville Rd and Creedmoor Rd) is already a favorite of the cyclists that live along it. I frequently see other cyclists using it to get from the near northwest side of Raleigh to the Falls Lake area. The "official" recognition with resulting signage can only help.

CONCLUSION

The results of these informal evaluations, in concert with consultant consideration, led to the recommendation that the current route system be discarded. The reasoning behind this recommendation is summarized in the following points:

- First and foremost, the Plan now defines a Bicycle Level of Service for the entire City. Since bicycles are considered vehicles, they are entitled to use the roadways as constructed.

- Second, there are many bicyclists that are not going to feel comfortable using the City's roadways as currently constructed. The Plan recommends a number of improvements that over time will make the entire community more bicycle friendly, and this includes substantial physical improvements to the roadway environment.

- Third, the current bicycle route system does not have substantial function nor utility. Bicyclists at public workshops, including commuter bicyclists, rarely used the existing signed and marked route system.

- Fourth, as the existing system evaluation revealed, many of the routes are missing essential signage and contain many awkward turns, street crossings, and directional issues that cause bicyclists not to follow the intended routes. This system of route designation is an outdated method of accommodating bicyclists.

- Fifth, a route system may imply falsely where bicyclists can bicycle in the City. It is a goal of this plan to encourage more people to bicycle and that should be done through facility development.

- Sixth, the City would be better served to direct its resources into the production of an updated Bicycle Map that provides current, updated information for bicyclists.

- Seventh, in the future, bicycle commuting routes may emerge from the newly developed bicycle facility network for the City that have greater function, utility, and safety. In upcoming years, the City can explore once again the use and utility of a signed route for commuters.

APPENDIX A OUTLINE:
Overview
Public Workshops
Public Opinion Form
Public Opinion Form Results
Public Workshop Map Comments

APPENDIX A: PUBLIC INPUT SUMMARY

OVERVIEW

Significant public input was gathered from multiple efforts throughout the planning process, which helped shape the outcome of a majority of the recommendations in this Plan. Public input was solicited via two public workshops, public outreach, paper opinion forms, and an online interactive version of the opinion form. A Steering Committee, composed of Raleigh officials and residents, was created to guide and foster the development of this Plan. The variety and depth of public input sought to ensure that a range of citizens from all areas of Raleigh were expressed and represented.

Two public workshops occurred during this planning process. Approximately 183 people attended these, providing input into plan recommendations. Above: Photo from first public workshop at Glen Eden Neighborhood Center. Below: Photo from second public workshop at the Sertoma Arts Center.

PUBLIC WORKSHOPS

Two public workshops were conducted during the planning process, each drawing significant comment, suggestion, support and awareness for the project. Newsletters were created and distributed at each Public Workshop, to keep the public abreast of the planning process. Copies of these newsletters can be found later in this appendix.

The initial public workshop was held in April 2008 at the Glen Eden Neighborhood Center and introduced the project to the public. Informational boards outlined the planning process, project timeline, and announced opportunities for public input. Participants were asked to add their goals and visions to the Project Goals Board. Additionally, base maps of the Raleigh area were provided to gather input on desired bicycling routes, problem areas, areas of opportunity and existing bicycle facility identification. Approximately 70 people attended this meeting.

The second public workshop was held in August 2008, during the final phases of the project. Preliminary network maps were presented at the Sertoma Arts Center and people were solicited for comments. 113 attended this workshop, providing input through map markups, direct conversation with client and consultant, and comment forms.

PUBLIC OPINION FORM

An online comment form was created for the Raleigh Bicycle Plan. The consultant worked with the City of Raleigh and Steering Committee to prepare questions and tabulate the results of this survey that received 838 online and paper responses. The online survey link was made available on the City of Raleigh's website, distributed to numerous local email listserves, and publicized at each of the public workshops. The survey contained 32 questions related to bicycling and demographics.

A variety of respondents completed the survey including a wide range of age groups and user groups. The majority of respondents were bicyclists. In general, most respondents supported the concept of a more bikeable community. People wanted to bike to a number of locations including greenways/trails, parks, and shopping. The leading factor that discouraged respondents from biking was a lack of bicycle facilities, especially bicycle lanes and greenways.

PUBLIC OPINION FORM RESULTS

1. How important to you is improving bicycling conditions in the Raleigh area? (select one)

	Response Percent	Response Count
Very important	**93.5%**	780
Somewhat important	5.4%	45
Not important	1.1%	9
	answered question	**834**
	skipped question	**5**

2. How do you rate present bicycling conditions in the Raleigh area? (select one)

	Response Percent	Response Count
Excellent	1.6%	13
Fair	47.1%	393
Poor	**51.3%**	428
	answered question	**834**
	skipped question	**5**

3. What bicycling destinations would you most like to get to? (choose all that apply)

	Response Percent	Response Count
Downtown	69.5%	572
NC State	40.7%	335
Other college	10.1%	83
Elementary, Middle, or High Schools	18.2%	150
Grocery stores	55.3%	455
Places of work	68.3%	562
Restaurants	39.7%	327
Public Transportation	35.1%	289
Other Shopping (retail stores)	32.7%	269
Parks	71.1%	585
Entertainment	32.8%	270
Trails and greenways	**80.2%**	660
I DON'T BICYCLE.	2.2%	18
Other specific location (please specify)	17.5%	144
	answered question	**823**
	skipped question	**16**

4. What do you think are the top three roadway intersections (in Raleigh City limits) most needing bicycling improvements? (Example response: Smith Street & 1st Avenue)

Blue Ridge & Hillsborough	28
Glenwood and Peace	26
Hillsborough and Oberlin	25
Hillsborough and Gorman	24
Glenwood and Creedmor	24
Avent Ferry and Western	23
Millbrook and Six Forks	23
Morgan and Hillsborough	22
Five Points	21
Six Forks and Wake Forest	21

5. What do you think are the top three roadway corridors (in Raleigh City limits) most needing bicycling improvements?	
Hillsborough St.	163
Glenwood Ave.	117
Six Forks Rd.	79
Capital Blvd	66
Wade Ave.	59
Creedmoor Rd.	40
Falls of Neuse Rd.	39
Western Blvd.	37
Avent Ferry Rd.	36
Peace St.	36
Wake Forest Rd.	33
Blue Ridge Rd.	31
Atlantic Ave.	27
Oberlin Rd.	26
Millbrook Rd.	16
New Bern Ave.	15
Lake Wheeler Rd	13
Leesville Rd.	12
Strickland Rd	12
Tryon Rd.	12
Duraleigh Rd	11
Edwards Mill Rd	10
Poole Rd.	9
Buck Jones Rd	8
Ebenezer Church Rd	7

6. What other bicycle related improvements do you consider priorities?	
More bike lanes	82
Connect and expand greenways	52
More roadway space for bicyclists	42
Drivers education	36
More bicycle parking	34

7. How long have you been bicycle riding? (select one)

	Response Percent	Response Count
Do not bicycle	2.2%	15
1-2 years	10.0%	69
2-5 years	13.9%	96
5-10 years	12.3%	85
10-20 years	19.3%	133
20+ years	**42.3%**	292
	answered question	**690**
	skipped question	**149**

8. How frequently do you bicycle? (select one)

	Response Percent	Response Count
never	3.3%	23
few times per month	23.1%	159
few times per week	**47.1%**	324
5+ times per week	26.5%	182
	answered question	**688**
	skipped question	**151**

9. Which statement best describes your comfort level on a bicycle.

	Response Percent	Response Count
I am comfortable bicycling on the road with automobiles in all situations, including heavy traffic.	38.2%	263
I am most comfortable on off-road paths or in a clearly designated bicycle lane.	**45.1%**	310
I don't feel comfortable sharing any roadway with cars and prefer off-road paths or very low-traffic residential roads.	16.7%	115
	answered question	**688**
	skipped question	**151**

10. How many people are in your household? (select one)

	Response Percent	Response Count
1	15.9%	110
2	**44.7%**	309
3	14.5%	100
4	20.1%	139
5+	4.8%	33
	answered question	**691**
	skipped question	**148**

11. How many bicycles do you have in your household? (select one)		
	Response Percent	Response Count
0	0.7%	5
1	13.2%	91
2	21.5%	149
3	17.6%	122
4	17.8%	123
5+	**29.2%**	202
	answered question	**692**
	skipped question	**147**

12. How many automobiles are at your household? (select one)		
	Response Percent	Response Count
0	1.2%	8
1	21.8%	151
2	**57.1%**	395
3	15.6%	108
4	3.6%	25
5+	0.7%	5
	answered question	**692**
	skipped question	**147**

13. Which terms most describe your current level of bicycling activity? (choose all that apply)

	Response Percent	Response Count
Do not bicycle	3.0%	21
Bicycle occasionally for short, utilitarian trips (1-5 times per month)	18.7%	129
Bicycle regularly for short, utilitarian trips (1-5 times per week)	26.7%	184
Bicycle occasionally on-road for fitness or recreation (1-5 times per month)	30.1%	208
Bicycle regularly on-road for fitness or recreation (1-5 times per week)	**49.1%**	339
Occasionally commute by bicycle (3-5 days a month)	20.0%	138
Regularly commute by bicycle (3-5 days a week)	26.1%	180
Occasionally mountain bicycle (1-2 times per month)	20.9%	144
Regularly mountain bicycle (1-2 times per week)	16.8%	116
	answered question	**690**
	skipped question	**149**

14. Should public funds be used to improve bicycle transportation options? (yes/no)

	Response Percent	Response Count
Yes	**97.7%**	675
No	2.3%	16
	answered question	**691**
	skipped question	**148**

15. Which types of funds should be used to improve bicycle transportation options? (please check all that apply)

	Response Percent	Response Count
Existing local taxes	78.9%	537
New local taxes	39.6%	270
State and federal grants	81.5%	555
NCDOT maintenance funds	**87.7%**	597
Other (please specify)	21.9%	149
	answered question	**681**
	skipped question	**158**

16. Is there a bicycle path, greenway trail, or bicycle lane within a half mile of your home? (yes/no)

	Response Percent	Response Count
Yes	49.3%	309
No	**50.7%**	318
	answered question	**627**
	skipped question	**212**

17. Do you ride on the bicycle path, greenway trail, or bicycle lane near your home? (yes/no)

	Response Percent	Response Count
Yes	**79.7%**	247
No	20.3%	63
	answered question	**310**
	skipped question	**529**

18. If there was a bicycle path, greenway trail, or bicycle lane within a half mile of your home, would you ride on it? (yes/no)

	Response Percent	Response Count
Yes	**94.7%**	305
No	5.3%	17
	answered question	**322**
	skipped question	**517**

19. Which of the following factors prevent you from bicycling or from bicycling more often? (choose all that apply)

	Response Percent	Response Count
Lack of bicycle lanes, paved shoulders, or paths	**76.8%**	522
Gaps in bicycle facilities	39.1%	266
Narrow lanes	62.5%	425
Other travel modes are safer or more comfortable	23.5%	160
Crossing busy roads	51.5%	350
Hills	7.5%	51
Loose gravel or potholes	18.8%	128
Yard waste in bicycle lane	14.6%	99
Drainage grates	12.5%	85
Poor lighting (along routes/trails or at roadway crossings)	18.5%	126
Personal safety (from crime)	9.4%	64
Physical ability	3.2%	22
Travel time or distance	19.7%	134
Heavy traffic	52.9%	360
High-speed traffic	60.4%	411
Inconsiderate motorists	66.0%	449
Lack of bicycle parking	23.1%	157
Lack of showers and lockers at workplace	19.0%	129
NOTHING	6.5%	44
Other (please specify)		92
	answered question	**680**
	skipped question	**159**

20. Which of the following changes would encourage you to bike more often? (choose all that apply)

	Response Percent	Response Count
Increased enforcement on speeding	32.0%	216
Commuter programs or incentives	37.5%	253
Bicycle racks at destination	36.4%	246
Showers or locker rooms at workplace	25.0%	169
Map of bicycle routes	35.3%	238
More bicycle lanes	**83.6%**	564
More off road bike paths or greenways	67.7%	457
More programs and events for new cyclists	17.9%	121
Safety education	26.7%	180
More bike racks on buses	18.1%	122
Lower speed limits	19.6%	132
NOTHING	2.1%	14
Other (please specify)		137
	answered question	**675**
	skipped question	**164**

21. Please rate the importance of each of the following transportation improvements in the Raleigh area. (rank in order, with 1 being the highest priority)

	#1	#2	#3	4	Rating Average	Response Count
Automobile/roadway improvements	19.9% (131)	13.9% (91)	18.6% (122)	**47.6% (313)**	2.94	657
Bicycle improvements	39.8% (263)	**41.1% (271)**	14.1% (93)	5.0% (33)	1.84	660
Pedestrian improvements	8.8% (58)	25.2% (165)	**41.2% (270)**	24.8% (163)	2.82	656
Public Transportation improvements	**33.4% (222)**	21.2% (141)	25.6% (170)	19.8% (132)	2.32	665
					answered question	**682**
					skipped question	**157**

22. How often do you take your bike on a Capital Area Transit (CAT) bus?

	Response Percent	Response Count
Never	**89.2%**	611
A few times per year	6.3%	43
A few times per month	2.8%	19
A few times per week	1.6%	11
Five or more times per week	0.1%	1
	answered question	**685**
	skipped question	**154**

23. How often do you take your bike on a Triangle Transit Authority (TTA) bus?

	Response Percent	Response Count
Never	**89.4%**	613
A few times per year	6.1%	42
A few times per month	2.3%	16
A few times per week	1.6%	11
Five or more times per week	0.6%	4
	answered question	**686**
	skipped question	**153**

24. Which aspect of biking is most appealing to you? (choose all that apply)

	Response Percent	Response Count
Increased health and fitness	**96.1%**	659
Money saved on fuel	70.8%	486
More time outdoors	78.3%	537
Faster commute	14.4%	99
Easier to find convenient parking	20.7%	142
Fewer traffic jams	26.2%	180
Reducing the amount of time spent in a car	50.7%	348
Less negative impact on the environment/preserving the environment	78.0%	535
I DO NOT BICYCLE.	1.5%	10
Other (please specify)	10.3%	71
	answered question	**686**
	skipped question	**153**

25. How do you feel drivers in your area typically behave around bicyclists? (Please check all that apply)

	Response Percent	Response Count
Courteous, yield, and give bicyclists space	28.4%	193
Drive too fast	57.4%	390
Pass bicyclists too closely	**68.8%**	467
Tolerate bicyclists not following rules of the road	15.6%	106
Harass bicyclists	32.8%	223
Fail to yield to bicyclists crossing a street	37.4%	254
Other (please specify)	16.9%	115
	answered question	**679**
	skipped question	**160**

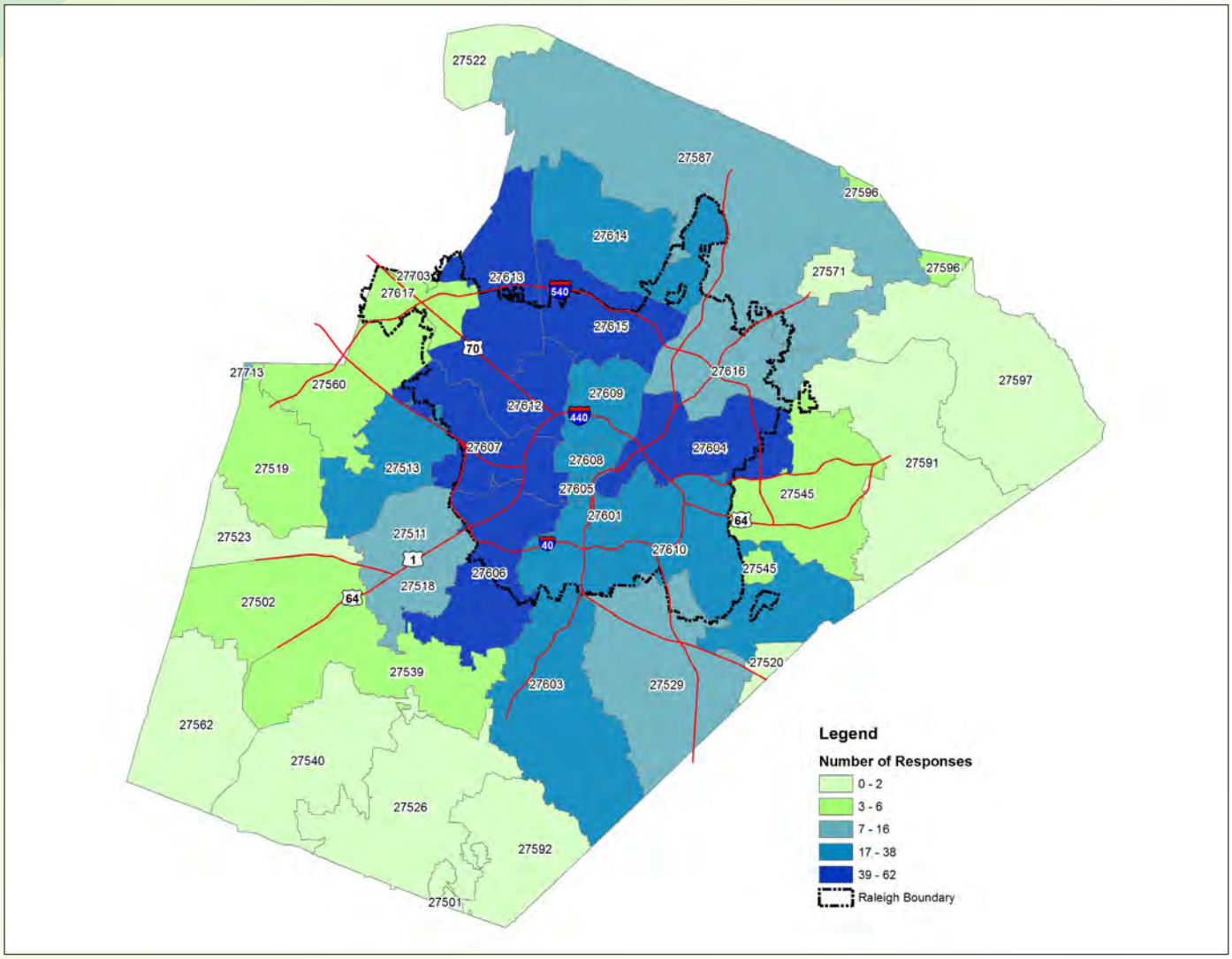
26. How do you feel bicyclists in your area typically behave? (Please check all that apply)

	Response Percent	Response Count
Courteous, obeying all traffic laws	**57.2%**	365
Cycle in the roadway the opposing direction as vehicles	14.1%	90
Fail to comply with traffic laws	40.6%	259
Ride too slowly	5.0%	32
Are young and/or inexperienced	13.0%	83
Multiple cyclists ride abreast in the same travel lane	29.0%	185
Behave rudely	5.6%	36
Don't signal turns or stops	35.7%	228
Ride on sidewalks	41.4%	264
Ride at night without lights	23.5%	150
	answered question	**638**
	skipped question	**201**

27. What is your zip code?

27613	62	27518	7	27501	1
27612	61	27560	6	27526	1
27607	60	27617	6	27549	1
27604	49	27502	4	27592	1
27606	44	27519	4	27619	1
27615	44	27545	4	27701	1
27609	38	27703	4	27707	1
27513	35	27539	3		
27605	33	27596	3		
27614	33	27517	2		
27603	29	27520	2		
27608	29	27522	2		
27610	21	27523	2		
27601	17	27527	2		
27616	12	27540	2		
27587	10	27602	2		
27511	9	20815	1		
27529	8	27278	1		
27713	8	27312	1		

The zipcode map below shows the geographic distribution of respondents to the comment form throughout Wake County and the City of Raleigh. The distribution is fairly representative and equitable with the most response coming from west and northwest Raleigh zipcodes.



28. What is your gender?

	Response Percent	Response Count
Male	**69.9%**	475
Female	30.1%	205
	answered question	**680**
	skipped question	**159**

29. What is your age?

	Response Percent	Response Count
0-9	0.0%	0
10-19	1.6%	11
20-29	18.6%	127
30-39	**28.4%**	194
40-49	28.0%	191
50-59	19.8%	135
60 and older	3.5%	24
	answered question	**682**
	skipped question	**157**

31. Where do you live? (select one)

	Response Percent	Response Count
Raleigh	**76.4%**	505
Cary	8.8%	58
Durham	2.7%	18
Wake Forest	1.7%	11
Knightdale	0.6%	4
Garner	1.4%	9
Wake County, outside Raleigh City limits	8.5%	56
	Other (please specify)	40
	answered question	**661**
	skipped question	**178**

PUBLIC WORKSHOP MAP COMMENTS

Sub-Area	Category	Workshop / Map Referenc	# / Comment
Note: The sub-areas of 'North Raleigh', 'East Raleigh', and 'West Raleigh' are delineated for public input analysis only. 'North Raleigh' refers to areas north of US 70 and US 401. 'East Raleigh' refers to areas south and east of US 401. 'West Raleigh' refers to areas south and west of US 70. Comments are written verbatim and assigned a number on the input map. Clarification of both written and drawn comments are in parenthesis.			
Public Workshop #1			
West Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	1. When will Wade Avenue to the beltline bridge be connected? (North of Merideth College, from the shopping center on Wade Ave to the existing trail)
West Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	2. Why is this a bike lane only part time? (Regarding the bike lane on Ridge Road near the Wade Ave shopping center) Employees of Whole Foods are allowed to park in the bike lane certain hours of the day.
West Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	3. Service Road and Trails (noted in Umstead State park)
West Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	4. New pavement, but no bike marking or shoulder (on Ebenezer Church Road, running just east of Umstead, from Graylyn Road to Duraleigh Road)
West Raleigh, North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	5. Crossing (improvements needed at the intersection of Glenwood Ave and Graylyn Road)
West Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	6. Bike Path (requested on Blue Ridge Road, from Edwards Mill Road to Western Blvd)
West Raleigh	Ancillary Facility	Glen Eden, Map #1 4/2/08	7. No Parking (signs noted along entrances to Umstead State Park at Graylyn Road, reedy Creek Road, and Trenton Road)
West Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	8. (greenway requested along creek from Umstead State Park to Crabtree Creek Trail)
West Raleigh, North Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	9. Better lighting needed here (at Crabtree Creek Greenway underpass at US 70/Glenwood Ave)
West Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	10. (Greenway requested parallel and east of I-440, from Glen Eden Drive to existing trail at the beltline bike/ped bridge)
West Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	11. (Commonly used on-road bike route noted on Glen Eden Drive, from US 70/Glenwwod Ave west to Ridge Road > south on Ridge Road to Wade Avenue > east on Wade Avenue to Faircloth Street > south on Faircloth to Hillsborogh Street)
West Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	12. (Intersections noted for improvement: Ridge Road/Wade Avenue and Wade Avenue/Faircloth)
West Raleigh, North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	13. Bike Path (requested on, or along Glenwood Avenue/US 70, from I-440 to Hillsborough Street)
West Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	14. (Bicycle facility requested on Oberlin Road, from Glenwood Ave/US 70 to Hillsborough Street)
West Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	15. Trails? (Circled area around NCSU Campus)
West Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	16. Work with Meredith College on (greenway) access issues: gate is open daylight hours only; commuters need access, like on the American Tobacco Trail (which is open until 10:00 PM for commuters)
Citywide	Policy/Program	Glen Eden, Map #1 4/2/08	17. Regional Map (requested for bicycle facilities)
West Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #1 4/2/08	18. Need a good east-west connector between Raleigh and RTP - through Umstead and Cary? (Bike/Ped) Bridge over 70?
Citywide	Policy/Program	Glen Eden, Map #1 4/2/08	19. Allow mountain bike trail development in City parks: Build facilities for all cyclists; on- and off-road cyclists
East Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	20. Link and show At. Augustine's College (trail connection requested from St. Augustine's College, south to Little Rock Trail on Watson Street)
East Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	21. Link these greenways? (trail connection requested from Buckeye Trail to Anderson Point)
Citywide	Greenway Facility	Glen Eden, Map #1 4/2/08	22. Connect existing greenways with dowtown Raleigh
East Raleigh, North Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	23. Future Trail (requested along the Nuese River from Falls Lake to the existing Nuese River trail near Milburnie Park)
Citywide	Ancillary Facility, Policy/Program	Glen Eden, Map #1 4/2/08	24. Some crosstown bike routes are not signed well
North Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	25. Why is the (Middle Crabtree Creek Trail) still closed? (noted just south and west of the exit ramps for Capital Blved at I-440)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	26. (Commonly used on-road bike route noted on Granville Road from Glenwood Avenue/US 70, east to Aleghany Drive > Aleghany Drive north to Crabtree Valley Trail > then north across I-440 on Yadkin Drive)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	27. Too narrow (noted on Six Forks Road, from I-440, south to Wake Forest Road)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	28. Tight (area noted along Wake Forest Road around intersection of I-440)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	29. Bad; No Shoulder (On St. Albans Drive, from Wake Forest Road to Apache Drive)

Sub-Area	Category	Workshop / Map Referenc	# / Comment
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	30. Restripe (St. Albans Drive is wide enough to restripe from I-440 to Wake Forest Road)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	31. Bike Lane/Bike Route (requested along Six Forks Road, from I-540 to I-440)
North Raleigh	Ancillary Facility	Glen Eden, Map #1 4/2/08	32. Need lights in tunnel (Bent Creek Trail at North Hills Road)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	33. Need shoulders to I-440 (on Falls of the Nuese Road from Millbrook Drive)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	34. Check intersection approach (on Falls of the Nuese Road, heading south into intersection with E. Millbrook Road)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	35. Bike lanes (requested on falls of the Nuese Road, from I-540 to E. Millbrook Rd.)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	36. This detour makes no sense! Keep on Spring Forest; safer too (noted near Spring Forest Road and Rainwater Road on Bike Route #11)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	37. Bike Route #11 (drawn on map)
North Raleigh	Bike Facility, Ancillary Facility	Glen Eden, Map #1 4/2/08	38. Turn arrow needed (at intersection of Spring Foest Road and Departure drive)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	39. Restripe (Sawmill Road, from Falls of the Nuese to Lead Mine Road)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	40. Check Stripping (Sawmill Road, from Lead Mine Road to Creedmore Rd)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	41. Bike Lane (Requested on Creedmore Road, from Strickland Road to Glenwood Avenue/US 70)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	42. Shoulders needed (on Leesville Road, from Norwood Road to W. Millbrook Road.
North Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	43. Nedd connection to bike trail. Currently not open to mountain bikers. (Noted in area around Leesville Park)
North Raleigh	Greenway Facility	Glen Eden, Map #1 4/2/08	44. (Greenway requested from Bent Creek Trail, north to I-540 near Honeycutt Park; existing tunnel noted under I-540)
North Raleigh	Ancillary Facility	Glen Eden, Map #1 4/2/08	45. Trek Raleigh (store location noted on Durant Road)
North Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #1 4/2/08	46. Access over Durant Road needed (along existing 'Durant Connector Trail' near Raven Ridge Road; no connectivity or safe crossing noted between school, Durrant Nature Park, and the neighborhoods north of Durant Road)
North Raleigh	Bike Facility	Glen Eden, Map #1 4/2/08	47. (Bike facility requested for Falls of the Nuese Road, from I-540 north > to a proposed greenway connection to New Falls of the Nuse Road > continuing on New Falls of the Nuese > ending at Capital Blvd.)
North Raleigh	Ancillary Facility	Glen Eden, Map #1 4/2/08	48. (Future trail crossing requested as needed at Raven Ridge Road near Koupela Drive)
North Raleigh	Ancillary Facility	Glen Eden, Map #1 4/2/08	49. M.B. (mountain bike trails requested at Falls Lake)
North Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	1. Wide outside lane existing (on Sawmill Road, from Six Forks Road to Creedmoor Road)
North Raleigh, West Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	2. (Potential bike route noted from I-440 near Six Forks Road, south to Dorthea Dix Soccer park; Route travels along the following roads: Lassiter Mill Road > Ramblewood Drive > Bellvue Road > W. Drewery Lane > Crabtree Chase Drive > Anderson Drive > Hazelwood Drive > Reeves Drive > Aycock Road > Glenwood Ave > Devereux Street> Boylen Avenue > Rocky Branch Trail)
West Raleigh	Greenway Facility	Glen Eden, Map #2 4/2/08	3. Finish This! (greenway connection between Umstead State park and Crabtree-Oak Park Trail)
West Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	4. Wide shoulders on Ebenezer Church Road (from Glenwood Ave/US 70 to Duraleigh Road)
West Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	5. Add bike lanes or wide outside lanes (on Blue Ridge Road from Glenwood Ave/US 70 to Duraleigh Road)
Citywide	Policy/Program, Bike Facility	Glen Eden, Map #2 4/2/08	6. Get Raleigh future road GIS layer (for analysis in the Bike Plan)
Citywide	Policy/Program, Bike Facility	Glen Eden, Map #2 4/2/08	7. Consider bike accomodations while doing rerouting of road projects
East Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	8. Check for improvement plans (of the intersection and/or surrounding area of Rock Quarry Road/New Hope Road/Jones Sausage Road
East Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	9. Need improvements (on Poole Road, from Rose lane to Sunnybrook Road)
East Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #2 4/2/08	10. What is the best connection? (between Downtown and middle Crabtree Creek Trail)
West Raleigh	Ancillary Facility	Glen Eden, Map #2 4/2/08	11. Farmer's Market (location noted as a trip attractor near intersection of Avent Ferry and Lake Wheeler Road)
West Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	12. Needs bike accomodations (Gorman Street, from Hillsborogh Street to Western Blvd.)
West Raleigh	Bike Facility	Glen Eden, Map #2 4/2/08	13. Maintenance (needed on Hillsborough Street, from Morgan to Pullen)
Citywide	Bike Facility	Glen Eden, Map #3 4/2/08	1. Need a good east-west bike corridor - to Cary; NC 54 and Hillsborough Street?
Citywide	Policy/Program	Glen Eden, Map #3 4/2/08	2. Promote safety for cyclists by building driver-awarness: follow speed limits, stop at traffic lights, etc.
West Raleigh, East Raleigh	Policy/Program, Greenway Facility	Glen Eden, Map #3 4/2/08	3. Low area, needs high-level maintenance (for corridor north of Tryon street and south of Rush Street)
Citywide	Policy/Program, Ancillary Facility	Glen Eden, Map #3 4/2/08	4. Signage should be first priority when built; bike lanes need to signed

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West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	5. There are a lot of cyclists using Oberlin Road (Check for possible improvements)
East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	6. Two-way on Person & Bount? (Is this feasible & would this be good for cyclists?)
Citywide	Policy/Program	Glen Eden, Map #3 4/2/08	7. No motorized bikes on greenways
East Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	8. (Greenway connection requested from Worthdale Trail to Walnut Creek Trail, to Neuse River)
East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	9. (Good on-road route, check for improvements; from N. Peartree Lane at Buckeye Trail, south to Donald ross Drive > the east to Sunnybrok drive via either Kidd Road or Poole Road > south on Sunnybrook Drive to Rock Quarry Road)
East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	10. (Good on-road route, check for improvements; from Sunny Brook, west on Rock Quarry Road to the fllowing roads: Crosslink Road > Rush Street > Renfrow Rd > Carolina Pines Ave > Henslow Drive > Sierra drive > Lineberry Drive > to either north or south on Trailwood Drive.)
East Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	11. Open Trail (between S. Wilmington Street and Garner Road, just north of I-40)
East Raleigh	Ancillary Facility	Glen Eden, Map #3 4/2/08	12. Wake Wed (location noted as trip attractor at south end of Buckeye Trail)
East Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	13. (Greenway connection requested between south end of Buckeye Trail and Anderson Point, along Crabtree Creek to the Nuese River)
Citywide	Policy/Program	Glen Eden, Map #3 4/2/08	14. Is there an existing downtown bike/walk historic tour? - Look into it.
East Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	15. Greenway or paved shoulders (along North Raleigh Blvd, from Brentwood Road to Trawick Road)
North Raleigh, East Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	16. Greenway-Sewerline (Greenway requested on sewerline running north-south from Brentwood Trail to Timberlake Park, contiuing south across I-440 to Buckeye Trail)
East Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	17. (Check conditions at I-440 and Brentwood Drive)
North Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	18. Status of bridge?/Closed? (Middle Crabtree Creek Trail, near the I-440 exit ramps at Capital Blvd)
North Raleigh, East Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	19. (Check conditions at I-440 and Capital Blvd)
East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	20. East-West connector (possible bike route noted along Glasscock Street and Larson Drive, from Delway Street to Chatham Lane)
North Raleigh, East Raleigh	Bike Facility, Ancillary Facility	Glen Eden, Map #3 4/2/08	21. Connectivity! (needed across Capital Blvd; possible bike/ped bridge across Capital Blvd, between Peace Street and Wake Forest Rd)
North Raleigh, East Raleigh	Bike Facility, Ancillary Facility	Glen Eden, Map #3 4/2/08	22. (Check current connditions on Atlantic Ave bridge over Capital Blvd; noted as poor; only way across for approximately one mile heading south)
North Raleigh, East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	23. (Check current connditions on Peace Street across Capital Blvd; only way across for approximately one mile heading north)
East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	24. (dowtown connector: along Salisbury Street, from downtown, to Halifax, to Franklin, to Harp, to Delway, to Person/Mordecai)
East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	25. (dowtown connector: along Bount Street, from downtown, to Peace, to N. Boundary Street, to Brookside Drive)
East Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	26. Connect Shaw and St. Augistine; off-road or sidepath
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	27. (Check W. Cabarrus Street as a downtown connector from Rocky Branch Trail)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	28. (Check S. Boylen as a connector to Rocky Branch and dorthea Dix)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	29. Heavey cycling use (On Yeates Mill Pond Road from Tryon Road south)
West Raleigh	Ancillary Facility	Glen Eden, Map #3 4/2/08	30. (Area of high student population noted south of Avent Ferry Road, near Lake Johnson)
West Raleigh	Bike Facility, Ancillary Facility	Glen Eden, Map #3 4/2/08	31. Closing time for bike/ped bridge over I-440 is bad for commuter cyclists.
West Raleigh	Bike Facility, Ancillary Facility	Glen Eden, Map #3 4/2/08	32. Perhaps an alternative route is needed from greenway to Ridge Road.
West Raleigh	Bike Facility, Ancillary Facility	Glen Eden, Map #3 4/2/08	33. Yes (in response to comment #31, Map #3)
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	34. Connection through Centenial! (from upper Walnut Trail to Rocky Branch Trail)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	35. Not bike-friendly: needs improvements (along Avent Ferry Road, from Lake Johnson to Western Blvd)
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	36. Rocky Branch (greenway connection requested from Rocky Branch to reedy Creek Trail through NCSU)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	37. Poorly maintained (noted on Founders Road, from Ashe Ave to Faircloth Street)
West Raleigh	Bike Facility, Ancillary Facility	Glen Eden, Map #3 4/2/08	38. Roundabout? (noted on intersection of Founders Road/Ashe Avenue/E. Morgan Drive)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	39. (Check condition on W. Morgan, from N. Dawson to Founders Road)
West Raleigh, North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	40. Rush hour is bad (noted on Glenwood Ave/US 70 from W. Morgan to Fairview Road)

