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Town of Chapel Hill

Hazard Mitigation Plan

May 7, 2002

A partnership with

State of North Carolina



Division of Emergency Management

Research Triangle Project Impact

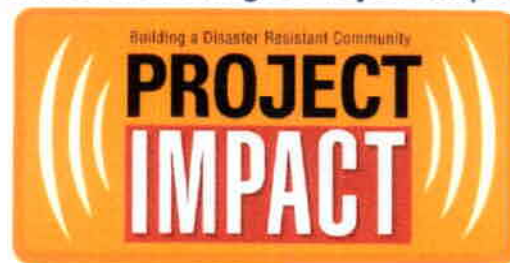


Table of Contents

Introduction	1
Objectives	3
Background	3
Hazard Identification and Analysis	6
Table 1: Hazard Identification and Analysis.....	7
Vulnerability Assessment	8
Table 2:Area Vulnerability for Chapel Hill	9
Table 3:Area Vulnerability for Bolin Creek.....	10
Table 4:Area Vulnerability for Booker Creek	11
Table 5:Area Vulnerability for Morgan Creek.....	12
Land Use and Floodplain Map, Bolin Creek	13
Land Use and Floodplain Map, Booker Creek	14
Land Use and Floodplain Map, Morgan Creek	15
Community Capability Assessment.....	16
Community Capability Assessment Tables	17
Goals.....	16
Goals Tables	24
Mitigation Strategy.....	26
Appendix: Critical Facilities	Appendix, page 1

I. Introduction

The Federal Emergency Management Agency (FEMA) defines hazard mitigation as “any sustained action taken to reduce long-term risk to human life and property from natural hazards.” In the short term, hazard mitigation makes communities safer places to live. Hapless, poorly planned development or a lack of disaster recovery resources can exacerbate a community’s susceptibility to natural hazards. In the long term, hazard mitigation is an essential part of creating a sustainable community, a place that meets the needs of the present without compromising the ability of future generations to meet their own needs. By having a hazard mitigation plan in place, we can save lives and properties, reduce our vulnerability to future hazards, speed recovery after events, and demonstrate our commitment to improving community health and safety (Keeping Natural Hazards from Becoming Natural Disasters, 1998).

Having a hazard mitigation plan in place is a prerequisite to receiving both state and federal disaster funding for our community. North Carolina requires local governments to have hazard mitigation plans. Senate Bill 300, passed by the North Carolina General Assembly in June 2001, requires that local governments have an approved hazard mitigation plan in place by August 1, 2002 in order to receive state disaster assistance funds. The federal Disaster Mitigation Act of 2000 also established a requirement that local governments must have an approved hazard mitigation plan in place in order to receive federal hazard mitigation funding.

This hazard mitigation plan is intended to meet the requirements of both the state and federal legislation. Creation of this plan was important not only to meet the minimum criteria, but to create effective strategies that will work toward reducing our vulnerability to natural hazards. Implementation of mitigation strategies delineated in this plan is dependent upon securing funding. Strategies are listed as suggestions so that we will be able to prioritize and be aware of our needs when funding opportunities become available. This plan will be revisited and reassessed as further hazard identification data becomes available.

General recommendations to town governments for the creation of hazard mitigation plans are made in two North Carolina Division of Emergency Management publications: "Local Hazard Mitigation Planning Manual" (1988) and "Keeping Natural Hazards from Becoming Natural Disasters" (1998). These documents describe a five-step process for hazard mitigation planning as follows:

1. **Identify and analyze each of the hazards possibly affecting the area.** This includes assessing the frequency of occurrence, extent of area impacted, and potential of exposure to hazards. Each hazard is then assigned a rated on its frequency, community impact, and exposure.
2. **Perform a vulnerability assessment.** During this phase the areas vulnerable to each kind of disaster are examined. An inventory of these areas is taken including number of residents, number and cost of residential buildings, number and cost of commercial buildings, number and cost of critical facilities¹, etc. Future development is estimated and the same assessment is completed. Vulnerable areas and critical structures are then mapped.
3. **Assess the community capability to manage and mitigate hazards.** This includes examining policies, programs, and ordinances that may affect vulnerability. Policies or programs that affect hazard mitigation are evaluated for their effectiveness.
4. **Research goals relevant to mitigation.** These can include community goals, state and federal mandates, and previously adopted local policies.
5. **Create a mitigation strategy.** This should include recommendations for new policies or changes to previously existing policies, how these proposals relate to the goals identified, and who has responsibility for carrying out each of these policies.

¹ Critical facilities are defined as those facilities critical to the safety of the community during a natural hazard. These include police stations, fire stations, and emergency shelters.

The following Hazard Mitigation Plan for the Town of Chapel Hill follows this format. Further guidance for the plan came from the Stafford Act, which requires the plan to include a “method of implementing, monitoring, evaluating and updating the mitigation plan.”

II. Objectives

The objectives of the Town of Chapel Hill’s Hazard Mitigation Plan are as follows:

- Reduce the risk to public health and safety from natural hazards.
- Meet State and Federal mandates in order to be eligible for disaster relief funds.
- Identify vulnerabilities to natural disasters.
- Review appropriate existing policies and regulations and suggest possible actions and changes that could be made to enhance mitigation capabilities.
- Identify existing community capabilities and goals relevant to mitigation.
- Suggest new mitigation strategies to incorporate as financial resources become available.

III. Background

Chapel Hill is a growing town of 46,798 people (2000 census), estimated to grow to 65,000 by 2020 (Chapel Hill Data Book, 2000). Chapel Hill is a diverse, vibrant, and prosperous community. Vulnerability to natural disasters is a fact of life in the Chapel Hill area, but with careful planning, we can reduce disastrous consequences and recover from events quickly and efficiently.

Chapel Hill contains a wealth of natural resources that add to the character of the community including: surface water (Bolin, Booker, Little, Morgan, and Dry Creeks) and their associated tributaries, lakes, and floodplains, erosion-prone soil types, steep slopes, wetlands, open space, and an expanse of greenways and forests. Protecting and understanding these resources and the function of their ecosystems are crucial to hazard mitigation planning. A hazard mitigation plan that takes environmental characteristics into consideration is necessary for timely and efficient handling of natural disasters.

Natural hazards that threaten the Chapel Hill area include hurricanes, severe winter storms, severe thunderstorms, tornados, drought, fire, and flooding. These events can cause loss of life, property damage, and tremendous economic disruption and inconvenience for Chapel Hill residents, businesses, and government services. Most natural hazard events in Chapel Hill result in flood damage or wind damage. These effects are the main focus of this hazard mitigation plan.

The Town of Chapel Hill has many hazard response programs and policies currently in place. These programs help us to respond quickly and effectively to natural hazards. Hazard response is not mitigation, however these programs do help to reduce the impact of natural hazards on the community. One such policy is the Major Emergency Disaster Operations Plan, approved in May 1997, and updated periodically. This plan maps out the Town's response to hazards ranging from severe storms to earthquakes. A system of emergency management command and control that is compatible with that of Orange County Emergency Management and the State of North Carolina is established in this Plan. The Town Public Works department has response plans for snow, ice, and debris removal that are flexible and can be easily adjusted to respond quickly and effectively to a snow, wind, or other storm event of any intensity or duration. There is no simple solution to mitigate these types of hazards, but these response plans help lessen their negative effects on the community.

