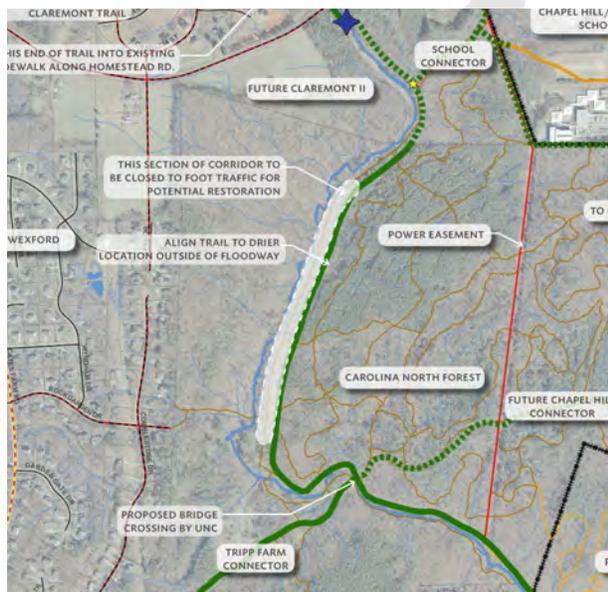


Conceptual Master Plan

TOWN OF CARRBORO, NC

BOLIN CREEK GREENWAY



prepared by:
Greenways Incorporated
December 2009

prepared for:
the Town of Carrboro, NC





Acknowledgements

Town of Carrboro

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Executive Summary

The Bolin Creek Greenway Conceptual Master Plan - 2009

The Town of Carrboro initiated the Bolin Creek Greenway project for the purposes of alternative transportation, recreation, and environmental protection and restoration through the Bolin and Jones Creek corridors. This conceptual plan is the first comprehensive guidance document for the construction of the greenway. It was funded by federal transportation funds administered by the North Carolina Department of Transportation (NCDOT) along with local matching funds. Through a summary of local plans dating from 1994-2008, it was determined that the Bolin Creek Greenway corridor was a highly desired off-road bicycle facility that would provide valuable connections in Carrboro and to Chapel Hill.



The Carrboro Planning Department and the Carrboro Greenways Commission collaborated to undertake the planning and design for the Bolin Creek Greenway. The mission of the Greenways Commission is to recommend to the Carrboro Board of Aldermen policies, programs, and actions that may assist the town in safeguarding the water quality, environment, and livability of the community by establishing greenways. Public input was obtained through two open house workshops, online and hard copy comment forms, meetings with project stakeholders and landowners, and field investigations throughout the planning process.



The established goals of the Bolin Creek Greenway Conceptual Master Plan are as follows:

- 1) *Protect and improve water quality along Bolin and Jones Creek*
- 2) *Protect, conserve, and preserve wildlife habitat*
- 3) *Connect surrounding land use in Carrboro by providing a non-motorized mode of transportation*
- 4) *Provide safe access to Bolin and Jones Creek*
- 5) *Enhance quality of life by providing a recreational facility for all citizens of Carrboro to enjoy*



This plan outlines existing corridor conditions, identifies opportunities and constraints for trail development along Bolin and Jones Creek, makes specific recommendations for trail design and planning, incorporates a phasing plan for implementation, and outlines specific guidelines for trail construction.

Benefits of Greenways in Carrboro

Trails and greenways provide a variety of benefits that ultimately affect the sustainability of economic, environmental, and social health. These benefits include:

- Creating Value and Generating Economic Activity
- Transportation Benefits
- Improving Health through Active Living
- Clear Skies, Clean Rivers, and Protected Wildlife
- Protecting People and Property from Flood Damage

Existing Conditions Analysis

The project consultant team conducted multiple field investigations along the corridor to determine green infrastructural elements such as existing vegetation, signs of wildlife, surrounding topography, significant natural features, and adjacent or intersecting streams. Man-made elements, such as existing buildings, structures, utilities, roadways, and railroads, were observed and documented. Destinations, connections, accessibility, and circulation were surveyed and a photo-inventory was developed of corridor impacts such as erosion and trail braiding.



Opportunities and Constraints

Opportunities and constraints along the corridor were determined through fieldwork and Geographic Informational Systems (GIS) mapping. These opportunities and constraints were mapped and later used to inform many of the greenway recommendations.

Summary of Corridor Opportunities

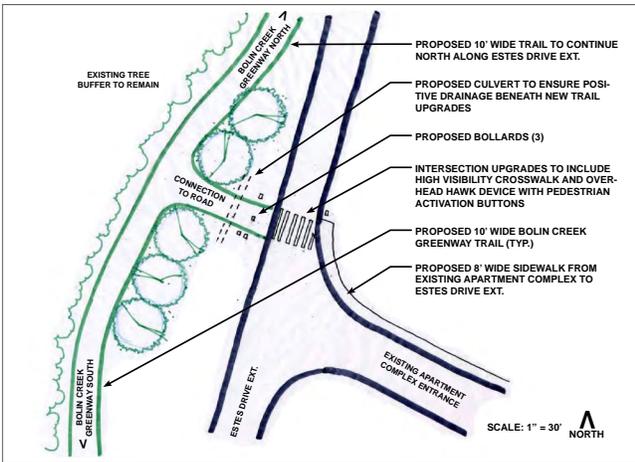
- Existing disturbed corridors such as trails and utility easements
- Connections to a multitude of destinations such as schools, parks, neighborhoods
- Environmental restoration
- Education and community enhancements
- Large amount of surrounding open space

Summary of Corridor Constraints

- Existing steep topography
- Proposed creek crossings
- Private property
- User conflict
- Difficulty in engineering for some areas
- Roadway, railroad, and utility Intersections

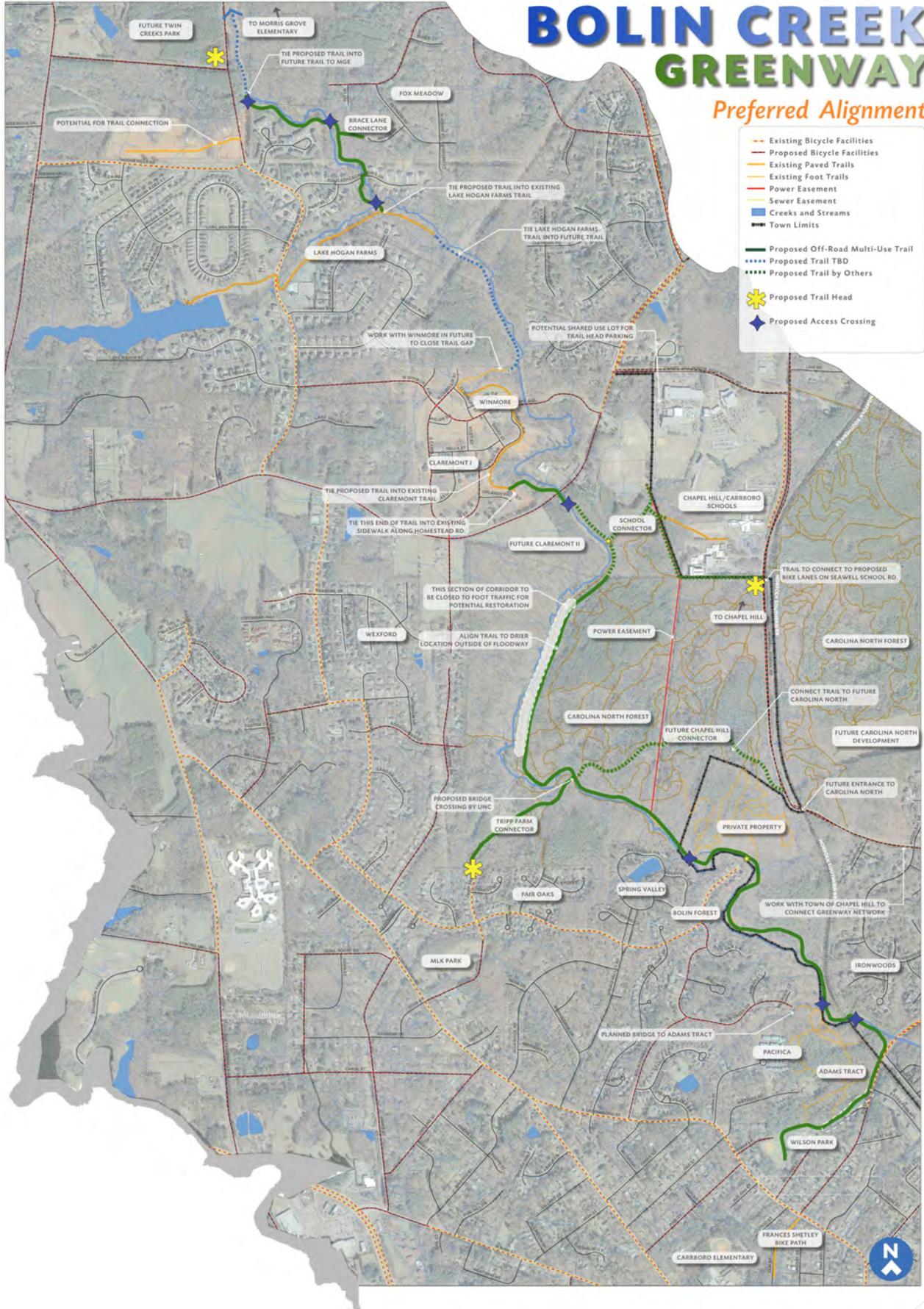
Proposed Design

This Plan makes recommendations for 4.8 miles of trail near Bolin and Jones Creek, which extends from Wilson Park to Homestead Rd., and from Lake Hogan Farms to Buckhorn Branch. Trail “connectors” are included, linking users to Tripp Farm Rd. and ten surrounding neighborhoods, five schools, three parks, and Seawell School Rd. If constructed, Carrboro’s Bolin Creek Greenway has the potential to link to Chapel Hill’s Bolin Creek Greenway network (both existing and future phases) and future planned developments such as Carolina North and Carolina Commons. Greenway planning objectives were defined for each segment of trail with details on materials and finishes, proposed crossings, land acquisition, and other important factors for consideration.



BOLIN CREEK GREENWAY

Preferred Alignment



Implementation

The implementation strategy provides a guide for the Town of Carrboro to realize a greenway facility. It is important for positive, successful action to take place in order to build momentum and support throughout the Town of Carrboro. A dedicated effort towards implementation will be necessary to create the envisioned corridor along Bolin and Jones Creeks. The implementation recommendations include action steps, project prioritization and phasing, and opportunities and constraints associated with each phase. In addition, detailed budget estimates are provided for each segment of trail.

Action Steps:

- 1) Adopt the Bolin Creek Greenway Master Plan
- 2) Create the Necessary Governance and Administrative Capability to Oversee Plan Implementation and Prioritize Next Steps
- 3) Seek Multiple Funding Sources
- 4) Coordinate with Stakeholders, Including Neighboring Jurisdictions and Utilities
- 5) Begin Top Priority Project Design
- 6) Begin the Easements/Land Acquisition Process
- 7) Begin Top Priority Project Construction
- 8) Begin Construction Administration
- 9) Program Trails
- 10) Create a Signage System
- 11) Conduct Operations and Maintenance

Bolin Creek Greenway - Phase 1A
 Probable Estimate of Construction Costs, 2009
 2088.48 linear feet (0.40 miles)

Demolition	Quantity	Cost	Unit	Subtotal
Clearing and grubbing understory (20' wide)	18,000	\$0.25	sf	\$4,500.00
Dumping Fees @ 6% of Demolition total			6%	\$270.00
			Subtotal	\$4,770.00
Trail Development	Quantity	Cost	Unit	Subtotal
Construction Entrance	2	\$1,900.00	ea	\$3,800.00
Temporary Rock Silt Check Type A	4	\$425.00	ea	\$2,550.00
Stabilization (Seeding: Temporary and Permanent)	20,885	\$0.25	sf	\$5,221.25
Straw with netting	500	\$4.50	lf	\$2,250.00
Temporary tree protection fence	3,050	\$4.00	lf	\$12,200.00
Temporary silt fence	2,350	\$5.00	lf	\$11,750.00
Temporary Diversion Ditch	300	\$3.00	lf	\$900.00
Temporary pipe inlet protection	1	\$900.00	ea	\$900.00
Trail initial grading (0-5 cu ft/lf)	525	\$3.30	lf	\$1,732.50
Trail fine grading (pavement)	2,088	\$3.30	lf	\$6,890.40
Trail fine grading (shoulders and ditch)	1,900	\$3.30	lf	\$6,270.00
10' wide multi-use asphalt trail	2,088	\$35.00	lf	\$73,080.00
2' wide gravel shoulder (both sides)	2,088	\$6.60	lf	\$13,780.80
Class B Rip Rap with filter fabric	15	\$42.00	ton	\$630.00
RCP Drainage Pipes	105	\$35.00	lf	\$3,675.00
Seeding or mulching trail edges (5' both sides)	20,880	\$0.13	sf	\$2,714.40
Estes Drive Intersection Signalization	1	\$25,000.00	ls	\$25,000.00
Concrete Curb and Gutter along Estes Drive	400	\$25.00	lf	\$10,000.00
* Street Trees along Estes Drive	19	\$750.00	ea	\$14,250.00
Boardwalk bridges for neighborhood access	12	\$75.00	lf	\$900.00
Signage				
* Mile Markers	2	\$400.00	ea	\$800.00
Trail and street regulatory/warning signs	11	\$220.00	ea	\$2,420.00
Directional signs	3	\$220.00	ea	\$660.00
* Educational signs	2	\$400.00	ea	\$800.00
Site Amenities				
* Benches (2 per mile recommended)	3	\$900.00	ea	\$2,700.00
* Bicycle rack (at Wilson Park trailhead)	1	\$800.00	ea	\$800.00
* Drinking fountains, with pet fountain (1 per mile)	1	\$2,000.00	ea	\$2,000.00
* Picnic tables/ tables (at trailheads)	1	\$550.00	ea	\$550.00
Trash receptacles (32-gallon, steel-at trailheads)	3	\$300.00	ea	\$900.00
Bollards (3 per trail/road intersection)	9	\$600.00	ea	\$5,400.00
			Subtotal	\$215,524.35
Design	Quantity	Cost	Unit	Subtotal
Wetlands and Stream Delineation (\$3,500/mile avg.)	0.13	\$3,500.00	mi	\$455.00
Surveying (\$10,000/mile avg.)	0.40	\$10,000.00	mi	\$4,000.00
Construction Documents @ 12 % of Dev. Cost			12%	\$25,862.92
			Subtotal	\$30,317.92
Subtotals				
Demolition				\$4,770.00
Trail Development				\$215,524.35
Design				\$30,317.92
SUBTOTAL (Demolition, Trail Development, Design)				\$250,612.27
Contingency (15% of total)			15%	\$37,591.84
TOTAL				\$266,304.11 **

Phasing Plan

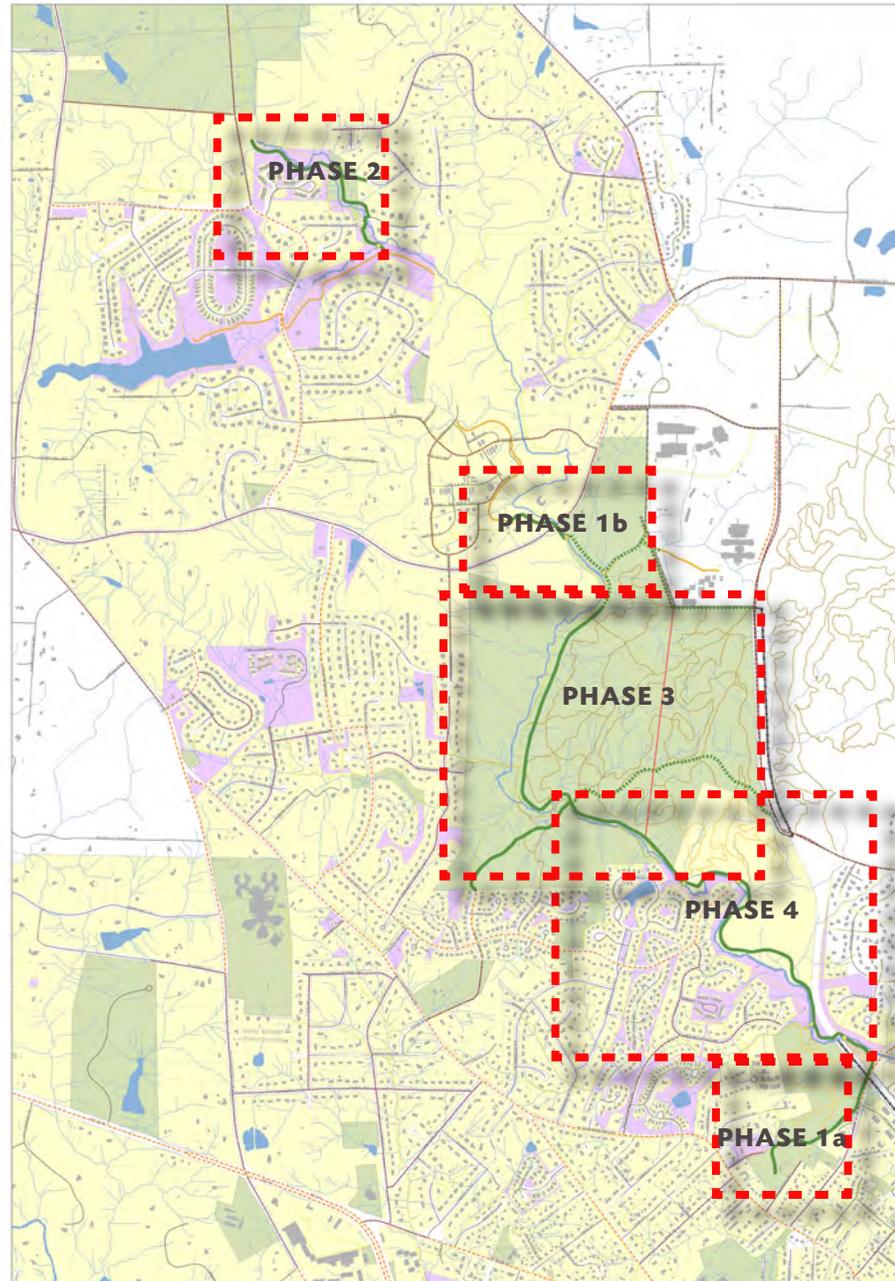
Input from the public, availability of funding, existing land ownership, permitting issues, engineering constraints, destination points and existing improvements projects were considered in the development of the phasing plan. The phasing breakdown includes:

- PHASE 1A: Wilson Park to Railroad - \$266,304
- PHASE 1B: CNF to Claremont - \$770,277
- PHASE 2: Jones Creek - \$672,451
- PHASE 3: Carolina North Forest - \$1,211,590
- PHASE 4: Railroad to PH Craig Tract - \$1,086,724

Note: Does not include the following: land acquisition, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, and taxes.

* Items not included in Total price shown (Additional cost for these items is \$21,900.00)
 ** Total price is sum of all costs and contingencies - \$21,900.00

Phasing Map for the Proposed Alignment



Operations and Maintenance

The Bolin Creek greenway should be regarded and maintained as a public resource. This begins with sound design, durable components, and a comprehensive management plan. A management plan should be embraced by the entities responsible for maintaining the greenway and trail network, at the beginning of the implementation process. In addition, community groups, residents, business owners, developers and other stakeholders should be engaged in the long term stewardship of the resources preserved and enhanced by this plan.

Operations management tools:

- Resource stewardship and enhancement
- Greenway facility safety and security
- Risk management and liability

- Hours of operation
- Trail user rules and regulations
- Police patrol/Emergency response system

Long and short-term maintenance guideline tables are included in the plan providing routine and remedial maintenance, frequency, and other specifications.

Funding and Land Acquisition

Funding

Implementing the recommendations of this plan will require a strong level of local support and commitment through a variety of local funding and easement/land acquisition mechanisms. Alternative transportation improvements are a high priority and can be supported through portions of the funding currently used for public safety, streets, parks and recreation, planning, community development, travel and tourism, downtown, and local bonds. Local bonds will be used to pay the local share of the Surface Transportation Program - Direct Attributable (STP-DA) funded portion of the proposed trail for Phase 1A. The Town should also seek a combination of funding sources that include local, state, federal, and private monies.

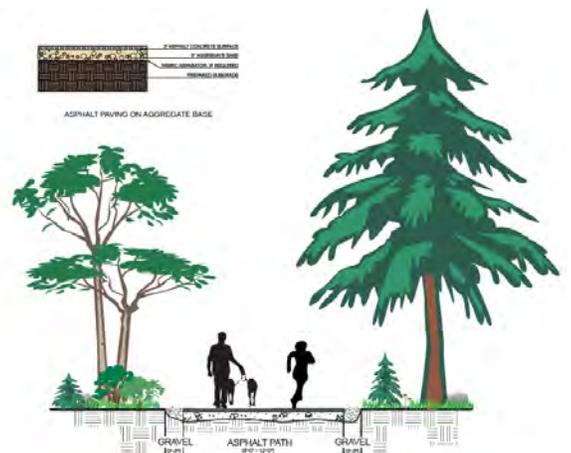
Land Acquisition

There are multiple methods for the Town of Carrboro to secure trail right-of-way for the Bolin Creek Greenway. The recommended trail alignment traverses public land (easements, parks, and Town-owned parcels) wherever possible; however a majority of the corridor will require working closely with land owners to secure easements. Land acquisition and resource protection methods should be strategic, efficient, and respectful. The Town of Carrboro should work with non-profit land protection agencies, land trusts, or environmental organizations when attempting to acquire or manage property. These entities often have a great deal of experience promoting the greenway benefits of conservation. Many options are available to obtain different degrees of control and ownership relationships to regulate resource use.

Design Guidelines

Guidelines for trail design were provided based on the best practices in use throughout the United States, as well as accepted national standards for greenway facilities. When designing and constructing the recommended facilities, ADA accessibility, low impact solutions, and sustainable materials should always be considered. For conceptual planning purposes, budget estimates prepared for this plan assumed a primary trail surface of concrete in creekside/flood prone areas and asphalt for hillslopes and upland areas. The final trail surface design will need to be completed as part of construction document preparation, and the following design guidelines be adhered to:

- 1) That no material that is prone to washing and high maintenance be used in flood prone areas. This includes organic and inorganic aggregates.
- 2) That AASHTO guidelines be followed for a multi-use trail surface.





Chapter 1: Introduction

Chapter Outline:

1. Overview
2. Project Purpose and Goals
3. Study Area

1. Overview

In November 2008, the Town of Carrboro commissioned Greenways Incorporated to prepare a conceptual master plan for the Bolin Creek Greenway. The Bolin Creek Greenway project was initiated by the Town for the purposes of alternative transportation, recreation, and environmental protection and restoration.

2. Project Purpose and Goals

Greenways preserve land and provide continuity to an open space system providing multiple benefits to the community and the environment. They connect natural areas and provide habitat for wildlife, as well as corridors for recreation. Greenways help filter sediment and pollutants from runoff thereby improving water quality; they enhance the natural function of streams and floodplains and accommodate stormwater flows. Creating a greenway along Bolin Creek provides an important opportunity to enhance the environment and quality of life for Town of Carrboro citizens.

Greenways Incorporated met with Town of Carrboro staff and members of the Carrboro Greenways Commission at the kickoff of the project to discuss overarching goals of the plan. The following are some of the key issues of importance in the development of the Bolin Creek Greenway.

Ecology and the Natural Environment

Bolin Creek is considered to be one of the Carrboro's richest natural resources. Therefore, protecting and improving water quality along the Bolin and Jones Creek corridor are of utmost importance to the Town. In 2006, Town staff teamed with the Chapel Hill Engineering Department, the North Carolina Department of Environment and Natural Resources (DENR), and the US Environmental Protection Agency (EPA) to form the *Bolin Creek Watershed Restoration Team*. The team's initiative includes efforts to restore and enhance the Bolin Creek Watershed as well as preparing grant applications and leveraging other resources to receive funding for these efforts.

Transportation

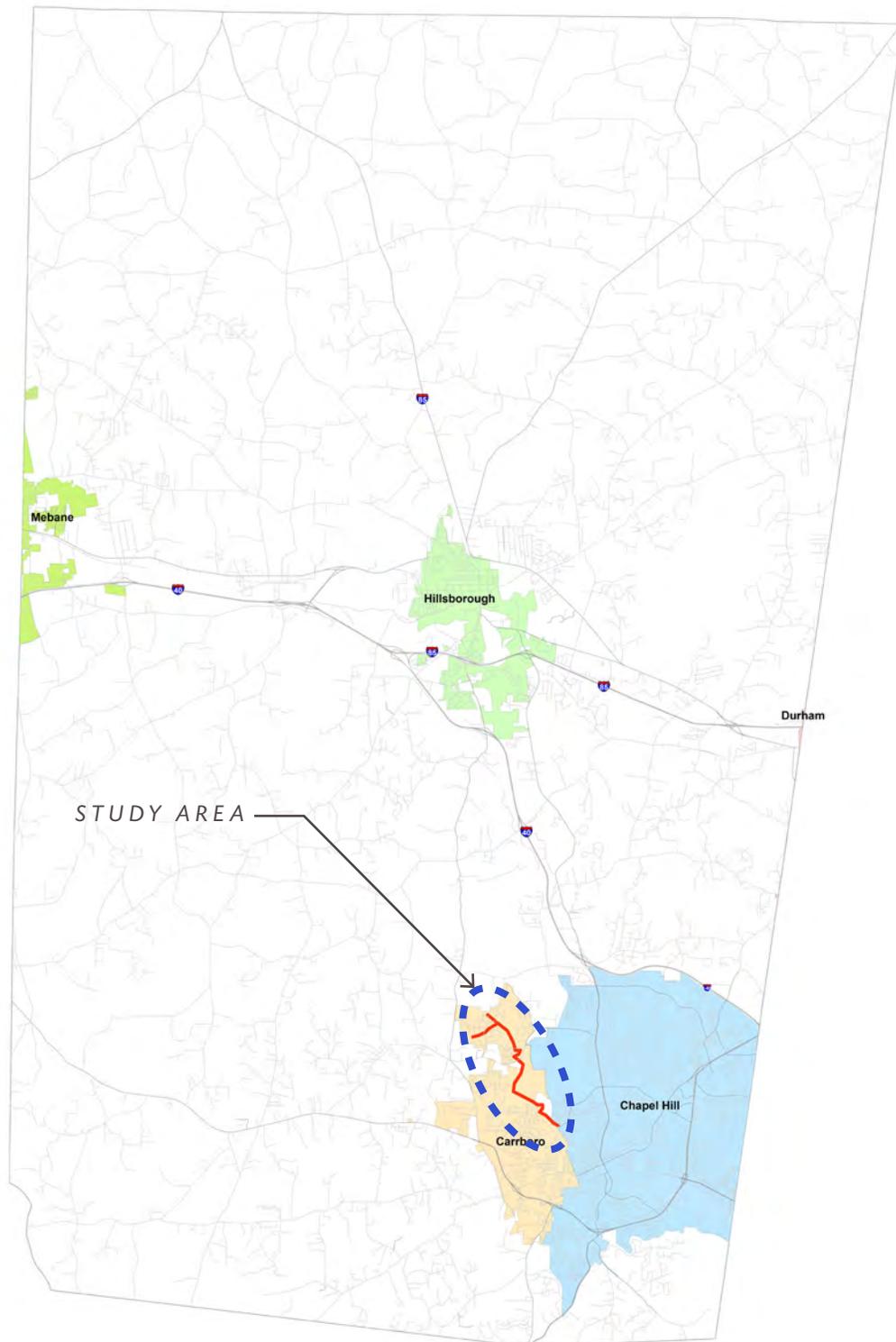
Greenways and off-road trails serve a transportation purpose by providing alternative routes of travel among the places where people live, work, learn, visit, shop and play. The proposed Bolin Creek Greenway provides an opportunity to connect various uses along its corridor and in neighboring jurisdictions, thereby decreasing automobile dependency and increasing bicycle and pedestrian mode share in Carrboro.

Recreation & Quality of Life

Providing safe access to Bolin and Jones Creek is important to the success of the proposed greenway. Trail accessibility and connectivity to other Carrboro parks and open space will be considered as part of the area's overall network of recreational facilities.

3. Study Area

The study area for this segment of the Bolin Creek Greenway extends approximately three miles, and makes up nearly 400 acres. The planning area starts at Estes Drive Extension and follows the creek north through Carolina North Forest to Homestead Road. Where Jones Creek and Bolin Creek converge, the study area travels along Jones Creek and ends at the northernmost edge of Lake Hogan Farms subdivision. Links to existing greenways are anticipated in the following neighborhoods: Claremont I and II, Winmore, and Lake Hogan Farms. Additionally, connections to Cobblestone, Fair Oaks, Spring Valley, all phases of Bolin Forest, Wexford, and Fox Meadow are anticipated.





Chapter 2: Existing Conditions

Chapter Outline:

1. Overview
2. Green Infrastructure Assessment
3. Grey Infrastructure Assessment
4. Land Use
5. Accessibility & Circulation
6. Destinations
7. Corridor Impacts
8. Trail Feasibility
9. Preliminary Hydraulic Analysis

1. Overview

Greenways Incorporated (GWI), EcoScience (a division of PBS&J), and PBS&J-Charlotte conducted an existing conditions evaluation in January 2009 of the proposed greenway corridor. Consultant staff walked the majority of the corridor, photo-documenting site features, taking notes, observing use and connections, walking existing trails and mapping specific areas using Global Positioning Systems (GPS). Sites of opportunities and constraints were mapped using Geographic Informational Systems (GIS). The examination and analysis of the corridor included both GIS mapping and fieldwork. A graphic presentation of these results is included in Chapter 3: Opportunities and Constraints.

2. Green Infrastructure Assessment

Part of the analysis along the corridor includes observing existing vegetation, signs of wildlife, surrounding topography, significant natural features, and adjacent or intersecting streams. The Bolin Creek corridor includes natural features such as Bolin Creek and associated tributaries, Jones Creek and associated tributaries, wetlands, riparian forest, stands of mature hardwood, and rolling topography. The corridor supports abundant flora and fauna. Wildlife sightings and evidence at first glance indicate the presence of deer, raccoon, beaver, owl, and a variety of bird species including the red-shouldered hawk, flocks of blue birds, woodpeckers, and migratory cedar waxwings to name just a few. Stands of mature hardwood can be found along the corridor with tulip poplar, sweet gum, beech, sycamores, and oaks very common.

A Division of PBS&J (EcoScience) personnel conducted a preliminary constraints evaluation of potential environmental red flag issues which may affect the proposed greenway alignment and the findings are illustrated below.

Methodology

Natural resources data were gathered from a variety of sources including U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping, Natural Resource Conservation Service (NRCS) soils mapping, NC Flood Mapping Program Light Detection and Ranging (LIDAR) topographic data, U.S. Geological Survey (USGS) topographic mapping, USFWS distribution records of federally listed species, NC Natural Heritage Program (NCNHP) listed species occurrence data, Inventory of Natural Areas and Wildlife Habitat of Orange County, NC, NC Division of Water Quality (NCDWQ) watershed and water quality data, NC Gap Analysis Program (NCGAP) Land Use/Land Cover (LULC) data, and aerial photography of Orange County.

Field mapping was prepared and field investigations were conducted in January 2009. Field observations were used to modify the GIS database for the project and natural resources constraint data was utilized by GWI while developing the greenway alignment.

Physical Features

The Bolin and Jones Creek Project Study Area (PSA) is located within the Carolina Slate Belt ecoregion (*Griffith et al. 2002*), which extends from southern Virginia, across the Carolinas, and into Georgia. The mineral-rich metavolcanic and metasedimentary rocks with slaty cleavage are finer-grained and less metamorphosed than most Piedmont regions. Some parts are rugged, such as the Uwharrie Mountains, and many areas are distinguished by trellised drainage patterns. Silty and silty clay soils, such as the Georgeville and Herndon series, are typical. This region contains some of the lowest water-yielding rock units in the Carolinas. The landscape elevation ranges from approximately 370 feet North American Vertical Datum (NAVD 1988) at the southern extent of the PSA to 590 feet NAVD along a ridge in the northwestern portion of the Jones Creek extent of the PSA (Chapel Hill, NC USGS quadrangle).

A significant county-wide natural area is located in the southern portion of the PSA near Adams Tract and north along the large privately-owned tract according to the Natural Areas and Wildlife Habitat Inventory of Orange County. Noteworthy features include mature hardwood forest and swamp forest, as well as a rare dragonfly species.

According to the Orange County soil survey, approximately 12 percent of the PSA is comprised of partially hydric soil map units. Map units with hydric inclusions include Enon and Chewacla series. Approximately 86 percent of the PSA is mapped as non-hydric soils. Partially hydric soil map units generally follow the stream channel and banks in the Jones Creek section, and are mostly confined to interstream flat areas in the Bolin Creek section. Soil units range from somewhat poorly drained interstream flat soils to very poorly drained floodplain soils.

The PSA is located within the Cape Fear River Basin in USGS Hydrologic Unit (HU) 03030002, NCDWQ subbasin 03-06-06. The Jones Creek extent of the PSA contains two named streams, Jones Creek and Buckhorn Branch. Jones Creek flows northwest to southeast through the entire Jones Creek section of the PSA. Buckhorn Branch enters the PSA from its source to the west and flows into Jones Creek. There are three named streams within the Bolin Creek section of the PSA. These streams are Bolin Creek, Jolly Branch, and Dry Gulch Creek. Jolly Branch enters the PSA from the east and connects to Bolin Creek, which flows northwest to southeast through the entire Bolin Creek section of the PSA. Bolin Creek is included in the 303(d) list from Pathway Dr. downstream. Dry Gulch flows along the edge of the Pacifica and Bolin Forest subdivisions into Bolin Creek. Small streams within this subbasin typically stop flowing during low flow periods due to lack of groundwater recharge. All stream systems within the PSA carry the same best usage classification (C, NSW). There are no 303(d) listed (impaired) streams or National Pollutant Discharge Elimination System (NPDES) permitted dischargers within the PSA.

Biological Features

The PSA supports both maintained/managed areas and natural communities. Wildlife directly observed or determined to be present through evidence (tracks, scat) during field investigations are indicated with an asterisk (*).

Maintained/managed areas are dominated by open fields, maintained rights-of-way and landscaped areas. Vegetation within maintained/managed areas varies from common herbaceous species and horticultural varieties of shrubs and trees to invasive exotics. These areas likely provide habitat for wildlife adapted to disturbance and habitat fragmentation such as white-tailed deer (*Odocoileus virginianus*), raccoon* (*Procyon lotor*), Norway rat (*Rattus norvegicus*), little brown myotis (*Myotis lucifugus*), American robin* (*Turdus migratorius*), blue jay* (*Cyanocitta cristata*), northern cardinal* (*Cardinalis cardinalis*), worm snake (*Carphophis amoenus*), and brown snake (*Storeria dekayi*).

Natural communities (as described in *Classification of the Natural Communities of North Carolina* [Schafale and Weakley 1990]) observed within the PSA include **Piedmont/Mountain Bottomland Forest**, **Basic Mesic Forest** (Piedmont Subtype) and **Mesic Mixed Hardwood Forest** (Piedmont Subtype).

Piedmont/Mountain Bottomland Forests occur on parts of floodplains, floodplain ridges, and terraces. Since they do not occur on active levees, greater vegetation diversity as well as a more developed herbaceous layer is typical. Canopy species include tulip poplar (*Liriodendron tulipifera*), cherrybark oak (*Quercus pagoda*), swamp chestnut oak (*Quercus michauxii*), American elm (*Ulmus americana*), ironwood (*Carpinus caroliniana*), green ash (*Fraxinus pennsylvanica*), loblolly pine (*Pinus taeda*), black walnut (*Juglans nigra*), sweetgum (*Liquidambar styraciflua*), American sycamore (*Platanus occidentalis*), and shagbark hickory (*Carya ovata*). The herb and shrub layers are diverse, but can sometimes be heavily invaded by Japanese honeysuckle (*Lonicera japonica*), Russian olive (*Elaeagnus angustifolia*), and Chinese privet (*Ligustrum sinense*), especially near road and utility margins. Other bottomland shrubs include flowering dogwood (*Cornus florida*), tag alder (*Alnus serrulata*), spicebush (*Lindera benzoin*) and pinxter-flower (*Rhododendron periclymenoides*). Herbs include wild ginger (*Hexastylis arifolia*), soft rush (*Juncus effusus*), bottlebrush grass (*Elymus hystrix*), and sedges (*Carex* spp.). A few large areas of joint-head arthraxon (*Arthraxon hispidus*) and microstegium (*Microstegium vimineum*), both invasive exotic grasses, were observed. Vines consist of cat greenbrier (*Smilax glauca*), poison ivy (*Toxicodendron radicans*), and others. Wildlife species that prefer bottomland habitat such as beaver* (*Castor canadensis*), mallard* (*Anas platyrhynchos*), belted kingfisher* (*Ceryle alcyon*) and northern water snake (*Nerodia sipedon*) are prevalent. Significant beaver activity was observed within the Bolin Creek section of the PSA.

Basic Mesic Forests (Piedmont Subtype) occur along lower slopes, ravines and well-drained stream bottoms with basic or circumneutral soils. They are distinguished from other adjacent communities by richer soils and greater vegetative species richness. The canopy is dominated by mesophytic trees such as tulip poplar, American beech (*Fagus grandifolia*), Eastern red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), hackberry (*Celtis laevigata*), southern sugar maple (*Acer floridanum*), buckeye (*Aesculus sylvatica*), hop hornbeam (*Ostrya virginiana*), willow oak (*Quercus phellos*), and northern red oak (*Q. rubra*). The herb layer is generally dense and very diverse. Herb layer species observed include Christmas fern (*Polystichum acrostichoides*), wild ginger, cranefly orchid (*Tipularia discolor*), and rattlesnake fern (*Botrychium* sp.). Wildlife species include white-tailed deer*, raccoon*, hermit thrush* (*Catharus guttatus*), winter wren* (*Troglodytes troglodytes*), Cooper's hawk* (*Accipiter cooperii*), barred owl* (*Strix varia*), ringneck snake (*Diadophis punctatus*), and five-lined skink (*Eumeces fasciatus*).

Mesic Mixed Hardwood Forests (Piedmont Subtype) occur on lower slopes, steep north-facing slopes, ravines, and acidic well-drained stream bottoms. The canopy is dominated by mesophytic trees such as American beech, white oak (*Quercus alba*), tulip poplar, sourwood (*Oxydendrum arboretum*), shortleaf pine (*Pinus echinata*), mockernut hickory (*Carya alba*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*). The herb layer is often moderately dense and diverse, though it may be sparse under heavy shade. Mesic Mixed Hardwood Forests can be distinguished from Basic Mesic Forests by more acidic soils, absence of base-loving plants, sparser herb layer, and lower floristic diversity. Some herbs observed were crane fly orchid, with broomsedge (*Andropogon virginicus*), wingstem (*Verbesina occidentalis*), dog fennel (*Eupatorium capillifolium*), and invasive sericea lespedeza (*Lespedeza cuneata*) along sunny edges. The vine component includes muscadine grape (*Vitis rotundifolia*), greenbrier (*Smilax rotundifolia*), and trumpet creeper (*Campsis radicans*). Wildlife species likely include those found in Basic Mesic Forests.

Protected Species

The following species are listed by the USFWS as protected (i.e., those with a federal listing of Threatened or Endangered) for Orange County: red-cockaded woodpecker (*Picoides borealis*), dwarf wedgemussel (*Alasmidonta heterodon*), Michaux's sumac (*Rhus michauxii*), and smooth coneflower (*Echinacea laevigata*). The bald eagle (*Haliaeetus leucocephalus*) has been federally delisted but still maintains protection under the Bald and Golden Eagle Protection Act (BGPA). All of the protected species are federally listed as Endangered. According to NCNHP records (as of December 2008), no federally protected species occur within a 3-mile radius of the PSA. Based on preliminary field investigations, habitat for protected species may occur within the PSA and review of additional available information and/or comprehensive surveys may be required by the USFWS.

Red-cockaded woodpecker – Endangered

USFWS optimal survey window: year round; November-early March (optimal)

Habitat Description: The red-cockaded woodpecker (RCW) typically occupies open mature stands of southern pines, particularly longleaf pine (*Pinus palustris*), for foraging and nesting/roosting habitat. The RCW excavates cavities for nesting and roosting in living pine trees, aged 60 years or older, and which are contiguous with pine stands at least 30 years of age to provide foraging habitat. The foraging range of the RCW is normally no more than 0.5 miles.

Based on preliminary field investigations, the project *may affect, but is not likely to adversely affect* the red-cockaded woodpecker. The PSA does not contain suitable stands of open mature pines for foraging or nesting/roosting.

Dwarf wedgemussel – Endangered

USFWS optimal survey window: year round

Habitat Description: In North Carolina, the dwarf wedgemussel is known from the Neuse and Tar River drainages. The mussel inhabits creek and river areas with a slow to moderate current and sand, gravel, or firm silt bottoms. Water in these areas must be well oxygenated. Stream banks in these areas are generally stable with extensive root systems holding soils in place.

The PSA has streams which exhibit some of the characteristics for dwarf wedgemussel habitat, but is located within the Cape Fear River Basin and therefore will have *no effect* on the dwarf wedgemussel.

Michaux's sumac – Endangered

USFWS optimal survey window: May-October

Habitat Description: Michaux's sumac, endemic to the inner Coastal Plain and lower Piedmont, grows in sandy or rocky, open, upland woods on acidic or circumneutral, well-drained sands or sandy loam soils with low cation exchange capacities. The species is also found on

sandy or submesic loamy swales and depressions in the fall line Sandhills region as well as in openings along the rim of Carolina bays; maintained railroad, roadside, power line, and utility rights-of way; areas where forest canopies have been opened up by blowdowns and/or storm damage; small wildlife food plots; abandoned building sites; under sparse to moderately dense pine or pine/hardwood canopies; and in and along edges of other artificially maintained clearings undergoing natural succession. In the central Piedmont, it occurs on clayey soils derived from mafic rocks. The plant is shade intolerant and, therefore, grows best where disturbance (e.g., mowing, clearing, grazing, periodic fire) maintains its open habitat.

The PSA contains many instances of suitable habitat for Michaux's sumac. Maintained clearings include roadway and powerline right-of-ways, as well as maintained sewer easements that extend through the majority of the greenway corridor. Surveys for this species will likely be required during the recommended survey window of May through October.

Smooth coneflower – Endangered

USFWS optimal survey window: late May-October

Habitat Description: Smooth coneflower, a perennial herb, is typically found in meadows, open woodlands, the ecotonal regions between meadows and woodlands, cedar barrens, dry limestone bluffs, clear cuts, and roadside and utility rights-of-way. In North Carolina, the species normally grows in magnesium- and calcium- rich soils associated with gabbro and diabase parent material, and typically occurs in Iredell, Misenheimer, and Picture soil series. It grows best where there is abundant sunlight, little competition in the herbaceous layer, and periodic disturbances (e.g., regular fire regime, well-timed mowing, careful clearing) that prevents encroachment of shade-producing woody shrubs and trees. On sites where woody succession is held in check, it is characterized by a number of species with prairie affinities.

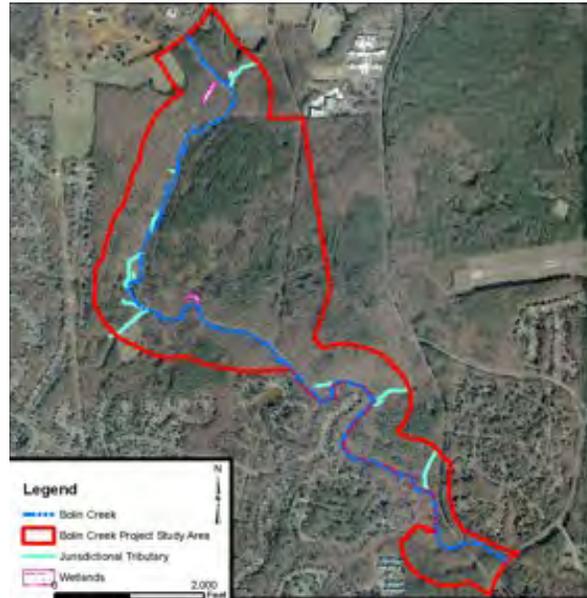
The PSA contains substantial areas of Georgeville and Iredell soils, which are known to be pH-neutral at or near the soil surface. Suitable habitat is likely to occur where these soil areas intersect maintained roadway or utility easements. Detailed surveys for this species will likely be required during the recommended survey period of late May through October.



Looking south down easement along Carolina North Forest property.

Jurisdictional Areas and Permitting

A jurisdictional delineation was not performed as a part of this preliminary constraints evaluation. However, potential jurisdictional areas were documented during field investigations. Streams, wetlands, and waters of the U.S. were observed within the PSA. Town of Carrboro and NC Division of Water Quality (NCDWQ) staff walked the corridor from Estes Dr. to Homestead Rd. in October, 2009. NCDWQ staff intend to return to the area and provide jurisdictional determinations for stream features.



Section 404 Resources within the Bolin Creek PSA



Section 404 Resources within the Jones Creek PSA

Prior to any construction activity, written justification for impacts and potential compensatory mitigation will be required for 404/401 permit issuance by the United States Army Corps of Engineers (USACE) and NCDWQ, respectively. A series of nationwide permits are available through the USACE for minor, specific activities. Nationwide Permit #42 (for Recreational Facilities) may be appropriate, along with the accompanying NCDWQ General Certification 3705. If less than 300 linear feet of stream and less than 0.5 acre of total wetlands and open waters are impacted due to proposed construction activities, a Nationwide Permit (NWP) may be issued by the USACE with an associated 401 Water Quality Certification issued by NCDWQ. Proposed impacts exceeding the above-mentioned thresholds will likely require an Individual Permit (IP).

UNC staff reported that UNC is in the process of applying for an individual permit for the Carolina North property. The Town and UNC are encouraged to coordinate permitting activities with regard to the alignment on UNC property.

