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Executive Summary

This Bicycle Plan is the first bicycle plan for Chatham County, NC. It’s goals include making bicycling a viable transportation option for residents and provide a high quality recreation amenity for residents and visitors alike. To meet this overarching goal, the plan activities included an evaluation of Existing Conditions (Chapter 2) and research of state and national Design Standards (Chapter 3) in order to create a Recommended Bicycle Network (Chapter 4). The plan also uses research of best practices and investigation of other plans to Recommend Programs (education, encouragement, and enforcement) and Policies (Chapter 5) that lead to a better bicycling climate. Finally it discusses the Implementation (Chapter 6) of the plan recommendations.

Existing Conditions

Chatham County has over 130 miles of signed state, county and local on-road bicycle routes. None of these routes have extra accommodation for bicycle nor do bicycle lanes exist in the county. The county’s only off-road facility, the American Tobacco Trail, a shared use path connecting Durham to Cary, runs 4.1 miles through the north eastern corner of the County. A survey of nearly 500 residents and non-resident bicyclists found that more would bike (and more often) if the county had more on and off road facilities and safer driving by bicyclists, among other factors. Chapter 2 discusses these conditions in more detail.

<table>
<thead>
<tr>
<th>Type</th>
<th>Existing Mileage</th>
<th>Future Mileage</th>
<th>Completed Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Short Term</td>
<td>Long Term</td>
</tr>
<tr>
<td>Shared Roads</td>
<td>0</td>
<td>87.1</td>
<td>50.7</td>
</tr>
<tr>
<td>Signed Routes on Shared Roads</td>
<td>131.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bicycle Lane - Construction</td>
<td>0</td>
<td>0</td>
<td>33.9</td>
</tr>
<tr>
<td>Bicycle Lanes - Restripe</td>
<td>0</td>
<td>0.4</td>
<td>3.5</td>
</tr>
<tr>
<td>Total On-Street Facilities</td>
<td></td>
<td>307</td>
<td></td>
</tr>
<tr>
<td>Shared Use Paths</td>
<td>4.1</td>
<td>2.0</td>
<td>105</td>
</tr>
<tr>
<td>Total Facilities</td>
<td>418 miles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bicycle Network Mileage

Recommended Bicycle Network

The plan recommends a final long term bicycle network consisting of over 400 miles of on and off road facilities. These facilities include shared roads, signed routes, bicycle lanes and off-road shared use paths. The network also includes intersection improvements. In all, 26 short term (less than 10 year) and
Executive Summary

28 long term projects are necessary to complete this bicycle network. Chapter 4 provides more detail regarding the network, projects and their costs.

Programs and Policy Recommendations
Providing a quality environment for bicycling also requires education, encouragement and enforcement programs and bike-friendly policies, described in Chapter 5. Education programs include distribution of safety materials, bicycle rodeos, and training to law enforcement regarding bicycle traffic laws. Encouragement programs seek to persuade non riders to bicycle and riders to bicycle more; these programs could include awareness days and events and bicycle map enhancements. Targeting roads traveled heavily by bicycles for stricter traffic enforcement (speeding, passing too closely to bicycles) is another way to improve safety for cyclists. Many local examples point to the effectiveness of these programs.

Implementation
Implementation of the plan requires the coordination of county and municipality governments both within and outside the county. Coordination should start with the creation of a new Bike and Pedestrian Subcommittee within the County’s Transportation Advisory Board (TAB). This board can help the TAB advise the County Commissioners regarding issues related to walking and biking. The board can help coordinate the implementation of the Bike Network and the various programs and policy improvements described above. Chapter 6 describes specific implementation steps, responsible parties and time frame are described in.
Chapter 1: Introduction

This chapter gives a Background of bicycling initiatives in the county, includes the Purpose and Scope of the plan, describes the overarching Vision Statement for Chatham County as related to bicycling, sets Goals and Objectives for the plan, describes the Methodology that created the plan, and finally describes the Plan Elements.

1.1 Background, Purpose and Scope

This is the first official Bicycle Plan for Chatham County, though there have been other initiatives aimed at improving the county’s bicycling environment. In the late 1990s, NCDOT’s Division of Bicycle and Pedestrian Transportation, along with the Pittsboro-Siler City Convention & Visitor’s Bureau, worked with local bicycle advocates and governments to create the Chatham County Bicycle Map showing a bicycle network utilizing existing roads. This map is set for updates and reprinting in 2011. More recently, the County’s Public Health Department, in its Chatham County 2010 Community Health Assessment, found that one of the four major health concerns affecting Chatham residents was physical inactivity, noting that the county lacks many safe areas to bike or walk.

The purpose of this Plan is to identify facility, program and policy recommendations to improve bicycling conditions in Chatham County. The Plan accomplishes this by establishing a vision and goals for bicycling in the county, assessing existing conditions and initiatives, identifying the needs of the users and recommending policies, projects and programs to achieve the vision.

The Plan will serve as the basis for the Bicycle Element of the county’s upcoming Comprehensive Transportation Plan, which is set to be completed in late 2012. It will also help the county secure funding for future bicycle facilities, since projects identified in an adopted Bicycle Plan score higher in NCDOT’s Division of Bicycle and Pedestrian Transportation ranking system.

The Plan covers the entire county, including the Town of Siler City, Town of Pittsboro, Town of Goldston and the portion of the Town of Cary located in Chatham County. It addresses both on and off road projects, policies and programs for both recreational and non-recreational riding.
1.2 A Vision for Bicycling in Chatham County

A vision helps focus a project to the final outcome and define its goals and objectives. The Vision expresses the desired outcome of the Plan, rather than the current conditions.

The Vision

Chatham County has a bicycle transportation system that contributes to a healthier, more active population. This system provides an alternative to driving, improving the environment and reducing congestion. Riders of all experience levels have safe and accessible bicycling options. The system provides a high-quality recreation amenity for both residents and non-residents, contributing to the local economy and quality of life. Chatham accommodates the bicycle as a viable part of its transportation system.

The Vision was drafted from comments from the online survey of local residents and riders, existing County plans and reports and input from County staff, and was refined through discussions with select Chatham Transportation Advisory Board (TAB) members and other bicycle supporters. The Vision also draws from the TAB’s Strategic Plan, which explicitly states that the TAB values a transportation system that supports social/equity, health, economics, education, environment, connectivity and a balance of travel modes.

1.3 Goals and Objectives

These goals and objectives were created through conversations with county staff and public input.

**Goal 1: Provide a safe bicycling transportation network for all experience levels**

  Objective 1.1: Assess and make recommendations on existing bicycle network deficiencies.
  Objective 1.2: Assess and make recommendations on creating new bicycle facilities to connect county destinations.
  Objective 1.3: Ensure adequate parking for bicycles at public and commercial facilities throughout the county.

**Goal 2: Encourage more residents to ride bicycles**

  Objective 2.1: Develop encouragement programs to increase bicycling rates.
**Goal 3: Improve bicycle safety through education and enforcement**

Objective 3.1: Develop and implement bicycle safety education programs for motorists, bicyclists, students and the public.

**Goal 4: Make Chatham County a preferred bicycle tourism destination**

Objective 3.1: Assess and update county Bicycle Map to help educate both residents and tourists.
Objective 3.2: Encourage the opening of a bicycle shop in the county.
Objective 3.3: Promote bicycling through local businesses, the Chamber of Commerce, and other Chatham organizations.

The goals and objectives were developed through input from the public, county and municipal staff.

### 1.4 Methodology

To develop a bicycle plan for Chatham County, activities included data collection, visioning and goal setting, analysis and Bike Network and program recommendations.

- **Data collection** activities included:
  - Windshield surveys on select roads,
  - Google Street View™ review of other roads,
  - Geographic information systems (GIS) analysis,
  - Discussion with county citizen’s advisory boards, Pittsboro and Siler City government representatives and other county staff.

- **Public input included** a survey of bicycle interests and needs with more than 400 residents and non-resident Chatham bicyclists, more focused review of the plan from Chatham residents subset of these survey respondents, and a thorough review of existing plans and policies, many which included public input.

These activities also provided input to set the **vision, goals and objectives**, and provided a comprehensive depiction of the existing bicycling network and facilities in the county (Chapter 2).
Then staff created a recommended **Bicycle Network** that consists of on and off-road facilities by:

- Analyzing the existing bicycle conditions (as outlined in Chapter 2).
- Researching bicycle facility types as well as state, federal and other guidelines for future bicycle facilities in the county (Chapter 3).
- Mapping and analyzing destinations and bicycle attractors such as parks and schools. Vehicle counts provided by NCDOT and observations helped to determine the recommended facility type.
- Using off-road bicycle routes from the Chatham Parks and Recreation Master Plan (2009-2029) and from the US 64 Corridor Plan.

Next, the plan recommended successful **programs** that used education, encouragement and enforcement to improve bicycling as well as **policies** that help improve the conditions for bicycling in the county. These were taken from national examples, and include resources for additional information.

### 1.5 Plan Elements

The Plan includes the following chapters:

**Chapter 2: Existing Conditions**
This chapter describes the conditions for bicycling in the county. It gives an overview of the county's transportation system, existing bicycle facilities and conditions, crash statistics, reviews plans and policies related to bicycling and provides results of a survey regarding bicycling in the county.

**Chapter 3: Facility Standards and Guidelines**
This chapter includes national and state guidelines regarding standards for bicycle facilities, introduces bike facility types and appropriate usage. Standards discuss include guidelines for on and off street facilities, intersections, signage, and parking.

**Chapter 4: Recommended Bicycle Network**
This chapter proposes a future bicycle network that includes on and off street facilities. It describes the type, length and estimated cost of projects to complete the network. It also discusses other
miscellaneous improvements that help improve bicycling in the county.

**Chapter 5: Program and Policy Recommendations**
This chapter provides potential programs and policy changes to help support bicycling. This includes encouragement, education and enforcement programs and policies at county and municipal levels.

**Chapter 6: Implementation Strategy**
This chapter describes how Chatham County and its municipalities can make the Recommended Bicycle Network a reality. It includes implementation steps, describes evaluation and monitoring options as well as potential funding sources for the plan.

There are also five appendices that complement these chapters:

**Appendix A: Bicycle Survey Questions & Answers**
This appendix provides the Bicycling in Chatham County Survey, which provided key information to complete this plan. It includes the detailed results of each question for the Bicycling in Chatham County Survey—highlights of this survey are included in Chapter 2.

**Appendix B: Short Term Network Project Recommendations**
Describes the specific projects to complete the short term network

**Appendix C: Long Term Network Project Recommendations**
Describes the specific projects to complete the long term network

**Appendix D: Image Sources**
This details the source of each of the images within the plan.

**Appendix E: Literature Review**
This appendix includes a review of the literature regarding bicycle plans and infrastructure upgrades. It also includes an extensive bibliography.
Chapter 1: Introduction

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Chapter 2: Existing Conditions

Existing conditions were evaluated in order to understand the barriers, opportunities for improvement and desires of current users and residents for a bicycle transportation system. This chapter’s evaluation includes:

- A **Community Overview** including socioeconomic and geographic characteristics and a description of the existing transportation system.
- A description of the **Existing Bicycle Facilities and Conditions**.
- **Bike Crash Statistics** since 1997.
- A review of **Existing Plans, Policies and Programs** that contribute to the bicycling environment in Chatham County.
- A review of **Survey Results** from residents and existing riders on biking attitudes, perceptions and route conditions.

### 2.1 Community Overview

Chatham is a large, mostly rural county characterized by rolling hills, densely wooded areas and farmland. It is located at the geographic center of the State of North Carolina and between two large metropolitan regions – the Raleigh-Durham “Triangle” and the Greensboro “Triad”. Jordan Lake, a regional recreation attraction, is located in the eastern portion of the county.

The county is best described by geographic area – east and west. The eastern portion of the county, including the Town of Pittsboro and a portion of the Town of Cary, includes a number of suburban housing developments with a population density significantly higher than the rural sections of the county. The western portion of the county is characterized by working lands, with the exception of the Town of Siler City, which boasts the highest population densities in the county, as shown in Figure 2.1. While higher densities can equate to a better bicycling climate, with closer distances between destinations, increased traffic in these areas make bicycle and vehicular conflicts...
much more likely. For this reason, facilities and education for safe bicycling are even more important in Siler City.

Chatham County’s population grew by 31.9% over the past 10 years, to 63,505 according to the 2010 Census\(^1\), largely due to growth pressures from the adjacent Triangle region. The State has estimated the population to continue to increase to over 75,000 in 2020 and 86,000 in 2030\(^2\). According to the 2010 Census, 21% of the population lives in the incorporated towns of Siler City (7,887), Pittsboro (3,743), Goldston (268) and Cary (1,422)—though most of its population is in Wake County). The county’s population has increasingly become Hispanic (12.9% of residents), mostly in the western section of the county. The population is aging: its estimated median age as of 2009 was 42, up from 38.7 in 2007 and above North Carolina’s median. The county is also characterized by income disparities; while its median income ranks 8th in the state, over 10% of its population live below the poverty line lower than the state average of nearly 15%. As car ownership and operation costs increase, and population growth continues to occur, providing and accommodating alternative transportation options, like the bicycle, will be key to maintaining mobility.

As of 2000, more than half of Chatham residents were employed out of the county—long distances which make it difficult for many to use bicycling as a commute mode\(^3\). A third of the local economy is based on agriculture and agribusiness\(^4\). Tourism – much of it ecotourism and outdoor recreation – is becoming more and more important, with a


double-digit growth in the sector over the past three years. Bicycling could potentially be an important part of this tourism in the county.

According to the US Census’ American Community Survey (2005-2009), 76.2% of Chatham County commuted to work alone by automobile\(^5\). Less than one percent of commuters used bicyclists as their primary method of getting to work. Many recreational bicyclists in the county actually ride from other counties, notably Wake and Orange Counties.

Four major US Highways criss-cross Chatham County. US 15-501 enters from Chapel Hill and traverses the county’s eastern portion from north to south. US 421 travels from Greensboro from the northwest corner of the county by Siler City and through Goldston in the southern quarter. US 64 crosses the county from west to east, connecting the two major municipalities, Siler City and Pittsboro, to Asheboro westward and Raleigh eastward. US 1 crosses the southeastern corner of the county around Moncure. These roads are mostly four lane highways, sometimes with controlled access but typically with at-grade connections to local roads.

Other roads are typically two lane rural roads, sometimes windy and with steep slopes. These roads may have turning lanes and traffic signals. Bikes have been observed using the sidewalks in Pittsboro, Siler City and some of the newest subdivisions in the county.

### 2.2 Existing Bicycle Facilities and Conditions

Chatham County has three designated state bicycle routes, two “bicycle highways” and three suggested, unmarked “connector” routes. Portions of the US 1 Bicycle Highway, North Carolina Mountains to Sea Trail and the Piedmont spur of this trail also briefly enter the county. The existing bicycle network is shown in Figures 2.3, 2.4 and 2.5 (pages 18-20). This map also shows potential attractors such as recreation areas and schools.

---

Chapter 2: Existing Conditions

The American Tobacco Trail (ATT) is the only official off-road bicycle facility in the county. It is a 4.68 mile shared use path in the northeastern corner of the county, part of a larger 22 mile rails-to-trails project that connects Cary and Apex to the southeast with Durham to the north. It was constructed in an abandoned corridor of the Norfolk Southern Railroad and opened in May 2010. The Chatham portion of the ATT is surfaced with ten feet of asphalt and six feet of granite screenings for horses and joggers/walkers. The asphalt is in good condition and includes a very slight grade, with no steep slopes or sharp curves. Based on weekend observations and user comments, it is utilized by a large range of age groups and experience levels. Over 50% of the survey respondents stated they had ridden the trail, with 15% more planning to ride in the future.

The Old Bynum Bridge also provides an off-road, albeit short, facility. Crossing the Haw River by Bynum, the bridge is closed to vehicular traffic and is part of State Bike Route 3. Seventeen feet wide, there are some cracks and vegetation on the bridge, but it is marked (by signage and pavement markings) as well as physically blocked from vehicular traffic.

Bike parking facilities are rare in Chatham County. Of the recreational facilities in the county, only Mary Haws Park in Pittsboro has a bike rack. There is also a bike rack at the new Chatham Public Library at the Central Carolina Community College (CCCC) in Pittsboro.

The existing system accommodates experienced road cyclists but doesn’t accommodate casual, inexperienced or commuter cyclists outside of residential subdivisions or the American Tobacco Trail. Bike routes typically follow rural two-lane roads, which have no separate facilities for bicycling and often have high speeds and poor sight distances due to curves and hills. In most cases, these are less travelled local roads with signs designating the route so bicyclists can keep track of their location and “Share the Road” signs that increase motorists’

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awareness for bicyclists. In some cases, these routes move through more congested areas, more often in the northeast quadrant in the county. When routes change roads or cross intersections, signage is used to provide riders direction. Other than these signs, there is no added bicycling infrastructure, such as bike-activated traffic signals, striped bike lanes, or bike markings painted on streets. On the major four lane highways of US 64 and US 15-501, outside shoulders exist without rumble strips, but these are not always uniform width or clear of debris. Even with these facilities, the speed (55mph speed limit and freeway design) gives the bicyclist the perception of isolation and vulnerability.

While time and resource constraints limit the ability to inspect every road in the county, user surveys and other sources shed light on current deficiencies in the road biking network. Survey results provided by existing riders and drivers pinpointed routes and intersections where conditions are suboptimal for bikes and/or conflicts between vehicles and bicycles exist. Figures 2.7-2.9 (on pages 21-23) show these survey results as located in Chatham County.