The Town participates in the National Flood Insurance Program (NFIP). Local floodplain maps indicate to residents and business owners of their proximity to floodways and floodplains with 100 and 500 year recurrence intervals. However, these maps are twenty-five years old and are in need of being updated. A floodplain remapping project has begun and we anticipate limited data will be available by January 2003.

Hazard mitigation projects that specifically address flooding are underway in Chapel Hill. Projects include 1721 East Franklin Street and Eastgate Shopping Center. Another is a public Flood Mitigation Assistance (FMA) project in which three single-family homes on Dickerson Court were purchased by the

Town and demolished. A fourth house was purchased as well, although it was not under the FMA grant agreement. These houses are directly in the floodway and had suffered repetitive flood losses. The area will be restored into an extension of the Bolin Creek greenway. The following hazard mitigation plan will address structures like these found to be at the highest risk for flooding and other hazards. The structures will be considered for future mitigation floodproofing actions to prevent to future events from causing substantial damages.

The Town of Chapel Hill is active with Research Triangle Project Impact, a regional cooperative based on three principles: 1) preventive actions must be decided at the local level, 2) private sector participation is vital, and 3) long-term efforts and investments in prevention measures are essential. Through Project Impact, the Town is working to strengthen our region's awareness, mitigation, and response to natural hazards. There are also many opportunities for new local hazard mitigation programs and to coordinate efforts between local and regional governments and communities which will be discussed in the following plan.

IV. Hazard Identification and Analysis

Chapel Hill residents generally enjoy mild, variable weather. Average temperatures range from 88°F in summer to 25°F in winter. Annual rainfall averages 46" providing drinking water and flowing creeks, and providing for wooded neighborhoods and expansive green spaces. Though residents generally appreciate the variable climate, extremes in these weather patterns can create natural disasters.

Over the past ten years, Chapel Hill has experienced a number of natural disasters including Hurricane Fran (1996), the January 2000 winter storm, and the July 2000 flash flood. In 2000 alone, approximated fiscal damages from natural disasters in Chapel Hill totaled \$8,200,000-\$10,200,000 as a result of the January and July storms. In July 2000, heavy rains pelted Chapel Hill and the surrounding areas. Historically flood-prone areas as well as areas that had not been flooded since 1973 saw the devastating effects of the resulting floods. Damaged areas included but were not limited to:

- **Arlington Street:** Houses sustaining damage
- **Bolin Creek Greenway:** Asphalt damage, lost rip-rap along concrete section, shoulder damage, loss of sand in playground area.
- **Blacktie Drive:** House sustained damage.
- **Brigham Road:** Houses with water damage.
- **Brookwood Condos:** Automobile damage in parking lot.
- **Camelot Village:** All first floors flooded 2" to 14". Office and club house sustained damage.
- **Cleland Road:** OWASA pump station lost ability to function. Road closure.
- **Dickerson Court:** Houses sustaining damage.
- **Hickory Drive:** House sustained damage.
- **Isley Street:** House sustained damage.
- **Long Leaf Drive:** Multiple houses flooded and automobile damage.
- **Long Leaf Drive Community Swimming Pool:** Pool pump flooded.
- **North Lakeshore Bridge:** Severe damage on southeast corner, southwest corner, debris under bridge blocked 80% of flow area.
- **Old WCHL Basement:** Flooded with diesel from generator leaking.
- **Old Forest Circle:** House sustained damage.
- **Piney Mountain Road:** Part of road washed out; 60 feet of water main was exposed and unsupported. Structural support work and installation of water valve left 25 customers without water service early morning July 24th.

- **Pinehurst Drive:** House sustained damage.
- **Ridgefield Apartments:** Automobile damage in parking lot.
- **Rogerson Drive:** OWASA Pump Station failed.
- **Shepard Lane Condos:** All first floor apartments flooded with 2-3 feet of water.
- **Stateside Drive:** Shoulder erosion.
- **Umstead Park:** 1st bridge damaged, entrance gate damaged, fence damaged, playground base washed out.
- **Wesley Drive:** House sustained damage.
- **Whitehead Circle:** House sustained damage.
- **Eastgate Shopping Center:** Extensive water damage throughout center, actual damages exceeded \$8 million. Two diesel or fuel tanks (200-300 gallons) floated, spilled, and caused further damage in shopping center. Merchandise floated downstream creating extensive litter.

The following figures and tables further identify natural hazards in Chapel Hill. Table 1 summarizes hazard identification information. Frequency, community impact, and exposure ratings were developed as a part of the Town of Chapel Hill Disaster Operations Plan, approved May 1997 Operations Plan, approved in May 1997. The hazard index rating (one is lowest and five is highest) was calculated using the frequency, community impact, and exposure ratings.

Table 1: Hazard Identification and Analysis

Hazard	Frequency	Community Impact	Exposure	Hazard Index Low (1) to High (5) ²
Flooding	Moderate ¹	Isolated ¹	Medium ¹	3
Hurricane	Low ¹	Wide ¹	Medium ¹	3
Severe Thunderstorm	Moderate ¹	Wide ¹	High ¹	4.3
Tornado	Low ¹	Wide ¹	High ¹	3.7
Severe Winter Storm	Low ¹	Wide ¹	Medium ¹	3
Drought	Low	Limited	Medium	2

¹based on the Town of Chapel Hill Disaster Operations Plan of May 1997

²based on frequency, community impact, and exposure

V. Vulnerability Assessment

Table 2 describes the vulnerability to natural hazards in the Chapel Hill Urban Services Boundary. Tables 3, 4, and 5 list the same information for Bolin, Booker, and Morgan Creek's 100-year floodplains. Please note that because of the Resource Conservation District Ordinance, additional residences and businesses will not be constructed in these floodplains. Not Available (NA) ratings were given in the tables where the information cannot be determined through available data.

A list of all the critical and hazardous facilities in all of Chapel Hill can be found in Table A1 in the Appendix. Those located in floodplains are noted. The information in Table A1 was used in creating each of the following tables.

**Table 2:
Area vulnerability for hazard area location: Town of Chapel Hill Urban Services Boundary**

Developed Land (15,202.7 acres)				Undeveloped Land (1,602.3 acres)		
	Number of People ¹	Number of Buildings ²	Approximate Value (total property) ⁴	# of Future People ³	# of Future Buildings ⁵	Approximate Future Value ⁴ (total property, 2001 dollars)
Residential	48715	22244	\$5,605,488,000	4638	1546	\$389,595,000
Commercial		2224 ³	NA		190	NA
Public Buildings		7 ⁶	NA		NA	NA
Sewage Treatment Plant & Pump Stations		21 pumps, 5 water tanks, 2 treatment plants ⁶	NA		NA	NA
Hospital		3 main branches, 12-14 total	NA		NA	NA
Schools		14 ⁶	NA		NA	NA
Nursing and Retirement Homes		9 ⁶	NA		NA	NA
Day Care Centers		18 ⁶	NA		NA	NA
Police		1 ⁶	NA		NA	NA
Fire		5 ⁶	NA		NA	NA
Hazardous Facilities		13 ⁶	NA		NA	NA
UNC Properties		458	NA		NA	NA
		25028	\$5,605,488,000	4638	1736	\$389,595,000
			<u>Total Current + Future</u>	53353	26764	\$5,995,083,000

¹Chapel Hill Data Book (Feb. 2000). ²Based on current 2.19 population to house ratio.

