

Riparian corridors are highly vulnerable to adverse impacts caused by upland management practices. The best place to address these impacts is not at the edge of the riparian corridor, but at the point of origin - in the uplands.

Conservation practices that reduce the amounts of sediments, fertilizers, and other pollutants leaving the field in runoff and erosion will support healthy riparian corridors. They will vary by region and landuse, but usually include the following recommendations:

- Cease cultivation of highly erodible soils on steep slopes.
- Use contour farming, strip cropping, etc. to reduce erosion on long slopes.
- Be flexible with crop choices - match the crop with a suitable soil type.
- Employ minimum tillage systems - no-till, mulch-till, ridge-till, for example.
- Practice crop rotation.
- Use rest-and-rotation grazing systems.
- Promote selective logging.
- Use effective waste management practices.

SUMMARY

Several planning concepts and principles are appropriate for use in wildlife corridor planning projects. They can be broken down into wildlife planning principles for patches, corridors, and matrices, and can be interpreted and used differently at different scales. In addition, design of NRCS conservation practices can be modified slightly to enhance wildlife habitat. High levels of connectivity, diverse vegetative structure, proper management and maintenance, and use of native plant species are key components of agricultural landscapes highly valuable to wildlife.



Gary Benning



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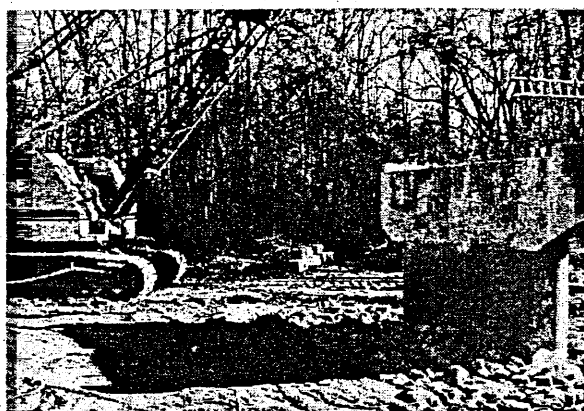


Wendell Gray NRCS

Trail and Greenway Standards

Once the trail or greenway right-of-way has been acquired, plans can begin for the development of the trail facilities. The available funding and the Council and Board approved priorities will guide the order of construction. Each type of trail described and named in the previous section has its own design requirements and standards.

*Work at
Rocky
Creek on
the
American
Tobacco
Trail*



The City's practice has been to hire a professional consultant for the design work on a trail project, then that consultant writes the specifications for bidding and acts as project manager for the actual construction process. Both the City and County should continue that practice for trails. Trails are paved (or hard-surfaced); must meet ADA accessibility criteria; often have structures such as bridges, boardwalks, or retaining walls; often must get Federal Emergency Management Agency (FEMA) or US Army Corps of Engi-

neers development permits; and frequently have busy street crossings. In addition, trails being constructed with funding from state or federal transportation programs must be approved by those agencies as meeting their particular specifications. Managing all those issues competently requires a licensed professional.

Recreation trails, on the other hand, can often be constructed by volunteers under the direction of a trained professional or trained volunteer. The trail layout needs to be designed by someone who can read the landscape and select a route that will have minimum impact on the natural resources, regardless of the expected trail use; but construction may be largely done by volunteers with hand tools.

Following are general trail design standards for trails, street trails, and recreation trails. These standards may be altered by an agreement among relevant City or County staff and design professionals when a particular site requires it.

Trails

Trails are generally preferred in an urban or suburban location where use by bicyclists and urban pedestrians is expected—including such uses as roller blades, wheelchairs, scooters, and strollers. Useful guidelines for development standards include the 1999 Guide for the Development of Bicycle Facilities (American Association of State Highway and Transportation Officials, AASHTO) and the 1994 North Carolina Bicycle Facilities Planning and Design Guidelines and 1997 Planning and Designing Local



Pedestrian Facilities, both from NCDOT's Division of Bicycle and Pedestrian Transportation. However, since these guides offer standards primarily for transportation routes, their recommendations may be as needed altered for urban trails that serve both transportation and recreation users.

A minimum trail width of ten (10) feet is recommended to assure safe two-way traffic. Exceptions will be required in some sections of trail to protect existing natural resources or existing development. The cleared trail corridor should be no more than an additional ten feet on either side of the trail tread; in an area where the existing vegetation is scarce, there should be re-vegetation in the right-of-way outside this thirty-foot expanse.

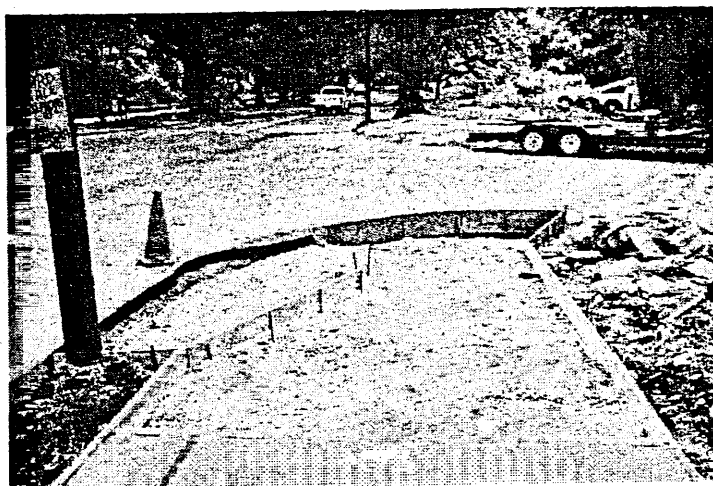
Trails in seasonally or permanently wet areas may need to be boardwalked. Trail design must address issues of on-site and off-site surface and subsurface runoff and drainage associated with the trail's construction and use.

The pavement choice for a trail should be decided by its design load—generally the gross weight of a maintenance or emergency vehicle—as well as by the underlying soil and its compaction, the level of wetness of a trail location, and the expected use. There will be occasions to use alternative paving materials or some other hard-surface materials for a trail, but the trail standard paving material will be asphalt.

Sidewalk Trail Section

Construction of the North/South Greenway at Club Boulevard

Sidewalk trail sections are ten (10) foot wide paved sections within or immediately adjacent to a roadway right-of-way. They link sections within a particular trail and thus should continue its width for user safety and convenience. They may be reduced to eight (8) feet wide in some sections if necessary to protect existing natural resources or existing development.