Table 2.1: Road Bicycling Issues Indicated in Survey

<table>
<thead>
<tr>
<th>Issue</th>
<th>Road Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles not obeying traffic laws (passing bicycles too closely, speeding)</td>
<td>O’Kelly Chapel Rd, Mt. Carmel Rd</td>
</tr>
<tr>
<td>No shoulder</td>
<td>Most two-lane rural roads</td>
</tr>
<tr>
<td>Heavy vehicular traffic</td>
<td>NC 751, US 15/501</td>
</tr>
<tr>
<td>Poor pavement quality (uneven or poor surface)</td>
<td>Andrews Chapel Rd Between Mann’s Chapel and 15/501, Rives Chapel Rd</td>
</tr>
<tr>
<td>Poor quality or debris in shoulder</td>
<td>US 15/501 north of US 64 to Orange County Line; US-64</td>
</tr>
<tr>
<td>High number of logging trucks</td>
<td>Moncure Pittsboro Rd</td>
</tr>
<tr>
<td>Road is curvy and hilly; poor sight lines</td>
<td>Hamlet’s Chapel</td>
</tr>
</tbody>
</table>

Table 2.2: Intersection Issues from Survey

<table>
<thead>
<tr>
<th>Issue</th>
<th>Road Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Signals not activated by bicycles</td>
<td>Beaver Creek &amp; US 64; 15/501 &amp; Old Lystra; 15/501 &amp; Mann’s Chapel Hill Rd; NC 751 &amp; US 64</td>
</tr>
<tr>
<td>Cars not aware of bicyclists</td>
<td>Chatham Courthouse Circle</td>
</tr>
<tr>
<td>Left turn extremely difficult</td>
<td>Intersections on NC 751</td>
</tr>
</tbody>
</table>
Chapter 2: Existing Conditions

Figure 2.4: Existing Bike Routes, Roads and Attractions – County Wide
Figure 2.5: Existing Bike Routes, Roads and Attractions -- Pittsboro
Chapter 2: Existing Conditions

Figure 2.5: Existing Bike Routes, Roads and Attractions – Siler City
Figure 2.6: Survey Findings – Route and Intersection Conditions - Countywide
Chapter 2: Existing Conditions

Figure 2.7: Survey Findings – Route and Intersection Conditions - Pittsboro
Figure 2.8: Survey Findings – Route and Intersection Conditions – Siler City
2.3 **Bike Crash Statistics**

It’s important to analyze the historical incidence of bike crashes in the county. This can be used as a baseline for improvement as safety infrastructure and initiatives take place in the future. Between 1997 and 2008, there have been 65 reported bike crashes in the county on the whole, 13 of which were in Siler City and two in Pittsboro. Minorities are disproportionately represented, involved in nearly half of the bike crashes in the county and over 80% in Siler City. Certain age groups also have higher crash rates, notably children under 15 (32%) and those aged between 30 and 39 (26%). Many of these crashes (nearly three per year) have been severe. These data include only crashes in which a police report was filed, suggesting an undercount of actual bicycle crashes. Table 2.3 summarizes the number of bike crashes by year.

<table>
<thead>
<tr>
<th>Year</th>
<th>County</th>
<th>Siler City</th>
<th>Pittsboro</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1998</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>1999</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2000</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2001</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>2002</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
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<tr>
<td>2003</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>2004</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2005</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2006</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2007</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2008</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>50</td>
<td>13</td>
<td>2</td>
<td><strong>65</strong></td>
</tr>
</tbody>
</table>

2.4 **Existing Plans and Policies**

The Plan must react to and address existing plans, policies and programs that pertain to bicycling in Chatham County. This review is divided into three sections: Local, Regional, and State. Local refers to any Chatham County, Siler City or Pittsboro plans, programs or policies relating to bicycling. Regional refers to any plans, programs or policies

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Chapter 2: Existing Conditions

promulgated in the region, generally by the Triangle Area Rural Planning Organization (TARPO) and the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO). State refers to any NCDOT programs or laws that pertain to bicycling.

2.4.1 Local Plans and Policies

**Pittsboro Pedestrian Transportation Plan (2009)**

Pittsboro adopted a Pedestrian Transportation Plan in 2009. This plan provides an assessment of existing conditions and provides recommendations on both on-street and off-street pedestrian improvements.

The plan also includes a recommended greenway alignment that runs near downtown Pittsboro along railroad alignments and on existing sewer easements. The plan includes many potential programs and policy recommendations that can be used to improve bicycling in the town and other parts of the county.

**Transportation Improvement Program**

The State Transportation Improvement Program (TIP) contains funding information and schedules for various transportation divisions including: bicycle and pedestrians, as well as motorized transportation. The Siler City 2013-2019 TIP Project list includes a paved trail along Loves Creek from SR 2208 (South Second Avenue) to Pony Farm Road in Siler City. However, other Chatham TIP projects include road widening or creation of new roads. These TIP projects, when appropriate, should accommodate multi-modal travel.

**Pittsboro Land Use Plan (2001, currently in review)**

Pittsboro’s current Land Use Plan includes vision and goals that promote safe access for multiple modes, including bicycling as well as the creation of greenways. While the draft plan does not include specific recommendations regarding bicycling, it promotes alternative transportation options and includes general background information about the type and usage of bicycling facilities.


Pittsboro’s zoning ordinance has language that supports bicycling, including references to accommodating bicyclists when designing parking as well as when creating site plans for libraries, schools, public buildings, and mixed use planned development. The ordinance also dictates that off street parking shall include a bicycle rack, unless “excepted by Commissioners”. However, some language may preclude
the types of bicycling facilities recommended in this Plan. Chapter 5 provides recommended amendments.

**Pittsboro Subdivision Regulations (1993)**

Pittsboro’s subdivision regulations define street classifications but only as related to vehicular traffic, without reference to the multi-modal nature of the streets. Amendments to certain sections can be a way to include “Complete Streets” concepts to strengthen multi-modal component of the streets.

**Siler City Ordinances**

Siler City Municipal code prohibits bicycling and skateboarding on downtown sidewalks, but permits it outside the Central Business District. The ordinances include sidewalk requirements for varying types of roadways. The ordinance also may require developers to set aside a 10 foot easement for pedestrian facilities if there’s no access from a subdivision to schools, parks, playgrounds or other facilities. Potential amendments to the Siler City Ordinances are recommended in Chapter 5.

**Chatham County Compact Communities Ordinance (2004)**

The CCCO includes several provisions for bicycling. These ordinances look to create zones where compact style developments, which protect rural farmland and create a more sustainable development pattern, are permitted. Note that these developments are only permitted in a very limited section of the county, bounded by the east by US 15-501, Andrews Store Road on the south, Mann’s Chapel Road on the west and north.

The Section 3 of the CCCO states as its goals:

**Goal D:** “Allow for compact village-style development ...that is easily walkable and bikeable by residents of all ages;”

**Goal H:** Establish a grid network of streets that provides multiple connections to different destinations, includes safe places for pedestrians and bicyclists to travel throughout the community, and allows for efficient transit service when and if it becomes available;

**Goal J:** Include neighborhood parks, active recreation areas, and larger open spaces throughout the community that are linked together by sidewalks and trails;
Other key points of the ordinance related to bicycling include requiring mixed uses, interconnectivity of streets and creation of narrow streets. In its appendix the ordinances “strongly encourage” bike racks--at least 1 per block--in a potential village center.

**County Subdivision Regulations (1980, revised 2008)**
The county’s subdivision regulations have some provisions for bicycles. Block lengths are “geared toward creating a street network that accommodates bicycle... scale connections.” Maximum block lengths range from 480’ in 8 unit developments to 660’ in medium density and compact community areas, and 1320’ and other areas. These regulations also discuss easements up to 20’ which may be required for pedestrian or bicycling egress and ingress from schools, neighborhood parks and other public spaces.

**Chatham County Zoning Ordinance (2008)**
The Zoning ordinances include no requirements for bicycle parking or accommodation. However, it discusses bicycle shops. Although no bicycle shops exist in the county, the county permits them in areas zoned for business (general, neighborhood, community and regional). Amendments that may permit more bicycle accommodation are listed in Chapter 5.

**The Chatham Land Conservation and Development Plan (2001)**
The Chatham Land Conservation and Development Plan sets out policy objectives that are related to bicycling in the county. One of the objectives deals directly with creating a greenway network that “includes ... biking... trails when appropriate”. Another objective includes a suggestion to incorporate bike trails in new communities, including bike shoulders along roads and in general promoting alternative modes of transportation.

Importantly, one of the 28 plan recommendations includes a review of roadway design, including support for bicycle facilities. The transportation element of the plan reiterates the awareness of the bicycle when revising roadway standards. Lastly, the Schools element recommends locating schools as part of neighborhoods and encouraging new adjacent residential development as ways to provide bicycle access for children. Currently, the plan is in the beginning stages of an update.

**Chatham County Parks and Recreation Master Plan Update (In process)**
Chatham County Parks and Recreation Master Plan 2009-2029, which is currently being considered for adoption, seeks to evaluate existing park and recreation facilities and propose guidelines for implementation of recommendations designed to meet the needs of the population for a span of 20 years. This includes several recommendations related to bicycle transportation. It recommends greenways (as well as a comprehensive Greenway Master Plan) and identifies potential funding mechanisms. The plan also recommends expansion of the bicycle network through bike lanes and provisions of bicycle travel on new roadways, while adding bike racks to all publically owned facilities, including schools. The plan also recommends bike trails at future parks.

Public participation in this planning process showed that bike trails were commonly requested by process participants. The plan also highlights the potential of ecotourism, especially with economic impact of attracting bicyclists. The Bicycle Plan will build upon the findings in the County Plan when discussing eco-tourism in Chatham County.

**Chatham County Advisory Board and Local Municipality Advisory Boards**

Local citizen-led advisory boards can be instrumental in implementing the Bicycle plan. Citizen advisory groups at the County level that have an impact on bicycling are the Transportation Advisory Board (TAB) which oversees Transportation, the Recreation Advisory Boards and the Active Chatham Alliance. Pittsboro also has a Parks & Recreation Advisory Board that advises the town on recreation and parks planning and implementation.

**2.4.2 Regional Plans and Policies**

*Triangle GreenPrint Regional Open Space Assessment (2002)*
This assessment identified important green spaces in the Triangle region, including Chatham County. Although not at a high level of detail, this document can be used to help identify potential greenway corridors in the county.

**DCHC MPO Long Range Transportation Plan 2035 (2009)**

The DCHC MPO covers the northeastern corner of Chatham County. The Long Range Transportation Plan (LRTP) guides transportation investments in bicycle and pedestrian facilities as well as road and transit projects. As a fiscally constrained document, it only includes potentially funded projects. This plan establishes as a goal a pedestrian and bicycle system that includes safety, access to public transit, recreational opportunities and includes off-road facilities. The plan includes a map that includes 19 miles total of planned bicycle facilities. Details, including length, location and estimated costs (by the DCHC MPO using an estimate of $500,000/mile) are located in Table 2.4.

### 2.4.3 State Plans and Policies

The North Carolina Department of Transportation (NCDOT) has adopted a number of policies addressing bicycles on state maintained roadways. These policies and guidelines, applied on these roadways when there is new construction or resurfacing projects, impact the bicycling environment in Chatham County and include the following:

**Resolution Mainstreaming Bicycling and Walking as part of Transportation System (2000)**

The NC Board of Transportation reaffirmed the importance of non-motorized transportation in its highway system. It states that “bicycling and walking accommodations shall be a routine part of the North Carolina Department of Transportation’s planning, design, construction, and operations activities.”

**NCDOT Bike Policy (1978, updated 1991)**

The NCDOT policy details guidelines for planning, design, construction, maintenance, and operations pertaining to bicycle facilities and accommodations. All bicycle improvements undertaken by the NCDOT are based upon this policy. The policy urges strong education of

<table>
<thead>
<tr>
<th>Facility Location</th>
<th>Facility Type</th>
<th>Length</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tobacco Trail</td>
<td>Bike Path</td>
<td>5.2</td>
<td>Complete</td>
</tr>
<tr>
<td>Mt. Carmel Church Road</td>
<td>Bike Lanes</td>
<td>1.2</td>
<td>$600,000</td>
</tr>
<tr>
<td>NC 751</td>
<td>Bike Lanes</td>
<td>3.2</td>
<td>$1,600,000</td>
</tr>
<tr>
<td>Farrington Point / Pld Farrington / Farrington Mill Rd</td>
<td>Bike Lanes</td>
<td>3.66</td>
<td>$1,830,000</td>
</tr>
<tr>
<td>O’Kelly Chapel Rd</td>
<td>Bike Lanes</td>
<td>2.9</td>
<td>$1,450,000</td>
</tr>
<tr>
<td>US 15-501 South</td>
<td>Bike Lanes</td>
<td>3.2</td>
<td>$1,600,000</td>
</tr>
<tr>
<td><strong>Chatham Totals</strong></td>
<td></td>
<td>19</td>
<td><strong>$7,080,000</strong></td>
</tr>
</tbody>
</table>
motorists and school children regarding traffic laws and safety. Lastly, the policy indicates that any state funded buildings, parks and recreational facilities should include bicycle parking facilities.

**NC Complete Streets Policy (2009)**
This NCDOT policy requires that planners and designers keep in mind multi-modal when planning and constructing any new or improvement of transportation facilities in growth areas of counties and municipalities. The policy is intended to encourage non-vehicular travel without reducing the safety, efficiency or function of the facility while ensuring that all users are considered in the creation and usage of the facility. NCDOT has convened a group of stakeholders that is currently in the process of developing guidelines for the design of complete streets.

This action requires highway planners developing highway alignments to take in consideration locally adopted greenway and greenway crossings corridors.

**Bridge Policy**
This policy controls the design elements of new and reconstructed bridges on the state highway network including minimum handrail height where bikeways cross bridges.

## 2.5 Survey Results
Existing and potential users were surveyed to assess existing conditions and potential remedies which would improve bicycling conditions and increase bicycling. Appendix A includes the entire survey results, but key results are described here. The survey was distributed to County employees, provided to the Parks and Recreation and Transportation Advisory Boards, listed on the County website and distributed to bike rider groups who ride in the county. Nearly 500 surveys from existing or potential riders were received between November 15 and December 15, 2010.

Table 2.5: Bicycle Survey Respondent Location and Experience Level

<table>
<thead>
<tr>
<th>Location</th>
<th>Beginner</th>
<th>Intermediate</th>
<th>Advanced</th>
<th>Non-Rider</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chatham Residents</td>
<td>7%</td>
<td>44%</td>
<td>31%</td>
<td>18%</td>
<td>52%</td>
</tr>
<tr>
<td>Non-Residents</td>
<td>3.4%</td>
<td>20.3%</td>
<td>70.5%</td>
<td>5.8%</td>
<td>48%</td>
</tr>
<tr>
<td>Total</td>
<td>7%</td>
<td>42%</td>
<td>64%</td>
<td>15%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The survey respondents were asked to self-assess their ability level in one of four categories (Beginner, Intermediate, Expert and Non-rider), described in Table 2.5. Survey responses dramatically differed based on the experience level of the respondent.
Beginning and non-riders riders said they were most comfortable on off-street bike trails, while intermediate and expert riders liked riding on quiet back or local roads the most.

Riders of all types ride because of exercise and recreational purpose, although 25% and 30% of all surveyed would or do ride to shop or commute to work, respectively. Only 12% of riders surveyed stated that the majority of their trips are for utilitarian (i.e. work, shopping, etc.) reasons. Survey respondents whether they would ride more often, and asked what factors limited their riding. The majority of respondents, across groups, felt that they would like to ride more often. The three most commonly cited factors in not riding more were consistent across biking experience levels, although Expert riders felt that Unsafe/unlawful motorist behavior limited their riding more than any other factor. Table 2.6 provides the top three rankings for each of the experience levels.

<table>
<thead>
<tr>
<th>Non-Riders</th>
<th>Beginners</th>
<th>Intermediate</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Unsafe / unlawful motorist’s behavior (40%)</td>
<td>No bike paths, bike lanes or bike routes (75%)</td>
<td>No bike paths, bike lanes or bike routes (75%)</td>
</tr>
<tr>
<td>#2</td>
<td>No bike paths, bike lanes or bike routes (35%)</td>
<td>Unsafe / unlawful motorist’s behavior (63%)</td>
<td>Unsafe / unlawful motorist’s behavior (62%)</td>
</tr>
<tr>
<td>#3</td>
<td>I don’t have enough time (32%)</td>
<td>Bikeways / roads are in poor condition (33%)</td>
<td>Bikeways / roads are in poor condition (32%)</td>
</tr>
</tbody>
</table>

As expected, the average one-way ride distance (currently or potentially) of those surveyed differed based on experience level, with the plurality of experts riding 20+ miles while the beginner and intermediate riders riding (or potentially riding) between one and five miles. Non-riders most often said they would not ride, but nearly as many said they would ride one to five miles.