Summary of Green Infrastructure Assessment

- Suitable habitat for federally protected species (Michaux's sumac and smooth coneflower) may be present within the PSA. The USFWS may require additional information and/or comprehensive field surveys to evaluate for the presence of protected species habitat and individuals during Section 404 permitting, if applicable. Current NCNHP records do not indicate the presence of any occurrences of federally protected species within a 3-mile radius of the PSA.
- The PSA contains jurisdictional streams, wetlands, and other waters of the U.S. A jurisdictional delineation of these systems is recommended along the preferred design corridor for the greenway segments once those alignments have been identified.
- Although North Carolina State Historic Preservation Office (SHPO) records were not reviewed for the purposes of this preliminary constraints evaluation, historic and other cultural resources may be present within the PSA. For example, the John Castlebury Mill, built ca. 1763 resides on southern UNC property. Other sites include the Weaver House on the edge of the Adams Tract which served as a tavern in colonial days and was the home of the Adams family; and the Iron Mine located in Ironwoods neighborhood. The Lloyd-Andrews Historic Farmstead is located near the headwaters of Bolin Creek. This was one of the original land-grants from Lord Grandville in the mid 1700's. 125 acres have been put in a conservation easement held by TLC for preservation. A review of SHPO records is recommended during design development.
- Phase I Environmental Assessment (EA) tasks were not undertaken for the purposes of this evaluation. Thus, the PSA was not examined for the presence of hazardous waste sites, underground storage tanks (USTs), or any other similar potential constraints. While some junk piles and an old car were identified within the PSA, no visible sources of contamination were observed.

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3. Grey Infrastructure Assessment

Manmade elements, such as existing buildings, structures, utilities, roadways, and railroads, were observed and documented along the study area.

Utilities

The Orange County Water and Sewer Authority (OWASA) sewer easement makes up a large portion of the corridor offering open cleared areas suitable for trail development. Sewer trunk lines traverse the corridor in some areas near the Bolin Forest and Spring Valley neighborhoods, as well as Carolina North Forest. If utilized for trail routing, these easements will require negotiations with OWASA with respect to their facilities.

Railroad Rights-of-Way

Railroad routes adjacent to or intersecting a trail present a significant situation within trail development. The rights-of-way associated with rail lines are typically very wide and their owners fear the liability associated with public access. The proposed Bolin Creek trail will encounter the Norfolk Southern rail line, which parallels and then traverses the southern portion of the corridor. Depending on final trail alignment, negotiations will need to be made with Norfolk Southern as to the degree of public access allowed within their right-of-way.

Roadways

Major roadway intersections are the most hazardous trail intersection. Although less frequent along the corridor, two major roadways occur at Homestead Road to the north and Estes Drive Extension at the south of the study area. Turtleback Crossing, a residential thoroughfare within Lake Hogan Farms, also crosses the corridor but is a local roadway with lower speed limits. These roadway intersections present significant challenges to the development of the greenway, and providing a safe and environmentally sound solution for crossing these roadways warrant further analyses.

- *Homestead Road* -High motor vehicle speeds (frequently over 40 miles per hour), and two lanes of traffic make up this roadway which connects northern Carrboro to western Chapel Hill. Poor site lines at grade make a crossing unlikely. Below-grade conditions present feasibility for a trail underpass with ample vertical clearance.



Railroad overpass at Estes Dr.



Typical sewer trunk line along Bolin Creek



Homestead Rd. at grade.



Bridge at Homestead Rd.

- *Estes Drive Extension* - A highly trafficked, north-south thoroughfare connecting Chapel Hill to Carrboro. Roadway crossing is approximately 30-feet above Bolin Creek with 3:1 slopes presenting a topographical challenge for at-grade crossing conditions. Poor site lines at north and south ends present dangerous at-grade crossing conditions.



Estes Dr. at grade.



The box culvert beneath Estes Dr. extension.

- *Turtleback Crossing* - A residential connector, this roadway is two lanes and has a speed limit of 25 miles per hour. At-grade crossings are more feasible at this location because site lines are open and topography surrounding the roadway crossing is suitable for trail development.



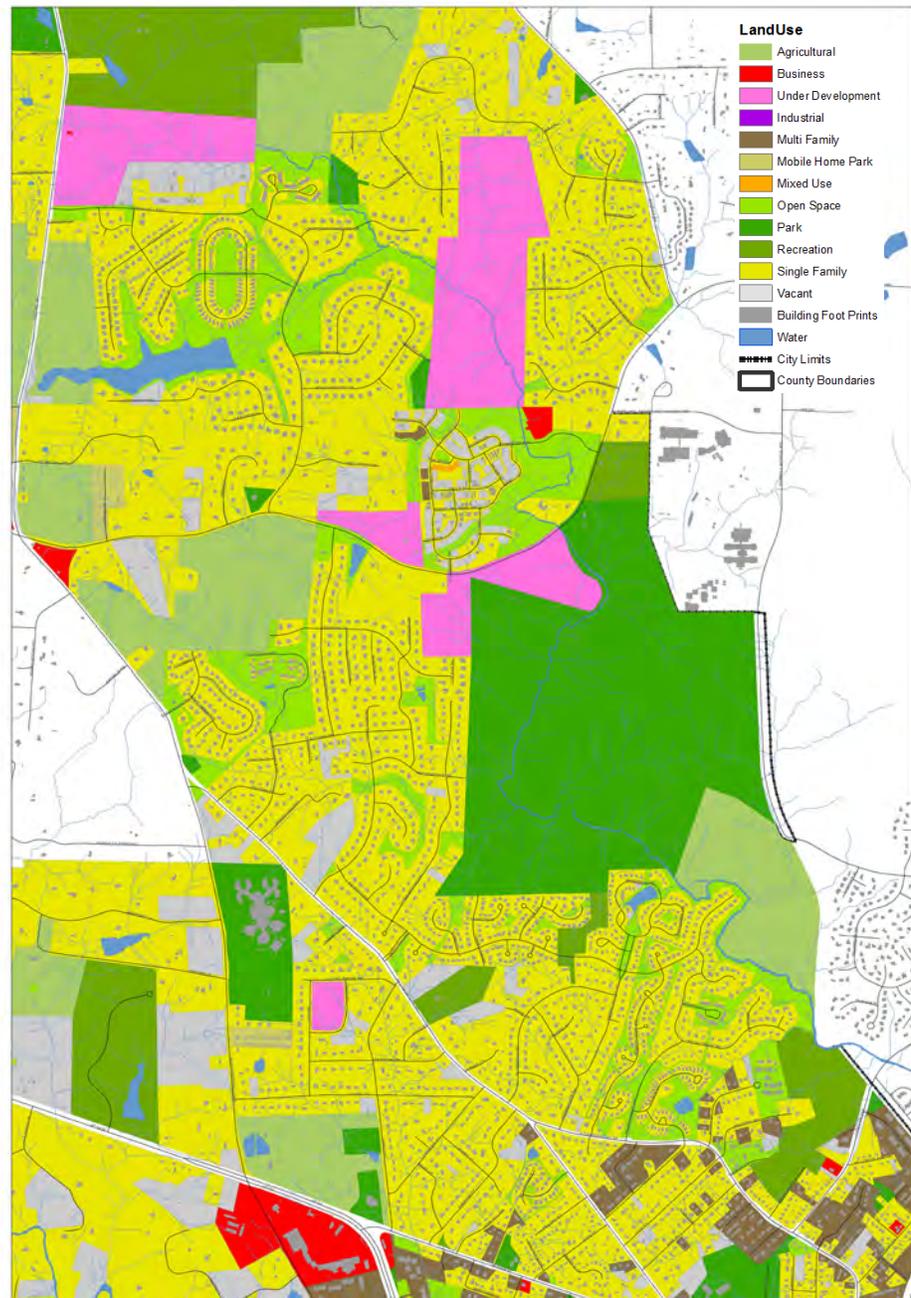
Turtleback Crossing at grade.



Creek crossing conditions beneath Turtleback Crossing.

4. Land Use

Residential land use makes up the majority of the study corridor. Although much of the property along the corridor is zoned for and used for residential purposes, Carrboro’s land use regulations require protection of 40% open space. These conservation areas include stream corridors. Per the Town of Carrboro’s land use ordinance, connections to these open space areas are expected through greenway development along stream corridors. A vast amount of open space is found along the corridor and owned by the University of North Carolina (UNC), as well as undeveloped privately owned property near Bolin Creek. The State of North Carolina also owns land along the corridor that is leased for the local school system and government use. The corridor is adjacent to the following neighborhoods: Ironwoods, Bolin Forest, Spring Valley, Cates Farm, Claremont, Cobblestone, Winmore, Lake Hogan Farms, Pacifica, Fair Oaks, Wexford, and Fox Meadow. A sewer trunk line parallels Bolin Creek with connecting lines extending into adjacent neighborhoods.



Map showing various land use along study corridor.

5. Accessibility and Circulation

The Bolin Creek corridor is a tremendous resource to the Town of Carrboro, providing a contiguous naturalized corridor throughout most of the study area. Due to the high attraction of this resource, neighborhoods surrounding the creek have generated a large network of social trails. In addition, UNC has worked closely with community recreational clubs such as the Trailheads and Triangle Off Road Cyclists (TORC) to build miles of trails throughout the Carolina North Forest and adjacent open space. Ladder bridges, steps, pavilions, play areas and signage have been installed at various locations along the corridor by surrounding home owner’s associations (HOA’s).

The Adams Tract, a Town-owned parcel dedicated to open space and recreational use adjacent to Estes Dr., connects to Wilson Park. This park provides parking, an athletic field, a tennis court pavilion, a tot lot, and restroom facilities. Foot trails lead to Bolin Creek through forested portions of Adams Tract. The southern portion of Adams Tract along Estes Dr. is currently an informal parking area which creates potential safety concerns and contributes to erosion in this area.

Other areas along Seawell School Rd. and within the Fair Oaks neighborhood have trail access areas with kiosks, waste and recycling, and gates that have been installed by the University. North of Carolina North Forest, neighborhoods with existing paved trails provide the potential for greenway network tie-ins. Winmore, Claremont, and Lake Hogan Farms have installed paved trails within their neighborhoods.



Trail conditions behind Chapel Hill-Carrboro schools.



Foot trails behind Tallyho Trail.



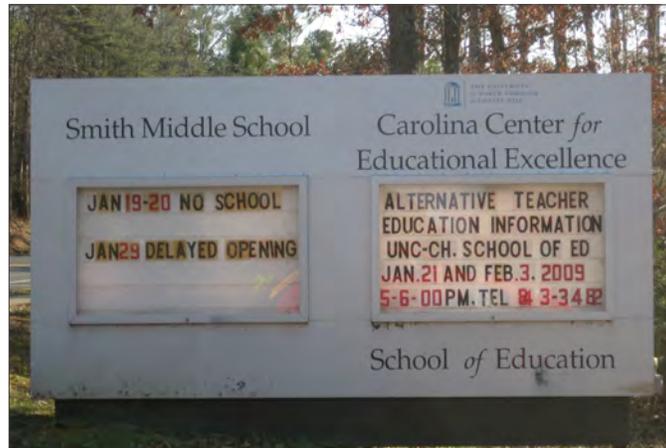
Foot trails leading down to Bolin Creek from Wild Oak Dr.



Paved trail behind Morris Grove Elementary School.

6. Destinations

The Bolin Creek corridor experiences high levels of recreational use within Carolina North Forest as well as targeted travel for commuting patterns. Nearby residents use the sewer easement frequently to connect to adjacent pedestrian facilities leading to downtown Carrboro and Chapel Hill/Carrboro schools. Other surrounding destinations and potential connections include Morris Grove Elementary off Eubanks Rd., MLK Park off Hillsborough Rd., the Frances Shetley Bikepath off Greensboro Rd., and future phases of Chapel Hill's Bolin Creek Greenway, and the Carolina North development, which is currently in design review.



One of five schools along the corridor.



Wilson Park in Carrboro, NC.

7. Corridor Impacts

The wide, cleared surface of the sewer easement east of Bolin Creek provides innumerable opportunities for walking, mountain biking, running, jogging, dog walking and hiking. This high level of foot and bicycle traffic, combined with maintenance vehicle access, has caused the easement surface to become severely eroded and worn down. Deep ruts caused by bicycle and automobile tires create inundated conditions during storm events, thereby encouraging trail braiding along the path of travel. This sequence of events, in combination with

continuous high use, widens the area of disturbance over time. The agitated surface conditions created by foot and bike traffic lead to increased erosion and sedimentation along the corridor, which has the potential to impact water quality during storm events.



Maintenance vehicles and overuse have contributed to erosion along the corridor.



Visible signs of overuse along Bolin Creek.



Hardscape materials imported onsite have furthered erosion problems.

8. Trail Feasibility

Key factors contributing to the feasibility of trail development, such as vertical and horizontal corridor clearance, surrounding land use and property ownership, and ancillary features for future trail use (such as crossing areas and trailheads) were observed and noted while in the field. Some areas of the corridor may be more suitable for trail alignment, from a cost standpoint or an environmental perspective. Constraints were also documented. Both opportunities and constraints are presented in the next chapter.

A significant challenge to trail development along the corridor will be bridge crossings; either across Bolin Creek or its associated tributaries. These and study area wetlands will require permitting costs and impact mitigation as well as further engineering studies. For the purposes of this report, PBS&J performed a preliminary evaluation of several potential pedestrian bridge crossing areas along the corridor and the results of their findings are presented in the next section.

9. Preliminary Evaluation of Possible Hydraulic Impacts of Pedestrian Bridge Locations along Bolin and Jones Creeks

Description

The defined reach of Bolin Creek is located on Flood Insurance Rate Map (FIRM) Panel 9779 in Orange County, NC, Map Number 3710977900J, effective date February 2, 2007. Greenway development along Jones Creek is primarily captured on FIRM Panel 9870 in Orange County, NC, Map Number 3710987000J, effective date February 2, 2007. The recommended alignment for the greenway will most likely fall within Zones AE and X as well as the floodway and non-encroachment area. Zone AE represents a special flood hazard area (SFHA), or 100-year floodplain, that has been studied in detail by the North Carolina Floodplain Mapping Program (NCFMP) through the Federal Emergency Management Agency's (FEMA) Cooperative Technical Community partnership initiative; this zone contains base (100-year) flood elevations (BFEs). Zone X represents the 500-year floodplain, areas of 100-year floodplain with average depths less than one (1) foot or drainage areas less than one (1) square mile, or areas of 100-year floodplain protected by levees. The floodway is the stream channel and adjacent floodplain areas required to permit passage of the base flood event without cumulatively increasing the water surface elevation (WSEL) greater than one (1) foot. Similar to a floodway, a non-encroachment area is designated in areas which are studied in limited detail by NCFMP, and are considered enforceable by a community in prohibiting development.

Purpose

The purpose of this study is to qualitatively assess the hydraulic impacts of potential pedestrian bridge locations for the proposed greenway along Bolin and Jones Creeks. The extent of work performed included data collection, office research, one field visit and generation of this data. Once the trail design (including all bridge locations) is complete, coordination with the North Carolina Floodplain Mapping Program (NCFMP) will be required to address possible impacts to the base floodplain and associated floodway/encroachment area. Such coordination will most likely require a more detailed flood study.

Hydraulic Impacts

The following paragraphs will address each potential crossing site individually and correspond to the locations shown on the included exhibits. An overall map is shown with each location on the next page.

Evaluated Pedestrian Bridge Locations along Bolin and Jones Creek



A. Buckhorn Branch Crossing

This site is located on Buckhorn Branch (tributary to Jones Creek) and currently has rip-rap lined banks with additional rock in channel to facilitate the crossing of vehicles to gain access to a sanitary sewer easement. The channel's confluence with Jones Creek occurs immediately downstream. This site is presently located within the SFHA (~ 120 ft wide) and stream buffer, appears to be contained within a non-encroachment area (~ 40 ft), and experiences a 100-year flood discharge of approximately 450 cubic feet per second (cfs). PBS&J recommends the implementation of a low-flow, curbed concrete bridge connecting the stream banks of Buckhorn Branch, which would permit the greenway to utilize the existing sanitary sewer easement northward.



B. Homestead Roadway Bridge

This site is located on Bolin Creek at the Homestead Road Bridge with a large sanitary sewer ductile iron pipe (SSDIP) crossing immediately downstream of the bridge. This site is presently located within the SFHA (~ 130 ft wide) and stream buffer, is contained within a floodway (~ 60 ft), and experiences a 100-year flood discharge of approximately 2,790 cfs. PBS&J recommends utilizing the existing sanitary sewer easement along the west bank of Bolin Creek as the proposed greenway alignment and excavating the west bank underneath the bridge to establish an underpass for pedestrian access north and south of Homestead Road.



C. Crossing south of Homestead Roadway Bridge

This site is located on Bolin Creek at a SSDIP crossing and is presently located within the SFHA (~ 600 ft wide) and stream buffer, is contained within a floodway (~ 400 ft), and experiences a 100-year flood discharge of approximately 2,790 cfs. PBS&J recommends the implementation of an arched wooden bridge with guardrails that will connect the existing SS easement paralleling the east and west stream banks in such a way that will not hinder access to the SSDIP and its two associated manholes. Town staff, Sungate Engineering, and GWI visited this site after the initial field investigation, resulting in a recommendation to relocate the crossing upstream to minimize flood zone impacts.



D. Crossing at Spring Valley Subdivision

This site is located at the confluence of Bolin Creek and a tributary near a SSDIP crossing east of Spring Valley subdivision. This site is presently located within the SFHA (~ 240 ft wide) and stream buffer, is contained within a floodway (~ 90 ft), and experiences a 100-year flood discharge of approximately 3,600 cfs. A three-foot wide wooden footbridge currently provides access from the playground (west bank) to the existing SS easement on the east side of Bolin Creek. PBS&J recommends the implementation of a low-flow, curbed concrete bridge over the tributary immediately downstream of the SSDIP crossing and an arched wooden bridge with guardrails over Bolin Creek in vicinity of the existing footbridge to provide access from the playground.



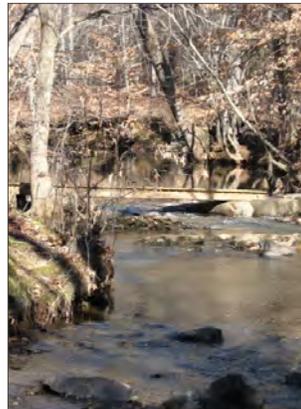
E. Pathway Dr. Crossing

This site is located on Bolin Creek at a SSDIP crossing. This crossing area is accessed at the end of Pathway Dr. and represents an important potential pedestrian connection to Bolin Forest. The site is presently located within the SFHA (~ 140 ft wide) and stream buffer, is contained within a floodway (~ 110 ft), and experiences a 100-year flood discharge of approximately 3,600 cfs. One SS easement parallels the east bank, while another is perpendicular to the west bank. PBS&J recommends the implementation of an arched wooden bridge with guardrails over or adjacent to the SSDIP crossing.



F. Crossing at Bolin Forest Subdivision

This site is located on Bolin Creek at a SSDIP crossing east of Bolin Forest subdivision. This site is presently located within the SFHA (~ 55 ft wide) and stream buffer, contained within a floodway (~ 45 ft) and experiences a 100-year flood discharge of approximately 4,100 cfs. A three-foot wide wooden footbridge provides access between the playground and walking trail on the west to the existing SS easement on the east side of the creek. PBS&J recommends replacing the existing footbridge with an arched wooden bridge with guardrails.



G. Crossing near Estes Dr. Ext.

This site is located on Bolin Creek in between an upstream SSDIP crossing and triple box culvert at Estes Drive Extension. This site is presently located within the SFHA (~ 200 ft wide) and stream buffer, is contained within a floodway (~ 40 ft), and experiences a 100-year flood discharge of approximately 4,400 cfs. A SS easement exists along the west side of the creek and connects to another SS easement at the DIP crossing. At this crossing, both easements veer away from the creek towards Estes Drive Extension.



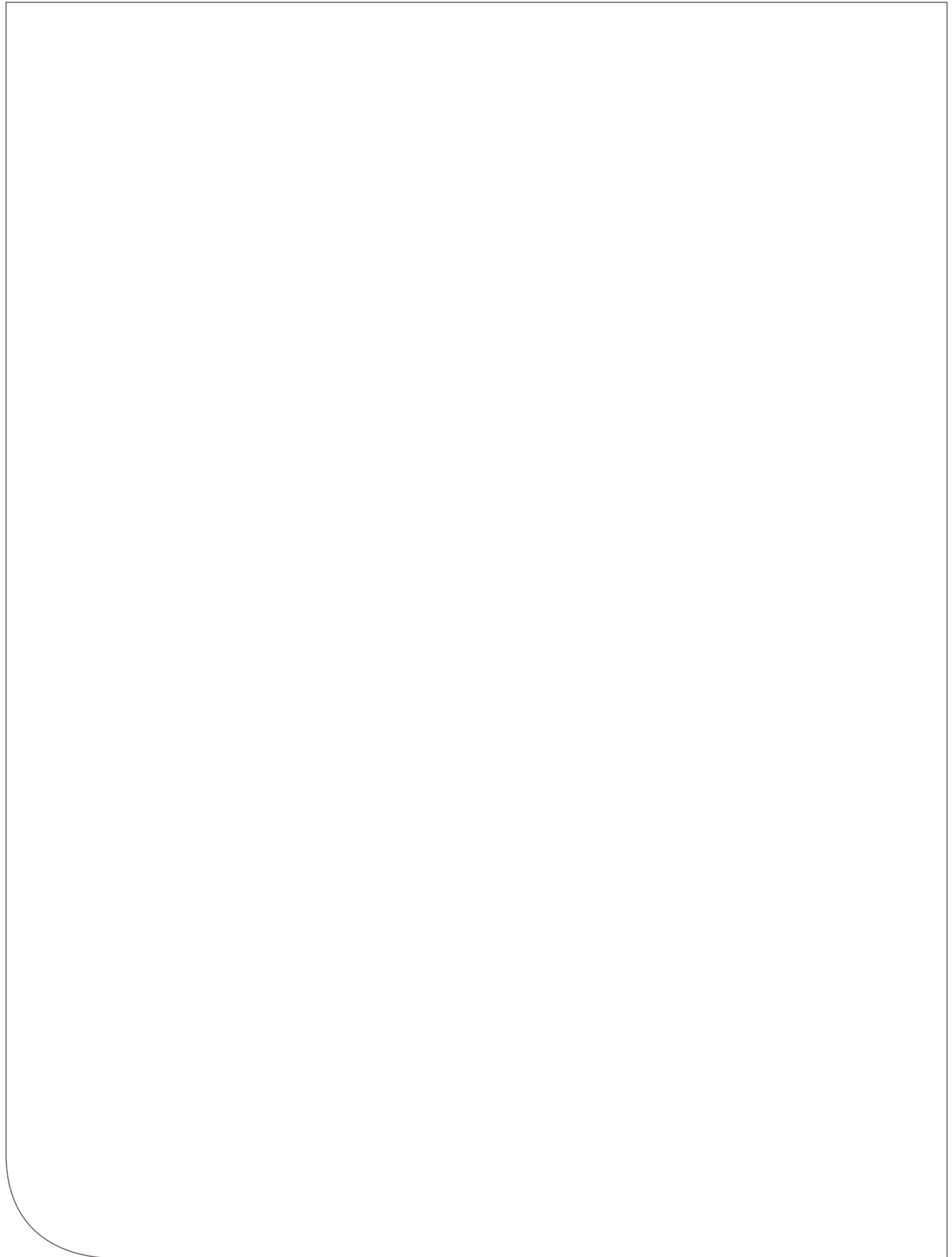
Conclusions & Recommendations

As is evident from the data presented in this preliminary evaluation, the potential bridge crossing locations will have to be studied in detail after final locations are determined in order to assess the impacts, if any, on the base flood elevation. While it is possible at this point to state that a curbed low water crossing will likely have less impact than an arched wooden structure with railings (depending on the depth of flow at the crossing), a definitive assessment will require the preparation of a hydraulic model and that is beyond the scope of this evaluation.

Given that there are numerous proposed crossing locations along Bolin Creek and that many of these will need to be arched bridges with railings, it should be noted that it will be very difficult to achieve a no-rise condition under these circumstances. This will likely mean that, at minimum, a LOMR (Letter of Map Revision, issued after construction is complete) will be necessary to gain approval for any increases in the base flood elevation throughout this project. It is not anticipated that these increases will be greater than one foot at any point, so a CLOMR (Conditional Letter of Map Revision, issued prior to construction and followed by a LOMR after construction) will not likely be necessary.

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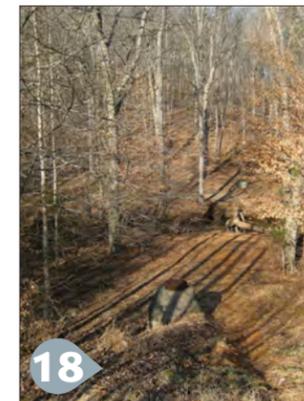
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Existing Conditions: Estes Drive Extension to Carolina North Forest Boundary

- 15 Opportunity:** Signs of overuse have severely eroded the creek corridor; however, providing a paved, delineated trail surface to users offers an environmental opportunity to limit trail braiding and discontinue erosion.
- 16 Opportunity & Constraint:** An existing foot trail connects Wild Oak Drive to the creek, and space will permit a trail on the south side for a short distance. Private property constraints and steep topography will make trail alignment a challenge both fiscally and environmentally.
- 17 Opportunity & Constraint:** At the third major tributary crossing, the soil has been almost entirely washed away creating the need for a bridge condition which will be a cost constraint. Efforts to improve this area with a crossing will beautify the corridor, improve water quality by preventing more sediment to enter the stream at this location, and provide a safe crossing for all user groups.
- 18 Opportunity & Constraint:** This easement connects up to Pathway Drive, a major neighborhood connecting Bolin Forest, Quarterpath Trace, Spring Valley, Webbwood, Fair Oaks, Cobblestone, and Cates Farm neighborhoods. Although conditions would permit a bridge, topography is a constraint and a larger crossing would need to span the creek.
- 19 Constraint:** Another tributary crossing along the corridor lends itself to a larger bridge crossing. Permitting and cost constraints will limit opportunity.
- 20 Opportunity:** MLK Park and other adjacent Town-owned lands provide the opportunity for trail spurs to connect to this park.
- 21 Opportunity:** Existing trail head feature off of Seawell School Road encourage trail use and provide opportunity for network tie-in.
- 22 Constraint:** Existing rip rap that crosses corridor tributary will require a bridge to sustain foot and bicycle traffic, presenting permit and cost constraints.
- 23 Opportunity & Constraint:** Across the creek on the south side is another stretch of Spring Valley HOA property that is flat, open and appropriate for trail development. A large creek crossing and land owner consent present constraints.

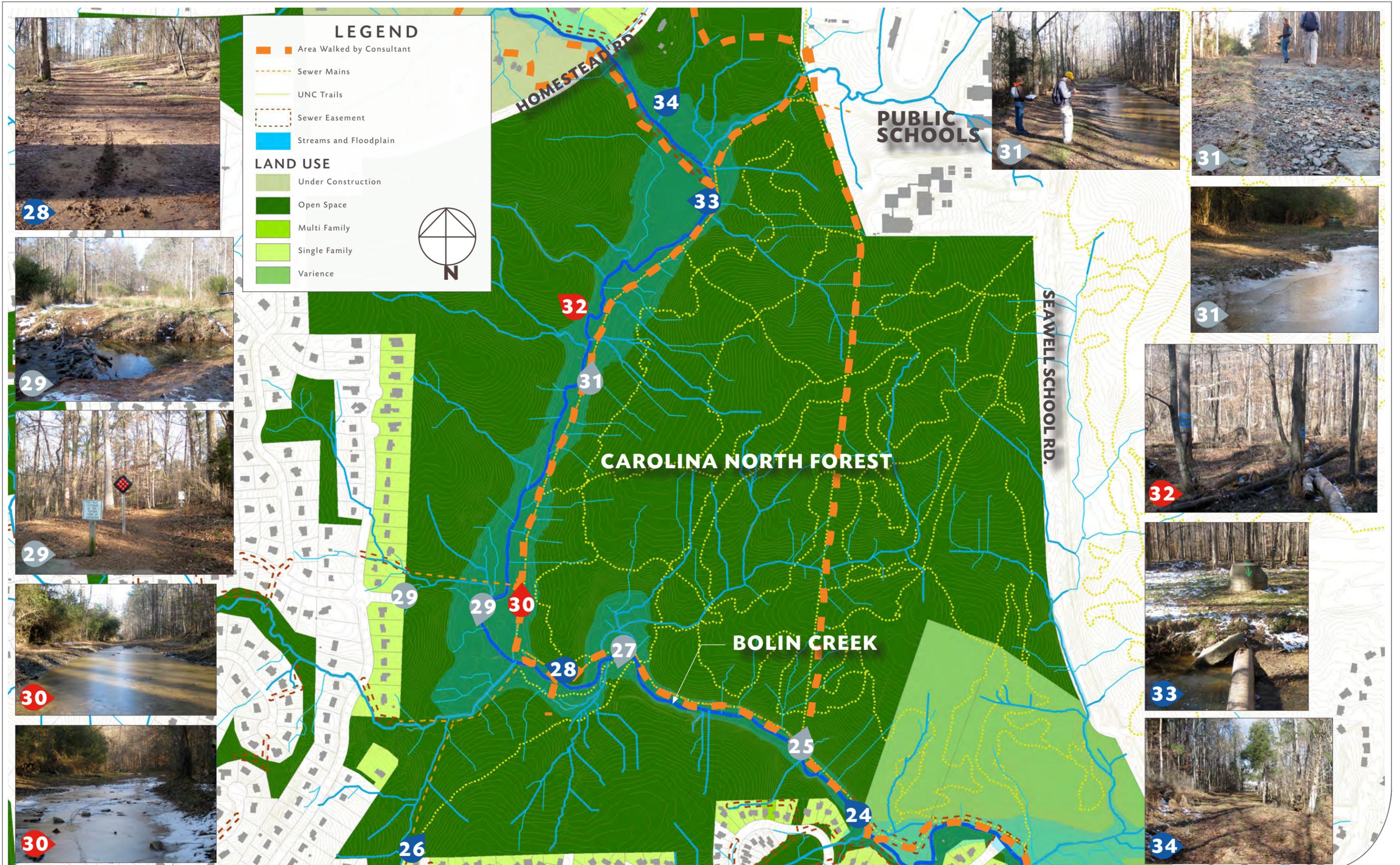




Existing Conditions: Carolina North Forest Boundary - Creek Corridor

- 24 Opportunity:** The Carolina North Forest is an excellent opportunity for open space and recreation that supports trail development, offering an experience for all user groups including on-and off-road bicycles, children, and people with accessibility challenges.
- 25 Opportunity & Constraint:** The existing power easement is a popular recreational route for mountain bikers, runners, dogwalkers and hikers and has the potential to connect to the high school, middle and elementary schools.
- 26 Opportunity:** Existing trail head feature provides access to Carolina North Forest to residents in Cates Farm; for proposed Bolin Creek trail, this is an existing access point.
- 27 Opportunity & Constraint:** At Bolin Creek (at the end of the Tripp Farm access trail) is the opportunity to tie into the greenway. At the time of this planning effort, UNC was planning to install a bridge crossing at this location.
- 28 Opportunity:** Visible signs of the multiple uses along the corridor are mountain bike tracks, animal tracks, and foot prints. These signs confirm the area's popularity and indicate the need for a creekside trail.
- 29 Opportunity & Constraint:** Crossing potential at this location is another opportunity to connect to Cates Farm neighborhood; however a bridge crossing will be required if trail is developed on east side of creek.
- 30 Constraint:** Wetland areas along the corridor presents inundated conditions which will require raised boardwalk or alternative trail surfacing, constraining costs and permitting.
- 31 Opportunity & Constraint:** Standing water, crusher run laid by OWASA, and over-use have severely degraded this portion of the corridor. Visible signs of trail furrows and trail braiding continue to widen the corridor, further impacting the usable surface. With appropriate trail surfacing and vegetative restoration, the opportunity exists to mitigate the erosion problems, improve wildlife habitat and enhance the trail user experience.
- 32 Constraint:** Along the west side of Bolin Creek, stands of hardwood are present, not presenting a feasibility for trail development on the west side of the creek. Based on conversations with UNC, this location for trail development was not preferred.
- 33 Opportunity:** Low water bridge opportunity exists at this location, which could tie future neighborhood development into trail.
- 34 Opportunity:** Relatively flat conditions on the east side of Bolin Creek near Homestead Rd. create potential for sustainable trail development; hardwood trees dot the landscape offering a pleasant experience.





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CAROLINA NORTH FOREST

BOLIN CREEK

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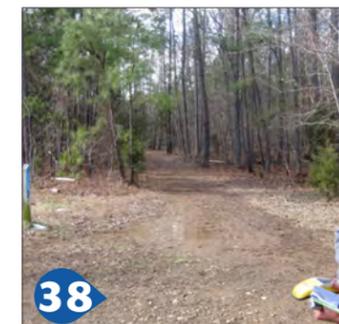
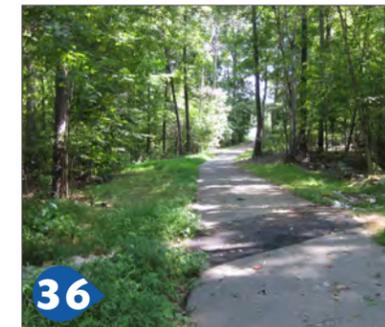
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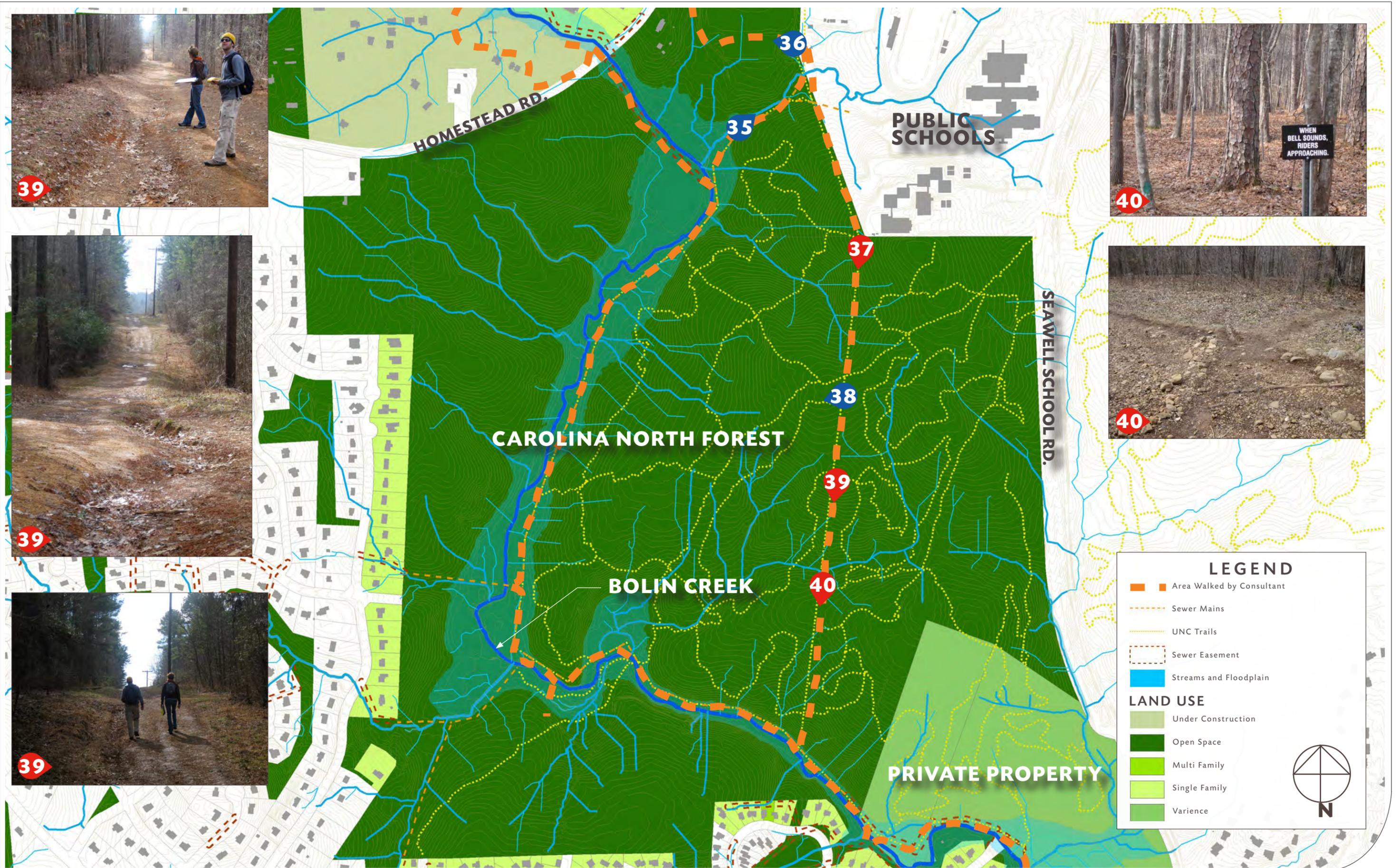
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Existing Conditions: Carolina North Forest Boundary - Upland Corridor

- 35 Opportunity:** Existing easement bends to the east to a kiosk and provides an upland route which connects ball fields and schools.
- 36 Opportunity:** Existing pedestrian trails have been installed as well as an outdoor classroom, indicating the high use of this area. Greenway development could improve these conditions, offering an alternative transportation for children attending school at this location.
- 37 Constraint:** Views down the power easement include transmission poles and straight-line conditions; compared to the creekside trail this alignment is less experiential.
- 38 Opportunity:** Wider trails throughout the upland portions of the Carolina North Forest property could potentially support multi-use trail development or trail spurs from a creekside alignment option.
- 39 Constraint:** Cross cut slopes, overuse, steep conditions and drainage problems have created severe erosion concerns along the power easement corridor.
- 40 Constraint:** User conflict along this area could be a potential constraint if trail is developed in upland corridor. Existing mountain biking trail users may not favor this interruption.





Existing Conditions: Homestead Road to Jones Creek

41 Opportunity & Constraint: Homestead Road’s roadway bridge offers approximately 8-feet of overhead clearance, making an underpass a possibility; however permitting and cost are constraints.



42 Constraint: Homestead Road is a busy roadway with speed limits at 45 miles per hour and bad site lines at the creek crossing.



43 Constraint: On the north side of Homestead Road, conditions continue to challenge trail crossing. Steep topography and limited land will require grading, tree removal, and cost-impacting structures.

44 Opportunity: Existing trail network in Calremont and Winmore neighborhoods offer potential for trail tie-ins, offering access to the Bolin Creek Greenway for hundreds of residents in these newly developed neighborhoods.



45 Opportunity: At the end of the Winmore bikeway, nature trails begin at the UNC property line. When Carolina Commons is built, a greenway trail through the open space will connect trails in Winmore and Lake Hogan Farms.

46 Opportunity: Lake Hogan Farm’s trail system terminates just before UNC’s property, but could eventually become a conduit for greenway users trying to access Jones Creek.



47 Opportunity: Existing paved trail leads users to Lake Hogan Farm clubhouse and could potentially become a trail tie-in for the proposed Bolin Creek Greenway.

48 Constraint: If Lake Hogan Farm’s trail network will tie Bolin Creek greenway to Jones Creek, a bridge crossing will be necessary, presenting cost and permitting issues.

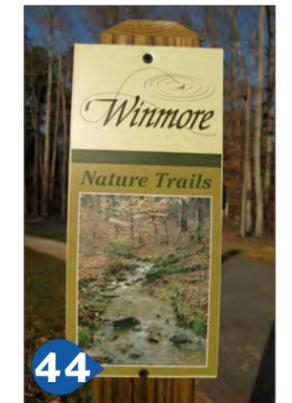
49 Opportunity: Trail alignment on the south side of Jones Creek is more practical from a topographical and connection standpoint.

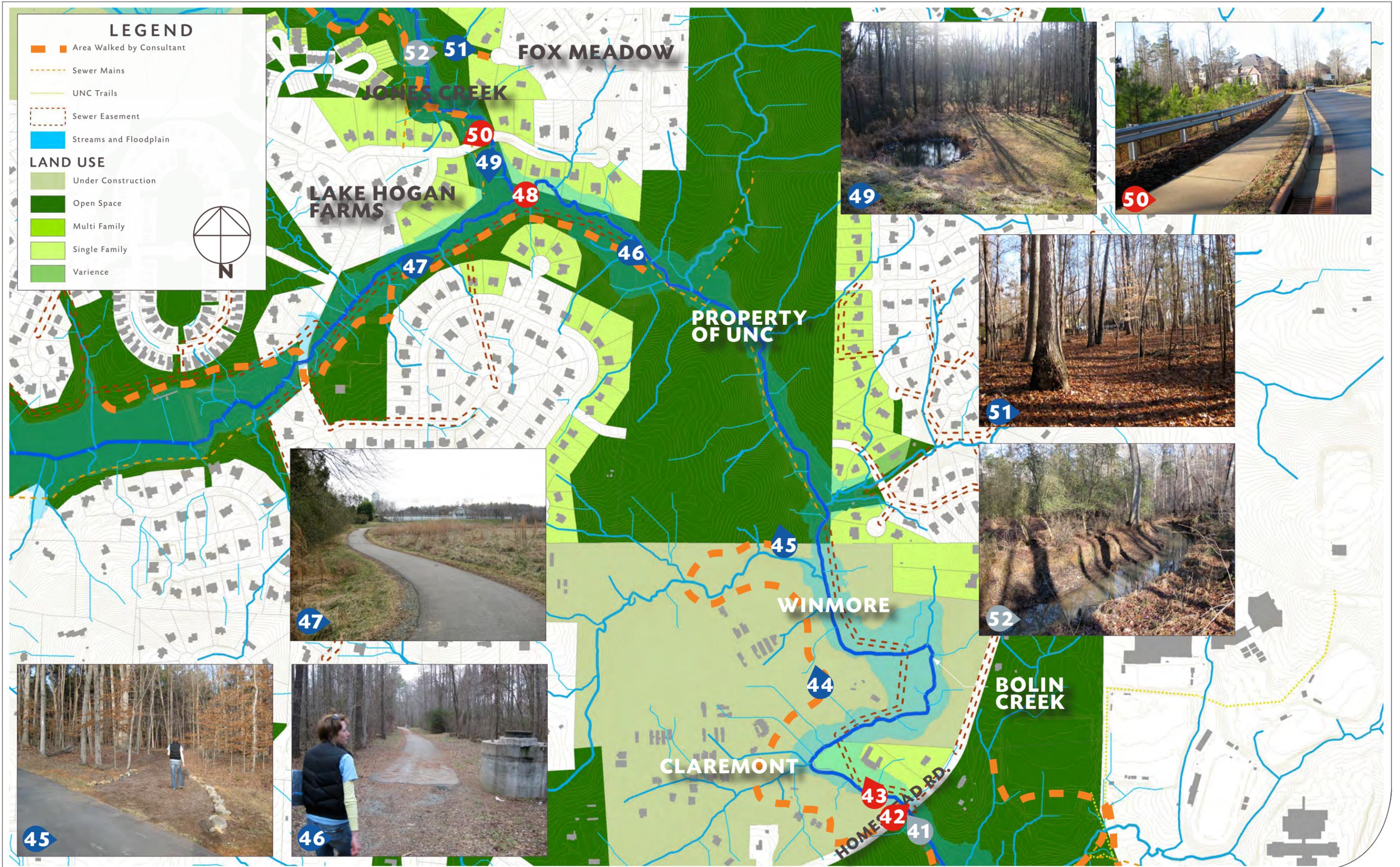


50 Constraint: An at-grade trail crossing will be necessary to cross the creek and road, presenting the possibility of neighborhood resistance and cost constraints.

51 Opportunity: A foot trail spur up to the Fox Meadow neighborhood could provide access to trail opportunity down at Jones Creek.

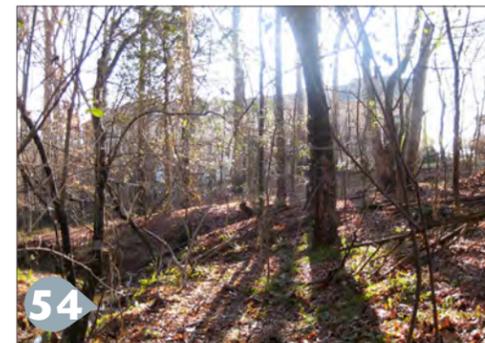
52 Opportunity & Constraint: In order to provide access to Fox Meadow residents, a crossing will be necessary at this location which could present permitting and cost constraints.





Existing Conditions: Jones Creek

- 53 Opportunity:** Open cleared conditions behind the townhomes in Lake Hogan Farm offer feasible trail conditions on the southern side of Jones Creek.
- 54 Opportunity & Constraint:** Creek conditions are relatively flat and will still permit south side alignment; however steeper topography gradually overwhelms the corridor, creating conditions that will require grading and retaining walls.
- 55 Constraint:** Property constraints, costly creek crossings and accessibility make this area a challenge for the Jones Creek corridor.
- 56 Opportunity & Constraint:** Existing sewer easement continues north to Morris Grove Elementary School, where a future trail will provide off-road transportation opportunity for children; however several tributary crossings will require permits and bridge crossings along the corridor.