Sidewalk trail sections are generally surfaced with concrete, because they also function as regular sidewalks—often they are expansions of an existing sidewalk. Utility poles, signs, fire hydrants, etc. should be re-located outside of a sidewalk trail section to ensure the safety of wheeled traffic using the trail; if re-location is not possible, these obstacles should be marked with some warning device. The City and County should encourage residents not to leave garbage and trash containers for pick-up on these sidewalk trail sections.

Street Trail

The street trail is a designated connector between trails, usually consisting of a standard five (5) foot sidewalk and a wide outer lane or bike lane on the adjacent roadway. The City or County may request an easement for additional sidewalk width on portions of these street trails if conditions warrant it, e.g., heavy vehicle traffic which could discourage some bicyclists or a back-of-curb sidewalk along a busy roadway.

The street trail cross section which follows the text illustrates some possible manifestations of a street trail: a sidewalk (ideally separated from the roadway by a planting strip) paralleled by either a wide outer lane for bicycle traffic or an actual striped bicycle lane. A roadway travel lane should be increased by four (4) feet over the design width for motorized vehicles to be a safe wide outer lane for bicycle traffic; a striped bicycle lane needs to be at least five (5) feet wide. No roadway would have both of these treatments in the same location. Street trails in rural areas may consist of a wide paved roadway shoulder only.

Recreation Trails

*New
Hope
Trail
workday*



Recreation trails are more varied in their design requirements than hard-surfaced urban trails. The design of each recreation trail is the solution to a unique set of site-based needs and situations: land features, resource constraints, anticipated use, and possible management and maintenance strategies. Paved trails in urban parks must connect recreation facilities within that park.

Information on those points will guide the design in its configuration on the land, the type and width of the trail tread, the necessary clearing limits, and specific construction needs such as erosion control features or creek crossings. Once those decisions are made, there are established references for directions on building the desired trail cross section, including the following recommended works:

The Complete Guide to Trail Building and Maintenance. Carl Demrow and David Salisbury, Appalachian Mountain Club. Boston, MA. 1998.

Trail Construction and Maintenance Notebook. US Department of Agriculture, Forest Service Technology and Development Program, Missoula Technology and Development Center. Publication No. 4E42A25-Trail Notebook. 1996.

NPS Trails Management Notebook. US Department of the Interior, National Park Service, Denver Service Center. US Government Printing Office Document NPS-2023. 1992.

Lightly on the Land—The SCA Trailbuilding and Maintenance Manual. Robert C. Birkby, Student Conservation Association. Seattle, WA. 1996.

Trail Development and Construction for Mountain Bicycling. Gary Sprung, ed., International Mountain Bicycling Association. Boulder, CO. 1995.

These descriptions and the following cross sections are intended as general standards for the various types of trails that exist in Durham and Durham County. Each trail is a unique construction and must be fitted onto the land in a way that will both enhance its usefulness and beauty and protect the natural environment. The relevant City and County staff members and the consultants they employ will make final determinations as to trail location within acquired rights-of-way and exact trail design specifications.



Signage

As a general rule, signs used for the trails and greenways system will be for the purpose of providing users with the following information:

- (a) the name of the greenway system and the particular trail;
- (b) permitted uses and other necessary rules;
- (c) a map of the trail;
- (d) any other information which may be necessary for the safety and convenience of the trail user, including distances between points.

A **major entrance sign** will be placed at points of entry to each trail where users will access the trail, ideally where parking is also available; a **minor entrance sign** will be placed at points limited to bicycle and pedestrian access with no adjacent parking.

An **information sign** will be used to provide information to trail users about permitted use and rules of behavior and will include a map of the trail and its location within a greenway system.

A **blaze and stop sign** will be placed on both sides of a street whenever the trail crosses a street.

Directional signs will be used as needed to direct trail users at route intersections or direction changes.

Trail connection signs will provide information on connections between trails via street trails.

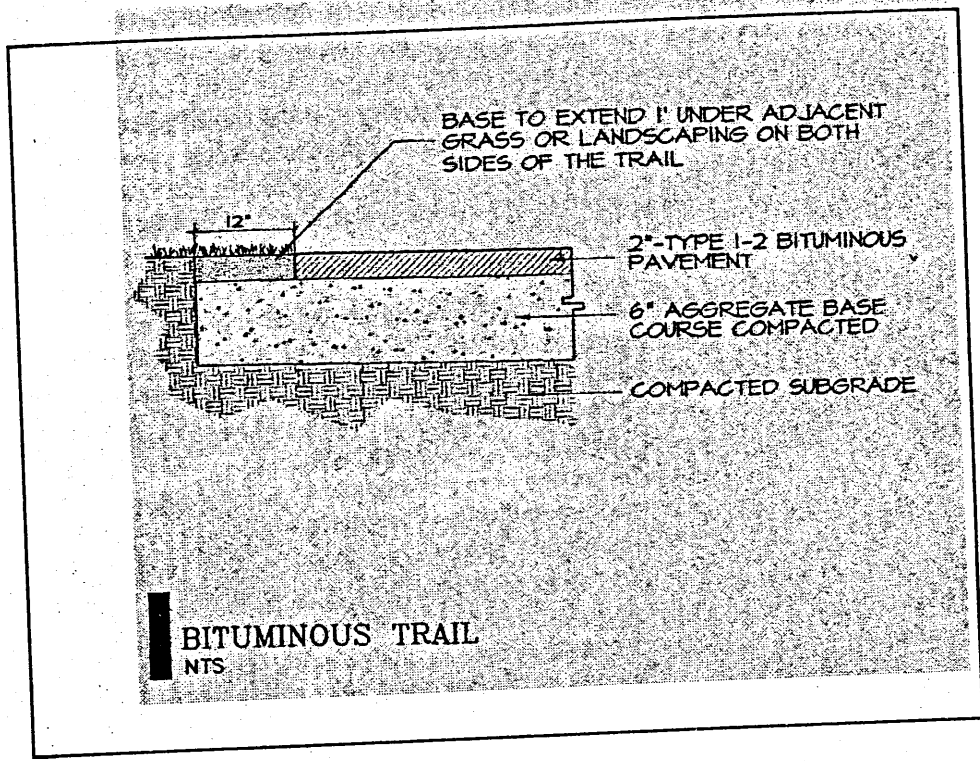
Bollards will be placed in the trails at road crossings to block trail access to motorized vehicles. A central bollard should be designed as a fold-down or removable type to permit access by maintenance vehicles.