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West Raleigh, North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	41. (Check conditions on Fairview Road, from Glenwood Ave/US 70 to Oberlin Road)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	42. Check for restripe (on Oberlin Road, from Fairview Road, to Founders Road)
West Raleigh	Ancillary Facility, Policy/Program	Glen Eden, Map #3 4/2/08	43. Bike Coop (location noted as a trip attractor on Chamberlain Street near Garden Street Trail)
West Raleigh	Ancillary Facility	Glen Eden, Map #3 4/2/08	44. Bike Shop (location noted as a trip attractor on Wade Ave and Ridge Road)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	45. (Commonly used route noted Faircloth Street, to Wade, to Ridge Road, to Glen Eden, to Blue Ridge, to Crabtree Valley Trail)
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	46. High demand! (noted for greenway connection between Ridge Road and the I-440 bridge)
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	47. House Creek (greenway connection requested along the east side of I-440, from the bike/ped bridge to Glen Eden Drive)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	48. Dangerous (noted on Lake Boone Trail, from Duraleigh Road to Glenwood Ave/I-440)
West Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	49. (greenway or sidepath connection requested along Wade Ave between Reedy Creek Trail and Ridge Road)
West Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	50. Need bike connection to Fairgrounds (location noted at intersection of Blue Ridge Road and Hillsborough Street)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	51. (Check for possible facilities on Youth Center Drive, from Hillsborough Street to RBC Center Road and Loblolly Trail; Also check along Westchase Blvd)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	52. Multiple crashes; dangerous (Noted along Blue Ridge Road from Hillsborough Street to Macon Pond Road)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	53. Existing bicycle lanes (noted on Edwards Mill Road, from Wade Avenue to Reedy Creek Road)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	54. Existing Sidepath (noted on Reedy Creek Road, from Edwards Mill Road to Reedy Creek Lake)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	55. These median strips making riding here very dificult! Why are they even there? (noted along Reedy Creek Road, just west of Edwards Mill Road)
West Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	56. Outside beltline there are many destinations, not many options (for getting there; mentioned near Fairgrounds)
West Raleigh	Policy/Program	Glen Eden, Map #3 4/2/08	57. Slower speed fo cars (request on Reedy Creek Road near Reedy Creek Lake)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	58. Wider Shoulders on Ebenezer Church Road (From Umstead State Park to Duraleigh Road)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	59. (Check for potential improvements along Trenton Road, from Reedy Creek Road to SAS Campus Drive; from SAS, connect on-road to Cary)
West Raleigh, North Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	60. Getting across 70 towards RTP is difficult
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	61. Connect Raleigh and Cary (through Umstead State Park trails)
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	62. Please complete! (noted for greenway connection between Umstead State Park and Crab Tree-Oak Park Trail)
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	63. Missing Link!!! (noted for greenway connection between Umstead State Park and Crab Tree-Oak Park Trail)
West Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	64. Build a bridge over low spot on Ceder Ridge Trail, so I can ride when wet! (noted in Umstead State Park)
West Raleigh	Ancillary Facility	Glen Eden, Map #3 4/2/08	65. Rock Quarry (location noted near Umstead State Park)
West Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	66. Wider shoulder on Ebenezer Church Road (noted along entire border of Umstead State Park)
West Raleigh	Policy/Program, Ancillary Facility	Glen Eden, Map #3 4/2/08	67. Allow parking for bike commutters on Ebenezer Church Road at Umstead: take down no parking signs at park entrance
Citywide	Policy/Program, Bike Facility	Glen Eden, Map #3 4/2/08	68. My prefernce is for wider roads over bike lanes. Bike landes always have rocks, etc., in them and drivers perception is that you are only allowed in the road if you are in the bike lane!
Citywide, North Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	69. Connect Crabtree Greenway to downtown!
Citywide	Bike Facility	Glen Eden, Map #3 4/2/08	70. I-440- Significant barrier to bicycles!!!
North Raleigh, West Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	71. (Check out intesection of I-440 and Glenwood Avenue for improvements)
Citywide	Policy/Program, Bike Facility	Glen Eden, Map #3 4/2/08	72. Resign existing bike routes (particularly noted in area of I-440 and Glenwood Ave/US 70)
North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	73. (Check potential bike route for improvements: From White Oak Road at Glenwood Avenue, to Oxford Road, to Fallon Creek Trail/Middle Crabtree Creek Trail)
North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	74. (Check potential bike route for improvements: From Whitaker Mill Road at Glenwood Avenue, to Noble Road, to Fallon Creek Trail/Middle Crabtree Creek Trail)
North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	75. (Check out intesection of I-440 and Six Forks Road for improvements)

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North Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	76. Creek (check out potential connection underneath I-440 between Six Forks Road and Wake Forest Road)
North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	77. (Wake Forest Road, from E. Six Forks Road to St. Albans Drive, is noted as too tight for bicycles)
North Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #3 4/2/08	78. Connect these neighborhoods to the greenway (across I-440, from Brentwood Trail area to the Middle Crabtree Creek area)
North Raleigh	Greenway Facility	Glen Eden, Map #3 4/2/08	79. Rail Road ROW? (check out opportunity for access parellel to Atlantic Avenue, from Middle Crabtree Creek, across I-440, and north towards Wake Forest)
North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	80. (Check on-road conditions on Atlantic Avenue near and across I-440)
North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	81. No shoulder (check conditions on Stalbans Drive, from Wake Forest Road to New Hope Church Road)
North Raleigh	Ancillary Facility	Glen Eden, Map #3 4/2/08	82. Bike shop (location noted as a trip attractor, near Milbrook Road and Falls of the Nuese Road)
North Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	83. Bike Lanes; Restripe (On Falls of the Nuese Road, from Milbrook Road north past Spring Forest Road)
East Raleigh	Bike Facility	Glen Eden, Map #3 4/2/08	84. Road diet for Wake Forest Road south of Capital Blvd?
Citywide	Policy/Program, Greenway Facility	Glen Eden, Map #3 4/2/08	85. Open greenway facilities at night for commuters until 10:00PM
North Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	1. (Red dotted line noted from Almance Drive from Allegany to Glenwood; Check conditions and connection to Crabtree Greeway)
North Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	2. (Red dotted line from Allegany/Granville from Crabtree Greenway to Glenwood; Check conditions)
North Raleigh	Ancillary Facility	Glen Eden, Map #4 4/2/08	3. North Hills Mall indicated as a Trip Attractor
North Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	4. Lassiter Mill Road, between 1-440 and Six Forks Road is narrow (in front of North Hills Mall)
North Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	5. Lassiter Mill Road from Crabtree Creek to Glenwood is too narrow.
North Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	6. Potential Creek Corridor from Crabtree Creek , north under I-440 to St. Albans, and north to Millbrook (parrellel to Quail Hollow).
North Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	7. Fix Crabtree Creek Greenway at Atlantic Avenue
North Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	8. Fix Crabtree Creek Greenway between US 1 and Atlantic
North Raleigh	Ancillary Facility	Glen Eden, Map #4 4/2/08	9. Potential location for bike/ped overpass over Capital Blvd, connecting Wade Ave to Park on Halifax Street.
West Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	10. Connect Crabtree Greenway from Lindsay Drive to Umstead State Park.
West Raleigh	Ancillary Facility	Glen Eden, Map #4 4/2/08	11. Hospital noted on Blue Ridge Road (potentail employee trip attractor)
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	12. Ridge Road from Wade to Glen Eden Drive has an existing Bike lane.
West Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	13. The House Creek Greenway was nted as under development, connecting Crabtree Creek Greenway to Merideth College along I-440
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	14. Noted existing sidepath along Reedy Creek Road from Blue Ridge to Umstead Park.
West Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	15. Greenway Connection needed around easy=t and north side of Merideth College (to bypass the gates that close at dust.
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	16. Red dotted line notes a route that connects NC State to Crabtree Creek Greenway, along the following roads: Sussix Rd., Brooks Ave, Hillsborough Rd, Dan Allen Dr, Fraternity Ct, Varsity Dr
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	17. Existing sharrow noted at NC State on Dan Allen Dr
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	18. Existing sidepath and wide outside lanes noted along Centenial Parkway, from Avent Ferry to Lake Wheeler Road
West Raleigh	Policy/Program	Glen Eden, Map #4 4/2/08	19. Check out long range plans for NC State's Centennial Campus
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	20. Lake Wheeler Road, from Centennial Parkway to Tryon Road, needs bike lanes to connect to Walnut Creek Greenway.
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	21. Request for bike lanes on Carolina Pines Avenue, from Lake Wheeler Road to South Saunders (I-70)
West Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	22. Connect Centennial Parkway to S. Saunders with a greenway parelleling I-40
West Raleigh, East Raleigh	Policy/Program, Greenway Facility	Glen Eden, Map #4 4/2/08	23. Improve security and signage along greenway between Dorthea Dix property and S. Wilmington St.
East Raleigh	Greenway Facility	Glen Eden, Map #4 4/2/08	24. Greenway under construction between Ketter Center Dr and Garner Rd
West Raleigh, East Raleigh	Policy/Program, Bike Facility	Glen Eden, Map #4 4/2/08	25. Use sharrows on all streets in downtown proper (box around downtown is deliniated with a green line)
West Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	26. Boylen Ave from Cabarruss Street, north to Park on Clay Street (noted as a desirable route)
East Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	27. Note to make Lane Street 2-way in Downtown
East Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	28. Note to make Jones Street 2-way in Downtown

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East Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	29. Red dotted line noted as a bike route on the following roads: Crabtree Greenway, Raleigh Blvd, Lehmen Rd, Glasscock St, Brookside Dr, Watauga St, Oakwood Ave, into downtown.
East Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	30. Bike facilty desired on Automotive Way from Brookside Drive to Person Street
East Raleigh	Bike Facility	Glen Eden, Map #4 4/2/08	31. Request for connection along Atlantic Ave from Automotive Way, north to Crbtree Greenway
East Raleigh	Policy/Program, Greenway Facility	Glen Eden, Map #4 4/2/08	32. Security issue on greenway between Fayetteville Street and Keeter Drive (loitering).
Citywide	Policy/Program	Glen Eden, Map #4 4/2/08	33. Request for Safe Routes to School Programs
Citywide	Policy/Program	Glen Eden, Map #4 4/2/08	34. Reduce parking reqirements - Density Bonus
Citywide	Policy/Program	Glen Eden, Map #4 4/2/08	35. Provide showers at workplaces
Citywide	Policy/Program	Glen Eden, Map #4 4/2/08	36. Provide incentives to instal showers at workplaces
Citywide	Policy/Program, Greenway Facility	Glen Eden, Map #4 4/2/08	37. Extend hours for cyclists on greenways, like the ATT in Durham
Citywide	Policy/Program, Greenway Facility	Glen Eden, Map #4 4/2/08	38. Provide centerline stripping on all greenway trails
Citywide	Policy/Program, Bike Facility	Glen Eden, Map #4 4/2/08	39. Sweep bike lanes regularly
Citywide	Policy/Program, Bike Facility	Glen Eden, Map #4 4/2/08	40. Enforce 'no parking' in bike lanes
Citywide	Policy/Program, Bike Facility	Glen Eden, Map #4 4/2/08	41. No leaf piles in bike lanes
West Raleigh	Policy/Program	Glen Eden, Map #4 4/2/08	42. Look at the Lake Wheeler Road Streetscape Project (part of the Southwest Raleigh District Plan update)
West Raleigh	Bike Facility, Greenway Facility	Glen Eden, Map #4 4/2/08	43. Connect NC State main campus to Centennial Campus
Citywide	Bike Facility	Glen Eden, Map #4 4/2/08	44. Contact 'Raleigh Rickshaws' input on downtwon bike conditions
Citywide	Policy/Program	Glen Eden, Map #4 4/2/08	45. Any new roads crossing greenways need to do so with seperated greenway bridge/tunnel under or over.
Citywide	Policy/Program	Glen Eden, Map #4 4/2/08	46. Signs should be number 1 priority

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Public Workshop #2			
Citywide	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	1. Need better connections to Cary (Hillsborough and Trinity)
Citywide	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	2. Need better connections to NC State
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	3. Need connection from Lake Johnson to NC State
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	4. Need trail connection from Lake Johnson to NC State
East Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	5. Need to develop Neuse River Greenway
East Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	6. Add facility to New Falls of Neuse Road
East Raleigh	Policy/Program	Sertoma Arts Center, Map #1, 8/26/08	7. Need biofilter as part of Neuse Greenway Plan (Neuse River an EPA Top 10 Most Endangered River)
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	8. Need alternative route to RTP
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	9. Add sharrow to bicycle route - Sierra/Lineberry/Henslowe
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	10. Hillsborough Rd, near NC State, should become bicycle lane
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	11. Need connection to Lassiter Mill
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	12. Consider bicycle lanes for Oberlin
East Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	13. Is US-1 an option to connect Wake Forest to Raleigh?
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	14. Put bike path on proposed overpass over I-40 near Trailwood Dr.
West Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	15. Bicycle lane on Faircloth
East Raleigh	Bike Facility	Sertoma Arts Center, Map #1, 8/26/08	16. Concept - Capitol Blvd - open creek as a ped bicycle park, northward from Downtown
Citywide	Policy/Program	Sertoma Arts Center, Map #1, 8/26/08	17. Action Step: Inventory small projects/quick fixes like changing grates and signage
Citywide	Policy/Program	Sertoma Arts Center, Map #2, 8/26/08	1. Existing and future bicycle lanes must be swept in order for people to use them.
Citywide	Policy/Program	Sertoma Arts Center, Map #2, 8/26/08	2. Bike racks on buses are often full.
North Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	3. Great bike lane potential on Lassiter Mill
West Raleigh	Policy/Program	Sertoma Arts Center, Map #2, 8/26/08	4. Need bicycle lockers and showers at Cameron Village
North Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	5. House Creek Greenway paralleling I-440 would be great
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	6. Would like bicycle lanes on Jones Franklin
North Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	7. Definitely need bicycle lanes on Six Forks Rd.
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	8. Blue Ridge and Reedy Creek is dangerous intersection
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	9. Edwards Mill and I-40 is a deadly intersection
North Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	10. Glenwood and Creedmoor is dangerous intersection
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	11. Need bicycle lanes and road diet for Hillsborough Rd coming into Downtown
North Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	12. Impossible to cross Capitol near Six Forks (need bridges).
East Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	13. Need ramp (must jump curb or ride on sidewalk now) at greenway crossing of Raleigh Rd. near Crabtree Blvd.
North Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	14. Traffic calming needed on Northcliff
North Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	15. Extend greenway northbound across Sawmill
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	16. Consider road diet on Ebenezer Church
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	17. Paved shoulder missing in places along Gorman St. just north of I-40
Citywide	Policy/Program	Sertoma Arts Center, Map #2, 8/26/08	18. Bicycle lockers needed for Downtown bus station
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	19. Need bicycle facilities on Lumley
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	20. Need connections from Briar Creek into Umstead (at Lumley)
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	21. Need connections to RTP and Perimeter Park
West Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	22. Need connections to RTP
East Raleigh	Bike Facility	Sertoma Arts Center, Map #2, 8/26/08	23. Dangerous curves on Buffaloe and Forestville.
South Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	1. Need connection to Garner
South Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	2. Need Tryon to be a safe bicycle corridor
South Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	3. Make Lake Wheeler a high priority
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	4. Make Avent Ferry a priority from Tryon to Lake Johnson
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	5. Need connection to NCSU Centennial Campus from Upper Walnut Trail greenway (just south of Avent Ferry)
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	6. Connect bicycle lane to RTP
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	7. Add bicycle lane paint to Faircloth north of Hillsborough (wide enough)
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	8. Cabarrus needs to be on greenway map - connection to greenway grid! Also in Comp Plan
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	9. Need to continue Clark as bicycle facility westward to Faircloth
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	10. Hillsborough west of Downtown needs bicycle lanes.
Citywide	Policy/Program	Sertoma Arts Center, Map #3, 8/26/08	11. Consider longer hours for greenways to facilitate bicycle commuting - i.e 6am-11pm
West Raleigh	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	12. Connect Jones Franklin to greenways
Downtown	Bike Facility	Sertoma Arts Center, Map #3, 8/26/08	13. Need bicycle racks at City Market
Citywide	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	1. Bicycle lanes downtown would be symbolic and build momentum for the entire City
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	2. Extend Clark Ave. facility westward from Oberlin and Cameron Village
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	3. Bicycle lanes on Hillsborough
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	4. Bicycle lanes on Hillsborough
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	5. Bicycle lanes on Hillsborough
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	6. Bicycle lanes on Hillsborough
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	7. Bicycle lanes on Hillsborough
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	8. Bicycle lanes on Hillsborough

Sub-Area	Category	Workshop / Map Referenc	# / Comment
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	9. Dangerous where Upper Walnut Trail ends at Trailwood, just south of Avent Ferry
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	10. Crossing issue of Edwards Mill over Wade Avenue
Citywide	Policy/Program	Sertoma Arts Center, Map #4, 8/26/08	11. Bicycle racks Downtown
South Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	12. Very important to connect greenway just south of downtown (Lower Walnut Creek Trail and Rocky Branch Trail)
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	13. Provide access from Brier Creek to Umstead
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	14. New development coming in Brier Creek - need connection into Raleigh
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	15. Need connections to RTP
Citywide	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	16. Need bicycle spokes into Downtown
Citywide	Policy/Program	Sertoma Arts Center, Map #4, 8/26/08	17. Education and enforcement important - booths at events to distribute materials
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	18. Need bicycle lanes and sidewalks on Lake Wheeler Rd.
Citywide	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	19. Greenways need safe roadway crossing and need to connect (many have dead ends)
Citywide	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	20. Greenways should have separation of pedestrians and bicyclists
Citywide	Policy/Program	Sertoma Arts Center, Map #4, 8/26/08	21. Drivers education important. Should be part of new drivers curriculum/test
Citywide	Policy/Program	Sertoma Arts Center, Map #4, 8/26/08	22. Put bicycle-related questions on drivers license test
Citywide	Policy/Program	Sertoma Arts Center, Map #4, 8/26/08	23. More bicycle racks needed everywhere with shelters...
East Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	24. Straighten Buckeye Trail (Crabtree Creek Greenway) in places to help commuters - north of Milburnie Rd.
Downtown	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	25. Consider bicycle lanes for Wilmington, Person, and Blount
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	26. Connection of Crabtree-Oak Park Trail westward to Umstead critical
West Raleigh	Bike Facility	Sertoma Arts Center, Map #4, 8/26/08	27. Need to connect Western sidepath greenway to Centennial campus
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	1. Need bicycle lanes along Avent Ferry to connect to Lake Johnson
Citywide	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	2. Need to consider bicycle activated sensors for stop lights
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	3. Reduce speed on AVent Ferry to 35mph
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	4. Connect Upper Walnut Trail to Centennial Campus
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	5. Take a look at Nazareth for possible bike stripe - lot of students ride there because it prevents having to go along Avent Ferry
Citywide	Policy/Program	Sertoma Arts Center, Map #5, 8/26/08	6. Need bike parking in parking garages
Citywide	Policy/Program	Sertoma Arts Center, Map #5, 8/26/08	7. Need better wayfinding signage and mile markers along greenways
Downtown	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	8. Bike lanes along Blount and Person
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	9. Want bicycle lanes along Oberlin
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	10. Need bicycle corridor to RTP
East Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	11. Need connection from Crabtree Creek Greenway at Raleigh Blvd into Downtown
East Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	12. Bike facilities along Wake Forest Rd north of Downtown should be a priority
Citywide	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	13. Need better greenway wayfinding signage.
Downtown	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	14. Need connection from western Downtown southward to Western Blvd. greenway
Citywide	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	15. Need separation stripe for pedestrians and bicyclists on greenways.
North Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	16. Need connection from northern Downtown north across all railroad tracks.
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	17. Western Blvd and I-40 is a dangerous intersection
West Raleigh	Bike Facility	Sertoma Arts Center, Map #5, 8/26/08	18. Western Blvd and Blue Ridge is dangerous intersection.
Citywide	Policy/Program	Sertoma Arts Center, Map #5, 8/26/08	19. Need greenways to be safer from crime (especially greenways in SE Raleigh area)
Downtown	Policy/Program	Sertoma Arts Center, Map #5, 8/26/08	20. Downtown proper roads should all have speed limits of 25mph, including Hillsborough, Glenwood S.

Below: Flyer for first public workshop

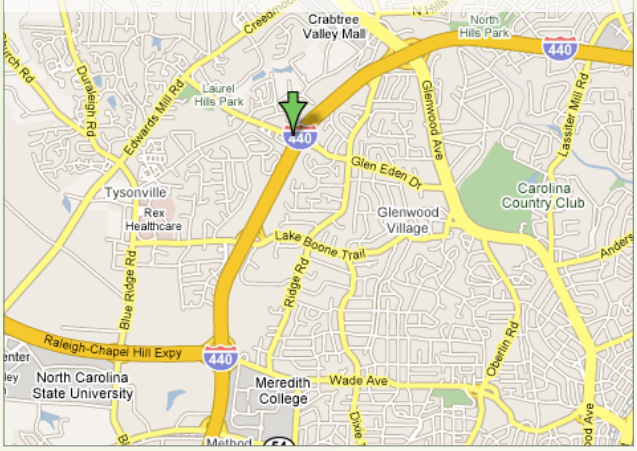
Division of Bicycle & Pedestrian Transportation

Come and help shape the future of your community!

APRIL 2, 2008
4:00-7:00 PM

PUBLIC WORKSHOP *for the*
Raleigh Bicycle Transportation Plan

Glen Eden Pilot Neighborhood Center
1500 Glen Eden Drive
Raleigh, NC 27612



This is a great opportunity to learn about the main components of the Bicycle Transportation Plan and to provide input on how to improve bicycling conditions in Raleigh. Drop in anytime between 4 PM and 7 PM to talk with Steering Committee members, City staff, and project consultants.

Contact Info: Fleming A. El-Amin II, Public Works/Transportation Services,
Tel: (919)516-2158; Email: Fleming.El-Amin@ci.raleigh.nc.us

Below: Front of newsletter for first public workshop

RALEIGH BICYCLE TRANSPORTATION PLAN
the city of raleigh, north carolina

Three common bicycle facilities (top to bottom): wide outside lane, bicycle lane, and greenway. The Plan aims to improve conditions for cyclists of all skill levels, from beginners to experts.

BICYCLE PLAN NEWSLETTER

April 2008 | 1 | Newsletter #1

Conditions to Improve for Bicycling in the Capital City

The City of Raleigh and the North Carolina Department of Transportation's Division of Bicycle and Pedestrian Transportation are developing a citywide comprehensive bicycle plan for the Capital City. Raleigh's original bicycle plan was adopted in 1991 and is overdue for an update.

The Plan will include an open, participatory process, with residents of Raleigh providing input through the Steering Committee, public workshops and an online comment form. The new plan will feature:

- A thorough analysis of current conditions for bicycling in Raleigh
- Standards and guidelines for the development of bicycle facilities
- Integration of bicycle policy into codes and ordinances
- Recommendations for programming, operations, maintenance, and funding
- A prioritized list of recommended strategic improvements

The goal is an integrated, seamless transportation framework to facilitate cycling as a viable transportation alternative throughout Raleigh.

A team of consultants will be conducting extensive fieldwork in April and May of 2008, evaluating the current bicycling conditions and creating a Bicycle Level of Service (BLOS) for Raleigh roadways. The goal of the inventory and analysis will be to identify 1) the current suitability of roadways for bicycling, 2) gaps in the bicycle network, and 3) opportunities for bicycle facility development.

Steering Committee

The Bicycle Transportation Plan Steering Committee will provide consistent feedback and direction throughout the development of the Plan. The committee assembled earlier this year at the project Kick-Off Meeting, where the overall scope of the project was discussed, and draft vision and goals of the plan were explored. Attendance at the first meeting included:

Brad Amstutz (Raleigh Police Department)
Fleming El-Amin (Bicycle Plan Project Manager)
Sig Hutchinson
David Jerose (CAMPO Bike/Ped)
Eric Lamb (Raleigh Transportation)
Timothy Lee
Laura Loyek
Bob Mosher (NCDOT Project Manager)
JJ Walter (CAMPO Bike/Ped)

Division of Bicycle & Pedestrian Transportation

This project was made possible with a matching grant from the North Carolina Department of Transportation (NCDOT) Division of Bicycle and Pedestrian Transportation.

Below: Flyer for second public workshop

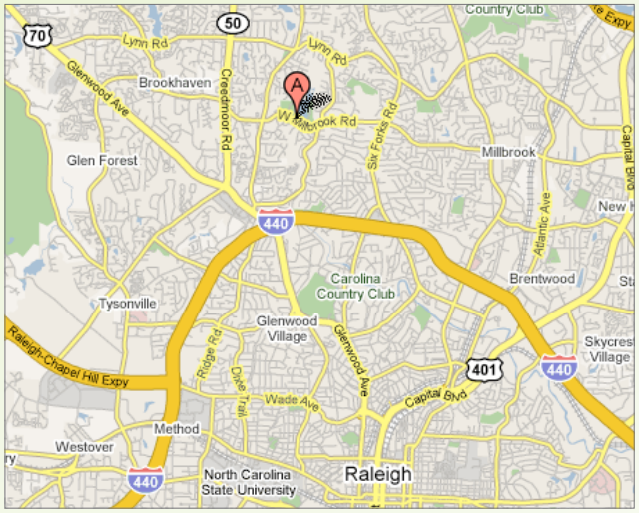
Division of Bicycle & Pedestrian Transportation

Come and help shape the future of your community!

AUGUST 26, 2008
4:00-7:00 PM

BICYCLE PLANNING PUBLIC WORKSHOP

THE RALEIGH ROOM *at the* **SERTOMA ARTS CENTER**
1400 W MILLBROOK ROAD, RALEIGH, NC



- Come to the Raleigh Room any time between 4 and 7pm to learn about Raleigh's Draft Bicycle Transportation Plan.
- Talk directly with Steering Committee members, city staff, and project consultants.
- Provide input on draft recommendations and write and/or draw your comments on draft maps.

Contact Info: Fleming A. El-Amin II, Public Works/Transportation Services,
Tel: (919)516-2158; Email: Fleming.El-Amin@ci.raleigh.nc.us

Below: Front of newsletter for second public workshop

RALEIGH BICYCLE TRANSPORTATION PLAN
the city of raleigh, north carolina

Group bicycle rides throughout the City of Raleigh in May of 2008 encouraged bicycling and involvement in the planning process (events above part of Bike-to-Work Week and the Southeast Transportation Forum).

Benefits of Bicycling

Affordability

Increased health and physical activity

Environmental benefits

Energy conservation

Automobile traffic reduction

Quality of life

BICYCLE PLAN NEWSLETTER #2

August 2008 | 1 | Newsletter #2

Project Planning on Schedule

The City of Raleigh is currently developing a DRAFT Bicycle Plan to address alternative transportation, community health and wellness, recreation, and safety needs. Through a combination of fieldwork, committee and public input, and an examination of existing conditions and needs, a draft bicycle network has been developed for public review, starting at the second public workshop on Tuesday, August 26 at the Sertoma Arts Center.

The planning process has included a high level of public involvement. Over 600 people have participated thus far in the online survey, which has helped project planners identify roadways and intersections most in need of bicycle-related improvements. In April 2008, over 70 people participated in an open house public workshop, which featured a 'visioning' board, educational posters and materials, and maps where participants were invited to write and draw their comments and ideas. Finally, local stakeholders (who volunteer time on project committees) are providing valuable insight and guidance as the plan develops.

The development of the Bicycle Plan and network has been supported by stakeholders and residents alike. Here the Downtown Raleigh Alliance provides input specific to the Downtown area.

Division of Bicycle & Pedestrian Transportation

This project was made possible with a matching grant from the North Carolina Department of Transportation (NCDOT) Division of Bicycle and Pedestrian Transportation.

APPENDIX B OUTLINE:
Prioritization Process
Project Cut-Sheets

APPENDIX B: PRIORITIZATION + PHASE 1/ TOP PRIORITY CUT-SHEETS

PRIORITIZATION PROCESS

The prioritization process began by making a list of all the roadways in the City of Raleigh for which bicycle recommendations were made. The roadways were then broken down into 243 segments at logical points, such as major intersections. Most segments are between one and two miles long, with several that are longer in more suburban and less developed areas.

The weighted criteria used to rank each segment was custom designed for Raleigh, based on public input, steering committee input, and data collected pertaining to Raleigh's existing conditions. Project steering committee members were given a worksheet with example criteria and weights used in other North Carolina communities. They were then asked to adjust both the criteria and the weights assigned to each criteria, according to the bicycling-related needs and desires expressed by themselves and the public (the specific criteria and weights used are listed on the following page). Furthermore, public survey results were also incorporated into the prioritization process.

After creating a list of prioritized individual segments, the top 25 were selected from the list based on two additional key factors. First, to ensure an equitable distribution of projects across the City of Raleigh, five priority projects were selected from each of the five council districts. Second, those chosen were selected based on both their high ranking from the prioritization process and the required method of construction. This last part is key because it results in the most efficient use of limited funding to complete 'paint' and 'restripe' projects that are relatively inexpensive.

In summary, the three steps to selecting the top 25 were: 1) prioritization through weighted criteria and public input; 2) equity across council districts; and 3) ease of construction/cost-effectiveness.

Note: While it is ideal to develop bicycle facilities in order of priority, it is best to also construct facilities as opportunities arise. Some of the most cost-effective opportunities to provide bicycle facilities are during routine roadway construction, reconstruction, and repaving projects. A new commercial development or a roadway widening project, for instance, would provide the means to build bicycle facilities or trails as a component of an existing effort, regardless of priority ranking through this process.

Criteria and Weight Used to Prioritize Bicycle Facilities

Criteria	*Weight**
Top 1-5 "Most in Need of Improvement" (from Online Survey)	5
Direct Access to/from Downtown (Downtown Overlay District)	5
Direct Access to/from an Existing or Funded Greenway	5
Direct Access to/from a Park or Recreation Center	5
Direct Access to/from a School	5
Serves Areas with a High % of No Vehicle Ownership (Census Data)	5
Segment Contains High Level of Reported Bike Accidents	5
Top 6-10 "Most in Need of Improvement" (from Online Survey)	4
Direct Access to/from Proposed Transit Hubs	4
Segment Contains an Intersection "Most in Need of Improvement" (from Online Survey)	4
Top 11-25 "Most in Need of Improvement" (from Online Survey)	3
College/University Proximity (1 mile radius)	3
Segment Serves as a Regional Connection and/or Interstate Highway Crossing	3
Direct Access to/from High Density Residential Areas (Census Data)	2
Direct Access to Major Shopping Centers**	2
Direct Access to Major Employment Centers***	2
Direct Access to/from a Planned Greenway	1

* (zero = lowest priority, 5 = highest)

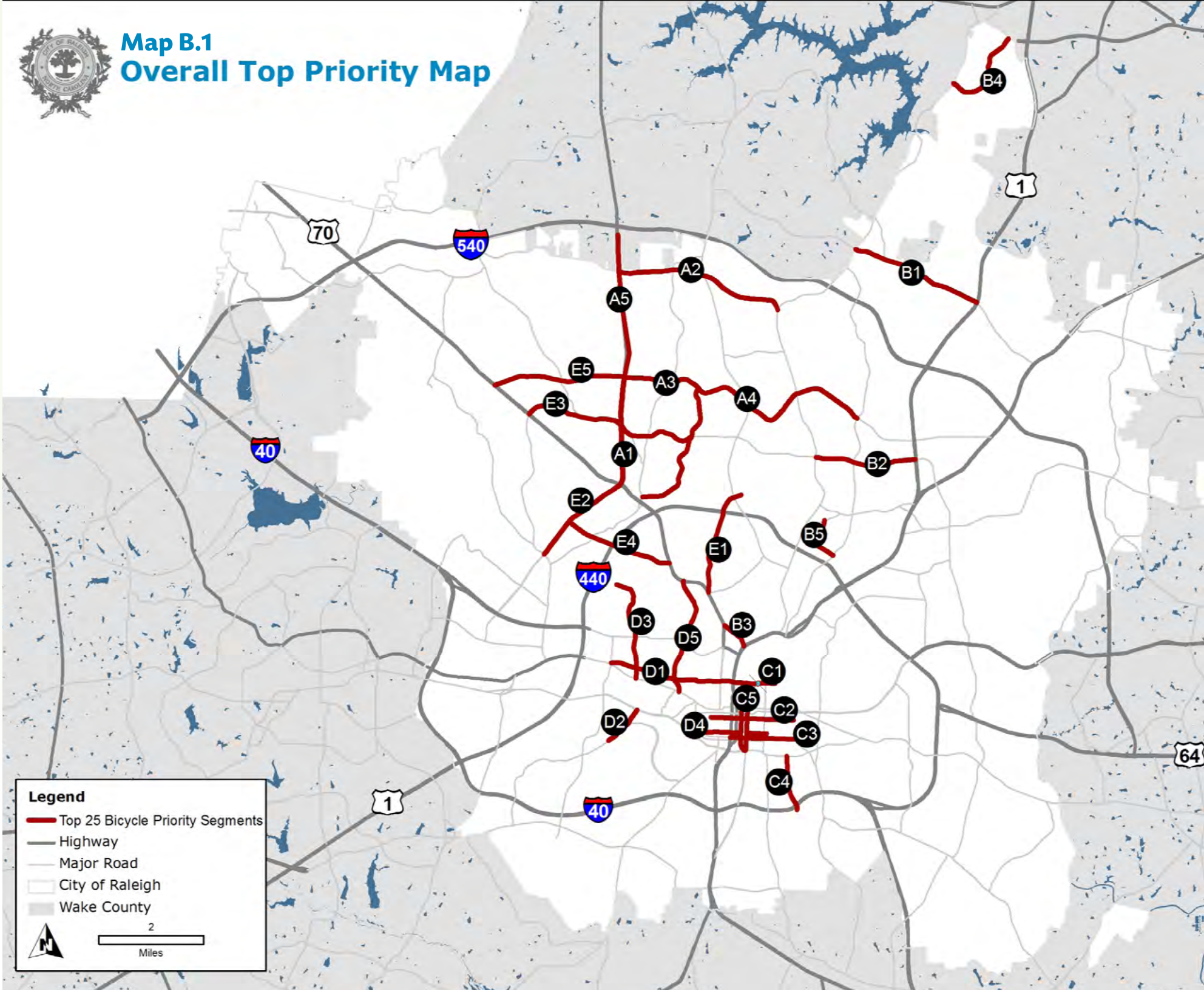
** Major Shopping Centers: Cameron Village, Crabtree Valley Mall, North Hills Shopping Center, Triangle Towne Center, Mission Valley Shopping Center, Glenwood South, North Carolina Farmers' Market, City Market, Five Points, Seaboard Station

*** Major Employment Centers: Wake Medical Center, State Capital, NC State University, Rex Healthcare, Progress Energy, Wake County Government, City of Raleigh Government

PROJECT CUT-SHEETS

The following project cut-sheets are provided for anyone who wishes to better understand the top 25 projects that are recommended in this plan. The cut sheets are particularly useful for city- and NC DOT-engineers as they begin developing more detailed design work for these projects. They will also help city planning and transportation department staff as they explain these projects to various parties, such as the City Council, potential funding agencies, and interested citizens. The map on the following page shows the locations of these key projects.

Map B.1
Overall Top Priority Map



CITY COUNCIL DISTRICT A

PROJECT A1:
CREEDMOOR ROAD

Phase 1 (2009)

From Glenwood Ave.
To Lynn Rd.

Miles 2.1
Feet 10,900

Recommendation:
Bicycle Lane (restripe)
- 10,900 feet

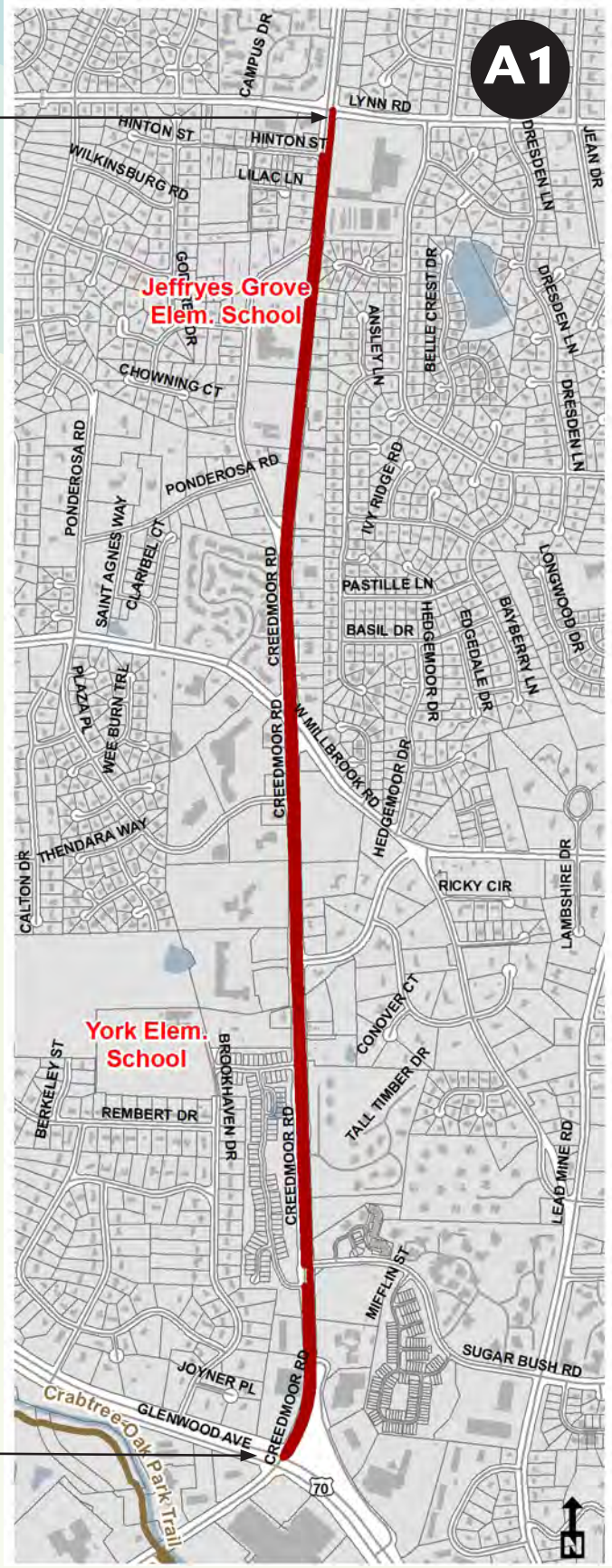
Important Notes:
A speed limit reduction should be considered for this roadway when developing bicycle lanes.

Cost Estimate:
$47,834

Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current:
4 lanes and center median, with 14' lanes (14|14|M|14|14)

Bicycle lane restripe:
(6|11|11|M|11|11|6)



CITY COUNCIL DISTRICT A

PROJECT A2:
STRICKLAND ROAD

Phase 1 (2009)

From Creedmoor Rd.
To Falls of the Neuse Rd.

Miles 3.3
Feet 17,400

Recommendation:
Bicycle Lane (restripe)
- 17,400 feet

Important Notes:
Connects to W. Millbrook Middle School, Honeycutt Creek Trail, Baileywick Trail, and residential and commercial areas; also was high-ranking in public requests.