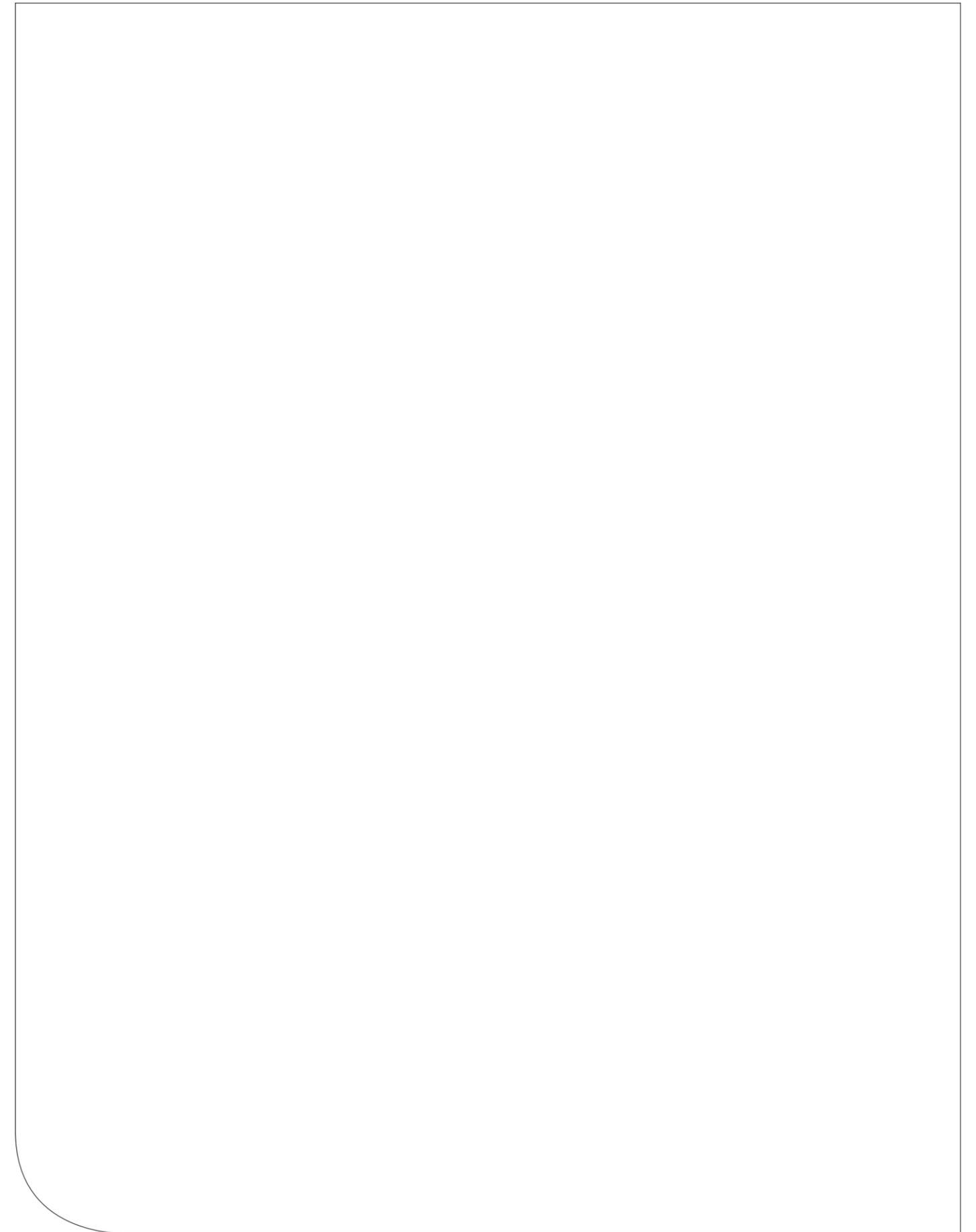


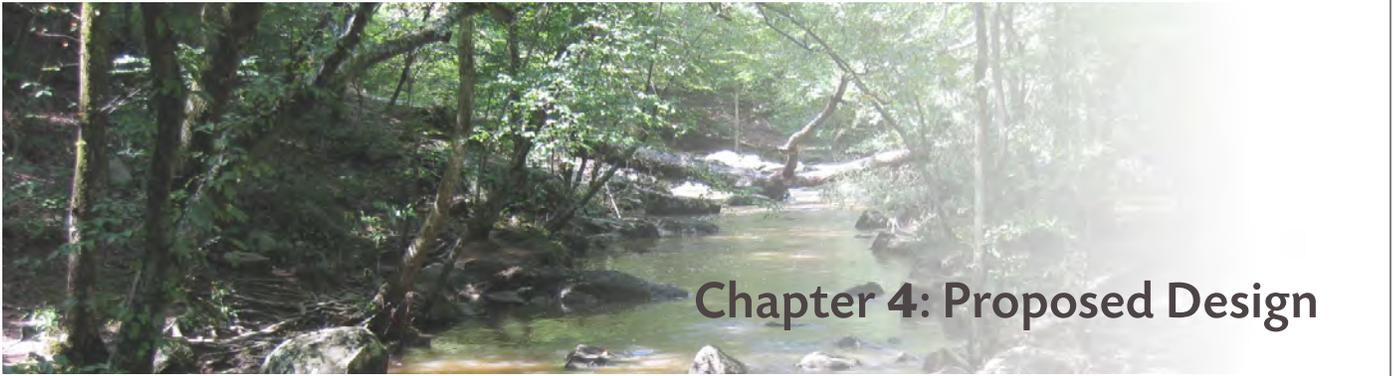
To: **MORRIS GROVE ELEMENTARY**

LEGEND

- Area Walked by Consultant
 - - - Sewer Mains
 - ⋯ UNC Trails
 - - - Sewer Easement
 - █ Streams and Floodplain
- LAND USE**
- █ Under Construction
 - █ Open Space
 - █ Multi Family
 - █ Single Family
 - █ Variance







Chapter 4: Proposed Design

Chapter Outline:

- 1. Overview*
- 2. Final Master Plan*
- 3. Wilson Park to PH Craig Tract*
- 4. PH Craig Tract to Carolina North Forest*
- 5. Carolina North Forest*
- 6. Carolina North Forest to Claremont*
- 7. Jones Creek to Lake Hogan Farms Rd.*

1. Overview

As described in the Introduction, the goals of this planning process include providing a multi-use trail to accommodate all potential users, providing access and connectivity to Carrboro open space, parks and other Town resources, and to protect and restore wildlife habitat and water quality along Bolin Creek. The Bolin Creek Greenway will do more than simply serve as a transportation corridor; rather, it will become a destination within the Town that allows for community gathering, recreation, and education. The Bolin Creek Greenway has the opportunity to be a contiguous trail system, connecting Chapel Hill to Carrboro, and ultimately extending to Orange County. The final conceptual master plan for the Bolin Creek Greenway was generated using the following input:

- An evaluation of existing corridor conditions, opportunities, and constraints (detailed in Chapters 2 and 3)
- Work sessions with the Carrboro Greenways Commission and Town Staff
- Two Public Workshops to gather public input
- Meetings with local stakeholders and adjacent landowners

The Consultant prepared three trail alignment “alternatives” for work sessions with the Carrboro Greenways Commission and for public comment during the first public workshop. The goal of preparing three different alternatives was to provide options to the public that were distinctly different from one another so that user needs and preference, origins, and destinations could be determined. The results of the public input received during the first and second public workshop were that a combination of the alternatives would provide the greatest number of connections and benefit to residents and other trail users. The Preferred Alignment, (shown in green on the maps) is the most successful in terms of serving the largest number of neighborhoods along the corridor. Further, the Preferred Alignment provides the greatest diversity of options for accessing the trail.

In the final month of the project, the Carrboro Board of Aldermen requested the three alignments to be included on the maps in the final master plan. In this chapter and in Chapter 5: Implementation, the alternatives are shown in different colors and the design intent of each is briefly summarized in the body of the text. The alternative alignments represent various schools of thought that were used to inform the Preferred Alignment and collect public input; however, they are not intended to be “stand-alone” designs for the final conceptual plan.

2. Final Master Plan

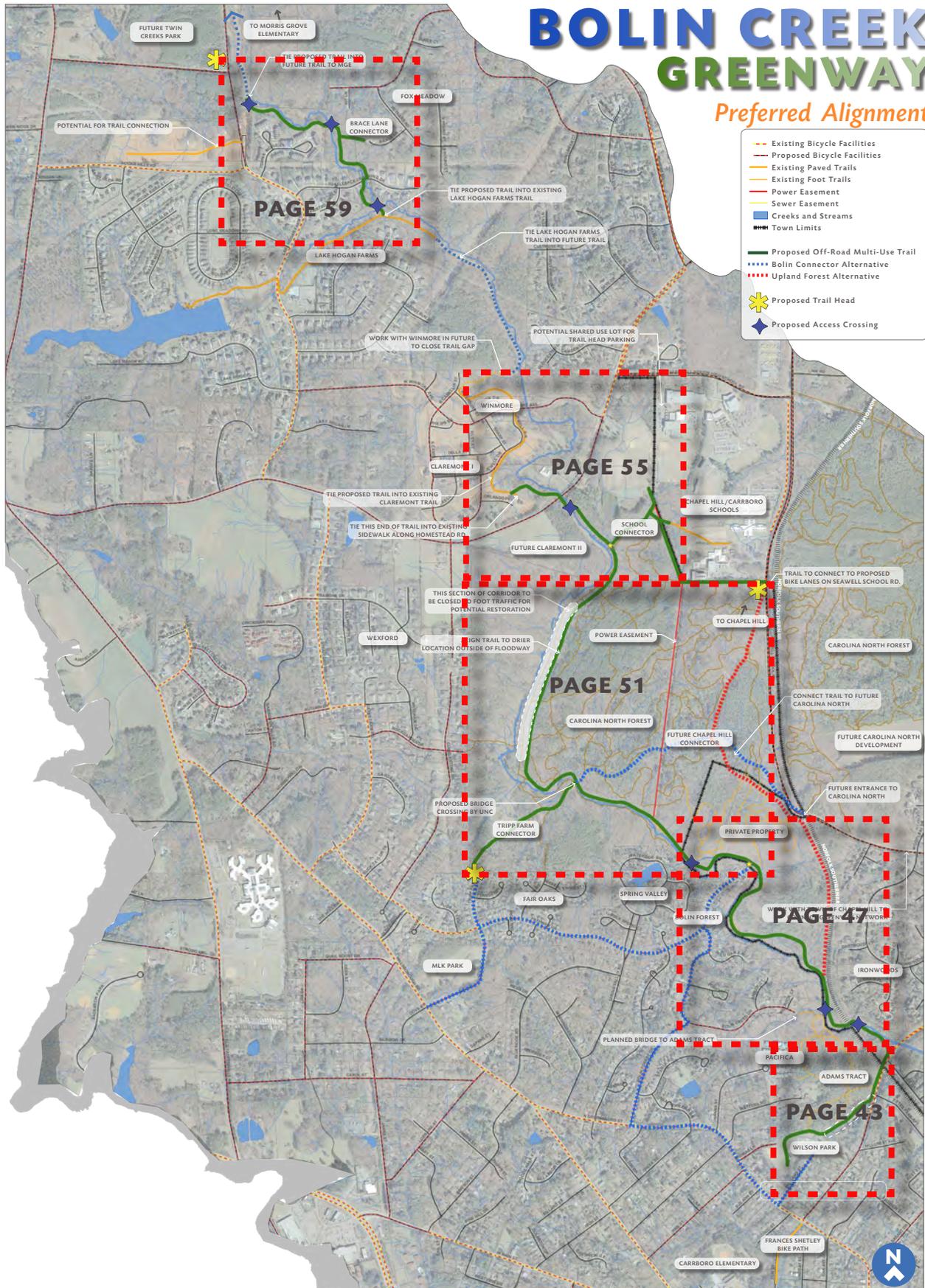
The following pages detail the recommendations for the corridor. A series of keyed maps and descriptive text provide the basis for the recommended design. Beginning at Wilson Park to the south, the corridor description moves north along the route, terminating north of Homestead Road. The corridor continues from a trail spur off the existing Lake Hogan Farms trail along Jones Creek until terminating at the end of Lake Hogan Farms Rd., near the future Twin Creeks Park. The project corridor is broken down into five sections for further analysis in this chapter. The sections are divided by the project study area as follows:

- Wilson Park to PH Craig tract
- PH Craig tract to Carolina North Forest
- Carolina North Forest
- Carolina North Forest to Claremont
- Jones Creek to Lake Hogan Farms Road

In Chapter 5: Implementation, these sections are broken down into phases and include trail surface material, amenities, budget costs, right-of-way issues and other concerns to be taken into consideration.

BOLIN CREEK GREENWAY

Preferred Alignment



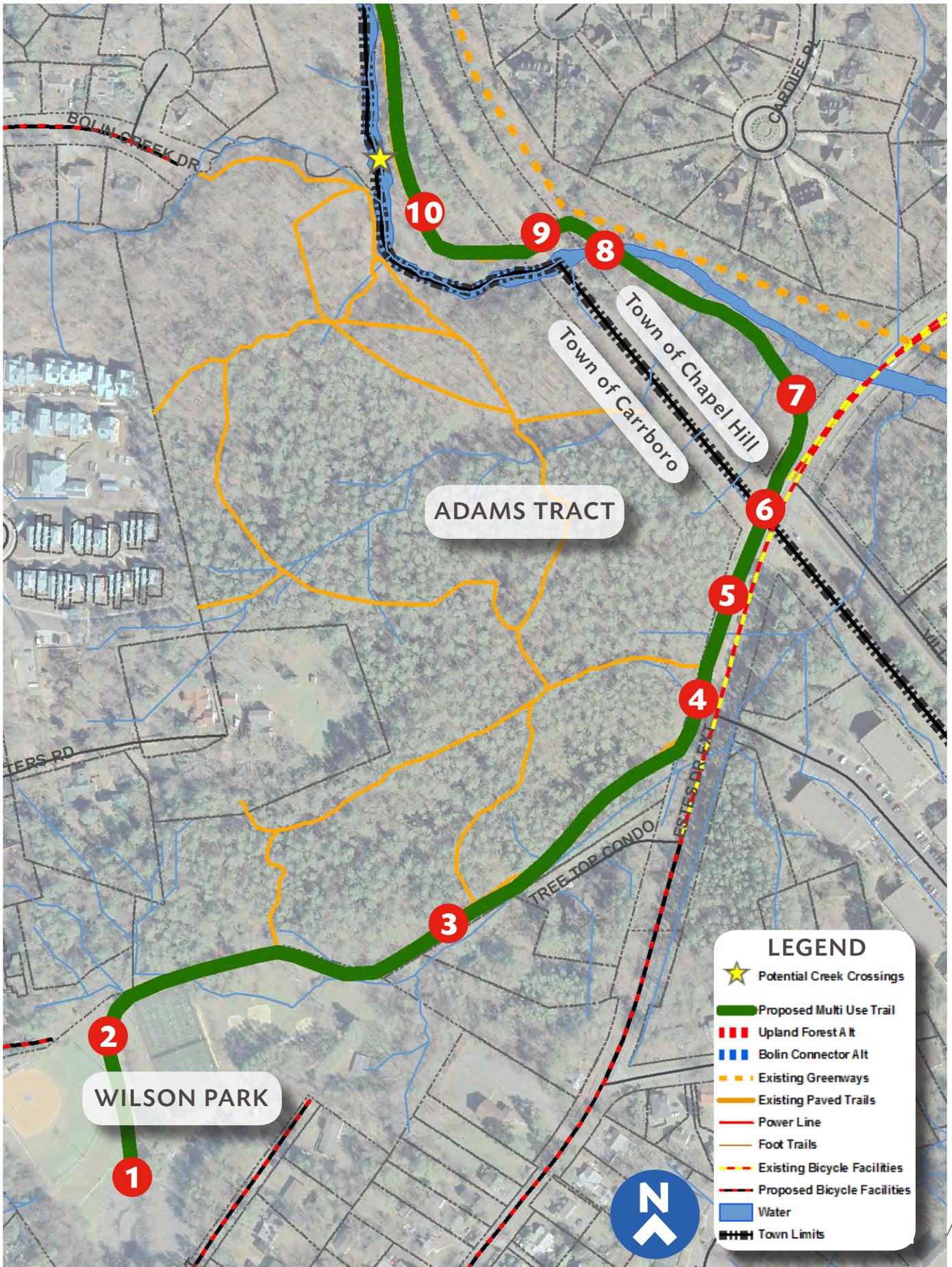
3. Wilson Park to PH Craig Tract

Wilson Park is a preferred gathering place for runners, bicyclists, walkers, and families due to its convenient location between Chapel Hill and Carrboro and its proximity to Bolin Creek. The existing park offers one ball field, tennis courts, a tot lot, picnic tables, restrooms, and parking for 100 vehicles. Proposed improvements to the park (anticipated between 2009 and 2014) include restroom building renovation and playground design. Wilson Park is an opportune location for a trailhead for the Bolin Creek Greenway.

A cleared flat corridor between the tennis courts and baseball field is well suited for trail development. An existing sewer easement continues parallel to the north side of the fields, also providing a suitable condition for a trail. Where the sewer easement runs adjacent to Adams Tract, steep grades exist and further grading studies may be necessary to determine accessibility. The Town should work with Chapel Hill to determine operations and maintenance where the alignment crosses Town boundary. Both the Carrboro Greenways Commission and the Chapel Hill Greenways Commission can work together to determine network tie-ins and develop partnerships. *(continued on page 42)*

Objectives: *(Items below can be referenced on map - see facing page)*

- 1** Utilize existing kiosks at Wilson Park to include a trail map, walking distances, and trail rules. Take advantage of and promote the use of the existing parking facilities at Wilson Park as shared trailhead parking.
- 2** Construct a 10-foot-wide concrete trail between the tennis court and ball field at Wilson Park.
- 3** Using previously allocated funds, continue the trail along the OWASA sewer easement to Estes Dr.
- 4** Provide a signalized pedestrian crossing facility at the entrance of Estes Place Apartments that will tie into the trail entrance. Work with NCDOT to install curb ramps with bollards and high visibility crosswalks.
- 5** Work closely with NCDOT to construct a 10-foot-wide concrete trail along Estes Dr. Ensure that trail construction along Estes Dr. accommodates future sidewalk construction. Install a vegetative buffer with street trees along Estes Dr. with curb and gutter while maintaining the existing paved shoulder and travel lane widths.
- 6** Work with Norfolk Southern operators to develop a safe at-grade railroad pedestrian crossing that incorporates bollards and regulatory signage, and flangeway fliers.
- 7** Work with Town of Chapel Hill and OWASA to determine maintenance, operational, and construction costs for segments that cross the jurisdictional boundaries. Coordinate with Chapel Hill proposed greenways.
- 8** Construct a low-water bridge crossing, working with federal and local agencies to obtain all necessary permits while addressing safety issues.
- 9** Design and construct a railroad underpass at the railroad trestle. Work to accommodate all owner requests regarding overhead structure design and/or alterations to all bridge members.
- 10** Obtain trail easement from PH Craig along sewer easement. Construct 10-foot-wide, concrete multi use trail.



Unapproved parking occurs along the edges of Adams Tract along Estes Dr., therefore the installation of a multi-use trail with bollards and/or vegetative buffering will likely deter future parking. The southbound paved shoulder provides a bicycle facility tie-in to the proposed trail. The Town should work with NCDOT to design and construct an approved trail intersection for both the paved shoulder tie-in and the apartment complex across the street. At a minimum, a curb ramp with bollards and a crosswalk will be necessary (see Figure 4-1), however considering the heavy traffic on Estes Dr., a High-intensity Activated crossWalk (HAWK) Signal would provide the safest crossing conditions. Both bicycles and pedestrians will need to be accommodated.

Permission will need to be obtained while designing a trail crossing for the railroad. The use of bollards, signage and flangeway fillers will provide a safe intersection for trail users that will not interfere with train operation. It is important that the trail be designed to cross the railroad at a right angle. This will prevent trail users' bicycle or wheelchair wheels from getting trapped in the rail flangeway.

Across the tracks along the sewer easement, further grading study will be necessary to determine accessibility from Estes Dr. to Bolin Creek. Near the creek, conditions flatten out along the banks. These low bank creek conditions provide an opportunity for the first low water bridge crossing. The Town should work with local and state regulatory agencies and Town of Chapel Hill to obtain necessary permits for the low water bridge. The trail continues on the north side of Bolin Creek, within sewer easement, for the majority of the proposed design. At the railroad trestle, adequate horizontal and vertical clearance is available for a trail underpass, and it will be important to work closely with rail operators to obtain permission for the trail to pass beneath (see Figure 4-2). At this point along the proposed corridor, an easement will need to be obtained from the property owner for the trail to connect to northern parts of the alignment.

Figure 4-1.



Existing conditions: Estes Dr. looking north



Proposed design: improvements include a multi-use trail with vegetative buffer; curb ramp for bicycle facility tie-in; and ornamental plantings

Figure 4-2.

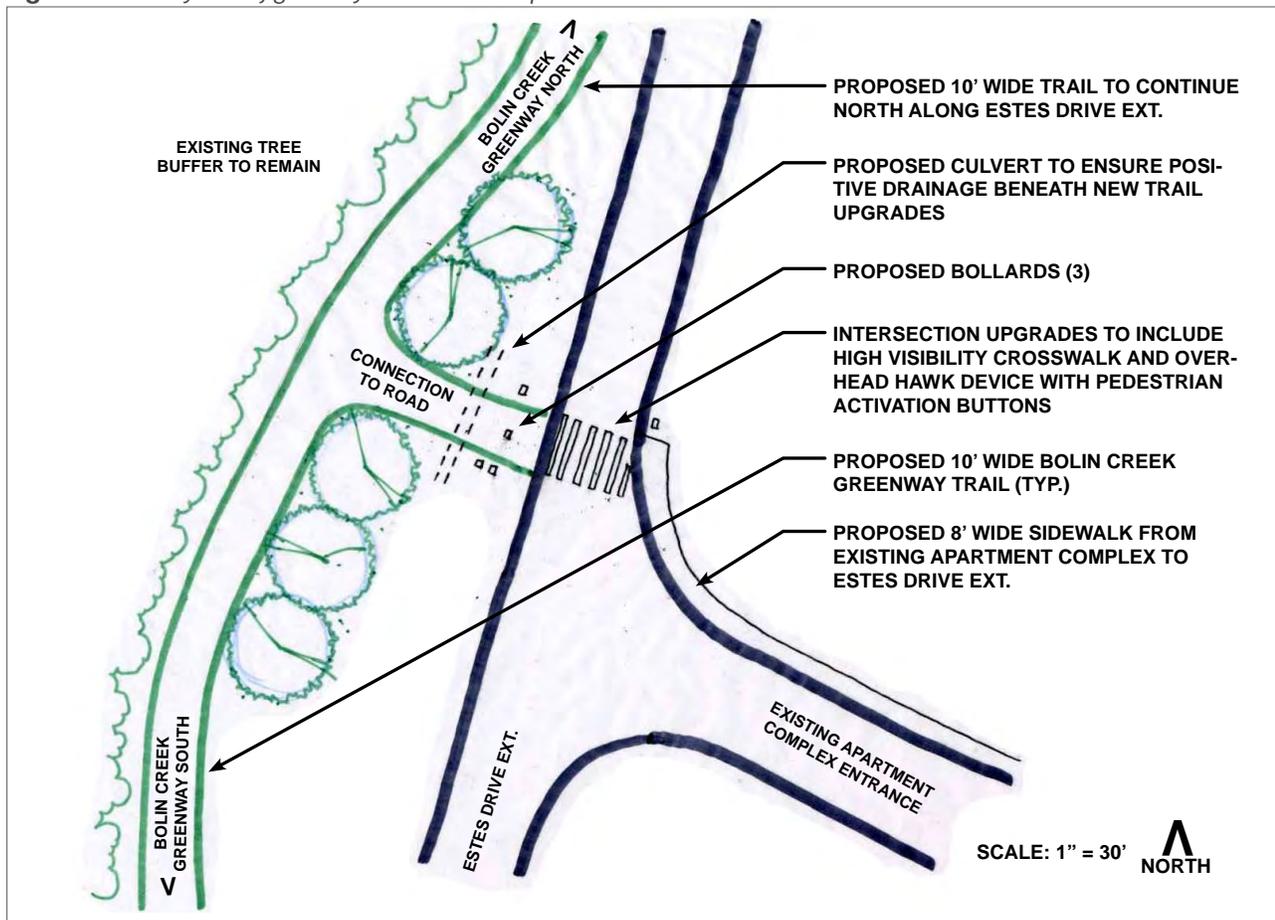


Existing conditions: Bolin Creek (left side of photo) and the Norfolk Southern railroad trestle



Proposed design: Low water bridge over Bolin Creek and trail underpass at the trestle.

Figure 4-3. Study area of greenway and Estes Dr. improvements



4. PH Craig Tract to Carolina North Forest

The large tract of land south of UNC property is privately owned. Property boundaries for the tract, known as the PH Craig property, begin just after the trail passes beneath the railroad trestle. It will be critical to acquire greenway easements on the PH Craig property in order to maintain trail connectivity. At the time permission is obtained, the trail would follow the sewer easement on the north side of Bolin Creek on the Craig property. Fencing, privacy signage and/or vegetative screening that would discourage social trails on the remainder of the Craig property are anticipated and considered necessary in order for the establishment of a public trail at this location. The Town should work to accommodate the owner's requests in order for the trail to be a publicly-operated trail facility.

Several Bolin Creek streams traverse the PH Craig tract. Low water bridges and/or boardwalk will be necessary (see Figure 4-4) for several of the crossings, and hydraulic modeling may be warranted during the next stage of design to determine the appropriate solution for each of these crossing areas. A stream just southwest of Seawell School Road at the roadway intersection with the railroad tracks has been observed as having excellent macroinvertebrate diversity. Any stream crossing or disturbance should be pursued in recognition of this high quality aquatic habitat.

At least two single family neighborhoods, Bolin Forest III and IV and Spring Valley, abut the PH Craig tract (across Bolin Creek) and consideration should be given to serving these neighborhoods by providing a creek crossing to the proposed trail. Several potential locations for these bridge crossings, (seen as yellow stars on the map at right) were indicated by interested homeowners at public workshops. It is recommended that the Town schedule open house meetings with citizens, HOA's, and property owners during design development to determine needs and concerns if a creek crossing is proposed over Bolin Creek.

Two additional alignments have been included for the Town's consideration. The "Upland Forest," shown in red on the map, was presented at the May 2009 workshop as a greenway alternative outside the floodplain that would direct users to Seawell School Rd. The Upland Forest alternative utilizes existing trail corridors which vary in width from 18 inches to 15-feet. Some of the constraints of this alignment include steep topography, increased engineering costs, and potential ADA accessibility constraints. The Bolin Connector Alternative is shown in blue, and was presented during the May workshop as an on-road alternative that would tie into existing and proposed bicycle facilities. *(continued on page 46)*

Proposed Solution: (Items below can be referenced on map - see facing page)

- 11** Work with property owner to obtain a 4,400 linear foot (.83 mile) trail easement. Discuss owner requests such as future needs, privacy, and access issues.
- 12** Construct a 10-foot-wide concrete trail within the sewer easement. Work with OWASA to determine operational concerns.
- 13** Survey all tributary crossings and design low impact crossing solutions whenever possible. Low water bridges and boardwalk are examples of low impact solutions for tributary crossings. Obtain all necessary permits.
- 14** Meet with adjacent property owners and HOA's to determine interest for providing neighborhood access to the proposed trail. Provide several options for bridge crossings, taking into consideration proximity to private property, topography, and existing recreational use along the creek.
- 15** Begin interpretive/educational trail signage design along the trail. Opportunities include native species identification, watershed education, wildlife viewing areas, and low impact design diagrams.

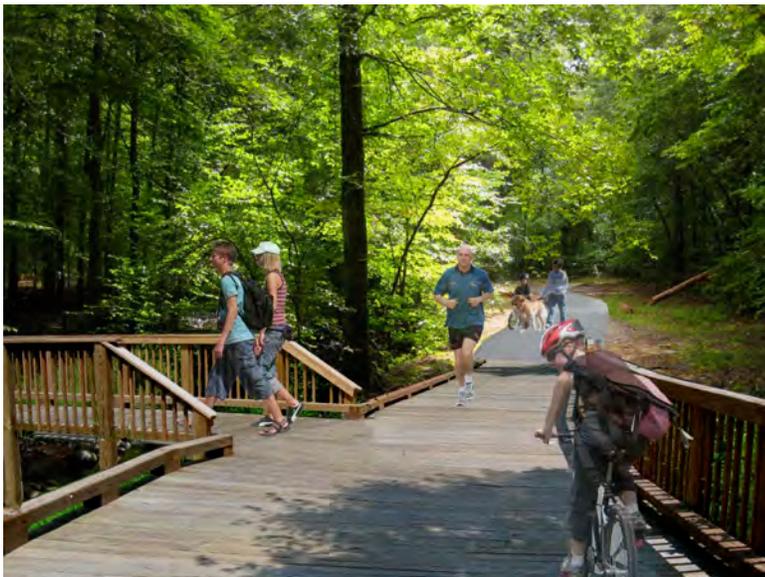
The Bolin Connector was proposed to create a “Complete Streets” concept. Challenges of the Bolin Connector, as communicated by participants of the May 2009 workshop, included concerns that many parents desired an off-road facility for their children to safely bicycle on. Additionally, making cost effective trail connections from Estes Dr. to Homestead Rd. presented engineering constraints. To read more about public input from the May 2009 workshop, see Appendix A: Public Input Summary.

The large open private property along this portion of the corridor is an important connection for the Bolin Creek Greenway. The Town should work with PH Craig to obtain an easement agreement. Trail development along this corridor would increase opportunities for local groups and clubs to develop programs and signage efforts for the trail such as wildlife observation, bird watching, and walking classrooms. Encourage use along the trail by holding fundraisers or Town events on the greenway to establish interest. See Appendix C: Operations and Management for more ideas about trail programming.

Figure 4-4.



Existing conditions: stream crossings along the corridor are not safe for proposed trail use. Exposed sewer mains (seen at right) and rip rap present hazards.



Proposed design: providing elevated boardwalk bridges over intersecting streams will allow for wildlife viewing platforms and provide a high and dry solution for trail users.

5. Carolina North Forest

The Carolina North Forest, a popular recreational destination in Carrboro and Chapel Hill, is a 750-acre tract of open space with many miles of trails and wooded forest. In Carrboro, the Carolina North Forest makes up 304 acres. Nearly 60 percent of the Bolin Creek Greenway alignment is proposed in the Carolina North Forest. The development of a trail across UNC property is and will continue to be a collaborative effort between the Town of Carrboro, the Town of Chapel Hill, OWASA, and UNC. During the planning process, Town staff and the consultant worked closely with representatives of Carolina North Forest (UNC) to determine operational issues, forest and land management needs, maintenance concerns, and trail funding, and their comments have been incorporated into this section.

The Carolina North Forest segment is very important to the proposed Bolin Creek Greenway because it has the most potential to connect a multitude of destinations in Carrboro. The Carolina North Forest is surrounded by neighborhoods and schools. With the exception of Seawell School Rd. and Old 86, there is no direct north/south connection to northern parts of Carrboro. If constructed, the proposed greenway would permit elementary, middle, and high school students to safely walk or bike to school who live in Ironwoods, Bolin Forest I, II, III and IV, the Cedars, Pacifica, Estes Park Apartments, Spring Valley, Quarterpath Trace, Fair Oaks, Cobblestone, Cates Farm, Barrington Hills, Wexford, and Carolina Commons, a currently proposed UNC housing development. Additionally, users would no longer be challenged by traffic conditions on Homestead Rd.

The existing sewer easement located along Bolin Creek through Carolina North Forest is and has been used for years by Carrboro citizens as a recreational corridor. Foot and bicycle traffic as well as utility vehicles have caused a significant degree of compaction along the surface, while erosion has caused further problems along the easement where rutting is evident. The greatest concern is in areas of the easement where overuse and surface disturbance has caused *trail braiding* to occur. After storm events, wet surface conditions create pocket areas of the corridor which remain muddy and inundated. As users bike, walk, and jog along the wet surface, efforts are made to avoid these wet and muddy areas, and seek the “high and dry” path of travel, thereby widening the corridor and creating what is known as trail braiding. Over time, trail braiding can widen corridors to up to 50-feet or more, impacting portions of the understory and otherwise areas that were not intended for foot traffic. The continuous disturbance of sediment increases runoff into streams, which contributes to further pollution of Bolin Creek. By providing a hardened surface, the user is confined to a ten-foot-wide route which minimizes social trails and trail braiding along the corridor and maintains the intended route of travel provided by the trail tread. Further, a hardened surface can be used by all groups including persons in wheelchairs. The final determination of the surfacing material will be determined by UNC.

Some public workshop attendants expressed concerns about wildlife and/or environmental impact that may be associated with trail development within the Carolina North Forest. The Bolin Creek Greenway, if constructed, has the potential to enhance, restore and further protect the natural resources found along Bolin Creek. The Carolina North Forest is a valuable natural resource; however it is surrounded by significant amounts of urban and suburban development. It is recommended that the Town attempt to accommodate the use of the corridor within Carolina North Forest by constructing a safe trail facility that can withstand high amounts of human traffic, will mitigate erosion that is already occurring along the corridor, and provide an environment where wildlife and human use can cohabit.

The Town should give strong consideration to meeting with OWASA and UNC representatives to discuss any relocation projects for sanitary sewer mains that run north/south along Bolin Creek through Carolina North Forest. The relocation of mains east of their existing location outside of the floodway would provide opportunities along the old easement for environmental restoration. Currently, there are at least six tributaries intersecting the easement. The existing sewer easement would be closed to foot traffic once the new corridor

is complete. If the sewer line were relocated, riparian restoration could be pursued, and the possibility of allowing a beaver colony to become established could also be considered, which could have the potential for a number of environmental benefits, including water quality improvement, wildlife habitat, and privet control. The proximity to schools could enable this to be a prime educational field site.

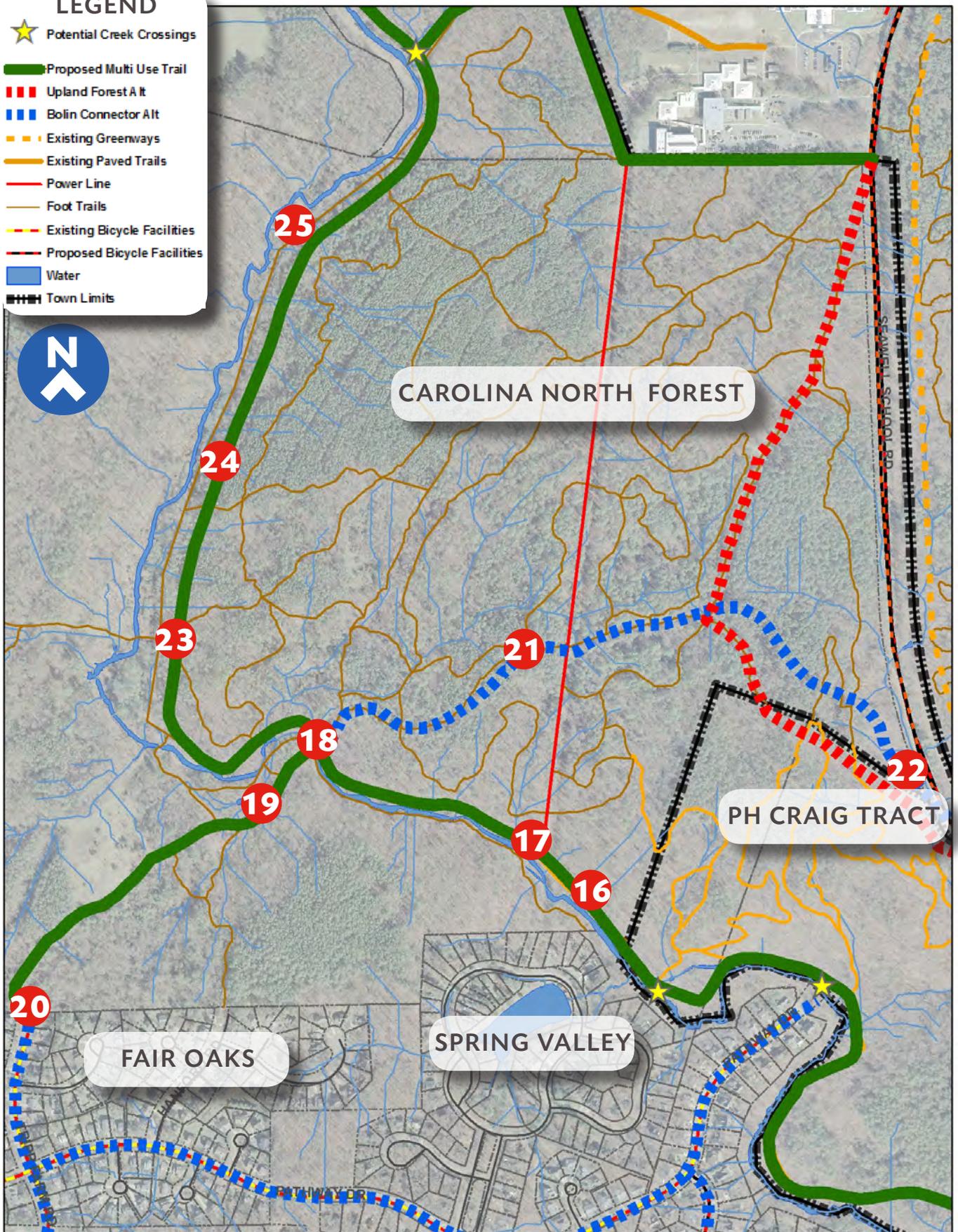
Opportunities for lateral connections exist within Carolina North Forest, linking Spring Valley and Wexford neighborhoods in the west and Seawell School Rd. to the future Carolina North Development in the east. These lateral connections are valuable with respect to future developments such as Carolina North, and Chapel Hill's future greenways and will be determined by UNC. An example of the relationship of this multi-solution alignment can be seen in Figure 4-5. The flat semi-open area at the end of Tripp Farm Rd. is well suited for a small trailhead. The Town should work with adjacent property owners and HOA's as well as UNC to determine trailhead feasibility at this location (see Figure 4-6 and 4-7). A gravel service road continues east on UNC property just before the location for a future pedestrian bridge crossing over Bolin Creek. Once the bridge is installed, there is potential for the proposed Bolin Creek Greenway to utilize this crossing to link users to Tripp Farm Rd. The Town should coordinate the construction plans of the bridge crossing with the construction drawings of the proposed trail, as well as all signage and trail construction plans with UNC. *(continued on page 50)*

Proposed Solution: (Items below can be referenced on map - see next few pages)

- 16** Obtain easement agreement for all trail corridors on UNC property. UNC has determined it will be responsible for all maintenance and management of proposed trail on UNC property.
- 17** Construct a 10-foot-wide trail "main line" along Bolin Creek. Work with UNC to determine exact materials and finishes.
- 18** Work with UNC during bridge construction to ensure that the proposed trail can tie into future bridge crossing.
- 19** Construct a paved trail along gravel service road to establish a lateral connection to Tripp Farm Rd.
- 20** Using the existing flat open area at the end of Tripp Farm Rd., work with adjacent homeowners and UNC to construct a small trailhead that can accommodate up to 15 cars. Incorporate a kiosk with trail signage and rules.
- 21** Establish an eastern connector to Seawell School Rd. by constructing a gravel trail along the service road that will connect to future Carolina North development. Work closely with UNC to determine alignment.
- 22** Develop wayfinding signage along the trail that directs users to future Carolina North development, working closely with UNC.
- 23** Work with OWASA to monitor future sewer main line relocation projects. In the event that sewer easements are relocated, these corridors are opportunities for trail development.
- 24** If and when the new sewer line is installed by OWASA, construct 10-foot-wide concrete trail within the corridor. Establish native plantings to restabilize the soils.
- 25** Allow the previous sewer easement to return to a natural state, by installing native species and removing invasive species, creating a vegetative buffer that will support wildlife habitat and stabilize soils located in the floodway.

LEGEND

- ★ Potential Creek Crossings
- Proposed Multi Use Trail
- Upland Forest A It
- Bolin Connector Alt
- Existing Greenways
- Existing Paved Trails
- Power Line
- Foot Trails
- Existing Bicycle Facilities
- Proposed Bicycle Facilities
- Water
- Town Limits



Two additional alignments have been included for the Town’s consideration. The “Upland Forest,” shown in red on the map, was presented at the May 2009 workshop as a greenway alternative outside the floodplain that would direct users to Seawell School Rd. The Upland Forest alternative utilizes existing trail corridors which vary in width from 18 inches to 15-feet. Some of the constraints of this alternative include steep topography, increased engineering costs, and potential ADA accessibility constraints. The Bolin Connector Alternative is shown in blue, and was presented during the May workshop as an on-road alternative that would tie into existing and proposed bicycle facilities. The Bolin Connector was proposed to create a “Complete Streets” concept. Challenges of the Bolin Connector, as communicated by participants of the May 2009 workshop, included concerns that many parents desired an off-road facility for their children to safely bicycle on. Additionally, making cost effective trail connections from Estes Dr. to Homestead Rd. presented engineering constraints. To read more about public input from the May 2009 workshop, see Appendix A: Public Input Summary.

Trail connections to Seawell School Rd. would provide links to existing and proposed bicycle facilities. Access to Carolina North Forest from Seawell School Rd. is currently limited to a gated entry and gravel shoulder. The construction of a more formal trailhead area would allow safe parking options and would prevent users from parking on Chapel Hill Carrboro City Schools (CHCCS) property during school hours. In addition, the Town could work with CHCCS to take advantage of shared parking on weekends and after school hours in the parking lots provided at the elementary school. The gravel access road near Dry Gulch that begins at Seawell School Rd. and terminates at Bolin Creek would provide a feasible cleared corridor and offers a direct connection to the main “spine” of the Bolin Creek Greenway along the creek.

The opportunity for trail development along the existing power easement through Carolina North Forest was considered. In the field, it was determined that surrounding trail traffic, surface conditions, topography, and potential user conflict from adjacent mountain bike trails is not conducive to trail development along the power easement. According to Duke Energy transmission rights-of-way restrictions, “streets, roads, driveways, sewer lines, water lines, and other utility lines, or any underground facilities shall not parallel the centerline within the rights of way, but may cross, from one side to the other, at any angle not less than 30 degrees with the centerline. No portion of such facility shall be located within 25 feet of Duke Energy’s supporting structures.” In order to comply with Duke’s restrictions, additional tree clearing would be necessary along the easement.

Figure 4-5.



This section shows proposed conditions in the Carolina North Forest. Carrboro citizens indicated a preference for both a creekside trail as well as an upland connection to Seawell School Rd.

Figure 4-6.



Existing conditions: entrance to Carolina North Forest near gravel area at end of Tripp Farm Rd.



Proposed design: adequate space is available to accommodate a small trailhead with informational kiosks and several cars.

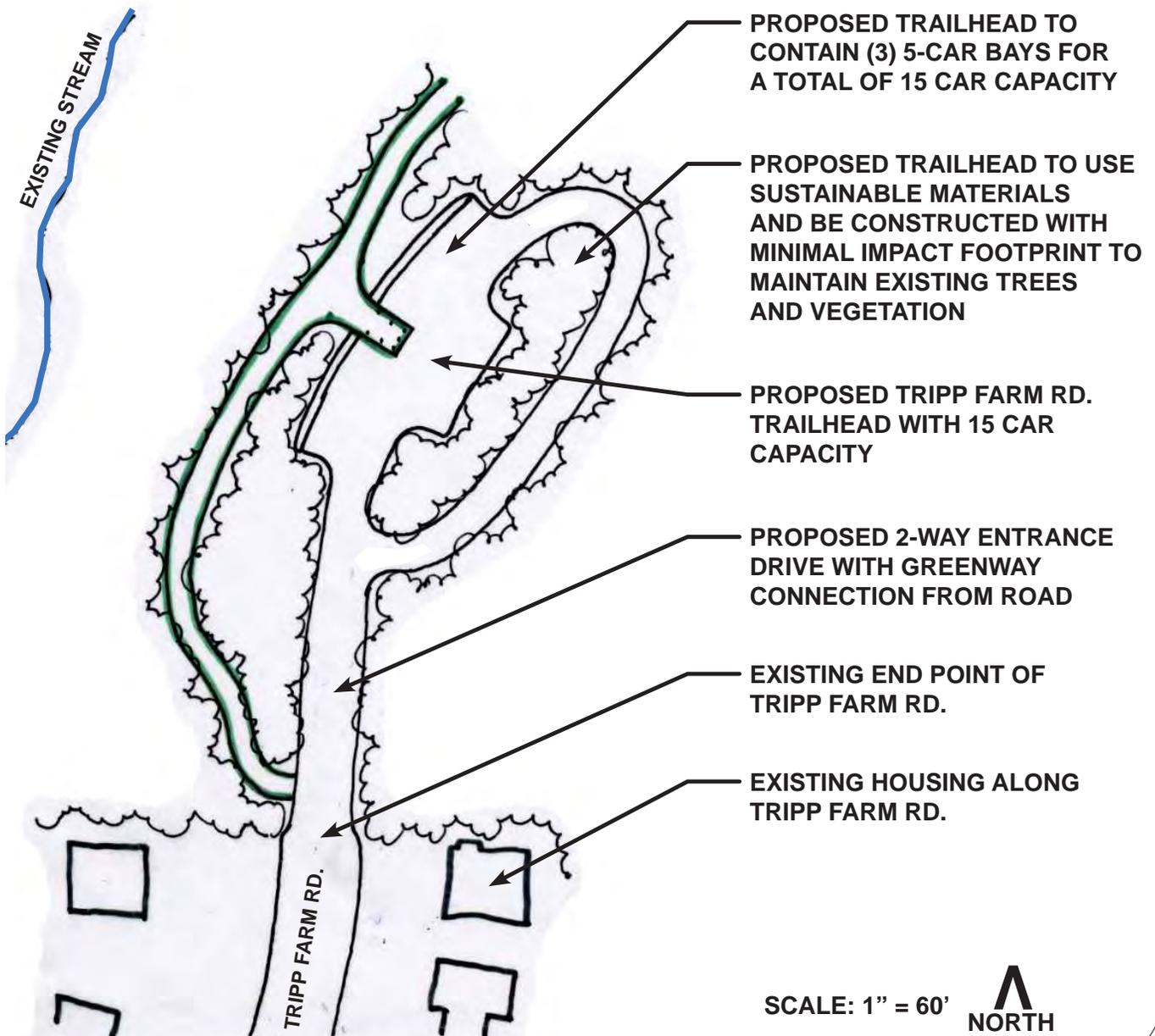


Figure 4-7. Enlargement of proposed trailhead at end of Tripp Farm Rd.

6. Carolina North Forest to Claremont

North of Carolina North Forest, the Bolin Creek Greenway continues through State of North Carolina-owned property along the sewer easement. A lateral sewer easement that travels east to the CHCCS property is well suited for a connecting spur, which should tie into the existing paved trails on campus property. The CHCCS connector shown on the following page is one of several possible alignments for this section of the trail. A final alignment will be determined through dialogue with UNC and consideration of safety for CHCCS students and other potential trail users, route efficiency, and the extent of vegetation clearing required. (See Chapter 5: Implementation for a map of potential alignment alternatives for this connector.) Work with CHCCS to develop a safe connection by determining security needs, maintenance, and signage issues. Wayfinding signage will be particularly important in this area for young children and other trail users. The Town should develop a partnership with the state that permits trail development on state-owned property.