Other types of signs may be used when staff and consultants determine that there is a need for them. For instance, routes constructed with funding from NCDOT may be required to have additional roadway bicycle and pedestrian markings. A trail in an historic district or a natural setting may include interpretive signage. If trails are "adopted" by volunteer groups for maintenance, they may install a sign noting their trail adoption that will be in place for the duration of their service. Trails that are part of some larger regional system may have signage indicating that fact.

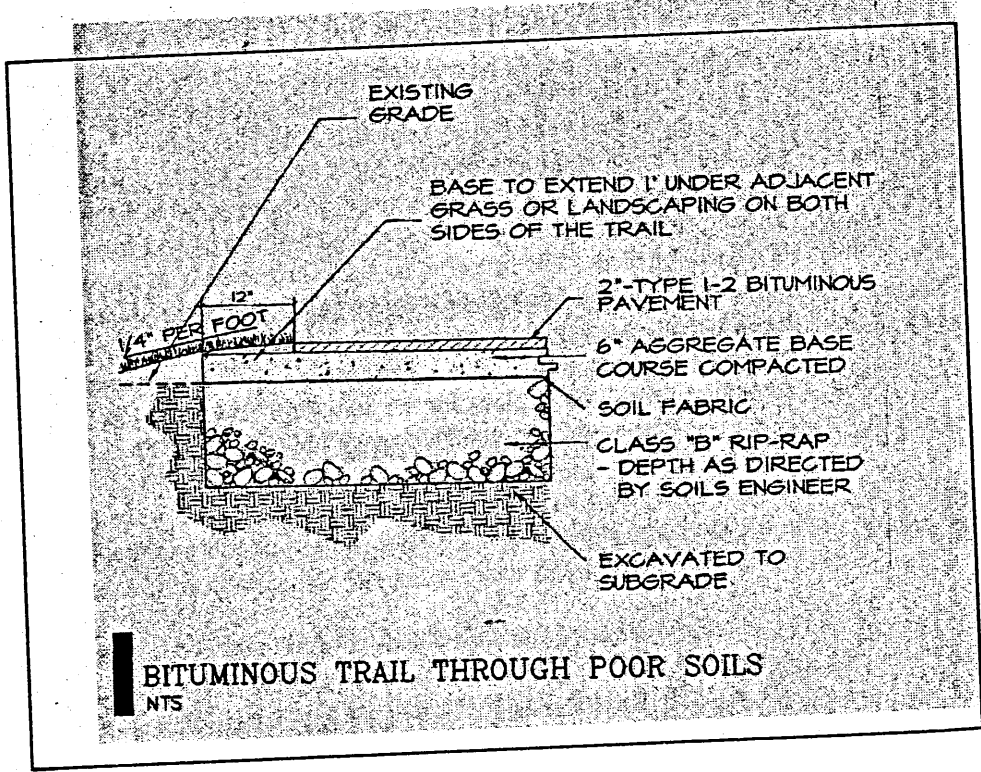
Other than signs for special situations as noted in the preceding paragraph, signs in the Durham system will be as consistent as possible in graphic design, coloration, and logos used.

Following are standard details for trail construction: asphalt trail, asphalt trail on poor soils, boardwalk section, concrete trail addition to existing sidewalk, and trail bollard. As noted previously, these details may be altered as needed by decisions of the staff and consultants. Details are courtesy of Coulter Jewell Thames, P.A.

