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Executive Summary

The Town of Morehead City, affectionately known as the Heart of the Crystal Coast, is located on the US 70 corridor and has the largest population of any municipality in Carteret County. Morehead City is home to one of the two seaports in North Carolina and supports a burgeoning tourism and fishing industry. The expected population and development surge as well as recent bicycle safety concerns make this the right time to begin examining a comprehensive bicycle system for Morehead City. The purpose of this planning effort is to increase bicycling trips, improve bicycle access and transportation options, assess current conditions, initiatives, and opportunities in the area, and understand and meet the needs of the public. In order to realize this role, a vision for the *Comprehensive Bicycle Plan* was developed including establishing connections with Atlantic Beach, Beaufort, and Carteret County, updating local ordinances to accommodate bicycles, promoting bicycle awareness, and involving partners such as the NCDOT and the Sherriff's Department, Police Department, and Highway Patrol to promote education and safety programs in Morehead City. From this vision, a set of goals and objectives was created as outlined in **Chapter 1**.

In order to truly have a *Comprehensive Bicycle Plan*, aspects such as policies, guidelines, programs, and ancillary facilities must be considered in addition to route improvements. This plan makes recommendations for modifications to the Morehead City municipal code and provides sample cross-sections for incorporating bicycle facilities into future road development. **Chapter 3** also provides examples of various roadway treatments such as signing, striping, and roundabouts.

Ancillary facilities such as bike racks, signal clearance loops, bicycle maps, restrooms, and water fountains are important to consider when creating a more bicycle-friendly community. These facilities will make the Morehead City area more appealing for both local and tourist bicyclists. These facilities are discussed in **Chapter 3**.

Education, encouragement, and enforcement programs are critical to the success of the *Comprehensive Bicycle Plan*. This plan proposes a wide variety of programs that give the Town a range of alternatives. Education programs such as bike rodeos, school-based bike education, and public service announcements are recommended to educate children and adults, bicyclists and drivers. Enforcement programs should be instituted that regulate the behavior of both bicyclists and drivers. Positive re-enforcement such as reward coupons for following the rules of the road are also a great way to make children aware of correct behavior. Encouragement programs such as rideabouts, Safe Routes to School, Walk and

Bicycle to School Days, bike mentor programs would promote bicycling in all segments of the population. More information on these programs is included in **Chapter 4**.

There are limited existing bicycle facilities in Morehead City. Morehead City currently has one designated bicycle route, a 10-foot wide multi-use path that runs on the north side of Bridges Street. The path begins at West Carteret High School and continues east until it terminates at the intersection with 35th Street. This path is separated by a verge of variable width from the road and includes striped crosswalks across all intersections and driveways it crosses. Connectivity is provided by this facility, linking schools, shopping, parks, and health services. However, the path itself is not part of an interconnected bicycle network and terminates abruptly at either end. This route is discussed in **Chapter 2**.

The *Comprehensive Bicycle Plan* seeks to improve upon the existing bicycle network by proposing a recommended set of routes and facility types and establishing priorities and cost estimates for each. In addition, a barrier analysis was conducted for a set of six barriers consisting of bridges, major routes, and railroad crossings. This analysis, shown in **Chapter 2**, examines mitigation measures for each area that were ultimately incorporated into the route recommendations and cost estimates.

Using input received from the Bicycle Advisory Committee and a day-long public charrette, a set of recommended routes was assembled. These routes and their corresponding facility types are detailed in **Chapter 4**. **Table 4.1**, included here, breaks out each route by facility type, total length, and total estimated cost. This table also includes the total length for each facility type in the network as well as the total estimated cost for the entire network. The routes cover a large portion of Morehead City and its extra-territorial jurisdiction and also make connections with Atlantic Beach, Beaufort, and Carteret County. These routes also make connections to major destination points in the area such as schools, commercial areas, parks, government facilities, and neighborhoods. If this plan is implemented, over 95% of the local population would have access to bicycle facilities that would be suitable for basic as well as more advanced riders.

After a comprehensive set of policy, program, and route recommendations was established, the next step was to look at implementation strategies. Route priorities were developed by attempting to maximize the benefits to a range of geographical areas and user groups in the community. Specific projects represent on-road as well as off-road facilities. Bicycling initiatives and program priorities were developed based on their ease of implementation and benefit received by the largest contingent of population. Implementation strategies for these projects were examined and are outlined in **Chapter 5**.

One of the primary purposes of the *Morehead City Comprehensive Bicycle Plan* is to communicate the framework for the future bikeway network and ancillary facilities. This plan conveys a concept of a system of bikeways that works to provide an interconnected loop network. Only through the adoption of local policies and programs, state programs, and private contributions can the incremental construction of bikeway facilities effectively occur. With this in mind, it will be important for Morehead City to identify funding sources to implement the recommendations of this plan. While some projects and programs will be funded by the Town, many other ways are available to provide financial support for improving local bicycling conditions. **Chapter 5** discusses potential funding measures in more detail.

Three levels are used to classify the priority level of each route: **short-term, mid-term, and long-term** improvements. The total probable construction cost of the bicycle projects for the plan (in 2006 dollars) is $13,500,000, representing more than 43 miles of bikeways. *Short-term* improvements are those projects that are recommended for or can be completed within a five-year period. The total probable construction cost for the short-term projects is $1,400,000. *Mid-term* improvements are expected to occur between five and ten years into the future, for which $2,900,000 in projects is recommended. *Long-term* improvements are those projects that fall outside of a 10-year horizon for which a total of $11.8 million in projects is presented. **Table 4.1** provides more information regarding these routes and **Appendix 1** provides detailed route cost estimates.

Table 4.1 Route and Network Characteristics

Routes	Signed Route	Striped Bike Lane	Paved Shoulder	Multi-Use Path	Length (miles)	Cost
Boardwalk Loop	✓		✓		6.3	$2,000,000
Country Club Loop			✓		7.1	$3,400,000
Mansfield Park Loop	✓				3.2	$9,000
Promised Land Loop	✓				3.1	$4,000
Prosperity Loop			✓	✓	7.6	$4,100,000
Swinson Loop	✓		✓	✓	7.3	$3,000,000
Crosstown Connector		✓			2.7	$155,000
Morehead-Beaufort Connector				✓	3.6	TBD
Waterfront Connector	✓			✓	4.5	$1,000,000
Total* (length in miles)	11.6	2.7	16.3	12.8	43.3	$13,500,000

The North Carolina Department of Transportation is credited for beginning the bicycle planning program in North Carolina and for project participation in this plan. Special thanks go to the NCDOT Division of Bicycle and Pedestrian Transportation and Transportation Planning Branch for providing funding and support to this effort.

Chapter 1 — Introduction

Vision

The Town of Morehead City, affectionately known as the Heart of the Crystal Coast, is located on the US 70 corridor and has the largest population of any municipality in Carteret County. Morehead City is home to one of the two seaports in North Carolina and supports a burgeoning tourism and fishing industry. In the Main Street Vision Forum conducted in 2001, a vision was set forth for downtown Morehead City to become the cultural hub of the Crystal Coast. This vision, included in the box to the left, confirms the community's desire to improve the quality of life for its residents by creating an environment less focused on the automobile and more on pedestrians and bicyclists. However, natural and manufactured barriers such as US 70 and the numerous bridges in the area continue to pose challenges for bicycle travel. The expected population and development surge as well as recent bicycle safety concerns make this the right time to begin examining a comprehensive bicycle system for Morehead City. The Town of Morehead City's vision for the *Comprehensive Bicycle Plan* includes:

In 2006, Downtown Morehead City is the cultural hub of the Crystal Coast…

… It serves as the center for shopping, dining, fishing, diving, the arts and entertainment. An eclectic but cohesive architectural design is evident throughout Downtown. The friendly area provides a historical residential neighborhood, and an active and vibrant waterfront and commercial district. Year-round attractions, restaurants and events offer a wide variety of daytime and evening activities in a culturally diverse, small fishing-town atmosphere. Specialty shops and cafes serve the needs of visitors and local residents. Tree-lined streets with benches and convenient parking make shopping in the specialty retail stores a walkable and pleasant experience. An eco-trail system on Sugar Loaf Island offers insight into our coastal environment.

- Developed January, 2001 at Main Street Vision Forum in Morehead City -

- A safe and convenient system that connects with the adjacent communities of Atlantic Beach and Beaufort
- An increase in bicycle awareness through strong public outreach programs, bicycle advocacy groups, and educational programs
- Local ordinances and design standards, so that future development is bike-friendly
- The involvement of partners (such as the NCDOT Division of Bicycle and Pedestrian Transportation, the NCDOT Transportation Planning Branch, and the Morehead City Police Department) in education and safety programs like helmet laws, bike laws, and Safe Routes to School programs

History

Benefits of Bicycling

Today, bicycling as a primary means of transportation is widely popular in densely populated cities around the world. Sometimes commuters find cycling more efficient, affordable, and convenient than traveling by automobile on congested urban streets. Although most people choose to travel by automobile in the United States, bicycling is still the first — and sometimes the only — choice for some people.

Bicycling is recognized to be an appealing alternative to traveling by car because of the benefits it offers, including:

- **It represents the "livability" of a place.** Being able to reach a destination via bicycle gives people another alternative when choosing a travel mode. It combines the functionality of actually getting there with the benefits of exercise and recreation. In places where residents are regularly seen outside walking or bicycling, visitors feel a sense of community and safety there. A town with great "livability" constantly attracts new residents and businesses. In addition, captive riders have enhanced travel options in an area that has good bicycle system interconnectivity.
- **It is environmentally-friendly.** Cyclists power the machines themselves and do not use fossil fuels. Since bicycles do not release polluting emissions into the air and run on gears versus engine power, neither air nor noise quality is negatively impacted.
- **Bicycling promotes good health practices.** The United States Surgeon General advises Americans to get 30 to 60 minutes of exercise four to six times each week. Bicycling is a low-impact way to exercise and can improve a person's health by lowering blood pressure, strengthening muscles, lowering stress levels, increasing the size, strength, and efficiency of the heart and cardiovascular system, burning fat, and increasing metabolism.
- **The economics of bicycling make sense.** According to the *Consumer Expenditures Annual Report* conducted by the Bureau of Transportation Statistics, typical American households in 2004 spent an average of $7,801 on transportation costs, including insurance, repair, maintenance, fuel costs, taxes, and other fees — a significant annual investment.[1] The average cyclist spends only $120 per year on bicycle costs. Choosing to ride a bicycle versus the bus or personal automobile could save one person thousands of dollars in a single year.
- **Bicyclists can generally avoid traffic congestion.** Since a bicycle only takes up about a quarter of the physical space that the average car does, cyclists can maneuver more easily through traffic in urban areas. Often, cyclists can use dedicated bicycle lanes or greenways, which allow for an even more efficient trip.
- **It is easy.** According to the 1995 National Personal Transportation Survey[2], analysts found that approximately 40 percent of all trips made are less than two miles in distance from origin to destination. Most bicyclists can make that level of trip in approximately ten minutes.

Types of Cyclists

In order to develop an appropriate bicycle element of a transportation plan, the following "ABCs" of cyclists need to be understood.

[1] Bureau of Transportation Statistics (BTS). *Consumer Expenditures Annual Report*, 2004, http://www.bls.gov/cex/csxann04.pdf,
[2] Bureau of Transportation Statistics (BTS), *National Personal Transportation Survey*, 1995, http://www.bts.gov/programs/national_household_travel_survey/.

Advanced Cyclists — These are usually experienced cyclists who have the ability to safely ride under more typical thoroughfare conditions of higher traffic volume and speed. This group of cyclists generally prefers shared roadways as opposed to striped bike lanes and paths. Although surveys show this group represents only about 20 percent of all cyclists, they also show that these cyclists ride about 80 percent of the bicycle miles traveled yearly. With monthly street sweeping of gutter debris, advanced cyclists typically accept striped bike lanes.

Basic Cyclists — These cyclists are casual or new adult and teenage riders less secure in their ability to ride in traffic without special accommodations. They typically prefer bike paths and bike lanes on collector or arterial streets with less exposure to fast-moving and heavy traffic. Surveys of the cycling public indicate that 80 percent of cyclists can be categorized as basic cyclists.

Child Cyclists — This group, which is a subset of the basic cyclists, includes children (aged 12 and under) on bicycles who have a more limited field of vision as they ride. This group generally keeps to neighborhood streets, sidewalks, and greenways. When children venture out onto busier roadways, they typically stay on sidewalks or bicycle facilities that keep them safely away from traffic. Given the comfort level of these cyclists, it is recommended that areas in Morehead City lacking bike lanes allow children and other cyclists who are uncomfortable riding in traffic to ride on sidewalks with the requirement that they yield to pedestrians. Cyclists, not unlike drivers, generally become more experienced over time and miles of riding. As cyclists ride and gain more experience operating in traffic, they eventually graduate from the classification of a basic cyclist to an advanced cyclist more capable of operating under typical roadway conditions.

In Morehead City, three distinct groups are representative of the majority of the bicycling population. Captive riders are those without access to a motor vehicle who as a result rely on bicycling, transit, and foot travel to get around. These groups are primarily situated within the city limits in the neighborhoods surrounding the downtown. A subgroup of these riders is composed of sailors who typically travel by foot or by bicycle in order to purchase supplies while in port. The next group consists of recreational riders, who may not be long-distance or advanced riders, but are interested in bicycling for exercise or as an occasional outdoor activity. As a part of this group, there is a contingent of the ridership in Morehead City that consists of visitors who want to ride for pleasure. The third group represented in Morehead City consists of more serious riders, who ride long distances and often ride in touring groups. Morehead City is home to many serious riders due to its favorable terrain and climate. Bicycling groups and focus areas are discussed in more detail in **Chapter 3**.

Bridges Street Multi-Use Path

The Bicycle's Role in Morehead City: Plans, Projects, and Citizen Initiatives

Morehead City lies on an area originally known as Shepard's Point. In the early 1850s, a group of investors including North Carolina Governor John Motley Morehead purchased 600 acres of what is now downtown Morehead City in order to construct a port and tie it in by rail to Goldsboro. Morehead City was incorporated in 1860 with a population of 300. Morehead City underwent periods of decline during the Civil War, Great Depression, and World War II that contributed to the decline of the downtown area. However, a Community Block Grant in the 1980s and subsequent local funding efforts have re-established the downtown as an attractive area with many destination points. Morehead City now has a population of more than 7,500.

Previous efforts by the citizens and officials reinforce the belief that Morehead City is committed to promoting bicycling. In the 1999 Comprehensive Parks and Recreation Master Plan, the number one priority identified was the need for non-vehicular means of transportation routes, i.e. bicycles and pedestrian trails. The 2004/2005 CAMA Land Use Plan included policy statements that mirror the Comprehensive Parks and Recreation Master Plan. The most notable example of the desire for a bicycle network in Morehead City is the multi-use path that runs along Bridges Street. The idea for this facility began with a high school student who expressed a desire to be able to safely ride his bicycle to school. From this, the town began investigating and applying for funding sources, and won an enhancement grant to construct the path. The result is an approximately 1.5-mile long facility regarded by many in the community as the standard to which future facilities should be designed.

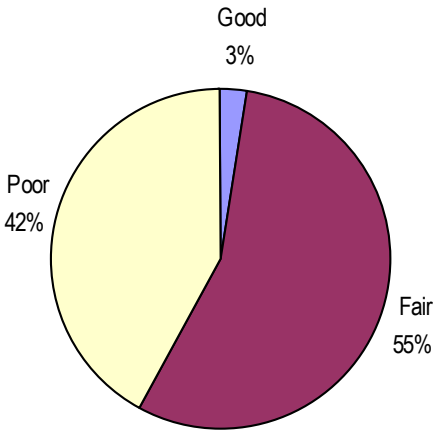
Table 1.1 Bicycling Purposes for Survey Respondents

Bicycling Purpose	Number	Percent
Commute to Work/School	13	16.7%
Run Errands	25	32.1%
Shopping Trip	13	16.7%
Physical Exercise	53	67.9%
Recreation	49	62.8%
Visit Neighbor/Family/Friend	29	37.2%

Goals and Objectives

Through regular meetings with an advisory committee and a charrette process, the public expressed their interests in the bicycle plan's goals and objectives. A survey was developed for the public involvement process (additional information is provided in **Appendix 2**), and results from this as well as key stakeholder meetings and other public input were considered while developing a set of goals and objectives. The survey indicated that 55% of the 78 survey respondents considered themselves to be advanced riders. It is likely that this statistic is more representative of the type of rider that participated in the public involvement process than it is of the actual makeup of rider skill levels in Morehead City. When asked why they bicycled, survey respondents overwhelmingly rated physical exercise and recreation as their number one reasons. However, a significant number of people also rated utilitarian uses such as visiting friends and family or running errands as major bicycle uses. Work, school, and shopping trips were also listed as bicycling purposes by a smaller number of respondents. These results can be seen in **Table 1.1**.

Figure 1.1 Overall Bicycle Conditions



Overall, 42% of all survey respondents rated the bicycling conditions in Morehead City as poor. An additional 55% of respondents rated conditions as fair (See **Figure 1.1** for full results). This indicates that programs, policies, and facilities should be put in place in an attempt to make the bicycling environment more user-friendly.

As a result of this input, a set of short- and long-range goals was prepared to use as a guide when developing the *Comprehensive Bicycle Plan*.

Short-Range:

- Increase the number of people who regularly bicycle
- Identify and implement a cost-effective pilot project to spur interest in bicycling
- Organize periodic events that encourage new riders and promote safety (e.g., rideabout or bicycle rodeo)
- Pursue funds to construct high priority facilities

Long-Range:

- Increase public awareness of bicycling as a viable mode of travel
- Promote rights and responsibilities of bicyclists, pedestrians, and motorists in a shared transportation network while improving safety and enforcement
- Ensure bicycle accommodations are considered in the bicycle plan in a balanced approach with education and enforcement programs
- Provide solutions for safe crossing opportunities of major natural and manufactured barriers, in particular US 70 and the bridges in this area
- Modify public policy to include provisions for bicycles through design standards, education initiatives, and enforcement and encouragement programs
- Create additional physical activity opportunities in Morehead City, increasing physical and mental wellness and improving air quality
- Provide improved opportunity and access for bicycling to all residents and visitors
- Encourage the design, finance, and construction of transportation facilities that provide safe, secure, and efficient linkages for bicyclists throughout the Town
- Provide safe and efficient bicycle connectivity between neighborhoods, businesses, and recreation areas
- Encourage safe riding practices on roads and paths
- Promote the development of seamless transitions for all bicycle facilities crossing over the town limits

Scope and Purpose of Plan

Scope

The *Morehead City Comprehensive Bicycle Plan* cannot exist in a vacuum. As a result, significant consideration was given to several influential factors. Some of these key factors include:

1. Providing good access and safe routes to the downtown cultural and commercial area
2. Coordinating bicycle plan activities with the improvements being made at the Port and at Radio Island; in particular, as they relate to bridge improvements
3. Linking Morehead City with Beaufort, Atlantic Beach, and Carteret County
4. Coordinating with NCDOT and state officials to make sure that bicycle provisions are accounted for in future improvements to major facilities like NC 24 and US 70

This bicycle plan focuses on both on-road and off-road facilities within the study area — the extra-territorial jurisdiction limits of Morehead City. The study area is shown in **Map 1.1**.

This plan addresses several issues. It considers the plans and statutes already developed that would impact bicycling in the community, the expectations of current members of the community, federal and state regulations, and financial constraints and opportunities. It is intended to serve as a master plan for investments of local, state, and federal monies.

Purpose

The purpose of this planning effort is to increase bicycling trips, improve bicycle access and transportation options, assess current conditions, initiatives, and opportunities in the area, and understand and meet the needs of the public.

To do this, the plan looked at bicycling trip characteristics, transportation priorities, safety considerations, barriers to bicycling, and the needs of special populations. This plan identifies long- and short-range project and program priorities by integrating the plan with other state, regional, and local planning initiatives, implementing existing local, state, and federal policies and guidelines, identifying high-priority transportation improvement projects, and integrating with other transportation modes.

Insert Map 1.1 Study Area

The plan provides standards and guidelines for the development of bicycle facilities and outlines strategies for raising community awareness of bicycle needs and issues. In addition, the comprehensive bicycle plan includes an implementation plan that identifies tasks and involves state, regional, and local agencies, elected officials, advocacy groups, and public/private partnerships. It includes implementation strategies, including recommendations for projects, policies, funding, staffing/committees, local ordinances, and program initiatives.

The vision of a well-connected, financially feasible bicycle system in Morehead City can become a reality. The *Morehead City Comprehensive Bicycle Plan* is intended to serve as a tool, guiding the future success of implementing Morehead City's bicycle facilities.

This plan includes descriptions of several key plan components. These components, critical to making a plan successful in terms of being able to be implemented, are addressed within the following chapters:

- Evaluating Current Conditions and Existing Plans, Programs, and Policies
- Developing Bicycle System Plan, Facility Standards and Guidelines, and Ancillary Facilities and Programs
- Project Development, Recommendations, and Implementation Plan

The North Carolina Department of Transportation is credited for beginning the bicycle planning program in North Carolina and for project funding and participation in Morehead City.

Chapter 2 – Existing Conditions

Chapter 1 highlights the benefits of bicycling, describes the bicycle user groups, and outlines the goals and objectives set for this study. This chapter will discuss existing bicycling conditions, look at the current bicycle-related statues and ordinances in Morehead City, and major barriers to safe bicycle travel in the area.

Existing Bicycle Facilities

Bridges Street Multi-Use Path

Morehead City currently has one designated bicycle route. This route is a 10-foot wide multi-use path that runs on the north side of Bridges Street. The path begins at West Carteret High School and continues east until it terminates at the intersection with 35th Street. This path is separated by a verge of variable width from the road and includes striped crosswalks across all intersections and driveways it crosses. Connectivity is provided by this facility, linking schools, shopping, parks, and health services. However, the path itself is not part of an interconnected bicycle network and terminates abruptly at either end. Extension of this multi-use path would be difficult as a result of the encroaching commercial and residential development to the east of the existing corridor. However, other facility types for this extension are discussed in **Chapter 4**.

Information about this facility and other streets in the road network was collected as part of a data collection effort at the outset of this plan. Morehead City already had an extensive set of data developed as a part of a study by the Institute of Transportation Research and Education (ITRE) at North Carolina State University[1]. This data included information such as pavement width, presence of curb and gutter, and presence of sidewalks. In addition to this, field data was collected to determine the presence of shoulders along with shoulder types and widths. Analysis of this data allows recommendations to be made that will best fit the terrain and be most cost-effective.