³Based on current 10% land to commercial use ratio (Chapel Hill Data Book, Feb. 2000).

⁴Based on estimate of \$252,000 per building (Chapel Hill Data Book, Feb. 2000).

⁵Chamber of Commerce estimate. ⁶See Tables A1 and A2.

Table 3:
Area Vulnerability Assessment for Hazard Area Location: Bolin Creek 100 year Floodplain
 *Under the Resource Conservation District Ordinance, future development in categories listed in this worksheet in the 100 year floodplain of Bolin Creek is not permitted.

Current Development	Number of People ¹	Number of Buildings ²	Approximate Value
Residential	846	282	Land: \$49,927,757
			Structure: \$58,732,830
Commercial		37	Land: \$10,785,408
			Structure: \$23,102,393
Public Buildings		1 ⁶	NA
Sewage Treatment Plants & Pump Stations		2 ⁶	NA
Hospital		0	\$0
Schools		0	\$0
Nursing and Retirement Homes		0	\$0
Day Care Centers		0	\$0
Police		0	\$0
Fire		0	\$0
Hazardous Facilities		0	\$0
Total	846	322	\$142,548,388

¹Based on an estimation of three people per building. ²Based on 2001 tax roll information.

**Table 4:
Area Vulnerability Assessment for Hazard Area Location: Booker Creek 100 year
Floodplain**

*Under the Resource Conservation District Ordinance, future development in categories listed in this worksheet in the 100 year floodplain of Booker Creek is not permitted.

Current Development	Number of People ¹	Number of Buildings ²	Approximate Value
Residential	786	262	Land: \$25,458,334
			Structure: \$25,458,596
Commercial		52	Land: \$8,266,271
			Structure: \$15,182,354
Public Buildings		0	\$0
Sewage Treatment Plants & Pump Stations		0	\$0
Hospital		0	
Schools		0	\$0
Police		0	\$0
Fire		0	\$0
Hazardous Facilities		2 ³	NA
Total	786	314	\$74,365,555

¹Based on an estimation of three people per building. ²Based on 2001 tax roll information.

³See tables A1 and A2

**Table 5:
Area Vulnerability Assessment for Hazard Area Location:
Morgan Creek 100 year Floodplain**

*Under the Resource Conservation District Ordinance, future development in categories listed in this worksheet in the 100 year floodplain of Morgan Creek is not permitted.

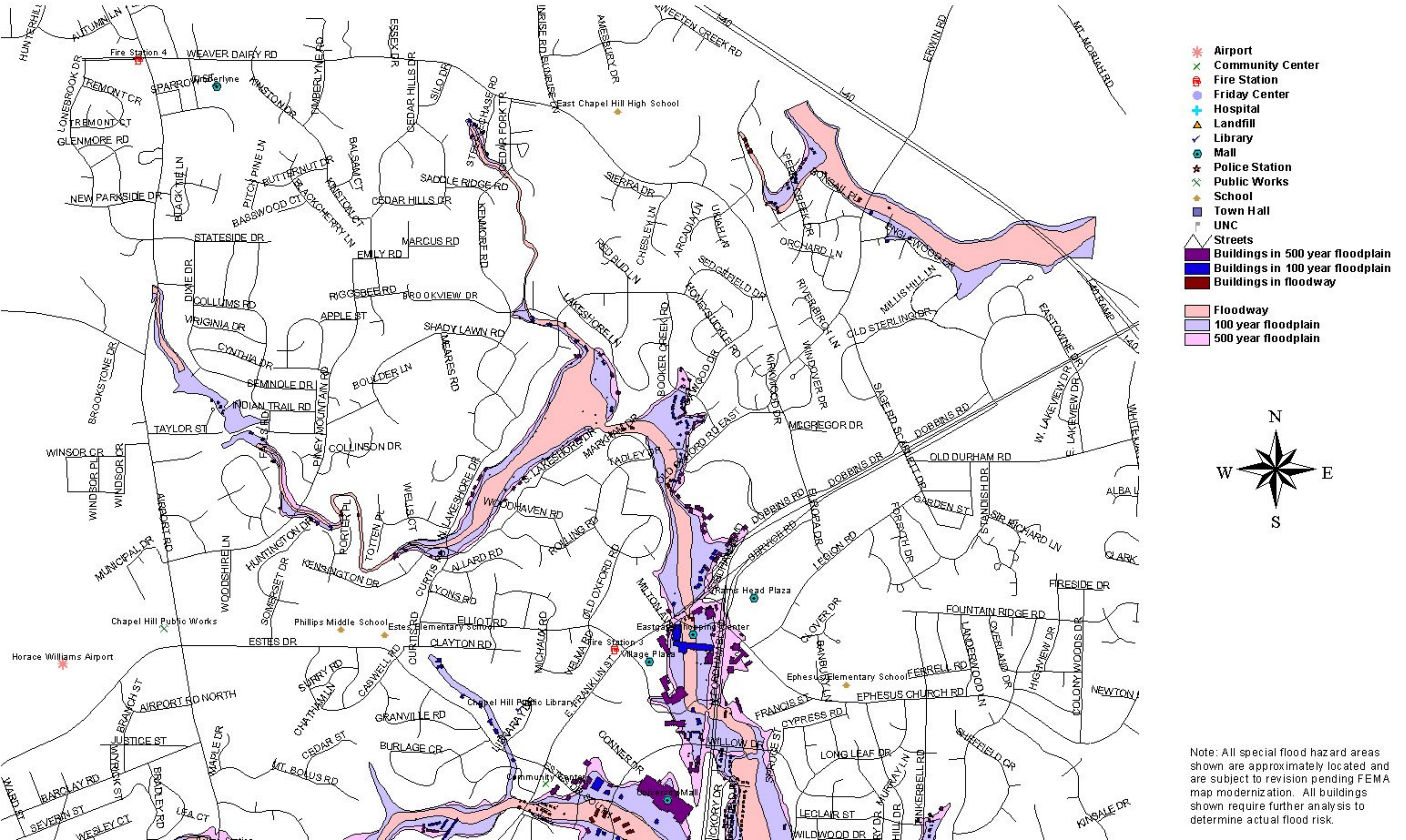
Current Development	Number of People¹	Number of Buildings²	Approximate Value (land/structure)
Residential	537	179	Land: \$20,456,028
			Structure: \$20,456,207
Commercial		0	Land: \$0
			Structure: \$0
Public Buildings		0	\$0
Sewage Treatment Plants & Pump Stations		0	\$0
Hospital		0	\$0
Schools		2 ³	NA
Nursing and Retirement Homes		1 ³	NA
Day Care Centers		0	\$0
Police		0	\$0
Fire		0	\$0
Hazardous Facilities		1 ³	NA
Total	537	183	\$44,912,235

¹Based on estimation of three people per building. ²Based on 2001 tax roll information.

