# Oak Island, North Carolina Bicycle Transportation Plan

2006

GREENWAYS
INCORPORATED
Landscape Architecture
Multi-Objective Trail Planning
Open Space Planning

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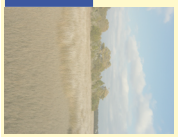
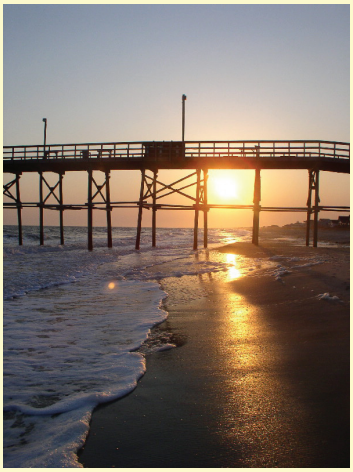


# Chapter 1
# Introduction

## 1.1 Scope and Purpose

In January 2005, the Town of Oak Island contracted with Greenways Incorporated (GWI) to create a Bicycle Transportation Plan for the Oak Island area that addresses all aspects of bicycling and provides recommendations for improvements. The project area encompasses the entire Oak Island municipal boundary that includes the main island and extends across the NC Highway 133 bridge to the airport and South Harbor area. The municipality contains the former Towns of Yaupon Beach (eastern sections) and Long Beach (western sections) which merged in 1999 to form the present-day Town of Oak Island.



Sunset on the beautiful Oak Island beach.

Because Oak Island continues to grow and attract more residents and tourists annually, there is a distinct need for a Bicycle Transportation Plan to address bicycle safety concerns, provide improved alternative transportation, improve and develop bicycle facilities, and create an attractive destination for bicyclist tourists. Improvements in bicycle facilities and education programs will make Oak Island a safer, more desirable place to live and visit.

Statistics also support the notion that bicycle facility improvements should occur. According to the 2000 Statewide Survey on Bicycling and Walking, the NCDOT's Division of Bicycle and Pedestrian Transportation found that 46% of all North Carolina households own bicycles and 75% of adult respondents believe their communities should spend more money to improve bicycling facilities and safety. The numerous benefits of bicycling and bicycle-friendly communities are described in Section 1.2

The planning process took twelve months to complete and included regular input from a local advisory/steering committee related to transportation planning in general and bicycle planning specifically. The Town of Oak Island worked closely with the GWI consulting team to ensure significant levels of public input including two public open house opportunities and a survey of the bicycle interests and uses of area residents.

This document presents the findings of these surveys and public input sessions, along with an examination of the existing bicycling conditions in Oak Island. A set of phased recommendations and funding options for developing a bicycle transportation system are discussed, to meet the future needs of the area's resident and tourist cycling public. The resulting recommendations

include actual physical changes to the existing transportation network as well as policy changes and possible program initiatives.

## 1.2 Benefits of Bicycling

For many years, small and large communities across America and throughout the world have been implementing strategies for serving the bicycle needs of their communities. They do this because of their obligations to promote safe travel and recreational opportunities for their residents and because of growing awareness of the many benefits of bicycling. These benefits can include improved alternative transportation options, increased health and fitness, lower levels of traffic congestion on area roadways, improved air quality from lower rates of vehicle emissions, and an increased sense of community among residents that experience their community at a bicycle-scale.

One of three major fishing piers in Oak Island.

### 1.2.1 Transportation Benefits

Bicycling is a means to get from place to place and is an excellent alternative to conventional transportation. In 1995, the National Personal Transportation Survey found that roughly 40% of all trips taken are less than 2 miles. By taking these short trips on a bicycle, rather than in a car, citizens can have a substantial impact on local traffic and congestion. Additionally, many people do not have access to a vehicle or for one reason or another are not able to drive. An improved bicycle network provides greater and safer mobility for these residents.

A woman enjoying a bicycle ride on Yacht Dr.

### 1.2.2 Increased Health and Fitness

Obesity from poor eating habits and lack of exercise has become a critical issue in America today. Our unhealthy lifestyles have led to an increased number of many diseases. The increased number of diseases reduces the overall quality of life for individuals and leads to increased medical costs for families, companies, and local governments. Increasing our activity levels is a crucial part of any strategy directed at improving overall community health, and bicycling is an excellent way to increase regular activity levels.

### 1.2.3 Environmental Improvements

When people choose to get out of their cars and onto their bicycles, they make a positive environmental impact. They reduce use of gasoline, which then reduces the volume of pollutants in the air. Other impacts can be a reduction in overall neighborhood noise levels and improvements in local water quality as fewer automobile-related discharges end up in local rivers, streams, and lakes.

### 1.2.4 Economic Benefits

As an affordable form of transportation, bicycling offers an alternative to the economic burdens of high gas prices, expensive car payments, and regular automobile maintenance. Car ownership consumes a major portion of many Americans' income. According to the Mid-Atlantic American Automobile Association (AAA), the cost of operating a car for one year is approximately $5,170. In comparison, the cost of operating a bicycle for a year is only $120 (League of American Bicyclists). These figures suggest that the average

family has to work for more than 6 weeks to pay a year's car expenses, compared to less than one day needed to pay for a year's bicycle expenses (based on U.S. Census, 1998 median family income figures)[1].

Tourism is another factor in the economic benefits of bicycling. Tourism can be expected to increase with quality of life. According to the National Center for Bicycling and Walking (NCBW), a safe facility network for bicyclists is a great place to start. In regions where networks of lightly traveled back roads and hospitable accommodations are prevalent, on-road bicycle routes can provide visitors and residents alike with an ecologically sound alternative to cars and motor coaches for sightseeing and recreational traveling purposes. Bicycle tourists attracted to such regions can contribute significantly to bed and breakfasts, eateries, and service providers in even the smallest of communities[2]. Finally, according to a recent NCDOT case study of the Northern Outer Banks[3], "the annual economic impact of cyclists is nine times the initial costs of the bicycle facilities built in the region."

A bicycle rack at The Point beach access, the westernmost portion of Oak Island. one of Oak Island's beach access points.

1.2.5 Quality of Life

Many factors go into determining the quality of life for the citizens of a community. The local education system, prevalence of quality employment opportunities, and affordability of housing are all items that are commonly cited. Increasingly though, citizens claim that access to alternative means of transportation and access to quality recreational opportunities such as parks, trails, greenways, and bicycle routes, are important factors in determining their overall satisfaction with their community. Happy, active citizens radiate a high degree of livability within a community and this livability factor can attract new businesses, new residents, and new opportunities - all important components of maintaining a high quality of life in the community.

1.2.6 Summary and Additional Resources

Many private and public organizations have completed studies and surveys that show the many benefits of bicycling. The ideas presented above are only a small sample of the information that is available. To learn more about the benefits of bicycling, the Internet can be a great source of information. The following websites are good starting points:

State and Local Policy Program of the Hubert Humphrey Institute of Public Affairs, based at the University of Minnesota.
This website lists dozens of studies related to economic, social, and natural resource impacts associated with cycling.

http://www.hhh.umn.edu/centers/slp/bike_bib.html

Federal Highway Adminstration's Pedestrian and Bicycling Information Center, based in Chapel Hill, NC.

http://www.bicyclinginfo.org/pp/benefits/

## 1.3 Prior Efforts

This Bicycle Transportation Plan is part of the Town of Oak Island's ongoing consideration and desire to provide safe and enjoyable bicycling opportunities to the tourists and residents of the area. Earlier transportation planning and mapping efforts have had a significant impact on the cycling landscape in the community as have the land use plans and documents that guide the community's growth. Before implementing a new bicycle plan, it is important to understand the history of transportation, land use, and bicycle planning in the area.

Funding assistance to create this plan was provided by the State of North Carolina's Department of Transportation (NCDOT) as part of its 2004 Bicycle and Pedestrian Planning Grant Initiative. The Town of Oak Island was awarded one of the grants in the first year of this initiative. The Bicycle and Bikeway Act of 1974 directs the NCDOT to assist local governments with the development of bicycle programs, construct a statewide bikeway system, develop policies and standards for facilities, and develop safety training programs. The Town has not previously worked with the NCDOT to develop bicycle project priorities.

Currently available bicycle map booklet of recommended bike routes.

In more recent years, the Town and the residents of the community have created other important documents to assist and plan for the community's cyclists. In 1998, a small booklet was developed by the Town of Long Beach's Parks and Recreation Department designating bicycle routes and loop trails and providing safety advice. These booklets are still available at local recreation and tourist attractions.

In August 1998, an NCDOT Transportation Plan Technical Report was completed for Oak Island, covering the Towns of Caswell Beach, Long Beach, and Yaupon Beach. The chief concern was the increase of visitors in the region and the accompanying additional traffic. It indicated the importance of having bicycle routes and also recommended bicycle accommodations along several routes with connections to NC Bicycle Route 3, a cross-state Bicycling Highways route that runs from Virginia to South Carolina.


A family biking across a boardwalk.

In July 1998, the Town of Long Beach and Brunswick County developed a Corridor Land Use and Development Plan for the Second Bridge to Oak Island. The Second Bridge will connect the center portion of the island to the mainland and NC Highway 211 (NC Bicycle Route 3). Included in this plan is the recommendation to develop bicycle routes and facilities and the statement that bikeways should be considered part of an intermodal transportation system that includes pedestrians, bikes, and autos.

Finally, goals of the NCDOT 1996 Long Range Transportation Plan for Bicycling and Walking include providing bicycle facilities, providing strategies of education, enforcement, and encouragement, and promoting new ways to advance bicycle safety.

Combined, these documents, plans, maps, and facilities represent a continued interest in the community and state to support bicycle transportation and a commitment to integrating bicycle needs into the physical development of the community's transportation infrastructure.

## 1.4 Vision and Goals

Overarching goals and objectives that relate to bicycle usage in Oak Island, listed below, were generated during four steering committee meetings and two public meetings.

A pier along the Intracoastal Waterway.

- Promote safe and effective bicycling in Oak Island for all types of resident and tourist cyclists and to promote the safe interaction of motorists and cyclists.

- Reduce traffic congestion by creatively investing in attractive, convenient, and safe means for bicycle travel, and improving bicycle facilities.

- Develop a system of designated island bicycle routes to connect destination points.

- Create a bikeway network that is an integral part of the transportation system and provides an alternative means of transportation as well as recreation opportunities.

- Provide system of safe and appropriate bicycle facilities and amenities for bicyclists.

- Increase public awareness and education initiatives to promote the legal rights and responsibilities of bicyclists.

- Improve the quality of life for Oak Island residents.

Sunset over the Atlantic Ocean.

Taken together and combined with the goals articulated by the participants at the summer 2005 public workshops, a vision of what the community wants to achieve becomes apparent:

Create a safe and effective system of bicycle facilities that links together existing resources and destinations, allows for safe interaction between bicyclists and motorists, supports alternatives to automobile travel, increases recreation opportunities, and provides improved options for advancing the community's mobility, health, quality of life, and attractiveness to tourists.

(Footnotes)
[1] Pedestrian and Bicycle Information Center (PBIC). Benefits of Bicycling : Economic Benefits. Retrieved on 11/29/05 from http://www.bicyclinginfo.org/
[2] National Center for Bicycling and Walking. The Economic Benefits of Bicycle- and Pedestrian-based Tourism. Retrieved on 11/29/05 from http://www.bikewalk.org/assets/Reports/economic_impact.htm
[3] NCDOT Division of Bicycle and pedestrian Transportation. The Economic Impact of Investments in Bicycle Facilities. 2004

# Chapter 2
# Current Bicycling Conditions

## 2.1 General Overview

The Town of Oak Island is the largest beach community in North Carolina with a population of approximately 8,000 year-round residents. Mostly residential, the island has experienced substantial growth in recent years. It is the largest of the municipalities in Brunswick County, which was the 61st fastest growing county in the United States between 2000-2004 (according to the United States Census Bureau). Between 1990 and 2000, Oak Island grew at a rate of 44.4%. In 2002, the Town issued 283 new residential building permits, up from 172 in 2001. The seasonal population difference is significant, escalating to approximately 27,000 people on summer weekdays and 40,000 on summer weekends, which is 5 times the year-round population.

Traffic coming across the NC 133 Intracoastal Waterway

Oak Island has become a popular community for older residents and retirees and the following data supports that. Based on the 2000 U.S. Census, the national percentage of people 55 and older is 21% compared to 39% in Oak Island. The national percentage of people 19 and younger is 29% compared to 17% in Oak Island. Finally, the national percentage of people 20-54 is 50% compared to 44% in Oak Island.

Davis Canal

Oak Island is 12.6 miles long, 10 miles of which are in Oak Island Town limits, running east-west with a south-facing beachfront. It averages one mile across from the ocean to the intracoastal waterway. Three major roads run east-west (Yacht Dr. along the intracoastal waterway; Oak Island Dr. down the middle; Beach Dr. along the coast). Dolphin and Pelican Drives run parallel to Beach Dr. just inland. A large number of roads intersect these major roads but do not run from Oak Island Dr. to Pelican, Dolphin, and Beach Drives on the western two-thirds of the island because of the Davis Canal. Two scenic boardwalks cross the Davis Canal providing some access.

The Bicycle Plan study boundary covers the entire Oak Island municipality, including the main island portion and extending across the NC Highway 133 intracoastal waterway bridge into the airport and South Harbor Village areas. As of 2005, the NC Highway 133 bridge is the only way to access Oak Island but is not safe for bicyclists (described in detail later). The Second Bridge across the intracoastal waterway will provide a second access from the north and will have more bicycle accommodations. The Second Bridge will enter the central portion of the island. These are the two "portals" and key transportation corridors to Oak Island.

These island geography and population characteristics have an overarching impact on the bicycle planning process. They significantly affect transportation, the environment, local ordinances, and everyday decisions made by motorists, bicyclists, and pedestrians. The following sections summarize the existing conditions, existing plans, policies, and island ordinances, and community usage and concerns.

## 2.2 Inventory of Existing Bicycling Conditions

Cyclists facing congestion along Beach Dr.

Cycling conditions vary across the island on spatial and temporal scales. Most residential north-south roads have minimal traffic and low speed limits providing safe, easy pedaling for novice bikers. The major east-west roads that include Yacht Dr., Oak Island Dr., and Beach Dr. all exhibit different characteristics and more traffic. These roadways are also difficult to cross because of higher traffic volume and speeds. Because summer automobile traffic is dramatically higher, potential conflict between bicyclists and motorists is higher. During the colder months, conditions are very different with fewer tourists. As a whole, there is not an interconnected bicycle facility system and because the island is elongated east-west, the major east-west transportation corridors become important focal points for this Plan.

It is important to consider a number of specific factors that affect the overall bicycling environment. The findings are presented below.

### 2.2.1 Trip Attractors

People currently bicycle to a variety of destinations across the island for different activities. Each of these destination points is referred to in this documen as a bicycle attractor. The most commont categories of bicycle trip attractors on Oak Island include:


Memorial Waterway Park is a popular destination, containing the Nature Center and Butterfly Garden area.

- Places of employment (e.g. business areas on E. Oak Island Dr.)
- Parks (e.g. Middleton Park, Memorial Park, Malcolm Register Park, Tidalwaves Park, May Moore Park, Bill Smith Park)
- Community and recreation centers (e.g. Recreation Center, Nature Center, Cabana, Ocean Education Center)
- Piers (e.g. Long Beach Pier, Ocean Crest Fishing Pier, Yaupon Beach Fishing Pier)
- Beach access points
- Trails (e.g. scenic boardwalks, Environmental Overlook Trail, Heron Trail)
- Tourist destinations (e.g. The Point, beach access points, motels, vacation rentals)
- Shopping locations (e.g. grocery stores, coffee shop, restaurants)

Each of these categories of bicycle trip attractors was considered when determining locations for the physical bicycle improvements recommended later in this Plan. They represent important starting and ending points and provide a good basis for planning bicycle improvements and developing bicycle routes. Some of the most important trip attractors that were identified are shown on the Existing Conditions map at the end of this chapter.

2.2.2 Land Use Characteristics

As mentioned previously, Oak Island is dominated by residential areas. Two small commercial areas exist on the eastern end of Oak Island Dr. and consist of restaurants and tourist-related businesses. There are few motels and most tourists stay in vacation home rentals. There are no schools or hospitals. Much of the island is built-out with a few exceptions, including the beachfront easement from SE 59th St. to SE 74th St. which is composed of grassy, low-lying, sandy areas.

South Harbor Village Marina

The areas of Oak Island north of the intracoastal waterway include a future condominium development on the western side of the bridge along with the existing Brunswick County Airport. On the eastern side of the bridge is the South Harbor Village area which is a new development consisting of vacation homes, condominiums, a marina, and a village center with shops.

Because there are many waterways, there is significant travel by water vessel. Kayakers, boaters, anglers, and larger fishing operations make use of this navigable resource.

2.2.3 Existing Bicycle Facilities

The Town of Long Beach created a Bicycle Trails Map booklet before it merged with Yaupon Beach to become the Town of Oak Island. While this serves as a guide for bicyclist tourists, the routes presented are not part of an official system and there are few facilities and signage to support them today.

Oak Island Dr. has a wide easement on the majority of the south side, with grass, plantings, and a five foot sidewalk used by both pedestrians and bicyclists. This does not provide adequate space for both users. Sidewalk bicycling is dangerous here because of the numerous crossing roadways and driveways coming into Oak Island Dr.

Four-foot shoulder along Beach Dr.

Beach Dr., from E. 58th Street to Middleton Ave., has four foot shoulders on both sides of the two-lane road. From Middleton to W. 30th, there is no shoulder; the shoulder section continues on the north side only from W. 30th to Kings Lynn Dr. There is no striping or signage for bicycle usage but there are occasional pedestrian signs. The Town created a plan recently for four-foot shoulders to extend from Middleton Ave. west all the way to The Point on both sides. This includes bicycle signage and pavement markings. The project began construction in 2005.

The NC Highway 133 Intracoastal Waterway bridge has eight-foot shoulders but only a 24" high wall that does not meet the AASHTO 54" minimum requirements. The Second Bridge to Oak Island includes a six-foot shoulder on each side with a 54" bicycle-safe rail (There will be no pavement markings for bicycling upon construction). The Middleton Bridge over the Davis Canal will be replaced with construction scheduled to be completed before 2010. Its design calls for an eight-foot shoulder, five and a half foot sidewalk between

Cyclists crossing one of the scenic boardwalks across the Davis Canal marshy areas.

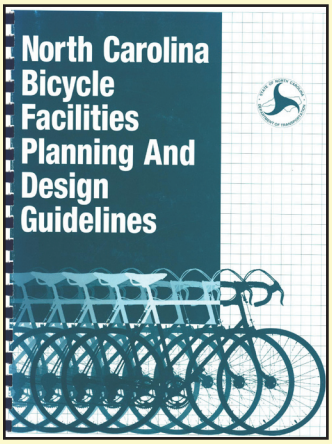
the travel lane and the bridge rail on one side, and an eight-foot shoulder with bicycle-safe railing on the other. Again there will be no official designation, signing, or pavement markings for bicycle lanes but the facilities will be in place on both bridges.

Other bicycle facilities are limited with very few, scattered bicycle racks mainly at major beach access points.

2.2.4 Connectivity

While the road system is well connected across the island, there is a lack of official connectivity between bicycle facilities and trip attractors. There is currently a lack of designated bicycle facilities or shoulders on most roads. As mentioned previously, the construction of four-foot bike lanes on the western half of Beach Dr. began in 2005. These facilities will connect the two ends of the island.

Water and traffic barriers present obstacles to connecting all parts of Oak Island effectively and safely. The Intracoastal Waterway prevents connectivity to the mainland portion of the Town limits. The Davis Canal and marshy zones, through the middle of Oak Island, prevent connectivity from the beachfront to the northern part of the island, especially on the western two-thirds, with the exception of two scenic boardwalks. The Second Bridge and improvements to the Middleton Bridge at Davis Canal will improve bicycle facility connectivity across these bodies of water.




NC Bike Facilities Planning and Design Guidelines

## 2.3 Existing Plans, Programs, Policies, and Ordinances

Bicycle planning in Oak Island is shaped by planning and project development at many levels. The Federal Government produces standards and guidelines that are then applied at the state, regional, and local levels. The State also produces long-range policy, project, and funding documents that are based on local-level needs and state-level interests and capacities.

Of all the plans, guidelines, and strategies, the most important documents for guiding this process are: NCDOT's Long-Range Statewide Transportation Plan (updated in 2004), North Carolina Bicycle Facilities Planning and Design Guidelines, NCDOT Transportation Plan Technical Report for Oak Island, and the Corridor Land Use and Development Plan for the Second Bridge to Oak Island.

In Oak Island, there are also local ordinances established by the Town that relate to pedestrian, bicyclist, and motorist interactions.

The following paragraphs summarize the key documents and ordinances that were referenced when designing the new bicycle network for the Town of Oak Island.

2.3.1 NCDOT Long-Range Statewide Transportation Plan (2004)

The latest version of this document calls for connectivity improvements

between different modes of transportation as well as the development of new opportunities for multimodal transportation. To achieve this, the plan recommends a larger financial investment in bicycle facilities than has historically been available. It also promotes the idea of strengthening the importance of community-level goals in transportation planning and "mainstreaming" the development of bicycle facilities. This ensures that bicycle facility planning is considered early on in the project planning process and is a regular part of transportation activities across the state rather than a secondary consideration or overlooked component.

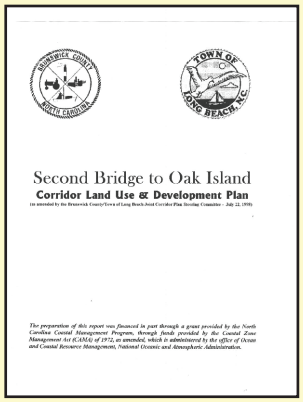
2.3.2 The North Carolina Bicycle Facilities Planning and Design Guidelines (1994)
This is the primary guidebook for designing bicycle facilities in North Carolina. It includes recommendations for the bicycle planning process and then provides references to the AASHTO Design Guidelines and those of other states to recommend a set of guidelines that maximize safety, efficiency, and conformity of facilities. The document was created by the UNC Institute for Transportation Research and Education (ITRE) for the NCDOT Office of Bicycle and Pedestrian Transportation. Document appendicies include excerpts from the MUTCD and State level bicycle policy and law.