Portions of the street network in Morehead City are conducive to bicycling. The collector and local street network is lower volume, but most roads in the study area do not include shoulder sections. The lack of shoulder is especially a problem for higher level roads, since the shoulder provides an added measure of comfort for the bicyclist and a potential refuge area. In addition, US 70 and NC 24 are two high level roadways lacking bicycle facilities that serve as barriers in the study area.

[1] Institute of Transportation Research and Education, Town of Morehead City Pavement Management System Database, Raleigh, NC, November 2003.

Bicycle Statutes and Ordinances

The Unified Development Ordinance (UDO) of the Town of Morehead City makes very few references to bicycle facilities. Bikeways and greenways fall under the designation of sidewalks in this ordinance, but no standards or regulations are set for their use. On sidewalks not fitting those descriptions, bicycling is not technically permitted. The ordinance is also unclear regarding right-of-way and roadway widths for varying street types. In most cases, Morehead City adheres to the state design standards. The North Carolina Department of Transportation uses a 12-foot lane width as its standard. Future street standards recommended for implementation by Morehead City for roadways maintained by NCDOT must receive design approval prior to their implementation.

It is recommended that Morehead City establish its own set of street and right-of-way standards. This will enable the Town to develop road cross-sections and design features favorable for bicycle and pedestrian travel. These will prove invaluable when discussing the responsibilities of future developments.

Current Programs and Initiatives

Morehead City has a limited number of bicycle programs that promote awareness and encourage safety in the community. Currently, the community has no proactive enforcement of bicycle regulations. The police department conducts bicycle rodeos once annually at the middle and high schools, performed by each school's safety officer. The department also owns two bicycles for police officers, which are used for special events. At this time, Morehead City has no formal training for bicycle police officers.

Safety and Barrier Analysis and Recommendations

Recent events have produced some serious concerns about bicycle safety in the Morehead City area. In January 2006, two separate bicycle fatalities occurred in Morehead City. One of these fatalities occurred as a bicyclist attempted to cross NC 24 by the Brandywine neighborhood, and the other occurred on a side road near Country Club Road. In both instances, the bicyclist failed to yield the right-of-way to an oncoming automobile. These fatalities stress the importance of educating drivers and cyclists and providing safe travel areas for bicyclists.

Bicycle crash data for the Town of Morehead City was obtained from the NCDOT Division of Bicycle and Pedestrian Transportation for a five-year period between 2000 and 2004. During this time period, a total of 20 bicycle crashes were reported, with the maximum number of crashes reported in one year recorded as seven in 2002. These crashes were evenly divided between being intersection related and non-intersection related. Interestingly, almost 70% of crashes occurred on local city streets, with only one crash recorded on a US Route and a NC

Route. Thirty percent of all bicycle crashes in Morehead City involved a bicyclist under the age of 20. However, most of these crashes involved middle-aged people, with only one crash involving an individual over the age of 69. It should also be noted that the frequency or characteristics of bicycle crashes can be misrepresented in crash statistics, since these crashes are often either not reported to the police or the specifics of the crash are not recorded.

A potential reason for some of these bicycle crashes could be the conflict with barriers in the system. The bicycle network should be well-connected with facilities and amenities that are easily accessible and safe for bicyclists. Every system-wide plan, however, presents inherent obstacles to safe travel. This section addresses key locations throughout Morehead City that create barriers or present obstacles to bicyclists. Typically, these barriers include topographical features such as rivers, railroads, or other impediments. This section identifies specific barrier locations, describes the conditions that prevent safe bicycle travel in these locations, and makes specific recommendations to remove these barriers to bicycling. In such cases, providing a facility to overcome a barrier can create new opportunities for bicycling. The following information addresses safety issues and locations identified by the Bicycle Advisory Committee (BAC) members, the citizens attending the public design charrette, and the consultants.

Some of the barrier types identified by local staff, the consultants, and the public include:

- Narrow shoulders (less than two feet) on several two-lane roads throughout the community including facilities such as Old Airport Road, 20th Street, and Country Club Road

Country Club Road

20th Street

- Railroad crossings unsafe or skewed at dangerous angles

Arendell Street

Bridges Street

- Lack of adequate and debris-free shoulders on bridges

Atlantic Beach Causeway Bridge

Grayden (Gallant's Channel) Bridge

- Major intersections with limited or no special provisions for bicyclists (e.g. crosswalks, bike lanes, bike detectors, signage, etc.)

Arendell Street at 35th Street

Penny Lane at Bridges Street

- Poorly maintained pavement and un-usable shoulders

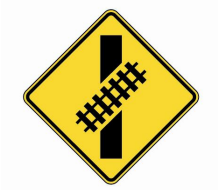
20th Street

Bridges Street

In an effort to address some of these critical barriers within the Morehead City study area, a field investigation was conducted to determine cost-feasible opportunities for providing bicycle improvements along these facilities. Six barrier locations were selected by the project team based on comments received from the public at the design charrette, their proximity to other bicycle facilities, and their importance to bicycle connectivity. Below is listed a synopsis of the existing conditions at these locations, as well as recommendations for bicycle-related improvements.

1. North Carolina Railroad at Old Airport Road and Bridges Street

At-grade North Carolina Railroad (NCRR) crossings occur throughout the Morehead City area. Flange spacing along the tracks can be troublesome for cyclists if they are too wide. Sharp track angles relative to the roadway also can create problems as the bicycle tires, especially those of narrow-tired road bikes, can become wedged between the pavement and the track. (Specific issues related to the railroad tracks located within the center median of Arendell Street are addressed later in this chapter.) Those roadways that cross the railroad tracks at-grade present a potential challenge to bicyclists who have to negotiate crossing the tracks while competing with vehicles for safe right-of-way. While experienced bicyclists may understand how to safely navigate these crossings, the indecision or trouble of less experienced riders may pose safety concerns.



Recommendations:

- Install a bicycle-friendly casing for the railroad tracks at the roadway crossing to reduce the width of the flangeway gaps that bicyclists must cross over. This casing should extend beyond the recommended shoulder of the road.
- Add high-visibility yellow-green Skewed Tracks warning signs to the roadway in advance of the railroad crossing to alert bicyclists to the potential hazard.

- At locations with an angled track crossing, add extra shoulder pavement at the crossing to allow bicyclists to cross the railroad with their wheels perpendicular to the tracks and stripe the new shoulder pavement area at the railroad crossing to direct bicyclists to cross the railroad tracks with their wheels perpendicular to the tracks.

Old Airport Road

Bridges Street

Bridges Street

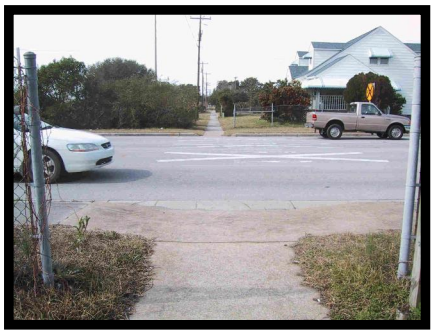
2. Atlantic Beach Bridge (Causeway)

The Causeway is the only means for direct access to the Atlantic Beach areas. Currently, the bridge has adequate shoulder width of four to five feet, 54-inch standard bicycle-safe railings, and a posted speed limit of 45 mph. However, debris such as clam shells, trash, metal objects, and rubber from tires continue to confront bicyclists trying to cross the sound.

Atlantic Beach Bridge

Recommendations:

- Perform regular maintenance to clear debris from the paved shoulder area along the entire length of the Causeway
- Add high-visibility yellow-green "Share the Road" warning signs to the Causeway to alert drivers to the presence of pedestrians and bicyclists
- Provide additional pedestrian level lighting to improve bicyclist and pedestrian visibility at night
- Consider lowering the speed limit on the bridge to 35 mph in order to match the speeds on the Morehead City and Atlantic Beach sides.



Evans Road sidewalks

The entrance to the Atlantic Beach Bridge is also a difficult area for bicyclists. The crossing with Evans Road currently poses a safety hazard for bicyclists due to the lack of crosswalks. The connection with Evans Road at this location has been terminated, leaving only the sidewalks that used to run along both sides of the road. One of these sidewalk connections should be terminated in order to channel bicycles and pedestrians to a centralized crossing location. It is recommended that a flashing light be installed on the southbound bridge approach to warn motorists of pedestrians or bicyclists crossing at the crosswalk. This light should not be flashing all the time but rather should be bicyclist-activated. While not guaranteeing the pedestrian or bicyclists' safety in the crossing, it will help make oncoming drivers more aware of their presence. In addition, a crosswalk should be striped and appropriate warning signage should be placed on both approaches to notify motorists of a crossing ahead. This will ultimately produce a safer crossing area that can serve as a connection for the proposed bicycle system network.

3. Existing Bridges Street Multi-Use Path

The new multi-use path is an amenity that has been well received by the Morehead City community. It connects West Carteret High School to 35th Street by way of Bridges Street. Users from beginners to experienced cyclists and pedestrians use this facility on a daily basis to access shopping and residential areas along the corridor. However, at its 35th Street terminus, the multi-use path abruptly ends. From this point, eastward progress along existing Bridges Street is hampered by the narrow right-of-way and the presence of above ground utilities. After an evaluation of the connection, it was determined that a continuation of the multi-use path would be the preferred option. **Chapter 4** shows recommendations for other connections that would link this proposed multi-use path to a greenway around the visitor center and Carteret Community College, and to bicycle lanes along Arendell Street. As a result, this connection is vital to overall system interconnectivity.

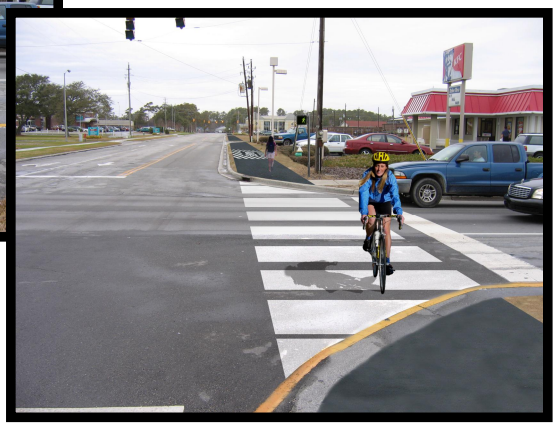
Existing Bridges Street multi-use path

Recommendations:

- Stripe crosswalks and install countdown signals at all approaches at the intersection of Penny Lane and Bridges Street. A stop bar should also be clearly marked on this road to indicate where motorists should stop to stay clear of the multi-use path.
- Install "Stop Here on Red" and "Yield Here to Pedestrians" signs to indicate to vehicles where they should stop in order to not block the multi-use path
- Install pedestrian count-down signals at the intersections of Bridges Street and Penny Lane and at Bridges Street and Friendly Street in order to improve ease of crossing for multi-use path users. Prohibiting right turns on red at Penny Lane may also help to create a safer bicycling environment
- Continue the 10-foot multi-use path southbound along the east side of 35th Street, through the intersection of Arendell Street to the Crystal Coast Visitor Center
- Install crosswalk and pedestrian count-down signal at the intersection of Arendell Street and 35th Street and at the intersection of Bridges Street and 35th Street

Crystal Coast Visitor Center

35th St./Arendell Street "Before"



35th St./Arendell Street "After"

- Stripe crosswalks across all four legs of the intersection of Bridges Street and 35th Street, as well as the intersection of Arendell Street and 35th Street
- Provide additional lighting to improve bicyclist and pedestrian visibility at night
- Prohibit right-turn on red vehicular movements to and from the Bridges Street and 35th Street intersection as well as Arendell Street and 35th Street intersection. Alternatively, signs could be installed to prohibit right turn on red when bicyclists or pedestrians are present

4. NC 24 Corridor

The NC 24 corridor is a major regional arterial connecting Cape Carteret to US 70 in Morehead City. Currently, it is a five-lane, primarily shoulder facility with a center turn lane and a posted speed limit of 45 mph. Traffic volumes along the section of NC 24 within Morehead City range from 19,000 to 21,000 vehicles per day. Commercial and residential uses line this corridor, especially near its terminus with US 70. With virtually no provisions for bicyclists, this high speed, high volume roadway is a very dangerous facility to ride along or cross using a bicycle. Public comments received at the design charrette included identifying ways to cross NC 24 safely to access commercial and residential areas. Prior to implementing these recommendations, a feasibility study should be performed to evaluate the benefits and drawbacks of a multi-use path versus other treatments such as wide curb lanes. The need for additional right-of-way required by each alternative should also be investigated. The following recommendations are for a multi-use path alternative.


Examples of two well-functioning multi-use paths (the second is the Bridges Street multi-use path)

Recommendations:

- Consider installing a median along the corridor to control vehicular turning movements. A plantable median would minimize conflict points between bicyclists, pedestrians, and vehicles
- Add a 10-foot multi-use path on the north side of NC 24 from McCabe Road to Executive Drive. This new path would utilize existing right-of-way and upgrade sidewalk facilities to connect residential areas along the corridor to existing commercial areas including Morehead Crossing Shopping Center, Cypress Bay Shopping Center, and Parkwood Shopping Center
- Add high-visibility yellow-green "Share the Road" warning signs along NC 24 to alert drivers to the presence of pedestrians and bicyclists
- Provide additional pedestrian level lighting to improve bicyclist and pedestrian visibility at night
- Consider lowering the posted speed limit to 35 mph within the city limits

5. US 70/Arendell Street

The US 70/Arendell Street corridor is identified by NCDOT as Strategic Corridor #46. (NCDOT defines strategic corridors as "a set of primarily existing highway corridors that exemplify the long-term potential to serve passenger and freight movements in a high-speed manner.") It provides regional mobility and access from Raleigh to Beaufort by way of Morehead City. Speed limits along the corridor slow from 45 mph near the NC 24 intersection to 35 mph in the downtown. Traffic volumes along the section of US 70 within Morehead City range from 21,000 to 33,000 vehicles per day. The twelve-foot lanes on the corridor are suitable for vehicular travel but do not provide additional space for bicyclists. Several traffic signals and numerous driveway cuts clutter the corridor, making bicycle travel unsafe. One of the key issues discussed at the public design charrette was how to cross this facility safely.

Another key factor to consider is the future plans for the US 70 corridor and the impact these plans will have on bicycle travel. Currently, there are two planning initiatives that may impact this important corridor. The Northern Carteret County Bypass study examined upgrading the NC 101 corridor to relieve congestion along the US 70 corridor. This project would begin in Havelock and connect to Beaufort. The project is currently unfunded on the NCDOT Transportation Improvement Program (TIP project number R-4431). However, additional planning and environmental studies are underway.

A second planning initiative is being conducted by the North Carolina Railroad (NCRR). This study objective is to evaluate alternative corridors to the existing NCRR tracks within the US 70 median in Morehead City. Potentially this study could result in the removal of the existing tracks or the conversion of the tracks to local use (i.e., trolley system).

Railroad line in US 70/Arendell Street median

Recommendations:

- If and when the NCRR tracks are removed from Arendell Street, consider converting the corridor to a "Village Main Street" from Bridges Street to 4th Street with enhanced streetscape improvements such as a plantable median, on-street parking, five-foot

bike lanes, pedestrian lighting, crosswalks, street trees, and high-visibility yellow-green "Share the Road" warning signs

- Develop a US 70 Corridor Overlay District to define signage requirements, architectural integrity improvements, building setbacks, curb-cut frontage requirements, parking, and cross-access requirements
- Upgrade the following signalized intersections to include crosswalks, pedestrian lighting and pedestrian countdown signals: 35th Street, 20th Street, 10th Street, 8th Street, and 4th Street. Speed tables can also be considered as a way to slow traffic through these intersections, in addition to providing an area for decorative paving treatments
- Consider lowering the posted speed limit to 25 to 30 mph

Arendell Street "Before"

Arendell Street "After"

6. Access to Beaufort

Comments received at the public design charrette indicated that a large contingency of intermediate to advanced cyclists frequently ride from the Morehead City area to Beaufort (a distance of 2.4 miles from 4th Street in Morehead City to Moore Street in Beaufort). However, the only way to access this route involves traveling along US 70 across the existing bridges. Traffic volumes along this section of US 70 range from 19,000 to 22,000 vehicles per day. This section of US 70 is two-lanes with industrial uses along the roadway, providing little to no usable shoulders for bicyclists on the two bridges.

According to the NCDOT TIP, project number R-3307 is the only programmed improvement for US 70 along this section of the corridor. It involves the removal of the Gallant's Channel Bridge and the construction of a new bypass facility and bridge beginning just west of the US 70/ Piper Island intersection and West Beaufort Road. The project is scheduled for right-of-way acquisition in 2008 and construction beyond 2011. No bicycle improvements have been recommended as a part of this plan.

The US 70 Newport River High Rise Bridge improvements are currently unfunded. Built in 1964, the bridge is two-lanes with no shoulders that elevates approximately 65 feet above water-level to provide adequate navigational clearance. Based on a recent study, the efficiency rating of the bridge is 53.9 out of a possible 100 points, meaning the bridge is either functionally obsolete or structurally deficient. The bridge has a remaining life of 24 years.

Cantilevered multi-use path

Recommendations:

- Work with NCDOT and Morehead City's Board of Transportation members to secure funding for the construction of a 10 foot cantilevered multi-use path along this section of US 70. Due to the existing lane widths of the bridges, it is currently not possible to accommodate striped bicycle lanes in the cross-section. However, when the bridges are replaced five-foot bicycle lanes should also be considered as an alternative
- Coordinate with NCDOT Division 2 and the Town of Beaufort to include bicycle provisions in the design and construction of the US 70 Gallant's Channel Bridge replacement (R-3307). These provisions could include a multi-use path or striped bicycle lanes
- Consider constructing a 10-foot-wide multi-use path supported by a cantilever bridge attached to the existing US 70 Newport River High Rise Bridge. This facility would provide direct access to the existing public park facilities located on Radio Island.
- Provide pedestrian countdown signal heads at key signalized intersections near each bridge terminus
- Provide additional lighting to improve bicyclist visibility at night
- Add high-visibility yellow-green bike crossing warning signs along the corridor at the approaches to key intersection crossings to alert drivers to the presence of bicyclists
- Consider running trolleys or buses between Morehead City and Beaufort to provide tourists and local residents a means of crossing the bridges with bicycles safely. This service could be provided during peak summer tourism, with increased service times available during special events and festivals. These buses could be fitted to include bike racks or could be equipped as low-floor buses that accommodate bicycles in their interior.

Chapter 3 — Facility Opportunities and Guidelines

Chapter 3 seeks to build on the existing conditions outlined in Chapter 2 by identifying options for the future bicycle system. This section discusses bicycle opportunities and focus areas, facility planning and design guidelines, and ancillary facilities and projects.

Bicycle Focus Areas

One objective of this plan is to fulfill the needs of special segments of the population that use bicycling for more than just recreational activity. Captive riders are those who have few transportation options and who often turn to modes such as biking or walking for utilitarian purposes. Using U.S. Census 2000 data, the percentage of households owning one vehicle or no vehicle at all was examined within Morehead City's extraterritorial jurisdiction. This information is shown in **Map 3.1**. The Census reports that in a representative sample of City residents, 13% of the households had no vehicle available to them, and just over 43% of the households have access to only one vehicle. Over 65% of the households in downtown Morehead City and living between Bridges Street and the Newport River own either no or one vehicle. Members of these households in many cases must turn to other modes of travel to complete errands and commute to work or school. As a result, an improved bicycle infrastructure would be beneficial to people with limited access to cars.

An improved bicycle infrastructure would be beneficial for people with limited access to cars.

This plan considers connections with shopping areas, municipal buildings, libraries, parks and community centers, tourist areas and destinations, and schools and colleges — the major destinations in and around Morehead City. A map of these locations is shown in **Map 3.2**. The development of a bicycle route system heavily favors the connection of these facilities so that the bicycle routes link citizens and tourists with places where they want to ride. This plan also considers regional destination points such as Atlantic Beach and Beaufort.

Insert Map 3.1 here - Census

Insert Map 3.2 here - Origin-Destination

Trip origins and destinations were investigated as a part of the Morehead City Bicycle Planning Survey. Many of the connections that respondents desired included natural destination points such as those shown in **Map 3.2**, with the most commonly mentioned being shopping, schools, and parks and recreation. Many people sought connections between these destination points and neighborhoods or the downtown area. An interesting result of this question was that a large number of people desired connections to out-of-town destinations, with the most common being Beaufort, Atlantic Beach, and Newport. County-wide connectivity was stressed as important by a large number of people, and the major bridges in the area were listed as highly desirable for future bicycle connections. In-town connections such as the existing multi-use path on Bridges Street, Country Club Road, and others were also listed as being important to survey respondents.

Bicycling Opportunities

There are currently no independent bicycle projects under construction in the Morehead City area. Morehead City has no roadway projects included in the 2006-2012 State Transportation Improvement Program (TIP). However, there is a project for the Town of Beaufort that affects transportation in Morehead City. Project #R-3307 involves the construction of a new US 70 bypass and four-lane bridge over Gallant's Channel with the removal of the current bridge. It is the recommendation of this study that accommodations be provided on the new bridge for bicyclists. There are also resurfacing projects scheduled for study area roads by the state and by the town that could potentially be utilized in restriping efforts, or simply to improve the quality of riding surface for bicyclists.

Bicycle Facility Design Guidelines

All new and reconstructed roadways in Morehead City should be designed to accommodate bicycles. While each roadway construction, paving, or striping project must be appropriate for the topography and land use of the corridor, the guidelines in this section should be considered to better incorporate bicycle facilities in roadway corridors.

To develop recommended bicycle design standards for Morehead City, several existing documents were reviewed, including the AASHTO Guide for the Development of Bicycle Facilities,[1] North Carolina Bicycle Facilities Planning and Design Guidelines,[2] and the Manual on Uniform Traffic Control Devices.[3]

[1] American Association of State Highway and Transportation Officials (AASHTO), *AASHTO Guide for the Development of Bicycle Facilities*, Washington, DC, 1999.
[2] North Carolina Department of Transportation (NCDOT), *North Carolina Bicycle Facilities Planning and Design Guidelines*, Raleigh, NC, 1994.
[3] Federal Highway Adminstration (FHWA), *Manual on Uniform Traffic Control Devices*, Washington, DC, 2003.