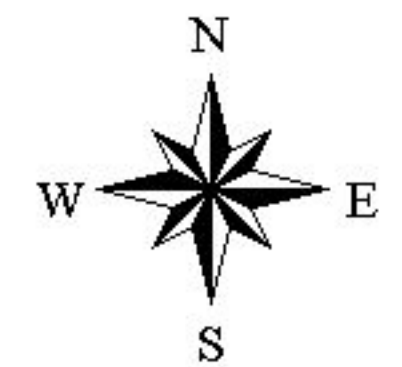
³See tables A1 and A2

Figures 1, 2, and 3 on pages 13-15 illustrate floodways and 100 and 500 year floodplains for Booker, Bolin, and Morgan Creeks. Building footprints that fall within these areas are noted. Critical Facilities and important buildings are also mapped. It is important to note that the floodplain and floodway maps are not extremely accurate; they should be updated as soon as possible.

Booker Creek Floodplains and Critical Facilities

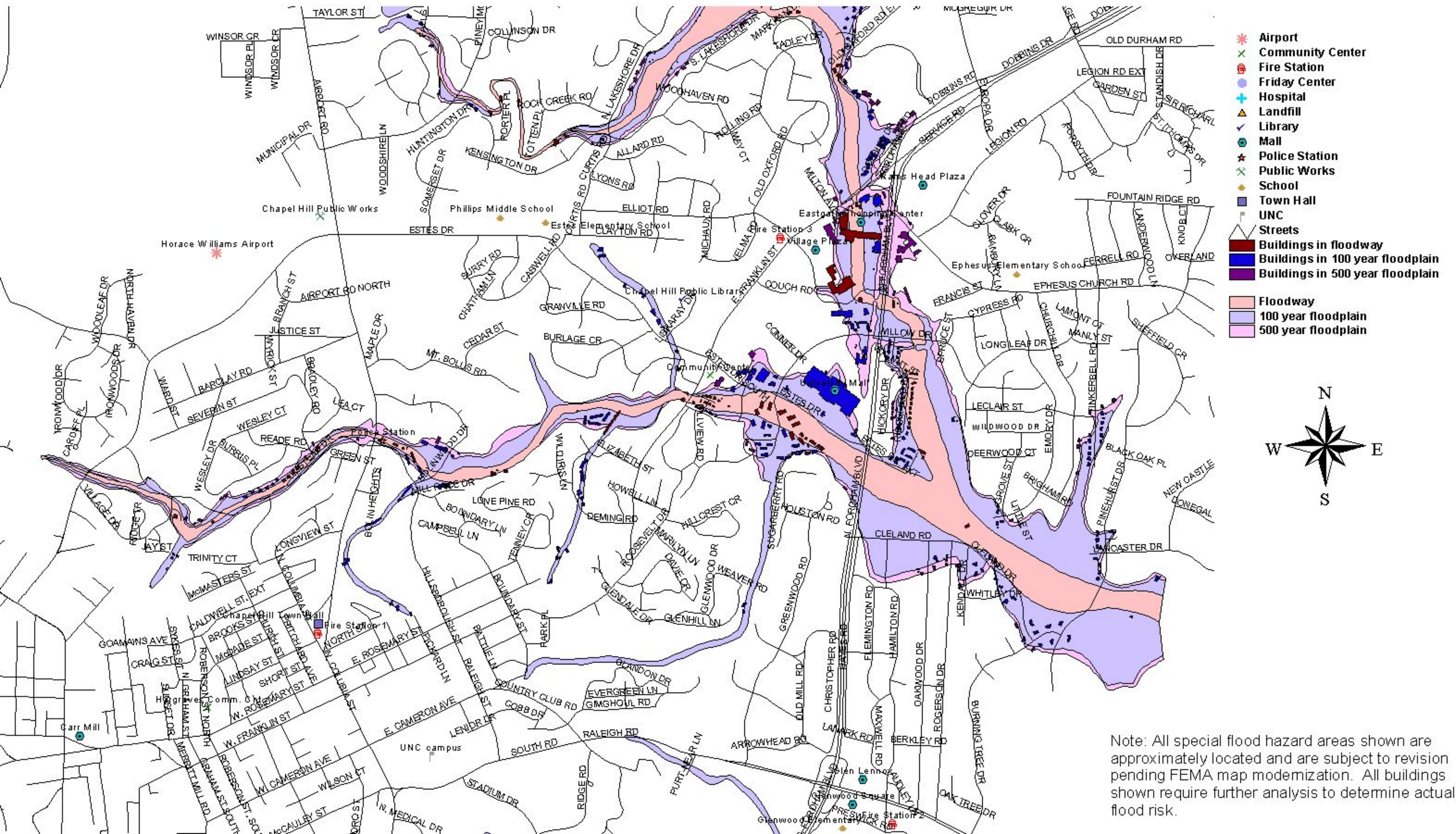


- ★ Airport
- × Community Center
- Fire Station
- Friday Center
- + Hospital
- ▲ Landfill
- ▼ Library
- ⊗ Mall
- ★ Police Station
- × Public Works
- ◆ School
- Town Hall
- UNC
- Streets
- Buildings in 500 year floodplain
- Buildings in 100 year floodplain
- Buildings in floodway
- Floodway
- 100 year floodplain
- 500 year floodplain



Note: All special flood hazard areas shown are approximately located and are subject to revision pending FEMA map modernization. All buildings shown require further analysis to determine actual flood risk.

Bolin Creek Floodplains and Critical Facilities



Note: All special flood hazard areas shown are approximately located and are subject to revision pending FEMA map modernization. All buildings shown require further analysis to determine actual flood risk.

VI. Community Capability Assessment

Chapel Hill's current capability to address the threats posed by natural hazards is described in Table 6 on pages 13- 18. This table lists existing policies and rates their effectiveness in mitigating natural hazards. We should assess our capabilities and work to modify them to create policies to maximize effectiveness in both hazard mitigation and in the original intent of the policy.

There are many examples of the Town's hazard mitigation capabilities. The Towns of Carrboro and Chapel Hill have formally entered into a partnership with the State Department of Emergency Management and FEMA called the Cooperating Technical Partnership. This partnership will increase cooperative efforts in flood hazard mitigation.

VII. Community Goals

Table 7 on pages 19-20 lists existing goals of Chapel Hill and describes their effectiveness for mitigation. Some goals were created with hazard mitigation in mind. Others can simply be used as mitigation tools in addition to their primary purpose. This table illustrates that although hazard mitigation planning, per se, is new in Chapel Hill, many of our existing goals parallel hazard mitigation initiatives. There are currently no known business-sponsored programs to address hazard readiness or response, and this should be pursued with local businesses, perhaps through the Chapel Hill-Carrboro Chamber of Commerce. Technology should be utilized to allow us to better prepare for natural hazards, for example, local floodplain maps must be updated to increase hazard awareness and more accurately map special flood hazard areas. They should then be made available through the Town's web page.