2.3.3 NCDOT Transportation Plan Technical Report for Oak Island (1998)
Created more specifically for Oak Island, this report indicates the importance of planning for increased tourist traffic and providing bicycle accomodations as one means of mitigating the problem. It recommends bicycle accomodations/routes for the following locations:

- Both sides of Beach Drive from Middleton Ave. to its west end
- Along Second Bridge to Oak Island
- Along East Oak Island Dr. from NC 133 to Beach Road to SE 58th St.
- Along NC 133 from NC 211 to the Intracoastal Waterway Bridge and from the south end of the Intracoastal Waterway Bridge to Caswell Beach Road

2.3.4 Corridor Land Use and Development Plan for the Second Bridge to Oak Island (1998)
Produced by the Town of Long Beach and Brunswick County, this plan reiterates the NCDOT's Statewide Transportation Plan concept that bikeways should be considered part of an intermodal transportation system and recommends the development of bicycle routes and facilities. It specifically addresses future land use and development policy regarding the areas affected by the future Second Bridge to Oak Island. It recommends that three types of bikeways be established: bike paths where easements or natural features provide that option, bike lanes along higher traffic volume streets, and shared roadways on low traffic volume residential streets. Specifically, it calls for 4' bicycle lanes on the bridge's "connector highway." It accentuates the importance of connectivity, calling for the option for every property owner to be able to ride a bicycle to all major destinations in the corridor. It also recommends secure bicycle storage at shopping areas and recreation facilities and appropriate, coordinated signage to designate bicycle facilities and provide

*The Transportation Technical Report for Oak Island*, 1998.



*Second Bridge to Oak Island: Corridor Land Use & Development Plan*, 1998.

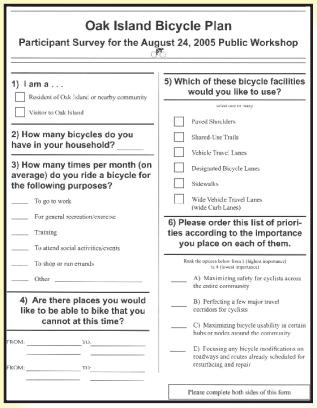
directions.

### 2.3.5 Local Ordinances

A variety of local ordinances pertain to multi-modal transportation activity. Because the summer sees significantly larger crowds and traffic, speed limits are lowered from 45mph to 35mph from June-September on Dolphin and Beach Drives. This is an attempt to make conditions safer for motorists, pedestrians, and bicyclists.

## 2.4 Community Usage and Concerns

While difficult to measure, community usage and concerns are vital to understand during the planning process. Bicycle usage varies across the island based on skill level and purpose. Most Oak Island bicyclists are recreational users and more users are present in the summer when automobile traffic is most congested. A participatory process brought out more specific ideas and concerns.



Oak Island Bicycle Plan

Participant Survey for the August 24, 2005 Public Workshop

1) I am a . . .

- Resident of Oak Island or nearby community
- Visitor to Oak Island

2) How many bicycles do you have in your household? _____

3) How many times per month (on average) do you ride a bicycle for the following purposes?

- ____ To go to work
- ____ For general recreation/exercise
- ____ Training
- ____ To attend social activities/events
- ____ To shop or run errands
- ____ Other _____

4) Are there places you would like to be able to bike that you cannot at this time?

FROM: _____ TO: _____

FROM: _____ TO: _____

5) Which of these bicycle facilities would you like to use?

- Paved Shoulders
- Shared-Use Trails
- Vehicle Travel Lanes
- Designated Bicycle Lanes
- Sidewalks
- Wide Vehicle Travel Lanes (wide Curb Lanes)

6) Please order this list of priorities according to the importance you place on each of them.

Rank the options below from 1 (highest importance) to 4 (lowest importance)

- ____ A) Maximizing safety for cyclists across the entire community
- ____ B) Perfecting a few major travel corridors for cyclists
- ____ C) Maximizing bicycle usability in certain hubs or nodes around the community
- ____ D) Focusing any bicycle modifications on roadways and routes already scheduled for resurfacing and repair

Please complete both sides of this form

Front side of participant survey form distributed at publi meetings (See Appendix A for a summary of findings).

While difficult to measure, community usage and concerns are vital to understand during the planning process. Bicycle usage varies across the island based on skill level and purpose. Most Oak Island bicyclists are recreational users and more users are present in the summer when automobile traffic is most congested. A participatory process brought out more specific ideas and concerns.

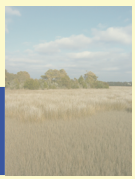
Citizens were given two means to provide input: public meetings and survey forms. Two public meetings were held, one in June, and another in August. Brief presentations were given to the public describing the planning process, bicycle facility options, opportunities and constraints on Oak Island, and the preliminary bicycle network. Open discussion and map markups were the chief methods to gather information. The goal of the June meeting was to understand community goals and concerns and locate areas that needed improvement. A preliminary bicycle network was presented at the August meeting in map form for review and comment. Only fifteen total citizens attended the meetings.


Map used at first public meeting.

During the public meetings, citizens provided several bicycle route recommendations used in the bicycle network development process. Several needs were voiced including desires for 1) more signage, 2) maintenance that includes debris removal on road shoulders, and 3) connectivity of bicycle facilities. A dichotomy of ideas also surfaced between two types of recreational users: Skilled bicyclists preferred to be in the roadway environment while those less-skilled users believed bicyclists should be out of the roadway.

Surveys were distributed at the public meetings, carried to other citizens by public meeting participants, and also dispersed in local venues such as the Recreation Center. The survey asked citizens several questions, including how often do they ride, for what purpose do they ride, what facility do they prefer to ride on, and what factors determine whether or not they ride to a destination. Eleven surveys were returned therefore, the significance of the results is minmal. All participants owned a bicycle and felt that public funds should be used to improve bicycle transportation. The majority biked for recreation and exercise and were most comfortable with bicycle lanes as a facility.

Complete survey results are found in Appendix A.



# Oak Island Bicycle Plan

## Existing Conditions

*Oak Island, NC*


| | | | |
|---|---|---|---|
| 1 | Bike Rental | 9 | Middleton Park |
| 2 | Bill Smith Park | 10 | Ocean Education Center |
| 3 | Cabana | 11 | Potential Park |
| 4 | Environmental Overlook Trail | 12 | Recreation Center |
| 5 | Heron Lookout | 13 | Skate Park |
| 6 | Library | 14 | South Harbor Marina/Village |
| 7 | May Moore Park | 15 | The Point |
| 8 | Memorial Waterway Park | 16 | Yaupon Park |

**Legend**

- Points of Interest
- Piers

**Facility**

- Bike Lane Construction
- Existing 4' Shoulder
- Roads
- Boardwalk/Scenic Walkway
- Oak Island Boundary
- Hydrology

0 0.5 1 Miles

Data Sources: Town of Oak Island, Brunswick County, Greenways Inc.

GREENWAYS INCORPORATED
Landscape Architecture
Multi-Objective Trail Planning
Open Space Planning

# *Chapter 3*
# *Bicycle Network Plan*

## 3.1 Overview

Based on an examination of the existing conditions (Chapter 2) and an understanding of the community's vision and goals for improved cycling opportunities (Chapter 1), Greenways, Inc. has prepared a proposal for a new bicycle network for the Town of Oak Island. Chapter 3 describes this new bicycle network along with providing recommendations for ancillary facilities.

Some of the individual network components that are described include the types of facilities that are being recommended, the major corridors that shape the network, and a number of specific recommendations for needed, individual changes. The methodology that was used to develop the network is briefly introduced in section 3.3.

Chapter 4 describes program and policy recommendations. Priorities, timelines, and steps for implementing the plan are presented in Chapter 5 - Implementation. Together, Chapters 3-5 provide a complete picture of the nature and design of the new bicycle network as well as the steps that are necessary for turning the vision into a reality.

## 3.2 The Network

The Bicycle Network is a set of on and off-road corridors that create a system of safe and convenient bicycle facilities throughout the island. The newly proposed network includes nearly 45 miles of new bicycle facilities. These facilities include bicycle lanes, signed-shared roadways, shared-use paths, and other bicycle accommodations. It is anticipated that the full network will be complete by 2020. The Bicycle Network is represented in a series of maps broken down by sections later in this chapter.

Overall Bicycle Network map. Detailed 11x17 maps are presented in Section 3.5.

Development of the Town of Oak Island's Bicycle Network will require a long-term, cooperative effort between the Town of Oak Island, the North Carolina Department of Transportation, Brunswick County, and other local and state agencies.

## 3.3 Bicycle Network Methodology

A variety of information sources were consulted during the development of the Bicycle Network, including previous plans and studies, recommended projects, the consultants' field work, existing transporation infrastructure and right-of-ways, public input, and noted bicycle trip attractors. A more complete

list of information inputs is shown in the box below (Figure 3.1). The process of selecting roadways and facilities for the Bicycle Network also took into account existing roadway cross-sections, traffic patterns, and surrounding geography, land use, and demographic characteristics.

Several concepts served as guides for the network development process. These concepts represented the interests expressed by the client, the steering committee, and the public. They also helped achieve the goals articulated in other local planning documents. Some of the concepts that guided the development of the network included:

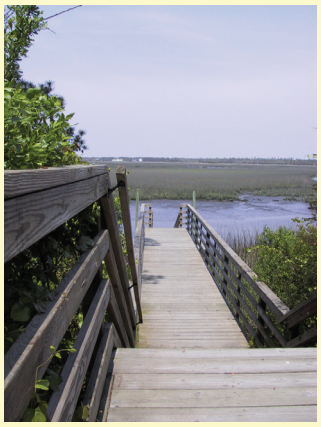
1) Residents and tourists, of all different skill levels, should be able to bike safely along the east-west routes of the island.

2) North-south bicycle routes should provide safe crossings over Oak Island Dr. and be determined mostly by trip attractors, existing facilities, and even spacing across the 12.6-mile island.

3) Most of the network's roadway segments should serve as connectors to important destinations.

4) There should be bicycle access across the Intracoastal Waterway allowing safe bicycle entry into the island onto the mainland portion of the town's limits.

5) A specific bicycle facility type should be specified for each roadway.



Dock at May Moore Park, a trip attractor along Yacht Dr.

**Oak Island Bicycle Network**
***List of Information Inputs***

1) Locations of the existing east-west transportation corridors on Oak Island
2) Locations of existing facilities and/or ROW
3) Public comments made during community workshops
4) Responses to the Town of Oak Island's Bicycle Survey
5) Recommendations from representatives of the Steering Committee
6) Field observations made in Spring and Summer 2005
7) Projects listed in the NCDOT Transportation Plan Technical Report for Oak Island
8) Second Bridge to Oak Island - Information from the *Corridor Land Use and Development Plan for the Second Bridge to Oak Island*
9) Existing parks, piers, beach accesses, commercial areas, and other pedestrian and bicycle attractors
10) Recreational and transportation routing

Figure 3.1

## 3.4 Recommended Facilities

There are many facility types that support bicycle use, all described in the following paragraphs. The primary types recommended in this plan are shown in Table 3.1. For each of these facility types, both the miles that

currently exist and the miles that this plan recommends as part of the network are listed. The different facility types have specific design components that enable them to work with particular types of roadways. These design components and guidelines can be found in Chapter 6. Selection of a facility type depends on roadway specifications such as volume of traffic flow, speed of traffic, amount of space available, and surrounding land use characteristics. Each of the facility types noted in Table 3.1 is described in more detail in the following paragraphs. All recommended facilities, with the exception of shared roadways, should be accompanied by bicycle route signage in the Town of Oak Island.

| Facility Type | Existing | Recommended |
|---|---|---|
| Signed-Shared Roadway | 0 mi | 19.7 mi |
| Wide Paved Shoulder | 4.9 mi | 0 mi* |
| Bike Lane | 0 mi | 17.0 mi |
| Shared-Use Paths | 0.5 mi** | 2.4 mi |
| Sidepaths | 0 mi*** | 5.7 mi |
| **Total** | **5.4 mi** | **~45 mi** |

Table 3.1 Appoximate mileages of existing and recommended facilities.
*The wide paved shoulder that exists is along Beach Dr. The recommendation is to add pavement marking and signage to create bicycle lanes, thus eliminating wide paved shoulders as the specific facility type.
**Mileage includes existing scenic walkways across Davis Canal.
***The Oak Island Dr. sidewalk does not currently qualify as a sidepath because of inadequate width.

### 3.4.1 Shared Roadways (No Special Bicycle Facilities)

Shared roadways are streets and roads where bicyclists can be served by sharing the travel lanes with motor vehicles. Usually, these are residential streets with low traffic volumes and/or low speeds, which do not need special bicycle accommodations in order to be bicycle-friendly. Most of the residential north-south island roads fit into this category already. They do not require any new facilities and are not part of the proposed bicycle network.

Example Locations: most residential north-south roadways, Oak Dr., Holly Dr.

E. Oak Dr. - an example of a shared roadway

### 3.4.2 Signed-Shared Roadways

A signed-shared roadway is a shared roadway which has been designated with signage as a preferred route for bicycle use. Bicycle route signs can be posted on key routes to indicate to bicyclists that particular advantages exist to using

Yacht Dr.

these routes compared with alternative routes. The signs are used to officially designate bicycle routes, show the proper direction for cycling on the road, and provide a visual cue that bikes are welcome on the road. These are shared roadways that provide important connections to other recommended bicycle facilities and destinations in the region. Because they do not require paint, these facilities are also less expensive than bike lanes.

Proposed Locations: Yacht Dr., Dolphin Dr., Yaupon Way, E. 9th St., E. 20th St, E. 30th St., E. 47th St., Middleton Park area, Barbee St.

3.4.3 Wide Paved Shoulders

Paved shoulder space improves the safety and comfort of bicyclists. A minimum width of four feet is recommended. On many roadways, motor vehicle travel lanes can be narrowed to provide more shoulder space. According to the AASHTO Guide for the Development of Bicycle Facilities (1999), “where four-foot widths cannot be achieved, any additional shoulder width is better than none at all." For instance, smaller shoulders may be necessary briefly in specific situations to provide continuity. Paved shoulders also improve safety for motor vehicles, prevent pavement damage to the travel lanes, and provide space for pedestrians. Bicycle route signage can also be posted for designation and directional guidance.

Existing 4' wide paved shoulder facility on Beach Dr.

Proposed Locations: None

3.4.4 Bike 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 by 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; five- and six-foot bike lanes are typical for collector and arterial roads. Bike lanes in the Oak Island proposed network are striped shoulders with designated markings for bicyclists.

One of two existing scenic boardwalks. It is asked that bicycles be walked across here (20th St.).

Proposed Locations: Middleton Ave., Oak Island Dr., Beach Dr., Fish Factory Rd.

3.4.5 Shared-Use Paths (Separated from the roadway right-of-way)

Shared-use paths are an important component of a bicycle and pedestrian transportation system. They can provide a high-quality bicycling experience in an environment that is protected from motor vehicle traffic because they are constructed in their own corridor, often within an open-space area. Shared-use paths can be paved and should be a minimum of ten-feet wide. Where high usage by a variety of users is anticipated, twelve feet is preferred. Width may be reduced to eight feet if there are physical or right-of-way constraints. Shared-use paths that are recommended in this Plan provide important connections that complement on-road bicycle facilities.

Proposed Locations: Path along NC Highway 133 bridge, Path along north side of intracoastal waterway

### 3.4.6 Sidepaths

Sidepaths can provide a more comfortable place for beginning bicyclists and other people who are not comfortable riding on the road with traffic. Pedestrians also benefit from wide sidepaths. Sidepaths should be provided on both sides of roadways, when possible, separated from the roadway by as large of a buffer as possible. The minimum width should be ten feet. This option was recommended for Oak Island Dr. because of an existing sidewalk, wide landscaped right-of-way (ROW), and double stop signs at north-south intersecting roads for both sidewalk and road traffic. It should be noted that there are numerous intersecting roads and driveways. Education and signage should be a part of this facility development to ensure safety of bicyclists, pedestrians, and motorists.

W. Oak Island Dr. sidewalk and easement.

Sidewalks generally should not be designated as bike routes because of conflicts with turning vehicles at intersections. Even in locations with sidewalks, the long-term strategy should be to widen the road or narrow the lanes to provide additional space for bicyclists in on-road bike lanes or shoulders.

Proposed Locations: Oak Island Dr., NC Highway 133/Country Club Dr.

## 3.5 Key Corridors and Areas

Section 3.5 describes the proposed bicycle network. The section is divided into four subsections (see Figure 3.2) that focus on individual geographic parts of the project area. Larger 11x17 maps for each subsection are found at the end of this chapter. The subsections are:

- Eastern Oak Island
- Central Oak Island
- Western Oak Island
- Oak Island Mainland Area

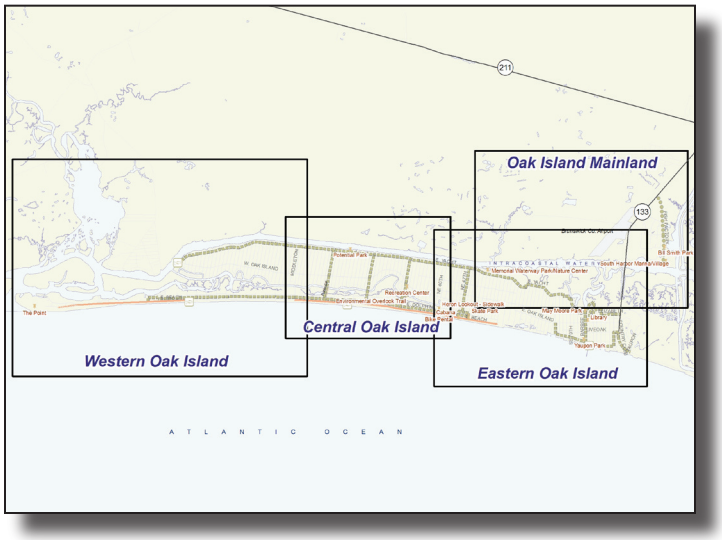



Figure 3.2. Study subsections

In each subsection, specific projects are recommended. Recommended facilities vary, but all should be accompanied by bicycle route signage. Implementation phasing is not presented until Chapter 5 - Implementation.

### 3.5.1 Eastern Oak Island

Eastern Oak Island covers the area from E. 40th St. eastward to the Town limits. It has the greatest concentration of commercial areas on the island and perhaps the most traffic, with the NC 133 Intracoastal Waterway Bridge currently serving as the only entry point to the island.

Country Club Dr. in Caswell Beach, just outside Oak Island town limits.

On the north end, the scenic Elizabeth Dr.-Yacht Dr. corridor along the intracoastal waterway is currently well-used by bicyclists despite the lack of facilities or marked bicycle routes. Because this corridor runs along the majority of the island and generally only carries residential traffic, it provides an excellent opportunity for a signed route. It links such trip attractors as May Moore Park, Memorial Waterway Park, and the Nature Center.

Along E. Oak Island Dr. lie the commercial areas with heavier traffic, and an existing sidewalk, mainly along the south side. Currently there are no bicycle facilities. There are two recommendations:
1) Additional concrete should be laid along the sidewalk to produce a ten-foot wide multi-use sidepath for bicyclists and pedestrians. Generally, there is adequate space despite some challenges in the commercial zones.
2) Creation of a minimum four-foot shoulder/bike lane adjacent to the main road. Additional pavement will be necessary given the road's current 32' width (10.5' travel lanes and 11' turn lane).
The sidepath should end at E. 58th St. with the bike lanes continuing through the commercial areas to the intersection with Country Club Dr. Adequate signage, reminding people to drive slowly and share the road, would be necessary to create a safe bicycle area. These signs should be placed strategically so that they do not add sign clutter to the commercial areas.

Beach access parking along E. Beach Dr.

On the southern end, Beach Dr. provides scenic views and beach accesses. Beach Dr., from E. 40th St. eastward to its temporary end at E. 58th St., has four foot wide paved shoulders in place on both sides. Pavement markings and bicycle route signage should be installed here to create a bike lane. Beach Dr. is discontinued between E. 58th St. and 74th St.. At this point, bike lanes should continue along 58th St. to Oak Island Dr., providing the opportunity to connect into bicycle lanes along Oak Island Dr. At E. 74th St., a signed bicycle route should link back to Beach Dr. where minimum four-foot bicycle lanes should be installed to the end of Beach Dr. at 79th St. In order to maintain connectivity, the Beach Dr. bicycle route should continue north briefly on 79th St. and then east on Live Oak Dr. to Country Club Dr. Because of low traffic in this area, only route directional signage would be necessary along these segments. From there, Country Club Dr. leaves the Oak Island limits as a signed route giving bicyclists options to continue on to Caswell Beach or over to Yaupon Way.

Dolphin Dr., a residential road running parallel and to the north of Beach Dr.

should be denoted as a signed bicycle route shared roadway and should also see reduced speed limits regardless of season. This would provide the option for cyclists to move off the main traffic road, Beach Dr. Share-the-Road signage may be necessary near blind spots and significant intersections.

Yaupon Way, a pleasant corridor through the Oak Island Golf Club community provides a connection from the Beach Dr. extension - Country Club Dr. bicycle route back to the NC Highway 133 bridge. This should be a signed-route shared roadway. Special attention should be given to a bicycle-safe crossing over NC Highway 133 to Elizabeth Dr. which would include signage warning motorists of bicycles crossing.

Worn path along Intracoastal Waterway Bridge.

A recreational bike path should be installed along an existing, overgrown, and damaged concrete path that extends from Yaupon Way north underneath and parallel to the Intracoastal Waterway Bridge, all the way to the waterfront. Excellent views of marsh areas and waterfowl provide the opportunity for a nature bicycle path.

A sidepath is recommended along NC Highway 133/Country Club Dr. from Yaupon Way southward to the intersection of Live Oak Dr. and Country Club Dr. This portion of State-maintained road has 80' ROW and would be an attractive feature of the bicycle system as automobile traffic enters the island.

The ROW of Country Club Dr (here facing north) provides adequate space for a sidepath.

The main north-south connections through the east side of Oak Island should be on 47th, 58th, and Barbee Streets. These north-south connectors are evenly spaced and were chosen to provide connectivity to trip attractors. These routes should be designated with directional signs. Bicycle crossing signs should be provided along Oak Island Dr. at those intersections. 47th St. provides a connection to the major recreation areas on the island including ballfields, skate park, cabana, etc. This entire recreation area should be well-signed with lower speed limits to provide safe bicycling from the beach north to Oak Island Dr. Because E. 58th St. and Oak Island Dr. form one of the major island intersections, special focus should be given to this pedestrian and bicycle crossing. Bike lanes should be provided along S. 58th St to extend the Beach Dr. bicycle lanes and connect to the Oak Island Dr. bicycle lanes. Barbee St. is an attractive north-south option because of May Moore Park at its north end, the library at Oak Island Dr., and Yaupon Park on Beach Drive.