Existing Design Guideline Documents

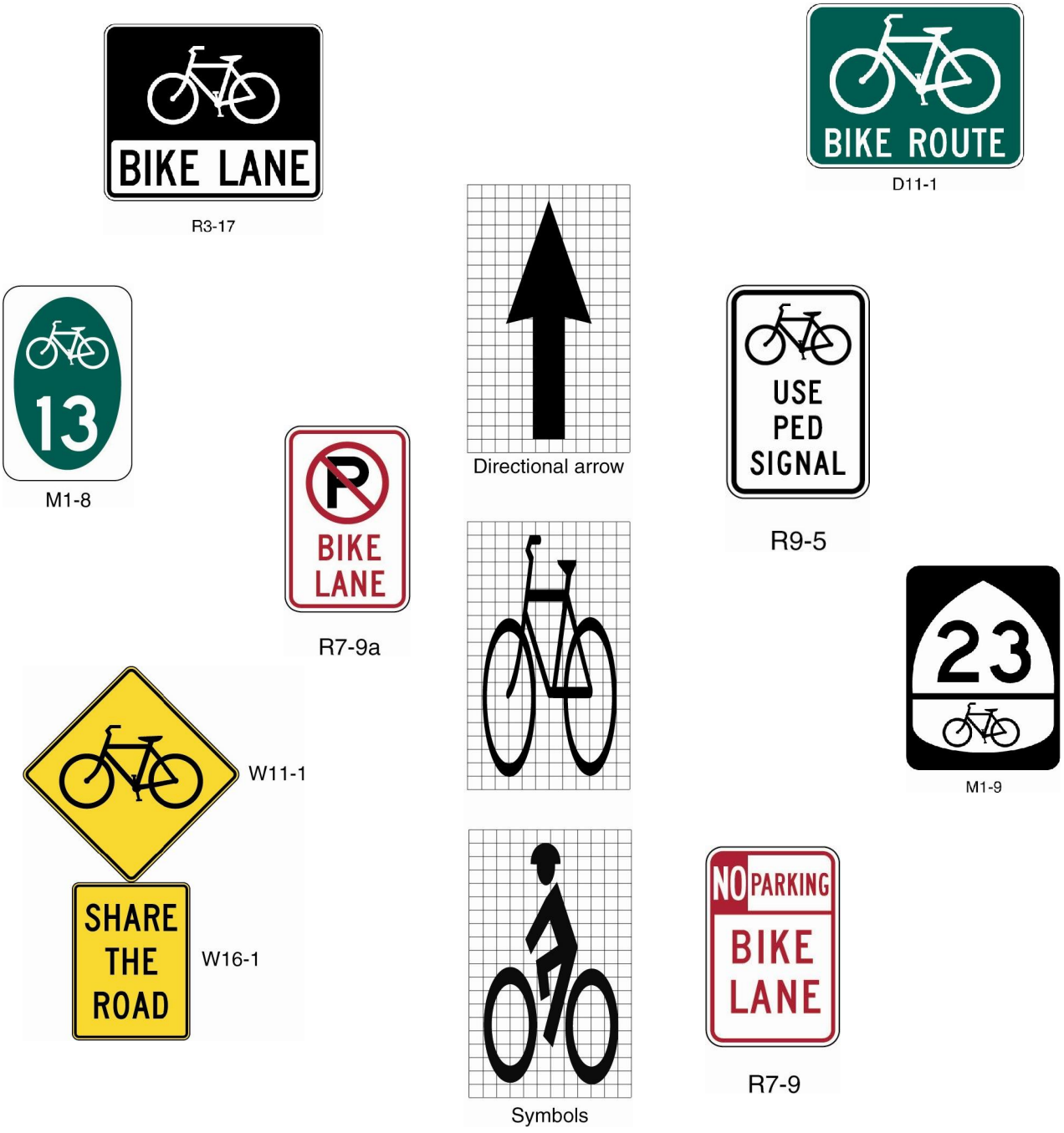
The section below summarizes the three main bicycle design guideline documents that were reviewed for this plan.

AASHTO Guide for the Development of Bicycle Facilities. Referred to as the *Bicycle Guide*, this is a federal document which sets forth the current design practices accepted by FHWA. This document discusses planning, design, operations, and maintenance issues associated with bicycle facilities. With respect to design, it addresses width dimensions, grades, cross slopes, radii, acceleration rates, deceleration rates, and sight distances. The *Guide for the Development of Bicycle Facilities* is not intended to establish strict standards. It provides "sound guidelines that are valuable in attaining good design sensitive to the needs of both bicyclists and other highway users" (p. 2). It does, however, establish minimum guidelines for many treatments.

FHWA Manual on Uniform Traffic Control Devices (MUTCD). Unlike the AASHTO *Guide for the Development of Bicycle Facilities*¸ the *MUTCD* does constitute a standard. Failure to comply with the *MUTCD* can result in being denied federal funds and opens up non-compliant jurisdictions to additional liability in the event of a crash. The *MUTCD* addresses standards for signing, striping, markings, signals, islands, and traffic work zone devices (e.g., cones and barricades). It provides information on what symbols may be used on signs and when sign text can vary from the signs provided. The color, width, types, and applications of striping are defined in detail. It also provides dimensions and shapes of pavement markings and pavement lettering. **Figure 3.1** contains some symbols from the MUTCD. See http://mutcd.fhwa.dot.gov/ for additional information.

North Carolina Bicycle Facility Planning and Design Guidelines. Design standards and guidelines for bicycle planning in North Carolina are provided in the *North Carolina Bicycle Facility Planning and Design Guidelines*. This document seeks to clarify specific aspects of standards that should be used when designing bicycle facilities. These guidelines are consistent with the AASHTO guidelines.

Figure 3.1 MUTCD Signage Examples



Designing Roadways for Bicyclists

It is important for roadway designers to understand how roadway and traffic characteristics affect bicyclists. Several research studies have suggested factors that influence bicyclist safety and comfort when riding on a roadway segment.[4,5,6,7]

These factors include:

- Effective width of the roadway, which includes the width of the outside lane and paved shoulder/bike lane space
- Presence of a bike lane or paved shoulder
- Motor vehicle traffic volumes on the roadway
- Traffic from intersecting roadways/driveways
- Speed of the traffic on the roadway
- Percent heavy vehicles on the roadway
- On-street parking
- Pavement surface condition

In the late 1990s, groundbreaking research was performed to quantify the influence of each of these factors on the perceptions of bicyclists. One research study had bicyclists rate the characteristics of roadways in the field;[8] another had cyclists rate roadway segments from video clips.[9] The former study resulted in the Bicycle Level of Service Model, and the latter resulted in the Bicycle Compatibility Index. All of the factors listed above were found to influence bicyclist comfort.

Lateral separation between bicyclists and motor vehicles is one of the most significant factors influencing bicycle comfort.

Both studies identified lateral separation between bicyclists and motor vehicles as one of the most significant factors influencing bicyclist comfort levels. The studies found that bicyclists preferred having wider pavement space on which to ride. Further, both studies found that most bicyclists prefer having a shoulder or bike lane stripe provided on roadway segments when compared to the same pavement width without a stripe. In addition, a third study found that motorists give bicyclists more lateral space when bike lanes are striped.[10] These are

[4] Landis, Bruce W., "The Bicycle Interaction Hazard Score: A Theoretical Model." *Transportation Research Record 1438*, Transportation Research Board, Washington, DC, 1994.
[5] Sorton, Alex. "Bicycle Stress Level as a Tool to Evaluate Urban and Suburban Bicycle Compatibility." *Transportation Research Record 1438*, TRB, Washington, DC, 1994.
[6] Epperson, Bruce. "Evaluating Suitability of Roadways for Bicycle Use: Toward a Cycling Level-of-Service Standard." *Transportation Research Record 1438*, TRB, Washington, D.C. 1994.
[7] Davis, Jeff. *Bicycle Safety Evaluation*. Auburn University, 1987.
[8] Landis, Bruce W., et al. "Real-Time Human Perceptions: Towards a Bicycle Level of Service," *Transportation Research Record 1578*, TRB, Washington, DC, 1996.
[9] Harkey, D.L., et al. "Development of the Bicycle Compatibility Index: A Level of Service Concept: Final Report," Report No. FHWA-RD-98-072, FHWA, Washington, DC, August 1998.
[10] Hunter, William W., et al. "A Comparative Analysis of Bicycle Lanes Versus Wide Curb Lanes: Final Report," FHWA, FHWA-RD-99-034, December 1999.

particularly important findings because bicycle lanes and shoulders can be incorporated during roadway design.

These studies provide the background behind the recommendations to provide bicycle lanes and paved shoulders as preferred bicycle facilities in Morehead City.

Guidelines for Specific Facilities

This section describes the types of bicycle facilities that should be incorporated into roadway projects in the Morehead City.

Typical striped bike lanes

Bicycle Lanes

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

The AASHTO *Guide for the Development of Bicycle Facilities* states, "[Bike lanes may be provided] by reducing the width of vehicular lanes or prohibiting parking…" (p. 8). The *North Carolina Bicycle Planning and Design Guidelines* (adapted from the AASHTO *Bicycle Guide*), specifies widths for bike lanes. This graphic is provided in **Figure 3.2** on the following page.

NCDOT recommends that bicycle lanes be considered for a roadway based on the demand, connectivity of origin and destination points, surrounding land uses, traffic and geometric conditions, and presence of other route alternatives.

Paved Shoulders

Paved shoulder space improves the safety and comfort of bicyclists. There is no minimum width for paved shoulders. According to the AASHTO *Guide for the Development of Bicycle Facilities*, "where four-foot widths cannot be achieved, any additional shoulder width is better than none at all." However, to be designated as a bicycle facility, AASHTO requires a minimum width of four feet. Even wider shoulders provide greater levels of bicyclist safety and comfort on roads with high traffic volumes. On many roadways, motor vehicle travel lanes can be narrowed to provide more shoulder space. Paved shoulders also improve safety for motor vehicles, prevent pavement damage to the travel lanes, and provide space for pedestrians.

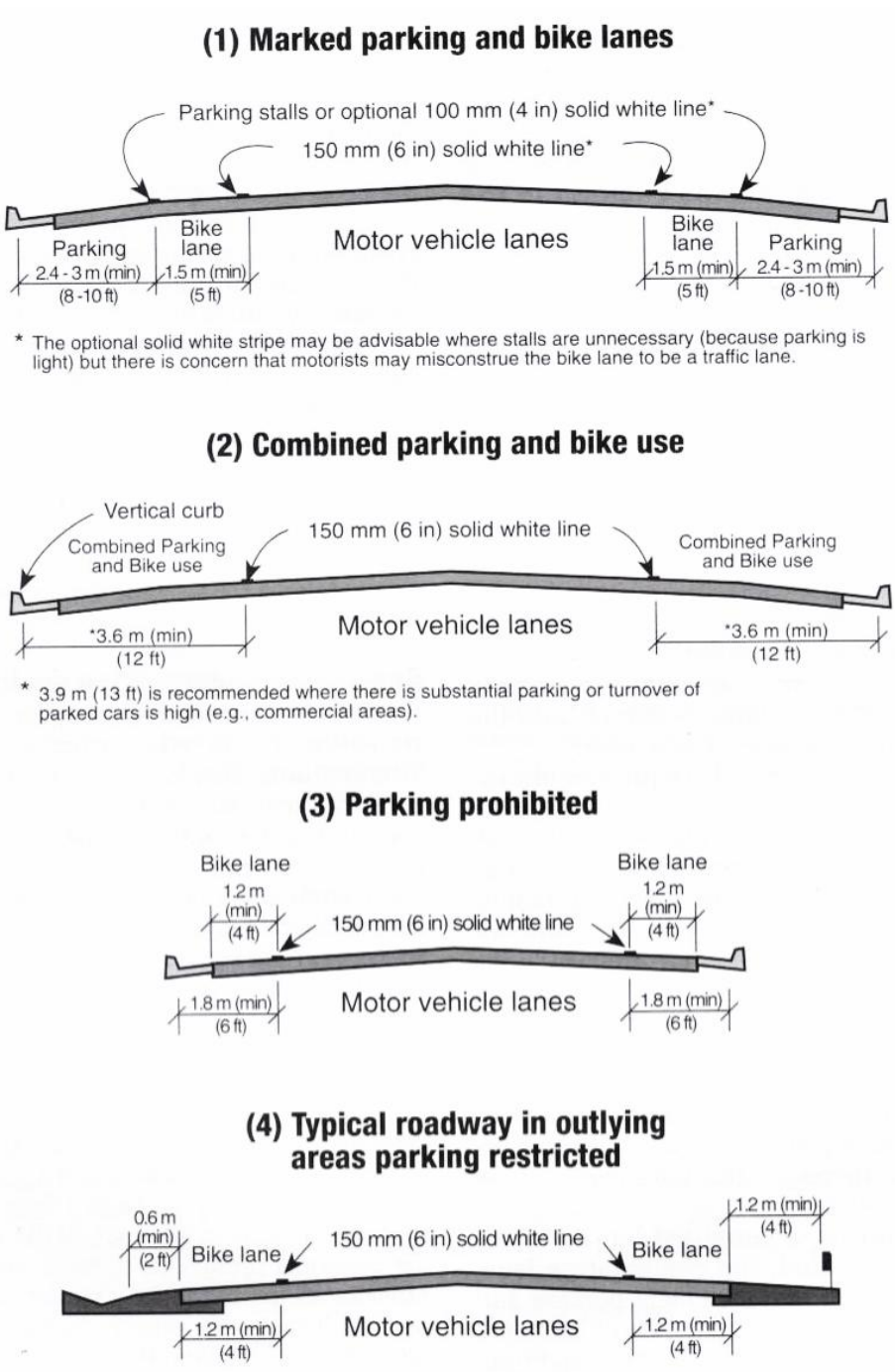


Figure 3.2 Typical bike lane cross sections on two-lane or multi-lane highways

(Source: *North Carolina Bicycle Planning and Design Guidelines*, 1994)

While unmarked paved shoulders are generally acceptable for roadway sections without frequent intersections, on those where intersections are frequent, appropriate bike lane marking should be applied if the width exists to accommodate it.[11]

Typical wide curb lanes

Wide Curb Lanes

Wide curb lanes (typically 14-feet wide) are used to provide extra space for bicyclists. While wide curb lanes are an effective way to encourage motorists to give bicyclists adequate clearance when passing, they are largely unrecognized by casual bicyclists as bike facilities. As noted in the research studies above, having a striped bike lane greatly improves feelings of safety and comfort for bicyclists. However, each roadway should be evaluated individually to determine what treatment is most appropriate for the surroundings and conditions.

Shared Roadways

Shared roadways are streets and roads where bicyclists can be served by sharing the travel lanes with motor vehicles. Usually, these are streets with low traffic volumes and/or low speeds, which do not need special bicycle accommodations in order to be bicycle-friendly. These streets are sometimes signed as bicycle routes to denote their bicycle-friendly nature.

Multi-Use Paths on Independent Alignments

Multi-use paths can provide a high-quality bicycling experience in an area protected from motorized traffic.

Multi-use paths (or shared use paths) are becoming quite popular, not only with bicyclists, but also with many non-motorized transportation device users across the country. They can provide a high-quality bicycling experience in an environment that is protected from motorized traffic because they are constructed in their own corridor, often within open-space area. Multi-use paths can be paved and should be a minimum of 10-feet wide. Their width may be reduced to eight feet if there are physical or right-of-way constraints. Twelve feet is preferred for areas with difficult terrain or heavy traffic.

Multi-use paths are, in effect, little roads and should be designed as such. This means there are clearance requirements, minimum radii, stopping sight distance requirements, and other functional criteria just as there are for roadways. Additionally, designers must comply with the *MUTCD* and AASHTO *Guide for the Development of Bicycle Facilities* when designing these facilities.

[11] In addition, AASHTO's *Guide for Achieving Flexibility in Highway Design* (2004) states, "Paving part or all of the shoulder…helps reduce crash rates…and helps to facilitate use of the road by bicyclists. Shoulder paving also reduces maintenance requirements….Where a 'full width' shoulder cannot be achieved, the designer should strive to provide as wide a shoulder as possible that meets functional requirements" (p. 66).

Though paths should be thought of as roadways for geometric and operational design purposes, they require much more consideration of amenities than do roadways. Shade and rest areas with benches and water sources should be designed along multi-use paths. Where possible, vistas should be preserved. Way finding signs (how far to the library or the next rest area or directions to restrooms) are important for non-motorized users. These types of design considerations can help make a multi-use path more attractive to potential users.

Typical sidepath

Sidepaths/Wide Sidewalks

A sidepath is essentially a multi-use path that is oriented alongside a road, but is separate from the road. The AASHTO *Guide for the Development of Bicycle Facilities* and *North Carolina Bicycle Facilities Planning and Design Guidelines* strongly caution those contemplating a sidepath (or wide sidewalk) facility to investigate various elements of the roadway corridor environment and right-of-way before deciding upon a final design. The *North Carolina Bicycle Facilities Planning and Design Guidelines* provide eight common problems faced (pp. 42) with sidepaths:

1. *Unless paired, they require one direction of bicycle traffic to ride against traffic, contrary to normal rules of the road.*
2. *When the path ends, bicyclists going against traffic will tend to continue to travel on the wrong side of the street. Likewise, bicyclists approaching a bicycle path often travel on the wrong side of the street to get to the path. Wrong way riding is a major cause of bicycle/automobile crashes and should be discouraged at every opportunity.*
3. *At intersections, motorists entering or crossing the highway often will not notice bicyclists coming from their right, as they are not expecting contra-flow vehicles. Even bicyclists coming from the left often go unnoticed, especially when sight distances are poor.*
4. *When constructed in narrow roadway right-of-way, the shoulder is often sacrificed, thereby decreasing safety for motorists and bicyclists using the roadway.*
5. *Many bicyclists will use the highway instead of the bicycle path because they have found the highway to be safer, more convenient or better maintained. Bicyclists using the highway are often subjected to harassment by motorists who feel that in all cases bicyclists should be on the path instead.*
6. *Bicyclists using the bicycle path generally are required to stop or yield at all cross streets and driveways, while bicyclists using the highway usually have priority over cross traffic because they have the same right-of-way as motorists.*

7. *Stopped cross street motor vehicle traffic or vehicles exiting side streets or driveways may block the path crossing.*
8. *Because of the closeness of motor vehicle traffic to opposing bicycle traffic, barriers are often necessary to keep motor vehicles out of bicycle paths and bicyclists out of traffic lanes. These barriers can be a hazard to bicyclists and motorists, can complicate maintenance of the facility and can cause other problems as well.*

In addition to the AASHTO cautions, research from the US and abroad confirm that bicycle/motor vehicle crash rates are higher for bicyclists riding on a sidepath than on a roadway.[12,13,14,15,16] Consequently, designers are advised to be careful when choosing to design sidepaths.

Some high-volume, high-speed roadways exist where sidepaths are the only bicycle facility that can be provided without very costly changes to the roadway corridor. In these cases, it may be desirable to provide a sidepath. This decision must consider the magnitude of intersecting driveway and roadway conflicts. If possible, sidepaths should be provided on both sides of the roadway to encourage bicyclists to ride in the same direction as adjacent traffic. The long-term strategy on these roadways should be to widen the road or narrow the lanes to provide additional space for bicyclists in on-road bike lanes or shoulders.

Blank-out signs

One recently completed research study suggests that there may be ways to mitigate some of the safety risks associated with sidepaths.[17] It finds that crashes occur less often when the speed of the trail user is reduced. This means some sort of "traffic calming" treatment for the trail may be appropriate at intersections. At signalized intersections, it is best to treat the path roadway crossings as crosswalks, bringing the pathway close to the adjacent roadway so its signals can be incorporated into the overall signalization plan. Additional treatments to the typical pedestrian heads may be desirable at these intersections. The most significant of these supplemental treatments is the blank-out sign. NO RIGHT ON RED or YIELD TO

[12] Kaplan, J. "Characteristics of the Regular Adult Bicycle User." FHWA, U.S. Department of Transportation, 1975.
[13] Moritz, W. "Adult Bicyclists in the United States — Characteristics and Riding Experience in 1996." Transportation *Research Record 1636*, TRB, Washington, DC, 1998
[14] Wachtel, A. and D. Lewiston. "Risk Factors for Bicycle-Motor Vehicle Collisions at Intersections." *ITE Journal*, September, 1994.
[15] Räsänen, M. "How to decrease the number of bicycle accidents? A research based on accidents studied by road accident investigation teams and planning guides of four cities." Finnish Motor Insurer's Centre, Traffic Safety Committee of Insurance Companies. VALT. Finland, 1995.
[16] Summala, H., E. Pasanen, M. Räsänen, and J. Sievänen, J. "Bicycle Accidents and Drivers' Visual Search at Left and Right Turns." *Accident Analysis and Prevention*. Elsevier Science Ltd., 1996/03, 28(2), pp.147-53, 1996.
[17] Petritsch, Landis, Huang, Challa. "Sidepath Safety Model - Bicycle Sidepath Design Factors Affecting Crash Rates," submitted to TRB for publication, July 2005.

PEDS IN CROSSWALK signage may increase motorist awareness of individuals riding (or walking) in the crosswalks.

At unsignalized intersections it is best to move the sidepath out of the area of the side street intersection with the adjacent roadway. This allows motorists to deal with one intersection at a time. Additionally, bicyclists are only required to scan in two directions.

Signed Bicycle Routes

Signed routes will be an integral part of the bicycling network in Morehead City. These facilities are an inexpensive way to guide riders to more bicycle-friendly roads. They can be used with any of the facilities listed above, including roads with bicycle lanes, shared roadways, and multi-use paths. The traffic and geometry of a road are important considerations when determining the location of a signed route. In addition, the functionality of the route for the purpose it was intended (e.g. scenic route or utilitarian connector) is a necessary component in the decision-making process.

BIKE ROUTE signing (M1-8, D11-1, or M1-9 signs with D1-1b or M7-1 through M7-7 subplates) is another treatment which can be implemented to improve conditions for bicyclists. BIKE ROUTE signs help guide bicyclists to preferred routes – roads with lower motor vehicle traffic speeds, fewer trucks, or lower volumes. Typically they are supplemented with destination and distance signing.

Special signs should be designed to guide bicyclists along the recommended Waterfront Connector. These signs should incorporate their own colors and logo so that they can be recognized easily and help advertise the route to potential bicyclists. These signs can be used on municipal roads.

SHARE THE ROAD signs (W11-1 warning sign with W16-1 subplate) can be used along bicycle routes to alert drivers to the presence of bicyclists. These signs are not used to designate bicycle routes. They are typically considered when one or more of the following criteria are met:

- Safety problems exist and the roadway cannot be improved with bicycle lanes
- Bicycling volumes are high
- A conflict or obvious courtesy problem exists between motor vehicle and bicycle traffic sharing the road

Other Bicycle Facilities and Amenities

The *North Carolina Bicycle Facility Planning and Design Guidelines* also provide design considerations and recommendations for other types of ancillary bicycle facilities and amenities. These items, such as bike racks, bikes on buses, and bike-safe drainage grates and railroad crossings help to complete the bicycle system by eliminating barriers and providing security. In addition, the guidelines also discuss the maintenance of bicycle facilities, which is essential for the continued safe travel of bicyclists. Ancillary bicycle facilities and amenities are discussed later in this chapter.