The survey also asked what improvements would lead to more riding by respondents. Almost two thirds of intermediate and advanced riders indicated they would ride more with either bike lanes or paved and widened shoulders. Beginners and intermediate riders felt more strongly than advanced riders that more off street bike trails and paths would induce them to ride. Advanced riders more strongly felt that more driver and bicyclist education and tighter enforcement of traffic laws would lead to more riding. On-road bike signage, maintenance of existing facilities, and bicycle parking and amenities like benches, were indicated significantly less often as potentially driving more biking. This trended across all skill levels.
Chapter 3: Facility Design Standards

Design guidelines are a critical component of any bicycle plan as they provide a reference guide for implementers for future bike system development and implementation plan that includes strong planning-level cost estimates. Consistent design helps encourage ridership by helping riders gain familiarity with the system, improves safety by enhancing visibility of bicyclists to other road users and improves comfort and safety for existing bicyclists. This chapter includes:

- The pertinent National and State Guidelines that the standards are derived from
- Descriptions of Bike Facility Types, their appropriate usage and characteristics
- Features of Bicycle Friendly Intersections
- Appropriate Signage for bicycle facilities
- Bicycle Parking guidelines
- Bicycle friendly Drainage Grate standards

3.1 National and State Guidelines

The guidelines discussed in this document follow the AASHTO Guide for the Development of Bicycle Facilities (AASHTO, 1999) as well as the North Carolina Bicycle Facilities Planning and Design Guidelines (NCDOT Office of Bicycle and Pedestrian Transportation, January 1994). These guidelines should be intended for illustrative purpose; planners and designers should review the latest versions of these and pertinent future publications for the timeliest standards. The guidelines discussed in this document are summarized key points from these documents; the documents themselves should be consulted for more specific information.

3.2 Bike Facility Types

The Chatham Bike Plan develops and proposes a set of bike facilities within this county. These range from route and “Share the Road” signage, to striped bike lanes to off-road shared-use facilities. These facility types are described below. Table 4.1 summarizes the proper usage and characteristics of the facilities. Some of these facility types, such as sharrows and wide outside lanes can be combined in the same...
Chapter 3: Facility Design Standards

Table 3.1: Bike Facility Types and Characteristics

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>On Street Vehicle Speed</th>
<th>Curb/ Gutter</th>
<th>Setting:</th>
<th>Pavement Marking</th>
<th>On-Street Parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide Paved Shoulder</td>
<td>35-60 mph</td>
<td>No</td>
<td>Rural/ Countryside</td>
<td>Not required</td>
<td>No</td>
</tr>
<tr>
<td>Wide outside Lanes</td>
<td>&lt;35 mph</td>
<td>Ok</td>
<td>Urban or rural</td>
<td>Not required</td>
<td>Ok</td>
</tr>
<tr>
<td>Sharrow</td>
<td>&lt;35 mph</td>
<td>Ok</td>
<td>Urban or rural</td>
<td>Sharrow</td>
<td>Ok</td>
</tr>
<tr>
<td>Shared Road</td>
<td>&lt;35 mph</td>
<td>Ok</td>
<td>Usually Urban, sometimes rural</td>
<td>None</td>
<td>Ok</td>
</tr>
<tr>
<td>Bike Lane</td>
<td>&lt;35 mph</td>
<td>Ok</td>
<td>Urban</td>
<td>Bicycle Symbol or Words</td>
<td>Ok</td>
</tr>
<tr>
<td>Shared-Use Facility</td>
<td>N/A</td>
<td>N/A</td>
<td>Urban or Rural</td>
<td>Sometimes centerline, bike symbol</td>
<td>NA</td>
</tr>
</tbody>
</table>

Figure 3.1: Wide Paved Shoulder

The key is that these types of treatments exist, and Chatham County as well as local jurisdictions should make decisions on the optimal facility based on local conditions.

3.1.1. Wide Paved Shoulder

Adding or improving shoulders for bicycle usage is an important way to provide bicycling facilities in rural areas. This also can extend the life of a road as edge degradation can be reduced. In resource limited areas, these can be placed on uphill areas to reduce conflicts with faster moving automobiles. Paved shoulders should be at least four feet wide and five feet from the guardrail, curb or other roadside barriers. Roads with speed limits above 50 mph or with significant large vehicle traffic should include wider shoulders. Rumble strips, installed to warn drivers that they are moving off the roadway, should be avoided. If these are required, there should be ample buffer around the rumble strip to allow for a minimum of four foot wide smooth area for safe bicycle travel.

3.1.2. Wide Outside Lanes

Wide outside lanes (sometimes called wide curb lanes) are preferred in areas where...
shoulders are not available, typically in more urban locations. This roadway design has outside lanes that are at least 14 feet wide. In roadway stretches with steep grades, on-street parking or drainage grates, a 15-foot lane may be necessary, but long stretches of 15 foot lanes may encourage cars to unsafely drive two cars within one lane. In cases where there are significant stretches of outside lane wider than 14 feet, bicycle lanes should be considered. Wide outside lanes should be avoided on very congested or roads with significant truck traffic. In these cases, off-street facilities or wide-paved shoulders may be more appropriate.

### 3.1.3. Shared Lane Markings

Shared lane markings (commonly called “sharrows”) are pavement markings with two chevron markings on top of a bicycle (see Figure 3.3). Sharrows serve a number of functions, including indicating where bicyclists should ride in order to avoid travelling in the door zone (see inset), convey that the street is a preferred bike route and educate motorists to share the road with and safely pass bicyclists, reduces wrong-way bicycling and encourages safe passing of bicycles by motorists.

Section 9C.07, Shared Lane Marking in the MUTCD (FHWA, 2009) provides dimensions of this marking and specific guidelines. Sharrows can be used in both rural and urban locations on streets with less than 35 mph speed, but not in shoulders or designated bike lanes. The center of these markings should be placed 11 feet from the curb on streets with on-street parking or 4 feet from the curb/edge of pavement on streets without on-street parking.

### 3.1.4. Shared Roads

Low speed and lightly travelled roads can accommodate bikes safely without pavement markings or other facility enhancements. These roads can include “Share the Road” signs in concert with traffic calming devices. These roads can be signed and numbered bicycle routes and like the existing bike routes, can be used in both rural and urban locations. These roads are meant to encourage ridership in comparison...
to other nearby parallel roads that might be less compatible for safe bicycle riding.

### 3.1.5. Bike Lane

Bicycle lanes are portions of a roadway designated by striping, signing or pavement markings for usage by bicyclists. These are typically used in urban locations or at intersections to guide cyclists and inform automobile drivers on the appropriate roadway position. The width of the bike lanes depends on roadway characteristics. Bike lanes should never be placed between parking and the curb as they subject bikes to potential ‘doorimg’, prevent left turns and reduce visibility to motorists, unless there is a physical separation between the parking and the roadway edge.

In addition to striping, bike lanes should be marked with pavement markings. These should include either of the two bicycle symbols (or the words: “BIKE LANE”) and a directional symbol (see Figure 3.4)

### 3.1.6. Shared Use Paths

Shared use paths, sometimes called multi-use path, off-road trail, or bikeways, restrict motorized vehicles and are good candidates where the existing road system does not and cannot reasonably serve bicyclists or where wide utility or former railroad-right of way provides the opportunity to construct such a path. These paths also handle other non-motorized users such as pedestrians or even horse riders. These paths should minimize any cross flow from motor vehicles. Paths adjacent to existing roadways (sometimes called sidepaths) are not ideal as they reduce visibility of cyclists, increase the frequency of conflicts at driveway crossings and cause bicyclists to ride against the flow of traffic (a major cause of bicycle crashes). If a path must be built adjacent to roadway, there needs to be a separation of at least five feet between the two facilities. If this not possible, some type of physical barrier would help to

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Minimum Bike Lane Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>No curb or gutter, no parking</td>
<td>Four Feet</td>
</tr>
<tr>
<td>Curb or gutter, On street parking, striped parking lane</td>
<td>Five Feet</td>
</tr>
<tr>
<td>Curb and gutter, no on-street parking</td>
<td>Five Feet</td>
</tr>
<tr>
<td>No curb, On street parking, no-striped parking lane</td>
<td>11 feet (from road edge)</td>
</tr>
<tr>
<td>Curb and gutter, On street parking, no-striped parking lane</td>
<td>12 feet (from curb face edge)</td>
</tr>
</tbody>
</table>
indicate to both bicyclists and motorists that the path is an independent facility of the road.

A shared use path should be at least ten (eight feet for paths with limited usage) (see Figure 3.5) and have a maintained 2 foot wide graded area with a maximum slope 1:6 adjacent to the path. The path should have a minimum design speed of 20mph; the speed should be at least the preferred speed of the fastest bicyclists to use the path. The AASHTO guidelines have more specific information on horizontal alignment (grades in curves), grading, sight distance and issues with roadway crossings.

### 3.3 Bicycle Friendly Intersections

Accommodating safe passage for bicycles through intersections is important as a high proportion of bicycle crashes occur there. Providing transitions, particularly at intersections with turn lanes, traffic signals and roundabouts, is important to reduce conflicts and improve safety. Bike lanes should not extend through the intersection or across crosswalks except in the most complicated circumstances. The solid striping at the approach for signalized or turning-lane equipped intersections should be replaced with a broken line.

#### 3.3.1 Intersection with Turn Lanes

Bike lanes that pass through intersections that have turn lanes may increase potential conflicts between vehicles and cyclists. Improved striping may be able to reduce this tendency; lanes can either be striped or eliminated before the intersection (See Figure 3.6). In some cases, bike lanes can be striped approaching the stop bar even if there are no previous bike lanes on the road.

#### 3.3.2 Signalized Intersections

Modifying the signal operation at both pre-timed and actuated signalized intersections can improve the comfort and safety of
intersections for bicyclists. Many pre-timed signals do not provide enough time for bicyclists to cross, particularly those crossing US-64 and US 15/501. Signals at these intersections that many bikes use can be changed to provide a better experience for bicyclists.

Other intersections that use actuated (loop or camera) signals are not designed to trigger when bicyclists arrive, leaving bicyclists stranded or forcing bikes to ride illegally against the red to cross. Bike-activated loop detectors can be installed at these intersections to trigger a signal change and provide longer green to allow bikes to travel through the intersection. Figure 3.7 illustrates the recommended pavement marking for bicycle activated signals.

### 3.3.3 Roundabouts

As Roundabouts are designed for lower speeds, many experienced bicyclists feel comfortable using these as they would a normal roadway. Less experienced bicyclists who may not feel comfortable entering a roundabout can either stop and walk their bike like a pedestrian, or use an adjacent shared-use path or sidewalk, if available. If a path exists, there should be ramps from the roadway on the curb so that bikes can safely navigate on and off the path. Bicycle lanes should not be extended through a roundabout.

### 3.4 Signage

Bicyclists are typically required to follow the same rules of the road as other users, but there are some signs and pavement markings specific to bicycling. “Share the Road” signs are approved by the NCDOT and are included in the State of North Carolina’s traffic control manual. These signs are typically used when designated bike routes use roads with higher levels of traffic, but can be used in other situations as well. The NCDOT website (http://www.ncdot.gov/bikeped/safetyeducation/signing/) has further information regarding these signs.

In addition to the State manual, the National Manual for Uniform Traffic Control Devices (MUTCD) regulates all roadway signage in the US while offering guidance on the application of signs depending on the conditions. Part 9, Traffic Controls for Bicycle Facilities of this manual provides specific location, size and usage for these signs. Figure 3.8 shows the warning signs indicated in the manual.
3.5 Bicycle Parking

Providing bike parking, specifically racks, encourages more ridership for those who have concerns about the security of their bikes. Quality bike racks discourage riders from locking bikes to trees, street poles or railings, which may impede pedestrian or even vehicular traffic. Facilities should be provided at both origins and destinations, when possible, and should be located near the entrances of buildings, but out of the way of major pedestrian paths. Racks should support the bicycle upright by its frame. These should be in clear view of windows to provide additional security.

Bike parking facilities in Chatham County should follow the Association of Pedestrian and Bicycle Professional (APBP) guidelines. These guidelines have just been updated in 2010, but an earlier edition (2002) is freely available (Available: [http://www.apbp.org/link.asp?ymlink=17534](http://www.apbp.org/link.asp?ymlink=17534)).

These guidelines include standards on the rack element, the rack itself, the rack area and its site. As discussed in the guidelines, color, types and types of mounting can vary considerably. The guidelines discourage the use of “wave” style racks, as they are more difficult for riders to park bikes. The guidelines encourage “Inverted U” or “A” style bike racks.

3.6 Drainage Grates

As bicyclists often ride as far to the right as possible in the roadway, the inlets, catchment basins and drainage grates must allow safe passage of bicycles as well as adequate stormwater drainage. NCDOT’s Roadway Design Manual (Section 5-14) recommends certain types of grates; these grates have slots perpendicular to the path of travel to prevent the catching of wheels and potential accidents. See Figure 3.10 for an example.
Chapter 4: Recommended Bicycle Network

This chapter describes the proposed Bicycle Network for Chatham County. It includes descriptions of Short Term and Long Term Projects necessary to complete the project. It also describes ancillary improvements that could help improve the bicycling conditions for riders in the county. The chapter’s focus is on infrastructure improvements; non-infrastructure programs and initiatives are described in Chapter 5.

4.1 The Bicycle Network

The Chatham County Bicycle Network includes a set of existing and proposed bicycle transportation facilities. The network includes shared roads, paved shoulders, on-street bicycle lanes, and greenways. In all, the proposed system covers 418 miles of roadway and off-street paths. The Short Term and Long Term network is shown visually in maps in Figures 4.1 and 4.2 (p. 41 &43).

The on-road bike routes include adding of 176 miles of new on-road facilities. The majority of the on-road bike routes include proposed improvements to share the road signage. On roads with more automobile traffic, yet popular with cyclists, widening of shoulders to create bicycle lanes is recommended. In the communities of Siler City and Pittsboro, the network includes bike lanes on existing roadway as well as additional construction when space is unavailable. 111 miles of new off-road shared road paths routes, are also included in this Bicycle Network. Table 4.1 provides a total of each of these types of facilities. The Bicycle Network also includes the improvement of nine specific intersections to further enhance safety for bicyclists.
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Figure 4.1: Short Term Bicycle Network
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Figure 4.2: Long Term Bicycle Network
4.2 Short Term Projects

The following infrastructure projects are relatively low cost projects that are either funded, part of an existing state-wide program, can be incorporated in future resurfacing projects, or are not relatively high cost. The section includes a description, location, planning-level cost estimates and potential funding sources for each project. The cost estimates do not include right-of-way, utility work or necessary bridges. These are described in further detail in Appendix B. Again, see Figure 4.1 on page 41 for locations.

Projects S2-13 and S15-17: Shared Roads

County-wide 88.1 miles

Install Share the Road signage on the connector routes and ensure that directional signage is installed at junctions with signed routes. The Share the Road signs should be added after junctions with other roads. These signs will raise awareness to both bicyclists and motorists of the fact that bicyclists use the road and the state law regarding sharing the road. The directional signs will ensure that new riders and visitors can find and stay on the state and county routes.

The signage is installed by the NCDOT Division of Bike and Pedestrian Transportation.

Potential Funding Sources: NCDOT Division Bike and Pedestrian Transportation funding.

Resources: NCDOT Share the Road Program:
http://www.ncdot.org/bikeped/safetyeducation/signing/

Project S14: Hillsboro Street Bicycle Lanes

Launis St to Thompson St, Pittsboro 0.4 miles

Restripe the existing pavement on Hillsboro St, just north of downtown Pittsboro: reduce the driving lanes to 11 feet in each direction, remove on-street parking on one side of the street*, and add a four foot wide bike lane on the non-parking side and a five foot wide bike lane on the on-street parking side.

Figure 4.3: Share the Road Signage
Chapter 4: Recommended Bicycle Network

The project will help bicycle commuters in Pittsboro reach downtown and county offices, and avoid areas of Hillsboro Street with diagonal parking due to potential hazards.

Potential Funding Sources: This should be combined with a future resurfacing project. Funding can be out of NCDOT Transportation Enhancement Program or State Street-Aid (Powell Bill) Program funds.

*The existing on-street parking would need to be studied to determine the feasibility of eliminating parking.

Project S1: Love’s Creek Greenway (in Progress) 2.0 miles SW of Downtown to US 421 Bypass $750,000
This shared use path along an existing sewer easement is part of Siler City’s funded Transportation Improvement Program.

Project S25: Car Parking at American Tobacco Trail- New Hope Ch. Rd NE Chatham $1.2 million
Car parking is necessary at the American Tobacco Trail as many of its users are not comfortable with riding on roads or live close enough to access the trail by bicycle. Bicyclists now park in the shoulders along the rural roads (O’Kelly and New Hope Church Road) that cross the American Tobacco Trail, creating a potential safety risk for both vehicles and bicyclists. This paved lot will build upon the existing gravel lot now at Pittard Sears Rd.

Potential Funding Sources:

- Adopt-A-Trail (AAT) Grant Program
- Recreational Trails Program
- Parks and Recreation Trust Fund
- Chatham Recreation Exaction Fund

Project S26: Car Parking at American Tobacco Trail- O’Kelly Chapel Rd NE Chatham $60,000
Similar to S25, but this parking is located adjacent to O’Kelly Chapel Road and is covered with gravel rather than asphalt.
At several intersections in the county often utilized by bicyclists, signals do not detect the presence of bicyclists; bicyclists must either wait extremely long or cross at a red light. These four projects add bicycle detection loops to four intersections, either by installation or calibrating of existing detectors for bikes.

Potential Funding Sources: NCDOT Division Bike and Pedestrian Transportation funding, NCDOT road maintenance funding.

This project installs signage that indicates the presence of bikes as well as bike route directional signage to help route wayfinding and safety.