The Town of Oak Island should coordinate the planning and construction of bikeways on its eastern edge with Caswell Beach because of their shared town limits.

### 3.5.2 Central Oak Island

Central Oak Island covers the area from Middleton Ave. eastward to E. 40th St. The majority of this area is residential but still sees substantial traffic, especially in the summer. The Second Bridge will allow for more entering traffic to the central portions of the island.

On the north end, the scenic Elizabeth Dr.-Yacht Dr. corridor would continue

as a signed bicycle route. A continuous five-foot sidewalk with nearly twenty feet of landscaped ROW between the edge of the road and the sidewalk is common along the south side of E. Oak Island Dr. There are two bicycle facility recommendations including: 1) wider multi-use sidepath or 2) bike lane. On the south end, Beach Dr. already has four-foot shoulders on both sides to Middleton Ave. Signage and pavement markings are necessary here to create bike lanes. Dolphin Dr. would continue as a signed shared roadway with adequate signage.

Because of the Davis Canal, there are no north-south crossing roadways in this section from Oak Island Dr. to Beach Dr. with the exception of Middleton Ave. The north-south bicycle corridors should be the existing scenic boardwalks at 29th - 30th Streets (connecting the Recreation Center), 20th St., and the future 9th St. boardwalk that provide access from Oak Island Dr. to the beachfront. These provide excellent scenic bicycle paths although the 20th St. corridor requires walking your bicycle across. It should be ensured that these boardwalks are wide enough and railings high enough for bicycles. Otherwise, bicycles should be walked across.

Location of future Second Bridge to Oak Island. The Second Bridge will provide shoulders and bicycle-safe railings.

The Middleton Ave. corridor runs north-south and is the location of the future Second Bridge to Oak Island across the intracoastal waterway and future reconstruction of the Davis Canal bridge. Once construction of the Second Bridge is complete, traffic volumes will increase dramatically on Middleton Ave. to the central portion of the island. Both bridge designs incorporate adequate shoulder widths (six-foot shoulder on Second Bridge; eight-foot shoulder on Davis Canal Bridge) and bicycle-safe railings (54" high). The construction will not include bicycle pavement markings or signage so these will need to be added upon completion of the bridge work. Construction on the bridges and also the widening of Middleton Ave. is slated to begin in 2006.

Existing Middleton bridge over Davis Canal.

Bicycle lanes should be installed along Middleton Ave. during the widening process along the non-bridge segments from Beach Dr. to the Second Bridge to create connectivity. This effort would support the Corridor Land Use and Development Plan for the Second Bridge to Oak Island that recommends that bikeways be considered part of an intermodal transportation system and should be developed. It specifically recommends bike lanes along higher traffic volume streets (Middleton Ave.), and shared roadways on lower traffic volume residential streets (Yacht and the north-south connectors).

The Town of Oak Island should coordinate with the Town of St. James and areas on the northern side of the Second Bridge for future bicycle route connectivity.

### 3.5.3 Western Oak Island

Western Oak Island covers the area from Middleton Ave. westward to the island's end at The Point, a popular beach access area. The majority of this area is residential and has less traffic than the central and eastern sections of the island.

On the north end, the scenic Elizabeth-Yacht corridor should continue as a signed shared roadway route to its terminus with W. Oak Island Dr. The two-prong facility option (1. multi-use sidepath, or 2. bike lane) for W. Oak Island Dr. will continue as the existing sidewalk and wide right-of-way continue on the road's south side to its terminus. No north-south connector routes are necessary between Yacht Dr. and W. Oak Island Dr. because of the low traffic volume, ease of traveling along any of the residential roads, and the nature of the roadway which accommodates shared use.

On the south end, Beach Dr. currently has no shoulders from Middleton Ave. to W. 30th St. (Long Beach Fishing Pier); a four-foot shoulder begins on the north side westward to Kings Lynn Dr. There are no shoulders beyond that on Beach Dr. to The Point. The Town of Oak Island has begun construction of four-foot bike lanes with route signage on both sides for the entire length from Middleton Ave. to the Point. It is recommended that proper signage and markings be included to complete the bike lane facility. The shared roadway signed route along Dolphin Dr. should continue to its end at W. 42nd St.

October 2005 construction of bicycle lanes on the western end of Beach Dr.

### 3.5.4 Oak Island Mainland Area

This area mainly includes the northeastern sections of the Town's limits, on the mainland portion along NC Highway 133. This includes the Brunswick County Airport and new developments such as the South Harbor Village and Marina east of the bridge and future condominiums on the west side.

The current Intracoastal Waterway Bridge has adequate eight-foot shoulders but only a 24" wall that does not meet the AASHTO standard of 54". In order to create an acceptable situation, a 54" rail would have to be added.

Fish Factory Rd. exiting South Harbor Village towards the north.

NC Highway 133 is the busiest of all roads in Oak Island and makes the most advanced cyclists in the area uneasy. The bicycle path, mentioned below, and Fish Factory Road provide an attractive alternative. Fish Factory Road, a two-lane road, extends north from the South Harbor Village area alongside the Bill Smith Park area. A bicycle lane is recommended along this stretch. Additional shoulder pavement to a minimum four-foot width will be necessary.

A bicycle path is recommended to connect the future condominium area to the South Harbor Village and Marina and Fish Factory Road. It would run underneath the NC Highway 133 bridge, along the intracoastal waterway. Currently there are two cleared underpass corridors with extremely high bridge clearance creating the possibility of a connected bike path. Future development plans include a private road underneath the bridge. Collaboration with the developers, landowners, the State (who currently own right-of-way beneath the bridge), and the Town of Oak Island will be necessary to establish a bike facility along the intracoastal waterway.

The marina at South Harbor Village.

The Town of Oak Island should also coordinate the planning and construction of bikeways on its eastern edge with Southport and its western edge with the Town of St. James. A safe connector route between Southport, Oak Island,

and St. James would be an attractive feature, desirable for active bicyclists.

## 3.6 Ancillary Facility Improvements and Other Improvements for Bicyclists

Signed-shared roadways, bike lanes, and shared-use paths are the most common facilities that will be used to develop the Bicycle Network within the Town of Oak Island. In some locations however, it is necessary to consider other facility improvements. It is also critical to consider potential bicycle connections to adjacent communities and other existing and planned bicycle routes.

### 3.6.1 Roadway Crossings and Intersections

In addition to modifications to the actual road system for cyclists, it is also important to ensure that intersections are appropriately designed to facilitate safe and efficient bicycle traffic. Because Oak Island has a large tourist and recreation-based bicyclist population, it is important to consider crosswalk improvements for those more comfortable with walking their bike across an intersection. Driveways in residential and commercial areas also create the potential for conflict between bicycles and turning motor vehicles.

Accommodations for bicyclists at intersections are discussed in detail in the Design Guidelines, Chapter 6. Treatments that can be used to improve intersections in the Town of Oak Island include:

- High-visibility crosswalks
- Bike-friendly traffic signals
- Advance warning signs and flashing lights
- Reduced (i.e., fifteen-foot) motor vehicle turning radii (to reduce motor vehicle turning speeds)

Potential Locations: 58th St. and Oak Island Dr., Oak Island Dr. & Country Club Dr., Oak Island Dr. with its numerous crossings and driveways

### 3.6.2 Bike-friendly Traffic Signals

There are a variety of ways to make traffic signals work for bicyclists. These treatments include changing signal timing so that bicyclists are able to clear intersections during green lights, providing adequate green time, and installing improved detection equipment.

Potential Locations: 58th St. and Oak Island Dr., Oak Island Dr. & Country Club Dr.

### 3.6.3 High-visibility Bicycle Warning Signs

Advance warning signs can be posted to make drivers more aware of trail and other key bike route crossings. “Share the Road” signs can be posted on road sections where improvements cannot be made, bicycle use is regular, and there are existing road curves, narrow bridges, and/or heavier traffic volumes. These signs can increase awareness of bicyclists, especially in areas where bicyclists may not be expected or where many drivers are tourists. A new fluorescent

yellow/green color has been approved in the national Manual on Uniform Traffic Control Devices and can be used on these signs. Signs should be used judiciously—too many signs can cause visual clutter and lead to non-compliance. Bike crossing signs will also be necessary along Oak Island Dr. where the north-south bicycle connector options cross.

Potential Locations: Oak Island Dr., Beach Dr., Dolphin Dr., Yacht Dr., 58th St., Middleton Ave. (bridges)

### 3.6.4 Bicycle Parking

Secure bicycle parking located close to building entrances, popular beach access points, piers, and parks can make bicycling more attractive to potential cyclists. It also reduces the risk of bicycle damage or theft. Bike rack design and site location are discussed in Chapter 6 - Facility Standards and Guidelines. Bike parking is important at destinations such as beach accesses, recreation areas, and commercial areas. It is also good to have bike parking available near business entrances and at employment sites.

Bicycle parking at beach access near Middleton Ave.

Potential Locations: Pier areas, cabana, beach accesses, Middleton Park recreation area, Memorial Waterway Park-Nature Center, The Point, commercial zones

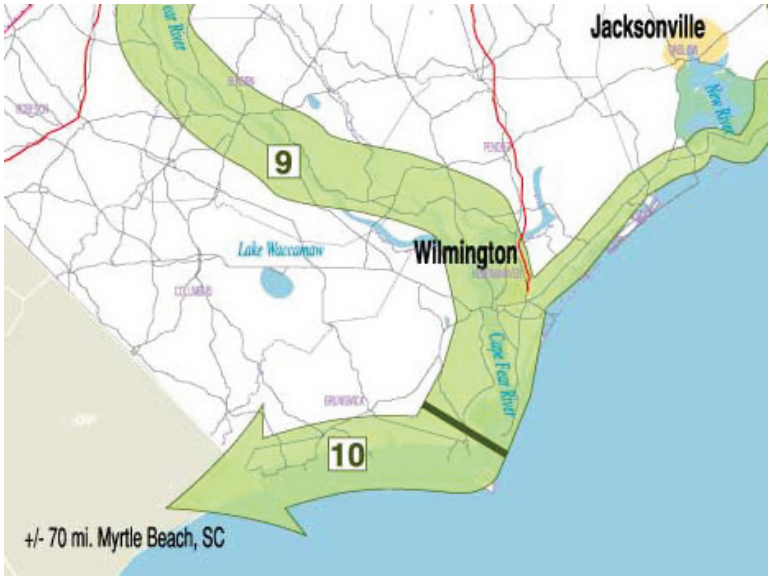
### 3.6.5 Connections Outside Oak Island

Bicycle route connections with adjacent communities would make accessing and leaving Oak Island a more attractive option. Particular attention should be given to the Towns of St. James, Caswell Beach, and Southport. Coordination with these communities will make a connected local system possible. Bicyclists who enjoy longer rides could benefit from this connectivity.

NC Bicycle Route 3 along the coast of North Carolina.

Connections to the NC Bicycle Route 3 and East Coast Greenway would provide a means of accessing longer bicycle routes and provide opportunities for long-distance and tourist riders to access Oak Island. Bike lanes proposed along Middleton Ave. and across the Second Bridge should continue as a signed bicycle route northward to NC Highway 211 which is the location of NC Bicycle Route 3. NC Bicycle Route 3 is a 300-mile route from South Carolina to Virginia taking riders to all the major ports of the colonial era—Southport, Wilmington, New Bern, Bath, and Edenton.

The East Coast Greenway will be the nation's first long-distance, city-to-city, multi-modal transportation corridor for cyclists, hikers, and other non-motorized users. The goal is to connect existing and planned trails that are locally owned and managed to form a continuous, safe, green route. This 2,600 mile traffic-free path linking East Coast cities from Maine to Florida was launched 14 years ago and is roughly 20 percent complete[1].




Map provided by the East Coast Greenway Alliance.

The Brunswick County Planning Department is working from a National Park Service grant to finalize a draft greenway plan that will address the potential route of the East Coast Greenway through the County and the Oak Island area. Additionally, the Brunswick County Planning Department and the National Park Service, among others on the planning committee, will consult with local municipalities before finalizing the plan in July 2006[2]. Participation from all affected municipalities, including Oak Island, is highly encouraged by the committee. The Town of Oak Island should stay involved in this process to ensure connections to the island.

(Footnotes)

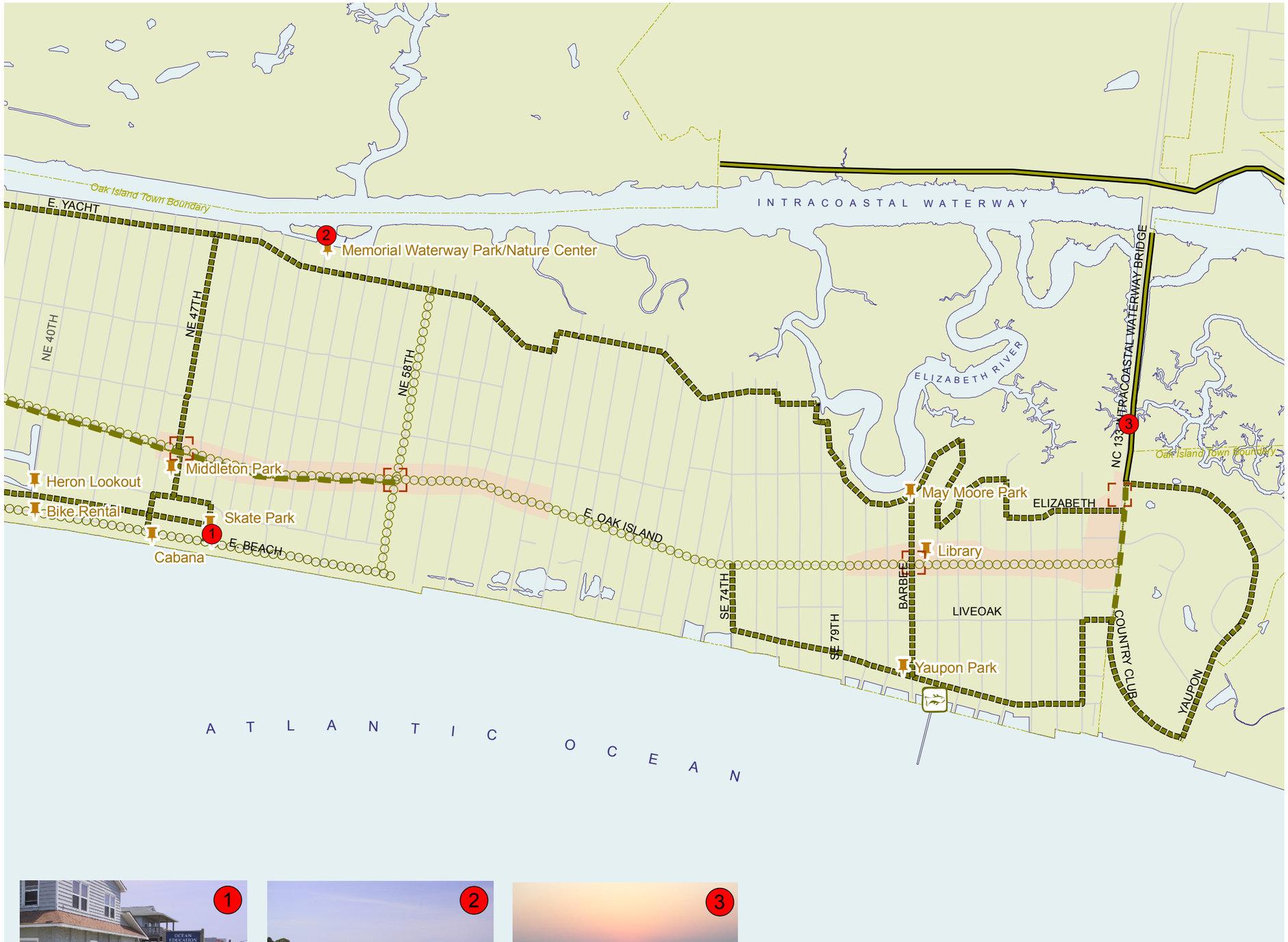
[1]The East Coast Greenway Alliance. About the East Coast Greenway. Retrieved on 12/6/05 from www.greenway.org/

[2] Dixon, Kristy. Brunswick County Planning Department. Telephone interview on 12/1/05.

# Oak Island Bicycle Plan

## Bicycle Network

*Eastern Oak Island*







**Legend**

- Critical Intersections
- Piers
- Points of Interest
- Bike Lanes
- Signed-Shared Roadways
- Shared-use Paths
- Sidepaths
- Roads
- Oak Island Boundary
- Commercial Areas
- Hydrology

0 0.25 0.5 Miles

Data Sources: Town of Oak Island, Brunswick County, Greenways Inc.

GREENWAYS INCORPORATED
Landscape Architecture
Multi-Objective Trail Planning
Open Space Planning

# Oak Island Bicycle Plan

## Bicycle Network

*Central Oak Island*



1


2


3

**Legend**

- Critical Intersections
- Piers
- Points of Interest
- Bike Lanes
- Signed-Shared Roadways
- Shared-use Paths
- Sidepaths
- Roads
- Boardwalk/Scenic Walkway
- Oak Island Boundary
- Hydrology

0 0.25 0.5 Miles

Data Sources: Town of Oak Island, Brunswick County, Greenways Inc.

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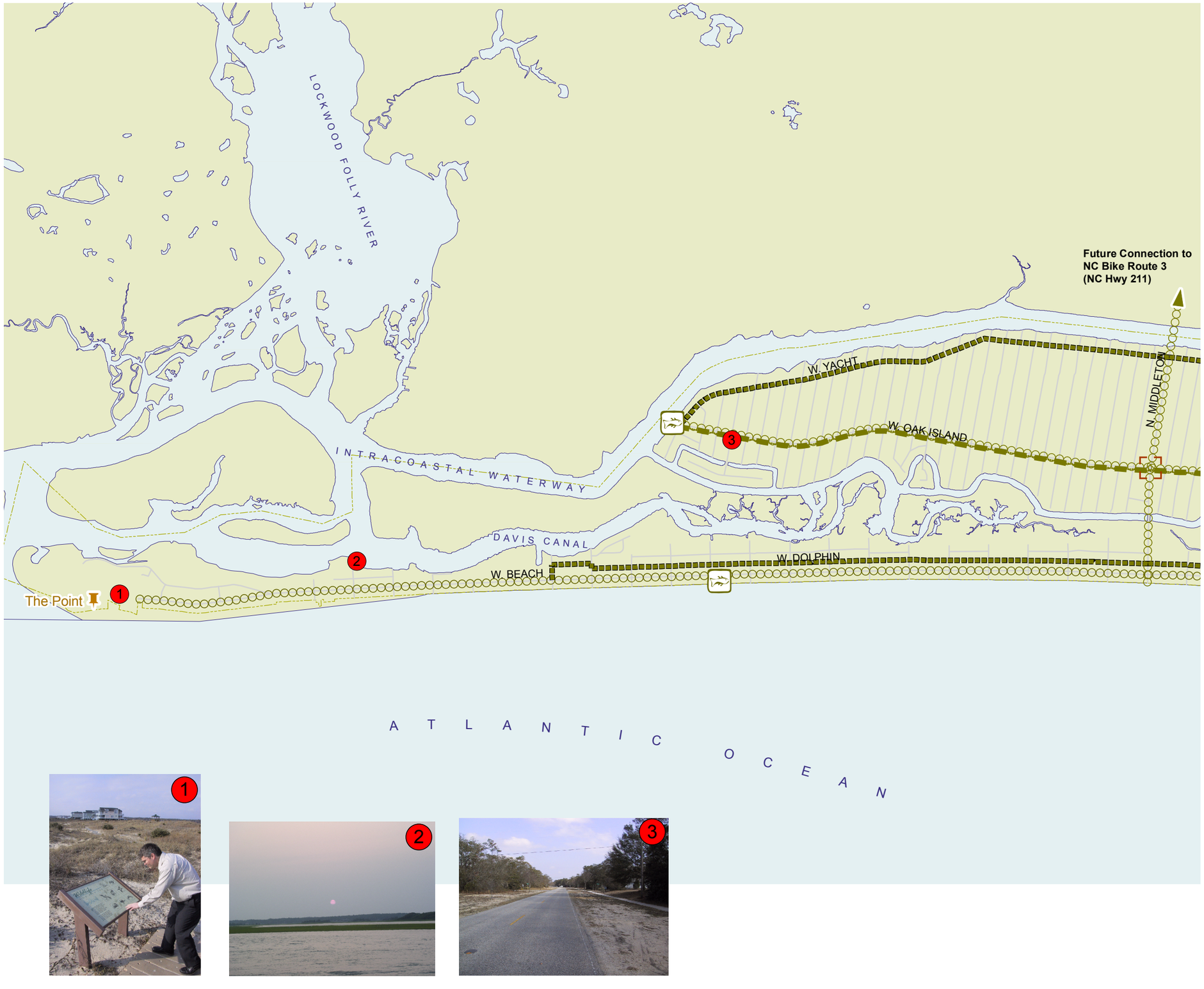
Landscape Architecture
Multi-Objective Trail Planning
Open Space Planning

# Oak Island Bicycle Plan

## Bicycle Network

*Western Oak Island*













**Legend**

- Critical Intersections
- Piers
- Points of Interest
- Bike Lanes
- Signed-Shared Roadways
- Shared-use Paths
- Sidepaths
- Roads
- Oak Island Boundary
- Hydrology

0 0.25 0.5 Miles

Data Sources: Town of Oak Island, Brunswick County, Greenways Inc.

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# Oak Island Bicycle Plan

## Bicycle Network

*Oak Island Mainland*





**Legend**

- Points of Interest
- Bike Lanes
- Signed-Shared Roadways
- Shared-use Paths
- Roads
- Oak Island Boundary
- Hydrology

0 0.25 0.5 Miles

Data Sources: Town of Oak Island, Brunswick County, Greenways Inc.

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# *Chapter 4*
# *Program and Policy Recommendations*

## 4.1 Overview

In order for future bicycle facilities to be effective, it is important for the necessary policies, programs, funding, and staffing infrastructure to be in place to manage, maintain, and promote bicycle transportation on Oak Island. A variety of considerations and recommendations are discussed below.

## 4.2 Program Recommendations

Education, encouragement, and enforcement programs should be in place to teach and encourage safe bicycling and ensure the success and integrity of Oak Island's future bicycle network.

### 4.2.1 Education, Encouragement, Enforcement

The recommended bicycle facilities listed in Chapter 3 will most successfully serve the Town of Oak Island with continued support for cycling, built through programs that focus on education, encouragement, and enforcement. Many of the following programs were suggested by members of the steering committee. Additional resources can be found on the NCDOT Division of Bicycle and Pedestrian Transportation website.

Children are the current and future users of Oak Island's bicycle network.