Recommendations for Incorporating Bicycle Facilities

All new collector and arterial roadways in Morehead City should include some provision for on- or off-road bicycle facilities when they are constructed. New construction is the easiest and most cost-effective opportunity to include bicycle facilities because they can be integrated as a part of a larger roadway project.

When collector and arterial roadways are resurfaced or reconstructed, Morehead City should evaluate the roadway cross-section to identify opportunities for bicycle facilities. This evaluation should consider how much motor vehicle travel lane width can be re-allocated and used for bike lanes, wide outside lanes, or shoulder space given the lane configuration, traffic volumes, and traffic composition of the roadway. Two types of modifications should be considered to provide additional pavement width for bicycling: striping narrower lanes and/or removing travel lanes on roads with excess capacity. Reconfiguring a roadway during a reconstruction project is also more cost-effective than adding shoulders or restriping lanes as an independent retrofit project.

Neighborhood streets and rural roadways with low traffic volumes may be suitable for bicycling as shared roadways (i.e., special bicycle facilities are not needed).

Recommended Changes to Morehead City Street and Sidewalk Standards

Land development and redevelopment projects are excellent opportunities to improve conditions for bicycling in Morehead City. The City can ensure that bicycle facilities are provided as a part of development projects by updating its municipal code. For example, the current code states that shoulders (minimum six-foot width) must be provided on all arterial and collector roadways constructed without curb and gutter.

This plan recommends several revisions to the Morehead City municipal code.

Article 12. Supplementary Use Regulations

- Develop a cost schedule and bicycle parking fund to fund installation of bicycle parking in the downtown commercial district, by schools, and by community facilities. This will provide the town with funding to install similar bicycle parking facilities in these area in much the same fashion as with sidewalks in Article 16 and will support the recommended revisions for Article 20.

Article 16: Streets, Alleys, and Sidewalks

- Require bicycle lanes, wide curb lanes, or wide shoulders to be provided on all roadways classified as thoroughfares
- Require bicycle lanes to be provided on all roadways classified as collectors
- Require sidewalks be separated by a minimum of two feet from the back of the curb (this will provide more space for pedestrians to walk side-by-side and to pass each other on sidewalks, as well as reduce potential conflicts between bicyclists and pedestrians on sidewalks)
- Require sidewalks to be provided on both sides of all thoroughfare, collector, local, and other through traffic streets (this reduces the need for pedestrians to make unnecessary street crossings and provides greater opportunity for bicyclists who choose to use the sidewalk to ride in the same direction as traffic)

Article 20: Off-Street Parking and Service Requirements

- Add minimum bicycle parking space requirements for different types of land uses

Sample Cross-Sections

A set of sample cross-sections has been developed to reflect road treatments for specific bicycle recommendations. These cross-sections can be adapted to correspond to different road conditions and attributes as necessary. **Figure 3.3** corresponds to a cross-section with striped bike lanes. **Figure 3.4** corresponds to a cross-section with striped bike lanes and parking. **Figure 3.5** denotes a cross-section that has used differential striping to obtain wide curb lanes. **Figure 3.6** shows a cross-section containing a sidepath on one side of the road.

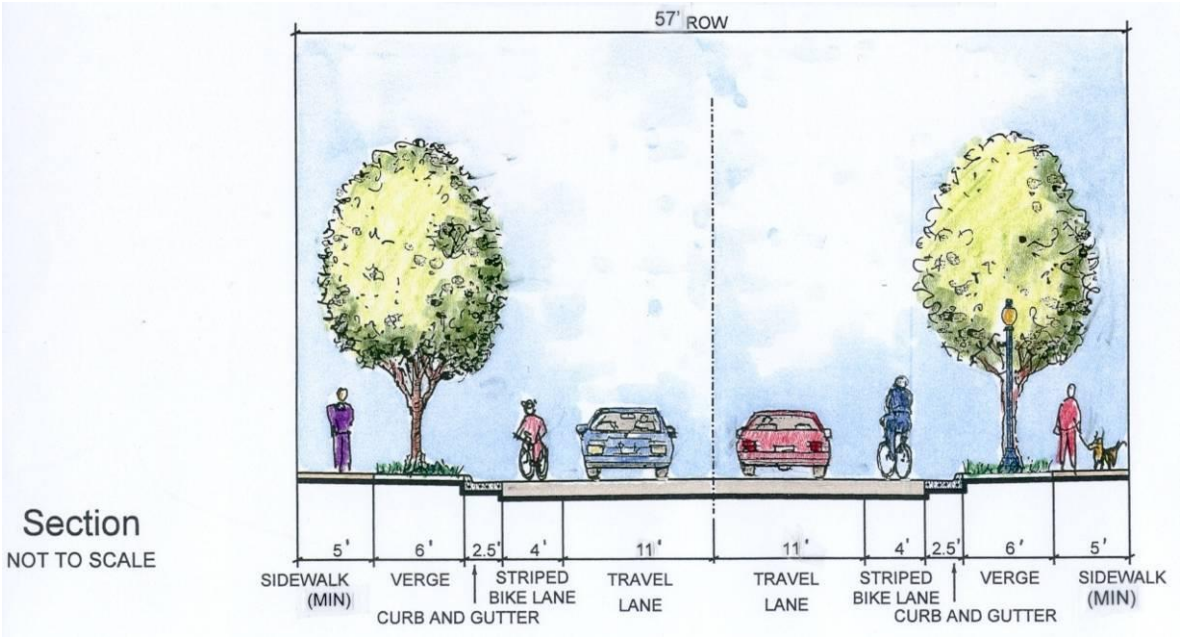


Figure 3.3 Striped Bike Lanes Cross-Section

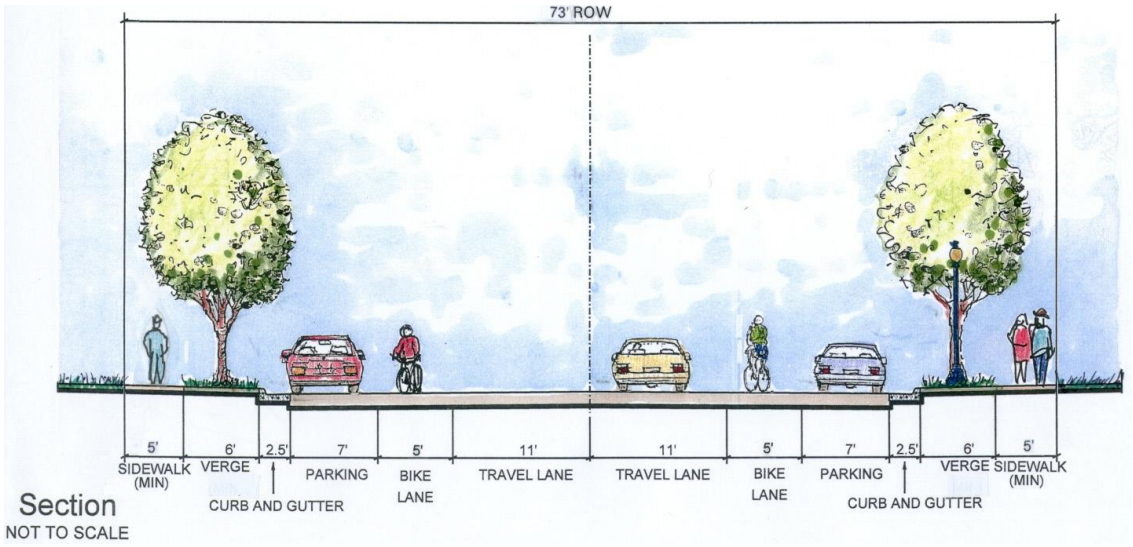


Figure 3.4 Striped Bike Lanes and Parking Cross-Section

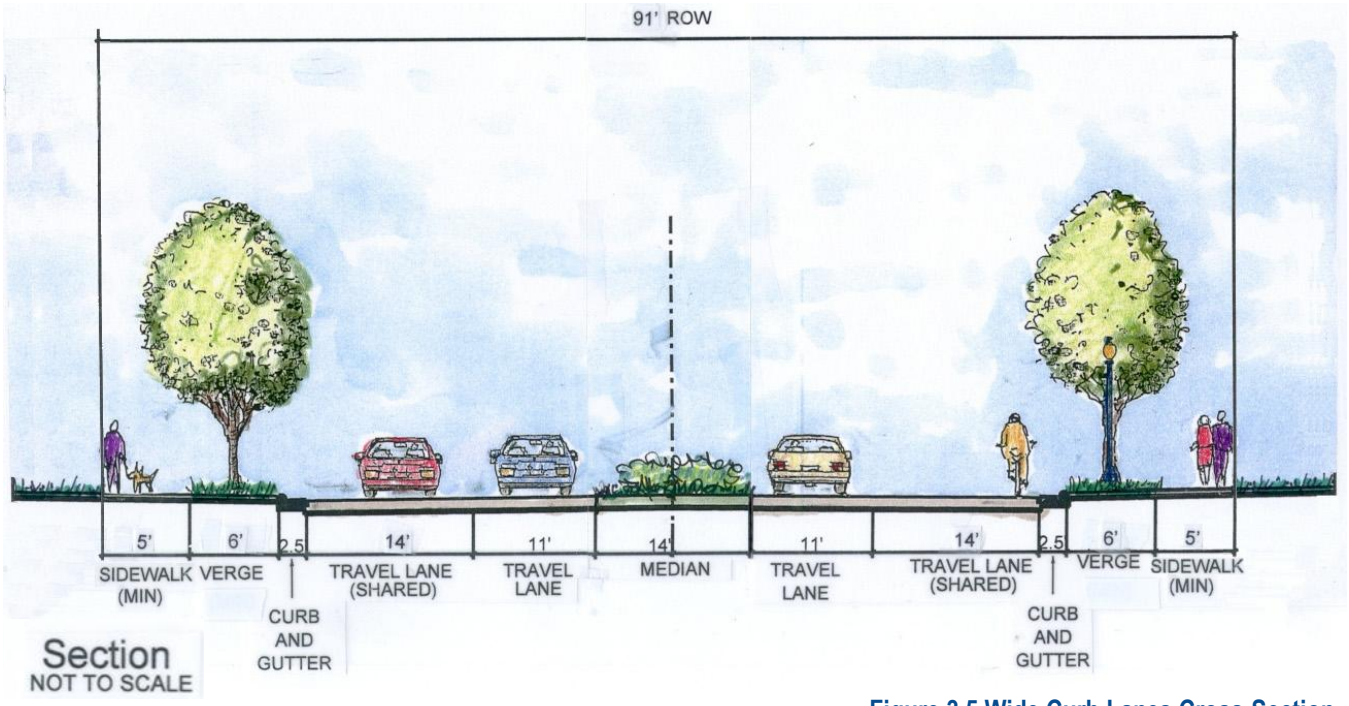


Figure 3.5 Wide Curb Lanes Cross-Section

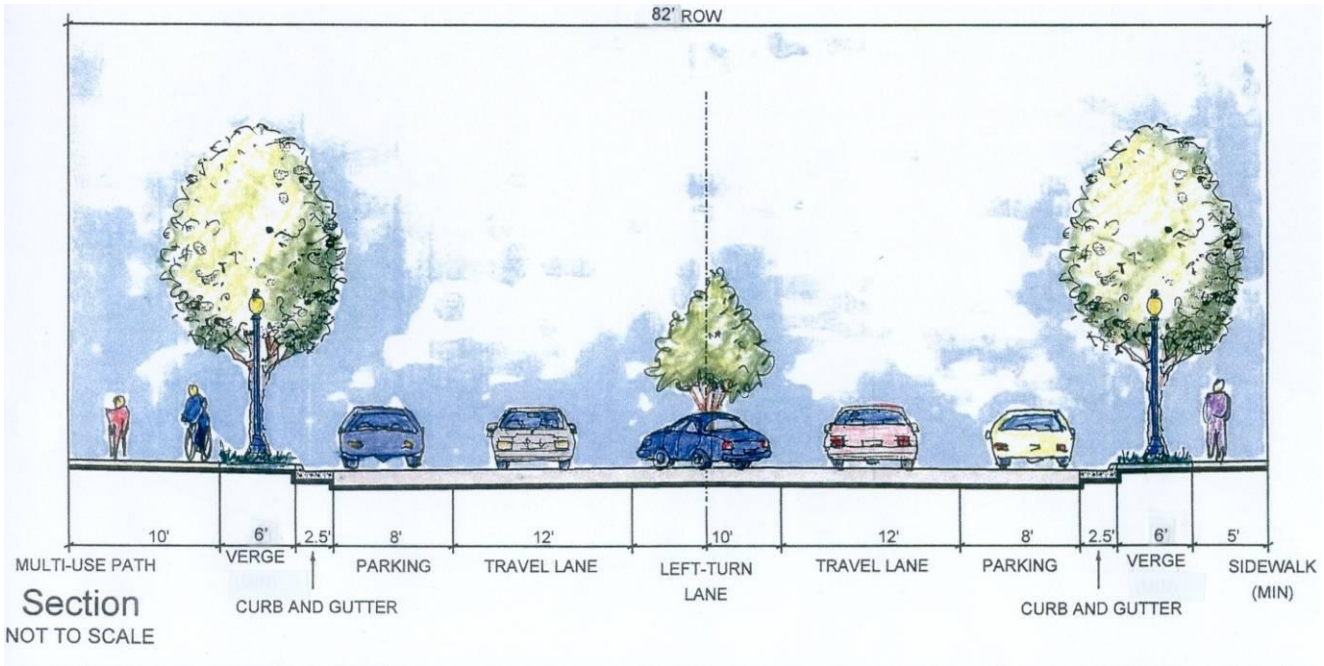


Figure 3.6 Sidepath Cross-Section

Roadway Intersections

Intersections should be designed with a balanced level of accommodation for all modes, including pedestrians, bicyclists, motor vehicle traffic, and public transit. Narrow intersections decrease crossing distances for all users, including bicyclists. Narrower intersections can have a shorter traffic signal cycle length than wide intersections (when the intersection is signalized) and are generally safer for pedestrians and bicyclists.

Special care must be given to bike lane design at intersections. Since intersections represent significant conflict points for bicyclists, appropriate striping, marking, and signing is critical to help ensure the proper behavior of cyclists and motorists.

When designing bike lanes at intersections, Morehead City should follow examples in the Pedestrian and Bicycle Information Center's *Bike Lane Design Guide*, which can be downloaded at www.bicyclinginfo.org/de/bikelaneguide.htm. This document is a summary of the *Chicago Bike Lane Design Guide*. Three example intersection striping treatments and a typical signing plan for an intersection from the Chicago manual are provided at the end of this section (**Figures 3.8 – 3.11**).

Signal Loops. Bicyclists frequently have trouble being detected at traffic signals. They often believe the signals are non-responsive and consequently run red lights. However, most traffic signal loops designed for motorists can detect bicyclists if the cyclists know where to place their bicycle. One effective way to address this problem is to mark the location on the pavement where a bicyclist must stop the bike to be detected by a traffic signal. The sign pictured to the left and the symbol it shows have been tested for bicyclist understanding and are being considered for future updates to *MUTCD*. To implement them before they are included in the *MUTCD* would require a request to experiment be filed with FHWA.

Specific signal loops for bike lanes (or multi-use paths) can also serve to improve cycling conditions. A typical treatment is a quadrapole loop with overall dimensions of two feet by 20 feet. Another alternate detection method is video detection. Video detection works for all types of bicycles (e.g. steel frame, carbon frame, etc.) but can be problematic during irregular light conditions such as sunrise and sunset.

Roundabouts. Bicycles fare well at urban compact roundabouts. With low design speeds, minimized conflict areas, and yield upon entry traffic control, well-designed urban compact roundabouts are convenient and safe for bicyclists. The approaches to roundabouts should be treated just as any other unsignalized intersection: the bike lanes should be terminated prior to the roundabout, and cyclists should be allowed to claim the lane in the circulating

roadway. At more complex roundabouts, designs can provide bicyclists with a choice to either claim the lane and ride through the circulating roadway, or to dismount, move to a widened sidewalk, and traverse the roundabout as pedestrians. An example drawing and illustration of this treatment, from the *Kansas Roundabout Guide*[18] is shown below in **Figure 3.7**.

It should be noted that the MUTCD states, "Bicycle lanes shall not be provided on the circular roadway of a roundabout intersection." This statement is made as a STANDARD and is thus not to be violated.

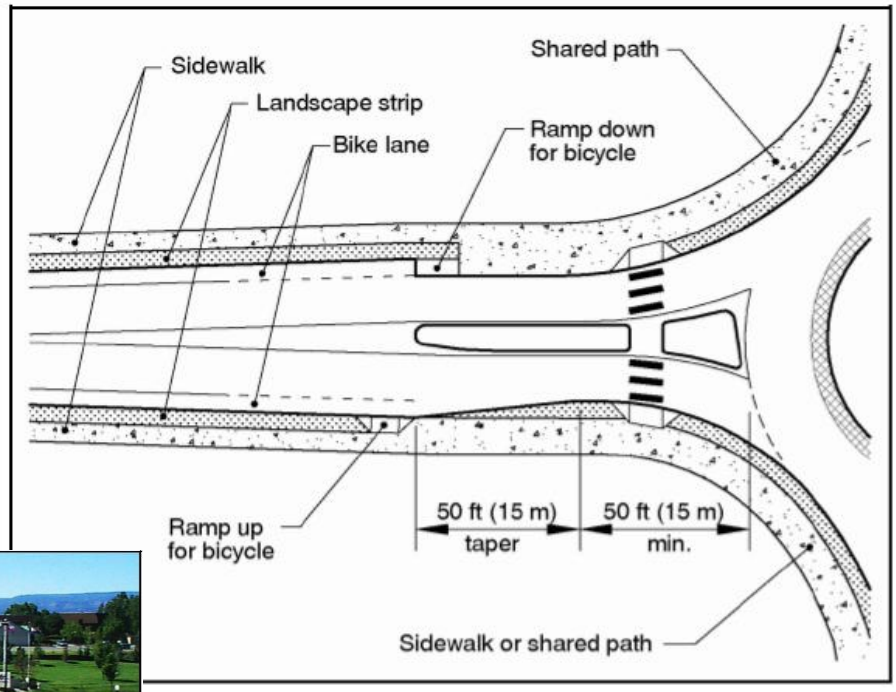


Figure 3.7 Bike lane transitions at roundabouts for on- and off-street cyclists
(Source: *Kansas Roundabout Guide,* Kansas DOT, 2003)

[18] Kansas Department of Transportation. *Kansas Roundabout Guide.* Topeka, KS. October 2003.

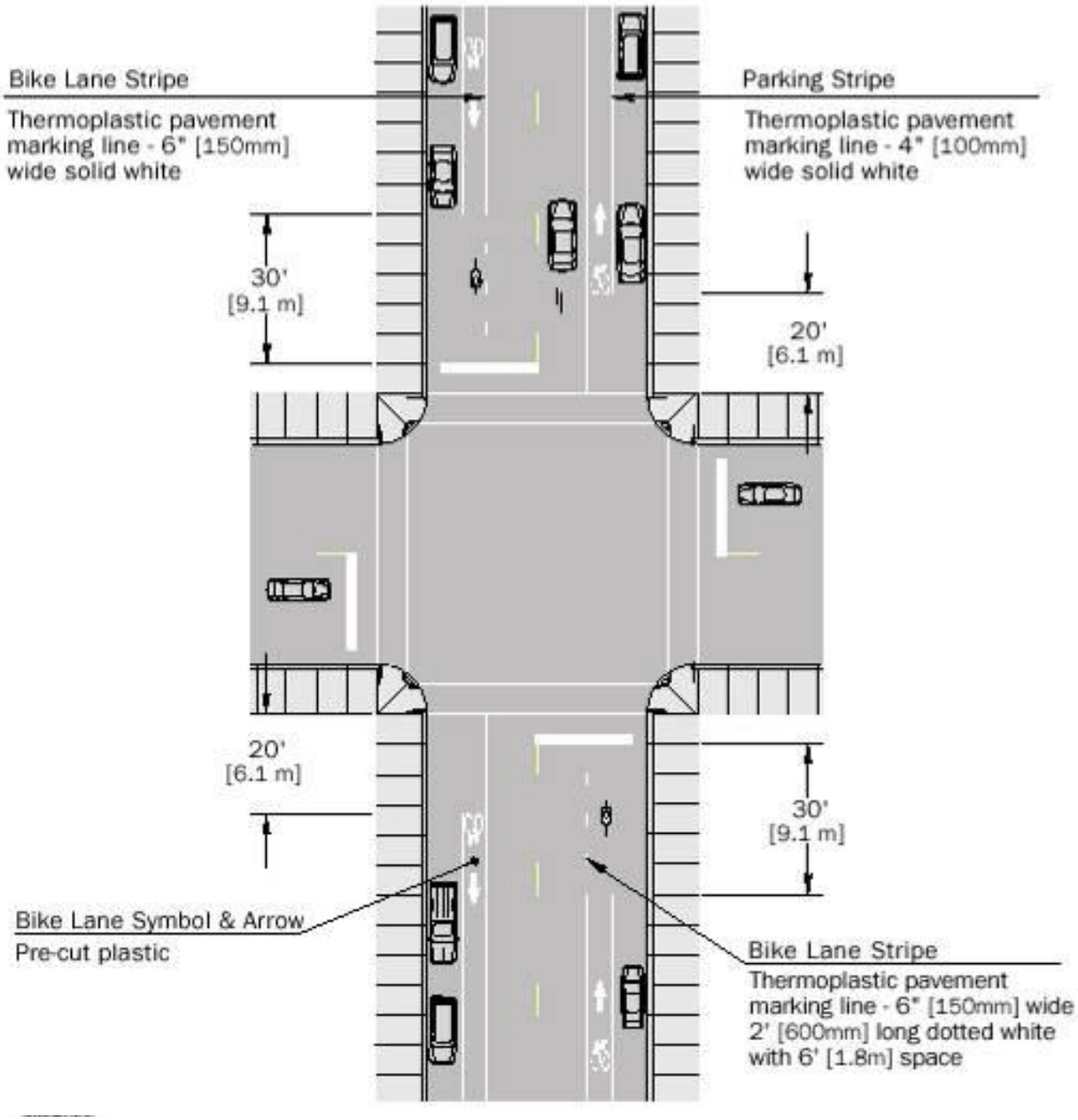


Figure 3.8 Striping for bike lane with parking at intersection with two-lane arterial
(Source: *Chicago Bike Lane Design Guide,* Chicago DOT, 2002)