Potential Funding Sources: NCDOT Division Bike and Pedestrian Transportation funding, NCDOT road maintenance funding.

### Long Term Projects

Long term projects are higher cost projects that entail more significant construction and complexity than the short term projects. While the details of each of these projects have not been completely finalized, the plan includes estimates to see the relative costs of projects. These are described in further detail in Appendix C and in Figure 4.2 on page 43.

These roads have been deemed lower priority than the Short Term Shared Road projects as they are less used bicycle routes or have less vehicular traffic. See Shared Roads in the Short Term projects for more information.

These are roads that have relative high vehicular volume or speed and either handle significant existing bicycle ridership or connect major attractors within and outside the county. The construction adds width to the roadway to accommodate either 4' wide paved shoulders or bike lanes with markings. The choice of marking has not been determined.
Chapter 4: Recommended Bicycle Network

Potential Funding Sources: State Transportation Improvement program, Transportation Enhancement Program, part of other roadway expansion (capacity) projects.

**Projects L1: Bike Lane Striping—Siler City**

*2nd Avenue (Downtown)*

2 miles  
$30,000

This project runs from Trinity to 6th Street along 2nd Avenue through the heart of downtown Siler City. This involves the reduction of travel lanes from four to three and the striping of bike lanes.

Potential Funding: This could be accomplished at the time of a repaving project.

**Projects L2: Bike Lane Striping—Siler City**

*Raleigh Avenue (Downtown)*

1.5 miles  
$23,000

This project runs on Raleigh Avenue from Elk St to US 64, connecting the west and east sides of town via downtown. This project involves striping bicycle lanes in the existing 2 lane roadway.

Potential Funding: This could be accomplished at the time of a repaving project.

**Projects L22-24; L27-28, Parks & Rec. Shared Use Paths**

*Countywide*

84 miles  
$4.3 - $22 million

The Chatham Parks and Recreation Master Plan, 2009-2030 includes potential shared use paths around the county, including three along rivers. The plan does not propose specific path surface or width; these paths may be natural surface paths that can only accommodate hikers and mountain bicycles, or they could be paved paths that accommodate all types of bicycles and users. The cost estimates (for the exception of project L24, the Haw River Trail, which has been already deemed unpaved) include both unpaved and paved

Potential Funding Sources:

- Adopt-A-Trail (AAT) Grant Program
- Recreational Trails Program
- Parks and Recreation Trust Fund
- Chatham Recreation Exaction Fund
Projects L22-24; L27-28, US 64 Shared Use Paths

W & E of Pittsboro

US 64 Corridor Study includes as part of its long term improvement recommendations a bicycle and pedestrian path adjacent to the roadway. This path starts west of the Haw River in Pittsboro and extends through eastern Chatham County, connecting to the American Tobacco Trail in western Wake County. This Bicycle Plan also proposes a future similar shared use path along US 64 West going west from Pittsboro to Siler City.

Potential Funding Sources:
Funding for these projects could be included as part of the overall US-64 improvement project funding, or use some of the funding sources listed above for Shared Use paths.

4.4 Network Prioritization

Resource and funding constraints dictates that not all the network elements will be completed at the same time. Because of these constraints, projects have been placed into two phases - short term and long term. Short term projects can be completed within five years from adoption of this Plan; long term projects will take between five and 20 years for implementation. These are based on three criteria: 1) impact on existing ridership, 2) impact on attracting ridership and 3) ease of construction/cost-effectiveness.

Impact on Existing Ridership

Survey comments and conversations with existing bicycle users have pinpointed the most heavily used routes. Among these routes, those that connect major attractors and have the most safety issues (i.e. conflicts with motorists, low visibility for cyclists) were placed on higher priority than those routes with fewer issues. These routes include the existing signed and connector bicycle routes.
Chapter 4: Recommended Bicycle Network

Impact on Attracting Ridership

Projects that might increase ridership are also prioritized. These projects include routes that link desired destinations (i.e. residential centers and parks). While not excluding the current experienced cyclists, these projects are designed to attract more inexperienced riders. These generally include off-street facilities, bicycle lanes or routes on lightly travelled roads.

Ease of Construction/Cost-Effectiveness

Projects that require fewer resources (i.e. restriping, signage improvements and signaling improvements) involve fewer parties to implement and are a more efficient usage of limited resources.

*Note: While ideally projects should be selected and implemented in order of priority, Chatham should take advantage of opportunities that arise through routine maintenance (such as repaving, restriping or addition) or new road construction.*

4.5 Miscellaneous Improvements

There are other types of roadway improvements that are not specifically identified but can contribute to an improved bicycling climate in the county. These include traffic calming, roadway maintenance programs, and spot improvements.

Traffic calming is intended to slow vehicular traffic in order to improve safety and general environment for pedestrians and bicycles as well as vehicles. Traffic calming measures could include speed bumps/humps, curb extensions, median islands, or lane narrowing. Certain neighborhood traffic calming projects require an engineering study and support from a specific percentage of affected residents. More details are provided by the Neighborhood Traffic Management Program (need to find link?).

Roadway maintenance programs, including pothole repair and resurfacing projects, help improve the driving condition for vehicles and bicyclists alike. It’s important that maintenance, especially on roads designated for bike routes, is compatible with comfortable bike riding. One method, called “chip seal”, is a more cost effective method of extending pavement life, but unpopular with riders. The process involves spraying liquid asphalt on the road, then adding stone chips to the road; these chips are embedded in the road as the asphalt solidifies. Unfortunately, roadways with chip seal are uncomfortable for bikers;
many survey respondents mentioned the poor condition of roadways with this treatment.

**Spot improvements.** Spot improvements to the road network include the installation of bicycle friendly grates (See Chapter 3.)
Chapter 5: Recommended Programs and Policies

To provide a good environment for bicycling in Chatham County, not only are safe and convenient bike facilities needed, but these must be complimented by programs and policies that support bicycling. This Chapter makes Bicycle Program Recommendations regarding education, encouragement and enforcement as well as Policy Recommendations for the County and its municipalities to improve the bicycling climate.

5.1 Bicycle Program Recommendations

Programs that support bicycling can be generally categorized as education, encouragement or enforcement – often referred to as the Three E’s. Recommendations, with potential responsible parties and links to local examples (when available) are detailed in the following subsections.

5.2 Education

Education programs seek to educate the public regarding proper bicycle riding, North Carolina bicycling laws, proper motorist behavior around bicyclists, and regarding safe and improved bicycle routes and facilities. Education can refer to safety materials, training programs and events.
Table 5.1: Education Program Recommendations

<table>
<thead>
<tr>
<th>Program</th>
<th>Details</th>
<th>Potential Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Material Creation/acquisition and Distribution</td>
<td>Create or borrow safety materials for distribution to county residents and riders</td>
<td>Bike Pedestrian Advisory Board/Chatham County Schools/Chatham Sheriff’s Office</td>
</tr>
<tr>
<td>Internal Staff Education</td>
<td>Educate staff that will be part of implementation of plan</td>
<td>Bike Pedestrian Advisory Board/Planning</td>
</tr>
<tr>
<td>School Education</td>
<td>Teaching children the safe, proper usage of bicycles</td>
<td>Chatham County Schools/Chatham Sheriff’s Office/Siler City and Pittsboro Police Departments</td>
</tr>
<tr>
<td>Bicycle Events</td>
<td>Events educate the public on safe riding promote safe bicycle riding. Events could include bike rodeos or bicycle safety clinics.</td>
<td>Bike Pedestrian Advisory Board</td>
</tr>
<tr>
<td>Bike Safety Campaign</td>
<td>Coordinated outreach to educate public on best bicycling practices and awareness.</td>
<td>Bike Pedestrian Advisory Board/Chatham Sheriff’s Office/Siler City and Pittsboro Police Departments</td>
</tr>
<tr>
<td>Law Enforcement Training</td>
<td>Periodic training law enforcement on the sharing the road laws and address common misconceptions.</td>
<td>NCDOT Division of Bike and Pedestrian Transportation/Chatham Sheriff’s Office/Siler City and Pittsboro Police Departments</td>
</tr>
</tbody>
</table>

Safety Materials

Chatham County should distribute, in addition to its existing Biking map, safety materials regarding safe riding. NCDOT provides many ready-made guides that cover topics ranging from bike safety, tips to conducting a repair clinic, as well as bicycle driving laws. Most of these guides can be downloaded from the NCDOT website; alternatively, NCDOT can provide up to 500 copies to agencies and residents. Several items, including videos and some manuals, are only available for loan. The guides should be distributed as broadly as possible, including to those taking vehicle driver tests, at festivals or at local restaurants. (Resource: www.ncdot.gov/bikeped/safetyeducation/materials)
Chapter 5: Recommended Programs and Policies

Training

Internal Education

Internal education refers to the education of the internal staff, whether at the County, Pittsboro or Siler City level tasked with implementing the Bicycle Plan. This training is necessary to help institutionalize the accommodation of bicycles throughout the county. Training can include brown bag lunch sessions, modifications of employee handbook, or invitations to webinars. Regular training is necessary as bicycling accommodation methods and design is constantly evolving.

School Education

Chatham County Schools should implement safe bicycle education in their elementary schools. NCDOT provides materials that can help the schools develop an education program that highlights safety and the benefits of bicycling through events and encouragement programs. Many of the events and programs are discussed in this chapter, including Bicycle Rodeos and bike days.

Events

Events promoted throughout the year provide opportunities for bicycle safety training and promote bicycling as a recreational activity and a potential alternative to driving. Potential events include:

- Bicycle Repair Clinic: Participants can learn about maintenance, socializing while exchanging tips. Partners can include bike activists and nearby bicycle shops. (Resource: http://www.durhambikecoop.org/)
- Bicycle Rodeo: These are safety clinics that include bike inspections and instruction on riding safely targeted to young cyclists through middle school age. Siler City has put on a Bicycle Rodeo in the past, but has been discontinued. Many communities in North Carolina (including Jacksonville, Wilson, Marvin, for example) have put on bicycle rodeos and these communities can be resources in planning a future rodeo. Partners include local law enforcement and schools. (Resource: http://www.wilsonnc.org/news/id/663/)

Bicycle Safety Campaigns

These events and dissemination of material and institution of education programs can be part of a wider bicycle safety campaign. Campaigns include coordinated outreach that increases the awareness around safety issues. Campaigns can include public service announcements (in
English and Spanish) on local radio regarding education events, posters in high traffic areas and pamphlets at public areas. Messages in these campaigns should be consistently provided and convey information to improve bicycle safety. (Resource: www.bikesbelong.org/assets/documents/uploads/Bikes_Belong_Foundation_Safety_Campaign_Best_Practices_Report_reduced.pdf)

5.3 Encouragement

Establishing biking as an important recreational and commute mode in the county requires the initiation of encouragement activities. Many Chatham County residents might not be receptive to riding on the roads or in greenways unless given support through events and programs. These are listed in Table 5.2 and described in this section.

Table 5.2: Encouragement Program Recommendations

<table>
<thead>
<tr>
<th>Program</th>
<th>Details</th>
<th>Potential Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Encouragement Programs</td>
<td>Programs that help encourage children to bicycle to school.</td>
<td>Chatham County Schools</td>
</tr>
<tr>
<td>Awareness Days</td>
<td>Days, such as Bike to Work Day/Week that spread awareness of the bicycle facilities and benefits of biking.</td>
<td>Bike Pedestrian Advisory Board/ Planning</td>
</tr>
<tr>
<td>Bike Tours/ Mass Rides</td>
<td>Group bike rides can help encourage bikers that are hesitant to bike solo as well as highlight attractions and the bicycle network.</td>
<td>Pittsboro/ Siler City Convention and Visitors Center, Cycling groups such as Carolina Tarwheels</td>
</tr>
<tr>
<td>Updated Bicycle Map</td>
<td>Updated existing map that includes updated transportation (bike/road) network.</td>
<td>NCDOT Division of Bike and Pedestrian Transportation, Pittsboro/ Siler City Convention and Visitors Center</td>
</tr>
</tbody>
</table>

School Programs

There are a multitude of programs that parents and school administrators can use to encourage safe bicycling and walking to school. A prominent program, the Safe Routes to School Program, provides grant funding, resources and potential programs for improving the safety and increasing the rates of walking and bicycling to school. The program provides ideas for encouragement (i.e. prizes for students,
contests) as well as infrastructure improvements to increase rates of walking and biking to school. Further information about this as a funding resource is provided in Chapter 6. (Resource: www.saferoutesinfo.org)

Awareness Days
Days dedicated to specific themes like bicycling and active recreation can be used to promote bicycling and related causes. Specific types of awareness days include:

- **Open Streets (or Ciclovias):** Cities around the world have closed their streets to automobile traffic on specific days on the calendar. The streets are instead used for active recreation: walking or bicycling. Locally, Durham, with its inaugural Bull City Summer Streets in 2010, closed several streets downtown, and sponsored activities. Durham plans on setting up several Summer Streets again this summer after a great turnout (1,000+ participants) despite poor weather. (Resource: bullcitysummerstreets.tumblr.com/)

- **Bike to Work Day/Month:** May is Bike to Work month; Bike to Work day is the third week of the month. The League of American Bicyclists (LAB) sponsors this awareness month and provides ideas on events and programs that increase awareness around biking.

- **Strive not to Drive Days:** Annual events that encourage public to not use single occupancy vehicles to get to work or activities. This may spark people to understand the benefits of walking, bicycling, carpooling or using public transit to take to work. Partners could include TARPO, Triangle Transit and Chatham Transit. (Resource: Asheville. https://sites.google.com/site/strivenottodrive/home)

- **Family Bike Days:** Supports the riding of bicycles of all family members to increase awareness of enjoyment of riding and safety concerns. (Resource: www.sfbike.org/?family_day)

- **International Walk and Bike Day to School Day:** Held on the first Wednesday in October, this event promotes using active transportation to attend school. Although many of these events are related to a Safe Routes to School Program, this can be completed without the program. (Resource: http://www.americabikes.org/Documents/State_Factsheets/North%20Carolina%20Factsheet.pdf)

- **Commute Challenge:** Employers can promote the usage of alternative commute modes. Employees can pledge to change commuting habits for a certain period, in exchange for chances at prizes or other incentives. At the end of the period, employers or other organizations can publish the results of the challenge and its impact on commuting and the environment.
Go Triangle sponsors a Smart Commute Challenge; in 2010 nearly 10,000 participated over a six week period. (Resource: http://www.smartcommutechallenge.org/)

**Bike Tours or Mass Rides**
Many riders might be more receptive to riding in a group. Chatham County bike tours organized by the Pittsboro/Siler City Convention Bureau with support from local biking groups like the Carolina Tarwheels, could lead cyclists from Chatham County historic landmarks or to/from recreation areas. This could be combined to coincide with Bike Day or Bike Month. (Resource: Blue Ridge Breakaway in Haywood County: http://blueridgebreakaway.com/)

**Bicycle Map**
Bicycle maps both educate the public on preferred bicycle routes and safety tips as well as encourage the public to try these routes. Chatham County’s bike map was developed over ten years ago and is currently being reprinted. It should be updated with the following existing facilities:

- American Tobacco Trail with parking locations
- New Chatham County parks
- Updated road network

The map should be able to be distributed in various formats electronically (Acrobat PDF, jpg images).

The map should be periodically updated to include the new facilities as they are constructed. The existing map can be found here: Map updates should be taken in collaboration between NCDOT DBPT and Pittsboro Siler City Convention and Visitors Bureau. Other local examples can be used for ideas in updating the map (see figure 5.6, Existing map can be found here: http://dotw-xfer01.dot.state.nc.us/gisdot/DOTBikeMaps/Chatham/chatham-front-sm.jpg)

**5.4 Enforcement**
Enforcement programs address unlawful behavior from road users and other residents that might be eroding the bicycle environment in Chatham County. These include the enforcement of laws regarding motorists and bicyclists, as well as those owning large pets.
Motorist Enforcement

The Bicycling in Chatham County Survey results (See Chapter 2 for details) indicated that many existing and potential bicyclists see unsafe driving as impediments to bicycling safely in the County. Unsafe motoring practices include tailgating of bicycles, passing at unsafe distances, general speeding, and harassment of bicyclists. Law enforcement should increase enforcement of these unsafe, illegal practices by giving out citations or warnings for bike passing and tailgating violations, speeding and other unsafe practices. Roads targeted for increased enforcement might include those more commonly traveled by bicyclists or those with previous crashes; this should have the effect of improving safety and enjoyment for bicyclists, pedestrians and motorists alike.

Bicyclist Enforcement

Table 5.2: Enforcement Program Recommendations

<table>
<thead>
<tr>
<th>Program</th>
<th>Details</th>
<th>Potential Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorist Enforcement</td>
<td>Target unsafe sharing the road practices (passing too closely, tailgating) especially in zones with high numbers of bike traffic and crashes</td>
<td>Chatham Sheriff’s Office/Siler City and Pittsboro Police Departments</td>
</tr>
<tr>
<td>Bicyclist Enforcement</td>
<td>Target the most unsafe bicycling behaviors (wrong way riding, biking without lights) for ticketing.</td>
<td>Chatham Sheriff’s Office/Siler City and Pittsboro Police Departments</td>
</tr>
<tr>
<td>Leash Law Enforcement</td>
<td>Cite owners who do not leash potentially dangerous animals. Includes education to residents regarding existing leash laws.</td>
<td>Chatham Sheriff’s Office/Siler City and Pittsboro Police Departments</td>
</tr>
</tbody>
</table>
Bicyclists must follow all pertinent traffic laws. Bicyclists who ride against traffic and signals and violate other laws endanger themselves, other bikers and motorists while tarnishing bicyclist’s public image. Unfortunately, according to Bicycling in Chatham County Survey, law enforcement personnel sometime reprimand law abiding cyclists. It’s important that law enforcement agencies are provided training on the rights and responsibilities for bicyclists as well as motorists. Training should be provided to both existing and any new law enforcement annually. Training can focus on commonly misunderstood biking laws; survey respondents indicated that law enforcement sometimes think that cyclists are required to ride as far right on the roadway as possible and ride single file (they are not).