Cost Estimate:
$116,880

Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current:
Mostly 5 lanes and center turn lane totaling 64' (14|12|12|12|14)

Bicycle lane restripe: (6|11|10|10|10|11|6)

Current:
Varying 6 to 7 lanes, totaling 86'

Bicycle lane restripe

Current:
Five lanes and center turn lane totaling 64' (14|12|12|12|14)

Bicycle lane restripe: (6|11|10|10|10|11|6)

CITY COUNCIL DISTRICT A

PROJECT A3:
LYNN ROAD

Phase 1 (2009)

From Creedmoor Rd.
To Sandy Forks Rd.

Miles 2.7
Feet 14,600

Recommendation:
Bicycle Lane (restripe)
- 14,600 feet

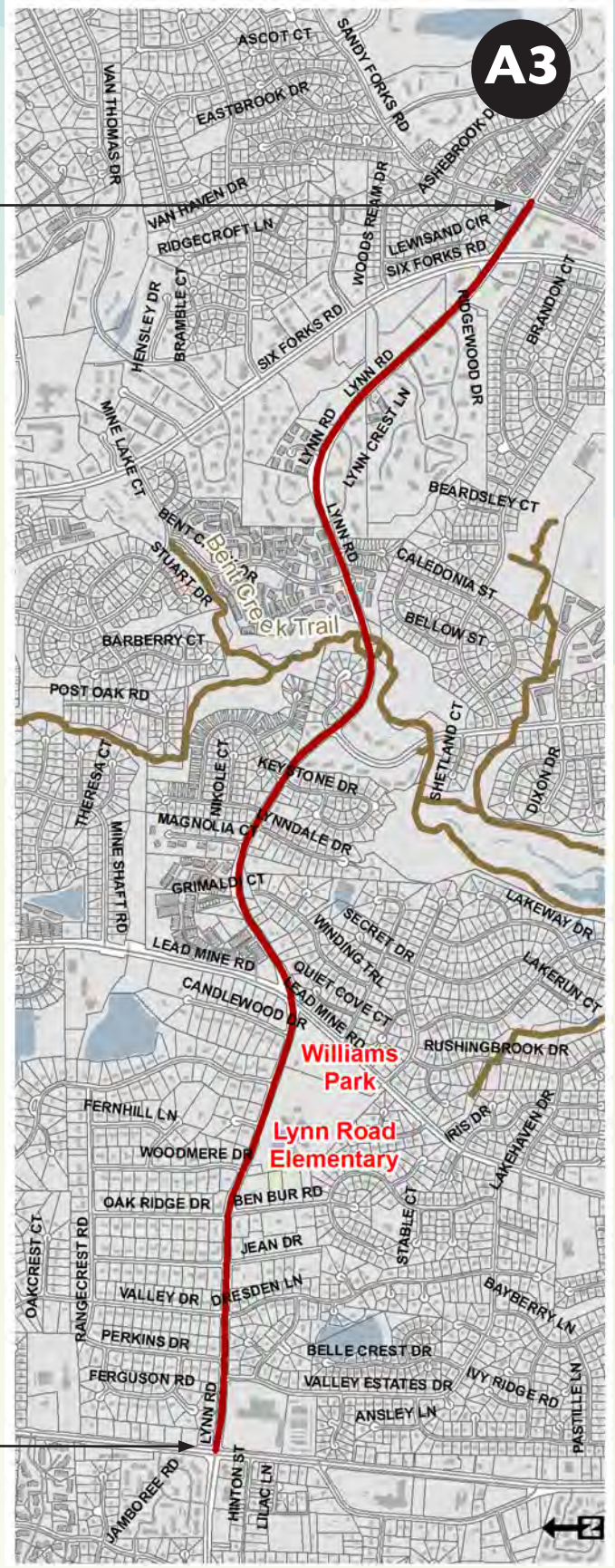
Important Notes:
Connects to Bent Creek Trail, Williams Park, Lynn Road Elementary, and residential and commercial areas

Cost Estimate:
$97,578

Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current:
5 lanes with center turn lane, totaling 62-64'
(14|12|12|12|14)

Bicycle lane restripe:
(6|11|10|10|10|11|6)



CITY COUNCIL DISTRICT A

PROJECT A4:
SPRING FOREST ROAD

Phase 1 (2009)

From Sandy Forks Rd.
To Atlantic Ave.

Miles 2.5
Feet 13,100

Recommendation:
Bicycle Lane (restripe)
- 13,100 feet

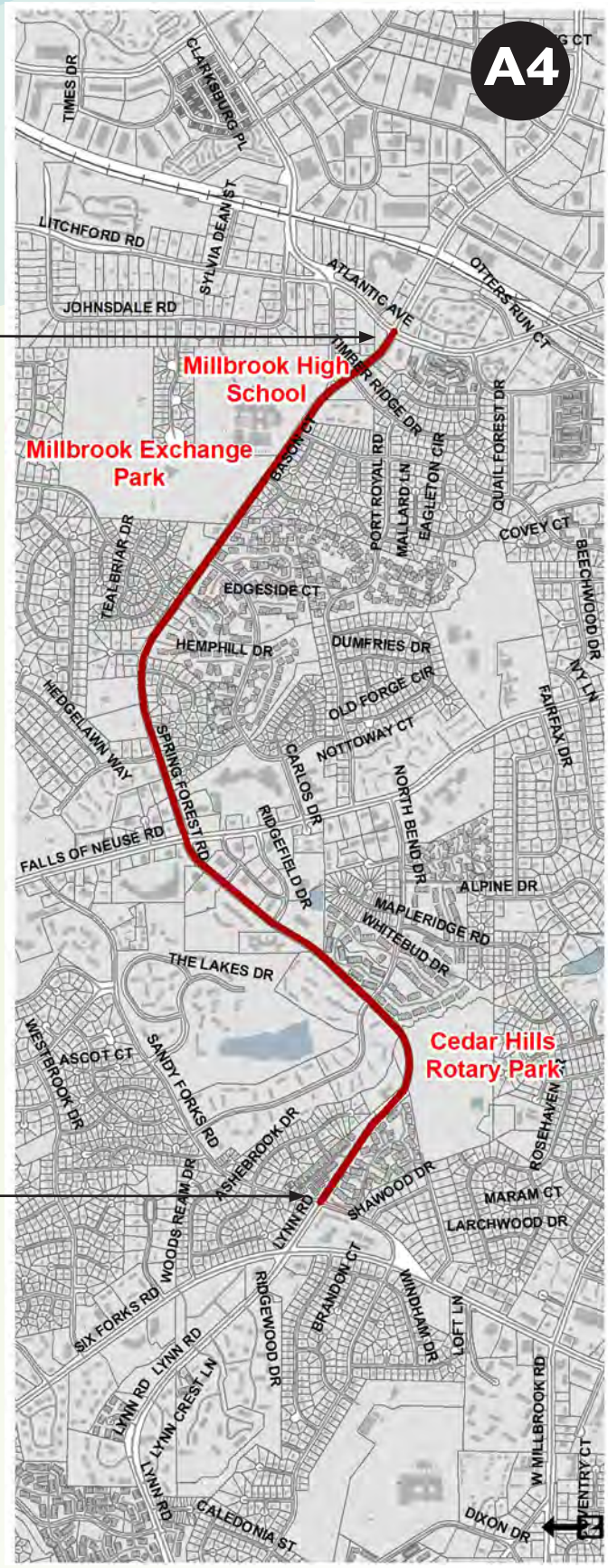
Important Notes:
Connects to Millbrook High School, Millbrook Exchange Park, Cedar Hills Park, and residential and commercial areas.

Cost Estimate:
$87,406

Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current:
5 lanes with center turn lane, totaling 64'
(14|12|12|12|14)

Bicycle lane restripe:
(6|11|10|10|10|11|6)



CITY COUNCIL DISTRICT A

PROJECT A5:
CREEDMOOR ROAD

Phase 1 (2009)

From Lynn Rd.
To I-540

Miles 2.7
Feet 14,400

Recommendation:
Bicycle Lane (restripe)
- 14,400 feet

Important Notes:
-Mix of land uses
- Commercial, office, residential; shopping centers
-Major commuting route
-High-ranking in public request
-A speed limit reduction should be considered for this roadway when developing bicycle lanes.

Cost Estimate:
$64,026

Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current: 4 lanes with center median: 26' on each side

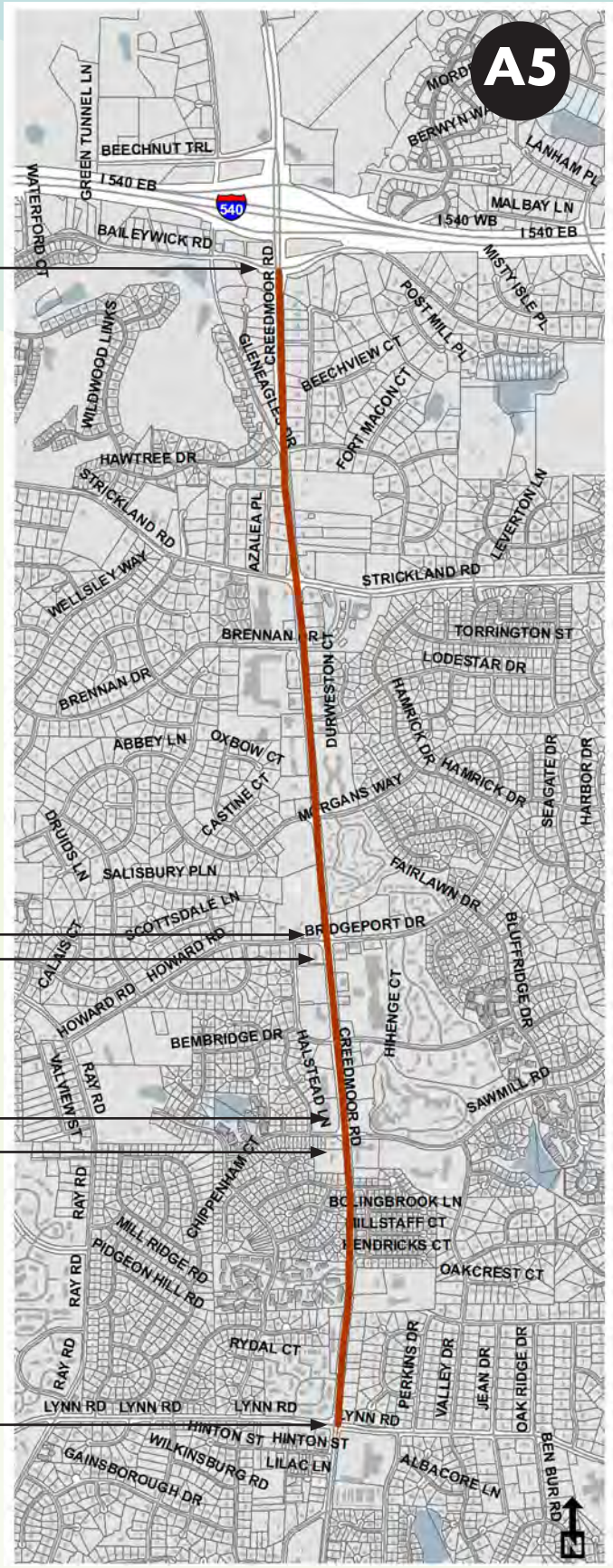
Bicycle lane restripe: (6|10|10|M|10|10|6)

Current: Irregular, multiple lanes, divided, turning lanes, major commercial area

Bicycle lane restripe

Current: 4 lanes with center median: 24'-28' on each side

Bicycle lane restripe (4-5|10|10|M|10|10|4-5)



CITY COUNCIL DISTRICT B

PROJECT B1:
DURANT ROAD

Phase 1 (2009)

From Falls of the Neuse Rd.
To Capital Blvd.

Miles 2.5
Feet 13,400

Recommendation:
Bicycle Lane (restripe)
- 13,400 feet

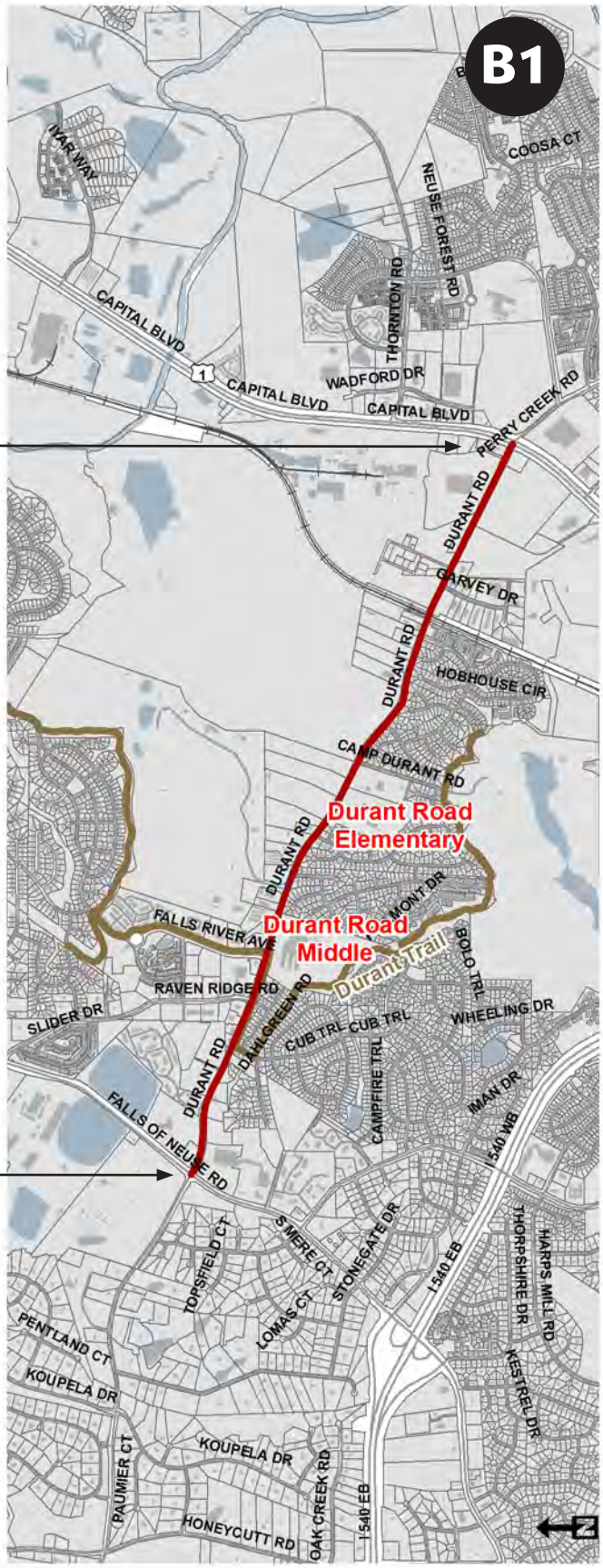
Important Notes:
Connects to Durant Road Elementary School, Durant Road Middle School, Durant Trail - Falls River Trail, and residential and commercial connections.

Cost Estimate:
$88,740

Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current:
Mostly 5 lanes with center turn lane, totaling 64'

Bicycle lane restripe:
(5|11|11|11|11|11|5)



CITY COUNCIL DISTRICT B

PROJECT B2:
E. MILLBROOK ROAD

Phase 1 (2009)

From Falls of the Neuse Rd.
To Capital Blvd.

Miles 1.9
Feet 10,200

Recommendation:
Bicycle Lane (restripe)
- 10,200 feet

Important Notes:
-Connects to Millbrook Elementary and residential and commercial areas.
-High-ranking in public request
-Serves area with higher percentage not owning a vehicle

Cost Estimate:
$62,204

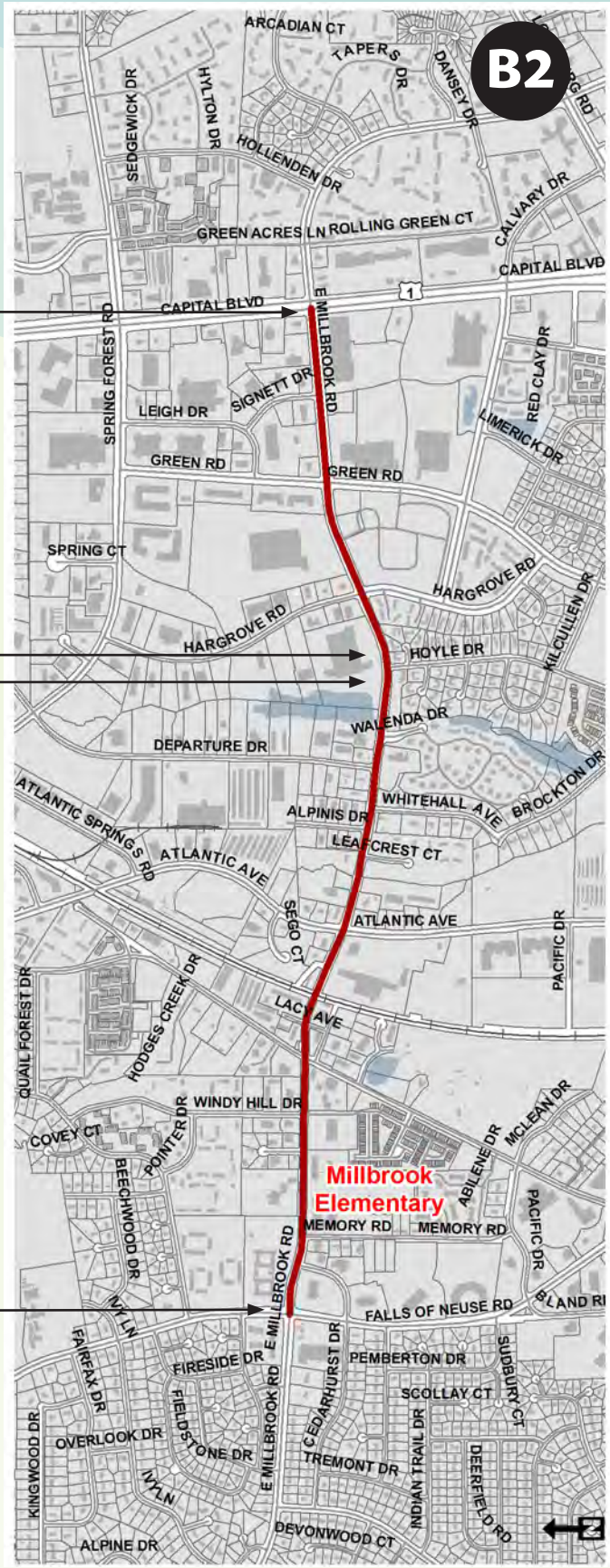
Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current:
4 lanes with center median (13|13|M|13|13)

Bicycle lane restripe:
(6|10|10|M|10|10|6)

Current:
5 lanes with center turn lane, totaling 64'-68" (14|12|12|12|14)

Bicycle lane restripe:
(6|11|10|10|10|11|6)



CITY COUNCIL DISTRICT B

PROJECT B3:
FAIRVIEWROAD

Phase 1 (2009)

From Glenwood Ave
To Capital Blvd.

Miles 0.6
Feet 3,000

Recommendation:
Shared lane marking (stripe) - 3,000 feet

Important Notes:
-Connects to Five Points, Underwood Elementary, and residential and commercial areas.

Cost Estimate:
$2,404

Agency/Agencies:
City of Raleigh Public Works

Current: 2 lanes totaling 24'-26' with sections of on-street parking

Shared lane markings after every intersection and at least every 250'

CITY COUNCIL DISTRICT B

PROJECT B4:
WAKEFIELD PLANTATION ROAD

Phase 1 (2009)

From Falls of the Neuse Rd.
To NC 98

Miles 1.7
Feet 9,200

Recommendation:
Bicycle lane (stripe)
- 9,200 feet

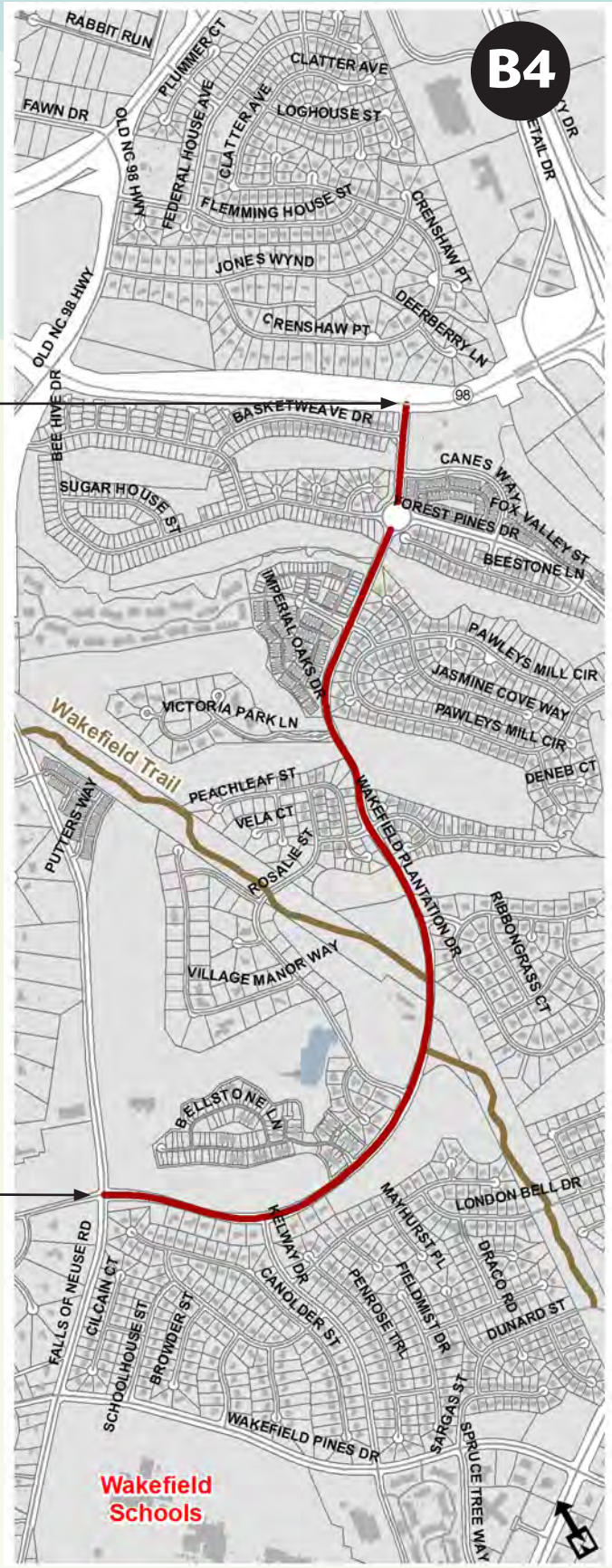
Important Notes:
Connects to Wakefield Schools, Wakefield Trail, residential areas, and Wake Forest (NC 98 future multi-use sidepath).

Cost Estimate:
$19,447

Agency/Agencies:
City of Raleigh Public Works

Current:
2 lanes totaling 40'

Bicycle lane stripe:
(6|14|14|6)



CITY COUNCIL DISTRICT B

PROJECT B5:
WOLF PACK LANE/BUSH STREET

Phase 1 (2009)

From St. Albans Dr.
To Atlantic Ave.

Miles 0.8
Feet 4,400

Recommendation:
Bicycle lane (stripe)
- 9,200 feet

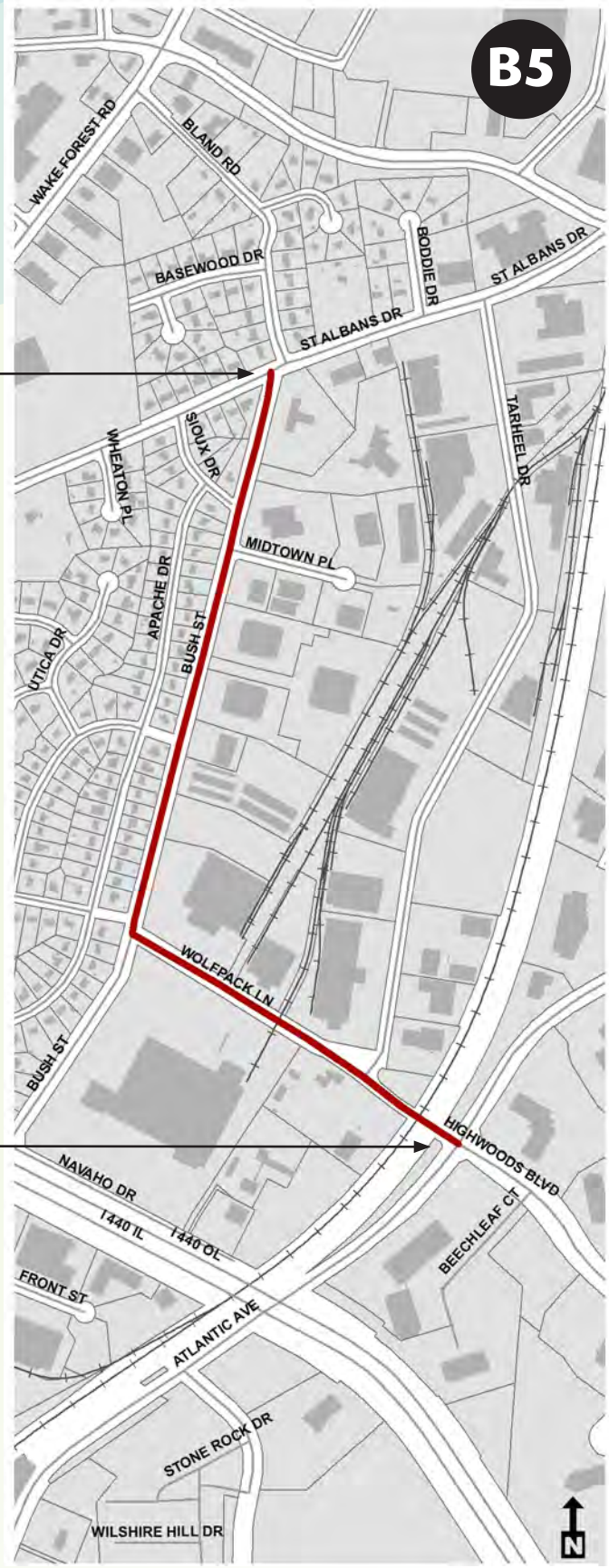
Important Notes:
Connects to a mix of land uses: commercial, office, residential.

Current:
2 lanes totaling 42'

Bicycle lane stripe:
(6|15|15|6)

Cost Estimate:
$9,907

Agency/Agencies:
City of Raleigh Public Works



CITY COUNCIL DISTRICT C (+ D)

PROJECT C1:

PEACE ST./BOUNDARY ST.

(+ SEGMENT OF LAKE BOONE TRAIL)

Phase 1 (2009)

From St. Mary's St.
To Watauga St.

Miles 1.3
Feet 6,800

Recommendations:
Bicycle Lane (restripe)
- 1,200 feet. (Peace St.)

Bicycle Lane (road diet)
- 3,900 feet. (Peace St.)

Shared Lane Marking
- 1,700 feet (Boundary St.)

Important Notes:
- Connects to Cameron Village Area/Broughton High School and Downtown
-High-ranking in public request
-Serves area with higher percentage not owning a vehicle
- A study should be conducted to analyze the need for on-street parking along segments of this route.

Cost Estimate:
$30,734

Agency/Agencies:
City of Raleigh Public Works

Current: 2 lanes totaling 36' with some on-street parking

Shared lane markings after every intersection and at least every 250'

Current: 4 lanes totaling 40'-42' (10|10|10|10)

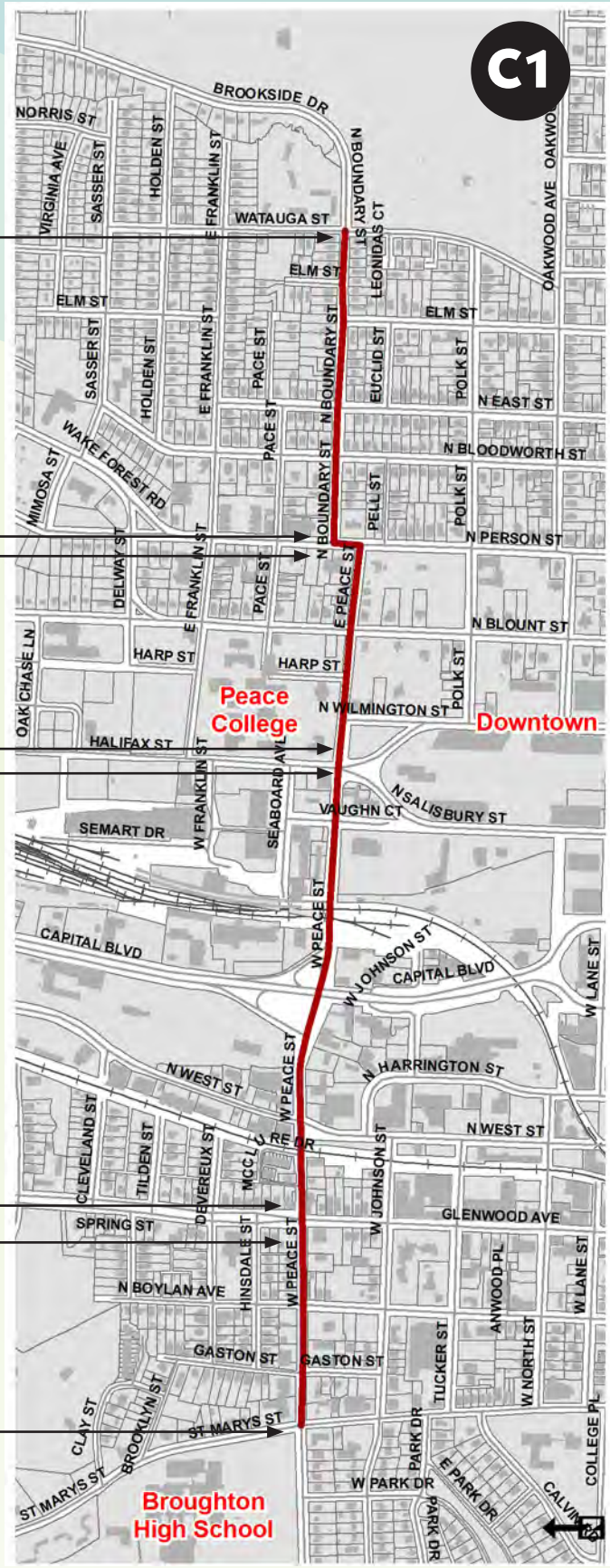
Bicycle lane road diet with center turn lane: (5|10|10|10|5)

Current: 4-5 lanes, totaling 55'-60'

Bicycle lane road diet with center turn lane: (6|11|11|11|11|6)

Current: 3 lanes with center turn lane, totaling 40' (14|12|14)

Bicycle lane restripe: (5|10|10|10|5)



CITY COUNCIL DISTRICT C2

PROJECT C1:
HARGETT STREET

Phase 1 (2009)

From St. Mary's St.
To S. Tarboro St.

Miles 1.6
Feet 8,300

Recommendation:
Shared Lane Marking
- 8,300 feet

Important Notes:
-Connects to Downtown, Nash Square, Moore Square, Shaw University, Chavis Way Greenway
-Serves area with higher percentage not owning a vehicle

Cost Estimate:
$8,309

Agency/Agencies:
City of Raleigh Public Works

Current:
2 lanes (2-way) with on-street parking totaling 36'

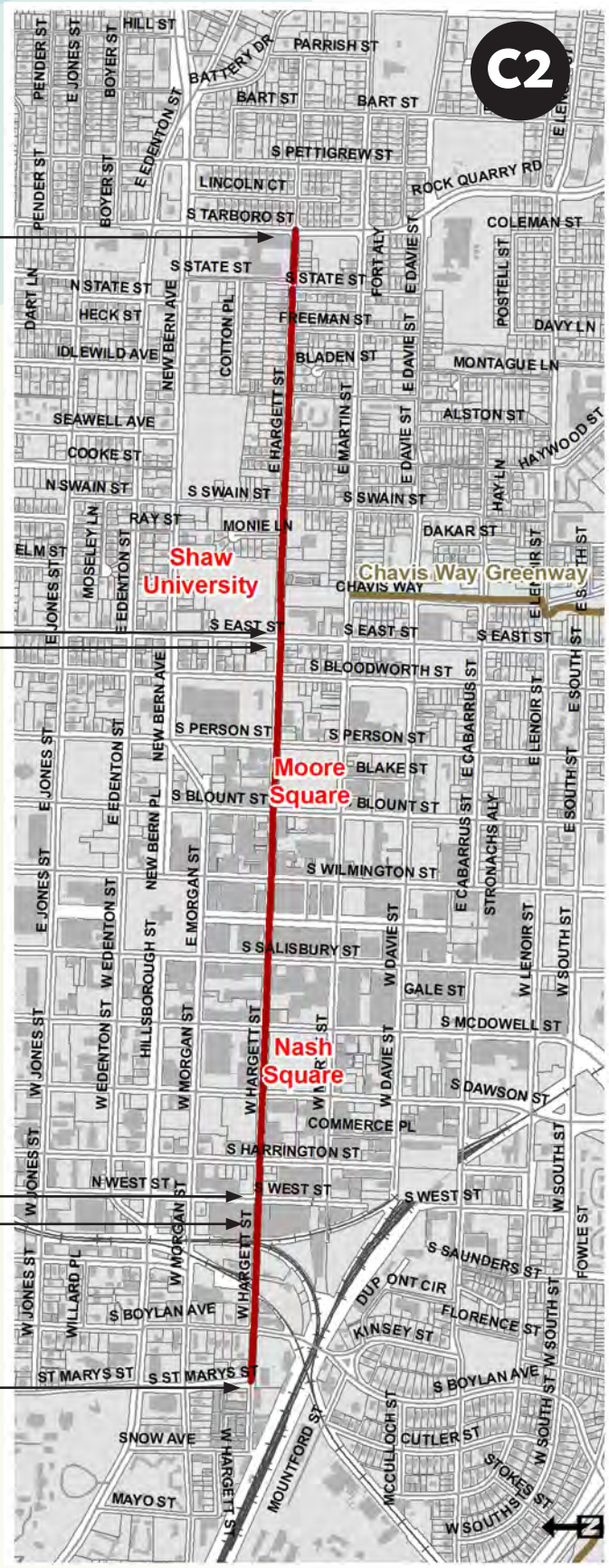
Shared lane markings after every intersection and at least every 250'

Current:
2-3 lanes (1-way, westbound) with on-street parking totaling 40'-42'

Shared lane markings after every intersection and at least every 250'

Current:
2 lanes (2-way) with on-street parking totaling 36'

Shared lane markings after every intersection and at least every 250'



CITY COUNCIL DISTRICT C

PROJECT C3:
LENOIR STREET

Phase 1 (2009)

From S. Dawson St.
To S. Tarboro St.

Miles 1.25
Feet 6,600

Recommendation:
Shared Lane Marking
- 6,600 feet

Important Notes:
-Connects to Downtown, Convention Center, Chavis Heights Park/Greenway, Ligon Middle School, and Hunter Elementary School

-Serves area with higher percentage not owning a vehicle

Cost Estimate:
$6,572

Agency/Agencies:
City of Raleigh Public Works

Current:
2 lanes (2-way) with on-street parking totaling 40'

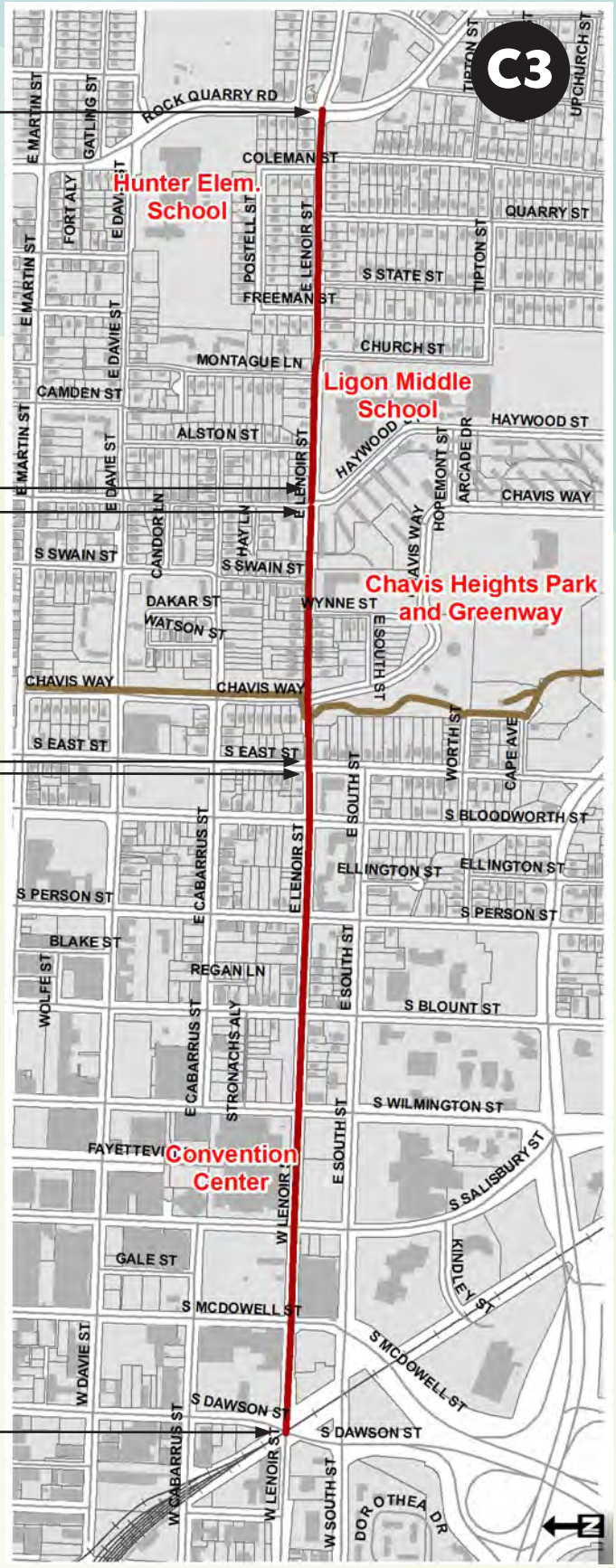
Shared lane markings after every intersection and at least every 250'

Current:
2 lanes (2-way) with on-street parking totaling 25'-30'

Shared lane markings after every intersection and at least every 250'

Current:
1-way, westbound with on-street parking totaling 42'

Shared lane markings after every intersection and at least every 250'



CITY COUNCIL DISTRICT C

PROJECT C4:
SOUTH STATE STREET

Phase 1 (2009)

From Bunche Dr.
To MLK Blvd..

