

Bicycle Element

Vision

The oft repeated vision identified by the Citizen Advisory Committee is to establish Cary as a “biker friendly” community. To realize this vision, the Bicycle Element identifies a system of bikeways and connections to greenways that provide adequate facilities for cyclists to reach desired destinations within and beyond Cary.

The vision includes an interconnected network that would allow for the needs of the commuting cyclist as well as the needs of the casual or recreational cyclist.

Goals

The goal for Cary is a planned network of bikeways that will serve every planned and existing activity center in the Town. The envisioned system of bikeways includes striped bike lanes, wide outside lanes (shared lanes), bike paths, neighborhood connectors, and signed bike routes.

Transportation Plan goals related to bikeways are listed below.

- Create a safe-efficient multimodal transportation system.
- Provide safe and convenient facilities and services for people who choose not to use an automobile.
- Improve environmental quality.
- Ensure serviceable operation of existing facilities and services.
- Coordinate transportation and land use planning.

- Plan, design and construct transportation facilities that contribute to Cary’s attractive visual appearance.
- Proactively plan, in conjunction with other agencies, to improve transportation linkages to other parts of the Triangle region.
- Identify sufficient, timely, and equitable financing mechanisms for transportation services and improvements.

Underlying these goals is the view that bicycles are vehicles on an equal level with cars and trucks. As stated in The North Carolina Drivers Handbook, “Bicycle riding is an important means of transportation, particularly for traveling to work and school.” Legally bicyclists are entitled to use most roads, the exception being interstates and similar roadways. With this legal entitlement comes the responsibility of bicyclists to obey the same traffic laws as other drivers.

Issues

Bicycling has proven to be a viable alternative mode of transportation, in some cases providing cyclists shorter travel times and less distance to reach desired destinations than that of motorists. Providing adequate facilities to support people who are willing to brave traffic and weather as they bicycle to work or run errands is an important step in encouraging bicycling as a viable mode of transportation.

4 E’s of Cycling

The 4 E’s of Cycling, according to Bruce Rosar who is a Bicycling Instructor with

Triangle Effective Bicycling, encompasses the following elements:

- Education – educate motorists about “sharing the road” with cyclists and educate cyclists to ride predictably.
- Encouragement – municipalities such as Moraga, California have successfully sponsored programs to reward good bicycling behavior with coupons for free ice cream - distributed by Police officers.
- Engineering – years of experience analyzing accident reports and evaluating human factors related to transportation facilities qualify the Town Engineer as a very important person when it comes to Cycle Safety.
- Enforcement – Police should speak to all cyclists, adults and children, when they are observed violating traffic laws such as riding the wrong way or not heeding traffic signals. Likewise, Police should cite all motorists who violate traffic laws including failure to yield right-of-way to bicyclists.

Attention to all 4 E’s of Cycling will further Cary in its quest to be a biker-friendly community.

Existing Deficiencies

The existing network of bikeways is a good starting point, however sections of some major thoroughfares do not meet the State standard width for wide outside lanes for bikeways. This standard calls for outside lanes to be 14-foot wide. Furthermore there are numerous neighborhood and community centers, local parks, shopping centers, employment centers, and other similar activity centers that are not connected to

major residential areas by the bikeway system.

With regard to one of Cary’s largest activity centers, the Town Center Area, the Transportation Advisory Committee raises the issue or challenge to identify bikeways for basic and advanced cyclists from all directions within and across the Maynard Road loop, destined for the Town Center Area. Their belief is that the Town Center should be an accessible destination for cyclists of all skill levels.

Bicycle Safety

The following table is derived from data in Bill Hunter's *Pedestrian and Bicyclist Crash Types in the 1990’s*:

Basic Bicycle - Automobile Collision Types

Collision Type	Percentage
Turning, Merging or Crossing Paths (TMCP)	77.0 %
Motorist Overtaking Vehicle (MOV)	8.5 %
Parallel Paths other than MOV	7.5 %
Specific circumstances	7.0 %

These data indicate that turning, merging and crossing-path type collisions, which typically occur at intersections, is nearly an order of magnitude more frequent than the more commonly feared Motorist Overtaking Vehicle (bicycle) type collision. Thus, intersection safety should be a primary focus of remedial bicycle facility investigations and engineering.

Town of Cary Police Department’s records show an annual average of 19 traffic accidents that involved bicycles from 1996 through 1998. Summaries by age of the bicyclist and severity of the injuries are shown in the **figures 4.1 and 4.2**.

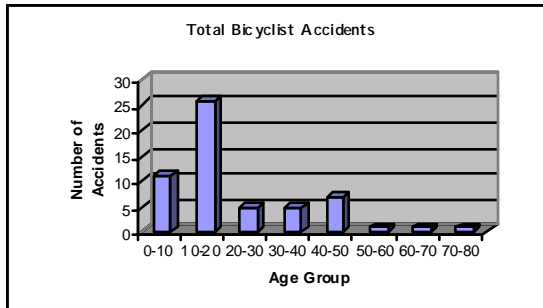


Figure 4.1 - Total Bicycle

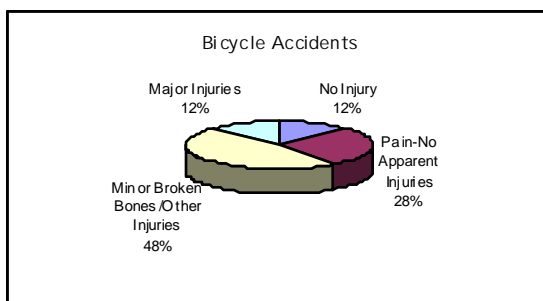


Figure 4.2 - Bicycle Accident

Safety of bicyclists is the cornerstone of this element of the Bicycle Element, just as in the Pedestrian Element. Adherence to State standards for the design and operation of bikeways is highly recommended.

Although there have been no recent cyclist fatalities in Cary, there has been a high occurrence of significant injuries of cyclists involved in accidents. Sixty percent of cyclists involved in accidents in Cary were reported to have had major injuries or broken bones when involved in a crash. Furthermore, crashes in other Triangle communities have involved cyclist fatalities.