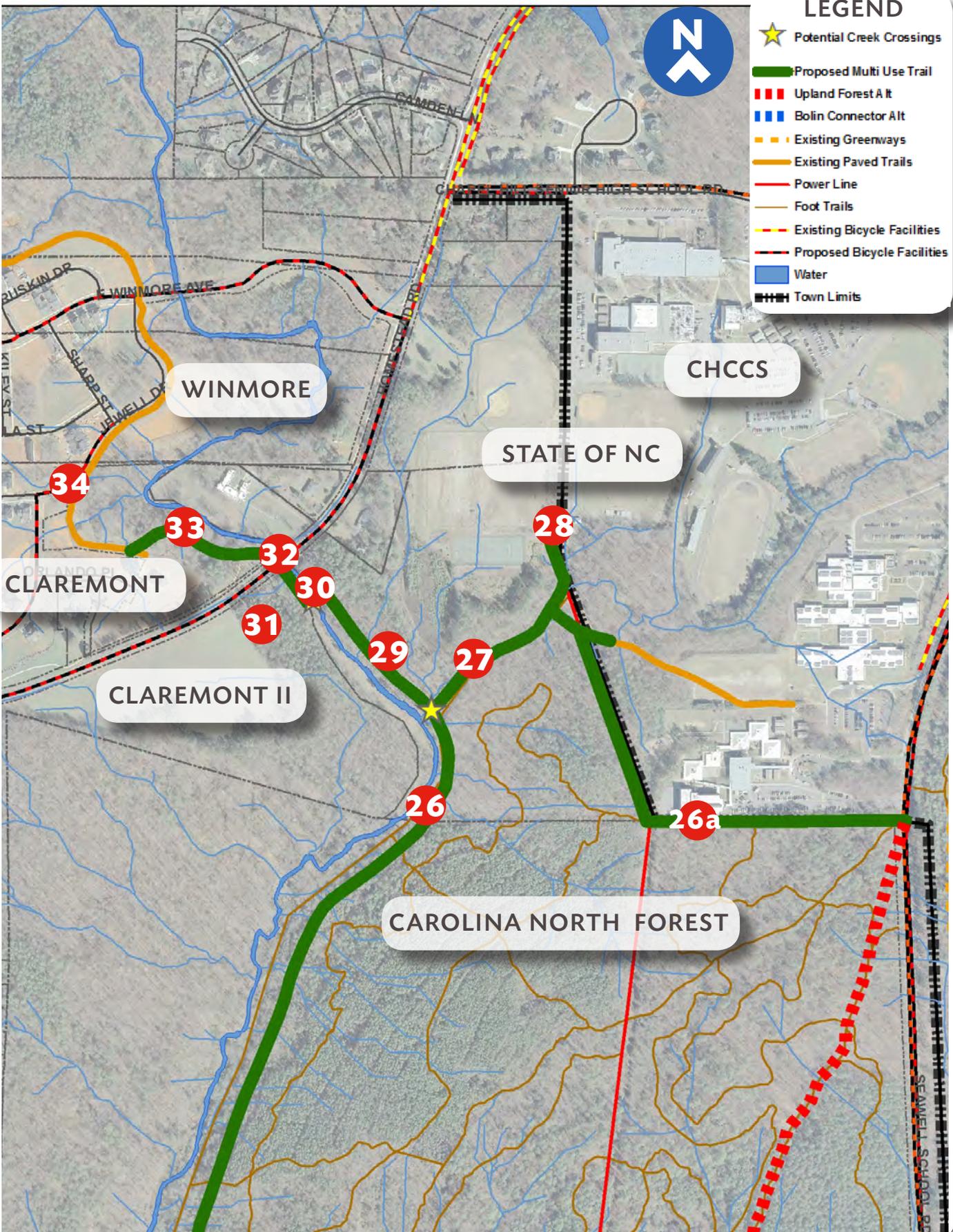
Future housing is proposed for Claremont II west of Bolin Creek and across from state-owned property. Plans include mixed density housing, sidewalks, and a multi-use path. During the planning process, project plans were obtained to determine the location for a creek crossing that would connect to the development and minimize impact to the corridor. Based on existing floodway bridge span requirements, existing topography, and future facility tie-in opportunities, the proposed alignment continues north along state-owned property and crosses Bolin Creek approximately 200 feet south of Homestead Rd. Efforts should be made to avoid removing as many trees as possible along this section of the corridor which does not align with the existing sewer easement. *(continued on page 54)*

Proposed Solution: (Items below can be referenced on map - see facing page)

- 26** Obtain a greenway easement along state-owned property for the trail. Construct a 10-foot-wide, concrete trail.
- 27** Utilizing the existing sewer easement, construct a 10-foot-wide concrete trail spur to CHCCS property.
- 28** Work with CHCCS to tie proposed Bolin Creek Greenway into campus network. Install wayfinding and regulatory signage, security screening, and other land owner requests along the spur.
- 29** Clear trail corridor and continue the 10-foot-wide concrete trail along the east side of Bolin Creek, avoiding the removal of as many trees as possible.
- 30** Work with an engineering consultant to design, fabricate, and install a safe and accessible bridge crossing over Bolin Creek. Determine the lowest impact design that will span the floodway.
- 31** Work with Claremont developers to implement trail connections at Claremont per conditions of their land use permit. Develop wayfinding signage for nearby trail connections as well.
- 32** Construct a trail underpass beneath Homestead Rd. Work closely to obtain approval from NCDOT. Include regulatory signage and any other NCDOT requests.
- 33** Secure a greenway easement along the eastern portion of Claremont I. Construct concrete trail with retaining walls and regulatory signage. Avoid the removal of as many trees as possible.
- 34** Connect the proposed greenway to the existing trail at Claremont neighborhood. Work with developers to introduce neighborhood signage or a kiosk that includes a trail map and rules.

LEGEND

-  Potential Creek Crossings
-  Proposed Multi Use Trail
-  Upland Forest Alt
-  Bolin Connector Alt
-  Existing Greenways
-  Existing Paved Trails
-  Power Line
-  Foot Trails
-  Existing Bicycle Facilities
-  Proposed Bicycle Facilities
-  Water
-  Town Limits



An additional alignment has been included for the Town’s consideration. The “Upland Forest,” shown in red on the map (page 55), was presented at the May 2009 workshop as a greenway alternative outside the floodplain that would direct users to Seawell School Rd. The Upland Forest alternative utilizes existing trail corridors which vary in width from 18 inches to 15-feet. Some of the constraints of this alternative include steep topography, increased engineering costs, and potential ADA accessibility constraints.

The proposed pedestrian bridge over Bolin Creek near Homestead Rd. is only one of two proposed bridge crossings across the creek. Depending on hydraulic and geotechnical studies, the bridge will likely span up to 150-feet and will require handrail. Further analysis will be required for the design of the proposed pedestrian bridge.

Traffic conditions along Homestead Rd. were examined in the field. Site lines, topography, traffic volumes, and vehicle speeds confirmed that an at-grade crossing would not be suitable for the proposed greenway. Beneath Homestead Rd., however, conditions are favorable for a trail underpass (see Figure 4-8). Ample vertical and horizontal clearance will permit a 10-foot wide trail with a small retaining wall on the west bank of Bolin Creek (see Figure 4-9). Conditions are less favorable for trail development on the east side of the creek. Preliminary evaluations of possible hydraulic impacts by PBS&J determined that the east side underpass presented a greater impact to Bolin Creek and would require fill dirt within the floodway. This condition, coupled with adjacent private property and topography, confirmed the western alignment of the trail beneath Homestead Rd.

North of Homestead Rd., the trail will require a retaining wall south of Claremont. Town staff and the consultant worked with developers of Claremont, the adjacent single family neighborhood, to determine a location for a connection to the neighborhood’s existing greenway (see Figure 4-10). Topography along Bolin Creek in this area is steep and in order for the trail to meet accessibility requirements, the proposed Bolin Creek Greenway will make its connection behind the clubhouse in Claremont. Efforts should be made during design development to avoid removing as many trees as possible.



Existing conditions: sewer easement paralleling Bolin Creek beneath Homestead Rd.



Figure 4-8. *Proposed design: adequate horizontal and vertical clearance beneath Homestead Rd. will allow a safe roadway alternative to crossing at grade.*

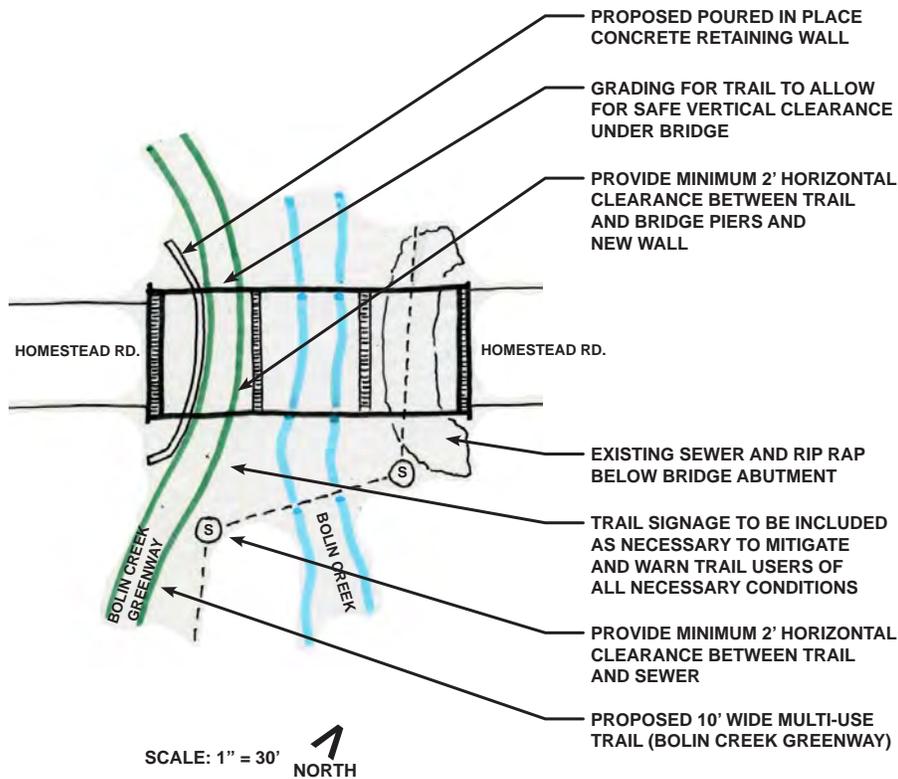


Figure 4-9. Enlargement of the Homestead Rd. trail underpass.

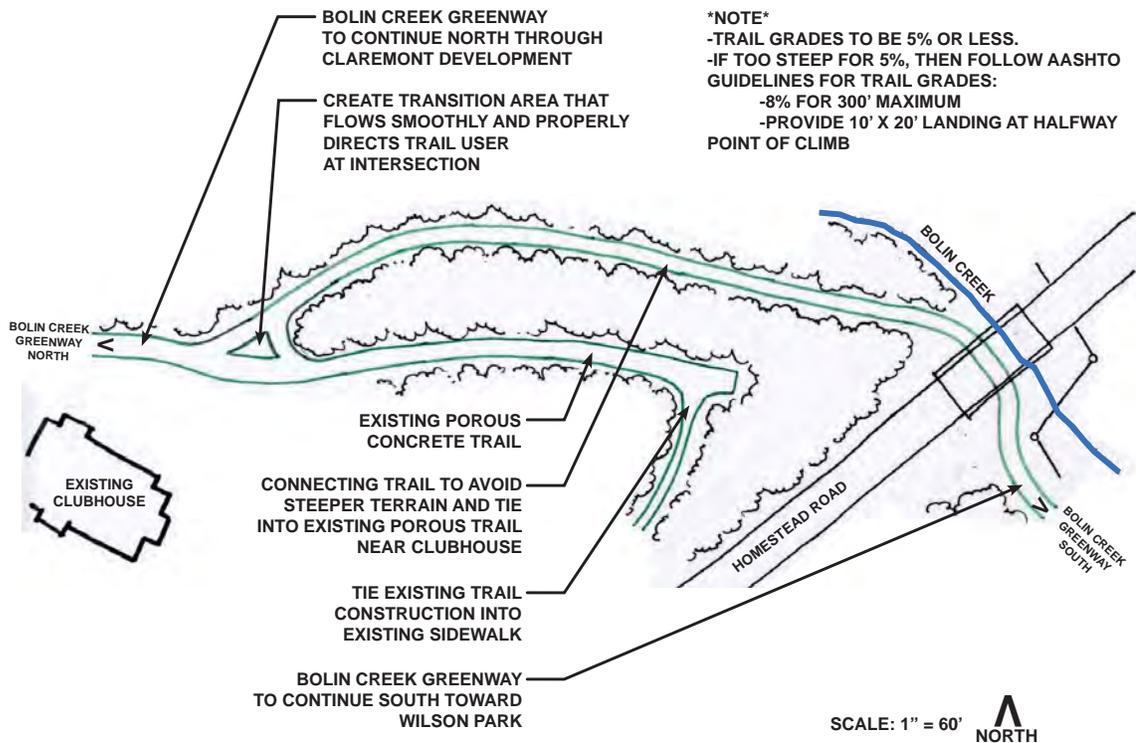


Figure 4-10. Enlargement of trail conditions at Homestead Rd. and the proposed trail tie-in at Claremont.

7. Jones Creek to Lake Hogan Farms Rd.

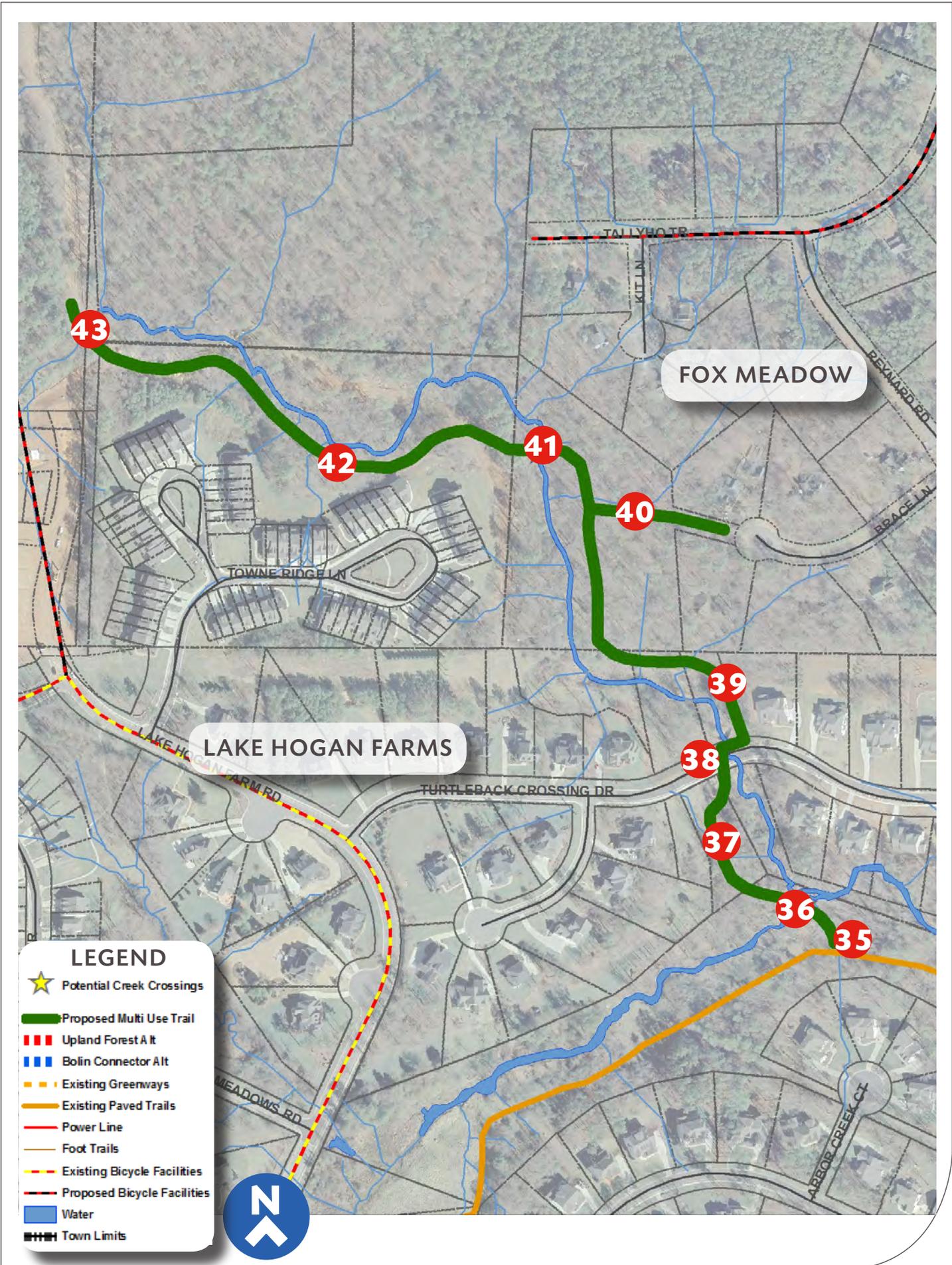
Jones Creek is unique to the Bolin Creek Greenway because it closes a gap that will provide continuity with the future trail connecting Morris Grove Elementary to Twin Creeks Park and southern parts of the Bolin Creek Greenway. Cooperation will be necessary from the Lake Hogan Farms (LHF) HOA for nearly all aspects of the alignment. LHF existing multi-use trail extends from the neighborhood lake east to UNC property, and parallels the sewer easement. Opportunity exists to provide a northern spur off the LHF trail within OWASA right-of-way, as several parcels exist along the corridor that are suited for trail development. A pedestrian bridge crossing will be necessary just south of the confluence of Bolin and Jones Creek to maintain the flexibility of available lands, and the Town should work to organize a meeting with both LHF HOA and OWASA to discuss trail development within these areas, respectively.

Topographical challenges exist at Turtleback Crossing Dr. The potential for a trail underpass beneath Turtleback Crossing was ruled out due to the presence of double box culverts beneath the roadway and costs associated with such engineering. Because Turtleback Crossing Dr. is a local residential road, an at-grade crossing is feasible with some minor adjustments to accommodate the width of the trail. See Figure 4-11 for the proposed at-grade crossing solution.

When working with LHF to obtain greenway easements within all LHF HOA parcels, consider privacy and security issues for adjacent homeowners. A substantial amount of clearing will be necessary along parts of the Jones Creek corridor because opportunity to take advantage of sewer easement (previously cleared corridors) on public property is limited. *(continued on page 58)*

Proposed Solution: *(Items below can be referenced on map - see facing page)*

- 35** Meet with LHF HOA to determine trail connection feasibility. Acquire greenway easements within LHF HOA parcels.
- 36** Design a low-flow, low water bridge across Bolin Creek (south of the confluence) that will connect the trail to OWASA property.
- 37** Work to obtain greenway easements along OWASA property. Construct 10-foot-wide concrete trail along Jones Creek.
- 38** Construct an at-grade crossing with low retaining walls, signage, and a crosswalk. See Figure 4.9 for further detail.
- 39** Arrange a meeting with all adjacent homeowners to determine privacy and screening concerns.
- 40** Provide a trail spur that connects the greenway to the Fox Meadow neighborhood. Meet with homeowners that live on the cul-de-sac on Brace Ln. to determine any potential concerns.
- 41** Construct a bridge crossing over Jones Creek on county property. Meet with officials to discuss partnerships for trail development on county property.
- 42** Meet with town home owners in Towne Ridge Ln. to discuss the proposed design. Determine privacy issues and accommodate any screening requests.
- 43** Design a low water bridge over Buckhorn Branch that will permit the trail to continue along the sewer easement northward, connecting with the future trail to Morris Grove Elementary School.



The Town should meet with Orange County to ensure a partnership for trail development between Orange County and the Town of Carrboro. Orange County property is well suited for trail development along the low banks of Jones Creek. Also proposed on county land is a connection to Brace Ln. Public workshop participants expressed an interest in a trail spur at this location, which will serve the Fox Meadow neighborhood. A grading study may be necessary when connecting to Brace Ln. to determine accessibility calculations. A low water bridge crossing is proposed on Orange County property. This crossing location provides adequate space on either side of the creek banks, while remaining on county property. Extending west, the proposed trail follows sewer easement corridors behind the town homes in Town Ridge Ln. Space is limited between the town home lots and Jones Creek. The Town should meet with adjacent property owners and the HOA to determine privacy and security concerns. Vegetative screening and opaque fencing are potential solutions for this area (see Figure 4-12).

Buckhorn Branch (a tributary of Jones Creek) necessitates a bridge crossing as the trail extends northward. A low water bridge would permit the greenway to utilize the sanitary sewer easement and tie into the future trail which is planned to begin at the proposed Twin Creeks Park and extend to Morris Grove Elementary.

Figure 4-12.



Existing conditions: the sewer easement behind Lake Hogan Farms town homes provides a cleared corridor well suited for trail development; however it is in close proximity to the town homes.



Proposed design: Opaque fencing and/or vegetative screening will help increase privacy and establish a clear delineation of what is privately owned and public property.

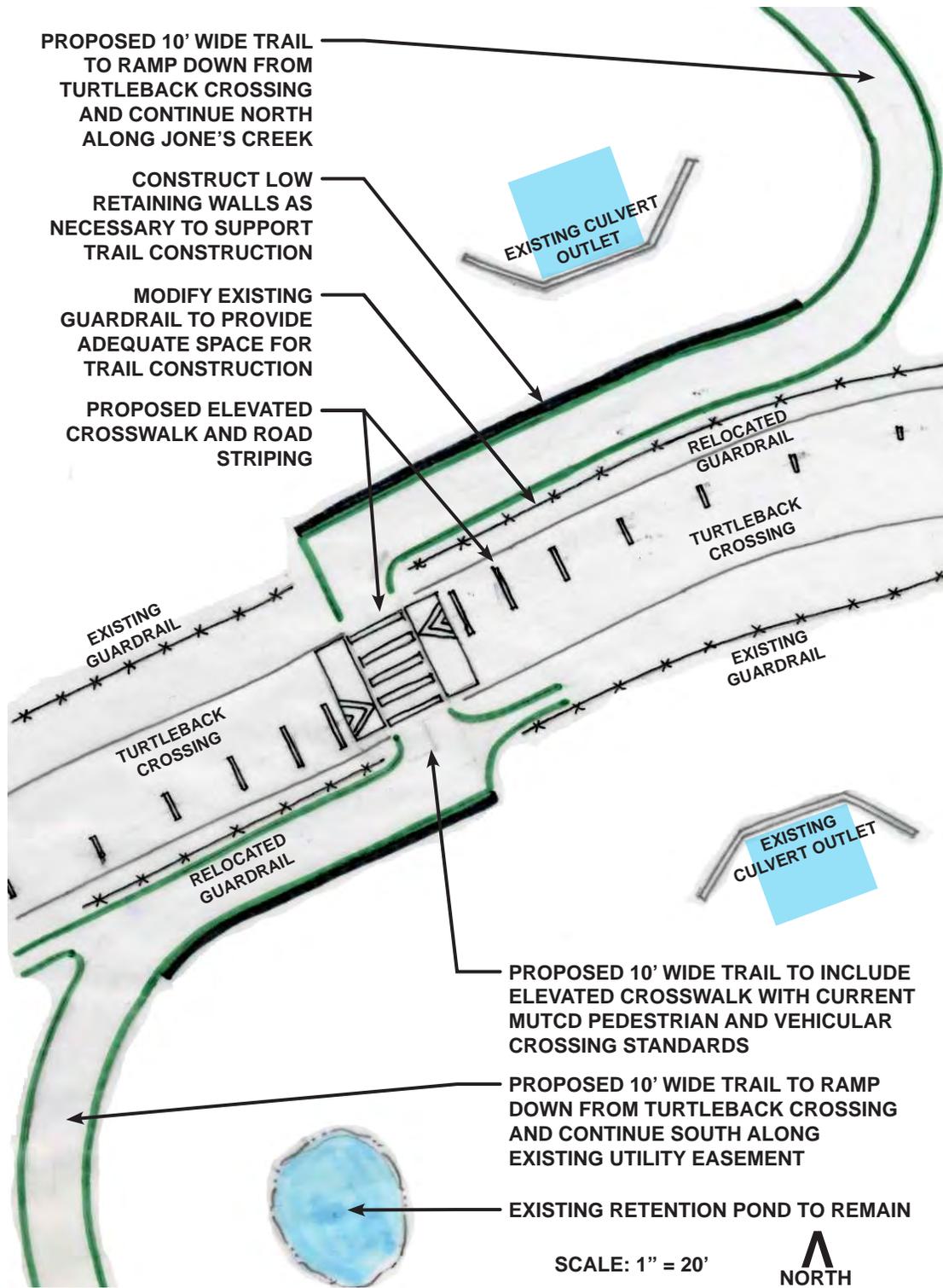


Figure 4-11. Study of the at-grade crossing at Turtleback Crossing Rd.

References:

Carolina North Website:

<http://www.fac.unc.edu/AboutUs/ShopsDepartments/Grounds/CarolinaNorth/tab-id/259/Default.aspx>

Information on HAWK signals:

http://www.saferoutesinfo.org/guide/case_studies/case_study.cfm?CS_ID=CS651&CHAPTER_ID=C353

Future UNC Carolina Commons Development:

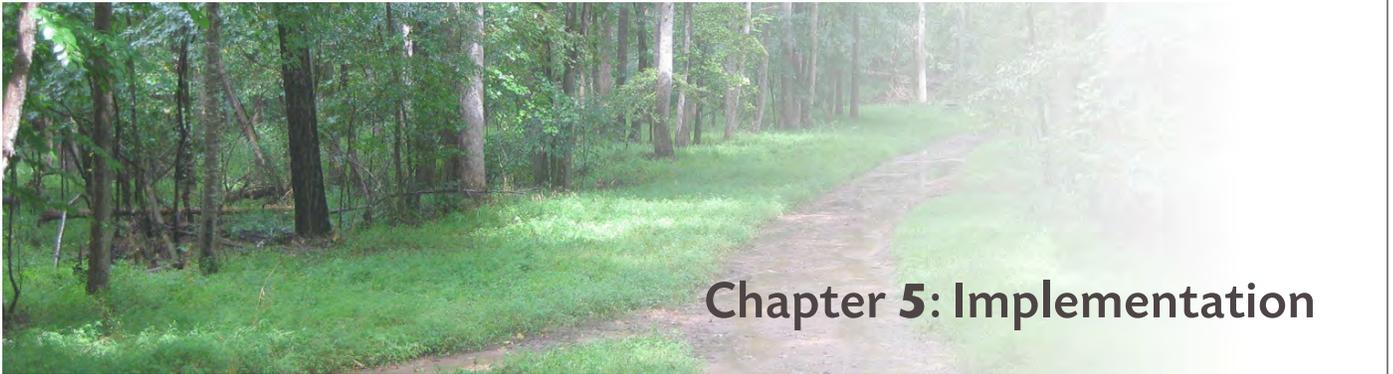
<http://www.unc.edu/community/carolinacommons.html>

Duke Energy Rights-of-way Restrictions:

<http://www.duke-energy.com/safety/right-of-way-management/transmission-restrictions.asp>

Carrboro Recreation and Parks Master Plan:

<http://www.ci.carrboro.nc.us/RP/PDFs/APPROVEDMASTERPLAN.pdf>



Chapter 5: Implementation

Chapter Outline:

1. Overview
2. Action Steps to Implementation
3. Phasing Plan
4. Land Acquisition

1. Overview

The text in this chapter describes how the Town of Carrboro can turn the goal of the Bolin Creek Greenway into a reality. The design recommendations in the previous chapter provide the framework for the plan while the implementation strategy provides a guide for taking action. It is important for positive, successful action to take place in order to build momentum and support throughout the Town of Carrboro. A dedicated effort towards implementation will be necessary to create the envisioned corridor along Bolin and Jones Creek. This chapter contains action steps, project prioritization and phasing, land acquisition strategies, and potential renovation recommendations.

2. Action Steps to Implementation

The following action steps will be key to kicking off the implementation process of the Bolin Creek Greenway:

1. *Adopt the Bolin Creek Greenway Master Plan*

Through adoption, the Bolin Creek Greenway Conceptual Master Plan becomes an official planning document of the Town of Carrboro. The Town of Carrboro can then use this document to receive funding.

2. *Create the Necessary Governance and Administrative Capability to Oversee Plan Implementation and Prioritize Next Steps*

Part of this effort could include broadening the capabilities of the Carrboro Greenways Commission so that the goals of this Plan are carried out. For example, during construction documentation, the Commission could help with public outreach in soliciting feedback. Additionally, Carrboro Recreation and Parks could incorporate a Trails Coordinator position to oversee day-to-day operations and management of trails.

3. *Seek Multiple Funding Sources*

A multi-pronged approach should be taken to support greenway facility development, operations, and programming. A combination of bonds, grants and other types of financing (discussed further in Appendix B) should be sought to develop the Bolin Creek Greenway that will allow the community to incrementally complete the trail over a 5-10 year period.

4. *Coordinate with Stakeholders, Including Neighboring Jurisdictions and Utilities*

In order to develop a connected trail network as proposed in this Plan, a cooperative planning effort will need to be made with trail stakeholders, utility owners and neighboring jurisdictional boundaries. Coordinate phasing and construction costs to implement an achievable project.

5. *Begin Top Priority Project Design*

Once the master plan has been adopted, begin the process of hiring a design consultant to develop construction contract documents for Phase 1 of the Bolin Creek Greenway Conceptual Master Plan. Include the services of a land surveyor to perform a metes and bounds sur-

vey of the project corridor. Work closely with the design consultant to ensure the contract documents are being developed according to master plan goals, state and local permitting issues, design specifications, and budget costs.

6. *Begin the Land Acquisition Process*

Begin acquiring land and easements necessary to complete the greenway corridor, especially in future phases of the master plan. Build partnerships by scheduling meetings with adjacent property owners, provide information and education, and begin negotiations with land owners along the corridor to ensure a connected system.

7. *Begin Top Priority Project Construction*

With existing available funds, award a construction contract for Phase 1 of the Bolin Creek Greenway Conceptual Master Plan. Develop a predetermined timeline for construction completion. The design consultant can provide assistance to the Town by helping to facilitate the bidding process. Depending on funding sources, the contractor may need to be selected through a formal bidding process in which the project scope and parameters are publicly defined.

8. *Construction Administration*

The design consultant can also act as construction administrator, to ensure the project is developed per the drawings and specifications. The construction administrator ensures the project is built according to the timeline and can handle payment schedules between the Town and the contractor.

9. *Trail Programming*

Once trail construction is complete, work with project stakeholders and partners to develop programs that encourage use of the trail. Examples of such programs can be found in Appendix C: Operations and Management.

10. *Create a Signage System*

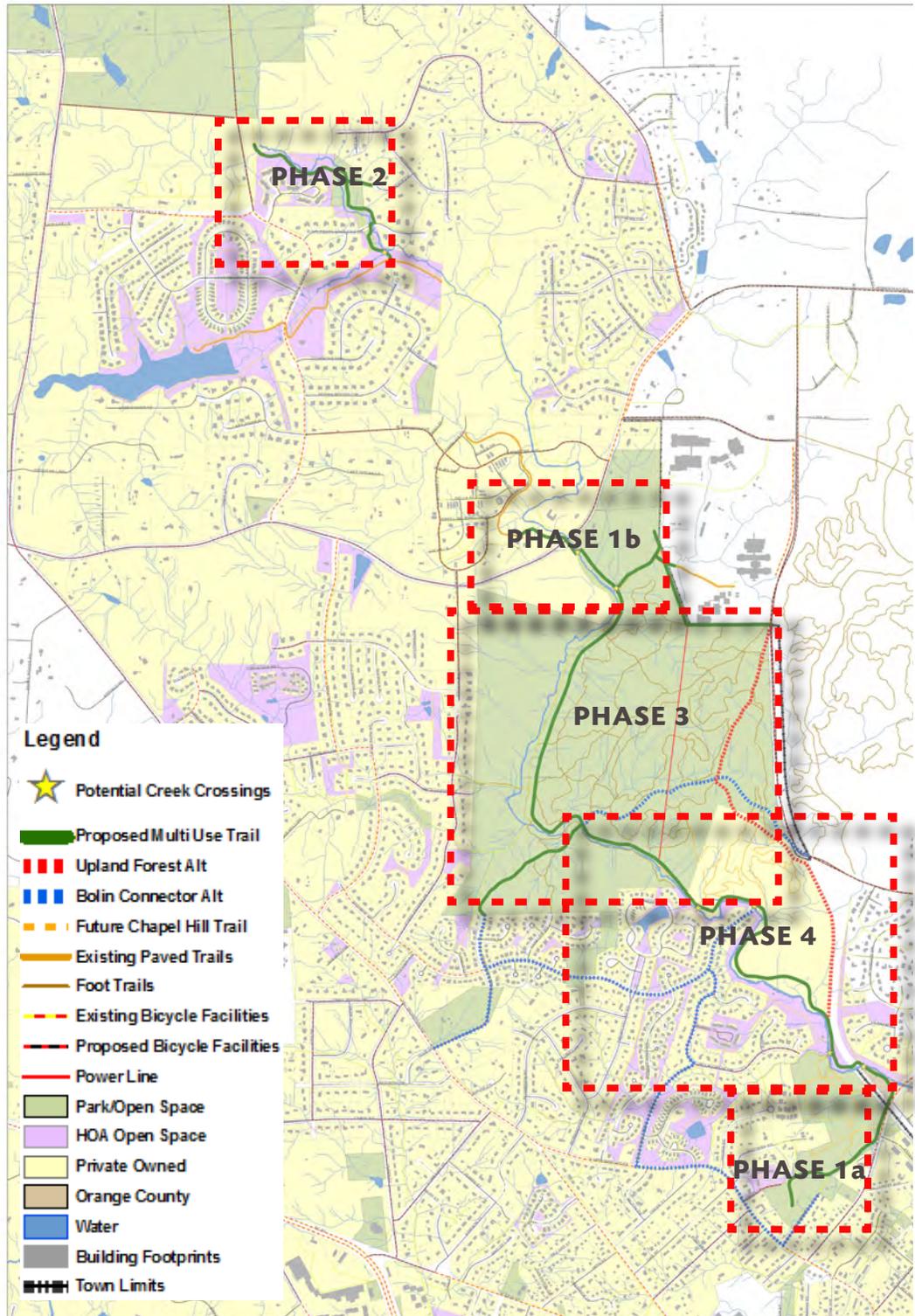
Consult with a graphic designer specializing in wayfinding, interpretive, and regulatory signage to develop a network signage system for Carrboro's Bolin Creek Greenway. Partner with local organizations to raise funds for trail signage.

11. *Operations and Maintenance*

Working with Carrboro Public Works, Carrboro Recreation and Parks, and Carolina North staff, develop a maintenance schedule for the Bolin Creek Greenway. Ensure all stakeholders' goals are being met in providing a safe, high quality user experience. See Appendix C: Operations and Maintenance for more information.

3. Phasing Plan

There are more than 4.5 miles of greenway (including spur trails) along the Bolin Creek Greenway. Regardless of available funds, it is necessary to prioritize the construction of the trail segments. Input from the public, availability of funding, existing land ownership, permitting issues, engineering constraints, destination points and existing improvements projects were considered in the development of the phasing plan and are broken down on the following pages.



Phase 1a: Wilson Park to Railroad

The first phase of trail begins at Wilson Park and terminates just before the railroad across Estes Dr. for a total of .4 miles. Prior to design development, the Town should meet with OWASA and NCDOT to discuss the proposed alignment.

Opportunities:

- All parcels are Town-owned
- Wilson Park provides existing trailhead facility
- 1,220 linear feet of trail have already been budgeted for construction
- Phase 1a will provide safe off-road alternative to steep roadway segment on Estes Dr. between Estes Park Apartments and Greensboro St.
- Phase 1a supported by the public

Constraints:

- May require encroachment agreement with NCDOT along Estes Dr., depending on land survey
- Traffic on Estes Dr. means increased trail costs for safe trail buffering and engineering

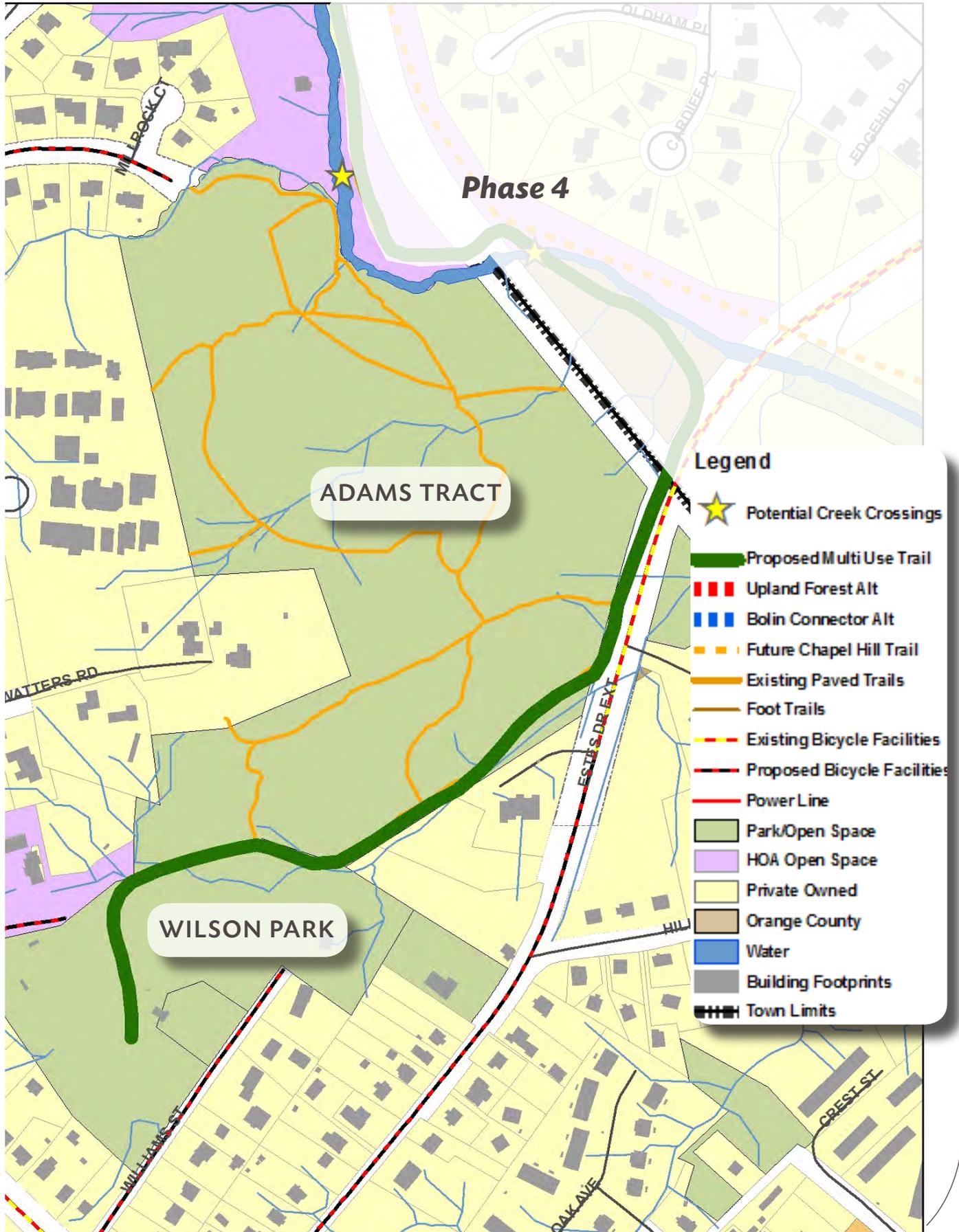
Bolin Creek Greenway - Phase 1A

Probable Estimate of Construction Costs, 2009
2088.48 linear feet (0.40 miles)

Demolition	Quantity	Cost	Unit	Subtotal
Clearing and grubbing understory (20' wide)	18,000	\$0.25	sf	\$4,500.00
Dumping Fees @ 6% of Demolition total			6%	\$270.00
			<i>Subtotal</i>	\$4,770.00
Trail Development	Quantity	Cost	Unit	Subtotal
Construction Entrance	2	\$1,900.00	ea	\$3,800.00
Temporary Rock Silt Check Type A	6	\$425.00	ea	\$2,550.00
Stabilization (Seeding: Temporary and Permanent)	20,885	\$0.25	sf	\$5,221.25
Straw with netting	500	\$4.50	lf	\$2,250.00
Temporary tree protection fence	3,050	\$4.00	lf	\$12,200.00
Temporary silt fence	2,350	\$5.00	lf	\$11,750.00
Temporary Diversion Ditch	300	\$3.00	lf	\$900.00
Temporary pipe inlet protection	1	\$900.00	ea	\$900.00
Trail initial grading (0-5 cu ft/lf)	525	\$3.30	lf	\$1,732.50
Trail fine grading (pavement)	2,088	\$3.30	lf	\$6,890.40
Trail fine grading (shoulders and ditch)	1,900	\$3.30	lf	\$6,270.00
10' wide multi-use asphalt trail	2,088	\$35.00	lf	\$73,080.00
2' wide gravel shoulder (both sides)	2,088	\$6.60	lf	\$13,780.80
Class B Rip Rap with filter fabric	15	\$42.00	ton	\$630.00
RCP Drainage Pipes	105	\$35.00	lf	\$3,675.00
Seeding or mulching trail edges (5' both sides)	20,880	\$0.13	sf	\$2,714.40
Estes Drive Intersection Signalization	1	\$25,000.00	ls	\$25,000.00
Concrete Curb and Gutter along Estes Drive	400	\$25.00	lf	\$10,000.00
Street Trees along Estes Drive	19	\$750.00	ea	\$14,250.00
Boardwalk bridges for neighborhood access	12	\$75.00	lf	\$900.00
Signage				
Mile Markers	2	\$400.00	ea	\$800.00
Trail and street regulatory/warning signs	11	\$220.00	ea	\$2,420.00
Directional signs	3	\$220.00	ea	\$660.00
Educational signs	2	\$400.00	ea	\$800.00
Site Amenities				
Benches (2 per mile recommended)	3	\$900.00	ea	\$2,700.00
Bicycle rack (at Wilson Park trailhead)	1	\$800.00	ea	\$800.00
Drinking fountains, with pet fountain (1 per mile)	1	\$2,000.00	ea	\$2,000.00
Picnic tables/ tables (at trailheads)	1	\$550.00	ea	\$550.00
Trash receptacles (32-gallon, steel-at trailheads)	3	\$300.00	ea	\$900.00
Bollards (3 per trail/road intersection)	9	\$600.00	ea	\$5,400.00
			<i>Subtotal</i>	\$215,524.35
Design	Quantity	Cost	Unit	Subtotal
Wetlands and Stream Delineation (\$3,500/mile avg.)	0.13	\$3,500.00	mi	\$455.00
Surveying (\$10,000/mile avg.)	0.40	\$10,000.00	mi	\$4,000.00
Construction Documents @ 12 % of Dev. Cost			12%	\$25,862.92
			<i>Subtotal</i>	\$30,317.92
Subtotals				
Demolition				\$4,770.00
Trail Development				\$215,524.35
Design				\$30,317.92
SUBTOTAL (Demolition, Trail Development, Design)				\$250,612.27
Contingency (15% of total)			15%	\$37,591.84
TOTAL				\$288,204.11

Note: Does not include the following: land acquisition, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, and taxes.

Phase 1a: Wilson Park to Railroad



Phase 1b: Carolina North Forest to Claremont

Phase 1b will tie into the trails at Claremont, cross beneath Homestead Rd., and cross Bolin Creek, where it will span for a total of .78 miles (including spurs to CHCCS). Prior to design development, the Town should meet with the following stakeholders: Claremont developers to obtain a greenway easement north of Homestead Rd.; NCDOT to approve the trail underpass at Homestead Rd.; NC state agencies for the permitting of a proposed bridge crossing over Bolin Creek; OWASA, and CHCCS to discuss the proposed alignment and all tie-ins.