Miles 1.1
Feet 5,600

Recommendation:
Bicycle Lane (stripe)
- 4,800 feet

Shared Lane Marking
- 800 feet

Important Notes:
-Connects to Downtown, areas south of Downtown, Ligon Middle School, Carnage Middle School, Fuller Elementary School, and Lower Walnut Creek Trail.

-Serves area with higher percentage not owning a vehicle

Cost Estimate:
$11,742

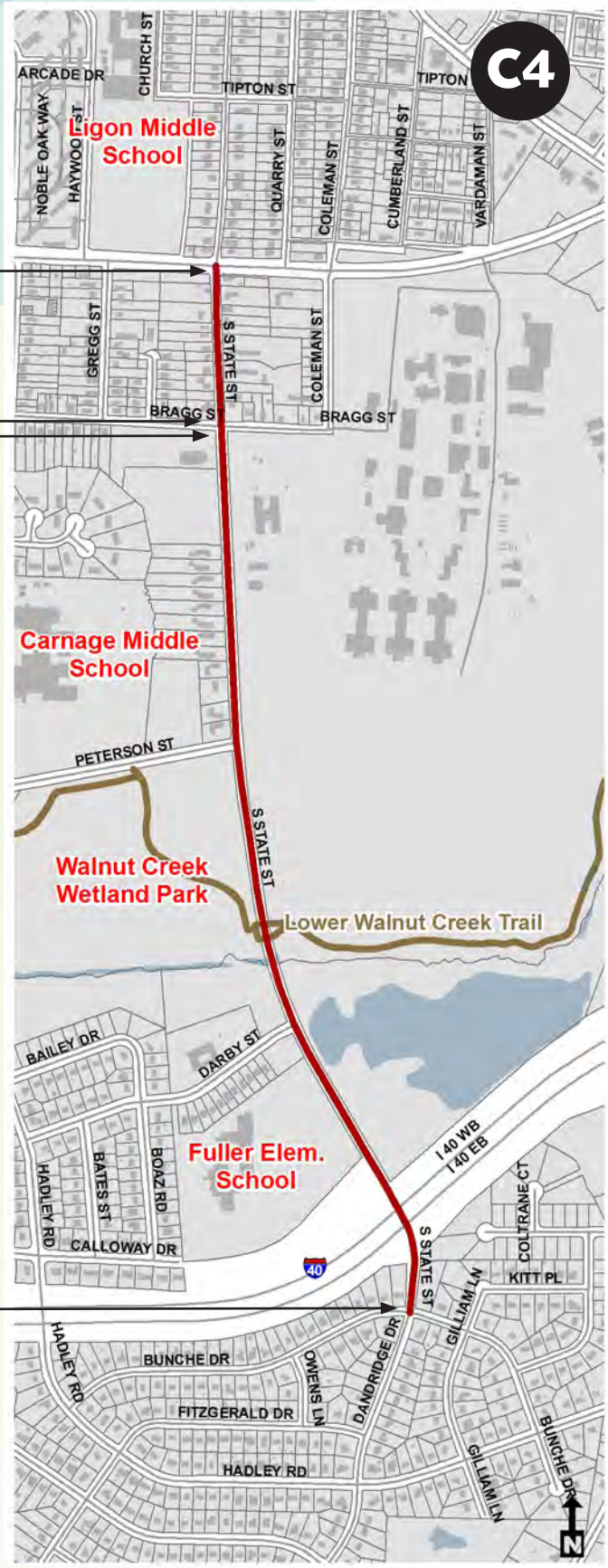
Agency/Agencies:
City of Raleigh Public Works

Current:
2 lanes with on-street parking totaling 30'

Shared lane markings (to keep facility going to MLK) after each intersection and at least every 250'

Current:
2 lanes totaling 40'-44'

Bicycle lane stripe:
(6|15|15|6)



CITY COUNCIL DISTRICT C

PROJECT C5:
WILMINGTON ST. + SALISBURY ST.

Phase 1 (2009)

From Peace St.
To MLK Blvd..

Miles 2.6
Feet 13,700

Recommendation:
Bicycle Lane (restripe)
- 7,000 feet (Salisbury St.)

Bicycle Lane (restripe)
- 6,700 feet (Wilmington St.)

Important Notes:
-Connects to Downtown, State Capitol, and Convention Center.

-Serves area with higher percentage not owning a vehicle

-A study should be conducted to determine proper removal of on-street parking to create adequate space for bicycle lanes. If parking cannot be modified, shared road markings with wide outside lanes should be considered.

Cost Estimate:
$24,742

Agency/Agencies:
NCDOT
City of Raleigh Public Works

Current (Salisbury): Mostly 3 lanes, one-way, with on-street parking on one side; totaling 42'

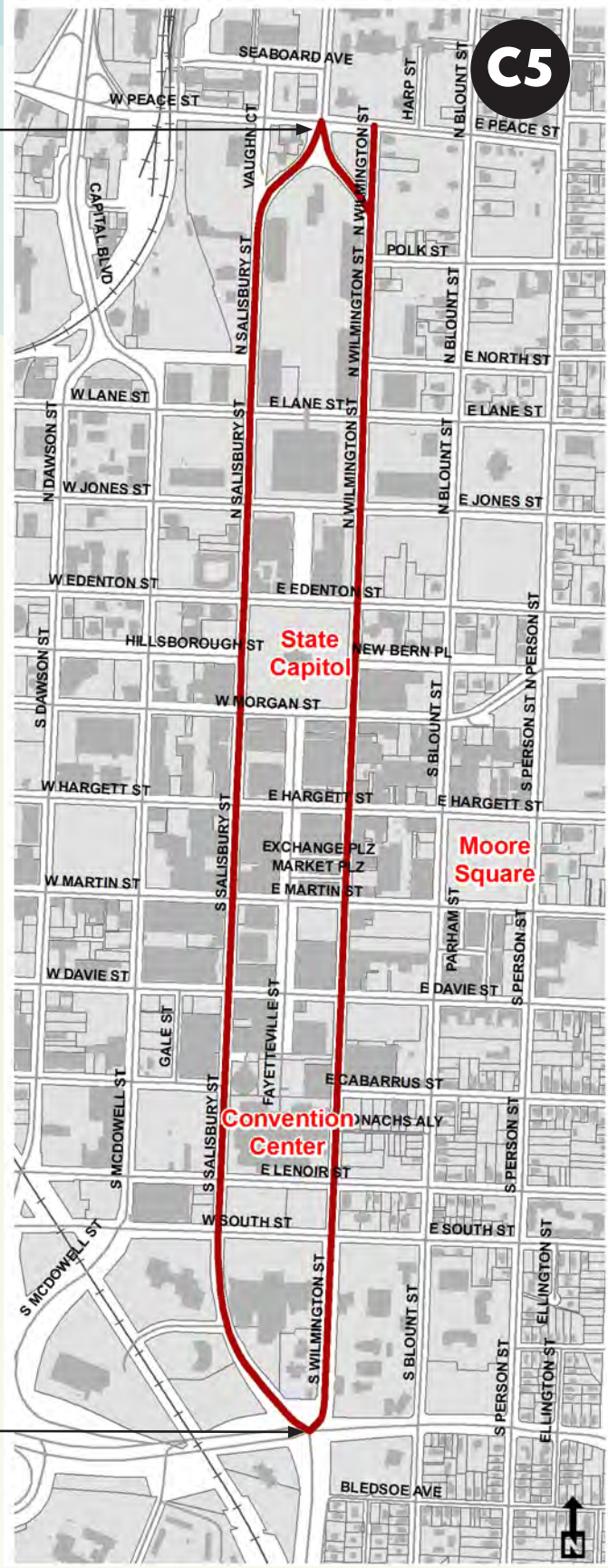
Preferred: Bicycle lane restripe with removal of a travel lane: (6|12|12|12)

Alt: Shared lane markings after each intersection and at least every 250' in a wide outside lane

Current (Wilmington): Mostly 2 lanes, one-way, with on-street parking both sides totaling 42'

Preferred: Bicycle lane restripe and remove parking on one side: (6|12|12|12)

Alt: Bicycle lane restripe and narrow parking: (8|6|10|10|8)



CITY COUNCIL DISTRICT D

PROJECT D1:
CLARK AVENUE *(+ SEGMENTS OF PEACE ST. AND EVERETT AVE.)*

Phase 1 (2009)

From Faircloth St.
To St. Mary's St.

Miles 2
Feet 10,500

Recommendation:
Bicycle Lane (restripe)
- 4,700 feet

Shared Lane Marking
- 5,800 feet

Important Notes:
-Connects to Cameron Village (future transit hub), residential areas, and is near NC State.

-Serves area with higher percentage not owning a vehicle

-A study should be conducted to analyze the need for on-street parking along segments of this route. If parking can be removed, a bicycle lane can be striped instead of a sharrow.

Cost Estimate:
$28,451

Agency/Agencies:
City of Raleigh Public Works

Current:
3 lanes with center turn lane, totaling 40'-42':
(14|13|14)

Bicycle lane restripe:
(5|10|10|10|5)

Current:
2 lanes with on-street parking (totaling 20' each direction, with center median).

Shared lane markings after each intersection and at least every 250'

Current:
2 lanes with some on-street parking, totaling 26'

Shared lane markings after each intersection and at least every 250'

Current:
2 lanes with on-street parking, totaling 40'-42'

Shared lane markings after each intersection and at least every 250'

CITY COUNCIL DISTRICT D

PROJECT D2:
AVENT FERRY ROAD

Phase 1 (2009)

From Crest Rd.
To Western Blvd.

Miles 0.8
Feet 4,280

Recommendation:
Bicycle Lane (restripe)
- 4,280 feet

Important Notes:
-Connects to NC State University, student apartments, shopping centers/restaurants

-High-ranking in public request

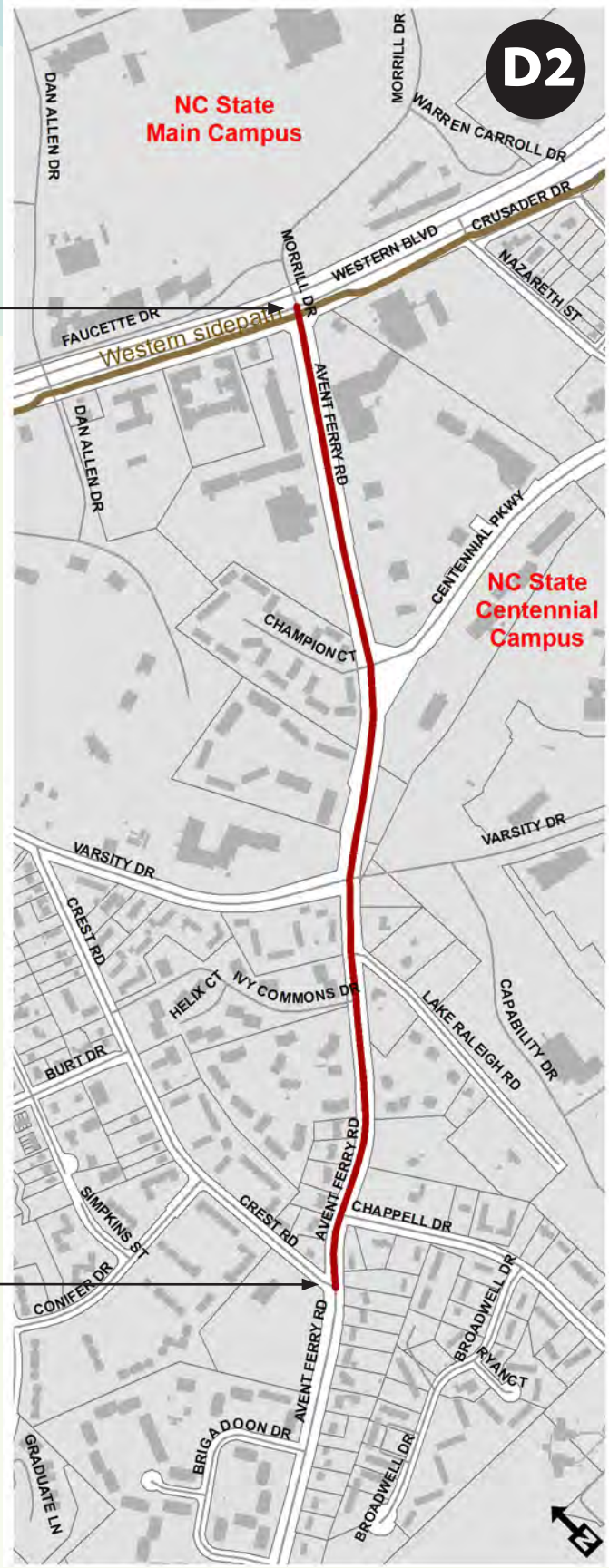
-Serves area with higher percentage not owning a vehicle

Cost Estimate:
$29,964

Agency/Agencies:
NCDOT +
City of Raleigh Public Works

Current:
5 lanes with center turn lane, totaling 60'-64'
(12|12|12|12|12)

Bicycle lane restripe:
(5|10|10|10|10|10|5)



CITY COUNCIL DISTRICT D

PROJECT D3:
DIXIE TRAIL
(+ SEGMENT OF LAKE BOONE TRAIL)

Phase 1 (2009)

From Hillsborough St.
To Ridge Rd.

Miles 2
Feet 10,800

Recommendation:
Bicycle Lane (restripe)
- 9,300 feet. (Dixie Trail)

Bicycle Lane (road diet)
- 1,500 feet. (Lake Boone Trail)

Important Notes:
-Connects to existing bicycle lane on Ridge Road, residential areas, schools, and parks.

-Serves area with higher percentage not owning a vehicle

-A study should be conducted to analyze the need for on-street parking along segments of this route.

Cost Estimate:
$50,600

Agency/Agencies:
City of Raleigh Public Works

Current: 4 lanes totaling 48': (12|12|12|12)

Bicycle lane road diet with new center turn lane: (6|12|12|12|6)

Current: 3 lanes with a center turn lane, totaling 44'-48' (16|14|16|)

Bicycle lane restripe: (6|12|10|12|6)

Current: 3 lanes with a center turn lane, plus on-street parking, totaling 44'-48' (the center turn lane is not in the center of the total roadway width)

Bicycle lane restripe: (9|4|10|10|4|9)

CITY COUNCIL DISTRICT D

PROJECT D4:
CABARRUS STREET

Phase 1 (2009)

From Western Blvd.
To Chavis Way

Miles 1.2
Feet 6,450

Recommendation:
Shared Lane Marking
- 2,050 feet.

Bicycle Lane (restripe)
- 4,400 feet.

Important Notes:
-Connects to Downtown, Convention Center, Fayetteville St., Western Blvd. sidepath (Rocky Branch Trail), and Chavis Way Greenway.

-Serves area with higher percentage not owning a vehicle.

-Identified as "Green Street" in Raleigh Comprehensive Plan

Cost Estimate:
$16,439

Agency/Agencies:
City of Raleigh Public Works

Current: 2 lanes with on-street parking totaling 26'

Shared lane markings after each intersection and at least every 250'

Current: 2 lanes with on-street parking totaling 42'

Remove on-street parking on one side (as on Green Street) + Bicycle lane restripe:

Current: 2 lanes with on-street parking totaling 36'

Shared lane markings after each intersection and at least every 250'

CITY COUNCIL DISTRICT D

PROJECT D5:
OBERLIN ROAD

Phase 1 (2009)

From Hillsborough St.
To Glenwood Ave.

Miles 2.3
Feet 12,200

Recommendation:
Bicycle Lane (stripe)
- 1,500'

Shared Lane Marking
- 1,600'

Bicycle Lane (restripe)
- 9,100'

Important Notes:
-Connects to Cameron Village, Broughton High School, Daniels Middle School, NC State, and commercial, office, and residential areas

-High-ranking in public request

-Serves area with higher percentage not owning a vehicle.

Cost Estimate:
$46,466

Agency/Agencies:
City of Raleigh Public Works

Current: 3 lanes with center turn lane totaling 40' (13|14|13)

Bicycle lane restripe: (4|10|10|10|4)

Current: 2 lanes with center turn lane (off-center), totaling 28'-30'

Bicycle lane restripe:

Current: 2 lanes with on-street parking, totaling 36'

Remove parking + Bicycle lane restripe

Current: 2 lanes with center turn lane (off-center), totaling 34'

Bicycle lane restripe

Current: 6-7 lanes, totaling 80'

Bicycle lane restripe

Current: 2 lanes with center turn lane (off-center), totaling 32'-36'

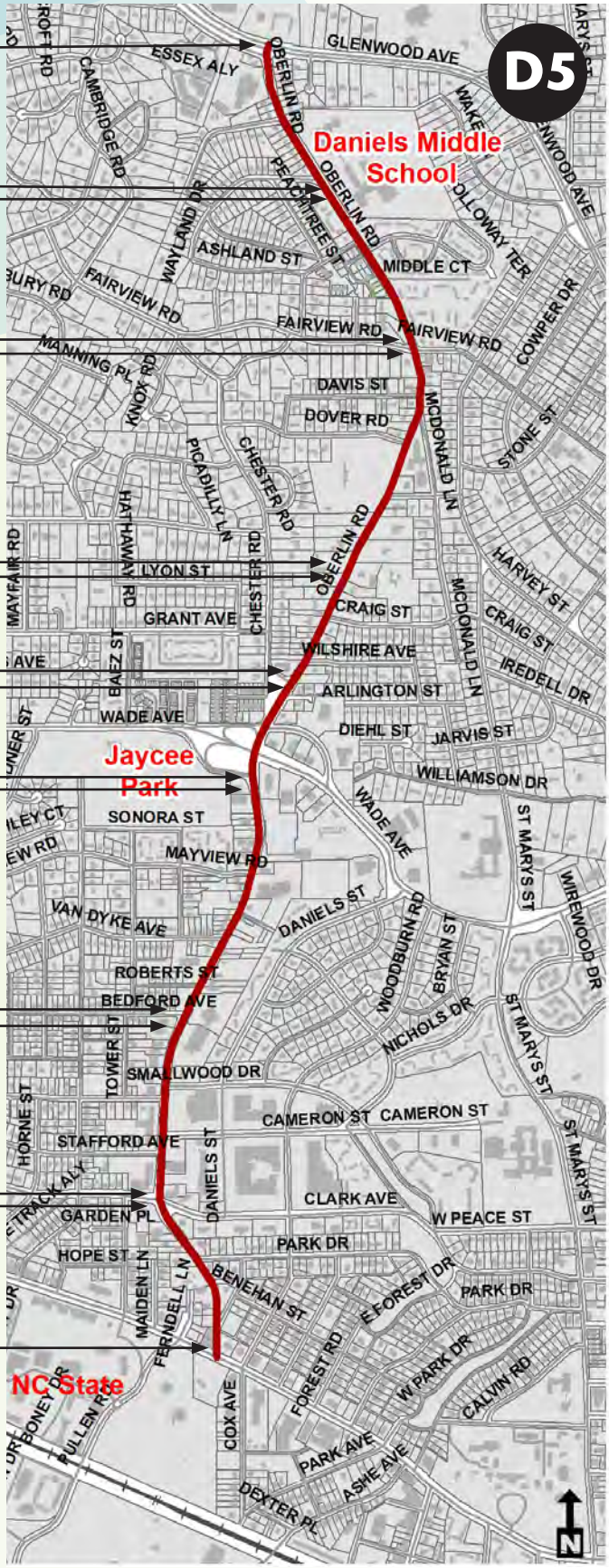
Bicycle lane restripe

Current: 5 lanes with center turn lane, totaling 55'

Shared lane markings after each intersection and at least every 250'

Current: 2 lanes totaling 36'-40'

Bicycle lane stripe



CITY COUNCIL DISTRICT E

PROJECT E1:
LASSITER MILL ROAD /ST. MARYS ST.

Phase 1 (2009)

From Glenwood Ave.
To Camelot Dr.

Miles 2.2
Feet 11,400

Recommendation:
Bicycle Lane (stripe)
- 8,100'

Bicycle Lane (restripe)
- 900'

Bicycle Lane (road diet)
- 2,400'

Important Notes:
-Connects to Alleghany Trail, Root Elementary, Drewry Hills Park, residential connections, and North Hills Shopping Center

Cost Estimate:
$26,732

Agency/Agencies:
City of Raleigh Public Works

Current:
5 lanes with a center turn lane, totaling 55'

Bicycle lane road diet:
remove outer lanes and replace with bicycle lanes

Current:
2 lanes totaling 40'-42'

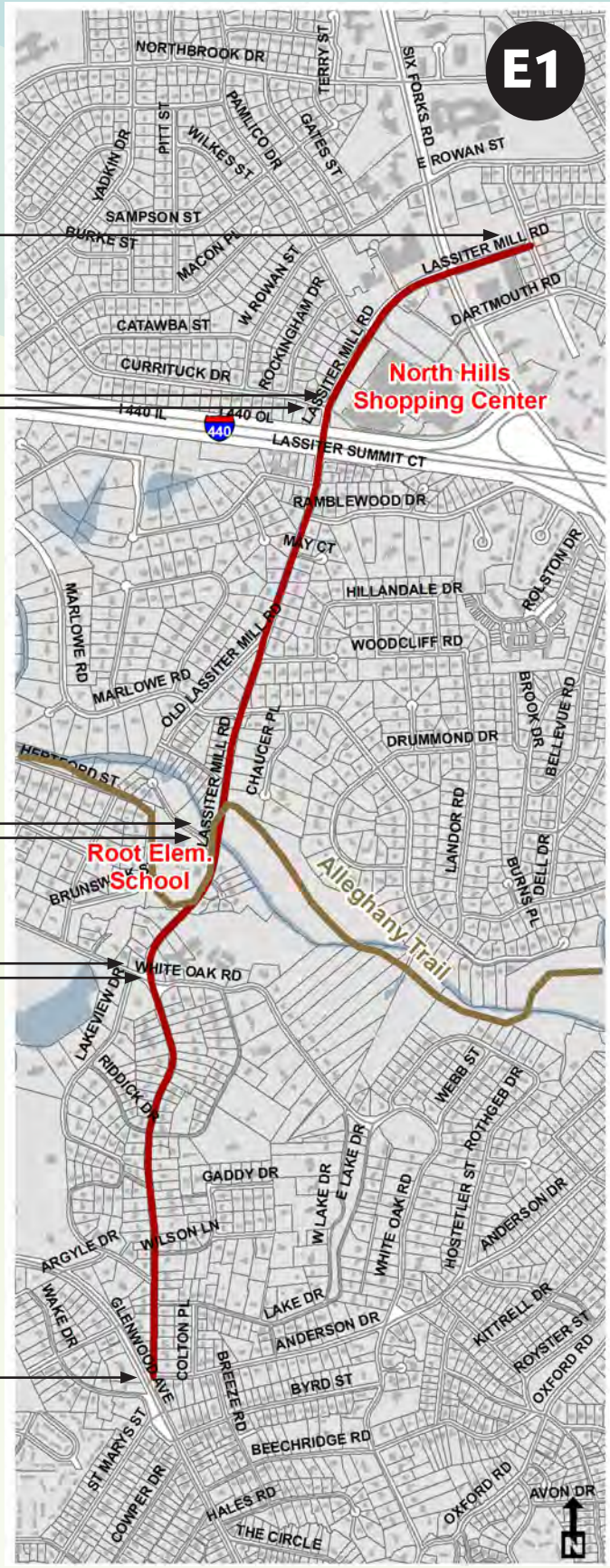
Bicycle lane stripe

Current:
3 lanes with a center turn lane, totaling 42' (14|14|14)

Bicycle lane restripe:
(6|10|10|10|6)

Current:
2 lanes totaling 40'

Bicycle lane stripe



CITY COUNCIL DISTRICT E

PROJECT E2:
EDWARDS MILL ROAD /CREEDMOOR ROAD

Phase 1 (2009)

From Blue Ridge Rd.
To Glenwood Ave.

Miles 2.0
Feet 10,400

Recommendation:
Bicycle Lane (restripe)
- 10,400'

Current:
5 lanes with a center turn lane, totaling 65'
(13|13|13|13|13)

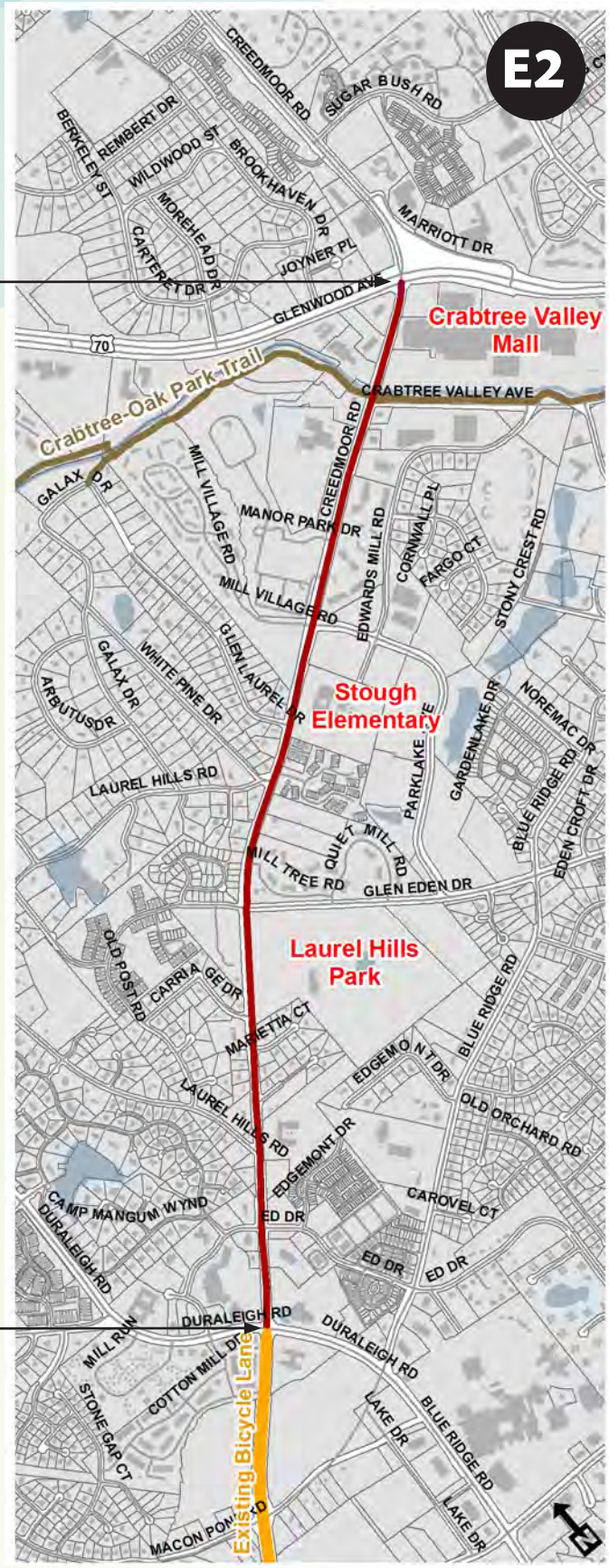
Bicycle lane restripe:
(5|11|11|11|11|11|5)

Important Notes:
-Connects to existing bicycle lane on Edwards Mill, Crabtree-Oak Park Trail, Crabtree Valley Mall, Stough Elementary, Laurel Hills Park, and residential and commercial areas

-High-ranking in public request

Cost Estimate:
$70,530

Agency/Agencies:
City of Raleigh Public Works



CITY COUNCIL DISTRICT E

PROJECT E3:
W. MILLBROOK ROAD

Phase 1 (2009)

From Glenwood Ave.
To North Hills Dr.

Miles 3.4
Feet 18,100

Recommendation:
Bicycle Lane (restripe)
- 18,100'

Important Notes:
-Connects to Shelley Lake, Wooten Meadow Park, and residential and commercial land uses

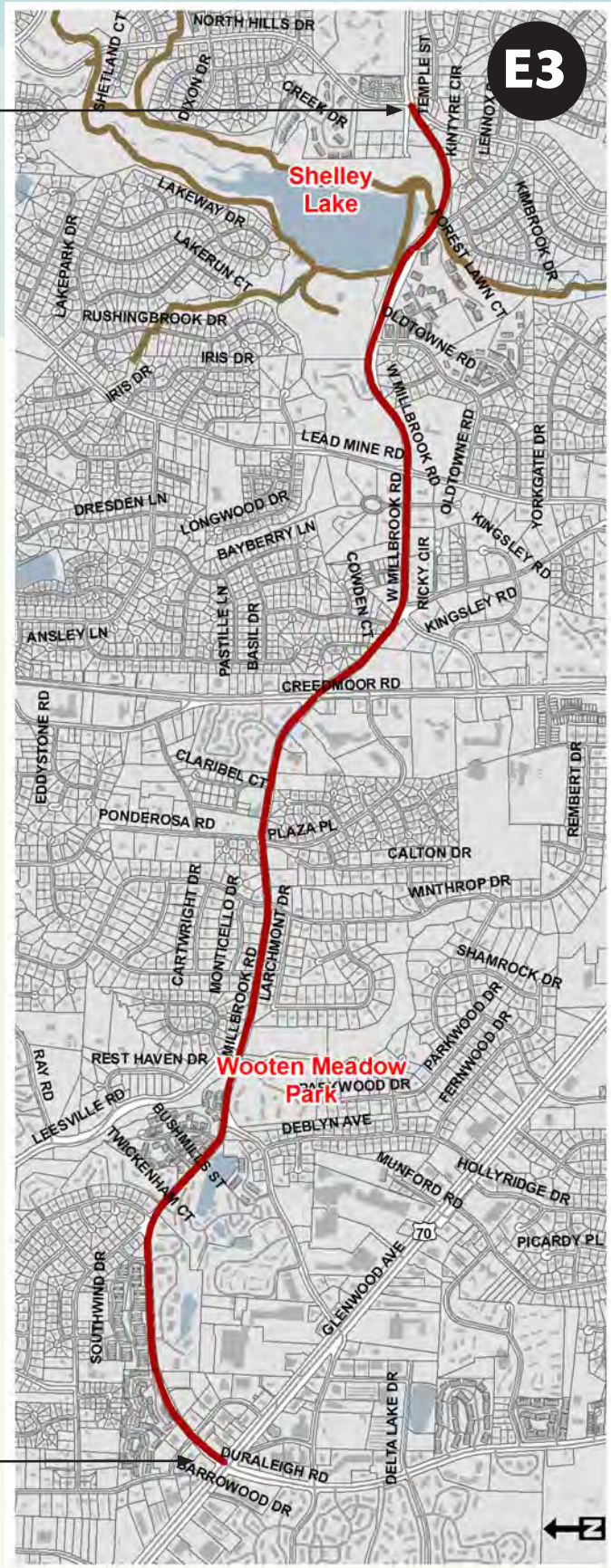
-High-ranking in public request

Cost Estimate:
$121,210

Agency/Agencies:
NCDOT and
City of Raleigh Public Works

Current:
Mostly 5 lanes with a center turn lane, totaling 64'-68' (13|13|13|13|13)

Bicycle lane restripe:
(5|11|11|11|11|11|5)



CITY COUNCIL DISTRICT E

PROJECT E4:
GLEN EDEN DRIVE

Phase 1 (2009)

From Glenwood Ave.
To Edwards Mill Rd.

Miles 2.1
Feet 11,000

Recommendation:
Bicycle Lane (stripe)
- 8,200 feet

Bicycle Lane (road diet)
- 2,800 feet.

Important Notes:
-Connects to Edwards Mill Rd. bicycle lane, Ridge Rd. bicycle lane, Laurel Hills Park, and commercial and residential areas

Cost Estimate:
$31,637

Agency/Agencies:
City of Raleigh Public Works

Current:
2 lanes totaling 42'-44'

Bicycle lane stripe

Current:
4 lanes totaling 62'

Bicycle lane road diet:
3 lanes with center turn lane or median, and bicycle lanes

CITY COUNCIL DISTRICT E

PROJECT E5:
LYNN ROAD

Phase 1 (2009)

From Creedmoor Rd.
To Glenwood Ave.