Given the age group that contributed the largest percentage of accidents (10 to 20 years of age) it can be deduced that increased education of adolescent and teenage cyclists could lead to less severe and less frequent accidents. The 10 to 20 year-old group is made up of primarily

recreational and youth cyclists who are not always familiar with rules and regulations that apply to safely operating a bicycle in and around vehicular traffic. This is not to say that motorists were not also at fault in crashes with this age group.

An educational program or a required supplement to the North Carolina Drivers Handbook more clearly outlining a driver’s responsibility toward a cyclist is also recommended. Often drivers are unaware that cyclists are allowed to ride on a roadway whether it is a designated bike route or not. Cyclists however, are not permitted to ride on access controlled facilities such as a freeway.

Types of Bicyclists

Just like drivers, there are various classes of experience when it comes to cyclists: basic or new riders as well as advanced riders. There are two readily recognized levels of cyclists that exist within the riding public. With each level of experience comes an ability to negotiate comfortably, any number of conditions that a cyclist may be faced with while riding for recreation, running an errand, or commuting to work. The two general classifications of cyclists are basic cyclists and advanced cyclists.

- **Basic Cyclists** - Basic bicyclists are casual or new adult and teenage riders less secure in their ability to ride in traffic without special provisions. This cyclist typically prefers bike paths or bike lanes on collector or arterial streets with less exposure to high traffic speeds and volumes. A general estimate is that 80 percent of bicyclists are in this category.

- **Advanced Cyclists** - Advanced bicyclists are experienced riders who can operate in traffic safely and under more typical thoroughfare conditions. This cyclist generally prefers shared roadways rather than bike lanes. Although surveys show that this group represents only about 20 percent of total riders, surveys show that they ride about 80 percent of the bicycle miles traveled yearly.



Children on bicycles do not fit either classification. This group of cyclists generally keeps to neighborhood streets and greenways. When children venture out onto busier roadways, they typically stay on sidewalks or separate bike paths, where possible. Cary has made efforts to accommodate children and other cyclists uncomfortable riding in traffic, by allowing them to utilize sidewalks with the provision that these cyclists yield to pedestrians on the sidewalk.

Cyclists, not unlike drivers, gain experience over time and miles of riding. As cyclists ride and gain more experience operating in traffic, often they move from being a basic bicyclist to an advanced cyclist capable of operating under more tenuous conditions.

Types of Bikeways

To accommodate all kinds of cyclists there are a number of different types of facilities that are employed, some of which readily appeal to more experienced cyclists, while others readily appeal to less experienced cyclists. Bike paths, neighborhood connectors, bike lanes, shared roadways, and signed connections are among the most common types of bike facilities found in most communities.

- **Bike Path** - A bike path is physically separated from motorized vehicular traffic. Bike paths are often used for recreational purposes, but can serve a transportation function when part of a comprehensive network of bikeways. Generally bike paths are most appealing to less experienced cyclists though they are used by all classes of cyclists.

- Neighborhood Connector** – There are many neighborhoods in Cary where access is cut off from adjacent neighborhoods, schools and shopping centers by something as simple as a dead-end street or a cul-de-sac. A neighborhood connector is designed as a 10-foot wide asphalt path that links adjacent areas for bicycle and pedestrian travel only (shown in **Figure 4.3**). In most cases it is necessary to install bollards in spaced intervals at both ends of a neighborhood connector, to prevent unauthorized vehicles from using them as cut-throughs. There are situations however where it is not possible to construct a path 10 feet in width, in which case less width is acceptable with the provision that cyclists dismount and walk along the path.

- Striped Bike Lane** - A bike lane is a portion of a roadway designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes are especially effective for basic bicyclists on collector or multi-lane minor thoroughfares with relatively low traffic volumes, few commercial driveways, and few complicated intersections. Typically bike lanes are a minimum of 4 feet in width, not including adjacent curb and gutter.

On roadways with higher speeds and/or higher traffic volumes it is often desirable to increase the width of the striped bike lane proportionally to the conditions that prevail.

Often in addition to a white line, bike lanes are delineated by a diamond stenciled marking or “BIKE ONLY” marking painted at regular intervals on the pavement or signs designating the route as “Bike Only”.

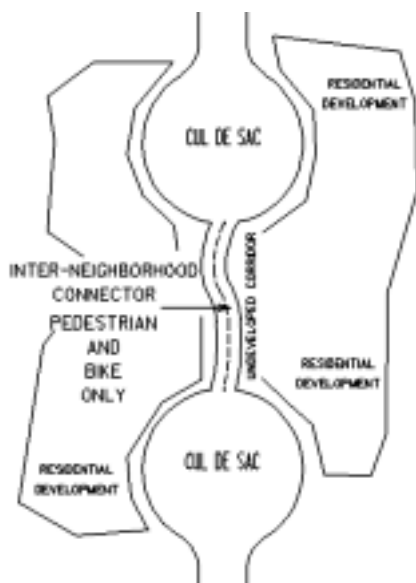


Figure 4.3
Neighborhood Connector



Bike Lane Striped along a

Striped bicycle lanes can be confusing at intersections, to the extent they encourage bicyclists to remain to the right at intersections, regardless of their intended destination. Traffic law requires drivers to move into the lane position closest to their destination before turning. A bicycle lane striped to the stop line of an intersection clearly encourages bicyclists to stay right and motorists to stay left, rather than merging before turning. As bicycle lane proponents began to recognize the reality of the problem of motorists turning across bicycle lanes and colliding with straight-through bicyclists, they proposed that lanes be dashed before intersections, indicating that drivers on either side of the line may merge. Although dashing may reduce the problem, the existence of any dividing line at an intersection discourages proper merging maneuvers. Drivers are used to merging into a lane, not straddling a lane line (the dashed bicycle lane)."