Education: Long term educational strategies should be developed to teach and promote safety. A good education program provides instruction in lawful behavior for bicyclists, pedestrians, and motorists. This education should be available to youngsters and adults.

Teaching children about bicycling can foster lifelong habits. While there are no schools in the Town of Oak Island, other local schools should be used to teach children about bicycle safety. Instruction programs and events for children should also be available on Oak Island through the Parks and Recreation Department and can be based on the NCDOT Division of Bicycle and Pedestrian Transportation's Basics of Bicycling curriculum. This will require support through the Town, citizens, and local cycling groups.

Bicycle instruction for teenagers can be taught in driver's education courses. Motorists should be taught to respect and work with cyclists who are sharing their travel corridors. Families should be given tools to help them understand

how cycling opportunities can improve their lives.

Children can benefit from training classes.

Instruction programs for adults are more difficult to develop. Events sponsored by the Oak Island Parks and Recreation Department may provide opportunities for adult education. For example, the Town could hold a Bike Rodeo early in the tourist season for children and adults and offer training classes all summer.

Education may also be provided through various print and electronic media. Safety tips for bicyclists and motorists could appear as a video on Local Channel 8. A bicycle brochure could include educational items about proper equipment, skills, and habits. The Town of Oak Island website could also provide educational materials.

Encouragement: Encouragement programs should be initiated to help build a larger bicycling community. Financial incentives and/or public praise can be provided to local businesses who support cycling through their actions. Awards can be created to celebrate advances in the community's bicycle facilities, bicycle ridership, and overall bicycle friendliness.

There are a variety of means to promote bicycling. The current bicycle route booklet should be updated, published, and distributed. Bicycle booths could distribute information at local events. Local businesses and tourist information centers could distribute bicycle maps and information. Inserts into local newsletters can detail the healthy benefits of bicycling. Mileage clubs could be established and awards given to those who reach their goals. Bicycle races and other contests would also encourage bicycling. An annual Bicycle Day could be sponspored by the Oak Island Parks and Recreation Department at the start of the tourist season with promotions, contests, and education programs.

Law enforcement officers can set examples for citizens.

Enforcement: Enforcement is critical to ensure that proper actions are being taken by both bicyclists and motorists and that the rights of each are recognized. A local law enforcement program for a shared transportation system should be developed for Oak Island. Appropriate and updated bicycle traffic laws are an important first step in developing an adequate enforcement program. The most effective bicycle ordinances distinguish between bicycles, motorized vehicles, and pedestrians and clarify the manner in which each shall lawfully share the roadways. Existing state traffic laws should be reviewed to ensure that appropriate rules and regulations are applied to Oak Island's bicycle network. This will result in a meaningful policy of which to enforce.

Enforcement truly requires the action of everyone including parents, teachers, and police officers. Officers should take an active role in bicycle enforcement, teaching safety, evaluating traffic concerns, providing a presence, and giving warnings or tickets to those who disobey the law. Examples include speeding, disobeying signs and signals, and biking in the wrong lane.

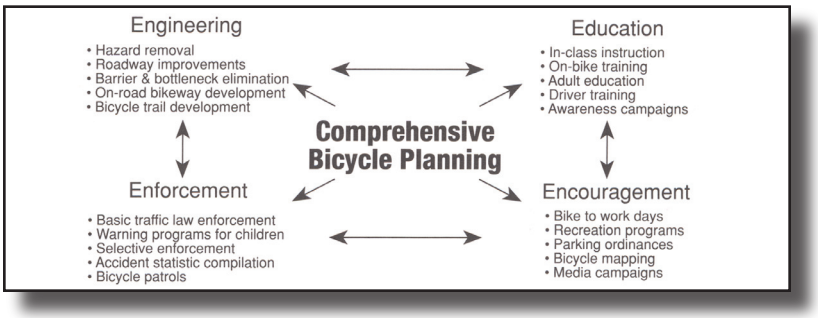



Figure 4.1 A model for comprehensive bicycle planning, from the North Carolina Bicycle Facilities Planning and Design Guidelines.

## 4.3 Policy Recommendations

### 4.3.1 Future Bicycle Facility Development

To ensure that the bicycle facilities recommended in this document are constructed, the elected leaders should allocate sufficient resources on an annual basis to regularly expand the bicycle network and maintain the facilities as they are completed. There must be commitment to a phased timeline of roadway modification and facility construction must be adopted and followed.

Regarding potential future bicycle facilities on county and state roads, it will be important to understand how NCDOT and Brunswick County are involved in the approval process for reconstruction, repaving, and restriping projects on different roads in the Oak Island area. If NCDOT or one of the counties has the authority to deny a recommendation from the bicycle plan, it will be important to discuss controversial issues with them during the planning process. The issues could potentially include:

- Striping ten-foot-wide motor vehicle travel lanes to slow traffic and provide space for bicycle lanes
- Striping bicycle lanes instead of providing wide outside vehicle travel lanes
- Adding shoulders to roads, which will require regrading the shoulder/ ditch area and relocating existing mailboxes

### 4.3.2 Maintenance

Once the proposed network has been adopted by the Town and efforts to implement the network are underway, focus should be directed towards the maintenance and enhancement of the system. Well maintained and managed facilities are critical elements to the long-term success of Oak Island's bicycle network. Regular maintenance of the community's bicycle facilities will be essential to maintain the safety of the facilities and their overall usability. To facilitate the practice of regular maintenance, the Town of Oak Island should develop a schedule of maintenance activities for the bicycle network along with the existing maintenance projects of the DOT and the Public Works Department.

Bicycle facilities need a maintenance plan (Picture not from Oak Island).

Types of maintenance required include:

- Repair of pavement
- Repair of boardwalk
- Restriping of lanes/remarking of pavement
- Replacement or repair of route signs due to damage caused by vandalism or general wear
- Removal of any collected debris (including sand, gravel, trash and vegetation)
- The replacement and repair of bicycle parking and storage facilities

Due to blowing sand, especially along Beach Dr., bicycle lane sweeping should occur on a biweekly basis to keep bicyclists safe.

Many of these maintenance projects are already regularly scheduled along the area's roadways. They now must simply be expanded to include the bicycle facilities as well. Off-road bicycle routes may require the attention of separate agencies. The Town should develop a standard bicycle maintenance schedule for incorporation into the activities of all the appropriate Town agencies. Many of the basic roadway maintenance tasks, such as debris removal, can be combined to reduce the number of hours needed to complete tasks and maximize the use of town resources.

## 4.4 Staffing

In order to implement, construct, promote, and maintain a bicycle network, Town departments and staff should be given the responsibilities shown in Figure 4.2.

Implementation: Planning Department

Facility Development and Maintenance: Public Works Department

Community Programs: Planning Department, Parks and Recreation Department

Enforcement: Town Police Department

Figure 4.2

Adapted from other successful bicycle communities[1], recommended staffing for each department is shown below:

Planning Department: The Town Planning Director or another high-ranking planning official should take on the responsibilities of "Bicycle

Coordinator." These duties would include the overall devotion to carrying out recommendations from this Plan, applying for funding, and overseeing the entire bicycling program. Members of the Planning staff should also conduct tasks such as updating and publishing new local bicycle maps, creating and updating GIS layers of all bicycle facilities, proposing future alternative routes, and working with adjacent communities and regional organizations to coordinate bikeway linkages.

Public Works Department: The Public Works Director should oversee the construction and maintenance of all bicycle facilities. The Public Works section devoted to Streets should also be devoted to future Bikeways. One member of the Public Works should handle bicycle facility development and construction among his/her other responsibilities.

Parks and Recreation Department: The Parks and Recreation Director and/or staff should play a role in education and encouragement programs. The recreation center and Middleton Park areas can be the location of events such as educational courses and bike rodeos. This department should also play a role in managing off-road bicycle facilities.

Police Department: All local police officers should be educated about North Carolina bicycle and pedestrian laws and interactions between bicyclists, pedestrians, and motorists. The Guide to North Carolina Bicycle and Pedestrian Laws, written by the NCDOT Division of Bicycle and Pedestrian Transportation, should be distributed to local law enforcement. Specific laws in the State of North Carolina include wearing a helmet under the age of 16, having an adequate light if riding after dark, riding on the right side of the road, and proper signaling when turning. Police officers should become more proactive in educating the public and enforcing laws when they are broken.

Volunteers: Services from volunteers, student labor, and seniors, or donations of material and equipment may be provided in-kind to offset construction and maintenance costs. Formalized maintenance agreements, such as adopt-a-trail or adopt-a-highway can be used to provide a regulated service agreement with volunteers. Other efforts and projects can be coordinated as needed with senior class projects, scout projects, interested organizations or clubs or a neighborhood's community service to provide for the basic needs of the bicycle network. Advantages of utilizing volunteers include reduced or donated planning and construction costs, community pride and connection to the Town's bicycle network, and increased awareness about bicycle safety issues.

## 4.5 Local Ordinances

Local ordinances are another means to develop and encourage safer bicycling across Oak Island which in turn could lead to greater ridership. There should be an effort to seek out ordinances that may need updating and/or to develop new ordinances that would relate to the new bicycle network. As of 2005, there are no existing ordinances addressing bicycle issues.

The Town should be aware of North Carolina laws relating to bicycling in The Guide to North Carolina Bicycle and Pedestrian Laws. A portion of this booklet discusses local ordinances and the issues sometimes addressed by these ordinances. If issues arise in the Town of Oak Island, the Town can consider developing ordinances that would be enforced by local police. Common issues are bicycling on sidewalks, more stringent helmet laws, and headphone usage.

One current ordinance increases the motor vehicle speed limit on Dolphin Dr. and Beach Dr. to 45 mph from 35 mph during the island's off-season (fall through early spring). To encourage year round bicycling on these proposed bicycle routes, it is recommended that these speed limits always remain at the lower range of 35 mph.

## 4.6 Annexation

For areas eligible for annexation under North Carolina's statutes, plans are developed to provide all required municipal services and an estimate for providing such services[1]. If bicycle facilities are to be included in annexed areas, they should be addressed in the annexation study and should be included in an update of any town plan that addresses such facilities, such as the Oak Island Bicycle Plan.

Services that will require no extensive capital outlay, such as bike lane striping, could be provided within a short time. With respect to services involving capital outlays, such as greenway trail development, bike/pedestrian bridges, or shoulder extensions for bike lanes, it should be remembered that: (1) extension of improvements should be commensurated with other parts of the Town and should be related to the needs of present settlement and future growth, and (2) extensions should be based on previously approved policies and standards. Therefore, if the Town of Oak Island is to ensure consistent bike facilities in annexed areas, the first step will be adopting the Oak Island Bicycle Plan. Furthermore, residents in the annexed area do not expect to be taxed without benefits, but they should also not expect a disproportionate balance of improvements at the expense of the other residents. Therefore, an annexation ordinance that addresses improvements, such as bicycle facilities, should take this balance into account when defining the services to be provided.

In some cities, such as Fayetteville, NC, facilities (such as sidewalks for example) are not something the City provides as a base service for annexed areas[2]. However, they have addressed such improvements through other means: they adopted a plan for sidewalk development based on pedestrian traffic and safety, so as the area becomes part of the city, it is eligible for the same improvements based on need. Additionally, the City has subdivision regulations in place that require developers to construct sidewalks on one side of the street in new developments. These are examples of ways in which Oak

Island can put policies in place that apply to the city as a whole, which would immediately include new areas once they are annexed.

(Footnotes)

[1] Charlotte-Mecklenburg Planning Commission. Annexation - Frequently Asked Questions. Retrieved on 11/30/05 from www.charmeck.org/Departments/Planning/Annexation/Annexation+FAQ.htm

[2] City of Fayetteville. Often Asked Smart Growth Questions and Corresponding Answers. Retrieved on 11/30/05 from http://www.cityoffayetteville.org/sgn/faq.htm

References

Urban and Regional Research Collaborative. A. Alfred Taubman College of Architecture and Urban Planning. The University of Michigan. Successful Bicycle Planning: Adapting Lessons from Communities With High Bicycle Use to Ann Arbor and Washtenaw County. September 2001. Retrieved on 12/6/05 from http://www.wbwc.org/bikereport.pdf

# Chapter 5
# Implementation

## 5.1 Overview

The text in this chapter describes how the Town of Oak Island can turn the vision of a connected network of safe bicycle routes into a reality. The strategy for doing so involves the physical changes discussed in Chapter 3, as well as new policy and program considerations covered in Chapter 4. The bulk of this chapter deals with opportunities and strategies, key implementation steps, methods for developing facilities, and phasing of the bicycle network. All of these fit together to form the implementation program.

## 5.2 Opportunities and Strategies

Among the opportunities to promote the Plan recommendations available to the Town of Oak Island, is the opportunity to build upon an already committed and active base of bicycle users in the area. This includes the Oak Island Bike Club, Southport Bicycle Tours, and other local bicycle stores, rentals, and events. Through their organizations, institutions, publications, and networks, the Town can get the word out about improved or new bicycle facilities and programs.

Bicycle rental store on Beach Dr.

Second among the opportunities, is the availability of the existing bicycle facilities (currently Beach Dr.'s wide paved shoulders). Though some changes are being suggested in the short-term and a much expanded network is suggested for the long-term, the presence of an existing network provides a strong foundation from which to build. Residents are already accustomed to seeing cyclists on the roadways and should become used to seeing bicycle route signs. Building on their existing awarenesses is much easier than building on no awareness.

The final category of opportunity is the existing patchwork of destination points. Parks, residential and commercial areas, scenic boardwalks, piers, and beach access areas are all places bicyclists currently travel to or would like to travel to. Short connectors between destinations, connect with other connectors to the next destination. In the end, long corridors are created from this distribution of linked destination points. The addition of bicycle racks, storage, and signage will make these destinations more attractive to bicyclists.

Bicyclist along Dolphin Dr.

From these opportunities comes the framework for an initial implementation strategy:

1) Use the base of bicyclists and strong tourist interest in cycling to expand the awareness of the benefits of bicycling

2) Expand and modify the existing bicycle route network to a comprehensive, connected system so that it better meets the needs of the community and enhances the current transportation infrastructure

3) Start making the critical connections between destination points that will allow for continuous growth of and improvement in the bicycle transportation network.

These three steps represent the core of the implementation strategy. As the individual policy recommendations and physical recommendations are addressed, they should each fit with one of these three primary strategies.

## 5.3 Adopting this Plan

Before any other action takes place, the local government of the Town of Oak Island should focus on adopting this plan. This should be considered the first step in implementation. Through adoption of this document and its accompanying maps as the area's official bicycle plan, the community is able to shape larger regional decisions so that they fit with the goals of this plan. The Town also gives itself greater authority in shaping local land use decisions so that they achieve the goals and vision of this plan.

## 5.4 Key Steps in Implementation

After the plan is adopted, implementation of specific recommendations can begin. Many of these will occur simultaneously and include policy and facility improvement changes. The key steps are:

1) Create the necessary governance capability and administration capability to oversee the implementation of this plan and the proper maintenance of the facilities that are developed (as detailed in Chapter 4).

2) Secure the funding necessary to undertake the short-term projects and develop a funding strategy that will allow the community to incrementally complete each of the suggested bicycle facility improvements over a 10-15 year period.

3) Add signs to the recommended network routes so that a functional, safe, and updated bicycle route is immediately available to the community.

4) Develop and implement education and awareness programs such as public events, which can be used to announce new bike routes and some of the upcoming projects.

5) Begin working on the proposed short-term phasing facilities listed in subsection 5.5.1.

6) Ensure that bicycle planning is integrated with other transportation planning and funding efforts at the state and local level, as well as with long-range and current land use, economic development, parks and recreation, environmental, and community planning.

7) Develop bicycle facilities during sewer construction that will occur in Oak Island through 2010. Off-road and on-road bike facility construction could occur simultaneously with sewer construction, providing the opportunity for cost-effective development.

8) Develop bicycle facilities as part of all future paving, construction, and reconstruction projects.

## 5.5 Bicycle Network Phasing

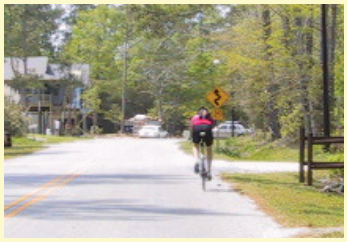
The entire Town of Oak Island Bicycle Network is described in Chapter 3. However, the system will likely be developed incrementally through a coordinated effort between the Town of Oak Island, surrounding communities, and other local and state government bodies. This section describes how the recommended facilities in the Bicycle Network are prioritized.

Beach Dr. bicycle lane construction. Roadway projects that are underway or scheduled become top priority bicycle projects.

As discussed in Chapter 3, the recommended bicycle network was determined by the following group of inputs and desires: 1) coverage and connectivity, 2) areas where a high percentage of the bike attractors and destinations are served, 3) routes suggested by committee and public input, 4) projects that can be integrated with other repaving or reconstruction improvements that are scheduled in the near future, 5) areas with higher concentrations of motorist-pedestrian-bicyclist interaction where safety is an issue and 6) areas defined by previous planning efforts. Therefore, all network segments carry significant importance, especially the major east-west spine routes and the two north-south accesses to the island.

Short-term phasing projects are largely determined by opportunity, taking advantage of construction and reconstruction improvements such as the Second Bridge to Oak Island. They are also determined by a ranking of all above inputs and expense. Longer-term projects are in areas where near-term reconstruction improvements are not scheduled.

The Bicycle Network Phasing Map, at the end of this chapter, reflects prioritization by showing two categories of recommended facility improvements: short-term and longer-term. In general, short-term projects should be completed within the next five years, and longer-term beyond five years.



Cyclist on Yacht Dr. This road is a top priority signage project and a recommended signed-shared roadway.


Section of Beach Dr. west of Middleton in need of a bicycle lane.

### 5.5.1 Short-term Phasing Projects

Short-term phasing projects are specific improvements and changes that will facilitate an immediate increase in safety and promotion of the bicycle network, focus the Town on critical road segments, and provide a timely, orderly start to completing the Bicycle Network. Improvements include signed-shared roadways, bicycle lanes, shared-use paths, and intersection improvements. These action items are listed below and are shown on the Bicycle Network Phasing Map.

Signed-Shared Roadways

All signed-shared roadways should be addressed immediately because signage is all that is required at this point. The result of these actions is to create new official signed routes designed to improve awareness and direct bicyclists along defined corridors. Bicycle route signs are relatively inexpensive and would call attention to the new routes. Road segments where high bicycle and motorist traffic occur, and/or where road curves and blind spots occur, may require properly placed Share-the-Road and Bicycle Crossing signs.

- Elizabeth Dr./Yacht Dr.
- Yaupon Way
- Dolphin Dr.
- All north-south connectors
  (Barbee Blvd. and SE 30th St. are scheduled for repaving in 2006. Extra pavement width should be considered here).

Additional facilities such as bicycle lanes, wide paved shoulders, or sidepaths can be added in the future if deemed necessary or if an opportunity to coincide with reconstruction projects presents itself.

Bicycle Lanes

- E. Beach Dr.: The addition of bicycle lane pavement markings and signage on the existing wide paved shoulder between 58th St. and Middleton Ave.

- W. Beach Dr.: The completion of four-foot striped and signed bicycle lanes between Middleton Ave. and The Point which began construction in 2005.

- SE. 58th St.: The addition of four-foot striped and signed bicycle lanes between Beach Dr. and Oak Island Dr. to complete the Beach Dr. bicycle lanes up to Oak Island Dr.

- Middleton Ave.: The addition of minimum four-foot striped and signed bicycle lanes between Beach Dr. and the intracoastal waterway. This prepares the way for the Second Bridge and reconstruction on the Davis Canal bridge that include bicycle-safe accomodations and takes advantage of 2006 NCDOT widening project.

Sidepaths

- Country Club Dr. (NC Highway 133): The completion of a sidepath from Yaupon Way to Live Oak Dr./Country Club Dr. intersection. This would be a great promotional tool as motorists would immediately see a bicycle-friendly sidepath upon entering the island. The NC Highway 133 portion from Yaupon Way to E. Oak Island Dr. is also a State TIP Incidental project.

Shared-Use Paths

- 9th St. scenic boardwalk (in 2005 proposed phase)

- Parallel segment along NC 133 Intracoastal Waterway Bridge. This would provide a unique scenic route that would extend from the Yaupon Way signed-shared roadway. Negotiations with Brunswick Electric about this ROW may be necessary.

- Segment along north side of intracoastal waterway connecting new developments. This would provide another unique scenic route. The Town should begin negotiations and promote the path.

Construction road underneath NC 133 Bridge provides an opportunity to connect the future condominiums to South Harbor Village as a scenic bike path.

Intersection Improvements

Even though bicycles are considered vehicles in the State of North Carolina, there are two important bicycle crossings that should receive improvements along the proposed signed bicycle routes. These intersections represent high traffic volumes. Pedestrian crosswalk improvements are helpful for walking bicycles across intersections, particularly in areas with high traffic volumes. The intersections are listed below and are shown in the Bicycle Network Phasing map.

- Route connection between Elizabeth/Yacht corridor and Yaupon Way corridor across NC 133. A high visibility crosswalk or traffic signal should be installed here for bicyclists to safely get across NC Highway 133. Yaupon Way intersects with NC Highway 133 approximately 350 feet north of the Elizabeth/NC 133 intersection. A facility such as a shared-use path should be installed along with a high visibility crosswalk or traffic signal.

- E 58th St. and Oak Island Dr. intersection. A high visibility pedestrian crosswalk should be installed each direction which would allow a bicyclist the option to stop and walk his/her bike across Oak Island Dr or E. 58th St. In addition, warning signs, bicycle route signs, and bicycle crossing signs should be installed along Oak Island Dr. to serve notice to motorists that a bicycle route is ahead.

5.5.2 Longer-term Phasing Projects

Longer-term phasing projects are also important components in the Bicycle Network. These include expensive, longer-term construction projects.

Included are bicycle lanes along Oak Island Dr., a sidepath along Oak Island Dr. from Yacht Dr. to 58th St., a bicycle lane along NE 58th St., and a bicycle lane along Fish Factory Rd.

Oak Island Dr. is a critical segment to improve safety because it is the main thoroughfare into the island. It is also part of the TIP Incidental Program. It is recommended to immediately collaborate with the State and investigate funding resources.

Site of Second Bridge area at Middleton Ave., facing south. Roadway reconstruction will occur with the Second Bridge construction. Bicycle lanes should be incorporated in this process.