Opportunities:

- Large state-owned parcel along Bolin Creek presents public facility opportunity
- Existing sewer easements provide feasible conditions for trail development
- Underpass beneath Homestead Rd. provides vertical and horizontal clearance, will not encroach on roadway bridge overpass
- Trail tie-ins on CHCCS campus
- Public-supported tie-in at CHCCS

Constraints:

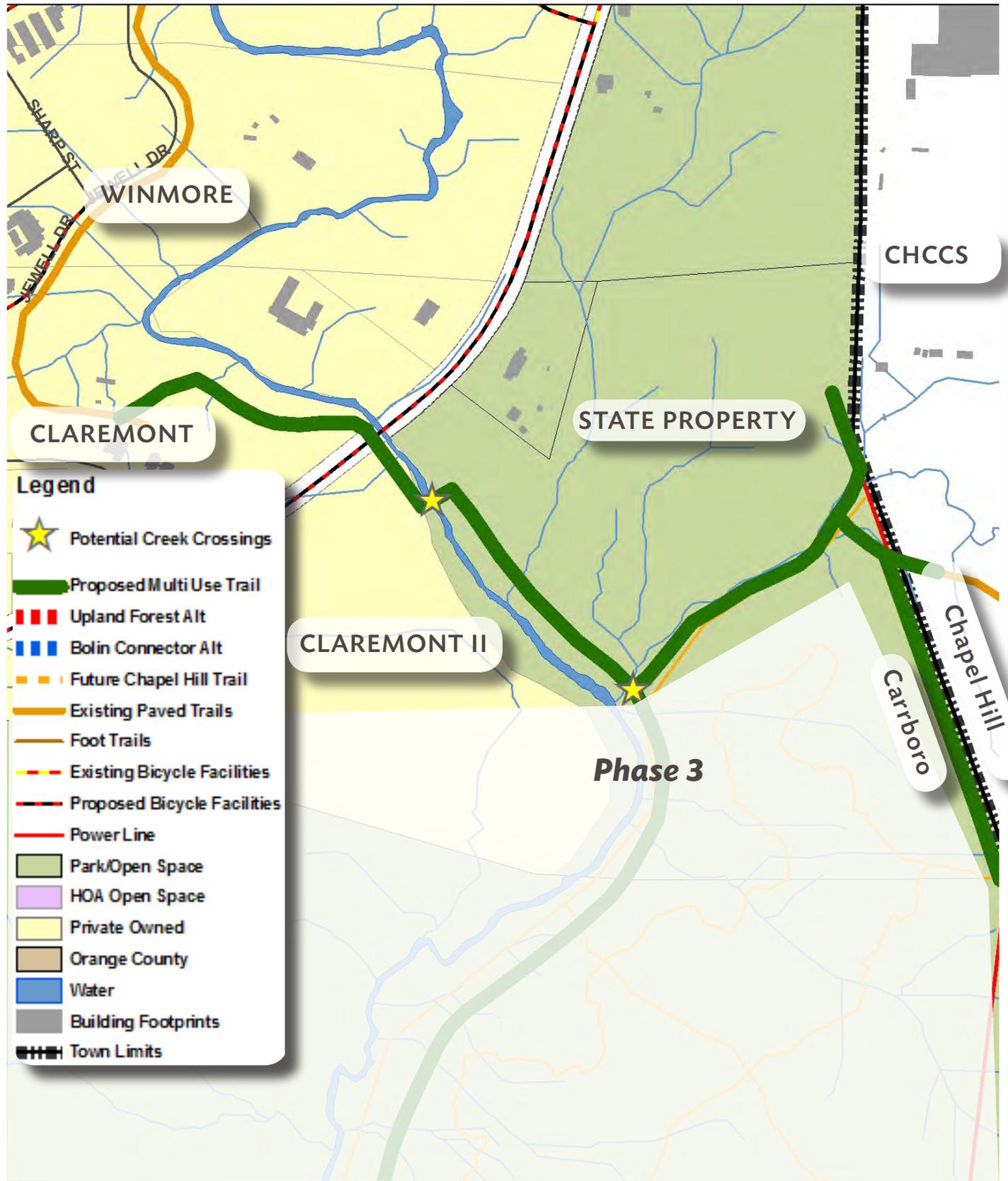
- Requires NCDOT approval for proposed trail underpass
- Bridge crossing at Bolin Creek must span the floodway, which may present delays in project permitting
- Clearing and mitigation will be required for some areas not already within sewer easement
- Topography north of Homestead Rd. presents engineering concerns and costs constraints

Bolin Creek Greenway - Phase 1B
 Probable Estimate of Construction Costs, 2009
 4137.25 linear feet (0.78 miles)

Demolition	Quantity	Cost	Unit	Subtotal
Clearing and grubbing understory (20' wide)	44,100	\$0.25	sf	\$11,025.00
Dumping Fees @ 6% of Demolition total			6%	\$661.50
			<i>Subtotal</i>	\$11,686.50
Trail Development	Quantity	Cost	Unit	Subtotal
Construction Entrance	2	\$1,900.00	ea	\$3,800.00
Temporary Rock Silt Check Type A	2	\$425.00	ea	\$850.00
Stabilization (Seeding: Temporary and Permanent)	33,320	\$0.25	sf	\$8,330.00
Straw with netting	600	\$4.50	lf	\$2,700.00
Temporary tree protection fence	6,100	\$4.00	lf	\$24,400.00
Temporary silt fence	5,580	\$5.00	lf	\$27,900.00
Temporary Diversion Ditch	300	\$3.00	lf	\$900.00
Trail initial grading (0-5 cu ft/lf)	600	\$3.30	lf	\$1,980.00
Trail fine grading (pavement)	3,332	\$3.30	lf	\$10,995.60
Trail fine grading (shoulders and ditch)	600	\$3.30	lf	\$1,980.00
10' wide multi-use concrete trail	2,872	\$75.00	lf	\$215,400.00
10' wide multi-use asphalt trail	1,265	\$35.00	lf	\$44,275.00
2' wide gravel shoulder (both sides)	3,182	\$6.60	lf	\$21,001.20
Class B Rip Rap with filter fabric	30	\$42.00	ton	\$1,260.00
RCP Drainage Pipes	135	\$35.00	lf	\$4,725.00
Seeding or mulching trail edges (5' both sides)	28,720	\$0.13	sf	\$3,733.60
Pre-Fab Bridge over Bolin Creek	1	\$175,000.00	ea	\$175,000.00
Tributary Crossing with boardwalk bridge	20	\$300.00	lf	\$6,000.00
Homestead Road Underpass	1	\$10,000.00	ls	\$10,000.00
Retaining Walls near Claremont II Development	100	\$30.00	lf	\$3,000.00
			<i>Subtotal</i>	\$585,660.40
Signage				
Mile Markers	3	\$400.00	ea	\$1,200.00
Trail and street regulatory/warning signs	16	\$220.00	ea	\$3,520.00
Directional signs	8	\$220.00	ea	\$1,760.00
Educational signs	2	\$400.00	ea	\$800.00
			<i>Subtotal</i>	\$78,329.25
Site Amenities				
Benches (2 per mile recommended)	2	\$900.00	ea	\$1,800.00
Bicycle rack (at CHCCS spur)	2	\$800.00	ea	\$1,600.00
Drinking fountains, with pet fountain (1 per mile)	1	\$2,000.00	ea	\$2,000.00
Picnic tables/ tables (at trailheads)	1	\$550.00	ea	\$550.00
Trash receptacles (32-gallon, steel-at trailheads)	2	\$300.00	ea	\$600.00
Bollards (3 per trail/road intersection)	6	\$600.00	ea	\$3,600.00
			<i>Subtotal</i>	\$585,660.40
Design	Quantity	Cost	Unit	Subtotal
Wetlands and Stream Delineation (\$3,500/mile avg.)	0.50	\$3,500.00	mi	\$1,750.00
Surveying (\$10,000/mile avg.)	0.63	\$10,000.00	mi	\$6,300.00
Construction Documents @ 12 % of Dev. Cost			12%	\$70,279.25
			<i>Subtotal</i>	\$78,329.25
Subtotals				
Demolition				\$11,686.50
Trail Development				\$585,660.40
Design				\$78,329.25
SUBTOTAL (Demolition, Trail Development, Design)				\$675,676.15
Contingency (15% of total)			15%	\$101,351.42
TOTAL				\$777,027.57

Note: Does not include the following: land acquisition, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, and taxes.

Phase 1b: Carolina North Forest to Claremont



Phase 1b: Carolina North Forest to Claremont (Alternatives)

The desire to make greenway connections to CHCCS was expressed during work sessions with the Greenways Commission as well as during public workshops. Upon exiting the Carolina North Forest along Bolin Creek, the existing sewer easement continues for several hundred feet before it splits in several directions. The western line crosses Bolin Creek and extends north to Homestead Rd.; the other extends laterally to the east toward CHCCS. Both corridors were examined as opportunities for trail development, and the results are shown as several trail alternatives. Phase 1b encounters other constraints such as landowner greenway development preference and environmental permitting. Direct connections, environmental impact and disturbance, and costs were considered while developing the alternatives.

Alternative 1 (red)

This alignment will continue along eastern Bolin Creek and extend east along the existing sewer easement to make a connection to CHCCS. For trail users continuing north, the trail will split to the west and meander through the understory while maintaining a consistent grade. The alignment stays outside the floodway which will minimize permitting constraints due to the reduced amount of cleared trees. South of Homestead Rd., the alignment continues, crossing Bolin Creek where the floodway narrows to less than 200 feet, decreasing bridge costs.

Advantages to Alternative 1: low impact bridge crossing; relative ease of trail construction; direct connection to schools; minimal tree removal; reduced permitting implications, reasonable construction costs

Constraints to Alternative 1: will require some disturbance within the floodplain, therefore flood study will be required; grading will be necessary

Alternative 2 (blue)

Alternative 2 utilizes the northern-extending existing sewer easement west of Bolin Creek that provides a direct connection to CHCCS via the existing sewer easement along Jolly Branch stream. The proposed Bolin Creek crossing is located at a sanitary sewer ductile iron pipe (SSDIP), which is located within the special flood hazard area (SFHA). The SFHA is approximately 600 feet wide, and to adequately span the floodway a bridge crossing of 500-600 feet will be necessary. This span length will have significant cost and permitting constraints on Phase 1b.

Advantages to Alternative 2: utilizes existing disturbed corridors; provides direct connection to CHCCS

Constraints to Alternative 2: cost-prohibitive bridge crossing; complex/rigorous permitting and flood studies; complicated engineering design work may be necessary for bridge crossing

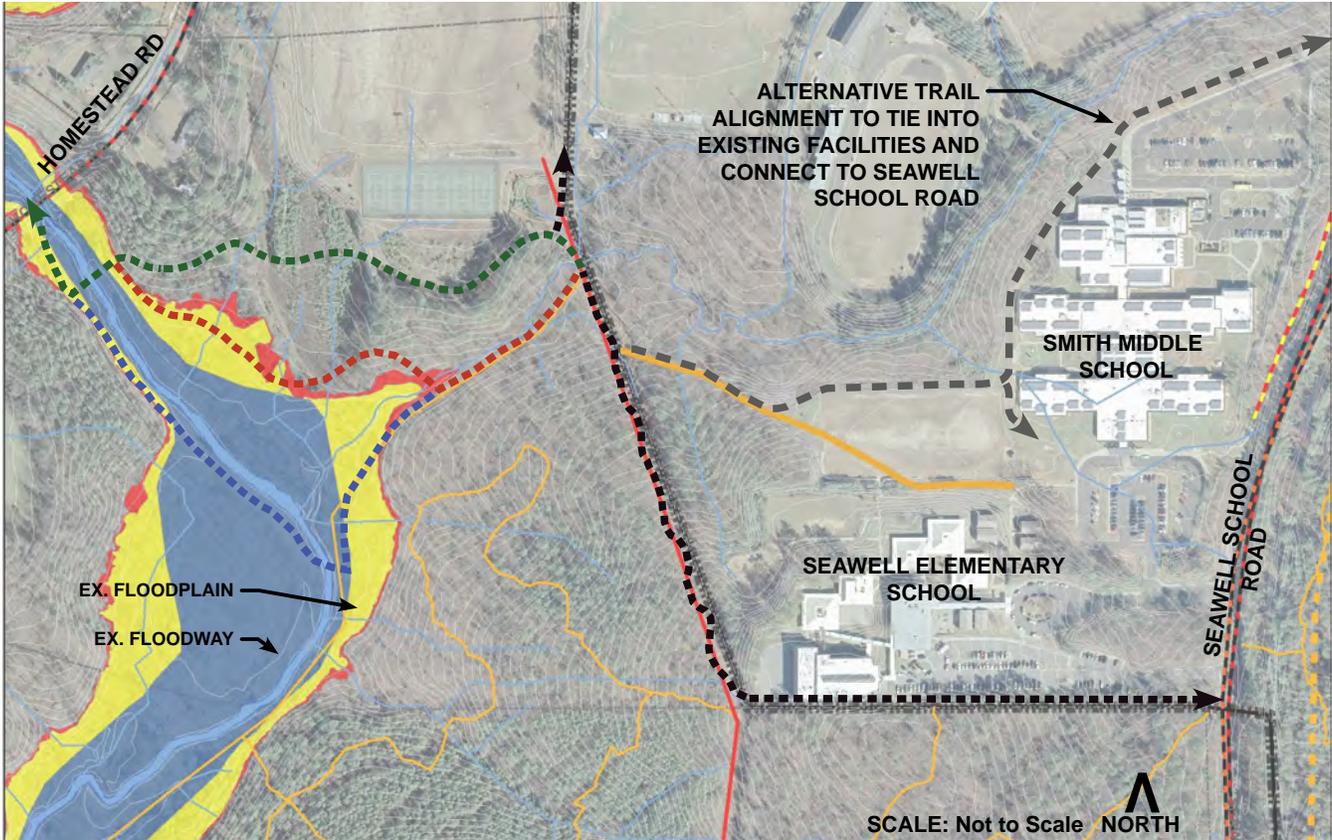
Alternative 3 (green)

Alternative 3 provides tie-ins to CHCCS and nearby athletic fields. Alternative 3 remains outside the floodplain and utilizes open areas of the understory where possible. Trail users not bound for CHCCS will be directed north and then south, increasing mileage along the corridor. Although requiring the least amount of tree removal, Alternative 3 provides the least-direct route from Bolin Creek to Homestead Rd. The proposed crossing will occur where the floodway narrows, approximately 200 feet south of Homestead Rd.

Advantages to Alternative 3: minimizes tree clearing; follows existing grade; provides multiple tie-ins at CHCCS

Constraints to Alternative 3: increased trail costs associated with augmented trail mileage; least direct connection to Homestead Rd. of all the alternatives, least complicated with regards to flood study

Phase 1b Alternatives



■■■■■■■	Proposed Bolin Creek Greenway		
■■■■■■■	Alternative Route 1	1365 linear feet (0.26 miles)	Estimated Cost = \$211,318.31 + \$175,000.00 Bridge = \$386,318.31
■■■■■■■	Alternative Route 2	1821 linear feet (0.34 miles)	Estimated Cost = \$277,909.20 + \$1,200,000.00 Bridge = \$1,477,909.20
■■■■■■■	Alternative Route 3	1285 linear feet (0.24 miles)	Estimated Cost = \$198,696.96 + \$175,000.00 Bridge = \$373,696.96

Phase 2: Jones Creek

Phase 2 is intended to tie into the trails at LHF with connections made at the future trail to Morris Grove Elementary. Phase 2 is .61 miles in length and presents several land acquisition constraints, requiring greenway easements with LHF HOA and OWASA property. Meetings should be scheduled with LHF HOA, OWASA, and Orange County.

Opportunities:

- Large county-owned parcel near Fox Meadow
- Trail tie-in with LHF trails
- Has potential to close gap between Morris Grove Elementary/Twin Creeks Park and LHF

Constraints:

- May require greenway easements with OWASA and LHF HOA
- 2 bridge crossings may delay project permitting
- At-grade crossing is required at Turtleback Crossing Dr. and will require engineering study
- Clearing and grubbing will be required along majority of the corridor
- Adjacent homes are very close in some areas to proposed trail

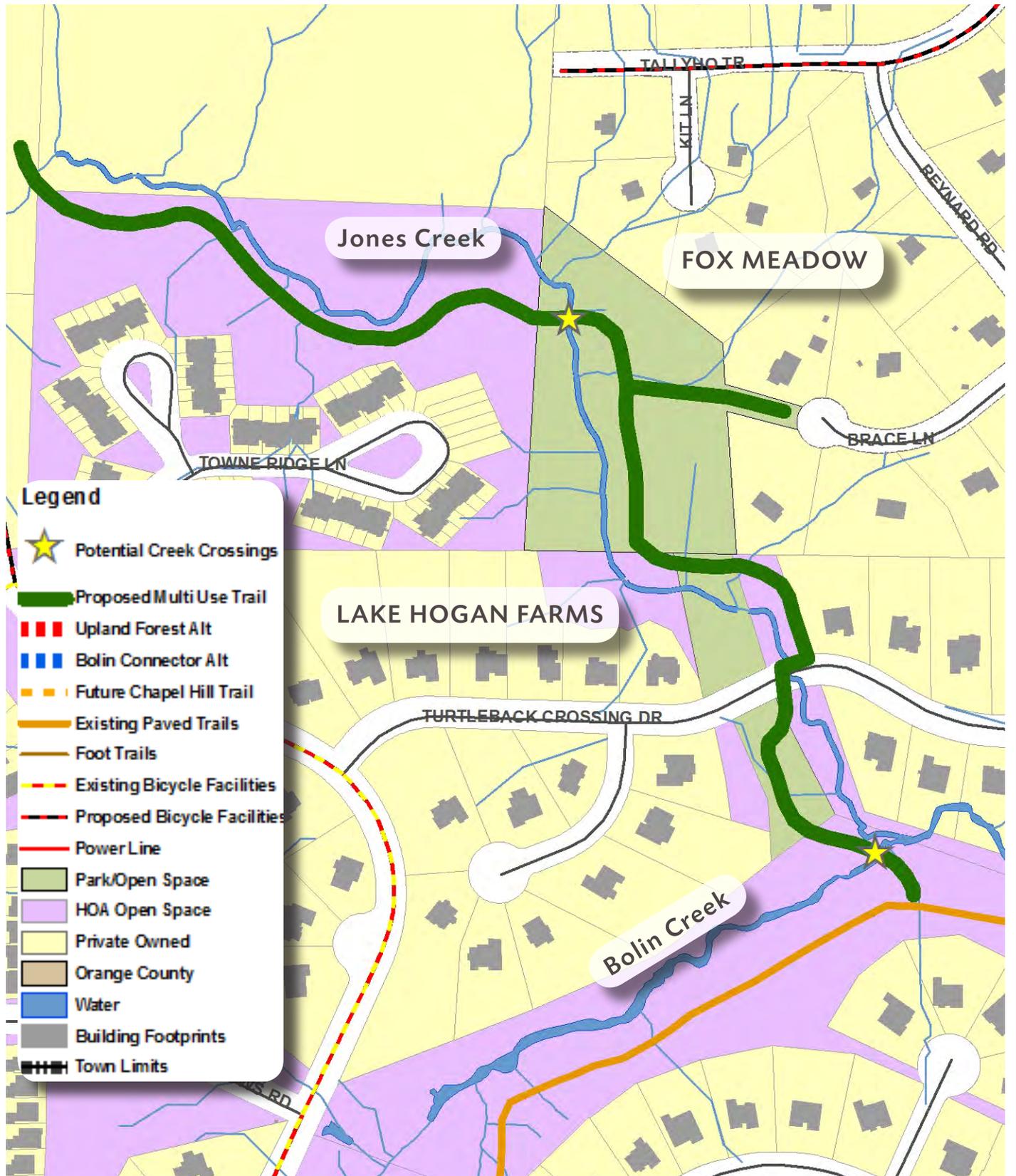
Bolin Creek Greenway - Phase 2

Probable Estimate of Construction Costs, 2009
3223.21 linear feet (0.61 miles)

Demolition	Quantity	Cost	Unit	Subtotal
Clearing and grubbing understory (20' wide)	53,600	\$0.25	sf	\$13,400.00
Dumping Fees @ 6% of Demolition total			6%	\$804.00
			<i>Subtotal</i>	\$14,204.00
Trail Development	Quantity	Cost	Unit	Subtotal
Construction Entrance	5	\$1,900.00	ea	\$9,500.00
Temporary Rock Silt Check Type A	8	\$425.00	ea	\$3,400.00
Stabilization (Seeding: Temporary and Permanent)	32,232	\$0.25	sf	\$8,058.00
Straw with netting	750	\$4.50	lf	\$3,375.00
Temporary tree protection fence	4,395	\$4.00	lf	\$17,580.00
Temporary silt fence	4,500	\$5.00	lf	\$22,500.00
Temporary Diversion Ditch	300	\$3.00	lf	\$900.00
Temporary pipe inlet protection	2	\$900.00	ea	\$1,800.00
Trail initial grading (0-5 cu ft/lf)	300	\$3.30	lf	\$990.00
Trail fine grading (pavement)	3,223	\$3.30	lf	\$10,635.90
Trail fine grading (shoulders and ditch)	1,500	\$3.30	lf	\$4,950.00
10' wide multi-use concrete trail	2,640	\$75.00	lf	\$198,000.00
10' wide multi-use asphalt trail	460	\$35.00	lf	\$16,100.00
2' wide gravel shoulder (both sides)	3,100	\$6.60	lf	\$20,460.00
Class B Rip Rap with filter fabric	25	\$42.00	ton	\$1,050.00
RCP Drainage Pipes	105	\$35.00	lf	\$3,675.00
Seeding or mulching trail edges (5' both sides)	26,400	\$0.13	sf	\$3,432.00
Low Water Bridge over Bolin Creek	1	\$45,000.00	ls	\$45,000.00
Low Water Bridge over Buckhorn Branch	1	\$30,000.00	ls	\$30,000.00
Low Water Bridge over Jones Creek	1	\$40,000.00	ls	\$40,000.00
Allowance for Screening Trees/Privacy Fencing	1	\$25,000.00	ls	\$25,000.00
Turtleback Crossing Intersection Improvements	1	\$25,000.00	ls	\$25,000.00
Signage				
Mile Markers	2	\$400.00	ea	\$800.00
Trail and street regulatory/warning signs	11	\$220.00	ea	\$2,420.00
Directional signs	6	\$220.00	ea	\$1,320.00
Educational signs	2	\$400.00	ea	\$800.00
Site Amenities				
Benches (2 per mile recommended)	3	\$900.00	ea	\$2,700.00
Bicycle rack (at one educational sign location)	1	\$800.00	ea	\$800.00
Trash receptacles (32-gallon, steel-at trailheads)	3	\$300.00	ea	\$900.00
Bollards (3 per trail/road intersection)	9	\$600.00	ea	\$5,400.00
			<i>Subtotal</i>	\$506,545.90
Design	Quantity	Cost	Unit	Subtotal
Wetlands and Stream Delineation (\$3,500/mile avg.)	0.44	\$3,500.00	mi	\$1,540.00
Surveying (\$10,000/mile avg.)	0.61	\$10,000.00	mi	\$6,100.00
Construction Documents @ 12 % of Dev. Cost			12%	\$60,785.51
			<i>Subtotal</i>	\$68,425.51
Subtotals				
Demolition				\$14,204.00
Trail Development				\$506,545.90
Design				\$68,425.51
SUBTOTAL (Demolition, Trail Development, Design)				\$589,175.41
Contingency (15% of total)			15%	\$88,376.31
TOTAL				\$677,551.72

Note: Does not include the following: land acquisition, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, and taxes.

Phase 2: Jones Creek



Legend

- Potential Creek Crossings
- Proposed Multi Use Trail
- Upland Forest Alt
- Bolin Connector Alt
- Future Chapel Hill Trail
- Existing Paved Trails
- Foot Trails
- Existing Bicycle Facilities
- Proposed Bicycle Facilities
- Power Line
- Park/Open Space
- HOA Open Space
- Private Owned
- Orange County
- Water
- Building Footprints
- Town Limits

Phase 3: Carolina North Forest

Phase 3 consists of 1.77 miles of trail, including lateral connectors. Phase 3 provides the majority of centralized east/west connections from the Bolin Creek Greenway corridor to nearby neighborhoods. Greenway easements/rights of entry will need to be obtained with UNC, and the Town should meet with OWASA and adjacent homeowners and HOA's prior to design development. During the planning process, UNC met with the Town of Carrboro to review and comment on the proposed alignment. UNC comments are presented in Chapter 4: Proposed Design.

Opportunities:

- Existing sewer easements provide wide, cleared corridor
- Largest tract of land within the corridor allows for multiple connection points
- Sole land owner cooperation
- Wildlife habitat restoration opportunities
- Future connections to Carolina North development
- General ease of construction

Constraints:

- Consider development agreement between UNC and Chapel Hill
- Numerous tributary crossings create potential for delays in permitting
- Northern stretch may require clearing and grubbing
- Need OWASA, CHCCS, and UNC cooperation for proposed trailheads

Bolin Creek Greenway - Phase 3
 Probable Estimate of Construction Costs, 2009
 9352.30 linear feet (1.77 miles)

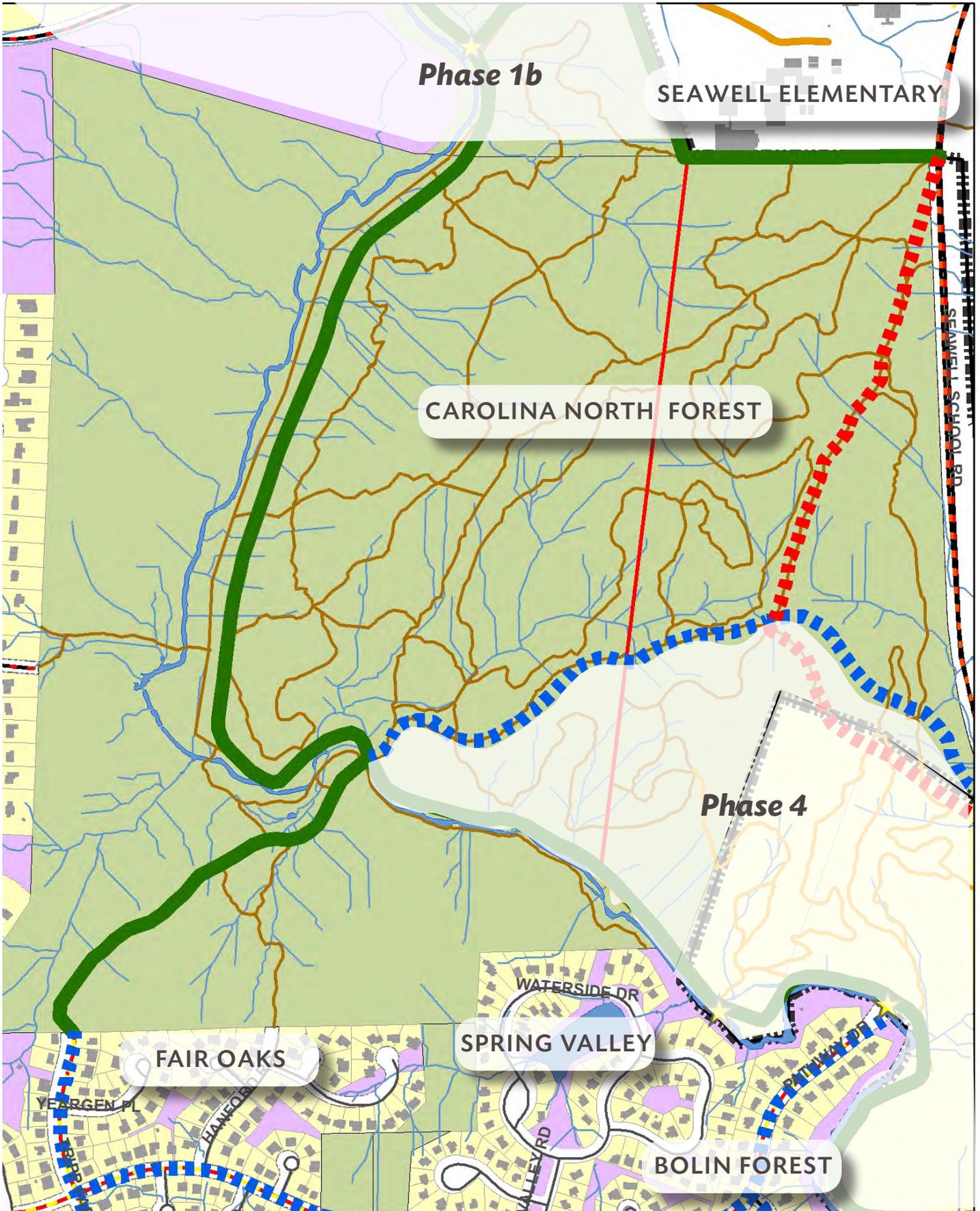
Demolition	Quantity	Cost	Unit	Subtotal
Clearing and grubbing understory (20' wide)	161,190	\$0.25	sf	\$40,297.50
Dumping Fees @ 6% of Demolition total			6%	\$2,417.85
			Subtotal	\$42,715.35
Trail Development	Quantity	Cost	Unit	Subtotal
Construction Entrance	2	\$1,900.00	ea	\$3,800.00
Temporary Rock Silt Check Type A	10	\$425.00	ea	\$4,250.00
Stabilization (Seeding: Temporary and Permanent)	107,460	\$0.25	sf	\$26,865.00
Straw with netting	2,500	\$4.50	lf	\$11,250.00
Temporary tree protection fence	20,400	\$4.00	lf	\$81,600.00
Temporary silt fence	13,700	\$5.00	lf	\$68,500.00
Temporary Diversion Ditch	1,500	\$3.00	lf	\$4,500.00
Temporary pipe inlet protection	2	\$900.00	ea	\$1,800.00
Trail initial grading (0-5 cu ft/lf)	2,000	\$3.30	lf	\$6,600.00
Trail fine grading (pavement)	10,746	\$3.30	lf	\$35,461.80
Trail fine grading (shoulders and ditch)	2,500	\$3.30	lf	\$8,250.00
10' wide multi-use concrete trail	3,697	\$75.00	lf	\$277,275.00
10' wide multi-use asphalt trail	2,736	\$35.00	lf	\$95,760.00
10' wide gravel trail	2,919	\$25.00	lf	\$72,975.00
2' wide gravel shoulder (both sides)	10,746	\$6.60	lf	\$70,923.60
Class B Rip Rap with filter fabric	30	\$42.00	ton	\$1,260.00
RCP Drainage Pipes	495	\$35.00	lf	\$17,325.00
Seeding or mulching trail edges (5' both sides)	36,970	\$0.13	sf	\$4,806.10
Tripp Farm Road Trailhead (5 cars)	1	\$25,000.00	ls	\$25,000.00
Seawell School Trailhead (10 cars)	1	\$35,000.00	ls	\$35,000.00
Bolin Creek Reforestation Plantings	80	\$750.00	ea	\$60,000.00
Signage				
Mile Markers	6	\$400.00	ea	\$2,400.00
Trail and street regulatory/warning signs	11	\$220.00	ea	\$2,420.00
Directional signs	10	\$220.00	ea	\$2,200.00
Educational signs	4	\$400.00	ea	\$1,600.00
Site Amenities				
Benches (2 per mile recommended)	6	\$900.00	ea	\$5,400.00
Bicycle rack (at one educational sign location)	3	\$800.00	ea	\$2,400.00
Trash receptacles (32-gallon, steel-at trailheads)	6	\$300.00	ea	\$1,800.00
Bollards (3 per trail/road intersection)	6	\$600.00	ea	\$3,600.00
Drinking fountains, with pet fountain (1 per mile)	2	\$2,000.00	ea	\$4,000.00
Picnic tables/ tables (at trailheads)	2	\$550.00	ea	\$1,100.00
			Subtotal	\$940,121.50
Design	Quantity	Cost	Unit	Subtotal
Wetlands and Stream Delineation (\$3,500/mile avg.)	1.25	\$3,500.00	mi	\$4,375.00
Surveying (\$10,000/mile avg.)	2.04	\$10,000.00	mi	\$20,400.00
Construction Documents @ 12 % of Dev. Cost			12%	\$112,814.58
			Subtotal	\$137,589.58
Subtotals				
Demolition				\$42,715.35
Trail Development				\$940,121.50
Design				\$137,589.58
SUBTOTAL (Demolition, Trail Development, Design)				\$1,120,426.43
Contingency (15% of total)			15%	\$168,063.96
TOTAL				\$1,288,490.39

Note: Does not include the following: land acquisition, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, and taxes.

Legend

-  Potential Creek Crossings
-  Proposed Multi Use Trail
-  Upland Forest Ait
-  Bolin Connector Ait
-  Future Chapel Hill Trail
-  Existing Paved Trails
-  Foot Trails
-  Existing Bicycle Facilities
-  Proposed Bicycle Facilities
-  Power Line
-  Park/Open Space
-  HOA Open Space
-  Private Owned
-  Orange County
-  Water
-  Building Footprints
-  Town Limits

Phase 3: Carolina North Forest



Phase 4: Railroad to Carolina North Forest

Phase 4 continues from the railroad tracks at the end of Phase 1a through the PH Craig tract. Greenway easements will be necessary along the OWASA property across the tracks, Bolin Forest HOA property, and PH Craig property. Permission will need to be obtained for the at-grade crossing and underpass beneath the railroad. Meetings should be scheduled with all parties as well as the Town of Chapel Hill (where trail crosses jurisdictional boundaries) to discuss the proposed trail alignment. Additional meetings with adjacent homeowners may be necessary to determine bridge crossing locations for access, which was requested at the public workshops.

Opportunities:

- Sewer easements provide wide, cleared corridor along Bolin Creek
- Bridge crossing over Bolin Creek is a candidate for low-water option
- Potential to tie into Chapel Hill trails

Constraints:

- Requires easement agreement with private property owner
- Engineering constraints from Estes Dr. down to Bolin Creek
- Multiple property owners will have different concerns/needs
- Requires permission from railroad operators

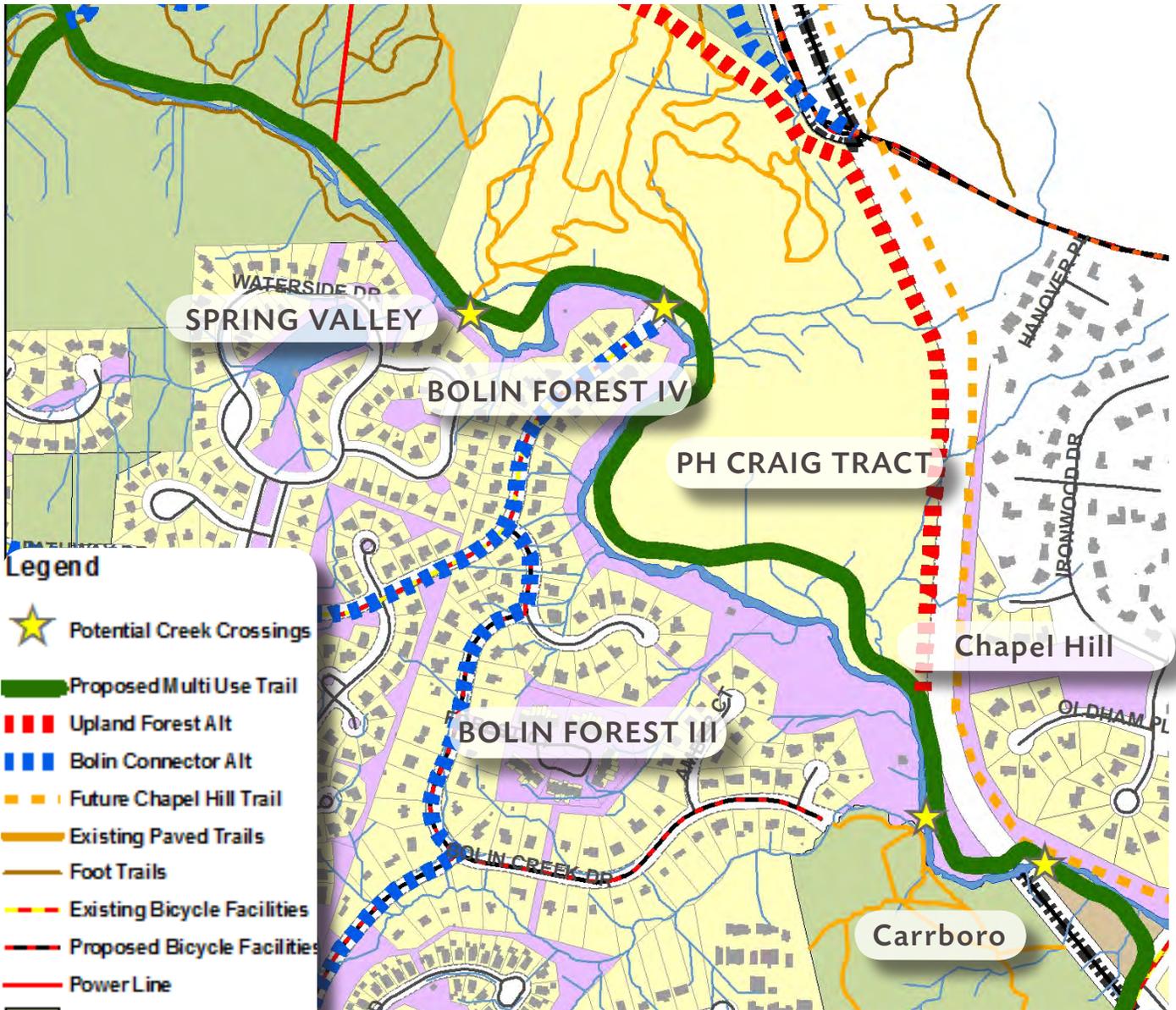
Bolin Creek Greenway - Phase 4

Probable Estimate of Construction Costs, 2009
6676.30 linear feet (1.26 miles)

Demolition	Quantity	Cost	Unit	Subtotal
Clearing and grubbing understory (20' wide)	40,000	\$0.25	sf	\$10,000.00
Dumping Fees @ 6% of Demolition total			6%	\$600.00
			<i>Subtotal</i>	\$10,600.00
Trail Development	Quantity	Cost	Unit	Subtotal
Construction Entrance	2	\$1,900.00	ea	\$3,800.00
Temporary Rock Silt Check Type A	6	\$425.00	ea	\$2,550.00
Stabilization (Seeding: Temporary and Permanent)	53,250	\$0.25	sf	\$13,312.50
Straw with netting	500	\$4.50	lf	\$2,250.00
Temporary tree protection fence	10,600	\$4.00	lf	\$42,400.00
Temporary silt fence	10,500	\$5.00	lf	\$52,500.00
Temporary Diversion Ditch	400	\$3.00	lf	\$1,200.00
Temporary pipe inlet protection	1	\$900.00	ea	\$900.00
Trail initial grading (0-5 cu ft/lf)	600	\$3.30	lf	\$1,980.00
Trail fine grading (pavement)	5,250	\$3.30	lf	\$17,325.00
Trail fine grading (shoulders and ditch)	800	\$3.30	lf	\$2,640.00
10' wide multi-use concrete trail	6,601	\$75.00	lf	\$495,075.00
2' wide gravel shoulder (both sides)	5,250	\$6.60	lf	\$34,650.00
Class B Rip Rap with filter fabric	15	\$42.00	ton	\$630.00
RCP Drainage Pipes	150	\$35.00	lf	\$5,250.00
Seeding or mulching trail edges (5' both sides)	66,010	\$0.13	sf	\$8,581.30
Estes Drive RR Crossing (at grade)	1	\$15,000.00	ls	\$15,000.00
RR Underpass at Bolin Creek	1	\$30,000.00	ls	\$30,000.00
Neighborhood Water Crossings (boardwalk bridge)	40	\$300.00	lf	\$12,000.00
Low Water Bridge over Bolin Creek	1	\$75,000.00	ls	\$75,000.00
Signage				
Mile Markers	2	\$400.00	ea	\$800.00
Trail and street regulatory/warning signs	6	\$220.00	ea	\$1,320.00
Directional signs	4	\$220.00	ea	\$880.00
Educational signs	2	\$400.00	ea	\$800.00
Site Amenities				
Benches (2 per mile recommended)	2	\$900.00	ea	\$1,800.00
Trash receptacles (32-gallon, steel-at trailheads)	2	\$300.00	ea	\$600.00
Bollards (3 per trail/road intersection)	3	\$600.00	ea	\$1,800.00
			<i>Subtotal</i>	\$825,043.80
Design	Quantity	Cost	Unit	Subtotal
Wetlands and Stream Delineation (\$3,500/mile avg.)	0.91	\$3,500.00	mi	\$3,185.00
Surveying (\$10,000/mile avg.)	1.01	\$10,000.00	mi	\$10,100.00
Construction Documents @ 12 % of Dev. Cost			12%	\$99,005.26
			<i>Subtotal</i>	\$112,290.26
Subtotals				
Demolition				\$10,600.00
Trail Development				\$825,043.80
Design				\$112,290.26
SUBTOTAL (Demolition, Trail Development, Design)				\$947,934.06
Contingency (15% of total)			15%	\$142,190.11
TOTAL				\$1,090,124.16

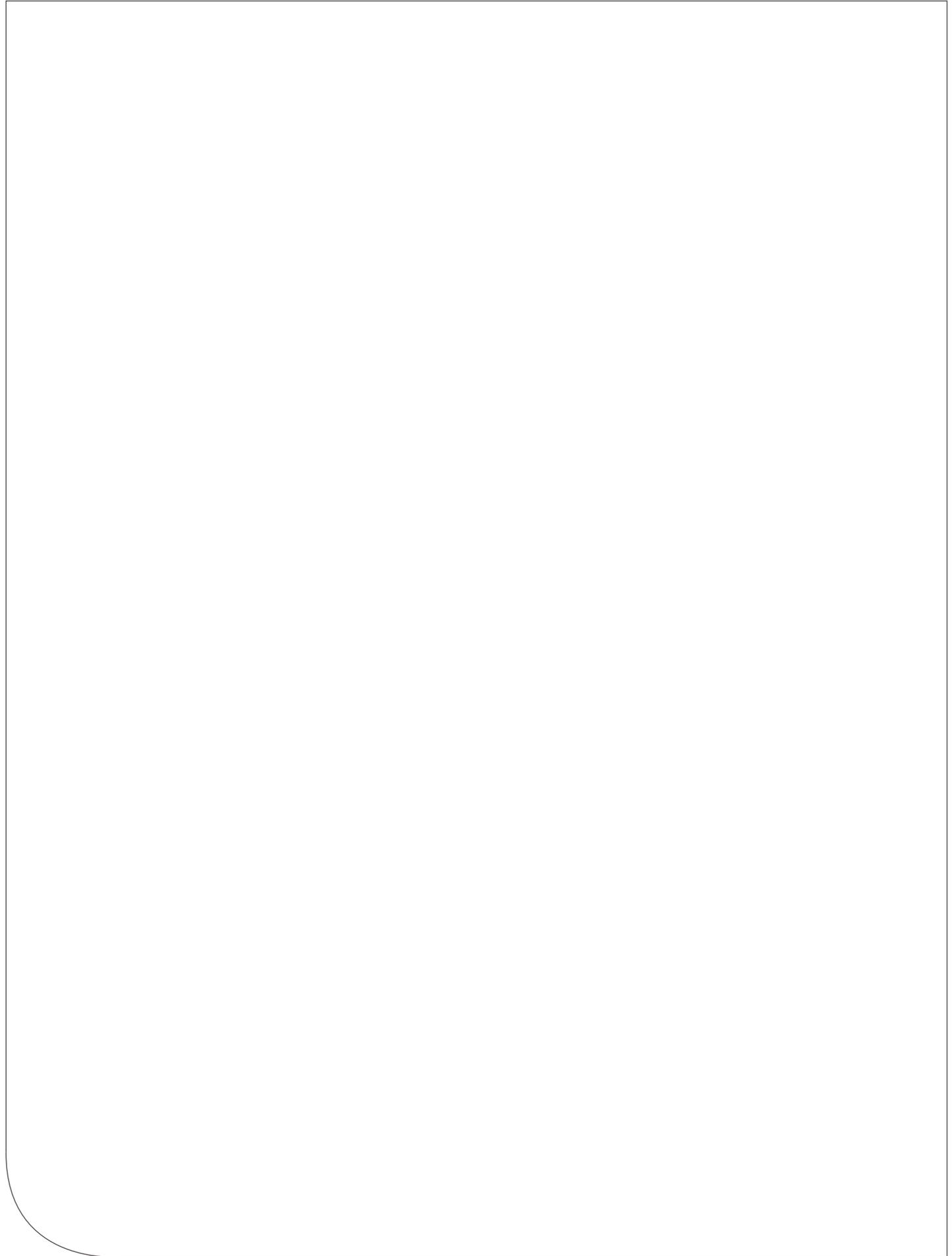
Note: Does not include the following: land acquisition, potential rock and unsuitable soils excavation, permitting fees, mobilization, utility coordination, and taxes.

Phase 4: Railroad to Carolina North Forest



Legend

- Potential Creek Crossings
- Proposed Multi Use Trail
- Upland Forest Alt
- Bolin Connector Alt
- Future Chapel Hill Trail
- Existing Paved Trails
- Foot Trails
- Existing Bicycle Facilities
- Proposed Bicycle Facilities
- Power Line
- Park/Open Space
- HOA Open Space
- Private Owned
- Orange County
- Water
- Building Footprints
- Town Limits





Appendix A: Public Input Summary

Chapter Outline:

1. Overview
2. Workshop Attendance
3. Summary of Public Workshop #1
4. Summary of Public Workshop #2

1. Overview

The purpose of this section is to provide a summary of the two Bolin Creek Greenway Open House Workshops – an important avenue for needs identification – that took place in May and September 2009. The purpose of the workshops was to invite the citizens of Carrboro to view, respond and mark on maps of the proposed Bolin Creek Greenway Alignment Alternatives, view educational display boards, share ideas about trail destinations and connections; and finally, to fill out a public comment form that contained specific questions relevant to trails in Carrboro.

2. Workshop Attendance

The first workshop was held at The Homestead Center in the north central part of Carrboro's planning jurisdiction, very near the project study area. Organizers of the workshop wanted to provide a location that was in close proximity to the neighborhoods surrounding the proposed greenway. At the May workshop, a total of 41 citizens signed the attendance registration sheet. A second open house workshop was held at the Century Center in September for citizens to view and respond to the Preferred Trail Alignment. There were 31 in attendance at the September workshop. Members of the Carrboro Greenways Commission were in attendance at both workshops. The meetings were also staffed by representatives from the Town and by the consultant team, Greenways Incorporated (GWI).

3. Summary of Public Workshop #1

Summary of Public Comment Cards

One of the workshop objectives at the public workshop was to have participants fill out comment cards, prepared by the Consultant. The comment card was designed to solicit direct feedback for each proposed trail alignment. Workshop participants were given one card for each alignment (3 total). At the top of each card, the name of the alignment was shown with a rating scale of 1 to 10 (1 being don't prefer, 10 prefer). Participants were asked to circle the number for their preference and write comments about why they made their selection on the cards. The responses to each question are summarized on the following pages. A total of 83 responses were recorded.

Summary of Public Comment Forms

Participants filled out public comment forms at both workshops, which were prepared by the Consultant. The comment form was designed to solicit input on a series of questions about trails in Carrboro. The responses to each question are summarized in the following text. A total of 31 responses were recorded for the first input session. The discrepancy between responses to the comment form and attendance at the meetings is due to a couple factors. First, some residents that attended the workshops picked up blank comment forms for friends and neighbors who were unable to attend the meetings. Second, the Town posted the comment form to a web site, and some residents downloaded the form and mailed it to the Town.

Summary of Comments on Cards - Workshop #1

Alignment	Rating	Comments
Creekside Trail	10	would like a connection to MLK & connect to Morris Grove. Need to connect to Fox Meadow
Creekside Trail	10	1) all streets used must have bike lanes; 2) connector to MGE must be done 1st
Creekside Trail	10	Best but depends on PH Craig
Creekside Trail	10	This is the only option.
Creekside Trail	10	I like this path because it runs primarily along the creek and from areas of people connection to other areas of people. It also forms a non fuel-based transportation corridor from one end of Carrboro to the other.
Creekside Trail	10	No comments
Creekside Trail	10	most natural
Creekside Trail	10	Focusing on this alternative provides a unique opportunity for reducing sediment and erosion impacts along Bolin Creek.
Creekside Trail	9	Appealing in that it would be the most "beautiful" probably and would provide an opportunity to fix up the very abused land along the creek.
Creekside Trail	9	I like going beside the creek - direct route -
Creekside Trail	9	This seems like a good plan as long as it doesn't increase sedimentation into Bolin Creek and/or encourage teenagers etc. to hang out, drink, etc. (i.e. - install good lighting, safety phones, be regularly patrolled by police officers on bikes).
Creekside Trail	8	No real eastern connection going north - maybe include one of the logging trails, include urban streets
Creekside Trail	8	No comments
Creekside Trail	8	I like the connection to the Estes Dr. bikepaths. I dislike the indirect connection of the Seawell/Smith/CHHS campus to downtown.
Creekside Trail	8	I like the zig-zagging of trail over creeks & under the railroad. Feel it adds interest to the recreation experience.
Creekside Trail	8	Like trail in sewer easement.
Creekside Trail	7	Prefer proximity to stream to upland trail.
Creekside Trail	6	Very pretty route
Creekside Trail	5	I like the way this takes advantage of already existing line (e.g., sewer). Also like the "creekside" aspect.
Creekside Trail	5	Good solution to trail under RxR at Estes Dr. Connects to Wilson Pk.
Creekside Trail	5	Support only in part and if trail surfaces are natural. I support Boardwalk way along wetlands from Trip Farm Rd. Meadow North to Homestead - mixed natural surface, realizing this is not the Dept. of Transportation standard. Were Dept. of Transportation to waive the requirement for concrete/asphalt trail surface, I would support creekside trailway as a #1 preference, until and unless D.O.T. waives the restrictive trail surfacing I don't support it along the creek.
Creekside Trail	3	Too many creek crossings. Cause opportunities for washing w/ heavy rains.
Creekside Trail	2	By adding bike traffic you're taking away from how people in nearby neighborhoods utilize the creek trail. People like to let their kids run around and their are also a lot of dogs. By increasing traffic you're increasing accidents along the trail & have potential for having the people who live along the trails to use it less.
Creekside Trail	1	Oppose using creek corridor for transportation, intro of traffic, human & pet, destruction of natural area. Use transportation corridors for transportation, preserve natural quality of Bolin Creek.
Creekside Trail	1	Protect the riparian zone.
Creekside Trail	1	Would rather not have creekside along the whole trail.
Creekside Trail	1	No comments
Creekside Trail	don't prefer	I would like to see the existing sewer easement trail upgraded & maintained as a nature preserve trail - not a transportation corridor trail. The natural beauty of ecosystem in this area is precious & should be preserved in its most natural state. No to creekside trail as transportation trail!