In Carrboro, at the intersection of North Greensboro Street and Estes Drive Extension, the bike lane stripe is terminated well before the intersection with a sign warning motorists of merging cyclists. Terminating the stripe well before the intersection gives cyclists an opportunity to position themselves correctly for the intersection.



Wide Outside Lane along High House Road

- Shared Roadway with Wide Outside Lane** - A wide outside lane refers to the through lane closest to the curb that should be a minimum of 14 feet wide to safely accommodate both motor vehicles and bicyclists. The 14 feet of lane width does not include the width of the curb and gutter, as this is not a suitable area to travel due to collection of debris, drainage structures, and proximity to the curb itself. Wide outside lanes are effective on collectors and thoroughfares and are effective for and preferred by advanced bicyclists.
- Signed Connection** - Signed connections are typically found on residential streets having low traffic speeds and volumes. Appropriate directional and/or informational signs typically designate bike routes. Signed connections often provide connections to other bikeways that otherwise could not be provided.



Bicycle Policies and Standards

The Town of Cary considers bicycle traffic an important mode of transportation. *The Standard Specifications and Details Manual* takes into account bicycles when designing thoroughfares and collector streets. The Town is currently undergoing a process to update this standard to reflect recent changes to bicycle-friendly facility design by incorporating 14-foot wide outside lanes as the standard instead of 13-foot wide.

The Bicycle Element has been prepared after thorough review of the *North Carolina Bicycle Facilities Planning and Design Guidelines*, published by the North Carolina Department of Transportation in 1994. It relies heavily on local, state, and federal research conducted in the past two decades and includes valuable insight based on engineering studies, thorough consideration of accident experience involving bicyclists, and extensive public input from bicyclists, motorists and the general public.

Existing Bikeways

Cary already has a good head start in bikeway planning and implementation, as can be seen from ordinances already in place in the Town to promote and encourage the design of bikeways. Between the standard for constructing new multi-lane roadways with 14-foot wide outside lanes and a planning effort completed for the Greenways Master Plan, Cary has a start at planning for additional bikeways.

Presently, there are no designated bike lanes in Cary and only a handful of other facilities actually completed within the Town. There are four multi-lane roadways that have wide (13- foot wide) outside lanes and “Share the

Road” signs through various sections including:

- High House Road
- Cary Parkway
- Maynard Road
- Walnut Street

It is cautioned however, that roadways with 13-foot outside lanes DO NOT meet State minimum standards for bikeways and that posting “Share the Road” signs on inadequate facilities does not alone make them suitable for cyclists.

North Carolina Bicycling Highways

In North Carolina there are designated bicycling highways to provide for long distance cycling throughout the State. In some cases these bicycling highways connect to a nationwide system of designated bike routes. Generally, bicycling highways are routed in either the north/south or east/west direction. Wherever possible they are routed mostly on low volume roadways that are well maintained where possible. Of the many bicycling highways in the state the Carolina Connection, the Mountains to Sea Route, and the Cape Fear Run pass through Cary at its outer boundaries.

The Carolina Connection is a route that runs north/south from South Carolina to Virginia passing through the East Piedmont and Southwestern Sandhills Region. This route is a part of the US Bike Route 1 that runs along the Eastern Seaboard from Florida to Maine.

As this route passes through Cary it utilizes sections of Davis Drive, Morrisville Carpenter Road, and Aviation Parkway.



The Mountains to Sea Route runs in a predominantly east/west direction from Murphy in the Mountains to Manteo on the Outer Banks. The Mountains to Sea Route uses Highway 751 and Green Level West Road as it enters Cary from the west, turning briefly northward onto Davis Drive and then eastward again on Morrisville Carpenter Road, leaving Cary on Aviation Parkway.

The Cape Fear Run is a predominantly north/south route that approximately parallels Interstate 40 from the Triangle Region to Wilmington. This route uses Ten Ten Road as it passes south of Cary and terminates in downtown Apex where it intersects the Carolina Connection.



Existing and Future Greenways

Greenways, though they serve a slice of the cycling public with adequate facilities, are in most cases for recreation purposes for pedestrians and bicycles.

The Cary Town Council adopted the Parks, Greenways and Bikeways Master Plan in 1998. Existing and future parks and greenways are shown in **Figure 4.4**. The reason for this report to mention greenways is that they are part of an integral pedestrian/bicycle system and providing connections between bicycle/pedestrian

transportation facilities and recreation facilities is important in creating that system.

Some of the *Parks, Greenways and Bikeways Master Plan* bikeway recommendations do not meet State standards for safety and those are therefore not included in this Bicycle Element. The primary issues with these routes are inadequate lane widths (13 feet compared with the minimum 14 feet) and/or rough (non-navigable) shoulders. The following table shows bikeways shown as existing in the adopted *Parks, Greenways & Bikeways Master Plan* that were found to not meet minimum State standards.

Existing Bike ways not Meeting State of North Carolina Minimum Standards for Bike ways

Road Name	Reason
Cary Parkway	Narrow Lanes, High Volumes
Davis Drive	Narrow Lanes, High Volumes
Northeast Maynard Road	Narrow Lanes (13feet Outside Lane)
Southwest Maynard Road	Narrow Lanes
Tryon Road	Narrow Lanes, High Volumes
Ten Ten Road	Narrow Lanes, Rough Shoulder Pavement
Holly Springs Road	Narrow Lanes, High Volumes
Walnut Street	Narrow Lanes (13feet Outside Lane)

[Link to Figure 4.4](#)
**Adopted Greenways and
Bikeways**

Recommendations

The goal of the Bicycle Element is to plan a system of bikeways to provide adequate facilities for cyclists to reach desired destinations within and outside of Cary. The main focus of providing facilities was to create an interconnected network that would both allow for the needs of the commuting cyclist as well as the needs of the casual or recreational cyclist.

The result of the planning process is a planned network of bikeways that will serve every planned and existing activity center in Town. The system of bikeways includes striped bike lanes, wide outside lanes (shared lanes), bike paths, neighborhood connectors, and signed bike routes.