Miles 2.5
Feet 13,300

Recommendation:
Bicycle Lane (restripe)
- 13,300'

Important Notes:
-Connects to Lake Lynn Trail and Park, Hillburn Drive Elementary, and commercial and residential areas

Cost Estimate:
$89,286

Agency/Agencies:
NCDOT and
City of Raleigh Public Works

Current:
5 lanes with center turn lane, totaling 60'-67'
(12|12|12|12|12)

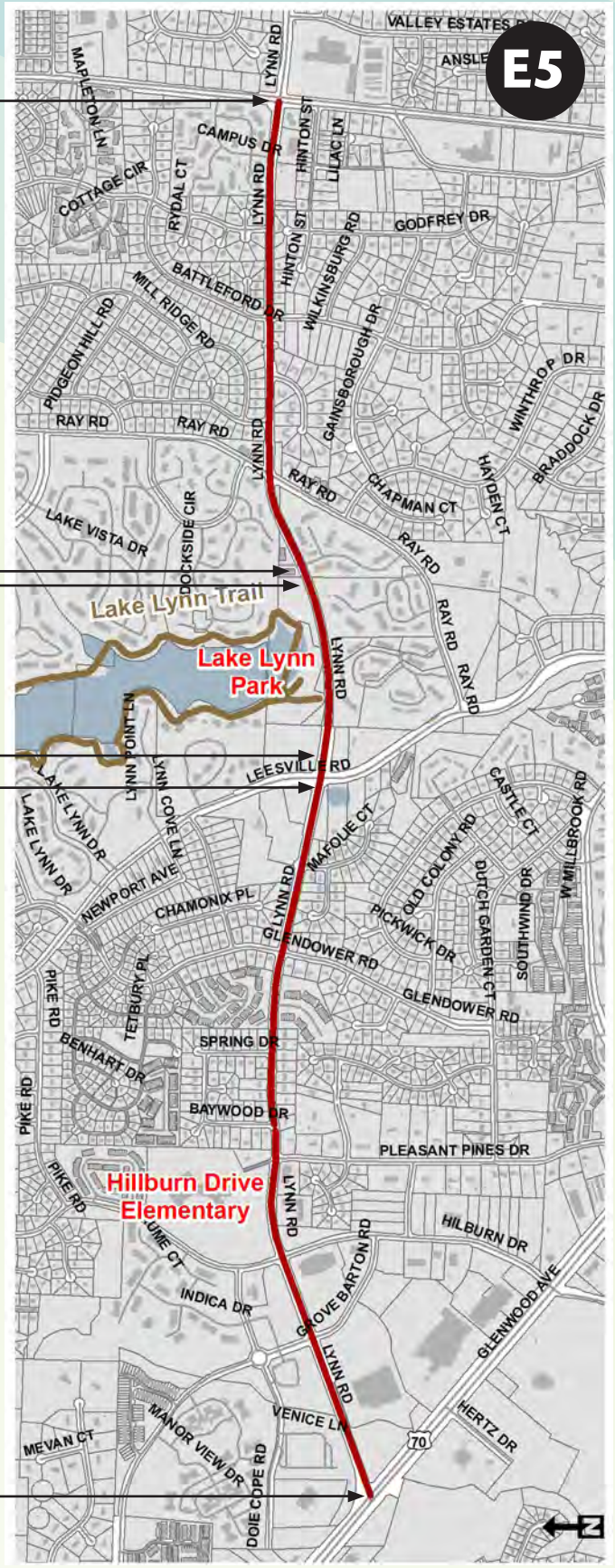
Bicycle lane restripe:
(5|10|10|10|10|5)

Current:
4 lanes totaling 50'
(13|12|12|13)

Bicycle lane restripe
(5|10|10|10|10|5)

Current:
Mostly 5 lanes with center turn lane, totaling 60'-64'
(12|12|12|12|12)

Bicycle lane restripe
(5|10|10|10|10|10|5)



BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 1*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost-effective construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" (1 mile radius)	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers*	Direct Access to Major Employment Centers**	Direct Access to/from a Planned Greenway	Totals
							5	5	5	5	5	5	5	4	4	4	3	3	2	2	2	2	1	77
MARTIN LUTHER KING JR BLVD	Poole Rd	S Saunders St	Bicycle Lane	New Construction/Restripe	C	State	0	5	5	15	10	5	5	0	0	0	0	3	0	0	0	0	0	**48**
MARTIN ST	Dawson St	Pettigrew St	Sharrow	Stripe	C	City	0	5	5	10	0	5	5	0	4	0	0	3	0	2	2	0	0	**41**
AVENT FERRY RD	Crest Rd	Western Blvd	Bicycle Lane	Restripe	D	State	0	0	5	0	0	5	10	4	4	4	0	3	0	0	2	2	0	**39**
CLARK AVE	Faircloth St	St. Marys St	Bicycle Lane/Sharrow	Restripe	D	City	0	0	10	10	0	5	5	0	4	0	0	3	0	0	2	0	0	**39**
DIXIE TRL	Ridge Road	Hillsbourough St	Bicycle Lane	Restripe, Road Diet	D, E	City	0	0	5	10	10	5	5	0	0	0	0	3	0	0	0	0	0	**38**
PEACE ST/BOUNDARY ST	St. Marys St	Watauga St	Bicycle Lane/Sharrow	Restripe, Road Diet/Stripe	C, D	City	0	5	0	0	5	5	5	4	0	4	0	3	0	2	2	2	0	**37**
HARGETT ST	St. Marys St	S Tarboro St	Sharrow	Stripe	C, D	City	0	5	0	10	0	5	5	0	4	0	0	3	0	2	0	2	0	**36**
CABARRUS ST	Western Blvd	Chavis Way	Bicycle Lane/Sharrow	Restripe/Stripe	D, C	City	0	5	10	5	0	5	5	0	0	0	0	3	0	2	0	0	0	**35**
LENOIR ST	S Dawson St	S Tarboro St	Sharrow	Stripe	C	City	0	5	5	5	5	5	5	0	0	0	0	3	0	2	0	0	0	**35**
WESTERN BLVD	Gorman St	S McDowell St	Wide Outside Lane	Stripe	D	State	0	0	5	5	0	5	5	4	0	4	0	3	0	0	2	2	0	**35**
HILLSBOROUGH ST	I-440	Gardner St	Sharrow	Stripe	D	State	5	0	5	0	0	5	5	0	0	4	0	3	3	0	0	2	0	**32**
MCDOWELL ST	South St	Lane St	Wide Outside Lane	Stripe	C, D	State	0	5	5	5	0	5	5	0	0	0	0	3	0	2	0	2	0	**32**
OBERLIN RD	Glenwood Ave	Hillsbourough St	Bicycle Lane/Sharrow	Restripe/Stripe	E, D	City	0	0	0	0	5	5	5	0	4	4	3	3	0	0	2	0	0	**31**
S BLOUNT ST	Hoke St	Morgan St	Bicycle Lane	Road Diet	C	State	0	5	0	5	0	5	5	0	4	0	0	3	0	2	2	0	0	**31**
S STATE ST	Bunche Dr	MLK Blvd	Bicycle Lane/Sharrow	Stripe/Stripe	C	City	0	0	5	5	5	5	5	0	0	0	0	3	3	0	0	0	0	**31**
AVENT FERRY RD	Athens Dr	Crest Rd	Bicycle Lane	New Construction	D	State	0	0	0	0	0	5	10	4	4	4	0	3	0	0	0	0	0	**30**
GARNER RD	Wake County Line	MLK Blvd	Bicycle Lane	Restripe	C	City	0	0	5	5	0	5	5	0	0	0	0	3	6	0	0	0	0	**29**
GLENWOOD AVE	Peace St	W. Morgan St	Sharrow	Stripe	D	City	5	5	0	5	0	5	0	0	0	4	0	3	0	0	2	0	0	**29**
HILLSBOROUGH ST	Oberlin Rd	Salisbury St	Bicycle Lane/Sharrow	Restripe/Stripe	D	State	5	5	0	5	0	5	0	0	0	4	0	3	0	2	0	0	0	**29**
W MORGAN ST	Person St	Hillsbourough St	Bicycle Lane	Road Diet, Restripe	C, D	State	0	5	0	0	0	5	10	0	0	4	0	3	0	0	0	2	0	**29**
GORMAN ST	Avent Ferry Rd	Hillsbourough St	Bicycle Lane	Restripe	D	City	0	0	5	0	0	5	5	0	4	4	0	3	0	0	0	2	0	**28**
N RALEIGH BLVD	Brentwood Rd	New Bern Ave	Bicycle Lane	Restripe	C, B	State	0	0	10	5	0	0	10	0	0	0	0	3	0	0	0	0	0	**28**
S WILMINGTON ST	Saunders St	MLK Blvd	Bicycle Lane	Restripe	C, D	State	0	0	5	0	0	5	5	0	4	0	0	3	6	0	0	0	0	**28**
TARBORO ST	Oakwood Ave	MLK Blvd	Bicycle Lane/Sharrow	Road Diet/Stripe	C	City	0	0	0	10	5	5	5	0	0	0	0	3	0	0	0	0	0	**28**
HILLSBOROUGH ST	I-40	I-440	Bicycle Lane	Restripe	D, E	State	5	0	0	0	0	5	0	0	4	4	0	3	6	0	0	0	0	**27**
S PERSON ST	New Bern Ave	Hoke St	Bicycle Lane	Road Diet	C	State	0	5	0	5	0	5	5	0	0	0	0	3	0	2	2	0	0	**27**
AVENT FERRY RD	Tryon Rd	Athens Dr	Bicycle Lane	Stripe	D	State	0	0	5	5	5	0	0	4	0	0	0	0	6	0	0	0	0	**25**
BOYLAN AVE	Western Blvd	Fletcher Park	Sharrow	Stripe	D	City	0	5	5	5	0	5	0	0	0	0	0	3	0	2	0	0	0	**25**
DAWSON ST	Western Blvd	Lane St	Bicycle Lane	Restripe	D, C	State	0	5	0	5	0	5	5	0	0	0	0	3	0	0	0	2	0	**25**
HILLSBOROUGH ST	Gardner St	Oberlin Rd	Bicycle Lane	New Construction	D	State	5	0	0	5	0	5	5	0	0	0	0	3	0	0	0	2	0	**25**

BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 2*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost-effective construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" from Online Survey	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers*	Direct Access to Major Employment Centers**	Direct Access to/from a Planned Greenway	Totals
							5	5	5	5	5	5	5	4	4	4	3	3	2	2	2	2	1	77
JONES ST	St. Marys St	Tarboro St	Bicycle Lane	Stripe, Road Diet	C, D	City	0	5	0	5	0	5	5	0	0	0	0	3	0	0	2	0	0	**25**
LASSITER MILL/ST MARYS	Camelot Dr	Glenwood Ave	Bicycle Lane	Stripe, Road Diet	E	City	0	0	10	5	5	0	0	0	0	0	0	0	3	0	2	0	0	**25**
S SAUNDERS ST	Wake County Line	MLK Blvd/Western Blvd	Wide Outside Lane	Stripe	D	State	0	0	5	0	0	10	0	0	4	0	0	0	6	0	0	0	0	**25**
EDWARDS MILL/CREEDMOOR	Duraleigh Rd	Glenwood Ave	Bicycle Lane	Restripe	E	State	0	0	5	5	5	0	0	0	4	0	3	0	0	0	2	0	0	**24**
SALISBURY ST	MLK Blvd	Peace St	Bicycle Lane	Restripe	C, D	City	0	5	0	0	0	5	5	0	0	0	0	3	0	2	2	2	0	**24**
SIX FORKS RD	Millbrook Rd	Anderson Dr	Bicycle Lane	New Construction	A, E	State	5	0	0	0	10	0	0	0	0	4	0	0	3	0	2	0	0	**24**
W NORTH ST/LANE ST	St. Marys St	East St	Sharrow	Stripe	C, D	City	0	5	0	0	5	5	0	0	0	0	0	3	0	2	2	2	0	**24**
ASHE AVE	Western Blvd	Hillsbourough St	Bicycle Lane	Stripe	D	City	0	0	5	5	0	5	5	0	0	0	0	3	0	0	0	0	0	**23**
FAIRCLOTH ST	Hillsbourgh St	Wade Ave	Bicycle Lane	Stripe	D	City	5	0	10	0	0	5	0	0	0	0	0	3	0	0	0	0	0	**23**
EDENTON ST	Hillsborough St	New Bern Ave	Bicycle Lane	Restripe	C, D	State	0	5	0	0	0	5	5	0	0	0	0	3	0	2	0	2	0	**22**
N BLOUNT ST	Railroad	Morgan St	Bicycle Lane	Road Diet	C	City	0	5	0	0	0	5	5	0	0	0	0	3	0	2	2	0	0	**22**
POOLE RD	MLK Blvd	New Bern Ave	Bicycle Lane	Road Diet	C	City	0	0	0	0	5	5	5	0	0	0	3	3	0	0	0	0	0	**21**
WESTERN BLVD	Gorman St	Jones Franklin Rd	Wide Outside Lane	Stripe	D	State	0	0	0	0	0	5	5	4	4	0	0	3	0	0	0	0	0	**21**
CREST RD	Varsity Dr	Avent Ferry Rd	Bicycle Lane	Restripe, Road Diet	D	City	0	0	5	0	5	5	0	0	0	0	0	3	0	0	0	2	0	**20**
EAST ST	Oakwood Ave	MLK Blvd	Sharrow	Stripe	C	City	0	5	0	0	0	5	5	0	0	0	0	3	0	2	0	0	0	**20**
GORMAN ST	Tryon Rd	Avent Ferry Rd	Bicycle Lane	Restripe	D	State	0	0	5	0	0	0	5	0	4	0	0	0	6	0	0	0	0	**20**
MILBURNIE RD/HILL ST	New Bern Ave	New Bern Ave	Bicycle Lane	Restripe	C	City	0	0	5	0	5	5	0	0	0	0	0	3	0	0	0	2	0	**20**
N PERSON ST	New Bern Ave	Brookside Dr	Bicycle Lane	Road Diet	C	State	0	5	0	0	0	5	5	0	0	0	0	3	0	2	0	0	0	**20**
WAKE FOREST RD	Capital Blvd	I-440	Bicycle Lane	Road Diet, New Construction	B	State	0	0	5	0	0	0	5	0	0	4	3	0	3	0	0	0	0	**20**
WILMINGTON ST	MLK Blvd	Peace St	Bicycle Lane	Restripe	C	City	0	5	0	0	0	5	0	0	4	0	0	0	0	2	2	2	0	**20**
BLUE RIDGE RD	Western Blvd	Lake Boone Trail	Bicycle Lane	New Construction	E, D	State	0	0	5	0	0	5	0	0	0	4	3	0	0	0	0	2	0	**19**
BLUE RIDGE RD	Lake Boone Trail	Glenwood Ave	Bicycle Lane	New Construction	E	State	0	0	5	5	0	0	0	0	4	0	0	0	0	0	2	2	1	**19**
CREEDMOOR RD	Glenwood Ave	Lynn Rd	Bicycle Lane	Restripe	A, E	State	0	0	0	0	5	0	0	4	4	4	0	0	0	0	2	0	0	**19**
EBENEZER CHURCH RD	Masota Rd	Duraleigh Rd	Paved Shoulder	New Construction	E	State	0	0	10	5	0	0	0	0	0	0	3	0	0	0	0	0	1	**19**
NEW BERN AVE	Yonkers Rd	Poole Rd	Wide Outside Lane	Stripe	C	State	0	0	0	0	0	5	5	0	0	0	3	3	0	0	0	2	1	**19**
STRICKLAND RD	Creedmoor Rd	Falls of the Neuse Rd	Bicycle Lane	Restripe	A	State	0	0	5	5	5	0	0	0	0	0	3	0	0	0	0	0	1	**19**
W MILLBROOK RD	Glenwood Ave	North Hills Dr	Bicycle Lane	Restripe, Road Diet	E, A	State	0	0	5	10	0	0	0	0	0	0	3	0	0	0	0	0	1	**19**
BROOKSIDE DR/WATAUGA ST	Oakwood Ave	Automotive Way	Bicycle Lane	Stripe, Restripe	C	City	0	0	0	5	5	5	0	0	0	0	0	3	0	0	0	0	0	**18**
CAPITAL BLVD	Wake County Line	Spring Forest Rd	Wide Outside Lane	Stripe	B	State	5	0	0	0	0	0	0	0	4	0	0	0	6	0	2	0	1	**18**
CHAVIS WAY	E Lenoir St	MLK Blvd	Bicycle Lane	Stripe	C	City	0	0	5	5	0	5	0	0	0	0	0	3	0	0	0	0	0	**18**

BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 3*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost effective-construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" from Online Survey	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers*	Direct Access to Major Employment Centers**	Direct Access to/from a Planned Greenway	Totals
							5	5	5	5	5	5	5	4	4	4	3	3	2	2	2	2	1	77
FALLS OF NEUSE RD	Old NC 98	Dunn Rd	Bicycle Lane	New Construction	B	State	0	0	5	0	5	0	0	4	0	0	0	0	3	0	0	0	1	**18**
NEW BERN AVE	Poole Rd	Person St	Wide Outside Lane	Stripe	C	State	0	0	0	0	0	5	5	0	0	0	3	3	0	2	0	0	0	**18**
ROCK QUARRY RD	I-40	MLK Blvd	Bicycle Lane	Restripe	C	State	0	0	5	5	0	5	0	0	0	0	0	0	3	0	0	0	0	**18**
S RALEIGH BLVD	New Bern Ave	Rock Quarry Rd	Bicycle Lane	New Construction	C	State	0	0	5	0	0	5	5	0	0	0	0	3	0	0	0	0	0	**18**
SOUTH ST	East Street	Boylan Ave	Bicycle Lane	Restripe, Stripe	C, D	City	0	5	0	0	0	5	5	0	0	0	0	3	0	0	0	0	0	**18**
ST MARYS ST	Peace St	Hargett St	Sharrow	Stripe	D	City	0	5	0	0	5	5		0	0	0	0	3	0	0	0	0	0	**18**
CHAPEL HILL RD	I-40	Hillsbourough St	Bicycle Lane	New Construction	E	State	0	0	0	0	5	5	0	0	0	0	0	0	6	0	0	0	0	**16**
POOLE RD	Maybrook Dr	Neuse River Greenway	Bicycle Lane	New Construction	C	State	0	0	0	10	0	0	0	0	0	0	3	0	3	0	0	0	0	**16**
CRABTREE VALLEY AVE	Glenwood Ave	Glenwood Ave	Bicycle Lane	New Construction	E	City	0	0	5	0	0	0	0	0	4	0	0	0	3	0	2	0	1	**15**
DURANT RD	Capital Blvd	Falls of the Neuse Rd	Bicycle Lane	Restripe	B	State	0	0	5	0	10	0	0	0	0	0	0	0	0	0	0	0	0	**15**
FAYETTEVILLE ST	Morgan St	Convention Center	Sharrow	Stripe	C, D	City	0	5	0	0	0	5	0	0	0	0	0	3	0	2	0	0	0	**15**
GLEN EDEN DR	Edwards Mill Rd	Glenwood Ave	Bicycle Lane	Stripe, Road Diet	E	City	0	0	0	10	0	0	0	0	0	0	0	0	3	0	0	0	2	**15**
GLENWOOD AVE	Pleasant Valley Rd	Lead Mine Rd	Wide Outside Lane	Stripe	E	State	5	0	0	0	0	0	0	0	4	4	0	0	0	0	2	0	0	**15**
JONES FRANKLIN RD	Tryon Rd	Buck Jones Rd	Bicycle Lane	New Construction	D	State	0	0	0	5	0	0	0	0	4	0	0	0	6	0	0	0	0	**15**
LAKE WHEELER RD	Centennial Pkwy	Western Blvd	Sidepath	New Construction	D	City	0	0	5	0	0	5	0	0	0	0	3	0	0	0	2	0	0	**15**
LYNN RD	Glenwood Ave	Creedmoor Rd	Bicycle Lane	Restripe	E	State	0	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	**15**
LYNN RD	Creedmoor Rd	Sandy Forks Rd	Bicycle Lane	Restripe	A	State	0	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	**15**
NORTH HILLS DR	Lead Mine Rd	Lynn Rd	Bicycle Lane	Stripe	A	City	0	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**15**
OAKWOOD/E NORTH/LORD BERKLE	New Bern Ave	N Wilmington St	Sharrow/Bicycle Lane	Stripe/Stripe	C	City	0	0	0	0	0	5	5	0	0	0	0	3	0	2	0	0	0	**15**
REEDY CREEK RD	Edwards Mill Rd	Umstead State Park	Sharrow	Stripe	E	State	0	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**15**
SPRING FOREST RD	Sandy Forks Rd	Atlantic Ave	Bicycle Lane	Restripe	A, B	State	0	0	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	**15**
ST MARYS ST	Glenwood Ave	Peace St	Bicycle Lane	Restripe, Stripe	E, D	City	0	0	0	5	5	0	0	0	0	0	0	3	0	2	0	0	0	**15**
TRENTON RD	I-40	Reedy Creek Rd	Paved Shoulder	New Construction	E	City	0	0	5	5	0	5	0	0	0	0	0	0	0	0	0	0	0	**15**
WEST ST	Wade Ave	Hargett St	Sharrow	Stripe	D	City	0	5	0	0	0	5	0	0	0	0	0	3	0	2	0	0	0	**15**
GLENWOOD AVE	Oberlin Rd	Whitaker Mill Rd	Wide Outside Lane	Stripe	E, B	State	5	0	0	0	0	0	0	0	0	4	0	0	3	0	2	0	0	**14**
LAKE WHEELER RD	Tryon Rd	Centennial Pkwy	Bicycle Lane	New Construction	D	State	0	0	0	5	0	0	0	0	0	0	3	0	6	0	0	0	0	**14**
NEW BERN AVE	Old Milburnie Rd	Yonkers Rd	Wide Outside Lane	Stripe	C, B	State	0	0	5	0	0	0	0	0	0	0	3	0	6	0	0	0	0	**14**
SIX FORKS RD	Anderson Dr	Capital Blvd	Bicycle Lane	New Construction	E, B, C	State	5	0	5	0	0	0	0	0	0	4	0	0	0	0	0	0	0	**14**
VARSITY DR	Western Blvd	Marcom St	Bicycle Lane	New Construction	D	City	0	0	0	0	0	5	0	0	4	0	0	3	0	0	0	2	0	**14**
WESTERN BLVD	I-40	Jones Franklin Rd	Wide Outside Lane	Stripe	D	State	0	0	0	0	0	0	0	4	4	0	0	0	6	0	0	0	0	**14**

BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 4*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost effective-construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" from Online Survey	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers*	Direct Access to Major Employment Centers**	Direct Access to/from a Planned Greenway	Totals
BUCK JONES RD	I-40	Western Blvd	Bicycle Lane	New Construction	D	City	0	0	0	0	0	0	0	0	4	0	3	0	6	0	0	0	0	**13**
E MILLBROOK RD	Falls of the Neuse Rd	Capital Blvd	Bicycle Lane	Restripe	B	State	0	0	0	0	5	5	0	0	0	0	3	0	0	0	0	0	0	**13**
EBENEZER CHURCH RD	Graylyn Dr	Masota Rd	Paved Shoulder	New Construction	E	State	0	0	5	5	0	0	0	0	0	0	3	0	0	0	0	0	0	**13**
EBENEZER CHURCH RD/GRAYLAN	Westgate Rd	Umstead State Park	Bicycle Lane	Restripe	E	State	0	0	5	5	0	0	0	0	0	0	3	0	0	0	0	0	0	**13**
EDWARDS MILL RD	Western Blvd	Wade Ave	Bicycle Lane	New Construction/Restripe	E	State	0	0	5	0	0	5	0	0	0	0	3	0	0	0	0	0	0	**13**
FAIRCLOTH ST	Hillsborough St	Wade Ave	Bicycle Lane	Stripe	D	City	0	0	5	0	0	5	0	0	0	0	0	3	0	0	0	0	0	**13**
FORESTVILLE RD	Louisburg Rd	Buffaloe Rd	Bicycle Lane	New Construction	B	City	0	0	0	5	5	0	0	0	0	0	0	0	3	0	0	0	0	**13**
FOX RD	Spring Forest Rd	Southall Rd	Bicycle Lane	New Construction	B	City	0	0	0	5	5	0	0	0	0	0	0	0	3	0	0	0	0	**13**
HAYWOOD ST/S SWAIN ST	MLK Blvd	E Jones St	Sharrow/Bicycle Lane	Stripe/Stripe	C	City	0	0	0	0	5	5	0	0	0	0	0	3	0	0	0	0	0	**13**
LAKE DAM RD	Tryon Rd	Existing Greenway	Paved Shoulder	New Construction	D	City	0	0	5	5	0	0	0	0	0	0	0	0	3	0	0	0	0	**13**
ROCK QUARRY RD	South New Hope Road	I-40	Bicycle Lane	New Construction	C	State	0	0	0	0	5	0	5	0	0	0	0	0	3	0	0	0	0	**13**
WAKE FOREST RD	I-440	Falls of the Neuse Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	5	5	0	0	0	0	0	3	0	0	0	0	**13**
S SAUNDERS ST	Cabarrus St	Lake Wheeler Rd	Wide Outside Lane	Stripe	D, C	State	0	0	5	0	0	0	0	0	4	0	0	3	0	0	0	0	0	**12**
SKYCREST DR	New Hope Rd	Wake County Line	Bicycle Lane	New Construction	B	State	0	0	5	0	0	0	0	0	0	0	0	0	6	0	0	0	1	**12**
VARSITY DR	Marcom St	Avent Ferry Rd	Bicycle Lane	Stripe	D	City	0	0	0	0	0	5	0	0	4	0	0	3	0	0	0	0	0	**12**
ATLANTIC AVE	New Hope Church Rd	Brookside Dr	Bicycle Lane	Road Diet	B, C	City	0	0	5	0	0	0	0	0	0	0	3	0	3	0	0	0	0	**11**
LEESVILLE RD	New Leesville Blvd	Westgate Rd	Bicycle Lane	Stripe	E	State	0	0	0	5	0	0	0	0	0	0	3	0	3	0	0	0	0	**11**
OLD WAKE FOREST RD	Fox Rd	Litchford Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	5	0	0	4	0	0	0	0	0	2	0	0	**11**
TRYON RD	Cyrus St	Sunnybrook Rd	Bicycle Lane	Stripe	C	State	0	0	0	5	0	0	0	0	0	0	3	0	3	0	0	0	0	**11**
TRYON RD	Lake Wheeler Rd	S. Saunders St.	Bicycle Lane	Restripe	D	State	0	0	0	0	0	5	0	0	0	0	3	0	3	0	0	0	0	**11**
BRIER CREEK PKWY	Globe Rd	T W Alexander Dr	Bicycle Lane	Restripe	E	State	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	**10**
BROOKS/CANTERBURY/FAIRVIEW	St. Marys St	Lake Boone Trail	Bicycle Lane	Stripe	E	City	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
FOREST PINES/HONEYCHURCH	Common Oaks Dr	Old NC 98	Bicycle Lane	Road Diet	B	City	0	0	0	0	5	0	0	0	0	0	0	0	3	0	0	2	0	**10**
GLENWOOD AVE	Lead Mine Rd	Oberlin Rd	Wide Outside Lane	Stripe	E	State	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
GLENWOOD AVE	Toyota Dr	Pinecrest Rd	Wide Outside Lane	Stripe	E	State	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
S SAUNDERS ST	Lake Wheeler Rd	S Wilmington St	Bicycle Lane	Road Diet	D	State	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	**10**
SIX FORKS RD	Sawmill Rd	Millbrook Rd	Bicycle Lane	New Construction	A	State	5	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	1	**10**
SUNNYBROOK RD	I-40	Poole Rd	Bicycle Lane	Restripe	C	State	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
TRAILWOOD DR	Main Campus Dr	Avent Ferry Rd	Bicycle Lane	New Construction	D	State	0	0	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	**10**
FAIRVIEW RD	Capital Blvd	Glenwood Ave	Sharrow	Stripe	B	City	0	0	0	0	0	0	0	0	0	4	0	3	0	0	2	0	0	**9**

BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 5*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost effective-construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" from Online Survey	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers*	Direct Access to Major Employment Centers**	Direct Access to/from a Planned Greenway	Totals
FALLS OF NEUSE RD	Spring Forest	Old Wake Forest Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	5	0	4	0	0	0	0	0	0	0	0	0	**9**
FALLS OF NEUSE RD	Strickland Rd	Spring Forest	Bicycle Lane	New Construction	B	State	0	0	0	0	0	0	5	4	0	0	0	0	0	0	0	0	0	**9**
PECAN RD	S Wilmington St	Lake Wheeler Rd	Bicycle Lane	Stripe	D	City	0	0	0	0	0	5	0	0	4	0	0	0	0	0	0	0	0	**9**
SUMNER BLVD/BARROW DR	Gresham Lake Rd	Triangle Town Blvd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	4	0	0	0	3	0	2	0	0	**9**
ATHENS DR	Jones Franklin Rd	Avent Ferry Rd	Bicycle Lane	Stripe	D	City	0	0	0	0	5	0	0	0	0	0	0	0	3	0	0	0	0	**8**
GLASCOCK/LARSON/CHATHAM	Milburnie Rd	Person St	Sharrow/Bicycle Lane	Stripe/Restripe	C	City	0	0	0	0	0	0	5	0	0	0	0	3	0	0	0	0	0	**8**
GLENWOOD AVE	Wake County Line	Brier Creek Parkway	Wide Outside Lane	Stripe	E	State	5	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**8**
GLOBE RD	Wake County Line	Brier Creek Parkway	Bicycle Lane	Restripe	E	City	0	0	0	5	0	0	0	0	0	0	0	0	3	0	0	0	0	**8**
LEESVILLE RD	Westgate Rd	Lynn Rd	Bicycle Lane	New Construction	E	State	0	0	0	0	5	0	0	0	0	0	3	0	0	0	0	0	0	**8**
LUMLEY RD	Arnold Palmer Dr	Glenwood Ave	Bicycle Lane	Restripe	E	State	0	0	0	0	0	5	0	0	0	0	0	0	3	0	0	0	0	**8**
N STATE ST	Oakwood Ave	Glascock St	Bicycle Lane	Restripe	C	City	0	0	0	0	0	5	0	0	0	0	0	3	0	0	0	0	0	**8**
OLD MILBURNIE RD	Forestville rd	New Bern Ave	Bicycle Lane	New Construction	C	City	0	0	0	5	0	0	0	0	0	0	0	0	3	0	0	0	0	**8**
POOLE RD	I-440	MLK Blvd	Bicycle Lane	New Construction	C	State	0	0	0	5	0	0	0	0	0	0	3	0	0	0	0	0	0	**8**
S MCDOWELL ST	Saunders St	South St	Wide Outside Lane	Stripe	C, D	State	0	0	0	0	5	0	0	0	0	0	0	3	0	0	0	0	0	**8**
SIX FORKS RD	I-540	Sawmill Rd	Bicycle Lane	New Construction	A	State	5	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**8**
SKYCREST DR	Brentwood Rd	New Hope Rd	Bicycle Lane	New Construction	B	State	0	0	0	5	0	0	0	0	0	0	0	0	3	0	0	0	0	**8**
STRICKLAND RD	Leesville Rd	Creedmoor Rd	Bicycle Lane	New Construction	A, E	State	0	0	0	5	0	0	0	0	0	0	3	0	0	0	0	0	0	**8**
T W ALEXANDER DR	Wake County Line	Brier Creek Parkway	Bicycle Lane	New Construction	E	State	0	0	0	0	0	5	0	0	0	0	0	0	3	0	0	0	0	**8**
TRINITY RD	I-40	Blue Ridge Rd	Bicycle Lane	New Construction	E	State	0	0	0	0	0	5	0	0	0	0	0	0	3	0	0	0	0	**8**
WAKEFIELD PLANTATION DR	NC 98 Bypass	Falls of the Neuse Rd	Bicycle Lane	Stripe	B	City	0	0	5	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**8**
WOLFPACK LN	Bush St	Atlantic Ave	Bicycle Lane	Stripe	B	City	0	0	0	0	0	5	0	0	0	0	0	3	0	0	0	0	0	**8**
BUFFALOE RD	I-540	Wake County Line	Bicycle Lane	Road Diet	B	State	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	1	**7**
CREEDMOOR RD	Lynn Rd	I-540	Bicycle Lane	Restripe	A	State	0	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0	0	**7**
FALLS OF NEUSE RD	Dunn Rd	Durant Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0	0	**7**
FALLS OF NEUSE RD	Durant Rd	Strickland Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0	0	**7**
LOUISBURG RD	Spring Forest Rd	Mitchell Mill Rd	Wide Outside Lane	Stripe	B	State	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	1	**7**
MILLBROOK RD	North Hills Dr	Falls of the Neuse Rd	Sharrow	Stripe	A	State	0	0	0	0	0	0	0	0	0	4	3	0	0	0	0	0	0	**7**
NAZARETH ST	Centennial Pkwy	Western Blvd	Sharrow	Stripe	D	City	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	2	0	**7**
LAKE BOONE TRL	Edwards Mill Rd	Ridge Rd	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	1	**6**
LEAD MINE RD	Glenwood Ave	Yorkgate Dr	Bicycle Lane	Restripe	A	State	0	0	0	0	0	0	0	0	4	0	0	0	0	0	2	0	0	**6**

BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 6*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost effective-construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" from Online Survey	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers**	Direct Access to Major Employment Centers*	Direct Access to/from a Planned Greenway	Totals
NEW FALLS OF NEUSE RD	Capital Blvd	Falls of the Neuse Rd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	1	**6**
NEWTON RD	Six Forks Rd	Falls of the Neuse Rd	Sharrow	Stripe	A	City	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1	**6**
POOLE RD	I-440	Maybrook Dr	Bicycle Lane	Restripe	C	State	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	**6**
SUNNYBROOK RD	New Bern Ave	Poole Rd	Bicycle Lane	New Construction	C	City	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	2	0	**6**
TRYON RD	Jones Franklin Rd	Lake Wheeler Rd	Bicycle Lane	Stripe	D	State	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	**6**
TRYON RD	S Saunders St.	Cyrus St	Bicycle Lane	New Construction	C, D	State	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	**6**
WHITAKER MILL RD	Atlantic Ave	Glenwood Ave	Bicycle Lane/Sharrow	Road Diet/Stripe	B	City	0	0	0	0	0	0	0	0	0	4	0	0	0	0	2	0	0	**6**
ANDERSON DR	Glenwood Ave	Six Forks Rd	Bicycle Lane	Stripe	B	City	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
BARWELL RD	Rock Quarry Rd	Poole Rd	Bicycle Lane	New Construction	C	City	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
BUFFALOE RD	Southall Rd	I-540	Bicycle Lane	New Construction	B	State	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
BUSH ST	St. Albans	Wolfpack Ln	Bicycle Lane	Stripe	B	City	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	**5**
CAPITAL BLVD	Spring Forest Rd	Highwoods Blvd	Wide Outside Lane	Stripe	B	State	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
CORPORATE CENTER DR	Trinity Rd	Chapel Hill Rd	Bicycle Lane	Stripe	E	City	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	**5**
CROSS LINK RD/RUSH ST	Rock Quarry Rd	S Wilmington St	Bicycle Lane	Restripe/Road Diet	C	City	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	**5**
GLENWOOD AVE	Pinecrest Rd	Pleasant Valley Rd	Bicycle Lane/Sharrow	Restripe/Stripe	E	State	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
GREEN RD	Spring Forest Rd	New Hope Church Rd	Bicycle Lane	Road Diet	B	City	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
HOKE ST	S Blount St	Garner Rd	Bicycle Lane	Stripe	C	City	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	**5**
LEWIS FARM RD	Banbury Rd	Canterbury Rd	Sharrow	Stripe	E	City	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
N NEW HOPE RD	Buffaloe Rd	Corporation Pkwy	Bicycle Lane	Stripe	B	State	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
NEW HOPE CHURCH RD	Green Rd	Wake Forest Rd	Bicycle Lane	Restripe	B	City	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	**5**
POYNER RD	Glenwood Forest	Ebenezer Church Rd	Bicycle Lane	New Construction	E	City	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
RAY RD	Strickland Rd	Leesville Rd	Bicycle Lane	New Construction	E	State	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
SAWMILL RD	Creedmoor Rd	Six Forks Rd	Bicycle Lane	Restripe	A	City	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
SPRING FOREST RD	Atlantic Rd	Fox Rd	Bicycle Lane	Restripe	B	State	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	**5**
ST ALBANS DR	Wake Forest Rd	New Hope Church Rd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	**5**
WATKINS RD	Mitchell Mill Rd	Jones Bay Ln	Bicycle Lane	New Construction	B	City	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
WESTCHASE BLVD/C. F. STADIUM	Blue Ridge Rd	Edwards Mill Rd	Bicycle Lane	Restripe	E	City	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	**5**
DURALEIGH RD/BLUE RIDGE RD	Lake Boone Trail	Glenwood Ave	Bicycle Lane	Restripe	E	State	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	**4**
ATLANTIC AVE	Dixie Forest Rd	New Hope Church Rd	Bicycle Lane	Road Diet	B	City	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	**3**
ATLANTIC AVE	New Hope Church Rd	Six Forks Rd	Bicycle Lane	Road Diet	B	City	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	**3**
AUBURN CHURCH RD	Jones Sausage Rd	Wall Store Rd	Bicycle Lane	New Construction	C	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**

BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 7*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost effective-construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" from Online Survey	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers*	Direct Access to Major Employment Centers**	Direct Access to/from a Planned Greenway	Totals
							5	5	5	5	5	5	5	4	4	4	3	3	2	2	2	2	1	77
GLENWOOD FOREST DR	Glenwood Ave	Poyner Rd	Bicycle Lane	Stripe	E	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
GRESHAM LAKE RD	Rainwater Rd	Capital Blvd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
JONES SAUSAGE RD	I-40	Rock Quarry Rd	Bicycle Lane	New Construction	C	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
LEESVILLE RD	Lynn Rd	Millbrook Rd	Bicycle Lane	New Construction	E	State	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	**3**
LEESVILLE RD	Mt. Herman Rd	Westgate Rd	Bicycle Lane	New Construction	E	State	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	**3**
LITCHFORD RD	Falls of the Neuse Rd	Old Wake Forest Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
MITCHELL MILL RD	Louisburg Rd	Wake County Line	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
N BOUNDARY ST	Brookside Dr	Person St	Sharrow	Stripe	C	City	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	**3**
NEW LEESVILLE BLVD	Shady Grove Rd	Leesville Rd	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
PLEASANT VALLEY RD	Millbrook Rd	Glenwood Ave	Bicycle Lane	Road Diet	E	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
PLEASANT VALLEY RD	Glenwood Ave	Duraleigh Rd	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
RAY RD	I-540	Strickland Rd	Paved Shoulder	New Construction	E	State	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
ROCK QUARRY RD	Wake County Line	South New Hope Road	Bicycle Lane	New Construction	C	State	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
SWAIN ST	Lenoir St	Jones St	Sharrow	Stripe	C	City	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	**3**
TRAILWOOD DR	Tryon Rd	Main Campus Dr	Bicycle Lane	Restripe	D	State	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	**3**
SHANTA DR	New Bern Ave	Milburnie Rd	Bicycle Lane	Restripe	C	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**2**
ST ALBANS DR/CAMELOT DR	Lassiter Mill Rd	Wake Forest Rd	Bicycle Lane	Stripe	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	**2**
TRIANGLE TOWN BLVD	Sumner Blvd	Capital Blvd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	**2**
DUNN RD	Durant Rd	Falls of the Neuse Rd	Bicycle Lane	Restripe	B	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
FERNWOOD DR/REMBERT DR	Deblyn Ave	Glenwood Ave	Sharrow	Stripe	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
N NEW HOPE RD	Corporation Pkwy	US 64	Bicycle Lane	New Construction	B	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
ROGERS LN	New Hope Rd	New Bern Ave	Bicycle Lane	Restripe, Road Diet	C	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
ACC BLVD	Brier Creek Pkwy	Leesville Rd	Bicycle Lane	Road Diet	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
ARNOLD PALMER DR/BRIER CLUB LI	T W Alexander Dr	Lumley Rd	Bicycle Lane	Stripe	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
BATTLE BRIDGE RD	Rock Quarry Rd	Wake County Line	Bicycle Lane	New Construction	C	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
BRENTWOOD RD	Noblin Rd	Capital Blvd	Bicycle Lane	Stripe	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
BRENTWOOD RD	Capital Blvd	New Hope Church Rd	Bicycle Lane	Road Diet	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
BUFFALOE RD	Capital Blvd	Southall Rd	Bicycle Lane	Road Diet	B	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
CALVARY DR	Louisburg Rd	Green Rd	Bicycle Lane	Road Diet	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
CAROLINA PINES AVE	Lake Wheeler Rd	S Saunders Rd	Bicycle Lane	New Construction	D	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

BICYCLE FACILITY SEGMENT PRIORITIZATION *Table B-1, Part 8*

Recommended bicycle facility segments (below) are prioritized according to weighted criteria (right).