**Leash Law Enforcement**

Increased enforcement of local leash laws may reduce instances where bicyclists are harassed or even injured by loose pets. Many bicyclists indicated this as a problem on Chatham County roads, causing some riders to modify their routes or even decrease their riding. Leaflets regarding these leash laws can be provided at places like pet shops or veterinary offices to educate owners of their leashing responsibilities.

### NC Bicycle Laws (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.
- Wear a bicycle helmet on public roads, public paths and public rights-of-way if the bicyclists is under 16 years old


#### 5.5 Policy Recommendations

Policies and codes at the local level have an impact on the bicycling climate. These changes can be implemented in future updates through ongoing maintenance updates to code or inclusion in future major updates depending on the jurisdiction. These ordinances address future development and roadway design. Changes that address bicycling and
this plan are listed in Table 5.2 (for Pittsboro), Table 5.3 (for Siler City) and Table 5.4 (for Chatham County) below.

### Table 5.2: Pittsboro Ordinance Modifications

<table>
<thead>
<tr>
<th>Document</th>
<th>Reference</th>
<th>Existing Text</th>
<th>Recommended Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoning Ordinance</td>
<td>Article XV REGULATION OF DEVELOPMENT WITHIN MAJOR TRANSPORTATION CORRIDORS.</td>
<td>N.A.</td>
<td>All new development within the Major Transportation Corridor Districted district shall include the bicycling facilities indicated on the Recommended Network Map in Chapter 4 of the Chatham County Bicycle Plan.</td>
</tr>
</tbody>
</table>

In addition to these changes, the Pittsboro Master Pedestrian Plan includes many proposed revisions to the Pittsboro Zoning Ordinance and Subdivision Regulations that address bicycling and greenways as well as pedestrian features.
### Table 5.3: Siler City Ordinance Modifications

<table>
<thead>
<tr>
<th>Document</th>
<th>Reference</th>
<th>Existing Text</th>
<th>Recommended Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>UDO</td>
<td>ARTICLE XIV - Streets and Sidewalks; § 193 Street Classification</td>
<td>N.A.</td>
<td>ADD: (a)(4). Regardless of Street classification, every street should be designed to accommodate all road users, including vehicles, bicycles and pedestrians.</td>
</tr>
<tr>
<td>UDO</td>
<td>ARTICLE XIV - Streets and Sidewalks; § 196 Entrances to Streets (a)(1)</td>
<td>Vehicles can enter and exit from the lot in question without posing any substantial danger to themselves, pedestrians, or vehicles traveling in abutting streets, and</td>
<td>Vehicles can enter and exit from the lot in question without posing any substantial danger to themselves, pedestrians, <strong>bicyclists</strong>, or vehicles traveling in abutting streets, and</td>
</tr>
<tr>
<td>UDO</td>
<td>ARTICLE XIV - Streets and Sidewalks; § 199 Street Width, Sidewalk, and Drainage Requirements in Subdivisions (a)</td>
<td>Street rights-of-way are designed and developed to serve several functions: (i) to carry motor vehicle traffic, and in some cases, allow on-street parking; (ii) to provide a safe and convenient passageway for pedestrian traffic; and (iii) to serve as an important link in the town’s drainage system. In order to fulfill these objectives, all public streets shall be constructed to meet either the standards set forth in Subsection (b) or (c).</td>
<td>Street rights-of-way are designed and developed to serve several functions: (i) to carry motor vehicle and bicycle traffic, and in some cases, allow on-street parking; (ii) to provide a safe and convenient passageway for pedestrian traffic; and (iii) to serve as an important link in the town’s drainage system. In order to fulfill these objectives, all public streets shall be constructed to meet either the standards set forth in Subsection (b) or (c).</td>
</tr>
<tr>
<td>UDO</td>
<td>ARTICLE XIV - Streets and Sidewalks; § 204 Road and Sidewalk Requirements in Unsubdivided Developments (a)</td>
<td>(a) Within unsubdivided developments, all private roads and access ways shall be designed and constructed to facilitate the safe and convenient movement of motor vehicle and pedestrian traffic.</td>
<td>(a) Within unsubdivided developments, all private roads and access ways shall be designed and constructed to facilitate the safe and convenient movement of motor vehicle, <strong>bicycle</strong>, and pedestrian traffic.</td>
</tr>
</tbody>
</table>
Chapter 5: Recommended Programs and Policies

Table 5.3: Chatham County Ordinance Modifications

<table>
<thead>
<tr>
<th>Document</th>
<th>Reference</th>
<th>Existing Text</th>
<th>Recommended Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chatham County Compact Communities Ordinance</td>
<td>SECTION 10. RECREATION AND OPEN SPACE. 10.2 Active Recreational Facilities</td>
<td>Any land proposed for dedication for active recreation shall be physically integrated into the design of the community and be easily and safely accessible by pedestrians.</td>
<td>Any land proposed for dedication for active recreation shall be physically integrated into the design of the community and be easily and safely accessible by pedestrians and bicyclists.</td>
</tr>
<tr>
<td>Land Conservation &amp; Development Policies</td>
<td>Transportation Section</td>
<td>N.A</td>
<td>Future updates to this plan should include references to the Bike Plan.</td>
</tr>
<tr>
<td>CHATHAM COUNTY SUBDIVISION REGULATIONS</td>
<td>7.2 Rural Roads. B. Relation to Present, Proposed and Future Road System</td>
<td>N.A</td>
<td>Add: 6. The recommended bicycling facilities within the Chatham Bicycle Plan shall be provided upon development of land adjacent to them.</td>
</tr>
</tbody>
</table>

NCDOT Relationship Policies

The County and each municipality should develop processes and policies that improve communication and coordination with NCDOT regarding road projects. Since NCDOT has ownership over most of the roads in the county, most of the projects detailed in this plan would require NCDOT approval and oversight. County, municipal staff and bicycle advocates can be involved in design and maintenance process early to ensure that road projects do not considerably negatively impact bicycle movement in the county. In fact, this coordination could be an easy, low cost option to introduce bicycle friendly facilities. NCDOT can provide a list to the County and municipalities of roads slated for resurfacing that year; the Transportation Planner or public works official could request NCDOT to add additional pavement on the sides of the roadway (Orange County does this now) or restripe for bike-lanes or pavement markings.
Chapter 6: Implementation

This chapter describes how Chatham County and its municipalities can make the recommended network, programs and policy changes a reality. It includes specific Implementation Steps to complete the plan, describes the Establishing of a Bike and Pedestrian Subcommittee, and introduces the concept of Becoming a Bike Friendly Community. It also discusses Evaluation and Monitoring concerns, lists potential Funding Sources and summarizes short term and long term steps in an Implementation Strategy matrix.

6.1 Implementation Steps

Implementation of the plan requires the coordination of a multitude of agencies and groups such as the county Commissioners, NCDOT, and the municipalities. The Transportation Advisory Board can serve as a warehouse/coordinating party for these agencies as they implement key tasks for the plan.

Steps include:

1) Establishing a citizen advisory council to lead bicycling and pedestrian efforts in the County and push forward the initiatives of this plan.

2) Explicitly include the tasks of coordinating bicycle and pedestrian improvements in the position of Transportation Planner.

3) Ongoing coordination with other plans, including the Comprehensive Land Use and Transportation plan updates.

4) Determining funding mechanisms for the planned facilities and programs.

5) Make the changes to policy at the municipality and county level discussed in Chapter 5.

6) Implement the enforcement, education and encouragement programs discussed in Chapter 5.
7) Coordinate with NCDOT to ensure that any infrastructure improvements or maintenance projects include bicycle facilities, when applicable.

8) Fund, plan and complete the recommended bicycle network.

9) Update the countywide bicycle map to include new facilities and information about encouragement and education programs.

10) Maintain the on and off road bicycle facilities.

These steps are further described in Table 6.1, Implementation Strategy, which details specific actions, leads and support, time horizons and references to the strategy in the plan.

### 6.2 Establishing a Bike and Pedestrian Subcommittee

Implementation of the Bike Plan should be spearheaded by a newly formed Bike and Pedestrian Subcommittee (BPS) within Chatham County’s Transportation Advisory Board (TAB).

**Bike and Pedestrian Subcommittee**

This Subcommittee will coordinate and help implement the action steps of this Bike plan within the existing TAB. This subcommittee will improve the TAB’s advising the County Commissioners on matters related to biking and walking. The subcommittee can also coordinate education, encouragement and enforcement activities related to active transportation. The subcommittee should focus on two themes, bike and pedestrian transportation, as many of the improvements and programs are complementary with these two activities.

While the subcommittee would be a part of a board, TAB’s existing bylaws allow for non-TAB members to serve on subcommittees. The board should be made up of representatives from the TAB, Parks and Recreation Board, Active Chatham as well as any pertinent municipality groups such as the Pittsboro Parks and Recreation Board. In addition to representatives from these groups, bicyclists and pedestrians from around the county should also be encouraged to join the board.

### 6.3 Local and Regional Planning Efforts

Both local and other regional bicycle and land use planning should be coordinated and not conflict with this plan. Chatham County is in the
beginning stages of updating its comprehensive plan; this update should include some of the policy enhancements discussed in Section 2.3. This Bicycle Plan is intended to be part of Chatham County’s Comprehensive Transportation Plan (CTP), slated for completion in the next several years.

Regional cooperation is also a key for successful implementation of this plan. Many of the proposed routes go to the county border, some of which connect with proposed or existing routes. As seen in the survey respondent profile, many out-of-county bicyclists ride in the county. As counties and municipalities build out their bicycle network or update their bicycle plans, Chatham County must be kept informed about projects that might impact Chatham County.

### 6.4 Becoming a Bike Friendly Community

The League of American Bicyclists (LAB) has established a Bicycle Friendly Community Program (BFC) recognizing communities that actively support bicycling. Meeting many of this Plan’s goals would also meet many of the criteria for the BFC program, including a well-connected bicycle network and education, enforcement and encouragement programs, as well as the existence of an adopted plan and advisory committee. Recognizing that there are different levels of support, LAB has instituted three separate rankings - Gold, Silver and Bronze. In North Carolina, the municipalities of Carrboro (Silver), Chapel Hill, Cary, Charlotte Davidson, and Durham (Bronze) have all received the BFC designation. Though nearly all the communities in the program are municipalities, there are some counties included as well. Communities of all sizes, even with populations less than 10,000, have been accepted into the program. Chatham County or municipalities may not be able to apply for the program in the short term, but achieving a designation can be a realistic mid-term goal after the implementation of the programs and a portion of the bicycle network.

### 6.5 Evaluation and Monitoring

The County should establish performance measures to track the meeting of the objectives of the plan. The performance measures should be gathered with low cost methods, preferably using already existing data sources and consistently. Within two years of the adoption of the plan, the County should provide a report that determines the performance measures, provides an updated baseline profile of current conditions of these performance measures, and sets
targets for future years to guide the plan. Performance measures and evaluation techniques could include:

- Estimated ridership by manual counts (see Appendix D for already developed count sites in NE Chatham)
- Online surveys to measure changes in attitudes and preferences and bicycling conditions. These should build upon the survey conducted for the plan.
- Number of attendees of education and enforcement programs
- Bicycle mode share from existing sources, such as the Census Journey to Work data and Census Transportation Planning Package (CTPP)

These and other performance measures should be collected and disseminated annually or bi-annually if possible.

6.6 Funding Sources

Various funding sources are available to Chatham County and its municipalities to help construct facilities, perform planning activities and support new programs. This section describes these sources and applicability. Some of the programs are directed for general road construction and maintenance, activities which can still improve bicycle transportation.

North Carolina Division of Parks and Recreation Programs

The North Carolina Division of Parks and Recreation manages three grant programs (www.ncparks.gov/About/grants/trails_main.php). The Adopt-A-Trail (AAT) Grant Program funds projects related to the promotion, construction or renovation of trails or trail-side facilities, providing up to 100% of projects costs with a maximum project cost of $5,000. The Recreational Trails Program (RTP) funds projects related to the construction or renovation of trails or trail-side facilities, providing up to 75% of project costs with a maximum project cost of $75,000. The Parks and Recreation Trust Fund (PARTF) provides dollar-for-dollar matching grants to local governments for parks and recreational projects to serve the public, with a maximum project cost of $500,000 (Resource: http://www.ncparks.gov/About/grants/partf_main.php).

Congestion Mitigation & Air Quality (CMAQ) Program
This competitive program funds transportation projects and programs in air quality nonattainment and maintenance areas to help achieve and maintain national standards for air quality pollutants. Bicycle projects are eligible as long as they are not exclusively used for recreation purposes. The program currently has a minimum project cost of $100,000 and will fund up to 80% of the project cost. Projects must be located in Baldwin, Center, New Hope or Williams Townships. Applications are submitted to NCDOT through either the DCHC MPO or TARPO. (Resource: http://www.ncdot.org/doh/PRECONSTRUCT/tpb/services/air.html)

Transportation, Community, and System Preservation (TCSP) Program

This comprehensive initiative of research and grants investigates the relationships between transportation, community and system preservation plans and practices and identify private sector-based initiatives to improve such relationships. States, metropolitan planning organizations, local governments, and tribal governments are eligible for discretionary grants to carry out eligible projects to integrate transportation, community and system preservation plans and practices that improve the efficiency of the transportation system of the United States; reduce environmental impacts of transportation; reduce the need for costly future public infrastructure investments; ensure efficient access to jobs, services, and centers of trade; and, examine community development patterns and identify strategies to encourage private sector development patterns and investments that support these goals. (Resource: www.fhwa.dot.gov/tcsp )

Safe Routes to School

The Safe Routes to School program is a federally funded initiative, administered by NCDOT, to increase rates of walking and biking to school. NCDOT provides funding for both infrastructure and non-infrastructure projects. It provides reimbursement grants for infrastructure projects within two miles of an elementary or middle school that will encourage and enable children to walk or bike to school. The program also provides reimbursement grants for non-infrastructure projects (such as the education and encouragement programs described in Chapter 5) that support increased walking or biking to school. Any county agency, school board and non-profit organization is encouraged to apply. For more information, contact NCDOT’s Division of Bicycle and Pedestrian Transportation at (919) 807-0774.
Chapter 6: Implementation

Transportation Improvement Programs

NCDOT’s Division of Pedestrian and Bicycle Transportation manages selection and approval for bicycle specific TIP projects. These “independent” projects are handled and funded separately from “incidental” projects that are included (i.e. bike lanes, bicycle safe drainage grates) in roadway new construction or enhancements.

Secondary Road Improvement Program

This program funds the improvement and maintenance of secondary roads, selected and prioritized in accordance with statewide criteria developed by NCDOT. Funds are allocated to each County annually from the Highway Fund and from the Highway Trust Fund.

High Hazard Elimination Program

This federally funded safety program provides funds to improve facilities with high crash rates. Projects are rated based on projected benefits in reducing crashes as compared to the costs of the project. The Safety Oversight Committee selects and approves project before final approval by the NC Board of Transportation.

Bicycle and Pedestrian Planning Grant Initiative

This annual matching grant program, administered by the DBPT, funds local comprehensive plans for walking and/or biking. Municipalities are reimbursed for planning activities included in creation of the plans and are limited to 18 months for plan completion. As only municipalities are eligible for the program, this would only apply if Siler City and Pittsboro would be interested in creating municipal specific plans.