Before recommendations for bicycle related improvements were made, a number of cyclist specific issues were placed before Town Staff and the Citizen Advisory Committee. The issues and corresponding recommendations were discussed and recommendations were formulated.

Recommendation #1: Short Term Priorities

In response to a request for input, the Advisory Committee and several members of the public who attended meetings or submitted e-mails offered the following suggested actions for the Town of Cary to initiate in the next one to two years to improve bicycle transportation:

- Widen Davis Drive with 14-foot wide outside lanes.
- Widen NC 55 with an appropriate bikeway for advanced cyclists.

- Widen High House Road, from Cary Parkway to NC 55 with 14-foot wide outside lanes.
- Build Louis Stephens Road, from High House Road to South Alston Avenue with 14-foot wide outside lanes.
- Build a greenway or striped bike lane connecting Bond Park with Brookgreen Drive/Lake Pine Drive neighborhoods via Chatham Street and suitable collector streets.
- Improve bicycle connections between Lake Crabtree County Park, Weston area businesses, and nearby high- and medium-density residential neighborhoods.
- Build a greenway or off-road asphalt bike path along Cary Parkway, from Holly Springs Road to High House Road. Build a barrier-separated bike path in the median of Cary Parkway through a reconstructed interchange with Highway 1/64.
- Build a greenway or off-road asphalt bike path in the Kildaire Farm Road corridor, from Ten Ten Road to Academy Street. Install bike racks in convenient locations around the Town Center area (downtown).
- Build a greenway or off-road asphalt bike path along High House Road to improve access to Bond Park.

Recommendation #2: Form Advisory Committee

To maintain on-going community input, The Town of Cary should consider the creation of an advisory committee. With the recent reorganization of transportation functions in the Town, The Transportation Planning section should be responsible for soliciting this on-going input. One potential avenue would be through a bike and walk subcommittee of the Planning Board.

Recommendation #3: Proactively Plan Non-Motorized Pathway Connections

The Town of Cary should proactively facilitate the planning, construction and maintenance of bicycle- and pedestrian-only (non-motorized) pathway connections between existing subdivisions, Planned Unit Developments and adjacent developed areas. These are not intended for use by traffic. Instead, these are to better connect established neighborhoods with pathways to adjacent neighborhoods, greenways, shopping areas, schools, and parks. This function should be added to the mission of the Pathway and Bikeway Advisory Committee.

The Connectivity Ordinance addresses future developments to improve accessibility to adjacent uses by a pedestrian trail that can also be used by bicyclists. However, since many developments were established before the Connectivity Ordinance was adopted, there should be a process to identify “missing links” in the current system to improve pedestrian and bicycle accessibility. The Pathway and Bikeway Advisory Committee should address these issues. Representatives from the Wake County School Board, Planned Unit Developments, shopping centers and other local attractions could be consulted in the process to locate missing links. Particularly in the beginning of the program, the Town of Cary should provide funding for the planning, design, construction and maintenance of these new facilities. Applications for federal Department of Transportation and possibly Department of Energy grants should be pursued.

The Citizen Advisory Committee was unanimous in their agreement for the Town of Cary to proactively facilitate the process of investigating opportunities to link neighborhoods together with pedestrian and bicycle “neighborhood connectors”. Initially, the connectors should be provided based upon neighborhood requests and avoid neighborhoods opposed to providing the connections.

Recommendation #4: Amend Roadway Design Standard

The Town of Cary should amend the Roadway Design Standard to change the 13-foot wide requirement for outside roadway lanes to 14-foot to better accommodate bicycles.

In practice, the Town is currently incorporating a 14-foot wide requirement where feasible in roadway designs. Formalizing this requirement by changing the standard would ensure that all new multi-lane roadways not yet designed would be bicycle-friendly for intermediate and advanced bicyclists.

Recommendation #5: Create a Bicycle Suitability Route Map

The Town of Cary should produce a bicycle suitability route map.

As Cary adds to its greenway and bikeway system, route maps indicating how to get to major attractions by bike will be needed. Either a town-wide map or smaller individual route maps can be produced. The maps should be available on the world wide web, in all government centers, as well as at schools, parks, recreational areas, offices, retail establishments, and in bike shops.

The map should display the suitability of the roadway, based on the roadway character and traffic volume. The suitability index takes into account pavement width, pavement conditions, roadway speed and other related factors. The Pathway and Bikeway Advisory Committee could solicit volunteers from local bicycle groups to work with the Town Engineer to collect and compile the needed information. U.S. DOT “transportation enhancement” funds can be used to produce the maps.

Recommendation #6: Adopt Bicycle Parking Standards

The Town of Cary should consider adopting appropriate bicycle parking requirements as new developments are approved to ensure the provision of adequate bicycle parking.

There are currently no bicycle parking requirements, although this issue is under review by the Town as part of its update of the Unified Development Ordinance (UDO). The Citizen Advisory Committee supports, in concept, the adoption of bicycle parking requirements for new developments. The specific requirements should be appropriate based on expected levels of need relative to what other jurisdictions require and be supported by the community.

Without convenient, secure bicycle parking, the effectiveness of bikeways will be diminished. The guidelines presented in **Table 4.1** were developed based on League of American Bicyclists recommendations and experience in other cities.

Short-term bicycle parking is meant to accommodate customers, visitors and others expected to depart within two hours. High-security racks that permit locking of the bicycle frame and one wheel with a u-type

bicycle lock, such as the inverted “U” rail rack and the ribbon rack, are preferred. Long-term bicycle parking is meant to



accommodate employees, students, commuters and others parking for two hours or more. Racks or bicycle lockers can be used to satisfy long-term needs. Typical costs are \$60 per bike parking space for short-term (racks) and \$800 per bike for long-term (lockers).

After discussions with Town Staff and the Citizen Advisory Committee it was determined that the guidelines given by the League of American Bicyclists provide for more than enough parking for particular land uses. Both Town Staff and the Steering Committee expressed interest in amending development requirements with bicycle parking requirements, but not requiring as many spaces as recommended by the League.