Detail 1: Standard asphalt trail

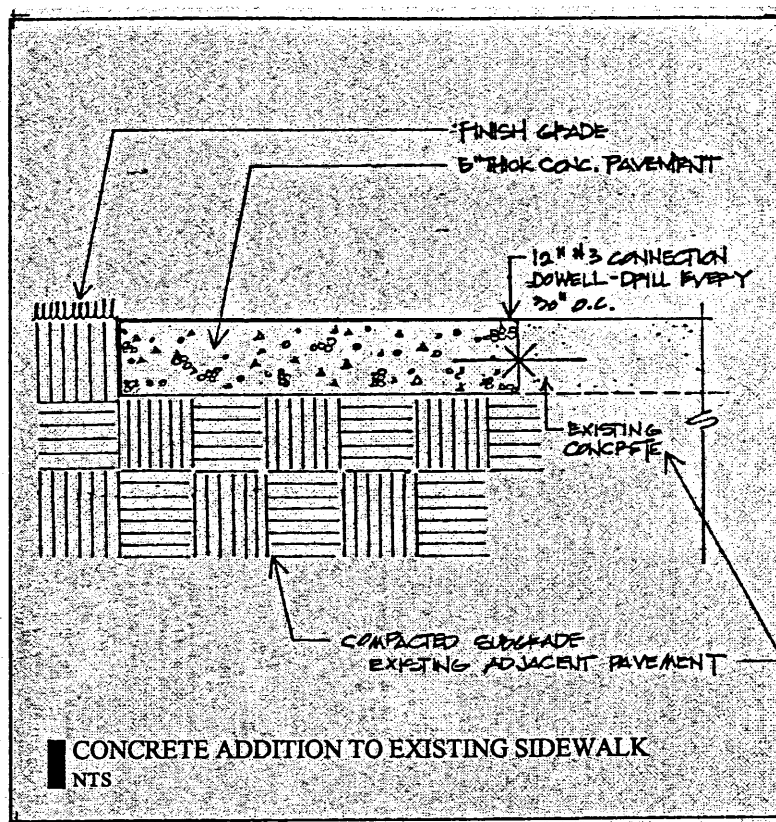


Detail 2: Asphalt trail on poor soils

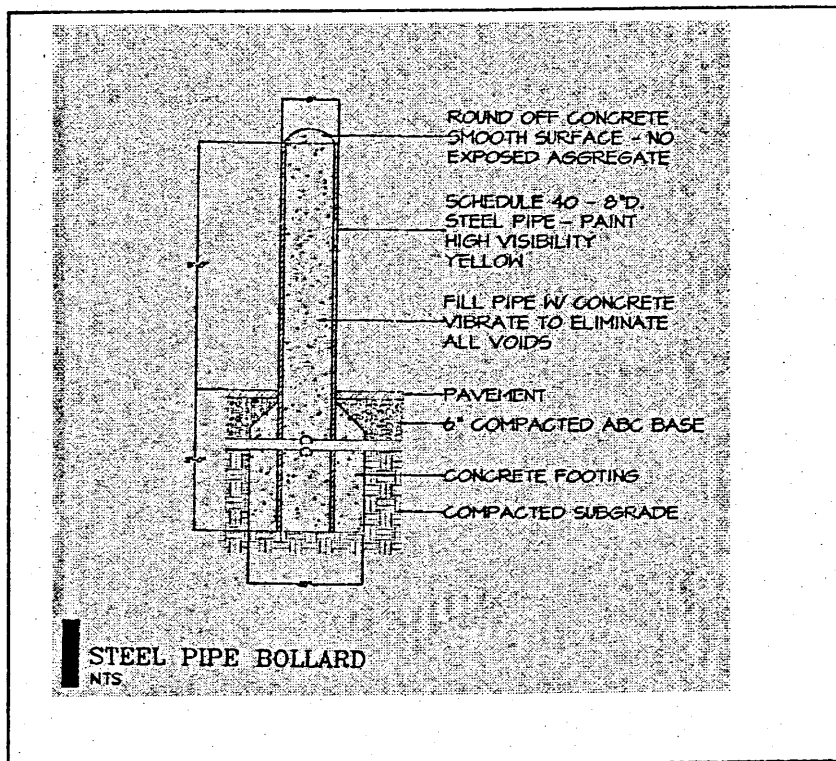




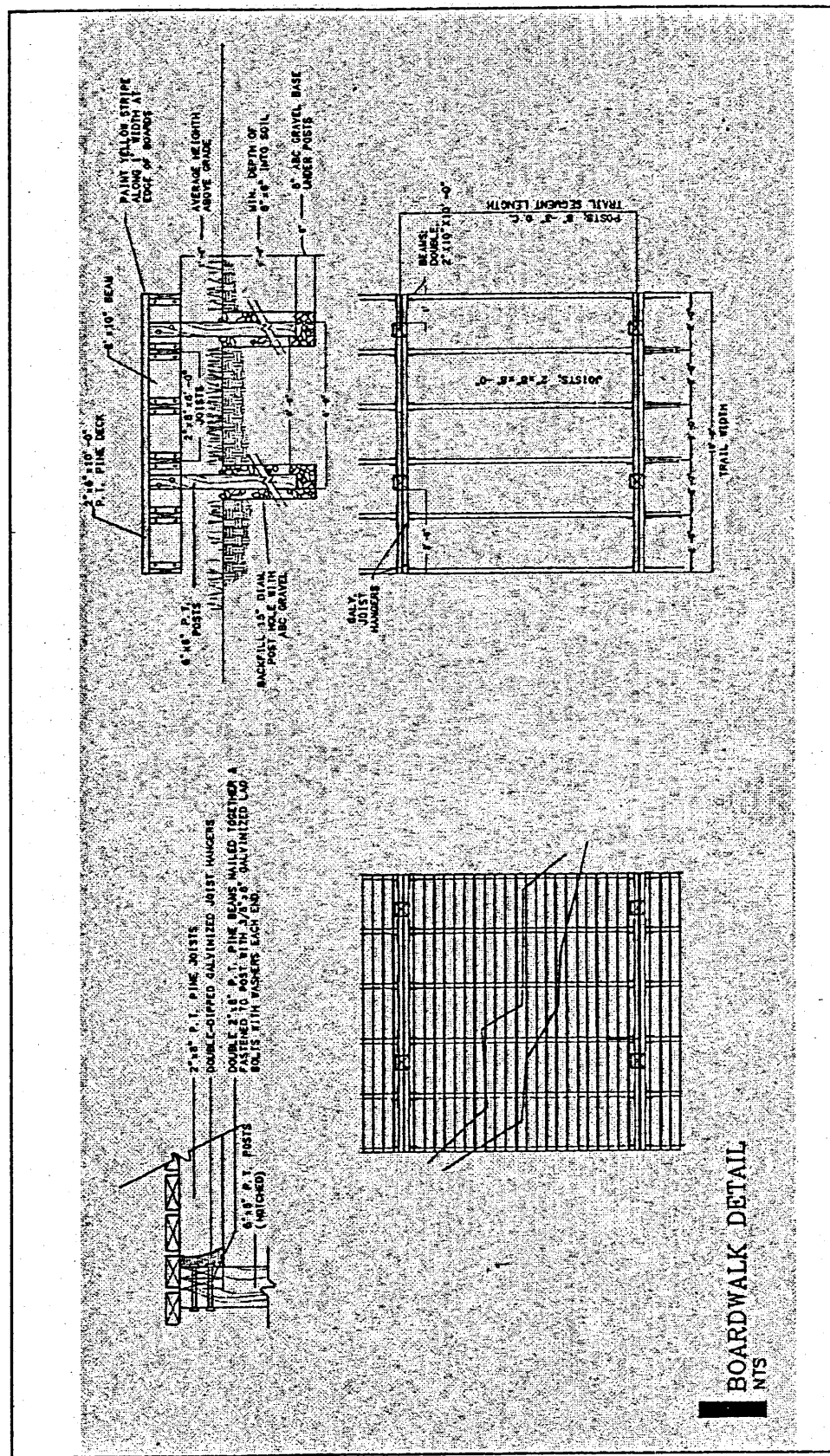
Detail 3: Sidewalk trail section addition to existing sidewalk