Light blue = Top 25 Projects (high priority with cost-effective construction method and equity across Council Districts)

Gray = Additional projects with cost-effective construction methods (bicycle lane restripe/stripe/road diet and shared lane markings)

Bicycle Facilities	From	To	Facility Type	Method	Council District	Maintenance	Top 1-5 "Most in Need of Improvement" from Online Survey	Direct Access to/from Downtown (Downtown Overlay District)	Direct Access to/from an Existing or Funded Greenway	Direct Access to/from a Park or Recreation Center	Direct Access to/from a School	Serves Areas with High Percent No Vehicle	Segment Contains High Level of Reported Bike Accidents	Top 6-10 "Most in Need of Improvement" from Online Survey	Direct Access to/from Proposed Transit Hubs	Segment Contains a Top 10 Intersection "Most in Need of Improvement" from Online Survey	Top 11-25 "Most in Need of Improvement" from Online Survey	College/University Proximity (1 mile radius)	Regional Connection and/or Interstate Highway Crossing	Direct Access to/from High Density Residential Areas (Census)	Direct Access to Major Shopping Centers**	Direct Access to Major Employment Centers*	Direct Access to/from a Planned Greenway	Totals
							5	5	5	5	5	5	5	4	4	4	3	3	2	2	2	2	1	77
DEANA LN	Capital Blvd	New Hope Church Rd	Bicycle Lane	Restripe	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
FAIRBANKS DR	Westgate Rd	Leesville Rd	Bicycle Lane	Stripe	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
FOREST OAKS DR	Old Wake Forest Rd	Atlantic Ave	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
FORESTVILLE RD	Buffaloe Rd	Old Milburnie Rd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	**0**
HARDIMONT RD	Wake Forest Rd	St. Albans Dr	Bicycle Lane	Stripe	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
HARPS MILL RD	Newton Rd	Litchford Rd	Bicycle Lane	Stripe	A, B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
HIGHWOODS BLVD	Atlantic Ave	Capital Blvd	Bicycle Lane	Restripe	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
LEAD MINE RD	Sawmill Rd	Six Forks Rd	Bicycle Lane	Restripe	A	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
LEAD MINE RD	Yorkgate Dr	Sawmill Rd	Bicycle Lane	New Construction	A	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
LINEBERRY DR	Sierra Dr	Lake Wheeler Rd	Bicycle Lane	New Construction	D	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
LINEBERRY DR	Sierra Dr	Trailwood Dr	Bicycle Lane	Stripe	D	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
LOUISBURG RD	Capital Blvd	Spring Forest Rd	Wide Outside Lane	Stripe	B	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
MT HERMAN RD/SHADY GROVE RD	ACC Blvd	New Leesville Blvd	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
N NEW HOPE RD	Capital Blvd	Buffaloe Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
NEW HOPE CHURCH RD	Capital Blvd	Green Rd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
NICHOLS RD	Harps Mill Rd	Litchford Rd	Sharrow	Stripe	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
NORTHCLIFT DR	North Hills Dr	Six Forks Rd	Sharrow	Stripe	A	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
PEARL RD	Rock Quarry Rd	Auburn Church Rd	Bicycle Lane	New Construction	C	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
PERRY CREEK RD	Capital Blvd	Louisburg Rd	Bicycle Lane	Restripe	B	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
PINECREST RD	Glenwood Ave	Fairbanks Dr	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
RIDGE RD	Crabtree Valley Ave	Tazwell Place	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
S NEW HOPE RD	US 64	Old Poole Rd	Bicycle Lane	Restripe	C	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
S NEW HOPE RD	Old Poole Road	Rock Quarry Rd	Bicycle Lane	New Construction	C	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
SANDY FORKS RD	Six Forks Rd	North Bend Dr	Bicycle Lane	Restripe	A	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
SANDY FORKS RD	North Bend Dr	Falls of the Neuse Rd	Bicycle Lane	New Construction	A	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
SIERRA DR	Lake Wheeler Rd	Lineberry Dr	Bicycle Lane	Restripe	D	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
SOUTHALL RD	Louisburg Rd	Buffaloe Rd	Bicycle Lane	New Construction	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
SPRING FOREST RD	Fox Rd	Buffaloe Rd	Bicycle Lane	New Construction	B	State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
VARNELL AVE	Ridge Road	Glenwood Ave	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
WESTGATE RD	Glenwood Ave	Leesville Rd	Bicycle Lane	New Construction	E	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
WESTINGHOUSE BLVD	Captial Blvd	N Raleigh Blvd	Bicycle Lane	Restripe	B	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
YONKERS RD	New Bern Ave	Capital Blvd	Bicycle Lane	New Construction	C	City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

APPENDIX C: COST ESTIMATES FOR TOP 25 PROJECTS

These cost estimates cover the top 25 projects identified in Appendix B, with the letter-number labels (A1 though D5) corresponding to the project cut-sheets. The total estimated cost for construction of these top 25 projects is approximately **$1.2 million**.

The source of the base figures (for lane stripe removal, lane stripping, symbol marking, and signs) is the North Carolina Department of Transportation (NCDOT) Division of Bicycle and Pedestrian Transportation. This Division of NCDOT has collected figures from DOT engineers, staff from various municipalities throughout North Carolina, and alternative transportation planning consultants. These cost estimates are for planning purposes only.

Project Cutsheet A1

Project Segment Road	**Creedmoor Rd.**
From	Glenwood Ave.
To	Lynn Rd.
Facility Type	Bicycle Lane
Method	Restripe
Miles	2.1
Feet	10,900
Number of Lanes	4
# of 4 inch stripes to remove	2
$/foot*	$0.40
Subtotal	*$8,720.00*
# of 4 inch stripes to stripe	4
$/foot	$0.60
Subtotal	*$26,160.00*
# of bicycle symbol markings per 250 ft	87.2
# of bicycle symbol markings at intersections	4
Total # of markings	91
$/marking	$65.00
Subtotal	*$5,915.00*
# of signs (after major intersections)	4
$/sign	$200.00
Subtotal	*$800.00*
Total cost	**$41,595.00**
% Contingency	0.15
Grand Total	**$47,834.25**

Project Cutsheet A2

Project Segment Road	**Strickland Rd.**
From	Creedmoor Rd.
To	Falls of the Neuse Rd.
Facility Type	Bicycle Lane
Method	Restripe
Miles	3.3
Feet	17,400
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$27,840.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$62,640.00*
# of bicycle symbol markings per 250 ft	139.2
# of bicycle symbol markings at intersections	8
Total # of markings	147
$/marking	$65.00
Subtotal	*$9,555.00*
# of signs (after major intersections)	8
$/sign	$200.00
Subtotal	*$1,600.00*
Total cost	**$101,635.00**
% Contingency	0.15
Grand Total	**$116,880.25**

Project Cutsheet A3

Project Segment Road	**Lynn Rd.**
From	Creedmoor Rd.
To	Sandy Forks Rd.
Facility Type	Bicycle Lane
Method	Restripe
Miles	2.7
Feet	14,600
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$23,360.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$52,560.00*
# of bicycle symbol markings per 250 ft	116.8
# of bicycle symbol markings at intersections	5
Total # of markings	122
$/marking	$65.00
Subtotal	*$7,930.00*
# of signs (after major intersections)	5
$/sign	$200.00
Subtotal	*$1,000.00*
Total cost	**$84,850.00**
% Contingency	0.15
Grand Total	**$97,577.50**

Project Cutsheet A4

Project Segment Road	**Spring Forest Rd.**
From	Sandy Forks Rd.
To	Atlantic Ave.
Facility Type	Bicycle Lane
Method	Restripe
Miles	2.5
Feet	13,100
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$20,960.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$47,160.00*
# of bicycle symbol markings per 250 ft	104.8
# of bicycle symbol markings at intersections	4
Total # of markings	109
$/marking	$65.00
Subtotal	*$7,085.00*
# of signs (after major intersections)	4
$/sign	$200.00
Subtotal	*$800.00*
Total cost	**$76,005.00**
% Contingency	0.15
Grand Total	**$87,405.75**

Project Cutsheet A5

Project Segment Road	**Creedmoor Rd.**
From	Lynn Rd.
To	I-540
Facility Type	Bicycle Lane
Method	Restripe
Miles	2.7
Feet	14,400
Number of Lanes	4
# of 4 inch stripes to remove	2
$/foot*	$0.40
Subtotal	*$11,520.00*
# of 4 inch stripes to stripe	4
$/foot	$0.60
Subtotal	*$34,560.00*
# of bicycle symbol markings per 250 ft	115.2
# of bicycle symbol markings at intersections	8
Total # of markings	123
$/marking	$65.00
Subtotal	*$7,995.00*
# of signs (after major intersections)	8
$/sign	$200.00
Subtotal	*$1,600.00*
Total cost	**$55,675.00**
% Contingency	0.15
Grand Total	**$64,026.25**

Project Cutsheet B1

Project Segment Road	**Durant Rd.**
From	Falls of Neuse Rd.
To	Capital Blvd.
Facility Type	Bicycle Lane
Method	Restripe
Miles	2.5
Feet	13,400
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$21,440.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$48,240.00*
# of bicycle symbol markings per 250 ft	107.2
# of bicycle symbol markings at intersections	2
Total # of markings	109
$/marking	$65.00
Subtotal	*$7,085.00*
# of signs (after major intersections)	2
$/sign	$200.00
Subtotal	*$400.00*
Total cost	**$77,165.00**
% Contingency	0.15
Grand Total	**$88,739.75**

Project Cutsheet B2

Project Segment Road	**E. Millbrook Rd. (part 1)**	**E. Millbrook Rd. (part 2)**	
From	Falls of Neuse Rd.	Hoyle Dr.	
To	Hoyle Dr.	Capital Blvd.	
Facility Type	Bicycle Lane	Bicycle Lane	
Method	Restripe	Restripe	
Miles	1.3	0.6	
Feet	7,000	3,200	
Number of Lanes	5	4	
# of 4 inch stripes to remove	4	2	
$/foot*	$0.40	$0.40	
Subtotal	*$11,200.00*	*$2,560.00*	
# of 4 inch stripes to stripe	6	4	
$/foot	$0.60	$0.60	
Subtotal	*$25,200.00*	*$7,680.00*	
# of bicycle symbol markings per 250 ft	56	25.6	
# of bicycle symbol markings at intersections	5	3	
Total # of markings	61	29	
$/marking	$65.00	$65.00	
Subtotal	*$3,965.00*	*$1,885.00*	
# of signs (after major intersections)	5	3	
$/sign	$200.00	$200.00	
Subtotal	*$1,000.00*	*$600.00*	
Total cost	**$41,365.00**	**$12,725.00**	
% Contingency	0.15	0.15	
Grand Total	**$47,569.75**	**$14,633.75**	**$62,203.50**

Project Cutsheet B3

Project Segment Road	**Fairview Rd.**
From	Glenwood Ave.
To	Capital Blvd.
Facility Type	Sharrow
Method	Stripe
Miles	0.6
Feet	3,000
Number of Lanes	2
# of 4 inch stripes to remove	0
$/foot*	$0.40
Subtotal	*$0.00*
# of 4 inch stripes to stripe	0
$/foot	$0.60
Subtotal	*$0.00*
# of bicycle symbol markings per 250 ft	24
# of bicycle symbol markings at intersections	2
Total # of markings	26
$/marking	$65.00
Subtotal	*$1,690.00*
# of signs (after major intersections)	2
$/sign	$200.00
Subtotal	*$400.00*
Total cost	**$2,090.00**
% Contingency	0.15
Grand Total	**$2,403.50**

Project Cutsheet B4

Project Segment Road	**Wakefield Plantation Rd.**
From	Falls of Neuse Rd.
To	NC 98
Facility Type	Bicycle Lane
Method	Stripe
Miles	1.7
Feet	9,200
Number of Lanes	2
# of 4 inch stripes to remove	0
$/foot*	$0.40
Subtotal	*$0.00*
# of 4 inch stripes to stripe	2
$/foot	$0.60
Subtotal	*$11,040.00*
# of bicycle symbol markings per 250 ft	73.6
# of bicycle symbol markings at intersections	4
Total # of markings	78
$/marking	$65.00
Subtotal	*$5,070.00*
# of signs (after major intersections)	4
$/sign	$200.00
Subtotal	*$800.00*
Total cost	**$16,910.00**
% Contingency	0.15
Grand Total	**$19,446.50**

Project Cutsheet B5

Project Segment Road	**Wolfpack Lane/Bush St.**
From	St. Albans Dr.
To	Atlantic Ave.
Facility Type	Bicycle Lane
Method	Stripe
Miles	0.8
Feet	4,400
Number of Lanes	2
# of 4 inch stripes to remove	0
$/foot*	$0.40
Subtotal	*$0.00*
# of 4 inch stripes to stripe	2
$/foot	$0.60
Subtotal	*$5,280.00*
# of bicycle symbol markings per 250 ft	35.2
# of bicycle symbol markings at intersections	4
Total # of markings	39
$/marking	$65.00
Subtotal	*$2,535.00*
# of signs (after major intersections)	4
$/sign	$200.00
Subtotal	*$800.00*
Total cost	**$8,615.00**
% Contingency	0.15
Grand Total	**$9,907.25**

Project Cutsheet C1

Project Segment Road	**Peace St. (part 1)**	**Peace St. (part 2)**	**N. Boundary St. (part 3)**	
From	St. Marys St.	Glenwood Ave.	N. Person St.	
To	Glenwood Ave.	N. Person St.	Watauga St.	
Facility Type	Bicycle Lane	Bicycle Lane	Sharrow	
Method	Restripe	Road Diet	Stripe	
Miles	0.2	0.8	0.3	
Feet	1,200	3,900	1,700	
Number of Lanes	3	4	2	
# of 4 inch stripes to remove	2	4	0	
$/foot*	$0.40	$0.40	$0.40	
Subtotal	*$960.00*	*$6,240.00*	*$0.00*	
# of 4 inch stripes to stripe	4	4	0	
$/foot	$0.60	$0.60	$0.60	
Subtotal	*$2,880.00*	*$9,360.00*	*$0.00*	
# of bicycle symbol markings per 250 ft	9.6	31.2	13.6	
# of bicycle symbol markings at intersections	4	6	4	
Total # of markings	14	37	18	
$/marking	$65.00	$65.00	$65.00	
Subtotal	*$910.00*	*$2,405.00*	*$1,170.00*	
# of signs (after major intersections)	4	6	4	
$/sign	$200.00	$200.00	$200.00	
Subtotal	*$800.00*	*$1,200.00*	*$800.00*	
Total cost	**$5,550.00**	**$19,205.00**	**$1,970.00**	
% Contingency	0.15	0.15	0.15	
Grand Total	**$6,382.50**	**$22,085.75**	**$2,265.50**	**$30,733.75**

Project Cutsheet C2

Project Segment Road	**Hargett St. (two-way) (part 1)**	**Hargett St. (one-way)(part 2)**	**Hargett St. (two-way) (part 3)**	
From	St. Marys St.	S. West St.	S. East St.	
To	S. West St.	S. East St.	S. Tarboro St.	
Facility Type	Sharrow	Sharrow	Sharrow	
Method	Stripe	Stripe	Stripe	
Miles	0.2	0.8	0.6	
Feet	1,300	4,000	3,000	
Number of Lanes	2	2	2	
# of 4 inch stripes to remove	0	0	0	
$/foot*	$0.40	$0.40	$0.40	
Subtotal	*$0.00*	*$0.00*	*$0.00*	
# of 4 inch stripes to stripe	0	0	0	
$/foot	$0.60	$0.60	$0.60	
Subtotal	*$0.00*	*$0.00*	*$0.00*	
# of bicycle symbol markings per 250 ft	10.4	16	24	
# of bicycle symbol markings at intersections	2	7	6	
Total # of markings	12	23	30	
$/marking	$65.00	$65.00	$65.00	
Subtotal	*$780.00*	*$1,495.00*	*$1,950.00*	
# of signs (after major intersections)	2	7	6	
$/sign	$200.00	$200.00	$200.00	
Subtotal	*$400.00*	*$1,400.00*	*$1,200.00*	
Total cost	**$1,180.00**	**$2,895.00**	**$3,150.00**	
% Contingency	0.15	0.15	0.15	
Grand Total	**$1,357.00**	**$3,329.25**	**$3,622.50**	**$8,308.75**

Project Cutsheet C3

Project Segment Road	**Lenoir St. (one-way)(part 1)**	**Lenoir St. (two-way)(part2)**	
From	S. Dawson St.	S. East St.	
To	S. East St.	S. Tarboro St.	
Facility Type	Sharrow	Sharrow	
Method	Stripe	Stripe	
Miles	0.6	0.6	
Feet	3,300	3,300	
Number of Lanes	2	2	
# of 4 inch stripes to remove	0	0	
$/foot*	$0.40	$0.40	
Subtotal	*$0.00*	*$0.00*	
# of 4 inch stripes to stripe	0	0	
$/foot	$0.60	$0.60	
Subtotal	*$0.00*	*$0.00*	
# of bicycle symbol markings per 250 ft	13.2	26.4	
# of bicycle symbol markings at intersections	6	6	
Total # of markings	19	32	
$/marking	$65.00	$65.00	
Subtotal	*$1,235.00*	*$2,080.00*	
# of signs (after major intersections)	6	6	
$/sign	$200.00	$200.00	
Subtotal	*$1,200.00*	*$1,200.00*	
Total cost	**$2,435.00**	**$3,280.00**	
% Contingency	0.15	0.15	
Grand Total	**$2,800.25**	**$3,772.00**	**$6,572.25**

Project Cutsheet C4

Project Segment Road	**S. State St. (part 1)**	**S. State St. (part 2)**	
From	Bunche Dr.	Bragg St.	
To	Bragg St.	MLK Blvd.	
Facility Type	Bicycle Lane	Sharrow	
Method	Stripe	Stripe	
Miles	0.9	0.2	
Feet	4,800	800	
Number of Lanes	2	2	
# of 4 inch stripes to remove	0	0	
$/foot*	$0.40	$0.40	
Subtotal	*$0.00*	*$0.00*	
# of 4 inch stripes to stripe	2	0	
$/foot	$0.60	$0.60	
Subtotal	*$5,760.00*	*$0.00*	
# of bicycle symbol markings per 250 ft	38.4	6.4	
# of bicycle symbol markings at intersections	4	2	
Total # of markings	42	8	
$/marking	$65.00	$65.00	
Subtotal	*$2,730.00*	*$520.00*	
# of signs (after major intersections)	4	2	
$/sign	$200.00	$200.00	
Subtotal	*$800.00*	*$400.00*	
Total cost	**$9,290.00**	**$920.00**	
% Contingency	0.15	0.15	
Grand Total	**$10,683.50**	**$1,058.00**	**$11,741.50**

Project Cutsheet C5

Project Segment Road	**Wilmington St. (one-way) (part1)**	**Salisbury St. (one-way) (part 2)**	
From	MLK Blvd	MLK Blvd	
To	Peace St.	Peace St.	
Facility Type	Bicycle Lane	Bicycle Lane	
Method	Restripe	Restripe	
Miles	1.3	1.3	
Feet	6,700	7,000	
Number of Lanes	2	3	
# of 4 inch stripes to remove	1	1	
$/foot*	$0.40	$0.40	
Subtotal	*$2,680.00*	*$2,800.00*	
# of 4 inch stripes to stripe	1	1	
$/foot	$0.60	$0.60	
Subtotal	*$4,020.00*	*$4,200.00*	
# of bicycle symbol markings per 250 ft	26.8	28	
# of bicycle symbol markings at intersections	8	8	
Total # of markings	35	36	
$/marking	$65.00	$65.00	
Subtotal	*$2,275.00*	*$2,340.00*	
# of signs (after major intersections)	8	8	
$/sign	$200.00	$200.00	
Subtotal	*$1,600.00*	*$1,600.00*	
Total cost	**$10,575.00**	**$10,940.00**	
% Contingency	0.15	0.15	
Grand Total	**$12,161.25**	**$12,581.00**	**$24,742.25**

Project Cutsheet D1

Project Segment Road	**Clark Ave./Everett Ave. (part 1)**	**Clark Ave. (part 2)**	
From	Faircloth St.	Horne St.	
To	Horne St.	St. Marys St.	
Facility Type	Sharrow	Bicycle Lane	
Method	Stripe	Restripe	
Miles	1.1	0.9	
Feet	5,800	4,700	
Number of Lanes	2	3	
# of 4 inch stripes to remove	0	2	
$/foot*	$0.40	$0.40	
Subtotal	*$0.00*	*$3,760.00*	
# of 4 inch stripes to stripe	0	4	
$/foot	$0.60	$0.60	
Subtotal	*$0.00*	*$11,280.00*	
# of bicycle symbol markings per 250 ft	46.4	37.6	
# of bicycle symbol markings at intersections	10	6	
Total # of markings	56	44	
$/marking	$65.00	$65.00	
Subtotal	*$3,640.00*	*$2,860.00*	
# of signs (after major intersections)	10	6	
$/sign	$200.00	$200.00	
Subtotal	*$2,000.00*	*$1,200.00*	
Total cost	**$5,640.00**	**$19,100.00**	
% Contingency	0.15	0.15	
Grand Total	**$6,486.00**	**$21,965.00**	**$28,451.00**

Project Cutsheet D2

Project Segment Road	**Avent Ferry Rd.**
From	Crest Rd.
To	Western Blvd.
Facility Type	Bicycle Lane
Method	Restripe
Miles	0.8
Feet	4,280
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$6,848.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$15,408.00*
# of bicycle symbol markings per 250 ft	34.24
# of bicycle symbol markings at intersections	6
Total # of markings	40
$/marking	$65.00
Subtotal	*$2,600.00*
# of signs (after major intersections)	6
$/sign	$200.00
Subtotal	*$1,200.00*
Total cost	**$26,056.00**
% Contingency	0.15
Grand Total	**$29,964.40**

Project Cutsheet D3

Project Segment Road	**Dixie Trail (part 1)**	**Dixie Trail (part 2)**	**Lake Boone Trail (part 3)**	
From	Hillsborough St.	Wade Ave.	Dixie Trail	
To	Wade Ave.	Lake Boone Trail	Ridge Road	
Facility Type	Bicycle Lane	Bicycle Lane	Bicycle Lane	
Method	Restripe	Restripe	Road Diet	
Miles	0.8	0.9	0.3	
Feet	4,400	4,900	1,500	
Number of Lanes	2	3	4	
# of 4 inch stripes to remove	2	2	4	
$/foot*	$0.40	$0.40	$0.40	
Subtotal	*$3,520.00*	*$3,920.00*	*$2,400.00*	
# of 4 inch stripes to stripe	4	4	4	
$/foot	$0.60	$0.60	$0.60	
Subtotal	*$10,560.00*	*$11,760.00*	*$3,600.00*	
# of bicycle symbol markings per 250 ft	35.2	39.2	12	
# of bicycle symbol markings at intersections	4	4	2	
Total # of markings	39	43	14	
$/marking	$65.00	$65.00	$65.00	
Subtotal	*$2,535.00*	*$2,795.00*	*$910.00*	
# of signs (after major intersections)	4	4	2	
$/sign	$200.00	$200.00	$200.00	
Subtotal	*$800.00*	*$800.00*	*$400.00*	
Total cost	**$17,415.00**	**$19,275.00**	**$7,310.00**	
% Contingency	0.15	0.15	0.15	
Grand Total	**$20,027.25**	**$22,166.25**	**$8,406.50**	**$50,600.00**

Project Cutsheet D4

Project Segment Road	**Cabarrus St. (part 1)**	**Cabarrus St. (part 2)**	
From	Western Blvd.	Kinsey St.	
To	Kinsey St.	S. East St.	
Facility Type	Sharrow	Bicycle Lane	
Method	Stripe	Restripe	
Miles	0.4	0.8	
Feet	2,050	4,400	
Number of Lanes	2	2	
# of 4 inch stripes to remove	0	1	
$/foot*	$0.40	$0.40	
Subtotal	*$0.00*	*$1,760.00*	
# of 4 inch stripes to stripe	0	2	
$/foot	$0.60	$0.60	
Subtotal	*$0.00*	*$5,280.00*	
# of bicycle symbol markings per 250 ft	8.2	17.6	
# of bicycle symbol markings at intersections	5	16	
Total # of markings	13	34	
$/marking	$65.00	$65.00	
Subtotal	*$845.00*	*$2,210.00*	
# of signs (after major intersections)	5	16	
$/sign	$200.00	$200.00	
Subtotal	*$1,000.00*	*$3,200.00*	
Total cost	**$1,845.00**	**$12,450.00**	
% Contingency	0.15	0.15	
Grand Total	**$2,121.75**	**$14,317.50**	**$16,439.25**

Project Cutsheet D5

Project Segment Road	**Oberlin Rd. (part 1)**	**Oberlin Rd. (part 2)**	**Oberlin Rd. (part 3)**	**Oberlin Rd. (part 4)**	
From	Hillsborough St.	Clark Ave.	Bedford Ave.	Greenway Ave.	
To	Clark Ave.	Bedford Ave.	Greenway Ave.	Glenwood Ave.	
Facility Type	Bicycle Lane	Sharrow	Bicycle Lane	Bicycle Lane	
Method	Stripe	Stripe	Restripe	Restripe	
Miles	0.3	0.3	1.5	0.2	
Feet	1,500	1,600	7,800	1,300	
Number of Lanes	2	5	2	3	
# of 4 inch stripes to remove	0	0	2	2	
$/foot*	$0.40	$0.40	$0.40	$0.40	
Subtotal	*$0.00*	*$0.00*	*$6,240.00*	*$1,040.00*	
# of 4 inch stripes to stripe	2	0	4	4	
$/foot	$0.60	$0.60	$0.60	$0.60	
Subtotal	*$1,800.00*	*$0.00*	*$18,720.00*	*$3,120.00*	
# of bicycle symbol markings per 250 ft	12	12.8	62.4	10.4	
# of bicycle symbol markings at intersections	2	2	6	2	
Total # of markings	14	15	68	12	
$/marking	$65.00	$65.00	$65.00	$65.00	
Subtotal	*$910.00*	*$975.00*	*$4,420.00*	*$780.00*	
# of signs (after major intersections)	2	2	6	2	
$/sign	$200.00	$200.00	$200.00	$200.00	
Subtotal	*$400.00*	*$400.00*	*$1,200.00*	*$400.00*	
Total cost	**$3,110.00**	**$1,375.00**	**$30,580.00**	**$5,340.00**	
% Contingency	0.15	0.15	0.15	0.15	
Grand Total	**$3,576.50**	**$1,581.25**	**$35,167.00**	**$6,141.00**	**$46,465.75**

Project Cutsheet E1

Project Segment Road	**St. Marys St. (part 1)**	**Lassiter Mill Rd. (part 2)**	**Lassiter Mill Rd. (part 3)**	**Lassiter Mill Rd. (part 4)**	
From	Glenwood Ave.	White Oak Rd.	Greenway	I-440	
To	White Oak Rd.	Greenway	I-440	Camelot Dr.	
Facility Type	Bicycle Lane	Bicycle Lane	Bicycle Lane	Bicycle Lane	
Method	Stripe	Restripe	Stripe	Road Diet	
Miles	0.6	0.1	0.9	0.5	
Feet	3,400	500	5,000	2,500	
Number of Lanes	2	3	2	5	
# of 4 inch stripes to remove	0	2	0	0	
$/foot*	$0.40	$0.40	$0.40	$0.40	
Subtotal	*$0.00*	*$400.00*	*$0.00*	*$0.00*	
# of 4 inch stripes to stripe	2	4	2	2	
$/foot	$0.60	$0.60	$0.60	$0.60	
Subtotal	*$4,080.00*	*$1,200.00*	*$6,000.00*	*$3,000.00*	
# of bicycle symbol markings per 250 ft	27.2	4	40	20	
# of bicycle symbol markings at intersections	2	2	2	4	
Total # of markings	29	6	42	24	
$/marking	$65.00	$65.00	$65.00	$65.00	
Subtotal	*$1,885.00*	*$390.00*	*$2,730.00*	*$1,560.00*	
# of signs (after major intersections)	2	2	2	4	
$/sign	$200.00	$200.00	$200.00	$200.00	
Subtotal	*$400.00*	*$400.00*	*$400.00*	*$800.00*	
Total cost	**$6,365.00**	**$2,390.00**	**$9,130.00**	**$5,360.00**	
% Contingency	0.15	0.15	0.15	0.15	
Grand Total	**$7,319.75**	**$2,748.50**	**$10,499.50**	**$6,164.00**	**$26,731.75**

Project Cutsheet E2

Project Segment Road	**Edwards Mill Rd./Creedmoor Rd.**
From	Blue Ridge Rd.
To	Glenwood Ave.
Facility Type	Bicycle Lane
Method	Restripe
Miles	2
Feet	10,400
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$16,640.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$37,440.00*
# of bicycle symbol markings per 250 ft	83.2
# of bicycle symbol markings at intersections	7
Total # of markings	90
$/marking	$65.00
Subtotal	*$5,850.00*
# of signs (after major intersections)	7
$/sign	$200.00
Subtotal	*$1,400.00*
Total cost	**$61,330.00**
% Contingency	0.15
Grand Total	**$70,529.50**

Project Cutsheet E3

Project Segment Road	**W. Millbrook Rd.**
From	Glenwood Ave.
To	North Hills Dr.
Facility Type	Bicycle Lane
Method	Restripe
Miles	3.4
Feet	18,100
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$28,960.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$65,160.00*
# of bicycle symbol markings per 250 ft	144.8
# of bicycle symbol markings at intersections	7
Total # of markings	152
$/marking	$65.00
Subtotal	*$9,880.00*
# of signs (after major intersections)	7
$/sign	$200.00
Subtotal	*$1,400.00*
Total cost	**$105,400.00**
% Contingency	0.15
Grand Total	**$121,210.00**

Project Cutsheet E4

Project Segment Road	**Glen Eden Dr.**	**Glen Eden Dr.**	
From	Glenwood Ave.	Blue Ridge Rd.	
To	Blue Ridge Rd.	Edwards Mill Rd.	
Facility Type	Bicycle Lane	Bicycle Lane	
Method	Stripe	Road Diet	
Miles	1.6	0.5	
Feet	8,500	2,500	
Number of Lanes	2	4	
# of 4 inch stripes to remove	0	4	
$/foot*	$0.40	$0.40	
Subtotal	*$0.00*	*$4,000.00*	
# of 4 inch stripes to stripe	2	4	
$/foot	$0.60	$0.60	
Subtotal	*$10,200.00*	*$6,000.00*	
# of bicycle symbol markings per 250 ft	68	20	
# of bicycle symbol markings at intersections	4	2	
Total # of markings	72	22	
$/marking	$65.00	$65.00	
Subtotal	*$4,680.00*	*$1,430.00*	
# of signs (after major intersections)	4	2	
$/sign	$200.00	$200.00	
Subtotal	*$800.00*	*$400.00*	
Total cost	**$15,680.00**	**$11,830.00**	
% Contingency	0.15	0.15	
Grand Total	**$18,032.00**	**$13,604.50**	**$31,636.50**

Project Cutsheet E5

Project Segment Road	**Lynn Rd.**
From	Creedmoor Rd.
To	Glenwood Ave.
Facility Type	Bicycle Lane
Method	Restripe
Miles	2.5
Feet	13,300
Number of Lanes	5
# of 4 inch stripes to remove	4
$/foot*	$0.40
Subtotal	*$21,280.00*
# of 4 inch stripes to stripe	6
$/foot	$0.60
Subtotal	*$47,880.00*
# of bicycle symbol markings per 250 ft	106.4
# of bicycle symbol markings at intersections	6
Total # of markings	112
$/marking	$65.00
Subtotal	*$7,280.00*
# of signs (after major intersections)	6
$/sign	$200.00
Subtotal	*$1,200.00*
Total cost	**$77,640.00**
% Contingency	0.15
Grand Total	**$89,286.00**

APPENDIX D OUTLINE:

Overview
High Priority Funding Options
State Funding Sources
Funding Allocated by Federal Agencies
Local Funding Sources
Other Local Options

APPENDIX D: FUNDING RESOURCES

OVERVIEW

The purpose of this appendix is to define and describe possible funding sources that could be used to support the planning, design and development of bicycle improvements.

Implementing the recommendations of this plan will require a strong level of local support and commitment through a variety of local funding mechanisms. Perhaps most important is the addition of bicycle and greenway recommendations from this Plan into the City's annual budget. These improvements should become a high priority and be supported through portions of the funding currently used for public safety, streets, parks and recreation, planning, Powell Bill funds, community development, travel and tourism, downtown, and local bonds.

The City should also seek a combination of funding sources that include local, state, federal, and private money. Fortunately, the benefits of bicycling and protected greenways are many and varied. This allows programs in Raleigh to access money earmarked for a variety of purposes including water quality, hazard mitigation, recreation, air quality, alternate transportation, wildlife protection, community health, and economic development. Competition is almost always stiff for state and federal funds, so it becomes imperative that local governments work together to create multi-jurisdictional partnerships and to develop their own local sources of funding. These sources can then be used to leverage outside assistance.

For the past two decades, a variety of funding has been used throughout North Carolina to support the planning, design and construction of urban and rural bicycle and greenway projects. The largest single source of funding for these projects has come from the Surface Transportation Act, first the Intermodal Surface Transportation Efficiency Act (ISTEA) in the early to mid 1990's; then its successor, Transportation Equity Act for the Twenty-First Century (TEA-21) through the early part of 2002; and now the Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The North Carolina Department of Transportation manages and distributes the majority of federal funds that are derived from the Act to support the development of bicycle/trail development.

The majority of federal funding is distributed to states in the form of block grants and is then distributed throughout a given state for specific projects. State funding programs in North Carolina also support the creation of greenways. North Carolina has developed a broad array of funding sources that address land acquisition, green infrastructure development, and trail facility development.

Additionally, there are many things that the City of Raleigh can do to establish their own funding for bicycle and greenway initiatives. For the most part, it takes money to get money. For Raleigh, it will be necessary to create a local funding program through one of the methods that is defined within this report. Financing will be needed to administer the continued planning and implementation process, acquire parcels or easements, and manage and maintain facilities.

This appendix is organized by first addressing the state sources of funding, then addresses separate federal and local government funding sources. It is by no means an exhaustive list as there are many other funding sources available that should be researched and pursued as well. Creative planning and consistent monitoring of funding options will likely turn up new opportunities not listed here.

HIGH PRIORITY FUNDING OPTIONS

While there are a number of funding sources provided in the following pages, these sources should be the highest priority in order to achieve successful implementation. It is critical for local government to step up given the competitiveness and finite availability associated with most funding sources. Details about the following sources are found later in this appendix.

- Local Capital Improvements Program (CIP)
- Local Bond
- Local Fees
- State Transportation Improvement Program (TIP)
- State Powell Bill Funds
- State Safe Routes to School Program
- State Health and Wellness Trust Fund (HWTF)
- Private Sources

STATE FUNDING SOURCES

The most direct source of public-sector funding for the City of Raleigh will come from state agencies in North Carolina. Generally, these funds are made available to local governments based on grant-in-aid formulas. The single most important key to obtaining state grant funding is for local governments to have adopted plans for greenway, open space, bicycle, pedestrian or trail systems in place prior to making an application for funding.

Unfortunately, there is no direct correlation between any of the programs listed and a constant stream of funding for greenway or trail projects and all projects are funded on the basis of grant applications. There is no specific set aside amount that is allocated for greenway and trail development within a given program. Funding is based solely on need and the need has to be expressed and submitted in the form of a grant application. Finally, all of these programs are geared to address needs across the entire state, so all of the programs are competitive and must allocate funding with the needs of the entire state in mind.

The Powell Bill Program is an annual state allocation to municipalities for use in street system maintenance and construction activities. There is considerable local control over Powell Bill Funds (it is not a grant application process). In the past, the State allocated a considerable portion of these revenues for construction purposes. However, budgetary constraints since 2001 have led to a shift of new Powell Bill funds to cover maintenance and operations activities. Both the Powell Bill reserves and the 2000 Transportation Bond funds are limited funding sources that will eventually be depleted.

In North Carolina, *the Department of Transportation, Division of Bicycle and Pedestrian Transportation (DBPT)* has been the single largest source of funding for bicycle and greenway projects, including non-construction projects such as brochures, maps, and public safety information for more than a decade. DBPT offers several programs in support of bicycle facility development. The following information is from NCDOT's interactive web site (www.ncdot.org). Contact the NCDOT, Division of Bicycle and Pedestrian Transportation at (919) 807-2804 for more information.

North Carolina programs are listed below. A good starting website with links to many of the following programs is http://www.enr.state.nc.us/html/tax_credits.html.

Funding Opportunities Through NCDOT:

Bicycle and Pedestrian Independent Projects Funded Through the Transportation ImprovementProgram (TIP):

In North Carolina, the *Department of Transportation, Division of Bicycle and Pedestrian Transportation* (DBPT) manages the Transportation Improvement Program (TIP) selection process for bicycle projects. Projects programmed into the TIP by the DBPT are independent projects – those which are not related to a scheduled highway project. Incidental projects – those related to a scheduled highway project – are handled through other funding sources described in this section.