Table 4.1 Potential Bicycle Parking Guidelines		
Land Use	Bicycle Parking Space	Examples
Office	1 per 5,000 sq. ft. of floor space	Office Building with 100,000 sq.ft. generally accommodates 400 employees (400 auto parking spaces). Requirement would provide 20 bike spaces (roughly 3 or 4 bike racks).
Restaurants	1 per 1,000 sq. ft. of floor space	Sit-down restaurant in a stand-alone building with 7,000 sq. ft. of floor space generally accommodates 200 seats. Bicycle parking would be 7 spaces.
Major Entertainment Event	1 per 100 seats	Raleigh's Entertainment and Sports Arena has over 21,000 seats. Parking for 210 bicycles should be added.(30 racks).
Industrial	1 per 15,000 sq. ft. of floor area	An industrial building with 100,000 sq.ft. of floor space would provide 7 bike parking spaces (1 rack).
Medical Center	1 per 20,000 sq. ft. of floor area	A medical center with 100,000 sq.ft. of floor space would provide 5 bike parking spaces (1 rack).
<u>School</u> - Elementary, Middle, High School	2 per classroom, 4 th grade and above	
Parking Garage and Park-and-Ride Lot	1 per 50 auto spaces provided	A 300-space parking garage should include six bike-parking spaces (1 rack).
Rail Station	1 per 20 auto parking spaces	For the future Triangle Transit Authority in the Town Center Area, 200 parking spaces are planned. 10 bike-parking spaces are recommended, one rack plus several bike lockers.
<p>Reference: League of American Bicyclists. Note that Cary's Citizen Advisory Committee believes that the initial requirements for bicycle parking spaces should be less than the generic recommendations made by the League of American Bicyclists.</p>		

Recommendation #7: Construct Physical Improvements

To allow for immediate bikeway system improvements as well as to coordinate bikeways with future long-term roadway improvements, the Bikeway Element has several exceptions that are noted. As illustrated in **Figure 4.5**, bikeway improvements are possible with already scheduled roadway improvement projects funded through Transportation Improvement Program (TIP), Capital Improvement Budget (CIB), and bond projects.

Recommendation #7: Construct Physical Improvements

To allow for immediate bikeway system improvements as well as to coordinate bikeways with future long-term roadway improvements, the Bikeway Element has several exceptions that are noted. As illustrated in **Figure 4.5**, bikeway improvements are possible with already scheduled roadway improvement projects funded through Transportation Improvement Program (TIP), Capital Improvement Budget (CIB), and bond projects.

As a result of changes that will take place due to roadway thoroughfare plan improvements, an enhanced system of bikeways will be created. Bikeways that will be added as a result of thoroughfare improvements include sections of the following corridors:

- Arthur Pierce Road
- Collins Road
- East Durham Road
- Green Level Church Road
- Green Level to Durham Road
- Green Level West Road
- Holly Springs Road
- Jenks-Carpenter Road
- Kildaire Farm Road

- Leonard Christian Road
- Morrisville Carpenter Road
- Old Reedy Creek Road
- Optimist Farm Road
- Penny Road
- Pierce Olive Road
- Reedy Creek Road
- South Alston Avenue
- Ten Ten Road
- Tryon Road
- West Lake Road

Also, as a result of necessary roadway improvements to accommodate future traffic growth, sections of the following corridors will be able to be upgraded from facilities with narrower 13-foot wide shared outside lanes to facilities with 14-foot wide outside lanes.

- Cary Parkway
- High House Road
- Kildaire Farm Road
- Maynard Road
- Walnut Street
- Weston Parkway

With the recommended Bikeway Element, every planned activity center in Cary will be accessible by bicycle. The recommended new Advisory Committee should work to implement the recommendations and also should seek different types of bikeways to accommodate different skill levels.

Striped Bike Lanes

The plan calls for over eight miles of striped bike lanes throughout the town. Because striped bikeways often give cyclists a false sense of security, roadways that will be designated as striped bikeways were carefully selected based on having wide pavement, carrying traffic volume that can be accommodated within the design capacity for that roadway, low to moderately low

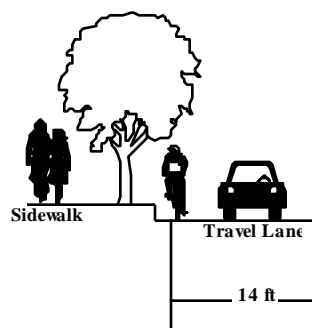
traffic speeds, and a limited number of commercial driveways. Roadways recommended to have 4-foot wide striped bike lanes in selected sections (5-foot wide if adjacent to on-street parking lanes) include:

- Farmington Woods Drive
- Hampton Valley Rd
- Sudbury Drive
- Northwoods Drive
- Two Creeks Road
- East Dynasty Road
- West Dynasty Road
- Lake Pine Drive
- Seabrook Avenue
- Sloan Drive Extension
- Westhaven Extension
- New Hope Church Road

In addition to adding a white line to each of these roadways it will be necessary to use appropriate signage and pavement markings to ensure that facilities are safe and unimpeded. Street trees will not be affected. Signs used to mark exclusive bike lanes are similar to the one pictured on the previous page. Additional pavement markings for bike lanes often include “BIKE ONLY” stenciled on the pavement at regular intervals.

Shared Roadway with Wide Outside Lanes

In the Bikeway Element there are numerous roadways designated as shared outside lane bikeways. Sections of existing roads such as Maynard Road, High House Road, and Cary



Parkway already have 13-foot wide outside lanes. Although these roadways do have an extra foot of width in the outermost lane, 13-

feet wide lanes do not meet state standards for a shared outside lane facility.

As roadways are widened in the future, rather than constructing 12-foot wide outer lanes, 14-foot wide outer lanes should be constructed to allow for a shared roadway. **Appendix E** lists roadways that will have shared wide outside lane facilities in the future.