Transportation Enhancement Program

This federal program, administered by NCDOT’s Program Development Branch, funds surface transportation and related projects that benefit the traveling public and help communities increase transportation choices and access, enhance the built or natural environment and create a sense of place. The program has twelve qualifying activities and funds up to 80% of the project cost. Funding is allocated by each county through an equity program. (Resource: www.ncdot.org/programs/Enhancement )

TJCOG Transportation Demand Management Program
Triangle J Council of Governments (TJCOG), a voluntary council of governments in the Triangle and surrounding region, coordinates funding for marketing activities that promote alternative commuting practices such as bicycling, using transit and carpooling. TJCOG provides funding through an annual competitive grant program to its local governments. (Resource: http://www.tjcog.dst.nc.us/regplan/transdemand.shtml)

6.7 Implementation Strategy
The matrix on the next two pages includes the tasks recommended to implement the Bike Plan. It provides the lead agency, organization or individual tasked with implementing the plan, details regarding the task, and a reference to the page number where the task is mentioned in the plan. The tasks are split into Short Term (within 10 years) as well as long term and on-going action items.
### Table 6.1 Short Term Implementation Strategy

<table>
<thead>
<tr>
<th>Task</th>
<th>Lead Agency (Support)</th>
<th>Details</th>
<th>Phase</th>
<th>Page Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Pedestrian and Bicycle Advisory Subcommittee (BPS) within Transportation Advisory Board</td>
<td>Transportation, Recreation Advisory Boards, Active Chatham, Parks and Recreation</td>
<td>Board integral into implementing plan and coordinating actions</td>
<td>Short Term</td>
<td>6.2 (p66)</td>
</tr>
<tr>
<td>Siler City Policy Actions</td>
<td>Siler City Board of Commissioners, Town Manager, BPS</td>
<td>Ensures that policies conducive to bicycling are implemented in Siler City</td>
<td>Short Term</td>
<td>5.5 (p50)</td>
</tr>
<tr>
<td>Pittsboro Policy Actions</td>
<td>Pittsboro Board of Commissioners, Town Manager, BPS</td>
<td>Ensures that policies conducive to bicycling are implemented in Pittsboro</td>
<td>Short Term</td>
<td>5.5 (p49)</td>
</tr>
<tr>
<td>Chatham County Policy Actions</td>
<td>Chatham County Commissioners, BPS, Planning Department</td>
<td>Ensures that policies conducive to bicycling are implemented in Countywide</td>
<td>Short Term</td>
<td>5.5 (p51)</td>
</tr>
<tr>
<td>Identify and secure specific funding sources for Short Term infrastructure projects</td>
<td>Transportation Planner, NCDOT</td>
<td>Ensures that Short Term projects are funded and completed.</td>
<td>Short Term</td>
<td>4.2 (p34), 6.6 (p55 – 57)</td>
</tr>
<tr>
<td>Complete top priority, Short Term projects</td>
<td>NCDOT, municipalities, BPS</td>
<td>These are the facility projects described in Chapter 4 to complete the short term Bicycle Network</td>
<td>Short Term</td>
<td>4.2(p47-48)</td>
</tr>
<tr>
<td>Develop long term funding strategy</td>
<td>BPS, Transportation Planner, NCDOT</td>
<td>This helps to maintain the long term viability of the bicycle network and to carry out plan recommendations.</td>
<td>Short Term</td>
<td>6.6 (p68-70)</td>
</tr>
<tr>
<td>Develop updated Chatham County Bike Map</td>
<td>Pittsboro-Siler City Convention and Visitor’s Bureau, BPS, NCDOT</td>
<td>Bicycle map needs to showcase bicycling for both residents and visitors; should be updated as facilities are built.</td>
<td>Short Term</td>
<td>5.3 (p 47)</td>
</tr>
<tr>
<td>Introduce Safe Routes to School Program</td>
<td>Chatham County Schools, BPS, NCDOT</td>
<td>Safe Route to School program is a proven way to increase physical activity among youths, bring awareness to cycling and walking, and potentially bring more advocates for plan implementation.</td>
<td>Short Term</td>
<td>5.3, 6.6 (p59,70)</td>
</tr>
<tr>
<td>Hold encouragement events such as Bike to Work Day, set up booths at festivals to disseminate safety and bicycling information</td>
<td>BPS, TAB, Chatham County Schools, CVB</td>
<td>These actions help market the benefits of biking, the proper ways to share roads with bicyclists and could bring more advocates for plan implementation.</td>
<td>Short Term</td>
<td>5.3 (p59)</td>
</tr>
<tr>
<td>Plan and apply for designation by the League of American Bicyclists as a ‘Bicycle Friendly Community’ by 2020</td>
<td>BPS, Municipalities, NCDOT, TAB, Transportation Planner</td>
<td>Implementing the plan’s recommendations will allow the county to potentially qualify for designation; this designation can be seen as a mid-term goal.</td>
<td>Short Term</td>
<td>6.4 (p67)</td>
</tr>
</tbody>
</table>
## Ongoing and Long Term Implementation Strategy

<table>
<thead>
<tr>
<th>Task</th>
<th>Lead Agency (Support)</th>
<th>Details</th>
<th>Phase</th>
<th>Section/Page Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate with NCDOT Division 8 regarding projects on state maintained roadways</td>
<td>NCDOT, TAB Transportation Planner, BPS</td>
<td>Coordination with NCDOT is necessary to ensure that bicycle facilities are not harmfully affected by projects; also provides a way to introduce bicycle friendly treatments at the project level.</td>
<td>Ongoing</td>
<td>5.5 (p64)</td>
</tr>
<tr>
<td>Coordinate Bicycle Plan with Comprehensive Plan Update and Integrate with upcoming County Comprehensive Transportation Plan (CTP)</td>
<td>Chatham County Planning, NCDOT, Bike and Pedestrian Subcommittee (BPS)</td>
<td>Any updates to Comprehensive Plan should include policy changes and ensure that the bike plan is referenced in document; this Bicycle Plan should be integrated into the upcoming CTP</td>
<td>Ongoing</td>
<td>6.4 (p67)</td>
</tr>
<tr>
<td>Continually support and evaluate implementation of this plan</td>
<td>BPS, Transportation Advisory Board, NCDOT</td>
<td>Evaluation of the plan includes coordination of collection, sharing and dissemination of measures (i.e. ridership, surveying) at a regular basis. This will help ensure that the plan meets changing county conditions.</td>
<td>Ongoing</td>
<td>6.5 (p67)</td>
</tr>
<tr>
<td>Ensure integrated regional planning efforts</td>
<td>BPS, DC-CHMPO, TARPO, Town of Cary, Town of Chapel Hill, Town of Carrboro</td>
<td>As many riders live outside of the county and regional connections are developed, governments and groups will need to coordinate to ensure that these linkages are phased and communicated to residents.</td>
<td>Ongoing</td>
<td>6.3 (p66)</td>
</tr>
<tr>
<td>Work with law enforcement to implement training for new officers regarding sharing the road laws</td>
<td>Chatham County Sheriff’s Department, BPS</td>
<td>Law enforcement should be partners with implementation of the plan to ensure safety of all users of the roads.</td>
<td>Ongoing</td>
<td>5.2 (p54)</td>
</tr>
<tr>
<td>Identify and secure specific funding sources for Phase 2 implementation</td>
<td>BPS, NCDOT</td>
<td>Ensures that Phase 2 projects are funded and completed.</td>
<td>Long Term</td>
<td>4.3, 4.5 (p49-50, p67-68)</td>
</tr>
<tr>
<td>Complete phase 2 projects</td>
<td>BPS, NCDOT, municipalities</td>
<td>These are the facility projects described in Chapter 4 to complete the long term Bicycle Network</td>
<td>Long Term</td>
<td>4.3 (p49-50)</td>
</tr>
</tbody>
</table>
# Bicycling in Chatham County

## 1. What kind of rider are you?

<table>
<thead>
<tr>
<th>Response</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginner: New rider or child</td>
<td>5.2%</td>
<td>24</td>
</tr>
<tr>
<td>Intermediate: Relatively skilled rider, but not comfortable on busy roads</td>
<td>32.2%</td>
<td>149</td>
</tr>
<tr>
<td>Advanced: Highly skilled rider, comfortable &quot;taking the lane&quot;</td>
<td>49.0%</td>
<td>227</td>
</tr>
<tr>
<td>I don't ride</td>
<td>13.6%</td>
<td>63</td>
</tr>
</tbody>
</table>

- answered question 463
- skipped question 0

## 2. Where are you or would you be comfortable be riding? (check all that apply)

<table>
<thead>
<tr>
<th>Response</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>On busy, wide roads (like 15-501)</td>
<td>41.0%</td>
<td>190</td>
</tr>
<tr>
<td>On busy, narrow roads (like Bus-64 going through downtown Pittsboro)</td>
<td>34.8%</td>
<td>161</td>
</tr>
<tr>
<td>On quiet, back roads or local streets</td>
<td>83.8%</td>
<td>388</td>
</tr>
<tr>
<td>On off-street trails or paths (like the American Tobacco Trail)</td>
<td>72.8%</td>
<td>337</td>
</tr>
<tr>
<td>Not comfortable riding anywhere</td>
<td>4.5%</td>
<td>21</td>
</tr>
</tbody>
</table>

- Other (please specify) 37

- answered question 463
- skipped question 0
### 3. Why do you or would you bike? (check all that apply)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>For exercise / health reasons</td>
<td>94.4%</td>
<td>437</td>
</tr>
<tr>
<td>For enjoyment</td>
<td>85.3%</td>
<td>395</td>
</tr>
<tr>
<td>For shopping / errands</td>
<td>25.3%</td>
<td>117</td>
</tr>
<tr>
<td>To get to work</td>
<td>29.8%</td>
<td>138</td>
</tr>
<tr>
<td>To get to school</td>
<td>5.6%</td>
<td>26</td>
</tr>
<tr>
<td>I don't and would not bike</td>
<td>3.5%</td>
<td>16</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

### 4. How would you describe the majority of your current or potential bicycle trips?

<table>
<thead>
<tr>
<th>Type</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational (i.e. exercise, outdoors)</td>
<td>78.8%</td>
<td>365</td>
</tr>
<tr>
<td>Utilitarian (i.e. work, school, shopping, etc.)</td>
<td>11.4%</td>
<td>53</td>
</tr>
<tr>
<td>Not sure</td>
<td>4.5%</td>
<td>21</td>
</tr>
<tr>
<td>I don't and will not bike</td>
<td>5.2%</td>
<td>24</td>
</tr>
</tbody>
</table>

answered question 463

skipped question 0
### 5. How often do you currently ride?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>11.0%</td>
<td>51</td>
</tr>
<tr>
<td>Rarely (several times a year)</td>
<td>16.0%</td>
<td>74</td>
</tr>
<tr>
<td>Sporadically (several times a month)</td>
<td>26.1%</td>
<td>121</td>
</tr>
<tr>
<td>Often (Two to three times a week)</td>
<td>37.1%</td>
<td>172</td>
</tr>
<tr>
<td>Daily</td>
<td>9.7%</td>
<td>45</td>
</tr>
</tbody>
</table>

answered question 463
skipped question 0

### 6. How often would you like to ride?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>4.8%</td>
<td>22</td>
</tr>
<tr>
<td>Rarely (several times a year)</td>
<td>4.3%</td>
<td>20</td>
</tr>
<tr>
<td>Sporadically (several times a month)</td>
<td>10.8%</td>
<td>50</td>
</tr>
<tr>
<td>Often (Two to three times a week)</td>
<td>44.9%</td>
<td>208</td>
</tr>
<tr>
<td>Daily</td>
<td>35.2%</td>
<td>163</td>
</tr>
</tbody>
</table>

answered question 463
skipped question 0
### 7. What prevents you from biking more often? (check all that apply)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bike paths, bike lanes or bike routes</td>
<td>52.9%</td>
<td>245</td>
</tr>
<tr>
<td>Insufficient bike parking or storage</td>
<td>11.2%</td>
<td>52</td>
</tr>
<tr>
<td>Bikeways / roads are in poor condition</td>
<td>30.7%</td>
<td>142</td>
</tr>
<tr>
<td>Biking facilities are not high quality or well planned</td>
<td>17.1%</td>
<td>79</td>
</tr>
<tr>
<td><strong>Unsafe / unlawful motorists behavior</strong></td>
<td><strong>53.3%</strong></td>
<td><strong>247</strong></td>
</tr>
<tr>
<td>Destinations are too far away</td>
<td>20.1%</td>
<td>93</td>
</tr>
<tr>
<td>I have too many things to carry</td>
<td>7.6%</td>
<td>35</td>
</tr>
<tr>
<td>I travel with small children</td>
<td>9.1%</td>
<td>42</td>
</tr>
<tr>
<td>I don't have enough time</td>
<td>31.7%</td>
<td>147</td>
</tr>
<tr>
<td>Insufficient lighting</td>
<td>14.3%</td>
<td>66</td>
</tr>
<tr>
<td>Weather</td>
<td>24.4%</td>
<td>113</td>
</tr>
<tr>
<td>Nothing is preventing me from riding</td>
<td>9.7%</td>
<td>45</td>
</tr>
<tr>
<td><strong>Other (please specify)</strong></td>
<td><strong>53</strong></td>
<td><strong>463</strong></td>
</tr>
</tbody>
</table>

| Total answered question | 463 |
| Total skipped question | 0   |
### 8. On average, how far are your rides (one-way) now or potentially if you did ride?

<table>
<thead>
<tr>
<th>Distance</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than a mile</td>
<td>2.5%</td>
<td>11</td>
</tr>
<tr>
<td>One to 5 miles</td>
<td>22.2%</td>
<td>96</td>
</tr>
<tr>
<td>6-10 miles</td>
<td>16.4%</td>
<td>71</td>
</tr>
<tr>
<td>11-20 miles</td>
<td>16.9%</td>
<td>73</td>
</tr>
<tr>
<td>More than 20 miles</td>
<td>37.5%</td>
<td>162</td>
</tr>
<tr>
<td>I would not ride</td>
<td>4.4%</td>
<td>19</td>
</tr>
</tbody>
</table>

- **answered question**: 432
- **skipped question**: 31
<table>
<thead>
<tr>
<th>Improvement</th>
<th>Yes, I would definitely bike more often</th>
<th>Maybe, I might bike more often</th>
<th>No, I would bike the same</th>
<th>No, this would make me bike less often</th>
<th>Not Sure</th>
<th>Rating Average</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike lanes on major roads</td>
<td>58.0% (242)</td>
<td>20.4% (85)</td>
<td>14.1% (59)</td>
<td>4.1% (17)</td>
<td>3.4% (14)</td>
<td>1.74</td>
<td>417</td>
</tr>
<tr>
<td>Widened outside/curb lanes on major roads</td>
<td>55.1% (223)</td>
<td>25.4% (103)</td>
<td>11.6% (47)</td>
<td>3.7% (15)</td>
<td>4.2% (17)</td>
<td>1.77</td>
<td>405</td>
</tr>
<tr>
<td>Paved and widened shoulders on rural roads</td>
<td>62.6% (259)</td>
<td>21.5% (89)</td>
<td>9.9% (41)</td>
<td>2.7% (11)</td>
<td>3.4% (14)</td>
<td>1.63</td>
<td>414</td>
</tr>
<tr>
<td>More off-street bike paths/trails</td>
<td>51.4% (205)</td>
<td>22.6% (90)</td>
<td>19.5% (78)</td>
<td>2.3% (9)</td>
<td>4.3% (17)</td>
<td>1.85</td>
<td>399</td>
</tr>
<tr>
<td>More on-road bike signage</td>
<td>23.9% (91)</td>
<td>28.2% (107)</td>
<td>37.6% (143)</td>
<td>3.7% (14)</td>
<td>6.6% (25)</td>
<td>2.41</td>
<td>380</td>
</tr>
<tr>
<td>More maintenance of existing facilities</td>
<td>24.5% (90)</td>
<td>28.8% (106)</td>
<td>34.0% (125)</td>
<td>4.1% (15)</td>
<td>8.7% (32)</td>
<td>2.44</td>
<td>368</td>
</tr>
<tr>
<td>More driver and bicyclist education programs</td>
<td>37.5% (145)</td>
<td>26.6% (103)</td>
<td>26.4% (102)</td>
<td>3.9% (15)</td>
<td>5.7% (22)</td>
<td>2.14</td>
<td>387</td>
</tr>
<tr>
<td>Tighter enforcement of traffic laws</td>
<td>36.4% (137)</td>
<td>27.1% (102)</td>
<td>26.9% (101)</td>
<td>3.2% (12)</td>
<td>6.4% (24)</td>
<td>2.16</td>
<td>376</td>
</tr>
<tr>
<td>More bicycle parking/storage at destinations</td>
<td>17.7% (64)</td>
<td>23.5% (85)</td>
<td>45.6% (165)</td>
<td>5.2% (19)</td>
<td>8.0% (29)</td>
<td>2.62</td>
<td>362</td>
</tr>
<tr>
<td>Amenities (i.e. benches or water fountains)</td>
<td>12.2% (41)</td>
<td>19.0% (64)</td>
<td>55.4% (186)</td>
<td>5.4% (18)</td>
<td>8.0% (27)</td>
<td>2.78</td>
<td>336</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>answered question</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>432</td>
<td></td>
</tr>
<tr>
<td>skipped question</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>
10. What Chatham County intersections or roads are difficult to bicycle on and why?

<table>
<thead>
<tr>
<th>1. Road/intersection and problem</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100.0%</td>
<td>179</td>
</tr>
<tr>
<td></td>
<td>51.4%</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>24.0%</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>12.3%</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>5.0%</td>
<td>9</td>
</tr>
</tbody>
</table>

answered question 179

skipped question 284

11. Have you ever ridden one of North Carolina’s State Bike Routes in Chatham County?

<table>
<thead>
<tr>
<th>Response</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>40.7%</td>
<td>176</td>
</tr>
<tr>
<td>No, but I want to</td>
<td>18.1%</td>
<td>78</td>
</tr>
<tr>
<td>No, I've never heard of them</td>
<td>21.1%</td>
<td>91</td>
</tr>
<tr>
<td>Not sure</td>
<td>11.8%</td>
<td>51</td>
</tr>
<tr>
<td>No, I don't ride</td>
<td>8.3%</td>
<td>36</td>
</tr>
</tbody>
</table>

answered question 432

skipped question 31
### 12. Have you ever ridden on the American Tobacco Trail in Chatham County?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>50.2%</td>
<td>217</td>
</tr>
<tr>
<td>No</td>
<td>28.7%</td>
<td>124</td>
</tr>
<tr>
<td>No, but I plan to</td>
<td>14.6%</td>
<td>63</td>
</tr>
<tr>
<td>No, I don't ride</td>
<td>6.5%</td>
<td>28</td>
</tr>
</tbody>
</table>

answered question 432

skipped question 31

### 13. Where in Chatham County do you live? (enter in municipality, subdivision or general area)

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siler City</td>
<td>5.8%</td>
<td>25</td>
</tr>
<tr>
<td>Pittsboro</td>
<td>20.8%</td>
<td>90</td>
</tr>
<tr>
<td>Goldston</td>
<td>3.9%</td>
<td>17</td>
</tr>
<tr>
<td>Other (Specify in comment field)</td>
<td>21.5%</td>
<td>93</td>
</tr>
<tr>
<td>I do not live in Chatham County (Specify location in comment field)</td>
<td>47.9%</td>
<td>207</td>
</tr>
</tbody>
</table>

Other (please specify) 282

answered question 432

skipped question 31
14. Please provide any comments or concerns you have regarding bicycling in Chatham County.