Table 6.
Community Capability Assessment

<u>Policies and Programs</u>	<u>Reference</u>	<u>Effectiveness for Mitigation</u>	<u>Specific Text Citation</u>
<p>Resource Conservation District (RCD)</p>	<p align="center"><u>Chapel Hill Development Ordinance (Article 5)</u></p>	<p align="center">High</p> <p>The RCD is established as a district that overlays other zoning districts established in Article 12 of the Development Ordinance and is primarily intended to reduce flood damage and maintain riparian buffers.</p>	<p>Entire document is useful for mitigation</p> <p align="center"><u>Section 5.1 -- Intent</u></p> <p>The Development Ordinance states that a purpose of the RCD is to minimize danger to lives and properties from flooding in and near the watercourses to preserve the water-carrying capacity of the watercourses</p> <p align="center"><u>Section 5.3 -- Establishment of Resource Conservation District</u></p> <p>The RCD is defined to be the elevation two feet above the 100-year floodplain elevation with a buffer zone 75 feet from the banks of perennial streams draining less than one square mile or 100 feet from the banks of perennial streams draining 1 mi² or more.</p> <p align="center"><u>Section 5.4.1 -- Development in RCD after March 19, 1984</u></p> <p>Development and land-disturbing activities within the RCD were prohibited after March 19, 1984 unless exempted by this Section, or permitted by § 5.5 or allowed pursuant to a variance authorized by this Article and approved by the Board of Adjustment.</p> <p align="center"><u>Section 5.5 -- Permitted Uses Within RCD</u></p> <p align="center"><u>Section 5.5.2 -- Intensity Regulations</u></p> <p>Establishment of impervious surface limits within the floodplain.</p> <p align="center"><u>Section 5.6 -- Standards for Development in RCD</u></p> <p align="center"><u>Section 5.8 -- Requirements for Development Applications</u></p>

Table 6. (continued)
Community Capability Assessment

<u>Policies and Programs</u>	<u>Reference</u>	<u>Effectiveness for Mitigation</u>	<u>Specific Text Citation</u>
<p align="center">UNC Stormwater Management</p>	<p align="center"><u>UNC Development Plan</u></p>	<p align="center">Low/Medium</p> <p>Individual zoning districts set varying standards for individual tracts of land. However, the University has committed itself to responsible stormwater management.</p>	<p>For each location where stormwater discharges from the campus property, the standards of no net increase in stormwater volume, runoff rate, or pollutant load will be applied at that location.</p> <p align="center"><u>Stormwater Management Techniques</u></p> <p>Porous paving systems, rain storage systems, vegetated roofing</p> <p align="center"><u>Stream Monitoring</u></p> <p>Three types of stream monitoring will be conducted on streams that may be impacted by main campus post-construction stormwater runoff.</p> <ol style="list-style-type: none"> 1. Hourly monitoring of Meeting of the Waters Creek 2. Quarterly visual monitoring at a Morgan Creek tributary 3. Quantitative benthic invertebrate sampling along various points along Meeting of the Waters Creek
<p align="center">Capital Improvements Fund Projects</p>	<p align="center">Capital Improvements Program (CIP) (2001-2016)</p>	<p align="center">Medium</p> <p>The CIP identifies capital needs and identifies funding sources for capital projects.</p>	<p align="center"><u>Infrastructure</u></p> <p>24. Replacement of Bolinwood Drive bridge over Bolin Creek, a part of the bridge replacement program. <i>Available funds --- limited to \$40,000 per year.</i></p> <p>29. Drainage assistance funding for projects which may be cost-shared with property owners. <i>Available funds -- ???</i></p> <p align="center"><u>Parks and Other Public Use Facilities</u></p> <p>45. Completion of various greenway projects based on the 1998 Greenways Master Plan following priorities set by the Council</p> <p align="center"><i>Available funds --- \$1,778,000 over 15 years</i></p>

Table 6. (continued)

Community Capability Assessment

<u>Policies and Programs</u>	<u>Reference</u>	<u>Effectiveness for Mitigation</u>	<u>Specific Text Citation</u>
<p>Capital Improvements Bond Projects</p>	<p>Capital Improvements Program (CIP) (2001-2016)</p>	<p>High The CIP identifies capital needs and identifies funding sources for capital projects.</p>	<p><u>Infrastructure</u></p> <p>4. Replacement of Lakeshore Drive bridge over Booker Creek Available funds (1996 Streets Bond) --- \$270,000 over 2001-2003</p> <p>7. Improvements to public drainage infrastructure Available funds (1996 Streets Bond) --- \$200,000 over 2001-2003 <u>Parks and Other Public Use Facilities</u></p> <p>13. Open space acquisition promoting non-automobile connectivity and/or preserving entrance way corridors, scenic vistas, environmentally sensitive Resource Conservation, community open space, and neighborhood open space. Negotiations are ongoing.</p>
<p>Tree Protection</p>	<p><u>Chapel Hill Development Ordinance (Article 11)</u></p>	<p>Medium The Town recognizes trees are a mechanism to control flooding and places strict regulations on tree removal at construction sites.</p>	<p>Trees and other landscape elements help to naturally control flooding.</p> <p><u>Section 11.1.2 (c) -- Finding</u></p> <p><u>Section 11.1.3 -- Purpose</u> soils in Chapel Hill.</p> <p>Regulate the protection and long-term management of trees, shrubs, and soils in Chapel Hill.</p> <p><u>Section 11.5.1 -- Permits Required</u></p> <p>It is unlawful to plant, prune, remove, apply chemicals or disturb any tree within the critical root zone. (Does not apply to single-family or two-family dwellings on individual lots less than 5 acres unless the trees are registered by the owner.) Additionally, clearing vegetation or removing soil on public land or easements owned or maintained by the Town of Chapel Hill is not permitted without approval from the Town Manager.</p>

Table 6. (continued)