Interchange Improvements

Bicycling along thoroughfares in the vicinity of a freeway interchange is a particularly challenging and potentially dangerous exercise, due to the high volume of turning traffic and complicated traffic signal phasing schemes. Alternatives to bicycling through interchange areas, such as bikeways on parallel (non-interchange) bridges and innovative bikeway facilities should be investigated. One such innovation is the use of a very wide bridge over US 1/64 within the Walnut Street interchange: bicyclists along Walnut Street could cross Buck Jones Road at the traffic signal before detouring onto the shoulder of the “Crossroads Shopping Center” ramp, and then traversing through the secondary street system to rejoin Walnut Street at either the Meeting Street or Dillard Drive signalized intersections. Although this increases the distance traveled by bicyclists, it has the potential to enhance the safety of cyclists in this busy area.

For future interchanges along the Western Wake Expressway, better interchange designs that incorporate bikeways (along the thoroughfare and the freeway) are recommended. Examples from other cities include the bikeway parallel to a northern Virginia freeway where bicycle-only loop ramps are provided for cyclists interchanging between the thoroughfare and

the bikeway parallel to the freeway. Another example is the median bikeway in Palo Alto, California where a barrier-separated bikeway is constructed in the median of the thoroughfare as it crosses over the freeway. Openings for bicyclists are provided only at the end points, within crosswalks at a signalized intersection.

Neighborhood Signed Connections

Neighborhood signed connections are planned for collector streets that have low traffic volumes. By installing signs on collector streets that already connect with other streets will provide a degree of connectivity within the bikeway system that could not otherwise be provided. Neighborhood signed connections will not result in any change other than to post green signs displaying the image of a bicycle and the words “Bike Route”.

The primary purpose of signing connections is to allow for greater cyclist awareness of streets other than thoroughfares. For signed connections to be effective, appropriate signage must be used both along the routes and at intersections. Signs that reference commonly known destinations at bikeway ends are useful in enhancing wayfinding for this type of bikeway.

A complete listing of all signed bike routes can be found in **Appendix E** as well as in **Figure 4.5**.

Inter-Neighborhood Connectors

The primary purpose of this facility type is to provide non-vehicular linkages where it is not possible or not feasible to construct a full street.

The following five inter neighborhood connectors were identified in the Plan.

- Academy to East Boundary Street connector
- Normandy Street to West Chatham Street connector

- Lion’s Park to Cary High School connector
- Greenwood Circle connector
- Kingston Ridge to Seabrook Ave Connector

Each of these connectors links neighborhoods that are not connected by the existing street system. By providing these connections, pedestrians and cyclists have the ability to travel efficiently between neighborhoods without having to backtrack to an arterial street and take a circuitous route to a nearby destination.

One of the responsibilities of the enhanced Pathways and Bikeways Advisory Committee could be to actively search for more non-motorized pathway connections between disconnected land uses and neighborhoods that would be useful to connect.

Other Improvements

Other suggested improvements for the bikeway plan include re-routing two North Carolina Bicycling Highways, the Mountains to Sea Route and the Carolina Connection, as they pass in the vicinity of Cary as well as maintaining a bicycle crossing on Green Hope School Road at the CSX Railroad.

The Mountains to Sea route currently utilizes Davis Drive to travel north/south between High House Road and Morrisville-Carpenter Road. It is recommended to re-route the section of the Mountains to Sea Route that currently utilizes Davis Drive to Carpenter-Upchurch Road in the future.

Carpenter-Upchurch Road offers several advantages over Davis Drive for cyclists including better pavement quality, lower traffic volumes, greater lane width, and lower prevailing traffic speeds which would improve the cycling quality of this link of the Mountains to Sea Route.

[Link to Figure 4.5 - Cary Bicycle Plan](#)

The Carolina Connection also uses sections of Davis Drive to travel through Cary from Apex to Northwest Raleigh. To improve safety, it is recommended that the Carolina Connection be rerouted along Leonard Christian Road, Jenks-Carpenter Road, and Carpenter-Upchurch Road instead of its current routing along Davis Drive. The recommended route would provide a safer facility due to lower traffic volumes and speeds, better overall pavement quality, and wider travel lanes.

Figure 4.6 on the following page illustrates the recommended routing change of The Mountains to Sea and Carolina Connection routes.

now closed to all types of vehicles as a result of CSX Transportation Company attempting to improve the safety of at-grade crossings in its rail corridor.

It is recommended to re-open this crossing to bicycles only. The section of the railroad that the road passes over is straight with good sight distance in both directions. Providing this bicycle-only crossing would greatly enhance mobility between areas west and east of Davis Drive. Without this crossing, cyclists reaching the east end of Green Hope School Road are forced to ride on NC 55 in either the north or south direction in order to cross over the railroad.



Green Hope School Road Looking East at Closed Railroad Crossing

As shown in **Figure 4.7**, Green Hope School Road is currently part of a heavily used recreational cycling route that passes between Cary and rural western Wake County. Cary area cycling clubs and teams rely on this roadway to avoid driving from Cary to rural staging areas. Until recently there was a railroad crossing open to all vehicles on Green Hope School Road, in the vicinity of Davis Drive and Carpenter Upchurch Road. The railroad crossing is

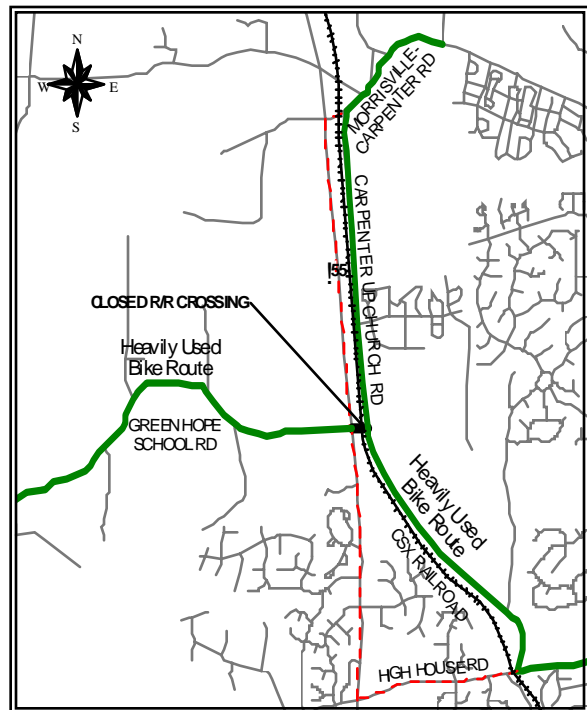


Figure 4.7 – Green Hope School Road Railroad Crossing

[Link to Figure 4.6 - NC Bicycling Highways](#)