Summary of Comments on Cards - Workshop #1

Alignment	Rating	Comments
Upland Forest Trail	prefer	the existing trail already provides access to the schools so it would be most practical for transportation uses. Also it would not disturb the natural habitat/beauty of Bolin Creek.
Upland Forest Trail	-	Like the Northern section as it connects Fox Meadow and adjacent neighborhoods. Like the connection to the schools.
Upland Forest Trail	10	Stay away from creek. Don't justify altering natural character of creek with suggestion that erosion will be controlled. Pets etc. will increase nutrient loading to creek.
Upland Forest Trail	10	The Upland Forest Trail supports transportation needs from Wilson Park through to each of the schools to Homestead Road. It is a good trailway to pave as it is in the Uplands-and given the need to use Dept. of Transportation Standards requiring cement or asphalt trails, it makes sense for it to be used where children can traverse terrain to get to and from school.
Upland Forest Trail	10	More efficient transportation by bike and foot. More economical. Less riparian zone disturbance.
Upland Forest Trail	10	No comments
Upland Forest Trail	10	No comments
Upland Forest Trail	10	Connects to Shetley BP via Wilson. Still needs crossing under RxR at Estes from Creekside Trail option.
Upland Forest Trail	8	No comments
Upland Forest Trail	8	There are few unpaved trails & paths for neighborhoods to use for relaxing walk with dogs & kids. This route allows the neighborhoods along the trail to utilize a more leisure trail.
Upland Forest Trail	8	I like getting from Fox Meadow to CHHS, and having the trail on the Fox Meadow side of the creek.
Upland Forest Trail	8	I like the direct (i.e. relatively short) connection from Seawell/Smith/CHHS to downtown, I dislike the lack of connection to the Estes Dr. bikepaths.
Upland Forest Trail	8	No comments
Upland Forest Trail	7	I do like going along the RR tracks - it provides an alternative to the other walking trails -
Upland Forest Trail	6.5	Prefer proximity to creek to high to upland trail.
Upland Forest Trail	6.5	don't know enough about this option, but I think I prefer the Creekside Trail more simply because there is already an existing path there.
Upland Forest Trail	6	I like the way this one makes access from Fox Meadow easier. (to go to Morris Grove & connect us to the rest of Carrboro, too!)
Upland Forest Trail	6	
Upland Forest Trail	6	Not crazy about RR portion, but having a continuous trail is better than not.
Upland Forest Trail	6	No comments
Upland Forest Trail	5	include thing into the creekside plan
Upland Forest Trail	4	No comments
Upland Forest Trail	4	This option has merit only if PH Craig refuses to allow the greenway along the creek. Still would still require his permission along r/r. Very unscenic!
Upland Forest Trail	3	Main appeal here seems to be directives for commuters. But as a bike commuter myself, I'd rather be along the creek.
Upland Forest Trail	1	No comments
Upland Forest Trail	1	too unuseful. does more damage. too much disturbance

Summary of Comments on Cards - Workshop #1

Alignment	Rating	Comments
Bolin Connector Trail	-	like the MLK connection. Not so much on pathway
Bolin Connector Trail	10	Opportunity to get some trails going! Get a base. Expand from there
Bolin Connector Trail	10	No comments
Bolin Connector Trail	8	Like connection to roads. Creek crossing would need to be done carefully
Bolin Connector Trail	8	Like the MLK connection to creek, then connect to school. Like coming from Bolin Forest.
Bolin Connector Trail	7	I like using existing road networks
Bolin Connector Trail	6	No comments
Bolin Connector Trail	6	Fairly direct (although not toward town); but does not disturb the creek as much as the Creekside Trail
Bolin Connector Trail	6	Nice that this uses part of the old logging road, but really parts of this are appealing only as stopgap connectors. Paths along neighborhood roads are useful but don't bring people out of their houses like true greenways do.
Bolin Connector Trail	6	Neutral - I am afraid the neighborhoods will object. Is this a safe option for bikes, children?
Bolin Connector Trail	5.5	Prefer use of floodplain for trail itself; but feel that trails to Carolina North and to Street network are important pieces of entire system.
Bolin Connector Trail	5	Last resort if PH Craig does not allow access necessary for 2 other options
Bolin Connector Trail	4	I feel that street trails reduce usability. I like the street connections but with small children won't use street bike lanes. As an adult on my own the street bike lanes are great.
Bolin Connector Trail	4	No comments
Bolin Connector Trail	3	Many disconnect points
Bolin Connector Trail	3	No comments
Bolin Connector Trail	3	Prefer more natural/rustic trails to "urban" street trails. Upcoming Carolina North development may increase traffic, impacting the use of current roads which the trails will follow. Traffic/parking changes to Pathway Drive.
Bolin Connector Trail	3	Using the roads is not as pleasing an experience. The main advantage is if access is controlled. It could provide a short term alternative.
Bolin Connector Trail	3	Too much work to do along Pathway Dr. No outlet to Wilson Park or Estes Dr.
Bolin Connector Trail	2	I understand the plusses of incorporating already existing bikeway roads, but I would be uncomfortable having my small children on the roads. Would prefer something more separate from cars.
Bolin Connector Trail	1	No comments
Bolin Connector Trail	1	Prefer work through Hillsborough Rd & MLK Park to Tripp Farm Rd keep off Pathway Dr. parked cars on Pathway Dr. already block bikeways. CN parking would create parking/traffic problems
Bolin Connector Trail	1	Awkward Not efficient. Still impacts the riparian zone.
Bolin Connector Trail	1	No comments
Bolin Connector Trail	1	I live in downtown, I'm interested in child-friendly bikeability to the Seawell/Smooth/CHHS Campus, & otherwise bypassing the nasty stretch of Estes Dr. ext. This alignment is irrelevant to me.
Bolin Connector Trail	1	using roadways instead is undesirable & presents safety perspectives. This option does provide alternative if PH says "No, no, no!"
Bolin Connector Trail	1	Don't like the thought of myself or kids having to ride on bike lanes on busy (or not busy) streets. Would much prefer greenways through the woods/fields/etc.

Comment Card Preference Results - Workshop #1

The following pages quantify the results of the three alignment alternatives from the May public workshop based on individuals' preference of the alignments on a scale of 1 to 10. Overall, the majority of workshop attendees preferred the Creekside Trail; however connections that resulted from the Upland Forest Trail alignment were also very popular. The numeric values seen within the graphs refer to actual number of ratings.

Creekside Trail

PLEASE CIRCLE YOUR PREFERENCE FOR THIS ALIGNMENT:

DON'T PREFERPREFER

COMMENTS: *Appealing in that it would be the most "beautiful" probably and would provide an opportunity to fix up the very abused land along the creek.*

Example of comment card from workshop



Photos from the first public workshop, held at the Homestead Community Center.

Creekside Trail Alignment

Total number of respondents: 30



- Do Not Prefer
- Neutral
- Prefer

Upland Forest Alignment

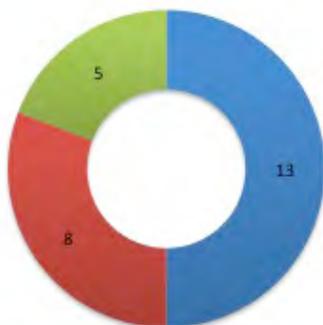
Total number of respondents: 23



- Do Not Prefer
- Neutral
- Prefer

Bolin Connector Alignment

Total number of respondents: 26

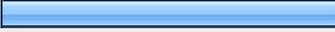


- Do Not Prefer
- Neutral
- Prefer

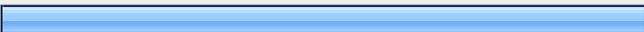
Question 1: How important to you is the goal of creating more trails in Carrboro?

		Response Percent	Response Count
very important		79.3%	23
somewhat important		17.2%	5
not important		3.4%	1

Question 2: How often do you use trails in Carrboro?

		Response Percent	Response Count
never		0.0%	0
few times per year		24.1%	7
few times per month		24.1%	7
few times per week		51.7%	15

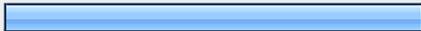
Question 3: Do you or have you used the corridor along Bolin Creek?

		Response Percent	Response Count
Yes		100.0%	29
No		0.0%	0

Question 4: What are the most significant factors that present obstacles for your ability to use trails in Carrboro?

	#1	#2	#3	Rating Average	Response Count
Lack of information about local trails	22.2% (2)	55.6% (5)	22.2% (2)	2.00	9
Unsafe street crossings	50.0% (3)	16.7% (1)	33.3% (2)	1.83	6
Lack of interest	0.0% (0)	33.3% (1)	66.7% (2)	2.67	3
Lack of time	75.0% (6)	25.0% (2)	0.0% (0)	1.25	8
Personal safety concerns	0.0% (0)	66.7% (2)	33.3% (1)	2.33	3
Located on private property	25.0% (1)	25.0% (1)	50.0% (2)	2.25	4
Accessibility concerns	25.0% (2)	50.0% (4)	25.0% (2)	2.00	8
Lack of connections	50.0% (9)	27.8% (5)	22.2% (4)	1.72	18
Other	28.6% (2)	14.3% (1)	57.1% (4)	2.29	7

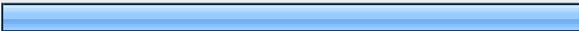
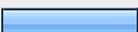
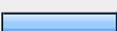
Question 5: Would you use trails more often if you could easily bike to, walk to, or park at a trailhead?

		Response Percent	Response Count
Yes		64.3%	18
No		0.0%	0
I can already access trails.		35.7%	10

Question 6: For what purposes would you use the Bolin Creek Greenway in the future? (Rank Top 3)

	#1	#2	#3	Rating Average	Response Count
Fitness or recreation	71.4% (20)	28.6% (8)	0.0% (0)	1.29	28
Getting to and from destinations in Carrboro/Chapel Hill	33.3% (6)	61.1% (11)	5.6% (1)	1.72	18
Socializing	0.0% (0)	18.2% (2)	81.8% (9)	2.82	11
Walking the dog	12.5% (1)	37.5% (3)	50.0% (4)	2.38	8
Environmental education	33.3% (1)	66.7% (2)	0.0% (0)	1.67	3
Other	0.0% (0)	0.0% (0)	100.0% (2)	3.00	2

Question 7: What modes of activity would you use on the Bolin Creek Greenway?

		Response Percent	Response Count
Bicycling		89.7%	26
Walking		89.7%	26
Running/Jogging		72.4%	21
Using a stroller		20.7%	6
Using a wheelchair		3.4%	1
Roller-blading		17.2%	5
Other (please specify)			2

Other: various provided the amenities i.e. bird-watching, community/pavilion rental, lawn sporting facilities, Art-walk, sponsored recreation events; hiking - nature/birding/geology

Question 8: What destinations would you most like to get to by trail?

	#1	#2	#3	Rating Average	Response Count
MLK Park	50.0% (2)	25.0% (1)	25.0% (1)	1.75	4
Wilson Park	14.3% (1)	28.6% (2)	57.1% (4)	2.43	7
Anderson Park	0.0% (0)	25.0% (1)	75.0% (3)	2.75	4
Other Carrboro parks	0.0% (0)	0.0% (0)	100.0% (2)	3.00	2
Downtown Carrboro	33.3% (5)	40.0% (6)	26.7% (4)	1.93	15
UNC	37.5% (3)	25.0% (2)	37.5% (3)	2.00	8
Carolina North forest	55.6% (5)	22.2% (2)	22.2% (2)	1.67	9
Chapel Hill-Carrboro schools	62.5% (10)	25.0% (4)	12.5% (2)	1.50	16
Chapel Hill	15.4% (2)	61.5% (8)	23.1% (3)	2.08	13

Question 9: How would you rate the current environmental conditions along the Bolin Creek corridor?

		Response Percent	Response Count
Good		32.1%	9
Fair		28.6%	8
Poor		21.4%	6
Do not know		17.9%	5

Question 10: What is your interest in improving environmental conditions along Bolin Creek (ex. water quality,

		Response Percent	Response Count
Very important		76.9%	20
Somewhat important		19.2%	5
Not important		3.8%	1

Question 11: Do you have any other comments?

- For the Bolin Creek Greenway to become a reality, the Town of Carrboro must sit down and negotiate with P.H. Craig to purchase a portion of his property along the creek or a conservation easement to construct the greenway through his property. Mr. Craig has offered to sell the Town up to 25 acres but the Town sits on its butt and twiddles its thumbs. So in the meantime the economy has tanked, the Town and County are broke, and the CWMTF has also gone belly up. Shame on Carrboro!!
- my interest in improving the tracks are for safer, more efficient travel in the Chapel Hill and Carrboro communities by bike, walking, running
- Great ideas. Would like to see expansion to even more of Chapel Hill.
- I would much prefer not to have the corridor trail going along the creek. I like the trail that goes closer to the rail. I do also like the idea of the boardwalk along creek where environmental danger/flooding is typical. I like keeping most of the trail for recreational use, not transport.
- All three plans have good features. -Don't have the trail run close to any neighborhoods that do not have a way to get to it (via a path, or a bridge over water, etc.)
- No sure how good the water quality is. A continuous trail from Estes to Hogan Farms is highly desirable. As a biker, my highest priority is a bike shoulder on Estes Extension from CH border to Greensboro.
- I'm most concerned to have short term workarounds for the poor bike connection between the bike lanes on Estes Rd. (from MLK to approx. Hillcrest) & the bike lanes on N. Greensboro St. I'm particularly interested in child-bikeable routes from downtown to the Seawell/Smith/CHHS Campus. I like the 'Creekside' alignment's connection of Wilson Park & Estes Rd., but dislike its lack of direct connection to the schools. I like the 'Upland Forest' Alignment's direct connection to the schools, but dislike its lack of connection to Estes. I'd most prefer a combination of 'Creekside' & 'Upland Forest' that provided a direct connection to the school campus from downtown. (I find the 'Bolin Connector' alignment irrelevant to my needs)
- I am very interested in connections/accessibility to the trail. We are residents of Fox Meadow and would like very much to access the trail to go to Morris Grove Elem. School and south to the parks and the town of Carrboro.
- It's a gorgeous trail but is very eroded. The Bolin Creek Corridor should be protected. Please protect the Bolin Creek corridor! Turning the trail into a paved transportation corridor will spoil the quiet & natural beauty & wildlife habitat
- For as progressive as Carrboro/Chapel Hill are, it seems like a no-brainer to have an excellent greenway system in place - allowing residents to easily, "greenly," safely, and quickly connect to friends, family, shopping, restaurants, and schools. A great greenway system would allow residents to "buy local" and create a strong community much more effectively than requiring us to get into the car for everything. Thanks for your efforts & help!! :)
- Thank you! Great maps! Please post all materials online, and put all three proposed trail systems on the same digital map, so we can better compare/contrast.
- I sense a separation of public attitude towards the paving or non-paving issue near creeks. I support paving options or boardwalks. P.S. It's strong.
- Go for connectivity (trails that go places) and providing an accessible, long, linear park where all types of will enjoy, walking, running, cycling, roller blading, spending time with family
- i would be interested in helping work and this plan! Great work! Mike VanHoy 338-8010 NURoseBowl@nc.rr.com
- Please consult with adjacent property owners on Turtleback Crossing re: the Bolin Creek Crossing / greenway.
- I probably shouldn't admit this, but I really don't care much about trails. What bugs me is that my kids can't bike from where we live, on Cheek St, to their schools (Smith and Chapel Hill High) because of the dangerous stretch of Estes Rd right at North Greensboro. So I'm interested in ways they can avoid that, since I have no clue when Carrboro is going to fix that. A trail from Wilson Park across Bolin Creek to the schools would be great!

Question 12: How did you hear about this project?

		Response Percent	Response Count
Newspaper ad		8.7%	2
Web blog/forum		34.8%	8
Public television/radio		0.0%	0
Word of mouth		56.5%	13
Town website		26.1%	6
Flyer		34.8%	8
Other (please specify)			9

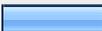
Other:

- I am a member of the Carrboro Greenways Commission
- Email from Spring Valley Homeowners Assoc.
- home owner organization
- email: neighborhood listserv
- fox meadow listserv
- flyer from Morris Grove
- email forwarded from Carrboro Parks & Rec
- email
- email

Question 13: What is your zip code?

- 27510 (10)
- 27516 (11)
- 27514 (2)

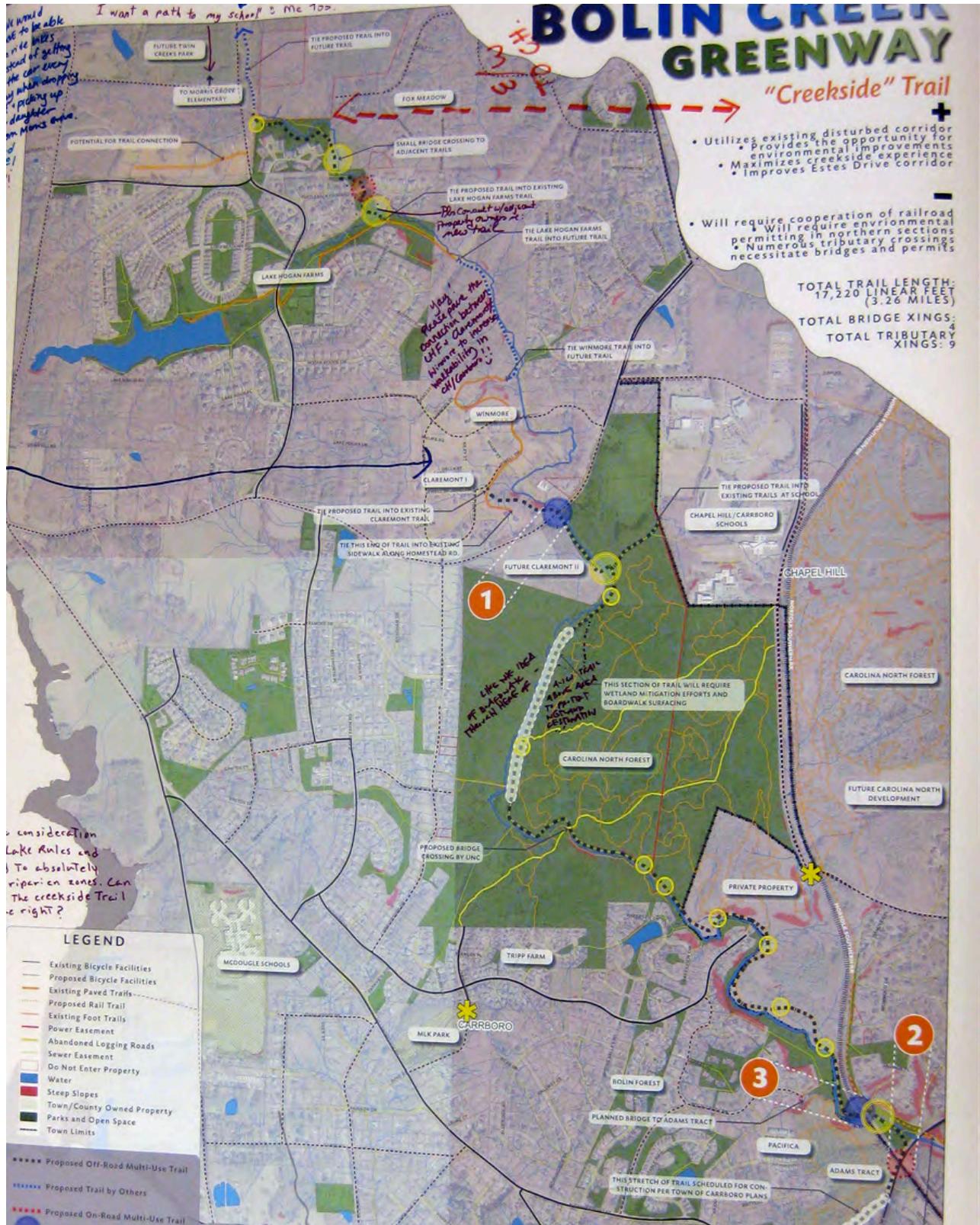
Question 14: Where do you live?

		Response Percent	Response Count
Carrboro		73.1%	19
Chapel Hill		15.4%	4
Downtown Carrboro		3.8%	1
Orange County		3.8%	1
Hillsborough		0.0%	0
Other (please specify)		3.8%	1

Public Map Comments

Workshop participants were also asked to provide written comments on maps, supplied by the consultant Greenways Incorporated. For each trail alignment alternative, a map was provided for marking comments, drawing connections, and suggesting areas for improvement. Each map is shown with written comments, and the following section summarizes the comments written on the maps.

Creekside Trail



Summary of Map Comments

The text below was taken directly from the public input maps present at the workshop:

Creekside Trail Input Map

- 1) Morris Grove Elementary
 - Would love to be able to ride bikes instead of getting in the car everyday when dropping and picking up kids from Morris Grove Elementary
 - Would like a path to school
 - The dirt path is walkable and bikeable as is
- 2) Proposed Trail into Existing Lake Hogan Farms Trail
 - Consult with adjacent property owners new trail
- 3) Lake Hogan Farms Trail into Future Trail
 - Pave connection between Lake Hogan Farms and Claremont/ Winmore to increase walkability in Chapel Hill/ Carrboro
- 4) Claremont I
 - Need to get to school faster
- 5) Trail West of Carolina North Forest
- 6) Across the Top Near Fox Meadow
 - E/W to Chapel Hill
- 7) General Comment
 - Take into consideration Jordan Lake rules and the need to protect riparian zones. Can the Creekside Trail move 100' to the right?

Upland Forest Trail Input Map

- 1) Morris Grove Elementary
 - Would like a path from neighborhood to Morris Grove
- 2) Tie Proposed Trail into Future Trail
 - The area that is beyond the purple arrow that points north off of the page is important
- 3) Fox Meadow
 - Is it possible to construct a path that runs NW-SE along the existing stream corridor within the next 2 years
- 4) Lake Hogan Farms
 - Beaver activity exist along the orange line that runs through Lake Hogan Farms
 - Is there be a public access point to the existing trail that runs through Lake Hogan Farms
 - "Path continues" comment made east of proposed trails that runs through Lake Hogan Farms
- 5) Proposed Trail into Existing Lake Hogan Farms Trail
 - Paved path from Lake Hogan Farms to Chapel Hill High School would be welcomed
- 6) Chapel Hill/ Carrboro Schools
 - Connect proposed off-road multi-use trail to high school
- 7) Carolina North Forest
 - Boardwalk or close highlighted area marked by zone 1
 - Close wetland trail, move 100' east
 - Having a trail along the creek will increase volume (south end of Carolina North Forest)
- 8) Private Property
 - Playground near stream (south of the private property label) is private, if the trail is built will he public use it?
 - Why not connect to Seawell School Road (marked at yellow asterisk adjacent to private property label)
- 9) Work with Town of Chapel to Connect Greenway Network
 - More economical to bring across railroad Estes Drive extension
 - Why not connect to Estes Road
- 10) General Comments
 - There is a large population east of Carolina North Forest
 - Can these maps be put online for comparison?

Bolin Connector Trail Map Input

- 1) Tie Proposed Trail into Existing Claremont Trail
 - Increase bike lane to McDougle
- 2) Proposed On-Road Multi-Use Trail (Carrboro)
 - "Bike lane?" referring to the proposed trail that runs from Carrboro to Carolina North Forest
- 3) Private Property
 - "Parking issues?" referring to the end of the proposed trail south of the private property label
- 4) Wilson Park
 - Northeast "bikeable path" from yellow asterisk in Wilson Park to Adams Tract



Conclusion from Workshop #1

On May 20th, 2009, the Town of Carrboro held a public open house to solicit input for the conceptual master plan of the Bolin Creek Greenway. Workshop attendees were asked to fill out a comment card rating their preference for each proposed trail alignment; write comments on large scale maps of the project; and fill out a paper comment form about trails in Carrboro.

The majority of workshop participants preferred the *Creekside Trail* of all three proposed alignments because of the proximity to the creek, environmental restoration opportunities, natural setting, and the previously disturbed corridor. Opponents of the *Creekside Trail* were concerned with the number of creek crossings, increased trail traffic, and feared further disturbance to the riparian zone. The *Bolin Connector Trail* alignment was the least popular among participants. Concerns included the lack of safety for children along roadways, increased traffic problems, unappealing trail experience, and increased costs of construction. Participants were more neutral in their rating of the *Upland Forest Trail* alignment; however, their comments favored connections made in the design. Proponents preferred the direct connections being made to schools and the decreased riparian disturbance; while opponents criticized the lack of natural beauty and increased disturbance in upland areas.

Preferred

- 49% Creekside Trail
- 38% Upland Forest Trail
- 13% Bolin Connector Trail

Undecided/Neutral

- 42% Bolin Connector Trail
- 32% Upland Forest Trail
- 26% Creekside Trail

Opposed

- 57% Bolin Connector
- 30% Creekside Trail
- 13% Upland Forest Trail

Based on the paper comment forms, many workshop participants claimed they would use the proposed Bolin Creek Greenway for recreation; however, transportation and socializing were also considered important. Many users claimed to use trails a few times per week, and would use trails more if trailheads were more accessible. Top destinations desired to be connected by trails were:

- 1) Chapel Hill-Carrboro schools
- 2) Town of Chapel Hill
- 3) Downtown Carrboro
- 4) Carrboro Parks

It is apparent through the results of the first public input session that citizens of Carrboro prefer a greenway that is set in a natural setting, as an off-road facility that will accommodate children, in an existing disturbed corridor that has proximity to Bolin Creek. Connections to schools, parks and the Town of Chapel Hill should be priorities, as these destinations are frequented for recreation and socialization. *Based on results from Workshop #1, it was recommended that the Town consider a combination of the Creekside Trail alignment and the Upland Forest Trail alignment due to the amount of positive response for both.* Both alignments meet the needs of Carrboro trail users while providing future connections for regional trails in the vicinity.

4. Summary of Public Workshop #2

On September 21st, 2009, a second public workshop was conducted to present the Draft Conceptual Alignment. The workshop was held at the Century Center, located in downtown Carrboro. There were 31 attendees at the September workshop. Educational boards, illustrative graphics boards, and two large copies of the preferred greenway alignment were presented where participants gathered to discuss and comment on the proposed alignment.

Summary of Comment Forms

Participants filled out public comment forms that targeted specific input for the preferred alignment. The responses to each question are summarized in the following text. A total of 19 responses were recorded for the second public input session.

1. Are there any additional connections along the Bolin Creek corridor you would like to see made that have not been shown?

		Response Percent	Response Count
No, enough connections have been made		100.0%	13
There are too many connections		0.0%	0
Yes (please specify)			5

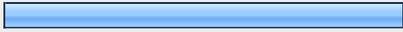
Comments:

- Need East-West from T(ri)pp (Farm) Road to McDo(ug)le and Chapel Hill
- Connector from McDoug(e) Schools perhaps using bike path that comes out on Autumn Drive
- Connect existing Bolin Creek trail to University Mall
- Looks good I like the additional connections since the last forum
- There might be enough connections but many in the lower (southern) neighborhoods are hard to find (unmarked)

2. What is the primary reason you use the corridor along Bolin Creek?

		Response Percent	Response Count
Exercise/Fitness		73.7%	14
Getting to and from destinations		21.1%	4
Socializing		0.0%	0
Walking the dog		0.0%	0
Environmental Education		0.0%	0
Meditation/Respite		5.3%	1
Other (please specify)			0

3. If the trail was built as shown in the proposed conceptual plan, how would that effect your use of the corridor?

		Response Percent	Response Count
I would use the trail more often		68.4%	13
I would use the trail less often		0.0%	0
I would not change my use of the corridor		31.6%	6

4. Do you support the Bolin Creek Greenway Conceptual Plan that you have seen today?

		Response Percent	Response Count
Yes		94.7%	18
No		5.3%	1
Yes, with the following changes:			4

Comments:

- Would love to have 1/2 gravel surface of some variety
- But need NW Crossing
- Please work with Chapel Hill to connect the existing greenways.
- Not clear paving is truly necessary for the most part the existing soil and gravel works ok

5. If you answered “no” to the previous question, please specify your reason:

- I would prefer a nature trail along the creek and transportation corridor to be closer to the schools.

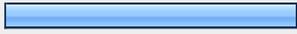
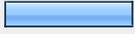
6. Trailheads provide ancillary features for greenways such as parking, water fountains, trash receptacles, and kiosks. Based on the proposed number and location of trailheads shown on the Plan, please select the following:

		Response Percent	Response Count
I would like to see fewer trailheads		7.7%	1
I am happy with the amount of proposed trailheads		92.3%	12
I would like to see additional trailheads (please specify location)			1

Comments:

- more specific location

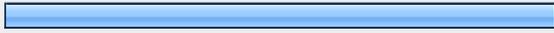
7. The proposed Bolin Creek Greenway project is being funded by the North Carolina Department of Transportation (NCDOT). NCDOT has defined specific standards for trail development, one of which includes providing approved surfacing on greenways that will accommodate all non-motorized users (including bicycles, wheelchairs, and strollers). What type of surfacing do you prefer for the Bolin Creek Greenway? (select one)

		Response Percent	Response Count
Asphalt		50.0%	7
Concrete		7.1%	1
Recycled Material (such as scrap tires)		21.4%	3
Raised Boardwalk		14.3%	2
None of the above		7.1%	1
Other/Multiple (please specify)			11

Comments:

- Or some sort of soft surface (more natural)
- Whatever is cheapest so we get the most
- Whatever is greenest at an affordable price
- Perhaps if your consultant was open to different materials this concept might go further. An impervious surface would be nice.
- Not sure- hard surface, whatever is economical and last
- Recycled Material
- Raised boardwalk seems to be the standard with regards to eco-friendliness. Also concerned about the impact of the installation process.
- As long as it is flat , it works
- Aren't there natural surfaces that are usable by those users as well?
- Would prefer gravel alongside paved to accommodate runners.
- If it has to be surfaced do whatever you think is best.

8. Goals of the proposed Bolin Creek Greenway project are 1) to protect and improve water quality along Bolin and Jones Creek; 2) to provide safe and accessible non-motorized connections to various uses along the corridor; and 3) to enhance and preserve the recreational resource that exists along Bolin Creek. Based on your understanding of the project, are these goals being met? (select one)

		Response Percent	Response Count
Yes		94.4%	17
I don't know		5.6%	1
No (please explain)			1

Comments:

- There is no mention of preservation of the forest, wildlife and natural environment

Summary of Map Comments

Because map comments were nominal during Workshop #2, images of the maps are not included. A summary of all comments are listed below.

1. Access schools from future UNC housing development?
2. Connect to "The Highlands"
3. The proposed bridge over Bolin Creek near Homestead Rd. is key for school access!
4. Put as many bridges as possible to connect to neighborhoods (Written on PH Craig property)
5. Provide access to Horn Hollow
6. Connect to McDougal
7. Install a crosswalk on Estes Dr. to slow traffic!

Conclusion from Workshop #2

Based on map comments, comment forms, and workshop dialogue, the majority of Carrboro workshop participants at the September workshop support the Draft Preferred Alignment for the Bolin Creek Greenway Conceptual Plan. Of the respondents questioned, 94.7% were in support of the trail as it was presented at the September workshop. Suggestions for improving the alignment include having a combined surfacing; a crossing to Wexford; and ties to Chapel Hill's greenways. Exercise and fitness, getting to and from destinations, and meditation were some of the preferred uses along the corridor, and there was a positive response from participants that the trail, if built, would be used frequently by citizens of Carrboro. Providing connections to all neighborhoods continues to be desired by participants.



Appendix B: Funding Strategies

Chapter Outline:

- 1. Overview*
- 2. State Funding Sources*
- 3. National and Federal Funding Sources*
- 4. Local Government Funding Sources*
- 5. Land Acquisition Funding*
- 6. Other Local Funding Options*

1. Overview

The purpose of this appendix is to define and describe possible funding sources that could be used to support the planning, design and development of the proposed Bolin Creek Greenway.

Implementing the recommendations of this plan will require a strong level of local support and commitment through a variety of local funding mechanisms. Perhaps most important is the addition of greenway recommendations from this Plan into the Town's annual budget. These improvements should become a high priority and be supported through portions of the funding currently used for public safety, streets, parks and recreation, planning, Powell Bill funds, community development, travel and tourism, downtown, and local bonds.

The Town should also seek a combination of funding sources that include local, state, federal, and private money. Fortunately, the benefits of protected greenways are many and varied. This allows programs in Carrboro to access money earmarked for a variety of purposes including water quality, hazard mitigation, recreation, air quality, alternative transportation, wildlife protection, community health, and economic development. Competition is almost always stiff for state and federal funds, so it becomes imperative that local governments work together to create multi-jurisdictional partnerships and to develop their own local sources of funding. These sources can then be used to leverage outside assistance.

For the past two decades, a variety of funding has been used throughout North Carolina to support the planning, design and construction of urban and rural bicycle and greenway projects. The largest single source of funding for these projects has come from the Surface Transportation Act, first the Intermodal Surface Transportation Efficiency Act (ISTEA) in the early to mid 1990's; then its successor, Transportation Equity Act for the Twenty-First Century (TEA-21) through the early part of 2002; and now the Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The North Carolina Department of Transportation manages and distributes the majority of federal funds that are derived from the Act to support the development of bicycle/trail development.

The majority of federal funding is distributed to states in the form of block grants and is then distributed throughout a given state for specific projects. State funding programs in North Carolina also support the creation of greenways. North Carolina has developed a broad array of funding sources that address land acquisition, green infrastructure development, and trail facility development.

Additionally, there are many things that the Town of Carrboro can do to establish its own funding for greenway initiatives. For Carrboro, it will be necessary to create a local funding program through one of the methods that is defined within this report. Funding will be needed to administer the continued planning and implementation process, acquire parcels or easements, and manage and maintain facilities.

This appendix is organized by first addressing the state sources of funding, then addressing separate federal and local government funding sources. It is by no means an exhaustive list as there are many other funding sources available that should be researched and pursued as well. Creative planning and consistent monitoring of funding options will likely turn up new opportunities not listed here.

High Priority Funding Options

While there are a number of funding sources provided in the following pages, these sources should be the highest priority in order to achieve successful implementation. It is critical for local government to step up given the competitiveness and finite availability associated with most funding sources in the current economic climate. Details about the following sources are found later in this appendix.

- State Transportation Improvements Program (STIP)
- State Transportation Enhancement Program (TE)
- State Congestion Mitigation Air Quality (CMAQ)
- State Surface Transportation Program – Direct Allocation (STP-DA)
- State Safe Routes to School Program
- State Parks and Recreation Trust Fund (PARTF)
- State Health and Wellness Trust Fund (HWTF)
- Local Capital Improvements Program (CIP)
- Local Bond
- Local Fees
- Private Sources

2. State Funding Sources

The most direct source of public-sector funding for the Town of Carrboro will come from state agencies in North Carolina. Generally, these funds are made available to local governments based on grant-in-aid formulas. The single most important key to obtaining state grant funding is for local governments to have adopted plans for greenway, open space, bicycle, pedestrian or trail systems in place prior to making an application for funding. Unfortunately, there is no direct correlation between any of the programs listed and a constant stream of funding for greenway or trail projects and all projects are funded on the basis of grant applications. There is no specific set aside amount that is allocated for greenway and trail development within a given program. Funding is based solely on need and the need has to be expressed and submitted in the form of a grant application. Finally, all of these programs are geared to address needs across the entire state, so all of the programs are competitive and must allocate funding with the needs of the entire state in mind.

In North Carolina, the Department of Transportation, *Division of Bicycle and Pedestrian Transportation* (DBPT) has been the single largest source of funding for bicycle and greenway projects, including non-construction projects such as brochures, maps, and public safety information 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). Contact the NCDOT, *Division of Bicycle and Pedestrian Transportation* at (919) 807-2804 for more information.

North Carolina programs are listed below. A good starting website with links to many of the following programs is www.enr.state.nc.us/html/tax_credits.html.

Funding Opportunities Through NCDOT

Bicycle and Pedestrian Independent Projects Funded Through the Transportation Improvement Program (TIP):

In North Carolina, the Department of Transportation, *Division of Bicycle and Pedestrian Transportation* (DBPT) manages the Transportation Improvement Program (TIP) selection process for bicycle projects. Projects programmed into the TIP by the DBPT are independent projects – those which are not related to a scheduled highway project. Incidental projects – those related to a scheduled highway project – are handled through other funding sources described in this section.

DBPT has an annual budget of \$6 million. Eighty percent of these funds are from STP-Enhancement funds, while the State Highway Trust provides the remaining 20 percent of the funding.

A total of \$5.3 million dollars of TIP funding is available for funding various bicycle-independent projects, including the construction of multi-use trails, the striping of bicycle lanes, and the construction of paved shoulders, among other facilities. Prospective applicants are encouraged to contact the DBPT regarding funding assistance for bicycle projects. For a detailed description of the TIP project selection process, visit www.ncdot.org/transit/bicycle/funding/funding_TIP.html. Another \$500,000 of the division's funding is available for miscellaneous projects.

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 bicycle safety accommodations built by NCDOT are included as part of scheduled highway improvement projects funded with a combination of National Highway System funds and State Highway Trust Funds.

Governor's Highway Safety Program (GHSP)

The mission of the GHSP is to promote highway safety awareness and reduce the number of traffic crashes in the state of North Carolina through the planning and execution of safety programs. GHSP funding is provided through an annual program, upon approval of specific project requests. Amounts of GHSP funds vary from year to year, according to the specific amounts requested. Communities may apply for a GHSP grant to be used as seed money to start a program to enhance highway safety. Once a grant is awarded, funding is provided on a reimbursement basis. Evidence of reductions in crashes, injuries, and fatalities is required. For information on applying for GHSP funding, visit www.ncdot.org/programs/ghsp/.

NCDOT Transportation Enhancement (TE)

The Enhancement Unit administers a portion of the enhancement funding set-aside through the Call for Projects process. In North Carolina the Enhancement Program is a federally funded cost reimbursement program with a focus upon improving the transportation experience in and through local North Carolina communities either culturally, aesthetically, or environmentally. The program seeks to encourage diverse modes of travel, increase benefits to communities and to encourage citizen involvement. This is accomplished through the following twelve qualifying activities:

- Bicycle and Pedestrian Facilities
- Bicycle and Pedestrian Safety
- Acquisition of Scenic Easements, Scenic or Historic Sites
- Scenic or Historic Highway Programs (including tourist or welcome centers)
- Landscaping and other Scenic Beautification
- Historic Preservation

- Rehabilitation of Historic Transportation Facilities
- Preservation of Abandoned Rail Corridors
- Control of Outdoor Advertising
- Archaeological Planning and Research
- Environmental Mitigation
- Transportation Museums

Funds are allocated based on an equity formula approved by the Board of Transportation. The formula is applied at the county level and aggregated to the regional level. Available fund amount varies. In previous Calls, the funds available ranged from \$10 million to \$22 million.

The next Call process takes place on even numbered years or as specified by the Secretary of Transportation. For more information, visit www.ncdot.org/financial/fiscal/Enhancement/

Bicycle and Pedestrian Planning Grant Initiative, managed by NCDOT, DBPT

To encourage the development of comprehensive local bicycle plans and pedestrian plans, the NCDOT *Division of Bicycle and Pedestrian Transportation* (DBPT) and the Transportation Planning Branch (TPB) have created a matching grant program to fund plan development. This program was initiated through a special allocation of funding approved by the North Carolina General Assembly in 2003 along with federal funds earmarked specifically for bicycle and pedestrian planning by the TPB. The planning grant program was launched in January 2004, and it is currently administered through NCDOT-DBPT and the Institute for Transportation Research and Education (ITRE) at NC State University. Over the past three grant cycles, 48 municipal plans have been selected and funded from 123 applicants. A total of \$1,175,718 has been allocated. Additional annual allocations will be sought for subsequent years. For more information, visit www.itre.ncsu.edu/ptg/bikeped/ncdot/index.html

Safe Routes to School Program, managed by NCDOT, DBPT

The NCDOT *Safe Routes to School Program* (SRTS) is a federally funded program that was initiated by the passing of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, which establishes a national SRTS program to distribute funding and institutional support to implement SRTS programs in states and communities across the country. SRTS programs facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools. The Division of Bicycle and Pedestrian Transportation (DBPT) at NCDOT is charged with disseminating SRTS funding.

The state of North Carolina has been allocated \$15 million in SRTS funding for fiscal years 2005 through 2009 for infrastructure or non-infrastructure projects. All proposed projects must relate to increasing walking or biking to and from an elementary or middle school. An example of a non-infrastructure project is an education or encouragement program to improve rates of walking and biking to school. An example of an infrastructure project is construction of sidewalks around a school. Infrastructure improvements under this program must be made within 2 miles of an elementary or middle school. The state requires the completion of a competitive application to apply for funding. For more information, visit www.ncdot.org/programs/safeRoutes/ or contact NCDOT's Division of Bicycle and Pedestrian Transportation at (919) 807-0774.

Funding Opportunities Through North Carolina Metropolitan Planning Organizations (MPOs)

The Durham Chapel Hill Carrboro Metropolitan Planning Organization (DCHC-MPO) manages the transportation planning process required by Federal law. The MPO plans for the area's surface transportation needs, including highways, transit, bicycle, and pedestrian facilities. There are two subcommittees of the MPO: the Technical Advisory Committee and the Technical Coordinating Committee. An important part of the transportation planning process is to identify transportation needs and to explore feasible alternatives to meet those needs. Plans and programs are often conducted in partnership with the NCDOT to identify

needs and projects to enhance Carrboro's transportation infrastructure. It is strongly encouraged to contact the DCHC-MPO to discuss current funding options in detail, such as getting the project listed on the TIP.

Surface Transportation Program – Direct Allocation (STP-DA)

This provides grants primarily to local governments, transit or transportation commissions awarded directly through the Metropolitan Planning Organization (MPO). Priority is given to projects that promote alternatives to single-occupancy vehicle trips. Funding has gone to transit and bicycle/pedestrian projects in past years. Nearly every bicycle project eligible under the Transportation Enhancement program is also eligible for this program, unless the project will clearly not reduce single-occupant vehicle trips. Unlike the Transportation Enhancement program, bicycle and pedestrian planning is eligible. The DCHC MPO currently allocates \$250,000 annually for bike and pedestrian specific projects; a 20% match is required by the local government.

Congestion Mitigation Air Quality (CMAQ)

MPOs in North Carolina which are located in air quality nonattainment or maintenance areas have the authority to program Congestion Mitigation Air Quality (CMAQ) funds. CMAQ funding is intended for projects that reduce transportation related emissions. In North Carolina, the current criteria pollutants are ozone, carbon oxides and particulate matter. In 2004, NCDOT changed the process for funding CMAQ projects by issuing a call for projects to be locally administered within North Carolina's non-attainment and maintenance counties. NCDOT announced that approximately \$20 million per year would be available to fund CMAQ projects in the TIP for the years 2006 – 2012. This project must be endorsed, through a signed letter, by the MPO. The Town will need to work with NCDOT and the MPO to determine if this funding source would be warranted for this project and what local match would be required. Some NC MPOs have chosen to use the CMAQ funding for bicycle projects. During the planning effort for the Bolin Creek Greenway Conceptual Master Plan, the Jones Creek segment (Phase 2) was being recommended for CMAQ funding by the MPO.

OTHER STATE FUNDING OPPORTUNITIES

NC Adopt-A-Trail Grant Program

This program, operated by the Trails Section of the NC Division of State Parks, offers annual grants to local governments to build, renovate, maintain, sign and map and create brochures for pedestrian trails. Grants are generally capped at about \$5,000 per project and do not require a match. A total of \$108,000 in Adopt-A-Trail money is awarded annually to government agencies. Applications are due during the month of February. For more information, visit <http://ils.unc.edu/parkproject/trails/grant.html>.

Recreational Trails Program

The Recreational Trails Program (RTP) is a grant program funded by Congress with money from the federal gas taxes paid on fuel used by off-highway vehicles. This program's intent is to meet the trail and trail-related recreational needs identified by the Statewide Comprehensive Outdoor Recreation Plan. Grant applicants must be able contribute 20% of the project cost with cash or in-kind contributions. The program is managed by the State Trails Program, which is a section of the N.C. Division of Parks and Recreation.

The grant application is available and instruction handbook is available through the State Trails Program website at <http://ils.unc.edu/parkproject/trails/home.html>. Applications are due during the month of February. For more information, call (919) 715-8699.

North Carolina Parks and Recreation Trust Fund (PARTF)

The fund was established in 1994 by the North Carolina General Assembly and is administered by the Parks and Recreation Authority. Through this program, several million dollars each year are available to local governments to fund the acquisition, development and

renovation of recreational areas. Applicable projects require a 50/50 match from the local government. Grants for a maximum of \$500,000 are awarded yearly to county governments or incorporated municipalities. The fund is fueled by money from the state's portion of the real estate deed transfer tax for property sold in North Carolina.

The trust fund is allocated three ways:

- 65 percent to the state parks through the N.C. Division of Parks and Recreation.
- 30 percent as dollar-for-dollar matching grants to local governments for park and recreation purposes.
- 5 percent for the Coastal and Estuarine Water Access Program.

For information on how to apply, visit www.partf.net/learn.html

Urban and Community Forestry Assistance Program

This program offers small grants that can be used to plant urban trees, establish a community arboretum, or other programs that promote tree canopy in urban areas. The program operates as a cooperative partnership between the NC Division of Forest Resources and the USDA Forest Service, Southern Region. To qualify for this program, a community must pledge to develop a street-tree inventory, a municipal tree ordinance, a tree commission, and an urban forestry-management plan. All of these can be funded through the program. For more information, contact the NC Division of Forest Resources. For more information and a grant application, contact the NC Division of Forest Resources and/or visit www.dfr.state.nc.us/urban/urban_grantprogram.htm.

Ecosystem Enhancement Program

Developed in 2003 as a new mechanism to facilitate improved mitigation projects for NC highways, this program offers funding for restoration projects and for protection projects that serve to enhance water quality and wildlife habitat in NC. Information on the program is available by contacting the Natural Heritage Program in the NC Department of Environment and Natural Resources (NCDENR). For more information, visit www.nceep.net/pages/partners.html or call 919-715-0476.