Detail 4: Standard trail bollard

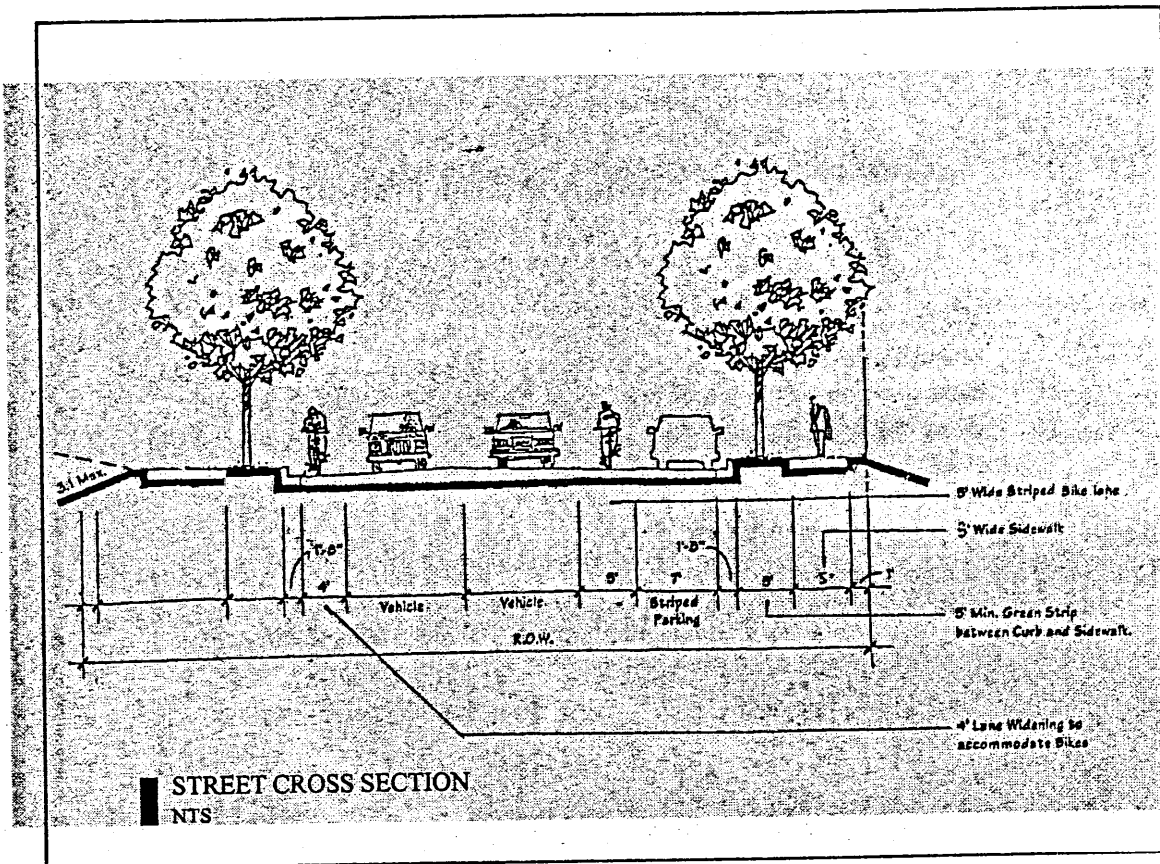


Detail 5: Standard boardwalk section detail





Detail 6: Cross section showing possible street trail design



Bollards (with central bollard down for maintenance access) and accessible ramp onto North/South Greenway at W. Markham Avenue

Part 7

DESIGN STANDARDS & GUIDELINES

The Design Standards and Guidelines section of the Master Plan provides a set of parameters for implementing a consistent physical character for Chapel Hill greenway system. The guidelines address the following design issues:

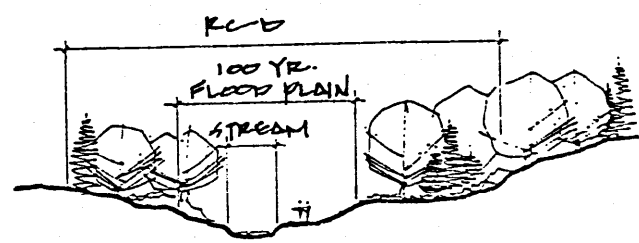
- Corridor Width Guidelines
- Trail Classifications
- Special Trail Needs
- Trail Locations
- Trail Amenities
- Parking Areas
- Accessibility
- Naming Trails
- Signage

Greenway design standards and guidelines can help elected officials, advisory board members, and staff make decisions involving the expenditure of public funds and the enhancement of public safety. Decisions related to amounts of land or easements to be purchased, the types of trails to construct, and the location of trails can be facilitated by incorporating standards and guidelines in the greenways planning and decision-making process.

Corridor Width Guidelines

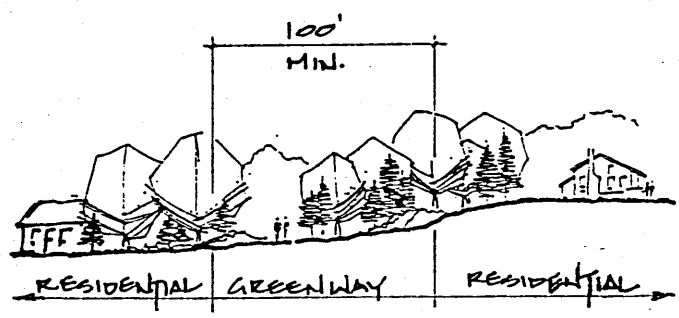
Greenway corridors in Chapel Hill vary in width according to the topography of the area, the amount of existing development, the existence of significant biological areas, and patterns of property ownership. The following guidelines are intended to balance the needs to preserve greenway corridors and connectors, provide enough land for trails when appropriate, and to provide privacy for existing residences.

The Town should make reasonable attempts to protect the following greenway corridors by restricting development, requiring greenway dedications, and purchasing land or easements.



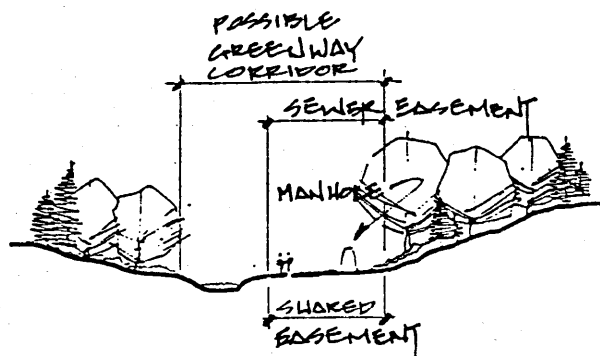
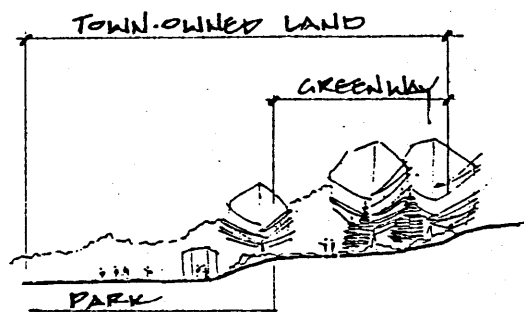
Stream Corridors:

Stream corridors may vary in width depending on the stream and the site specific characteristics of the land itself. Corridor widths should generally be as wide as can be acquired to help assure the privacy of adjacent property owners and the environmental quality of the site. Several factors which often contribute to increased corridor widths of stream-associated greenways include adjacent sanitary sewer easements, 100-year floodplain land and areas within the Town's Resource Conservation District.