Recommendation #8: Sensitize Traffic Signal Detectors for Bicycles

Detectors for traffic-actuated signals should be sensitive to bicycles and should be located in the bicyclist's expected path, including left-turn lanes. The preferred options are depicted in Section 4 of the NCDOT *Bicycle Facilities Planning and Design Guidelines*.

Where programmed visibility signal heads are used, they should be checked to ensure that they are visible to bicyclists that may be positioned near the right edge of the roadway.

Additionally, signal timing at intersections should take into account bicycle travel. In particular, sufficient yellow time should be provided to allow a bicyclist to clear the intersection.

Recommendation #9: Remediate Rail Crossing Improvements

For bicyclists, there are two challenges associated with railroad at-grade crossings. First, if the tracks cross the roadway at less than 45 degrees, a bicyclist's front wheel may be diverted by the rail or trapped in the flangeway, causing loss of steering control. Second, a rough crossing may cause wheel damage or may cause a bicyclist to crash. It is recommended that each at-grade rail crossing in Cary be inventoried, evaluated from a bicycle safety perspective, and a program for remediation recommended to Town Council. Section 4 of the NCDOT *Bicycle Facilities Planning and Design Guidelines* should be referenced in the development of remedial measures.

Methods of Implementation

Implementation of planned bikeways can occur through one or both of the following mechanisms:

- As part of future roadway improvements, such as, new road construction or road widening; or
- As independent projects, by retrofitting the existing roadway.

The greatest difference between retrofit projects and roadway improvement projects is clearly cost and time. Often retrofit projects just require restriping a roadway to provide a wide outside lane or posting signs to designate a neighborhood route whereas roadway improvement projects often require physical changes to existing roadway sections.

Cost of Implementation

- **Thoroughfares** – Most bikeways will be built as wide outside lanes on thoroughfares, constructed in conjunction with a thoroughfare-widening project. Accordingly, the marginal cost of building 14-foot wide lanes instead of the standard 12-foot wide lanes is an additional \$ 111,000 per mile of thoroughfare. This includes the additional cost of pavement and right-of-way. To rebuild the roadway simply to add two feet of pavement on both sides for bicyclists would cost \$ 325,000 per mile. This includes curb-and-gutter demolition and reconstruction, mobilization of work crews, relocation of utilities plus the additional cost of pavement and right-of-way.
- **Drainage Grates** – while grates are a necessary feature for avoiding stormwater ponding on roadways, they have a significant impact on the safety of

bicyclists. Alternative inlet designs can create more usable roadway width within the same right-of-way. Bicycle-friendly drainage grates cost no more than standard drainage grates.

- **Bike Parking** – Just as automobile parking is considered as a critical element in the transportation system, so is bicycle parking. Bicycle parking facilities fall into three categories:

Class I: bicycle locker or fenced-in area that completely protects the bicycle from vandalism and weather. Cost is typically \$800 per storage unit, based upon the number of units.

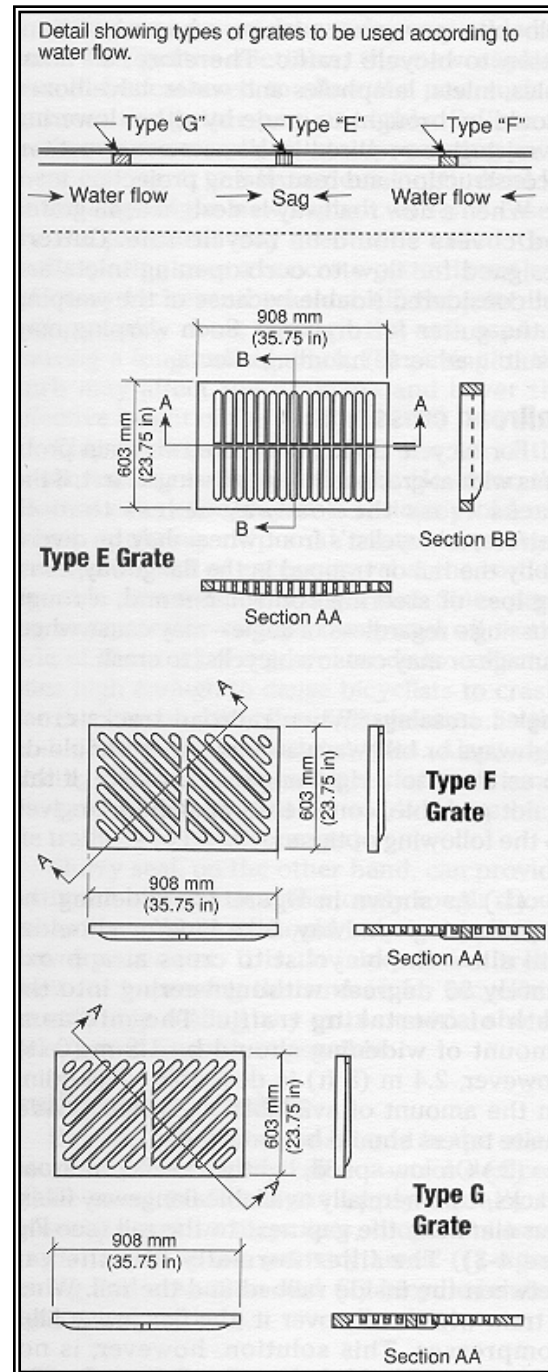


Class I Bike Locker

Class II: bicycle-friendly bike rack to which the frame and at least one wheel can be secured with a user-provided padlock and cable. Cost is typically \$275 for a five-bike rack.