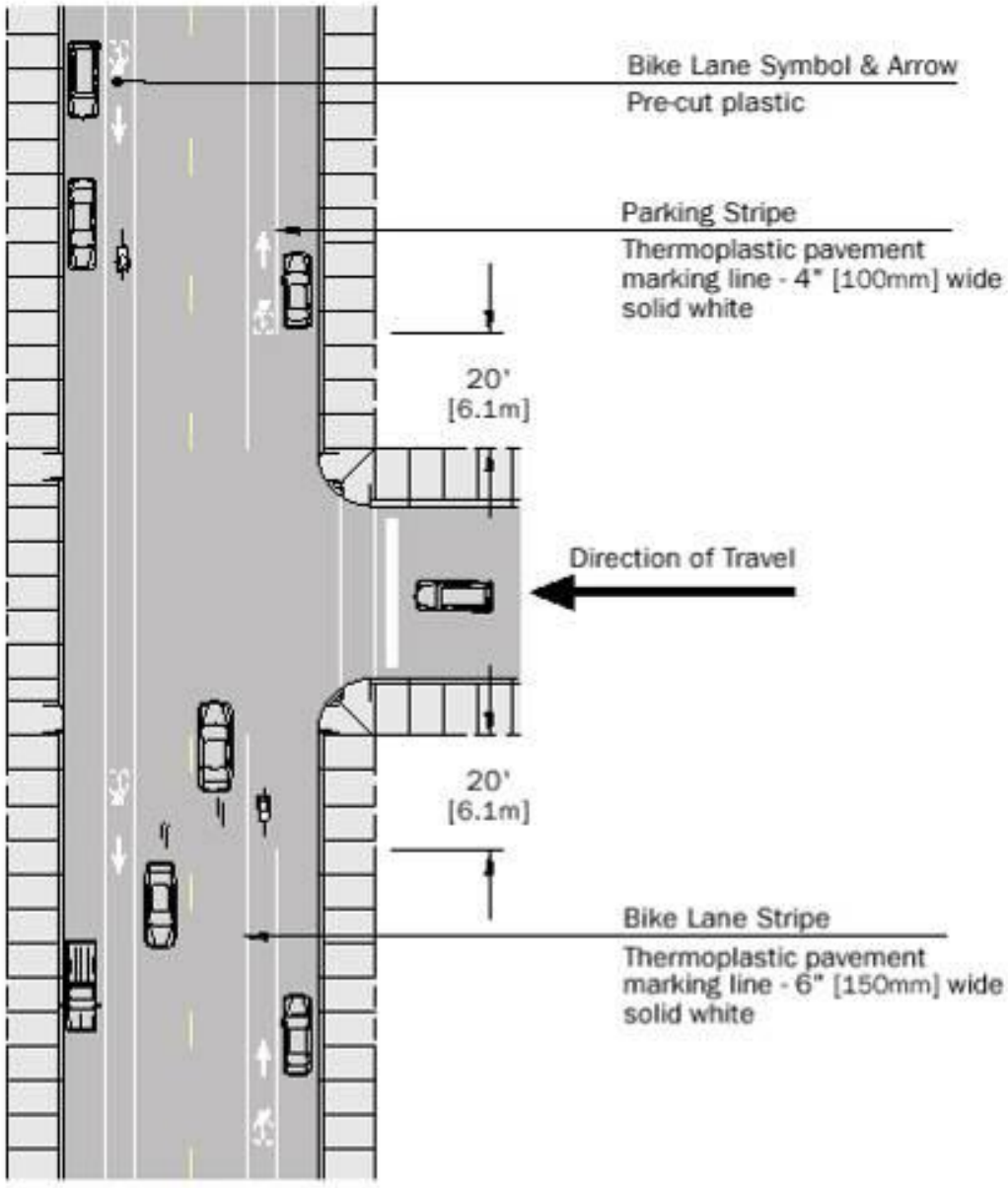


Figure 3.9 Striping for bike lane with parking at T-intersection with one-way local street
(Source: *Chicago Bike Lane Design Guide,* Chicago DOT, 2002)

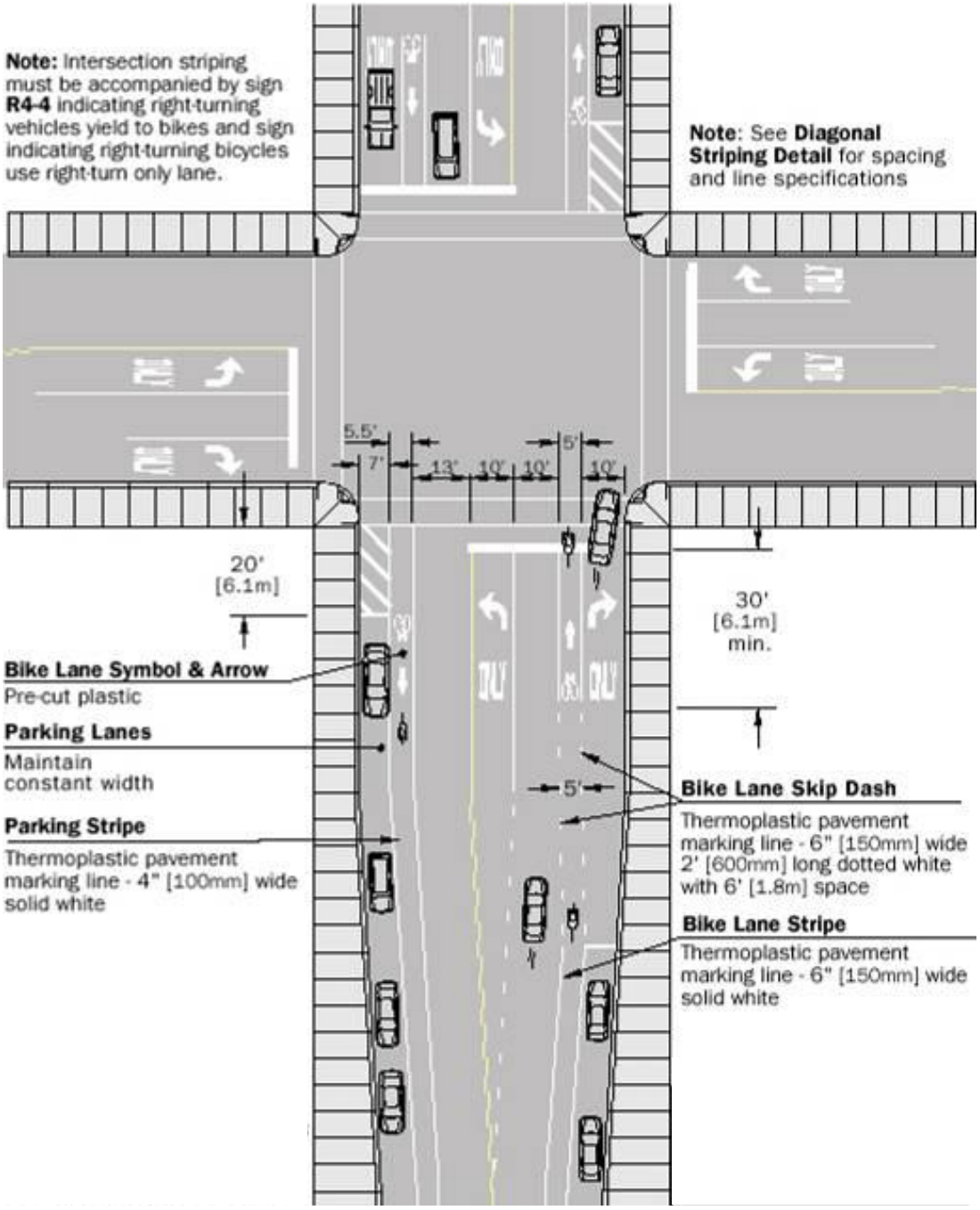


Figure 3.10 Striping for bike lane at 60' wide intersection with left- and right-turn bays
(Source: *Chicago Bike Lane Design Guide,* Chicago DOT, 2002)

Sample Cost Estimates

To accommodate the bicycle facilities being considered, a set of sample construction cost estimates were developed. These cost estimates were derived based on unit costs for similar facilities in other areas as well as by referencing the NCDOT cost estimation spreadsheet. Each unit cost is included below, along with a description of how it was obtained. The construction costs do not include right-of-way acquisition or mitigation. Relocation of utility poles is not considered due to the large variability associated with a specific scenario. Potential replacement of drainage grates is estimated from $150 to $500 depending on the necessity of replacing the frame. Railroad flangeway fillers are estimated at a cost of $500 per site, excluding additional crossing mitigation such as concrete pads and other surface treatments. All estimates are provided in 2006 dollars.

Multi-Use Path..... ***$360,000 to $600,000 per mile***
This estimate assumes a 10-foot wide asphalt surface and does not include other potential mitigation such as building a structure over a wetland area.

Wide Paved Shoulder..... ***$360,000 to $480,000 per mile***
This figure assumes a four-foot wide paved shoulder on both sides of the road being built where there was currently a grass shoulder. Other factors such as extensive ditch work are not considered.

Signed Route ..... ***$300 per sign or $1200 per mile***
This estimate accounts for four signs to be placed in a mile section, with two signs in each direction. Many bicycle routes in urban and suburban areas require more than four signs per mile.

Striped Bike Lanes ..... ***$18,000 per mile***
The estimate for striped bike lanes accounts for striping lanes (thermoplastic) in each direction and signing the route. Also, painting the bike lane with a more visible color on municipal roads (not allowed on state roads) may be desired at a cost of $30,000 per mile. This will help to calm traffic by creating a sense of enclosure. These lanes are often created in conjunction with resurfacing projects; however, the cost of resurfacing is not included here.

Wide Outside Lanes ..... ***$18,000 per mile***
Wide outside lanes are used here when differential striping can be applied to a roadway. As a result, no additional widening is necessary. The estimate accounts for the cost of restriping and signing the route.

Signed Route with Striped Parking ..... ***$18,000 per mile***
These routes are again the result of working within the existing cross-section to create a new facility type. This estimate accounts for striping and signing costs.

Neighborhood Connector ..... ***$60,000 to $102,000 for a prefabricated bridge***
This estimate assumes that the neighborhood connector would consist of a prefabricated bridge run for a short section (maximum of 50 feet) over a stream or other barrier. The cost of a paved link to a roadway or other bicycle facility is not included, and could be substantial.

Ancillary Facilities and Programs

According to the Morehead City Bicycle Planning Survey, there is a large demand for many different types of ancillary facilities in the Morehead City area. **Table 3.1** indicates that when asked what ancillary facilities they would like to see implemented in the community, almost 67% of survey respondents desired cleaner road surfaces. Bicycle racks at destination points, bicycle route maps, bicycle route signage, and drainage grates flush with the pavement surface were also considered to be important almost half of all survey participants. This section outlines several different types of ancillary facilities and their potential benefits to the community.

Table 3.1 Desired Ancillary Facilities for Survey Respondents

Desired Ancillary Facilities	Number	Percent
Bike rack at destination	32	41.0%
Clean road surface	52	66.7%
Maps of bike routes	35	44.9%
Bike rack on transit bus	8	10.3%
Bike route signage	37	47.4%
Drainage grates flush with pavement	36	46.2%

Mapping and Signing Projects

Comprehensive Route Systems

The recommendations shown in **Chapter 4** have been set forth in order to create a comprehensive route system for Morehead City linking commercial, recreational, and residential areas. Over the next twenty years, the implementation of these routes will ultimately result in an interconnected set of facilities. However, a set of supporting facilities will also need to be put in place to ensure the success of the network. Potential improvements are identified in this chapter. These recommendations encompass issues from maintenance to design and include but are not limited to:

- Provision of bike lanes on local streets where space is available and on-street parking is not an issue
- Exploration of the use of the shared lane symbol under restricted conditions
- Marking and signing signal loops (and possibly recalibrating them) for bicyclists
- Replacing unsafe utility covers and grates within the bicyclists' line of travel
- Marking railroad crossings to improve safety
- Route signage

While the first five items listed above are important for the bicyclist who has decided to use a specific route, the last — route signage — is critical to helping cyclists determine which route to use. Route signage should provide useful information to the bicyclists. When creating a route system signing plan, the destinations being served and the best roadways (or facilities) to access those destinations must be considered. Signing should include information on the direction and distance to destination points, as well as intermittent confirmation that the bicyclist is still on the correct route.

Facilities that can be used to create a comprehensive route system include multi-use paths, bike lanes, shoulders, and wide outside curb lanes.

Share the road signage example

Share the Road Signing Initiative

North Carolina has been installing "Share the Road" signage since 1987. Although it was not part of the *Manual on Uniform Traffic Control Devices* (*MUTCD*) at that time, the sign has since been standardized and included in that manual. This sign, shown in the picture to the left, serves to make motorists more aware of the possibility of bicyclists on high-use roads with potentially hazardous conditions. When this sign is placed along a bicycle route, it typically denotes a major roadway connecting with less frequently traveled roads. These signs serve as important and cost-effective safety and education tools. In fact, the visibility and impact of these signs recently has been acknowledged by the state by the issuing of a "Share the Road" license plate. The additional funds received through the sale of this license plate will be used to promote bicycle education and safety initiatives statewide.

Suitability Rating System

The bicycle level of service (LOS) methodology allows planners and designers to select a level of accommodation rather than a required specific design treatment to provide for bicyclists along a bike route. What the bicycle LOS methodology does not do is dictate what level of service is appropriate for a given community or user. This means that a community can decide that for one type of bike route system, such as a neighborhood route system, a LOS A or B may be required. Conversely, LOS C may be acceptable for the routes serving cross-town commuter cyclists. In addition to being widely accepted by state DOTs and local

jurisdictions, the bicycle LOS method is also being considered as the basis for a national LOS model to be included the *Highway Capacity Manual (HCM)*. Chapter 19 of the current HCM outlines LOS criteria for exclusive off-street bicycle paths, multi-use off-street paths, on-street bicycle lanes on urban streets, and for bike lanes at signalized and unsignalized intersections.[19]

A bicycle level of service analysis was not conducted as a part of this study. However, it is recommended that the city work with neighboring municipalities and Carteret County to perform a level of service analysis with a corresponding map component. Ultimately this exercise also could serve as a benchmark for the road system in Morehead City during future re-evaluations of the system.

Spot Improvement/Maintenance Programs

General Considerations

Broken utility cover

All non-controlled access roadways should be maintained so they are safe for bicyclists to use. The surface should be free of debris. Longitudinal cracks should be patched and drainage grates with longitudinal slots should be replaced. Utility covers should be flush with the roadway surface. Paved shoulders should be installed where rutting is occurring on the side of non-curb and gutter roadways. These items should be addressed through the normal roadway maintenance and Powell Bill program.

The alignment of drainage grates and gutter pans with existing pavement also is an area of concern in Morehead City. Over repeated repavings, the pavement level on streets with curb and gutter can become significantly higher than the gutter pan. This poses a safety hazard for bicyclists and cars by creating a dangerous edge of pavement. This situation can be avoided by milling down the pavement so that a repaving will be flush with the gutter pan or by raising the drainage grates and paving all the way to the curb. Another concern with drainage grates is their alignment relative to the street. Parallel drainage grates create hazards for bicyclists since front wheels are easily trapped in the openings. A concerted effort should be made to replace parallel drainage grates with more acceptable perpendicular or diagonal grates. Bridges Street has many damaged utility and manhole covers, as well as parallel drainage grates. This street should be an initial focus area for improvement.

Bicycle facilities, including trails, require an additional level of effort to provide acceptable maintenance. These maintenance issues occur most frequently on the right side of the pavement, where the cyclists is likely to be riding. Consequently, a more frequent

[19] Transportation Research Board, *Highway Capacity Manual 2000*, Washington, DC, 2000.

maintenance cycle to address these defects should be provided for bicycle routes. Areas such as bridges where excessive debris tends to build up and bicyclists have limited refuge options should be maintained even more frequently. Examples of this include the US 70 bridges over the Newport River and Gallant's Channel and the Atlantic Beach Causeway.

Special attention should be given to intersections, which frequently experience gravel buildup near turning areas. This gravel can pose a serious hazard to bicyclists. As a result, Morehead City should consider changing the practice of spreading gravel in ruts near uncurbed intersections. Also, street sweeping should include all parts of an intersection in order to eliminate these debris areas.

Signal Clearance

Traffic signal timing and loops along bicycle facilities require extra attention. According to the MUTCD,[20]

Bicyclist on loop detector

"At installations where visibility-limited signal faces are used, signal faces shall be adjusted so bicyclists for whom the indications are intended can see the signal indications. If the visibility-limited signal faces cannot be aimed to serve the bicyclist, then separate signal faces shall be provided for the bicyclist.

On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists."

While the former can be easily evaluated, the latter concern (that of signal timing) is a little harder to address. The AASHTO *Guide for the Development of Bicycle Facilities* provides information of clearance intervals and minimum green times for bicyclists.[21] At wide intersections, the clearance interval equation can result in some excessively long yellow-plus-all red periods for signals. If the facility consists of a multi-use path or a bike lane, a signal loop can be placed in the bike lane or on the path in advance of the intersection. When a cyclist passes over the loop, the signal will extend the green time for the intersection approach to accommodate the crossing cyclists. This treatment is in common use for motorist and has been applied in various locations for bikes. The design of the loop is critical; an oversized loop in a bike lane will detect cars in the adjacent lane. An effective loop design for detecting bikes in bike lanes is a quadrapole two feet wide and 20 feet long (approximately half the size of a normal 40 foot roadway loop). Such a loop readily detects cyclists, but will not detect a car six inches to the side.

[20] FHWA, *MUTCD*, p. 9D-1.
[21] AASHTO, p.65

Roadway Symbol Buildup

Thermoplastic buildup is another concern of bicyclists. Bike lane symbols, lane use (directional) symbols, and even crosswalks can build up with repeated application and cause handling problems for bicyclists. More than two layers of thermoplastic (one marking) should not be allowed on bicycle facilities.

The slipperiness of thermoplastic and paints is another concern of bicyclists. One way to mitigate this concern is to add sharp silica sand to the glass spheres when it is being applied to the wet thermoplastic or paint. This increases the roughness of the markings' surface, reducing the potential for bicyclists to slip on the thermoplastic.

Safety Railings along Bicycle Facilities

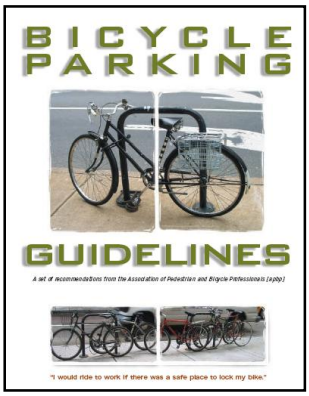
Bridge railing heights have been the subject of recent revisions to the AASHTO *Guide for the Development of Bicycle Facilities* and ongoing debates among bicycle facility design professionals. The current guide states that railing heights should be at least 42 inches to prevent bicyclists who hit the railing from tipping over the top. However, the current AASHTO Bridge Specifications require a 54-inch railing (this is also referenced in NCDOT's Bridge Policy as found at the following link: http://www.ncdot.org/doh/construction/altern/value/manuals/RDM2001/revpt1ch6-1yel.pdf). In practice, designers have been using the 54-inch railing when a structure is being built to the AASHTO specifications and a 42-inch railing along non-structural locations, such as when protecting bicyclists from embankments. Deficiencies in this standard create an unsafe riding environment and discourage bicycle connectivity. If bridges in the study area are found to be deficient in this area, the problem should be remedied as quickly as is practicable.

Bicycle Parking Facilities

Example of good short-term bicycle parking

Just as motorists need a place to park their cars when they arrive at destinations, bicyclists also need a place to park their bicycles. Consequently, when creating a transportation system to accommodate bicycling, parking must be included in that system. Bicycle parking is critical in areas where there are frequent bicycle riders such as the mall, schools, the YMCA, the marina, and other recreational areas. Bicycle parking should also be considered downtown and near businesses where bicyclists may frequent.

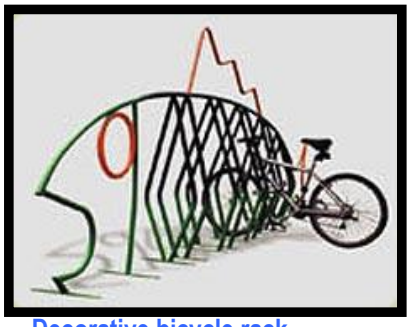
Typically, when parking is installed for bicyclists, the primary consideration is simply the accessibility or the convenience of the parking. While these are significant concerns for bicyclists, they are not the only issues. Bicyclists must also consider the security of the parking and the protection afforded to the bicycle.



The security concerns of bicycle parking can be addressed in several ways. High visibility of the parking rack can improve security. By locating parking near storefronts, or in high pedestrian use zones, the potential for theft or vandalism is reduced. However, placement needs to be carefully considered so as not to become a hazard to pedestrians or to diminish ADA accessibility. Well-lit areas can improve the security in areas where bicycles are parked after dark. Providing racks that support the frame instead of the wheel make it easier to lock a bike without damaging it. Bike lockers also provide good security for bicycles.

The protection required for a bicycle varies with respect to the purpose of the bicycle trip. For short duration trips, such as to the grocery store or the library, U-shaped bicycle racks on a concrete pad in front of the building may be acceptable. At a park and ride lot, or in front of an office building where the parking is for commuters, bike lockers or covered parking is more appropriate.

The Association of Pedestrian and Bicycle Professionals has produced a guidance document on good bicycle parking design. This excellent document is available on line at the APBP website.[22] The website http://www.bicyclinginfo.org/de/park.cfm also provides information regarding bicycle parking costs and number of spaces recommended.



Decorative bicycle rack

There are four basic elements to bicycle rack design. First, the bicycle should be supported upright by its frame in at least two places. Second, the rack should enable the frame and one wheel to be locked. Third, the rack should be anchored so that it cannot be stolen with bikes on it. Fourth, the rack should be placed as close to the building it serves as possible.

Bicycle racks can be tailored to reflect the culture or character of an area, or as a form of public art. Bike racks such as the one shown to the right make a statement about the area in which they serve as well as providing parking facilities for bicyclists.