Connector Trails:

Greenway connectors not located along streams should be a minimum of 100 feet in width, if possible. This width should allow for sufficient buffering between neighborhoods, placement of trails, and adequate area for the free movement of wildlife. Smaller corridor widths, however, may be necessary in order to create trail connections between lots in subdivisions.



Greenways as Parks:

Wider greenways may be needed if the land is to be developed as a park. Parks require more land than is typically acquired for a linear greenway. Parks and greenways can share the same land, although the needs of the park may require additional lands outside of the greenway corridor.

Developed Areas:

Greenway corridors or connectors should not be used for trails within areas that are currently developed if placement of a greenway trail would severely impact the privacy of existing residences.

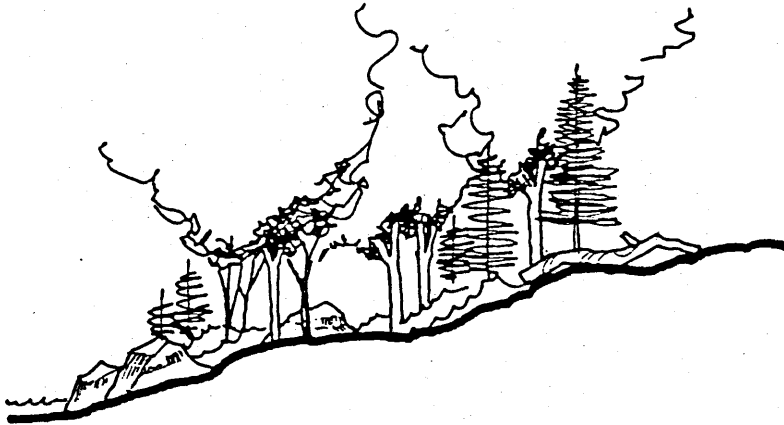
Utility Easements:

Pedestrian and non-motorized vehicle easements should be coupled with utility easements when possible.

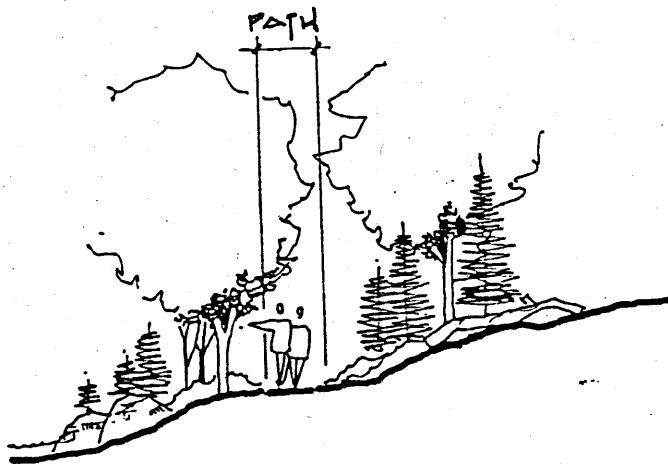
Trail Classifications

Trails proposed within the Chapel Hill Greenway System can range from primitive woodland paths designed for low intensity pedestrian travel to paved bike paths designed for bicycle and wheelchair use.

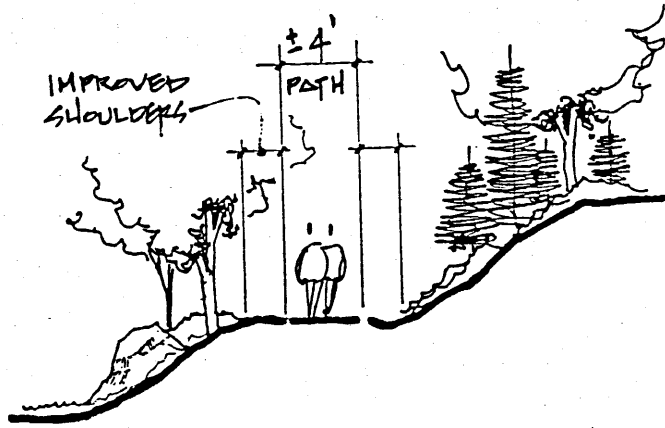
The following class system identifies different levels of trail development that were assigned to greenway segments in Part 4, "Strategic Planning". Essentially, it is a 6-level hierarchy of trail development ranging from unimproved greenways, to soft, natural surface trails, to paved trails of varying widths to accommodate different trail uses and intensity of use.



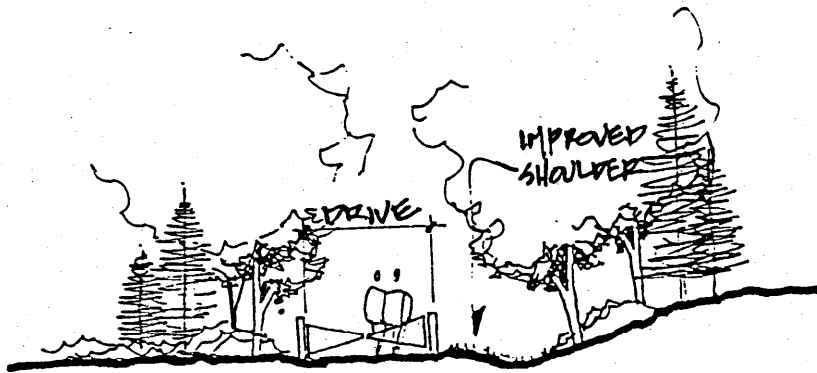
Class 1 Unimproved greenways lacking trails. No maintenance unless problems, such as diseased or dying trees on Town owned greenways, affect neighboring properties.