<table>
<thead>
<tr>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
</tr>
</tbody>
</table>

answered question 169
skipped question 294

15. Please fill out the contact information below if you would like to receive more information about the Bicycle Plan and the future of biking in Chatham County.

<table>
<thead>
<tr>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: 94.8%</td>
<td>164</td>
</tr>
<tr>
<td>Address: 84.4%</td>
<td>146</td>
</tr>
<tr>
<td>Address 2: 3.5%</td>
<td>6</td>
</tr>
<tr>
<td>City/Town: 85.5%</td>
<td>148</td>
</tr>
<tr>
<td>ZIP Code: 85.0%</td>
<td>147</td>
</tr>
<tr>
<td>Email Address: 94.2%</td>
<td>163</td>
</tr>
<tr>
<td>Phone Number: 50.3%</td>
<td>87</td>
</tr>
</tbody>
</table>

answered question 173
skipped question 290
### 16. What is your age?

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 18</td>
<td>0.5%</td>
<td>2</td>
</tr>
<tr>
<td>19-30</td>
<td>13.1%</td>
<td>56</td>
</tr>
<tr>
<td>31-45</td>
<td>41.5%</td>
<td>177</td>
</tr>
<tr>
<td>46-60</td>
<td>36.9%</td>
<td>157</td>
</tr>
<tr>
<td>60+</td>
<td>7.0%</td>
<td>30</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>0.9%</td>
<td>4</td>
</tr>
</tbody>
</table>

answered question 426

skipped question 37

### 17. What is your gender?

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>60.7%</td>
<td>256</td>
</tr>
<tr>
<td>Female</td>
<td>37.4%</td>
<td>158</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>1.9%</td>
<td>8</td>
</tr>
</tbody>
</table>

answered question 422

skipped question 41
### 18. What is your race?

<table>
<thead>
<tr>
<th>Race</th>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian or Alaska Native</td>
<td></td>
<td>0.5%</td>
<td>2</td>
</tr>
<tr>
<td>Asian</td>
<td></td>
<td>0.5%</td>
<td>2</td>
</tr>
<tr>
<td>Black or African American</td>
<td></td>
<td>2.4%</td>
<td>10</td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td></td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td>85.6%</td>
<td>364</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>2.1%</td>
<td>9</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td></td>
<td>8.9%</td>
<td>38</td>
</tr>
</tbody>
</table>

- **answered question**: 425
- **skipped question**: 38
## Appendix B: Short Term Network Project Recommendations

<table>
<thead>
<tr>
<th>Project #</th>
<th>Location</th>
<th>Facility Type</th>
<th>Length (in miles)</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Siler City (SE of Downtown)</td>
<td>Shared Use Path</td>
<td>2.0</td>
<td>$750,000</td>
<td>Love's Creek Greenway - part of Siler City STIP</td>
</tr>
<tr>
<td>S2</td>
<td>Oakley Church, Jim Brown, Mount Vernon Springs Rds (SW Chatham County)</td>
<td>Shared Road</td>
<td>7.6</td>
<td>$3,200</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S3</td>
<td>Bernard Purvis, Chatham St, Bennett, Bonlee-Bennett, Airport Roads (Near Bennett in SW Chatham)</td>
<td>Shared Road</td>
<td>10.8</td>
<td>$4,400</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S4</td>
<td>McClaurin Rd, Sandy Branch Church, Ike Brooks Rd, Elmer Moore Rd (SE of Siler City)</td>
<td>Shared Road</td>
<td>6.4</td>
<td>$2,800</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S5</td>
<td>NC 902 &amp; Jerry Frye Rd (Near Bennett in SW Chatham)</td>
<td>Shared Road</td>
<td>4.9</td>
<td>$2,000</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S6</td>
<td>Goldston Glendon, Mert McNamus, Wilson, Glendon Rds (SW Chatham near Goldston)</td>
<td>Shared Road</td>
<td>10.2</td>
<td>$4,400</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S7</td>
<td>Snow Camp Rd (NW Chatham County)</td>
<td>Shared Road</td>
<td>2.5</td>
<td>$1,200</td>
<td>Install “Share the Road” signs</td>
</tr>
</tbody>
</table>
## Appendix B: Short Term Network Project Recommendations

<table>
<thead>
<tr>
<th>Project #</th>
<th>Location</th>
<th>Facility Type</th>
<th>Length (in miles)</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S8</td>
<td>White Cross, Crawford Dairy and Chicken Bridge Rd (North Central Chatham County)</td>
<td>Shared Road</td>
<td>2.9</td>
<td>$1,200</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S9</td>
<td>Bynum, Bynum Ridge, Durham Eubanks, Mt Gilead Church, Pea Ridge Roads (NE of Pittsboro)</td>
<td>Shared Road</td>
<td>7.9</td>
<td>$3,200</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S10</td>
<td>Lewter Shop Rd (NE Chatham County)</td>
<td>Shared Road</td>
<td>1.6</td>
<td>$800</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S11</td>
<td>Moncure Pittsboro Rd (SW of Pittsboro)</td>
<td>Shared Road</td>
<td>5.3</td>
<td>$2,400</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S12</td>
<td>W Salisbury St, US 64 Bus, Thompson St (Pittsboro)</td>
<td>Shared Road</td>
<td>2.4</td>
<td>$4,000</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S13</td>
<td>Gum Springs Church Rd &amp; Hanks Chapel Rd (E of Pittsboro)</td>
<td>Shared Road</td>
<td>7.8</td>
<td>$3,200</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S14</td>
<td>Hillsboro St (from Launis St to Thompson St) (Downtown Pittsboro)</td>
<td>Bicycle Lane</td>
<td>0.4</td>
<td>$6,600</td>
<td>Potential Road Diet (eliminate parking on one side of street)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(restriping)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S15</td>
<td>Launis &amp; Credle St (Downtown Pittsboro)</td>
<td>Shared Road</td>
<td>0.5</td>
<td>$800</td>
<td>Install “Share the Road” signs (more frequency in urban locations)</td>
</tr>
</tbody>
</table>
## Appendix B: Short Term Network Project Recommendations

<table>
<thead>
<tr>
<th>Project #</th>
<th>Location</th>
<th>Facility Type</th>
<th>Length (in miles)</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S16</td>
<td>Pea Ridge Rd (SE Chatham County)</td>
<td>Shared Road</td>
<td>6.5</td>
<td>$2,800</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S17</td>
<td>Beaver Creek and Farrington Rd South of US 64 (SE Chatham County)</td>
<td>Shared Road</td>
<td>9.8</td>
<td>$4,000</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>S18</td>
<td>US 64 and Big Woods (East of Pittsboro)</td>
<td>Intersection Improvements</td>
<td>N/A</td>
<td>$5,000</td>
<td>Bike actuated traffic signal and markings</td>
</tr>
<tr>
<td>S19</td>
<td>US 64 and Beaver Creek Rd (East of Pittsboro)</td>
<td>Intersection Improvements</td>
<td>N/A</td>
<td>$5,000</td>
<td>Bike actuated traffic signal and markings</td>
</tr>
<tr>
<td>S20</td>
<td>US 15-501 and Mann’s Chapel Rd (NE Chatham)</td>
<td>Intersection Improvements</td>
<td>N/A</td>
<td>$5,000</td>
<td>Bike actuated traffic signal and markings</td>
</tr>
<tr>
<td>S21</td>
<td>US 15-501 and Old Lystra (NE Chatham)</td>
<td>Intersection Improvements</td>
<td>N/A</td>
<td>$5,000</td>
<td>Bike actuated traffic signal and markings</td>
</tr>
<tr>
<td>S22</td>
<td>Mann’s Chapel Rd and Andrews Store Rd (N Chatham)</td>
<td>Intersection Improvements</td>
<td>N/A</td>
<td>$1,600-$2,000</td>
<td>Bicycle awareness signs and bike route directional signage</td>
</tr>
<tr>
<td>S23</td>
<td>NC 751 and US 64 (East Chatham near Wake Co)</td>
<td>Intersection Improvements</td>
<td>N/A</td>
<td>$1,600-$2,000</td>
<td>Bicycle awareness signs and bike route directional signage</td>
</tr>
<tr>
<td>S24</td>
<td>US 64 and Mt Gilead Rd (East Chatham)</td>
<td>Intersection Improvements</td>
<td>N/A</td>
<td>$1,600-$2,000</td>
<td>Bicycle awareness signs and bike route directional signage</td>
</tr>
</tbody>
</table>
## Appendix B: Short Term Network Project Recommendations

<table>
<thead>
<tr>
<th>Project #</th>
<th>Location</th>
<th>Facility Type</th>
<th>Length (in miles)</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S25</td>
<td>New Hope Church Rd (NE Chatham adjacent to American Tobacco Trail)</td>
<td>Car Parking</td>
<td>N/A</td>
<td>$1.2 million</td>
<td>Paved lot for 100 cars</td>
</tr>
<tr>
<td>S26</td>
<td>1 (NE Chatham adjacent to American Tobacco Trail)</td>
<td>Car Parking</td>
<td>N/A</td>
<td>$60,000</td>
<td>Gravel lot for 15 cars</td>
</tr>
</tbody>
</table>

**Cost Assumptions:**

*Note: Cost estimates do not include right-of-way, utility work or necessary bridges.*

- Bicycle Lanes (construction): $500,000 per mile
- Bicycle Lanes (Restriping): $15,000 mile
- Shared Use Path (10 foot paved): $350,000 per mile
- Shared Use Path (unpaved): $50,000 per mile
- Parking: Using existing cost estimates
- Shared Roads (Rural): $400 per mile (1 sign per mile), rounded up to nearest $400
- Shared Roads (Urban): $1,600 per mile (4 sign per mile), rounded up to nearest $400

**Intersection Improvements:**

- Bicycle awareness signs and bike route directional signage: $1,600 : $400 per sign, 4 signs at each intersection
- Bike friendly traffic signal and markings: $1,700 : 2 on-road markings ($75 each), 2 sensor signs and 2 bike crossing signs ($400 each), loop detection sensitivity modification ($3,000)
## Appendix C: Long Term Network Project Recommendations

<table>
<thead>
<tr>
<th>Project #</th>
<th>Location</th>
<th>Facility Type</th>
<th>Length (in miles)</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>2nd Ave</td>
<td>Bicycle Lane</td>
<td>2.0</td>
<td>$30,000</td>
<td>Adequate road width to restripe.</td>
</tr>
<tr>
<td></td>
<td>(Siler City)</td>
<td>(restriping)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>Raleigh Rd</td>
<td>Bicycle Lane</td>
<td>1.5</td>
<td>$23,000</td>
<td>Adequate road width to restripe.</td>
</tr>
<tr>
<td></td>
<td>(Siler City)</td>
<td>(restriping)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>White Oak</td>
<td>Shared Road</td>
<td>0.2</td>
<td>$400</td>
<td>Install “Share the Road” signs (Urban roads more frequent than rural)</td>
</tr>
<tr>
<td></td>
<td>(Siler City)</td>
<td>(Urban)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L4</td>
<td>Alston Bridge Rd</td>
<td>Bicycle Lane</td>
<td>0.6</td>
<td>$300,000</td>
<td>Requires increasing pavement width. May or may not have bicycle pavement markings.</td>
</tr>
<tr>
<td></td>
<td>(Siler City)</td>
<td>(construction)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L5</td>
<td>NC 902</td>
<td>Shared Road</td>
<td>9.7</td>
<td>$4,000</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td></td>
<td>(South of Siler City)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L6</td>
<td>Rives Chapel Rd</td>
<td>Shared Road</td>
<td>5.7</td>
<td>$2,400</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td></td>
<td>(East of Siler City)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L7</td>
<td>Pleasant Hill Rd</td>
<td>Shared Road</td>
<td>7.4</td>
<td>$3,200</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td></td>
<td>(Central Chatham County)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L8</td>
<td>White Smith, Irving Lindley, Woody Store Rd</td>
<td>Shared Road</td>
<td>3.7</td>
<td>$1,600</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td></td>
<td>(Central Chatham County)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L9</td>
<td>Old Graham Rd</td>
<td>Shared Road</td>
<td>5.0</td>
<td>$2,400</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td></td>
<td>(NW of Pittsboro)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix C: Long Term Network Project Recommendations

<table>
<thead>
<tr>
<th>Project #</th>
<th>Location</th>
<th>Facility Type</th>
<th>Length (in miles)</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>L10</td>
<td>Jones Ferry Rd and Lamont Norwood Rd (N of Pittsboro)</td>
<td>Shared Road</td>
<td>4.3</td>
<td>$2,000</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>L11</td>
<td>Old Lystra Rd (NE Chatham near Orange Co border)</td>
<td>Shared Road</td>
<td>1.8</td>
<td>$800</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>L12</td>
<td>Farrington Point Road/ Farrington Mill Rd (NE Chatham Co)</td>
<td>Bicycle Lane (construction)</td>
<td>9.3</td>
<td>$4,650,000</td>
<td>Requires increasing pavement width. May or may not have bicycle pavement markings.</td>
</tr>
<tr>
<td>L13</td>
<td>Old Farrington Rd (NE Chatham Co)</td>
<td>Bicycle Lane (construction)</td>
<td>1.7</td>
<td>$850,000</td>
<td>Requires increasing pavement width. May or may not have bicycle pavement markings.</td>
</tr>
<tr>
<td>L14</td>
<td>NC 751 (NE Chatham Co)</td>
<td>Bicycle Lane (construction)</td>
<td>9.4</td>
<td>$4,700,000</td>
<td>Requires increasing pavement width. May or may not have bicycle pavement markings.</td>
</tr>
<tr>
<td>L15</td>
<td>Big Woods Rd (NE Chatham Co)</td>
<td>Shared Road</td>
<td>6.4</td>
<td>$2,800</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>L16</td>
<td>Tody Goodwin (E Chatham Co near Wake Border)</td>
<td>Shared Road</td>
<td>6.7</td>
<td>$2,800</td>
<td>Install “Share the Road” signs</td>
</tr>
<tr>
<td>L17</td>
<td>Hillsboro St (from US 64 Bypass to Launis St) (Pittsboro)</td>
<td>Bicycle Lane (construction)</td>
<td>1.5</td>
<td>$750,000</td>
<td>Requires increasing pavement width. Should have bicycle pavement markings.</td>
</tr>
</tbody>
</table>
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<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>L18</td>
<td>US 64 W (from US 64 Bypass to NC 87) (W of Downtown Pittsboro)</td>
<td>Bicycle Lane (construction)</td>
<td>2.5</td>
<td>$1,250,000</td>
<td></td>
</tr>
<tr>
<td>L19</td>
<td>NC 87 Bypass (Pittsboro)</td>
<td>Bicycle Lane (construction)</td>
<td>1.0</td>
<td>$500,000</td>
<td>Requires increasing pavement width. Should have bicycle pavement markings.</td>
</tr>
<tr>
<td>L20</td>
<td>O’Kelly Chapel Hill Road (NE Chatham Co)</td>
<td>Bicycle Lane (construction)</td>
<td>2.8</td>
<td>$1,420,000</td>
<td>Requires increasing pavement width. May or may not have bicycle pavement markings.</td>
</tr>
<tr>
<td>L21</td>
<td>US 15-501 (from Orange Co Line to Mt Gilead Church Rd) (NE Chatham, north of Pittsboro)</td>
<td>Bicycle Lane (construction)</td>
<td>5.2</td>
<td>$1,300,000</td>
<td>Requires increasing pavement width. May or may not have bicycle pavement markings.</td>
</tr>
<tr>
<td>L22</td>
<td>Rocky River (Central Chatham)</td>
<td>Shared Use Path</td>
<td>25.0</td>
<td>$1.3 million (unpaved) $8.8 (paved)</td>
<td>Multi Use trail along Rocky River. Trail surface and size has not been determined. From Parks and Recreation Master Plan</td>
</tr>
<tr>
<td>L23</td>
<td>Deep River (SE Chatham County)</td>
<td>Shared Use Path</td>
<td>29.8</td>
<td>$1.5 million (unpaved) $10.5 million (paved)</td>
<td>Multi Use trail along Deep River. Trail surface and size has not been determined. From Parks and Recreation Master Plan</td>
</tr>
<tr>
<td>L24</td>
<td>Haw River (North Central Chatham)</td>
<td>Shared Use Path</td>
<td>21.6</td>
<td>$1.1 million (unpaved)</td>
<td>Multi Use trail along Haw River. Slated to be hiking, mountain bike trail with river access, bare earth with some gravel. From Parks and Recreation Master Plan</td>
</tr>
</tbody>
</table>
### Appendix C: Long Term Network Project Recommendations