Community Capability Assessment

<u>Policies and Programs</u>	<u>Reference</u>	<u>Effectiveness for Mitigation</u>	<u>Specific Text Citation</u>
<p>Zoning Districts</p>	<p><u>Chapel Hill Development Ordinance (Article 3)</u></p>	<p>Medium</p> <p>The zoning district section recognizes the RCD and WPD (see below) as overlay districts. Land use intensity restrictions are established for each zone in Articles 12 and 13 of the Development Ordinance.</p>	<p><u>Section 3.1 – Establishment of Zoning Districts</u></p> <p>The planning jurisdiction is divided into zoning districts. The use regulations and intensity regulations are laid out in Articles 12 and 13.</p> <p><u>Sections 3.1.1-3.1.11</u></p> <ol style="list-style-type: none"> 1. <i>Town Center Districts</i>, 2. <i>Community Commercial District</i>, 3. <i>Neighborhood Commercial District</i>, 4. <i>Office/Institutional District 3</i>, 5. <i>Office/Institutional District 2</i>, 6. <i>Office/Institutional District 7</i>, 7. <i>Industrial District</i>, 8. <i>Residential Districts</i>, 9. <i>Rural Transition Districts</i> 10. <i>Overlaying Districts</i>, 11. <i>Conditional Use Districts</i>
<p>Watershed Protection District (WPD)</p>	<p><u>Chapel Hill Development Ordinance (Article 10)</u></p>	<p>Medium</p> <p>The WPD is established as a district that overlays other zoning districts established in Article 12. The WPD is primarily intended to preserve water quality.</p>	<p>Intended to apply a part of the New Hope Watershed draining to Jordan Lake.</p> <p><u>Section 10.1 -- Intent</u></p> <p><u>Section 10.2 -- Establishment of Watershed Protection District</u></p> <p>The WPD is established for certain lands within the New Hope Watershed as a zoning overlay district. All development within the watershed will comply with article 12</p> <p><u>Sections 10.5-10.7</u></p> <p>In order to prevent excessive stormwater runoff from damaging water quality of reservoirs, it is desirable that as much runoff from hard surfaces as possible be absorbed into penetrable land areas. Low and high density development will comply with article 5 of the RCD concerning stream buffers.</p>

Table 6. (continued)

Community Capability Assessment

<u>Policies and Programs</u>	<u>Reference</u>	<u>Effectiveness for Mitigation</u>	<u>Specific Text Citation</u>
<p><u>Design Standards</u></p>	<p><u>Chapel Hill Development Ordinance (Article 14)</u></p>	<p>Medium Design standards provide guidelines for overall design safety. Stormwater requirements are mentioned.</p>	<p><u>Section 14.1: Intent</u> This article provides general performance standards to ensure development within Chapel Hill planning jurisdiction will be constructed in a safe, orderly, energy-efficient and visually harmonious fashion.</p> <p><u>Section 14.4: General Site Arrangement</u> Structures shall be placed and arranged so as not to affect adjacent property. These effects include, the removal of lateral support, the creation of hazard, nuisance, danger, inconvenience, loss of light, air, solar access, privacy or views.</p> <p><u>Section 14.7: Drainage and Storm Water Management</u> Natural drainage systems and storm water management installations shall be designed to extend the time of concentration of stormwater runoff.</p>
<p><u>National Flood Insurance Program</u></p>	<p>National Flood Insurance Act 1969</p>	<p>High NFIP recognizes and financially rewards actively mitigating communities.</p>	<p>The NFIP makes Federally-backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage. Further, buildings constructed in compliance with NFIP building standards suffer 77% less damage annually than those not built in compliance. And, every \$3 paid in flood insurance claims saves \$1 in disaster assistance payments.</p>

Table 6. (continued)
Community Capability Assessment

<u>Policies and Programs</u>	<u>Reference</u>	<u>Effectiveness for Mitigation</u>	<u>Specific Text Citation</u>
<u>Project Impact</u>		Medium Project Impact offers federal government partnership in mitigation planning.	<i>Project Impact</i> helps communities protect themselves from the devastating effects of natural disasters by taking actions that dramatically reduce disruption and loss. The incentive of <i>Project Impact</i> is clear: a disaster resistant community can rebound from a natural disaster with far less loss of property and a reduced cost for repairs. The Town is currently participating in a Partnership with Triangle J Council of Governments to carry out Research Triangle Project Impact.
<u>Hazard Mitigation Grant Assistance Program/ Flood Mitigation Assistance Program</u>	NFIP- Stafford Act- Disaster Mitigation Act 2000	Very High	The Town has received a Flood Mitigation Assistance grant to remove three houses from the Bolin Creek floodway. Additional projects such as this can prevent property damage and injury from predictable natural hazards.
<u>Cooperative technical Partnership between Chapel Hill, Carrboro NCDEM and FEMA</u>		Very High	Provides a mechanism for cooperative approaches to flood hazard mitigation.
<u>Flood Damage Prevention Ordinance</u>	Article IV Chapel Hill Code	Very High	Restricts or prohibits uses which are dangerous to health, safety, and property due to water or erosion or flood heights or velocities. Requires that uses vulnerable to floods to be protected against flood construction at the initial time of construction. Controls the alteration of natural floodplains, stream channels, And natural protective barriers, which are involved in the accommodation of Flood waters. Controls filling, grading, dredging, and other development which may increase erosion or flood damage. Prevents or regulates the construction of obstructions which will unnaturally divert flood waters or which may increase flood hazards to other lands.

Table 6. (continued)

Community Capability Assessment

<u>Policies and Programs</u>	<u>Reference</u>	<u>Effectiveness for Mitigation</u>	<u>Specific Text Citation</u>
<u>Amendment of official maps and profiles Ordinance</u>	Section 5-57: Chapel Hill Code	<u>High</u>	Any base flood elevation or location of special flood hazard may be amended when a flood control project has altered the flood hazard, or subsequent data indicates that the elevations or locations are no longer correct, or plans are submitted for a channel improvement or relocation that would alter the elevation or location.
<u>Soil Erosion and Sedimentation Control Division</u>	Section 5-73 Chapel Hill Code	<u>High</u>	This division has the purpose of regulating the clearing, grading, excavating, filling, and manipulation of the earth and the moving and storing of waters in order to: control and prevent accelerated soil erosion and sedimentation, prevent the pollution of water, prevent damage to property, maintain the balance of nature, prevent the obstruction of natural and artificial drainageways, and inhibit flooding and reduce the undermining of roads and other transportation features.
<u>Water Conservation Ordinance</u>	Article X. Chapel Hill Code	<u>High</u>	Mandatory conservation is required (and enforced by OWASA) during Stage 1 and 2 Water Shortages and Water Supply Emergencies.

Table 7.
Goals Assessment

<u>SOURCE</u>	<u>EXISTING GOAL STATEMENTS</u>	<u>EFFECTIVENESS FOR MITIGATION</u>
<u>Chapel Hill Comprehensive Plan</u>	The Comprehensive Plan presents guidelines for urban services and rural buffer zones, conservation of Chapel Hill's natural setting, and the establishment of greenways and bike trails.	The comprehensive plan outlines goals, objectives, and implementation strategies. This plan allows the town to make guidelines that best benefit Chapel Hill.
<u>Chapel Hill Comprehensive Plan</u>	Adopt a dedicated source of funding for stormwater management no later than 12/1/2004	This utility will finance and manage stormwater runoff, soil erosion, and sedimentation control in Chapel Hill. This will help mitigate flood problems caused by unmaintained or failing stormwater infrastructure.
<u>Chapel Hill Development Ordinance</u>	The purpose of the Development Ordinance is to protect the health safety and welfare of the town and its surrounding area. This is to be accomplished through zoning regulations and restrictions in Chapel Hill	The guidelines are clearly defined. However, there is concern with the RCD which permits streets "where there is a practical necessity." Some of the regulations may allow too much leeway. Still, town zoning sets very important standards and guidelines for future development. The revised Development Ordinance will address more stringent RCD and stormwater management guidelines.
<u>1998 Chapel Hill Greenways Comprehensive Master Plan</u>	The greenway plan provides a direction for the physical development of the greenway system.	The plan incorporates other ordinances such as the RCD into its future plans. The goals are realistic, realizing potential problems as well as making important recommendations pertaining to land acquisition. This plan provides the best alternative to conventional development.