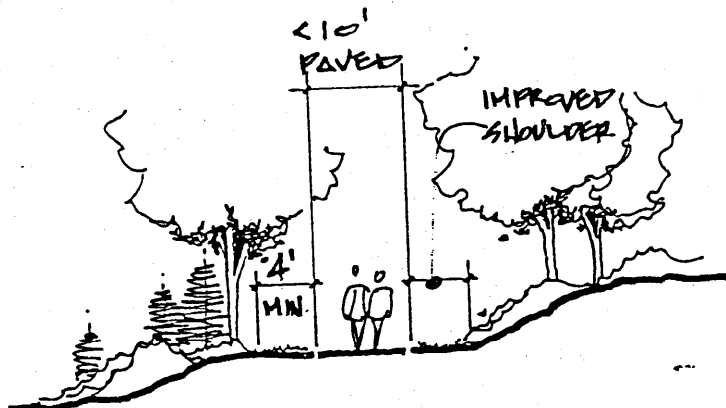
Class 2 Primitive trails, created by wildlife or citizens, not maintained by the Town.



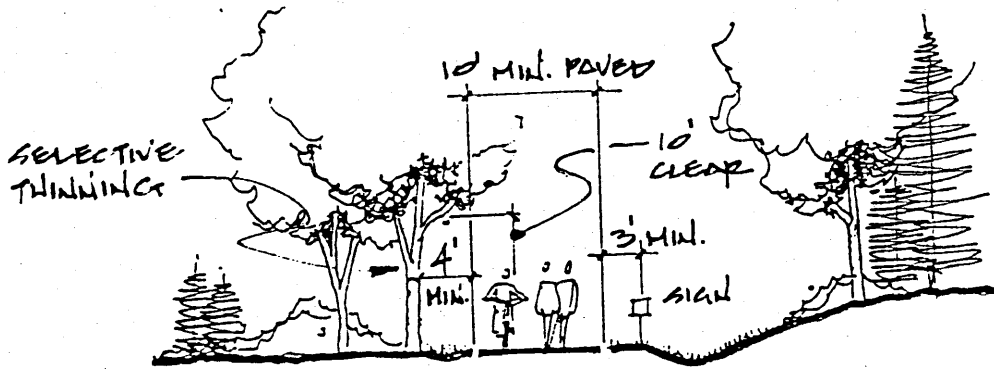
Class 3 Improved woodland trails generally with soft surface and minimal improvements. Surface is typically natural, but may have gravel or boardwalk sections to address erosion problems and wet areas. An important goal of the soft surface trails is to safely accommodate mountain bicycles. Specific trail design should address erosion problems likely to result from mountain bicycle use. Maintenance typically includes removal of litter, removal of fallen tree limbs and trees, repair of erosion damage, and bridging of wet areas.



Class 4 Unpaved access drive with gates or bollards to prevent casual vehicle use. Suitable for pedestrians or mountain bicycle use. This class is usually a road built for other purposes and used as a trail.



Class 5 Paved trail under 10 feet wide. This class of trail can be used to improve short sections of Class 3-4 trail suffering from severe erosion problems. This class can also be used for pedestrian only trails which are signed against bicycle use. However, in situations of difficult terrain, this class of trail can be employed for pedestrian and bicycle use, but only if signage is displayed to warn users of possible conflicts.



Class 6 Paved trail 10 feet in width or wider for mixed bicycle and pedestrian traffic. Short sections may be under 10 feet wide if difficult construction problems exist, however these should be well signed with adequate sight-distance in order to assure the safety of trail users.

The Town's goal for all its paved trails is to be compliant with AASHTO and ADA standards as much as is practicable. All Class 6 trails should be designed and constructed to the standards for off-road bicycle trails as published in the American Association of State Highway and Transportation Officials (AASHTO) "Guide for the Development of Bicycle Facilities" and the North Carolina Department of Transportation's, "Bicycle Facilities Planning and Design Guidelines". The editions of these publications which are current at the time of trail construction should be used by the planning team. These guidelines address design standards for trail alignment, design speeds, paving widths and clearances, slope restrictions, bridge structures and safety railings.

Class 6 trails should be designed also to comply the American with Disabilities Act (ADA) standards, where possible. In attempting to provide access to the greatest extent possible for the greatest number of people, the Town's Class 6 greenways will allow handicap, elderly and very young users to more fully utilize the trails.

Special Trail Needs

There are some special trail needs that may be considered by the Town for various reasons. Some uses such as hiking and mountain bicycling

may not be compatible on the same trail. Specialty trail needs should be addressed if funds, land, and public support are assured. Examples of special trail needs are listed below:

Mountain Bicycle Use

Class 3-4 trails should be designed for the use of mountain bicycles whenever possible. The extent of possible environmental damage by bicycle users should be considered on every project. Mountain bicycle use may have to be curtailed on occasion to allow natural regeneration of heavily eroded trails. Signs should be placed at all Class 3 and 4 trailheads requesting mountain bicycle users to yield to pedestrians and to refrain from using the trails in wet conditions.

Sidewalks and Public Streets

In some cases, trail connections will be on sidewalks and along public streets. In the event that off-street bicycle paths merge onto streets, provide appropriate signage and pavement markings to help safe merging. The provision of designated bicycle lanes is desirable. Where a public street provides a link in a pedestrian path, sidewalks should be provided where possible.

Interpretive Trails

Trails can meet many different needs including education. Many trails can be converted to dual recreational/educational use by placing interpretive signs and stations along the pathway.

Interpretive signage may identify or provide explanations of special natural features, geographic, historic or other points of interest. Interpretive trails should not be built in conjunction with trails that are anticipated to have moderate to heavy bicycle traffic.

Fitness Trails

Fitness trails have stations that are used for various exercises. Users often run from station-to-station in order to work a variety of muscle groups. These features can be incorporated into many existing trails. Fitness trails must be well maintained with pathways that are free of obstacles. The various fitness stations must be placed well off the actual trail. Fitness trails should not be built in conjunction with trails that are anticipated to have moderate to heavy bicycle traffic. It should be noted that public fitness trails, as a recreational amenity, have decreased in popularity over the past several years.

Measured Trails

Many individuals enjoy recreational walking and running. It is possible to measure sections of trails and to mark them for persons wishing to monitor their mileage. This type of activity is suitable on most trails, although, for fitness walking, the path surface should be relatively stable and free of obstacles.