## 5.6 Methods for Developing Facilities

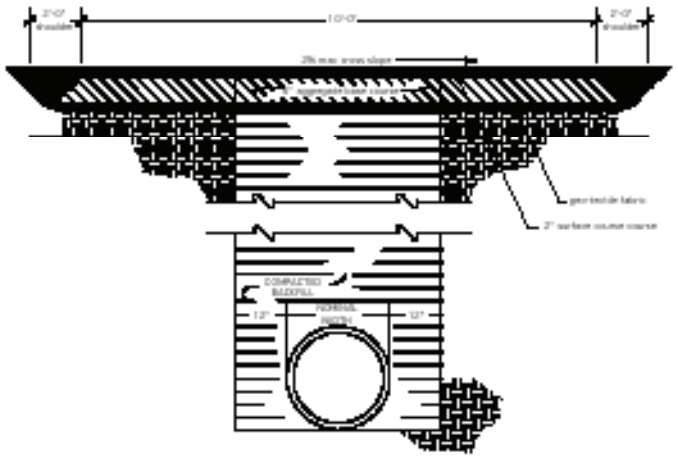
This section describes types of transportation facility construction and maintenance projects that can be used to create new bicycle facilities. Note that roadway construction and reconstruction projects offer excellent opportunities to incorporate facility improvements for bicyclists. It is much more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

To take advantage of upcoming opportunities and to incorporate bicycle facilities into routine transportation projects, the "Bicycle Coordinator" should keep track of the Town's repaving projects (through the Public Works Department) and any other local and state transportation improvements. There are different procedures for state and local roads. State roads in Oak Island can be seen in Figure 5.1 and include Beach Dr., E. Oak Island Dr., Country Club Dr., and S. Middleton Ave. More detail on facility design and treatment can be found in Chapter 6.


Figure 5.1

### 5.6.1 Oak Island Sewer Construction

Sewer construction will begin in 2006 and continue through 2010. Bike facility construction could be very cost-effective if combined with the sewer construction. The Bicycle Coordinator should work closely with the Public Works Department and this Bicycle Transportation Plan to ensure that Oak Island takes advantage of developing facilities in a cost-effective manner. An asphalt trail with geotextile fabric beneath an aggregate sub-base will help hold the cross-section together above a sewer line. Because the island is at or slightly above sea-level and flooding may pose a problem, engineers should be consulted about more specific details regarding separation depth between the top of the sanitary pipe and the aggregate sub-base. A typical dimension for constructing a trail over any type of utility line requires a difference of at least 18" between the utility and the trail surface. This dimension may need to be adjusted due to the sandy soil type and low elevation of Oak Island. A general design is shc



### 5.6.2 Restriping

The simplest type of restriping project is the addition of bicycle lanes, edgelines, or shoulders to streets without making any other changes to the roadway.

Bicycle lanes, edgelines and shoulder stripes can also be added by narrowing the existing travel lanes or removing one or more travel lanes. In some locations where the existing lanes are twelve or thirteen feet wide, it may be possible to narrow them to eleven feet, based on NCDOT approval. This requires changing the configuration of the roadway during a resurfacing project.

### 5.6.3 Repaving

Repaving projects provide a clean slate for revising pavement markings. When a road is repaved, the roadway should be restriped to create narrower lanes and provide space for bike lanes and shoulders. In addition, if the space on the sides of the roadway has a relatively level grade and few obstructions, the total pavement width can be widened to include paved shoulders.

Middleton Bridge over Davis Canal is already scheduled for replacement.


Example of a bicycle route sign with map.

### 5.6.4 Roadway Construction and Reconstruction

Bicycles should be accommodated any time a new road is constructed or an existing road is reconstructed. All new roads with moderate to heavy motor vehicle traffic should have on-road bike facilities (bike lanes or wide paved shoulders); some may warrant both on-road and off-road facilities so that all types of bicyclists can be accommodated comfortably.

The Town of Oak Island should take advantage of several upcoming construction projects. These include sewer construction (scheduled to begin in 2006), the Second Bridge corridor, and yearly repaving. This provides an opportunity to develop sidepaths, bicycle lanes, and wider paved shoulders.

### 5.6.5 Bridge Replacement

All new or replacement bridges should accommodate bicycles with on-road facilities on both sides of the bridge. If the bridge is in a developed area or an area that may experience development in the future, it should also have wide sidewalks on both sides to accommodate all types of bicyclists and pedestrians. Regular maintenance is necessary to remove roadside debris and special care should be taken to ensure that smooth bicycle-safe expansion joints are used.

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

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

Recommended bridge shoulder minimum width is six feet based on NCDOT's North Carolina Bicycle Facilities Planning and Design Guidelines. The minimum height of railing used to protect a bicyclist is 54."

### 5.6.6 Retrofit Roadways with New Bicycle Facilities

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

In some places, such as Oak Island Dr., it may relatively easy to add extra pavement for shoulders, but others may require removing trees, relocating landscaping or fences, regrading ditches or cut and fill sections. Retrofitting roadways with sidepaths creates similar challenges.

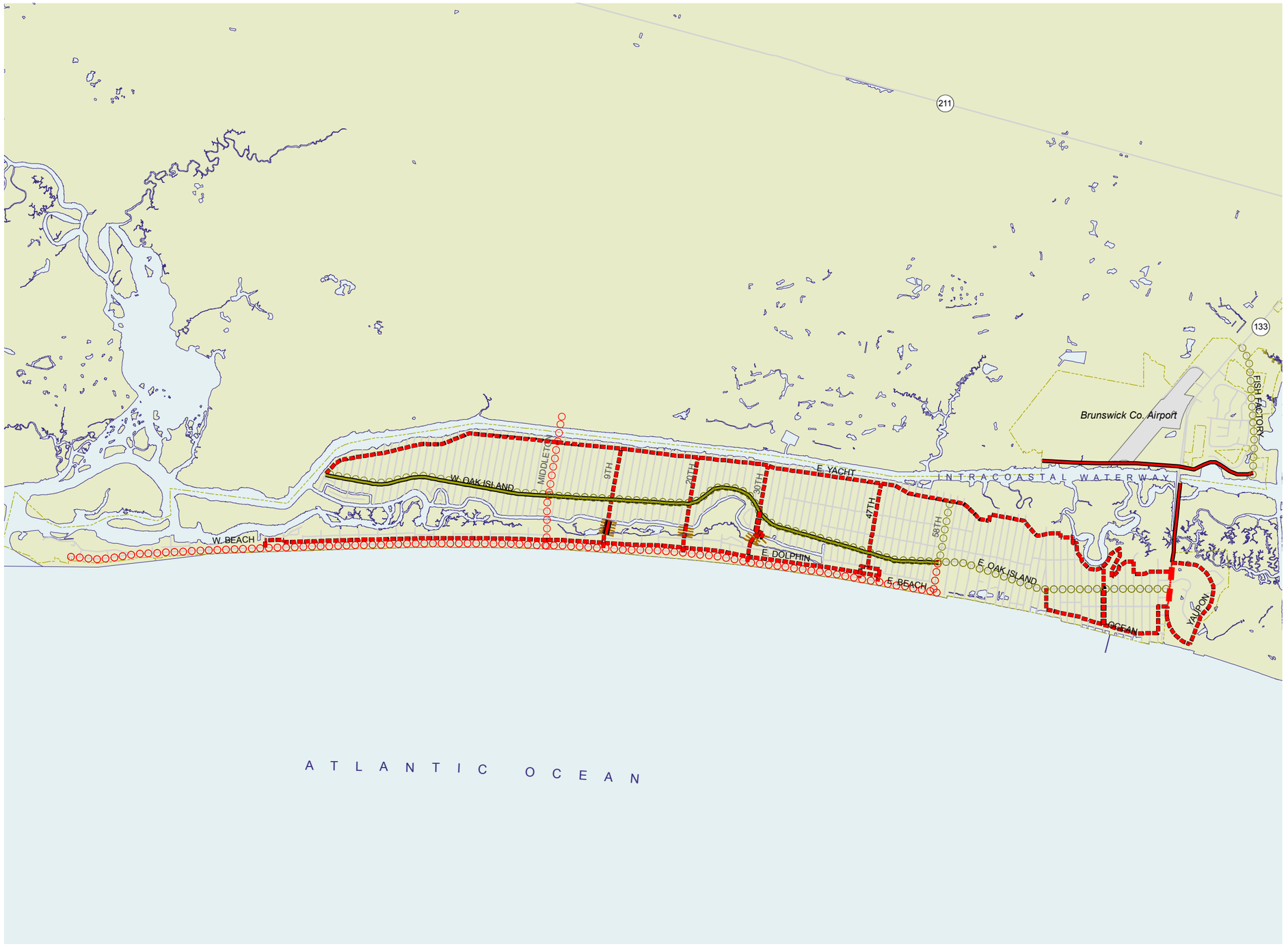
### 5.6.7 Signage and Wayfinding Projects

Signage along specific routes or throughout an entire community can be

updated to make it easier for people to find destinations. Bicycle route signs are one example of these wayfinding signs, and they can be installed along routes independently of other signage projects or as a part of a more comprehensive wayfinding improvement project.

# Oak Island Bicycle Plan

## Bicycle Network Phasing




**Legend**

- Phase 1 Bike Lanes
- Phase 1 Signed-Shared Roadways
- Phase 1 Sidepath
- Phase 1 Shared-use Paths
- Bike Lanes
- Sidepaths
- Boardwalk/Scenic Walkway
- Roads
- Hydrology
- Oak Island Boundary

0 0.5 1 Miles

Data Sources: Town of Oak Island, Brunswick County, Greenways Inc.

GREENWAYS INCORPORATED
Landscape Architecture
Multi-Objective Trail Planning
Open Space Planning

# Chapter 6
## Facility Standards and Guidelines

### 6.1 Introduction

This section of the report provides design guidelines for the development of bicycle facilities. These are based on the best practices in use throughout the United States, as well as accepted national standards found in AASHTO Guide for the Development of Bicycle Facilities, the Manual on Uniform Traffic Control Devices, and the North Carolina Bicycle Facilities Planning and Design Guidelines (which is largely based on the AASHTO guides). These guides should be consulted further in the design and construction of all facilities. Weblinks for these guides are found in the Footnotes section at the end of this chapter. As national standards are revised, any resulting discrepancies should favor the updated national standards.

### 6.2 General Guidelines

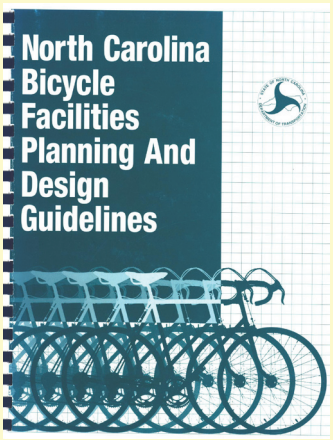
All new and reconstructed roadways in the Town of Oak Island should be designed to accommodate bicycles[1]. While each roadway construction, paving, or striping project must be appropriate for the topography and land use of the corridor, this section includes typical roadway cross-sections as guidelines for designing new and reconstructed roads.

National research has shown that bicyclists feel more comfortable and motor vehicles give bicyclists more lateral space when a shoulder or bike lane stripe is provided (Landis, et al. 1996; Harkey, et al. 1998; Hunter, et al. 1999; City of Cambridge, MA 2005). This research is supported by policies in the AASHTO Bicycle Guide (1999)[2], which states:

> "Bike lanes are intended to delineate the right of way assigned to bicyclists and motorists and to provide for more predictable movements by each. Bike lanes also help to increase the total capacities of highways carrying mixed bicycle and motor vehicle traffic…[Bike lanes may be provided] by reducing the width of vehicular lanes or prohibiting parking…" (p. 8)

### 6.3 Bicycle User Types

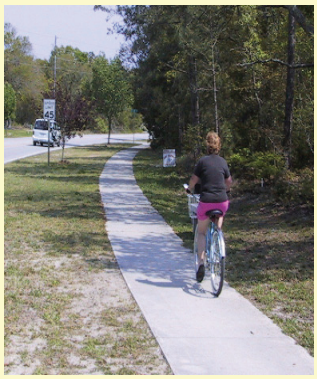
Cycling has become a diversified pursuit for millions of Americans. Today, equipment modifications have enabled users to access and ride within a variety of landscapes. The design of bicycle facilities has evolved to keep pace with these changes.




Design guidelines and figures in this chapter come from the NCDOT's *North Carolina Bicycle Facilities Planning and Design Guidelines.*

In North Carolina, bicyclists are regarded as vehicle operators and are therefore subject to the laws, rules, and regulations that govern the operation of vehicles within the public rights-of-way and on roadways. Common causes of bicycle/motor vehicle collisions are bicyclists riding the wrong way on the road or riding on the sidewalk.

Bicyclists can be divided into one of the following categories:


"B" or "C" cyclist on the sidewalk of Oak Island Dr.

"A" or Expert Cyclist: These cyclists use their bicycles for transportation and athletic purposes. They are confident in their ability to control their vehicle and ride in a variety of conditions, including along side motor vehicles. They are comfortable using urban, suburban, and rural roads that do not provide a special accommodation for bicycles.

"B" or Casual Cyclists: These cyclists use their bicycles for both recreation and transportation purposes. While they will ride within the roadway environment, they generally avoid high speed, heavy traffic roads, unless bike lanes or paved shoulders are provided. They often prefer quiet, less traveled streets and shared-use paths that are separated from the road environment.

"C" or Inexperienced Cyclists: Many of these cyclists are children, seniors, or people who have not had the opportunity to learn safe cycling skills. They are either novice or inexperienced riders that have neither an understanding of traffic laws and regulations nor a good grasp of how to control their vehicle. They are often dependent on their bicycle as a form of transportation (to friends' homes, jobs, schools, and recreation venues). This user group is most comfortable on shared-use, off-road paths.

In Oak Island, a large percentage of bicyclists are tourists hoping to enjoy casual, enjoyable rides. Because the population is composed of tourists and a relatively higher percentage of older residents, the majority of riders fall into the "B" and "C" class. A comprehensive and functional bicycle system caters to the needs of all three bicycle classification systems.

## 6.4 Bicycle Facility Types

Cyclists are trying to access the same origins and destinations as any other traveler and will typically use the most direct route from point A to point B. Roadway and pathway systems need to be planned to accommodate this demand. In order to choose the appropriate bicycle facility along roadways, an analysis of the types of cyclists, traffic volumes, traffic speeds, sight distance, roadway geometrics, and presence of truck traffic need to be evaluated. When the opportunity for off-road facilities exist, the incorporation of shared-use paths into a bicycle network can help cyclists avoid congested or heavily traveled routes. The following facility types are recommended for Oak Island's bicycle network.

### 6.4.1 Signed Shared-Use Roadway

A street does not necessarily have to be physically widened in order to be designated as a bicycle facility. A road with standard twelve-foot wide travel lanes (or less) can be designated as a signed shared-use roadway with the appropriate signage, given that certain conditions are met.

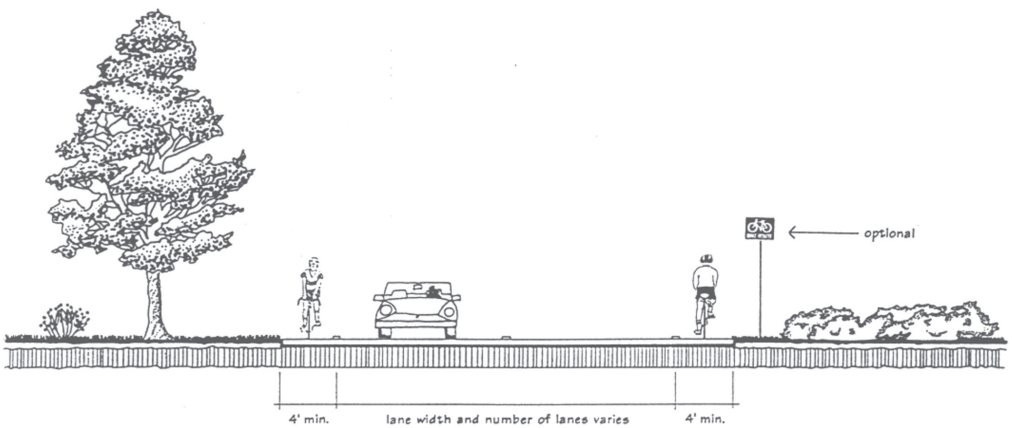
1. In its present state, the roadway has suitable traffic volumes to adequately accommodate cyclists, few blind curves, good pavement conditions, and traffic does not regularly exceed posted speed limits.
2. All bicycle hazards must be removed from the roadway or otherwise remedied, including uneven pavement and potholes, vegetation that effects site distance, unsafe drainage grates, and bottlenecks where lane width is reduced (such as over bridges).
3. A signed shared-use roadway should be designated as one segment in an interconnected system of bikeway facilities.

Note: A liability risk may be created by erecting bicycle signage on roadways that have hazards to bicycle travel, since these signs could attract bicyclists to a dangerous situation. Bicycle facilities created on unimproved streets should undergo careful evaluation of their sustainability for cycling prior to erecting signage.

### 6.4.2 Paved Shoulders

Shoulders should be four to six-feet wide to accommodate cyclists, depending on traffic volumes, speed limit, and amount of truck traffic. As with bicycle lanes, paved shoulders should have the same pavement quality as the adjacent roadway, and should be regularly swept and kept free of potholes. Paved shoulders should not be signed as bike routes unless local jurisdiction authorities can adequately maintain them for bicycle use.

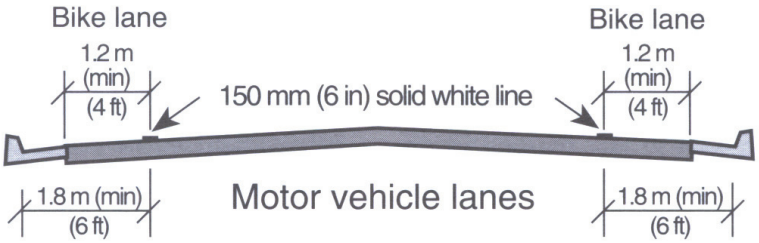
Bicycle shoulders are always one-way facilities and carry bicycle traffic in the same direction as adjacent motor vehicle traffic. On two-way streets, bicycle shoulders should always be located on both sides of the road. Bicycle shoulders should be separated from the travel lanes by solid, six to eight-inch painted white lines. Thermoplastic tape should not be used, as it can become slippery and cause the cyclist to fall.

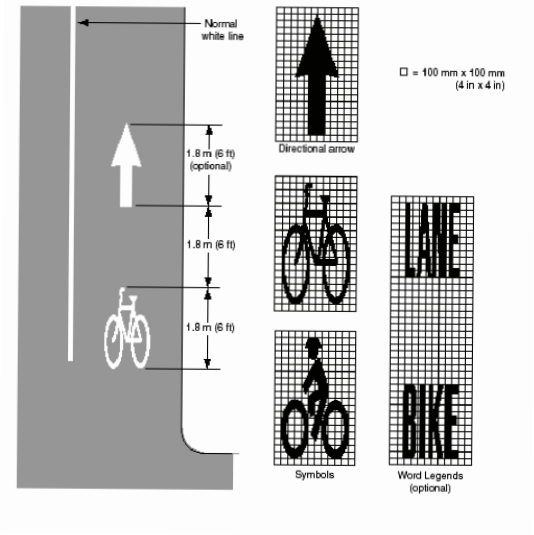


Proposed bike lane corridor along Beach Dr.

### 6.4.3 Bicycle Lanes

Bicycle lanes are always one-way facilities and carry bicycle traffic in the same direction as adjacent motor vehicle traffic. On two-way streets, bicycle lanes should always be located on both sides of the road. The width of each lane varies from four to six feet depending on roadway conditions along a particular route. Gutter pan width is not included in the usable width of the bicycle lane, since the seam between the pan and the street surface creates a hazard for a cyclist. On roads with parallel parking, bike lanes should be a minimum of five-foot wide and should be installed adjacent to the motor vehicle lanes, rather than between the parking lane and the curb. Along streets with higher motor vehicle speeds and traffic volumes, wider bicycle lanes are recommended. Bike lane pavement and sub-base should always have the same depth and quality as the adjacent roadway. Bike lanes are not required to have curb and gutter. Bicycle lane stripes should be solid, six to eight-inch wide painted white lines. Thermoplastic tape should not be used, as it can become slippery and cause the cyclist to fall.



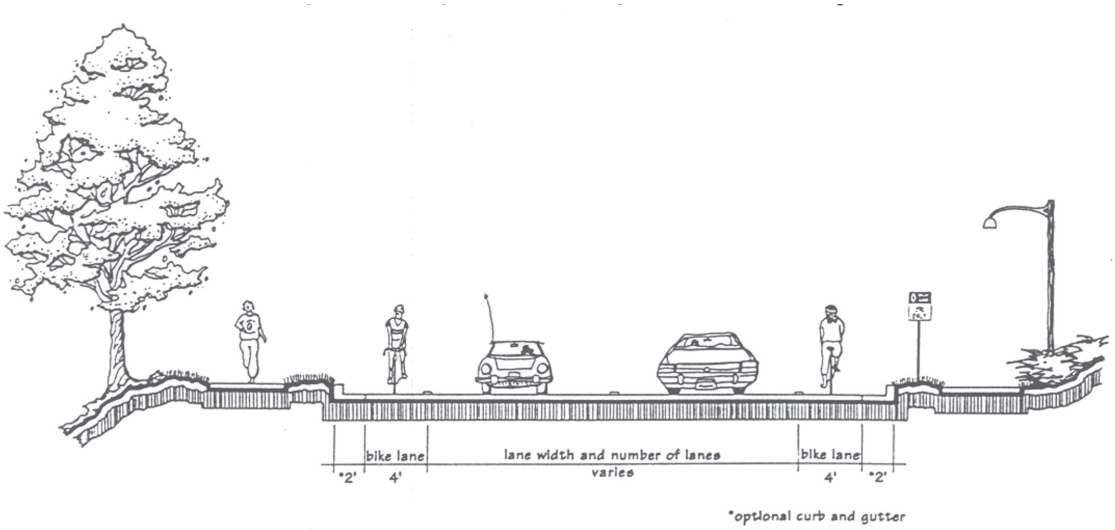




Bicycle lane design from North Carolina Bicycle Facilities Planning and Design Guidelines and MUTCD.

One aspect of bicycle lane development that deserves special attention is pavement striping at intersections. Traffic has a tendency to mix at intersections (i.e. cyclist turning left, motorists moving into the far right hand lane to turn right) –this adds to the complexity of intersection striping. In order to minimize conflict at intersections, the standard striping solutions found in AASHTO and in North Carolina's Bicycle Facilities Planning and Design Guidelines should be utilized. Further discussion of intersections can

be found later in this chapter.