Small Cities Community Development Block Grants

State level funds are allocated through the NC Department of Commerce, Division of Community Assistance to be used to promote economic development and to serve low-income and moderate-income neighborhoods. Greenways that are part of a community's economic development plans may qualify for assistance under this program. Recreational areas that serve to improve the quality of life in lower income areas may also qualify. Approximately \$50 million is available statewide to fund a variety of projects. For more information, visit www.hud.gov/offices/cpd/communitydevelopment/programs/stateadmin/

North Carolina Health and Wellness Trust Fund

The NC Health and Wellness Trust Fund was created by the General Assembly as one of 3 entities to invest North Carolina's portion of the Tobacco Master Settlement Agreement. HWTF receives one-fourth of the state's tobacco settlement funds, which are paid in annual installments over a 25-year period.

Fit Together, a partnership of the NC Health and Wellness Trust Fund (HWTF) and Blue Cross and Blue Shield of North Carolina (BCBSNC) announces the establishment of Fit Community, a designation and grant program that recognizes and rewards North Carolina communities' efforts to support physical activity and healthy eating initiatives, as well as tobacco-free school environments. *Fit Community* is one component of the jointly sponsored *Fit Together* initiative, a statewide prevention campaign designed to raise awareness about obesity and to equip individuals, families and communities with the tools they need to address this important issue.

All North Carolina municipalities and counties are eligible to apply for a *Fit Community* designation, which will be awarded to those that have excelled in supporting the following:

- physical activity in the community, schools, and workplaces
- healthy eating in the community, schools, workplaces
- tobacco use prevention efforts in schools

Designations will be valid for two years, and designated communities may have the opportunity to reapply for subsequent two-year extensions. The benefits of being a *Fit Community* include:

- Heightened statewide attention that can help bolster local community development and/or economic investment initiatives (highway signage and a plaque for the Mayor's or County Commission Chair's office will be provided)
- Reinvigoration of a community's sense of civic pride (each *Fit Community* will serve as a model for other communities that are trying to achieve similar goals)
- Use of the *Fit Community* designation logo for promotional and communication purposes.

Fit Community grants are designed to support innovative strategies that help a community meet its goal to becoming a *Fit Community*. Eight to nine, two-year grants of up to \$30,000 annually will be awarded to applicants that have a demonstrated need, proven capacity, and opportunity for positive change in addressing physical activity and/or healthy eating. For more information, visit www.FitTogetherNC.org/FitCommunity.aspx.

Eat Smart, Move More NC Community Grants

The *Eat Smart, Move More* (ESMM) NC Community Grants program provides funding to local communities to implement strategies that advance the goals and objectives of the ESMM NC Plan. These goals include increasing physical activity opportunities and increasing the number of citizens who get the recommended amount of physical activity. Administered by the Physical Activity and Nutrition branch of the Division of Public Health, the program awards \$10,000 - 20,000 to local communities each year. Interested applicants must submit a letter of intent in late June and an application in mid-July. For more information, visit www.eatsmartmovemorenc.com/funding/index.html.

The North Carolina Division of Forest Resources

Urban and Community Forestry Grant can provide funding for a variety of projects that will help toward planning and establishing street trees as well as trees for urban open space. See www.dfr.state.nc.us/urban/urban_ideas.htm

3. National and Federal Funding Sources

The Community Development Block Grant (HUD-CDBG)

The U.S. Department of Housing and Urban Development (HUD) offers financial grants to communities for neighborhood revitalization, economic development, and improvements to community facilities and services, especially in low and moderate income areas. Several communities have used HUD funds to develop greenways, including the Boulding Branch Greenway in High Point, North Carolina. Grants from this program range from \$50,000 to \$200,000 and are either made to municipalities or non-profits. There is no formal application process. For more information, visit www.hud.gov/offices/cpd/communitydevelopment/programs/.

USDA Rural Business Enterprise Grants

Public and private nonprofit groups in communities with populations under 50,000 are eligible to apply for grant assistance to help their local small business environment. \$1 million is available for North Carolina on an annual basis and may be used for sidewalk and other community facilities. For more information from the local USDA Service Center, visit www.rurdev.usda.gov/rbs/busp/rbeg.htm

Rivers Trails and Conservation Assistance Program (RTCA)

The Rivers, Trails, and Conservation Assistance Program, also known as the Rivers & Trails Program or RTCA, is the community assistance arm of the National Park Service. RTCA staff provide technical assistance to community groups and local, State, and federal government agencies so they can conserve rivers, preserve open space, and develop trails and greenways. The RTCA program implements the natural resource conservation and outdoor recreation mission of the National Park Service in communities across America.

Public Lands Highways Discretionary Fund

The Federal Highway Administration administers discretionary funding for projects that will reduce congestion and improve air quality. The FHWA issues a call for projects to disseminate this funding. In the past, Congress has earmarked a portion of the total available funding for projects. For information on how to apply, visit <http://www.fhwa.dot.gov/discretionary/>

Environmental Protection Agency- Clean Water Act 319

Congress amended the Clean Water Act (CWA) in 1987 to establish the section 319 Nonpoint Source Management Program because it recognized the need for greater federal leadership to help focus State and local nonpoint source efforts. Under section 319, State, Territories, and Indian Tribes receive grant money which support a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific nonpoint source implementation projects. For more information visit: <http://www.epa.gov/nps/cwact.html>

4. Local Government Funding Sources

Municipalities often plan for the funding of pedestrian facilities or improvements through development of Capital Improvement Programs (CIP). In Raleigh, for example, the greenways system has been developed over many years through a dedicated source of annual funding that has ranged from \$100,000 to \$500,000, administered through the Recreation and Parks Department. CIPs should include all types of capital improvements (water, sewer, buildings, streets, etc.) versus programs for single purposes. This allows municipal decision-makers to balance all capital needs. Typical capital funding mechanisms include the following: capital reserve fund, capital protection ordinances, municipal service district, tax increment financing, taxes, fees, and bonds. Each of these categories are described below.

Capital Reserve Fund

Municipalities have statutory authority to create capital reserve funds for any capital purpose, including pedestrian facilities. The reserve fund must be created through ordinance or resolution that states the purpose of the fund, the duration of the fund, the approximate amount of the fund, and the source of revenue for the fund. Sources of revenue can include general fund allocations, fund balance allocations, grants and donations for the specified use.

Capital Project Ordinances

Municipalities can pass Capital Project Ordinances that are project specific. The ordinance identifies and makes appropriations for the project.

Municipal Service District

Municipalities have statutory authority to establish municipal service districts, to levy a property tax in the district additional to the citywide property tax, and to use the proceeds to provide services in the district. Downtown revitalization projects are one of the eligible uses of service districts.

Tax Increment Financing

Tax increment financing is a tool to use future gains in taxes to finance the current improvements that will create those gains. When a public project, such as the construction of a greenway, is carried out, there is an increase in the value of surrounding real estate. Oftentimes, new investment in the area follows such a project. This increase in value and investment creates more taxable property, which increases tax revenues. These increased revenues can be referred to as the "tax increment." Tax Increment Financing dedicates that increased revenue to finance debt issued to pay for the project. TIF is designed to channel funding toward improvements in distressed or underdeveloped areas where development would not otherwise occur. TIF creates funding for public projects that may otherwise be unaffordable to localities. The large majority of states have enabling legislation for tax increment financing.

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 up-front 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.

Taxes

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 popu-

lar Pinellas Trail. Sales taxes have also been used in Allegheny 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. A number of taxes provide direct or indirect funding for the operations of local governments. Some of them are:

Sales Tax

In North Carolina, the state has authorized a sales tax at the state and county levels. Local governments that choose to exercise the local option sales tax (all counties currently do), use the tax revenues to provide funding for a wide variety of projects and activities. Any increase in the sales tax, even if applying to a single county, must gain approval of the state legislature.

Property Tax

Property taxes generally support a significant portion of a municipality’s activities. However, the revenues from property taxes can also be used to pay debt service on general obligation bonds issued to finance greenway system acquisitions. Because of limits imposed on tax rates, use of property taxes to fund greenways could limit the municipality’s ability to raise funds for other activities. Property taxes can provide a steady stream of financing while broadly distributing the tax burden. In other parts of the country, this mechanism has been popular with voters as long as the increase is restricted to parks and open space. Note, other public agencies compete vigorously for these funds, and taxpayers are generally concerned about high property tax rates.

Excise Taxes

Excise taxes are taxes on specific goods and services. These taxes require special legislation and the use of the funds generated through the tax are limited to specific uses. Examples include lodging, food, and beverage taxes that generate funds for promotion of tourism, and the gas tax that generates revenues for transportation related activities.

Occupancy Tax

The NC General Assembly may grant towns the authority to levy occupancy tax on hotel and motel rooms. The act granting the taxing authority limits the use of the proceeds, usually for tourism-promotion purposes.

Fees

Three fee options that have been used by local governments to assist in funding pedestrian and bicycle facilities are listed here:

Stormwater Utility Fees

Greenway sections may be purchased with stormwater fees, if the property in question is used to mitigate floodwater or filter pollutants. Stormwater charges are typically based on an estimate of the amount of impervious surface on a user’s property. Impervious surfaces (such as rooftops and paved areas) increase both the amount and rate of stormwater runoff compared to natural conditions. Such surfaces cause runoff that directly or indirectly discharge into public storm drainage facilities and creates a need for stormwater management services. Thus, users with more impervious surface are charged more for stormwater service than users with less impervious surface. The rates, fees, and charges collected for stormwater management services may not exceed the costs incurred to provide these services. The costs that may be recovered through the stormwater rates, fees, and charges includes any costs necessary to assure that all aspects of stormwater quality and quantity are managed in accordance with federal and state laws, regulations, and rules.

Streetscape Utility Fees

Streetscape Utility Fees could help support streetscape maintenance of the area between the curb and the property line through a flat monthly fee per residential dwelling unit. Dis-

counts would be available for senior and disabled citizens. Non-residential customers would be charged a per foot fee based on the length of frontage on streetscape improvements. This amount could be capped for non-residential customers with extremely large amounts of street frontage. The revenues raised from Streetscape Utility fees would be limited by ordinance to maintenance (or construction and maintenance) activities in support of the streetscape.

Impact Fees

Developers can be required to provide greenway impact fees through local enabling legislation. Impact fees, which are also known as capital contributions, facilities fees, or system development charges, are typically collected from developers or property owners at the time of building permit issuance to pay for capital improvements that provide capacity to serve new growth. The intent of these fees is to avoid burdening existing customers with the costs of providing capacity to serve new growth (“growth pays its own way”). Greenway impact fees are designed to reflect the costs incurred to provide sufficient capacity in the system to meet the additional needs of a growing community. These charges are set in a fee schedule applied uniformly to all new development. Communities that institute impact fees must develop a sound financial model that enables policy makers to justify fee levels for different user groups, and to ensure that revenues generated meet (but do not exceed) the needs of development. Factors used to determine an appropriate impact fee amount can include: lot size, number of occupants, and types of subdivision improvements. If Carrboro is interested in pursuing open space impact fees, it will require enabling legislation to authorize the collection of the fees.

Exactions

Exactions are similar to impact fees in that they 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 pedestrian facility that crosses through the property, or adjacent to the property being developed.

In-Lieu-Of Fees

As an alternative to requiring developers to dedicate on-site greenway sections that would serve their development, some communities provide a choice of paying a front-end charge for off-site protection of pieces of the larger system. Payment is generally a condition of development approval and recovers the cost of the off-site land acquisition or the development’s proportionate share of the cost of a regional facility serving a larger area. Some communities prefer in-lieu-of fees. This alternative allows community staff to purchase land worthy of protection rather than accept marginal land that meets the quantitative requirements of a developer dedication but falls a bit short of qualitative interests.

Bonds and Loans

Bonds have been a very popular way for communities across the country to finance their pedestrian and greenway projects. A number of bond options are listed below. Contracting with a private consultant to assist with this program may be advisable. Since bonds rely on the support of the voting population, an education and awareness program should be implemented prior to any vote. 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 from a certain local government activity. 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). Revenue bonds are not constrained by the debt ceilings of general obligation bonds, but they are generally 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 land acquisition and greenway development and make funds available for immediate purchases and projects. 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.

5. Land Acquisition Funding Sources***The North Carolina Conservation Tax Credit, managed by NCDENR***

This program, managed by the North Carolina Department of Environment and Natural Resources (NCDENR), provides an incentive (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, visit www.enr.state.nc.us/conservationtaxcredit/.

Land and Water Conservation Fund (LWCF)

The Land and Water Conservation Fund (LWCF) program is a reimbursable, 50/50 matching grants program to states for conservation and recreation purposes, and through the states to local governments to address "close to home" outdoor recreation needs. LWCF grants can be used by communities to build a trail within one park site, if the local government has fee-simple title to the park site. Grants for a maximum of \$250,000 in LWCF assistance are awarded yearly to county governments, incorporated municipalities, public authorities and federally recognized Indian tribes. The local match may be provided with in-kind services or cash. 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 small fraction of this amount.

The Land and Water Conservation Fund (LWCF) has historically been a primary funding source of the US Department of the Interior for outdoor recreation development and land acquisition by local governments and state agencies. In North Carolina, the program is administered by the Department of Environment and Natural Resources. Since 1965, the LWCF program has built a permanent park legacy for present and future generations. In North Carolina alone, the LWCF program has provided more than \$63 million in matching grants to protect land and support more than 800 state and local park projects. More than 37,000 acres have been acquired with LWCF assistance to establish a park legacy in our state. However, funds have not been made available since 2008. For more information, visit http://www.ncparks.gov/about/grants/lwcf_grant.php

Clean Water Management Trust Fund (CWMTF)

This fund was established in 1996 and has become one of the largest sources of money in North Carolina for land and water protection. 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 is allocated as grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address water pollution problems. CWMTF funds may be used to establish a network of riparian buffers and greenways for environmental, educational, and recreational benefits. The fund has provided funding for land acquisition of numerous greenway projects featuring trails, both paved and unpaved. For a history of awarded grants in North Carolina and more information about this fund and applications, visit www.cwmtf.net/.

Natural Heritage Trust Fund

This trust fund, managed by the NC Natural Heritage Program, has contributed millions of dollars to support the conservation of North Carolina's most significant natural areas and cultural heritage sites. The NHTF is used to acquire and protect land that has significant habitat value. Some large wetland areas may also qualify, depending on their biological integrity and characteristics. Only certain state agencies are eligible to apply for this fund, including the Department of Environment and Natural Resources, the Wildlife Resources Commission, the Department of Cultural Resources and the Department of Agriculture and Consumer Services. As such, municipalities must work with State level partners to access this fund. Additional information is available from the NC Natural Heritage Program. For more information and grant application information, visit www.ncnhtf.org/.

Water Resources Development Grant Program

The NC Division of Water Resources offers cost-sharing grants to local governments on projects related to water resources. Of the seven project application categories available, the category which relates to the establishment of greenways is "Land Acquisition and Facility Development for Water-Based Recreation Projects." Applicants may apply for funding for a greenway as long as the greenway is in close proximity to a water body. For more information, see www.ncwater.org/Financial_Assistance or call 919-733-4064.

Wetlands Reserve Program

This federal funding source is a voluntary program offering technical and financial assistance to landowners who want to restore and protect wetland areas for water quality and wildlife habitat. The US Department of Agriculture's Natural Resource Conservation Service (USDA-NRCS) administers the program and provides direct payments to private landowners who agree to place sensitive wetlands under permanent easements. This program can be used to fund the protection of open space and greenways within riparian corridors. For more information, visit <http://www.nrcs.usda.gov/PROGRAMS/wrp/>.

Orange County Lands Legacy Program

In April 2000, Orange County enacted a comprehensive program for the acquisition of protection of highly important natural and cultural resource lands entitled the "Lands Legacy Program."

In a county that has seen its population double since 1970, thousands of acres of important resource lands have been lost to urban conversion. Fortunately, however, many important resource lands still exist in the County.

Leveraging local funds (including \$10 million approved by County voters since 1997) with State and Federal dollars, and working with area conservation partners, the Lands Legacy Program has protected over 1800 acres to date – both via outright purchase and through donated or purchased conservation easements. During that timeframe Lands Legacy has received over \$3.7 million in State and Federal grants – including grants for the Little River Regional Park and Natural Area (for which Orange and Durham counties were named the "Lo-

cal Government Conservationists of the Year” in 2001 by the Conservation Trust for North Carolina). The Triangle Land Conservancy’s State of Open Space 2002 also lauds the program as a model for acquisition at the local government level.

The Lands Legacy Program has five standing priority areas for acquisition:

- Natural Areas and Wildlife Habitat (NC Natural Heritage sites) and Prime Forest areas
- Prime or Threatened Farmlands
- Lands of Cultural, Archaeological or Scenic Significance
- Future Parklands
- Watershed Riparian Buffer lands

In addition to these categories, other opportunities that arise are also evaluated and considered for conservation value. Every two years the Board of County Commissioners adopts an “Annual Action Plan” which contains the Lands Legacy priorities for the upcoming two fiscal years. For more information visit: http://www.co.orange.nc.us/ercd/lands_legacy.asp

Triangle Land Conservancy

TLC believes achieving a balance between developed and protected land means ultimately conserving more than 45,000 acres of the most critical forests, farms, and natural areas in our region. To realize our vision, we:

- identify the most significant and threatened lands (Priority Areas);
- plan with local governments, organizations and individuals for the time and appropriate protection of these lands (Conservation Planning);
- conserve these lands through purchase or private conservation agreements (Conservation Lands); and
- manage these lands (Stewardship).

For more information please visit: http://www.triangleland.org/lands/our_work.shtml

6. Other Local Funding Sources

Facility Maintenance Districts

Facility Maintenance Districts (FMDs) can be created to pay for the costs of on-going maintenance of public facilities and landscaping within the areas of the Town where improvements have been concentrated and where their benefits most directly benefit business and institutional property owners. An FMD is needed in order to assure a sustainable maintenance program. Fees may be based upon the length of lot frontage along streets where improvements have been installed, or upon other factors such as the size of the parcel. The program supported by the FMD should include regular maintenance of streetscape of off road trail improvements. The municipality can initiate public outreach efforts to merchants, the Chamber of Commerce, and property owners. In these meetings, Town staff will discuss the proposed apportionment and allocation methodology and will explore implementation strategies.

The municipality can manage maintenance responsibilities either through its own staff or through private contractors.

Partnerships

Another method of funding facilities is to partner with public agencies and private companies and organizations. Examples of Carrboro partners include UNC, OWASA, and CHCCS. 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. Very specific routes that make critical connections to place of business would be targeted for private partners’ monetary support following a successful master planning effort. Potential partners include major employers which are located along or accessible to

pedestrian facilities such as multi-use paths or greenways. Name recognition for corporate partnerships would be accomplished through signage trail heads 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.

Local Trail Sponsors

A sponsorship program for trail amenities allows smaller donations to be received from both individuals and businesses. Cash donations could be placed into a trust fund to be accessed for certain construction or acquisition projects associated with the greenways and open space system. Some recognition of the donors is appropriate and can be accomplished through the placement of a plaque, the naming of a trail segment, and/or special recognition at an opening ceremony. Types of gifts other than cash could include donations of services, equipment, labor, or reduced costs for supplies.

Local groups in Carrboro who may serve as potential stakeholders for the proposed greenway:

- Carrboro Parks Project
- HOA's
- Friends of Bolin Creek
- Trail Heads
- Triangle Off Road Cyclists (TORC)

Volunteer Work

It is expected that many citizens will be excited about the development of a greenway corridor. Individual volunteers from the community can be brought together with groups of volunteers from church groups, civic groups, scout troops and environmental groups to work on greenway development on special community work days. Volunteers can also be used for fund-raising, maintenance, and programming needs. The Town of Carrboro could initiate and/or lead these types of efforts.

Private Foundations and Organizations

Many communities have solicited greenway funding assistance from private foundations and other conservation-minded benefactors. Below are a few examples of private funding opportunities available in North Carolina.

Land for Tomorrow Campaign

Land for Tomorrow is a diverse partnership of businesses, conservationists, farmers, environmental groups, health professionals and community groups committed to securing support from the public and General Assembly for protecting land, water and historic places. The campaign is asking the North Carolina General Assembly to support issuance of a bond for \$200 million a year for five years to preserve and protect its special land and water resources. Land for Tomorrow will enable North Carolina to reach a goal of ensuring that working farms and forests; sanctuaries for wildlife; land bordering streams, parks and greenways; land that helps strengthen communities and promotes job growth; historic downtowns and neighborhoods; and more, will be there to enhance the quality of life for generations to come. For more information, visit www.landfortomorrow.org/

The Trust for Public Land

Land conservation is central to the mission of the Trust for Public Land (TPL). 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 com-

munity groups to:

- Create urban parks, gardens, greenways, 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.

The following are TPL's Conservation Services:

- Conservation Vision: TPL helps agencies and communities define conservation priorities, identify lands to be protected, and plan networks of conserved land that meet public need.
- Conservation Finance: TPL helps agencies and communities identify and raise funds for conservation from federal, state, local, and philanthropic sources.
- Conservation Transactions: TPL helps structure, negotiate, and complete land transactions that create parks, playgrounds, and protected natural areas.
- Research and Education: TPL acquires and shares knowledge of conservation issues and techniques to improve the practice of conservation and promote its public benefits.

Since 1972, TPL has worked with willing landowners, community groups, and national, state, and local agencies to complete more than 3,000 land conservation projects in 46 states, protecting more than 2 million acres. Since 1994, TPL has helped states and communities craft and pass over 330 ballot measures, generating almost \$25 billion in new conservation-related funding. For more information, visit www.tpl.org/.

Z. Smith Reynolds Foundation

This Winston-Salem based Foundation has been assisting the environmental projects of local governments and non-profits in North Carolina for many years. The foundation has two grant cycles per year and generally does not fund land acquisition. However, the foundation may be able to support municipalities in other areas of greenways development. More information is available at www.zsr.org.

North Carolina Community Foundation

The North Carolina Community Foundation, established in 1988, is a statewide foundation seeking gifts from individuals, corporations, and other foundations to build endowments and ensure financial security for nonprofit organizations and institutions throughout the state. Based in Raleigh, North Carolina, the foundation also manages a number of community affiliates throughout North Carolina that make grants in the areas of human services, education, health, arts, religion, civic affairs, and the conservation and preservation of historical, cultural, and environmental resources. In addition, the foundation manages various scholarship programs statewide. Web site: <http://nccommunityfoundation.org/>

National Trails Fund

In 1998, the American Hiking Society created the National Trails Fund, the only privately supported national grants program providing funding to grassroots organizations working toward establishing, protecting and maintaining foot trails in America. Each year, 73 million people enjoy foot trails, yet many of our favorite trails need major repairs due to a \$200 million in badly needed maintenance. National Trails Fund grants give local organizations the resources they need to secure access, volunteers, tools and materials to protect America's cherished public trails. For 2005, American Hiking distributed over \$40,000 in grants thanks to the generous support of Cascade Designs and L.L.Bean, the program's Charter Sponsors. To date, American Hiking has granted nearly \$382,000 to 105 different trail projects across the U.S. for land acquisition, constituency building campaigns, and a variety of trail work projects. Awards typically range from \$500 to \$5,000 per project.

What types of projects will American Hiking Society consider? Securing trail lands, including acquisition of trails and trail corridors, and the costs associated with acquiring conservation easements. Building and maintaining trails which will result in visible and substantial ease of access, improved hiker safety, and/or avoidance of environmental damage. Constituency building surrounding specific trail projects - including volunteer recruitment and support. Web site: www.americanhiking.org/NTF.aspx

Annual Azalea Celebration

Each year, NC Beautiful and sponsor WRAL-TV 5 partner together to make thousands of azalea plants available to non-profit organizations who wish to beautify their grounds. To date, close to 200,000 plants have been awarded to over 2,500 non-profit organizations statewide. Last year, NC Beautiful distributed over 13,000 azaleas to 144 non-profits. Azaleas from the Celebration now enhance the beauty of hundreds of acres on the grounds of schools, churches, parks, greenways, public rights-of-way, and community and senior centers across North Carolina. Applications for non-profit organizations that could benefit from 100 azaleas are available in June. Applications must be postmarked by September 10, 2008. For more information, visit www.ncbeautiful.org/programs/celebration.html.



Appendix C: Operations and Management

Chapter Outline:

1. Overview
2. Guiding Principles for Effective Operations and Management
3. Routine and Remedial Operations
4. Routine and Remedial Maintenance
5. Administrative Responsibilities

1. Overview

Operations and maintenance refers to specific day-to-day tasks and programs performed to assure resources and facilities are kept in good, safe, usable condition. This begins with sound design, durable components, and a comprehensive management plan. A management plan should be embraced by the entities responsible for maintaining the greenway and trail network, at the beginning of the implementation process. In addition, community groups, residents, business owners, developers and other stakeholders should be engaged in the long term stewardship of the resources preserved and enhanced by this plan as discussed later in this section.

2. Guiding Principles for Effective Operations and Maintenance

The Bolin Creek greenway should be regarded and maintained as a public resource. The greenway will serve the Carrboro community for generations to come. The following guiding principles will help assure the preservation of a first class system:

- Good maintenance begins with sound planning and design
- Foremost, protect life, property and the environment
- Promote and maintain a quality outdoor recreation and transportation experience
- Develop a management plan that is reviewed and updated annually with tasks, operational policies, standards, and routine and remedial maintenance goals
- Maintain quality control and conduct regular inspections
- Include field crews, police and fire/rescue personnel in both the design review and on-going management process
- Maintain an effective, responsive public feedback system and promote public participation
- Be a good neighbor to adjacent properties
- Operate a cost-effective program with sustainable funding sources

Resource Stewardship and Enhancement

A well-managed greenway and trail system is critical to the long-term success of this Plan. This involves stewardship, the oversight of resources, and operations and maintenance. Stewardship might range from cleaning up litter to assuring that a project does not visually scar the surrounding landscape.

The stewardship process must consider both the private sector (such as land subdivision and development) and public sector activities, such as the construction of roads and utilities. In pursuit of this, coordination among agencies at the local, regional, state, and federal level is vital to assure that these activities are supportive of the plan and complementary to each other. Long term stewardship also calls for the enduring commitment of agency staff, elected officials and concerned citizens all working together. This suggests the need for a shared community vision and value system centered on the protection of greenway, trail, bicycle, pedestrian, and outdoor recreational resources. This plan and similar plans can help coordinate and guide that action.

Greenway Facility Safety and Security

Safety is a duty and obligation of all public facility managers. Therefore, as the construction documents for the Bolin Creek greenway are completed, appropriate local, state, and federal agencies should review these plans and specifications to ensure that they meet all existing regulations.

In order to provide reasonable and ordinary safety measures, the Town of Carrboro should develop and implement a Safety and Security Program. This program should consist of well-defined safety and security policies; the identification of trail management, law enforcement, emergency and fire protection policies; and a system that offers timely response to the public for issues or problems related to safety and security. The Town will need to implement internal coordination for safety and security between Recreation and Parks, Police, Fire, Public Works, and Administration Departments. Additionally, procedures and policies should be established for external coordination among the Town, local alliances, local neighborhood watch associations, and "Adopt-a-Greenway" organizations. Important components of the Safety and Security Program should include:

- Establishment of a safety committee or coordinator
- Preparation of a trail safety manual for employees and agencies
- Establishment of user rules and regulations
- Development of greenway and trails emergency procedures
- Preparation of a safety checklist for the trail
- Preparation of a trail user response form
- A system for accident reporting and analysis
- Regular maintenance and inspection program
- Site and facility development and review
- Public information program
- Employee training program for safety and emergency response
- Ongoing research and evaluation of program objectives

Risk Management and Liability

The design, development, management, and operation of the Bolin Creek greenway must be carefully and accurately executed in order to provide a resource that protects the health, welfare, and safety of the public.

Liability most often occurs when a facility has been under-designed for the intended volume of use, when management of the facility is poor, or when unexpected accidents occur because the trail manager failed to recognize the possibilities of a potentially hazardous situation. To reduce the exposure to liability, the Town should have in place the following measures prior to opening the first phase of the trail:

- A complete maintenance program that provides the appropriate duty or level of care to trail users;
- A risk management plan that appropriately covers all aspects of the trail
- A comprehensive working knowledge of public use laws and recent case history applicable in North Carolina

Public use of the Bolin Creek greenway should be covered under existing municipal policies for the use of parkland and public spaces. The Bolin Creek greenway is available for public use as defined by the Hours of Operation Policy (described below); therefore, any individual found using the trail outside the normal hours of operation would be treated as a trespasser and would not be covered by the municipal insurance policies for public use.

The Town should exercise reasonable care in the construction of all trail facilities to reduce hazardous, public nuisance and life threatening situations. Once the trail is open for use, liability can be further reduced by adopting the following practices:

- Posting and enforcement of trail regulations.
- Regular inspection of the trail by a person qualified to identify hazardous conditions and maintenance problems.
- Timely correction and documentation (e.g., notes, photographs) of maintenance problems.
- When a problem cannot be promptly corrected, warnings to trail users should be erected.
- Maintenance of inspection records including findings and responses.
- Development of procedures for handling medical emergencies and documentation of their occurrence.

These risk management techniques will not only help to ensure that hazardous conditions are identified and corrected in a timely manner, thereby averting injury to trail users, but will also serve to protect the Town from liability. Showing that the Town had been acting in a responsible manner can serve as an excellent defense in the event that a lawsuit develops (BCEMC 1997, p. 58).

For more information on trail-related liability laws, risk management techniques, and special risk situations, refer to the Rails-to-Trails Conservancy report *"Rails-with-Trails: Design, Management, and Operating Characteristics of 61 Trails Along Active Rail Lines"* (2000).

Hours of Operation

The consultant recommends that the Bolin Creek greenway be operated like all other non-lighted public parks and recreation facilities open for public use from dawn to dusk, 365 days a year, except as specifically designated by the Carrboro Recreation and Parks Department. Individuals who are found using these facilities after dusk and before dawn should be deemed in violation of this policy and subject to fines and/or prosecution. Additionally, trail segments should not be considered officially opened for public use until a formal dedication ceremony and authorized agents of the Town have completed an official opening. Individuals who use greenway segments that are under construction, without written permission from an authorized agent, should also be deemed in violation of the Bolin Creek greenway Hours of Operation policy.

Trail User Rules and Regulations

One of the emerging safety issues in greenway trail planning, design, and development is multi-user conflict. Typically, these conflicts are caused by overuse of a trail. However, other factors may lead to user conflicts and problems including poorly designed and engineered trail alignments, inappropriate user behavior, or inadequate facility capacity. The most effective trail use management plan is a well-conceived safety program that provides the individual user with a Code of Conduct for the trail, sometimes called a Trail Ordinance. Several multi-use trail systems across the United States have adopted progressive ordinances for public use. The consultant recommends that the following Rules and Regulations be implemented for the Bolin Creek greenway. These rules should be displayed in both brochures and on information signs throughout the trail. The consultant recommends that these rules and regulations be reviewed by the appropriate authorities and legally adopted by the Town.

1) Be Courteous: All trail users, including bicyclists, joggers, walkers, wheelchairs, skateboarders and skaters, should be respectful of other users regardless of their mode of travel, speed, or level of skill. Never spook animals like dogs - talk to them in a calm voice as you approach. Respect the privacy of adjacent landowners.

2) Keep Right: Always stay to the right as you use the trail, or stay in the lane that has been designated for your user group. The exception to this rule occurs when you need to pass another user.

3) Pass on the Left: Pass others going in your direction on their left. Look ahead and behind

to make sure that your lane is clear before you pull out an around the other user. Pass with ample separation. Do not move back to the right until you have safely gained distance and speed on the other user. Faster traffic should always yield to slower and oncoming traffic.

4) Give Audible Signal when Passing: All users should give a clear warning signal before passing. This signal may be produced by voice, bell, or soft horn. Voice signals might include "Passing on the Left!" or "Cyclist on the left!" Always be courteous when providing the audible signal - profanity is unacceptable.

5) Be Predictable: Travel in a consistent and predictable manner. Always look behind before changing position on the trail, regardless of your mode of travel.

6) Control Your Bicycle: Inattention, even for a second can cause disaster - always stay alert! Maintain a safe and legal speed at all times.

7) Don't Block the Trail: When in a group, including your pets, use no more than half the trailway, so as not to block the flow of other users. If users approach your group from both directions, form a single line, or stop and move to the far right edge of the trail to allow safe passage by these users.

8) Yield when Entering or Crossing Trails: When entering or crossing a trail at uncontrolled intersections, yield to traffic already using the other trail.

9) The Use of Lights: When using a trail during periods of low visibility, each cyclist should be equipped with proper lights. Cyclists should have a white light that is visible from five hundred feet to the front, and a red or amber light that is visible from five hundred feet to the rear. Other trail users should use white lights (bright flashlights) visible two hundred fifty feet to the front, and wear light or reflective clothing.

10) Don't Use this Trail Under the Influence of Alcohol or Drugs: It is illegal to use this trail if you have consumed alcohol in excess of the statutory limits, or if you have consumed illegal drugs. Persons who use a prescribed medication should check with their doctor or pharmacist to ensure that it will not impair their ability to safely operate a bicycle or other wheeled vehicle.

11) Clean up Your Litter: Please keep this trail clean and neat for other users to enjoy. Do not leave glass, paper, cans, or other debris on or near the trail. Please clean up after your pets. Pack out what you bring in and remember to always recycle your trash.

12) Keep Pets on Leashes: All pets must be kept on a secure and tethered leash. Failure to do so will result in fines and possible detention of the pet.

13) Use the Buddy System: Use the trail system with a friend!

14) Trail Subject to Flash Flooding: Please be aware that the Bolin Creek greenway is officially closed during times when floodwaters overflow the creek banks and cover the trail surface. For your personal safety, please be prepared to leave the trail immediately during periods of heavy rainfall.

15) Swimming Prohibited: Swimming is prohibited in creeks and tributary streams.

16) Vegetation Removal: It is illegal to remove vegetation of any type, size, or species from the trail. Please contact the Carrboro Recreation and Parks Department or Town of Carrboro Planning and Inspections Department should you have concerns about noxious weeds, poisonous vegetation, dying or dead vegetation, or other concerns about vegetation growth in the greenway.

17) Share the Trail: Always exercise due care and caution when using the trail!

Police/Park Ranger Patrol and Emergency Response System

In order to provide effective patrol and emergency response to the needs of trail users and adjacent property owners, the consultant recommends that the Town Police and the Carrboro Recreation and Parks Departments work together to develop a specific patrol and emergency response plan for the Bolin Creek greenway. This plan should define a cooperative law enforcement strategy for the trail based on the capabilities of different agencies and services typically required for the facility. There will be several phases of design and construction for each segment of the trail until completion. As consultants are hired for each phase, they should be required to work with the designated departments to deliver a site plan that illustrates points of access to the trail; approved design details for making these access points safe, secure, and accessible to law enforcement officials; and potential locations for a system of cellular-type emergency phones. The consultant will also work with appropriate officials to locate other mechanisms or project elements that will aid local agencies in managing the trail in a safe and secure manner.

The Carrboro Police and Recreation and Parks Departments should also define an emergency response system in conjunction with appropriate local fire stations and paramedic units that defines which agencies should respond to 911 calls, and provides easy-to-understand routing plans and access points for emergency vehicles. Local hospitals should be notified of these routes so that they may also be familiar with the size and scope of the project. The entire trail system will be designed and developed to support a minimum gross vehicle weight of 6.5 tons to allow emergency vehicle access.

At all public entrances to the Bolin Creek greenway, appropriate signage should be installed to notify trail users of the potential for flash flooding and the need to quickly exit the trail during periods of heavy rainfall.

3. Routine and Remedial Operations

Routine operations refer to the daily activities required to oversee a greenway and trail system. The following task lists describe the general routine and remedial operations responsibilities for all network facilities.

Task: Inter-agency design review

Coordination between and commitment of agencies responsible for greenway facilities is crucial to complete the following routine maintenance tasks. In addition to department managers, planners, designers and engineers, police and fire/rescue, and field maintenance personnel should be consulted in the design and review process. The Carrboro Greenways Commission (recommended in Chapter 5: Implementation) is suggested to carry out the following.

- Establish a coordinating committee with representatives from each of the participating agencies and stakeholders
- Identify an entity to provide on-going oversight, coordination, and leadership for the overall network
- Review critical public and private sector projects that might impact the greenway, bicycle, and pedestrian projects as they come on line
- Pursue grants and cooperative agreements
- Monitor operations and maintenance and other advocacy functions now and over the years to come.
- Review accident and crime reports and take the necessary up-front actions, on a case by case basis, to assure that greenway, bicycle, and pedestrian facilities do not deteriorate due to safety concerns, crime, or from fear of criminal activity

Task: Accurate and Organized Record Keeping

Good record-keeping techniques are essential to a comprehensive operations and maintenance program. This information can be used to eliminate overlap or gaps in maintenance services provided, identify levels of use, and prioritize management needs.

- Daily activities
- Schedule of routine (and remedial) maintenance tasks
- Hazards, incidents, safety issues observed and action taken
- Inspection reports
- Annual maintenance budget, pursuing various funding sources
- Projected costs for subsequent years (short-, medium-, and long-term) to reflect on project phasing as shown in Chapter 5: Implementation
- Internal working database for existing, planned, or proposed projects for greenway and trail system

Remedial Operations Defined

Remedial operations refer to activities required to sustain the quality of the greenway and trail network.

Task: Program Development

- Update informational signage (rules and regulations) to communicate proper usage of all network facility types
- Update directional signage to integrate greenway, bicycle, and pedestrian systems and as new projects are implemented
- Update user maps to reflect any additions or changes to the systems or overall network and also reference the connections between greenway, bicycle, and pedestrian facilities

Task: General Operations

Provide contact information and institute an agency response for facility users to report questions, comments, concerns, or complaints regarding the network, and a feedback phone number and Web address.

- Continue to provide and establish new public education and citizen participation programs for network users
- Pursue development of an easy to use management manual and training program and incorporate it into existing and new maintenance programs and procedures within the participating agencies

4. Routine and Remedial Maintenance

The following task lists describe the general routine and remedial maintenance responsibilities for all greenway and trail facilities. To complement this text, Table 1 and 2 illustrates maintenance recommendations. A Town staff member should be designated as the main contact for the maintenance of trail facilities near any roadway right-of-way. This staff member should coordinate with the appropriate departments to conduct maintenance activities in the field. Funding for an ongoing maintenance program should be included in the Town's operating budget or Capital Improvements Program.

Note that the schedule is intended to provide general guidance for routine and remedial maintenance activities. The frequency of trail facility maintenance within the roadway right-of-way will vary. Maintenance needs will depend upon many factors, including trail surface type, the use of paint or thermoplastic for markings, and traffic volumes. The Town of Carrboro Public Works Department and NCDOT should make immediate repairs to any trail facilities that are damaged or have hazardous conditions. The Town staff member in charge of maintenance should set up a free maintenance hotline for users to provide information about spot maintenance needs in the urban area.

Routine Maintenance Defined

Routine maintenance refers to the day-to-day regimen of litter pick-up, trash and debris removal, weed and dust control, trail sweeping, sign replacement, tree and shrub trimming, and other regularly scheduled activities. Routine maintenance also includes minor repairs and replacements such as fixing cracks and potholes or repairing a broken hand railing.

The following tasks should be performed on a regular basis to keep all network facilities in good, usable condition. Maintenance tasks should be conducted more frequently for greenway facilities where use is the most concentrated. Methods such as trail use counts, sketch plan analysis methods for estimating demand, public survey results, and public meeting comments can be used to determine which areas are the most heavily used and may require the most maintenance attention. The frequency of required maintenance tasks should be established as new phases are implemented and should be reviewed and updated annually to reflect any changes in usage, safety issues, etc.

Task: Facility Maintenance

Basic housekeeping of greenway and trail facilities will ensure that the network is clean and functional and will also improve the life of each facility. Volunteer efforts should be utilized in the performance of this maintenance task.

- Sweeping
- Trash removal

Task: Vegetation Management

To maintain a high quality network, regular attention should be given to the surrounding landscape, both natural and man-made. This not only improves the aesthetic quality of the network but also improves the users' sense of safety as well.

- Tree and shrub trimming and pruning
- Mowing of vegetation
- Mulching and edging
- Invasive species control

Remedial Maintenance Defined

Remedial maintenance refers to correcting significant defects in the network, as well as repairing, replacing or restoring major components that have been destroyed, damaged, or significantly deteriorated from normal usage and old age. Some items ("minor repairs") may occur on a five to ten year cycle such as repainting, seal coating asphalt pavement or replacing signage. Major reconstruction items will occur over a longer period or after an event such as a flood. Examples of major reconstruction remedial maintenance include stabilization of a severely eroded hillside, repaving a trail surface or a street used for biking, or replacing a footbridge. Remedial maintenance should be part of a long-term capital improvement plan.

The following tasks should be performed on an as needed basis to keep network facilities in good, usable condition. The repair or replacement of existing facilities should be reflected in a projected budget for future maintenance costs.

Task: Facility Repair or Replacement

All facilities will require repair or replacement at one time or another. The time between observation and repair/replacement will depend on whether the needed repair is deemed a hazard, to what degree the needed repair will affect the safety of the user, and whether the needed repair can be performed by an in-house maintenance crew or if it is so extensive that the needed repair must be done by outside entities or replaced completely. Some repairs are minor, such as repainting or resurfacing and can be done in conjunction with other capital projects, such as repaving the adjacent street.

Table 1.

Routine Maintenance Activities - Paved Multi-Use Trail		
	Frequency	Recommendations
Facility Maintenance	Sweeping	2 times/year Paved facilities will be swept by machine or spot sweeping of bad areas will be swept by hand or with blowers. Some trails require a combination of methods.
	Trash removal	6 times/year This includes removing ground debris. Emptying trash containers is discussed in Table 2. Volunteers should be utilized for this task, such as Adopt-a-trail programs.
Vegetation Management	Tree and shrub trimming and pruning	Spring and fall and as needed such as after a storm to maintain 10' high (12' high for equestrian) and 12-14' wide clearance Tree and shrub trimming and pruning should be performed to the Town's specifications and should be scheduled according to species type. This service will be performed for the safety of trail users, to maintain safe use of all facilities without physical obstacles, such as low-hanging tree limbs, and visual obstructions, such as limited line of sight.
	Mowing of vegetation	30 times/year Vegetation along trail corridors should be mowed on a regularly scheduled basis.
	Edging	N/A Edging to prevent encroachment of grass vegetation on trail is recommended.
	Invasive species control	Once a year and as needed in problem areas Vegetation, weed, and pest management plans should be put into place to control invasive species, protect endangered plant and animal species, and preserve wetlands, riparian buffers, and other resources of special natural, cultural, or urban infrastructure value.

Table 2.

Remedial Maintenance Activities - Paved Multi-Use Trail		
	Frequency	Recommendations
Facility Repair or Replacement	Resurfacing	10-12 years Replace asphalt or concrete
	Drainage	As needed Regrade to prevent or eliminate low spots and drainage issues
	Structures	30 years or as needed Addition or repair of culverts, bridges, boardwalks, retaining walls, etc., to prevent or eliminate drainage/ erosion issues
	Rerouting	As needed Reroute trail, if necessary, to avoid environmentally sensitive or overused areas, safety issues, or construction projects
Seasonal Maintenance	Remove leaf litter	As needed Prioritize removal by the most heavily used facilities and geographic location. Limited development trails should be emphasized as natural environments and warnings should be posted that hazardous conditions may exist with the changing seasons.
	Remove snow and ice	As needed Prioritize removal by the most heavily used facilities and geographic location. Limited development trails should be emphasized as natural environments and warnings should be posted that hazardous conditions may exist with the changing seasons.
Habitat Enhancement	Vegetative Enhancements	As needed Plant vegetation, such as trees and shrubs to prevent erosion or introduce landscape features during installation of a trail

- Replenish gravel, mulch, or other materials
- Repaint/restripe/stain
- Repave/seal
- Replace asphalt or concrete
- Remove encroaching debris along paved trail/sidewalk edges
- Regrade to prevent or eliminate low spots and drainage issues
- Add culverts, bridges, boardwalks, retaining walls, etc., to prevent or eliminate drainage/erosion issues
- Reroute trail, if necessary, to avoid environmentally sensitive or overused areas and any safety issues

Task: Seasonal Maintenance

Seasonal tasks should be performed as needed. When conditions cannot be improved to provide for safe use, the facility should be closed to prevent the risk of injury to facility users. Designated maintenance crews will remove leaf debris, snow, and ice, etc. from all network facilities as soon as possible. Leaf debris is potentially hazardous when wet and special attention should be given to facilities with heavier usage. Ice control and removal of ice build-up is a continual factor because of the freeze-thaw cycle. Ice control is most important on grade changes and curves. Ice can be removed or gravel/ice melt applied. After the ice is gone, left-over gravel should be swept as soon as possible.

- Remove leaf litter from network facilities, via raking, blowing, mulching, etc. as needed to sustain the safe usability of all network facilities and prevent any storm water drainage and/or erosion issues
- Remove snow and ice from network facilities, via shoveling, picking, salt, sand, etc. as soon as possible after storm

Task: Habitat Enhancement and Control

Habitat enhancement and control can improve aesthetics, help prevent erosion, and provide for wildlife habitat. Habitat control involves mitigation of damage caused by wildlife.

- Plant vegetation, such as trees and shrubs
- Take preventative measures to protect landscape features from wildlife, such as installing fencing around sensitive or newly planted plant materials
- Apply herbicide to eliminate any problem plant species, such as poison ivy or kudzu, etc.
- Apply herbicide to maintain facility edges and prevent encroaching vegetation, such as along trails and sidewalks
- Deter interaction between facility users and facility inhabitants, such as feeding the wildlife, etc.

5. Administration Responsibilities

Operation Responsibilities by Department

For a successful greenway system to be developed it is critical for the players to understand their role in supporting and managing the system.

Role of the Town of Carrboro

The Bolin Creek Greenway will be developed and managed by the Town and its departments. Listed below are the key departments and organizations that will play a role in this implementation and management of the trail.

Role of the Planning Department

The Planning Department should provide support for the Bolin Creek Greenway Conceptual Master Plan and assistance with future implementation of the system. This can be accomplished by defining future phases within related planning efforts; utilizing the rezoning

process to encourage dedication of lands, and planning transportation improvements in coordination with greenways.

Role of Carrboro Recreation and Parks Department

The Carrboro Recreation and Parks Department will have a role in the design, management and maintenance of the greenway system. The Recreation and Parks Department will need to work closely with the Planning Department in the design development of greenways.

Role of Carrboro Greenways Commission

The Carrboro Greenways Commission makes recommendations to the Town Board of Aldermen about local greenway programs, policies and actions. The Commission was instrumental during the development of the Bolin Creek Conceptual Master Plan and should continue to work closely with the Town of Carrboro planning department and future consultants throughout design development.