DBPT has an annual budget of $6 million. Eighty percent of these funds are from STP-Enhancement funds, while the State Highway Trust provides the remaining 20 percent of the funding.

A total of $5.3 million dollars of TIP funding is available for funding various bicycle-independent projects, including the construction of multi-use trails, the striping of bicycle lanes, and the construction of paved shoulders, among other facilities. Prospective applicants are encouraged to contact the DBPT regarding funding assistance for bicycle projects. For a detailed description of the TIP project selection process, visit: http://www.ncdot.org/transit/bicycle/funding/funding_TIP.html. Another $500,000 of the division's funding is available for miscellaneous projects.

Incidental Projects – Bicycle accommodations such as bike lanes, widened paved shoulders, and bicycle-safe bridge design are frequently included as incidental features of highway projects. In addition, bicycle-safe drainage grates are a standard feature of all highway construction. Most bicycle safety accommodations built by NCDOT are included as part of scheduled highway improvement projects funded with a combination of National Highway System funds and State Highway Trust Funds.

Governor's Highway Safety Program (GHSP) – The mission of the GHSP is to promote highway safety awareness and reduce the number of traffic crashes in the state of North Carolina through the planning and execution of safety programs. GHSP funding is provided through an annual program, upon approval of specific project requests. Amounts of GHSP funds vary from year to year, according to the specific amounts requested. Communities may apply for a GHSP grant to be used as seed money to start a program to enhance highway safety. Once a grant is awarded, funding is provided on a reimbursement basis. Evidence of reductions in crashes, injuries, and fatalities is required. For information on applying for GHSP funding, visit: www.ncdot.org/programs/ghsp/.

Funding Available Through North Carolina Metropolitan Planning Organizations (MPOs)

MPOs in North Carolina which are located in air quality nonattainment or maintenance areas have the authority to program Congestion Mitigation Air Quality (CMAQ) funds. CMAQ funding is intended for projects that reduce transportation related emissions. Some NC MPOs have chosen to use the CMAQ funding for bicycle projects. Local governments in air quality nonattainment or maintenance area should contact their MPO for information on CMAQ funding opportunities for bicycle facilities.

Transportation Enhancement Call for Projects, EU, NCDOT

The Enhancement Unit administers a portion of the enhancement funding set-aside through the Call for Projects process. In North Carolina the Enhancement Program is a federally funded cost reimbursement program with a focus upon improving the transportation experience in and through local North Carolina communities either culturally, aesthetically, or environmentally. The program seeks to encourage diverse modes of travel, increase benefits to communities and to encourage citizen involvement. This is accomplished through the following twelve qualifying activities:

1. Bicycle and Pedestrian Facilities
2. Bicycle and Pedestrian Safety
3. Acquisition of Scenic Easements, Scenic or Historic Sites
4. Scenic or Historic Highway Programs (including tourist or welcome centers)
5. Landscaping and other Scenic Beautification
6. Historic Preservation
7. Rehabilitation of Historic Transportation Facilities
8. Preservation of Abandoned Rail Corridors
9. Control of Outdoor Advertising
10. Archaeological Planning and Research
11. Environmental Mitigation
12. Transportation Museums

Funds are allocated based on an equity formula approved by the Board of Transportation. The formula is applied at the county level and aggregated to the regional level. Available fund amount varies. In previous Calls, the funds available ranged from $10 million to $22 million.

The Call process takes place on even numbered years or as specified by the Secretary of Transportation. The next Call is anticipated to take place in 2008, barring financial constraints related to federal recisions resulting from the war on terror and Hurricane Katrina. For more information, visit: www.ncdot.org/financial/fiscal/Enhancement/

Safe Routes to School Program, managed by NCDOT, DBPT

The NCDOT Safe Routes to School Program is a federally funded program that was initiated by the passing of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, which establishes a national SRTS program to distribute funding and institutional support to implement SRTS programs in states and communities across the country. SRTS programs facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools. The Division of Bicycle and Pedestrian Transportation at NCDOT is charged with disseminating SRTS funding.

The state of North Carolina has been allocated $15 million in Safe Routes to School funding for fiscal years 2005 through 2009 for infrastructure or non-infrastructure projects. All proposed projects must relate to increasing walking or biking to and from an elementary or middle school. An example of a non-infrastructure project is an education or encouragement program to improve rates of walking and biking to school. An example of an infrastructure project is construction of sidewalks around a school. Infrastructure improvements under this program must be made within 2 miles of an elementary or middle school. The state requires the completion of a competitive application to apply for funding. For more information, visit www.ncdot.org/programs/safeRoutes/ or contact Leza Mundt at DBPT/NCDOT, (919) 807-0774.

Small Cities Community Development Block Grants

State level funds are allocated through the NC Department of Commerce, Division of Community Assistance to be used to promote economic development and to serve low-income and moderate-income neighborhoods. Greenways that are part of a community's economic development plans may qualify for assistance under this program. Recreational areas that serve to improve the quality of life in lower income areas may also qualify. Approximately $50 million is available statewide to fund a variety of projects. For more information, visit www.hud.gov/offices/cpd/communitydevelopment/programs/stateadmin/ or call 919-733-2853.

North Carolina Health and Wellness Trust Fund

The NC Health and Wellness Trust Fund was created by the General Assembly as one of 3 entities to invest North Carolina's portion of the Tobacco Master Settlement Agreement. HWTF receives one-fourth of the state's tobacco settlement funds, which are paid in annual installments over a 25-year period.

Fit Together, a partnership of the NC Health and Wellness Trust Fund (HWTF) and Blue Cross and Blue Shield of North Carolina (BCBSNC) announces the establishment of *Fit Community,* a designation and grant program that recognizes and rewards North Carolina communities' efforts to support physical activity and healthy eating initiatives, as well as tobacco-free school environments. *Fit Community* is one component of the jointly sponsored *Fit Together* initiative, a statewide prevention campaign designed to raise awareness about obesity and to equip individuals, families and communities with the tools they need to address this important issue.

All North Carolina municipalities and counties are eligible to apply for a *Fit Community* designation, which will be awarded to those that have excelled in supporting the following:

- physical activity in the community, schools, and workplaces
- healthy eating in the community, schools, workplaces
- tobacco use prevention efforts in schools

Designations will be valid for two years, and designated communities may have the opportunity to reapply for subsequent two-year extensions. The benefits of being a *Fit Community* include:

- Heightened statewide attention that can help bolster local community development and/or economic investment initiatives (highway signage and a plaque for the Mayor's or County Commission Chair's office will be provided)

- Reinvigoration of a community's sense of civic pride (each *Fit Community* will serve as a model for other communities that are trying to achieve similar goals)

- Use of the *Fit Community* designation logo for promotional and communication purposes. The application for *Fit Community* designation is available on the Fit Together Web site: www.FitTogetherNC.org/FitCommunity.aspx.

Fit Community grants are designed to support innovative strategies that help a community meet its goal to becoming a *Fit Community.* Eight to nine, two-year grants of up to $30,000 annually will be awarded to applicants that have a demonstrated need, proven capacity, and opportunity for positive change in addressing physical activity and/or healthy eating.For more information, visit: www.healthwellnc.com/

Eat Smart, Move More NC Community Grants

The Eat Smart, Move More (ESMM) NC Community Grants program provides funding to local communities to implement strategies that advance the goals and objectives of the ESMM NC Plan. These goals include increasing physical activity opportunities and increasing the number of citizens who get the recommended amount of physical activity. Administered by the Physical Activity and Nutrition branch of the Division of Public Health, the program awards $10,000 - 20,000 to local communities each year. Interested applicants must submit a letter of intent in late June and an application in mid-July. For more information, visit: http://www.eatsmartmovemorenc.com/funding/index.html.

FUNDING ALLOCATED BY FEDERAL AGENCIES

The Community Development Block Grant (HUD-CDBG)

The U.S. Department of Housing and Urban Development (HUD) offers financial grants to communities for neighborhood revitalization, economic development, and improvements to community facilities and services, especially in low and moderate income areas. Several communities have used HUD funds to develop greenways, including the Boulding Branch Greenway in High Point, North Carolina. Grants from this program range from $50,000 to $200,000 and are either made to municipalities or non-profits. There is no formal application process. For more information, visit: www.hud.gov/offices/cpd/communitydevelopment/programs/.

Public Lands Highways Discretionary Fund

The Federal Highway Administration administers discretionary funding for projects that will reduce congestion and improve air quality. The FHWA issues a call for projects to disseminate this funding. The FHWA estimates that the PLHD funding for the 2007 call will be $85 million. In the past, Congress has earmarked a portion of the total available funding for projects. For information on how to apply, visit: http://www.fhwa.dot.gov/discretionary/

LOCAL FUNDING SOURCES

Municipalities often plan for the funding of pedestrian facilities or improvements through development of Capital Improvement Programs (CIP). In Raleigh, for example, the greenways system has been developed over many years through a dedicated source of annual funding that has ranged from $100,000 to $500,000, administered through the Recreation and Parks Department. CIPs should include all types of capital improvements (water, sewer, buildings, streets, etc.) versus programs for single purposes. This allows municipal decision-makers to balance all capital needs. Typical capital funding mechanisms include the following: capital reserve fund, capital improvement projects, municipal service district, taxes, fees, and bonds. Each of these categories are described below.

Capital Reserve Fund

Municipalities have statutory authority to create capital reserve funds for any capital purpose, including bicycle-related improvements. The reserve fund must be created through ordinance or resolution that states the purpose of the fund, the duration of the fund, the approximate amount of the fund, and the source of revenue for the fund. Sources of revenue can include general fund allocations, fund balance allocations, grants and donations for the specified use.

Capital Projects

Bicycle facility recommendations within this plan (listed by street and cross streets in Appendix B) should be incorporated into any street-related Capital Improvement Project (CIP) for the City of Raleigh. Also, several of the recommended improvements will require standalone CIP funding

Municipal Service District

Municipalities have statutory authority to establish municipal service districts, to levy a property tax in the district additional to the citywide property tax, and to use the proceeds to provide services in the district. Downtown revitalization projects are one of the eligible uses of service districts.

Installment Purchase Financing

As an alternative to debt financing of capital improvements, communities can execute installment/ lease purchase contracts for improvements. This type of financing is typically used for relatively small projects that the seller or a financial institution is willing to finance or when up-front funds are unavailable. In a lease purchase contract the community leases the property or improvement from the seller or financial institution. The lease is paid in installments that include principal, interest, and associated costs. Upon completion of the lease period, the community owns the property or improvement. While lease purchase contracts are similar to a bond, this arrangement allows the community to acquire the property or improvement without issuing debt. These instruments, however, are more costly than issuing debt.

Taxes

Many communities have raised money through self-imposed increases in taxes and bonds. For example, Pinellas County residents in Florida voted to adopt a one-cent sales tax increase, which provided an additional $5 million for the development of the overwhelmingly popular Pinellas Trail. Sales taxes have also been used in Allegheny County, Pennsylvania, and in Boulder, Colorado to fund open space projects. A gas tax is another method used by some municipalities to fund public improvements. A number of taxes provide direct or indirect funding for the operations of local governments. Some of them are:

Sales Tax

In North Carolina, the state has authorized a sales tax at the state and county levels. Local governments that choose to exercise the local option sales tax (all counties currently do), use the tax revenues to provide funding for a wide variety of projects and activities. Any increase in the sales tax, even if applying to a single county, must gain approval of the state legislature. In 1998, Mecklenburg County was granted authority to institute a one-half cent sales tax increase for mass transit.

Property Tax

Property taxes generally support a significant portion of a municipality's activities. However, the revenues from property taxes can also be used to pay debt service on general obligation bonds issued to finance greenway system acquisitions. Because of limits imposed on tax rates, use of property taxes to fund greenways could limit the municipality's ability to raise funds for other activities. Property taxes can provide a steady stream of financing while broadly distributing the tax burden. In other parts of the country, this mechanism has been popular with voters as long as the increase is restricted to parks and open space. Note, other public agencies compete vigorously for these funds, and taxpayers are generally concerned about high property tax rates.

Excise Taxes

Excise taxes are taxes on specific goods and services. These taxes require special legislation and the use of the funds generated through the tax are limited to specific uses. Examples include lodging, food, and beverage taxes that generate funds for promotion of tourism, and the gas tax that generates revenues for transportation related activities.

Occupancy Tax

The NC General Assembly may grant municipalities the authority to levy occupancy tax on hotel and motel rooms. The act granting the taxing authority limits the use of the proceeds, usually for tourism-promotion purposes.

Exactions

Exactions are similar to impact fees in that they provide facilities to growing communities. The difference is that through exactions it can be established that it is the responsibility of the developer to build the greenway or pedestrian facility that crosses through the property, or adjacent to the property being developed.

Bonds and Loans

Bonds have been a very popular way for communities across the country to finance their pedestrian and greenway projects. A number of bond options are listed below. Contracting with a private consultant to assist with this program may be advisable. Since bonds rely on the support of the voting population, an education and awareness program should be implemented prior to any vote. Billings, Montana used the issuance of a bond in the amount of $599,000 to provide the matching funds for several of their TEA-21 enhancement dollars. Austin, Texas has also used bond issues to fund a portion of their bicycle and trail system.

Revenue Bonds

Revenue bonds are bonds that are secured by a pledge of the revenues from a certain local government activity. The entity issuing bonds, pledges to generate sufficient revenue annually to cover the program's operating costs, plus meet the annual debt service requirements (principal and interest payment). Revenue bonds are not constrained by the debt ceilings of general obligation bonds, but they are generally more expensive than general obligation bonds.

General Obligation Bonds

Cities, counties, and service districts generally are able to issue general obligation (G.O.) bonds that are secured by the full faith and credit of the entity. In this case, the local government issuing the bonds pledges to raise its property taxes, or use any other sources of revenue, to generate sufficient revenues to make the debt service payments on the bonds. A general obligation pledge is stronger than a revenue pledge, and thus may carry a lower interest rate than a revenue bond. Frequently, when local governments issue G.O. bonds for public enterprise improvements, the public enterprise will make the debt service payments on the G.O. bonds with revenues generated through the public entity's rates and charges. However, if those rate revenues are insufficient to make the debt payment, the local government is obligated to raise taxes or use other sources of revenue to make the payments. G.O. bonds distribute the costs of land acquisition and greenway development and make funds available for immediate purchases and projects. Voter approval is required.

Special Assessment Bonds

Special assessment bonds are secured by a lien on the property that benefits by the improvements funded with the special assessment bond proceeds. Debt service payments on these bonds are funded through annual assessments to the property owners in the assessment area.

State Revolving Fund (SRF) Loans

Initially funded with federal and state money, and continued by funds generated by repayment of earlier loans, State Revolving Funds (SRFs) provide low interest loans for local governments to fund water pollution control and water supply related projects including many watershed management activities. These loans typically require a revenue pledge, like a revenue bond, but carry a below market interest rate and limited term for debt repayment (20 years).

OTHER LOCAL OPTIONS

Facility Maintenance Districts

Facility Maintenance Districts (FMDs) can be created to pay for the costs of on-going maintenance of public facilities and landscaping within the areas of the City where improvements have been concentrated and where their benefits most directly benefit business and institutional property owners. An FMD is needed in order to assure a sustainable maintenance program. Fees may be based upon the length of lot frontage along streets where improvements have been installed, or upon other factors such as the size of the parcel. The program supported by the FMD should include regular maintenance of streetscape of off road trail improvements. The municipality can initiate public outreach efforts to merchants, the Chamber of Commerce, and property owners. In these meetings, City staff will discuss the proposed apportionment and allocation methodology and will explore implementation strategies.

The municipality can manage maintenance responsibilities either through its own staff or through private contractors.

Partnerships

Another method of funding facilities is to partner with public agencies and private companies and organizations. Partnerships engender a spirit of co-operation, civic pride and community participation. The key to the involvement of private partners is to make a compelling argument for their participation. Very specific routes that make critical connections to place of business would be targeted for private partners' monetary support following a successful master planning effort. Potential partners include major employers which are located along or accessible to pedestrian facilities such as multi-use paths or greenways. Name recognition for corporate partnerships would be accomplished through signage trail heads or interpretive signage along greenway systems. Utilities often make good partners and many trails now share corridors with them. Money raised from providing an easement to utilities can help defray the costs of maintenance. It is important to have a lawyer review the legal agreement and verify ownership of the subsurface, surface or air rights in order to enter into an agreement.

APPENDIX E OUTLINE:
CAMPO 2030 LRTP
Wake County Transportation Plan
CAMPO Bicycle and Pedestrian Plan
CORE Pedestrian -Bicycle-Green Space Plan
Raleigh Parks Plan

APPENDIX E: RELATED PLANNING EFFORTS

CAMPO 2030 Long Range Transportation Plan

The Capital Area Metropolitan Planning Organization (CAMPO) 2030 Long Range Transportation Plan (LRTP) is an update to the 2025 LRTP, corrected to reflect more recent projections of socio-economic data to 2030. It includes a summary of the socio-economic forecasts and the travel forecasts resulting from them, maps and tables showing roadway, transit, and incidental bicycle improvement projects recommended for completion by 2010, 2020, and 2030, and additional detailed information about the socio-economic data and revenue forecasts.

One component of the CAMPO LRTP is the Capital Area Congestion Management System which, among other efforts, includes a Bicycle and Pedestrian Support program. This program aims to execute the Transportation Advisory Committee-adopted Bicycle and Pedestrian Plan of 2003 under the leadership of local citizens and planners in the Capital Area Bike and Pedestrian Stakeholders Group (BPSG). The BPSG meets monthly to identify regional bicyclist and pedestrian needs and to promote bike safety and education. They have also served as a stakeholder in the drafting of the Wake County UDO.

The Bike Element of the LRTP discusses bicycle facility projects, funding sources, and safety measures. It recommends the installation of bicycle facilities through incidental projects along 325 miles of road in the MPO area. To underline the importance of bike facilities in the transportation system, the element included the necessary funding for these projects in the cost estimates of the parent road projects. A primary source of funding is annual TIP requests for bike and pedestrian accommodations submitted by the Capital Area BPSG. Additional funding for bike and pedestrian projects can hopefully be secured so that a fixed percentage of CAMPO's annual expenditures will be available for projects that cannot be completed in tandem with road projects and/or fail to receive TIP monies. Another funding source is the CAMPO-approved portion of STP-DA funding to be allocated towards bicycle, pedestrian, and transit projects. Beginning in FY 2006, $750,000 has been dispersed annually on a merit-based system between alternative transportation projects to facilitate an increase in multi-modal interconnectivity. Lastly, and with respect to improving safety, CAMPO hopes to work with NCDOT in the future to improve the capability of the Traffic Engineering Accident Analysis System (TEAAS) crash report system so that safety concerns for bicycles and pedestrians can be easily identified and addressed.

Wake County Transportation Plan

The Wake County Transportation Plan built on the 2025 CAMPO Plan of 2002. Originally envisioned as a collector street plan, it came to encompass thoroughfares, public transit, bicycle, and pedestrian needs in unincorporated areas of the county.

As part of the plan's development, five citizen advisory groups from different areas of Wake County were formed as sources of on-the-ground knowledge of transportation issues. Members of these groups envisioned a future Wake County transportation system that is multimodal and includes interconnected bicycle and pedestrian networks.

The Pedestrian and Bicycle Element recognizes that special transportation facilities are needed to serve residents who do not own vehicles and bicyclists of varying ability. It also highlights the three state bicycle highways that originate in or pass through Wake County: the Cape Fear Run, the Carolina Connection, and the Mountains to Sea Route. Lastly, the element identifies the four E's of successful bicycle and pedestrian planning- engineering, education, encouragement, and enforcement.

The Bicycle Plan in the Pedestrian and Bicycle Element is intended to complement the county's open space and greenways plan by providing access to the county's many roadside destinations without the use of an automobile. It specifies several types of facilities, including wide outside lanes, multi-use paths, paved shoulders, and signed routes to provide safe opportunities for transportation and recreation for child, basic, and advanced cyclists. In addition, the bicycle plan recognizes that gravel from unpaved surfaces can minimize the safe cycling area, damage bikes, and create dangerous conditions for cyclists. It recommends regular road maintenance that includes the removal of gravel and other loose materials from roadway surfaces, as well as paving minor roads a minimum of 200 feet from the nearest intersection with major roads.

The Implementation section of the plan is based on seven objectives agreed upon jointly with the Wake County Growth Management Task Force of 2001. The five of these relevant to Raleigh bike planning, and their associated strategies, are as follows:

- *Create and Maintain a Safe, Efficient, and Effective Transportation System*
  - Study the feasibility of developing a new capital improvement program to reduce the backlog of unfunded projects to build sidewalks and bike paths that serve community facilities frequented by children, the elderly, and other citizens with limited access to a personal vehicle. The "Safe Routes to Schools" program should consider funding levels that would complete at least one major

school-area improvement each year.

– Coordinate with NCDOT to develop a "Community Access Road Safety" program in which existing state secondary rural roads would be eligible for safety-oriented widening to allow for left turn-only lanes at driveways and intersections. These roads would be striped for two wide lanes between intersections, enhancing safety for bicyclists and drivers alike. Eligibility and prioritization would consider crash history, bicycle network routes, environmental impact costs, and availability of right-of-way.

- *Complete regional thoroughfares*
  – Prepare a map showing interconnected greenway, sidewalk, and bikeway plans for Wake County and all municipalities with adopted plans. Present the map to the NCDOT Highway Administrator with a request to design all future segments of the I-540 Outer Loop to include suitable facilities to link existing and future greenways, sidewalks, and bikeways across or beneath the new freeway.

- *Interconnect local collector roads*
  – The transportation plan identifies a system of planned interconnected local roads collector streets) that are designed to include sidewalk on at least one side and shared use with bicycles. The recommended width of collector streets is 34 feet that could be striped to provide a four-foot wide bicycle lane on both sides of the roadway, leaving 21 feet of pavement for two-way travel. This design will maintain reasonable average speeds consistent with neighborhood quality of life while providing multiple outlet connections to more than one thoroughfare. The cost of right-of-way and construction of the collector streets should be borne by the new homeowners. The cost of right-of-way, construction, and maintenance of the sidewalk should be borne by the new homeowners.
  – Coordinate with NCDOT to prepare a sample two-party sidewalk/multiuse pathway maintenance agreement that is intended for developers and homeowners where no homeowners association exists.

- *Encourage mixed-use developments*
  – Submit a list of bicycle and pedestrian improvements eligible for funding through the state's bicycle program and the federal enhancements program.

- *Provide access and connections to open space system*
  – Create opportunities for greenway and trail development.

The Wake County Transportation Plan concludes with cost estimates for the various county transportation projects above and beyond those described in the CAMPO plan. Existing revenues will be insufficient to cover these costs; therefore new revenues will be needed. Since state law does not allow counties to build, own, operate, or maintain roads, enabling legislation is needed in order to increase revenue for transportation in Wake County to implement the many recommendations in this plan.

CAMPO Bicycle and Pedestrian Plan

The CAMPO Bicycle and Pedestrian Plan was created in response to a paradigm shift in transportation design to accommodate pedestrians and bicyclists as well as motor vehicles. Specifically, it aims to make bicycle and pedestrian travel throughout the metropolitan area convenient, efficient, viable, and safe. Accordingly, the goals of the CAMPO Bicycle and Pedestrian Plan are:

- To ensure compliance with Federal regulations and requirements of state and local authorities
- To promote the transportation benefits of bicycle and pedestrian travel, including improvements to air quality and health
- To make travel by bicycling and walking efficient and viable by ensuring connections to usable venues by bicyclists and pedestrians. Those areas that are most likely to benefit from improvements to this element of the transportation system include residential or commercial zones that have or are planned to have transit access, mixed use development, and/or school and recreation facilities.

The plan intends to guide governments and agencies within the MPO to meet these goals by maximizing the use and availability of local infrastructure. To this end, it enumerates a series of directives they can use to frame local policies:

- Establish bicycle and pedestrian access as a fundamental means of travel in regional transportation planning
- Implement bicycle and pedestrian-friendly elements within existing and future land use, travel demand management and clean air policies
- Identify all potential funding opportunities to implement bicycle and pedestrian transportation
- Encourage safe and efficient bicycle\pedestrian travel
- Promote an integrated, seamless, interconnected transportation network through bicycle and pedestrian planning
- Promote and implement education and encouragement plans aimed at youth, motorists, and sedentary populations
- Promote education and law enforcement

Additionally, the plan provides multiple strategies under each directive by which the policy can be enacted.

Lastly, the CAMPO Bicycle and Pedestrian Plan details a series of actions to be spearheaded by a Bicycle/Pedestrian Advisory Committee. These actions are categorized by the aforementioned four E's of bicycle and pedestrian design- engineering, enforcement, education, and encouragement.

Center of the Region Enterprise (CORE) Pedestrian-Bicycle-Green Space Plan (ca. April 22, 2005)

The CORE Pedestrian-Bicycle-Green Space Plan was developed, not as a statement of policy in and of itself, but as a tool to help Triangle communities coordinate their respective alternative transportation and green space policies. It focuses on the resources within and immediately surrounding a 60-square mile area roughly bounded by Umstead Park/Harrison Avenue on the east, Chatham Street/High House Road on the south, NC 55 on the west, and Lawson Street/Angier Avenue/US 70 on the north. Although this area does not include central Raleigh, it does include trail systems and green spaces in the northwest portion of the city.

The CORE plan summarizes in text, maps, and tables a variety of data and analysis of pedestrian, bicycle, and green space conditions of the focus area. These include:

- Existing and planned facilities
- Opportunities and barriers
- Local development policies
- Green space and trails
- Project prioritization
- Project cost estimates
- Project benefits

This information can enable communities to fit their respective projects in with those of their neighbors. By linking new pedestrian, bicycle, and green space facilities to those in the 60-square mile center of the region, Raleigh and other Triangle communities can create a safe and useful regional travel network between popular destinations. In this way, jurisdictions can increase the value of these facilities for their constituents and maximize the benefits of their public investments.

Raleigh Parks Plan (ca. May 2004)

The Raleigh Parks Plan was recently updated to continue the original vision of the city as providing parks and open space for all citizens. It serves as a framework for city park planners to use in developing programming, maintenance, and development of the park system through 2025. The primary goals of the plan, with bicycle facility-relevant objectives cited for each, include:

- *Provide park and open space opportunities to all residents.*
  - Develop recreational facilities that are within close proximity of all residents. (proximity is only as close as it is accessible)

- *Provide a diverse, well-balanced, well-maintained range of recreational facilities.*
  - Develop park and recreational facilities that provide a wide range of recreational opportunities and that offer varied experiences to residents within close proximity to their home.
  - Encourage effective and citizen-responsive use of City recreational facilities and programs.
  - Capitalize on the value of park and recreation facilities to improve the overall aesthetic character of the City and as a means of promoting livability

- *Optimize the appreciation, use and stewardship of Raleigh's historic, cultural and natural resource heritage.*
  - Develop and maintain parks and greenways using nationally-accepted sustainable design principles and best management practices.

(The following three goals are not specifically bike-relevant, but they could still apply to bike planning):

- *Provide the opportunity for community involvement.*
- *Encourage inter- and intragovernmental collaboration.*
- *Encourage private recreation initiatives to supplement public facilities.*

Citizens and Parks and Recreation staff provided both qualitative and quantitative data that were analyzed to determine the park needs of the city. These needs as well as the goals of the Raleigh Parks Plan were addressed in the following recommendations:

- Place a priority on land acquisition
- Provide a balanced dedicated usage of parkland
- Provide an equitable distribution of facilities across the community
- Plan for flexibility
- Incorporate universal design
- Develop new/upgraded parks
- Utilize Recommended Facilities Per Park

- Utilize Facility Space Guidelines
- Enhance Access to and Awareness of Raleigh's Recreation Opportunities
- Improving the Aesthetic Character of the City and Promoting Livability
- Encourage Stewardship of Parklands and Awareness of Ecological Principles
- Promote, Preserve and Ensure Protection of Raleigh's Cultural and Historic Resources
- Provide Environmental Education Opportunities
- Encourage Public Involvement
- Utilize School Parks
- Collaborate and Partner with other Communities and Agencies
- Collaborate with Non-Profit Groups, Athletic Clubs and the Private Sector

Implementation of the plan is broken up into three time stages: short-range (1-2 years), medium-range (1-10 years), and long-range (1-20 years). Actions relevant to the Raleigh Bicycle Plan are:

Short-range

- Adopt the Parks Plan
- Adopt Greenway Corridor Modification
- Implement revised Fee structure
- Identify strategies that enable protection of natural resources through environmental stewardship and sustainable design practices
- Develop strategy and acquire land for new Neighborhood Parks to achieve the goal of one-mile service area coverage throughout the ETJ and in keeping with population growth

Medium-range

- Continue reinvesting in existing parks to maintain facilities
- Develop multi-use trails within greenways to expand recreational opportunities and to create a complete trail system

Long-range

- Utilize the Parks Plan, Master Plan and System Integration Plan process in all new park planning efforts
- Utilize the development of new park facilities and upgrading of existing facilities to enhance the aesthetic character of the City and to promote livability
- Continue reinvesting in existing parks to maintain facilities
- Continue acquiring land for Neighborhood Parks to reach the ultimate goal of one-half mile service areas
- Develop Neighborhood Parks to achieve the goal of one-half mile service area coverage throughout the ETJ
- Develop new parks in a manner that ensures universal access to recreation facilities

APPENDIX F OUTLINE:

Overview
Study Scope and Approach
BLOS Regression Equation
BLOS Grades
BLOS Model Data
BLOS Table Summary
BLOS Maps

APPENDIX F: BICYCLE LEVEL OF SERVICE (BLOS) ANALYSIS

OVERVIEW

One of this study's major tasks was the development of a special indicator to monitor the quality of bicycle travel conditions along City's arterial and collector streets. The study team selected the Bicycle Level of Service (BLOS)[1] model as the quality of service indicator. The BLOS model (version 2.0) was applied for analyzing the City of Raleigh's arterial and collector roadways only. The BLOS model was developed through a national research project for arterial and collector streets. The BLOS model has been applied in many jurisdictions to measure and monitor bicycle travel conditions.

The Bicycle Level of Service Model is based on the proven research documented in Transportation Research Record 1578 published by the Transportation Research Board of the National Academy of Sciences. It was developed with a background of over 150,000 miles of evaluated urban, suburban, and rural roads and streets across North America. Many urban planning agencies and state highway departments are using this established method of evaluating their roadway networks. The Virginia Department of Transportation is using the Bicycle LOS Model in both the Richmond and Northern Virginia regions.

The model has also been applied in Anchorage AK, Baltimore MD, Birmingham AL, Buffalo NY, Gainesville FL, Greensboro NC, Houston TX, Lexington KY, Philadelphia PA, Sacramento CA, Springfield MA, Tampa FL, Washington, DC, Winston-Salem NC, and by the Delaware Department of Transportation (DelDOT), Florida Department of Transportation (FDOT), New York State Department of Transportation (NYDOT), Maryland Department of Transportation (MDOT) and many others. Widespread application of the original form of the BLOS Model has provided several refinements. Application of the BLOS Model in the metropolitan area of Philadelphia resulted in the final definition of the three effective width cases for evaluating roadways with on-street parking.

Application of the BLOS Model in the rural areas surrounding the greater Buffalo region resulted in refinements to the "low traffic volume roadway width adjustment". A 1997 statistical enhancement to the Model (during statewide application in Delaware) resulted in better quantification of the effects of high speed truck traffic [see the SPt(1+10.38HV)2 term]. As a result, Version 2.0 has the highest correlation coefficient (R2 = 0.77) of any form of the Bicycle LOS Model.

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

STUDY SCOPE AND APPROACH

The study took on the task of developing Bicycle Level of Service (BLOS) for the first time in the City of Raleigh. The consultant team was responsible for compiling and verifying input data for the entire City of Raleigh network of arterial and collector streets, developing a GIS-based database to store input data, computing BLOS scores, and preparing BLOS maps to document problem areas and to identify opportunities for improvements.

The BLOS analysis utilized GIS as the main database platform and focused on utilizing existing data resources in the City and avoided new data collection. The City intends to commit resources in the future to improve BLOS input data. The BLOS results helped determine locations needing bicycle improvements and assisted in the preparation of the bicycle suitability map.

The BLOS model (version 2.0) was applied for analyzing the City of Raleigh's arterial and collector roadways only. The BLOS model is not applicable for freeways.

The following data sets were obtained and utilized in the BLOS model (Version 2.0):

- Street center lines with attribute data
- Historical Annual Average Daily Traffic (AADT) Counts
- Pavement Condition Data for State-maintained roadways
- Pavement Condition Data for City-maintained roadways
- Triangle Regional Model (TRM) databases
- City of Raleigh Peak Hour Intersection Counts
- City of Raleigh Parking maps

In addition, the Consultant team used aerial maps and Google Street views to verify geometric and other attribute data needed for the BLOS model. The results of the BLOS analysis were mapped to document current bicycle travel conditions and to identify causes of poor conditions.

BLOS REGRESSION EQUATION

Bicycle Level of Service (BLOS) was developed as a linear regression model by transportation researchers. The BLOS regression equation (version 2.0) provides a discomfort and inconvenience score for bicycle travel by taking into account four prevailing roadway and traffic conditions:

1. Peak traffic flow in the outside lane
2. Speed of traffic and percent of heavy traffic
3. Pavement surface condition
4. Pavement width available for bicycling

The first three variables are impact scores and reflect perceived challenges to bicycling. The fourth variable is a benefit score and reflects perceived opportunities to bicycling.

The BLOS regression equation is presented below (colored text in the equation corresponds to the descriptions that follow):

$$\text{BLOS} = 0.507 \times \ln(\text{Vol15}/\text{Ln}) + 0.199 \times \text{SPt}\,(1+10.38\text{HV})2 + 7.066 \times (1/\text{PR5})2 - 0.005 \times (\text{We})2 + 0.76$$

Where,

Vol15 Directional traffic volume during peak 15-minute time period

= (ADT x D x Kd) / (4 x PHF)

Where, ADT = Average daily traffic
D = Directional factor
Kd = Peak to Daily factor
PHF = Peak hour factor (1.0 assumed)

Ln Number of directional through lanes

SPt Effective Speed Limit

= 1.1199 x Ln(SPp – 20) + 0.8103

Where, SPp = posted speed limit

HV Percentage of heavy vehicles

PR5 Pavement condition rating based on FHWA's 5-point scale

We Average effective width of outside through lane

= Wv – (10 ft x % OSPA), for Wl = 0
= Wv + Wl (1 - 2 x % OSPA), for Wl > 0 and Wps = 0
= Wv + Wl – 2 (10 x % OSPA), for Wl > 0 and Wps > 0 and has a bike lane

Where, Wv = Effective width as a function of traffic volume
= Wt if ADT > 4,000 vehicles per day
= Wt (2 - 0.00025 x ADT) if ADT ≤ 4,000 vehicles per day and the street is undivided and unstriped

Wt = total width of outside lane (and shoulder) pavement
Wl = width of paving between the outside lane stripe and the edge of pavement
OSPA = percentage of segment with occupied on-street parking
Wps = width of pavement striped for on-street parking

The first part of the BLOS equation measures the impacts of peak hour vehicular traffic flow on bicyclists. Roads with high traffic volume on the outside lane would receive high BLOS score, indicating low suitability for bicycle travel. The second part of the BLOS equation measures the impacts of speed of travel and percent of heavy traffic (buses and trucks) on bicycle travel environment. Roads with high posted speed limit and high number of trucks and buses would receive high BLOS score, indicating low suitability for bicycle travel. Similarly, the third part of the BLOS equation measures the impact of pavement surface condition on bicycle ride quality and assigns high BLOS score for roadways with deteriorated pavements. These first three parts of the BLOS score and a constant term are added together to compute the raw BLOS score. The final BLOS score is computed by subtracting the benefits score (fourth term in the BLOS equation) based on pavement width available for bicycling from the raw score. Roadways with striped bike lanes, wide outside lanes, paved shoulders, or low on-street parking volumes would receive discounts from the raw BLOS score, resulting in low BLOS values or good level of service.

BLOS GRADES

Bicycle Level of Service (BLOS) was developed as a linear regression model by transportation researchers. The BLOS regression equation (version 2.0) provides a discomfort and inconvenience score for bicycle travel by taking into account four prevailing roadway and traffic conditions:

The BLOS scale uses six letter grades, A through F, to describe the quality of a roadway segment for bicycle travel from best to worst conditions based on user perception. This is depicted in Table F.1.

Table F.1 Bicycle Level of Service Definition

BLOS Grade	BLOS Score	Description
A	<=1.5	Excellent bicycle environment
B	1.5 - 2.5	Good bicycle environment
C	2.5 - 3.5	Fair bicycle environment (acceptable to experienced and novice bicyclists)
D	3.5 - 4.5	Poor environment (acceptable to experienced bicyclists)
E	4.5 - 5.5	Deficient environment (Unacceptable to experienced and novice bicyclists)
F	> 5.5	Unsafe environment (Unsuitable for any bicycle travel)

In urban areas like the City of Raleigh, it is desirable to have a long range target of achieving BLOS C or better on bicycle network routes. This high service standard would ensure that bicycling is a viable, efficient and safe mode of travel for work, recreational and school trips.