Table 7. (continued)
Goals Assessment

SOURCE	EXISTING GOAL STATEMENTS	EFFECTIVENESS FOR MITIGATION
<p><u>UNC Development Plan</u></p>	<p>The University is committed to a development plan that prevents any increase in the volume of stormwater runoff leaving the campus, the rate at which runoff leaves the campus, or the pollutant load conveyed in that runoff.</p>	<p>The Town may rely on the University to maintain or decrease the amount of runoff in transition areas between Town property and University property. The Town may also analyze mitigation ideas used by the University plan (i.e. porous pavement installation, rainwater collection systems, vegetated roofing).</p>
<p><u>Capital Improvements Program (2001-2016)</u></p>	<p>The Capital Improvements Program (CIP) is a financial plan for the Town's major capital and infrastructure needs. The CIP identifies capital needs, establishes priorities, identifies potential funding sources and includes needs for which sources have not been identified.</p>	<p>The Town can use the CIP to identify specific funding amounts and sources for mitigation projects over the next 15 years (see Table 4 for individual funding sources.)</p>
<p><u>National Flood Insurance Program Grants (FEMA)</u></p>	<p>This program is an attempt to provide relief for flood victims by endorsing management that will increase the community's protection from flood damages.</p>	<p>Through this program, incentives and funding is available to the Town to protect itself from future flooding damages.</p>
<p><u>Project Impact</u></p>	<p>Project Impact seeks to assist communities in becoming disaster-resistant and thereby minimizing flood losses.</p>	<p>This funding could be very useful to reduce losses for the Town, but mitigation options will be approached from a regional perspective.</p>
<p><u>Community Rating System- National Flood Insurance Reform Act 1994</u></p>	<p>CRS is another government program that recognizes and rewards actively mitigating communities.</p>	<p>Under the CRS, flood insurance premium rates are adjusted to reflect reduced flood risk resulting from community activities that meet the goals of the CRS: (1) reduce flood losses; (2) facilitate Accurate insurance rating; and (3) promote the awareness of flood insurance.</p>

VIII. Mitigation Strategy

Some hazard mitigation strategies for the Town of Chapel Hill are currently ongoing, such as a Flood Mitigation Assistance grant for the acquisition of three repetitive loss structures on Dickerson Court, the Drainage Assistance program, the Capital Improvements Program, and the Storm Sewer Inventory. This plan makes the following recommendations for expanding and strengthening the Town's resilience to natural hazards:

Mitigation can be achieved by strengthening existing programs. These include:

- 1) The Town currently has a "Stormwater Maintenance Program" database underway that lists stormwater/flood problem areas in Chapel Hill. This database should be further developed and maintained with a ranking system to quickly and effectively prioritize capital improvements and drainage assistance projects to be completed as funding becomes available.
- 2) Develop a more comprehensive Stormwater Management Program by implementing Stormwater Utility to provide consistent and stable revenue for program enhancements.
- 3) Enhance the existing right-of-way drainage maintenance and drainage assistance programs with sufficient resources to plan and implement improvement activities on public and private property.
- 4) The developing Storm Sewer Inventory, which includes inlet and outlet locations and conditions, should be adequately completed and properly managed through a Geographic Information Systems (GIS) format. The inventory should be utilized to carry out an effective storm sewer maintenance program, and should be updated periodically. This program operates with limited resources.
- 5) At-risk repetitive loss commercial and residential structures have been preliminarily identified for possible future mitigation activities. This should database should be further established, managed, and maintained.

- 6) Further develop cooperative efforts between the Town of Chapel Hill and other local units of government including Triangle J Council of Governments, the Town of Carrboro, UNC-Chapel Hill, and Orange County in floodplain mapping and mitigation activities. Cooperative efforts would be effective for watershed-wide planning and research such as the currently developing Research Triangle Project Impact and the Cooperative Technical Partnership with Carrboro.
- 7) A database of granting sources, applications, and implementation programs should be actively maintained. This will facilitate applications for hazard mitigation funding and ensure that any monies received are used in the most efficient manner.
- 8) The Town of Chapel Hill requires new developments to install electric, cable, and telephone wires underground. In older neighborhoods, utilities are overhead and services fail when trees or limbs fall and break the lines. If mitigation funds were made available, it would be beneficial to relocate these utilities underground since the Town has experienced lengthy power outages during ice storms or major storm events such as Hurricane Fran. Retrofitting above ground utilities by placing them underground is beyond the financial means of the Town, but could be accomplished with resources from state or federal assistance.
- 9) Article 5 of the Development Ordinance (the Resource Conservation District Ordinance) provides substantial flood hazard mitigation. This ordinance is currently under revision, and changes that are made should take into account opportunities for flood mitigation.
- 10) The Town's Open Space and Greenways Programs target tracts of open lands for acquisition to maintain the property as open space. Much of this land is located within the special flood hazard area. Acquiring and demolishing repetitively flooded structures could increase Town open space and enhance these programs.

Mitigation can also be achieved by creating new programs. These should include:

- 1) Produce new National Flood Plain Insurance Program (NFIP) flood maps. These should be detailed flood studies that include all main stems and many tributaries experiencing development pressure, particularly in basins draining less than one square mile. (Detailed FEMA maps will include only subbasins of one square mile or more).
- 2) Applications for further Flood Mitigation Assistance funding should be completed to mitigate Chapel Hill's most flood-prone structures, in accordance with #5 under existing programs. Priorities should be based on repetitive loss, depth of flooding, and Town open space considerations.
- 3) Produce elevation certificates for the highest priority at-risk structures and consult with property owners and FEMA.
- 4) Establish a public education program that would involve the community in learning about their watershed and natural hazards. Topics of discussion could include: watershed water quality, pollution, urban watershed hydrology and function, and what they can do to help keep natural hazards from becoming natural disasters, such as floodproofing. The underlying principles of this program should be that the public will be more receptive to hazard mitigation if they better understand the natural systems that create these hazards.
- 5) A stormwater design manual to develop design standards for future development and to make modifications, repairs, or upgrades of existing stormwater infrastructure should be created.
- 6) Enhanced resources as necessary to efficiently carry out the multiple tasks described above.