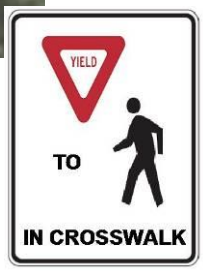
Safety Initiatives to Reduce Bicycle Motor Vehicle Crashes in Morehead City

Bicycle crashes were analyzed in **Chapter 2** of this report. However, the next step for further study could include a more detailed analysis of the bicycle crashes in the area with mitigation measures provided at each problem site.

[22] APBP, Bicycle Parking, available at http://www.bicyclinginfo.org/pdf/bikepark.pdf.

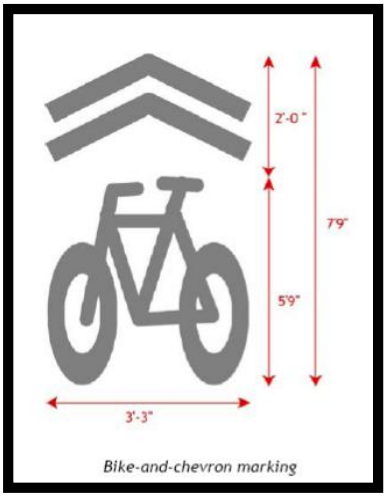
Engineering/Traffic Calming Countermeasures

Intersection Signage



Static signs such as NO TURN ON RED when Pedestrians Present or the Left Turning Vehicles Yield to Pedestrians have been found to reduce the incidence of pedestrian conflicts at intersections. Consequently, it is reasonable to expect that these signs also would reduce the conflicts between motorists and bicyclists riding on the sidewalk or on a sidepath. However, they should be used sparingly and only where a problem has been documented and relatively constant pedestrian/bicycle use of the intersection exists. The overuse of signs or the use of the signs where pedestrians or bicyclists are not using the crosswalks diminish the ability of the signs to command the attention of motorists. Eventually this results in the signs being just background visual clutter.

Because they are real time traffic control devices, blank out signs like the one pictured on page 3-12 can continue to be effective at intersections because they are only activated when there is a potential conflict. If motorists see a YIELD TO PEDS sign next to a permissive left turn signal, the motorists will know a pedestrian is crossing the conflicting crosswalk at that time. This "real-time" aspect of blank out signs allows for them to be placed at locations where conflicts are not frequent or constant enough to make a static sign appropriate.



"Sharrow" symbol

Shared Lane Symbol

The Shared Lane Symbol, or "Sharrow," has the potential to reduce several different types of crashes and is being used in jurisdictions across the country. Because cyclists tend to center over the symbol, it may be useful for reducing door crashes (where a parked motorist opens a door into the path of a cyclist). Additionally, a similar treatment has been found to reduce wrong way riding and riding on the sidewalk, and to improve bicyclists' position in the travel lanes.

Consequently this treatment may actually reduce the incidence of motorist failure to yield to the bicyclist crashes and overtaking crashes. Despite the potential for these collateral improvements, this treatment is recommended only in very selective areas, such as adjacent to on-street parking, or completing a link in a bicycle route.

This treatment is experimental and has not been approved by MUTCD, so its use would require one of two alternatives. This treatment can be used as a demonstration project on a non-state maintained roadway. If there is a desire to use "Sharrows" on a state or federal roadway, a Request to Experiment must be filed with FHWA prior to implementation. An

evaluation plan must accompany this Request to Experiment and this must include measures of effectiveness. The following measures of effectiveness are suggested for Morehead City:

- Separation between parked cars and bicyclists
- Percent of bicyclists riding on the sidewalk
- Percent of bicyclists riding against traffic
- Motorists' understanding of the symbol
- Bicyclists' understanding of the symbol

The National Committee on Uniform Traffic Control Devices (NCUTCD) has recently reviewed a case study with "Sharrows" and has recommended that the treatment be submitted to the Federal Highway Administration (FHWA) for consideration. This indicates that this treatment is receiving increased support on a national level.

Transit Interface

At this time, no bicycle amenities are included on the vans, mini-buses, and sedans that make up the fleet of the Carteret County Area Transportation System (CCATS). CCATS, a service administered by Carteret County, is geared toward elderly and disabled riders with the service available to the general public on a space-available basis. Bike racks on these vehicles can eliminate a barrier presented to those individuals who need their bicycle for supplemental transportation after they deboard. Amenities for bikes on the CCATS service should be considered as a way to enhance the multimodal riding experience for users by extending the catchment area for the transit service, giving bicyclists more options, and potentially increasing transit ridership. Another amenity that should be considered to more fully integrate bicycle use and the transit system is the installation of bike racks near heavily used bus stops and destination points in town. With features such as bike racks, benches, and shelters, bus stops become more user-friendly environments.

Bicycle rack on transit bus

Public Amenities

In addition to bicycle parking and provisions for bikes on buses, other amenities should be considered for implementation in order to create a more user-friendly bicycle system. Benches, water fountains, public restrooms, and changing areas provide riders with valuable services and were frequently requested during this plan's public involvement process. These amenities are especially helpful in high traffic areas such as downtown and by major destination points such as shopping areas and schools. Bicycle rentals, especially within the downtown and near the marina, can also be a great amenity for tourists and residents alike. This service could be provided through a private entity or administered by the parks and recreation department.

Chapter 4 – Recommendations

Proposed Bicycle Routes

After evaluating the existing conditions and standards in place in Morehead City, the next step in the bicycle planning process was to develop a set of bicycle route recommendations. A set of six loops and three connectors was assembled, as shown in **Map 4.1**. Each of these routes can be ridden on its own or as a part of an interconnected system. Each route is recommended to be signed with the D11-1 bike route sign, as shown at left. Facility types were also recommended for segments of the routes and are displayed in **Map 4.2**. These routes are described in detail in the following section, and a cost estimate is provided for each. The costs estimated reflect construction costs only and are estimated in 2006 dollars. These values were derived based on NCDOT unit costs provided in **Chapter 3** and on specific project attributes and are shown in **Table 4.1.** Priorities have been established for these routes and are given in **Chapter 5. Appendix 1** provides a more detailed breakout of project cost estimates and segment lengths.

Boardwalk Loop (Map 4.3)

20th Street

The Boardwalk Loop is a 6.3-mile loop utilizing two of the key bridge crossings in Morehead City and connects Morehead Middle School, Morehead Elementary School at Camp Glenn, and Carteret General Hospital. This route also connects to the Promised Land Loop, the Country Club Loop, and the Swinson Loop, part of which is the existing multi-use path along Bridges Street.

This route consists of recommended paved shoulders and signed routes. It is recommended that 20th Street have paved shoulders since it functions as a major travelway for those individuals trying to reach the northern part of the ETJ. This road already has a boardwalk that enables bicycles and pedestrians to stay out of the road on the bridge, but also has a shoulder to accommodate bicyclists who choose to remain on the road. Barbour Road, however, is only recommended to be a signed route. Much of this has to do with constraints presented by the bridge, which does not have significant shoulders and has raised sidewalks that do not give a bicyclist a refuge area. The portion of Bridges Street along this route is also recommended to be signed due to the fact that there is not enough room in many places to currently support a multi-use path. This area should be re-evaluated when the bridge is scheduled for replacement to determine whether it can be modified to accommodate additional bicycle facilities.

The total estimated construction cost for the Boardwalk Loop is $2 million.

Country Club Road

Country Club Loop (Map 4.4)

The Country Club Loop runs for seven miles past the country club and into the northernmost sections of the Morehead City Extra Territorial Jurisdiction. This area is the site of many new developments and is already popular with bicyclists. However, there are currently no shoulders on the roads on this loop, making it difficult for bicyclists. As a result, paved shoulders are recommended for all roads in this route. There appears to be space available to accommodate these shoulders without extensive reworking of drainage or other infrastructure.

The total estimated construction cost for this route is $3.4 million.

Mansfield Park Loop (Map 4.5)

The 3.2-mile Mansfield Park Loop connects the Mitchell Village/Mansfield Park area and its accompanying park to the Prosperity Loop and the Swinson Loop. This loop is recommended to be entirely signed since it consists of local neighborhood streets with low traffic volumes and vehicle speeds. Pedestrian signals and crosswalks are also recommended to be installed where this route intersects with US 70. This route will connect with the multi-use path currently under construction on Executive Drive.

As a result of the recommended facility type on this route, the estimated construction cost is only $9,000.

Promised Land Loop (Map 4.6)

Morehead City Depot

The 3.1-mile Promised Land Loop circles the heart of downtown Morehead, passing by the Depot, City Park, Cape Lookout High School, Shevans Park, the Parks and Recreation Center, and the waterfront shops and retail. This route connects with the Boardwalk Loop, the Waterfront Connector, the Morehead-Beaufort Connector, and the Crosstown Connector.

The roads utilized in this route are recommended to be signed. These roads are low speed and relatively low volume and most of them accommodate parking, making this designation the most cost effective choice. At its crossing with Arendell Street (US 70), crosswalks, pedestrian signals and enhanced pedestrian lighting should be installed to allow safe passage for bicyclists and pedestrians.

Due to the low cost of the signed route designation, enhanced crosswalks, and the pedestrian signals, the total construction cost for this facility is estimated as $4,000.

Prosperity Loop (Map 4.7)

The Prosperity Loop passes by some of the major commercial centers of the Morehead City area. In addition, this 7.6-mile loop connects with the Swinson Loop and the Mansfield Park

Loop. This route runs for part of its length on NC 24 and provides three crossing opportunities of US 70.

A combination of paved shoulders and multi-use paths are recommended for the facilities in the Prosperity Loop. A 10-foot multi-use path, functioning as a sidepath here, is recommended to run along Executive Drive and along NC 24 on its north side. The Executive Drive portion of this path is already under construction. NC 24 is a five-lane road with high speeds and volumes and has become very dangerous for bicyclists and pedestrians. However, it provides access to many commercial and residential areas. For these reasons, it is recommended that a multi-use path in this location be implemented to provide access for bicyclists wanting to utilize these areas. Currently there is sidewalk located along the north side of NC 24 near the Wal-Mart which could be expanded to include a 10-foot multi-use path. This is a viable option because it not only separates bicyclists from the high traffic volumes and speeds of NC 24 but also because there are limited driveway cuts in this area. The remainder of the roads comprising this route are recommended to have paved shoulders.

The total estimated construction cost of the Prosperity Loop is $4.1 million.

Bridges Street multi-use path


35th Street "Before"


35th Street "After"

Swinson Loop (Map 4.8)

The Swinson Loop runs for 7.3 miles past Morehead Primary, Swinson Park, West Carteret High School, Parkwood Shopping Center, and Carteret General Hospital. A portion of this route consists of the existing multi-use path along the north side of Bridges Street, which runs from West Carteret High School to 35th Street and is currently signed as a bicycle route. This route also connects to the Boardwalk Loop, the Mansfield Park Loop, the Prosperity Loop, the Waterfront Connector, and the Crosstown Connector.

The majority of this route consists of paved shoulder or multi-use path recommendations. The exception is Swinson Park Road, which is a low-traffic alleyway and is recommended to be a signed route. The Bridges Street multi-use path is recommended to be extended to reach Gloria Dawn Road. Another stand-alone section of multi-use path is recommended to be built behind the high school and connecting with Pond Drive. Paved shoulders are recommended on 35th Street from Country Club Road until the intersection with Bridges Street, the current terminus of the Bridges Street multi-use path. The existing path is recommended to be extended south to cross US 70 in order to reach the Visitor Center.

The total construction cost estimated for this project is $3 million.

Crosstown Connector (Map 4.9)

The 2.7-mile Crosstown Connector is a recommended set of striped bicycle lanes running along US 70 from 35th Street to 4th Street. This route would be created along Arendell Street (US 70) if the railroad currently occupying the median was relocated to run along another alignment (currently under study). The railroad is currently taking public comments on the relocation. Of the six relocation alternatives being proposed, five will reroute through Beaufort. There is also federal funding available to cover 90% of the relocation cost. The railroad lines have high growth potential in this area, which makes relocation very realistic. Morehead City is working with the railroads to move this study forward. If the railroad is eliminated, there will be additional width in this right-of-way that can be utilized for a smaller landscaped median and striped bicycle lanes. This route will connect the Morehead City Visitor Center and Boat Launch with downtown Morehead City, including the Train Depot and City Park. In addition, this route will connect to the Promised Land Loop, the Swinson Loop, the Waterfront Connector, and the Morehead-Beaufort Connector. If the railroad is not relocated, additional traffic calming measures would need to be investigated in order to consider this portion of Arendell Street as a bicycle route.

Arendell Street "Before"

Arendell Street "After"

Crosswalks, pedestrian signals and enhanced pedestrian lighting should be installed at the following crossing locations with US 70 to allow safe passage for pedestrians and bicyclists:

- 35th Street
- 20th Street
- 10th Street
- 8th Street
- 4th Street

The total estimated construction cost for the Crosstown Connector (assuming cost for restriping, pedestrian signals, crosswalks, and lighting only) is $155,000.

Morehead-Beaufort Connector (Map 4.10)

The Morehead-Beaufort Connector is a 3.6-mile route that links downtown Morehead City with Radio Island and the Town of Beaufort. These communities are currently linked by non-bicycle and pedestrian-friendly US 70 bridges over the Newport River and Gallant's Channel. The Gallant's Channel Bridge is scheduled to be replaced as TIP project R-3307. It is recommended that a multi-use path be installed on this bridge either as a part of the main bridge or as a cantilevered section. In addition, it is recommended that this project be modified to include installing a multi-use path on the Newport River Bridge as well. This fully connected facility would give bicyclists and pedestrians the opportunity to cross from Morehead City to Beaufort comfortably, as well as a way to easily access Radio Island. This

would be ideal for the burgeoning tourism industry that these communities are enjoying and would allow commerce to more easily flow between the communities.

Existing laneage on the Newport River Bridge does not provide additional space for bicyclists, so unless a bridge replacement is being considered for that bridge as well, it may not be economically viable to consider adding width to the bridge. A cantilevered multi-use path provides a separated area for bicyclists without fundamentally altering the original bridge structure. It would also be desirable to maintain a consistent facility type over both sets of bridges.

Further study as to the type of multi-use path needed and the alignment of the path will determine the cost estimate for this route. The feasibility of bicycle lanes as an alternative to a multi-use path can also be evaluated as part of this study. It is recommended that the two communities work with NCDOT to ensure that safe bicycle provisions are provided along this section of US 70 as an incidental project with TIP project R-3307. Funding for bicycle provisions has not yet been allocated for this project.

Waterfront Connector (Map 4.11)

The 4.5-mile Waterfront Connector is a scenic and functional route connecting the Carteret Community College, the Civic Center, the Visitor Center, the Boat Launch, the Train Depot, the City Park, downtown Morehead, and the Morehead Waterfront. The Waterfront Connector also links to the Promised Land Loop, the Swinson Loop, the Crosstown Connector, and the Morehead-Beaufort Connector.

Crystal Coast Visitor Center

This connector consists of a combination of multi-use paths and signed routes. The area surrounding the Community College and the Visitor Center is recommended to have a multi-use path that could be used as a short recreational loop. This would connect to a signed route along Evans Street, which would continue running near the water as a signed route until Third Street. The creation of this route may rest on future redevelopment projects in order to open up the space for these facilities.

The total estimated construction cost for this connector is $1 million.

Morehead-Newport Connector

If the North Carolina Railroad line is diverted off of its current alignment through Morehead City, it is recommended that the portion of the rail line from the recommended terminus of the Bridges Street multi-use path up to Newport be converted into a multi-use path. This would be a long-term recommendation and is contingent on the railroad realignment. This multi-use

path would provide a long-distance connector for those individuals wanting to travel between the two municipalities.

Construction Cost Estimates

Table 4.1 provides a summary of the bicycle routes recommended in the Morehead City Comprehensive Bicycle Plan. Each route is listed along with the presence of the various facility types within that route. The lengths and estimated construction costs for the individual loops and connectors are also shown. These values assume that there are no existing facilities that will be shared, so that the cost can be considered for each route as a stand-alone value. In addition to this information, **Table 4.1** provides the total mileage of each facility type estimated as a part of the network, the overall length of all facilities in the network, and the total estimated construction cost for the entire network. This overall cost accounts for overlapping in the network so no facility is considered more than once. The only cost not accounted for in this table is for the Morehead-Beaufort Connector, which does not have a cost estimated at this time, but could become an incidental project as part of another TIP project.

From this table, it is shown that the total estimated construction cost for the more than 43 proposed miles of bicycle facilities is over 13.5 million dollars. A further breakdown of construction cost estimate information can be found in **Appendix 1**.

Table 4.1 Route and Network Characteristics

Routes	Signed Route	Striped Bike Lane	Paved Shoulder	Multi-Use Path	Length (miles)	Cost
Boardwalk Loop	✓		✓		6.3	$2,000,000
Country Club Loop			✓		7.1	$3,400,000
Mansfield Park Loop	✓				3.2	$9,000
Promised Land Loop	✓				3.1	$4,000
Prosperity Loop			✓	✓	7.6	$4,100,000
Swinson Loop	✓		✓	✓	7.3	$3,000,000
Crosstown Connector		✓			2.7	$155,000
Morehead-Beaufort Connector				✓	3.6	TBD
Waterfront Connector	✓			✓	4.5	$1,000,000
Total* (length in miles)	11.6	2.7	16.3	12.8	43.3	$13,500,000

* Total accounts for overlapping in the network to produce an overall value
Does not include cost estimate for the Morehead-Beaufort Connector

Insert Map 4.1 here

Insert Map 4.2 here

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Bicycle rodeo

Education, Enforcement, and Encouragement Program Recommendations

In order to form a complete bicycle system in Morehead City the routes and facilities recommended in this chapter must be supplemented by a set of education, enforcement, and encouragement programs. It will be important to educate users about how the facilities recommended in this plan should be used in order to create a safe bicycling environment. These programs seek to help bicyclists and motorists work together to create a comfortable and approachable environment by teaching each the responsibilities they bear as users of these shared facilities. Both motorists and bicyclists have a responsibility to use roadways in a safe manner. If they behave unsafely, their actions should be discouraged through police enforcement. However, while discouraging inappropriate and unsafe behavior is important, it is equally as important to encourage appropriate behavior. This section outlines some recommendations for ways to promote safe use of Morehead City's existing and proposed network of bicycle facilities.

In light of Morehead City's increased frequency of bicycle fatalities in 2006, there has been a renewed interest in educating bicyclists on the proper use of bicycling. Safety and education programs must be a high priority for the community. At a public design charrette conducted for the town as a part of this study, citizens were asked to vote on their choice of special education programs tailored to Morehead City to improve the safety and mobility of bicyclists. The results indicated the following programs received the highest level of support.

1. Safe Routes to School
2. Public Service Announcements
3. Published Bicycle Map
4. School Bike Safety Education Program
5. Bicycle Registration Program

Boys and Girls Club, Morehead City

Education Programs

The community itself often provides valuable resources in developing and promoting bicycle programs. Law enforcement officials, local bicycle shops, local bicycle advocacy groups, educators, church organizations, public health professionals, local media, and other community groups can all offer resources to the Town as it strives to establish a broad-based bicycle safety education campaign.

Incorporating the diverse community groups listed above in education programs allows people of all ages and bicycling abilities to become more informed about bicycle safety. Because these programs can help drivers and bicyclists operate more safely around each other, they should address both bicyclists and drivers.

Rules of the Road

Conveying the proper way to operate on roadways is a cornerstone of any bicycle safety education campaign. A summary of these "rules of the road" is provided below.

Florida sidewalk bicycling informational sign

For cyclists:

- Follow the same laws that apply to motorists, obeying all traffic signals, signs, and lane markings. Always yield to pedestrians.
- Ride on the right side of the road with the flow of traffic — never against it.
- Always wear a properly fitting helmet.
- Be visible. If riding at night, use lights, reflectors, and bright clothing.
- Ride predictably and defensively. Use hand signals before turning.
- Avoid riding on sidewalks. If it is necessary to ride on a sidewalk, be aware of risks at intersections.

For motorists:

- Obey speed limits. Higher speeds result in greater injuries to cyclists and pedestrians.
- Obey signs, signals, and markings. Never run red lights.
- Yield to cyclists where required. Always look for bicyclists when turning.
- Pass cyclists with care. Slow down and provide enough space when passing.
- Do not honk your horn close to cyclists.
- Look for cyclists when opening car doors.
- Watch for children.
- Watch for bicyclists riding at night.

Bicyclists riding against traffic

Other Critical Safety Issues

In addition to the rules of the road, other critical safety issues that should be addressed by the Morehead City bicycle safety campaign include:

- Riding against traffic
- Riding on sidewalks
- Riding at night

These three behaviors can increase the risk of bicycle-motor vehicle crashes.

Riding Against Traffic — A common practice in the Morehead City area is riding against traffic, which increases the risk of being involved in crashes at driveways or intersections. Most right-turning drivers only look left before they turn, which means they can miss seeing bicyclists approaching from the opposite direction.


Bicyclist riding on the sidewalk

Riding on Sidewalks — When asked why they ride on sidewalks rather than on roads, bicyclists often say they feel more comfortable being on a facility that is separated from motor vehicles. They are not as safe, however, as they might think. Similar to the hazards faced by riding against traffic, bicyclists riding on sidewalks do not approach intersections from the same direction as motor vehicles, making it difficult for drivers to see them and making them more susceptible to crashes.

When forced to ride on the sidewalk because no other choice would be reasonable, bicyclists should try to ride in the same direction as vehicles in the adjacent roadway lanes. Even so, an education program should inform bicyclists who chose to ride on the sidewalk about the potential dangers they face with this behavior.


Bicyclist with safety gear

Riding at Night — Riding at night can be dangerous for bicyclists, when road hazards can be hidden in the dark and motorists don't have as much sight distance as in the day. Bicyclists who must travel at night need to ride with lights in order to increase their visibility to drivers. North Carolina state law requires a front lamp visible for a minimum of 300 feet and a rear reflector visible for a minimum of 200 feet. Yet even bicycles properly fitted with reflectors and lights can be overlooked by motorists until it is too late for the driver to react.

Bicyclists need to be educated about the dangerous aspects of a dark environment. The Town should distribute posters or fliers that show sight distances for various colors of clothing and illustrate the limitations of reflectors.


Bicycle rodeo

The educational campaign should help inform bicyclists about various safety issues. However, motorists also need to be informed so they can be made aware of bicycle crash risks. The Town's education program should instruct motorists to look in both directions for bicyclists when turning at intersections, drive more slowly, and be aware of the potential for bicyclists to be riding at night.

Elements of the Safety Education Campaign

To be truly effective, Morehead City should implement a broad-based education campaign. Bike rodeos, bicycle safety education programs in schools, public service announcements,

Bicycle rodeo

and documents such as posters, brochures, and websites can all be valuable tools in creating a bike-friendly environment.