It is essential to design, construct, and maintain bicycle lanes to the highest standards, as they attract users that are more susceptible to bicycle hazards. A bicycle lane that has collected broken glass and debris is rendered useless and puts the cyclist in a dangerous situation. The installation of bicycle lanes must be accompanied by an inspection and maintenance commitment from local jurisdictions. Regular bicycle lane sweeping and pavement patching should be included in regular maintenance and inspection schedules. Please refer to the hazard discussion later in this chapter.




### 6.4.4 Shared-Use Path

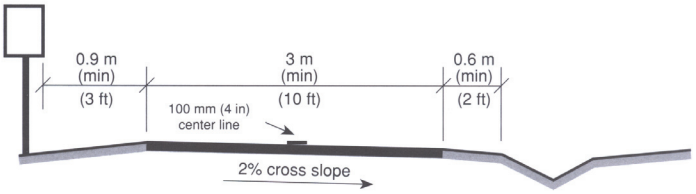
Shared-use paths are physically separated from motor vehicle traffic and built either within an independent right-of-way or along specially acquired easements across private lands. Off-road trails can offer a convenient and pleasant alternative, as well as an opportunity for a novice cyclist to get some riding experience in a less threatening environment. Such trails cater to a variety of users besides cyclists, including walkers, joggers, rollerbladers, and skateboarders. Possible conflicts between user groups must be considered during the design phase, as cyclists often travel at a faster speed than other users.

The minimum width for off-road multi-use trails is ten feet, however twelve and fourteen-foot widths are preferred where heavy traffic is expected. Due to the popularity of off-road trails, centerline stripes should be considered for paths designed to accommodate bicyclists, and speed limits or cautionary signs should be posted. Trail etiquette signage should clearly state that bicyclists should give an audible warning before passing pedestrians, such as "passing on your left!" Safety considerations such as these will insure that shared-use paths are successful as both transportation and recreation facilities.

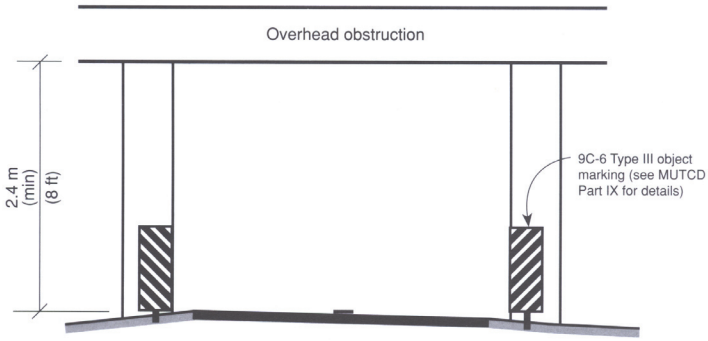
Typical pavement design for off-road trails should be based upon the specific loading and soil conditions for each project. Trails designed to serve bicycle transportation purposes should be composed on a hard surface such as asphalt or concrete, although other materials may be used as long as they meet ADA standards. One important concern for asphalt paths is the deterioration of trail

Proposed bicycle paths in Town of Oak Island. Top: Scenic path along NC133 Intracoastal Waterway Bridge. Bottom: Scenic path to South Harbor Village.

edges. Installation of a geo-textile fabric beneath a layer of aggregate base course can help maintain the edge of trail. It is also important to provide a two-foot wide graded shoulder to prevent crumbling, as well as a two-foot clear zone between the edge of trail and vegetation.



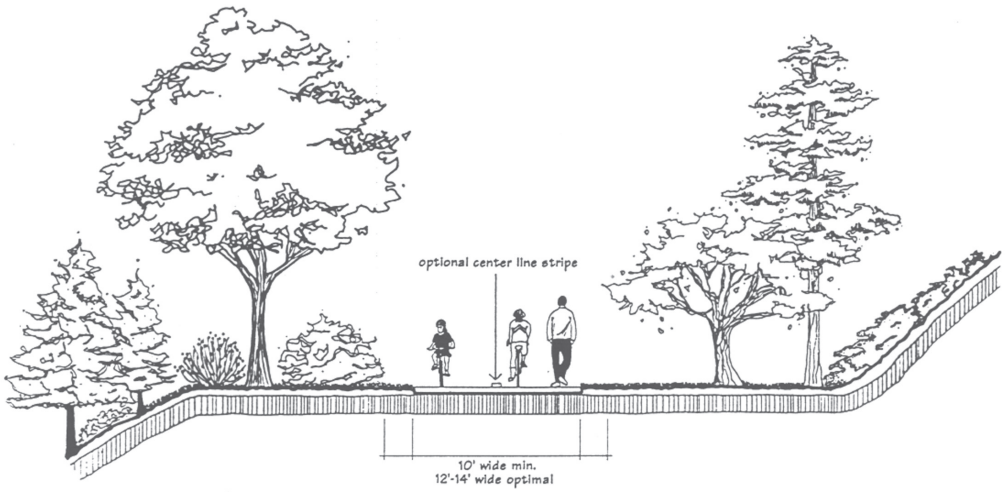

**Typical bicycle path cross section**

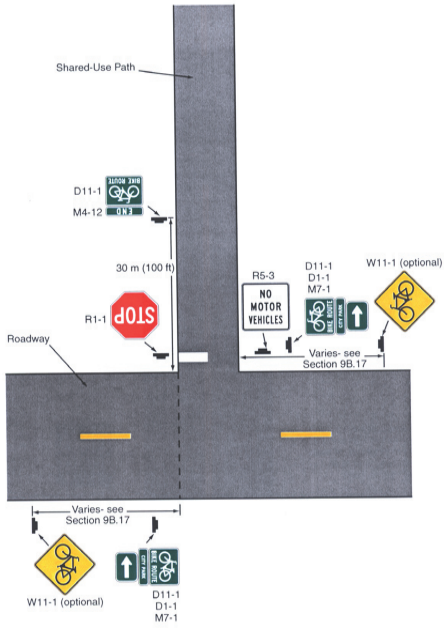



**Bicycle path with overhead and adjacent obstructions**

(W5-4 "Bikeway Narrows" sign should be used at least 15 meters (50 feet) in advance of obstruction)

Shared-use path design from North Carolina Bicycle Facilities Planning and Design Guidelines






Example of signing for the beginning and end of
a designated bicyle route on a shared-use path (MUTCD).

### 6.4.5 Bridges

Modifying an existing bridge to accommodate cyclists can be very challenging. Any improvements to facilitate bicycle traffic are better than no improvements at all. In areas where the minimum width standard cannot be achieved, a facility with lesser widths may be installed. This substandard facility should not be signed or striped as a bike lane. New bridge construction should be designed to include both bicycle and pedestrian facilities. Minimum accommodations of a five-foot sidewalk and four-foot paved shoulder should be provided on both sides of the bridge to facilitate two-way traffic flow. It is also important to provide paved shoulders and sidewalks along roadways that pass under bridges.

Future bridge site at Middleton. The bridge will have bicycle-safe features.

Bicycle-safe railings should be used on bridges designed to carry bicycle traffic. They should be in accordance with AASHTO specifications and be crash-tested in accordance with FHWA guidelines. The minimum height of a railing should be 54 inches, from the top of the riding surface to the top of the rail.

There are two main bicycle hazards on bridges: expansion joints and metal grate bridge decks. Some bridge expansion joints are uneven and can cause wheel damage when bicyclists pass over them. One solution is to use a rubber-filled joint system. Another is to cover the joint with a beveled and textured steel plate and weld it to one side on the joint (to allow for bridge expansion and contraction). Concrete or another solid surface material is preferable for bicycle travel. However, when these materials cannot be used, such as with a steel honeycomb bridge, it may be possible to fill the voids with concrete, particularly near the right edge of the roadway.

In special situations, it may be necessary to construct a physical barrier between pedestrian traffic and motor vehicle traffic on bridges. In areas where a barrier is warranted, the safety benefits to trail users can be substantial. It is important to note, however, that curbs do not qualify as adequate barriers. Except when traveling at very low speeds, motor vehicles can easily mount curbs.

For new bridge construction, it is NCDOT policy that when a bikeway is required, the bridge shall be designed in accordance with AASHTO standard bicycle accommodations and North Carolina Bicycle Facilities Planning and Design Guidelines to give safe access to bicycles where feasible. A minimum handrail height of 54" is required where bicyclists will be riding next to the handrail. For more information, visit: http://www.ncdot.org/doh/construction/altern/value/manuals/RDM2001/part1/chapter6/pt1ch6.pdf

Finally, it may be possible to create stand-alone bridges for bicycle and pedestrian use only (especially over Davis Canal). The bridge should be a minimum of 10' wide with 14' preferred. Railings or barriers on each side should be a minimum of 54." The ends of railings should offset away from the path to avoid conflict upon entering and exiting the bridge.

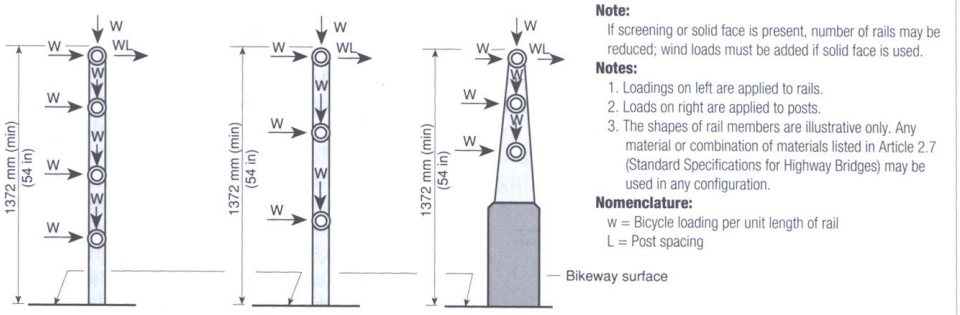



*Figure 7-13: Alternative railing designs for independent bicycle bridges.*

*Source: Standard Specifications for Highway Bridges; AASHTO, 1989*

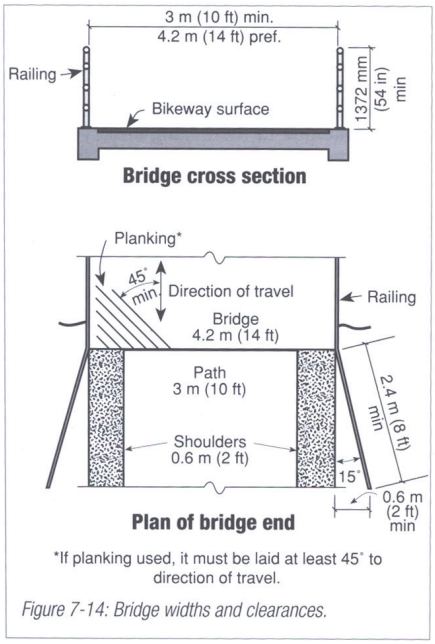



*Figure 7-14: Bridge widths and clearances.*

*Bridge diagrams from North Carolina Bicycle Facilities and Design Guidelines.*

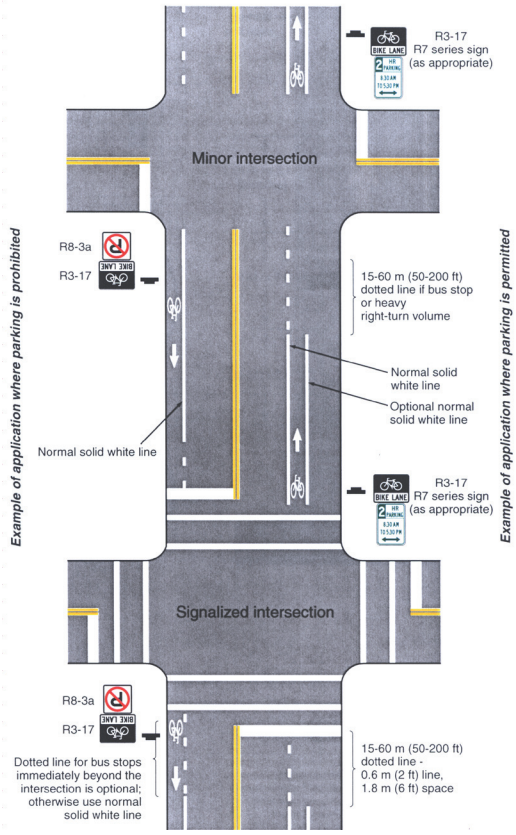
### 6.4.6 Culverts and Underpasses

Culverts, tunnels, and underpasses may cause difficulties because of the issues of grade, surface type and width, and levels of lighting. Like bridges, these are long-term investments. Providing adequate width is important for safety. These should be incorporated wisely into roadway design and reconstruction to allow for safe bicycle passage.

### 6.4.7 Intersections

Trail/roadway intersections can become dangerous conflict areas if not carefully designed. When a bicyclist is approaching all intersections, a clear line of site and proper stopping distance are important features. Intersections must have bicycle articulated signals, proper lane markings, and signage in compliance with MUTCD. Warning signage and pavement markings should be used to alert motorists of the trail crossing. Traffic signals should be modified to ensure the traffic light would respond to the presence of a bicyclist, especially in high traffic areas. Because traffic has a tendency to mix at intersections, bike lane striping can be a challenge. Several intersection striping patterns are provided by AASHTO's Guide for the Development of Bicycle Facilities (1999) and the MUTCD. When possible, grade separated crossings are almost always preferable to at-grade crossings.

For wide street crossings (more than 75 feet), mid-block crossings of at least six feet wide are recommended to cut the crossing time in half and to provide users with a safe waiting area to complete the crossing. However, mid block crossings should not be sited in close proximity to major intersections with other highways or where the line of site towards on coming traffic is limited, such as a curve in the roadway.




*Example of signing and pavement markings for intersections that include bicycle lanes (MUTCD).*

## 6.5 Applying the Typical Cross-Sections

It is important for roadway designers and engineers to consider the unique characteristics of each roadway when choosing the appropriate cross-section. This includes roadway geometrics, functional classification, traffic volumes and speed, use by large trucks, and surrounding land use characteristics.

Narrowing the motor vehicle lanes in several of the current bicycle cross-sections would provide extra space for shoulders and bicycle lanes. In some situations this may also have a desired traffic calming effect, slowing typical motor vehicle traffic by several miles per hour. According to AASHTO's Guide for Achieving Flexibility in Highway Design (2004), the normal range of design lane width is between nine feet and twelve feet. This guide states:

"In urban areas and along rural routes that pass through urban settings, narrower lane widths may be appropriate. For such locations, space is limited and lower speeds may be desired. Narrower lane widths for urban streets lessen pedestrian crossing distances, enable the provision for on-street parking and transit stops, and enable the development of left-turn lanes for safety."

None of the cross-sections would require striping motor vehicle travel lanes narrower than ten feet, a width that is already used on several roadways in the Town of Oak Island. Wider lane widths are typically used on roads with higher speeds and volumes and to accommodate wider vehicles, such as trucks and buses. Because traffic characteristics vary across the Town of Oak Island, some of the lane widths in the bicycle lane cross sections would only be appropriate for specific types of roadways.

According to the AASHTO Policy On Geometric Design of Highways and Streets (2004), minor thoroughfares (collector roadways) can be designed with ten-foot motor vehicle travel lanes. Wider widths should be considered in rural areas if the roadway has high traffic volumes or speeds and considered in urban areas if the roadway carries a large amount of truck traffic (p. 425, 433).

Major thoroughfares (arterial roadways) are commonly designed with eleven-foot travel lanes. However, in urban areas, some major thoroughfares can have narrower lanes. The AASHTO guide states, "Lane widths of 3.0 m [10 ft] may be used in highly restricted areas having little or no truck traffic" (p. 472).

## 6.6 Transportation Enhancement Guidelines

In addition to the previous design criteria, the following guidelines and selection criteria are provided by the NCDOT for applicants wishing to request TIP projects and use Transportation Enhancement funds.

- Complete information regarding the right-of-way should be provided.
- All necessary permits and approval must be obtained involving a public jurisdiction.

- The bicycle request must be an element of a comprehensive transportation or bicycle planning process.
- There should be evidence of local support.
- Bike paths must be at least 10 feet in width.
- Bike paths must have an established design speed.
- Bike paths must connect logical, accessible termini.
- Bike path surfaces typically include concrete or asphalt; however, other materials may be acceptable (as long as they meet ADA standards).
- Paved shoulders/bike lanes must be at least four feet in width and located on both sides of the road.
- Bicycle facilities must primarily serve a transportation purpose--not a recreation purpose.
- Bicycle designs must be consistent with the NCDOT "roadway standard drawings" and the "standard specifications" publications available from the NCDOT Highway Design Branch, and the North Carolina Bicycle Facilities Planning and Design Guidelines publication available from the NCDOT Division of Bicycle and Pedestrian Transportation office.
- Priority will be given to those projects where the greatest need is demonstrated.

## 6.7 Support Facilities

### 6.7.1 Signage

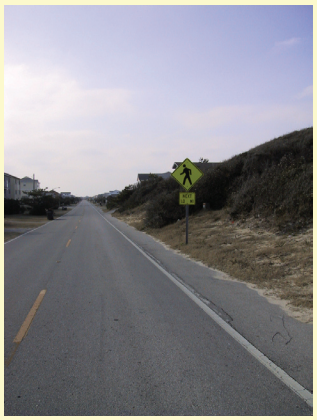
Bicycle facility signage is standardized in North Carolina. Information on appropriate signage is provided in the Manual of Uniform Traffic Control Devices (MUTCD), Part 9 (Traffic Controls for Bicycle Facilities) as well as in North Carolina's Bicycle Facilities Planning and Design Guidelines. Signs must be installed at appropriate heights, and as far in advance of a condition so as to provide adequate warning to cyclists and other vehicle operators. Oak Island should follow these standards in order to achieve a uniform system of signage that corresponds and flawlessly transitions into neighboring transportation systems.

Signage should be used where appropriate to provide valuable information to both motorist and cyclist. According to MUTCD, signage should:

- fulfill a need
- command attention
- convey a clear and simple meaning
- command respect of road users
- give adequate time for proper response

Speed limit signs should be used where appropriate. Caution signs should be used to give adequate warning of any upcoming hazards or tight curves. Special attention should be given to transitional areas where bike lanes may change from off-road to on-road, providing information about travel direction and traffic patterns.

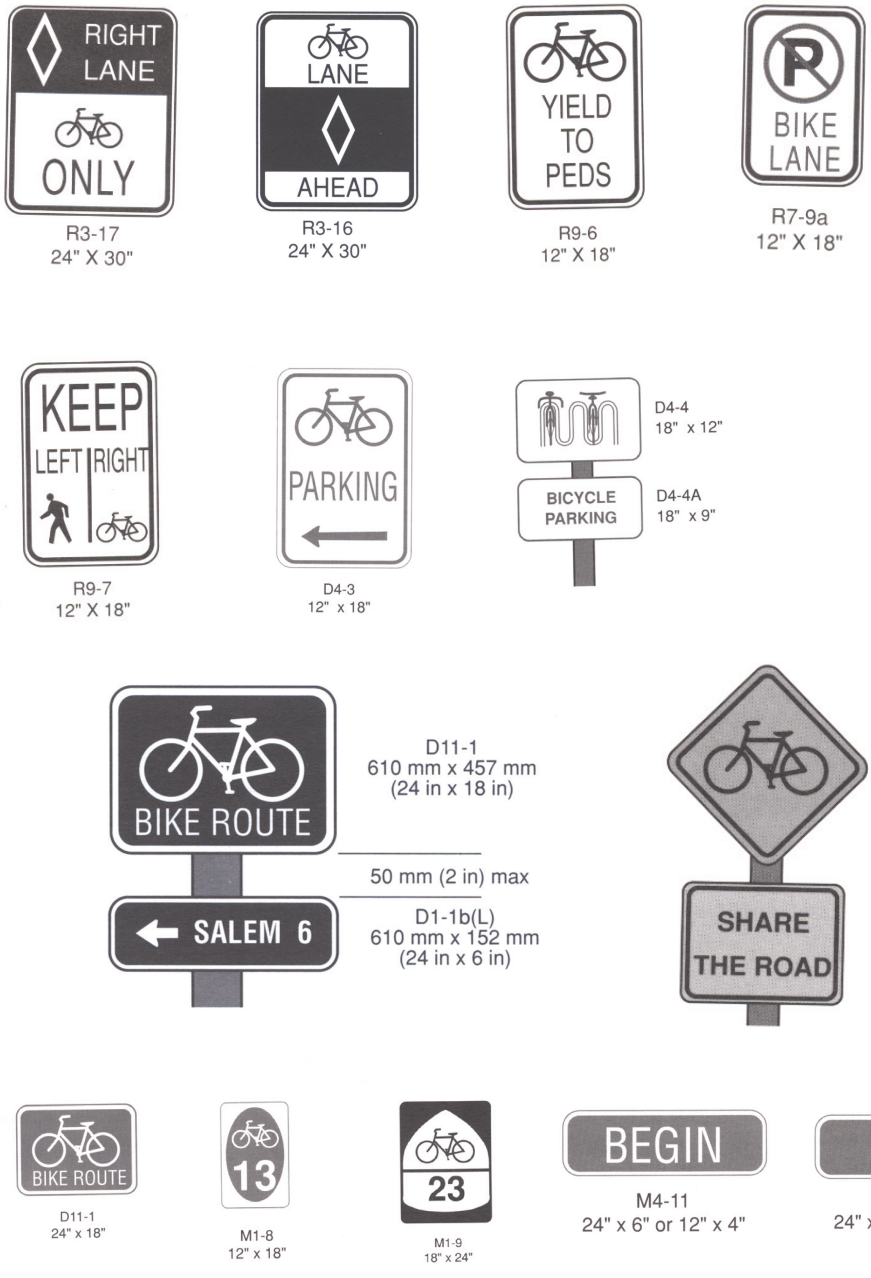
When developing bicycle facility plans and design specifications for both on-



Future bicycle lane along W. Beach

road and off-road bicycle projects, including paved shoulders, bicycle lanes, and shared-use paths, complete signage and pavement plans should also be produced. These plans should indicate the location and position of all signs, referencing the MUTCD sign number and size of the proposed sign. Dimensions should be given between the sign and the upcoming intersection or hazard. In the case of signed shared-use roadways, signs should be placed at frequent intervals per NCDOT recommendations.

Existing bicycle rack at Memorial Waterway Park.