Role of Public Utilities and Orange Water and Sewer Authority (OWASA)

Carrboro public utilities and OWASA are important players in the implementation strategy for the Bolin Creek Greenway. These entities manage utility systems, whose corridors offer enormous potential for shared use with greenway development objectives. For the expansion and development of new sanitary sewer lines, OWASA should consider the use of a joint-use easement document during right-of-way negotiations to acquire subsurface and surface rights from willing sellers. The Departments could function as greenway developers in partnership with the Recreation and Parks Department.

Role of Carrboro Police Department

The Carrboro Police Department should assist the Recreation and Parks Department with patrolling and law enforcement for the Bolin Creek Greenway lands and facilities.

Role of Private Sector

The private sector throughout Carrboro is the primary beneficiary of the Bolin Creek Greenway. As such, private organizations, businesses and individuals can and should play an important role in the development and management of the system. Private sector groups and businesses can sponsor implementation projects for open space and greenways as a partner of the Town. These groups can also help to maintain open space and greenway lands through cooperative management agreements with the Town.

Role of Local Businesses and Corporations

Carrboro businesses and corporations might choose to sponsor a segment of greenway for development or maintenance. Businesses and corporations can work with the Recreation and Parks Department to give money, materials, products and labor toward the development of a greenway facility. Businesses can also consider installing facilities, such as bike racks or lockers, benches, and signage that links their operations to the Bolin Creek Greenway.

Role of Civic Organizations

Local civic groups and organizations, including the Junior League, Boy Scouts and Girl Scouts, Women's Club, Chamber of Commerce, garden clubs, YMCA, Kiwanis and Rotary Clubs, to name a few, can be participants in the implementation of the Bolin Creek Greenway. These organizations can play a vital role in building sections of greenway trails, maintaining and managing greenway lands and facilities, and co-hosting events that raise money for the Bolin Creek Greenway.

There are many ways in which civic organizations can participate in the development of the Bolin Creek Greenway. The most appropriate involvement can be determined by matching the goals and objectives of each organization to the needs of the greenway program.

Role of Individual Citizens

Local residents who are interested in the development of the Bolin Creek Greenway can participate by agreeing to donate their time, labor, and expertise to the Recreation and Parks Department.

Residents might choose to partner with a friend or form a local neighborhood group that adopts a section of greenway for maintenance and management purposes. As an adopt-a-greenway organization, individuals might help pick-up trash, plant flowers and trees, care for newly planted vegetation and serve as additional “eyes and ears” for safety and security on greenway lands. All volunteer efforts would be recognized by the Recreation and Parks Department through a community-wide program.

References and Additional Resources

BARTC, 1998. “California’s Recreational Use Statute and Landowner Liability.” Bay Area Ridge Trail Council, San Francisco, CA.

BCEMC, 1997. “Community Trails Handbook.” Brandywine Conservancy Environmental Management Center. Chadds Ford, PA.

Drake, B. 1995. “Risk Management and Tort Liability.” Publication unknown.

Ferster, A. and M. Jones. 1996. “Addressing Liability to Rails with Trails.” Rails-to-Trails Conservancy, Washington, D.C.

Goldstein, D. 1997. The Recreation Use of Land and Water Act: Lory v. City of Philadelphia.” Duquesne Law Review, Vol. 35, Num. 3, Spring 1997.

Kozlowski, J. C. et al. “The Supply of Recreational Land and Landowner Liability: Recreational Use Statutes Revisited.”

LTA, 1991. “Land Trust Liability and Risk Management.” Exchange: Journal of the Land Trust Alliance. Vol. 10, No. 1.

Montange, C., 1989. “Preserving Abandoned Railroad Rights-of-Way for Public Use: A Legal Manual.” Rails-to-Trails Conservancy, Washington, D.C.

RTC, 1996. “Acquiring Rail Corridors: A How To Manual.” Edited by Jeff Allen and Tom Iurino, Rails-to-Trails Conservancy in Cooperation with the National Park Service. Washington, D.C.

RTC, 2000. “Rails-with-Trails: Design, Management, and Operating Characteristics of 61 Trails Along Active Rail Lines.” Rails-to-Trails Conservancy. Washington, D.C., 2000.

TCRP, 1998. “Strategies to Minimize Liability under Federal and State Environmental Laws.” Transit Cooperative Research Program, Legal Research Digest. Transportation Research Board, National Research Council, Washington, D.C.



Appendix D: Design Guidelines

Chapter Outline:

1. Overview
2. Trail Guidelines
3. Ancillary Facilities
4. Crossings and Intersections
5. Over Passes and Under Passes
6. Ancillary Trail Features
7. Trailheads
8. Public Art

1. Overview

This chapter provides guidelines to both public and private entities for the future development of various types of trails in Carrboro. The guidelines noted herein are based on the best practices in use throughout the United States, as well as accepted national standards for greenway facilities.

Guidelines for Best Management Practices

The guidelines should be used with the understanding that each trail project is unique and that design adjustments will be necessary in certain situations in order to achieve the best results. Each segment should be evaluated on a case-by-case basis, in consultation with local or state bicycle and pedestrian coordinators, a qualified engineer and a landscape architect. Should these national standards be revised in the future and result in discrepancies with this chapter, the national standards should prevail for all design decisions.

Facility design is a broad topic that covers many issues. This section provides guidelines for typical greenway facilities and is not a substitute for more thorough design and engineering work. For more in-depth information and design development standards, the following publications should be consulted:

- Greenways: A Guide to Planning, Design and Development. Island Press, 1993. Authors: Charles A. Flink and Robert Searns
- Trails for the Twenty-First Century. Island Press, 2nd ed. 2001. Authors: Charles A. Flink, Robert Searns, Kristine Olka
- Guide to the Development of Bicycle Facilities. American Association of State Highway Transportation Officials (AASHTO), 1999.
- Manual on Uniform Traffic Control Devices (MUTCD). U. S. Department of Transportation, Washington, DC, 2004.
- Universal Access to Outdoor Recreation: A Design Guide. PLAE, Inc., Berkeley, CA, 1993.
- North Carolina Bicycle Facilities Planning and Design Guidelines. NCDOT Office of Bicycle and Pedestrian Transportation, Raleigh, NC, 1994

Other useful web sites for information include:

- Rails-to-Trails Conservancy - www.railtrails.org (Note: the Trails and Greenways Clearinghouse is now a part of this website)
- National Park Service - www.nps.org
- U.S. Department of Transportation - www.walkinginfo.org and www.bicyclinginfo.org
- U.S. Department of Transportation - Federal Highway Administration - Bicycles and Pedestrian Program - www.fhwa.dot.gov/environment/bikeped/index.html
- Pedestrian and Bicycle Information Center - www.pedbikeinfo.org

ADA Requirements

The Americans with Disabilities Act requires that portions of Carrboro greenways be accessible to persons with varying motor skills and abilities. Perhaps the best way to comprehend the importance of ADA is to understand that most of us, at some time in our life, will experience a temporary disability which will affect the way in which we make use of outdoor resources. ADA benefits all Americans by making the outdoor environment more accessible.

Sustainable Design

The consultant recommends the use of recycled materials and products in the construction of trails and trail facilities. Recycled materials offer design versatility, often have a long life span, and require less long-term maintenance than similar products constructed from natural materials. Recycled plastic lumber and or concrete can be used for the construction of posts and poles, and recycled aluminum can be used for signs. Whenever possible, local materials should be used for construction.

Trail Details & Standards

The graphics on the following pages depict greenway trail details, on-road guidelines, and typical trail amenities. They are provided as examples only, and are not intended as substitutes for professional, site-specific design and engineering work.



2. Trail Construction Guidelines

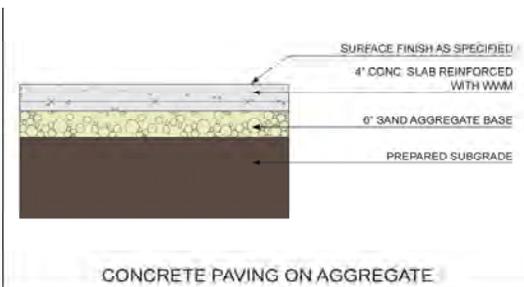
10' WIDE CONCRETE TRAIL

Purpose

This trail type is recommended for the majority of the trail corridor and accommodates multiple modes of travel along the trail within the floodplain.

Guidelines/Considerations

- Subject to infrequent, periodic flooding.
- Require paved surfaces of either asphalt or concrete depending on frequency of flooding and expected velocity of flow.
- Proper trail foundation (see detail) will increase the longevity of the trail.
- No soft shoulder should be constructed due to flood considerations.
- A vegetative buffer between the stream and trail should be left intact.



10' WIDE ASPHALT WITH RUBBERIZED LANE

Purpose

Due to the high cost of installation, this trail type is recommended for premier areas only.

Guidelines/Considerations

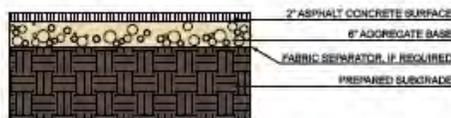
- Same installation as for 10' wide asphalt, except the edge of asphalt must be sawcut, the rubberized lane installed and the edge between the two surfaces sealed.



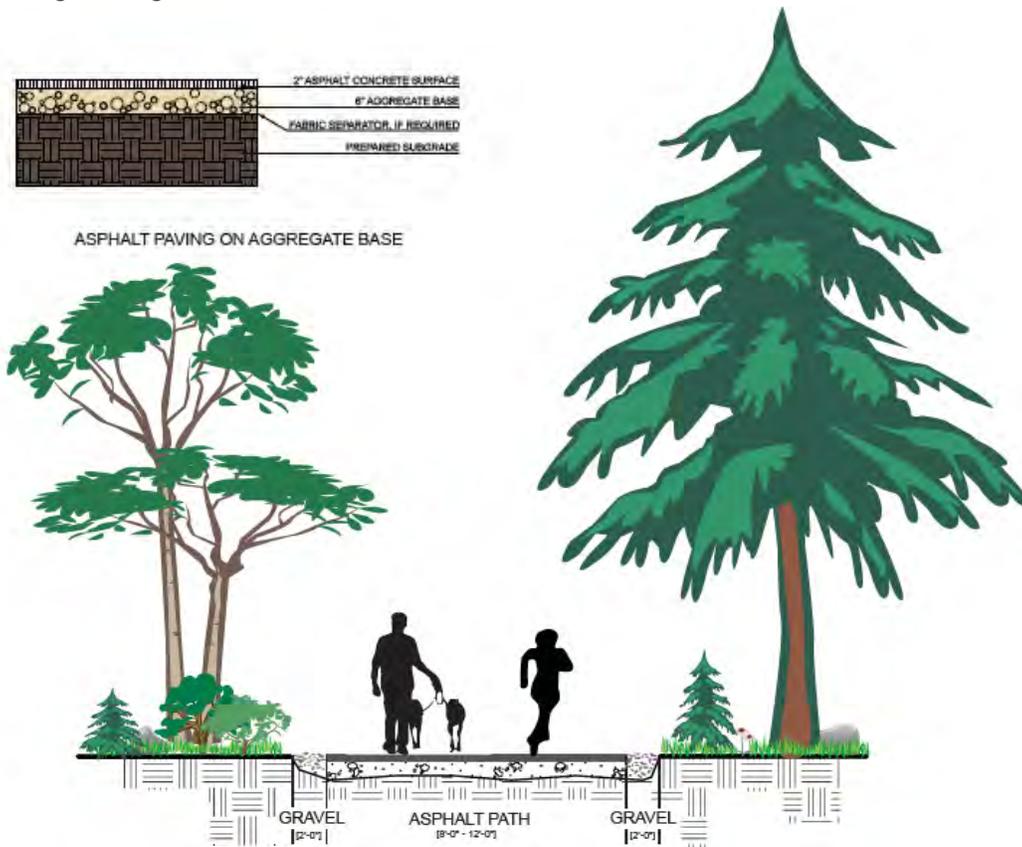
Asphalt trail with rubberized lane Greenville, SC.

10" WIDE TRAIL WITH GRAVEL SHOULDER

- Typically composed of asphalt or concrete, paved multi-use trails should be designed to withstand the loading requirements of occasional maintenance and emergency vehicles.
- In areas prone to frequent flooding, it is recommended that concrete be used for its excellent durability.
- As a flexible pavement, asphalt should be considered when installing a paved multi-use trail on slopes.
- A concern for the use of asphalt is the deterioration of trail edges. Installation of geotextile fabric beneath a layer of aggregate base course (ABC) can help to maintain the edge of the trail. It is also important to provide a 2 foot wide graded shoulder to prevent edges from crumbling.
- Most often, concrete is used for intensive urban applications. It is the strongest surface type and has the lowest maintenance requirement if it is installed properly.
- In floodplain areas, using a gravel shoulder can be a maintenance issue during flooding events. If a shoulder is used in the floodplain, the trail should be inspected after every flood event.
- Centerline stripes should be considered for trails that generate substantial amounts of traffic. Centerline stripes are particularly useful along curving sections of trail.



ASPHALT PAVING ON AGGREGATE BASE





Boardwalks with guardrail (above) and curb rail (below) can add interest to the greenway trail as well as span wetlands and low areas. (Photos courtesy of York Bridge Concepts).

3. Bridges and Boardwalks

BOARDWALK

Purpose

For use in areas with poor soils and wetland areas to reduce traffic impact to the wetland. Also used create a unique trail experience.

Guidelines/Considerations

- Boardwalks are typically located when crossing wetlands or poorly-drained areas.
- Boardwalk width will vary according to the connecting trail (see individual trail segments). A minimum width of 10' clear (inside of guardrails/curb rails) is recommended.
- Boardwalk shall be constructed of real wood or recycled plastic.
- Consult a structural engineer for wood member sizing and post footing design.
- A 6" curb rail is recommended, however, a 42" guardrail is required at locations where there is a 30" or greater difference in the boardwalk elevation and the ground elevation below. A 54" railing is recommended for bicycle trails.
- Additional seating and signage can be included into the design of a boardwalk for a specific overlook or wildlife viewing area.
- Permitting within wetlands and water crossings is a consideration.

LOW WATER BRIDGE

Purpose

Provides access to the user over certain natural (i.e. streams, rivers, creeks) features with the use of a low impact bridge.

Guidelines/Considerations

- Low water bridges are typically located when crossing wetlands or poorly-drained areas.
- Low water bridge width will vary according to the connecting trail see individual trail segments). A minimum width of 10' clear (inside of guardrails/ curb rails) is recommended.
- Consult a structural engineer for member sizing and post footing design.
- A 6" curb rail is recommended, however, a 42" guardrail is required at locations where there is a 30" or greater difference in the low water bridge elevation and the ground elevation below.
- Permitting within wetlands and water crossings is a consideration.



4. Crossings and intersections

NEIGHBORHOOD ENTRANCE TRAIL

Purpose

An access trail is developed in a residential area to link to a greenway.

Guidelines/Considerations

- Trail pavement shall be 8' wide to accommodate emergency and maintenance vehicles, meet ADA requirements and be considered suitable for multi-use.
- Trail widths should be designed to be less than 8' wide only when necessary to protect large mature native trees over 18" in caliper, wetlands or other ecologically sensitive areas.
- Trail pavement shall not encroach within the sideyard set back to a distance equal to the sideyard setback of the adjacent property.
- No access trail shall be less than 5' wide.
- Access trails should meander whenever possible.
- All landscape materials shall be installed during the appropriate planting season for the particular species.
- Other ornamental landscape shall be included at the street frontage of the access trail based upon input from the residents of the cul-de-sac. If the access is not in a cul-de-sac the adjacent property owners and property owners directly across from the access trail will be invited to provide landscape design input.
- Annuals may be provided when there is a commitment from at least 3 neighbors or a Home Owners Association to install and maintain these plants.
- Two sections of diamond rail fencing shall be included on each side of the trail near the street frontage. Diamond rail will not be included if the respective neighbor hood deeds and covenants do not permit it.



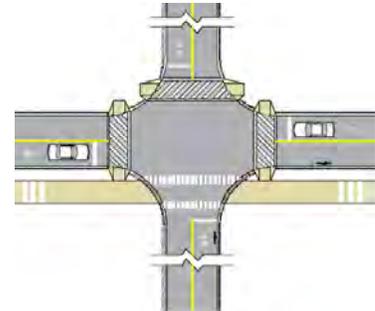
TRAIL INTERSECTIONS

Purpose

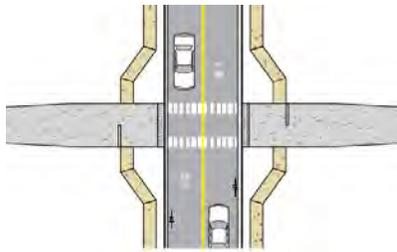
Provides safe and convenient cross to trail users

Guidelines/Considerations

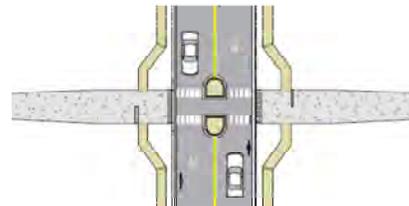
- Site the crossing area at a logical and visible location.
- Warn motorists of the upcoming trail crossing and trail users of the upcoming intersections.
- Maintain visibility between trail users and motorists.
- Intersection approaches should be made at relatively flat grades so that cyclists are not riding downhill into intersections.
- If the intersection is more than 75 feet from curb to curb, it is preferable to provide a center median refuge area



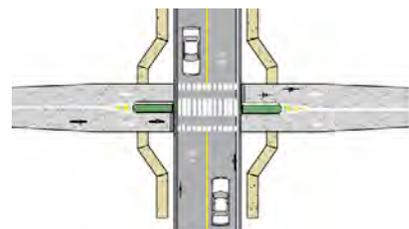
4-WAY INTERSECTION CROSSING
Shared Use Path



MID-BLOCK INTERSECTION
Shared Use Path with Sidewalks



MEDIAN REFUGE
Shared Use Path with Sidewalks



MIDBLOCK CROSSING
Shared Use Path with Sidewalks and Median

RAILROAD INTERSECTIONS

Purpose

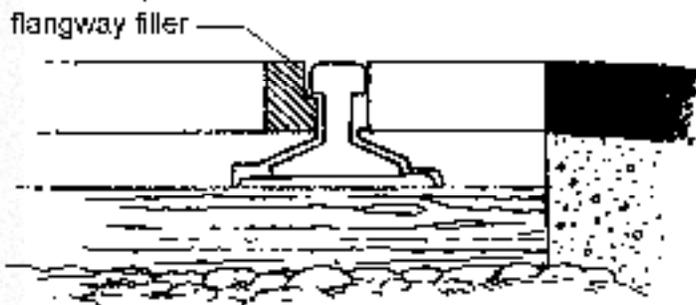
Provides safe and convenient mean for trail users to cross railroad corridors.

Guidelines/Considerations

- Make the Crossing Level: Raise approaches to the tracks and the area between the tracks to the level of the top of the rail.
- Bikes Should Cross RR at right angle
- When bikeways or roadways cross railroad tracks at grade, the roadway should ideally be at a right angle to the rails. When the angle of the roadway to the rails is increasingly severe, the approach recommended by Caltrans (Highway Design Manual, Section 1003.6) and AASHTO (Guide for the Development of Bicycle Facilities, 1999, p.60) is to widen the approach roadway shoulder or bicycle facility, allowing bicycles to cross the tracks at a right angle without veering into the path of passing motor vehicle traffic.
- Use Multiple Forms of Warning: Provide railroad crossing information in multiple formats, including signs, flashing lights, and audible sounds.
- Clear Debris Regularly: Perform regular maintenance to clear debris from shoulder areas at railroad crossings.
- Fill Flangeway with Rubberized Material or Concrete Slab: Normal use of rail facilities causes buckling of paved-and-timbered rail crossings. Pavement buckling can be reduced or eliminated by filling the flangeway with rubberized material, concrete slab, or other treatments. A beneficial effect of this is a decrease in long-term maintenance costs.



Railroad crossing signage.



The "flangeway filler" eliminates the gap in the path of travel for pedestrians crossing railroad tracks. The filler, consisting of a rubber insert, will deflect downward with the weight of a train and does not affect railway function.



Installing a rubber surface rather than asphalt around railroad flangeways reduces changes in level and other maintenance problems.

5. Trail Overpass and Underpasses

TRAIL OVERPASS

Purpose

Provides safe means for users to cross over vehicular thoroughfare

Guidelines/Considerations

- Safety should be the primary consideration in bridge/overpass design.
- Specific design and construction specifications will vary for each bridge and can be determined only after all site-specific criteria are known.
- Always consult a structural engineer before completing bridge design plans, before making alterations or additions to an existing bridge, and prior to installing a new bridge.
- A 'signature' bridge should be considered in areas of high visibility, such as over major roadways. While often more expensive, a more artistic overpass will draw more attention to the trail system in general, and could serve as a regional land mark.



TRAIL UNDERPASS

Purpose

Provides safe means for trail users to cross under roadway

Guidelines/Considerations

- Vertical clearance of the underpass should be at least 10-feet.
- Width of the underpass must be at least 12-feet
- Proper drainage must be established to avoid pooling of stormwater.
- Lighting is recommended for safety.



6. Ancillary Trail Features

TRAIL IDENTITY SIGNAGE

Purpose

To provide and reinforce a trail's identity

Guidelines/Considerations

- The logo should be simple, direct and easy to identify.
- A skilled graphic designer/sign consultant should be consulted when generating the design. It should be used as a consistent element throughout the length of the greenway and trails.



Trail logo examples.

INFORMATIVE SIGNS

Purpose

To inform trail users the rules of the trails and associated amenities and distances along the trail. These include regulatory and warning signs, maps and directional signs, mileage markers and location identities for emergency services.

Guidelines/Considerations

- Locate regulatory signs at trailheads, parking lots and public gathering spaces along the greenway.
- Locate warning signs appropriately at the specific hazards that they refer to such as at road crossings, steep terrain, trail narrowing and stop signs.
- Locate maps and directional signage at trailheads, public gathering spaces and key trail access points to help people entering the trail to determine their next destination and to identify their locations should they need emergency assistance.
- Locate specific identification signs at trailheads
- Locate mile markers 3' from the edge of the trail and at approximately one mile intervals beginning at the north and south ends of the trail system. (Note: Mile marker should be cumulatively labeled as follows: mile 1, mile 2, mile 3, etc so that each mile is unique for identification purposes).



Lake Brandt Marina map, Greensboro, NC



Trail mile marker examples.



Regulatory sign examples

INTERPRETIVE SIGNS

Purpose

To provide greenway and trail users with information about the Bolin Creek, wild-life, vegetation, history and significance of elements along the greenway.

Guidelines/Considerations

- There is a wide variety of interpretive signage styles and amount/type of information they can provide.
- Consider the character of the greenway trail and surrounding elements when designing these signs.
- A professional graphic designer/sign consultant should be consulted for sign design.
- Locate interpretive signage 3' from the edge of the trail.



Examples of interpretive signs - historical (left) and environmental education (right).

KIOSKS

Purpose

To provide visitors with information to orient themselves, learn of site opportunities, read the rules and regulations of the site, find the hours of operation and read about local events such as activities programmed for the greenway or seasonal festivals.

Guidelines/Considerations

- Install kiosks at each trailhead
- Kiosk design should be coordinated with the character of the entire greenway trail sign system.
- Keep the style of the kiosk simple and readily identifiable by trail users as an information contact station.
- Bulletin boards, regional trail maps, rules and regulations and accessibility advisories should be designed as part of the kiosk.

- When locating kiosks next to parking facilities, set the units back far enough from traffic and protect the support posts or structure with appropriately sized bollards.



Kiosks along a greenway in Maine (above) and Durham, NC (right) provide information for trail visitors.

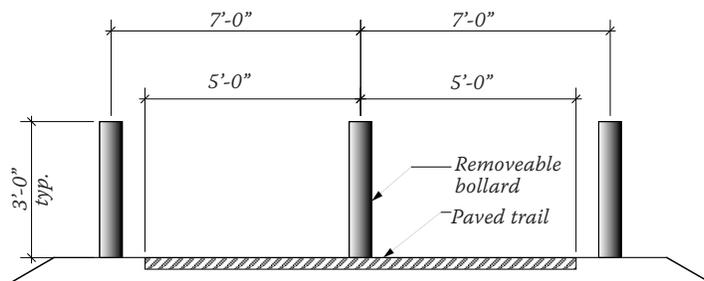
BOLLARDS (REMOVABLE AND PERMANENT)

Purpose

To increase trail safety by providing separation between motorized vehicles and trail users. Installing removable bollards allows emergency and maintenance vehicles to access the trail.

Guidelines/Considerations

- Coordinate bollard locations with street crossing and trail access points.
- Bollards are available in a variety of shapes, sizes and colors and come with a variety of features.



Typical bollard placement



Unlighted metal bollard by Fairweather



Lighted metal bollard by Selux

- Bollards are typically constructed of painted steel or aluminum. Some have halogen or metal halide lights in weather tight casings for pedestrian lighting.
- Bollards should be chosen according to the specific needs of the site and should be similar in style to the surrounding site furniture.
- Lighted bollards are intended to provide trail users with minimum levels of safety and security along the trails that are open after dark.

EMERGENCY PHONES

Purpose

To provide a means of contacting emergency personnel while using trail facilities and for convenience of trail users.

Guidelines/Considerations

- Locate emergency phones at all trail heads, major intersections, areas of potential conflict along the trail.
- Locate emergency phones approximately every 1/2 mile along the trail.
- When locating the emergency phones, provide reference information on the location, such as mile markers so that a caller can be located.
- Emergency phones have options for cellular and arrangements may be possible with local cell phone providers for reduced service fees.
- Emergency phones also have options for power. If phones are located in a remote area, it may be feasible to use solar power to avoid electric wiring installation and service costs.



"Wide-Area Emergency Broadcast"



Electric powered



Solar powered

SECURITY FENCING

Purpose

To provide a safe and secure boundary between the trail and adjacent property.

Guidelines/Considerations

- 12' height (typical)
- Chainlink or similar if there is a need to see through the fence. Otherwise, the fence can be a solid material such as wood.
- Fence posts should be driven to refusal or set in concrete depending on local codes.
- Consider gate locations per the adjacent property owner's needs.



Ornamental iron fencing by Long Fence.

PERIMETER/NON-SECURITY FENCING/BOUNDARY (LANDSCAPING)

Purpose

To decoratively define an edge or boundary to the greenway such as in a Natural Heritage Area or historical interpretive site.

Guidelines/Considerations

- There are many varieties of decorative fences, low walls and landscaping that can be used to define a boundary. When determining the appropriate edge treatment, consider the character of the specific site and surrounding design elements. Is the area more suburban or naturalized, in an open field or wooded area, along the river's edge or inland.
- A low wall can also serve as a seat wall if it is between 18" and 24" tall.



Welded wire fencing (an alternative to chain link) by APPS Inc.



Boundary fencing along the Levels Creek Greenway Mount Airy, NC.



LANDSCAPE SCREENING

Purpose

To provide visual screening between the trail and adjacent property.

Guidelines/Considerations

- Consider the dimensions of a mature plant when determining appropriate plant species and locations. A common mistake is to install plant material too close together and not allow adequate room for the plants to grow resulting in unhealthy plants that may need replacing.
- Determine the level of screening, i.e., total visual screen or merely filtering views.
- Try to utilize native, low maintenance plant material wherever possible.
- Consider temporary irrigation (drip irrigation or Tregator bags) to establish plants versus a traditional irrigation system.



LIGHTING

Purpose

Allows certain areas of the greenway trail to be used in the nighttime and provides safety for trail users.

Guidelines/Considerations

- There is a great variety of lighting fixtures available including solar light fixtures. Consider the character of the specific site to determine appropriate lighting fixtures. A lighting professional can also help in determining lighting options such as appropriate light level, sports lighting and security lighting.
- Locate lighting at the following locations at a minimum:
 - a. Trailheads and parking lots
 - b. Restroom facilities
 - c. Entrances and exits of bridges
 - d. Street crossings
 - e. Public gathering spaces along the greenway
- Design lighting levels appropriate to each situation.
- Avoid light fixtures at eye level that could impair visibility.
- Only use lighting along a trail if:
 - a. Night usage is desired



Solar lighting is an option for remote areas where utility connections are difficult. (Photos courtesy of Sonne by Se'lux).

b. It is acceptable to neighboring land uses

c. The area is not a wildlife area

PICNIC TABLES

Purpose

To provide places for trail users to congregate for meals or to just sit and relax.

Guidelines/Considerations

- Locate picnic tables far enough back from the trail to avoid interfering with circulation along the trail (min. 3')
- Wheelchair access should be possible at some picnic tables.
- Wheelchair-accessible tables should be connected to the trail by a firm surface path such as asphalt or concrete.
- Locate picnic tables in areas that provide interesting views, are close to an educational or historical trail element, shade or shelter from seasonal winds.
- Install (1) trash/recycle receptacle for every (1) picnic table.



Example of 8' side accessible picnic table manufactured by Pilot Rock.



Example of 8' universal accessible picnic table manufactured by Pilot Rock.



Bench placement along the Levels Creek Greenway Mount Airy, NC (top) and with interpretive signage in Greensboro, NC (above).



Welded wire Prestige Bench by Wabash Valley.

BENCHES

Purpose

To provide places to trail users to rest, congregate, or contemplate along trails and throughout the greenway. Benches can be designed to create identity in a place or along the greenway or be strictly utilitarian.

Guidelines/Considerations

- Locate benches (and other site furniture) a minimum of 3' from the edge of the trail.
- Locate benches at all trailheads, picnic areas and at regular intervals along the trail.
- Locate benches in areas that provide interesting views are close to an educational or historical trail element, shade or shelter from seasonal winds.
- Drainage should slope away from the bench and trail.
- Wheelchair access should be provided alongside benches with firm surface to match the trail.
- Locate benches a minimum of 4' from restrooms, phone booths and drinking fountains and a minimum of 2' from trash receptacles, light poles and sign posts.
- Benches should be securely anchored to the ground.
- Install one trash/recycle receptacle per every (2) benches.

BIKE RACKS

Purpose

To provide a safe place to secure bicycles while trail users may walk and explore destinations along the greenway.

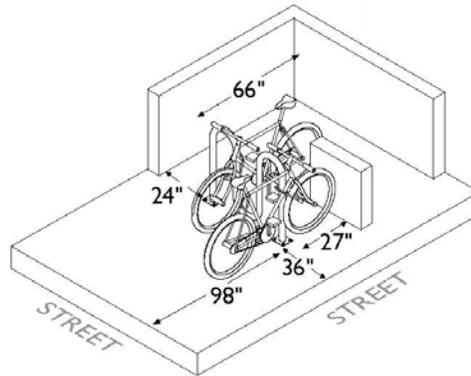
Guidelines/Considerations

- Install bicycle racks at trailheads, public gathering areas, public transit stations, picnic areas and periodically along the greenway.
- Bicycle racks should be installed in public areas within easy viewing distance from a main pedestrian walkway, but without interfering with pedestrians.
- Bicycle racks should be located within 50' of building entrances (where bicyclists would naturally transition into pedestrian mode).

- Bike Racks should be installed with 24" clearance from a parallel wall and 6' clearance from a vertical wall (see illustration).



"Rolling" bike rack manufactured by Dero.



Typical "rolling" bike rack dimensions and clearances (Details courtesy of Dero).

DRINKING FOUNTAINS

Purpose

To provide a more enjoyable greenway experience and to protect the health of two and four-legged trail users.

Guidelines/Considerations

- Locate drinking fountains at least 5' from trail edge.
- Locate drinking fountains near restrooms, at trailheads, parks and other public gathering places along the greenway trail.
- Standard, accessible and dog height bowls should be installed to accommodate all trail users.
- Drinking fountains should be placed on a well-drained surface (ie. 2% sloped concrete slab)
- Include hose bib connections for maintenance purposes.



Dual Barrier Free Fountain & Pet Fountain manufactured by Stern-Williams.



32-gallon recycled plastic trash receptacle by Belson Outdoors.

TRASH/RECYCLING RECEPTACLES

Purpose

To provide for proper maintenance and appearance of the greenway and trail system.

Guidelines/Considerations

- Locate receptacles at each trailhead and each seating area (1 per every 1 picnic table, 1 per every 2 benches).
- Placement of other receptacles will depend upon the location of concessions, facilities and areas of group activities.
- Receptacles should be selected using the following criteria:
 - a. Expected trash amount
 - b. Maintenance program requirements
 - c. Types of trail users
 - d. Durability
- Receptacles need to be accessible to maintenance personnel and trail users.
- Receptacles should be set back a minimum of 3' from the edge of the trail.
- Consider selecting trash receptacles that are made of recycled materials and that are appropriate for flood prone areas.



RESTROOMS

Purpose

Public sanitary facilities.

Guidelines/Considerations

- Local ordinance codes for health issues and accessibility.
- Locate restrooms at each trailhead.
- Restroom structures should be located adjacent to vehicular access points for security, maintenance, and access to utility hookups.
- Restrooms should also make use of natural light and ventilation as much as possible.



Composting restroom facilities are an option where connecting to utilities is difficult. (Photo courtesy of BioSun).

7. Trailhead and Support Facilities

TRAILHEADS

Purpose

Trailheads provide access for the surrounding community to the trail.

Guidelines/Considerations

- Locate trailheads near commercial developments and transportation nodes.
- Trailhead should be accessible to the surrounding communities.
- Trailhead facilities often include parking, water fountains, benches, bike racks, trash receptacles, information kiosk, emergency phones, shelters, and picnic areas
- Locate trailheads near commercial developments and transportation nodes.



8. Public Art

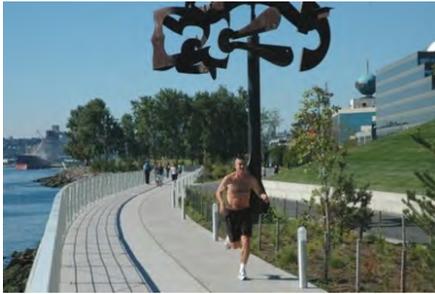
PUBLIC ART

Purpose

Public art engages community through artists' work creating a memorable experience to trail users.

Guidelines/Considerations

- Strengthen emotional connection between users and trail.
- Memorable installation may prove to be a valuable wayfinding tool.
- Public art can be a device used for telling a trail's history and provide a compelling and memorable story.





Appendix E: Land Acquisition

Chapter Outline:

1. Overview
2. Partnerships
3. Regulatory Methods
4. Land Management
5. Open Space Acquisition
6. Land Acquisition for the Bolin Creek and Jones Creek Corridors

1. Overview

There are multiple methods for the Town of Carrboro to secure trail right-of-way for the Bolin Creek Greenway. The recommended trail alignment traverses public land (easements, parks, and Town-owned parcels) wherever possible; however a majority of the corridor will require working closely with land owners to secure easements. Land acquisition and resource protection methods should be strategic, efficient, and respectful. The Town of Carrboro should work with non-profit land protection agencies, land trusts, or environmental organizations when attempting to acquire or manage property. These entities often have a great deal of experience selling the greenway benefits of conservation. Because these types of organizations do not have the power to tax, they often have excellent personal and professional relations with local landowners. Many options are available to obtain different degrees of control and ownership relationships to regulate resource use. The following is a list of potential tools that include developing partnerships, development regulations, land management techniques, and acquisition/donation.

2. Partnerships

Land trust organizations, such as the *Trust for Public Land* and *Conservation Trust for North Carolina*, are valuable partners when it comes to acquiring land and right-of-way for greenways. These groups work directly with landowners and conduct their business in private so that sensitive land transactions are handled in an appropriate manner. Once the transaction has occurred, the land trust will usually convey the acquired land or easement to a public agency, such as the Town of Carrboro or Orange County for permanent stewardship and/or ownership.

Private land manager relationships (including OWASA) are other potential partnerships that could be strengthened during the land acquisition process. Many utility companies have long recognized the value of partnering with local communities, non-profit organizations, and private land owners to permit their rights-of-way to be used for trail development. This has occurred all across the United States and throughout North Carolina. The Town of Carrboro should actively update and maintain relationships with OWASA, UNC, and other private land owners to ensure that the trail maintains continuity community-wide. The Town will need to demonstrate that maintenance and operations will be addressed, liability will be reduced and minimized, and utility needs access will be provided.

3. Regulatory Methods

This type of resource protection is used to shape the use and development of the land without transferring or selling the land. The rules for this type of tool are established and enforced by a governing body. Examples include:

Exactions

An exaction is a condition of development approval that requires development to provide or contribute to the financing of public facilities at their own expense. For example, a developer may be required to build a greenway on-site as a condition of developing a certain number

of units because the development will create the need for new parks or will harm existing parks due to overuse. This mechanism can be used to protect or preserve greenway lands, which are then donated to the City of Mount Holly. Consideration should be given to include greenway development in future exaction programs. Most commonly, exactions are in the form of mandatory dedications of lands for parks and infrastructure, fees in lieu of mandatory dedication, or impact fees.

Mandatory Dedication

This is a type of exaction where subdivision regulations require a developer to dedicate or donate improved land to the public interest. A dedication may involve the fee simple title to the land, an easement, or some other property interest. Sometimes, the construction of an improvement itself is required such as a park or greenway.

Fee-in-Lieu

An exaction can take the form of a fee-in-lieu of mandatory dedication. It can also complement negotiated dedications (described below). Based on the density of development, this program allows a developer the alternative of paying money for the development/protection of open space and greenways in lieu of dedicating greenway and park lands. Payments are made representing the value of the site or improvement that would have been dedicated or provided. This allows local governments to pool fees from various subdivisions to finance facilities like parks and greenways. This money can be used to implement greenway management programs or acquire additional open space.

Impact Fee

A final type of exaction, an impact fee can fund a broader range of facilities that serve the public interest. They are commonly imposed on a per unit rather than a build out basis, making them more flexible and keeping developers from having to pay large up front costs. These do not have to be directly tied to any requirements for improvements or dedications of land. They can be more easily applied to off-site improvements.

Growth Management Measures (Concurrency)

Concurrency-based development approaches to growth management simply limit development to areas with adequate public infrastructure. This helps regulate urban sprawl, provides for quality of life in new development, and can help protect open space. In the famous case with the Town of Ramapo (1972), the Town initiated a zoning ordinance making the issue of a development permit contingent on the presence of public facilities such as utilities and parks. This was upheld in Court and initiated a wave of slow-growth management programs nationwide. This type of growth management can take the form of an adequate public facilities ordinance.

Performance Zoning

Performance zoning is zoning based on standards that establish minimum requirements or maximum limits on the effects or characteristics of a use. This is often used for the mixing of different uses to minimize incompatibility and improve the quality of development. For example, how a commercial use is designed and functions determines whether it could be allowed next to a residential area or connected to a greenway.

Incentive Zoning (Dedication/Density Transfers) Also known as incentive zoning, this mechanism allows greenways to be dedicated for density transfers on development of a property. The potential for improving or subdividing part or all of a parcel can be expressed in dwelling unit equivalents or other measures of development density or intensity. Known as density transfers, these dwelling unit equivalents may be relocated to other portions of the same parcel or to contiguous land that is part of a common development plan. Dedicated density transfers can also be conveyed to subsequent holders if properly noted as transfer deeds.

Conservation Zoning

This mechanism recognizes the problem of reconciling different, potentially incompatible land uses by preserving natural areas, open spaces, waterways, and/or greenways that function as buffers or transition zones. It can also be called buffer or transition zoning. This type of zoning, for example, can protect waterways by creating buffer zones where no development can take place. Care must be taken to ensure that the use of this mechanism is reasonable and will not destroy the value of a property.

Overlay Zoning

An overlay zone and its regulations are established in addition to the zoning classification and regulations already in place. These are commonly used to protect natural or cultural features such as historic areas, unique terrain features, scenic vistas, agricultural areas, wetlands, stream corridors, and wildlife areas.

Negotiated Dedications

This type of mechanism allows municipalities to negotiate with landowners for certain parcels of land that are deemed beneficial to the protection and preservation of specific stream corridors. This type of mechanism can also be exercised through dedication of greenway lands when a parcel is subdivided. Such dedications would be proportionate to the relationship between the impact of the subdivision on community services and the percentage of land required for dedication-as defined by the US Supreme Court in *Dolan v Tigar*.

Reservation of Land

This type of mechanism does not involve any transfer of property rights but simply constitutes an obligation to keep property free from development for a stated period of time. Reservations are normally subject to a specified period of time, such as 6 or 12 months. At the end of this period, if an agreement has not already been reached to transfer certain property rights, the reservation expires.

4. Land Management

Management is a method of conserving the resources of a specific greenway parcel by an established set of policies called management plans for publicly owned greenway land or through easements with private property owners. Property owners who grant easements retain all rights to the property except those which have been described in the terms of the easement. The property owner is responsible for all taxes associated with the property, less the value of the easement granted. Easements are generally restricted to certain portions of the property, although in certain cases an easement can be applied to an entire parcel of land. Easements are transferable through title transactions, thus the easement remains in effect perpetually.

Management Plans

The purpose of a management plan is to establish legally binding contracts which define the specific use, treatment, and protection for publicly owned greenway lands. Management plans should identify valuable resources; determine compatible uses for the parcel; determine administrative needs of the parcel, such as maintenance, security, and funding requirements; and recommend short-term and long-term action plans for the treatment and protection of greenway lands.

Conservation Easement

This type of easement generally establishes permanent limits on the use and development of land to protect the natural resources of that land. When public access to the easement is desired, a clause defining the conditions of public access can be added to the terms of the easement. Dedicated conservation easements can qualify for both federal income tax deductions and state tax credits. Tax deductions are allowed by the Federal government for donations of certain conservation easements. The donation may reduce the donor's taxable income.

Preservation Easement

This type of easement is intended to protect the historical integrity of a structure or important elements in the landscape by sound management practices. When public access to the easement is desired, a clause defining the conditions of public access can be added to the terms of the easement. Preservation easements may qualify for the same federal income tax deductions and state tax credits as conservation easements.

Public Access Easements

This type of easement grants public access to a specific parcel of property when a conservation or preservation easement is not necessary. The conditions of use are defined in the terms of the public access easement.

5. Open Space Acquisition

Land acquisition is a method used to acquire property rights to protect resources or to allow access and free movement of users on a property. This type of method is permanent. Acquisition methods can be divided into two categories: 1) landowners retain ownership of the land and preserve a resource through an easement or other mutual agreement; or 2) land ownership and management is transferred or donated from a landowner to a conservation agency (local government, land trust, or other preservation organization). Examples include:

Donation or Tax Incentives

In this type of acquisition, a government body, public agency, or qualified conservation organization agrees to receive the full title or a conservation easement to a parcel of land at no cost or at a "bargain sale" rate. The donor is then eligible to receive a federal tax deduction of up to 30 to 50 percent of their adjusted gross income. Additionally, North Carolina offers a tax credit of up to 25 percent of the property's fair market value (up to \$5000). Any portion of the fair market value not used for tax credits may be deducted as a charitable contribution. Also, property owners may be able to avoid any inheritance taxes, capital gains taxes, and recurring property taxes.

Fee Simple Purchase

This is a common method of acquisition where a local government agency or private greenway manager purchases property outright. Fee simple ownership conveys full title to the land and the entire "bundle" of property rights including the right to possess land, to exclude others, to use land, and to alienate or sell land.

Easement Purchase

This type of acquisition is the fee simple purchase of an easement. Full title to the land is not purchased, only those rights granted in the easement agreement. Therefore the easement purchase price is less than the full title value.

Purchase / Lease Back

A local government agency or private greenway organization can purchase a piece of land and then lease it back to the seller for a specified period of time. This lease may contain restrictions regarding the development and use of the property.

Bargain Sale

A property owner can sell property at a price less than the appraised fair market value of the land. Sometimes the seller can derive the same benefits as if the property were donated. Bargain Sale is attractive to sellers when the seller wants cash for the property, the seller paid a low cash price and thus is not liable for high capital gains tax, and/or the seller has a fairly high current income and could benefit from the donation of the property as an income tax deduction.

Installment Sale

An installment sale is a sale of property at a gain where at least one payment is to be received after the tax year in which the sale occurs. These are valuable tools to help sellers defer capital gains tax. This provides a potentially attractive option when purchasing land for open space from a possible seller.

Option / First Right of Refusal

A local government agency or private organization establishes an agreement with a public agency or private property owner to provide the right of first refusal on a parcel of land that is scheduled to be sold. This form of agreement can be used in conjunction with other techniques, such as an easement to protect the land in the short-term. An option would provide the agency with sufficient time to obtain capital to purchase the property or successfully negotiate some other means of conserving the greenway resource.

Purchase of Development Rights

A voluntary purchase of development rights involves purchasing the development rights from a private property owner at a fair market value. The landowner retains all ownership rights under current use, but exchanges the rights to develop the property for cash payment.

Land Banking

Land banking involves land acquisition in advance of expanding urbanization. The price of an open space parcel prior to development pressures is more affordable to a jurisdiction seeking to preserve open space. A City or County might use this technique to develop a greenbelt or preserve key open space or agricultural tracts. The jurisdiction should have a definite public purpose for a land banking project.

Condemnation

The practice of condemning private land for use as a greenway is viewed as a last resort policy. Using condemnation to acquire property or property rights can be avoided if private and public support for the greenway program is present. Condemnation is seldom used for the purpose of dealing with an unwilling property owner. In most cases, condemnation has been exercised when there has been an absentee property ownership, when the title of the property is not clear, or when it becomes apparent that obtaining the consent for purchase would be difficult because there are numerous heirs located in other parts of the United States or different countries.

Eminent Domain

The right of exercising eminent domain should be done so with caution by the community and only if the following conditions exist: 1) the property is valued by the community as an environmentally sensitive parcel of land, significant natural resource, or critical parcel of land, and as such has been defined by the community as irreplaceable property; 2) written scientific justification for the community's claim about the property's value has been prepared and offered to the property owner; 3) all efforts to negotiate with the property owner for the management, regulation, and acquisition of the property have been exhausted and that the property owner has been given reasonable and fair offers of compensation and has rejected all offers; and 4) due to the ownership of the property, the timeframe for negotiating the acquisition of the property will be unreasonable, and in the interest of pursuing a cost effective method for acquiring the property, the community has deemed it necessary to exercise eminent domain.

6. Land Acquisition for the Bolin Creek and Jones Creek Corridors

When negotiating easements or property for trail development, corridor width may flex, depending on constraints. The ideal width for trail easements is 50 feet. This allows for comfortable trail construction, adequate space for maintenance, in addition to areas for water access and conservation. Where space is constricted, a 20-30 foot corridor may be used. For the purposes of the Bolin Creek Greenway, many OWASA sewer easements are 30 feet wide, which is appropriate for successful trail construction.