Table A1. Critical Facilities

Type	Name	Address	Floodplain?
Gas Station	East Franklin Carcare Exxon	1710 East Franklin St.	NO
Gas Station	Glen Lennox Service Station	1200 Raleigh Rd.	NO
Gas Station	McFarlings Exxon	126 West Franklin St.	NO
Gas Station	Upchurchs Citgo	1744 North Fordham Blvd.	NO
Gas Station	Walkers BP Service	1500 East Franklin St.	NO
Gas Station	Wilco #1	1213 Airport Rd.	NO
Gas Station	Eastgate BP	15-501 Eastgate Shopping Center	YES, Booker Creek
Gas Station	Etna Self Serve	1509 East Franklin Street	NO
Gas Station	Oak Hollow Texaco	3233 NC Hwy. 54	NO
Gas Station	Eastgate Amoco	15-501 Eastgate Shopping Center	YES, Booker Creek
Hazardous Substances	UNC	Various locations, data on file	NO
Hazardous Substances	Mason Farm Wastewater Treatment Plant	20 Old Mason Farm	Yes, Morgan Creek
Water Tank	Manning Drive Tank	Manning Drive	NO
Water Tank	Hilltop Tank	450 Hilltop St.	NO
Water Tank	Carrboro Tank	Old Fayetteville Rd.	NO
Water Tank	Nunn Mountain Tanks (2)	609 Piney Mountain Rd.	NO
Wastewater Pump	Mason Farm/Morgan Creek	Mason Farm	NO
Wastewater Pump	Cane Creek Reservoir	Hwy. 54	NO
Wastewater Pump	Camden Place	1600 Homestead Rd.	NO
Wastewater Pump	Chapel Hill North	1800 Airport Rd.	NO
Wastewater Pump	Clayton Road	401 Clayton Rd.	NO
Wastewater Pump	Countryside	840 Kenmore Rd.	NO
Wastewater Pump	Finley Forest	206 Brookberry Circuit	NO
Wastewater Pump	Forest Creek	103 1/2 Nuttal Place	NO
Wastewater Pump	Lake Ellen	1208 Airport Rd.	NO
Wastewater Pump	Legion Road	10 Martin Luther King, Jr. St.	NO
Wastewater Pump	Lloyd Street	408 Lloyd St.	NO
Wastewater Pump	Manning Drive	701 Manning Dr. Apt. P	NO
Wastewater Pump	Meadowmont	4011 Barbee Chapel Rd.	NO
Wastewater Pump	North Forest Hill	303 1/2 Forbush Mtn. Dr.	NO
Wastewater Pump	North Lake Shore	2106 N. Lakeshore Dr.	NO
Wastewater Pump	Oaks I	995 1/2 Cleland Dr.	YES, Little Creek
Wastewater Pump	Oaks III	224 Lancaster Dr.	NO
Wastewater Pump	Patterson Place	417 Patterson Dr.	NO
Wastewater Pump	Rogerson Drive	791 Cleland Dr.	YES, Little Creek
Wastewater Pump	Sherwood Forest	7 Friar Lane.	NO
Wastewater Pump	Springcrest	341 Erwin Rd.	NO
Wastewater Pump	Starlite Drive	122 Starlite Dr.	NO
Wastewater Pump	Tinkerbell	1910 Ephesus Church Rd.	NO
Public Facility	Town Hall	306 N. Columbia St.	NO
Public Facility	Public Library	100 Library Dr.	NO

Type	Name	Address	Floodplain?
Shelter	Homeless Shelter	W. Rosemary St. and Airport Rd.	NO
Communications	Old Post Office/Court Building	Henderson and E. Franklin St.	NO
Communications	Post Office-Timberlyne Branch	Timberlyne Shopping Center	NO
Communications	Post Office-Estes Branch	Estes Dr.	YES, Bolin Creek
School	Ephesus Road Elem.	1495 Ephesus Church Rd.	NO
School	Estes Hills Elem.	500 N. Estes Dr.	NO
School	FP Graham Elem.	101 Smith Level Rd.	Yes, Morgan Creek
School	Glenwood Elem.	Prestwick Rd.	NO
School	Green Hill Academy	1001 S. Columbia St.	NO
School	McDougle Elem.	890 Old Fayetteville Rd.	NO
School	Scroggs Elem.	501 Kildaire Rd.	NO
School	Seawell Elem.	9115 Seawell School Rd.	NO
School	St. Thomas Moore Catholic School	920 Carmichael St.	NO
School	Culbreth M.S.	225 Culbreth Rd.	Yes, Morgan Creek
School	McDougle M.S.	900 Old Fayetteville Rd.	NO
School	Philips M.S.	Estes Dr.	NO
School	Chapel Hill H.S.	1709 High School Rd.	NO
School	East Chapel Hill H. S.	500 Weaver Dairy Rd.	NO
Hospitals	UNC Hospitals	Manning Dr.	NO
Fire and Rescue	Chapel Hill Fire Department, Station 1	302 N. Columbia St.	NO
Fire and Rescue	Fire Station 2	1003 S. Hamilton St.	NO
Fire and Rescue	Fire Station 3	1615 E. Franklin St.	NO
Fire and Rescue	Fire Station 4	1695 Airport Rd.	NO
Fire and Rescue	Fire Station 5	Hwy. 15-501 S.	NO
Police	Headquarters	828 Airport Rd.	NO
Day Care	Advent Lutheran Church and Montessori Preschool	230 Erwin Rd.	NO
Day Care	Artgarden Montessori Children's House	1603 E. Franklin St.	NO
Day Care	Binkley Preschool	1712 Willow Dr.	NO
Day Care	Carolina Friends Chapel Hill Early School	531 Raleigh Rd.	NO
Day Care	Chapel Hill Carrboro Head Start	116 S. Graham St.	NO
Day Care	Chapel Hill Co-operative Preschool	106 Purefoy Rd.	NO
Day Care	Children's Campus	110 Kingston Dr.	NO
Day Care	Cimmunity School for People Under Six	400 Caldwell St. Ext.	NO
Day Care	Doris Wilson Home Daycare	500 Church St.	NO
Day Care	Emerson Waldorf School	6211 New Jericho Rd.	NO
Day Care	Family Preschool	632 Laurel Hill Rd.	NO

Type	Name	Address	Floodplain?
Day Care	Head Start Program CHCCS	891 Willow Dr.	NO
Day Care	Kindercare Learning Centers	210 S. Elliot Rd.	NO
Day Care	The Language Center	1200 Mason Farm Rd.	NO
Day Care	Little People	1740 Smith Level Rd.	NO
Day Care	Montessori Day School	1165 Weaver Dairy Rd.	NO
Day Care	My Morning Out	209 East Franklin St.	NO
Day Care	Orange United Methodist School	1220 Airport Rd.	NO
Nursing Home	Britthaven of Chapel Hill	1716 Legion Rd.	NO
Nursing Home	Chapel Hill Rehabilitation and Healthcare	1602 East Franklin St.	NO
Retirement Home	Alterra Wynwood of Chapel Hill	2220 Farmington Dr.	NO
Retirement Home	Carol Wood Retirement Community	750 Weaver Dairy Rd.	NO
Retirement Home	Carolina House of Chapel Hill	100 Lanark Rd.	NO
Retirement Home	The Cedars of Chapel Hill	190 Finley Golf Course Rd.	NO
Retirement Home	Partners in Care	170 St. Andrews Ln.	NO
Retirement Home	Sheperd House	405 Smith Level Rd.	Yes, Morgan Creek