Bike Rodeos

The Town of Morehead City should partner with local law enforcement, the department of parks and recreation, and volunteer bicyclists to offer bicycle rodeos several times during the year to teach basic bicycling skills and rules of the road. While Morehead City police officers have conducted bicycle rodeos in the past, they are not frequently conducted at this time. These rodeos could be the initial stages in developing a more comprehensive safety education program for local schools. Bike rodeos can be conducted as school education programs, through independent programs at community centers, or as a part of other group bicycle riding activities.

School-based bicycle education is critical

School-Based Bicycle Safety Education (#4 Priority Program)

The current school curriculum does not spend much time on bicycle safety. The school officers at the middle and high schools in Morehead City conduct a bicycle education seminar once annually; however, nothing is offered to the elementary school students. Now is the perfect opportunity to work with local elementary schools to develop a bicycle safety education program. Pedestrian and bicycle safety could be incorporated into the regular physical education classes. While children in kindergarten and grades one and two could be taught about pedestrian safety, Grades three, four, and five could be given hands-on bicycle safety lessons about wearing helmets, following the rules of the road, and turning and signaling. NCDOT's *Basics of Bicycling Curriculum* could serve as the basis for Morehead City's classroom and on-bike education efforts. The Town also could enlist the support of local bicyclists and law enforcement officers for bike lessons. One potential source of funding could be the Governor's Highway Safety Program 402 Funds or the new state Safe Routes to School program. Building partnerships with local public and private schools could also lead to additional financial support.

Public service announcement

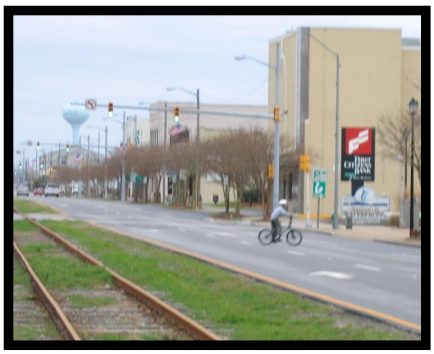
Public Service Announcements (#2 Priority Program)

One method of informing the public about safe bicycle riding and driver courtesy is through public announcements on television, radio, and in the newspaper. By developing and broadcasting public service messages about bicycle safety, Morehead City will be able to reach additional community members.

Other Educational Materials

In addition to announcements and hands-on programs, the Town should develop written material and images to distribute throughout the community. Brochures, posters, and web

pages all will help increase awareness of potentially dangerous situations. The print materials can be provided at local businesses, schools, and public buildings.



Unsafe bicycle crossing location

State Support for Bicycle Education

A significant amount of information regarding bicycle safety already has been developed by the NCDOT Division of Bicycle and Pedestrian Transportation (DBPT). Educational materials for children to learn the basics of bicycling, safety, and how to follow the law are available, and posters, pamphlets and brochures, and educational videos can be ordered online (http://www.ncdot.org/transit/bicycle/) or by calling the DBPT.

In addition to offering educational programs, the NCDOT Bicycle Policy also supports the development of bicycle programs in Morehead City:

- State, county, and local law enforcement agencies are encouraged to provide special training for law enforcement personnel with regard to bicycling.
- Education of both motorists and bicyclists on bicycle rights and responsibilities shall be an integral part of the NCDOT Bicycle Program.
- School systems are encouraged to conduct bicycle safety education programs as a part of and in addition to the driver's education program, to the maximum extent practicable.
- The Division of Motor Vehicles is urged to include bicycle safety and user information in its motor vehicle safety publications.

Enforcement Programs

When it comes to bicycle safety, education is important, but so is enforcement. The Morehead City Police Department should work with the Carteret County Sherriff's Department and the North Carolina State Highway Patrol to establish a well-publicized countywide, coordinated bicycle enforcement campaign. Through this enforcement effort, bicycle safety will be shown as a shared responsibility between bicyclists and motorists. To enforce the laws regarding bicycle safety, it is important to understand what they are and what they mean.

State Bicycle Statutes

Some of the North Carolina statute bicycle-related laws are identified below:

Laws Addressing Bicyclists

- In North Carolina, the bicycle has the legal status of a vehicle. Bicyclists have full rights and responsibilities on the roadway and are subject to the regulations governing the operation of a motor vehicle.

- Bicyclists are required to use both a front lamp and rear reflector when riding at night (front lamp visible for a minimum of 300 feet and rear reflector visible for a minimum of 200 feet).
- All bicyclists under the age of 16 must wear a bicycle helmet on public roads, paths, and rights-of-way.
- Bicycles traveling under the maximum posted speed limit must ride in the right-hand lane or as close as practicable to the right-hand curb or edge of the highway, except when overtaking and passing another vehicle or when preparing for a left turn.

Laws Addressing Drivers

- A vehicle overtaking a bicyclist must pass at least two feet to the left of the bicyclist, and is not allowed to drive to the right side of the roadway until safely clear of the bicyclist.
- Motorists must not follow a bicyclist more closely than is reasonable, showing appropriate respect for the speed of such vehicles and conditions of traffic and pavement on the highway.
- Motorists must yield right-of-way to bicyclists as they would another motor vehicle.

Targeted Behaviors

Behaviors that go against the laws in North Carolina concerning bicycles should be targeted for enforcement, including the following:

Bicycle Behaviors

- Violating traffic signals
- Riding against traffic on the roadway
- Riding at night without lights

Driver Behaviors

- Not allowing enough space when passing cyclists
- Not yielding to bicyclists when turning
- Speeding

Bicycle Registration Program (#5 Priority Program)

A bicycle registration program is one method of enforcing bicycle safety that the Town of Morehead City should also consider. By requiring bicyclists to register and affix a license tag or identification tag to their bicycles, the program could help identify bicyclists who might be unresponsive after an accident. This could help rescue personnel quickly establish an accident victim's identity, leading to improved decision-making for emergency medical treatment.

Another benefit of a bicycle registration program is deterring bicycle theft and increasing the opportunity for stolen bicycles to be returned to their proper owners.

Positive Re-enforcement

Enforcement does not always have to be a negative experience. Positive re-enforcement can also be a great way of promoting safe riding techniques. As is done in other cities, the Morehead City Police Department could recognize and reward kids seen operating their bicycles in a safe manner with coupons for redemption at local merchants (e.g. free ice cream, pizza, movie ticket). When a police officer spots a child bicycling properly as a part of his or her normal rounds, the child is given coupons redeemable at local merchants recruited to participate in the program. This program not only rewards a child following the rules, but encourages other kids to follow their example in order to be rewarded.

Safe routes to school workshop

Encouragement Programs

Several types of programs can be established to encourage residents to use the new bicycle facilities.

Safe Routes to School (#1 Priority Program)

The implementation of a Safe Routes to School (SRTS) program has helped communities across the nation promote pedestrian and bicyclist safety. Funding is available for this program, and Morehead City should work with local K-8 schools and bicycle advocacy groups to apply for state funding. The program should be designed to increase the number of students walking and bicycling to school through improved facilities and encouragement. For additional information about this program, please see the websites http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/Safe_Routes.html or http://www.saferoutesinfo.org/.

Walk and bicycle to school day

Two pilot schools should be selected to be the first in Morehead City to implement the Safe Routes to Schools program. The program can then be expanded to additional schools in the future. Over a period of five years North Carolina will get approximately $15 million in funding for Safe Routes to Schools Programs. The SRTS program is now a part of the NCDOT Division of Bicycle and Pedestrian Transportation. The state SRTS Program Coordinator can provide advice and help guide the program in Morehead City.

Walk and Bicycle to School Day

In the past decade, many North Carolina schools have identified “walk and bicycle to school” days. Through these programs, schools are able to increase awareness of bicycling and walking as fun, healthy transportation choices. This kind of encouragement also brings the

added benefit of reducing automobile congestion and pollution near schools. For more information, please see the website http://www.iwalktoschool.org/.

Helmet Promotions

The Child Bicycle Safety Act was passed in 2001. As a result of this bill, the NCDOT awarded over $300,000 to 240 local police and sheriff's departments and the Highway Patrol. The purpose of these funds was to purchase bicycle helmets for use in safety awareness programs in the communities in which funding was awarded. Each law enforcement agency applied for a grant worth up to $2,000 each based on the need, community size, and available funding. Morehead City received a grant of $2,000 which was used for helmets given to children at local bicycle safety events. More information on this program can be found at the following website: http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/helmets_helmet.html. More information on helmet initiatives can be found online at http://www.helmets.org/toolkit.htm.

Bicycling school bus

Other School-Based Programs

Other activities that could encourage bicycling include organizing a "bicycling school bus" where students meet and bicycle to school as a group, establishing a "frequent rider" club through which students could earn points and prizes, and giving away bicycle helmets to classes that have the highest number of students bicycling to school. Local bicycle groups should be contacted to see if they can sponsor these programs. For information on these programs and more, please see the website http://www.pedbikeinfo.org/.

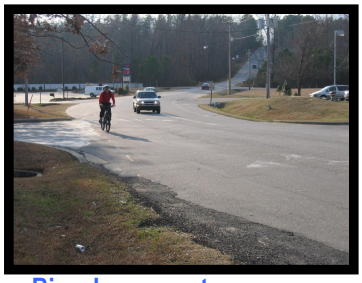
Bicycle map

Published Bicycle Map (#3 Priority Program)

A bicycle map for the Morehead City area can be an effective means of spreading information regarding bicycle routes and education measures. Identifying safe bicycle routes and making the public aware of the bicycle amenities available to them is the cornerstone of an effective bicycle education program.

Bike Mentor Program

One way to encourage bicyclists is by taking advantage of the people in the community who are already bicycling. Morehead City should consider establishing a bike mentor program to match adults who would like to learn more about commuting by bicycle with an experienced volunteer. This gives bicyclists the opportunity to share optimal commuting routes as well as cover important safety basics, such as how to bicycle in traffic, in the dark, or in the rain. This is an effective way to make new bicyclists more comfortable with the idea of bicycling for transportation purposes.



Bicycle commuter

Bike to Work Week

Another idea for promoting bicycling is identifying and publicizing a "Bike to Work" week. Local employers might compete to see which can have the greatest percentage of employees bicycle at least one day during the week, or give away bicycles or bicycle helmets.

Morehead City should consider sponsoring a bicycle rally downtown. May is typically considered Bicycle Month in the U.S., so Morehead City could select a week of this month to highlight the benefits of bicycling to work. In fact, May 2006 marked the 50th Annual National Bike Month™ designated by the League of American Bicyclists.

Bicycle rideabout

Bicycle Rideabout

A bicycle rideabout can be a great way to promote interest in bicycling in Morehead City. A rideabout typically consists of a short (three to five mile) ride around bicycle-friendly roads in the community. The Morehead City Police Department should also get involved with the ride in order to provide this opportunity to inexperienced riders who may want to participate as well as to help direct traffic at key intersections along the route. Bicycle groups in the area can use a rideabout as a recruiting opportunity or just a fun exercise. This also allows citizens to speak with town staff and learn about the bicycle planning projects that are ongoing in the community. A bicycle rideabout is suitable as a stand-alone event, as a part of a larger festival or event, or as an event kicking off/opening a new bicycle facility or program.

Health Initiatives

The Morehead City planning staff should partner with Carteret General Hospital or other local advocacy groups to sponsor a health-based initiative. This campaign can include "be active" programs that encourage healthy exercise and "eat right" programs that promote healthy lifestyles. Bicycling is a natural fit to be included as a part of this initiative. For more information, see the following website: www.beactivenc.org.

Bicycle Friendly Community

Administered by the League of American Bicyclists, the Bicycle Friendly Communities Campaign identifies communities that provide safe accommodations for bicyclists while also encouraging bicycling for transportation and recreation. Morehead City should apply for the Bicycle Friendly Community designation within five years of developing the Comprehensive Bicycle Plan. Cary and Carrboro are two cities in North Carolina that have been awarded this honor previously. For more information, please see the website http://www.bicyclefriendlycommunity.org/.

Chapter 5 — Implementation

Introduction

Implementation is the key to success in long-range transportation planning, especially when you consider how action-oriented bicyclists can be. This chapter provides general policy recommendations and an action plan to assist local decision-makers and planning staff in the implementation of the ***Morehead City Comprehensive Bicycle Plan.*** As shown in previous chapters of this report, an interconnected network of bicycle loops supported by ancillary facilities such as bike parking, water fountains, bathrooms, and bike route kiosks can further the Town's goal of developing a safe and convenient bicycle-friendly community. The implementation of this plan can serve as a guide to similar efforts in other Carteret County communities.

The implementation of this plan can serve as a guide to similar efforts in other Carteret County communities.

Action Plan

To firmly establish *Comprehensive Bicycle Plan* principles into the normal course of business in Morehead City, several amendments to current policies and programs are recommended, including the following:

1. **Morehead City Comprehensive Bicycle Plan** — It is recommended that Morehead City adopt the *Comprehensive Bicycle Plan* (map) as a part of the Comprehensive Plan and state-mandated Comprehensive Transportation Plan (CTP) map. The Down East Rural Planning Organization (RPO) will serve as the lead transportation agency to implement bike planning activities within other parts of the region, while Morehead City will control the areas within the Town limits and the ETJ. Working together, these agencies will use all available strategies to obtain rights-of-way, ensure connectivity, approve requested variations, and secure funding agreements.

2. It is recommended that Morehead City and Carteret County update the **Street Design Standards** to include general street design requirements (included on pages 3-5 through 3-12) and recommended cross-sections (shown on page 3-13) for bicycle facility treatments.

3. It is recommended that the Town conduct one **sponsored bicycle event** within the three months following the adoption of this plan. This event could include a **Bike Rodeo or Rideabout** to encourage more riders as well as educate cyclists about proper "rules of the road."

4. **Development Review Process** — It is recommended that the Town require new development projects to incorporate bicycle provisions in their proposed projects.

At a minimum, all new collector streets with posted speeds of 35 mph or less should include four foot bike lanes. Also, the Town should update the subdivision ordinance to include bicycle parking and sidewalk requirements on new development projects.

5. **Performance Measures** — It is recommended that Morehead City work with the BAC to establish performance measures to benchmark progress in achieving the goals of this plan. These performance measures should be stated in an official report after the plan is completed. Each measure requires data to be collected following the implementation of the plan in order to determine its effectiveness. Data should begin being collected immediately following the adoption of this plan in order to get a control sample. Data should then be collected at regular intervals so that the long-term improvements can be determined. The performance measures should address the following aspects of bicycle transportation in Morehead City:

To calculate the true impact of any changes, Morehead City should establish performance measures to benchmark progress.

- Safety — Measures of bicycle crashes or injuries
- Usage — Measures that document how many people are bicycling
- Facilities — Measures of how many bicycle facilities are available or the suitability of bicycling on roadways
- Education/Enforcement — Measures of the number of people educated or number of people ticketed as a part of a bicycle safety campaign
- Institutionalization — Measures of the total budget spent on bicycle projects and programs or the number of Town employees receiving bicycle facility design training

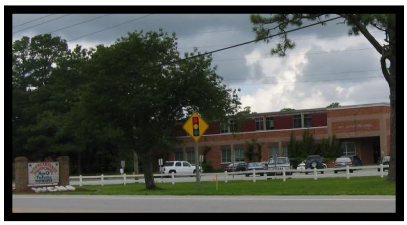
The Town should set performance measures that:

- Are related to the goals of the plan
- Provide a description of the data that need to be collected
- Utilize data that can be collected cost-effectively
- Are quantifiable and time-constrained (e.g., provide four miles of bike lanes by 2008)
- Can be reported at regular intervals, such as in an annual bicycle performance measures report

6. **Incidental Bicycle Projects** — As a result of Transportation Improvement Program projects or funds resulting from public and private organizational partnerships, certain sections of some of the bicycle routes may be implemented earlier than the routes of which they are a part. These sections are listed below.

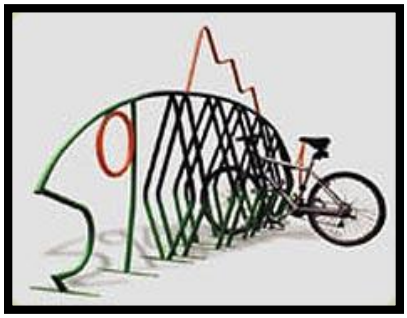
   - **Beaufort Bypass** (Gallants Channel Bridge replacement TIP R-3307) — It is recommended that Town staff pursue incorporating bicycle facilities along the new Gallant's Channel Bridge. Ultimately, bicycle facilities are recommended to be pursued along the Newport River Bridge and the Gallant's Channel Bridge. These facilities should be consistent in type in order to reduce confusion for cyclists. Facility types may include a cantilevered multi-use path or bicycle lanes. As an interim solution, outfitting both bridges with 54-inch bicycle-safe railings would be a low cost safety enhancement.

   - **US 70** (Arendell Street) — If the NCRR reroutes the existing railroad tracks and the right-of-way reverts back to Morehead City, it is recommended that local staff officials work with NCDOT to incorporate a new cross-section along Arendell Street including a landscaped median, five-foot bike lanes on each side of the road, and on-street parking.



High School located on Arendell Street

7. **Public Amenities** — In addition to bicycle parking and provisions for bikes on buses, other amenities can be considered for implementation in order to create a more user-friendly bicycle system. Benches, water fountains, public restrooms, and changing areas provide riders with valuable services and were frequently requested during this plan's public involvement process. These amenities are especially helpful in high bicycle traffic areas such as Arendell Street and downtown and by major destination points such as shopping areas and schools. Bicycle rentals, especially within the downtown and near the marina, can also be a great amenity for tourists and residents alike. This service could be provided through a private entity or administered by the parks and recreation department. It is recommended that the Town partner with local agencies, schools and shopping areas to establish an annual budget ($20,000) for the implementation of public amenities.



Amenities like this bike rack should be considered

Project Prioritization

Based on input received during the public charrette as well as information provided by the BAC, a set of project and program priorities were developed. These priorities were developed in an attempt to provide an equitable distribution of projects that would benefit a range of geographical areas as well as user groups in the community. Specific projects represent on-road as well as off-road facilities. Bicycling initiatives and program priorities

BAC input

were developed based on their ease of implementation (including set-up costs), connectivity to existing routes and benefit received by the largest contingent of population.

Seven independent bicycle route loops were developed as a part of this plan connecting neighborhood communities, commercial areas, and public institutions in Morehead City. The intent of developing the bicycle loops was to provide access to bicycle facilities for a greater percentage of the population. If this plan is implemented, over 95% of the local population would have access to bicycle facilities, representing all three levels of bicycle users.

Route Priorities

Three levels are used to classify the priority level of each route: **short-term, mid-term, and long-term** improvements. The total probable construction cost of the bicycle projects for the plan is $13,500,000 representing more than 43 miles of bikeways. *Short-term* improvements are those projects that are recommended for or can be completed within a five-year period. The total probable construction cost for the short-term projects is $1,400,000. While this may be a significant amount of capital investment, a large portion of the multi-use path implementation can be facilitated through right-of-way donation and "in-kind" services and contributions. In addition, the multi-use path running along Executive Drive is already under construction. *Mid-term* improvements are expected to occur between five and ten years into the future, for which $2,900,000 in projects is recommended. *Long-term* improvements are those projects that fall outside of a 10-year horizon for which a total of $11.8 million in projects is presented. Please note that all figures are presented in year 2006 dollars, thus not accounting for inflation or escalation of construction costs. In order to accommodate route segments that can be accomplished more easily in different time frames, some of the routes were split between priority levels. Each route has been classified into one of these priority levels, as shown in **Map 5.1** and listed on the following page. **Chapter 4** provides additional details about each route, and **Appendix 1** provides detailed cost and segment distance values for each route.

Insert Map 5.1

Arendell Street "Before"

Arendell Street "After"

Short-Term:

- Crosswalks/ enhanced signage at Penny Lane/Bridges Street and Post Office/Bridges St. ($10,000)
- Bike racks at key destinations – e.g., Morehead City waterfront, high school, middle school, shopping centers, parks ($10,000)
- Promised Land Loop ($4,000)
- Bridges Street multi-use path extended to Visitors Center ($100,000)
- Multi-use path constructed around Visitors Center and Community College ($800,000)[1] – *Dedicated right-of-way exists*

Mid-Term:

- Atlantic Beach Bridge Bike Accommodations ($20,000)[2]
- Mansfield Park Loop ($20,000)
- Waterfront Connector ($15,000)[3]
- Boardwalk Loop ($2,000,000)

Long-Term:

- Swinson Loop ($3,000,000)
- Country Club Loop ($3,400,000)
- Prosperity Loop ($4,100,000)
- Waterfront Connector ($200,000)
- Crosstown Connector ($155,000)
- Morehead City-Beaufort Connector ($TBD)[4]

Project implementation will be a shared responsibility between multiple agencies. Additional detail on agency participation is provided in the funding section of this chapter.

[1] Total cost offset by dedicated right-of-way and in-kind contributions

[2] Paint paved shoulders (non-slip); add "Share the Road" signage

[3] Signed route with enhanced crosswalks, signage, and actuated signal at Atlantic Beach Bridge

[4] The Morehead City-Beaufort Connector would require a feasibility study evaluating bicycle facility alternatives. A portion of this connector runs along the proposed Gallants Channel Bridge replacement (TIP R-3307)

Policy and Program Priorities

Few bicycle-related policies or program initiatives for the Town exist. The following initiatives, however, should be pursued in Morehead City during the next two-four years to ensure adequate education, encouragement, and enforcement of bicycle awareness for its citizenry. The following items were identified as the highest priority bicycle programs by the BAC and town staff.

- **Bicycle Summary Poster** — Within one year of the adoption of this Plan, it is recommended that the Town produce a bicycle summary poster for local and tourist distribution. The poster should include a map of the bicycle routes as well as provide education, enforcement, and encouragement information. The bicycle plan and map could also be advertised or discussed in local newspapers (e.g., *The Gam* or *Carteret County News Times*) or magazines (e.g., *Coaster Magazine*).
- **Public Service Announcements** — Another program initiative highly supported by the BAC was the need for enhanced public service announcements. These educational and encouragement announcements should be geared toward cyclists as well as motorists (as discussed on page 4-7). The announcements should cover issues like "Rules of the Road" and events like a Bike Rodeo or Rideabout.
- **Route Signage Program** — It is recommended that the Town work cooperatively with NCDOT to develop a route signing plan to improve bicycle awareness and information. Signing should include information on the direction and distance to destination points, as well as intermittent confirmation that the bicyclist is still on the correct route (see the Ancillary Facilities and Programs section of **Chapter 3**). Route maps placed on kiosks at destination points or along heavily traveled portions of the routes also can help to publicize the interconnected route system.
- **Traffic Calming Program** — As a part of the Town's ongoing traffic calming efforts, it is recommended that bicycle facilities such as striped and painted bike lanes be incorporated into the program as a viable option for calming traffic.
- **Spot Improvements and Maintenance Programs** — The Town receives Powell Bill funds for street maintenance and dedicates grant-matching funding through their CIP funds for streetscape projects. To become a bicycle friendly community, the Town should dedicate funding to bike improvements and maintenance. As a bold initiative, the Town could consider creating a set-aside for spot improvements and maintenance of bicycle facilities. It is recommended that $50,000 - $100,000 be allocated to this program on an annual basis. These monies can be used for small projects like improved signing, drainage grates, intersection crosswalks, shoulder repair, debris

Example of signed bike route

Bicycle rideabout

removal, railroad flangeway repairs, and repairing edge of pavement seams (see the Ancillary Facilities and Programs section of **Chapter 3**).