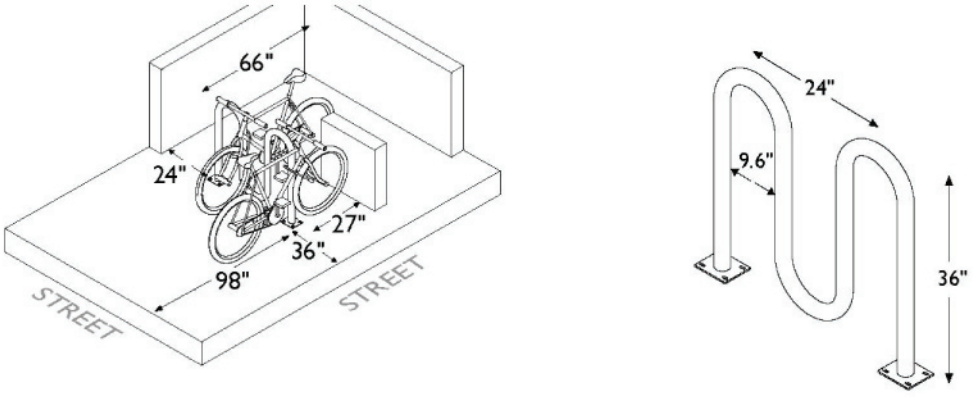



*Examples of signage taken from the North Carolina Bicycle Facilities Planning and Design Guidelines.*

### 6.7.2 Parking

Convenient bicycle parking is essential to encourage bicycle commuting. It is extremely disconcerting to arrive at a destination and find little or no available bicycle parking. Bicycle parking should be provided at all destinations such as parks, recreation facilities, shopping centers, entertainment complexes, schools, libraries, transit stations, and housing complexes. The North Carolina Facilities Planning and Design Guidelines has an excellent description of appropriate on-site locations for bicycle parking.

According to the Pedestrian and Bicycle Information Center (http://www.bicyclinginfo.org/de/park_costs.cfm ), the average cost to install a bicycle rack is $150 (that parks two bicycles).




*Examples of typical "rolling" bike rack dimensions and clearances (Details courtesy of Dero)*

*Examples of "rolling" bike rack manufactured by Dero*

### 6.7.3 Traffic Coordinated Signals

Traffic signals that detect bicycles should be a standard element for bicycle facilities. Additionally, signalized intersections that cannot be tripped with special bicycle-sensitive signal designs should be replaced or a cyclist activated push button system, similar to the type used at pedestrian crosswalks, should be installed. This can be accomplished through incidental improvements and

on new roadway projects. There are several standards for bicycle friendly traffic signals, including a wide coverage bicycle detector loop design and loop detectors designed specifically for placement within bicycle lanes.

### 6.7.4 Bicycle Hazards

Unsafe conditions for cyclists are generated not only by congested and narrow roadways, but also because of obstacles in the path of travel and poorly maintained travel lanes. Bicycles are much more vulnerable to surface irregularities than motor vehicles, mainly because they rely on narrow, highly pressured wheels with no suspension. A simple pothole that might cause a slight jarring to the passengers of a car can cause a serious crash for a cyclist. Other hazards such as bumps, corrugations, rumble strips, seams, unraveled pavement, bridge expansion joints, and recessed manhole covers can cause a cyclist to loose balance and swerve. Rocks, glass, dead animals, dirt, leaves, or debris swept to the road edges can cause bicycle crashes. Such debris limits the width of usable roadway for bicycling. Some roadway drainage grate designs trap bicycle wheels. Sign posts, mailboxes, utility poles, and other objects that are placed too close to the edge of the roadway can catch the handlebars. Temporary roadway construction or improvements such as milled pavement and sudden pavement changes due to roadway resurfacing are very hazardous to cyclists. Signage should warn of any temporary surface irregularities.

## 6.8 Cost Estimates

The following cost estimates are a reference for each bicycle facility type. Due to varying site conditions, the actual cost may be higher depending on soil type, available resources, site access, and construction obstacles. Design fees for construction documents are not included in the following estimates.

<u>Signed Shared Use Roadways</u>

No amendments are made to a roadway that can in its correct state, safely facilitate shared-use between a cyclist and motorist other than signage.
$ 100.00-$250.00/ each for sign for fabrication and installation (depending on sign dimensions)

<u>Paved Shoulders</u>

Amendments to the condition of the shoulder need to be made so that the shoulder is the same pavement quality as the adjacent roadway. In some cases, no modification to the shoulder pavement is necessary.
$125,000-$150,000/mile for 4' shoulders on both sides of the roadway, paved with full depth asphalt
$6,000-$10,000/mile for painted 6" to 8" white line on both sides of the road, installed between travel lane and shoulder

<u>Bicycle Lanes</u>

Amendments to the roadway may be minimal if the width of the paved surface is wide enough to accommodate both vehicular travel and bicycle lanes. However, re-paving and re-striping of the road would be required. If the road would need to be widened, the removal or relocation of guard rails, utility

poles, and other obstacles will become additional expenses.
$74,000/mile, installed for 2” asphalt repaving (heavy duty)
$106,000/mile, installed for 2” asphalt and 8” sub-base (heavy duty)
$5,300/mile, installed for painted 6”-8” white line between travel lane and shoulder

Shared Use Path

An off-road facility is usually the most expensive type of facility. However, because it is a shared-use facility, numerous pedestrian or greenway based funding sources may also be utilized for design and construction costs.
$200,000-$350,000/mile for a full depth 10' asphalt path, excluding structural items that may be needed (i.e. drainage piping, bridges, lengthy sections of boardwalk).
$300,000-$450,000/mile for a full depth 12' asphalt path, excluding structural items.
$1,320,000/mile for a 10’ wide boardwalk (A boardwalk is not the preferred surface for bicycle facilities, but may be used to extend path across wetlands, preferably no more than 1,000 feet).

Support Facilities

All costs are estimates based on popular facilities. Uniquely designed or custom facilities can also be used. Costs for custom facilities are on a case-by-case basis.
$ 100.00-$250.00/ each for sign for fabrication and installation (depending on sign dimensions)
$ 175.00/ each for mileage markers
$ 400.00/ each for a bike rack (holding 9 bicycles); $150/ each for a bike rack (holding 2 bicycles)
$ 800.00/ trash receptacle

Footnotes from Section 6.2

[1] With the exception of freeways/expressways where bicycles are prohibited. In these situations, bicycles should be accommodated on a shared-use path or other parallel route nearby.

[2] 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).

[3] Recommended bicycle cross-sections D-B, E-B, F-B and H-B have bike lanes that use 4-feet of pavement width. The AASHTO Bicycle Guide (1999) allows gutter pan width to be included to meet the 5-foot minimum bike lane width standard as long as the gutter pan is flush with the pavement surface.

[4] Recommended typical thoroughfare cross-sections B, D, E, and M have bike lanes that are 4-feet wide. Though the preferred width for bike lanes is 5 feet, the AASHTO Bicycle Guide (1999) allows this narrower width if the bike lane is adjacent to a gutter pan that is flush with the pavement surface.

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# Appendix A
## Public Input

Public input was solicited at two public meetings in June and August 2005. Participants were asked to complete a survey at these workshops (shown at end of this appendix). Eleven surveys, filled out by Oak Island residents, were returned for the following analysis. Results are presented here but because of the small sample, there is no statisical validity or significance.

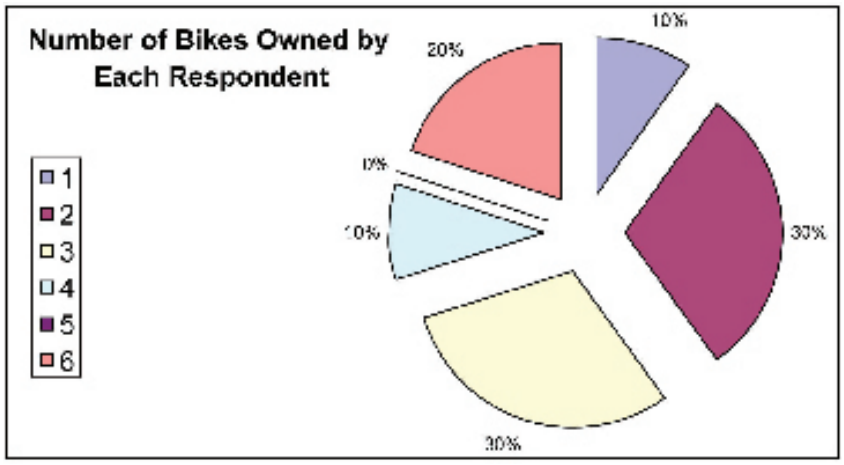
In summary, all respondents owned at least one bicycle, and mostly cycle for recreation and exercise with safety being a top concern. Below are the complete results of the public survey responses.

### 1) Are you a resident of Oak Island or a visitor?

All of the 11 respondents to the Oak Island Bicycle Plan participant survey were Oak Island residents.

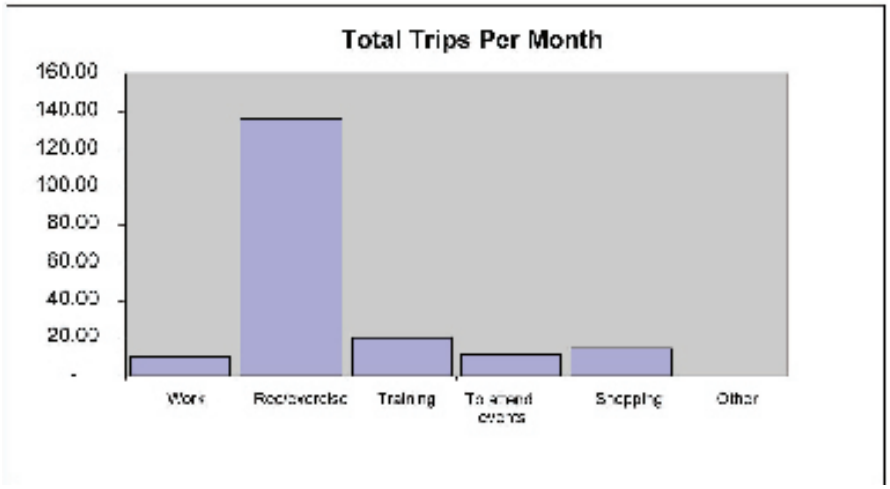
### 2) How many bicycles do you have in your household?

All respondents owned between 1 and 6 bikes each. 70% owned between 2 and 4. The average number of bikes owned by each respondent was 2.82.



3) How many times per month (on average) do you ride a bicycle for the following purposes?

82% responded that recreation and exercise was one of the reasons they bicycled. Exercise and recreation also accounted for the highest number of total bicycle trips that respondents took per month, 137.

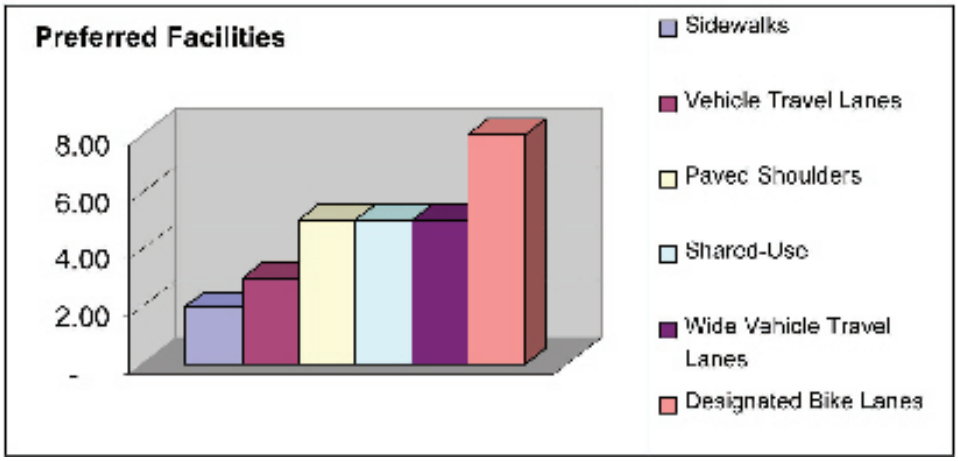



4) Are there places you would like to be able to bike that you cannot at this time?

The most common answer was from Oak Island to Southport. Three of the six who answered this question claimed that as their route of interest.

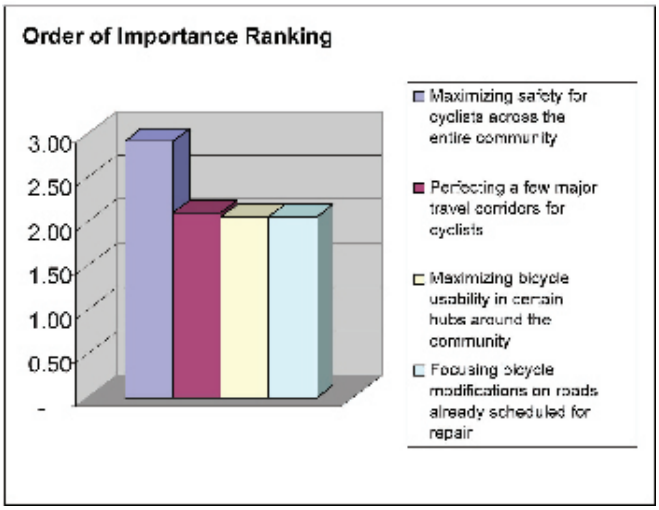
5) Which of these bicycle facilities would you like to use?

"Designated bike lanes," with 8 votes, was the option that most respondents would use. Paved shoulders, shared-use, and wide vehicle travel lanes each received 5 votes. Two respondents said they would use the least chosen option, sidewalks.



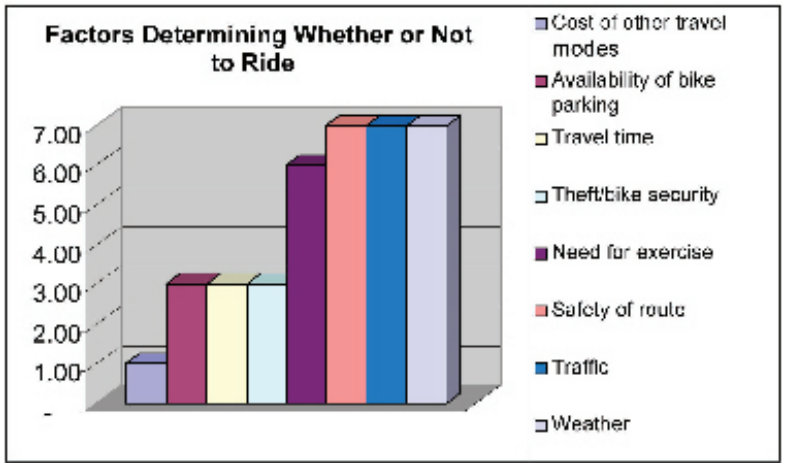
6) Please order this list of priorities according to the importance you place on each of them.

The results were tallied by reverse ranking the responses; a score of first importance was given a ranking of 4. Maximizing safety for cyclists across the entire community was ranked the highest, with an average ranking of 2.9. The other options all received similar average scores of approximately 2.




7) Which of the following factors plays a role in whether or not you ride your bike to a destination? (Check as many as apply).

Eleven options were on the survey as possible factors that could affect whether or not the respondent rode their bike. All factors that applied could be chosen. Three of the options: bike availability, available shower or changing facilities, and other factors were not chosen by any respondent. The top three choices were weather, traffic, and the safety of the route.



## 8) Should public funds be used to improve bike transportation?

All eleven respondents agreed that public funds should be used to improve bicycle transportation.

## 9) Do you have any suggestions about specific programming or bicycle related policies that you would like to see enacted?

Six respondents gave suggestions about the future Bicycle Plan for Oak Island. Two of the responses asked for more signage. Two other comments both asked for bike lanes going to Highway 211. One person suggestd Long Beach Rd. and the other suggested West Beach Dr. Creating bikeways along the water, the new bridge, and along new sewer pipelines were suggested as well. Other suggestions included adding public education on bicycle safety and cleaning debris on road shoulders.

## 10) Please provide your address below so we can better understand who was represented at tonight's meeting.

One survey respondent did not answer this question; all other respondents were from various areas within the Town of Oak Island.

# Oak Island Bicycle Plan

## Participant Survey for the August 24, 2005 Public Workshop

### 1) I am a . . .

- ☐ Resident of Oak Island or nearby community
- ☐ Visitor to Oak Island

### 2) How many bicycles do you have in your household? _____

### 3) How many times per month (on average) do you ride a bicycle for the following purposes?

- _____ To go to work
- _____ For general recreation/exercise
- _____ Training
- _____ To attend social activities/events
- _____ To shop or run errands
- _____ Other _____

### 4) Are there places you would like to be able to bike that you cannot at this time?

FROM: _____ TO: _____

_____ _____

FROM: _____ TO: _____

_____ _____

### 5) Which of these bicycle facilities would you like to use?

select one or many

- ☐ Paved Shoulders
- ☐ Shared-Use Trails
- ☐ Vehicle Travel Lanes
- ☐ Designated Bicycle Lanes
- ☐ Sidewalks
- ☐ Wide Vehicle Travel Lanes (wide Curb Lanes)

### 6) Please order this list of priorities according to the importance you place on each of them.

Rank the options below from 1 (highest importance) to 4 (lowest importance)

- _____ A) Maximizing safety for cyclists across the entire community
- _____ B) Perfecting a few major travel corridors for cyclists
- _____ C) Maximizing bicycle usability in certain hubs or nodes around the community
- _____ D) Focusing any bicycle modifications on roadways and routes already scheduled for resurfacing and repair

Please complete both sides of this form

Front of the survey.

**7) Which of the following factors plays a role in whether or not you ride your bike to a destination?**

Check as many as apply

- ☐ Availability of a bicycle
- ☐ Availability of bicycle parking
- ☐ Safety of route for cyclists
- ☐ Traffic
- ☐ Costs of other travel modes
- ☐ Need for exercise
- ☐ Availability of showers/changing facilities
- ☐ Weather
- ☐ Travel time
- ☐ Theft/bike security
- ☐ Other _____

**8) Should public funds be used to improve bicycle transportation options?**

- ☐ Yes
- ☐ No

**9) Do you have suggestions about specific programming or bicycle related policies that you would like to see enacted?**

_____

_____

_____

_____

**10) Please provide your address below so we can better understand who was represented at tonight's meeting.**

Address: _____

_____

_____

*Thanks for your input!*

**Please complete both sides of this form**

June 2005

Back of the survey.



# *Appendix B*
# *Funding Sources*

## B.1 Overview

The most effective method for funding the recommendations in this plan will be through a "funding quilt" where public and private sources of money are combined to fund facility implementation, education, enforcement, and encouragement projects and programs. This appendix provides a listing of the most commonly used funds for bicycle facility projects in North Carolina.

## B.2 Federal Funding

In 1991, Congress enacted the ***Intermodal Surface Transportation Efficiency Act (ISTEA)***, a six year bill authorizing a wide range of federal aid transportation programs, including programs that fund trail acquisition and development. In June of 1998, the ***Transportation Equity Act for the Twenty-first Century (TEA-21)*** was enacted and authorized through 2003 and expands on those programs that have proven to be a boon to the implementation of bicycle related facilities. Currently, Congress is considering the passage of the ***Safe, Accountable, Flexible, and Efficient Transportation Equity Act (SAFETEA)***. Since SAFETEA is still pending legislation which is subject to change, the following text describes applicable portions of TEA-21 that relate to the funding of bicycle projects.

• ***National Highway System*** funds can be used for bicycle projects adjacent to any highway on the National Highway System, including Interstate Highways.

• ***Surface Transportation Program (STP)*** funds may be used for construction or non-construction projects that benefit bicycles and pedestrians. "Non-construction" projects are items such as maps, brochures, and public service announcements. These funds may be programmed to bring sidewalks and intersections into compliance with ADA regulations.

• Enhancements – Ten (10%) percent of STP funds are earmarked for ***Transportation Enhancement Activities (TEAs)***. The list of activities that are eligible under the TEA program, include the following:

- Pedestrian and bicycle facilities
- Pedestrian and bicycle safety and education activities
- Acquisition of scenic easements and historic easements and sites
- Scenic or historic highway programs including tourist and welcome

centers
- Landscaping and scenic beautification
- Historic preservation
- Rehabilitation and operation of historic transportation buildings, structures, or facilities
- Preservation of abandoned railway corridors
- Control and removal of outdoor advertising
- Archaeological planning and research
- Mitigation of highway runoff and provision of wildlife undercrossings
- Establishment of transportation museums

• ***Hazard Elimination and Railway-Highway Crossing Programs*** account for another 10 percent of a state's STP funds. These funds should be used to inventory and/or address safety concerns of motorists, pedestrians, and bicyclists.

• ***Congestion Mitigation and Air Quality (CMAQ) Improvement Program*** funds are similar to STP funds in that they may be used for construction or non-construction projects that benefit bicyclists and pedestrians.

• ***National Recreational Trails Program (NRTP) (Symms Act)*** funds are different from other Federal Aid programs for bicycles and pedestrians in that they are set aside specifically for either motorized and non-motorized trails. The RTP funds explicitly prioritize recreational facilities. This program funds acquisition of easements or property for trails, construction of new trails, maintenance and restoration of existing trails, and development of trailhead facilities and trail linkages.

• ***The Federal Lands Highway Program*** will fund bicycle and pedestrian facilities as a provision of roads, highways, and parkways. This program is under the discretion of the appropriate Federal Land Agency or Tribal government.

• ***The National Scenic Byways Program*** funds bikeways and walkways along scenic routes. This program recognizes certain roads as National Scenic Byways or All-American Roads based on their archeological, cultural, historic, natural, recreational, and scenic qualities. There are 72 such designated byways in 32 states. Bicycle facilities can be funded as a component of a corridor's management plan.

• ***Job Access and Reverse Commute Grants*** may fund bicycle-related services intended to transport welfare recipients and eligible low-income individuals to and from employment.

• ***High Priority Projects and Designated Transportation Enhancement*** Activities are those projects specifically identified by TEA-21. These projects include bicycle, pedestrian, trail, and traffic calming projects throughout the nation.

• The ***TEA-21*** legislation amended the ***Urbanized Area Formula Grants, Capital Investment Grants and Loans***, and ***Formula Program for Other than Urbanized Area*** transit funds, part of the Federal Transit Program, to include projects that improve bicycle and pedestrian access to transit facilities and vehicles. One of the activities that qualify for funding is the provision of bicycle storage facilities and pedestrian walkways and access.

• ***State and Community Highway Safety Grants*** are part of the Section 402 formula grants for which each state is eligible. States must submit a Performance Plan that establishes goals and performance measures for improving highway safety, including improved bicycle and pedestrian safety.

Typically, TEA 21 funds provide 80 percent of a project's cost with 20 percent of the funds required from local funds. Federal funding programs, in addition to the TEA-21 programs are discussed below.