Trail Locations

The location of trails within greenway corridors is of vital importance to greenways planners, trail users, and the citizens who must live and work in the vicinity of these trails. Greenway planners should consider the following trail location guidelines:

1. Trails should generally be located as far from residential structures as is reasonable in order to preserve privacy of nearby residents and the experience of trail users.
2. Trails of Class 5 or higher should be located no closer than 25 feet from any perennial stream bank unless absolutely necessary and no other practical

location for the trail exists. Trails should be located further than 25 feet from streams if there is evidence that stream banks are eroding.

3. Stream crossings should be avoided when possible.
4. Trails should be located to ensure that minimum disruption of the trail would result from the repair or replacement of utilities.
5. Street crossings should be grade separated if possible. At grade, street crossings should be planned so that trail and road users have the greatest sight distance possible.

Trail Amenities

Certain amenities may be planned to provide for the comfort and safety of trail users and area residents. The Town may provide the following amenities within greenway corridors:

Bollards

These devices prevent automobiles from driving on greenway trails. Bollards are commonly used on trails of Class 5 or higher. Bollards should be locked so that emergency vehicles, police cars, and maintenance vehicles have access to the trail.

Keys to bollards should be provided to the Chapel Hill Parks & Recreation Department, the Chapel Hill Police Department, Chapel Hill Fire Department, South Orange Rescue Squad and the Orange Water and Sewer Authority, as appropriate.

Observation Decks

Observation decks can be built overlooking scenic areas. These structures should not be built within floodplains, in places where they may compromise the privacy of nearby residents, or in areas not readily accessible to maintenance vehicles.

Gazebos

These small structures can be provided to allow trail users to enjoy passive recreation activities

Dedicated Public Access Land

Text Street Names

Streets

Streams

Carboro City Limits

Carboro Planning Jurisdiction

Water Bodies

Dedicated Public Access

Basins

BOLIN CREEK

BOOKER CREEK

MORGAN CREEK

3600 0 3600 Feet

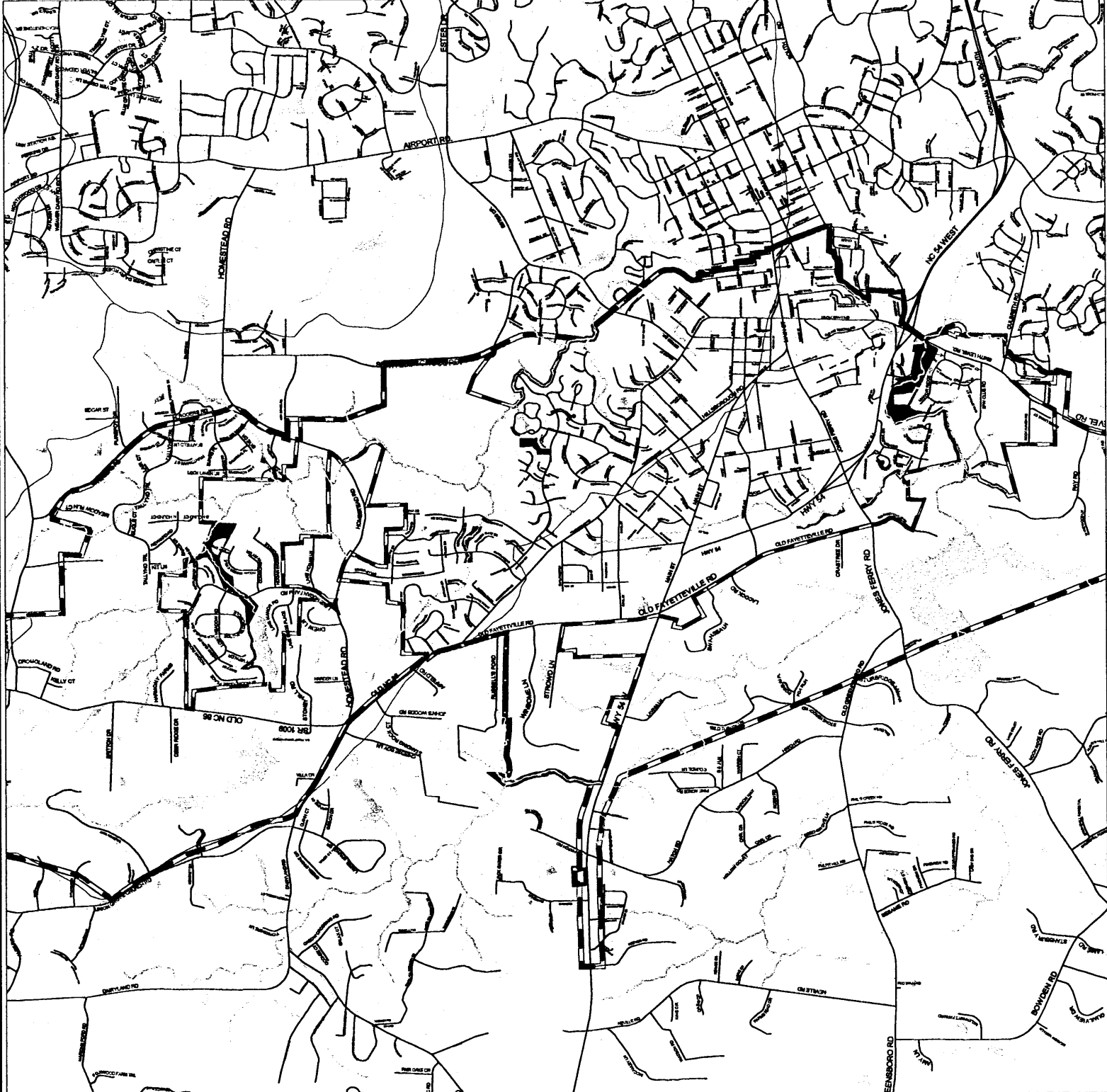
NC State Plane Coordinate System (NAD83)



TOWN OF CARBORO
301 W. Main St.
Carboro, NC 27510

21 October 2003
Ruth Heston, Planning Department
918-7138

THIS MAP IS NOT A CERTIFIED SURVEY AND IS FOR REFERENCE
The requester must be aware of data conditions and ultimately bear responsibility for the appropriate use of the information with respect to possible errors, original data collection methodology, currency of data, and other conditions specific to the data.



5/25/2003 - AMH revised

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