BLOS MODEL DATA

Table F.2 depicts the data sources and methodology used to prepare input data for the BLOS model application for the City of Raleigh's arterial and collector streets.

Table F.2 BLOS Input Data Sources and Analysis Approach

Input Data	Data Source Methodology
Average Daily Traffic (ADT)	•2005 ADT point shapefile from Capital Area Metropolitan Organization (CAMPO) •Averaged multiple data points for each network segment •Estimated missing ADT data using City of Raleigh's peak hour intersection traffic counts (2005-2007)
Posted Speed Limit	•Started with CAMPO shapefile data •Verified/Corrected based on Google Streetview
Number of Through lanes	•Started with CAMPO shapefile data •Verified/Corrected based on Google Streetview
Pavement Condition Rating	•2006 NCDOT Pavement Rating Data (100-point scale) •Raleigh Pavement Rating Data (100-point scale) •Linear conversion from 100-point scale to 5-point FHWA scale •Estimated weighted average rating for multiple data points
Peak Hour Traffic Distribution Factors (K,D)	•Estimated from the baseline Triangle Regional Model (TRM) •Checked reasonableness against Raleigh peak hour intersection counts •Averaged for multiple data points
Heavy Vehicles (%HV)	•Estimated from the baseline TRM •Checked reasonableness against Raleigh peak hour intersection counts •Averaged for multiple data points
Peak Hour Factor (PHF)	•Typical value of 0.92 was used for all study area arterials and collectors
Total Width of Outside Lane (Wt) and Width of Paving between the Outside Lane Stripe and the Edge of Pavement (Wl)	•Aerials
Percentage of Segment with Occupied On-Street Parking	•Raleigh parking zone maps •Aerials

BLOS TABLE SUMMARY

Table F.3 Raleigh Bicycle Level of Service (BLOS) Summary for Study Network Roadways

BLOS Grade	Miles	% Measured Miles	Segments
A	3.0	0.7%	11
B	14.0	3.3%	11
C	30.5	7.2%	34
D	198.5	46.7%	129
E	138.5	32.6%	106
F	40.5	9.5%	27
No Grade*	184.2	N/A	131
Total	**425.0**	**100.0%**	**449**

**Segments with no grade include controlled access highways, interstates, and certain roadways lacking sufficient data at the time of this study.*

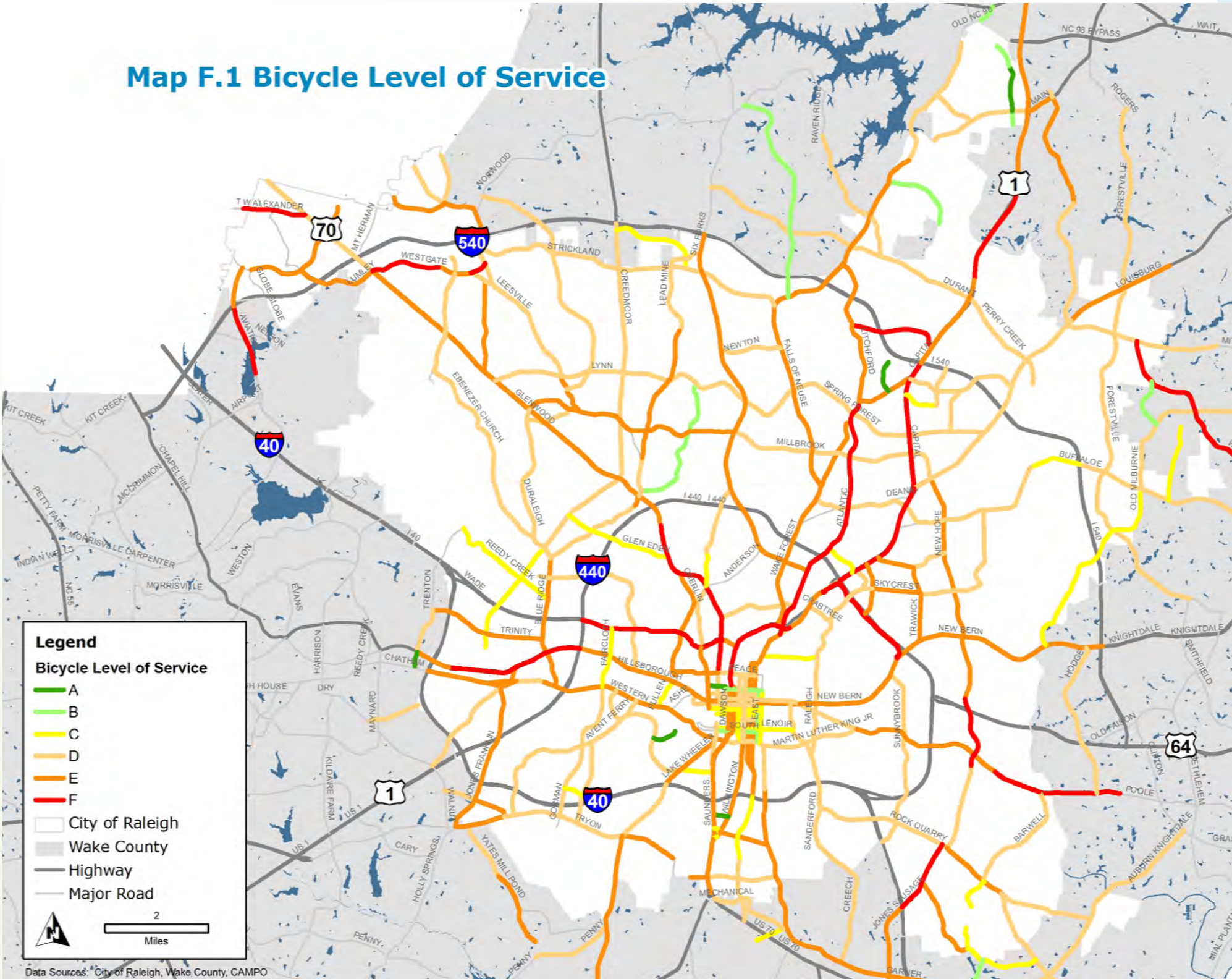
BLOS MAPS

Map F.1 shows the Bicycle Level of Service (BLOS) for the arterial and collector streets that are within the City of Raleigh's jurisdiction. The map shows each roadway segment analyzed in the study with six color codes to reflect letter grades A (best) through F (worst). It should be noted that the freeways are not rated in the BLOS model as they are not eligible for bicycle travel.

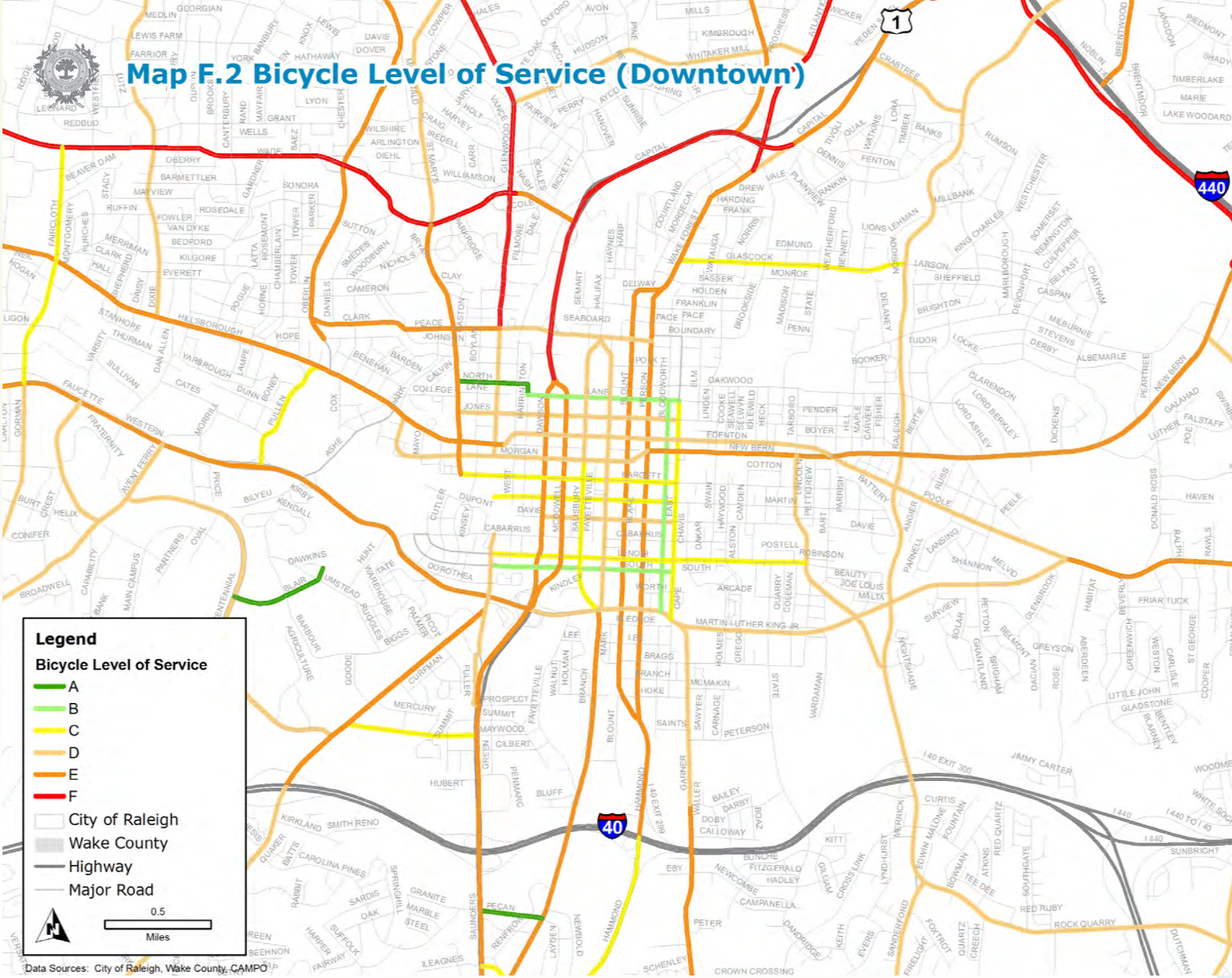
The BLOS map shows that a majority of the principal arterials in the City of Raleigh are currently at LOS E and F due to heavy traffic volumes and lack of bicycle accommodation along the travel lanes due to built-up environment. It also shows that many collector streets in the City of Raleigh are at LOS D due to heavy traffic volumes and lack of bicycle accommodation along the travel lanes.

Map F.2 shows the BLOS for a zoomed area of Downtown Raleigh.

Map F.1 Bicycle Level of Service



Map F.2 Bicycle Level of Service (Downtown)



APPENDIX G OUTLINE:
Overview
Destinations in Raleigh
Conclusion
Bicycle Facilities Chart

APPENDIX G: ANALYSIS OF BICYCLE ACCOMMODATIONS AT DESTINATIONS

OVERVIEW

The design of a successful bicycle plan relies on an integrated set of connections between major nodes and destinations. However, in order for these connections to function properly, the destinations need to include programs and facilities that encourage and accommodate for bicycle use.

CLH Design, P.A. completed a study to examine some of the major destinations in Raleigh and determine both the strengths and weaknesses of these areas. Facilities examined ranged from bicycle parking, storage facilities, and showers. Other amenities such as water fountains, bicycle maps, and roadway conditions were also examined. Overall trends of these areas will be examined. Finally, three precedent studies of ideal bicycle environments were also researched. These environments include a campus, a workplace, and an entire community.

DESTINATIONS IN RALEIGH

- North Carolina State University
- Shaw University
- Peace College
- Saint Augustine's College
- Meredith College
- Wake Technical Community College
- Cameron Village
- Ridgeway Shopping Center
- North Hills Shopping Center
- Crabtree Valley Mall
- Wake Medical Center
- Downtown Raleigh Districts
- Raleigh Museums
- Pullen Park
- Raleigh Convention Center
- Raleigh Bicycle Transportation Plan 2008

North Carolina State University

NCSU is the largest university in North Carolina and has the most extensive bicycle facilities of the destinations studied. Site visits and discussions with NCSU's transportation planner, Torsha Bhattacharya, revealed the following findings.

Bicycle Facility features include:

- 120+ Bicycle parking racks with plans to add more
- Presence of "sharrows," or "share the road arrows" to educate motorists of the presence of bicyclists, and to safe riding and positioning in the lane
- Covered parking, storage lockers, and shower facilities at the Engineering Building II on Centennial Campus
- Numerous campus bicycle clubs that conduct biking and repair workshops, including BUG (Bicycle User Group) an organization that encourages ridership, safety, and campus improvements
- Covered bicycle racks in the plans for the new parking decks
- A bicycle sharing program, currently in its pilot stage

NCSU is currently in early stages of its revised Master Plan, which does include strengthened connections for pedestrians and bicyclists. Other improvements may include additional bicycle lockers and shower facilities, increased motorist awareness, and a campus bicycle map readily available to the public.

Bicycle rack in front of Gold Hall

"Sharrow" on an NCSU campus road

Peace College
Saint Augustine's College
Shaw University

Peace College, Saint Augustine's College, and Shaw University are small, private colleges. All three are located in or nearby the Downtown Raleigh core and had very few, if any, bicycle facilities.

Shaw University currently does not have any bicycle facilities. Shaw facilities manager, Darryl Daniels, stated that very few students commuted to school via bicycle. Most students who lived downtown or in the adjacent dormitories walked to class. Others who were not within walking distance used public transportation. With increasing ridership and increasing downtown residents, Daniels did feel that bicycle facilities needed to be integrated into the campus plan. The inclusion of bike racks will be discussed at Shaw's upcoming planning meetings.

Saint Augustine's College also does not have any bicycle facilities. In fact, bicycles are not allowed on campus. Similar reasons were cited – students live close by and walk to campus. Peace College also does not have a significant number of students who use bicycles, according to Cheryl Brown, facilities Director.

Peace College campus path

Bicycle racks in front of the pool area, Peace College

Bicycle racks in front of residence hall, Meredith College

Greenway trail head, Meredith College

They do have a few bicycle racks near the gym and pool area, and have plans to add more. Showers are available in the gym. A new library being constructed on campus will include new bicycle racks. Despite a culture of bicycles not being very apparent, Brown states that there are a number of students who take bike trips together, and also a number of faculty who commute on bicycle.

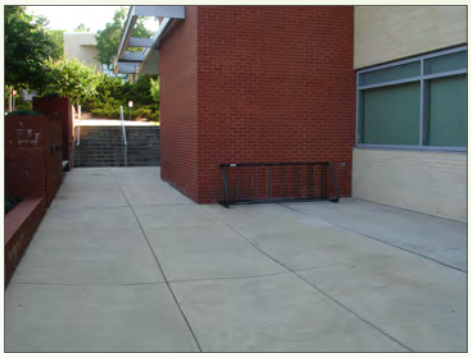
Meredith College

Meredith is an historic private college located in West Raleigh. According to Aaron Schettler, Grounds Manager with Meredith College Facility Services, the campus has three bicycle rack areas with about six bicycles on average during the semester. These are located near the residence halls. Schettler also indicated that there is a new LEED-rated project under construction on campus which will include additional bicycle facilities.

Meredith is situated along the popular Reedy Creek Greenway Trail which connects to the NC Art Museum and other Raleigh destinations. While Meredith may not typically see a significant number of students using bicycles on campus, this greenway trail brings in a large volume of bicyclists from other parts of the Triangle.

Wake Tech Health Sciences Campus/ Wake Med Main Campus Wake Tech North Campus

Mostly due its location, beyond I-540, near busy roads, and low-density development, Wake Tech North Campus sees very little bicycle use. Wake Med Main Campus and Wake Tech Health Sciences campus, although located closer to Raleigh's center, also sees very little bicycle use. Lee Bullock, Wake Tech Assistant Facilities Manager, indicated that the Health Sciences campus has only about five regular bicycle riders per semester. A few bicycle racks were found around these campuses, but no other facilities. Similarly, one bicycle rack was found at the Wake Med Main campus. No bicyclists were seen at either campus during the time of observation.



Bicycle parking at Wake Med

Fig. G.8: Bicycle rack at Wake Tech Main Campus

Cameron Village

Cameron Village, situated near Downtown Raleigh, North Carolina State University, Broughton High School, and dense historical neighborhoods, has a number of attractive destinations, ranging, from restaurants, coffee shops, a grocery store, salons, and clothing stores. Because of this, it is a major destination for bicyclists in Raleigh.

During Cameron Village's most recent renovations, numerous bicycle racks were added. You can find these bicycle racks at almost every major intersection in the Cameron Village area. With a consistent style and color, they serve as a unifying element in the landscape. With narrower streets and slower traffic than the surrounding context, Cameron Village offers a pleasant biking atmosphere.

Friends resting at Cameron Village after a long ride

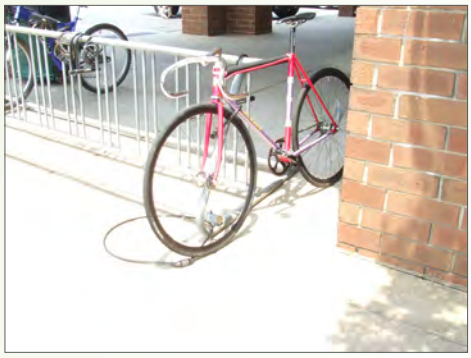
Ridgeway Shopping Center

Observations at Ridgeway Shopping Center revealed a significant number of bicyclists. One of the main draws of this area appears to be the presence of All Star Bike - a full-service bicycle shop. All Star Bike shop carries maps and also has information about local bicycle organizations. Next door, Whole Foods also attracts a significant number of bicyclists throughout the day. Ridgeway has a minimal amount of facilities - two sets of bicycle racks. They do, however, appear to be sufficient for this complex.

Bicycle racks in front of Whole Foods

North Hills Mall

North Hills is an outdoor mall and mixed-use development just outside Raleigh's beltline. Although North Hills Mall offers a pedestrian friendly environment, there were not a significant amount of bicyclists seen in the area. A few bicycle racks were observed in the main shopping area. Two of them are strategically located in front of establishments that would most likely attract bicyclists – REI Outdoor Equipment and Gold's Gym.



Bicycle racks near All Star Bike Shop

Bicycle rack outside REI

Bus stop and bike rack at North Mills Mall

Crabtree Valley Mall

While Crabtree is surrounded by high-speed traffic and very wide roads, it is also adjacent to a greenway trail. The scenic Crabtree-Oak Park Trail runs through the west edge of the site, funneling in a significant number of bicyclists. Bicycle racks are situated not too far from this trail around the parking garages. Those found within the parking garages are covered.

Raleigh Downtown Core

Many of the bicyclists you will find downtown are not commuting to work, but rather they are already at work. The Downtown Raleigh Ambassadors, employed by the city, can be found biking the streets offering helpful information to pedestrians. Raleigh Police officers can also be found travelling around on bicycle. During the evenings and weekends, Raleigh Rickshaw Service provides a unique and fun transportation alternative.

Downtown Raleigh

Groups of bicyclists can often be found congregating at local hot spots, such as the Raleigh Times Bar or Helios Café further north on Glenwood Ave. Others can be found weaving through the downtown streets, sometimes in groups of ten or more. Downtown areas that are higher in pedestrian activity (Moore Square, Fayetteville St districts) have a greater number of bicyclists than those higher in vehicular activity (Nash Square area, Government Complex area).

Bicycle parked at local hot spot in downtown Raleigh

Bike parking racks can be found at some of the parking garages downtown. Many riders lock up their bicycles to tree grates or poles although this practice is discouraged by the city; there are currently no other public bicycle facilities such as storage areas. Stationary maps for downtown wayfinding can be found, but they do not offer bike or greenway maps. Major destinations such as the Raleigh Convention Center, set to open this fall, have plans to add facilities to accommodate bicyclists. According to Barclay Williams, Assistant to the Director of the Convention Center, there will be bicycle racks around the exterior of the building, as well as showers available to employees and clients.

Bicyclists on Wilmington Street

Raleigh Museums

The North Carolina Art Museum off Blue Ridge Road includes a 164-acre outdoor park. Its extensive trail system meanders through large outdoor sculptures, natural woodlands, and flowing creeks. The paved trails are very popular with bicyclists and pedestrians alike. The museum's trails connect to the Reedy Creek Greenway System which connects to West Raleigh, Meredith College, and North Carolina State University. Reedy Creek Trail markers with maps are located at the main entrance to the museum as well as other strategic points in the art park.

Paved trail at outdoor park

Tia Herring, Museum Park Manager, stated that the museum has artist-designed bicycle racks in the outdoor sculpture park, as well as typical bicycle racks near the museum entrances. In addition to this, showers are available to museum staff. The Art Museum is also currently undergoing extensive renovations. When the construction is completed in 2009, they plan on adding additional bicycle facilities.

Railings at NCMNH often used as racks

The museums located in downtown include the Museum of Natural Sciences, the NC History Museum, and Marbles Children's Museum. While a number of bicyclists were observed in the surrounding area, there were no bicycle facilities found at these museums. Bicycles are sometimes seen locked up to railings near the entrance to the museums.

NC Museum of Natural Sciences

Pullen Park

Since its founding in 1887, Pullen Park has been a popular Raleigh destination, offering a quiet and scenic retreat for residents and visitors. Its beautiful walking paths weave through lush vegetation and over arched bridges. With a peaceful lake, a historical carousel, a children's train, and many areas for activity and interaction, the park comes alive with people.

In the main areas of the park, signs indicate that you must walk your bike through the park due to the narrow paths and small children in the area. Larger parks in the area, such as Umstead State Park, are well-designed for bicyclists looking to take short or long rides. Pullen Park does offer some accommodations, though. Visitors coming to the park on bicycle can lock them up at the bicycle rack near the main east entrance. Water fountains are also available nearby.

Scenic lake at Pullen Park

Bicycle rack at east entrance

Bicycle rack at Cameron Village

Conclusion

Some of the destinations observed serve as good examples of places in Raleigh that offer facilities for bicyclists. These include North Carolina State University, Cameron Village, and North Carolina Museum of Art.

All of these destinations offer bicycle racks, maps, and other amenities on site, such as showers and drinking fountains. Destinations such as Ridgeway Shopping Center and Downtown Raleigh continue to draw bicycle riders despite a low number of bicycle facilities.

One of the destinations observed with apparent deficiencies in the facilities offered to bicyclists was downtown Raleigh, where many people resort to securing their bikes to tree grates or light poles due to insufficient and/or convenient bicycle racks. Other destinations, such as Shaw and Peace College, could clearly benefit from additional facilities and resources. Additionally, the North Carolina Museum of Art, Crabtree Mall, and Meredith College may have varied facilities, however all of them experience a large volume of bicyclists due to their adjacency to the Raleigh Greenway System. The chart on the following pages shows a summary of the destinations and their facilities.

With healthier and active lifestyles emerging and increasing bicycle awareness, the number of Raleigh bicyclists will only continue to grow. The representatives and employees interviewed who are in charge of bicycle facility planning at the observed destinations recognize this and are eager to improve their facilities to accommodate for this need.

Bicycle locked up to a tree on Hargett St.

Bicycle racks at NCSU Brickyard

Art Museum trail sign

Table G.1 Bicycle Facilities and Amenities at Destinations

DESTINATION	BIKE RACKS	PROGRAMS/ CLUBS	SHOWERS	STORAGE/ LOCKERS	DRINKING FOUNTAINS	BIKE MAP	OBSERVED RIDERSHIP*
NCSU	✓	✓	✓	✓	✓	✓ (At transport. Office)	Moderate-High
PEACE COLLEGE	✓	✓	✓				Low
SAINT AUGUSTINE'S COLLEGE							N/A
SHAW UNIVERSITY	Planned						N/A
MEREDITH COLLEGE	✓					✓	Moderate-High (on adjacent greenway)
WAKE TECH (HEALTH SCIENCES & NORTH CAMPUS)	✓						Low
NCSU	✓	✓	✓	✓	✓	✓ (At transport. Office)	Moderate-High
PEACE COLLEGE	✓	✓	✓				Low
SAINT AUGUSTINE'S COLLEGE							N/A
SHAW UNIVERSITY	Planned						N/A
MEREDITH COLLEGE	✓					✓	Moderate-High (on adjacent greenway)
WAKE TECH (HEALTH SCIENCES & NORTH CAMPUS)	✓						Low

Table G.1 Bicycle Facilities and Amenities at Destinations (continued)

DESTINATION	BIKE RACKS	PROGRAMS/ CLUBS	SHOWERS	STORAGE/ LOCKERS	DRINKING FOUNTAINS	BIKE MAP	OBSERVED RIDERSHIP*
CONVENTION CENTER (UNDER CONSTRUCTION)	Planned		For employee/ client use				N/A
DOWNTOWN RALEIGH CORE	✓	✓				✓	Varies: Low - High

**The site visits occurred from May - June 2008 at a time when the colleges were in summer session with low attendance. The site visits also occurred during a time when many of the afternoons were unseasonably hot (near 100 degrees) which kept many people indoors.*

APPENDIX H OUTLINE:
Glossary Terms

APPENDIX H: GLOSSARY

AASHTO – American Association of State Highway and Transportation Officials: a nonprofit, nonpartisan association representing highway and transportation departments of all transportation modes in the 50 states, the District of Columbia and Puerto Rico.

"A" Cyclist – a term generally used to describe experienced or advanced bicyclists that are comfortable in all cycling environments, even busy roadways that lack bicycle facilities. "A" Cyclists will typically bicycle in any condition, whether hospitable or not.

ADA – American Disabilities Act of 1991: The Act gives civil rights protections to individuals with disabilities including equal opportunities in public accommodations, employment, transportation, state and local government services, and telecommunications.

Advance Stop lines - applies to a stop line placed prior to a crosswalk or bicycle box, to either prevent motor vehicle encroachment, or to improve visibility. It plays an important safety role especially in multi-lane roads.

Alternative Transportation Network – a connected system for travel using transportation other than private cars, such as walking, bicycling, rollerblading, carpooling and transit

Arterial Connections – interconnected corridors designed to accommodate a large volume of through traffic

Bargain Sale – the sale of a property at less than the fair market value. The difference between a bargain sale price and fair market value often qualifies as a tax-deductible charitable contribution. Commonly used to acquire land or easements for greenways or multi-use paths.

"B" Cyclist – a term generally used to describe intermediate level cyclists, who bicycle for reasons ranging from recreation and fitness riding to commuting. "B" cyclists typically prefer on-street bicycle facilities, such as bicycle lanes and paved shoulder.

Bicycle – Every vehicle propelled solely by human power upon which any person may ride, having two tandem wheels, except scooters and similar devices. The term "bicycle" in this document also includes three and four-wheeled human-powered vehicles, but not tricycles for children.

Bicycle Activated Detector Loop – sensors installed in the roadway at intersections that trigger a change in a traffic signal. They allow cyclists to remain in the travel lane and avoid maneuvering to the side of the road to trigger a push button.

Bicycle Box – a box painted on a roadway at an intersection that allows bicyclists to move to the front of the line in traffic. Generally a bicycle lane allows cyclists to pass stopped motor vehicle traffic and enter the bicycle box. The bicycle box is located between the intersection and front of the motor vehicle stop line. Bicycle Boxes increase awareness of cyclists in the roadway environment and provide the opportunity to cross intersections before motor vehicles.

Bicycle Facilities – a general term denoting improvements and provisions made by public agencies to accommodate or encourage bicycling. Examples include, but are not limited to bicycle parking/storage facilities, roadways with sharrow markings, bicycle lanes, paved shoulders, sidepaths, and greenways.

Bicycle Friendly Community – a program established by the League of American Bicyclists that recognizes and awards municipalities who encourage bicycling and make significant strides in creating a bicycle friendly environment.

Bicycle Lane - a portion of a roadway that has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists.

Bridge Culvert – a sewer or drain crossing used for the transference of surface water from a bridge

Buffer (See also Screening) - A strip of land with natural or planted vegetation, located between a structure or use and a side or rear property line, intended to spatially separate and visually obstruct the view of two adjacent land uses or properties from one another. A buffer area may include any required screening for the site.

Bulb-out - extended pavement to narrow roadway, or pinch through fare, or provide space for bus stop, bench, etc. Commonly used as a traffic calming measure.

Capital Area Metropolitan Planning Organization (CAMPO) - CAMPO is the MPO comprised of municipalities within Wake County and is responsible for multi-modal transportation planning and coordination between the municipalities. The Capital Area MPO serves as the coordinating agency between local governments, NCDOT, and FHWA.

"C" Cyclist – a term generally used to describe beginner, juvenile or elderly cyclists who are not comfortable bicycling in an environment with significant motor vehicle traffic. Typically "C" cyclists prefer to cycle on shared-use paths, greenways, and calm neighborhood streets.

Collector Streets – a public road designed to flow traffic from small neighborhood streets and connect to larger thoroughfares

Concurrent Signal Timing - motorists running parallel to a crosswalk are allowed to turn into and through the crosswalk (left or right) after yielding to bicyclists or pedestrians

Condemnation - the taking of private property for public use, with adequate compensation to the owner, under the right of eminent domain

Connectivity - the logical and physical interconnection of functionally related points so that people can move among them

Conservation Easement - a legally binding agreement not to develop part of a property, but to leave it "natural" permanently or for some designated very long period of time regardless of ownership transfer

Consultant - Certified professionals such as engineers, planners, arborists, biologists, foresters and horticulturists that are approved by the Planning Director.

Corridor - a spatial link between two or more significant locations

Crosswalk - a designated point on a road at which some means are employed to assist pedestrians who wish to cross a roadway or intersection. They are designed to keep pedestrians together where they can be seen by motorists, and where they can cross most safely with the flow of vehicular traffic.

Curb Cut – interruption in the curb, as for a driveway

Curb Extension - a section of sidewalk at an intersection or mid-block crossing that reduces the crossing width for pedestrians and is intended to slow the speed of traffic and increase driver awareness

Curb ramp - a ramp leading smoothly down from a sidewalk, greenway or multi-use path to an intersecting street, rather than abruptly ending with a curb

Development - The carrying out of any building activity, the making of any material change in the use or appearance of any structure or land, or the subdividing of land into two or more parcels.

Driveway Apron – the section of a driveway between a sidewalk or greenway and the curb

Eminent Domain – the acquisition of property by the government which is deemed to be necessary for the completion of a public project from an owner that is unwilling to negotiate a price for its sale.

EPA – Environmental Protection Agency

Fee Simple Purchase – an outright purchase of the land by municipality

FHWA – Federal Highway Administration

First Right of Refusal - the right specified in an agreement to have the first opportunity to purchase or lease a given property before it is offered to others

Fitness Trail - a pathway upon which users jog or walk from station to station to perform various exercise tasks

Greenway - a linear path or open space, often composed of natural vegetation. Greenways can be used to create connected networks of open space that include traditional parks and natural areas specifically designed for pedestrian and bicycle use. Greenways provide an off-street component to the bicycle network.

High Volume Artery – an important transportation corridor that is used by large traffic levels

Hydrologic Resources – stream and sewer corridors and buffer zones that can be used to facilitate the building of greenways

Incentive Zoning - a system by which zoning incentives are provided to developers on the condition that specific physical, social, or cultural benefits are provided to the community

Intersection - an area where two or more pathways or roadways join together

ISTEA – Intermodal Surface Transportation Efficiency Act of 1991

Leaseback - the process of selling a property and also entering into a lease to continue using that property

Linear Stream Corridor - generally consists of the stream channel, floodplain, and transitional upland fringe aligned linearly

LRTP – Long Range Transportation Plan

Median - a median is a barrier, constructed of concrete, asphalt, or landscaping, that separates two directions of traffic

Mixed Use Area – a term used to describe a specific area that posses a combination of different land use types, such as residential, commercial, and recreation

Mode Share - a term used to describe percentage splits in transportation options

MPO – Metropolitan Planning Organization

MUTCD – Manual of Uniform Traffic Control Devices: National standards guidebook on signage and pavement marking for roadways

Municipal Boundary – the limit of municipal jurisdiction

Nature Trail - a marked trail designed to lead people through a natural environment, which highlights and protects resources

NCDOT – North Carolina Department of Transportation

Negotiated dedications - a local government may ask a landowner to enter into negotiations for certain parcels of land that are deemed beneficial to the protection and preservation of specific parcel of land

Off-road Trail – paths or trails in areas not served by the street system, such as parks and greenbelt corridors. Off-street paths are intended to serve both recreational uses and other trips, and may accommodate other non-motorized travel modes, such as bicycles in addition to walking.

On-street Bicycle Facility – any bicycle facility that is constructed or marked on a roadway, such as a shared roadway, signed route, wide outside lane, bicycle lane, or paved shoulder

Open Space - empty or vacant land which is set aside for public or private use and will not be developed. The space may be used for passive or active recreation, or may be reserved to protect or buffer natural areas.

Overlay Zone - a zone or district created by the local legislature for the purpose of conserving natural resources or promoting certain types of development. Overlay zones are imposed over existing zoning districts and contain provisions that are applicable in addition to those contained in the zoning law.

Pedestrian - a person on foot or a person on roller skates, roller blades, child's tricycle, non-motorized wheelchair, skateboard, or other non-powered vehicles (excluding bicycles)

Planned Unit Development (PUD) - a project or subdivision that includes common property that is owned and maintained by a homeowners' association for the benefit and use of the individual PUD unit owners

Pocket Park - a small area accessible to the general public that is often of primarily environmental, rather than recreational, importance; they can be urban, suburban or rural and often feature as part of urban regeneration plans in inner-city areas to provide areas where wild life can establish a foothold.

Preservation Easement – a voluntary legal agreement that protects historic, archaeological, or cultural resources on a property. The easement provides assurance to the property owner that intrinsic values will be preserved through subsequent ownership. In addition, the owner may obtain substantial tax benefits.

Public Access Easement – a voluntary legal agreement which grants a municipality a perpetual right-of-way and easement for public access and public benefit

Quality of Life - a measure of the standard of living which considers non-financial factors such as health, functional status and social opportunities that are influenced by disease, injury, treatment or social and political policy

Retrofit - the redesign and reconstruction of an existing facility or subsystem to incorporate new technology, to meet new requirements, or to otherwise provide performance not foreseen in the original design

Road Diet – reconfiguring or reducing the number or width of motorized vehicle lanes to provide room to integrate a bicycle facility into a roadway. Commonly used on 4 lane roads with moderate motorized traffic volumes. Generally roadways are reconfigured to include a center turn lane, two 5' bicycle lanes and two motor vehicle travel lanes on either side.

Roundabout - traffic calming device at which traffic streams circularly around a central island after first yielding to the circulating traffic

ROW (right of way) - an easement held by the local jurisdiction over land owned by the adjacent property owners that allows the jurisdiction to exercise control over the surface and above and below the ground of the right-of-way; usually designated for passage

RTOR – Right turn on red

Safe Routes to School (SRTS) – a federal program that provides funding to encourage and facilitate the planning and implementation of bicycle and pedestrian projects near schools.

SAFETEA - Safe, Accountable, Flexible and Efficient Transportation Equity Act of 2003:

SAFETEA-LU - Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

Sharrow – painted roadway marking that alerts motorists that bicyclists are present and frequently use the roadway. Traditionally used in 35 MPH settings with wide curb lanes. To officially appear in the MUTCD in 2009.

Shoulder - The portion of the roadway contiguous with the traveled way for the accommodation of stopped vehicles, for emergency use, and for lateral support of sub-base, base, and surface courses. Paved shoulders can be used for bicycle travel as well.

Shared Roadway – A roadway that is open to both bicycle and motor vehicle travel. This may be an existing roadway, street with wide curb lanes of 14-feet to 15-feet, or road with paved shoulders. Generally lower speed roadways that are located in residential or compact urban environments.

Shared Use Path (Multi Use Path/Sidepath) - A paved path, typically 10-feet wide, physically separated from motorized vehicular traffic by an open space or landscaped barrier and located either within the highway right-of-way (often termed "side path") or within an independent right-of-way (often termed "greenway" or "multi-use path"). Shared use paths may be used by bicyclists, pedestrians, skaters, motorized and non-motorized wheelchair users, joggers, and other non-motorized users. In some cases shared use paths also accommodate equestrians.

Sidewalk - an improved facility intended to provide for pedestrian movement; usually, but not always, located in the public right-of-way adjacent to a roadway. Typically constructed of concrete, but can be made with asphalt, bricks, stone, wood, and other materials.

Signed/Shared Roadway (signed bike route) – A shared roadway that has been designated by signing as a preferred route for bicycle use with either a "Share the Road" or "Bike Route" sign.

Thoroughfare - Any street on the adopted thoroughfare plan or any street which is an extension of any street on the thoroughfare plan and which extends into the area not covered by the thoroughfare plan.

TND (traditional neighborhood development) - an area of land developed in a planned fashion for a compatible mixture of residential units for various income levels and nonresidential commercial and workplace uses, with a high priority placed on access to open spaces and alternative forms of transportation

Traffic Calming - a range of measures that reduce the impact of vehicular traffic on residents, pedestrians and cyclists - most commonly on residential streets, but also now on commercial streets

Trip Attractor - a location which, because of what it contains, generates itself as a destination for people