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>L25</td>
<td>US 64 Shared Use Path (Between Siler City and Pittsboro)</td>
<td>Shared Use Path</td>
<td>10.9</td>
<td>$3.8 million</td>
<td>Multi Use path along US 64 between Siler City and Pittsboro.</td>
</tr>
<tr>
<td>L26</td>
<td>US 64 Shared Use Path (Between Pittsboro and Wake Co)</td>
<td>Shared Use Path</td>
<td>10.7</td>
<td>$3.8 million</td>
<td>Multi Use path along US 64. Proposed in US 64 Thoroughfare study.</td>
</tr>
<tr>
<td>L27</td>
<td>Southwest Chatham Connector (SW Chatham)</td>
<td>Shared Use Path</td>
<td>3.7</td>
<td>$185,000 (unpaved) $1.3 million (paved)</td>
<td>Multi Use trail adjacent Bonlee Carbonton and NC 42 towards Deep River Trail. Trail surface and size has not been determined. From Parks and Recreation Master Plan</td>
</tr>
<tr>
<td>L28</td>
<td>Moncure Trail (Near Moncure)</td>
<td>Shared Use Path</td>
<td>3.9</td>
<td>$200,000 (unpaved) $1.4 million (paved)</td>
<td>Multi Use trail on abandoned rail alignment. Trail surface and size has not been determined. From Parks and Recreation Master Plan</td>
</tr>
</tbody>
</table>

**Notes:**

*For Long Term Shared Use Paths, lengths are approximate as the routes are under development and meant to help provide an idea of destinations connected and cost estimates.*

**Cost Assumptions:**

*Note: Cost estimates do not include right-of-way, utility work or necessary bridges.*

- Bicycle Lanes (construction): $500,000 per mile
- Bicycle Lanes (Restriping): $15,000 mile
- Shared Use Path (10 foot paved): $350,000 per mile
Appendix C: Long Term Network Project Recommendations

Shared Use Path (unpaved): $50,000 per mile
Parking: Using existing cost estimates
Shared Roads (Rural): $400 per mile (1 sign per mile), rounded up to nearest $400
Shared Roads (Urban): $1,600 per mile (4 sign per mile), rounded up to nearest $400

Intersection Improvements:
Bicycle awareness signs and bike route directional signage: $1,600 : $400 per sign, 4 signs at each intersection
Bike friendly traffic signal and markings: $1,700 - : 2 on-road markings ($75 each), 2 sensor signs and 2 bike crossing signs ($400 each), loop detection sensitivity modification ($3,000
Appendix D: Image Sources

Chapter 1
Vision Picture: Flickr User, Smythe Richbourg
(http://www.flickr.com/photos/tsmyther/3016389320/)

Chapter 2
Figure 2.2: American Tobacco Trail
Wikiedia Commons
(http://upload.wikimedia.org/wikipedia/en/9/95/ATT_chatham.jpg)

Figure 2.3: Old Bynum Bridge
Flickr User, Keith Weston
(http://www.flickr.com/photos/kweston/729558755/)

Chapter 3
Figure 3.1: Wide Paved Shoulders
Source: NCDOT, Bicycle Facilities Guide, Wide Paved Shoulders
(http://www.ncdot.org/bikeped/projectdevelopment/bicycle_project_type/)

Figure 3.2: Wide Outside Lanes
Source: NCDOT, Bicycle Facilities Guide, Wide outside lanes
(http://www.ncdot.org/bikeped/projectdevelopment/bicycle_project_type/)

Figure 3.3: Sharrow in Chapel Hill
Flickr User, townofchapelhill
(http://www.flickr.com/photos/townofchapelhill/5395142979/)

Figure 3.4: Winston Salem Bike Lane
City of Winston Salem, Department of Transportation
(http://www.ci.winston-salem.nc.us/Home/Departments/Transportation)

Figure 3.5: Recommended Trail Dimensions
Federal Highway Administration
http://www.fhwa.dot.gov/environment/sidewalk2/sidewalks214.htm

Figure 3.6 Intersection with turning lanes
Federal Highway Administration, Manual on Traffic Control Devices
http://mutcd.fhwa.dot.gov/htm/2009/part9/part9c.htm#figure9C01

Figure 3.7 Pavement Marking for Bike Actuated Signal
Appendix D: Image Sources

Federal Highway Administration, Manual on Traffic Control Devices

**Figure 3.8: Bicycle Warning Signs**
Federal Highway Administration, Manual on Traffic Control Devices
http://mutcd.fhwa.dot.gov/htm/2009/part9/part9b.htm#figure9B03

**Figure 3.9: U Style Bike Rack**
City of Greensboro, Downtown Greensboro Bike Racks
http://www.downtowngreensboro.org/citylight/go/bike-racks

**Figure 3.10: Bike Friendly Drainage Grate**
Federal Highway Administration, Maintenance of Drainage Features for Safety
http://safety.fhwa.dot.gov/local_rural/training/fhwsa09024/

**Chapter 4**

**Figure 4.1: Share the Road Signage**
NCDOT, Division of Bicycle and Pedestrian Transportation
(http://www.ncdot.gov/bikeped/safetyeducation/signing/default.html)

**Figure 4.2: US 64 – Adjacent Shared Use Path Concept**
NCDOT, US 64 Thoroughfare Study
http://www.ncdot.org/doh/preconstruct/tpb/shc/studies/us64/report/

**Chapter 5**

**Figure 5.1 Example of NCDOT Handout**
NCDOT, Safety Education Materials
www.ncdot.gov/bikeped/safetyeducation/materials

**Figure 5.2 NCDOT Poster Example**
NCDOT, Safety Education Materials
www.ncdot.gov/bikeped/safetyeducation/materials

**Figure 5.3 Bicycle Rodeo in Elizabeth City**
City Elizabeth City, Police Athletic League
http://www.cityofec.com/index.asp?Type=B_BASIC&SEC={88543DA4-0A07-492E-88A8-11BAD7B308D4}&DE={72BC5C54-8E32-4C03-9059-012B409F06A9}

**Figure 5.4 Asheville Strive Not to Drive Poster**
Flickr User, Klein Digital
http://www.flickr.com/photos/kleindigital/4619834458/

**Figure 5.5 Randolph County Bicycle Map**
NCDOT, Division of Bicycle and Pedestrian Transportation
http://dotw-xfer01.dot.state.nc.us/gisdot/DOTBikeMaps/Randolph/randolph.pdf
Appendix: E Literature Review

Appendix: E Literature Review

Literature related to bicycle planning typical focuses on three areas: effectiveness of various interventions on attitudes and travel behavior, recommended elements of plans and its process as well as the prevalence of bicycle and pedestrian plans. This review also looks at studies of the economic benefits of bike tourism and, not unrelated, greenways. Literature on the efficacy of bicycle plans is very limited. This review examines the findings from the literature under each area and evaluates its utility in helping produce a bicycle plan for Chatham County.

Effectiveness of interventions

The debate on effectiveness of bicycling interventions, focusing on the safety impacts of separated versus in traffic facilities is heated. Studies typically focus on the preference and efficacy of using bike lanes (BL) and wide curb lanes (WCL). Stated preference surveys indicate that more people would ride if there were separated bicycle lanes (Rodale Press, 1991). Another study attempted to analyze the comfortability of certain roadway conditions by showing study participants video tape of roadway conditions (Harkey, December 1998). Participants then rated the conditions; in this case, the single biggest impact on comfort rating was in having bicycle lanes at least 0.9 m in width. Having wide curb lanes also improved comfortability, but to a lesser degree. However, other research points to the mixed safety benefits of having separated lanes. Certain studies show that automobiles may, by staying within their own lanes, pass too closely to bicyclists in the adjacent bike lanes (Parkin, 2010).

An FHWA study (Harkey, 1999) looked to bring more data on the subject. The conclusions were mixed. WCLs showed more riding against the traffic, while vehicles moved into the oncoming lane more often on WCL than at BL sites. The study also made several recommendations to improve safety on both types of bike facilities, including eliminating parking within the bike facilities and adding bicyclist warning signs. The study concluded that while both WCLs and BLs are beneficial in improving riding conditions, but BLs can induce more people to ride. A study in Melbourne found that women (who were found to bicycle less than men) preferred off-street, completely separated paths rather than roads without any lanes, or roads with lanes. (Garrard, 2008) Another study (Dill, 2003) that included 43 large cities, found that building
bicycling infrastructure increases bicycling mode share. Specifically, it found that Class II infrastructure (BLs in the study) is much more strongly associated with higher rates of riding than the amount of Class I infrastructure (off street bicycle and shared-use paths).

Improving rider comfort may induce more to ride, but one must look at the safety benefits of infrastructure as well. Researchers analyzed bicycle-motor vehicle accidents in Palo Alto to determine the risk factors that increased accidents (Wachtel, 1994). This study shows that bicyclists travelling against the direction of traffic are at much higher risk of accident than those travelling with traffic; additionally it reports that riding on the sidewalk and bicycle paths has increased injury rates.

Pavement markings efficacy has also been studied. In San Francisco a study analyzed the driver and bicyclist comprehension of shared-use markings (either a chevron with bicycle, bike with arrow, or bike inside an arrow). The study showed that these markings were effective in increasing awareness of the bicyclists; the bike and chevron marking was more likely a driver slow down response than the other markings. (San Francisco Department of Parking & Traffic, 2004).

Adding bike infrastructure sometimes usually requires retrofits to existing roads. Reducing the number of travel lanes and adding street parking, bike lanes, or turning lanes (road diets) have been shown to reduce conflicts and reduce crashes (Burden, 1999). Good candidates for road diets include roads with moderate volumes, popular or essential bicycle routes/links, reinvestment areas, historic streets, main streets. However, there’s political and popular opposition in many areas against reducing traffic lanes. Despite the benefits of improved infrastructure, some research (Moudon, 2005) shows that certain people will use bicycles irrespective of the existing infrastructure. This research suggested, however, that this could be due to the weakness of infrastructure in most locations.

**Recommended elements of plans and process**

State, federal guidance dominates the literature on this subject, rather than scholarly research. While the NCDOT guidelines (spelled out in the Section VI) follow much of the guidelines, several differences exist. The Pedestrian and Bicycling Information Center (PBIC) includes guidance on visioning, fact base generation, corridor prioritization, alternative evaluation and solution selection, design procedures and evaluation and revision of the plan (Pedestrian and Bicycle Information Center, 2010).
In addition, which the NCDOT guidelines do not address, it includes information on incorporating the public’s input into the process.

Victoria Transport Policy Institute (Litman et al, 2009) provides model guidelines and a bicycle plan template. These guidelines include 1) Goals and objectives, 2) Bicycle Network Plan, 3) Design guidelines, 4) maintenance policy and procedures, 5) end of trip bicycle facilities, 6) Capital expenditure plan, and 7) Support programs. These guidelines provide information about potential public involvement techniques, including visioning, brainstorming, planning a charrette, holding public meetings and establishing an advisory committee. The guidelines also include information regarding bicycle facility guidelines. Very importantly these guidelines are referenced to specific standards from American Association of State Highway and Transportation Officials (AASHTO) and the FHWA published Manual on Uniform Traffic Control Devices (MUTCD).

**Bicycle Plans**

In North Carolina, a research study (Evenson, et al. 2009) inventoried the bicycle and pedestrian plans present within the state. They found that as of fall 2008, 30 bicycle plans and 12 combined bicycle and pedestrian plans existed in North Carolina. The vast majority of these plans were on the municipality level. According to the study, this mirrors the NCDOT’s grant program, which only provides funding to municipalities, not counties or MPOs. Only two of the joint plans were at the county level, Alamance County (directly adjacent to Chatham County) and Caldwell County, a county with similar population in western North Carolina. The study found that most plans were in areas with growth (like Chatham) and midsized cities. The vast majority of municipalities and counties, however, currently do not bicycle plans.

Schimek (1997) identified eight dilemmas, several of which are inherent in planning in Chatham County and should be kept in mind during the planning process. He included: 1) inaccurate preconception of bicycling, 2) neglect by professional planners and engineers, 3) the most necessary routes are also dangerous or uncomfortable, 4) bicycles are not considered in the design of roadways, 5) transportation funds focus on capital spending rather than education and encouragement activities, 6) lack of enforcement of both bicyclists and motorists, 7) the unintended effects of facilities (see above on the debate between lanes and off street paths) and 8) too much of a focus on facilities rather than education. Schimek includes possible remedies to these dilemmas,
including building skill base, having better road design, targeting enforcement and bike promotion. This article focused on safety improvements and the general low standing of biking on the infrastructure planning process.

Guidelines include data collection as an integral part of collecting existing conditions as well as future evaluation. An FHWA report (Schneider, 2005) delved into data collection efforts in 29 different communities. The communities collected the data mainly to illustrate to the public the benefits of infrastructure improvements. Many communities, although understanding the benefits, didn't collect data due to staff constraints and a fear that the data would show that too few users on non-motorized facilities. The report highlights the needed coordination between staff members, especially if the collectors of the information do not typically work on pedestrian and bicycle transportation issues.

Accident data, even if collected, may prove inadequate. Data on North Carolina bicycle crashes has been recorded by UNC’s Highway Safety Research Center; the crashes include all reported to the North Carolina Department of Motor Vehicles by law enforcement. Unfortunately, crashes only usually reported when motor vehicles are involved, which may discount a large number of crashes. A study (Stutts, et al, 1999) of emergency room visits due to pedestrian and bicycle crashes found that most bike crashes (70%) didn't occur with motor vehicles, while a third of the crashes occurred off a roadway (sidewalk, trail, parking lot, driveway). Another study in Canada showed that many crashes occur on sidewalks; none of the analyzed crashes these were reported to police (Autman-Hall, Lisa, et al, 1998). This illustrates that the existing crash data is most likely undercounting the actual extent of severe bicycle crashes.

Prioritizing areas intervention areas may require more in-depth data, but research can help more efficiently pinpoint these zones. Sorton (1994) developed a bicycle stress level index by postulating that bicyclists look to minimize conflicts with motorists and other road users. By interviewing bicyclists viewing a videotaped road conditions, the researchers developed a one to five stress scale based on roadway variables (i.e. speed, volume, curb lane width). The FHWA (Carter, et al, 2006) has also developed intersection safety index model which can be used to judge the relative safety of intersections for pedestrians and bicyclists. A modified Rural Bicycle Compatibility index (RBCI) was created using Nebraska rural roads as a study area (Jones, 2003).
Appendix: E Literature Review

study found differences between the model created in urban environments and the unique characteristics of rural roads. These tools are useful for creating priorities for projects with limited time and resources.

Researchers have developed LOS guidelines for bicycling. A LOS used real-time bicycling perception to calibrate a model based on actual urban traffic and roadway conditions with a fairly high strength of association (Landis, 1997). The LOS index found that pavement conditions and bike lane striping is very important in terms of LOS perception by bicyclists. Another LOS (Patten, 2006) for shared-use paths used four inputs (trail width, traffic volume, mode split, and presence of centerline striping). The weighting of the inputs illustrate that trail width has the largest impact on LOS; over 15% road usage by non bicyclists as well as inclusion of a centerline also negatively affects LOS. These LOS guidelines can be used to quickly assess the bicycling potential of roads and off-street facilities, but only if geometry and modal share data has already been collected.

Facility design and infrastructure manuals

Organizations have produced a multitude of design manuals and guides to assist planners and engineers in improving bicycling infrastructure. AASHTO’s 1999 Guide for the Development of Bicycle Facilities (AASHTO, 1999) includes information regarding design of shared roadways, bike lanes, turning lanes and shared use paths. The data is not too technical, as it defers to “state and local” guidelines for the specific facilities, but includes simplified facility cross-sections. The Guide, as well as many other publications, refers to the Manual on Uniform Traffic Control Devices (MUTCD), which prescribes, among other details, sign placement and design, including positions vis-a-vis intersections, and usage (Manual on uniform traffic control devices, 2003). This manual is much more specific (down the exact color number required) than the AASHTO guidelines, but it very useful for installation of signage and pavement markings when local and state implementers have no specific experience.

Potential infrastructure might include rails with trails. Rails with trails are shared-use paths adjacent to active or rail corridors. An FHWA report (Birk, et al, 2002) focuses on the development of the rails with trails, including the assessment of potential benefits, concerns with railroads (especially liability mitigation), design issues including setback, crossings and operation and maintenance issues.
**Bike Tourism**

County commissioners are excited about the prospect of promoting bike tourism. The economic benefits of this have been documented in North Carolina’s Outer Banks (Lawrie, 2004). Seventeen percent of the tourists to the area spend time biking, and a third of these indicated that biking was important factor in choosing the Outer Banks to visit. But how do areas attract bicyclists? A New Zealand study showed that bicycle tourists place importance on infrastructure, promotion and information dissemination, but seek remote areas (Ritchie, 1998). Other guidelines for attracting tourists include infrastructure improvements, marketing (free maps, website) and coordination with businesses (Hughes, n.d).
Appendix: E Literature Review

Reference List


Hughes, Chris. (n.d.) Promoting Mountain Bike Tourism, International Mountain Biking Association. Available:
http://www.imba.com/resources/research/economics/tips-promoting-mountain-bike-tourism.


Klop, Jeremy, and Asad Khattak (1999). Factors influencing bicycle crash severity on two-lane, undivided roadways in north carolina. Transportation Research Record: Journal of the Transportation Research Board 1674 (-1) (01/01/): 78-85, Available: http://dx.doi.org/10.3141/1674-11


Parkin, John, C. M. (2010, January). The effect of cycle lanes on the proximity between motor traffic and cycle traffic. Accident Analysis & Prevention, 42(1), 159-165.


Appendix: E Literature Review