Class II “S” Shaped Rack



**Bicycle Friendly Drainage Grates,
Approved by NCDOT, Shown
According to Direction of Water Flow**

Class III: old-fashioned bicycle rack that secures only one wheel. Not recommended except in a secure fenced-in area. Cost is typically \$350 for a five-bike rack.



Class III Bike Rack

- **Rubberized railroad crossings** - The cost of installing rubberized crossing material at railroad crossings is typically \$25,000 per lane.
- **Traffic signal detectors/ markings** – The cost of sensitizing traffic signal detectors and remarking the lanes to show where bicyclists should sit in order to trigger the detector should be included in the *Traffic Signal System Feasibility Study* currently underway by the Town of Cary.
- **Advisory Committee** – Town staff liaison resources for a new committee may exceed available staff resources. The role of the Pathways and Bikeways Advisory Committee should be expanded as an alternate to forming a new committee. The functions, however, are split between two different Town departments; Parks and Recreation Department oversees greenways while the Engineering Department oversees sidewalks and bikeways that are within the roadway right-of-way.

- **Inter-Neighborhood Connectors** – the typical length of an inter-neighborhood connector path is estimated to be 300 feet. At a recommended width of 10 feet, the cost is estimated to be \$11,500 assuming a modest purchase of easement rights from adjacent homeowners.

Best Practices

With stronger policies and a set plan to guide future developments, the Town of Cary can build on its bicycle and pedestrian friendliness. As a point of reference, the best practices that some recognized bicycle-friendly and pedestrian-friendly cities are taking are highlighted below.

- A bike station in Long Beach, California provides free valet bike parking, bicycle repairs and tune-ups, a restroom and changing area, and coffee-bar and patio seating in addition to other amenities at a major transit station.
- Bike racks on buses in San Jose, Phoenix and other locations that have increased both bicycling and transit usage.
- Walking and bicycling maps and guides all over the world.
- Exclusive pedestrian interval signal phases that reduce conflicts between pedestrians and turning traffic in San Francisco and New York.
- A separate, parallel bike path along a freeway corridor in northern Virginia that includes bicycle-only loop ramps to interchange between the main path and local streets above.
- A barrier-separated bike path within the median of a major thoroughfare traversing through a freeway interchange in Palo Alto, California. The bike path end points occur in the crosswalk of pedestrian-actuated traffic signalized intersections at either end of the

interchange (next major intersection rather than the ramp terminals). The only interchange configuration where this concept works is a full (loop ramps in all four-quadrants) cloverleaf interchange.

- A “bicycle boulevard” in Palo Alto, California where a local residential collector street linking the downtown business district with outlying neighborhoods is restricted to local traffic only and bicycles. Landscaped half-street barriers are constructed at key locations to reinforce the “local traffic only” requirement.
- Boston Bike Week, a seven-day bicycle Spring extravaganza that includes educational, recreational, competitive, lobbying, and culinary events. Tours are provided of transportation facilities that are under construction; for example, showing how the mega-Central Artery/Tunnel project will be bicycle-friendly.
- Portland, Oregon “bicycle facility improvement program” using the world wide web to solicit suggestions intended to enhance bicycle safety and encourage bicycling through low-cost small-scale improvements suggested by concerned bicyclists; such as, pavement maintenance and sweeping, hazard removal, bike rack installation, rubberized rail crossings, and grate replacements.

Conclusion

The Town of Cary is continually working toward creating a more pedestrian-friendly and bicycle-friendly community by building pedestrian and bicycle facilities. Even with facilities built as roadways are improved, new developments are completed, and stand-alone projects are completed there is a need

for a system plan. The Bicycle Element of the *Comprehensive Transportation Plan* provides such a system plan.

The Bicycle Element addresses where and how bicycles are to be handled in specific locations throughout the town as well as reviewing and recommending changes to relevant standards and ordinances.

The Town has already taken the initiative to update the roadway design standard for outside lane widths on multilane roadways from 13 feet to a more bicycle-friendly 14 feet. In addition they are taking a hard look at their development ordinances and other standard specifications that may affect bicycle transportation.

Striped bike lanes, shared outside lanes, neighborhood connectors, signed neighborhood connections, and bike paths can all be found in the Bicycle Element among other bicycle critical issues. Just as High House Road and the newly completed section of Cary Parkway have shared outside lanes, the plan also shows Kildaire Farm Road and NC 55 as well as other roadways having similar shared lane treatments in the future.

Striped bike lanes are planned for sections of Lake Pine Road and Two Creeks Road to name a few. To increase neighborhood connectivity without using roadways, neighborhood connectors are suggested for numerous areas throughout Cary, including in North Academy Street neighborhood and near Cary High School. The recommended Pathways and Bikeways Advisory Committee would supplement the Bicycle Element recommendations by identifying more pedestrian and bicycle facilities and pathways to complete the network.

Bicycles are a key part of our diversified transportation system. Full implementation of the Bicycle Element of the *Comprehensive Transportation Plan* is a first step in growing Cary into a biker-friendly community.

References

1. *Incorporating Bicycle and Pedestrian Elements into Transportation Plans*, North Carolina Department of Transportation, Statewide Planning Branch, September, 1998
2. *Bicycling and Walking in North Carolina, A Long-Range Transportation Plan*, North Carolina Department of Transportation, Office of Bicycle and Pedestrian Transportation, November, 1996
3. *North Carolina Bicycle Facilities Planning and Design Guidelines*, North Carolina Department of Transportation, Office of Bicycle and Pedestrian Transportation, January, 1994
4. *Improving Conditions for Bicycling and Walking, A Best Practices Report*, Federal Highway Administration, January 1998
5. Crash Statistics Database; Town of Cary Police Department, May 1999.