- **Bicycle Events** — Special community events that reach out to citizens have proven successful for a number of North Carolina communities. Because Morehead City has no active "ongoing" bike programs, it is recommended that the Town staff organize and advocate the following bicycle events on an annual basis: Bike Rodeos for elementary and middle schools (through actively soliciting school participation) and Rideabouts (at different geographical locations). These events can be conducted on their own or in conjunction with local festivals such as Americas' Sail and the North Carolina Seafood Festival.

- **Safe Routes to School Program** — One way to stimulate the educational programs would be to introduce a Safe Routes to School program to Morehead City. The Town should work closely with the new North Carolina Safe Routes to School coordinator to apply for funding, as the program is established, in Morehead City schools. Safe Routes to Schools funds do not require a local match. The program should be offered at two pilot schools in the first year after this plan is adopted and expand to additional schools in the future. More information is available on the websites http://www.ncdot.org/transit/bicycle/safety/programs_initiatives/Safe_Routes.html and http://www.saferoutesinfo.org/.

Example of signed bike route

- **Safety Education Programs** — It is recommended that safety education programs be initiated within two years following the adoption of this plan. These programs should be targeted to specific audiences and road user problems, and should be combined with enforcement activities that are coordinated with the appropriate law enforcement agencies. Education programs at churches, schools, and community centers will allow all age levels to become more informed about bicycle safety. Coordination with the Morehead City Police Department will allow for this program to be spread throughout the town and to target areas that need it most. Public services announcements on the radio and television should be an integral part of this program.

Incidental bicycle project

Funding and Phasing Concepts

One of the primary purposes of the *Morehead City Comprehensive Bicycle Plan* is to communicate the framework for the future bikeway network and ancillary facilities. This plan conveys a concept of a system of bikeways that works to provide an interconnected loop network. Only through the adoption of local policies and programs, state programs, and private contributions can the incremental construction of bikeway facilities effectively occur. With this in mind, it will be important for Morehead City to identify funding sources to implement the recommendations of this plan. While some projects and programs will be

funded by the Town, many other ways are available to provide financial support for improving local bicycling conditions.

Bicycle Facility Funding

Bicycle facility projects can be divided into two types: independent and incidental. Independent projects are those that are independent of scheduled highway projects, while incidental projects are bicycle accommodations that are created as a part of a highway project. Both types of funds should be sought to create a well-connected and user-friendly network in Morehead City.

Morehead City should take advantage of cost-effective opportunities to include bicycle facilities in incidental roadway improvements, such as repaving and reconstruction projects. The Planning Department should coordinate regularly with town and state transportation planners to make sure that upcoming projects in the Morehead City area include bicycle facilities. In addition, it is recommended that the Town take a proactive approach to creating the bicycle facility network and finding opportunities to enhance the network.

Bicycle Program Funding

Morehead City should build partnerships with local bicycle shops, bicycle advocacy groups, church groups, health professionals, and educators to develop bicycle programs.

While the Town may be able to fund some program activities, it can seek to build partnerships as a cost-effective way to offer comprehensive programs.

For example, the Town should partner with Carteret County and state and local law enforcement agencies to implement the bicycle safety enforcement campaign. In addition, having local co-sponsors of events such as Walk and Bike to School Day and Bike to Work Week can help fund events and build relationships with other groups that believe bicycling is important in the community. Therefore, the Town should build partnerships with local bicycle shops (i.e., EJW Bike Shop), bicycle advocacy groups, church groups, the business community, health professionals, and educators to develop bicycle programs.

State Funding Support

Many of the roadways where bicycle facilities are needed in Morehead City are owned and maintained by NCDOT. Therefore, the Town should take advantage of strong state support for funding bicycle projects and programs. To obtain state funding, the Town should take the following actions:

- Send the recommendations of this plan to the NCDOT Division of Bicycle and Pedestrian Transportation and to the NCDOT Division Two Engineer immediately after the plan is adopted. This will improve the likelihood that bicycle accommodations will be included during incidental construction and paving projects.

- Review the State Transportation Improvement Program (STIP) regularly to identify opportunities to include bicycle facilities as a part of STIP projects in Morehead City. For projects where bicycle facilities are possible, the Town bicycle and pedestrian coordinator (i.e., Planning Department) should notify both the NCDOT Division Two Engineer and the NCDOT Division of Bicycle and Pedestrian Transportation to make sure that bicycle facilities are included during the scoping, design, and construction phases of the project.
- Submit one or two of the plan's Top Priority projects to NCDOT during the first year after the plan is adopted so they can be considered for the Bicycle/Pedestrian Program section of the State Transportation Improvement Program (STIP). Typically, the total cost of construction should not exceed $500,000. Continue to submit one or two additional projects for consideration each year in the future. Projects that do not require the Town to purchase additional right-of-way are the best candidates for this funding source. The Bicycle/Pedestrian TIP can include incidental and independent projects. Currently, $6 million for independent projects is available per year for the entire state through this funding source, and it does not require local matching funds.
- Apply for Transportation Enhancements Program funding for an important bicycle project. Bicycle facilities are one of several types of projects that are eligible to be funded by this program. This funding source requires a 20% local match. More information is available on the Enhancement Grant Program at www.ncdot.org/planning/development/Enhancement/enhancement/enhancement.htm.

The Town can apply for state grants to purchase bicycle helmets for low- and moderate-income children.

- Submit spot improvement projects to NCDOT Division Two so that they can be fixed with Division Discretionary Funds. Through the course of this study, two dangerous intersections were identified as priority "spot safety" projects:
  - Penny Lane/Bridges Street — presents vehicular sight distance problems associated with multi-use path
  - Country Club Road/Bridges Street Extension — has high volume, inadequate crosswalks, and lack of actuated pedestrian signal

  Using Discretionary Funds will allow the improvement requests to go through an abbreviated TIP process so that they are funded and implemented within one to two years rather than six years. Spot improvement projects include short road sections that need shoulders, drainage grate replacements, and improvements to minor intersections.
- Apply for grants from the Governor's Highway Safety Program (GHSP) to fund education, enforcement, and encouragement campaigns. These federal Section 402

Highway Safety funds can be used for bicycle programs. For more information, please see the website http://www.ncdot.org/programs/GHSP/default.html.

- Consider applying for state grants to purchase bicycle helmets for low- and moderate-income children so that they can participate in the new Pedestrian and Bicycle Safety Education Program. NCDOT may have funds available for this purpose through its "Share the Road" license plate campaign.
- Take advantage of state planning grant funding to update this plan in five years. In addition, seek state planning grant funding to implement a pedestrian plan. Typically, improving conditions for pedestrians also makes it safer and more convenient to bicycle. In fact, this plan was funded in part by a grant from the Division of Bicycle and Pedestrian Transportation of NCDOT.
- Take advantage of programs similar to N.C. Moving Ahead!, which provided $5 million for bicycle and pedestrian improvements in 2004-2005 (out of $70 million total for multimodal transportation). If a similar program is established in the future, the Town should actively pursue having several bicycle projects funded through this source.

Create an environment for a great bicycling experience

Local Funding Programs

Alternative Funding Measures

It is evident that Powell Bill and general fund revenues alone will not be sufficient to fund a systematic program of constructing bicycle facilities within the Town. Alternative funding measures that other jurisdictions use for bike system improvements include:

- Transportation/Recreational Bonds
- Impact Fees
- Oversize Agreements

Transportation/Recreational Bonds

Transportation and recreational bonds have been instrumental in the strategic implementation of local roadways, as well as bicycle and pedestrian facilities throughout North Carolina. Voters in communities both large and small regularly approve the use of bonds in order to improve their transportation system. Projects that have historically been funded include sidewalk projects, bikeways, greenways, new road construction, and streetscape enhancements.

- The Town should incorporate bicycle facility improvements into future local bond initiatives. Incorporating a pilot bicycle project into a bond package would be an effective way to secure short-term bicycle funding.

- Powell Bill or other road maintenance funds can be used to create incidental bicycle projects through repaving and restriping roads.

Impact Fees

Developer impact fees and system development charges are another funding option for communities looking for ways to pay for bicycle facilities and associated infrastructure. They are most commonly used for water and wastewater system connections or police and fire protection services but they have recently been used to fund school systems and pay for bicycle and pedestrian connections. Impact fees place the costs of new development directly on developers and indirectly on those who buy property in the new developments. Impact fees free other taxpayers from the obligation to fund costly new public services that do not directly benefit them. Only a handful of communities in North Carolina have approved the use of impact fees (e.g., Cary). The use of impact fees requires special authorization by the North Carolina General Assembly.

Oversize Agreements

This is an agreement between the Town and a developer to identify cost sharing to compensate a developer for constructing a collector street with bicycle and pedestrian facilities instead of a local street with no provisions for bicyclists. For example, instead of a developer constructing a 30-foot back-to-back local street, additional funding would be provided by the Town to upgrade the particular cross section to a 33-foot back-to-back cross section (including bike lanes).

Appendices

Appendix 1 – Detailed Cost Estimates

Appendix 2 – Bicycle Planning Survey

Appendix 1 – Detailed Cost Estimates

Morehead City Comprehensive Bicycle Plan
Unit Cost Estimates

Facility Type	Cost Per Mile
Multi-Use Path	$500,000
Wide Paved Shoulder	$400,000
Signed Route	$1,000
Striped Bike Lanes	$40,000
Wide Outside Lanes	$15,000
Signed Route with Striped Parking	$15,000
Neighborhood Connector	$85,000
Striped Bike Lanes (Additional Pavement)	$440,000

Add a Contingency (20%) to all costs

** Note - construction costs only - no ROW

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Boardwalk Loop
Total Mileage	6.24
Total Cost	$1,633,166
Total + Contingency	$1,959,799
Multi-Use Path	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Wide Paved Shoulder	
Total Feet	21529
Total Miles	4.08
Total Cost	$1,631,001
Signed Route	
Total Feet	11430
Total Miles	2.16
Total Cost	$2,165
Striped Bike Lane	
Total Feet	0
Total Miles	0.00
Total Cost	$0

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Country Club Loop
Total Mileage	7.05
Total Cost	$2,819,289
Total + Contingency	$3,383,146
Multi-Use Path	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Wide Paved Shoulder	
Total Feet	37215
Total Miles	7.05
Total Cost	$2,819,289
Signed Route	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Striped Bike Lane	
Total Feet	0
Total Miles	0.00
Total Cost	$0

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Mansfield Park Loop
Total Mileage	3.16
Total Cost	$3,157
Total + Contingency	$3,789
Multi-Use Path	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Wide Paved Shoulder	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Signed Route	
Total Feet	16671
Total Miles	3.16
Total Cost	$3,157
Striped Bike Lane	
Total Feet	0
Total Miles	0.00
Total Cost	$0

Add $5,000 to total for 1 intersection with pedestrian crossing signals and crosswalks

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Promised Land Loop
Total Mileage	3.10
Total Cost	$3,099
Total + Contingency	$3,719
Multi-Use Path	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Wide Paved Shoulder	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Signed Route	
Total Feet	16362
Total Miles	3.10
Total Cost	$3,099
Striped Bike Lane	
Total Feet	0
Total Miles	0.00
Total Cost	$0

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Prosperity Loop
Total Mileage	7.62
Total Cost	$3,438,623
Total + Contingency	$4,126,348
Multi-Use Path	
Total Feet	20609
Total Miles	3.90
Total Cost	$1,951,593
Wide Paved Shoulder	
Total Feet	19629
Total Miles	3.72
Total Cost	$1,487,030
Signed Route	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Striped Bike Lane	
Total Feet	0
Total Miles	0.00
Total Cost	$0

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Swinson Loop
Total Mileage	5.62
Total Cost	$2,445,620
Total + Contingency	$2,934,744
Multi-Use Path	
Total Feet	10474
Total Miles	1.98
Total Cost	$991,842
Wide Paved Shoulder	
Total Feet	19190
Total Miles	3.63
Total Cost	$1,453,778
Signed Route	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Striped Bike Lane	
Total Feet	0
Total Miles	0.00
Total Cost	$0

Existing Bridges Street multi-use path is a part of this loop.
When added, the total length is 7.26 miles

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Crosstown Connector
Total Mileage	2.67
Total Cost	$106,946
Total + Contingency	$128,335
Multi-Use Path	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Wide Paved Shoulder	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Signed Route	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Striped Bike Lane	
Total Feet	14117
Total Miles	2.67
Total Cost	$106,946

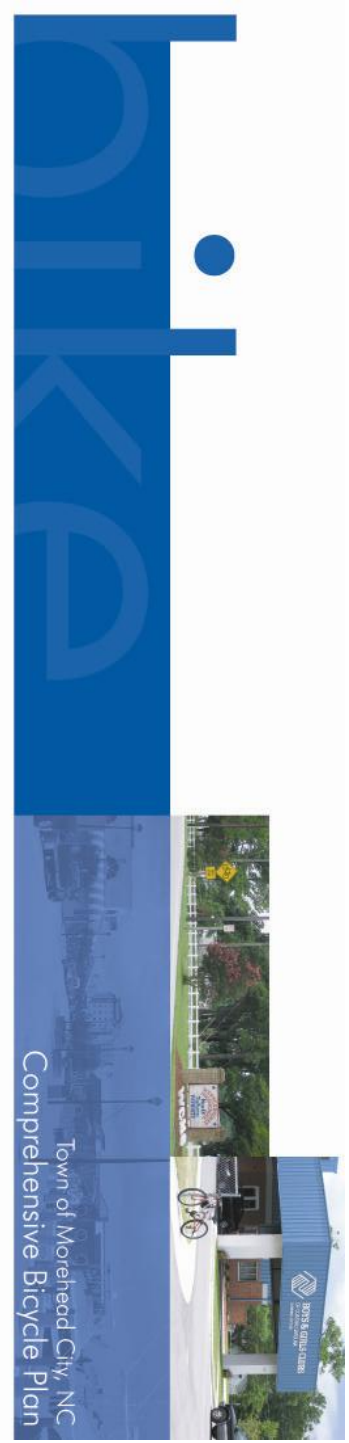
Add $25,000 for pedestrian signals, crosswalks, and lighting for 5 intersections

Morehead City Comprehensive Bicycle Plan
Bicycle Route Cost Estimate

Facility Name	Waterfront Connector
Total Mileage	4.48
Total Cost	$838,628
Total + Contingency	$1,006,353
Multi-Use Path	
Total Feet	8826
Total Miles	1.67
Total Cost	$835,820
Wide Paved Shoulder	
Total Feet	0
Total Miles	0.00
Total Cost	$0
Signed Route	
Total Feet	14825
Total Miles	2.81
Total Cost	$2,808
Striped Bike Lane	
Total Feet	0
Total Miles	0.00
Total Cost	$0

Routes	Signed Route	Striped Bike Lane	Paved Shoulder	Multi-Use Path	Length (miles)	Cost	
Boardwalk Loop	✓		✓		6.3	$2,000,000	
Country Club Loop			✓		7.1	$3,400,000	
Mansfield Park Loop	✓				3.2	$9,000	with signals and crosswalks
Promised Land Loop	✓				3.1	$4,000	
Prosperity Loop			✓	✓	7.6	$4,100,000	
Swinson Loop	✓		✓	✓	7.3	$3,000,000	
Crosstown Connector		✓			2.7	$155,000	with signals and crosswalks
Morehead-Beaufort Connector				✓	3.6	TBD	
Waterfront Connector	✓			✓	4.5	$1,000,000	
Total* (length in miles)	11.6	2.7	16.3	12.8	43.3	$13,500,000	

* Total accounts for overlapping in the network to produce an overall value
Does not include cost estimate for the Morehead-Beaufort Connector



Appendix 2 – Bicycle Planning Survey

MOREHEAD CITY BICYCLE PLANNING SURVEY

Morehead City would like to improve the conditions and opportunities for bicycling in our community. Your input will support the work in progress to develop the Morehead City Comprehensive Bicycle Plan. Please complete the survey by providing information as it applies to you. Providing your name and contact information is optional; however, it would be helpful to discuss bicycling and to inform you of bicycle plans in the future.
(Please print clearly)

Name _____
Mail address _____
_____
_____ Zip code _____

Telephone _____ (home) _____ (work)
Email _____

Age_____ Sex_____

1. Work Status: Employed_____ Work at home_____ Retired____ Student_____

2. Do you ride a bicycle? ____ Do you own a bicycle? ____ How many? _____

3. How many bicycle riders live at your address? _____

4. How would you classify your bike riding skill level?
____ Beginner (Under age 12) ___ Basic ___ Advanced

5. How often do you ride a bicycle?
___ days per week / __ days per month / ___ days per year

6. What is the length of your typical bicycle trip? _____ miles

7. Check ALL the times that you typically ride a bicycle.

___ almost everyday	___ daytime	___ night time	___ weekdays
___ weekends	___ holiday	___ vacation	___ summer
___ fall	___ winter	___ spring	

8. Where do you ride? Check all that apply.

__ In Morehead City	__ Carteret County	__ Vacation sites
__ Other cities	__ Other states	
__ Competitive races	__ Touring events	

9. For what purposes do you ride? Check all that apply.

___ Commute to work/school	___ Physical exercise
___ Run errands	___ Recreation
___ Shopping trip	___ Visit neighbor/family/friend

10. Please check all that would enhance your riding safety and enjoyment.

___ bike rack at your destination
___ striped bicycle lane on the road pavement
___ clean road surface
___ maps of bike routes
___ bike rack on transit bus
___ bike route signage
___ drainage grates flush with pavement surface

11. Do you wear a helmet when riding? _____

12. Have you ever been in a traffic crash on a bicycle? _____ What type?

Bicycle / Car or Truck ____
Bicycle / Motorcycle ____
Bicycle / Pedestrian ____
Bicycle alone ____

13. Please rate the Morehead City streets for bicycle riding by circling one number.

		Not Dangerous		**Dangerous**	
Gravel, glass, debris	1	2	3	4	5
Drainage grates	1	2	3	4	5
Cars turning/stopping in front of bicycles	1	2	3	4	5
Cars ignoring or crowding bicycles along the roadside	1	2	3	4	5
Roads too narrow for both cars and bicycles	1	2	3	4	5
Traffic volume	1	2	3	4	5
Harassment from drivers	1	2	3	4	5
Other _____	1	2	3	4	5

14. What roads would you most like improved for bicycling?

_____ _____
_____ _____

15. Name the facilities or types of places you think bicycle routes should connect.

_____
_____

16. In general, how would you rate the bicycle conditions in Morehead City?

___ good ____ fair ____ poor

Please return the survey by fax to (252) 726-2267 or mail to Linda Staab, Town of Morehead City, 706 Arendell Street, Morehead City, NC 28557.

For more information on transportation planning activities in Morehead City contact the Planning and Inspections Department at (252) 726-6848.

Morehead City Bicycle Planning Survey Summary

78 surveys received

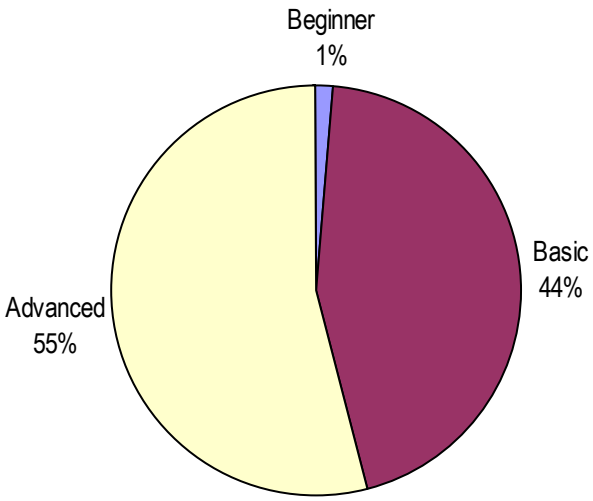
Participants' Gender:

39 (50%) – Female
39 (50%) – Male

Bicycle Riding Skill Level:

Beginner	1
Basic	32
Advanced	39

Bicycle Riding Skill Level



Purposes of riding:

Commute to work/school	13
Run Errands	25
Shopping Trip	13
Physical Exercise	53
Recreation	49
Visit neighbor/family/friend	29

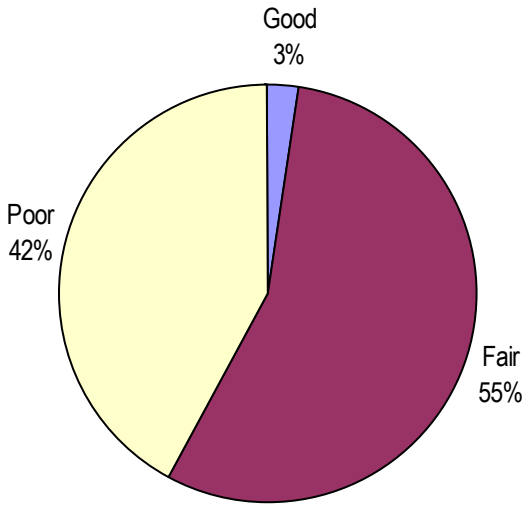
All elements that enhance riding safety and enjoyment:

Bike rack at destination	32
Striped bicycle lane on the road	64
Clean road surface	52
Maps of bike routes	35
Bike rack on transit bus	8
Bike route signage	37
Drainage grates flush with pavement	36

Rate the overall bicycle conditions in Morehead City:

Good	2
Fair	42
Poor	32

Overall Bicycle Conditions



Facilities or types of places that bicycle routes should connect:

Out-of-town Connectors – 31 responses
In-town Connectors – 26 responses
Shopping – 26 responses
Schools – 25 responses
Parks and Recreation – 23 responses
Service/Public Buildings – 15 responses
Downtown/Waterfront – 8 responses
Residential – 8 responses