Environmental Protection Agency Federal sources of funding for bicycle facilities have been available through the EPA's Office of Transportation and Air Quality (OTAQ). One such grant source under OTAQ is "***Clean Air Transportation Communities: Innovative Projects to Improve Air Quality and Reduce Greenhouse Gases***". These funds assist in the funding of innovative pilot projects to reduce transportation related emissions of criteria pollutants and greenhouse gases by decreasing vehicle miles traveled and increasing use of cleaner technologies. Eligible recipients are state, local, multi-state, and tribal agencies involved with transportation/air quality and/or climate change issues. The use of federal air quality monies was utilized in Billings, Montana for implementation of bike trails using the idea that increased usage of bicycles as non-polluting vehicles are a justification for obtaining air quality grants.

A second source of EPA funds is through the ***Congestion Mitigation and Air Quality (CMAQ)*** funding, as discussed above under TEA-21 programs. These funds have been used for bicycle related projects in many states. An additional potential source of funds relating to outreach and public education is the EPA's Mobile Source Outreach Assistance Competition. This funding source focuses on outreach and public education relating to cleaner air and alternative transportation. These grants have a $100,000 maximum with a 40% required local match.

• In 2001, trail projects received $4 million from the ***Public Lands Highways Discretionary Fund***. This year, bicycle and pedestrian trails providing access to or within federal lands are again eligible for funding.

• ***The Community Development Block Grant (CDBG)*** program directly funds cities and towns for projects with community-wide benefits. Entitlement funds provide assistance with neighborhood revitalization and economic development. Eligible activities must benefit low to moderate income persons or aid in preventing or eliminating slums and blight. Routes and trails can qualify for CDBG money, particularly those with documentable economic,

cultural, and historic merits. For communities, which are non-eligible for entitlement funds based on population, the Small Cities Program Funds serves a similar role for neighborhood revitalization.

• ***The Rivers Trails and Conservation Assistance Program (RTCA)*** is a program of the National Park Service. The program does not provide funding for projects, but rather it provides valuable on-the-ground technical assistance, from strategic consultation and partnership development to serving as liaison with other government agencies. Communities must apply for assistance.

• Another program of the National Park Service is the ***American Battlefield Protection Program Funds*** which supports the restoration and preservation of battlefields. Eligible battlefields can be preserved as open space with applicants being local or state government and nonprofit organizations.

Many organizations seek ways to incorporate more of their community into their trail and bike planning. One way to do this is to celebrate the cultural and historic uniqueness of communities. There are many funding opportunities for these types of projects. ***The National Endowment of the Arts*** funds arts-related programs through the Design Arts Program Assistance, and provides many links to other federal departments and agencies that offer funding opportunities for arts and cultural programs.

## B.3 State Funding

Many of the following funding sources are actually federal allocations provided to the State. The State programs are described below.

***Transportation Improvement Program (TIP)***
Transportation projects in North Carolina progress through a standard process of planning, design, and construction. Improvements for bicycling and walking may be included in the Transportation Improvement Program (TIP) as part of the construction of a highway project or, where no highway project is programmed, as an independent project. Bicycle and pedestrian projects follow essentially the same TIP process as do highway projects. The Division of Bicycle and Pedestrian Transportation (DBPT) works with localities to create a four-year schedule of projects using the locality's priority listing of needs along with the adopted project selection criteria. The Cape Fear Council of Governments Rural Planning Organization (RPO) works to develop and prioritize projects that the RPO believes should be in the TIP. The DBPT compiles candidate bicycle projects to be considered for inclusion in the TIP from the following sources:

- The prioritized Metropolitan Transportation Improvement Program (MTIP) lists, produced by the 17 Metropolitan Planning Organizations (MPOs), have been derived from separate lists produced by communities comprising the MPO.

- Project requests that are made at the biennial TIP meetings or through

written requests within 30 days of a meeting by the state's small urban areas, counties, public and private entities, and citizens.

- Internal DBPT assessment of statewide bicycle and pedestrian project needs.

Bicycle facility projects are divided into two categories, which determine the types of funds that may be available. Independent projects are those that are not related to a scheduled highway project. Incidental projects are those related to a scheduled highway project. Local requests for small pedestrian projects, such as sidewalk links, should be directed to the relevant NCDOT Highway Division office.

*Independent Projects* – $6 million is annually set aside for the construction of bicycle improvements that are independent of scheduled highway projects in communities throughout the state. Eighty percent of these funds are from STP-Enhancement funds, while state funds provide the remaining 20 percent. Currently, $1.4 million is annually set aside for pedestrian hazard elimination projects in the 14 NCDOT highway divisions across the state; $200,000 is allocated to the Division of Bicycle and Pedestrian Transportation for projects such as training workshops, pedestrian safety and research projects, and other pedestrian needs statewide.

*Incidental Projects* – Bicycle accommodations such as bike lanes, widened paved shoulders and bicycle-safe bridge design are frequently included as incidental features of highway projects. In addition, bicycle-safe drainage grates are a standard feature of all highway construction. Most pedestrian safety accommodations built by NCDOT are included as part of scheduled highway improvement projects funded with a combination of federal and state roadway construction funds.

All project requests are documented and distinguished as independent or incidental (part of a highway project). Independent project requests are evaluated by DBPT using project selection criteria. A prioritized list of these projects is presented to the North Carolina Bicycle Committee. The Committee reviews the list, makes revisions and recommendations, and adopts a four-year schedule of projects. The adopted schedule is sent to the North Carolina Board of Transportation for approval and inclusion in the state's TIP.

Inclusion of a bicycle or pedestrian project in the TIP does not guarantee that it will be implemented; rather, it means that it will receive further study and will be implemented if feasible. Incidental projects are considered in conjunction with the planning study for the given highway or bridge project and implemented, if feasible.

For independent construction projects, DBPT conducts a detailed feasibility study, including cost estimates. If the project is determined to be feasible, DBPT prepares a more detailed planning study, which is reviewed and approved by the Bicycle and Pedestrian Task Force before being submitted to the Board of Transportation for funding authorization. Once the funding is

authorized, project design and development begins.

*The Transportation Improvement Program Process*:

From Need to Bicycle Improvement
The Transportation Improvement Program (TIP) is the process through which local areas and citizens are asked to present their transportation needs to state government. Bicycle facility and safety needs are an important part of this process. Every other year, a series of TIP meetings is scheduled around the state. Following the conclusion of these meetings, all requests are evaluated. Bicycle improvement requests, which meet project selection criteria, are then scheduled into a four-year program as part of the state's long-term transportation program.

Incidental projects — those where the bicycle request is an incidental feature of a planned highway improvement — are built with a mixture of state and federal funds as part of overall highway improvement. Independent bicycle projects — those which are separate from any other scheduled highway improvement — are paid for from funds allocated for that purpose by the North Carolina Board of Transportation.

Examples of bicycle projects already underway include signed bike routes, greenway/multi-use paths, roadways with widened outside lanes, widened paved shoulders, bicycle parking, replacement of hazardous drainage grates, mapping and signing projects, and producing bicycle route maps.

Steps in the Process

1. Recognizing a need for a bicycle improvement project. Somewhere in a local area there may be unsafe or difficult riding conditions for bicyclists that highlight a need for bicycle transportation improvements. Such improvements may be an on-road improvement such as wide paved shoulders, an off-road bike path, bicycle parking, or printed materials such as maps or safety brochures.

2. The need is presented to the North Carolina Department of Transportation. If it is a citizen or private group such as a local bicycle club, there are several ways to present the need to transportation officials. First, a citizen or local club may present their request to appropriate local government officials—aldermen, town council members, county commissioners, local planning boards, Transportation Advisory Committees, or another group appropriate to that local area. These agencies may or may not choose to include the request in their transportation improvement plan to be presented to NC Department of Transportation at the biennial Transportation Improvement Program (TIP) meeting.

If an official of an agency desires to make a request at a division TIP meeting but is unable to attend on the date of the meeting, a written request may be submitted within 30 days of the scheduled TIP meeting. The request should be addressed to the Secretary of the North Carolina Department of


Transportation. All requests will receive the same degree of consideration.

3. All bicycle requests are documented. Following the public TIP meetings, requests for bicycle transportation improvement projects will be organized and documented by the NCDOT Division of Bicycle and Pedestrian Transportation.

4. Some bicycle improvement projects are selected for construction. The Division of Bicycle and Pedestrian Transportation first evaluates and prioritizes all requests; then a summary of the project requests is presented to the NCDOT Bicycle Committee for its review. The Committee then forwards recommendations on the scheduling of some of the requested projects to the North Carolina Board of Transportation, which makes the final decision on projects to be included in the Transportation Improvement Program. Inclusion in the TIP Plan does not in any way guarantee that a requested project will be implemented. Rather, it means that the project will receive further study and will be implemented if feasible.

5. Projects listed in the TIP fall into two categories. Bicycle and pedestrian projects that can be incorporated into a planned and scheduled highway improvement are categorized as incidental projects. The bicycle or pedestrian element will be considered during the planning and design phases of the total project. Incidental projects are built with a combination of state and federal funds in the same manner as the larger highway project is constructed. Projects not incorporated into a planned and scheduled highway improvement are categorized as independent projects. These projects are constructed using 80% federal and 20% state money.

6. Finally, some TIP projects are implemented. In the case of a scheduled incidental bicycle improvement, inclusion in the TIP means that the project will be considered in conjunction with the planning and environmental studies for the given highway project. If the bicycle component is judged to be feasible, it will be scheduled for construction.

Following inclusion in the TIP, each independent project will undergo a detailed planning study that includes the evaluation of the feasibility of the project as well as the actual project cost. Upon completion and acceptance by the NCDOT, the planning study will be submitted to the North Carolina Board of Transportation for final approval and funding. A project must successfully pass through each of these levels in order to be implemented. During any of the above phases of project development, it may be necessary to alter or eliminate a proposed improvement due to regulatory or design constraints or because of unanticipated costs.

7. TIP bicycle projects may take many forms. A number of bicycle improvement projects involve construction of on-road or off-road facilities: wide paved shoulders (4-ft. minimum width); specially striped lanes for bicycles (minimum 4-foot width); wide outside lanes (14-ft. minimum width) which permit a safer mix of bicycles and motor vehicles); greenway-type

bicycle paths; railroad crossing improvements for bicycle safety; and the addition of bicycle-safe bridge railings.

However, not all eligible bicycle improvements require a construction project. The following are examples of other acceptable projects: signing bicycle routes; producing maps and safety brochures for cyclists in local areas; replacing unsafe drainage grates; making spot improvements such as paving potholes or hazard marking of dangerous roadway features; and providing bicycle safety education materials for local areas.

***North Carolina Department of Transportation (NCDOT)*** -- In North Carolina, the Department of Transportation, Division of Bicycle and Pedestrian Transportation (DBPT) has been the single largest source of funding for bicycle, pedestrian, and greenway projects for more than a decade. DBPT offers several programs in support of bicycle facility development. The following information is from NCDOT's interactive web site (www.ncdot.org)

***Bicycle and Pedestrian Planning Grant Initiative*** -- In 2004, a new program was initiated by NCDOT providing communities with planning grants in support of the completion of community-wide bicycle and pedestrian plans. NCDOT will continue this program through 2005 and beyond.

***Federal Aid Construction Funds*** – Several categories of federal aid construction funds — National Highway System (NHS) and Surface Transportation Program (STP) — or Congestion Mitigation and Air Quality (CMAQ) funds provide for the construction of pedestrian and bicycle transportation facilities. The primary source of funding for bicycle and pedestrian projects is STP Enhancement Funding.

***State Construction Funds*** – State roadway construction funds (not including the Highway Trust Fund for Urban Loops and Interchanges) may be used for the construction of sidewalks and bicycle accommodations that are a part of roadway improvement projects.

***Governor's Highway Safety Program (GHSP)*** – GHSP funding is provided through an annual program, upon approval of specific project requests, to undertake a variety of pedestrian and bicycle safety initiatives. Amounts of GHSP funds vary from year to year, according to the specific amounts requested.

***North Carolina's Clean Water Management Trust Fund (CWMTF)***
At the end of each fiscal year, 6.5 percent of the unreserved credit balance in North Carolina's General Fund, or a minimum of $30 million, is placed in the CWMTF. The revenue of this fund, which was established in 1996, is allocated as grants to local governments, state agencies, and conservation non-profits to help finance projects that specifically address water pollution problems. The CWMTF funds projects that (1) enhance or restore degraded waters, (2) protect unpolluted waters, and/or (3) contribute toward a network of riparian buffers and greenways for environmental, educational, and


recreational benefits.

***North Carolina Conservation Tax Credit Program***
The North Carolina Conservation Tax Credit is an incentive program (in the form of an income tax credit) for landowners that donate interests in real property for conservation purposes. Property donations can be fee simple or in the form of conservation easements or bargain sale. The goal of this program is to manage stormwater, protect water supply watersheds, retain working farms and forests, and set-aside greenways for ecological communities, public trails, and wildlife corridors. (For more information see: http://ncctc.enr.state.nc.us/).

***Land and Water Conservation Fund***
The Land and Water Conservation Fund is the largest source of federal money for park, wildlife, and open space land acquisition. The program's funding comes primarily from offshore oil and gas drilling receipts, with an authorized expenditure of $900 million each year. However, Congress generally appropriates only a fraction of this amount. Between 1995 and 1998, no funds were provided for the state-and-local grant portion of the program, which provides up to 50 percent of the cost of a project, with the balance of the funds paid by states or municipalities.

LWCF funds are apportioned by formula to all 50 states, the District of Columbia, and territories. Cities, counties, state agencies, and school districts are eligible for LWCF fund monies. These funds can be used for outdoor recreation projects, including acquisition, renovation, and development. Projects require a 50 percent match.

In fiscal year 2000, Congress approved stateside grant funding at $40 million. In FY 2001, $89 million was approved. In the current fiscal year of 2005, the stateside amount has been increased to $140 million nationwide, which will provide North Carolina with an apportionment of $3,250,596.

The President's budget request for FY 2003 proposes a $200 million stateside program, a portion of which will be earmarked for a Cooperative Conservation Initiative (CCI). The CCI will provide additional funding for competitive matching grants for natural resource restoration.

## B.4 Local Funding

***Taxes and Bonds***
Many communities have raised money through self-imposed increases in taxes and bonds. For example, Pinellas County residents in Florida voted to adopt a one-cent sales tax increase, which provided an additional $5 million for the development of the overwhelmingly popular Pinellas Trail. Sales taxes have also been used in Alleghany County, Pennsylvania and in Boulder, Colorado to fund open space projects. A gas tax is another method used by some municipalities to fund public improvements. Billings, Montana used the

issuance of a bond in the amount of $599,000 to provide the matching funds for several of their TEA- 21 enhancement dollars. Austin, Texas has also used bond issues to fund a portion of their bicycle and trail system.

***Revenue Bonds***

Revenue bonds are bonds that are secured by a pledge of the revenues of the public enterprise or local government. The entity issuing bonds pledges to generate sufficient revenue annually to cover the program's operating costs, plus meet the annual debt service requirements (principal and interest payment) times a factor, termed the coverage factor, which is designed to provide additional protection to the bondholders. The coverage factor generally ranges from 110 to 150 percent of the utility's annual or maximum annual debt service requirement in the current or any future year. Revenue bonds are not constrained by the debt ceilings of general obligation bonds, but they are more expensive than general obligation bonds.

***General Obligation Bonds***

Cities, counties, and service districts generally are able to issue general obligation (G.O.) bonds that are secured by the full faith and credit of the entity. In this case, the local government issuing the bonds pledges to raise its property taxes, or use any other sources of revenue, to generate sufficient revenues to make the debt service payments on the bonds. A general obligation pledge is stronger than a revenue pledge, and thus may carry a lower interest rate than a revenue bond. Frequently, when local governments issue G.O. bonds for public enterprise improvements, the public enterprise will make the debt service payments on the G.O. bonds with revenues generated through the public entity's rates and charges. However, if those rate revenues are insufficient to make the debt payment, the local government is obligated to raise taxes or use other sources of revenue to make the payments. G.O. bonds distribute the costs of open space acquisition and makes funds available for immediate purchases. Voter approval is required.

***Special Assessment Bonds***

Special assessment bonds are secured by a lien on the property that benefits by the improvements funded with the special assessment bond proceeds. Debt service payments on these bonds are funded through annual assessments to the property owners in the assessment area.

***State Revolving Fund (SRF) Loans***

Initially funded with federal and state money, and continued by funds generated by repayment of earlier loans, State Revolving Funds (SRFs) provide low-interest loans for local governments to fund water pollution control and water supply related projects including many watershed management activities. These loans typically require a revenue pledge, like a revenue bond, but carry a below market interest rate and limited term for debt repayment (20-years).

***Installment Purchase Financing***

As an alternative to debt financing of capital improvements, communities can execute installment/lease purchase contracts for improvements. This



type of financing is typically used for relatively small projects that the seller or a financial institution is willing to finance or when upfront funds are unavailable. In a lease purchase contract, the community leases the property or improvement from the seller or financial institution. The lease is paid in installments that include principal, interest, and associated costs. Upon completion of the lease period, the community owns the property or improvement. While lease purchase contracts are similar to a bond, this arrangement allows the community to acquire the property or improvement without issuing debt. These instruments, however, are more costly than issuing debt.

***Sales Tax***

In North Carolina, like many other states, the state has authorized a sales tax at the state and county levels. Local governments that choose to exercise the local option sales tax, use the tax revenues to provide funding for a wide variety of projects and activities. Currently, the North Carolina sales tax is four cents per dollar of sale (four percent) for the state tax and two cents (two percent) for the county tax, for a total authorized sales tax of six cents (six percent). All counties currently have a total sales tax of at least six cents. Any increase in the sales tax, even if applying to a single county, must gain approval of the state legislature. In 1998, Mecklenburg County was granted authority to institute a one-half cent sales tax increase for mass transit. That is the only time North Carolina's lawmakers have granted the local option sales tax. Dedicated sales taxes can generate considerable sums of money, are easily administered, and tap tourism expenditures. Objections to the sales tax generally revolve around the regressive nature of the tax and the reduction of funds in an economic slowdown. Objections can be alleviated by exempting basic necessity items such as food and drugs. By exempting basic necessity items, the sales tax becomes a consumptive tax.

***Impact Fees***

Some communities provide for impact fees that require residential, industrial and commercial development project leaders to provide sites, improvements, and/or funding for developing public improvements like open space and trails. Impact fees may be allocated to a particular trail from land development projects in all other areas of a county or town if the fund is a dedicated account established to help develop a county- or town-wide system of trail projects.

***Partnerships***

Another, often overlooked, method of funding bike systems and greenways is to partner with public agencies and private companies and organizations. Partnerships engender a spirit of cooperation, civic pride, and community participation. The key to the involvement of private partners is to make a compelling argument for their participation.

Major employers and developers should be identified and provided with a "Benefits of Biking"-type handout for themselves and their employees. Very specific routes which make those critical connections to place of

business would be targeted for private partners' monetary support, but only after a successful master planning effort. People rarely fund issues before they understand them and their immediate and direct impact.

Potential partners include major employers which are located along or accessible to bicycling routes, lanes, or multi-use paths. Name recognition for corporate partnerships would be accomplished through signage along designated portions of a bike route or lane, or through signage trailheads or interpretive signage along greenway systems.

Utilities often make good partners and many trails now share corridors with them. Money raised from providing an easement to utilities can help defray the costs of maintenance. It is important to have a lawyer review the legal agreement and verify ownership of the subsurface, surface, or air rights in order to enter into an agreement.

***Exactions***

Exactions are similar to impact fees in that they both provide facilities to growing communities. The difference is that through exactions it can be established that it is the responsibility of the developer to build the greenway or bicycle facility that crosses through the property, or adjacent to the property being developed.

***Non-Profit Organizations***

*Eastman Kodak American Greenways Fund*

This fund, a partnership project of Kodak, The Conservation Fund, and the National Geographic Society, provides small grants to stimulate the planning and design of greenways in communities throughout America. The annual awards program was instituted in response to the President's Commission on Americans Outdoors recommendation to establish a national network of greenways. Made possible by a generous grant from Eastman Kodak, the program also honors groups and individuals whose ingenuity and creativity foster creation of greenways. Grants may be used for activities including the following:

- Mapping, ecological assessments, surveying, conferences, and design activities
- Developing brochures, interpretative displays, audio-visual productions or public opinion surveys
- Hiring consultants, incorporating land trusts, building a foot bridge, planning a bike path, or other creative projects

In general, grants can be used for all appropriate expenses needed to complete a greenway project including planning, technical assistance, legal, and other costs. Grants may not be used for academic research, general institutional support, lobbying, or political activities. Applicants are primarily local, regional, or statewide nonprofit organizations. Although public agencies may also apply, community organizations receive preference. The maximum grant is $2,500. However, most grants range from $500 to $1,000.

*Bikes Belong Coalition*
The Bikes Belong Coalition is sponsored by members of the American Bicycle Industry. Their mission is to put more people on bikes more often. They assist local organizations, agencies, and citizens in developing bicycle facility projects that will be funded by TEA-21. Bikes Belong has awarded over $400,000 in grants, with a return of over $200 million in funding for bicycle facilities. Bikes Belong Coalition accepts applications for grants of up to $10,000 each, and will consider successor grants for continuing projects, subject to policy guidelines. Funding decisions are made on a rolling basis. Applications and proposals are reviewed under the auspices of the Bikes Belong Coalition's Executive Director and the Grant Review Committee, and presented to the Board of Directors for approval, rejection, or resubmission. The Coalition considers grants from local organizations, agencies, and communities in developing bicycle facilities projects.

*The Robert Wood Johnson Foundation*
The Robert Wood Johnson Foundation was established as a national philanthropy in 1972 and today it is the largest U.S. foundation devoted to improving the health and health care of all Americans. Grantmaking is concentrated in four areas:

- To assure that all Americans have access to basic health care at a reasonable cost
- To improve care and support for people with chronic health conditions
- To promote healthy communities and lifestyles
- To reduce the personal, social, and economic harm caused by substance abuse: tobacco, alcohol, and illicit drugs

*The Trust For Public Land*
Land conservation is central to TPL's mission. Founded in 1972, the Trust for Public Land is the only national nonprofit working exclusively to protect land for human enjoyment and well being. TPL helps conserve land for recreation and spiritual nourishment and to improve the health and quality of life of American communities. TPL's legal and real estate specialists work with landowners, government agencies, and community groups to:

- Create urban parks, gardens, greenways, and riverways
- Build livable communities by setting aside open space in the path of growth
- Conserve land for watershed protection, scenic beauty, and close-to home recreation safeguard the character of communities by preserving historic landmarks and landscapes.
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